



GOLDONI S.p.A.
FABBRICA MACCHINE AGRICOLE

Star - 3000 Star



GOLDONI S.p.A. FABBRICA MACCHINE AGRICOLE

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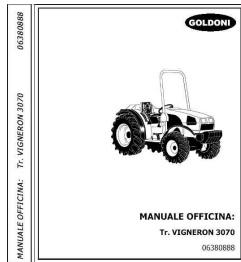
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Published by UFFICIO PROGETTI – 06380953 – 1st. Edition

INTRODUCTION



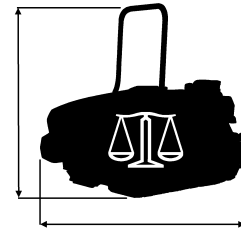
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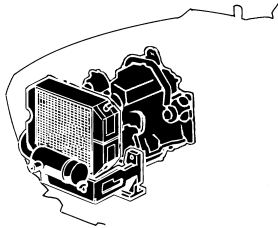
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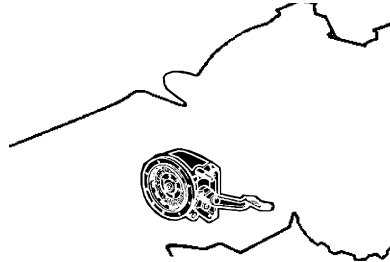
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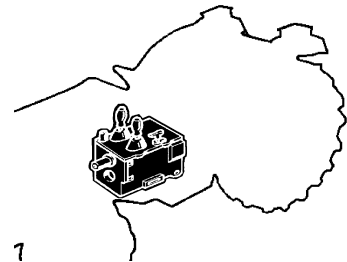
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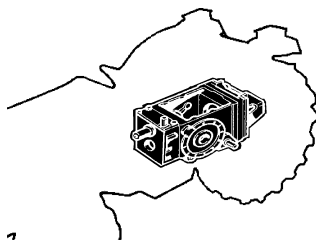
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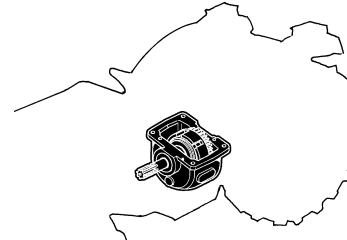
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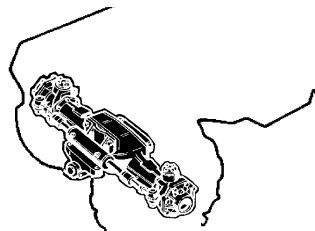
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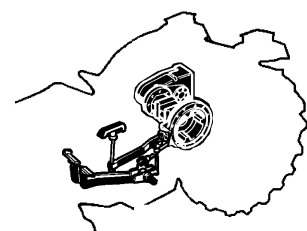
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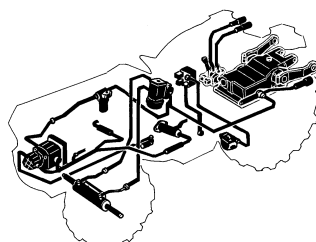
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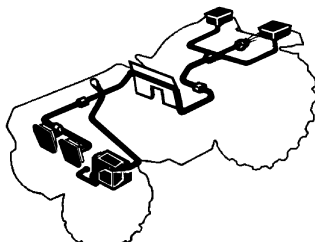
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SAFETY NOTES



Failure to comply with the safety instructions is the cause of the majority of accidents in workshops.

The machines are designed and built to make repairs and maintenance work easy. However, this is not enough to prevent accidents from happening.

Only a careful mechanic who complies with the following safety regulations is the best safeguard for both himself and others.

1. Carefully comply with the procedures described in the manual.
2. Proceed in the following way before carrying out maintenance work or repairs of any type:
 - Lower any implements to the ground.
 - Stop the engine and remove the key.
 - Disconnect the ground cable of the battery.
 - Affix a card to the steering position, prohibiting any controls to be used.
3. Make sure that all rotating parts on the machine (power take-offs, universal couplings, pulleys, etc.) are well protected.
4. Do not wear unbuttoned or loose objects and garments that could become caught up by moving parts of the machine.
Depending on the jobs required, wear approved safety clothing such as: a helmet, footwear, gloves, dungarees and protective goggles.
5. Do not work on the machine when persons are seated at the controls unless these persons are trained and are helping with the operations required.
6. Never inspect or work on a machine with the engine running unless specifically told to do so.
In this case, ask for help from an operator seated in the driving seat and who keeps the mechanic under visual control.
7. Never have the machine or implements connected operated from any position other than the driving one.
8. Before removing caps and covers, make sure that there are no objects in your pockets that could drop into open housings. The same care should also be taken of the tools used.
9. Do not smoke near inflammable liquids or products.
10. To deal with emergency cases, it is essential:
 - To keep an efficient extinguisher and a first-aid kit ready to hand.

- To keep the telephone numbers of the Hospital casualty department and fire-brigade near the telephone.
11. When the brakes are rendered inactive for maintenance requirements, the machine must be kept under control by means of adequate blocking systems.
 12. When towing, use the coupling points provided by the manufacturer and make sure that the towing attachments are correctly fixed.
Keep well away from bars or ropes when they pull tight for towing requirements.
 13. When a machine is being loaded on to a means of transport, take great care to ensure that the machine itself is securely fastened.
Loading and unloading operations must always be carried out with the transport means on flat ground.
 14. Use hoists or other equipment to lift or move heavy parts. Make sure that the lifting chains, ropes or belts used are efficient.
Have all bystanders move away from the area.
 15. For safety and toxicity reasons, never pour gasoline or diesel fuel in large, open vessels. Never use these products as detergents. Only use the proper non-inflammable and non-toxic products available on the market.
 16. Wear goggles with side guards when compressed air must be used to clean parts.
 17. Before starting an engine in a closed place, make sure that the gas exhaust device has been routed outdoors.
If this device is unavailable, make sure that the room is adequately and continuously ventilated.
 18. Operate with care and take all the necessary precautions when work must be carried underneath the machine outside the workshop. Choose flat ground, block the machine in an adequate way and wear protective garments.
 19. Oil stains and puddles of water must be cleaned from the work area.
 20. Do not throw rags dirtied with oil or grease into heaps as they could represent a fire hazard. These rags must be thrown into metal containers which must be kept tightly closed.
 21. Wear approved protective garments such as a helmet, goggles, gloves safety footwear and special dungarees when using grinders, lapping machines and similar.
 22. Wear approved protective garments such as a helmet, dark glasses, gloves, safety footwear, leg guards and special dungarees when carrying out welding work. If help from an assistant is required, he must also wear such garments.

23. Avoid creating (and therefore inhaling) dust when work is carried out on parts containing asbestos fiber.
The new technologies have allowed asbestos to be eliminated from almost all processes in which it was previously used, but the above mentioned precaution still remains valid since the parts the mechanic may encounter during work on the machines may have been produced prior to the new standards.
When working on such parts, avoid using compressed air and do not carry out brushing or grinding work. Always wear a protective mask on these jobs.
Any spare parts we send that contain asbestos fiber will bear the relative indication.
24. Unscrew the radiator plug very slowly to allow the pressure to be relieved from the system.
The expansion plug must also be treated with the same care and attention when installed.
25. Do not use flames or create sparks near the battery as this could lead to explosions. Do not smoke.
26. Never test the battery charge by making jumpers between the terminals with metal objects.
27. To prevent injuries from battery acid:
- Wear rubber gloves and protective goggles.
 - Top up in a well ventilated place and do not inhale the fumes as they are toxic.
 - Prevent the electrolyte from spilling or dripping.
 - Only charge batteries in a well ventilated place.
 - Do not charge frozen batteries as they can explode.
28. Fluid under pressure that leaks from a tiny hole can be almost invisible but have the force to penetrate under the skin, causing serious infection or dermatitis. Never use the hands to check for leaks from the circuit. Use a piece of cardboard or wood.
29. Check the pressure in hydraulic circuits with the proper instruments.

30. ***THE SAFETY STRUCTURES OF THE TRACTOR (FRONT AND REAR ROLL-BARS, PTO SHIELDS, NETS GUARDING THE SPINNING PARTS, SUPPORTS AND TOW HOOKS, SEAT, ETC.) HAVE BEEN SUBJECTED TO APPROVAL TESTS AND AS SUCH, HAVE BEEN CERTIFIED; THESE STRUCTURES MAY NOT BE MODIFIED OR USED FOR PURPOSES OTHER THAN THOSE ENVISAGED BY THE MANUFACTURER, AS SUCH ACTION COULD VOID THE RELATIVE APPROVAL.***

MACHINE IDENTIFICATION



Fig. 1

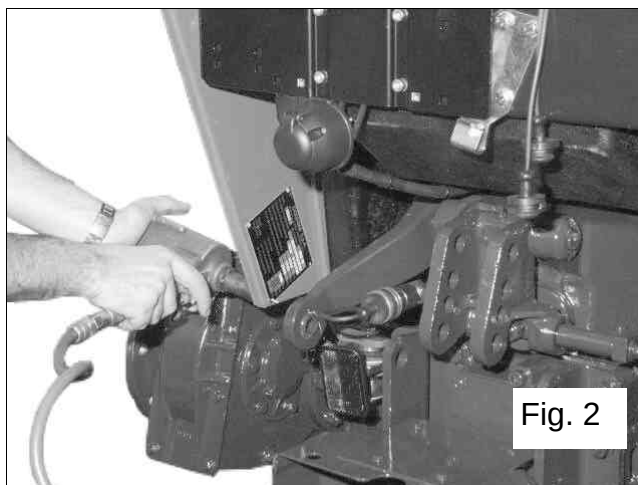


Fig. 2



Fig. 3

State the machine identification data each time you need to contact our assistance service for technical explanations or if spare parts are required. These data are:

1. Type and model of the machine.
2. Chassis and serial number.

The type of machine, serial and chassis numbers are to be found on the identification tag (fig. 1), attached to all machines, or are stamped on the metal data plate (fig. 2), affixed to the machine in an easily accessible place.

The chassis number is also stamped on the actual chassis itself, as shown in fig. 3. Consult the manuals supplied by the respective manufacturers for the engine ratings.

UPDATES

Future updates of the manual will be made by reprinting the sections describing the assemblies or parts of them involved in the modifications or additions, which will then be sent to your offices.

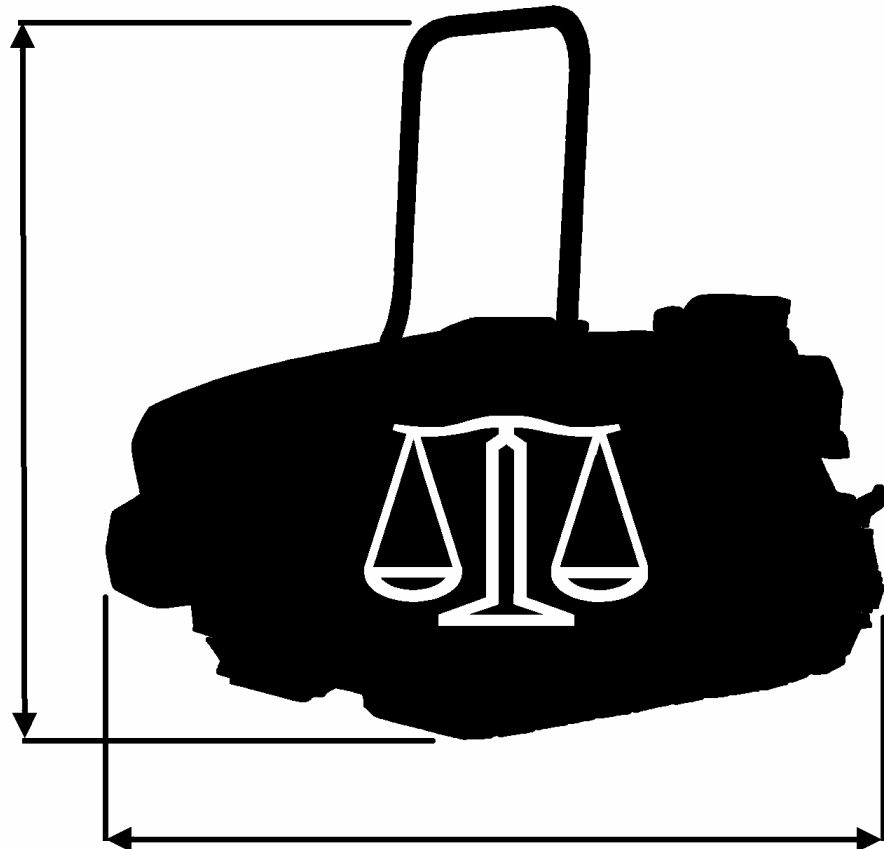
You shall then update the manual by substituting the modified parts.

The modified parts can be discarded since the updates will illustrate the operations required prior to and after the modification plus the work needed if conversion is obligatory.

WARNINGS

The words "*right*", "*left*", "*front*" and "*rear*" used in the descriptions of the interventions refer to the direction in which the machine or implements are driven.

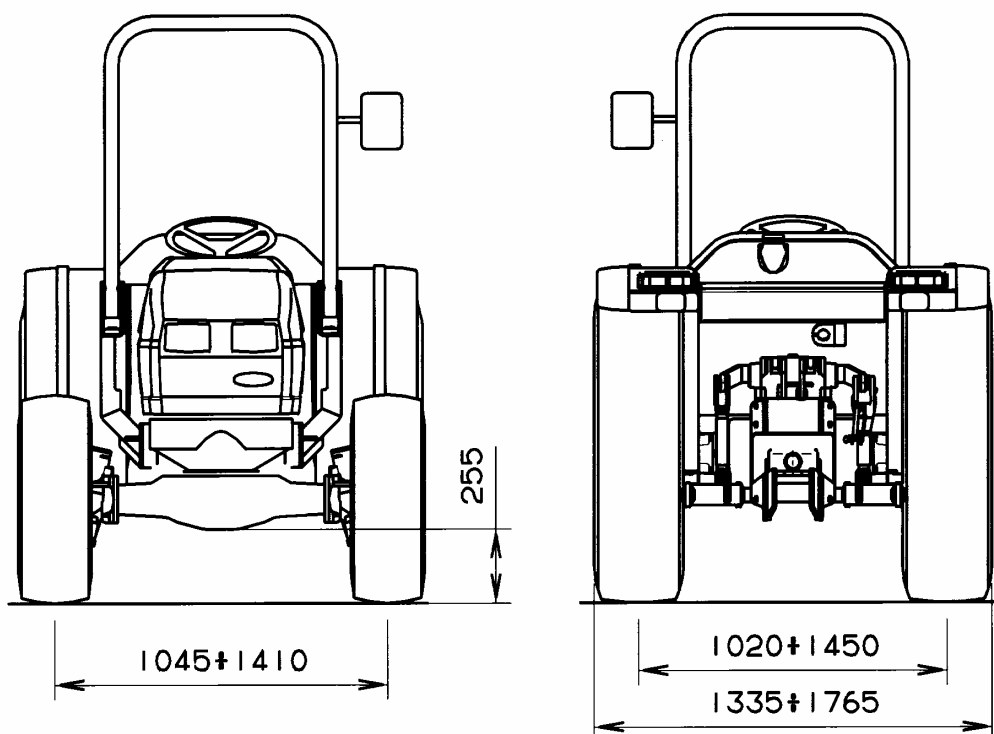
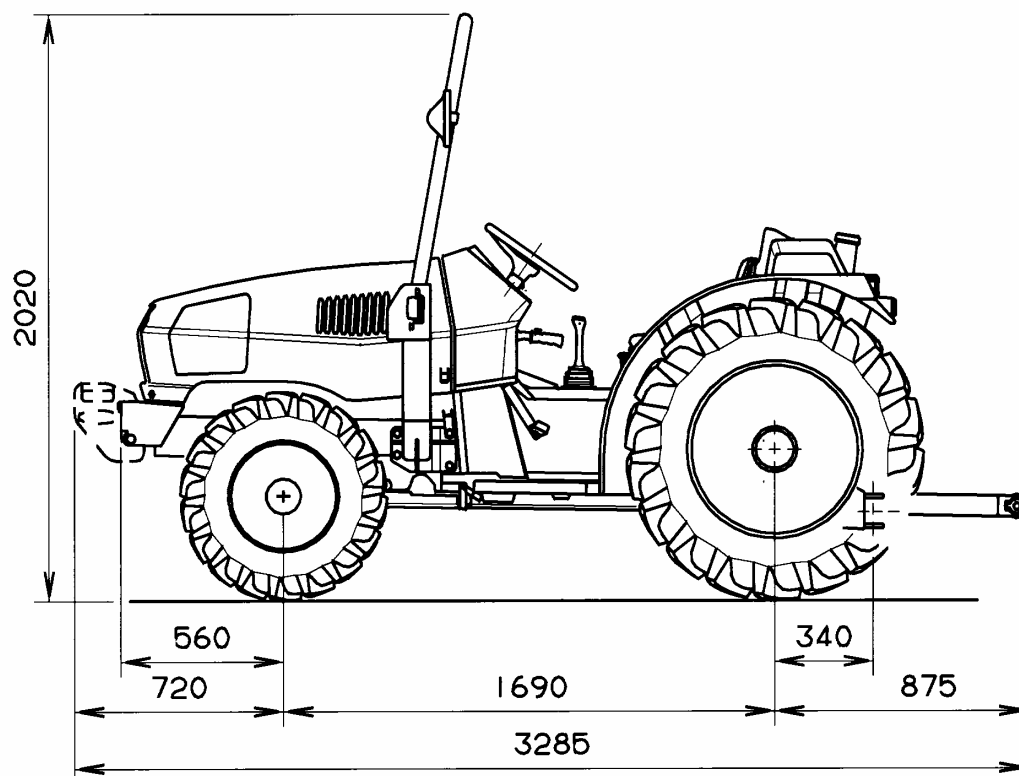
DIMENSIONS, TRACK WIDTHS SPEEDS, WEIGHTS



Star - 3000 Star

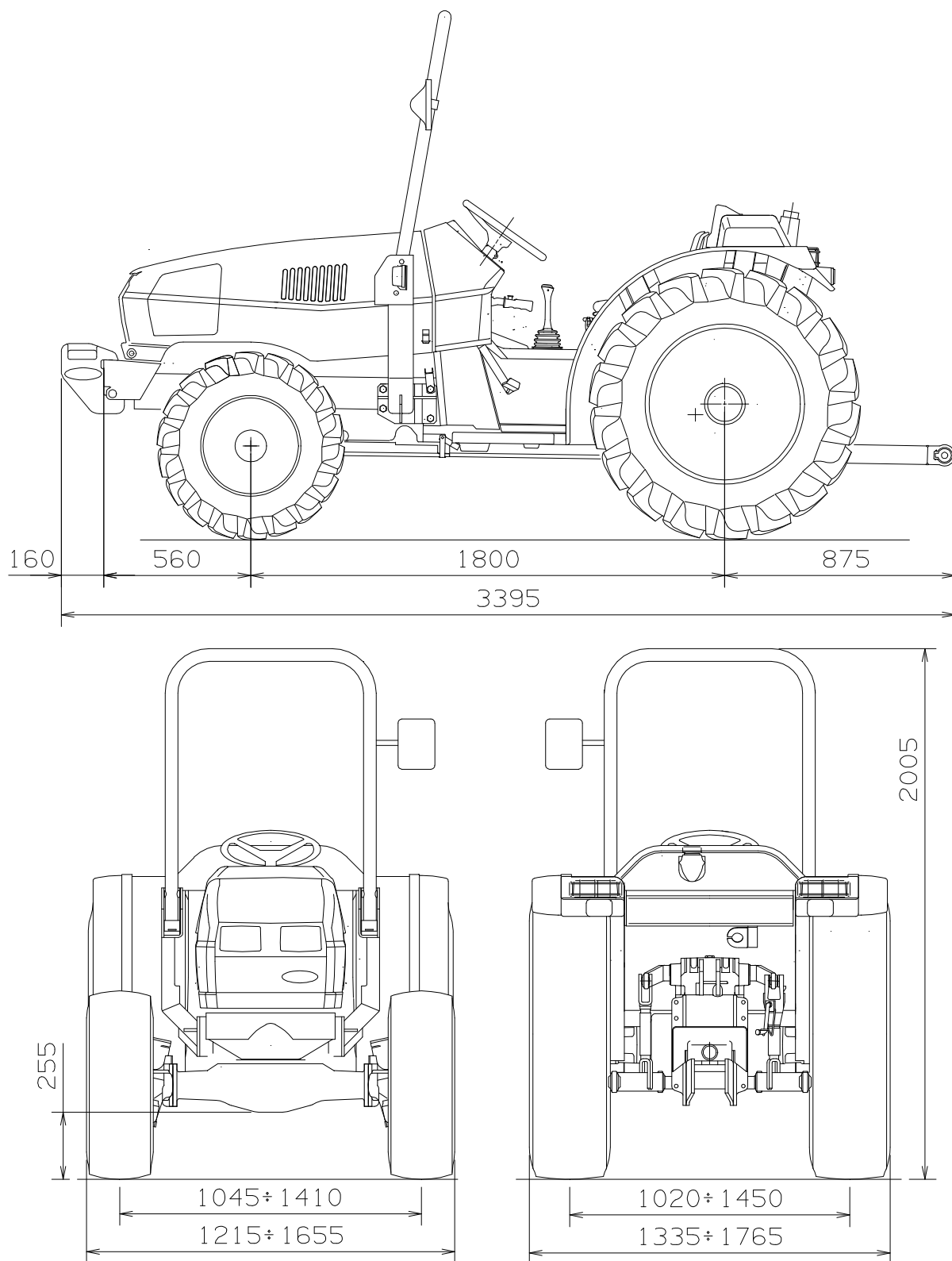
Assembly 02

Tractor dimensions: 3050 Star



The tractor mainly consists of the engine assembly, a chassis, a gearbox and two front and rear differential assemblies.

Tractor dimensions: 3070 Star



The tractor mainly consists of the engine assembly, a chassis, a gearbox and two front and rear differential assemblies.

Tractor: 3050 / 3070 Star

TYRES	TYPE	MAX LOAD PER AXLE (Kg)	PRESSURE (Bar)	SPEED (Km/h)
FRONT	10.0/80 -12 - 6 PR	1350	2.3	35
REAR	320/70 R24 - 116 A8	2575	1.6	35
ALTERNATIVE TYRES	TYPE	MAX LOAD PER AXLE (Kg)	PRESSURE (Bar)	SPEED (Km/h)
FRONT 1)	7.5L - 15 8 PR (PIRELLI)	1460	3	35
2)	240/70 R16 104 A8 (GOOD YEAR)	1854	2.4	35
3)	6.00-16 8 PR	1111	4	35
4)	7.00-12 10 PR	1170	4	35
5)	11.0/65 - 12 6 PR	1520	2.9	35
6)	26 x 12.00 - 12 4 PR (GOOD YEAR)	1370	1.4	30
REAR 1)	320/70 R24 113 A8	2575	1.6	35
2)	320/70 R24 113 A8	2575	1.6	35
3)	11.2 R24 114 A8	2430	1.6	35
4)	12.4 R 20 116 A8	2575	1.6	35
5)	12.4 R 20 116 A8	2575	1.6	35
6)	38 x 14.00-20 4 PR (GOOD YEAR)	2400	1.75	30

Tractor: 3050 / 3070 Star

MECHANICAL TRANSMISSION 16 + 8 DUAL POWER + REV.SHUTTLE

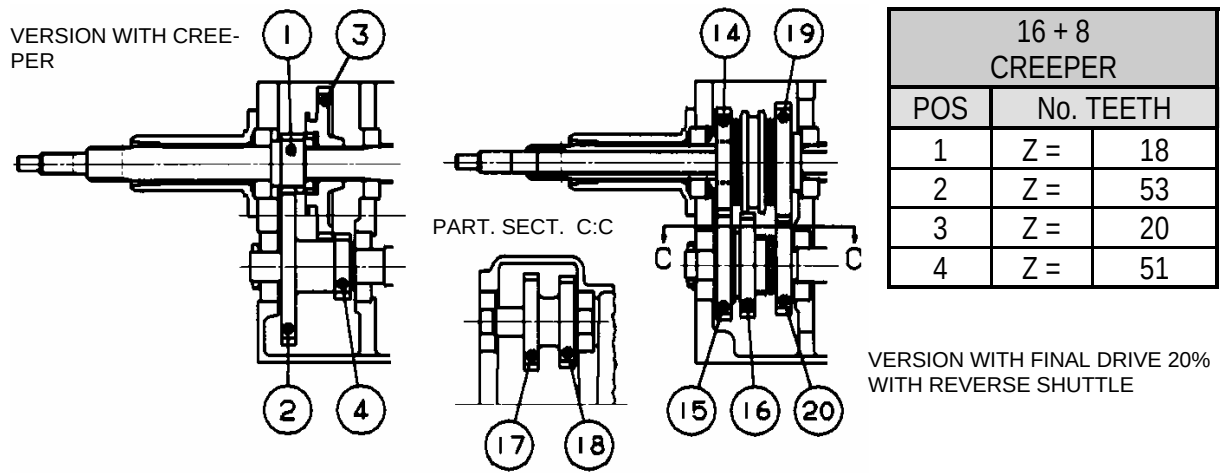
NO-LOAD GROUND SPEEDS WITH ENGINE AT TOP RATE							
TRANSMISSION RATIOS				2600 rpm			
				Speeds with Tyres (Km / h)			
GEARS		GEARB.	TOTAL	11.2 R24	320/70 R24	12.4 R20	38x14.00-20
				ROLL. CIRC. mm 3236	ROLL. CIRC. mm 3236	ROLL. CIRC. mm 3079	ROLL. CIRC. mm 2796
NORMAL							
FORWARD	1	3.67	384.95	1.31	1.31	1.25	1.13
	2	2.23	233.83	2.16	2.16	2.05	1.86
	3	1.29	135.47	3.72	3.72	3.54	3.22
	4	0.89	93.64	5.39	5.39	5.13	4.66
	5	3.67	67.45	7.48	7.48	7.12	6.46
	6	2.23	40.97	12.31	12.31	11.72	10.64
	7	1.29	23.74	21.25	21.25	20.22	18.37
	8	0.89	16.41	30.75	30.75	29.26	26.57
REVERSE	1	3.67	161.14	3.13	3.13	2.98	2.71
	2	2.23	97.88	5.15	5.15	4.90	4.45
	3	1.29	56.71	8.90	8.90	8.47	7.69
	4	0.89	39.20	12.87	12.87	12.25	11.12
FINAL DRIVE 20%							
FORWARD	1	3.67	486.18	1.04	1.04	0.99	0.90
	2	2.23	295.32	1.71	1.71	1.63	1.48
	3	1.29	171.09	2.95	2.95	2.81	2.55
	4	0.89	118.26	4.27	4.27	4.06	3.69
	5	3.67	85.19	5.92	5.92	5.63	5.12
	6	2.23	51.75	9.75	9.75	9.28	8.42
	7	1.29	29.98	16.83	16.83	16.01	14.54
	8	0.89	20.72	24.35	24.35	23.17	21.04
REVERSE	1	3.67	203.52	2.48	2.48	2.36	2.14
	2	2.23	123.62	4.08	4.08	3.88	3.53
	3	1.29	71.62	7.04	7.04	6.70	6.09
	4	0.89	49.50	10.19	10.19	9.70	8.81
REVERSE SHUTTLE							
FORWARD	1	3.67	384.95	1.31	1.31	1.25	1.13
	2	2.23	233.83	2.16	2.16	2.05	1.86
	3	1.29	135.47	3.72	3.72	3.54	3.22
	4	0.89	93.64	5.39	5.39	5.13	4.66
	5	3.67	67.45	7.48	7.48	7.12	6.46
	6	2.23	40.97	12.31	12.31	11.72	10.64
	7	1.29	23.74	21.25	21.25	20.22	18.37
	8	0.89	16.41	30.75	30.75	29.26	26.57
REVERSE	1	3.67	487.47	1.04	1.04	0.98	0.89
	2	2.23	296.11	1.70	1.70	1.62	1.47
	3	1.29	171.54	2.94	2.94	2.80	2.54
	4	0.89	118.57	4.26	4.26	4.05	3.68
	5	3.67	85.42	5.91	5.91	5.62	5.10
	6	2.23	51.89	9.72	9.72	9.25	8.40
	7	1.29	30.06	16.78	16.78	15.97	14.50
	8	0.89	20.78	24.28	24.28	23.10	20.98

Tractor: 3050 / 3070 Star

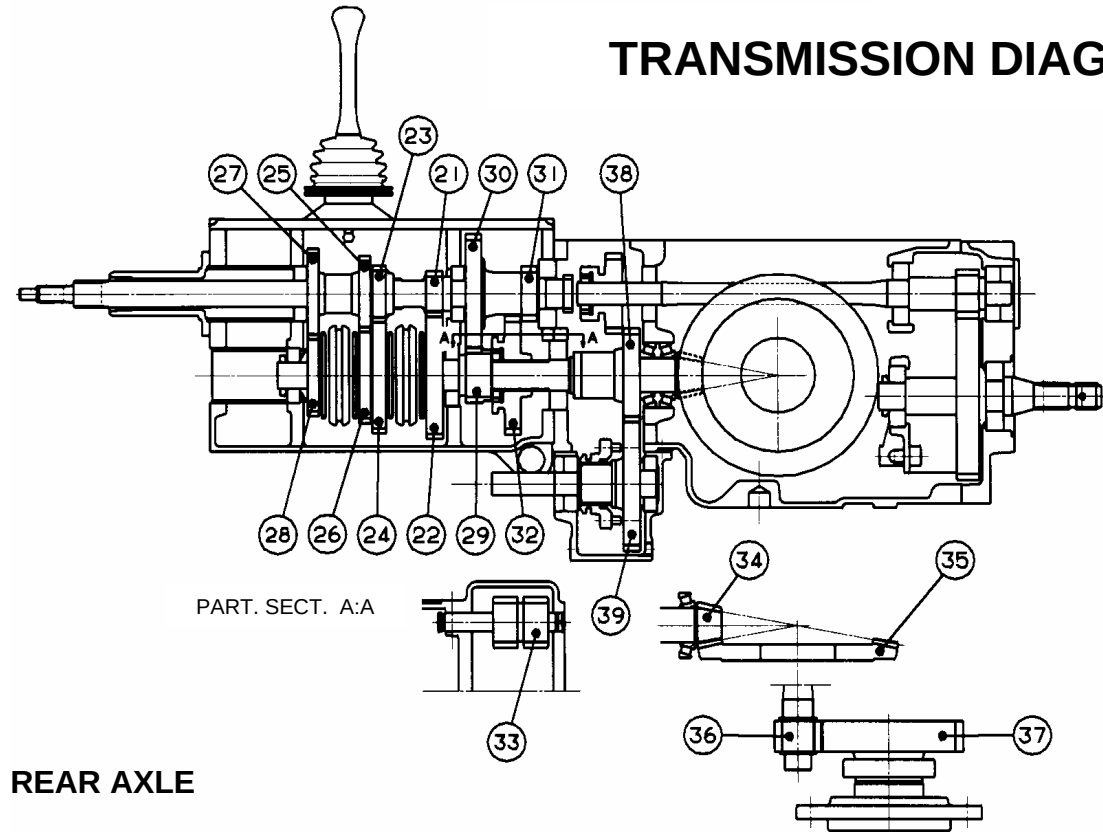
MECHANICAL TRANSMISSION 16 + 8 CON CREEPER

NO-LOAD GROUND SPEEDS WITH ENGINE AT TOP RATE							
TRANSMISSION RATIOS			2600 rpm				
			Speeds with Tyres (Km / h)				
GEARS		GEARB.	TOTAL	11.2 R24	320/70 R24	12.4 R20	38x14.00-20
				ROLL. CIRC. mm	ROLL. CIRC. mm	ROLL. CIRC. mm	ROLL. CIRC. mm
				3236	3236	3079	2796
NORMAL							
F O R W A R D	1	3.67	384.95	1.31	1.31	1.25	1.13
	2	2.23	233.83	2.16	2.16	2.05	1.86
	3	1.29	135.47	3.72	3.72	3.54	3.22
	4	0.89	93.64	5.39	5.39	5.13	4.66
	5	3.67	67.45	7.48	7.48	7.12	6.46
	6	2.23	40.97	12.31	12.31	11.72	10.64
	7	1.29	23.74	21.25	21.25	20.22	18.37
	8	0.89	16.41	30.75	30.75	29.26	26.57
R E V	1	3.67	161.14	3.13	3.13	2.98	2.71
	2	2.23	97.88	5.15	5.15	4.90	4.45
	3	1.29	56.71	8.90	8.90	8.47	7.69
	4	0.89	39.20	12.87	12.87	12.25	11.12
CREEPER							
A V A N T I	1	3.67	2890.32	0.17	0.17	0.17	0.15
	2	2.23	1755.69	0.29	0.29	0.27	0.25
	3	1.29	1017.12	0.50	0.50	0.47	0.43
	4	0.89	703.05	0.72	0.72	0.68	0.62
	5	3.67	506.47	1.00	1.00	0.95	0.86
	6	2.23	307.65	1.64	1.64	1.56	1.42
	7	1.29	178.23	2.83	2.83	2.69	2.45
	8	0.89	123.20	4.10	4.10	3.90	3.54
R M	1	3.67	1209.90	0.42	0.42	0.40	0.36
	2	2.23	734.94	0.69	0.69	0.65	0.59
	3	1.29	425.77	1.18	1.18	1.13	1.02
	4	0.89	294.30	1.71	1.71	1.63	1.48

Tractor: 3050 / 3070 Star



TRANSMISSION DIAGRAM



REAR AXLE

DUAL POWER + REVERSE SHUTTLE									
POS	No. TEETH								
14	Z =	40	23	Z =	22	32	Z =	43	
15	Z =	31	24	Z =	49	33	Z =	17	
16	Z =	29	25	Z =	31	34	Z =	11	
17	Z =	28	26	Z =	40	35	Z =	53	
18	Z =	26	27	Z =	37	36	Z =	11	
19	Z =	44	28	Z =	33	37	Z =	42	
20	Z =	27	29	Z =	18	38	Z =	32	
21	Z =	15	30	Z =	43	39	Z =	49	
22	Z =	55	31	Z =	18				

Tractor: 3050 / 3070 Star

SPECIFICATIONS		
DIMENSIONS (mm)	SAFETY FRAME VERSION	CAB VERSION
MAXIMUM LENGTH	3695	
MAXIMUM WIDTH	1890	
MAX. WIDTH (for road circulation)	1800	
MAXIMUM HEIGHT	2160	2220
WHEELBASE	1930	
FRONT OVERHANG	550 / 710 / 915	
REAR OVERHANG	850	
FRONT TRACK - (VARIABLE - 1)	1145 : 1495	
REAR TRACK - (VARIABLE - 1)	1100 : 1470	

1) - OBTAINED BY FITTING WHEEL DISC DIFFERENTLY ON HUB

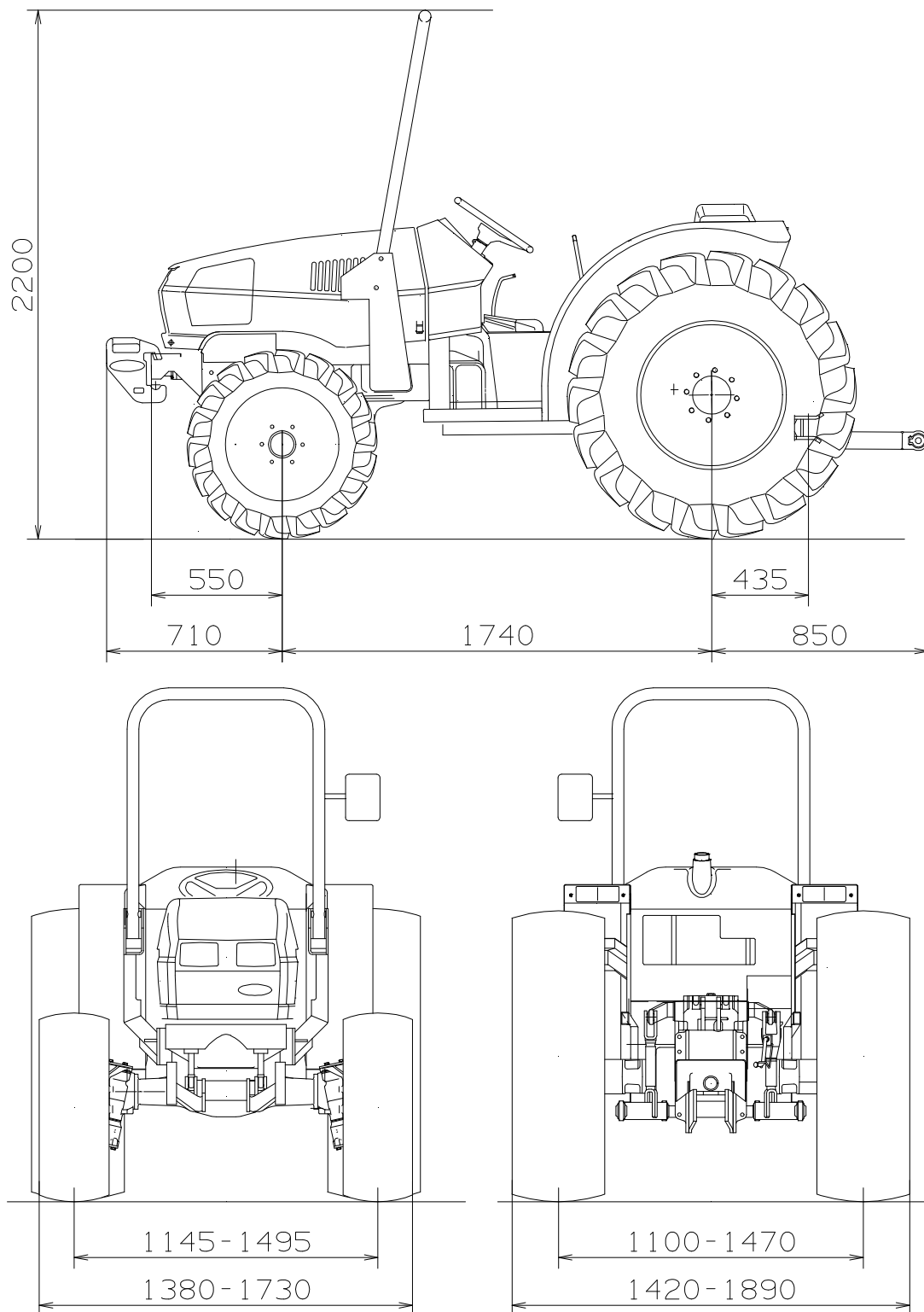
WEIGHTS (IN RUNNING ORDER INCLUDING DRIVER) in kg:								
MACHINE	SAFETY FRAME VERSION				CAB VERSION			
	(1)	(2)	(3)	(3)	(1)	(2)	(3)	(3)
FRONT AXLE	1010	1120	1090	1090	1000	1110	1100	1100
REAR AXLE	1360	1480	1350	1475	1500	1620	1470	1605
TOTAL	2370	2600	2440	2575	2500	2730	2570	2705

KEY:

WITHOUT BALLAST	(1)
WITH BALLAST	(2)
WITH FRONT POWER LIFT	(3)

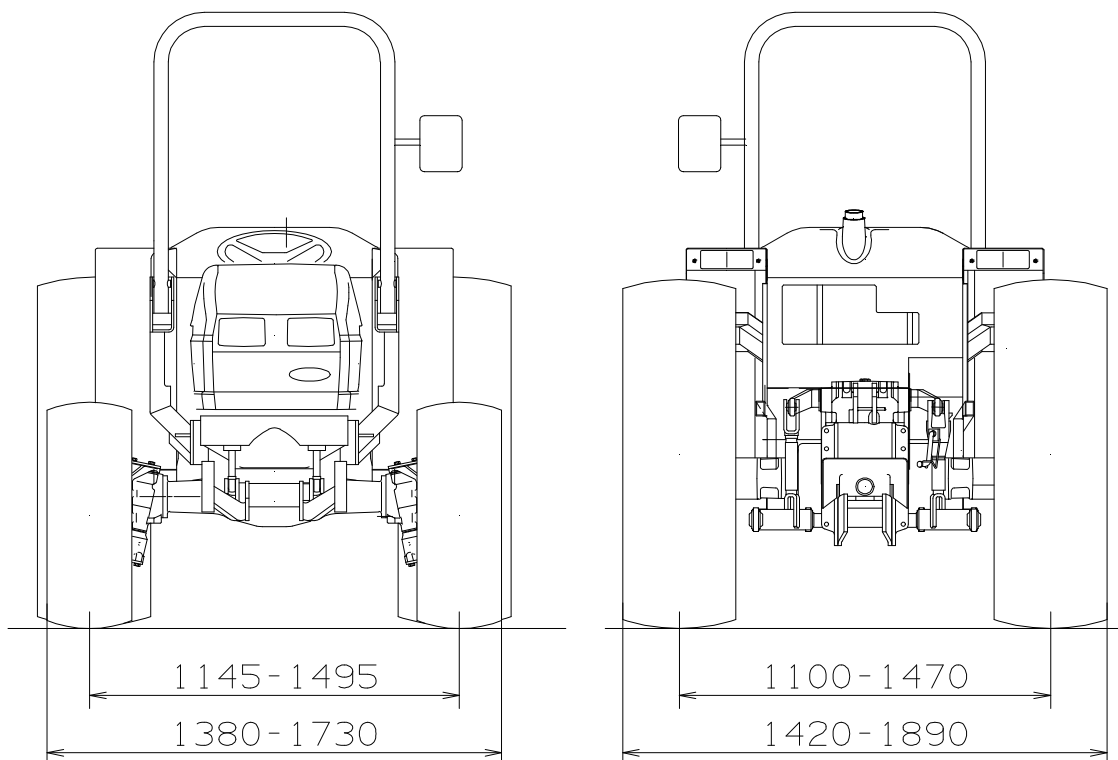
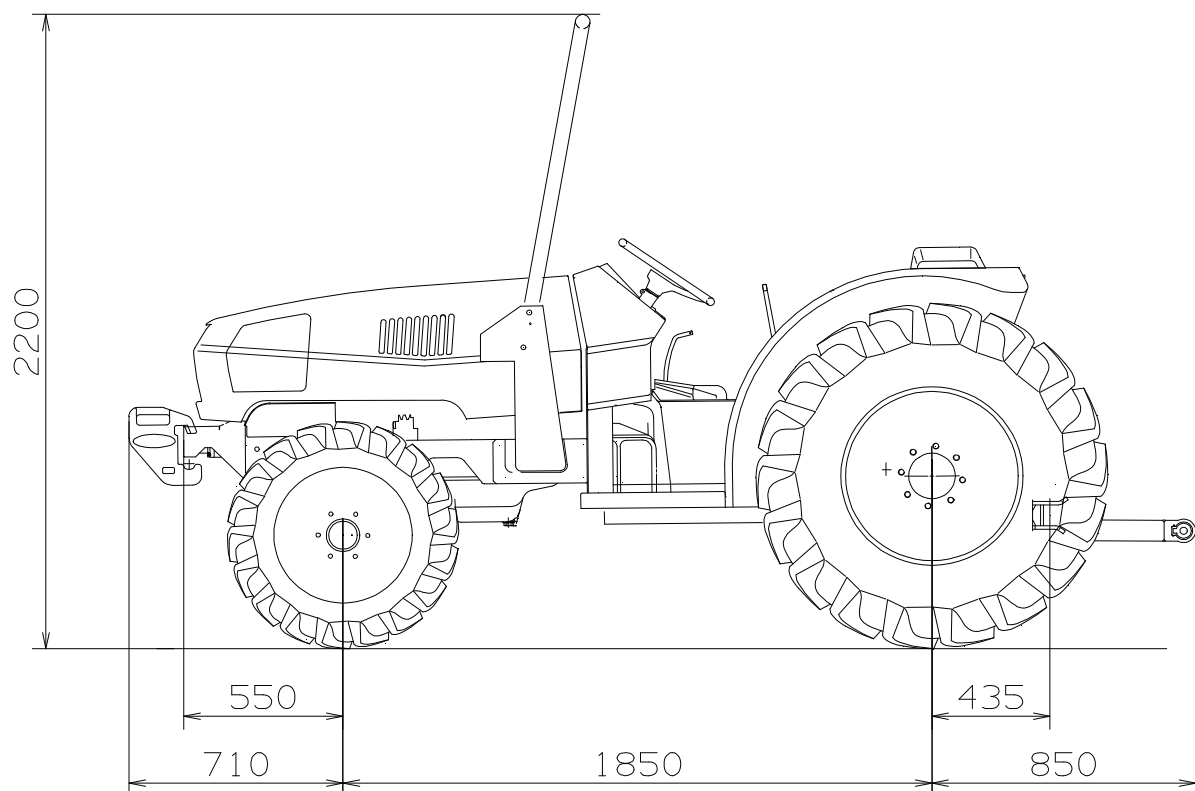
TECHNICALLY TOLERATED MAXIMUM LOADS		
FRONT	REAR	TOTAL
1800	2800	3700

Tractor: Star 50



The tractor mainly consists of the engine assembly, a chassis, a gearbox and two front and rear differential assemblies.

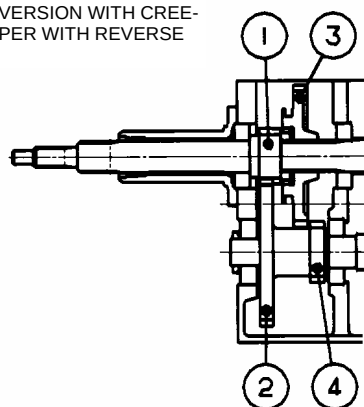
Tractor: Star 70



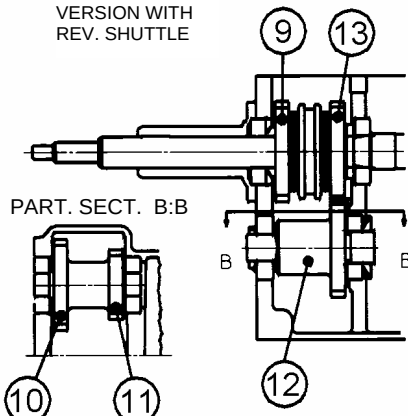
The tractor mainly consists of the engine assembly, a chassis, a gearbox and two front and rear differential assemblies.

Tractor: Star 50 / 70

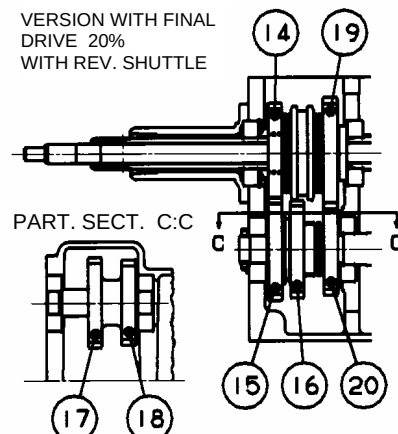
VERSION WITH CREEPER WITH REVERSE



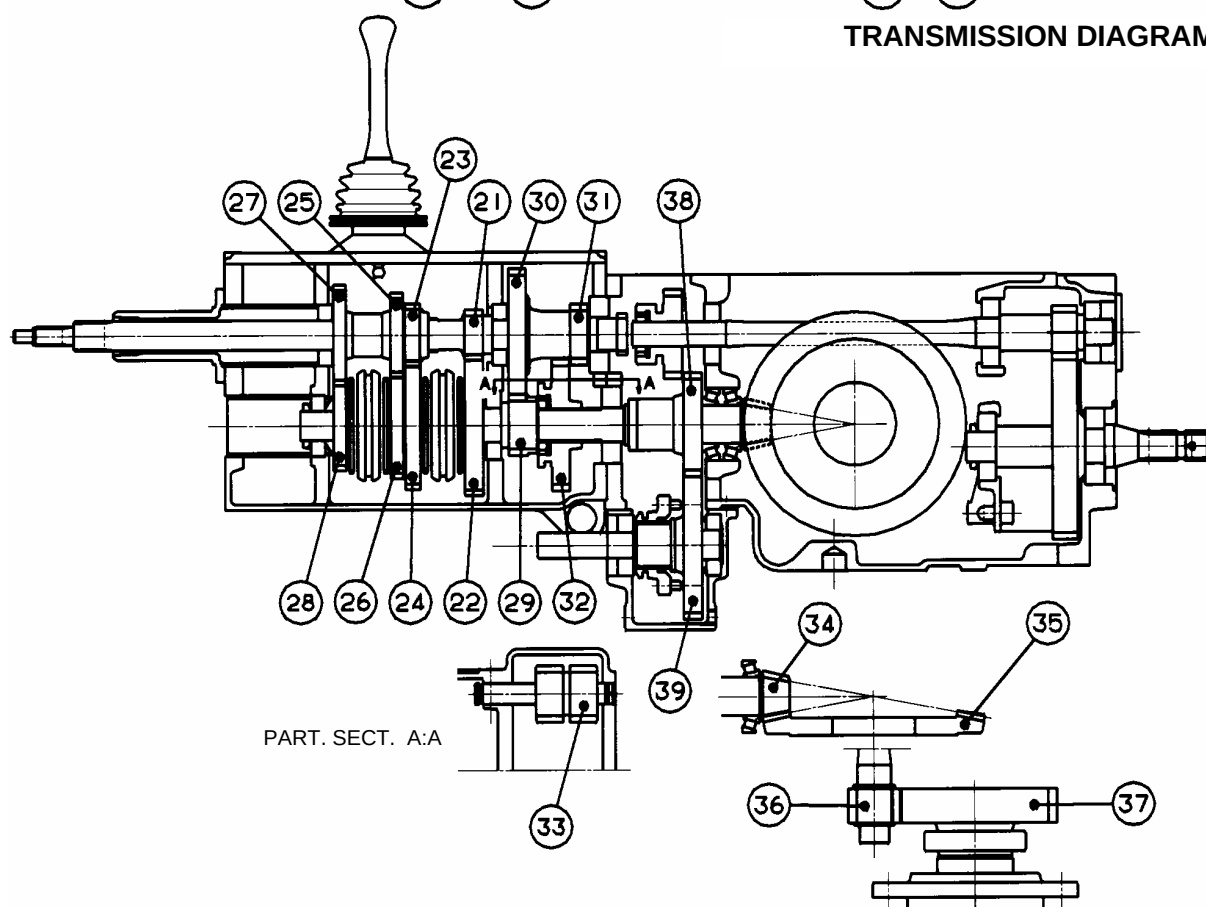
VERSION WITH REV. SHUTTLE



VERSION WITH FINAL DRIVE 20% WITH REV. SHUTTLE



TRANSMISSION DIAGRAM



POS	No. TEETH	POS	No. TEETH	POS	No. TEETH	POS	No. TEETH
1	Z = 18	14	Z = 35	23	Z = 22	32	Z = 43
2	Z = 53	15	Z = 35	24	Z = 49	33	Z = 17
3	Z = 20	16	Z = 34	25	Z = 31	34	Z = 11
4	Z = 51	17	Z = 30	26	Z = 40	35	Z = 53
9	Z = 35	18	Z = 30	27	Z = 37	36	Z = 12
10	Z = 30	19	Z = 40	28	Z = 33	37	Z = 53
11	Z = 30	20	Z = 30	29	Z = 18	38	Z = 35
12	Z = 34	21	Z = 15	30	Z = 43	39	Z = 46
13	Z = 40	22	Z = 55	31	Z = 18		

Tractor: Star 50 / 70

TYRES	TYPE	MAX LOAD PER AXLE (Kg)	PRESSURE (Bar)	SPEED (Km/h)
FRONT	280/70 R16 112 A8 (GOOD YEAR)	2060	2.4	40
REAR	380/70 R24 125 A8	3300	1.6	40
ALTERNATIVE TY- RES	TYPE	MAX LOAD PER AXLE (Kg)	PRESSURE (Bar)	SPEED (Km/h)
FRONT 1) 3)	280/70 R18 111 A8 (GOOD YEAR)	2090	2.4	45
2) 4) 5)	250/80 R18 8 PR	1800	3.2	45
6)	8.25 R16 8 PR	1460	3.0	40
7) 8)	260/70 R16 109 A8	2060	2.4	40
9)	29x12.50 – 15 4PR (GOOD YEAR)	1260	1.4	40
10)	240/70 R16 100 A8 (GOOD YEAR)	1600	2.4	40
11)	280/60 –15.5 6 PR (TRELLEBORG)	2010	1.5	40
REAR 1)	360/70 R28 125 A8	3300	1.6	45
2)	12.4 R28 121 A8	2900	1.6	45
3)	420/70 R24 130 A8	3800	1.6	45
4)	14.9 R24 126 A8	3400	1.6	45
5)	11.2 R28 121 A8	2500	1.6	40
6)	13.6 R24 121 A8	2900	1.6	40
7)	360/70 R24 122 A8	3000	1.6	40
8)	12.4 R24 119 A8	2720	1.6	40
9)	44x18.00 – 20 4PR (GOOD YEAR)	3250	1.4	40
10)	320/70 R24 116 A8	2500	1.6	40
11)	375/75 R20 143 B (MICHELIN)	2850	3.8	40

Tractor: Star 50 / 70

MECHANICAL TRANSMISSION 16 + 8; 8+8 DUAL POWER + R.SHUTTLE

NO-LOAD GROUND SPEEDS WITH ENGINE AT TOP RATE														
GEARS	TRANSMISSION RATIOS		2600 rpm											
			Speeds with Tyres (Km / h)											
	GEAR	TOTAL	360/70 R 28	12.4 R 28	420/70 R 24	14.9 R 24	11.2 R 28	13.6 R 24	380/70 R 24	360/70 R 24	12.4 R 24	44x18.0 0 R20	320/70 R 24	375/75 R 20
			C. R. mm	C. R. mm	C. R. mm	C. R. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm
			3707	3707	3707	3707	3550	3518	3518	3393	3393	3353	3236	3204
NORMAL														
FORWARD	1	3.67	445.29	1.32	1.32	1.32	1.32	1.24	1.23	1.23	1.19	1.19	1.17	1.13
	2	2.23	270.48	2.18	2.18	2.18	2.18	2.05	2.03	2.03	1.96	1.96	1.93	1.87
	3	1.29	156.70	3.76	3.76	3.76	3.76	3.53	3.50	3.50	3.38	3.38	3.34	3.22
	4	0.89	108.31	5.45	5.45	5.45	5.45	5.11	5.07	5.07	4.88	4.88	4.83	4.66
	5	3.67	78.03	7.56	7.56	7.56	7.56	7.09	7.03	7.03	6.78	6.78	6.70	6.47
	6	2.23	47.40	12.44	12.44	12.44	12.44	11.68	11.58	11.58	11.16	11.16	11.04	10.64
	7	1.29	27.46	21.48	21.48	21.48	21.48	20.16	19.98	19.98	19.27	19.27	19.05	18.37
	8	0.89	18.98	31.07	31.07	31.07	31.07	29.16	28.91	28.91	27.87	27.87	27.56	26.32
REVERSE	1	3.67	186.40	3.16	3.16	3.16	3.16	2.97	2.94	2.94	2.84	2.84	2.81	2.71
	2	2.23	113.23	5.21	5.21	5.21	5.21	4.89	4.85	4.85	4.67	4.67	4.62	4.46
	3	1.29	65.60	8.99	8.99	8.99	8.99	8.44	8.36	8.36	8.07	8.07	7.98	7.62
	4	0.89	45.34	13.01	13.01	13.01	13.01	12.21	12.10	12.10	11.67	11.67	11.54	11.02
FINAL DRIVE 20%														
FORWARD	1	3.67	593.72	0.99	0.99	0.99	0.99	0.93	0.92	0.92	0.89	0.89	0.88	0.84
	2	2.23	360.65	1.64	1.64	1.64	1.64	1.53	1.52	1.52	1.47	1.47	1.45	1.39
	3	1.29	208.93	2.82	2.82	2.82	2.82	2.65	2.63	2.63	2.53	2.53	2.50	2.39
	4	0.89	144.42	4.08	4.08	4.08	4.08	3.83	3.80	3.80	3.66	3.66	3.62	3.49
	5	3.67	104.04	5.67	5.67	5.67	5.67	5.32	5.27	5.27	5.08	5.08	5.03	4.85
	6	2.23	63.20	9.33	9.33	9.33	9.33	8.76	8.68	8.68	8.37	8.37	8.28	7.91
	7	1.29	36.61	16.11	16.11	16.11	16.11	15.12	14.99	14.99	14.45	14.45	14.29	13.65
	8	0.89	25.31	23.31	23.31	23.31	23.31	21.87	21.68	21.68	20.90	20.90	20.67	19.74
REVERSE	1	3.67	248.53	2.37	2.37	2.37	2.37	2.23	2.21	2.21	2.13	2.13	2.10	2.03
	2	2.23	150.97	3.91	3.91	3.91	3.91	3.67	3.63	3.63	3.50	3.50	3.47	3.34
	3	1.29	87.46	6.74	6.74	6.74	6.74	6.33	6.27	6.27	6.05	6.05	5.98	5.71
	4	0.89	60.45	9.76	9.76	9.76	9.76	9.16	9.08	9.08	8.75	8.75	8.65	8.26
REVERSE SHUTTLE														
FORWARD	1	3.67	445.29	1.32	1.32	1.32	1.32	1.24	1.23	1.23	1.19	1.19	1.17	1.13
	2	2.23	270.48	2.18	2.18	2.18	2.18	2.05	2.03	2.03	1.96	1.96	1.93	1.87
	3	1.29	156.70	3.76	3.76	3.76	3.76	3.53	3.50	3.50	3.38	3.38	3.34	3.22
	4	0.89	108.31	5.45	5.45	5.45	5.45	5.11	5.07	5.07	4.88	4.88	4.83	4.66
	5	3.67	78.03	7.56	7.56	7.56	7.56	7.09	7.03	7.03	6.78	6.78	6.70	6.47
	6	2.23	47.40	12.44	12.44	12.44	12.44	11.68	11.58	11.58	11.16	11.16	11.04	10.64
	7	1.29	27.46	21.48	21.48	21.48	21.48	20.16	19.98	19.98	19.27	19.27	19.05	18.37
	8	0.89	18.98	31.07	31.07	31.07	31.07	29.16	28.91	28.91	27.87	27.87	27.56	26.32
REVERSE	1	3.67	523.87	1.13	1.13	1.13	1.13	1.06	1.05	1.05	1.01	1.01	1.00	0.96
	2	2.23	318.22	1.85	1.85	1.85	1.85	1.74	1.72	1.72	1.66	1.66	1.64	1.59
	3	1.29	184.35	3.20	3.20	3.20	3.20	3.00	2.98	2.98	2.87	2.87	2.84	2.74
	4	0.89	127.43	4.63	4.63	4.63	4.63	4.34	4.31	4.31	4.15	4.15	4.11	3.96
	5	3.67	91.80	6.42	6.42	6.42	6.42	6.03	5.98	5.98	5.76	5.76	5.70	5.44
	6	2.23	55.76	10.58	10.58	10.58	10.58	9.93	9.84	9.84	9.49	9.49	9.38	8.96
	7	1.29	32.30	18.26	18.26	18.26	18.26	17.13	16.98	16.98	16.38	16.38	16.19	15.47
	8	0.89	22.33	26.41	26.41	26.41	26.41	24.79	24.57	24.57	23.69	23.69	23.43	22.38

Tractor: Star 50 / 70

MECHANICAL TRANSMISSION 16 + 8 CREEPER

NO-LOAD GROUND SPEEDS WITH ENGINE AT TOP RATE														
GEARS	TRANSMISSION RATIOS		2600 rpm											
			Speeds with Tyres (Km / h)											
	G E A R B	T O T A L	360/70 R 28	12.4 R 28	420/70 R 24	14.9 R 24	11.2 R 28	13.6 R 24	380/70 R 24	360/70 R 24	12.4 R 24	44x18.00 R 20	320/70 R 24	375/75 R 20
			C. R. mm	C. R. mm	C. R. mm	C. R. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm
			3707	3707	3707	3707	3550	3518	3518	3393	3393	3353	3236	3204
CREEPER														
F	1	3.67	2379.11	0.22	0.22	0.22	0.22	0.21	0.20	0.20	0.20	0.19	0.19	0.19
O	2	2.23	1445.16	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.32	0.32	0.31	0.31
R	3	1.29	837.22	0.61	0.61	0.61	0.61	0.59	0.58	0.58	0.56	0.56	0.55	0.53
W	4	0.89	578.70	0.88	0.88	0.88	0.88	0.85	0.84	0.84	0.81	0.81	0.80	0.77
A	5	3.67	416.89	1.23	1.23	1.23	1.23	1.18	1.16	1.16	1.12	1.12	1.11	1.07
R	6	2.23	253.24	2.02	2.02	2.02	2.02	1.93	1.92	1.92	1.85	1.85	1.83	1.76
D	7	1.29	146.71	3.49	3.49	3.49	3.49	3.34	3.31	3.31	3.19	3.19	3.16	3.04
	8	0.89	101.41	5.04	5.04	5.04	5.04	4.83	4.79	4.79	4.62	4.62	4.57	4.40
R	1	3.67	995.91	0.51	0.51	0.51	0.51	0.49	0.49	0.49	0.47	0.47	0.46	0.45
E	2	2.23	604.95	0.85	0.85	0.85	0.85	0.81	0.80	0.80	0.77	0.77	0.77	0.74
V	3	1.29	350.47	1.46	1.46	1.46	1.46	1.40	1.39	1.39	1.34	1.34	1.32	1.27
	4	0.89	242.25	2.11	2.11	2.11	2.11	2.02	2.00	2.00	1.93	1.93	1.91	1.84
NORMAL														
F	1	3.67	445.29	1.32	1.32	1.32	1.32	1.24	1.23	1.23	1.19	1.19	1.17	1.13
O	2	2.23	270.48	2.18	2.18	2.18	2.18	2.05	2.03	2.03	1.96	1.96	1.93	1.87
R	3	1.29	156.70	3.76	3.76	3.76	3.76	3.53	3.50	3.50	3.38	3.38	3.34	3.22
W	4	0.89	108.31	5.45	5.45	5.45	5.45	5.11	5.07	5.07	4.88	4.88	4.83	4.66
A	5	3.67	78.03	7.56	7.56	7.56	7.56	7.09	7.03	7.03	6.78	6.78	6.70	6.47
R	6	2.23	47.40	12.44	12.44	12.44	12.44	11.68	11.58	11.58	11.16	11.16	11.04	10.64
D	7	1.29	27.46	21.48	21.48	21.48	21.48	20.16	19.98	19.98	19.27	19.27	19.05	18.37
	8	0.89	18.98	31.07	31.07	31.07	31.07	29.16	28.91	28.91	27.87	27.87	27.56	26.32
R	1	3.67	186.40	3.16	3.16	3.16	3.16	2.97	2.94	2.94	2.84	2.84	2.81	2.71
E	2	2.23	113.23	5.21	5.21	5.21	5.21	4.89	4.85	4.85	4.67	4.67	4.62	4.46
V	3	1.29	65.60	8.99	8.99	8.99	8.99	8.44	8.36	8.36	8.07	8.07	7.98	7.69
	4	0.89	45.34	13.01	13.01	13.01	13.01	12.21	12.10	12.10	11.67	11.67	11.54	11.02

Tractor: Star 50 / 70

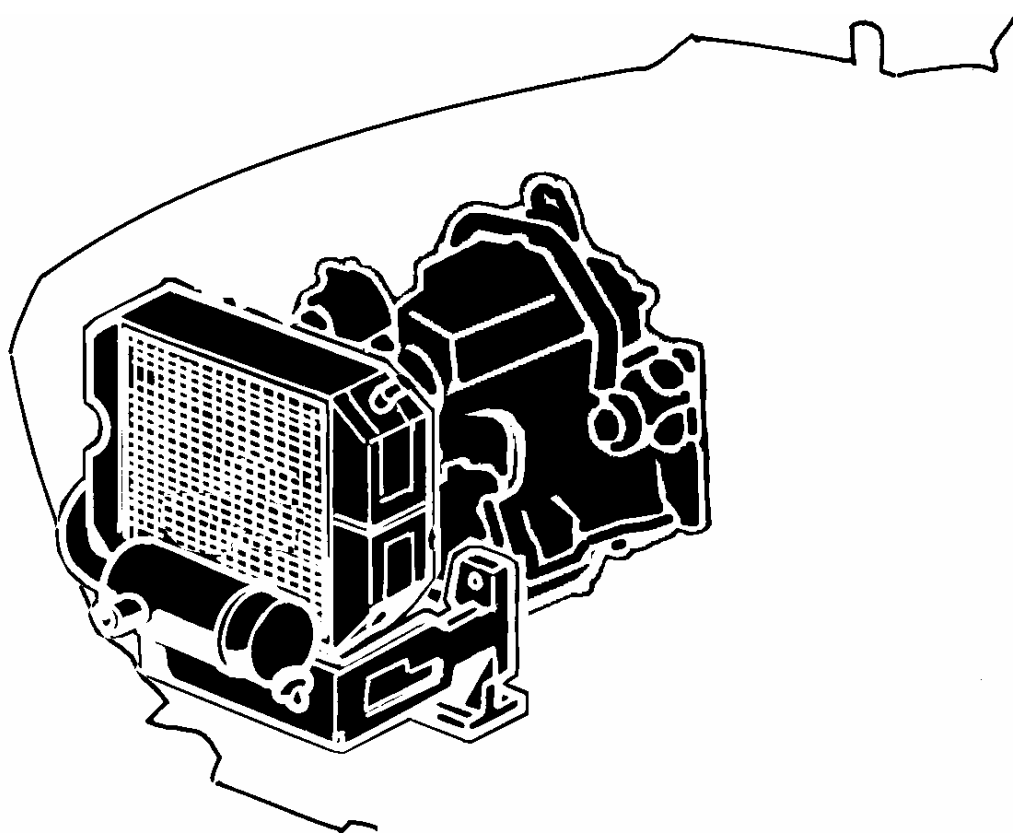
NO-LOAD GROUND SPEEDS WITH ENGINE AT TOP RATE														
GEARS	TRANSMISSION RATIOS		2600 rpm											
			Speeds with Tyres (Km / h)											
	GEAR B	TOTAL	360/70 R 28	12.4 R 28	420/70 R 24	14.9 R 24	11.2 R 28	13.6 R 24	380/70 R 24	360/70 R 24	12.4 R 24	44x18.0 0 R 20	320/70 R 24	375/75 R 20
			C. R. mm	C. R. mm	C. R. mm	C. R. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm
			3707	3707	3707	3707	3550	3518	3518	3393	3393	3353	3236	3204
NORMAL														
F	1	3.67	445.29	1.32	1.32	1.32	1.32	1.24	1.23	1.23	1.19	1.19	1.17	1.13
O	2	2.23	270.48	2.18	2.18	2.18	2.18	2.05	2.03	2.03	1.96	1.96	1.93	1.87
R	3	1.29	156.70	3.76	3.76	3.76	3.76	3.53	3.50	3.50	3.38	3.38	3.34	3.22
W	4	0.89	108.31	5.45	5.45	5.45	5.45	5.11	5.07	5.07	4.88	4.88	4.83	4.66
A	5	3.67	78.03	7.56	7.56	7.56	7.56	7.09	7.03	7.03	6.78	6.78	6.70	6.47
R	6	2.23	47.40	12.44	12.44	12.44	12.44	11.68	11.58	11.58	11.16	11.16	11.04	10.64
D	7	1.29	27.46	21.48	21.48	21.48	21.48	20.16	19.98	19.98	19.27	19.27	19.05	18.37
	8	0.89	18.98	31.07	31.07	31.07	31.07	29.16	28.91	28.91	27.87	27.87	27.56	26.58
REVERSE SHUTTLE														
	1	3.67	523.87	1.13	1.13	1.13	1.13	1.06	1.05	1.05	1.01	1.01	1.00	0.96
R	2	2.23	318.22	1.85	1.85	1.85	1.85	1.74	1.72	1.72	1.66	1.66	1.64	1.59
E	3	1.29	184.35	3.20	3.20	3.20	3.20	3.00	2.98	2.98	2.87	2.87	2.84	2.74
V	4	0.89	127.43	4.63	4.63	4.63	4.63	4.34	4.31	4.31	4.15	4.15	4.11	3.96
E	5	3.67	91.80	6.42	6.42	6.42	6.42	6.03	5.98	5.98	5.76	5.76	5.70	5.50
R	6	2.23	55.76	10.58	10.58	10.58	10.58	9.93	9.84	9.84	9.49	9.49	9.38	9.05
S	7	1.29	32.30	18.26	18.26	18.26	18.26	17.13	16.98	16.98	16.38	16.38	16.19	15.62
E	8	0.89	22.33	26.41	26.41	26.41	26.41	24.79	24.57	24.57	23.69	23.69	23.43	22.38

Tractor: Star 70

MECHANICAL TRANSMISSION 16 + 8 CREEPER

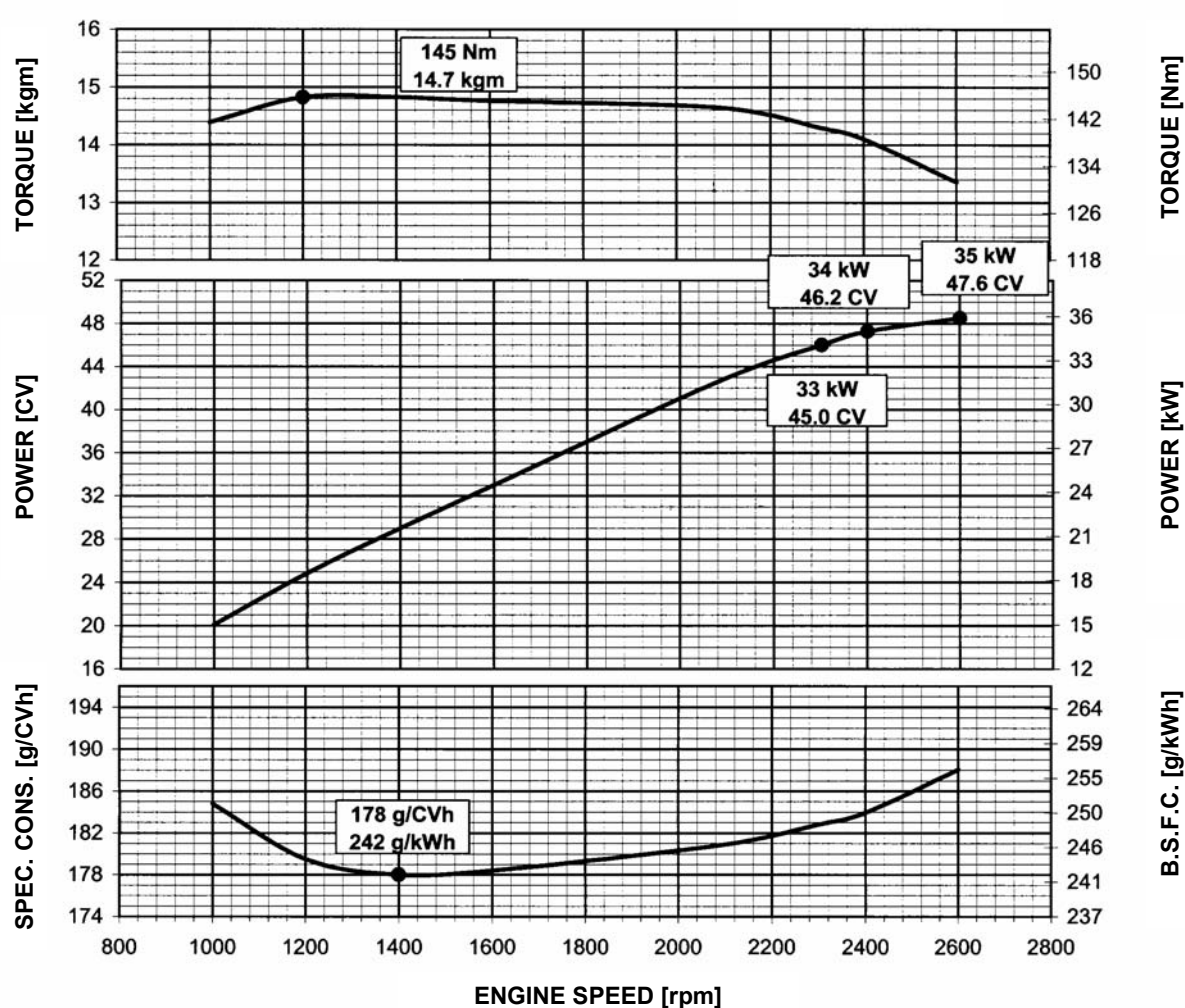
NO-LOAD GROUND SPEEDS WITH ENGINE AT TOP RATE														
GEARS	TRANSMISSION RATIOS		2600 rpm											
			Speeds with Tyres (Km / h)											
	GEAR	TOTAL	360/70 R 28	12.4 R 28	420/70 R 24	14.9 R 24	11.2 R 28	13.6 R 24	380/70 R 24	360/70 R 24	12.4 R 24	44x18.00 R 20	320/70 R 24	375/75 R 20
			C. R. mm	C. R. mm	C. R. mm	C. R. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm	R. I. mm
			3707	3707	3707	3707	3550	3518	3518	3393	3393	3353	3236	3204
CREEPER														
F	1	3.67	2379.11	0.22	0.22	0.22	0.22	0.21	0.20	0.20	0.20	0.19	0.19	0.19
O	2	2.23	1445.16	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.32	0.32	0.31	0.31
R	3	1.29	837.22	0.61	0.61	0.61	0.61	0.59	0.58	0.58	0.56	0.56	0.53	0.53
W	4	0.89	578.70	0.88	0.88	0.88	0.88	0.85	0.84	0.84	0.81	0.81	0.77	0.76
A	5	3.67	416.89	1.23	1.23	1.23	1.23	1.18	1.16	1.16	1.12	1.12	1.07	1.06
R	6	2.23	253.24	2.02	2.02	2.02	2.02	1.93	1.92	1.92	1.85	1.85	1.76	1.75
D	7	1.29	146.71	3.49	3.49	3.49	3.49	3.34	3.31	3.31	3.19	3.19	3.04	3.01
	8	0.89	101.41	5.04	5.04	5.04	5.04	4.83	4.79	4.79	4.62	4.62	4.40	4.36
R	1	3.67	995.91	0.51	0.51	0.51	0.51	0.49	0.49	0.49	0.47	0.47	0.45	0.44
E	2	2.23	604.95	0.85	0.85	0.85	0.85	0.81	0.80	0.80	0.77	0.77	0.74	0.73
V	3	1.29	350.47	1.46	1.46	1.46	1.46	1.40	1.39	1.39	1.34	1.34	1.27	1.26
	4	0.89	242.25	2.11	2.11	2.11	2.11	2.02	2.00	2.00	1.93	1.93	1.84	1.83
NORMAL														
F	1	3.67	445.29	1.32	1.32	1.32	1.32	1.24	1.23	1.23	1.19	1.19	1.17	1.12
O	2	2.23	270.48	2.18	2.18	2.18	2.18	2.05	2.03	2.03	1.96	1.96	1.87	1.85
R	3	1.29	156.70	3.76	3.76	3.76	3.76	3.53	3.50	3.50	3.38	3.38	3.22	3.19
W	4	0.89	108.31	5.45	5.45	5.45	5.45	5.11	5.07	5.07	4.88	4.88	4.66	4.61
A	5	3.67	78.03	7.56	7.56	7.56	7.56	7.09	7.03	7.03	6.78	6.78	6.47	6.40
R	6	2.23	47.40	12.44	12.44	12.44	12.44	11.68	11.58	11.58	11.16	11.16	10.64	10.54
D	7	1.29	27.46	21.48	21.48	21.48	21.48	20.16	19.98	19.98	19.27	19.27	18.37	18.20
	8	0.89	18.98	31.07	31.07	31.07	31.07	29.16	28.91	28.91	27.87	27.87	26.58	26.32
R	1	3.67	186.40	3.16	3.16	3.16	3.16	2.97	2.94	2.94	2.84	2.84	2.71	2.68
E	2	2.23	113.23	5.21	5.21	5.21	5.21	4.89	4.85	4.85	4.67	4.67	4.46	4.41
V	3	1.29	65.60	8.99	8.99	8.99	8.99	8.44	8.36	8.36	8.07	8.07	7.69	7.62
	4	0.89	45.34	13.01	13.01	13.01	13.01	12.21	12.10	12.10	11.67	11.67	11.13	11.02

ENGINE



ENGINE SPECIFICATIONS

Engine	15C / 3	D 703 E2
Power rating	48 HP - 35 kW	
Type	Diesel	
No. Cylinders	3	
Swept volume	2082	
Cooling	Water	



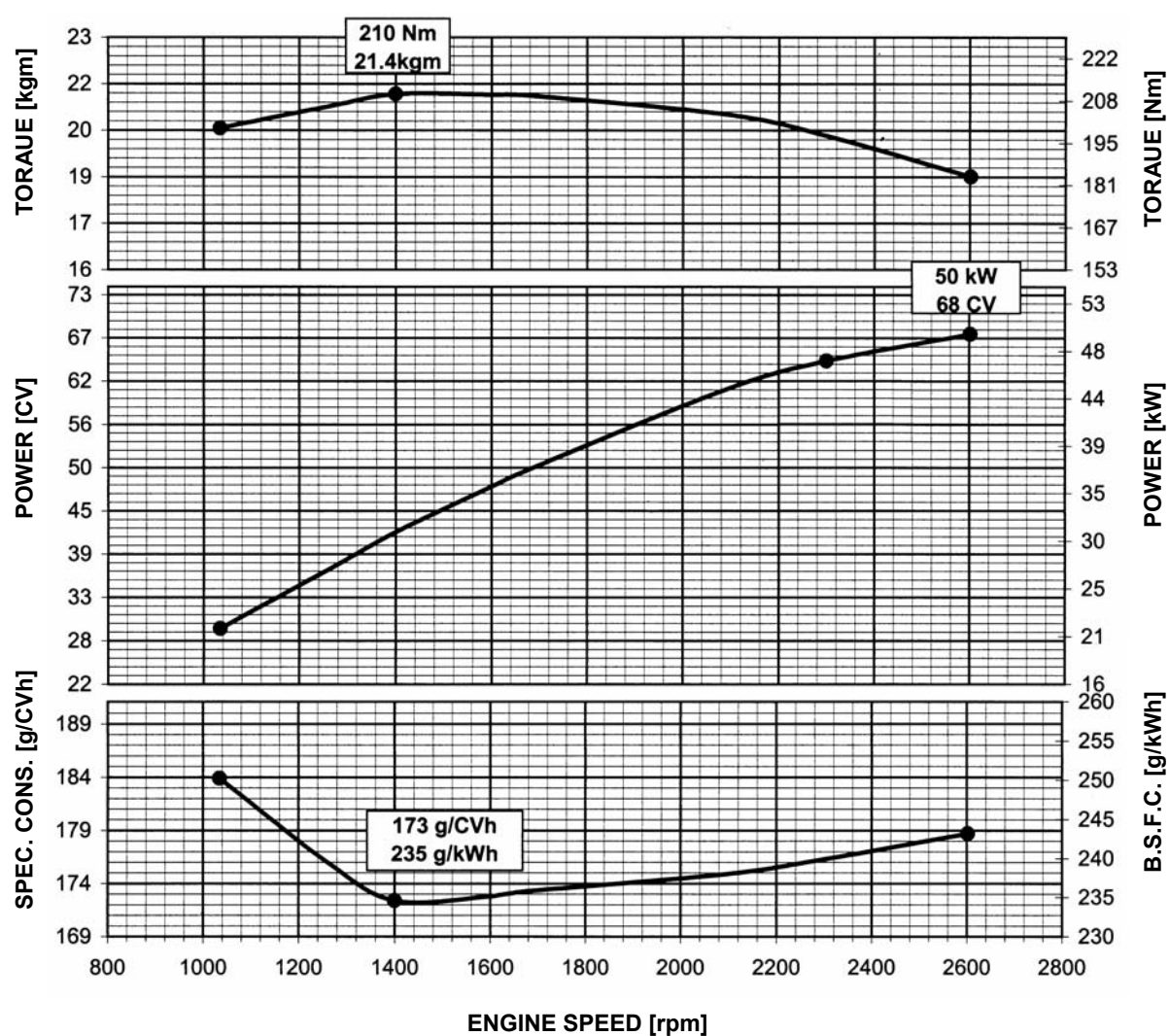
Contact a VM Motori S.p.A. authorized workshop if engine repairs are required. Consult the operation and maintenance manual of the engine for filter replacement, greasing and oil changes.

ENGINE SPECIFICATION TABLE		
		15C / 3 D 703 E2
Cylinders	N.	3
Swept volume	cm ³	2082
Bore	mm	94
Stroke	mm	100
Compression ratio		18:1
Rpm		2600
Power rating KW/HP at 2600 rpm	KW/HP	35-48
Maximum torque	Nm (kgm) min/rpm	145 (14.7) 1200
3rd. drive engine speed ratio		1:1
No-load idling rate rpm		850
Oil consumption (Max, rpm – Power NA)	kg/h	0,025
Oil sump capacity	L.	4.5
Minimum permissible oil pressure	Kg/cm ²	1.5
Max. Permissible angles for discontinuous service (instantaneous)		25° (35°)
Dry weight	kg	190
Recommended battery	V/ah	12/80

Contact an authorized VM Centre if the engine's Workshop Manual is also required.

ENGINE SPECIFICATIONS

Engine	13C / 3	D 754 E2
Power rating	68 HP - 50 kW	
Type	Diesel	
No. Cylinders	4	
Swept volume	3024	
Cooling	Water	



ENGINE SPECIFICATION TABLE		
		13C / 3 D 754 E2
Cylinders	N.	4
Swept volume	cm ³	3024
Bore	mm	94
Stroke	mm	107
Compression ratio		18:1
Rpm		2600
Power rating KW/HP at 2600 rpm	KW/HP	50-68
Maximum torque	Nm (kgm) min/rpm	190 (195) 1200
3rd. drive engine speed ratio		1:1
No-load idling rate rpm		850
Oil consumption (Max, rpm – Power NA)	kg/h	0.025
Oil sump capacity	L.	6.4
Minimum permissible oil pressure	Kg/cm ²	1.5
Max. Permissible angles for discontinuous service (instantaneous)		25° (35°)
Dry weight	kg	254
Recommended battery	V/ah	12/80

Contact an authorized VM Centre if the engine's Workshop Manual is also required.



Fig. 1

In Fig. 1 the screws securing the engine to the clutch bowl are tightened to 10 kgm when they are M16 and 5 kgm when they are M 8.

Fig. 2 shows a detail of the assembly of the flexible supports under the radiator. It is worth noting the assembly of the seal under the air manifold on the engine shown in Fig. 3 and in Fig. 4.

It is important not to forget it and to smear it carefully with silicone as shown in Fig. 4 so that an airtight seal is formed preventing dust getting inside the engine and damaging it.

Fig. 5 shows the engine assembly where you can see the assembly of the radiator with its hoses and the air intake system from the filter at the front of the radiator.

Fig. 6 shows the location of the alternator on the engine and Fig. 7 shows how it is possible to extract the hydraulic pump drive shaft as far as necessary for the belt to pass.

Tighten the screws securing the shaft to 4 kgm.

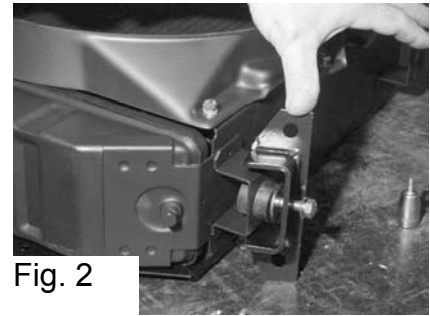


Fig. 2

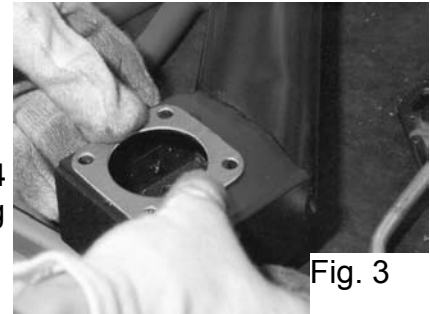


Fig. 3



Fig. 4

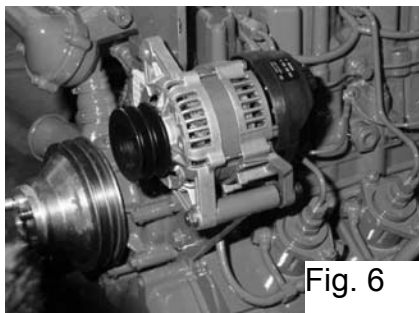


Fig. 6

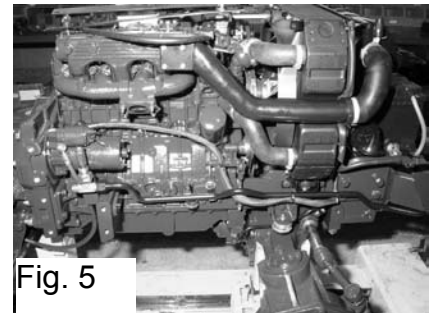


Fig. 5

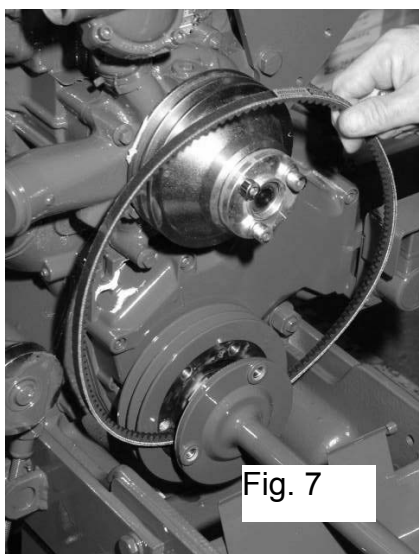


Fig. 7

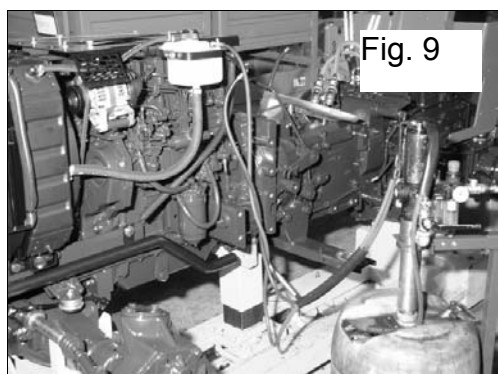
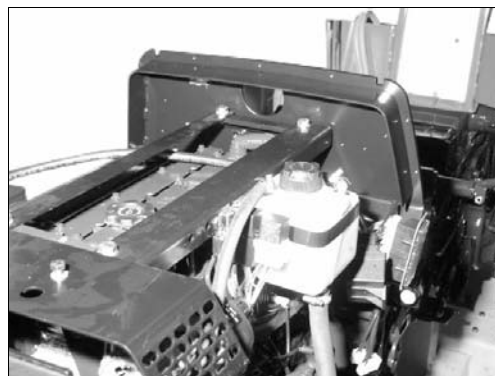
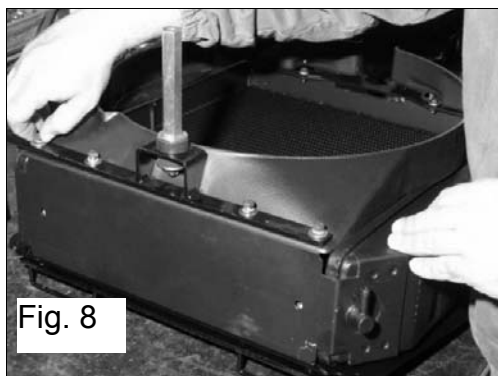


Fig. 8 shows some stages in the assembly of the duct on the radiator. Fig. 9 shows the location of the coolant expansion tank on the engine, with its connection to the radiator for filling and bleeding the coolant.

Between 3 and 4 cylinders the positioning of some components can vary, but the basic assembly diagrams do not change.

DRIVING TORQUES

kgm

M 8 engine - clutch bowl fixing screw

5

M 16 engine - clutch bowl fixing screw

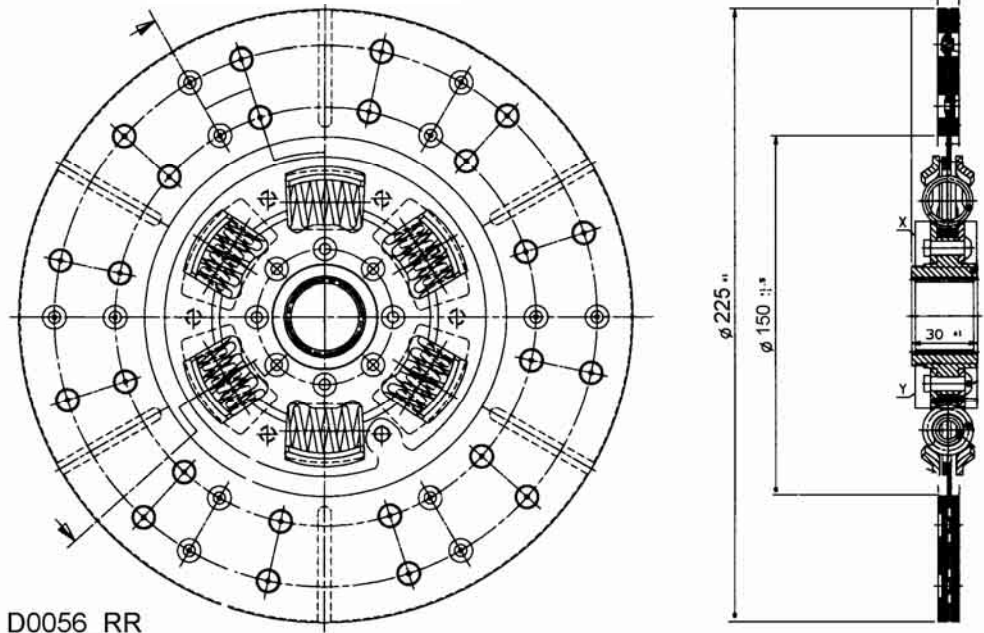
10

CLUTCH



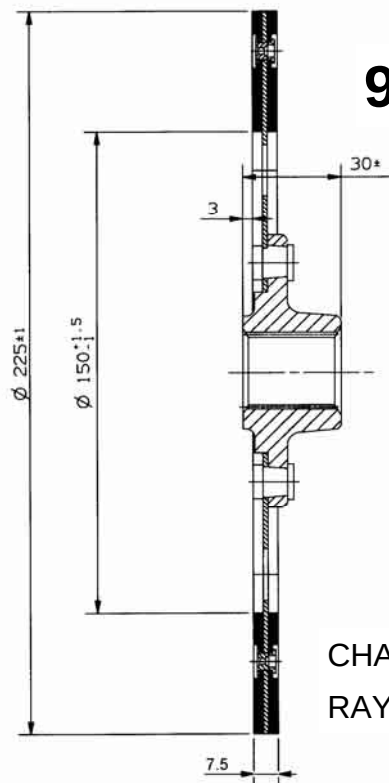
Clutch	DRY TWIN PLATE	
Type	9" Luk	Mod. 3050

9" Gearbox



D0056_RR

CHARACTERISTICS OF THE FRICTION MATERIAL:
RAYBESTOS 8402

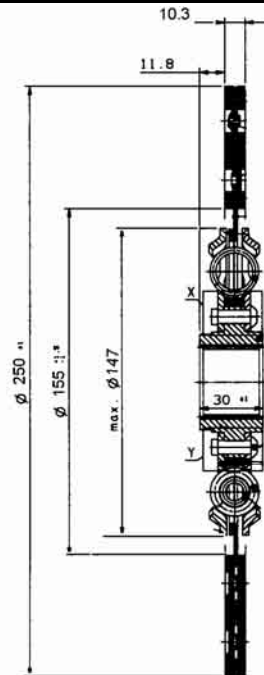
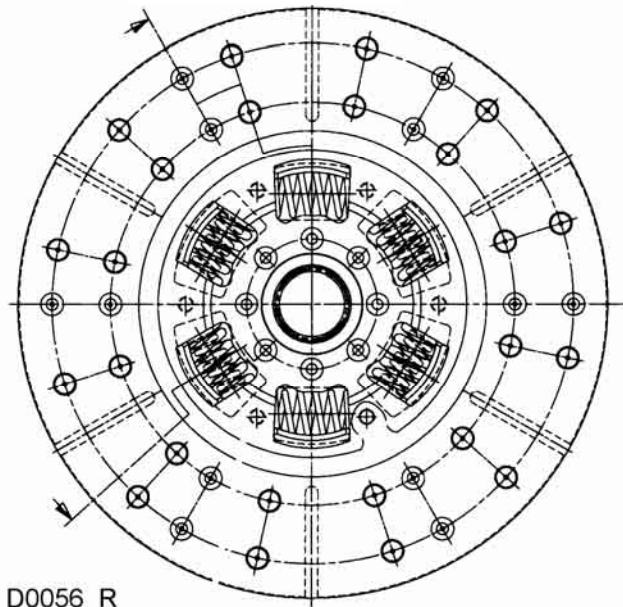


9" P. t. o.

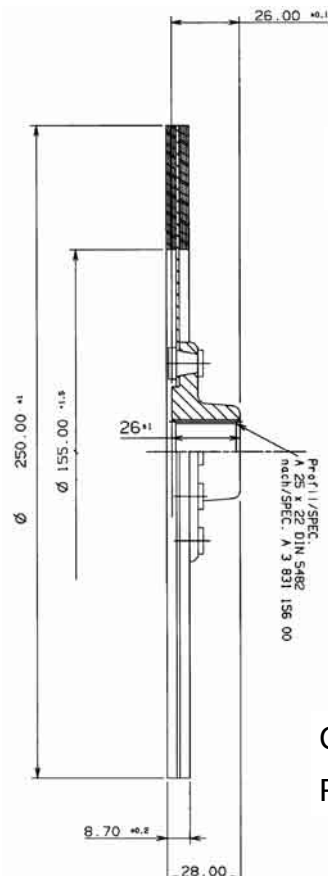
CHARACTERISTICS OF THE FRICTION MATERIAL:
RAYBESTOS 8402

Clutch	DRY TWIN PLATE		
Type	10" Luk	Mod. 3070 — Star 50 70	

10" Gearbox



CHARACTERISTICS OF THE FRICTION MATERIAL:
RAYBESTOS 8402



10" P. t. o.

CHARACTERISTICS OF THE FRICTION MATERIAL:
RAYBESTOS 8402

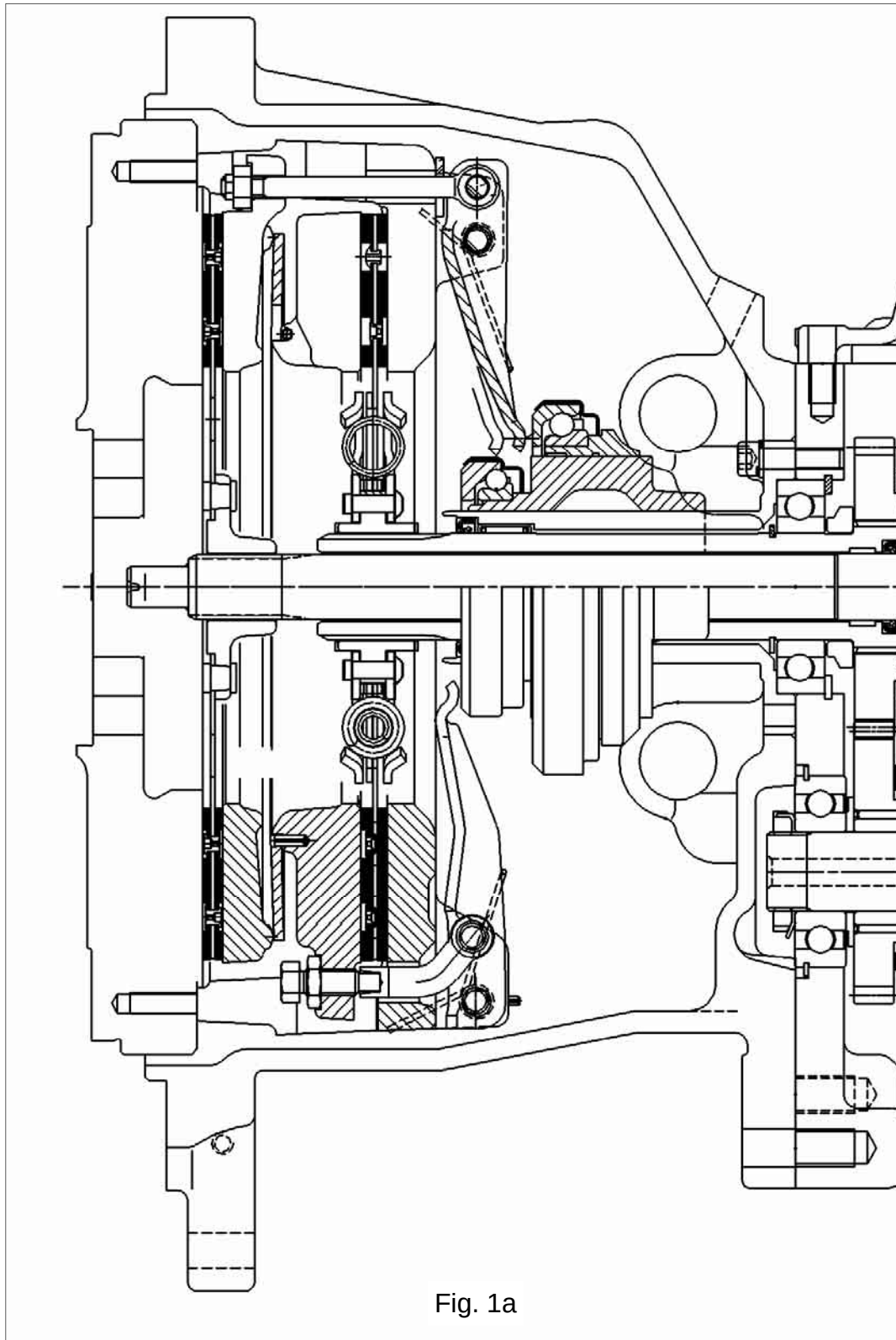
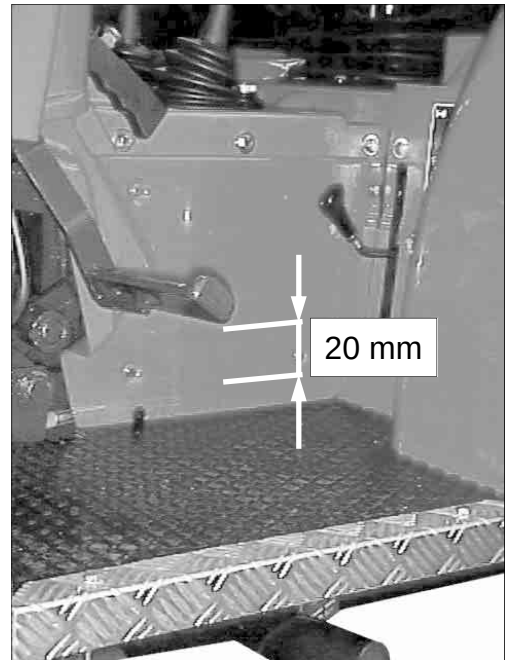
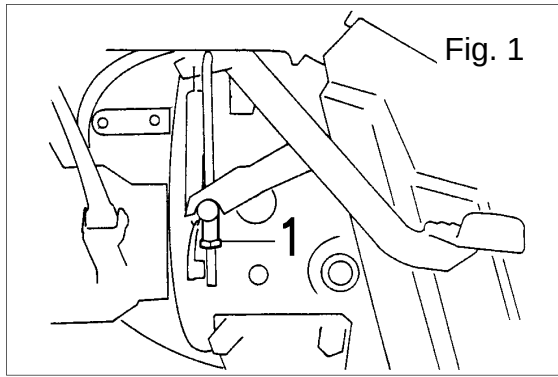


Fig. 1 shows the assembly drawing of the engine's clutch unit. The clutch is the twin-plate type and the friction plate in contact with the flywheel governs power take-off engagement, while the one nearest the thrust bearing governs the machine's drive. The chapter on the gearbox specifies the transmission drive line.



DRIVE CLUTCH PEDAL ADJUSTMENT (GEARBOX)

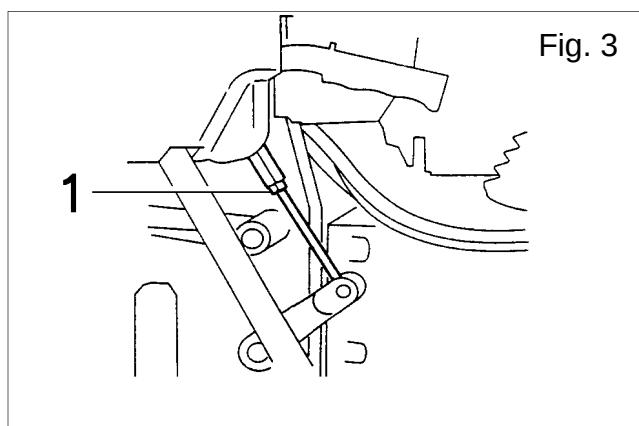
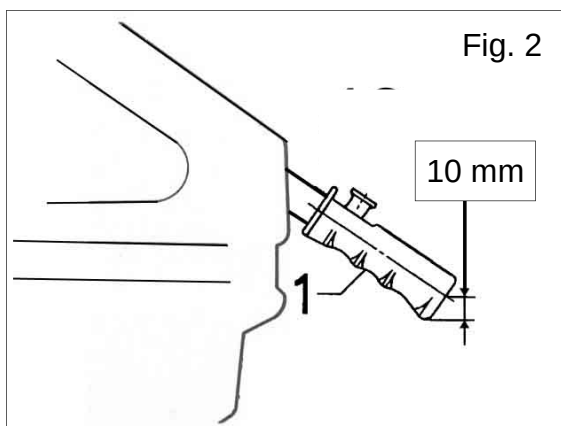
The free travel of the pedal must be 20 mm. The total pedal travel is 130 mm (fig. 1).

- Remove the guard;
- Unscrew the adjuster screw **1** (fig. 3) to lengthen the free travel of the pedal. Tighten the screw to shorten it. Fit the guard back in place once the adjustments have been made.

PTO CLUTCH LEVER ADJUSTMENT

The free travel of the lever must be 10 mm (fig. 2).

- Remove the guard;
- Unscrew the adjuster screw **1** (fig. 1) to lengthen the free travel, tighten the screw to shorten it;
- Fit the guard back in place.



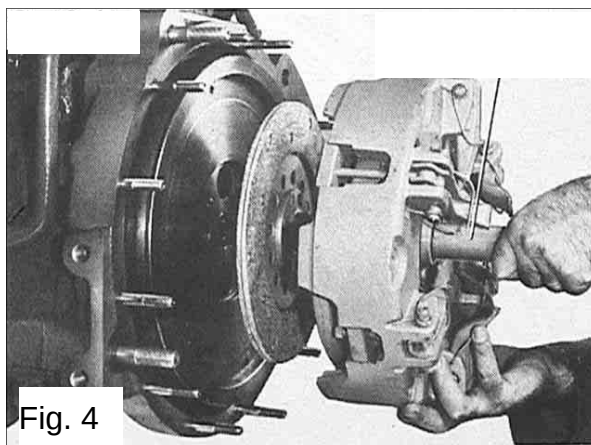


Fig. 4

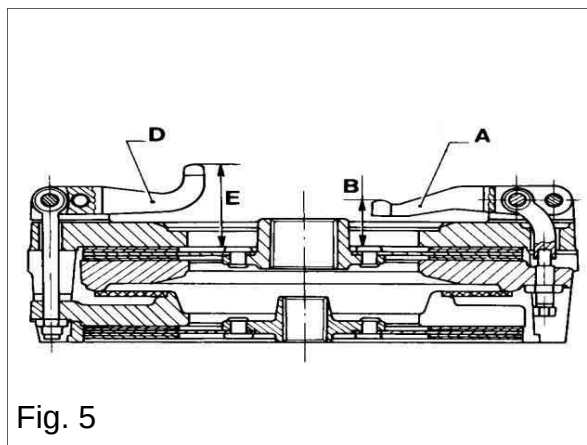


Fig. 5

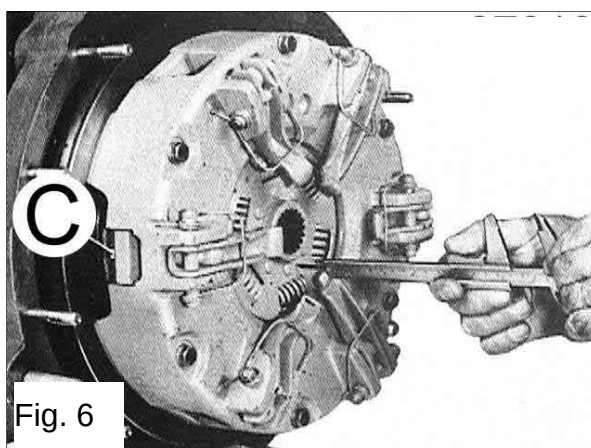


Fig. 6

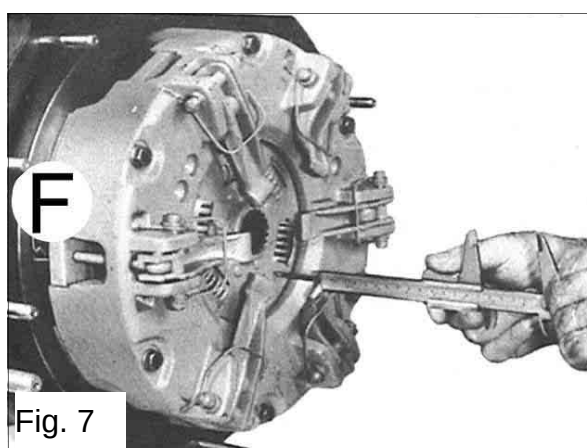


Fig. 7

INTERNAL LEVER ADJUSTMENT

To access the clutch compartment it is necessary to separate the tractor as illustrated in Fig. 4 removing the side guards, gearbox guard, hydraulic pipes and the power supply, electrical connections and the dashboard.

The levers **A** (Fig. 5) must be adjusted so as to obtain the distance **B** = 32 mm (With 10" clutch)
B = 35 mm (With 9" clutch)

Gearbox

For the adjustment it is necessary to:

- loosen the lock nuts and turn the nuts **C** (fig. 6) to obtain the prescribed distance;
- on completing adjustment, tighten the lock nuts.

The levers **D** (Fig. 5) must be adjusted so as to obtain the distance
E = 56 mm (With 10" clutch)
E = 59 mm (With 9" clutch)

P.t.o.

For the adjustment it is necessary to:

- turn the nuts **F** (fig. 7) to obtain the prescribed distance;
- on completing adjustment, press the edge of the nut with snap pliers.

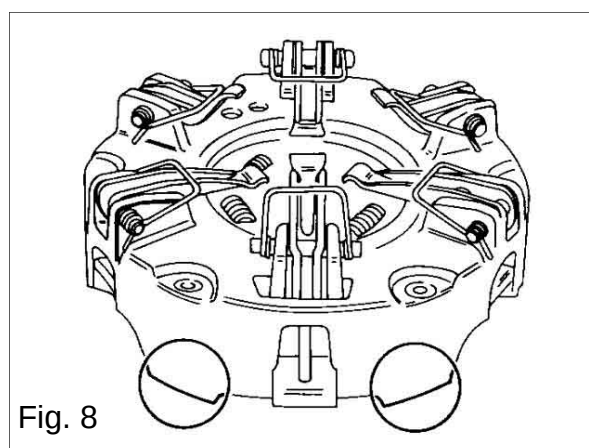
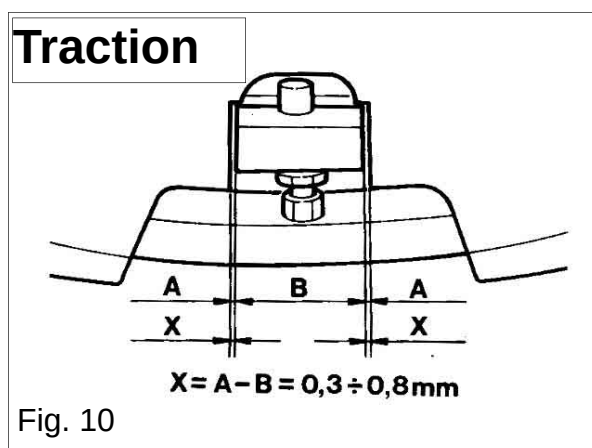
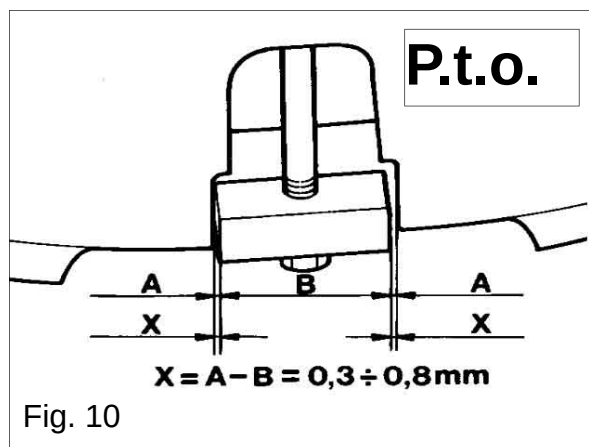
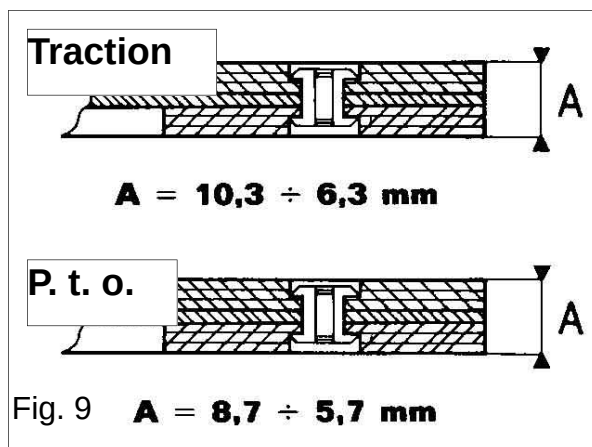


Fig. 10 shows the max range of clearance that must come to bear on the tie-rods of the two clutch assemblies: the one for the power take-off and the one for traction.

ELEMENT CONTROL

If the pressure plate rings show any scoring or signs of overheating it is necessary to grind the working faces removing 0.5 mm of material from the original thickness; for further removal (max 1 mm) it is necessary to remove the same amount of material from the coupling seat of the clutch on the flywheel (fig. 8).

Fig. 9 shows the wear thicknesses of the two clutch plates: the one for the power take-off and the one for traction.

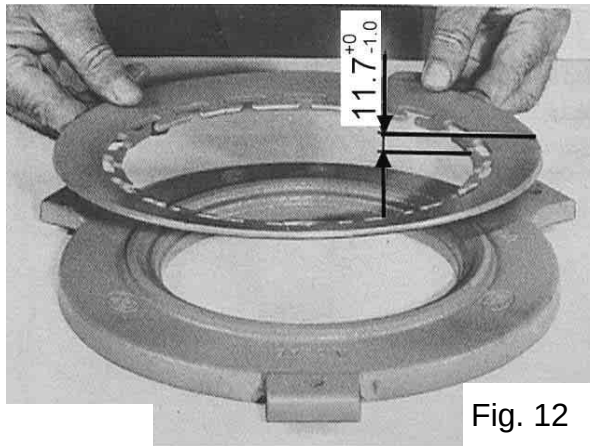


Fig. 12

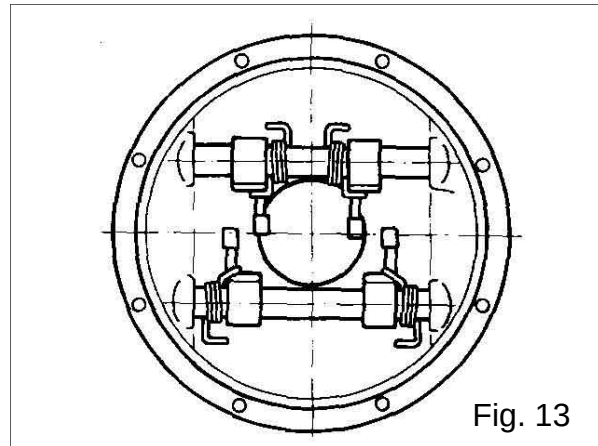


Fig. 13

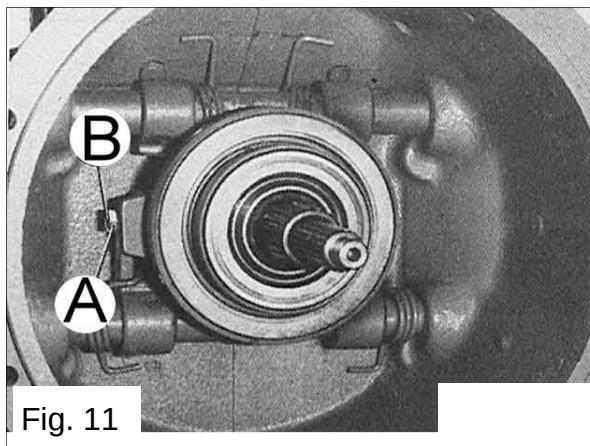


Fig. 11

HOW TO DISASSEMBLE THE CLUTCH ASSEMBLY

Note - Mark the various components before they are disassembled.

Fig. 12 shows the operating camber of the clutch spring.

When relieved, the spring must have this dimension to as to ensure it pushes on the clutch plate in the correct way.

Fig. 13 shows the correct positions of the clutch linkages in the clutch bowl: the one used to operate the PTO clutch and the one used to operate the main clutch.

HOW TO ASSEMBLE THE CLUTCH ASSEMBLY

Note - Comply with the positions of the marks made on the components to ensure that the assembly is correctly balanced.

HOW TO ASSEMBLE THE CLUTCH LINKAGES

Note - To correctly assemble the thrust bearings on the levers, screws **B** (fig. 11) must lightly contact the sleeve housings. Block nuts **A** when this condition has been achieved.

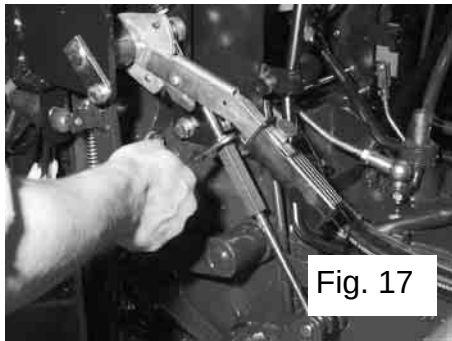


Fig. 17

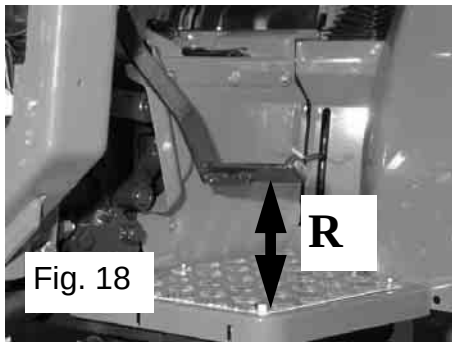


Fig. 18



Fig. 19

Fig. 14 shows the plate supporting the PTO shaft guide bearing inside the flywheel. The plate fixing screws must be tightened to 1.3 kgm.

In Fig. 15 the clutch assembly is fitted with the aid of a centring block that keeps the assembly and the P.T.O. plate in position

The screws securing the clutch must be tightened to 4 kgm.

Fig. 16 illustrates clutch pedal adjustment to obtain the distance **R** of Fig. 18 equal to 145-150 mm.

Fig. 17 on the contrary shows the adjustment of the hand clutch lever, where the tie rod shown in Fig. 17 must be pulled so that with the lever at rest

as in the figure there is a clearance of approximately 10 mm (see page 5).

Fig. 19 shows the switch on the hand clutch lever that switches on the indicator light on the dashboard when the clutch is engaged to prevent the thrust bearing getting left in operation for too long.



Fig. 14

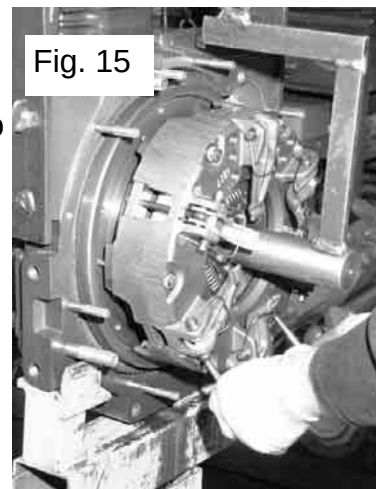


Fig. 15



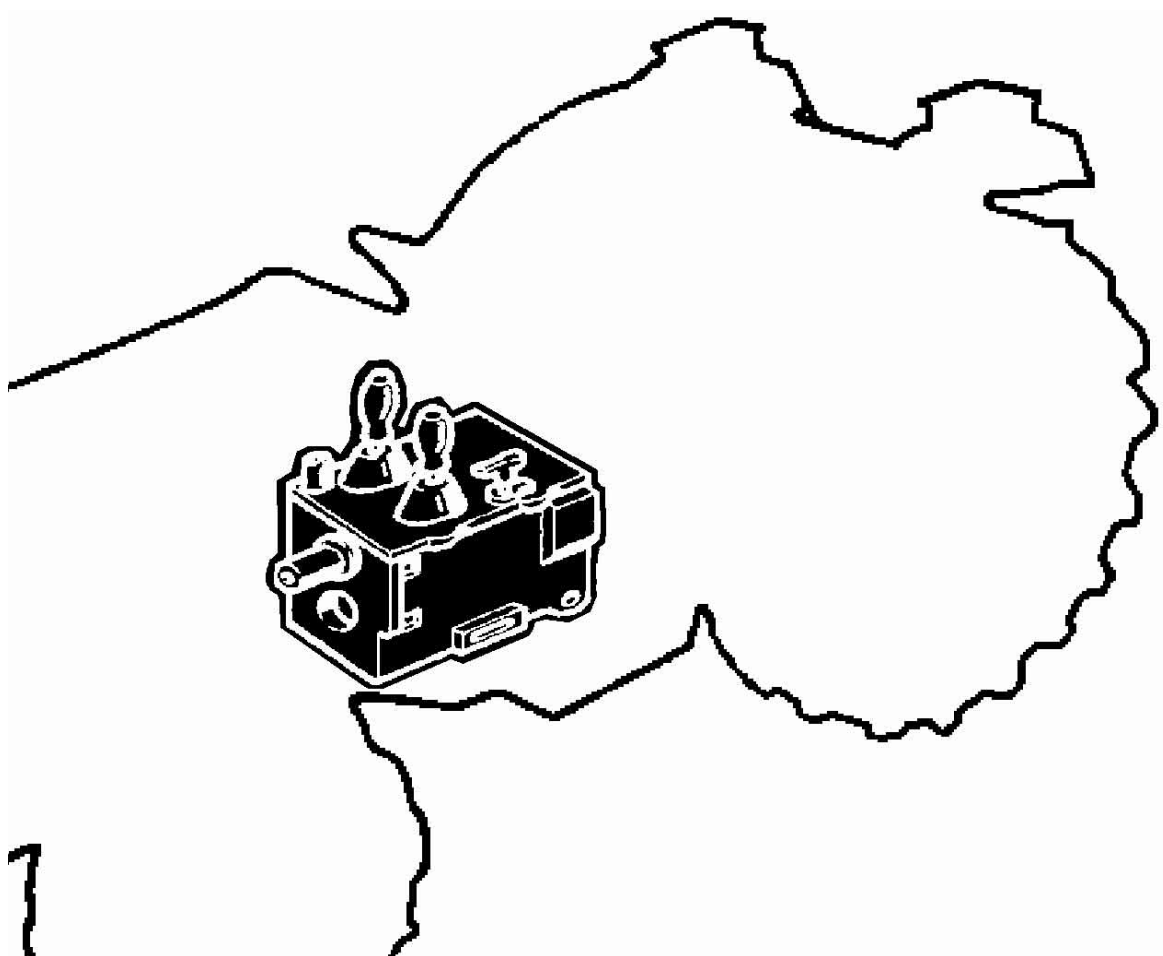
Fig. 16

DRIVING TORQUES

(kgm)

M8 x 90 screw that fixes the clutch to the flywheel	4
M10 x 12.5 nut that fixes the engine flange, clutch bowl	6
M8 x 20 main shaft sleeve fixing screw	3.3
M12 x 35 dashboard support fixing screw	8
M16 x 140 motor flange - clutch bowl fixing screw	10

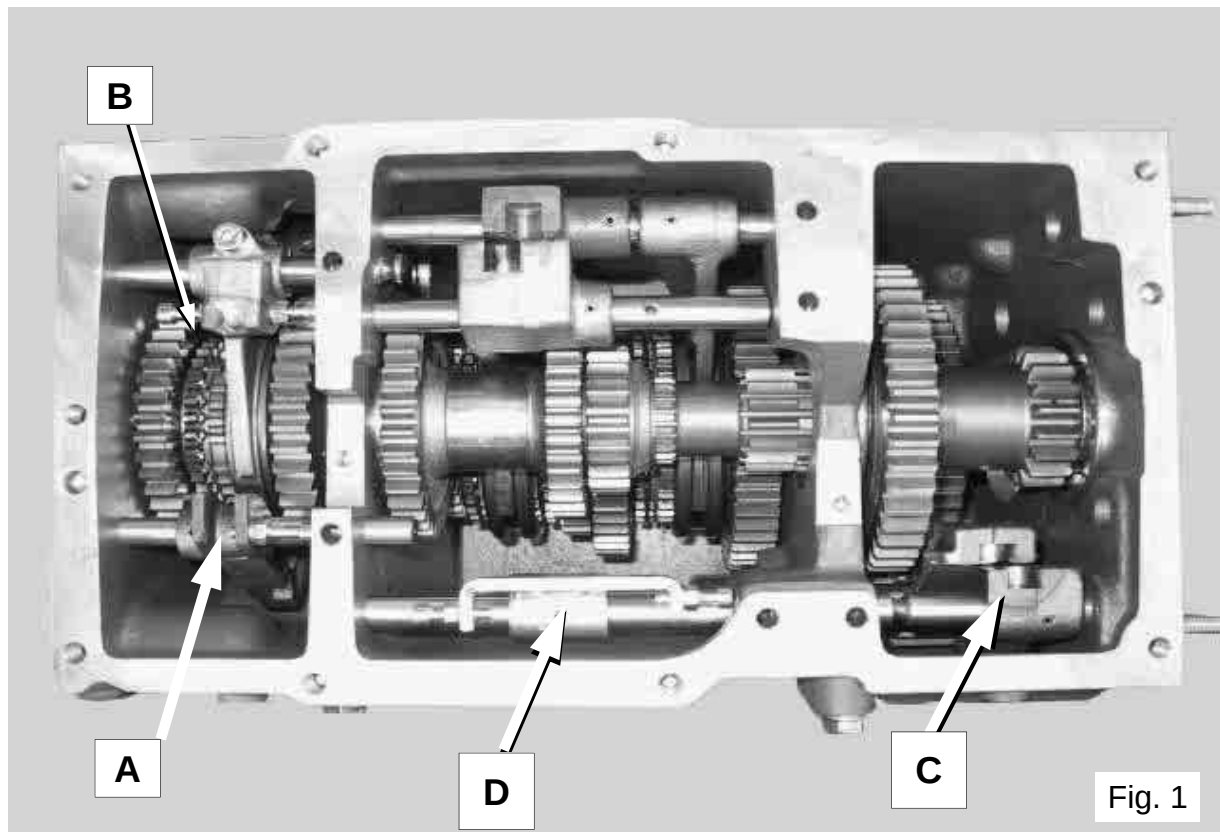
GEARBOX



1

Star - 3000 Star

Assembly 33



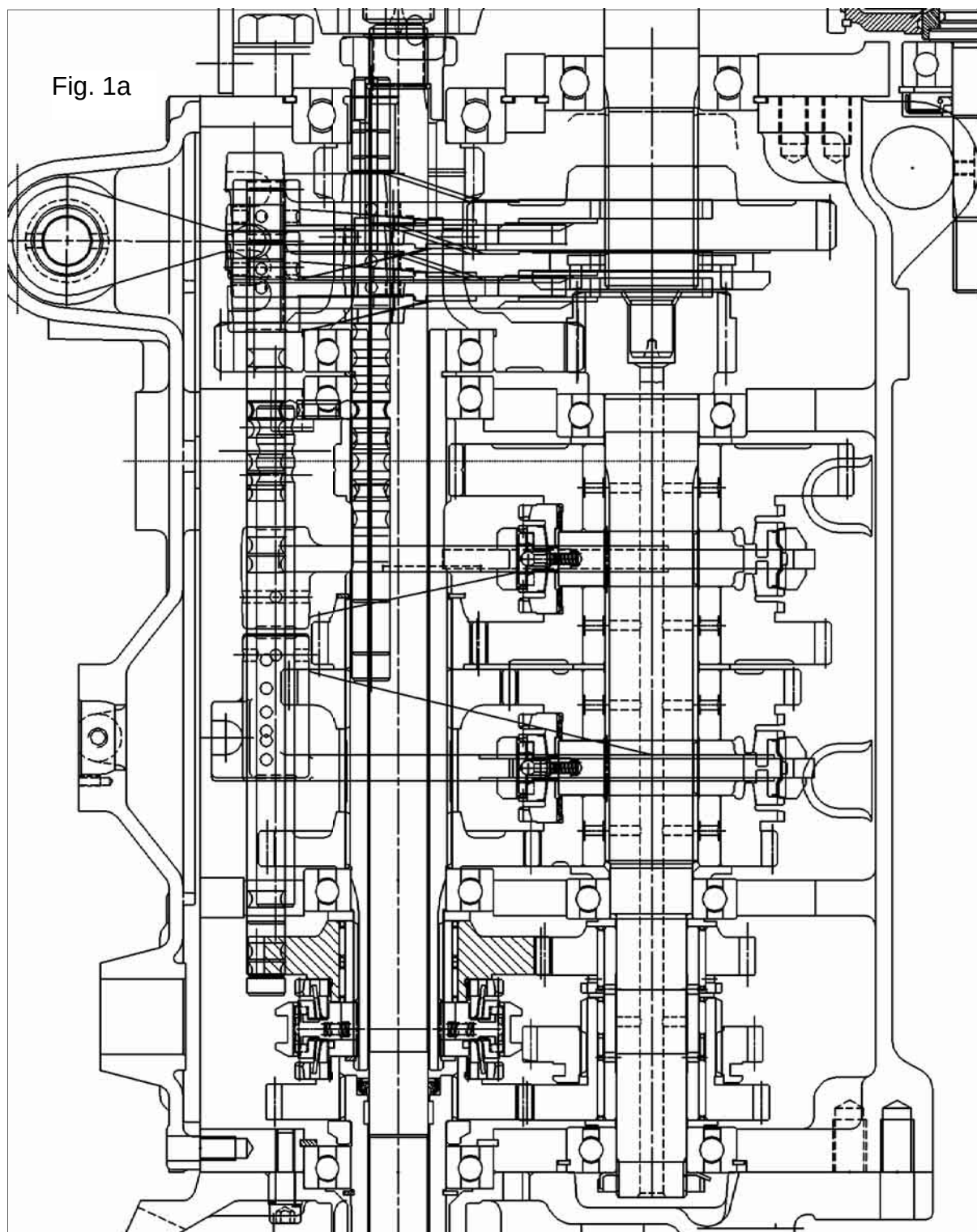
With reference to (fig. 1), the selectors indicated with the letter **C** are positioned as shown in the figure for machines with side levers.

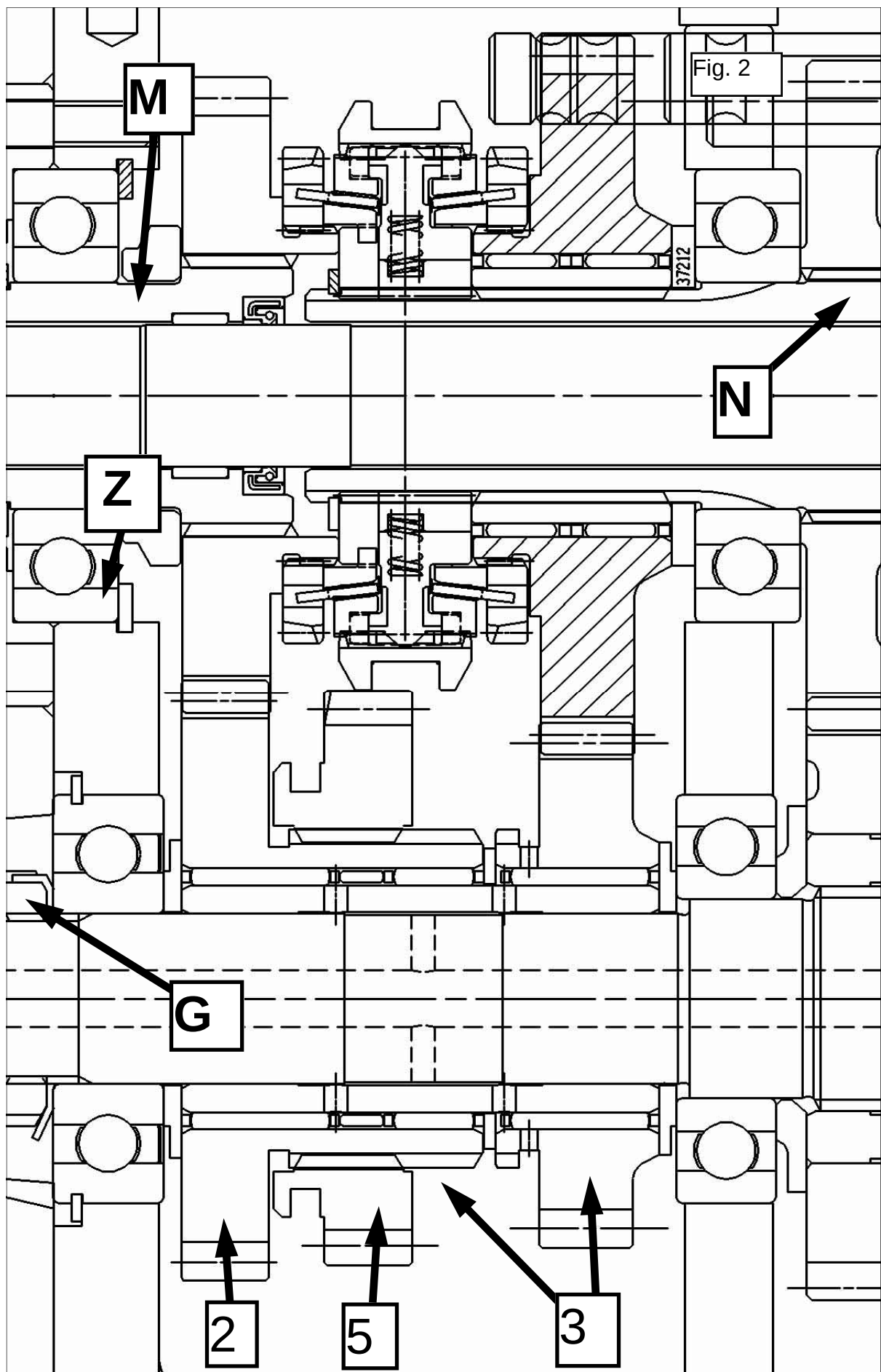
Consult the following descriptions when adjusting the end of travel screws.
The screw adjustments must prevent the levers from being pushed beyond the selector races when operated.

All the pictures, adjustments and assembly instructions on the following pages refer to the 16+8/8+8 gearbox, which is the most complete and widely used version.

Certain specific instructions will be included in future updates for the creeper version even though many parts and specifications are the same as those of the version described in this text.

Fig. 1 shows the assembly drawing of the gearbox.
The following pages analyse the construction phases starting from the reverse shuttle assembly.
This version of the gearbox has a double-cone synchronizing device for the reverse shuttle.





The first portion of the gearbox is shown on the previous page, i.e. the section that houses the reverse shuttle and the -20% reversing selector. Gear 5 of (Fig. 2) is governed by fork **A** of (Fig. 1) and when it is in position 5 the reverse shuttle is selected, whereas when it is in position 3 the -20% option is selected.

Fork **B** of (Fig. 1) selects the -20% option or the reverse shuttle according to the position of fork **A**.

Once forks **A** and **B** have been installed, lock the screws shown in (Fig. 4) so that it is not possible to slip out of the selection made by the balls that position in the races of the respective rods.

For fork **B**, first centre the synchro-ring on the neutral position and then tighten the screw that locks the fork on the rod to 3.5 kgm.

Fig.5 illustrates the first phases of assembly of the reverse shuttle transmission.

In Fig. 6, with the aid of a rubber mallet, the bearings are positioned in the casing.

In Fig. 7 the gear is splined onto the shaft.

Fig. 8 shows the following phase, i.e. fitting the reverse gear transmission at the rear of the casing.

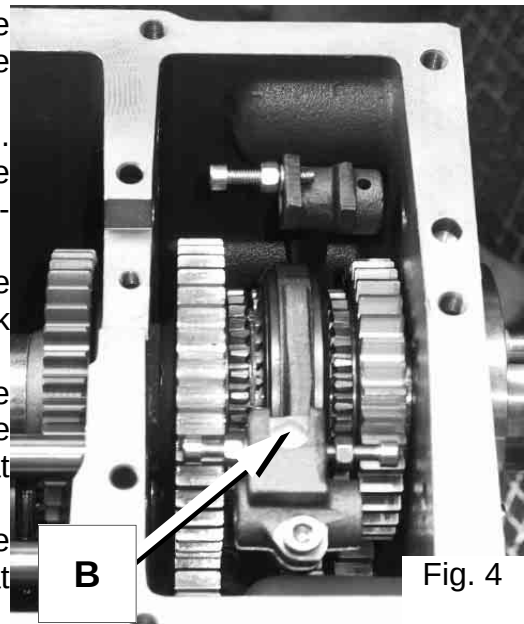


Fig. 4

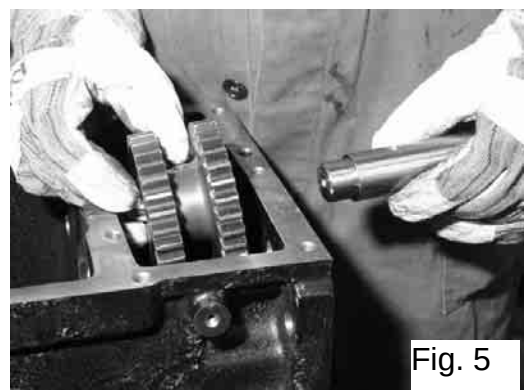


Fig. 5

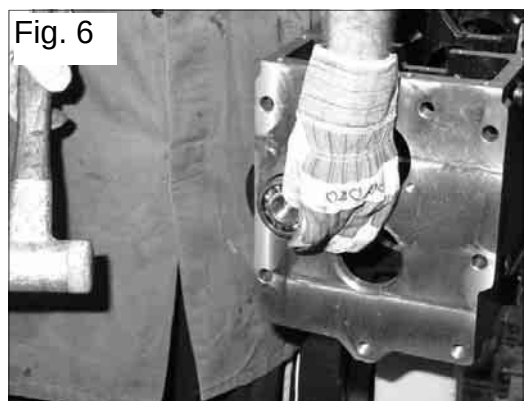


Fig. 6

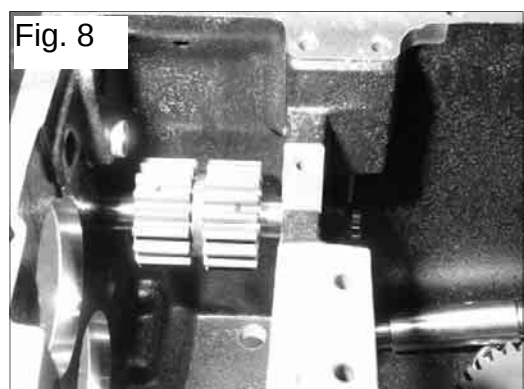


Fig. 8

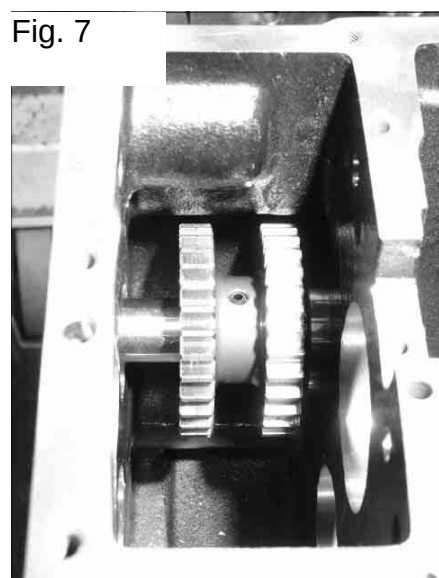


Fig. 7



Fig. 16

Fig. 9a shows the assembly drawing of the lower shaft on which the synchronizer packs are located. It also shows the assembly drawing of the gearbox to highlight the position of the gearbox lower shaft inside the casing.

In Fig. 9 the synchronizer assemblies are pre-assembled, together with their spacers, following the assembly drawing of Fig. 9a.

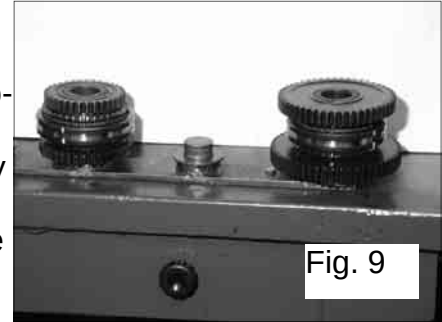


Fig. 9

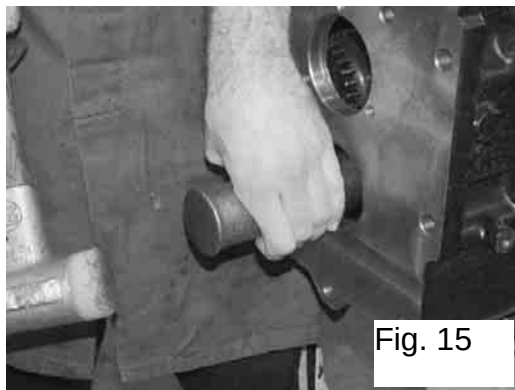


Fig. 15

In Fig. 10, with the aid of a special tool, the synchronizer blocks are lowered inside the casing. In Fig. 11 the spacer A of Fig. 9a is positioned with the aid of a pair of pliers.

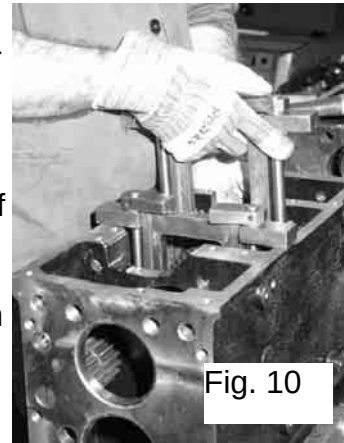


Fig. 10

In Fig. 12, before inserting the lower shaft in the synchronizer packs, the spacer B is fitted on the shaft and it is all inserted inside the gearbox (see Fig. 13).

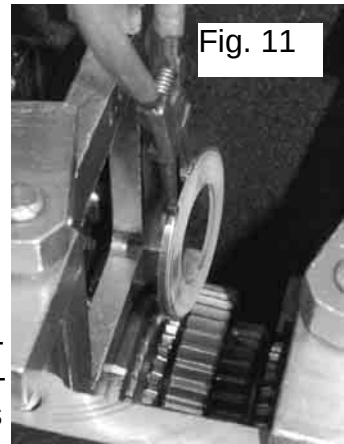


Fig. 11

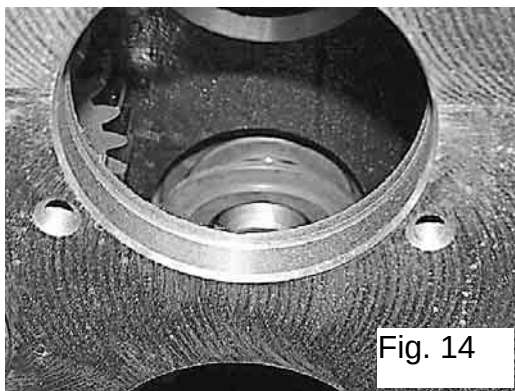


Fig. 14

Fig. 14 and Fig. 15 highlight the phases of inserting the shaft in the packs of gears and synchronizers; the final positioning is made with the aid of a block to place the bearings in their seats.

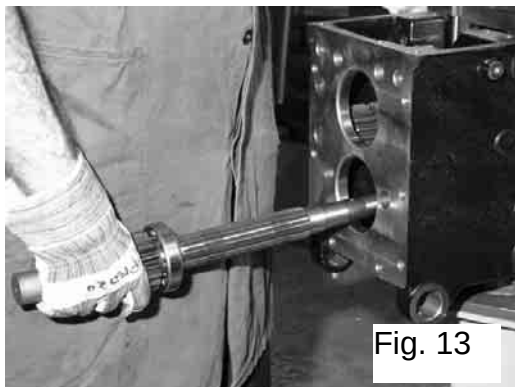


Fig. 13

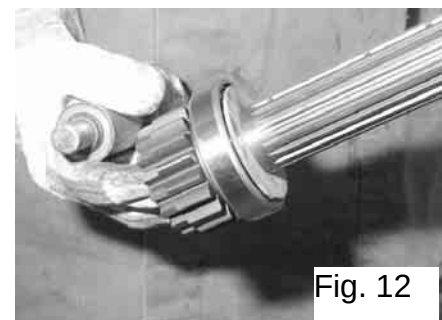


Fig. 12

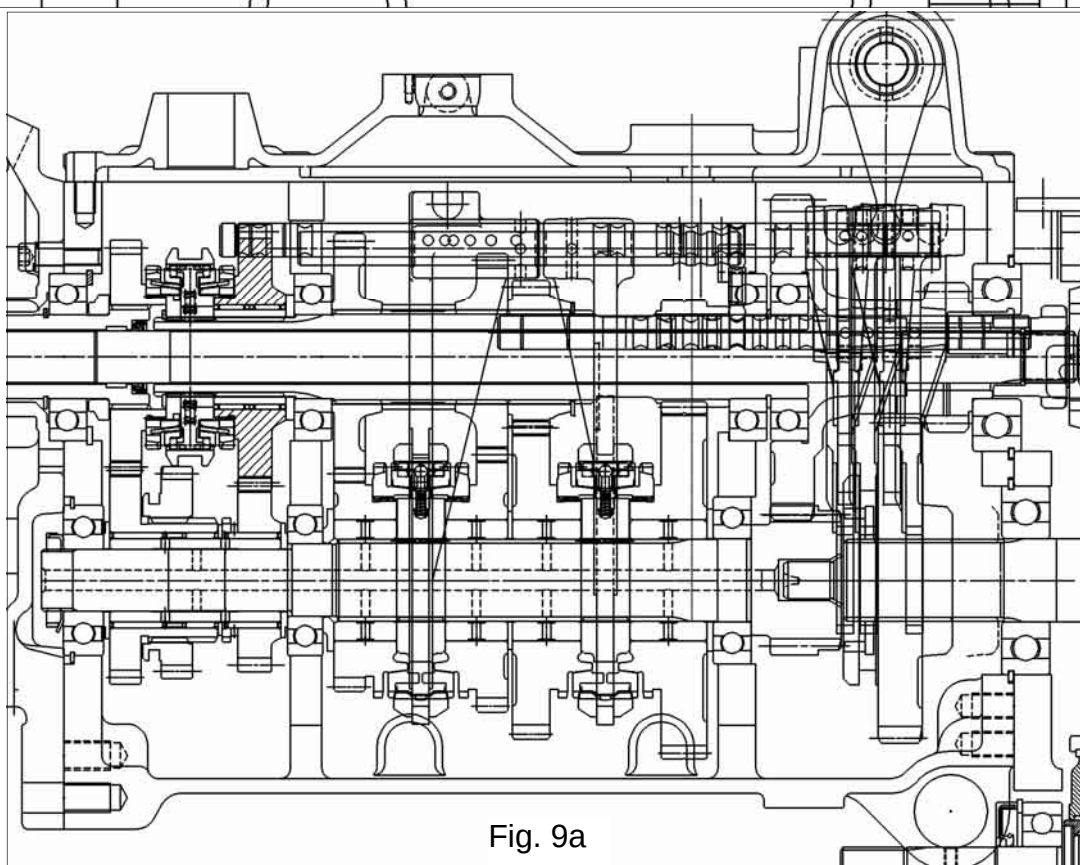
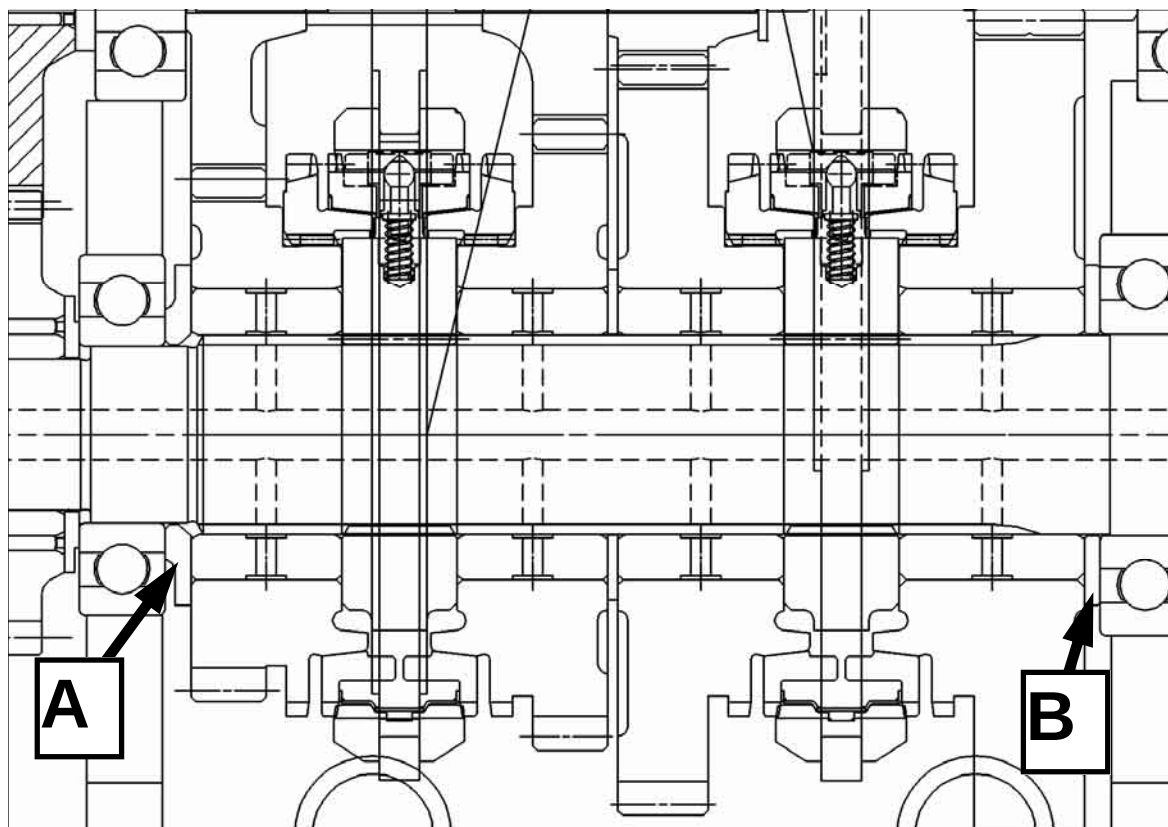


Fig. 9 shows the pair of synchronizers that operate the gearbox. These synchronizers have a greater diameter and are made in a more modern way than the previous versions.

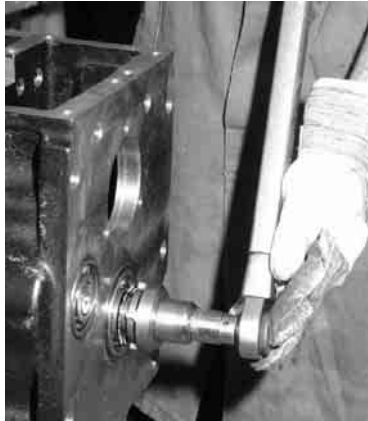


Fig. 24

Before fully inserting the shaft, position the last gears that are fitted at the front of the casing. In Fig. 17 the set of gears forming the bottom of the reverse shuttle – 20% final drive assembly is prepared on the bench.

In practice these are the gears marked with the numbers 2-5-3 in Fig. 2. While the pack prepared in this way is inserted, the fork and the spacers are positioned too, as seen in the drawing of Fig. 2, as illustrated in Fig. 17 and 18. Fig. 19 shows the packing getting positioned. In Fig. 20 the spacer is positioned and in Fig. 21 the closing bearing is fitted with the aid of a block and a rubber mallet. After inserting the bearing in its seat, fit the stop plate and the ring nut making the pack of synchronizers.



Fig. 17



Fig. 23

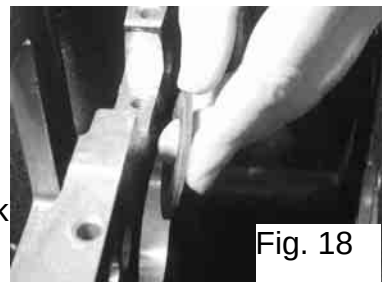


Fig. 18



Fig. 22

The ring nut must be tightened to 10 kgm and subsequently the plate must be beaten and the ring nut punched to avoid accidental loosening of the pack (see Fig. 23-24-25).



Fig. 19

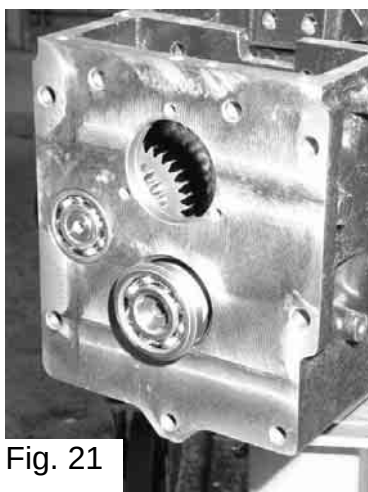


Fig. 21

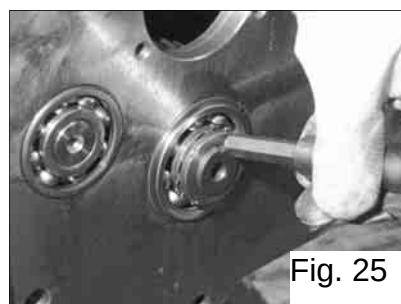


Fig. 25



Fig. 20

Before passing on to fit the top main shaft, it is necessary to position some other elements such as the forks that select the speeds and the final drive selection gear that is lowered inside the casing in Fig. 26.

Fig. 27 shows the speed selection forks inside the casing, located on the synchronizers. After positioning the forks, the rods are fitted (see Fig. 28) and the selectors (spring + ball) are positioned. The retainer shown in Fig. 28 prevents two speeds from accidentally getting selected. In Fig. 29 the gear couplings are keyed onto the respective rods with spirol pins. Fig. 30 shows a pin punch used to fit the spirol pins.

Fig. 9a shows the positions of the gear forks on the synchronizer rings and the positions of the couplings keyed on the rods.

It is now possible to move on to fit the top main shaft.

The first operation to carry out is to fit the snap ring illustrated in Fig. 31 that can be done outside the casing. Subsequently you can insert the shaft inside the gearbox as illustrated in Fig. 32, positioning the splined couplings on the rods.

It is now possible to move on to fit the top main shaft.

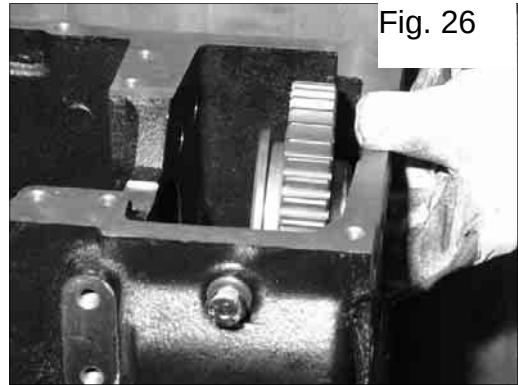


Fig. 26

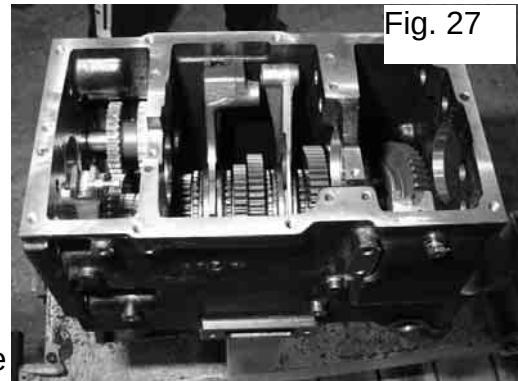


Fig. 27

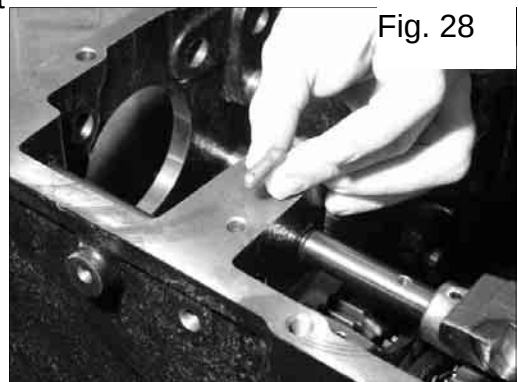


Fig. 28

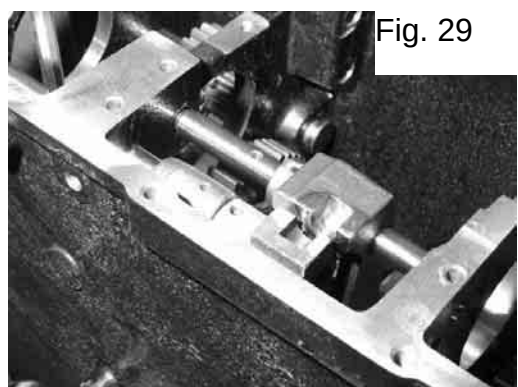


Fig. 29

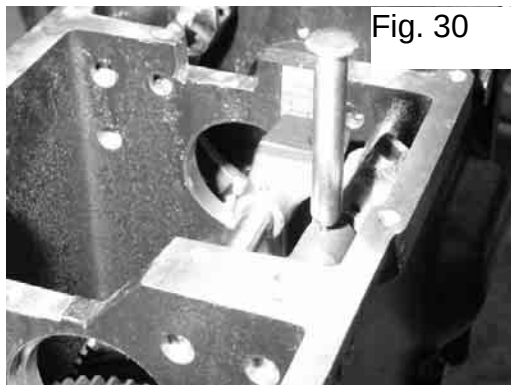


Fig. 30

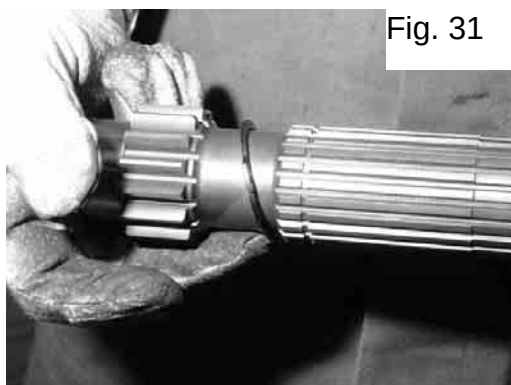


Fig. 31

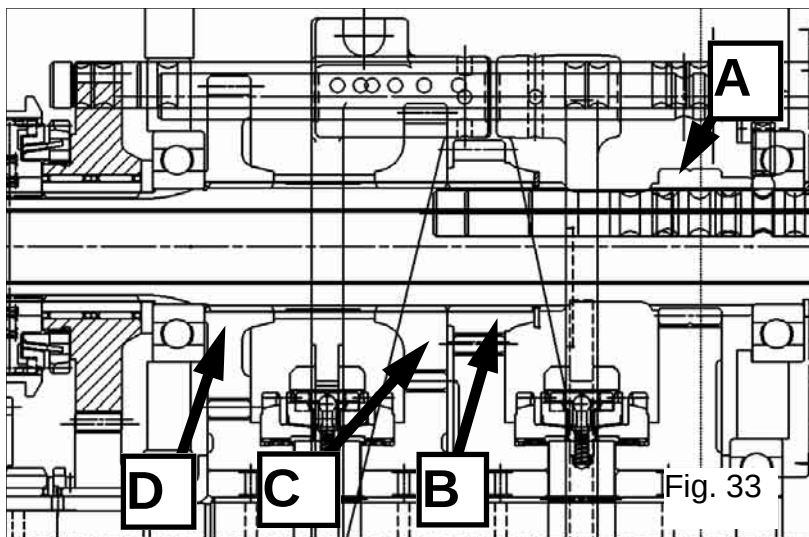


Fig. 33

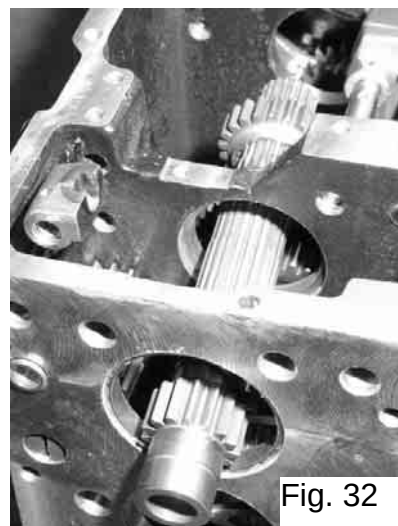


Fig. 32

Insert the shaft (part **A** of Fig. 33) and move on to fit the gears **B-C** and **D** of Fig. 33. The gear **B** is held in position by the snap ring shown in the assembly drawing of Fig. 33. Sometimes it is necessary to insert spacers between the gear and the snap ring to position the band of gear B correctly in relation to the lower mating one.

Fig. 34 shows the top of the main shaft fitted with the 4 gears making the 4 speeds.

Check that all 4 toothed bands correspond with the lower ones.

In Fig. 34a the first of the two bearings indicated with the letter **R** in Fig. 36 is fitted. The second one is positioned inside the reduction gear shown in Fig. 35.

In Fig. 36, marked with the letter **Q**, there is the position of the reduction gear inside the gearbox.

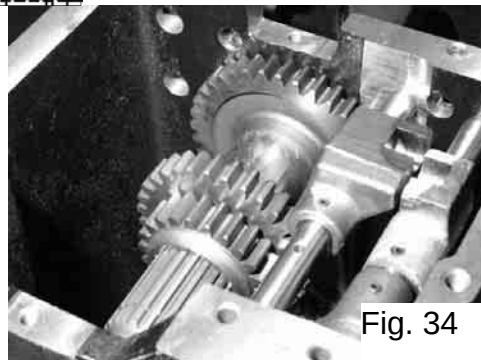


Fig. 34

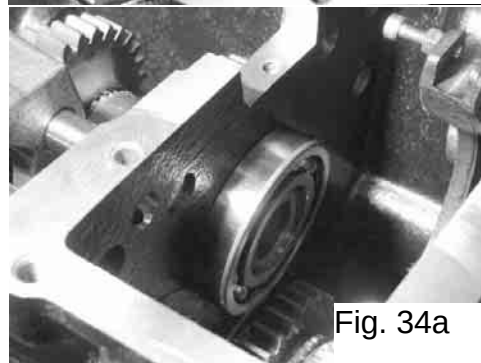


Fig. 34a

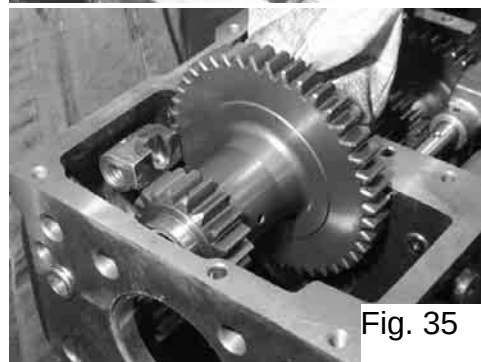


Fig. 35

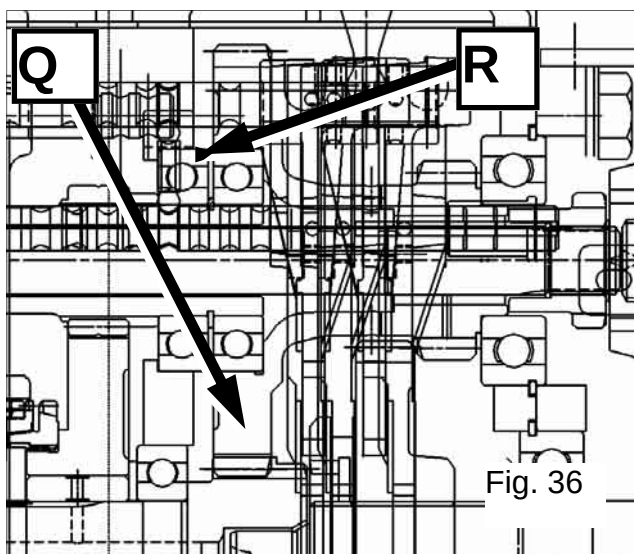


Fig. 36

What was mentioned above holds for this gear too: check its correct alignment with the lower toothed bands.

In Fig. 37 the pack is prepared comprising the double-cone synchronizer that is positioned on the front at the top of the main shaft. Fig.39 shows the assembly drawing of the entire unit.



Fig. 37

The letter **F** indicates the spacer shown in Fig. 38 and that is positioned inside the casing in Fig. 40. Again in Fig. 40 you can see the fork that acts on the -20% reversing selector already inserted in the casing. In Fig. 41 the entire pre-assembled unit is lowered inside the casing and positioned, using a block, as illustrated in Fig. 42, seating the bearing positioned behind the spacer **F** of Fig. 39.



Fig. 38

Do not forget to lock the whole pack with the snap ring marked with the letter **H** in Fig. 39, as shown in Fig. 43.

Fig. 43 also shows a simple tool composed of two blades and a screw that holds the gear marked with the letter **L** in Fig. 39 in position until the initial portion of the main shaft gets

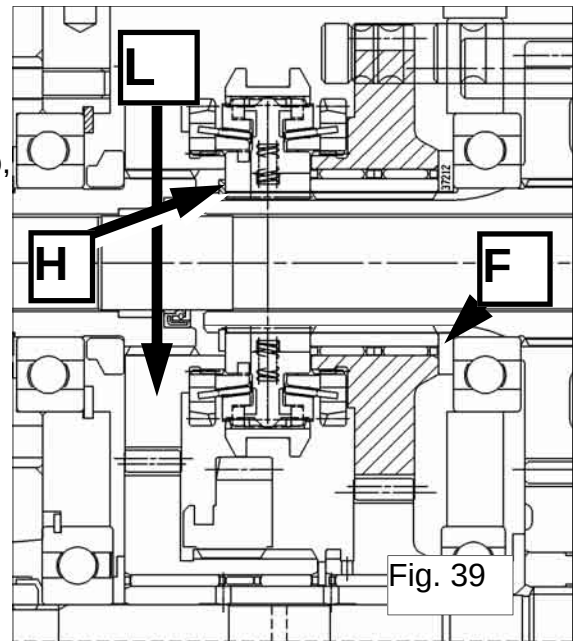


Fig. 39

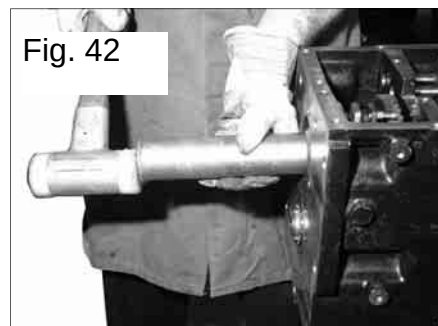


Fig. 42



Fig. 41

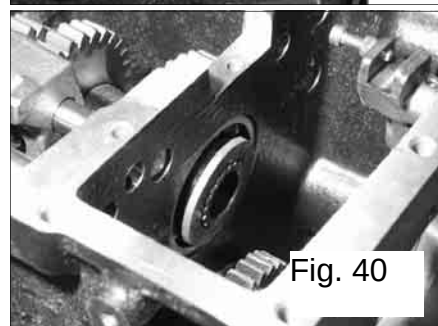


Fig. 40

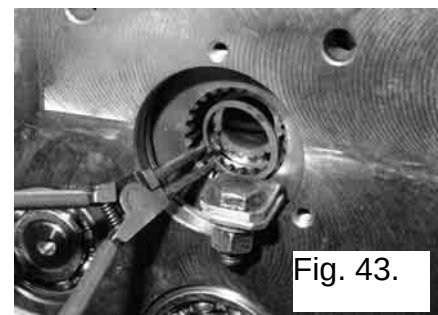


Fig. 43.

Before finishing the front of the gearbox it is better to finish the rear.

In Fig. 44 the snap ring is fitted between the two paired bearings (part **R** of Fig. 36). Afterwards, install the gear selector fork in the casing as illustrated in Fig. 45a and then fit the upper reduction gear.

In Fig. 45 a spacer is placed between the gear and bearing that may be necessary depending on the clearance between the bearing and gear.

To verify whether this spacer is necessary, fit the bearing as in Fig. 46 and check whether there is a gap between the bearing and gear. Using a feeler gauge, measure the gap, fit the spacer and reposition the bearing permanently. Now, after positioning the gear **S** of Fig. 48 inside the casing, you can install the lower bearing as illustrated in Fig. 47 with the aid of a block. Returning to the front of the gearbox, proceed to fit the rods and selector forks of the reverse shuttle and of the 20% reduction gear - reversing selector.

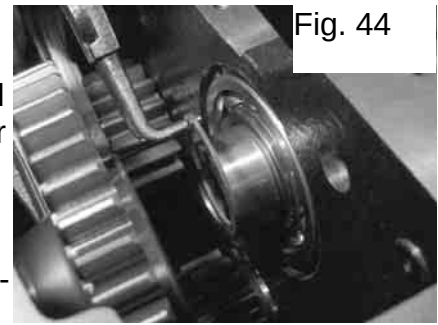


Fig. 44



Fig. 45

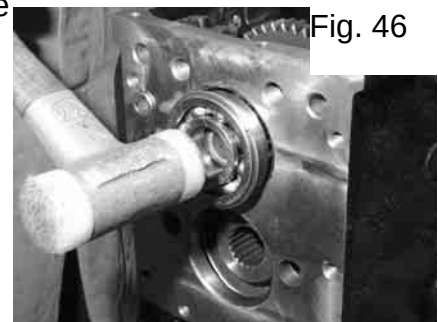


Fig. 46

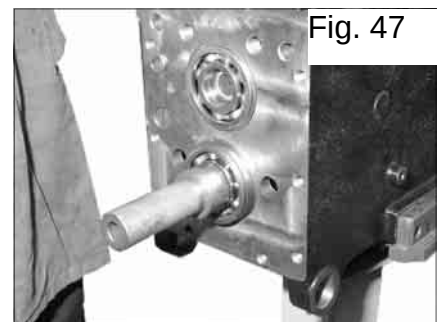


Fig. 47

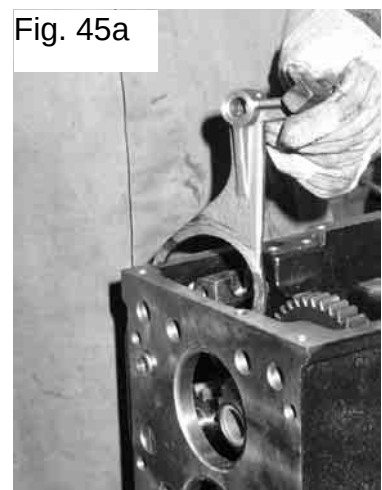


Fig. 45a

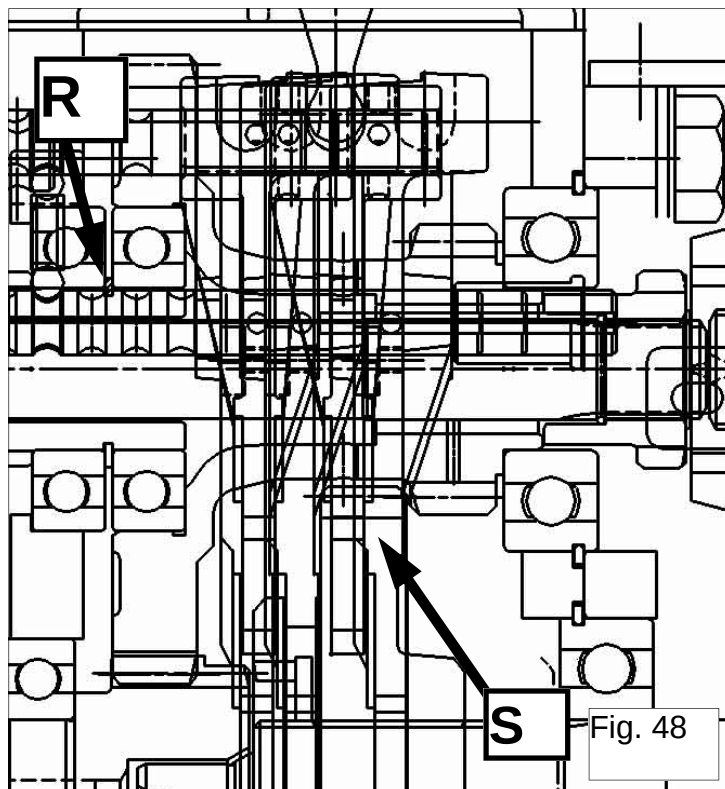


Fig. 48

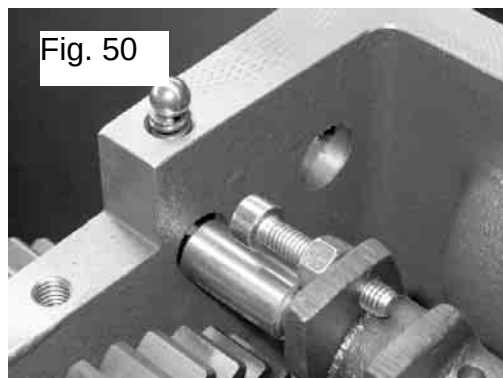


Fig. 50

In Fig. 50, after inserting the rod in the fork, and before splining it, install the spring and ball.



Fig. 51a



Fig. 50a

In Fig. 50a, insert the guide bushing of the guide rod of the lower reduction gear selector fork.

The fork has already been positioned inside the casing in the preceding phases and in Fig. 51a the lower guide rod is inserted that positions it on the coupling.

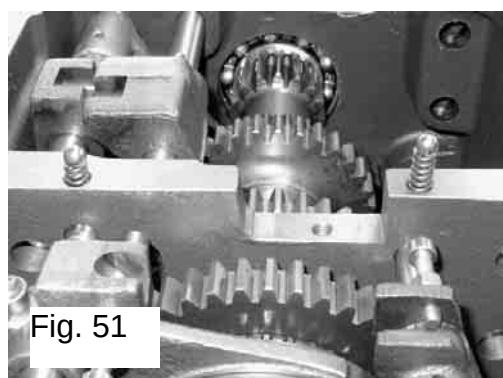


Fig. 51

At the top it will be splined on the rod with the selection races. Fig. 50 and 51 show the position of the springs and balls to select the 20% option and the reverse shuttle.

In Fig. 52 with the aid of a rod you fit the spring + ball packs, packing the spring and sliding the rod on the supports until fully inserted in its seat.

Then fit any pins, lining up the hole on the rod and on the fork with the aid of a pin punch.

It is then wise to test the selection, verifying the various positions taken by the selection fork and adjust the setscrew on the couplings splined on the rods (with spirol pins) so that at the limit stops the ball cannot come out of the race. If this happens there could be early wear on the fork and damage to the synchronizers.

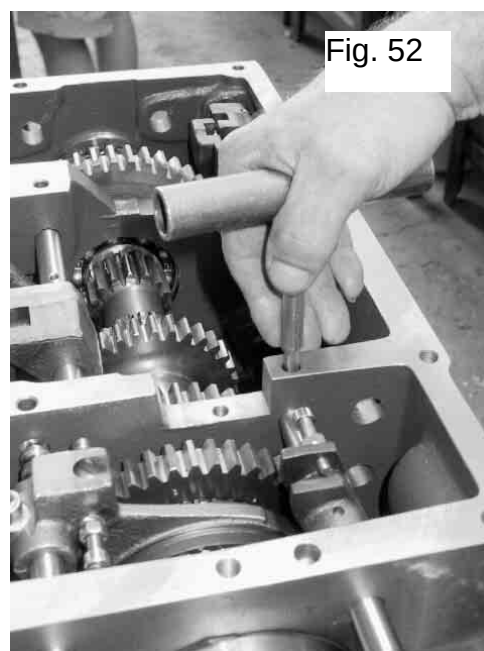


Fig. 52

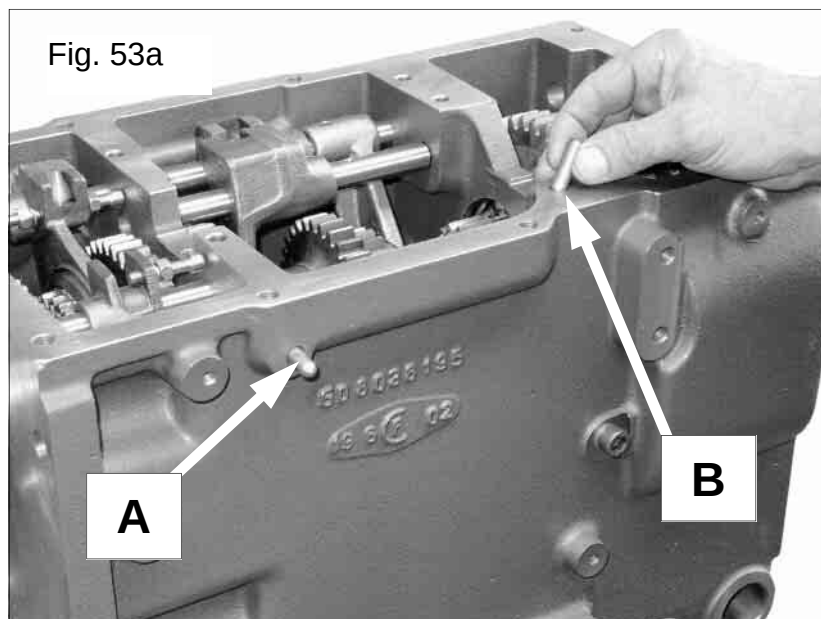


Fig. 53a illustrates the other retainers to install in the gearbox during the assembly phase.

Retainer **A** of Fig. 53a is the one that prevents engaging reverse gear after selecting the reverse shuttle option and that on the contrary enables engaging the reverse gear when the 20% option is selected.

Retainer **B** of Fig. 53a works between the reverse gear and the final drive and prevents two ranging getting engaged at the same time.

These retainers should be considered together with the one illustrated above, which works between the two rods of the gears and prevents engaging two ranges at the same time.

Before proceeding further with the illustration of the following phases, it is worthwhile dwelling on the assembly of the lower fork operating the final drive assembly.

On the following page, Fig. 54 illustrates the position of the fork inside the casing.

We have already spoken of the assembly of the reverse transmission and engaging the final drive selector gear inside the casing, before fitting the lower rear bearing on the bevel pinion shaft.

(see Fig. 53).

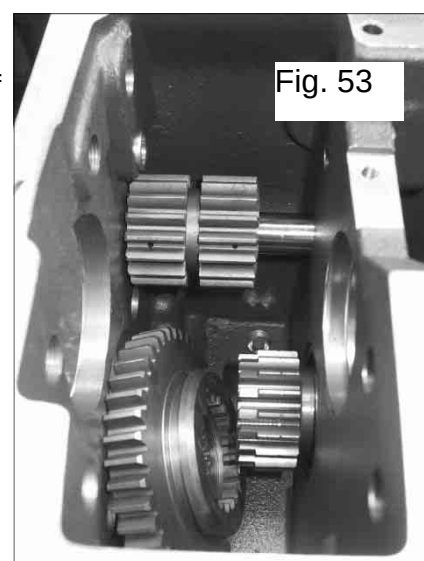


Fig. 54 illustrates assembling the final drive fork, which has been mentioned above. After fitting the reverse gear and the fork, you need to correctly direct the final drive fork as indicated in Fig. 54 to permit installing it correctly inside the casing.

After fitting the snap ring between the two bearings, as mentioned above and briefly summarized in Fig.

54a, you can

proceed as

shown in Fig.

55 to fit the

rods and cou-

plings that

govern en-

gaging the re-

verse gear

and the final

drive, fitting

the springs and balls in the casing (Fig. 55).

To perform this operation, use a strut as illustrated in the figure.

Then spline the couplings on the rods and verify the selectors are inserted in the race correctly and the positions of the gears inside the box are right.



Fig. 55

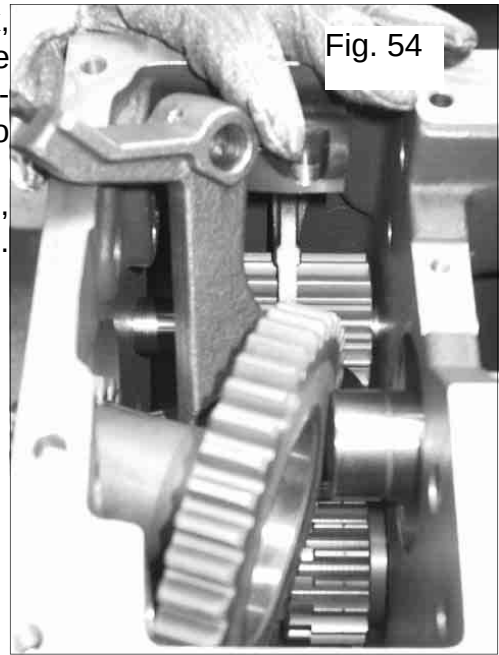


Fig. 54

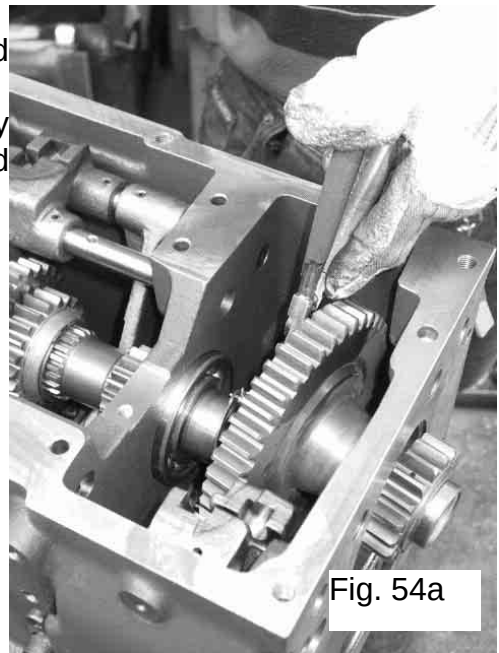


Fig. 54a

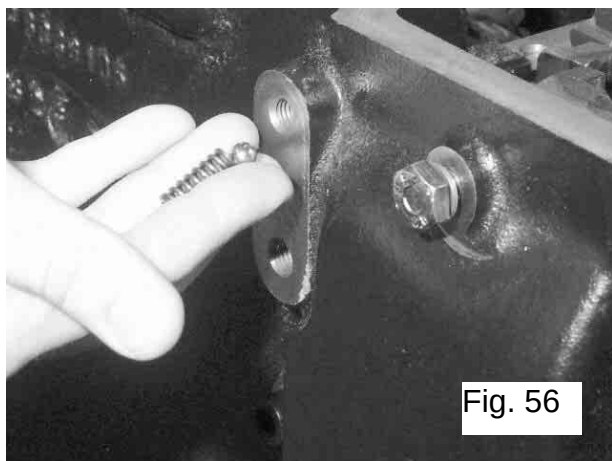


Fig. 56

In Fig. 56 the springs and balls making the double selection on the final drive are fitted: this is to have a safer selection and with a greater load on the rod. Then fit the two screws that hold the two springs and two balls in position, tightening them to 3 kgm.

After performing this operation and making the final drive selections, you can move on to fit the PTO internal shaft, the so-called whip that transmits motion from the 2nd clutch plate to the rear PTO transmission. Fig. 57 illustrates the preparation of the whip and Fig. 58 its insertion in the gearbox and the upper shaft.

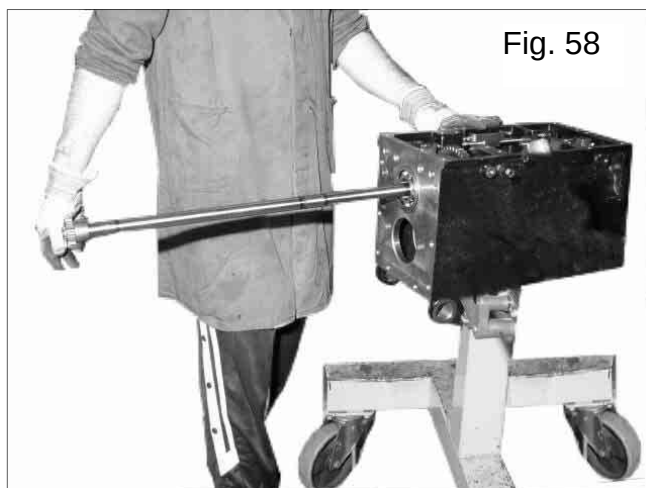


Fig. 58

After inserting the whip from the rear of the casing, you can proceed with the last phases of the assembly of the gearbox, i.e. insertion of the front of the main shaft and the cover on which the clutch thrust bearing works.



Fig. 57



Fig. 60



Fig. 61

Fig. 59 shows the assembly drawing of the initial part of the upper main shaft that in Fig. 60 and Fig. 61 is preassembled, placing the seal in position that will operate on the whip fitted in the previous operations. This seal is marked with the letter **M** in Fig. 59. Afterwards, on the shaft it is possible to fit the rear bearing (bearing **R** of Fig. 59a).

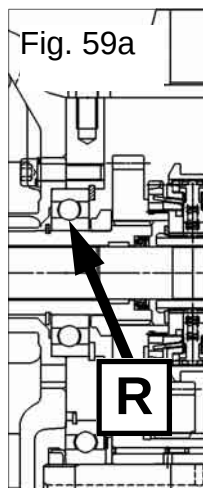


Fig. 59a

R

This bearing is held in position by two snap rings. The shimming to be done on this bearing to provide the right clearance for the synchronizer is the following:
depending on the tolerances on the single components the shimming is equal to 1.6 mm.

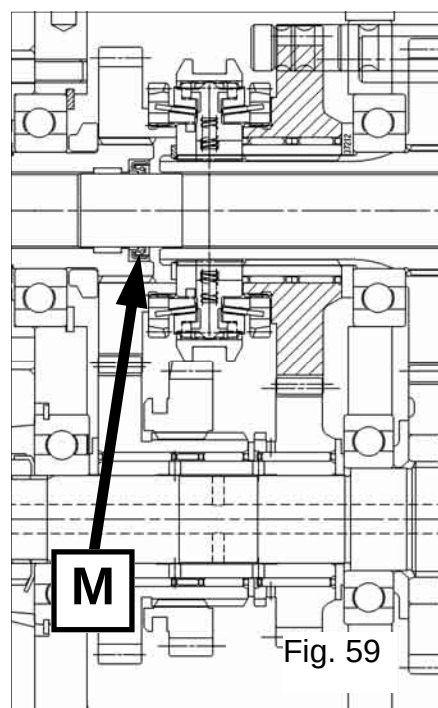


Fig. 59

M

A 1 mm shim is normally placed between the bearing and the snap ring on the shaft and a 0.6 mm shim in front of the bearing. The thicker spacer always goes on the side of the snap ring while the other, on the other side of the bearing, must be such that the sum of their thicknesses always gives 1.6 mm. After these operations you can proceed to fit the shaft inside the casing.

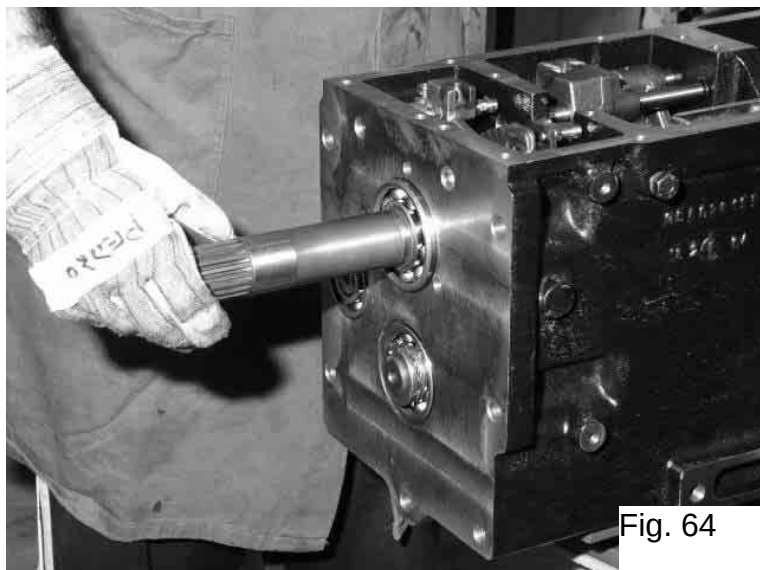


Fig. 64



Fig. 63

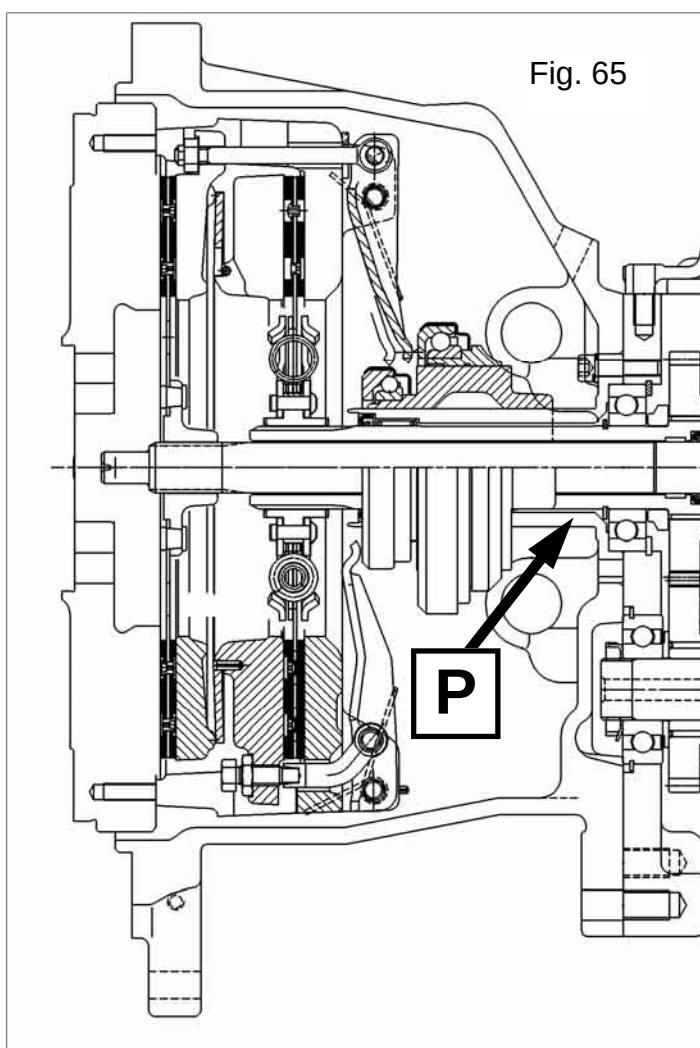


Fig. 65

This last operation is illustrated in Fig. 64, preceding installation of the coupling, part **P** of Fig. 65 that supports the thrust bearing of the clutch.

In Fig. 66 with the aid of a block the oil seal is inserted on the coupling, before assembling on the gearbox casing.

In Fig. 67 the mating surface of the coupling on the casing is carefully siliconed to prevent oil leaks.



Fig. 66



Fig. 67

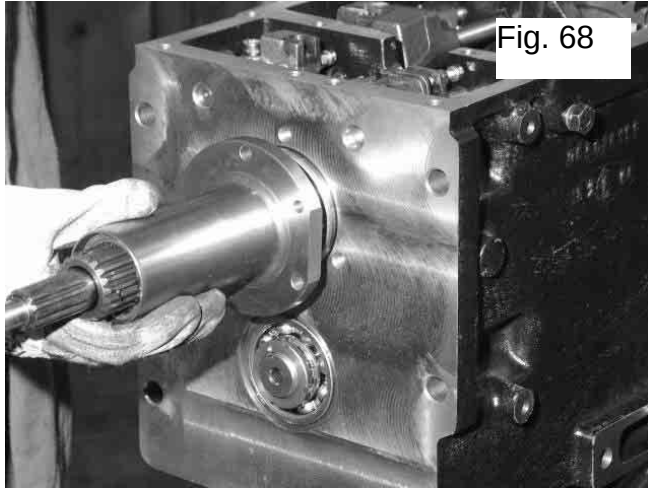


Fig. 68

In Fig. 68 the coupling is positioned on the main shaft and moved up to the gearbox to allow the silicone to form a seal.

In Fig. 69 the screws fixing the coupling are tightened to 3 kgm.

Insert the coupling on the groove of the main shaft with care so as not to cut or damage the seal fitted beforehand inside the coupling.

After performing these operations the assembly of the gearbox is almost complete, it just remains to fit the clutch bowl that as illustrated in Fig. 70 completes the assembly of the lower shaft and of the drive reversal shaft of the reverse shuttle.

Spacers will be inserted between the clutch bowl and the gearbox that are specified on the following page.

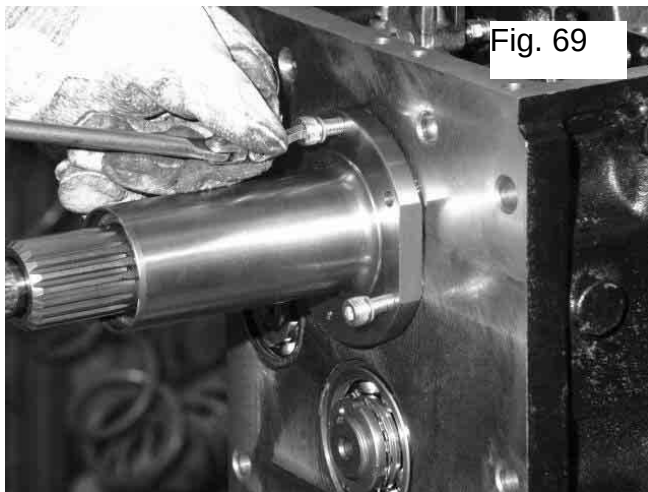


Fig. 69

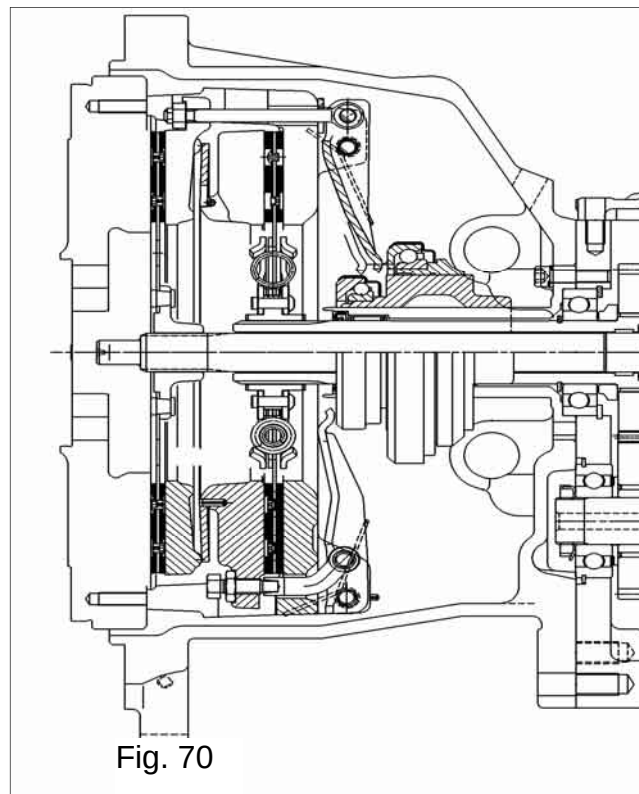


Fig. 70

Before flanging the clutch bowl on the gearbox it is necessary to preassemble the components governing the clutch.

As illustrated in Fig. 71 with the aid of a pin punch install the lower shaft and the control levers.

With the aid of a piece of shaped blade position the terminals of the torsion springs as illustrated in Fig. 72.

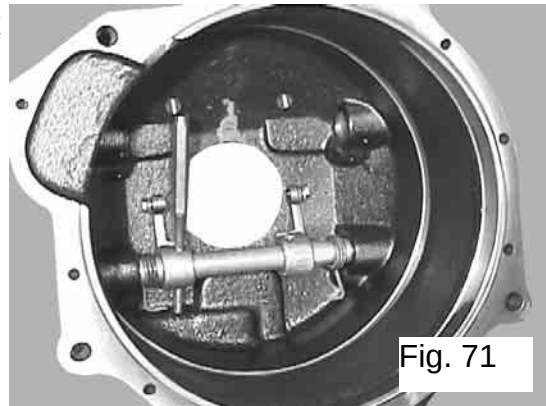


Fig. 71

Then fit the shafts and the upper control levers as illustrated in Fig. 73
The direction of the levers is as illustrated in Fig. 73.

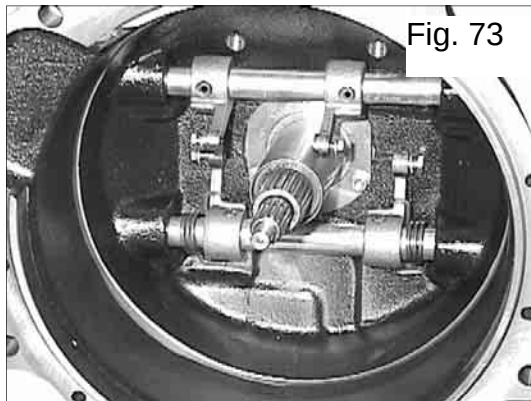


Fig. 73

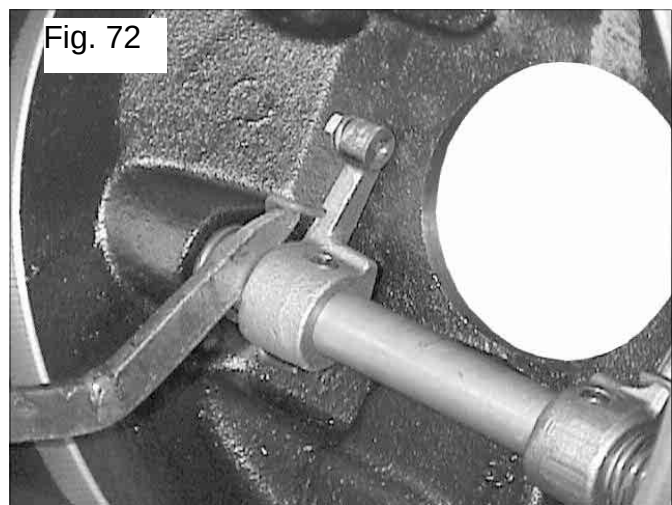


Fig. 72

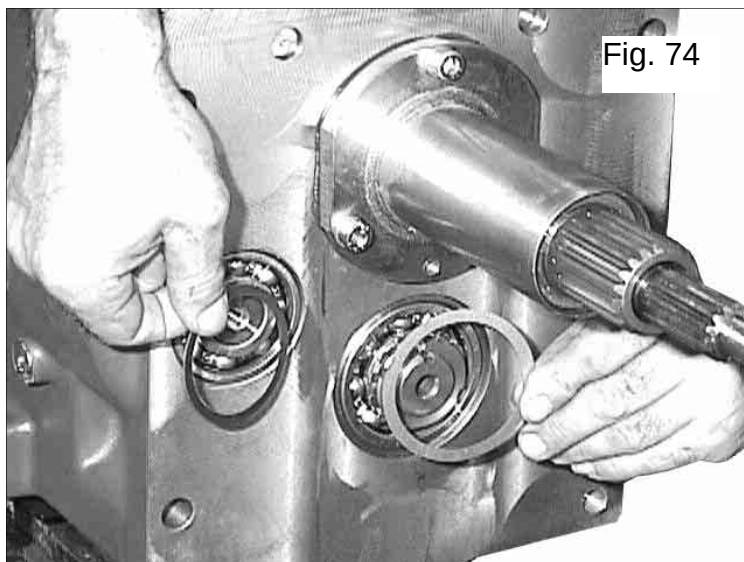


Fig. 74

After fitting the guide coupling of the thrust bearings as illustrated in Fig. 73, shim the lower shaft bearing as already described on the previous pages (shimming from 0.2 to 0.4 mm), and assemble the clutch bowl to the gearbox, tightening the screws to 7.0 kgm.

Do not forget to shim the shaft of the guide pulley of the reverse shuttle, as illustrated in Fig. 74.

The usual shimming is between 0.2 and 0.4 mm.

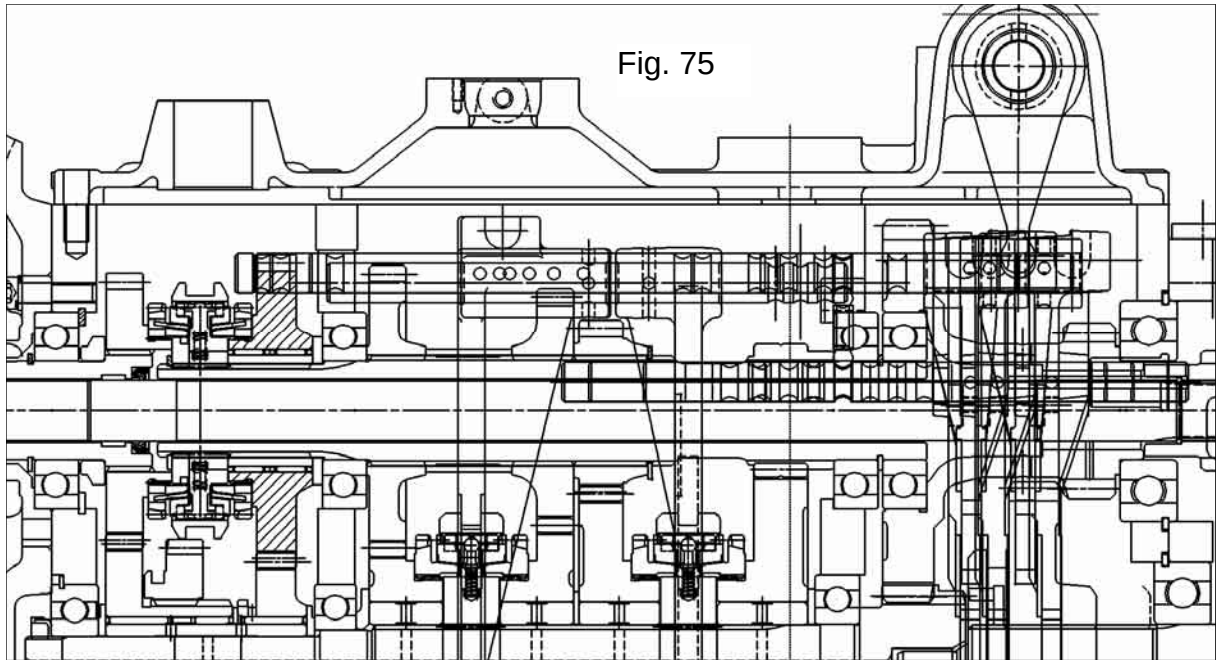


Fig. 75

Once the clutch bowl is flanged, preassemble the gearbox cover with the levers operating the final drive assembly, reverse shuttle and gears. This operation can be done on the bench.

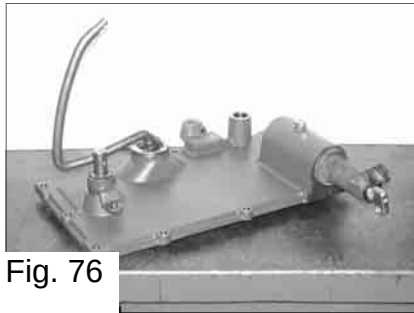


Fig. 76

Fig. 76 shows the gearbox assembly cover and Fig. 75 shows the position of the gearbox cover on the gearbox. In this assembly drawing you can also see the position of the levers on the gearbox in relation to the internal controls. Fig. 80 shows the start of the sequence to fit the gearbox cover by inserting the bushing, smeared with loctite, which supports the final drive control.

In Fig. 78 with the aid of a plug, the bushing is inserted in the casting.

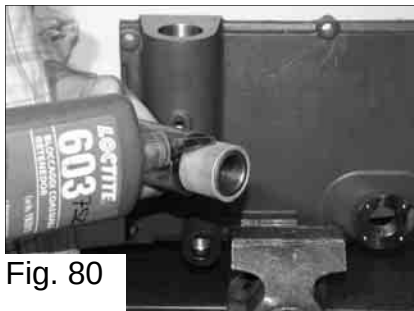


Fig. 80

In Fig. 77, after inserting the bushing, a seal is fitted to prevent oil coming out of the cover.



Fig. 77



Fig. 79

In Fig. 79 with the aid of a block also the seal is positioned opposite the bushing, in the seat of the cover.

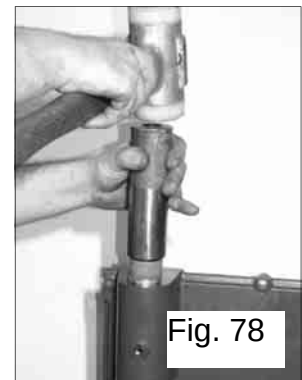


Fig. 78

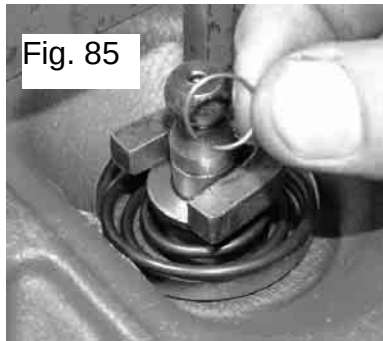


Fig. 85

In Fig. 81 the gear lever starts to be fitted on the cover.

The lever is inserted on the spherical seat and from the bottom of the cover there begins the assembly of the tapered spring illustrated in Fig. 82.

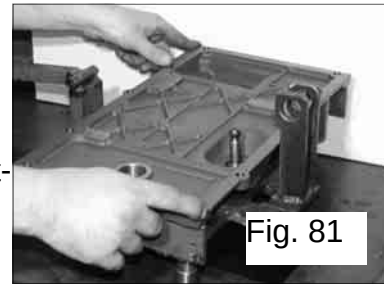


Fig. 81



Fig. 86

The tapered spring rests on a collar placed on the casting. Fig. 83 shows the direction of assembly of the spacer that is placed over the tapered spring, as illustrated in Fig. 84.

Fig. 85 illustrates the ring that is to go into the race and will keep the spring under tension and close the pack.

Fig. 86 illustrates the tool that permits loading the spring and creating room for insertion on the race obtained in the lever of the retainer ring of the pack.



Fig. 82



Fig. 83

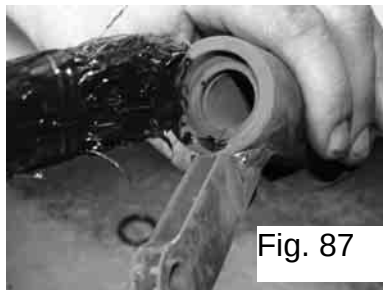


Fig. 87

After fitting the gear lever, pass on to fit the final drive lever. In Fig. 87 the seat of the O-ring and seal that are positioned inside the lever is lubricated with grease.



Fig. 88



Fig. 89



Fig. 84



Fig. 90

In Fig. 88 and 89 these elements are fitted, which are made to ensure the oil seal even for parts that, as in this case, make axial movements. In Fig. 90 the other end of the lever support is greased, which will then be inserted in the casting as illustrated in Fig. 91.

fitted in Fig. 93.

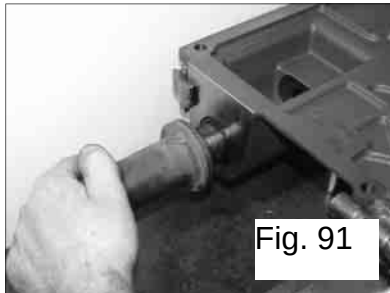


Fig. 91

In Fig. 92 a spacer is inserted that locks the lever support in position and acts as a support for the snap ring that is

In Fig. 94 the internal lever is greased, which in Fig. 97 is inserted in the support, taking care to insert also the spring and the internal lever shown in Fig. 95 and 96.

The internal lever in Fig. 98 is splined onto the lever. To conclude this assembly, it just needs the external lever. You now pass on to the control linkage of the 20% option - reverse shuttle selector and the linkage that actuates the real engagement of the reverse shuttle or 20% option, connected to the lever situated under the steering wheel (see Fig. 99).



Fig. 92

Fig. 93



Fig. 95



Fig. 96



Fig. 98



Fig. 97

Fig. 99

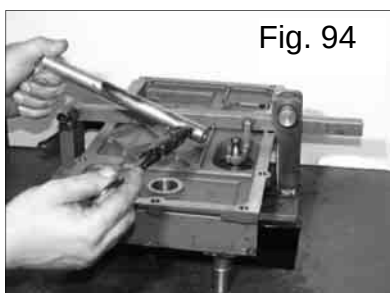


Fig. 94



Fig. 100

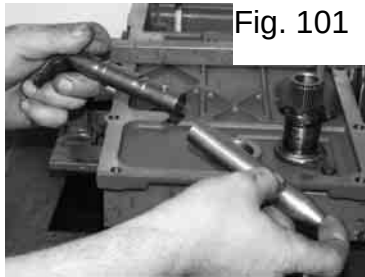


Fig. 101

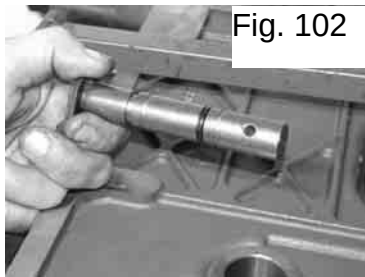


Fig. 102

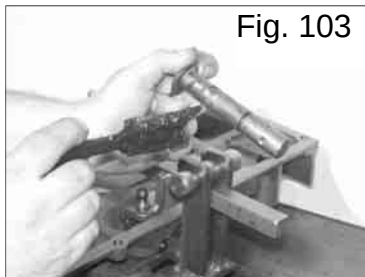


Fig. 103



Fig. 104

Fig. 100 shows a simple tool to help fit the seals on the reverse selector pin, without the machining on the pin being able to damage the sealing parts while they are being positioned in their seats. In Fig. 101 the element used for assembly is extracted and Fig. 102 shows the O-ring fitted in its seat. In Fig. 103 the pin is greased to help insert the external shaft shown in Fig. 104. In Fig. 105 the snap ring is fitted that keeps the two pins in position, after the O-ring has been fitted on the external pin to prevent oil coming out from the gearbox cover.

In Fig. 106 the two pins are inserted in the casting, after abundantly greasing the surfaces to avoid damaging and pinching the seals.

In Fig. 107 you can see the control on the inside of the cover, where you can see the two concentric levers that operate the 20% option - reverse shuttle selector and the control of the device. In Fig. 108 the assembly of the gear lever is completed by inserting the pivot of the spherical surface. This special screw with a copper washer must be tightened to 3 kgm.

In Fig. 109 the hole in the final drive lever control is closed, again using a copper washer and screw.

After performing these operations there remain just a few more steps to complete the assemblies presented on the preceding pages, concerning the external part of the gearbox cover.

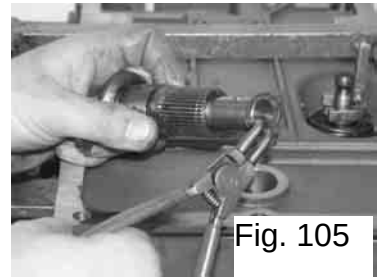


Fig. 105



Fig. 106

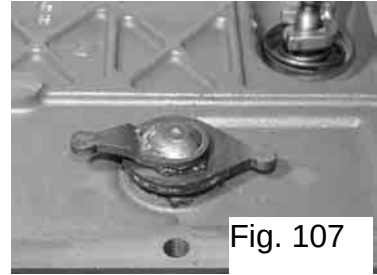


Fig. 107

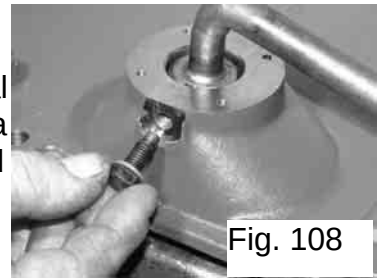


Fig. 108



Fig. 109



Fig. 110

In Fig. 110 the external lever is fitted, which is controlled by the transmission coupling connected to the lever of the steering wheel.



Fig. 111

It is positioned on the keying and the snap ring is inserted that keeps it in position, with the aid of a pair of snap ring pincers (see Fig. 111).

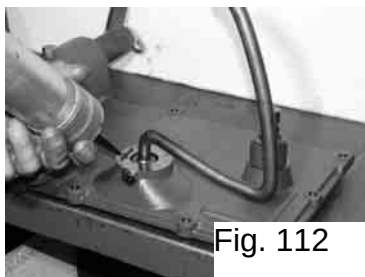


Fig. 112

In Fig. 112 we move on to conclude assembling the gear lever, where the external surface of the gearbox cover is siliconed, the supporting plate of the casing shown in Fig. 113 is positioned.

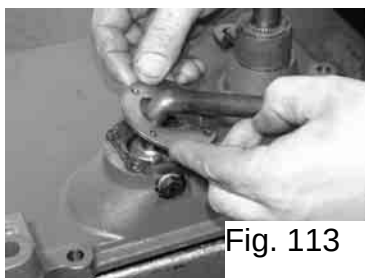


Fig. 113

In Fig. 114, we prepare the casing, smearing it with plenty of grease.



Fig. 114

In Fig. 115 it is positioned on the plate and then the other plate is inserted that locks the casing in position, tightening the 4 screws shown in Fig. 116 to 3 kgm.



Fig. 115

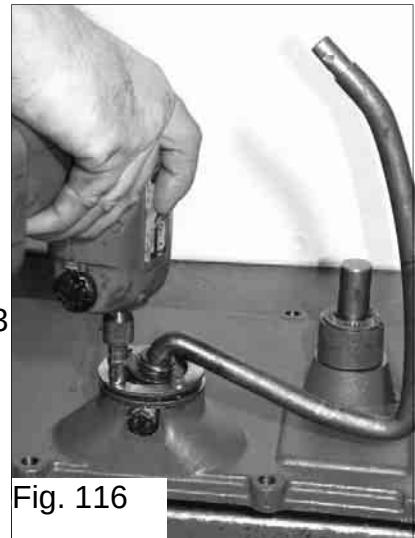


Fig. 116



Fig. 117

In Fig. 117, before installing the gearbox cover on the casing, the gear selection balls and springs are inserted, the entire mating surface of the gearbox cover is siliconed as shown in Fig. 118. Lastly, the screws fastening the cover are tightened to 5 kgm.



Fig. 118

After fitting the platform on the tractor, you can pass on to complete the final drive assembly operating lever.

In Fig. 119 the external lever is fitted on the two ends of the levers coming out of the gearbox cover. The fixing screws, equipped with self-locking, are tightened to 3 kgm.

In Fig. 120 the lever is completed with the rubber casing and the upper handgrip that is held in position by a screw tightened to 3 kgm.

The upper press-on cover with the indication of the ranges and reverse gear completes the lever (see Fig. 121).

In Fig. 122 we complete assembling the central lever on the tunnel that governs selection of the reverse shuttle or the 20% option.

The lever is splined on the pin that comes out of the gearbox cover and is subsequently completed with the casing and the knob.

Fig. 123 shows the coupling joining the lever to the steering wheel with the reverse shuttle - 20% option control lever on the gearbox cover.

In Fig. 124 the coupling is adjusted to secure the start and finish position of the lever under the steering wheel.

The screw fastening the coupling to the cover lever should be tightened to 3 kgm.

On the lever column under the steering wheel there is a lubricator.

It is wise if every time the fixed bonnet is removed you grease the column of this lever with the lubricator.

Any sticking of this lever is due to a lack of grease inside the sleeve.

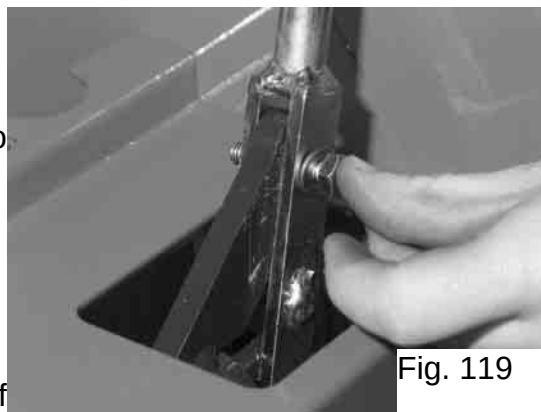


Fig. 119



Fig. 120



Fig. 121



Fig. 122



Fig. 124

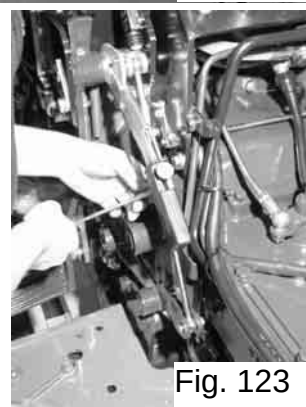


Fig. 123

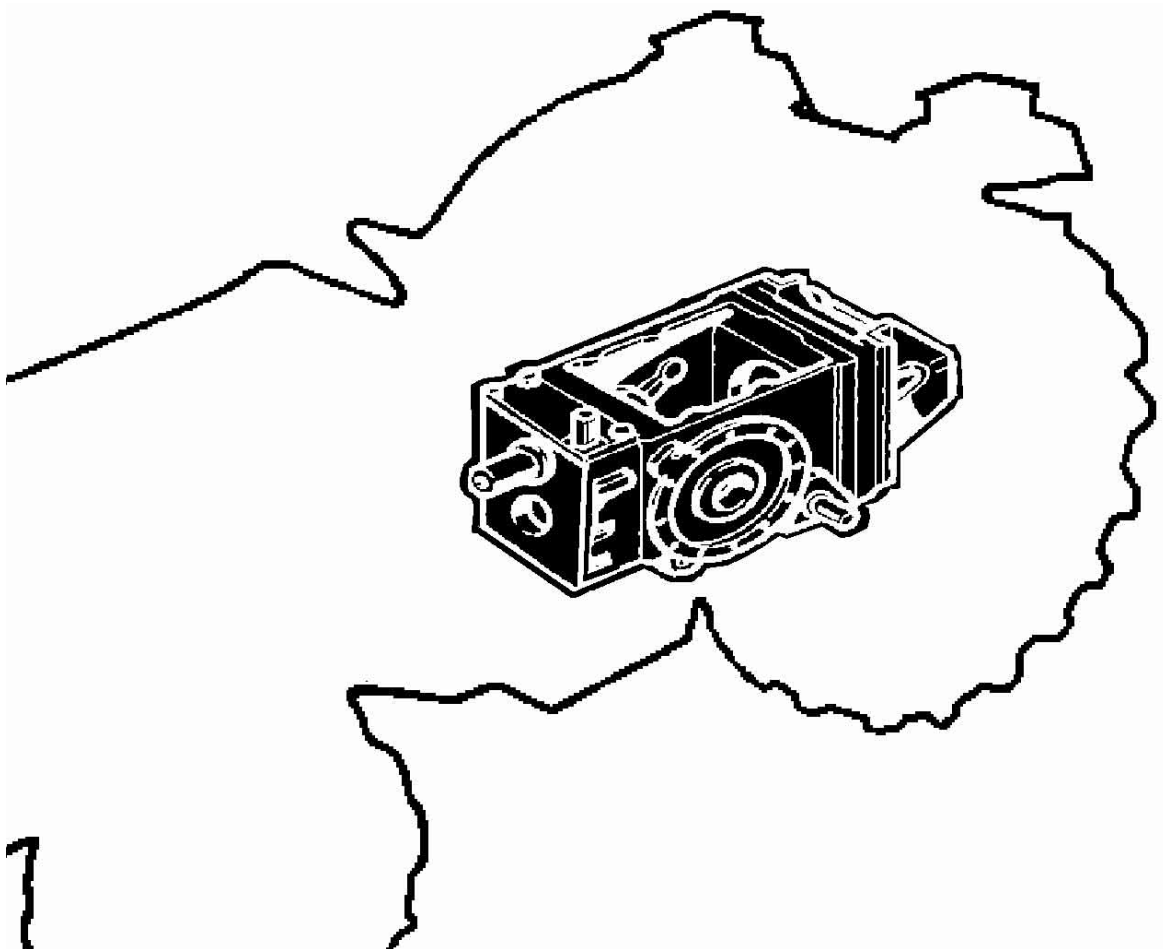
DRIVING TORQUES		kgm
M 10 x30 gearbox cover fixing screw		5.4
M14 x 7 clutch bowl - gearbox fixing nut		8
M12 x 4.6 gearbox - rear axle fixing nut		7.4
M12 x1.5 gearbox - rear axle fixing screw		7
M 30x1.5 transmission shaft fixing ring nut		10
M 35x1.5 transmission shaft fixing ring nut		10
M 8x30 main shaft cover fixing screw		2.4
M 8x16 retainer plate fixing screw		2.4
M 16x140 bowl - engine flange fixing screw		10
Screw locking the fork on the rod		3.5

LUBRIFIANT

Oil	ARBOR UNIVERSAL 10W-40 (SAE 10W/40)	32	Liters
Grease	ARBOR MP EXTRA (NLGI2)		

We recommend lubricants and liquid by: FL SELENIA.

REAR DIFFERENTIAL



1

Star - 3000 Star

Assembly 36

REAR DIFFERENTIAL ASSEMBLY



Fig. 1

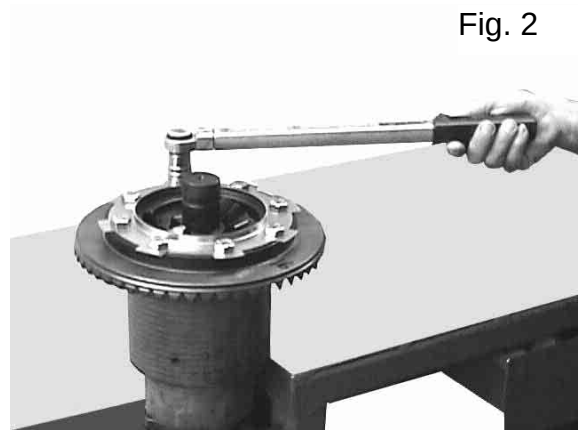


Fig. 2



Fig. 3

The first thing to do is to pre-assemble the planetary gears and bevel ring gear as shown in figures 1 and 2. Install the retainer plate for the screws that fix the bevel ring gear to the central shaft of the differential as shown in fig. 2, tightening the screws to 7 Kgm and clinching the plate around the screws with the aid of a chisel.

Pre-assemble the bearings on the crown wheel with the aid of a plug, as shown in fig. 3.

A special tool is used to establish the assembly conditions for the differential and determine shim **A** of fig. 4, in order to allow the correct play to be obtained between the crown wheel and planetary gear (i.e. between 0.07 and 0.15 mm). If this tool is unavailable, proceed by attempts in the casing, trying out various shims **A** of fig. 4 until the correct one has been obtained.

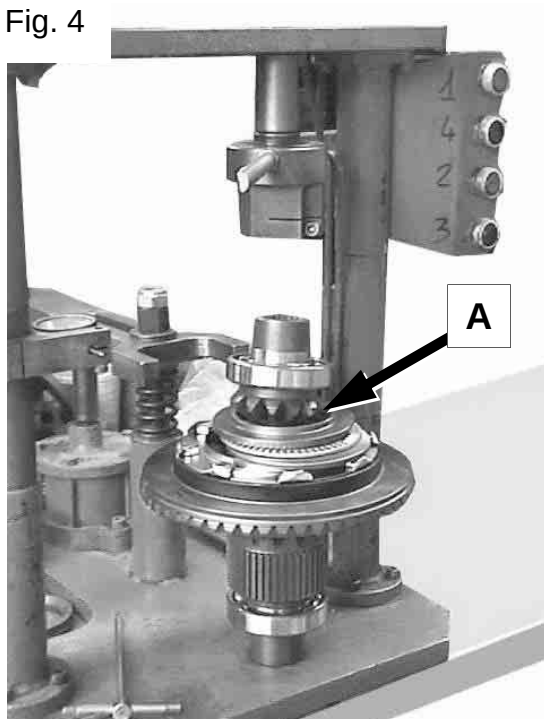


Fig. 4

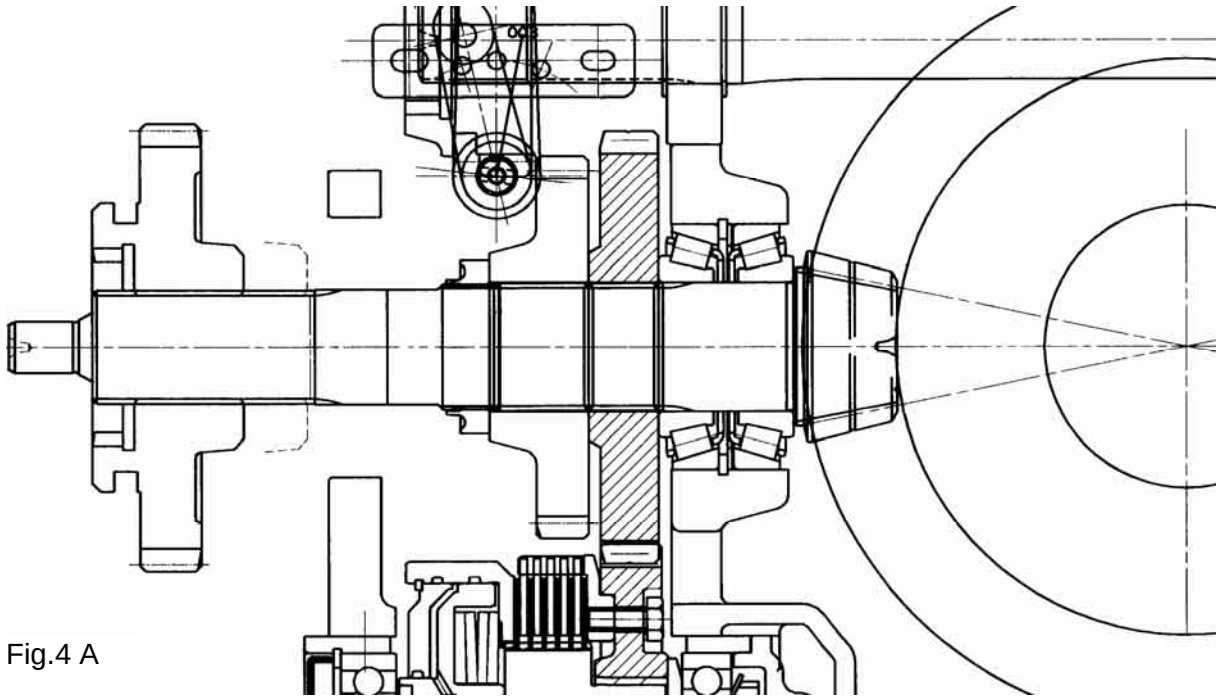


Fig.4 A

Fig. 4A illustrates the overall assembly of the bevel pinion with the two taper bearings and ring nut that provides the preload for the taper bearings.

The play adjustments of the crown wheels and planetary gears and that of the rear bevel gear pair are summed together when the rear differential is assembled.

The following pages describe how these adjustments are made and how to make sure that the correct meshing play is maintained in all conditions throughout the entire circular meshing surface of the gear.

Thus, when the text explains that the play of a bevel gear pair must be checked, it means that the whole circular meshing surface must be checked.

Using the press shown in fig. 5, load one of the taper bearings (the one behind the pinion head) that position the bevel pinion with a load value that corresponds to that of assembly (ring nut that fixes the bevel pinion must be tightened to 4 Kgm).

In these conditions, which correspond to those of assembly, insert the shims behind the taper bearing so that this is positioned in a correct way in relation to the ring bevel gear and to obtain the right meshing play.

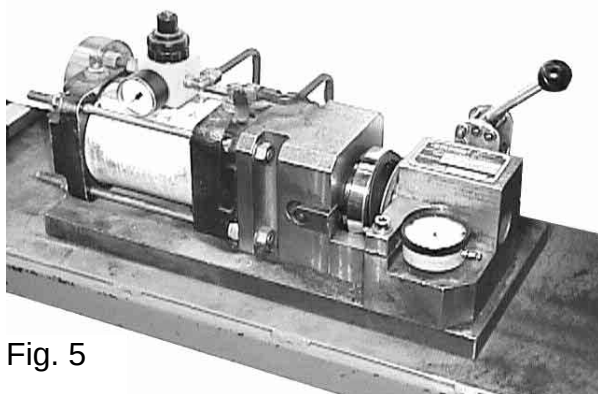


Fig. 5

NB:

If the machine is disassembled, all the spacers will have already been determined thus these operations need not be carried out.

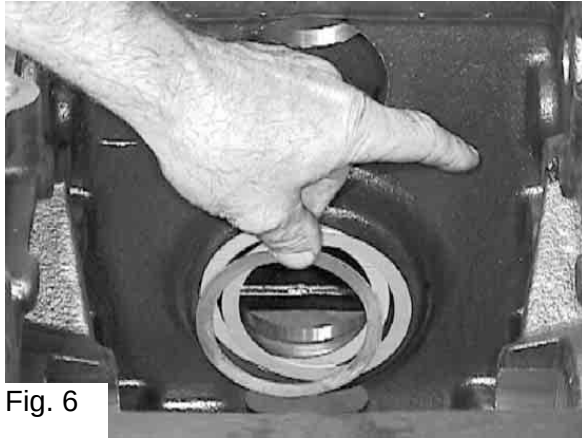


Fig. 6

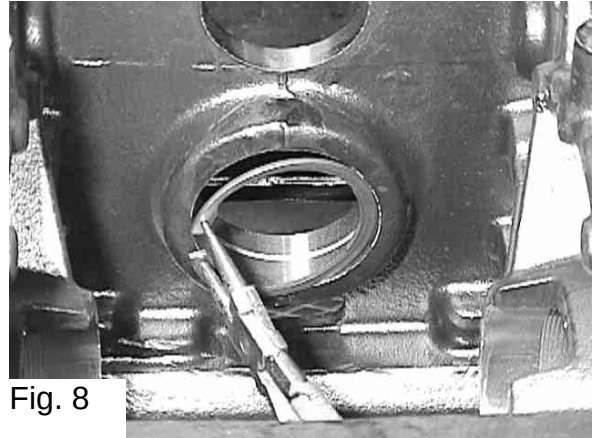


Fig. 8

Figs. 6 to 8 show the assembly sequence, beginning with the circlip and followed by shim positioning, then the seat of the taper bearing and lastly, the bevel pinion shaft with the internal part of the taper bearing pre-assembled.

Fig. 8 shows how the internal part of the bearing is installed on the shaft with the aid of a plug.

Make sure that the bearing is fully seated behind the head of the bevel pinion: this ensures that the pre-determined shimming sets the pinion in the right position.

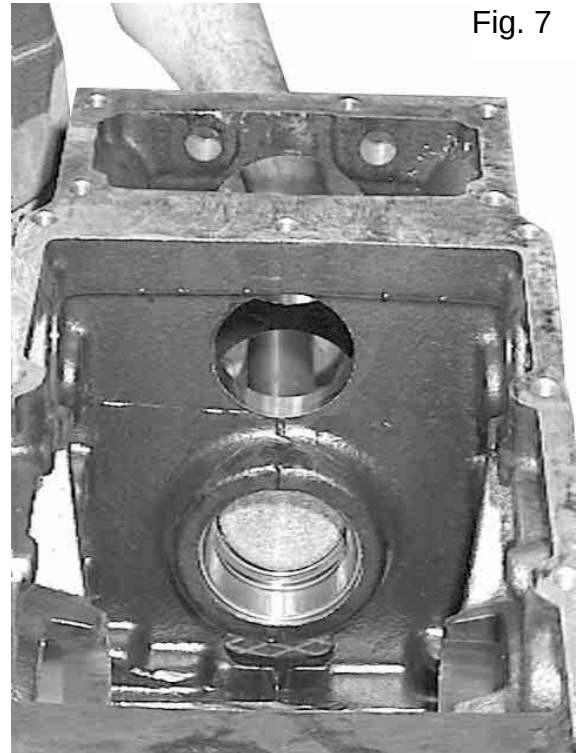


Fig. 7

Fig. 9 shows how the pinion is installed inside the differential housing.

Bed the bearings and bevel pinion shaft by tapping a few times with a plastic mallet.

Position the shaft on the gears and tighten the ring nut to 4 Kgm as shown in fig. 10. Comply with the following procedure:

After having fully tightened the ring nut to pack everything together using two large wrenches as shown in fig. 10, loosen the nut one quarter of a turn and then tighten it again to 4 Kgm.

Once the ring nut has been tightened, punch it with a plug as shown in fig. 11 to prevent it from working loose.

Once the bevel pinion has been assembled and the ring nut torqued, make sure that the pinion is free to turn but that it is not too loose. If all the parts have bedded correctly, rotation will occur but a certain torque will be required.

Now proceed by installing the pre-determined pack of the bevel ring gear, using a plug to position the bearings that support the crown wheels inside the differential housing (fig. 12).

Do not forget to position the rear differential locking ring in the pack of the bevel ring gear.

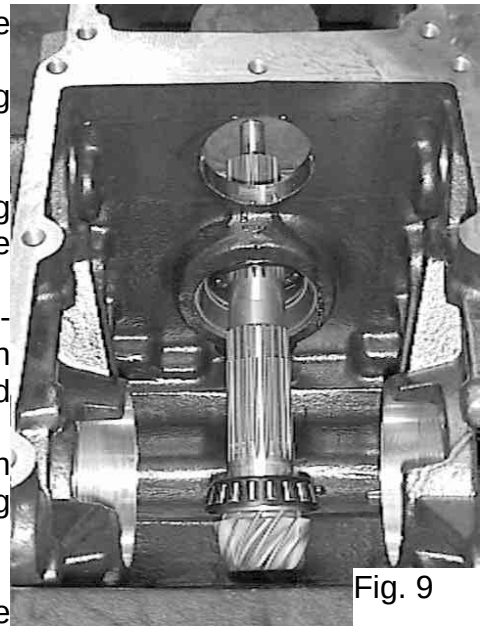


Fig. 9

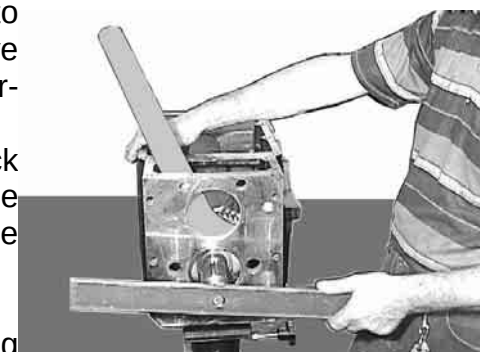
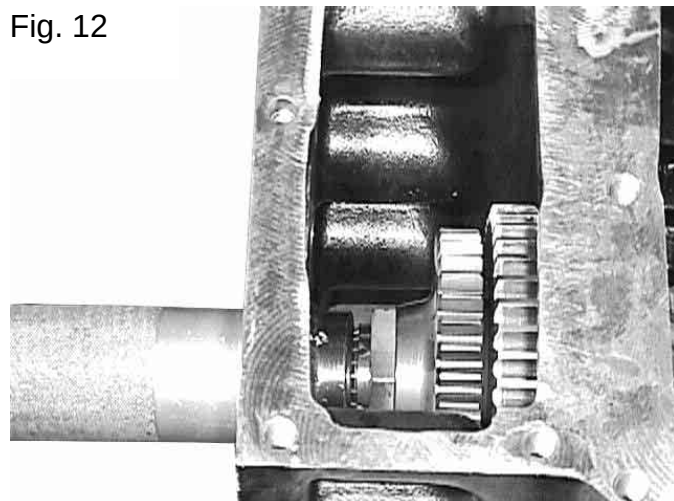


Fig. 10



Fig. 11

Fig. 12



Tap the bearings as illustrated in fig. 12.
Fully tighten the lh ring nut, annulling the play between the bevel pinion and bevel ring gear.
Now unscrew the lh ring nut (fig. 14) by 3-4 positions using the M 6 hole on the differential housing of fig. 14 (part **A**) as a reference.
Fully tighten the ring nut on the rh side also, with a torque wrench and a preload of 2 kgm (fig. 13).

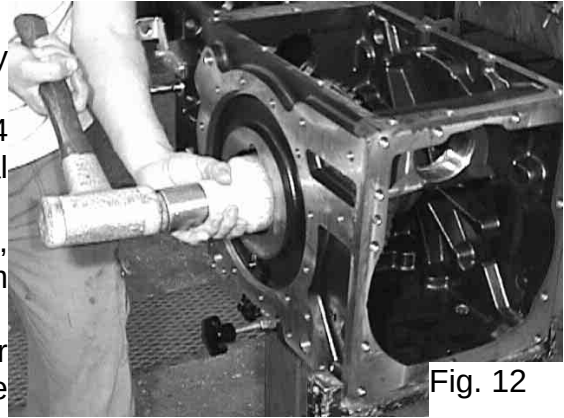


Fig. 12

Measure the misalignment of the ring gear with the aid of a comparator positioned at the root of the tooth, as illustrated in fig. 15. If the misalignment over the entire circumference is within 0.15 mm, proceed with the following phases.

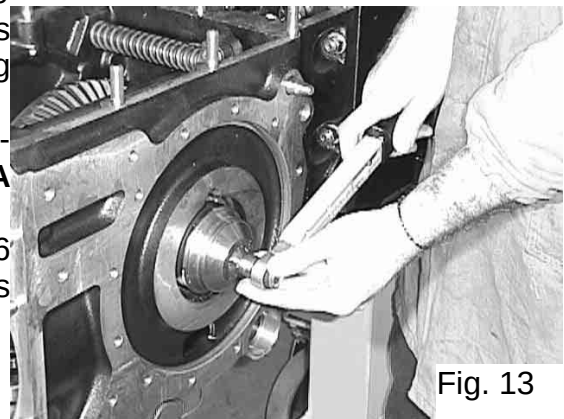


Fig. 13

Loosen the right-hand ring nut by 5-6 positions compared to the usual M6 hole (part **A** of Fig. 14)

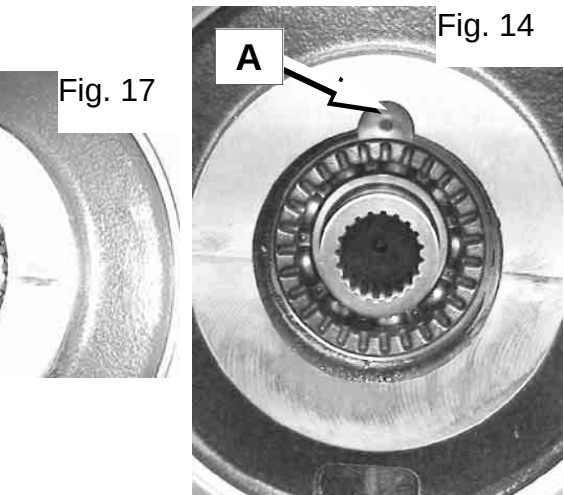


Fig. 14

tap a plastic mallet on the bearing **B** of Fig. 16 towards the outside. Tap the side pinion as well to bed it in.

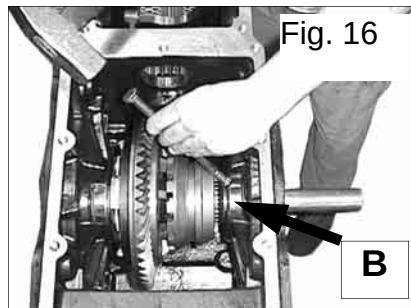


Fig. 16

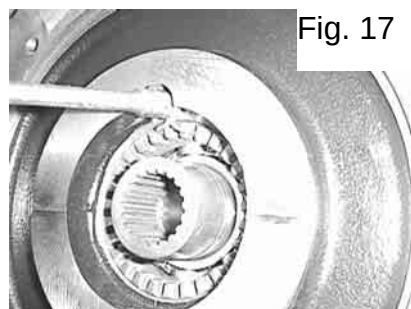


Fig. 17

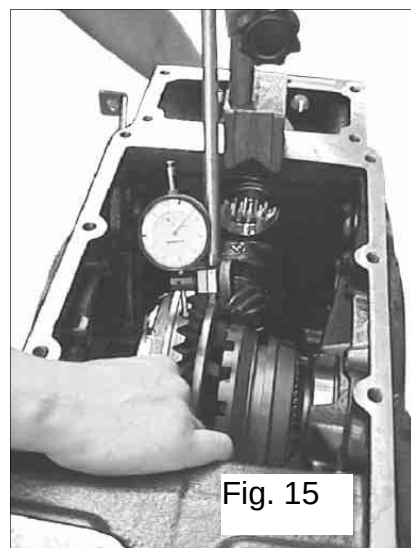


Fig. 15

The crown wheel rests on the ring nut so check there is a clearance of between 0.07 and 0.15 thereby slackening the pressure between the pinion and crown, recheck that the pinion and the bevel crown wheel turn with the right mesh.

Fit the plates and the setscrews of the ring nuts as illustrated in fig. 17.

To modify the mesh clearance between the pinion and crown, use the left-hand ring nut.

The components of the rear part of the PTO and the differential lock must be installed to complete the assembly operations for the rear differential housing.

Fig. 18 shows how the upper PTO shaft is assembled after the bearing, the relative retainer circlip and the gear that carries the PTO selector fork have been pre-assembled on it.

As illustrated in figs. 19 and 20, finish assembling the PTO shaft with the main gear, the relative bearing complete with spacer and the closing circlip.

Now install the external lever that selects the PTO, checking the position of the fork inside the housing to make sure that the external selector plate has been regulated correctly (fig. 20A).

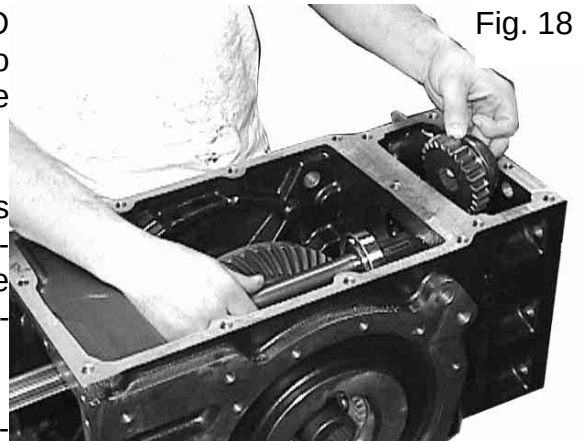


Fig. 18

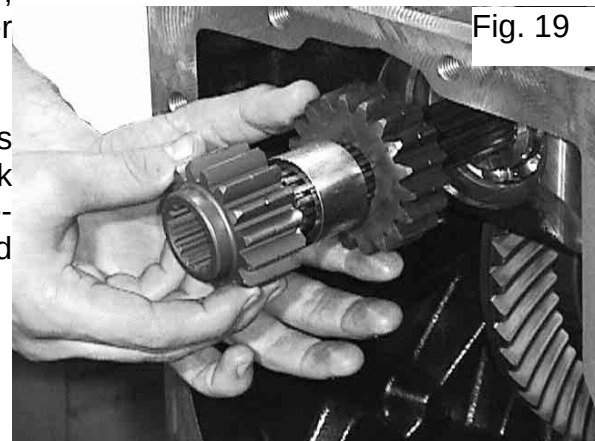


Fig. 19

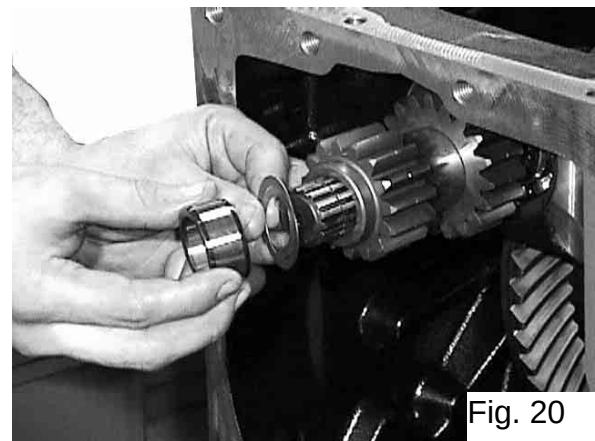


Fig. 20

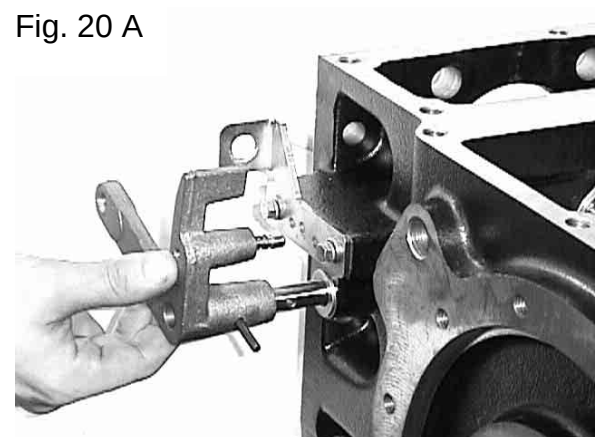


Fig. 20 A

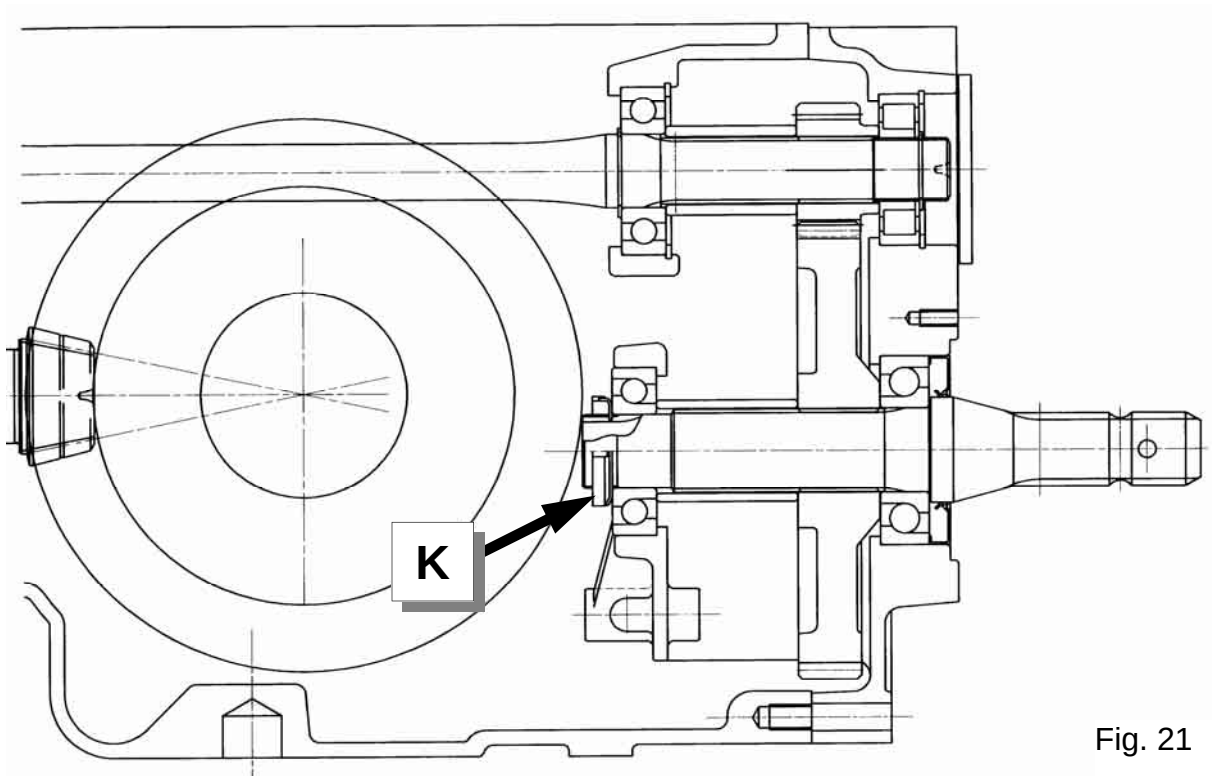


Fig. 21

Once the bearing has been pre-assembled on the upper PTO shaft, proceed by assembling the rear casing which can house the double speed option for the PTO or the single speed as illustrated in fig. 21.

Tighten ring nut **K** of fig. 21 to 2.4 Kgm and punch it to clinch before coupling the PTO casing with the differential housing.



Fig. 22 The last operation required when assembling the rear differential housing is to install the diff lock control rod as shown in figs. 22 and 23.

Oil the rod on which the O-Rings will then be inserted. Fit the rod carefully into its housing. When this is done, make sure that the O-Ring is not pinched as shown in fig. 23.

Having completed the assembly operations, make sure that a 1.5-2 mm gap remains between the diff lock ring and the teeth on the ring gear. Fig. 23



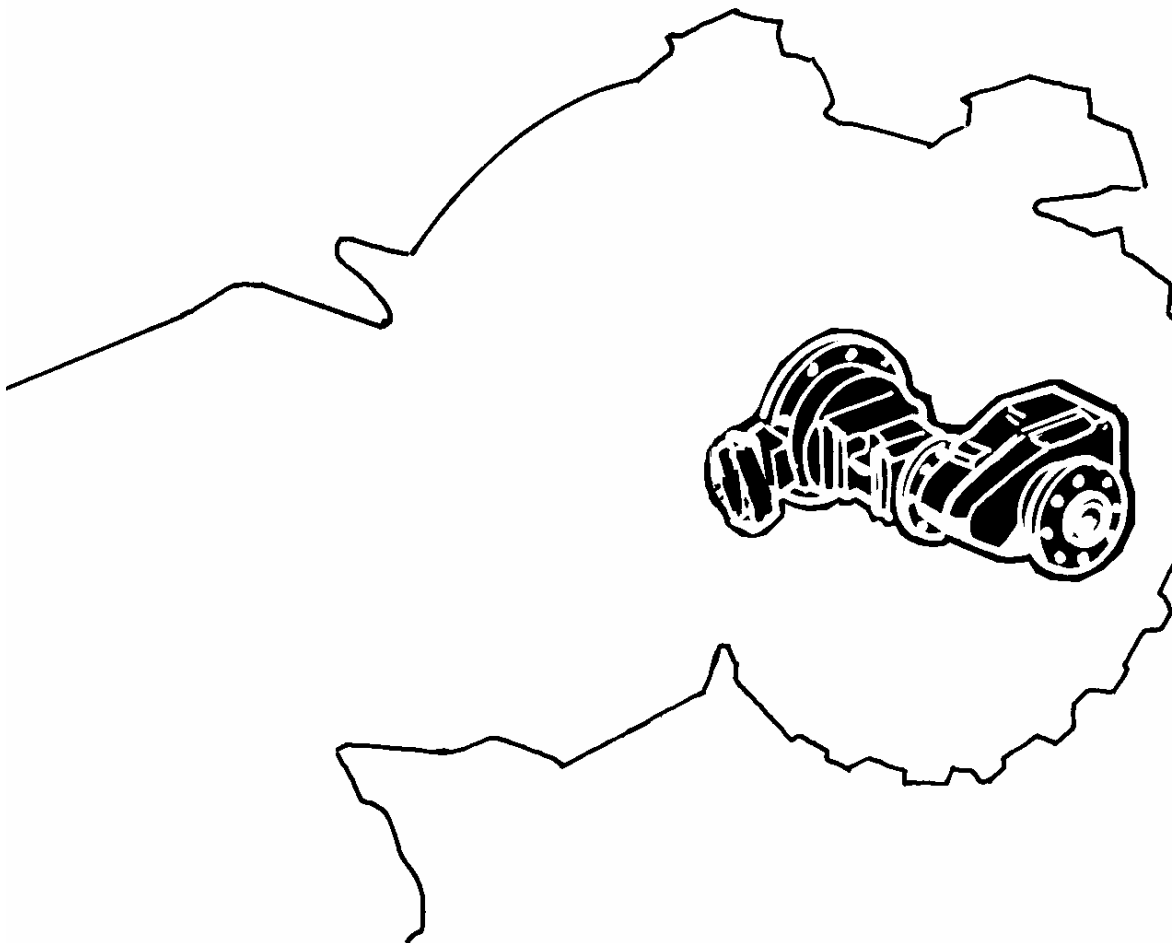
DRIVING TORQUES		kgm
M12 x 14.6 rear axle - gearbox fixing nut		7.4
M18 x 1.5 rear axle - gearbox fixing screw		11.7
M12 x 14.6 rear axle - power lift fixing nut		7.4
M12 x 30 screw that fixes the cover to the rear axle		4.9
M12 x 14.6 rear axle - PTO flange fixing nut		7.4
M12 x 40 screw that fixes rear axle - hubs		7.4
M12 x 35 rear axle - drive transmission support fixing screw		5.9
M12 x 50 bevel ring gear fixing screw		7.4
M10 x 35 diff lock control fork fixing screw		5.4

LUBRICATION

Oil	ARBOR UNIVERSAL 10W-40 (SAE 10W/40)	32	Liters
Grease	ARBOR MP EXTRA (NLGI2)		

We recommend lubricants and liquid by: FL SELENIA.

REAR FINAL DRIVES



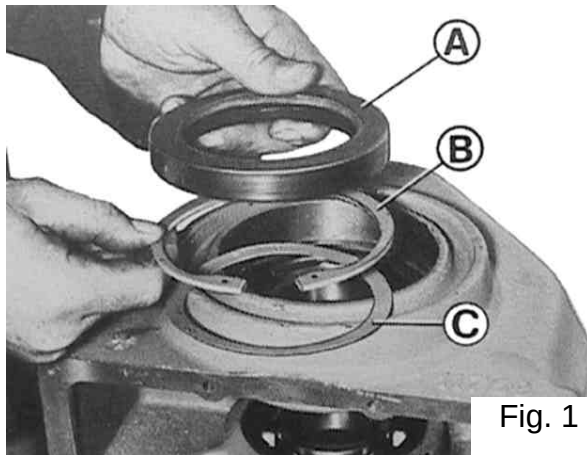


Fig. 1

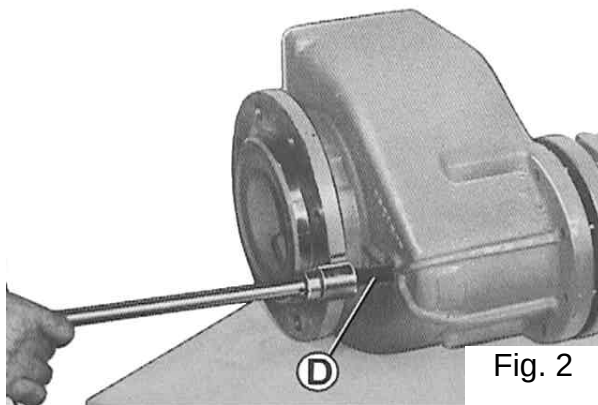


Fig. 2

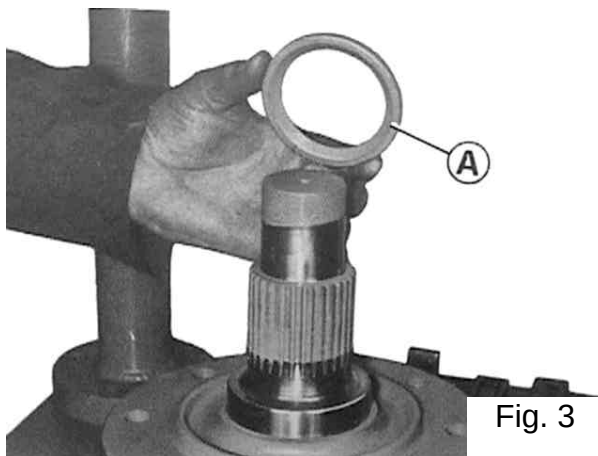


Fig. 3

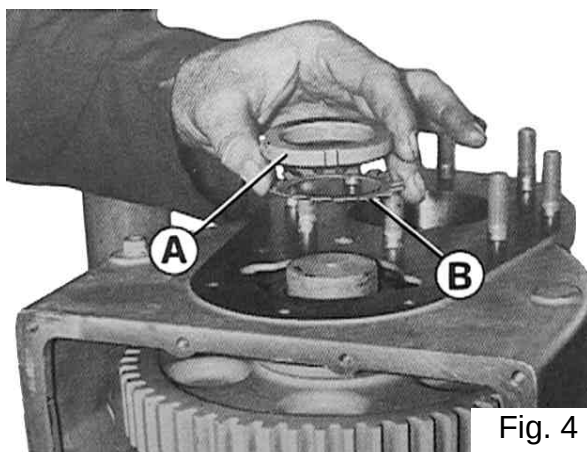


Fig. 4

AXIAL PLAY ADJUSTMENT.

Comply with the following instructions. Jack up the machine and remove the wheel;

- apply the parking brake so as to lock the braking components;
- split the complete final drive from the hub, working with screw **D** of fig. 2 on the internal axle shaft;
- unscrew the ring nut and remove the axle shaft;
- remove the oil retainer ring **A** of fig. 1;
- remove the circlip ring **B** of fig. 1;
- insert 0.2 mm spacers **C** until the float has been eliminated.

Re-assemble the complete final drive on the hub.

If the final drive must be assembled, spacer **A** of fig. 3 must be positioned with the chamfered part pointing towards the flange of the axle shaft.

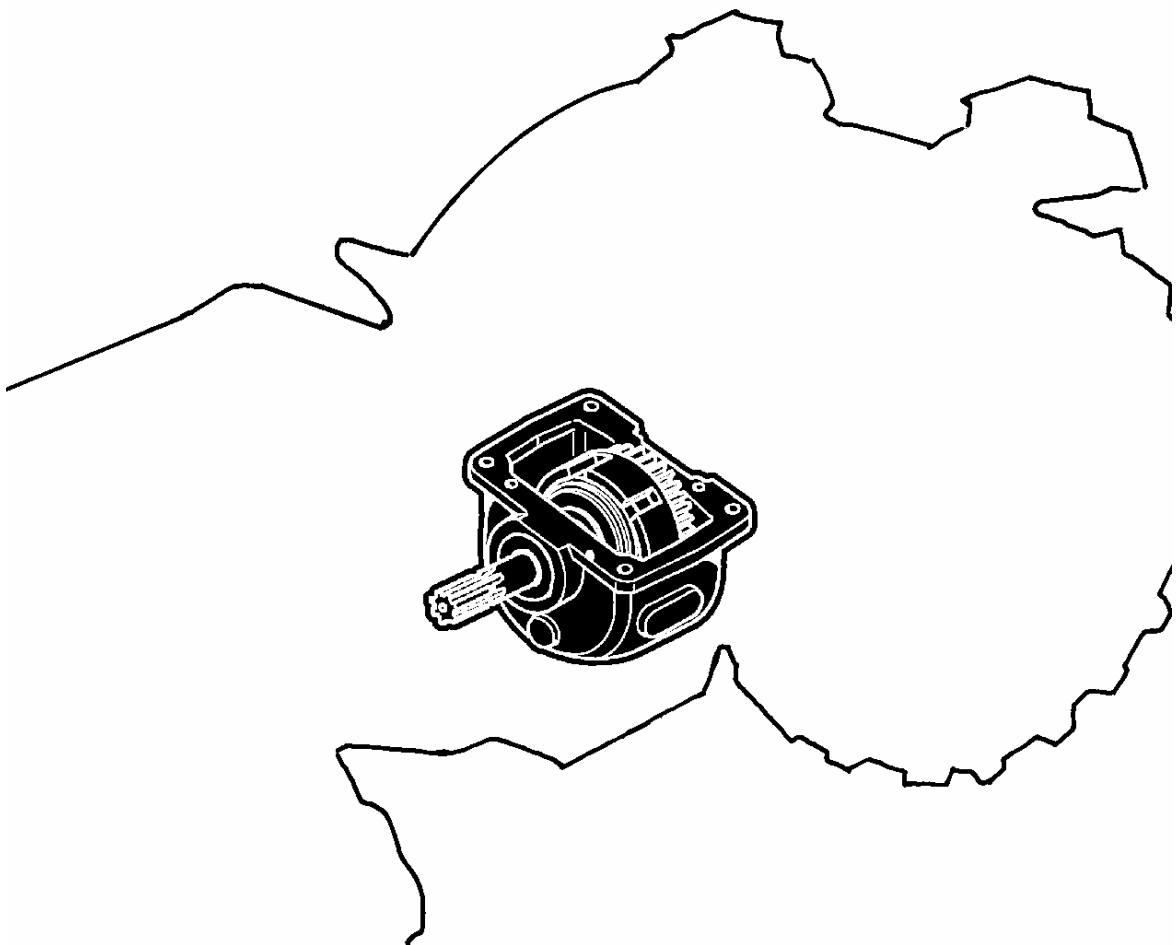
Tighten ring nut **A** of fig. 4 to a 17 kgm. Lock it in place with the retainer plate and punching.

This ring nut must be replaced whenever the axle shaft is disassembled.

Take care of the fact that the ring nut on the lh final drive has lh threading while the one on the rh final drive has rh threading.

DRIVING TORQUES	kgm
M 50 x 1.5 axle shaft fixing ring nut	17
M 18 x 1.5 screw that fixes the wheel to the axle shaft	15
M12 nut that fixes the final drive to the axle shaft support	7
M 8 x 20 axle shaft ring nut cover fixing screw	2.4
M 8 x 20 final drive gear cover fixing screw	2.4

DRIVE TRANSMISSION



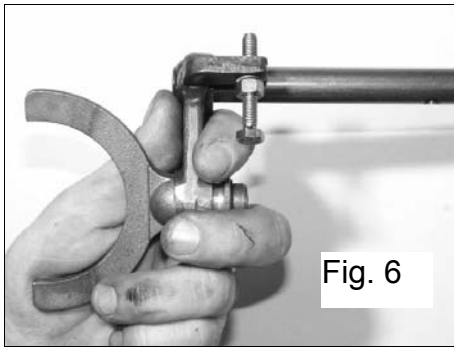


Fig. 6

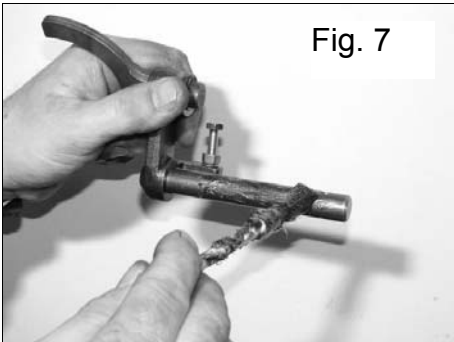


Fig. 7



Fig. 8

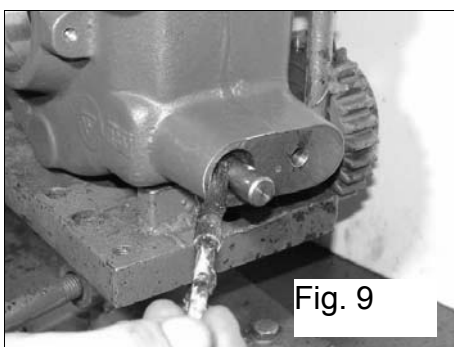


Fig. 9

Fig. 1 starts assembling the drive transmission box with the plug closing the hole to drain off the oil. In Fig. 2 the first of the bearings supporting the gear is positioned, which in Fig. 3 is installed in its seat with the aid of a block. In Fig. 4 the parts connected to the selector fork forming the four-wheel drive engagement drive line are pre-assembled. In Fig. 5 the snap ring joining the selector fork to the engagement lever is placed in its seat.

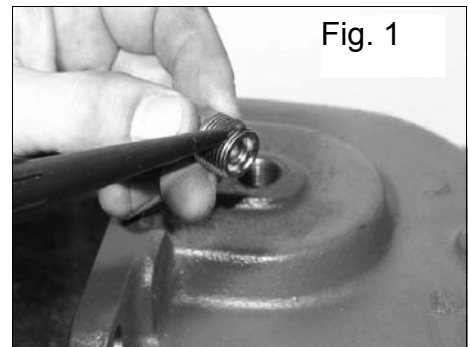


Fig. 1

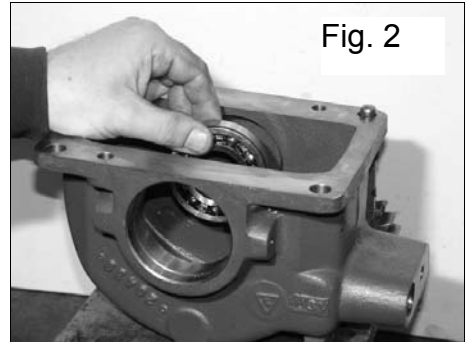


Fig. 2

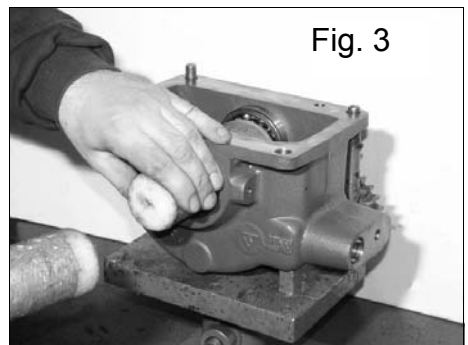


Fig. 3

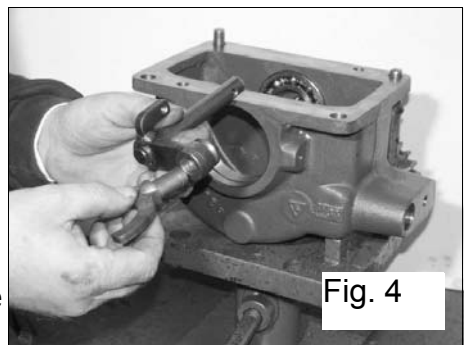


Fig. 4

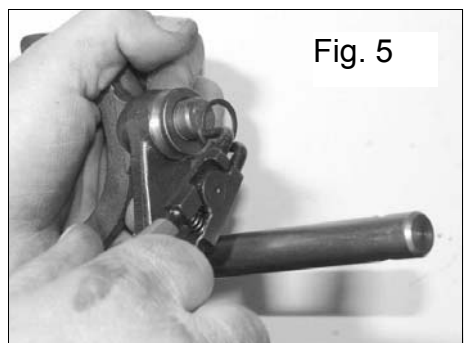


Fig. 5

Fig. 6 shows the linkage fitted with the adjuster screw equipped with a lock nut to help adjust the fork travel.

In Fig. 7 before inserting the linkage in the casting, it is greased and, after fitting the torsion spring in Fig. 8, it is placed in the box making the shank of the pin come out as shown in Fig. 9.

The shank is smeared with plenty of grease to prepare it for fitting the seal shown in Fig. 10.

Fig. 14



With the aid of a block and a plastic mallet, the seal is positioned inside the seat obtained in the casting and the lever is splined on the external transmission relay shown in Fig. 12.

Fig. 10

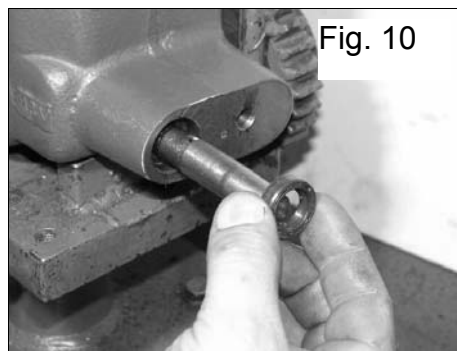


Fig. 15



Fig. 13 shows the installation of the ends of the torsion spring inside the casting and the position taken by the fork in assembly conditions.

In Fig. 14, with the aid of a lever, the spring is positioned and the travel of the device checked.

Fig. 15 shows the other parts that will be fitted inside the box, starting with the control coupling, on which the

Fig. 11

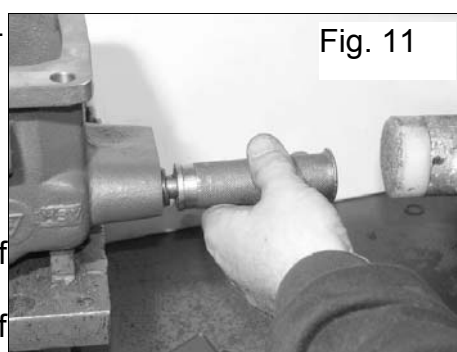


Fig. 12

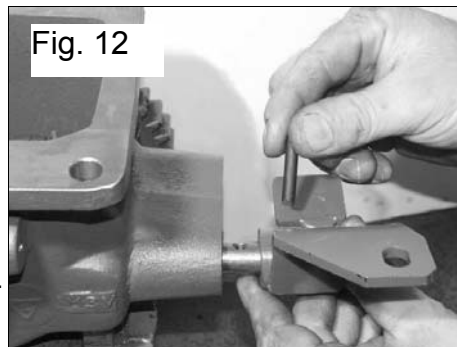
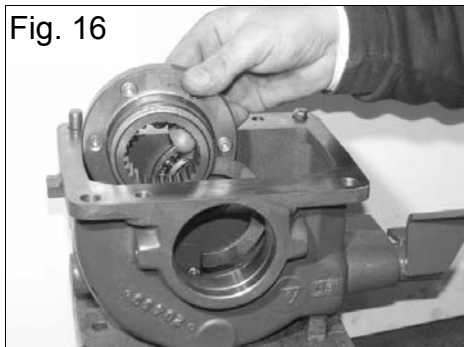


Fig. 16



fork engages; in Fig. 16 the coupling is placed in the casting and in Fig. 17

also the shaft is set under assembly conditions inside the box trying to take the race of the coupling onto the inside diameter of the fork. While fitting it all in Fig. 17 and 18, the spacer is placed behind the coupling separating it from the gear and acting as a shim for the bushing inside the gear.

Fig. 17

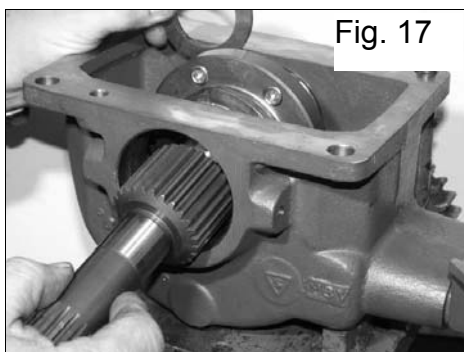


Fig. 13



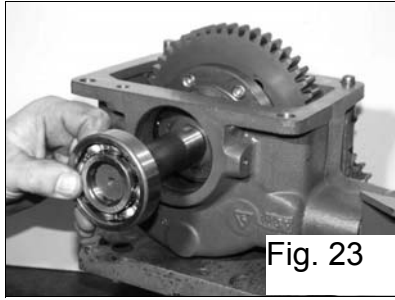


Fig. 23

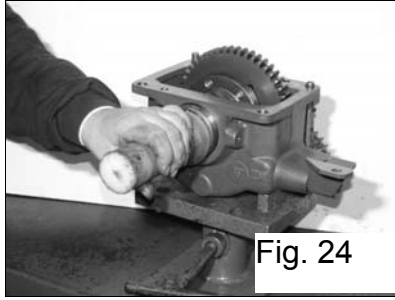


Fig. 24

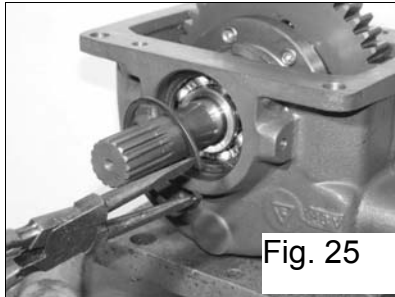


Fig. 25

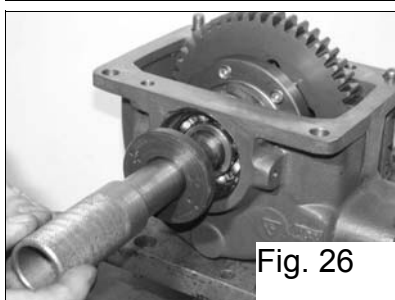


Fig. 26

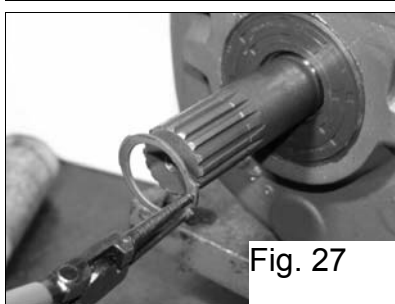


Fig. 27

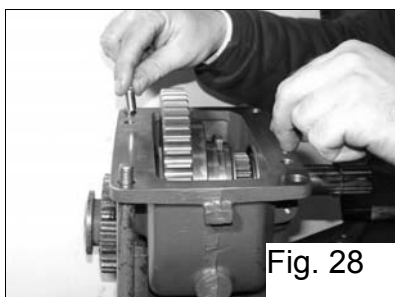


Fig. 28

In Fig. 19 the gear is inserted inside the box.

Behind the gear the spacer is positioned shown in Fig. 20 that in Fig. 21 is placed with the step facing the gear, in the assembly position.

In Fig. 22, with the aid of a rubber mallet, the shaft is placed in position.

It is possible to continue as illustrated in Fig. 23 assembling the front bearing, with the aid in this case too of a block and a plastic mallet as shown in Fig. 24.

Fit the snap ring that holds the shaft in position, as illustrated in Fig. 25; fit the oil seal of Fig. 26 and lastly conclude the sequence with the snap ring of Fig. 27 that keeps the oil seal in position.

At this stage, the assembly of the drive transmission box is completed, it only remains to install the pins for positioning in relation to the gearbox.

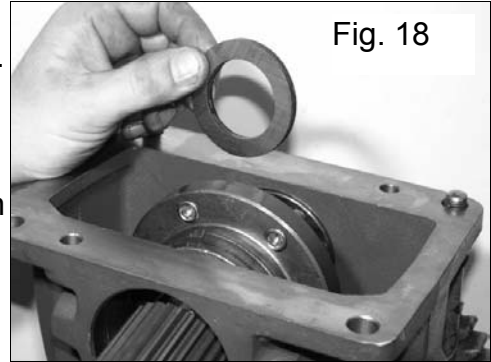


Fig. 18

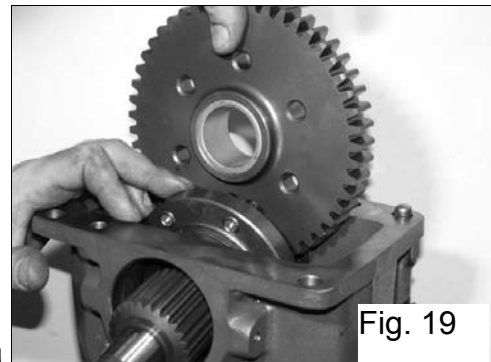


Fig. 19

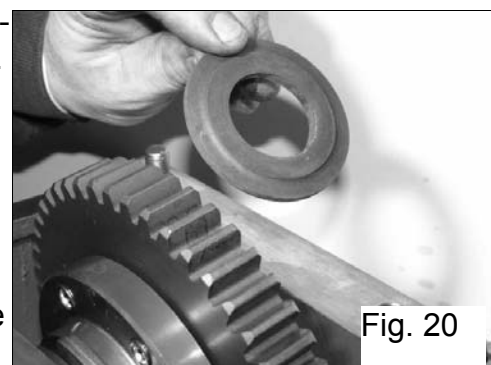


Fig. 20

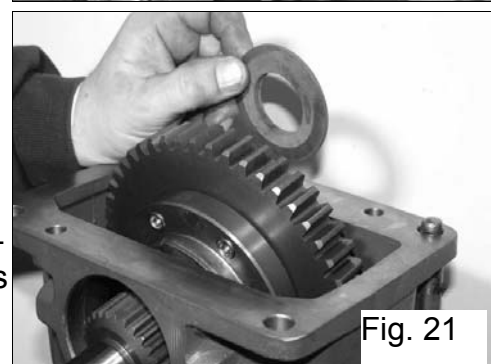


Fig. 21

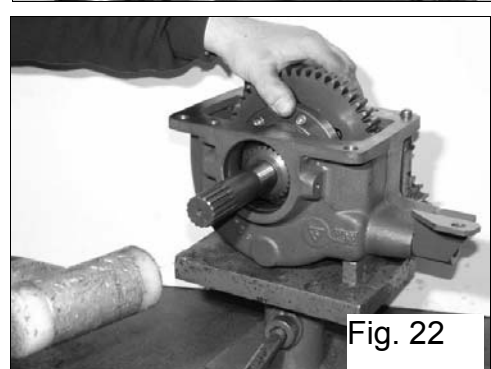


Fig. 22

Adjust the internal screw with the lock nut so that the thrust of the torsion spring doesn't discharge onto the fork.

To create play on the fork, tighten the screw and when the right play is obtained, tighten the lock nut to lock the adjustment.

Smear the contact surfaces with silicone and apply to the gearbox, tightening the fixing screws to 6 kgm.

Fig. 29 shows the lever equipped with a cam that governs four-wheel drive engagement.

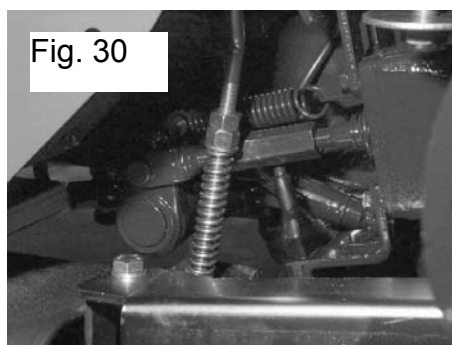
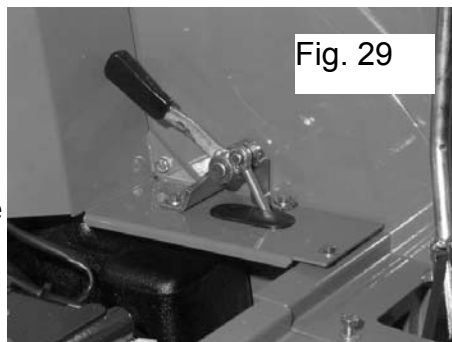
As shown in Fig. 31 the lever of Fig. 30 is connected by a rigid rod to the external lever connected to the drive box.

On the end section of the rod that is threaded, the nut and lock nut are fitted, which when appropriately adjusted load the spring that operates engagement of the four-wheel drive when pressed by the cam of the lever.

The purpose of the device is to keep a constant load on the internal coupling until the pins are inserted on the gear making the front axle integral with that rear one.

In Fig. 32 the spring is lubricated with grease to help it slide on the rigid rod.

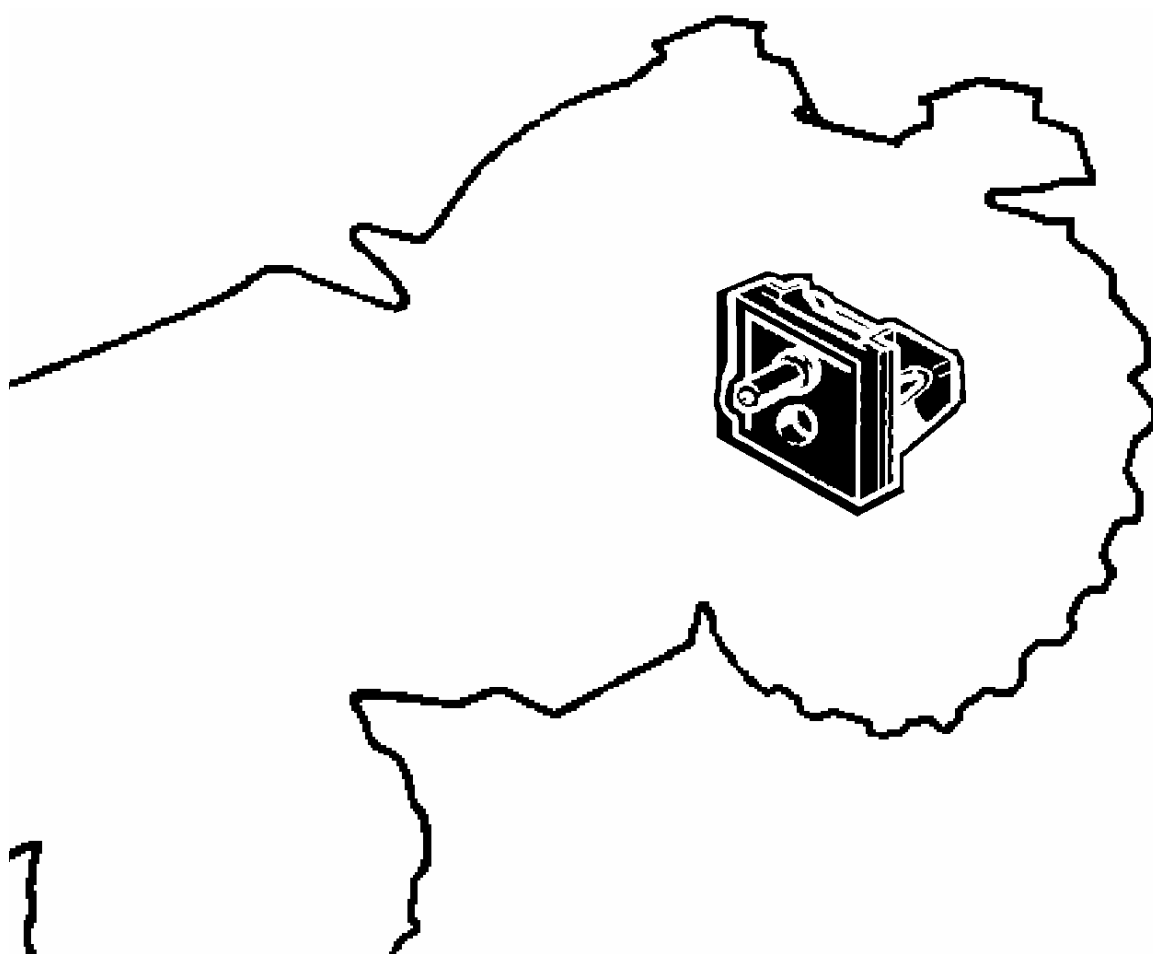
To do this the external spring loaded by the nut and lock nut must overcome the internal torsion spring that keeps the four-wheel drive disengaged; therefore the external spring is to be loaded until the correct selection of the four-wheel drive is made.



DRIVING TORQUES

	kgm
M 12 drive transmission—gearbox fixing screw	7
M 10 gearbox fixing screw	6

REAR POWER TAKE-OFF



1

Star - 3000 Star

Assembly 45

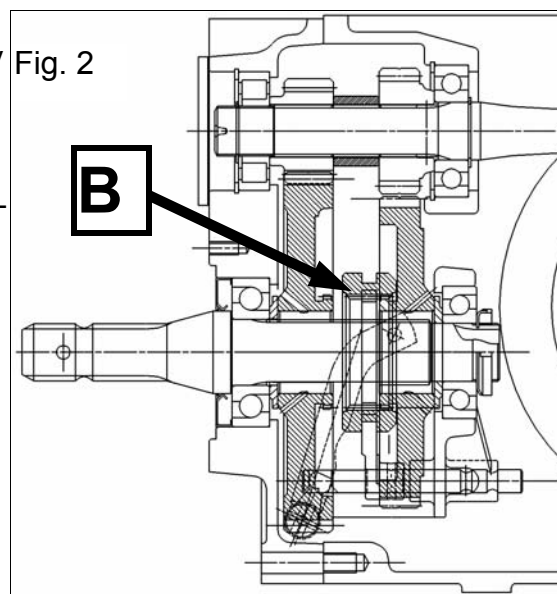
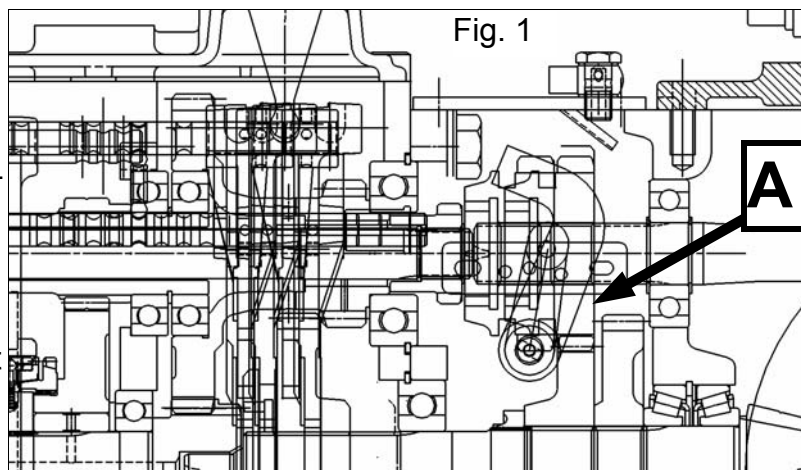
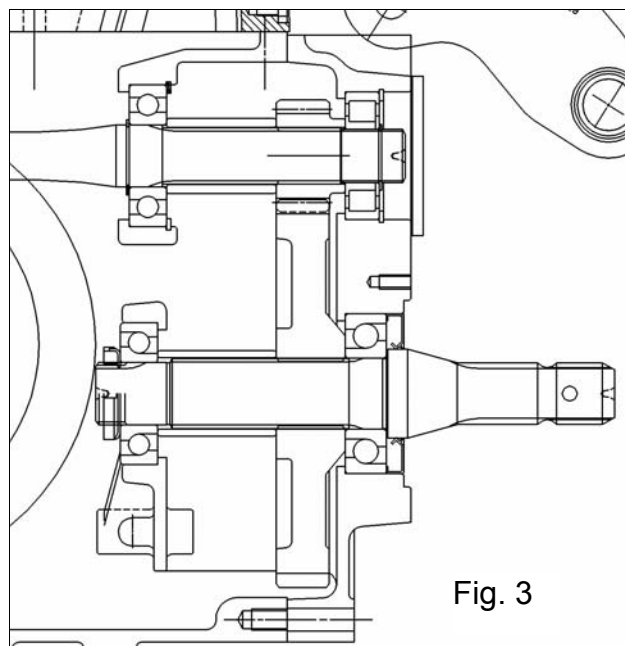
Fig. 1 shows the assembly drawing of the power take-off engagement, gear **A** of Fig. 1.

With this selection the independent power take-off is engaged, synchronized or in neutral.

With the external lever at the bottom the independent one is selected, with the lever horizontal neutral is selected and with the lever at the top the synchronized one is selected.

Fig. 2 on the other hand shows the assembly drawing of the power take-off speed selection. The coupling **B** of Fig. 2 shifts to the right or left making integral one of the two pairs of gears that determine the speed of rotation of the power take-off.

The selection is located to the right of the

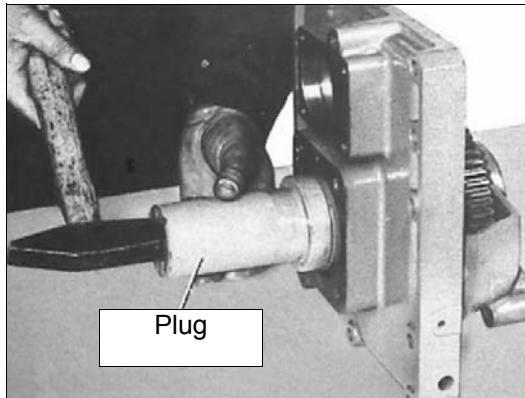


driver under the seat and is an optional application. Fig. 3 shows the standard 540 rpm power take-off that is the standard version of the machine.

The pair of gears is only one and, on the machine, there is no longer the selection for the gearbox and the power take-off of the tractor.

The power take-off casing is assembled on the bench and fitted to the rear differential casing.

The phases of this assembly and its subsequent fitting to the rear differential casing will be illustrated.



The sequence shown here illustrates the assembly of the power take-off casing.

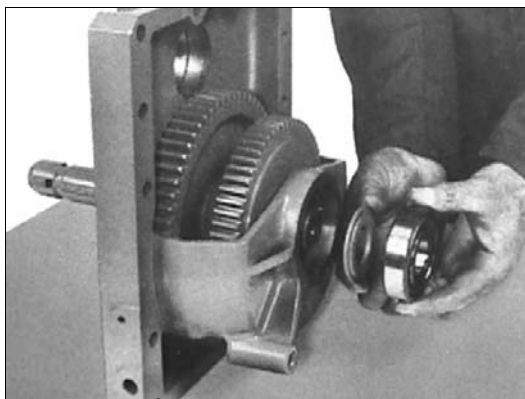
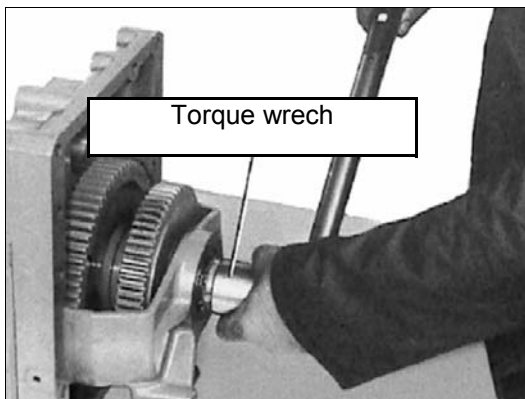
The tightening of the ring nut that fixes the lower shaft of the power take-off is particularly important.

This tightening must be made with a torque wrench at 2.5 kgm and the ring nut must subsequently be punched to prevent it accidentally coming loose.

Pay special attention, once the power take-off casing has been fitted on the rear differential assembly, to the adjustment of the power take-off selection.

Before fitting the power lift on the rear differential casing, adjust the power take-off selection plate.

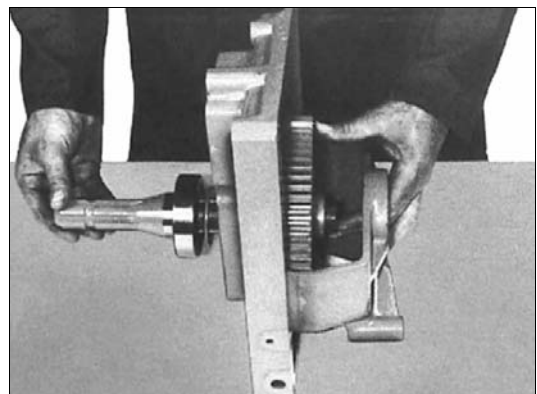
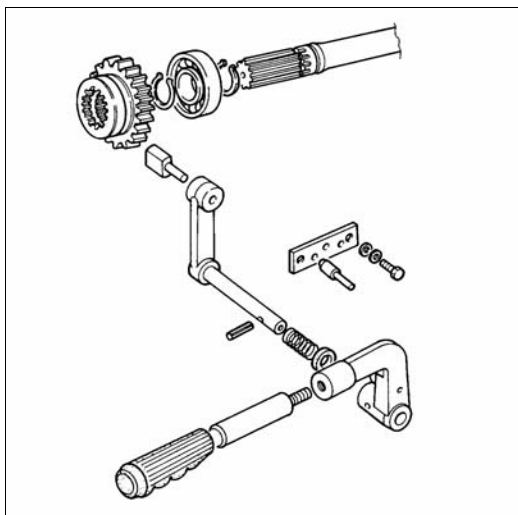
Position the plate so that the selection of the neutral, synchronized power take-off or independent power take-off is made without the fork being forced on the gears and so that the selection is correct. These pictures show the assembly in both standard and double speed versions.

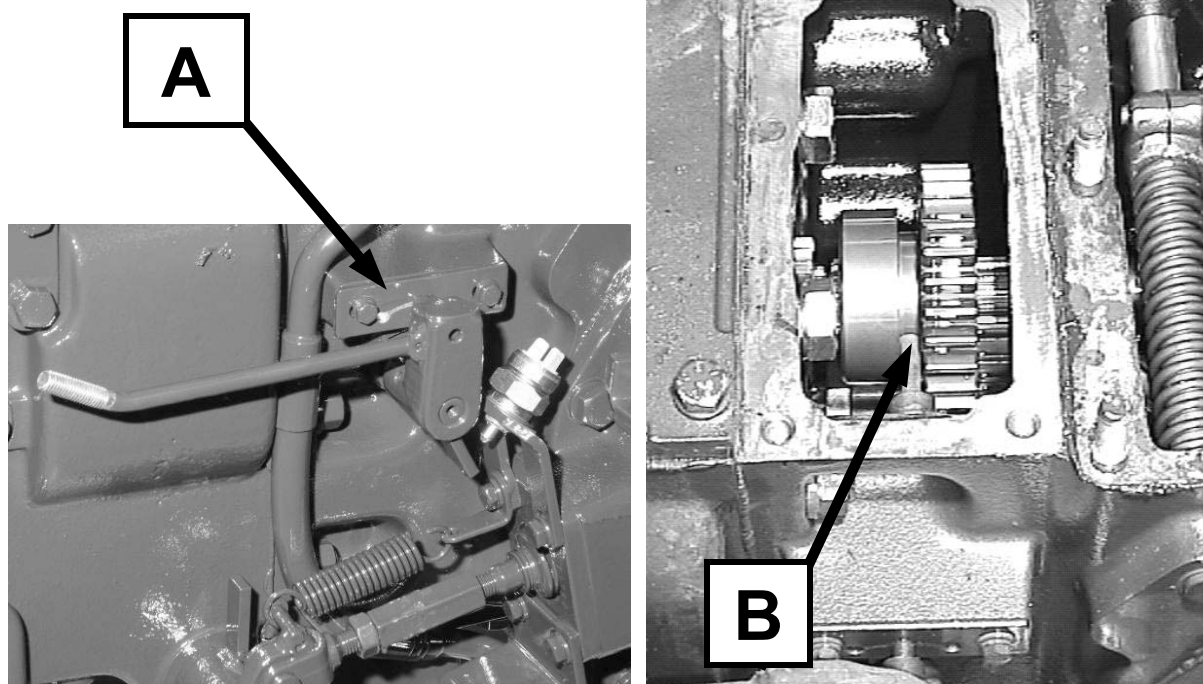


The diagram at the bottom shows the power take-off selection drive line.

With the external lever at the bottom the independent power take-off is engaged. In the horizontal there is the neutral position and at the top the synchronized PTO is selected.

Since the external lever of the power take-off is also fitted with an enabling switch that prevents starting the engine if the PTO is engaged, remember to adjust this switch correctly too.





The pictures above show the parts that form the PTO selection option.

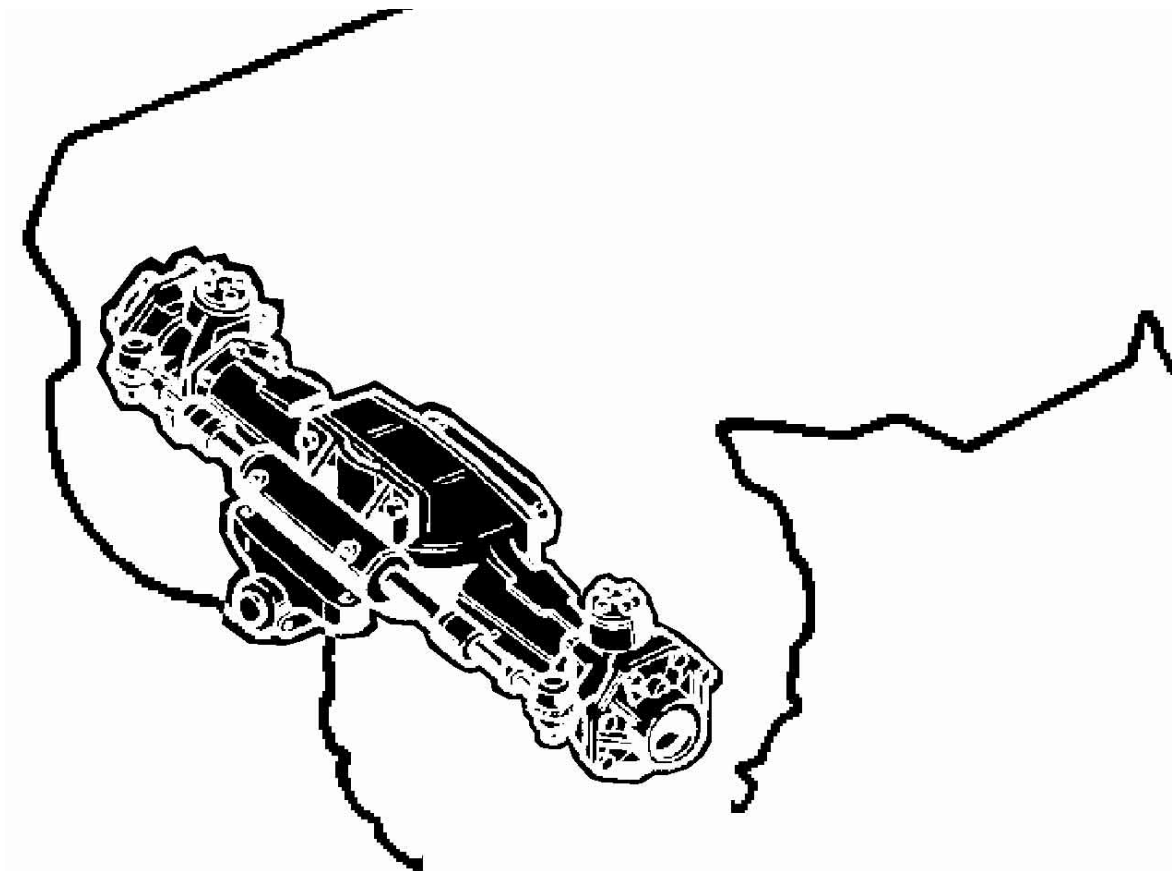
Part **A** is the PTO selector plate whose correct adjustment ensures that the entire operating range of the PTO is engaged.

Part **B** is the end element of the selection mechanism on the sliding gear, illustrated schematically on the previous page.

DRIVING TORQUES

	kgm
M 35 x 1.5 ring nut that fixes the rear PTO shaft	2.5
M12 nut that fixes the rear PTO assembly	7
M12 x 30 screw that fixes the cover of the upper compartment of the PTO	4.9
M12 x 35screw that fixes the transmission unit	4.9
M 8 x 20 screw that fixes the rear Pto cover	2.4

FRONT AXLE



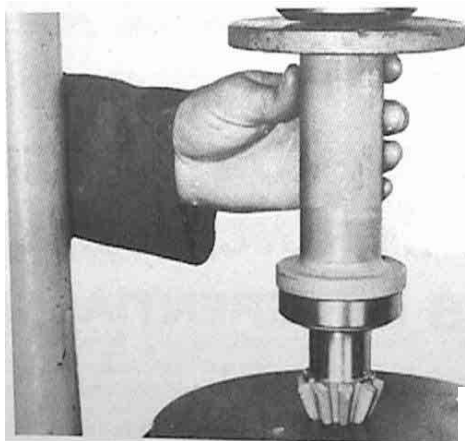


Fig. 1

The first thing to do is to pre-assemble the pinion as illustrated in fig. 1, using the plugs shown in fig. 2.

Tighten the ring nut **A** of Fig. 3 to 4.0 kgm and punch it to prevent it working loose.

Take care to renew this ring nut each time it gets removed.

Pre-assemble the bevel ring gear as shown in fig. 4.

Fit the safety pins in the relative housings so that the safety plates keep them in position. Tighten the M 12 screws that fix the ring gear to the shaft to 8 kgm as illustrated in fig. 4, then clinch the plates around the screws to prevent them from accidentally working loose.

Assemble the bevel ring gear unit and tighten the ring nuts as shown in fig. 5.

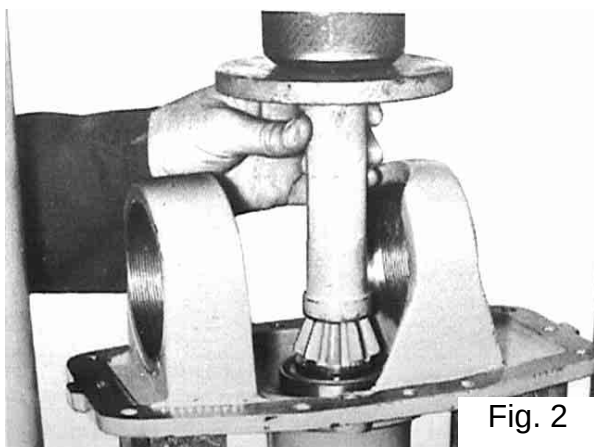


Fig. 2

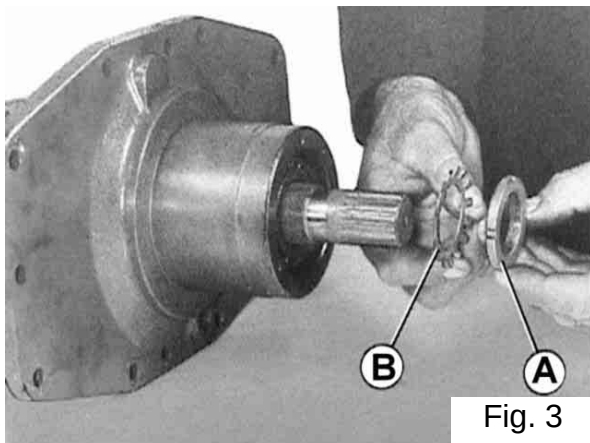


Fig. 3

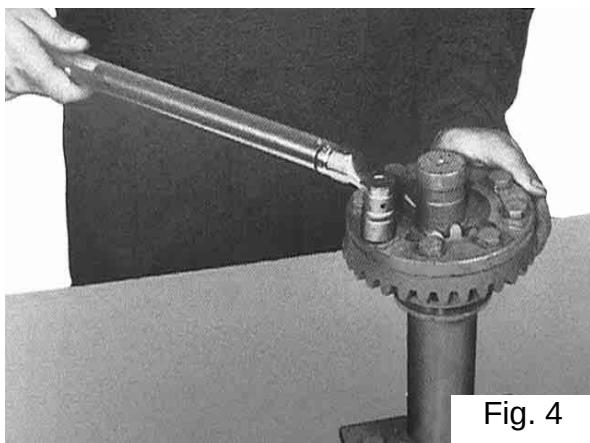


Fig. 4

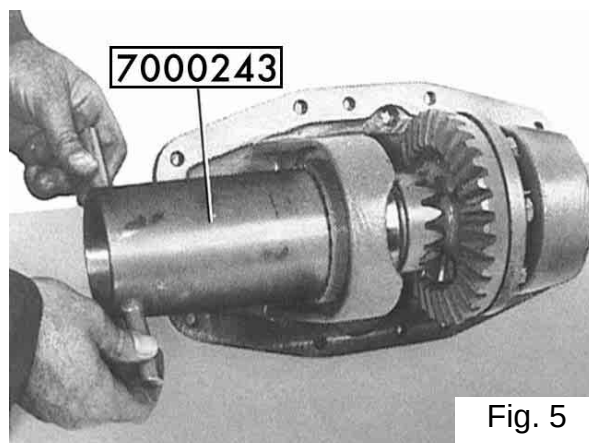


Fig. 5

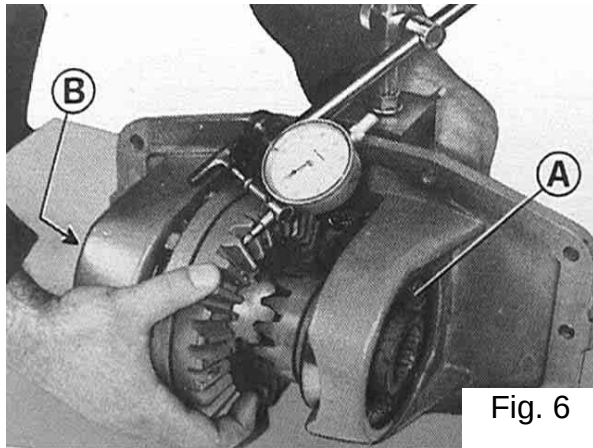


Fig. 6

Good adjustment of the pinion - ring gear assembly requires a 1.9 kgm preload on the differential obtained by means of ring nuts **A-B**.

Work on the ring nuts to an equal extent in order to adjust the coupling to the above mentioned preload.

The play between the pinion and bevel ring gear must be checked all around the circumference and must be between 0.10-0.18 mm.

To achieve a correct coupling, comply with

the instructions on the following pages.

After having adjusted the pinion and ring gear, proceed by adjusting the differential.

Unscrew ring nut **A** of fig. 6 by about 3 positions, relieving the preload and thus obtaining a 0.16-0.17 mm play between the crown wheel and planetary gear.

Once the adjustments have been made, lock the ring nuts with safety retainers **C** of fig. 7 and make sure that the differential is free to turn.

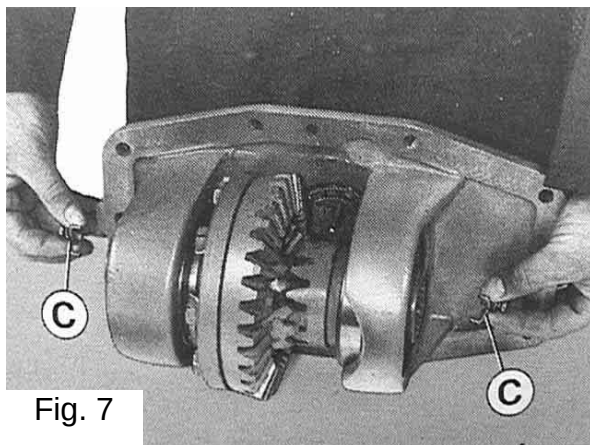


Fig. 7

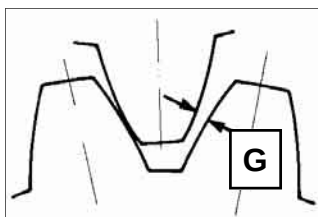


Fig. 8

Fig. 8 – To obtain a good coupling, play **G** between the pinion and ring gear must be between 0.10 and 0.18 mm.

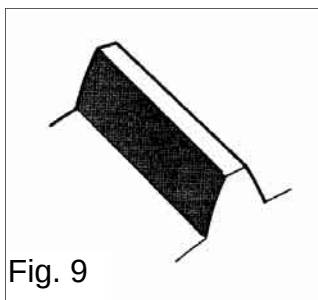


Fig. 9

Fig. 9 – Correct adjustment: contact between the teeth must be uniform throughout the entire length.

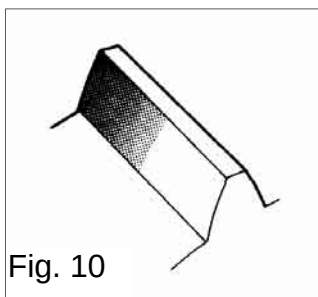


Fig. 10

Fig. 10 – The pinion is in an excessively forward position and works on the root of the tooth too much: this means that the bevel gear pair must be replaced.

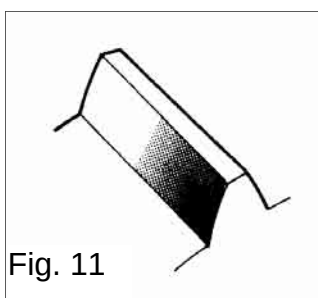


Fig. 11

Fig. 11 – The pinion is in an excessively retracted position and works on the crest of the tooth too much: add 0.2 mm shims between the bearing and casing;

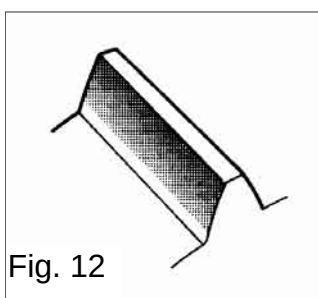


Fig. 12

Fig. 12 – The ring gear is too far from the pinion and works on the crest of the tooth. Unscrew ring nut **A** of fig. 6 and tighten ring nut **B** to an equal extent.

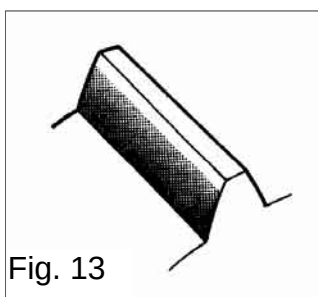


Fig. 13

Fig. 13 – The ring gear is too near the pinion and works on the root of the tooth. Unscrew ring nut **B** of fig. 6 and tighten ring nut **A** to an equal extent.

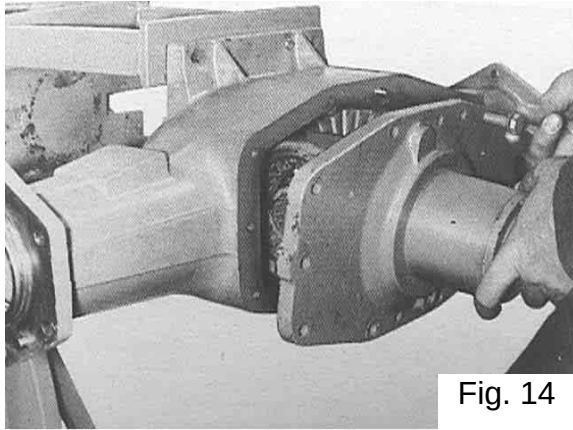


Fig. 14

First assemble the differential unit and then proceed by assembling the front axle.

Fig. 14 to fig. 17 illustrate the various assembly phases. It is worthwhile paying particular attention to the way the front side final drives are pre-assembled. The instructions are given on the next page.

Instructions about how to adjust the steering cylinder are also given so as to ensure correct wheel toe-in and tyre wear as well as a correct steering position.

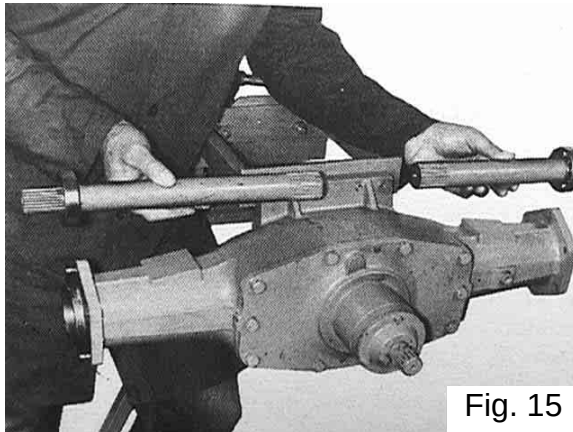


Fig. 15

Many of the seals made with O-Rings must be strengthened with silicone to prevent oil from oozing out. This will be specified when required.

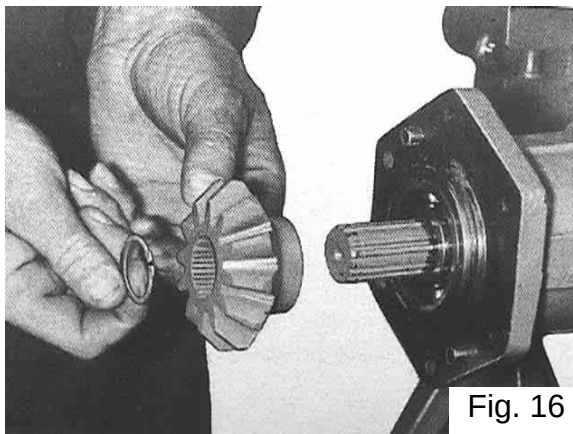


Fig. 16

In fig. 17, adjuster screw **K** is used to adjust the front axle end of travel positions.

This adjustment must be made on the tractor to suit the tyres mounted and the conditions in which the tractor is used.

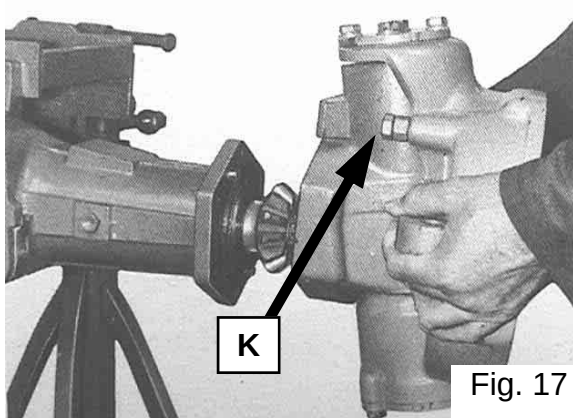


Fig. 17

The steering system of the tractor can be regulated by means of these adjuster screws and by fitting spacers under the pads that limit the longitudinal pivot of the front axle, modifying the minimum turning radius or the axle's longitudinal pivot as required (depending on the slope on which the tractor operates, the type of soil worked, the implements hitched, etc.).

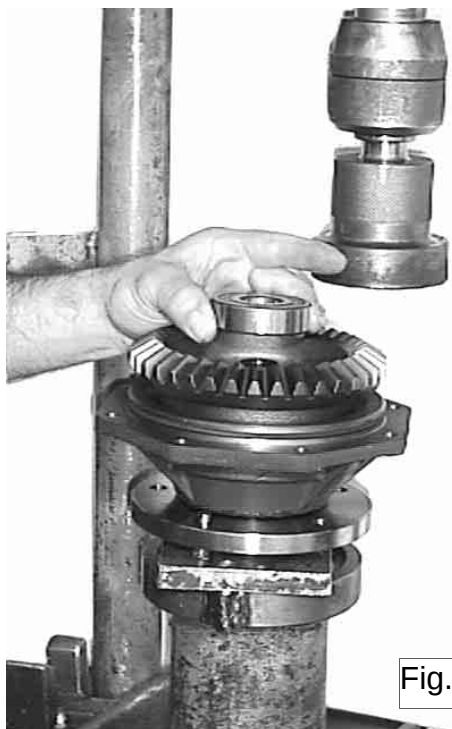


Fig. 18

The bevel ring reduction gear must be pre-assembled on the front final drives as illustrated in fig. 18, with the aid of a press able to exercise a thrust of at least 5000N.

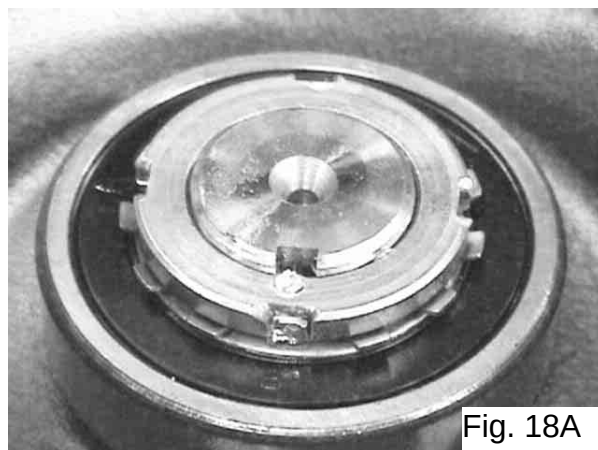


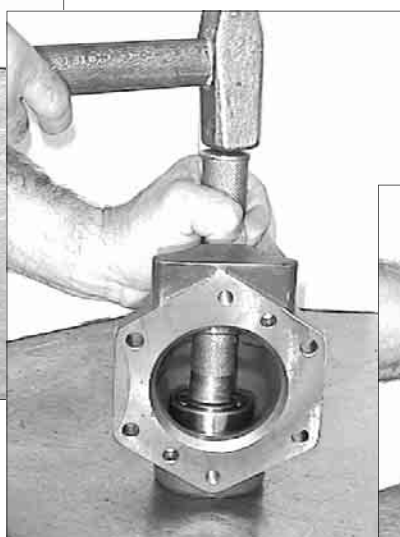
Fig. 18A

As shown above, the bevel ring gear must then be locked in place by tightening the ring nut to 15 kgm to prevent it from accidentally working loose.

Once the ring gear has been pre-assembled, proceed by assembling the central part of the front reduction gear as shown in the sequence illustrated alongside and using a plug and circlip pincers.



Fig. 19



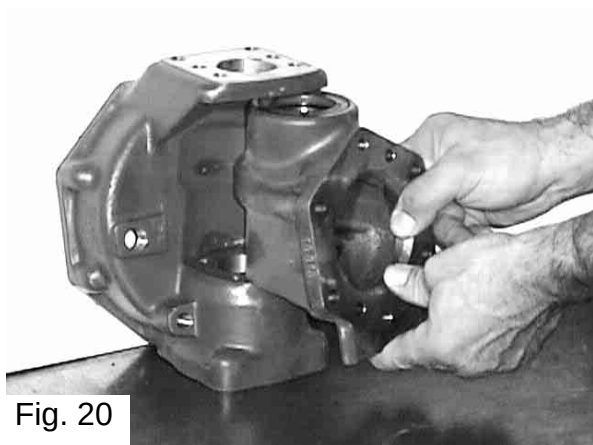


Fig. 20

Fig. 21

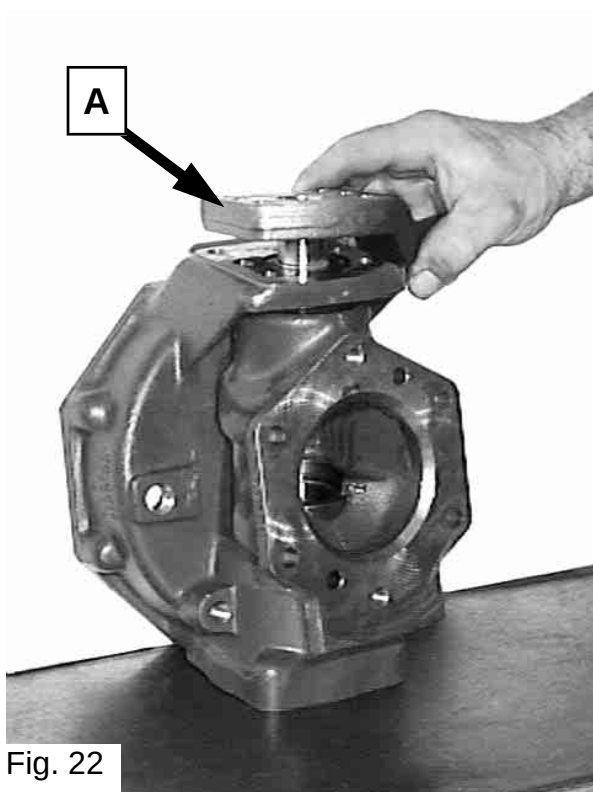


Fig. 22

Figs. 20 – 21 – 22 show the successive assembly phases. The only precaution to take is to oil the seat of the pin of fig. 21 before fitting it into its housing.

Don't forget to spline part **A** of Fig. 22 and the fixing screws of this wheel control lever should be tightened to 6.0 kgm.

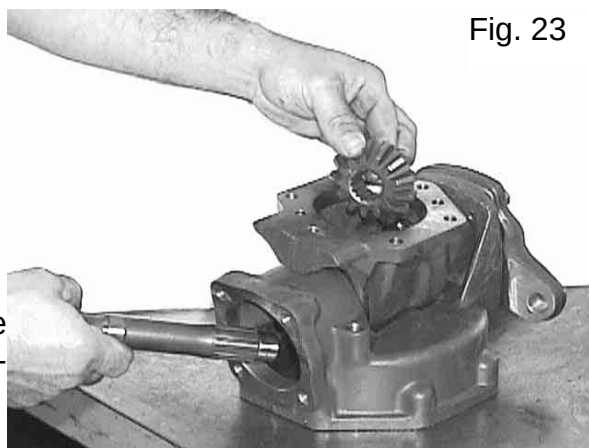


Fig. 23

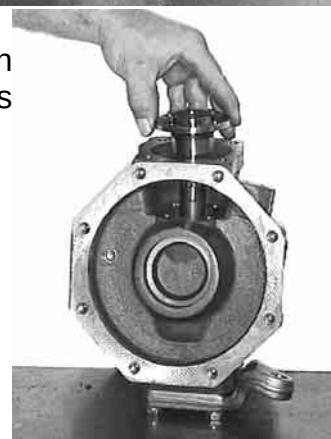
Fig. 23 illustrates the assembly sequence of the bevel gear that works on the front differential gear.

Don't forget to put silicone on the pin illus-

Fig. 23A



trated in Fig. 23A and on the screws fastening this pin to avoid oil oozing out.



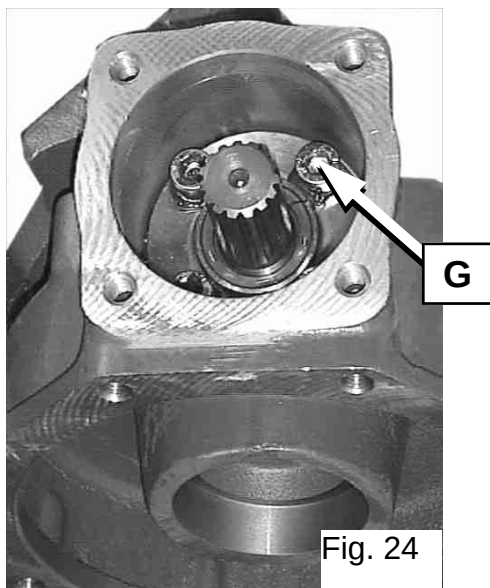


Fig. 24

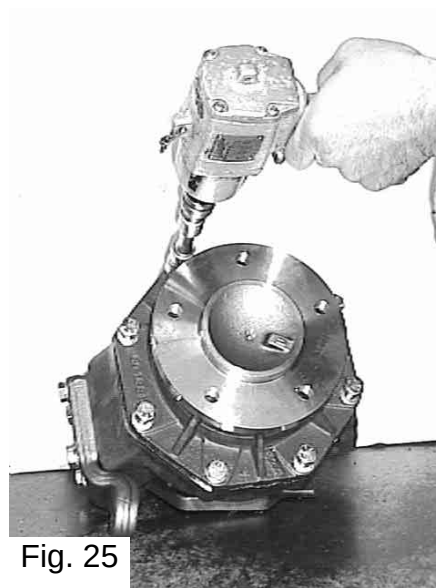


Fig. 25

After tightening the Allen screws **G** of Fig. 2.4 to 4.5 kgm and siliconing them to ensure the seal on the thread, fit the bevel crown wheel as illustrated in Fig. 25 tightening the screws to 9 kgm that secure the axle-shaft and the ring gear to the final drive body. To correctly tighten the 8 screws that fix the ring gear, begin by tightening two opposite screws so as to correctly distribute the torque value around the entire perimeter of the final drive cover and prevent the O-Ring from being pinched.

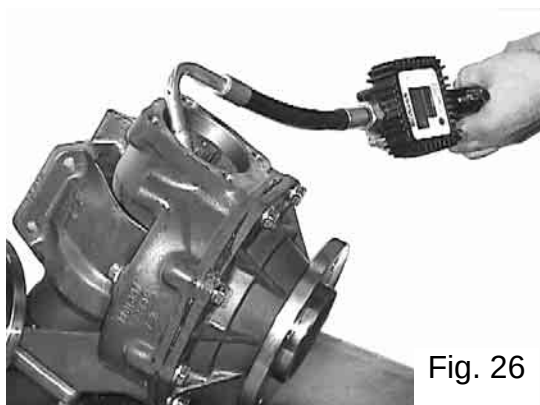


Fig. 26

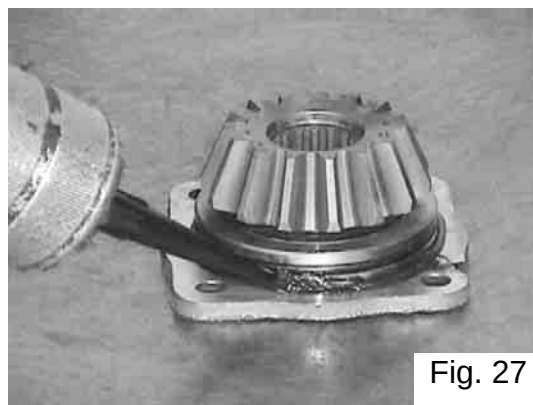


Fig. 27

Once the ring gear has been pre-assembled, pour 0.8 liters of SAE 80-90 W oil into the final drive as illustrated in fig. 26.

Pre-assemble the crown wheel driving gear and put silicone on the oil seal as illustrated in Fig. 27.

Carry out the assembly operations illustrated in fig. 28, tightening the screws to 6 kgm and thus concluding the pre-assembly operations for the front final drive.

You can now proceed to the final assembly of the front axle.

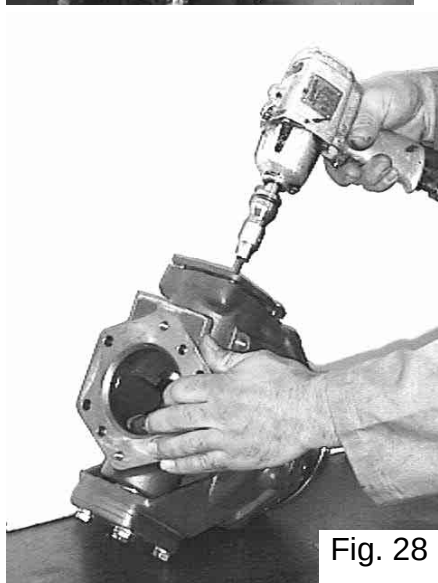


Fig. 28

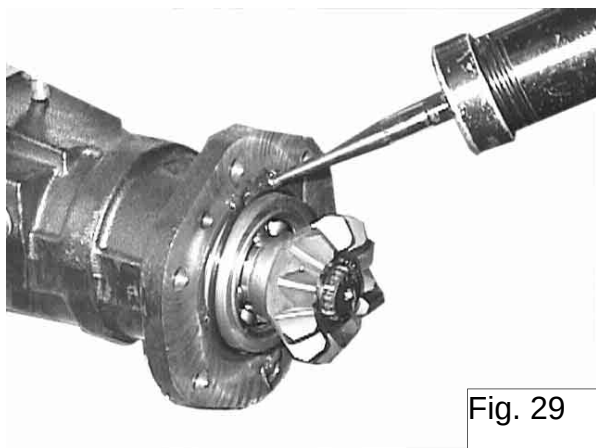


Fig. 29

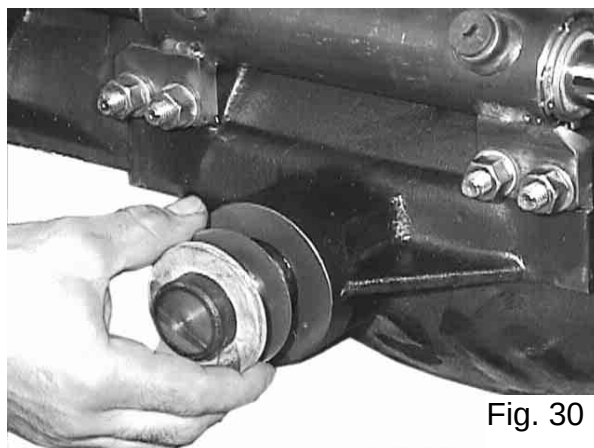


Fig. 30



Fig. 31

As shown in fig. 29, apply silicone to the axle support and do not forget to pre-assemble the spacer illustrated in fig. 30.

Tighten the screws that fix the front final drive to the axle support to 6 kgm, as illustrated in fig. 3-1.

Fit the notched nuts and relative retaining split pins on to the steering links, as illustrated in fig. 32.

Complete the axle by filling the axle support with about 3 liters of SAE 80-90 W oil.

Adjust the toe-in as shown in fig. 33. Make sure that you comply with the measurements given in the figure.

To obtain these dimensions, adjust the steering links and once they have been regulated, lock the ring nuts by tightening them to 8 kgm after having applied loctite to the threads.



Fig. 32

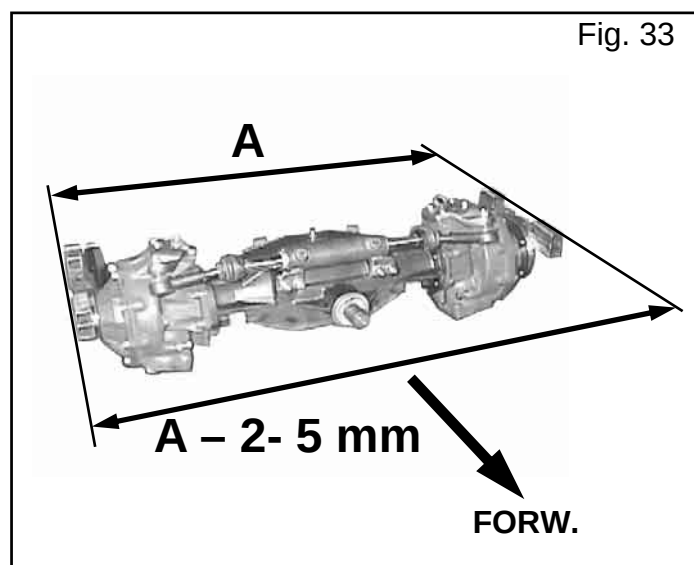


Fig. 33

DRIVING TORQUES

kgm

M 35x1.5 bevel pinion fixing ring nut	4
M 10x30 screw that fixes the differential support to the axle	6
M12 bevel ring gear fixing screw and nut	7
M 10x30 final drive axle fixing screw	6
M 6x16 bevel pinion cover fixing screw	1.5

LUBRICATION

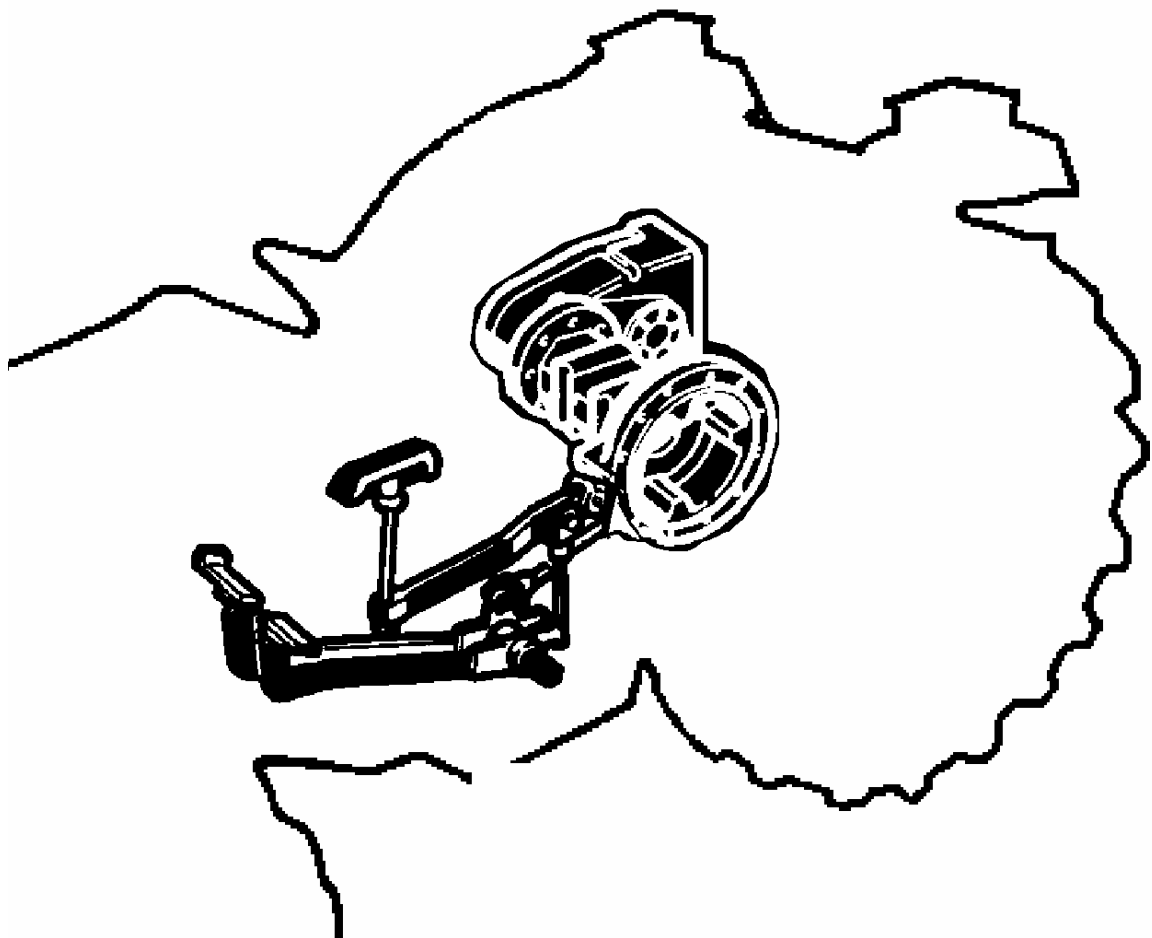
Oil	ARBOR TRW90 (SAE 80W-90, API GL-5)	3	Liters
Oil	ARBOR TRW90 (SAE 80W-90, API GL-5)	1,8	
Grease	ARBOR MP EXTRA (NLGI2)		

We recommend lubricants and liquid by: **FL SELENIA**.

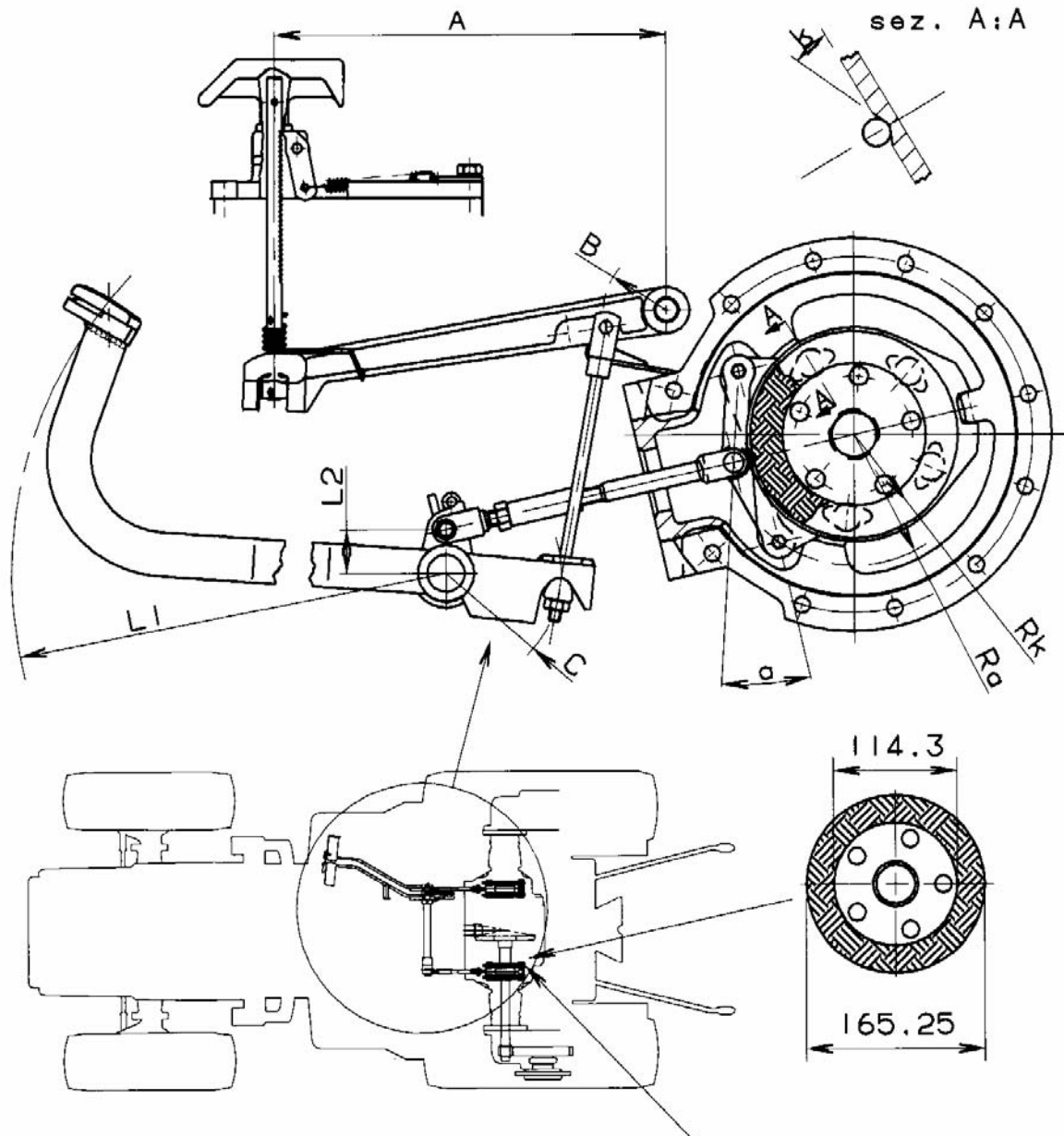
N.B.

As regards the front axle of the Star 50-70 High and Low, refer to the notes and information already given under the relevant heading for the front axle of the Star 75 and 85 Q version.

BRAKES



BRAKING SYSTEM DIAGRAM



MAIN BRAKE

MAIN BRAKE PEDAL LEVERS	
ACTIVE LEVER LENGTH (L1)	508 mm
RESISTANT LEVER LENGTH (L2)	35 mm

PARKING BRAKE

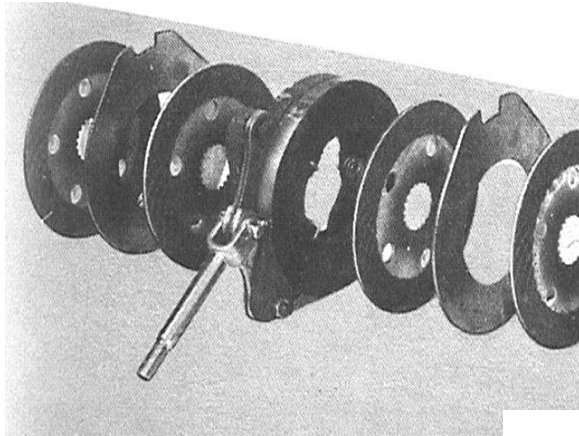
ACTIVE LEVER LENGTH (A)	310 mm
RESIST. LEVER LENGTH (B)	50 mm
LENGTH OF ACTIVE LEVER BRAKE PED (C)	92 mm

BRAKING SURFACES

AXLE	REAR
No. DISCS PER WHEEL	4
TOTAL SURFACE AREA cm ²	1788.8
MATERIAL USED	HDT 303

REAR BRAKING MASSES

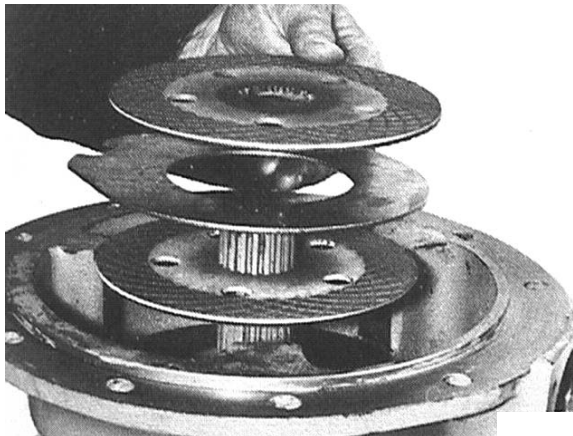
ACTIVE LEVER LENGTH (L1)	105 mm
RESISTANT LEVER LENGTH (Rk)	66.5 mm
APPLIC. ANGLE OF ACTIVE LEVER (O)	26°
APPLIC. ANGLE OF RESIST. LEVER (k)	38°
DISC OUTSIDE DIAMETER (De)	165.25 mm
DISC INSIDE DIAMETER (Di)	114.3 mm



HOW TO ASSEMBLE THE BRAKING ELEMENT.

To access the braking element, raise the rear part of the platform, then detach the wheels, the axle shaft supports and the complete final drives.

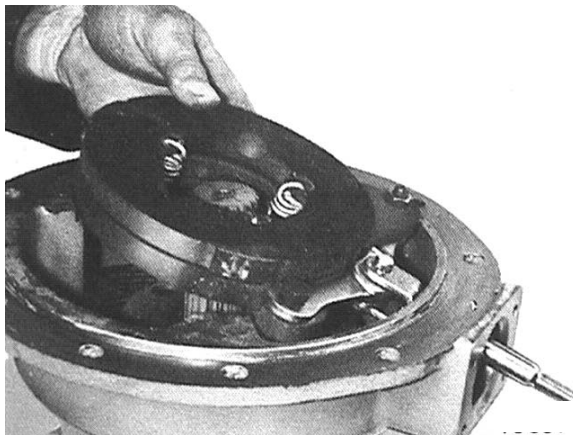
The friction material of the brake discs must never be thinner than 3.8 mm. If the brake discs are replaced, they must be kept in an oil bath for at least 12 hours before they are assembled.



When the final drive axle shaft supports are fitted back on the differential housing, make sure that the metal plates are correctly positioned as shown in the sequence alongside.

EXTERNAL BRAKE CONTROL LINKS

Remove the rear wheels from the machine to access the external links and seals on the controls.



The main brake operates correctly when the braking action begins after about 35-40 mm free travel of the pedal. Proceed in the following way to adjust:

- loosen nut **A** of fig. 1 (see next page),
- adjust by means of link **B**,
- lock nut **A** after the adjustments have been made.

Make sure that the braking action is applied simultaneously on the two wheels. If necessary, make adjustments to the wheel that brakes in advance by loosening the link.

EMERGENCY AND PARKING BRAKE ADJUSTMENT

The emergency brake is correctly adjusted when the control lever travels 2-3 positions. Proceed in the following way to adjust:

- position the control lever as indicated above,
- adjust nut **C** of fig. 2. Until block **D** slightly touches lever **E**.

Fig. 2

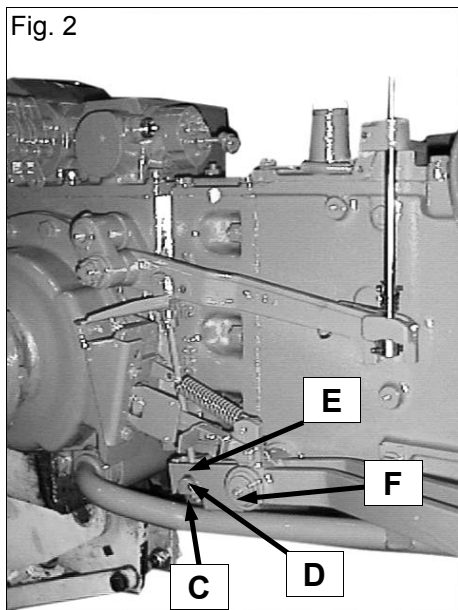
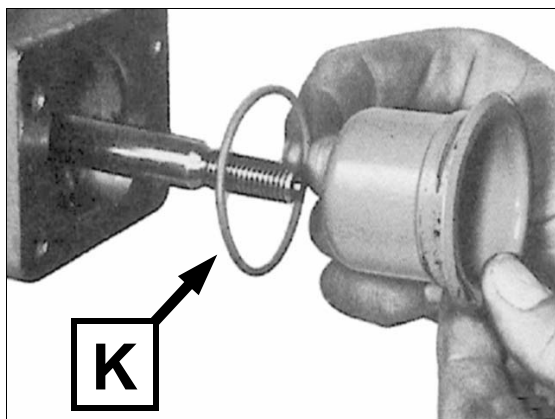
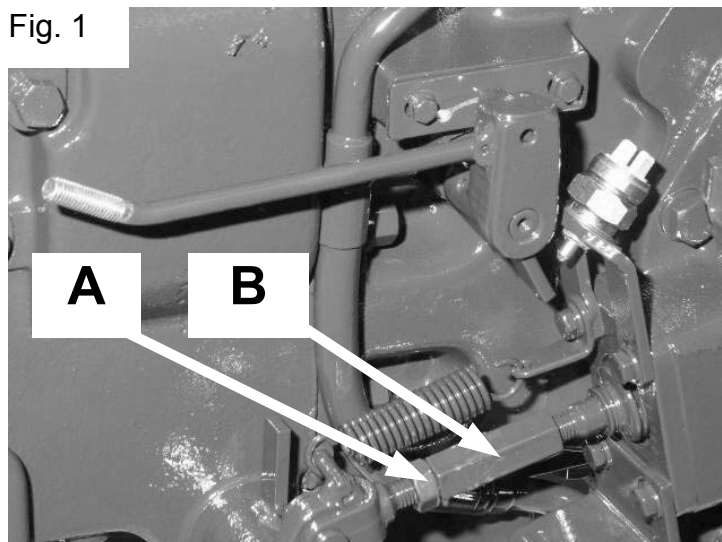


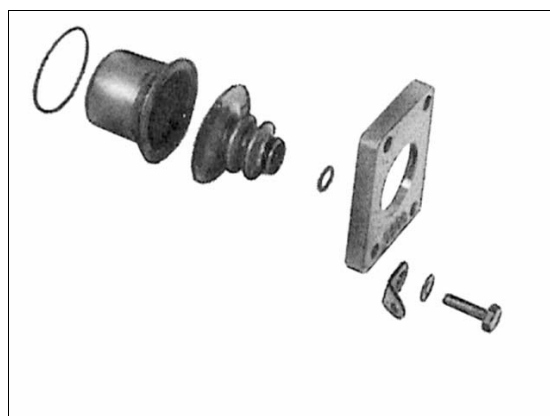
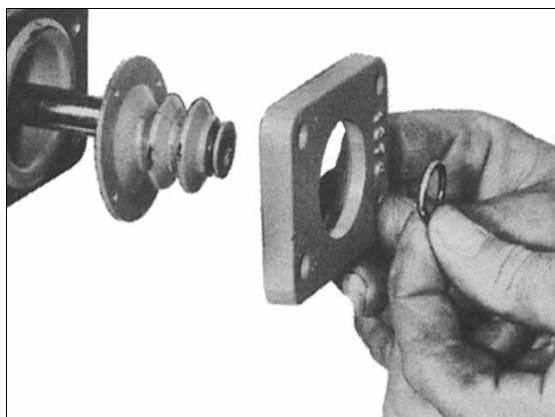
Fig. 1

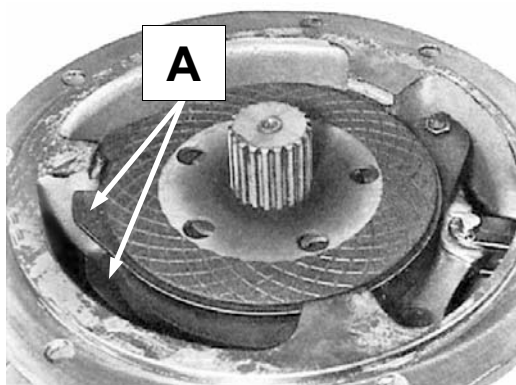


Remove the rear wheels from the machine to access the external links (except for adjusting the main and parking brakes) and the seals on the controls.

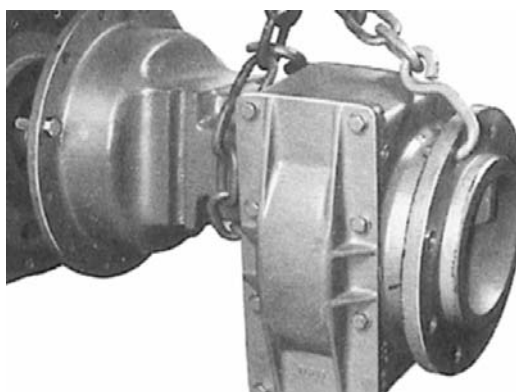
The pictures alongside show how the seals are assembled on the brake link.

Pay particular attention when assembling seal **K** shown in the picture. Apply silicone all round to prevent oil from oozing out.





When the hub assembly is assembled on to the differential housing, make sure that metal plates **A** are correctly positioned inside the casting.



Assemble the hub using lifting equipment. Make sure that the wheel hub is installed in the initial position, in a symmetrical way to the other hub (this must also be done for the final drive - shaped housing).

Or mark the position of the final drive housing in relation to the axle shaft support before disassembling the final drive.

Do not forget to grease the internal bushes that support the brake pedals using grease nipples **F** of fig. 2 (previous page).

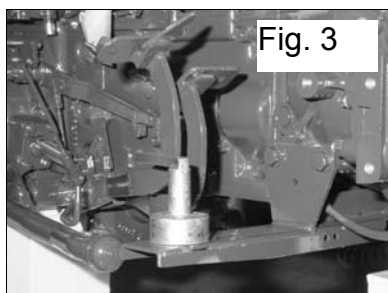


Fig. 3

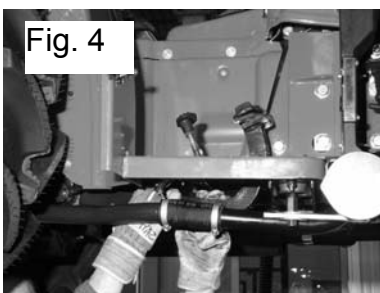


Fig. 4

Fig. 3 and Fig. 5 show the initial phase of adjusting the brakes.

In order to adjust both the right and left pedals equally, it is recommended to make a spacer as in Fig. 5 to permit checking that the pedals

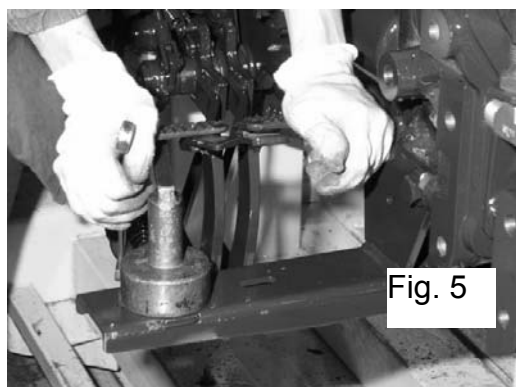
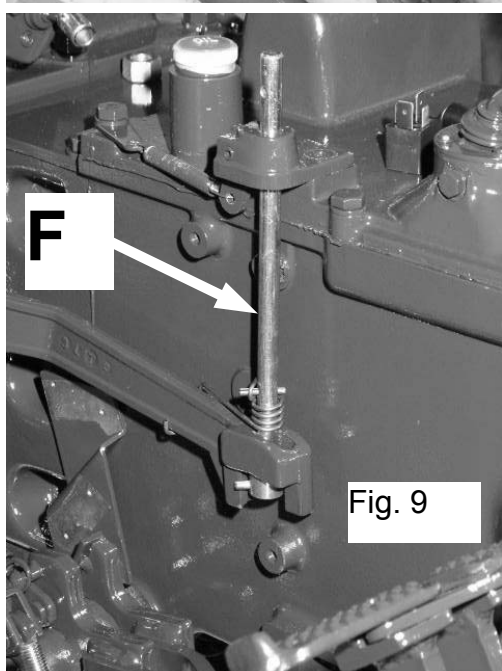
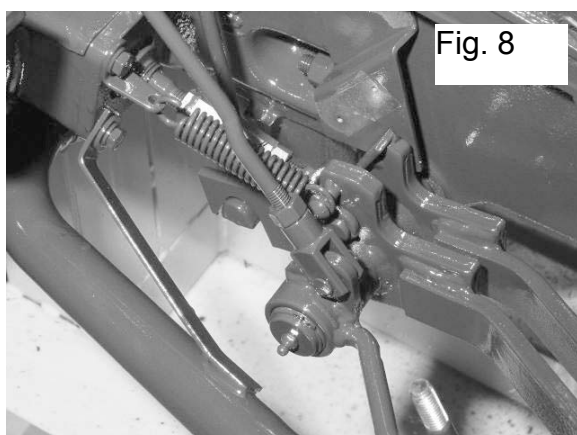
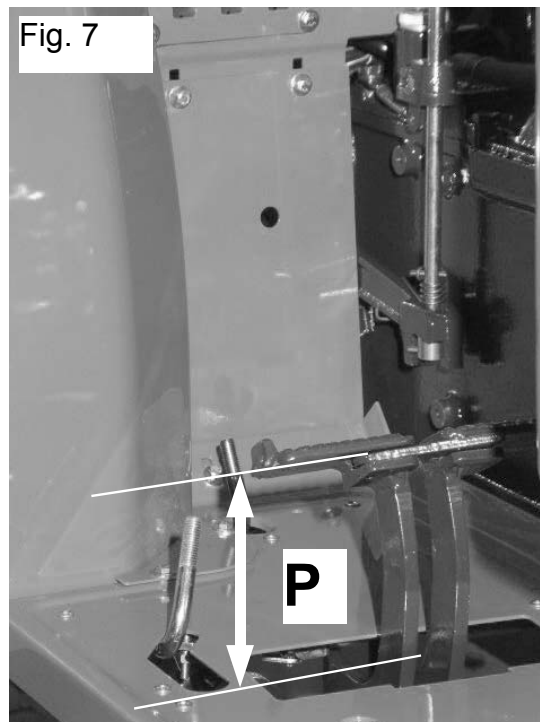
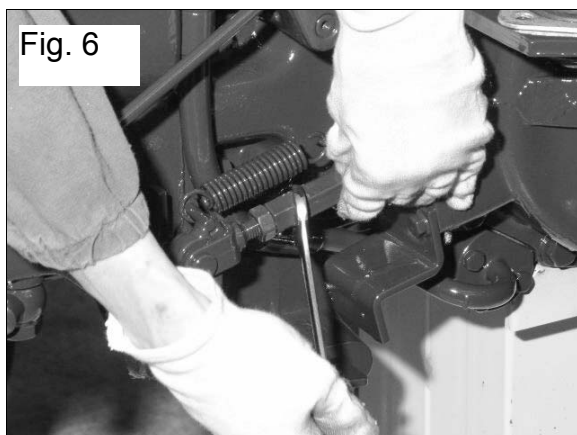


Fig. 5

have the same pull. At rest the height of the pedals from the footboard must be 115 mm.

Fig. 4 shows the final adjustment to make on the finished machine, preferably on a lift.



In Fig. 7 the letter **P** indicates the distance of approximately 115 mm that must be measured after correctly adjusting the brake pedals.

Fig. 6 again shows the operation of adjusting the brakes and tightening the lock nut to 3 kgm to lock the adjustment.

Fig. 8 shows the grease nipple on the brake pedal transmission pin. Remember to periodically lubricate the bushings on which the pedals move with this grease nipple to prevent the linkage from getting stiff.

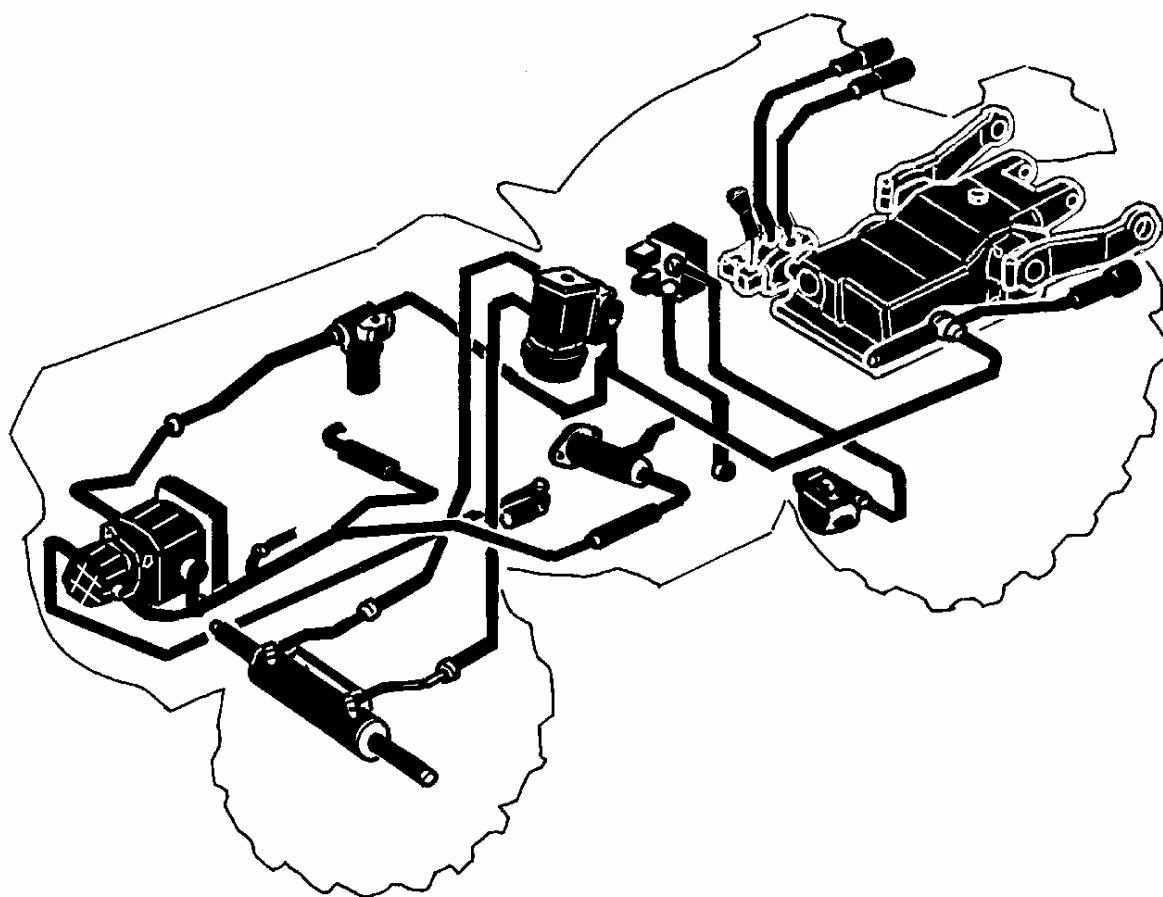
Fig. 9 shows the emergency and parking brake that, as mentioned above, acts on the main brake pedals.

Correct adjustment of the linkage permits locking the rear wheels with a travel equal to 3 positions made by pin **F** of Fig. 9.

DRIVING TORQUES

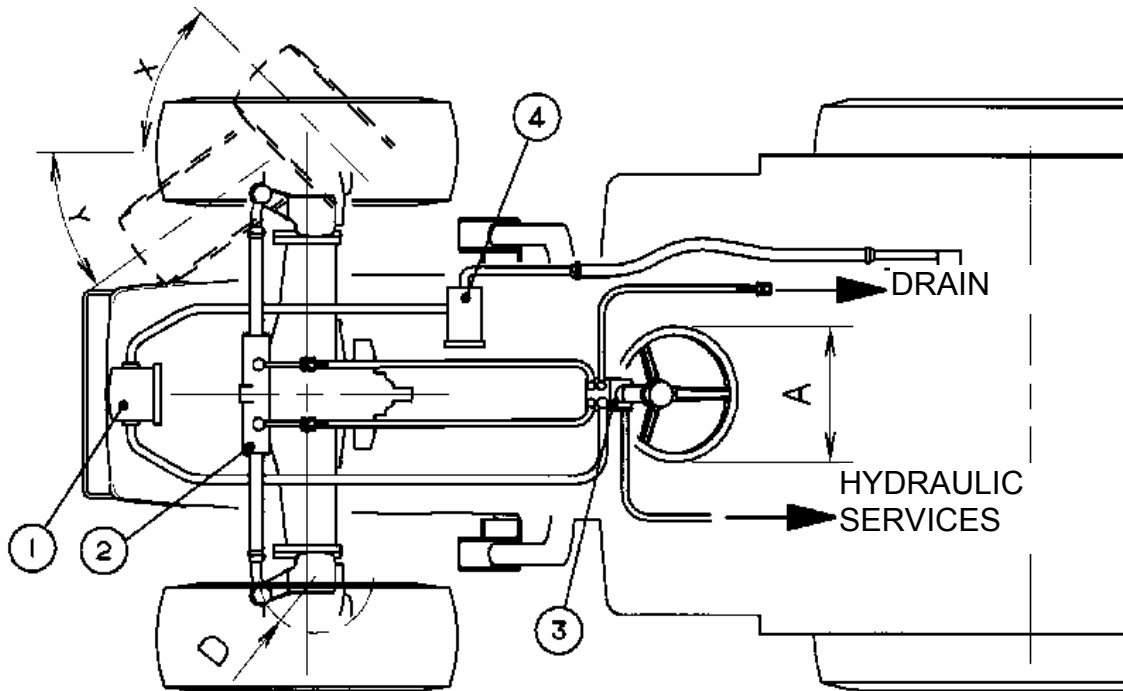
	kgm
Screw that fixes final drive axle shaft support to differential housing	8
M 8 x 25 oil retainer cover fixing screw	2.4

HYDRAULIC CIRCUIT



STEERING DEVICE

(Hoses: SAE 100 R1 AT bursting pressure 870 BAR)



1) HYDRAULIC PUMP DATA

MAKE	HIDROIRMA	TOTAL TRAVEL	242 mm
MODEL AP200/11-0.5/1.2	SX2827	TOTAL DISPLACEMENT	245 cm ³
DISPLACEMENT CM3	11	STEM DIAMETER	32 mm
PUMP DELIVERY L/1	34	BORE DIAMETER	48 mm

2) STEERING CYLINDER DATA

3) POWER STEERING DATA DANFOSS OSPC 80 LS

STEERING LEVER DIMENSIONS

PRESSURE RELIEF VALVE SETTING	BAR 90	STEERING LEVER USEFUL LENGTH (D)	170 mm
SHOCKPROOF VALVE SETTING	BAR 150	ANG. OF STEERING RIGHT (X)	45°
TOTAL DISPLACEMENT	80 cm ³	ANG. OF STEERING LEFT (Y)	40°
WORKING PRESSURE	BAR 5 -100	STEERING WHEEL DIAMETER (A)	380 mm

HYDRAULIC STEERING SYSTEM DIAGRAM

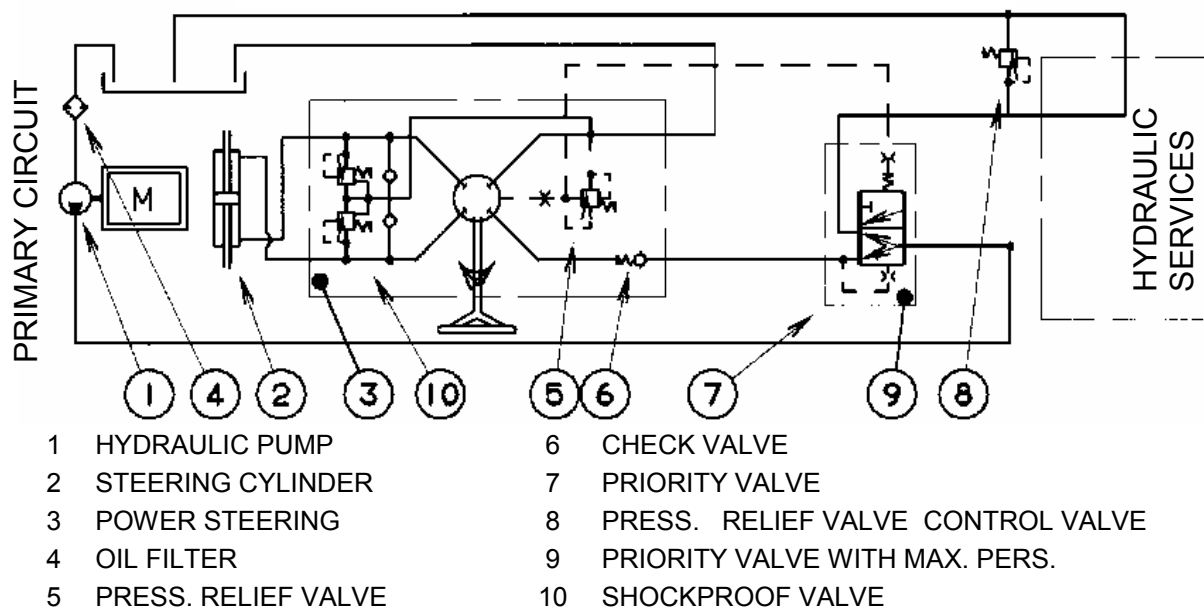




Fig. 5

Fig. 1 shows the positioning of the hydraulic gear pump that is fitted to the front axle support in the area in front of the radiator.

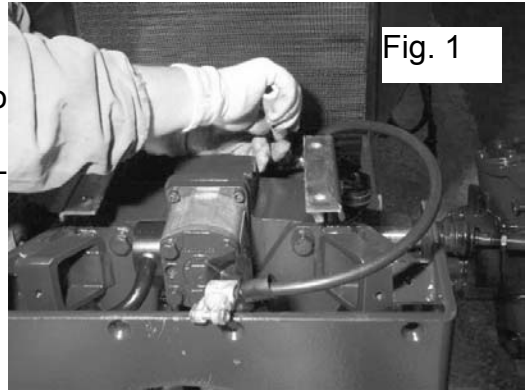


Fig. 1

In Fig. 2 the inlet pipe is fitted.

Take care you correctly install the O-ring seal, keeping it in position with grease during the assembly phase.

The pipe head fixing screws must be tightened to 4 kgm.

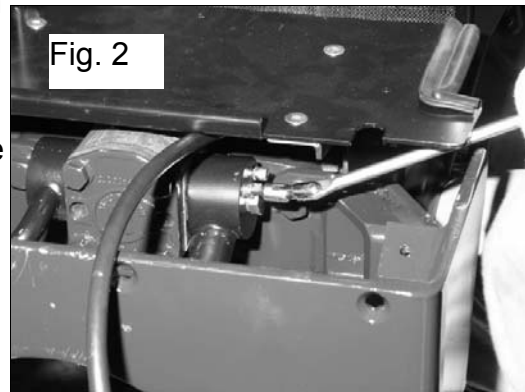


Fig. 2

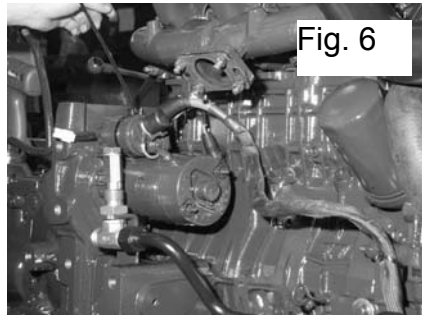


Fig. 6

Fig. 3 shows the inlet pipe and the point where there is the rubber coupling that permits cutting off the piping if it is necessary to detach the engine assembly from the gearbox



Fig. 7

As for instance occurs when renewing the clutch plate.

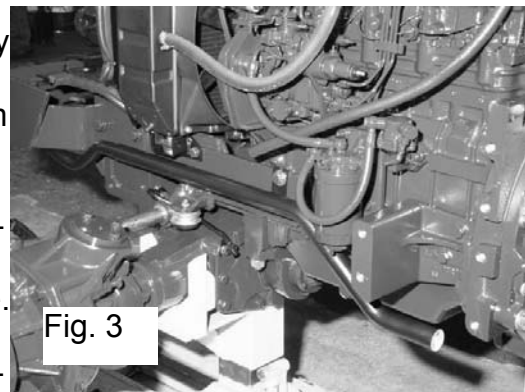


Fig. 3

Fig. 4 shows a detail of the passage of the hydraulic pipes supplying the steering cylinder.



Fig. 8

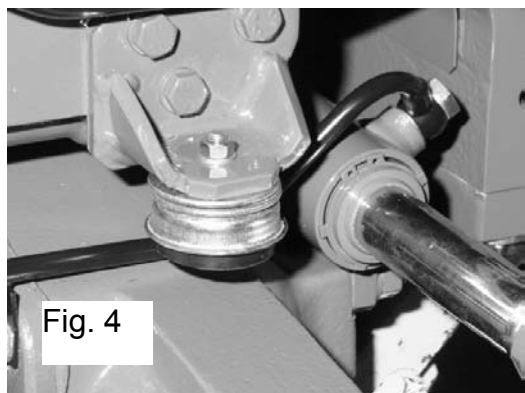


Fig. 4

Fig. 5 shows the free discharge at the rear of the tractor that permits draining the oil off into the rear differential casing of the tractor without meeting any backpressure (usually used for equipment that has this type of need).

In Fig. 6 (on page 3) you can see the valve that supplies the forced lubrication to the gearbox. Positioned on the delivery pipe, this valve, regardless of the speed of rotation of the engine, supplies an oil flow rate of 3-3.5 litres a minute.

The oil is sent to the bushings of the gearbox through a 1/4" rubber pipe that leaves the valve and goes straight to the gearbox.

In Fig. 7 (on page 3) you can see the large inlet filter, with a mesh cartridge and 90 micron filtering capacity. It must be periodically cleaned to remove the debris held by the filter mesh.

In Fig. 8 (on page 3) you can see the power steering assembly fitted on the column and ready to be put on the tractor.

Part **C** in Fig. 9 indicates the pressure relief valve of the power steering that must be set to 130 bar.

To access pressure adjustment it is necessary to remove the cover **C** illustrated in Fig. 9 and use the adjuster Allen screw under the plug.

Tightening the screw increases the pressure that will be sent to the steering cylinder, while unscrewing it decreases the pressure.

To check this setting, on the delivery pipe, near the forced lubrication valve of the gearbox, a pressure gauge is fitted with full scale 250 bar.

To verify the pressure of the power steering, take the steering cylinder to its limit stop on the right or left side and read the value of the pressure shown on the pressure gauge; naturally, no other service must be operated while carrying out this test.

Fig. 7 illustrates the hydraulic filter on the suction side with a filtering capacity of 90 micron with the filter clogging bulb that signals when the hydraulic filter is clogged by turning on an indicator light on the dashboard.

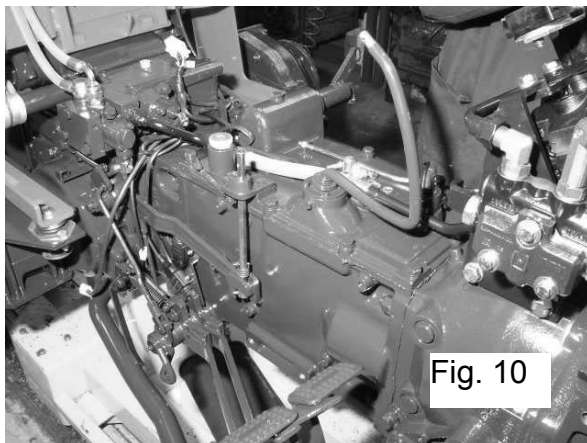


Fig. 10

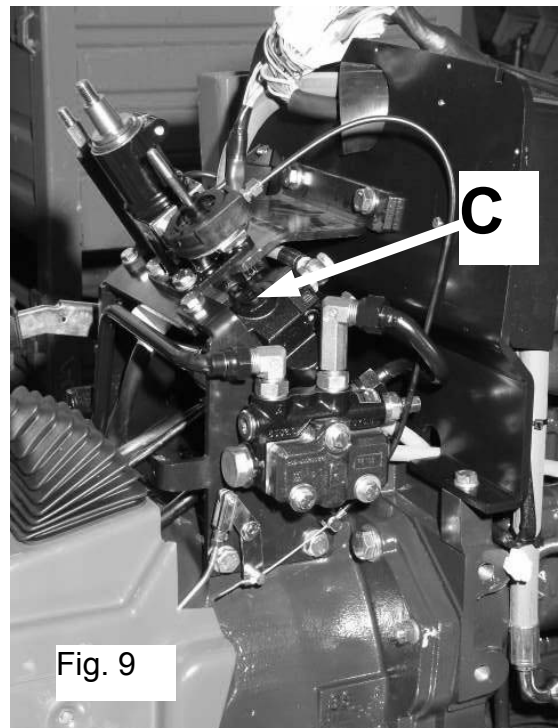


Fig. 9

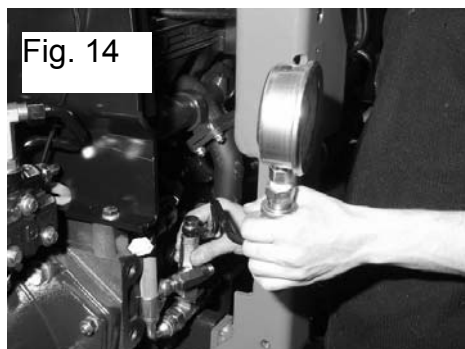


Fig. 14

In Fig. 10 (on page 4) you can see the front control valve support plate that also contains the pressure relief valve that determines the maximum pressure of the hydraulic circuit.

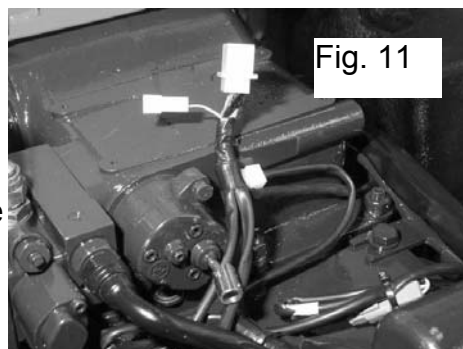


Fig. 11



Fig. 15

Fig. 12 and 13 show the adjustment phases for this valve. After removing the cover that protects the adjuster grub screw, tighten it to increase the pressure or unscrew it to decrease the pressure.

Remember that the correct value is 180 bar.

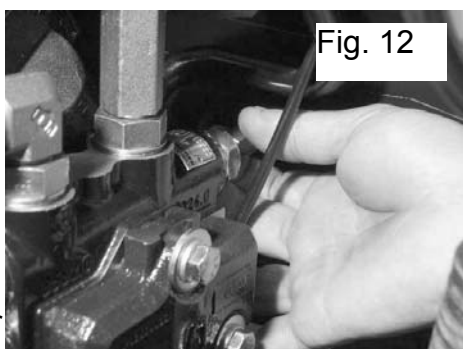


Fig. 12

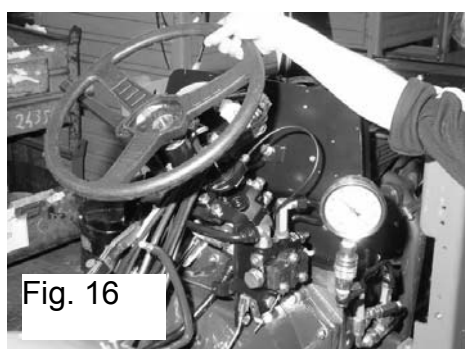


Fig. 16

Fig. 14 shows the point of application of the pressure gauge on the union where the valve is fitted for the forced lubrication of the gearbox (as mentioned on the preceding page) Fig. 15-16-17 show the different checks

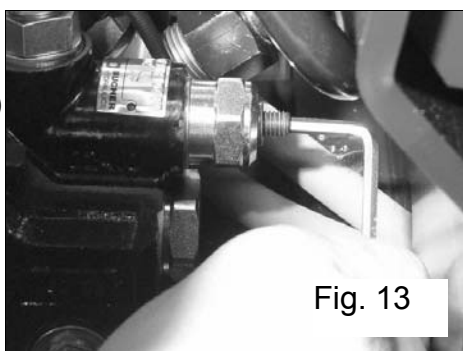


Fig. 13

on the hydraulic system settings.

Connecting the power lift arms to the towing hook checks the functionality and working pressure of the power lift; taking the steering to the limit stop first on the right side then on the left side check the setting pressure of the power steering and its operation.

Regardless of whether the tractor is fitted with front auxiliary control valves, the plate that contains the pressure relief valve is always present and determines the working pressure of the rear control valves too.

Fig. 11 shows the control valve operating the rear power lift.

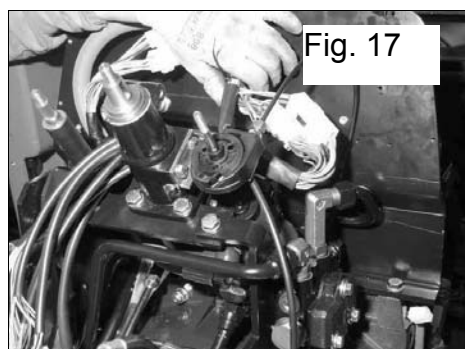
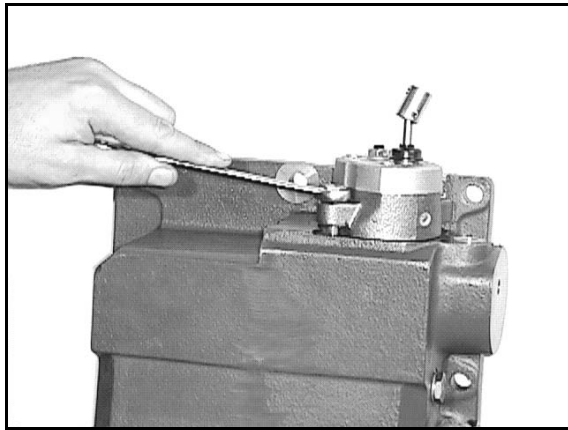


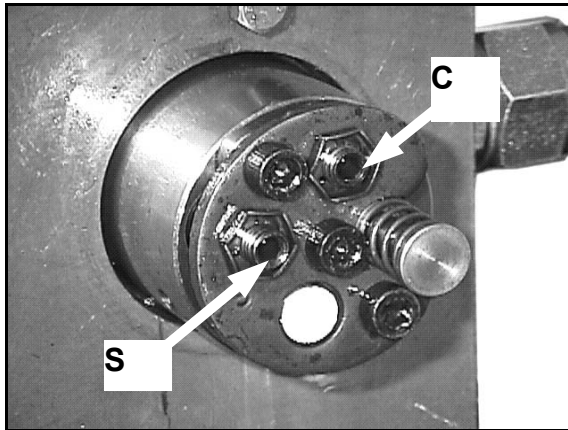
Fig. 17

To check the pressures acting inside the control valve of the power lift, remove the control valve body as illustrated here alongside.



Before performing this operation, place a pressure gauge in the seat obtained on the delivery pipe of the tractor's hydraulic system mentioned on the preceding pages. As shown in the figure here alongside, the two valves are marked **C** and **S**. Valve **C** is the overpressure valve while **S** is the safety valve.

The setting of valve **C** must be 30 bars higher than that of valve **S** (180 bar).



To increase the pressure, tighten the screws in **S** and **C** locking the adjustments with the lock nut. After reassembling the control valve on the power lift check the pressure on the pressure gauge fitted on the delivery pipe.

To pressurize the power lift, lock the power lift arms with a bar fastened to the towing hook.

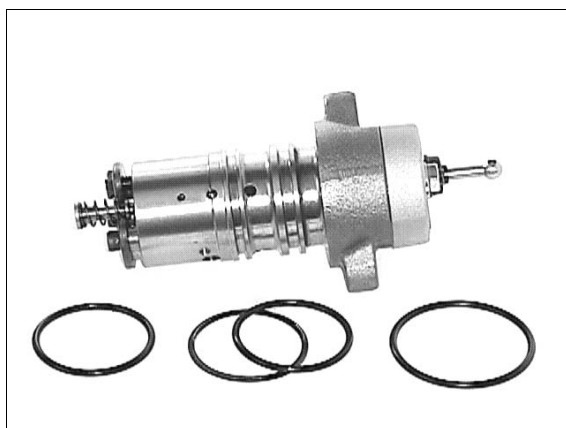
The sequence shown here illustrates the sequence to check the components of the valves **C** and **S**, to completely dismantle the entire rear portion of the block.



Pay attention when refitting the control valve block: the longest spring must be fitted behind the valve **S**.

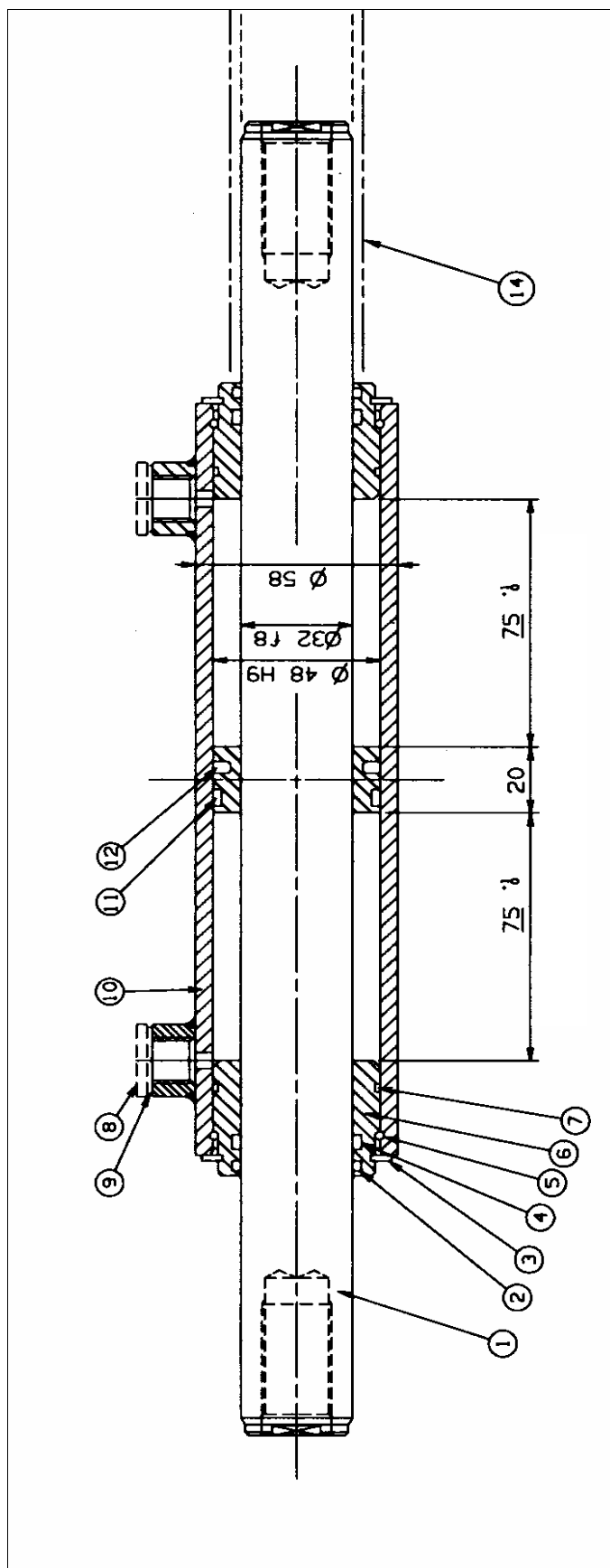
The spring that is fitted behind the valve **C** is shorter than the one in **S**.

Take care not to swap over the two springs when reassembling the control valve.



When refitting the power lift control valve block check that all the O-rings of the photo shown here are in perfect condition and have not been pinched.

This to avoid then having malfunctioning that would require further work on the assembly.



To renew the seals 11 and 12 it is necessary to remove the cylinder. Remove the snap ring 3 of the figure alongside.

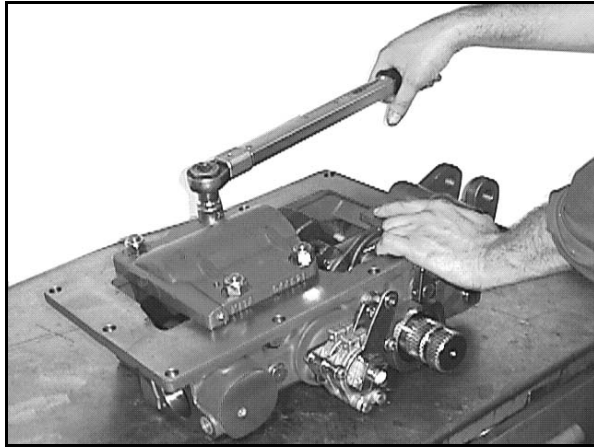
With the aid of a pair of pincers, extract the toroidal ring (part 5) of the figure alongside.

Extract the head by sliding it on the stem, taking care not to damage the seals inside the head.

Remove the damaged or worn seals 11 and 12 and replace them.

Repeat the operations described above in reverse order and reassemble the whole cylinder.

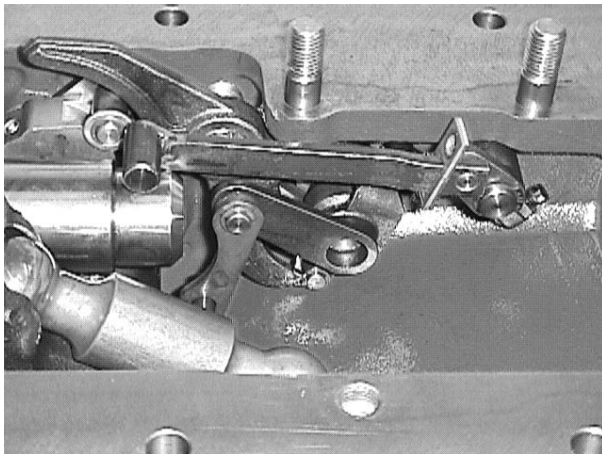
During the entire operation of removing and refitting the steering cylinder pay attention not to damage the chromium-plating of the stem.



To go ahead and check and possibly replace the seals of the lifting cylinder, proceed as in the photos here alongside.

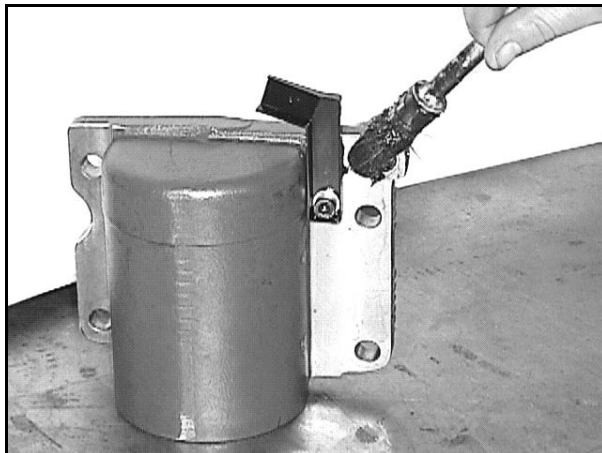
So as not to damage the new seals in the assembly phase, lubricate them and fit them carefully as illustrated in the photo.

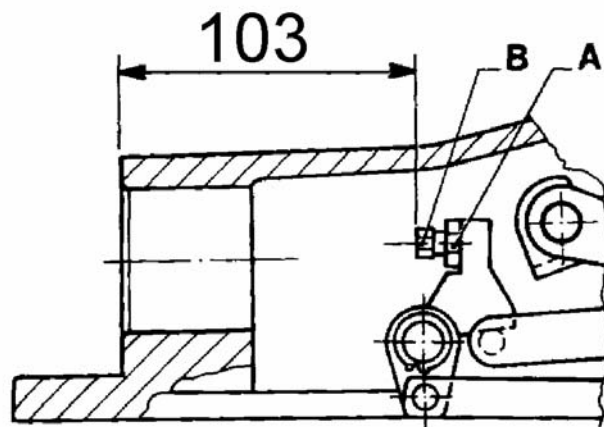
The cylinder fixing screws must be tightened to 9 kgm and locked with loctite thread locker.



Before reassembly, grease the seals of the cylinder as illustrated in the photo.

To facilitate removal of the piston from the cylinder on the delivery pipe to the piston, insert a compressed air pipe and blow pressurized air to help the piston come out.

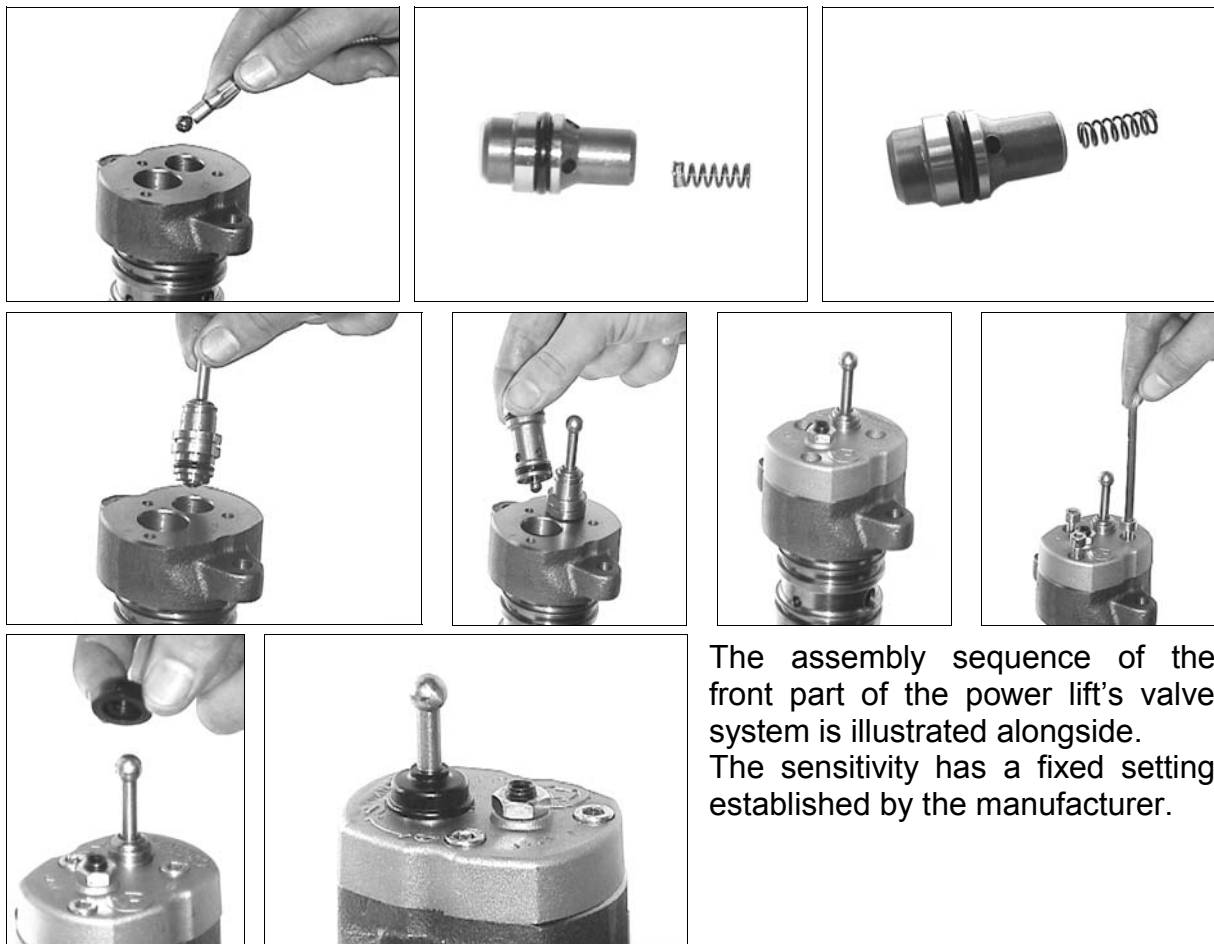




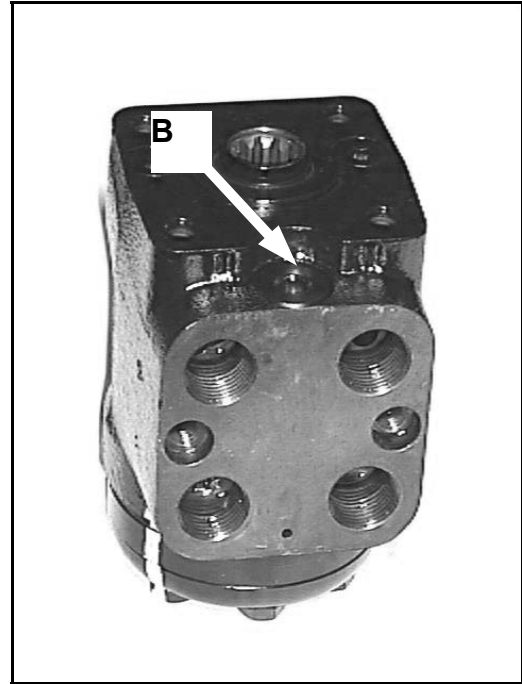
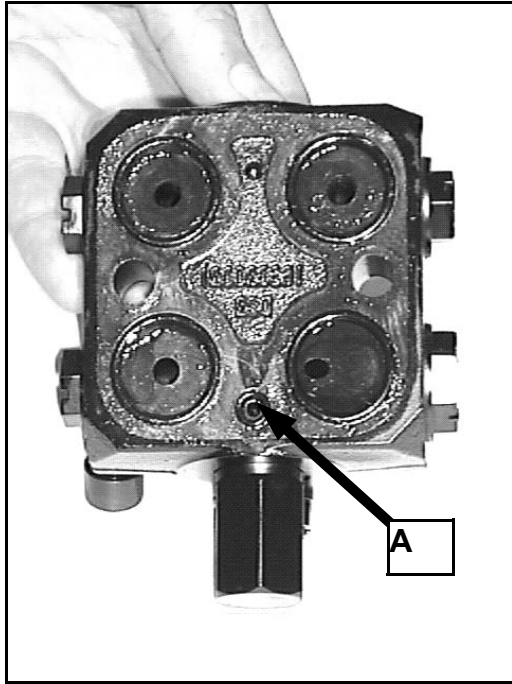
Make sure that the dimension indicated in the diagram is correct when the power lift's valve system is assembled.

If the distance is not correct, turn screw **B** and lock nut **A** to obtain the right measurement.

This measurement must be checked with both the power lift levers in the low position and with the lift links at the end of their downward travel.



The assembly sequence of the front part of the power lift's valve system is illustrated alongside. The sensitivity has a fixed setting established by the manufacturer.



The above photos highlight some parts of the power steering that can have trouble. For more thorough analysis of the power steering please refer to the specific shop manual for the unit that will be supplied on request.

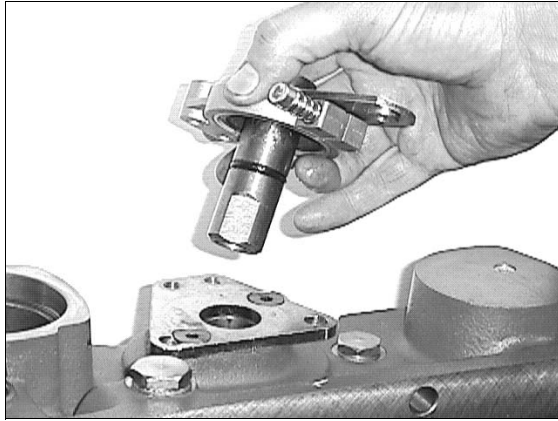
Plug **B** provides access to the steering unit pressure relief valve adjustment that can be verified by inserting the usual pressure gauge on the tractor's delivery pipe and taking the steering cylinder to its limit stop on the right side or on the left side.

The valve setting must be **130** bars.

Part **A** in the figure shows the load-sensing branch of the power steering. When the machine is new before changing the oil and cleaning the filter, the power steering could malfunction due to the orifice **A** clogging and preventing the unit from operating correctly.

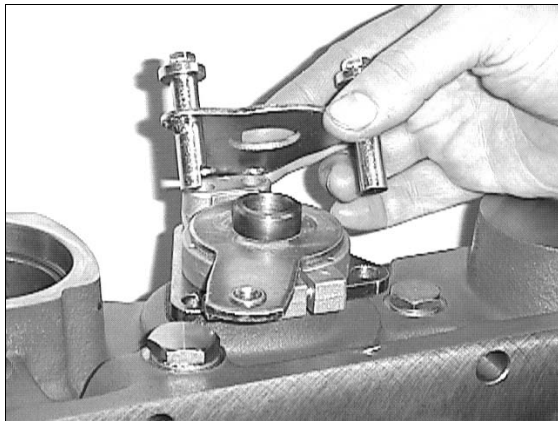
Therefore, in the event of the steering unit malfunctioning, check the setting of the valve **B** and if necessary clean the orifice **A**.

ASSEMBLY SEQUENCE FOR THE INTERNAL LINK- AGES OF THE REAR POWER LIFT

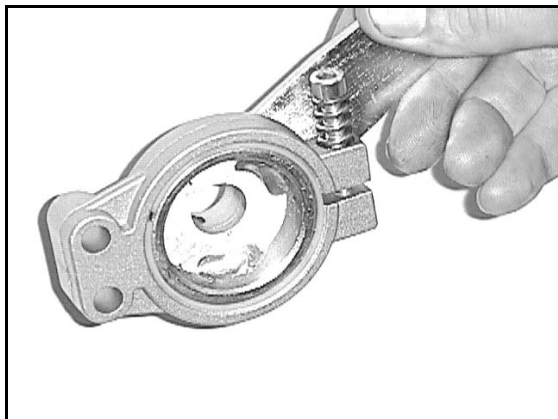


The sequence depicted in the following pages explains how the internal and external links of the power lift are assembled.

The explanations merely give hints about the main parts forming the links of the rear power lift assembly.

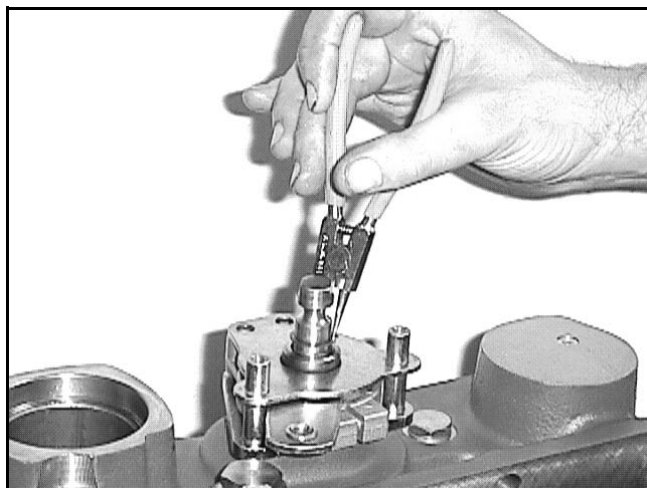
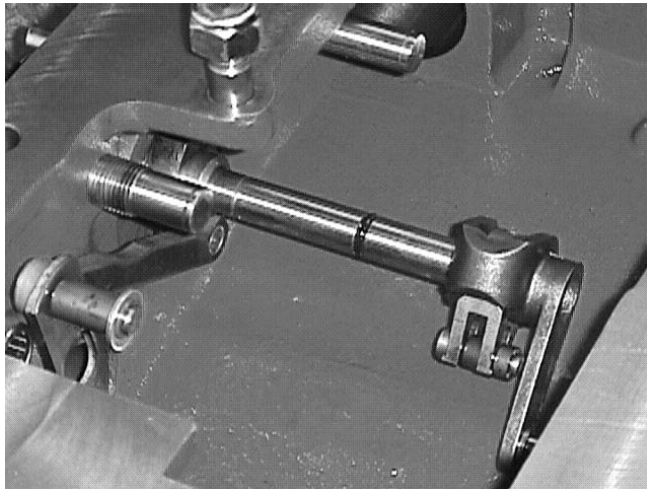
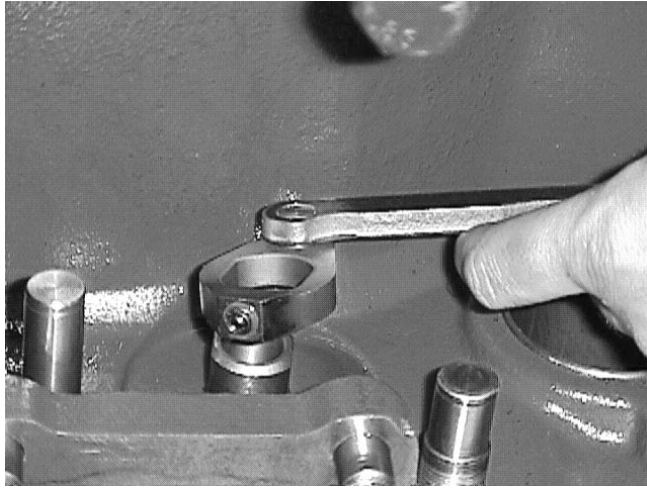


All the parts that form the power lift links are available from our Spare Parts Service. However, it is highly unlikely that these parts will develop faults and they are very easy to assemble by merely examining the pictures without going into too much detail.

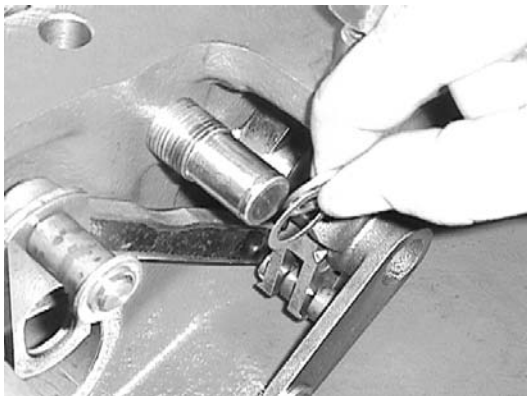
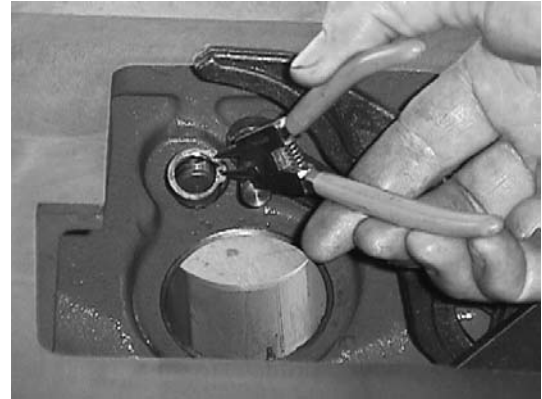
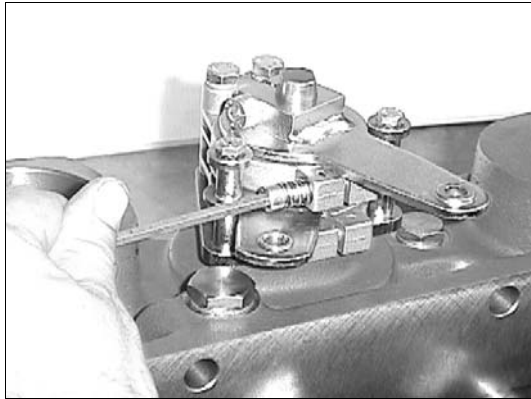


As will also be mentioned on the following pages, a specific Workshop Manual about the links and the entire rear power lift assembly is available on request. This manual is extremely detailed and can be obtained if the explanations on these pages are not sufficiently exhaustive.

This page shows the assembly sequence of the fulcrum of the levers that govern draft and position control, on the outside of the power lift.

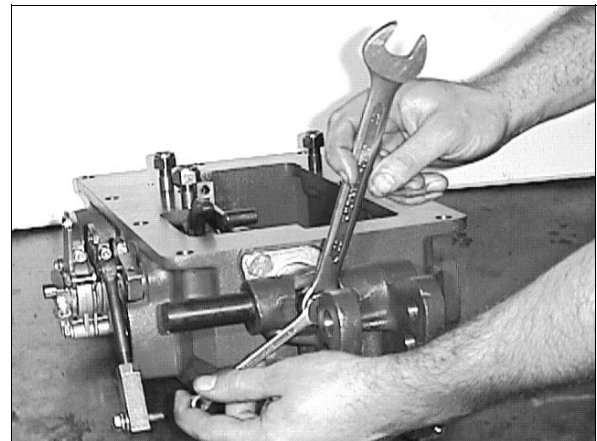
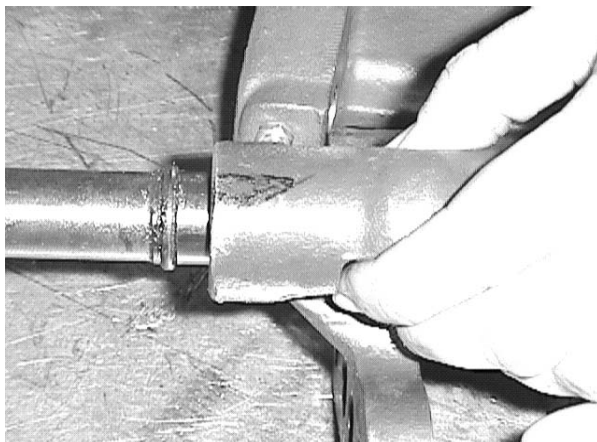
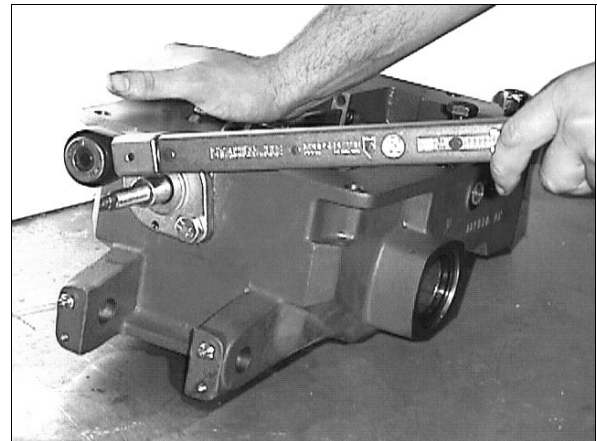
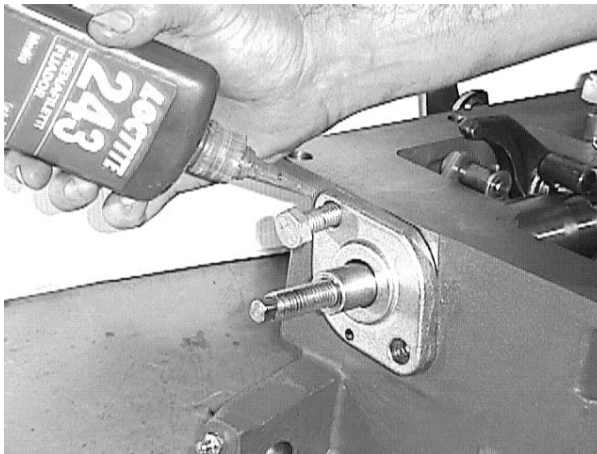
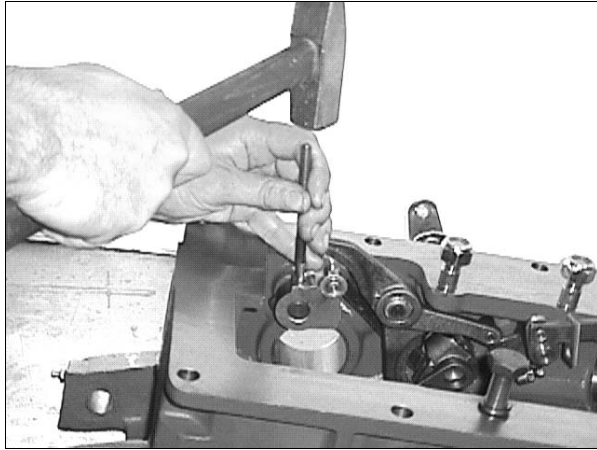


The pictures show the assembly sequence for the internal shaft for position control.



The following phases are shown for assembling the internal linkages of position and draft control.

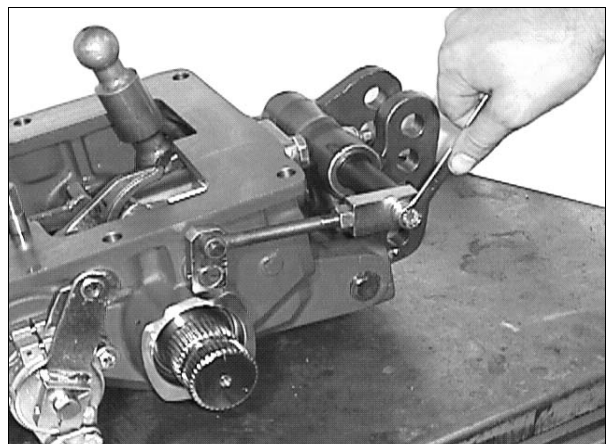
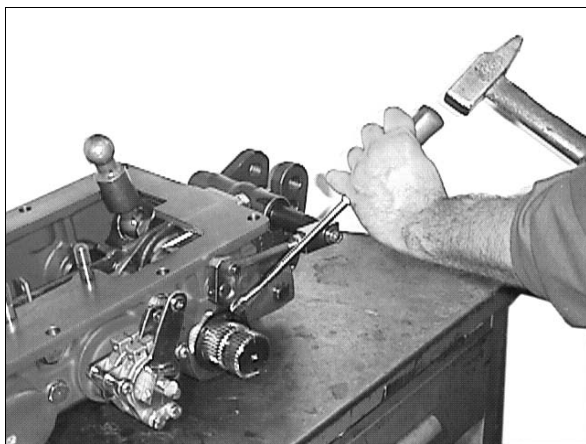
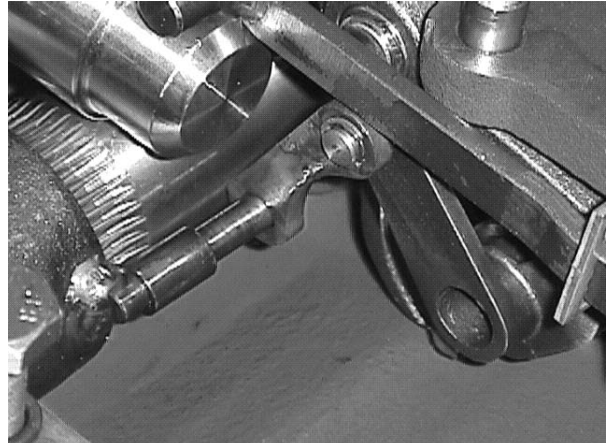
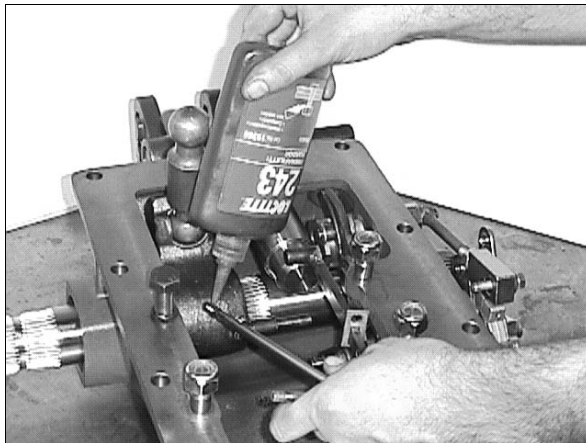
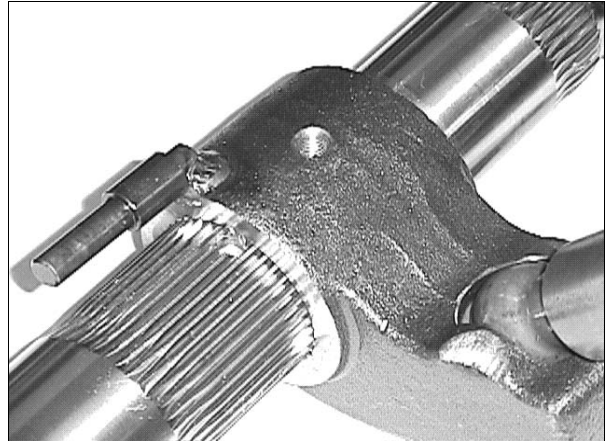
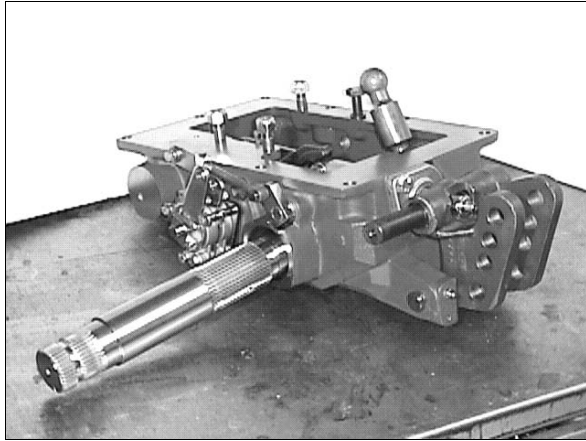




All the sequences on this page refer to the assembly of the sensitive unit for draft control.

The tie rod joining the sensitive element on the rear of the power lift with the draft control lever permits adjustment.

This adjustment makes it possible so that the draft adjustment with the lever on the power lift corresponds to the full travel of the sensitive element on the casing of the power lift.



The last operation is to fit the arms control shaft that will be operated by the piston of the power lift, this assembly has been illustrated on the preceding pages. A specific workshop manual for the power lift is available for a detailed explanation about how these linkages are assembled.



Fig. 1a

Fig. 1a

Fig. 2a

Fig. 2a

Fig. 3a

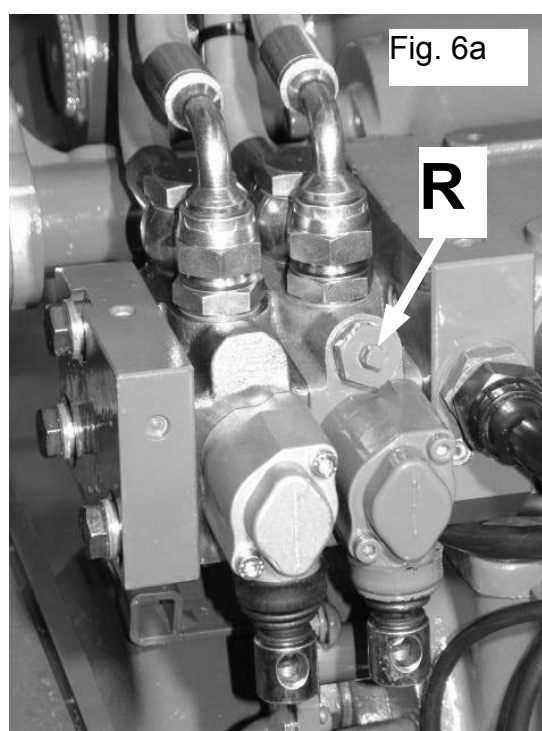
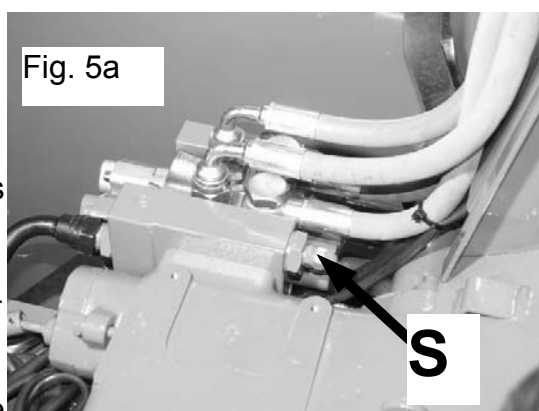
Fig. 3a

The orifice at **L** is closed with a plug, while under the valve the letter **T** identifies the assembly outlet.

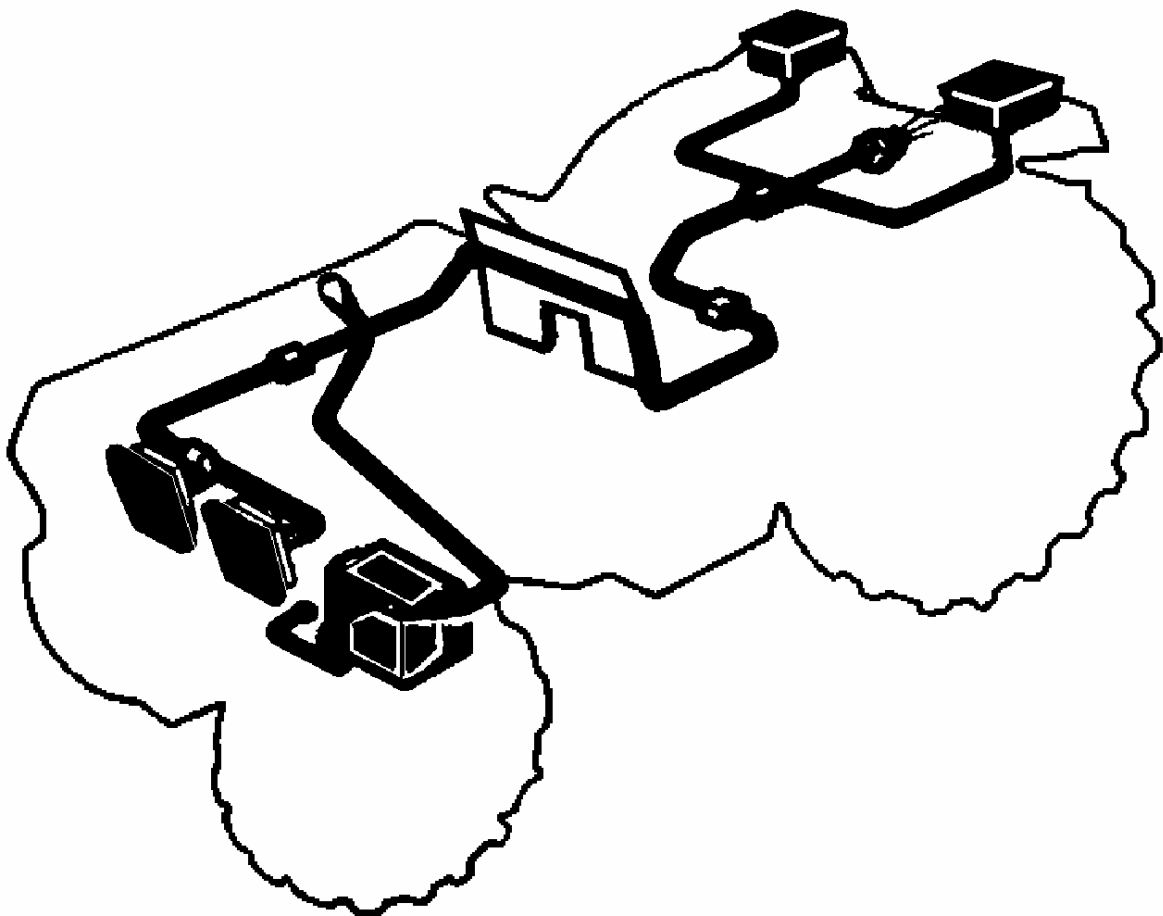
To check that the assembly works properly, connect a pressure gauge with full scale 100 bar on the delivery pipe to the drive engagement box (pipe coming from the orifice marked with the number 1 of the valve assembly) and check the flow of oil is sent correctly, which must be cut off if the four-wheel drive is engaged (which can be done either by pressing the brake pedals or the four-wheel drive engagement switch).

Fig. 7a shows the hydraulic system of the 3050 Star NRG series that is a variant of the 3070 Star and STAR 70 system. The power steering support does not have the plate housing the pressure relief valve and the setting of the maximum pressure available for the hydraulic circuit is done using valve **S** of Fig. 5a. Also in this case, screwing the setscrew under the cover increases the pressure and unscrewing decreases it (the check should always be made with the pressure gauge on the gearbox lubrication valve as mentioned on the preceding pages).

In addition, it is wise to remember that screwing or unscrewing the screw **R** of Fig. 6a transforms the rear auxiliary control valve into single- or double-acting with spring return. In Fig. 5a and 6a it is moreover possible to appreciate the connection of the rear quick-fit couplers to the rear auxiliary control valves that are flanged to the power lift body up to a maximum of three.

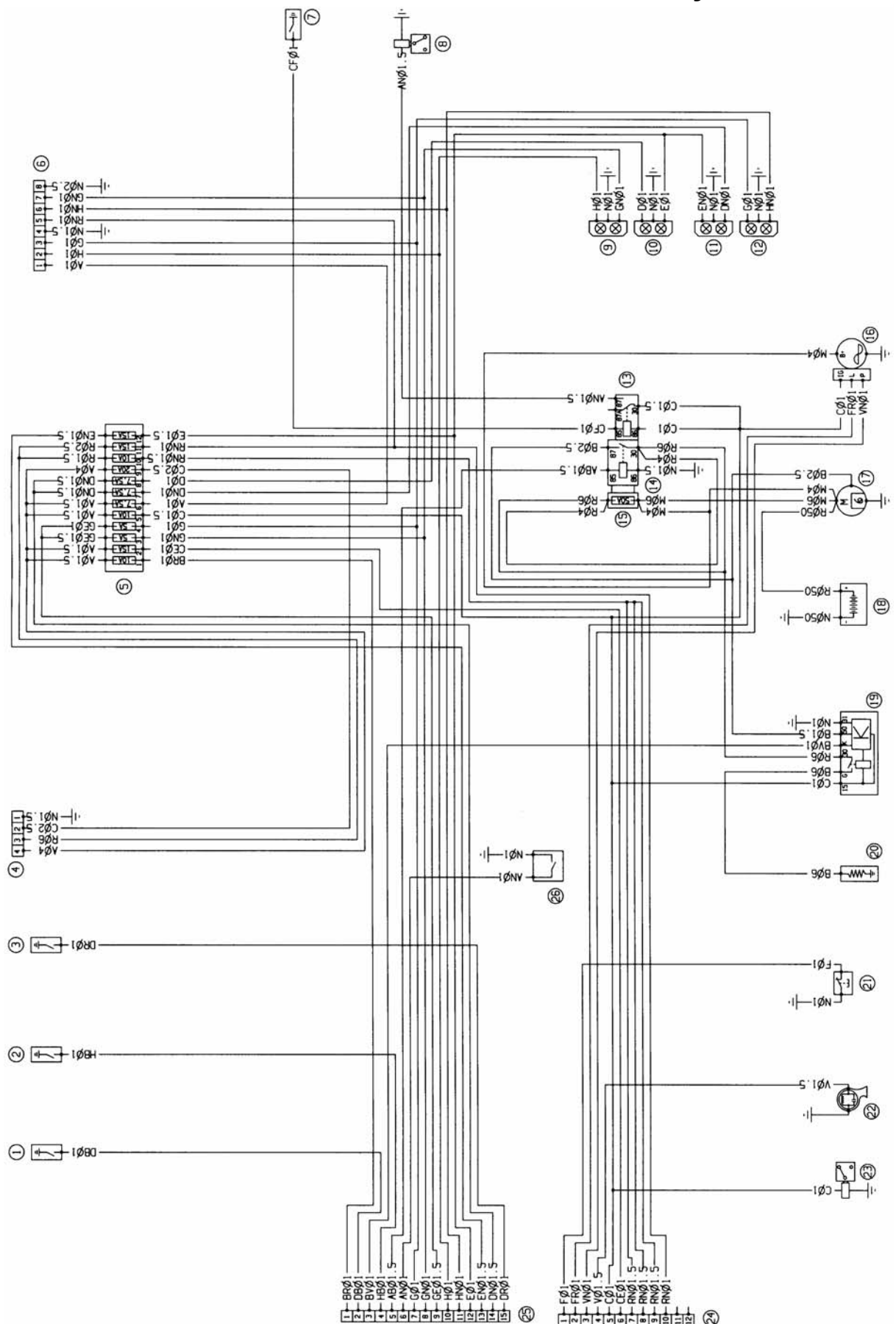


ELECTRICAL SYSTEM



WIRING DIAGRAM

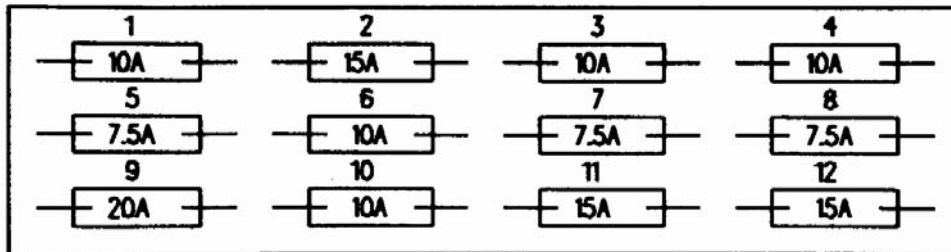
4 cylinders 70HP



Description of electric system (4 cylinders 70HP)	
Ref.	Description
1	HYDRAULIC FLUID SENSOR
2	WATER TEMPERATURE SENSOR
3	ENGINE OIL PRESSURE SENSOR
4	4-WAY M CONNECTOR FOR SYSTEM POWER CONNECTION
5	FUSE BOX
6	8-WAY M CONNECTOR FOR CAB CONNECTION
7	KSB VARIATOR SENSOR
8	KSB ADVANCE VARIATOR
9	RIGHT DIRECTION INDICATOR – SIDE LIGHT
10	FRONT RIGHT HEADLIGHT
11	FRONT LEFT HEADLIGHT
12	LEFT DIRECTION INDICATOR – SIDE LIGHT
13	ADVANCE VARIATOR RELAY
14	STARTING RELAY
15	MAXI-FUSE PROTECTING SYSTEM
16	FRONT
17	STARTER MOTOR
18	BATTERY 12V
19	PRE-HEATING CONTROL PLANT
20	STARTER HEATER
21	ROLL-BAR SWITCH
22	HORN
23	ENGINE STOP SOLENOID
24	12-WAY F CONNECTOR FOR SYSTEM CONNECTION
25	15-WAY F CONNECTOR FOR SYSTEM CONNECTION
26	CLOGGED AIR FILTER SENSOR

DESCRIPTION OF FUSE BOX 4 cylinders 70HP

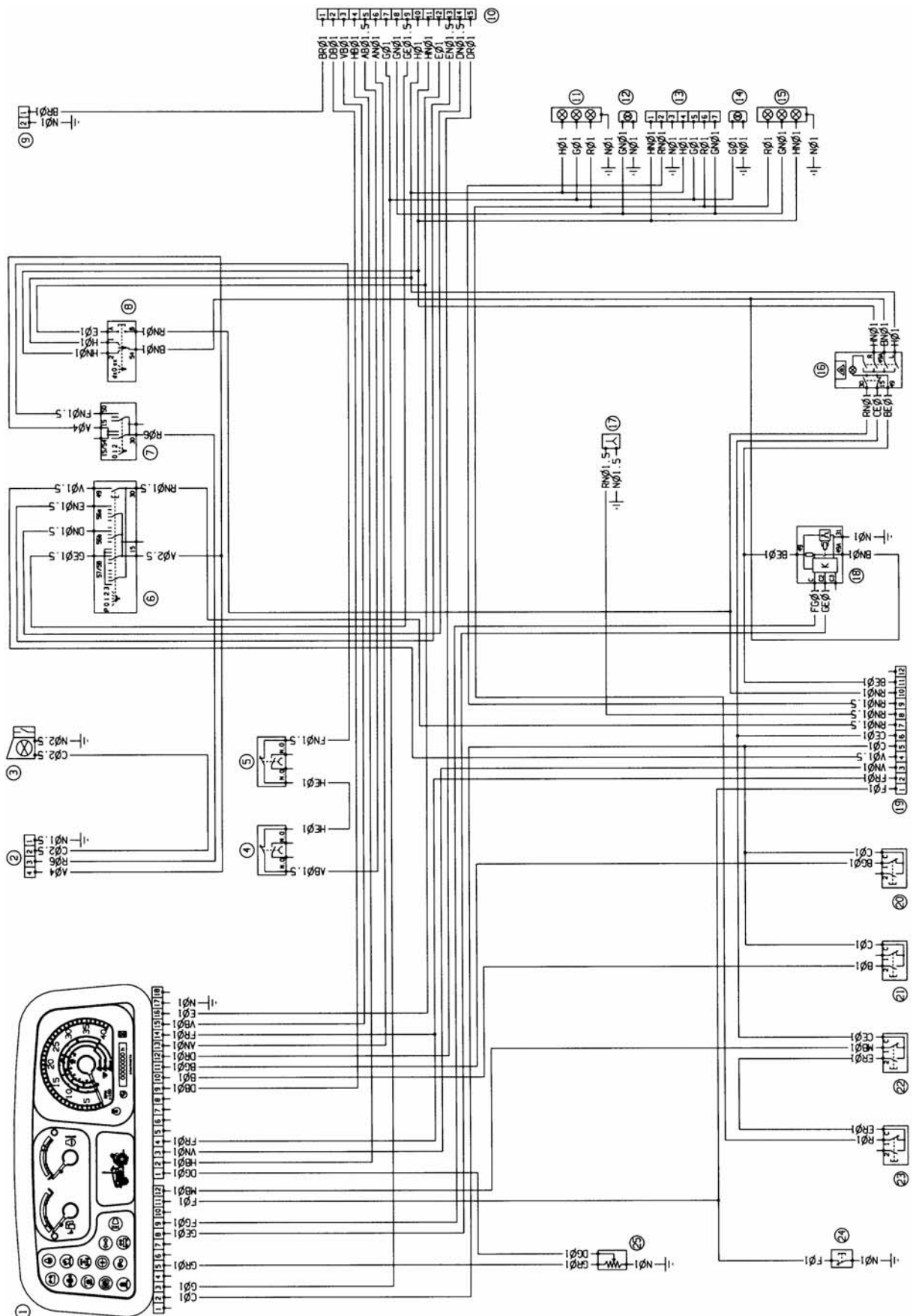
FUSE BOX



Ref.	USERS
1	OPTIONAL POWER SUPPLY
2	-15 DIRECTION INDICATORS HAZARD LIGHT SWITCH POWER SUPPLY PARKING BRAKE INDICATOR LIGHT SWITCH – BRAKE LIGHTS OFF
3	FRONT RH – REAR LH SIDE LIGHT. 7-PIN SOCKET. RH NUMBER PLATE LIGHT. CAB CONNECTOR
4	FRONT LH – REAR RH SIDE LIGHT. 7-PIN SOCKETS. LH NUMBER PLATE LIGHT. CAB CONNECTOR. MULTI-FUNCTION INSTRUMENT LIGHTING
5	ADVANCE VARIATOR RELAY POWER SUPPLY MULTI-FUNCTION PANEL ENGINE STOP SOLENOID. FRONT-WHEEL DRIVE ENGAGEMENT INDICATOR LIGHT SWITCH. P.T.O. INDICATOR LIGHT SWITCH ALTERNATOR OFF. PRE-HEATING CONTROL PLANT
6	CAB CONNECTOR POWER SUPPLY
7	LH DIPPED BEAM HEADLIGHT
8	RH DIPPED BEAM HEADLIGHT
9	WORK LIGHT POWER SUPPLY
10	HORN – LIGHTS SELECTOR POWER SUPPLY. 1-PIN SOCKET. 7-PIN SOCKET
11	CAB CONNECTOR POWER SUPPLY. +30 DIRECTION INDICATORS HAZARD LIGHT SWITCH. MAIN BEAM FLASHER
12	LEFT/RIGHT MAIN BEAM. MAIN BEAM INDICATOR LIGHT

WIRING DIAGRAM

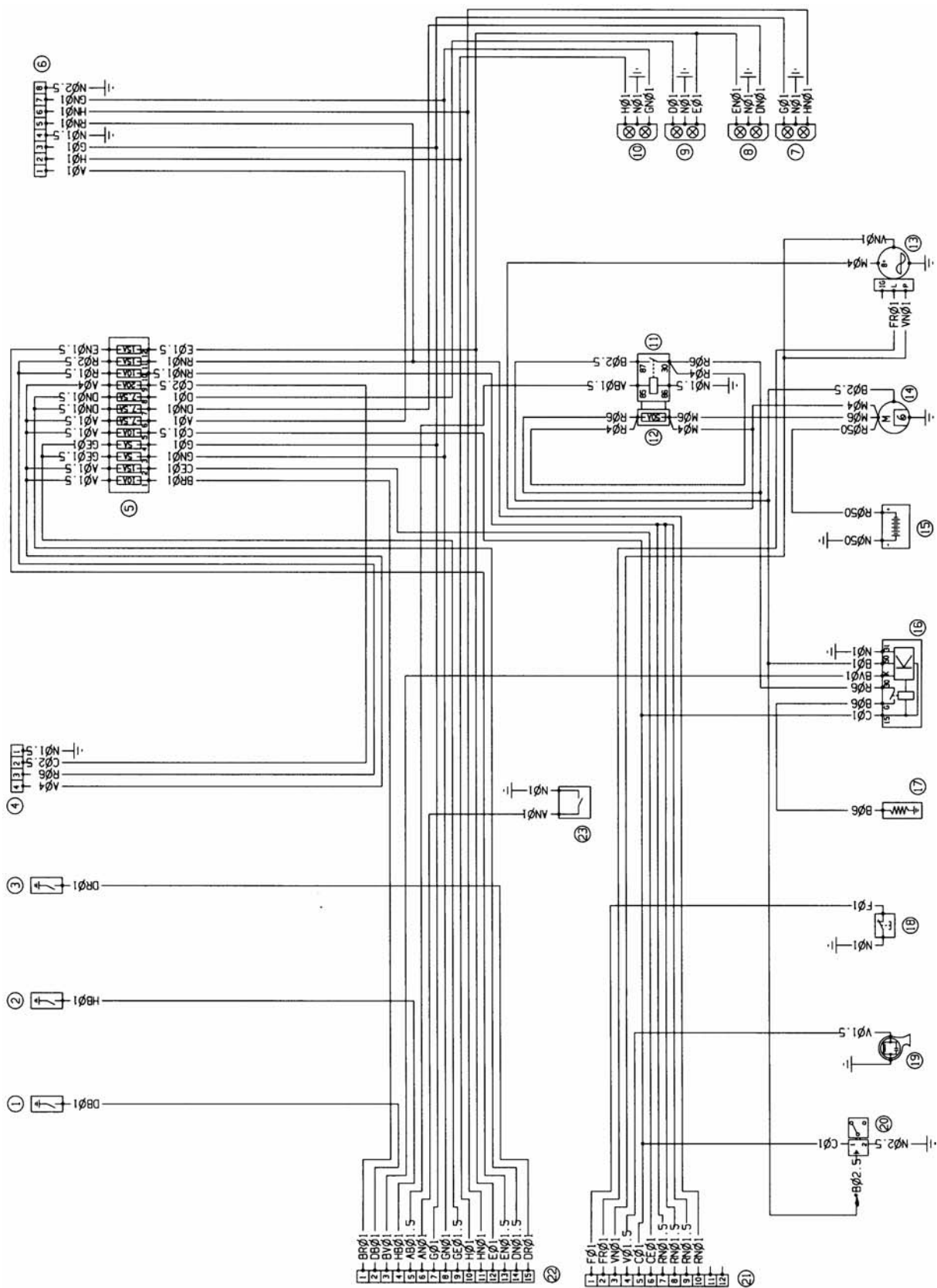
Dashboard line



Description of electric system – Dashboard line	
Ref.	Description
1	MULTI-FUNCTION INSTRUMENT
2	4-WAY F CONNECTOR FOR ENGINE LINE POWER CONNECTION
3	WORK LIGHT
4	STARTING SIGNAL SWITCH
5	STARTING SIGNAL SWITCH
6	LIGHT SELECTOR - HORN
7	IGNITION KEY SWITCH
8	DIRECTION INDICATOR CONTROL LEVER
9	2-WAY M CONNECTOR FOR OPTIONAL POWER SUPPLY
10	15-WAY M CONNECTOR FOR ENGINE LINE CONNECTION
11	RIGHT TAIL LIGHT
12	RH NUMBER PLATE LIGHT
13	7-PIN SOCKETS
14	LH NUMBER PLATE LIGHT
15	LEFT TAIL LIGHT
16	DIRECTION INDICATOR HAZARD LIGHT SWITCH
17	1-PIN SOCKET
18	DIRECTION INDICATOR FLASHER
19	12-WAY M CONNECTOR FOR ENGINE LINE CONNECTION
20	FRONT-WHEEL DRIVE ENGAGEMENT INDICATOR LIGHT SWITCH
21	P.T.O. INDICATOR LIGHT SWITCH
22	PARKING BRAKE INDICATOR LIGHT SWITCH – BRAKE LIGHTS OFF
23	BRAKE LIGHT SWITCH
24	ROLL-BAR SWITCH
25	FUEL LEVEL FLOAT

WIRING DIAGRAM

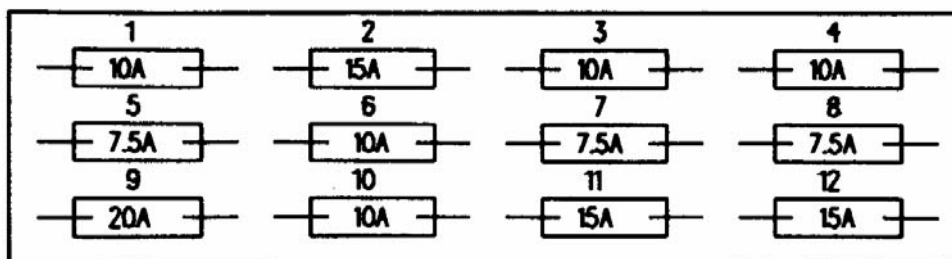
3 cylinders 48HP



Description of electric system - 3 cylinders 48HP	
Ref.	Description
1	HYDRAULIC FLUID SENSOR
2	WATER TEMPERATURE SENSOR
3	ENGINE OIL PRESSURE SENSOR
4	4-WAY M CONNECTOR FOR SYSTEM POWER CONNECTION
5	FUSE BOX
6	8-WAY M CONNECTOR FOR CAB CONNECTION
7	RIGHT DIRECTION INDICATOR – SIDE LIGHT
8	FRONT RIGHT HEADLIGHT
9	FRONT LEFT HEADLIGHT
10	LEFT DIRECTION INDICATOR – SIDE LIGHT
11	STARTING RELAY
12	MAXI-FUSE PROTECTING SYSTEM
13	ALTERNATOR
14	STARTER MOTOR
15	BATTERY 12V
16	PRE-HEATING CONTROL PLANT
17	STARTER HEATER
18	ROLL-BAR SWITCH
19	HORN
20	ENGINE STOP SOLENOID
21	12-WAY F CONNECTOR FOR SYSTEM CONNECTION
22	15-WAY F CONNECTOR FOR SYSTEM CONNECTION
23	CLOGGED AIR FILTER SENSOR

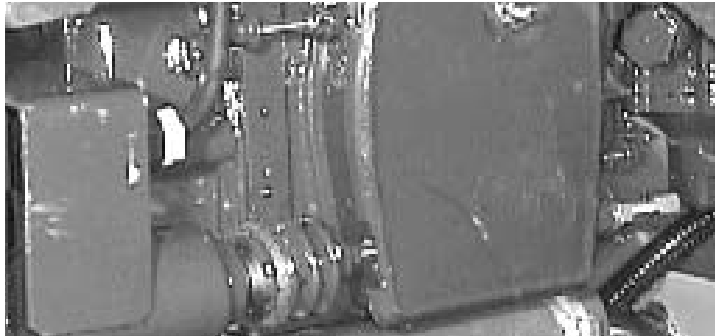
DESCRIPTION OF FUSE BOX (3 cylinders 48HP)

FUSE BOX



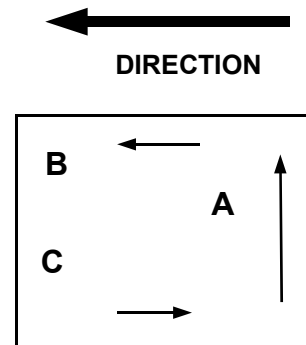
No.	USERS
1	OPTIONAL POWER SUPPLY
2	-15 DIRECTION INDICATORS HAZARD LIGHT SWITCH POWER SUPPLY PARKING BRAKE INDICATOR LIGHT SWITCH – BRAKE LIGHTS OFF
3	FRONT RH – REAR LH SIDE LIGHT. 7-PIN SOCKET. RH NUMBER PLATE LIGHT. CAB CONNECTOR
4	FRONT LH – REAR RH SIDE LIGHT. 7-PIN SOCKETS. LH NUMBER PLATE LIGHT. CAB CONNECTOR. MULTI-FUNCTION INSTRUMENT LIGHTING
5	ENGINE STOP SOLENOID POWER SUPPLY, MULTIFUNCTION PANEL. P.T.O. INDICATOR LIGHT SWITCH FRONT DRIVE ENGAGEMENT INDICA- TOR LIGHT SWITCH. PRE-HEATING CONTROL PLANT
6	CAB CONNECTOR POWER SUPPLY
7	LH DIPPED BEAM HEADLIGHT
8	RH DIPPED BEAM HEADLIGHT
9	WORK LIGHT POWER SUPPLY
10	HORN – LIGHTS SELECTOR POWER SUPPLY. 1-PIN SOCKET. 7-PIN SOCKET
11	CAB CONNECTOR POWER SUPPLY. +30 DIRECTION INDICATORS HAZ- ARD LIGHT SWITCH. MAIN BEAM FLASHER
12	LEFT/RIGHT MAIN BEAM. MAIN BEAM INDICATOR LIGHT

Stopping the engine



This photo shows the electrostop (STAR50 and 3050 Star).

The correct solenoid connection must mirror the diagram shown below.



The solenoid prod **A** must be connected to the 50 of the ignition key.

Prod **C** must be connected to ground.

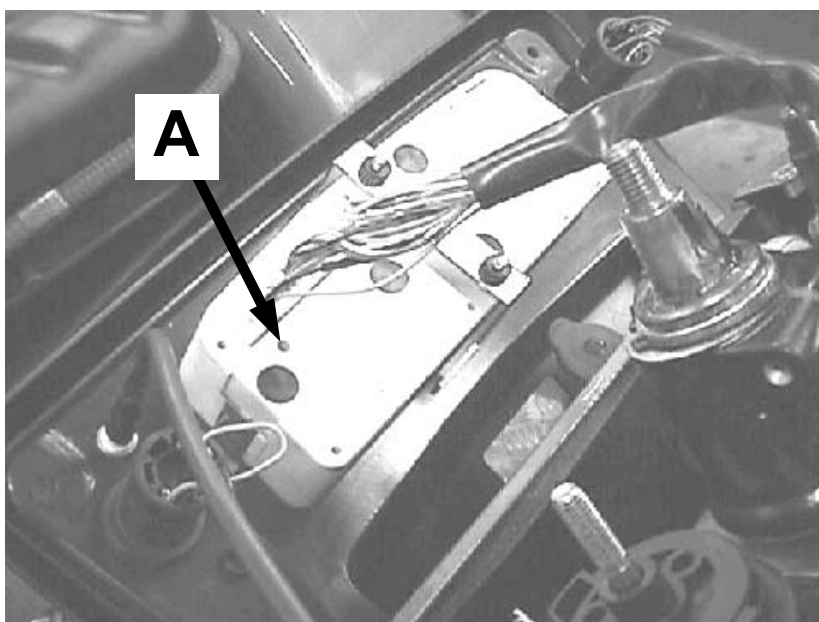
Prod **B** must be connected to the 15 of the ignition key.

Inside the electrostop there are two circuits that are energized at the same time in the phase of machine ignition then there just remains the circuit powered by 15 that keeps the engine running.

The photo below illustrates the point where, with the aid of a small screwdriver, it is possible to adjust the rev counter.

Set the engine at idling speed (approximately 850 rpm) and calibrate the instrument with screw **A** in the photo making the indication of the instrument tally with the stated speed.

It is also possible to make a more thorough check, using a rev counter to measure the number of revolutions of the power take-off and going up in this way to the actual rpm of the engine, bearing in mind that the ratio between the revs of the power take-off at 540 rpm and the engine speed is 4.5.





This photo illustrates the positioning of the fuse box on the tractor. The key for the fuse box is given on the preceding pages.

Part **A** marks the starting signal switch, located on the clutch pedal; an incorrect adjustment can jeopardize starting the tractor. Connecting wires to the narrow contacts.

The photo at the bottom shows the bulb that signals clogging in the air filter by turning on an indicator light in the multifunction instrument.

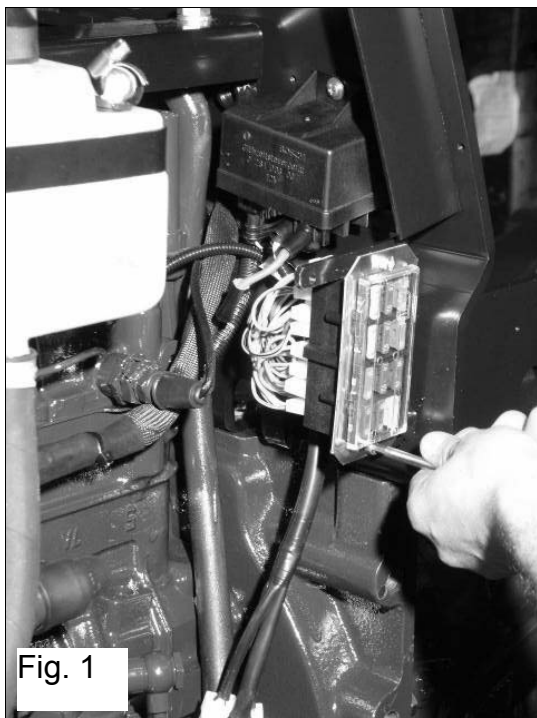


Fig. 1

Fig. 1 shows the position of the fuse box on the front left side of the engine, near the fixed bonnet. A diagram of the fuse box is given on the preceding pages. The pre-heating control unit is also fitted near the fuse box; its connection diagram is given on the following page.

Fig. 2 shows a detail of the engine line passage beyond the hot air deflection plate; the clamp holding the wiring in position is important as it avoids dangerous interference with the exhaust manifold.

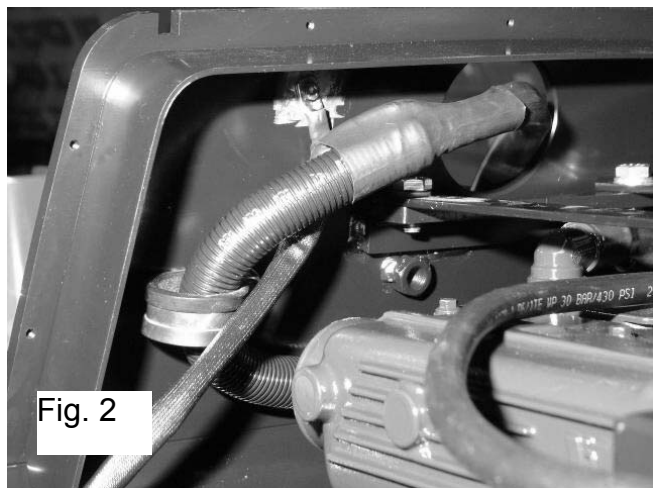
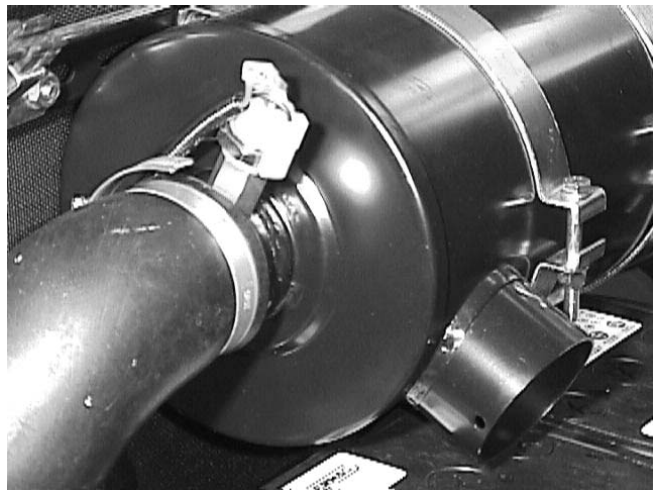
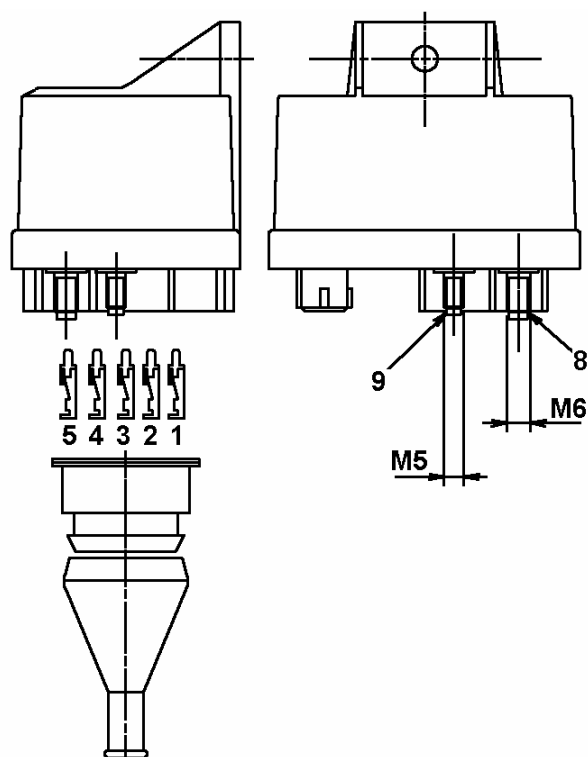
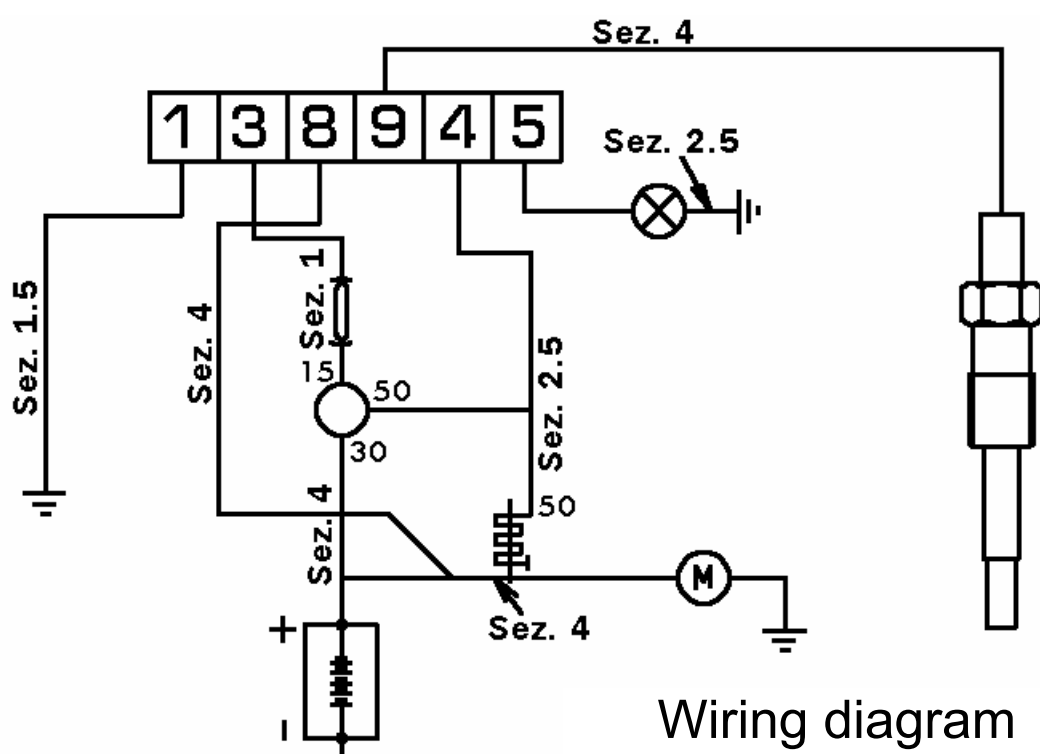


Fig. 2

COMPLETE DEVICE FOR PREHEATER PLUGS
ENGINE D 703 L / LT
REF. VM 13002151F



TECHNICAL SPECIFICATIONS OF THE GLOW PLUGS
VOLTAGE **12 V**
POWER DRAW ON PICK-UP **10A**



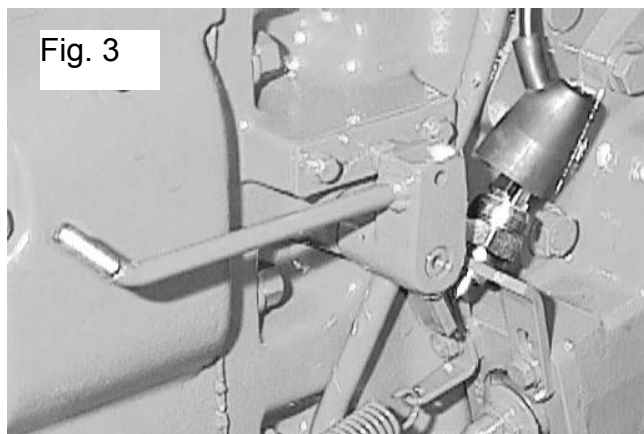


Fig. 3

This photo shows the starting signal fitted on the power take-off lever that makes sure the tractor cannot start running if the power take-off is engaged (connection to the wide terminals).

In this case, too, an incorrect adjustment of the starting signal switch on the power take-off can cause problems when starting the tractor.

The photo alongside and the one below show the switches that control the handbrake and brake lights indicator

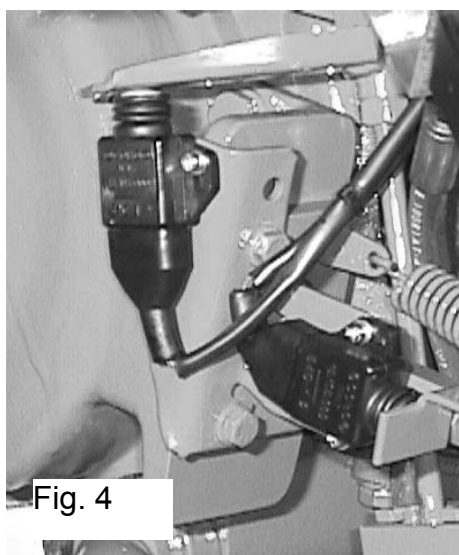


Fig. 4

light. The slot on the switches permits adjusting and positioning them correctly.

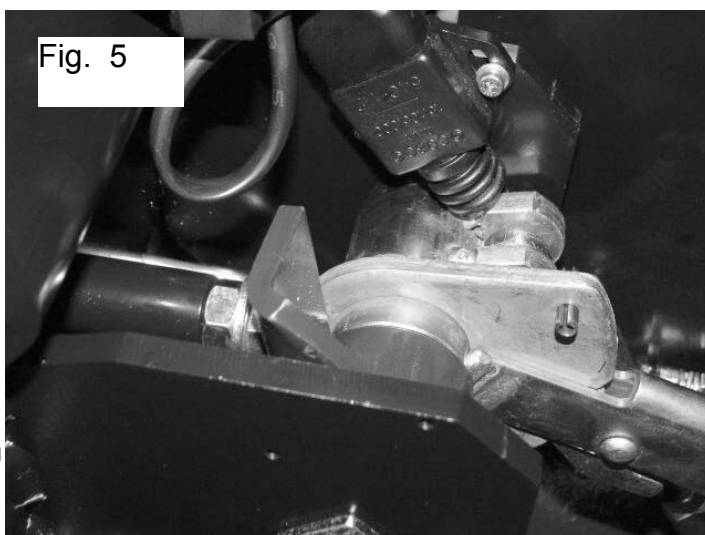


Fig. 5

Fig. 5 illustrates the position of the switch on the hand clutch lever that switches on the indicator light when the clutch is engaged and operates the thrust bearing.

Fig. 6 shows the position of the hydraulic oil filter clogging bulb.

Filter clogging is highlighted by an indicator light on the dashboard coming on.

It is worth remembering that the hydraulic oil filter clogging and air filter clogging bulbs provide a ground signal, which turns on the indicator lights on the dashboard. On the 4-cylinder engine version, the engine has an advance variator that acts on the engine's emissions, varying the injection phase of the pump, when the coolant temperature reaches a value above 65 degrees Celsius.

On the following page the position of this device on the engine is illustrated along with the necessary connections for its operation.

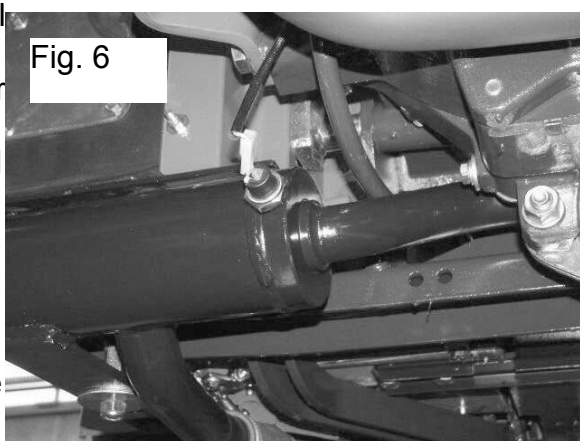


Fig. 6

Fig. 9

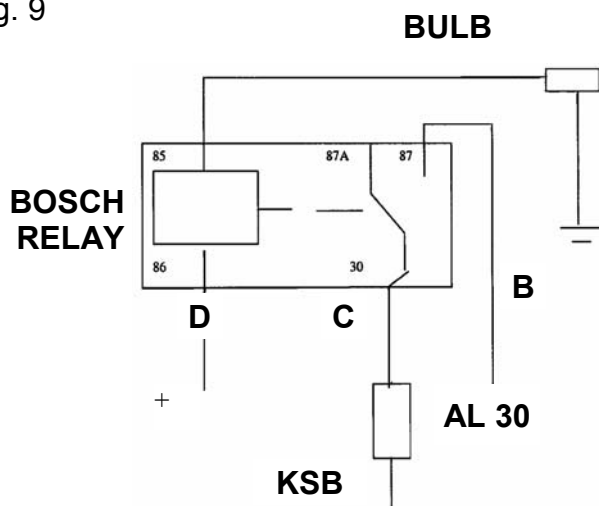


Fig. 7 shows the **KSB**, on the left-hand side of the engine near the injection pump. Fig. 9 shows the diagram of the connections between the device and the coolant bulb on the engine that supplies the signal to the relay, shown in Fig. 8 alongside the expansion tank. The larger relay is the one that governs engine ignition and it receives the enabling signal from the switch fitted on the power take-off engagement lever and from the one under the clutch pedal, seen on the preceding pages.

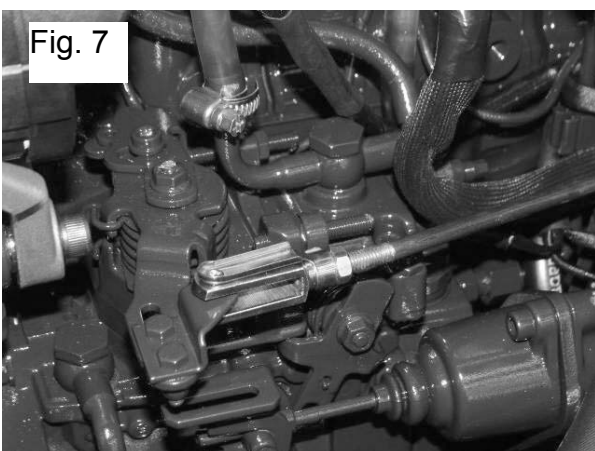


Fig. 7

On the left-hand side of the engine at the height of the injectors on the side of the crankcase, there are two coolant bulbs. The one towards the driver's side is the coolant temperature gauge connected to the multifunction instrument on the dashboard, while the bulb on the fan side is the one that operates the **KSB** device.

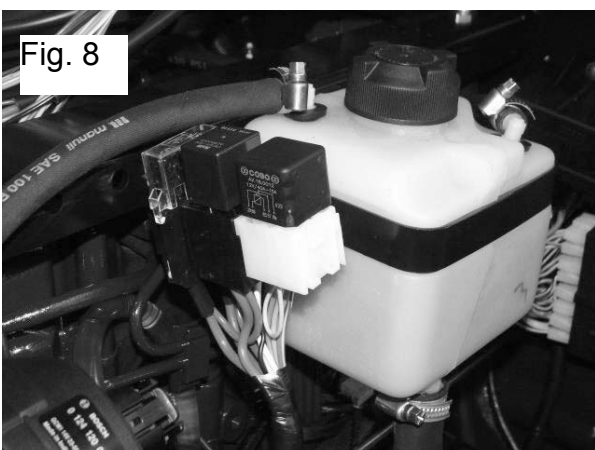


Fig. 8



Fig. 10

Fig. 10 and Fig. 10a show the position of the fuel level under the rear cross member of the tractor that covers the tank, made of plastic.

The connection between the instrument and the rear line of the electric system is preset according to the type of block that makes the connection. Anyhow, the wiring diagram on the first few pages of this chapter shows the colours of the wires and the methods of connection.

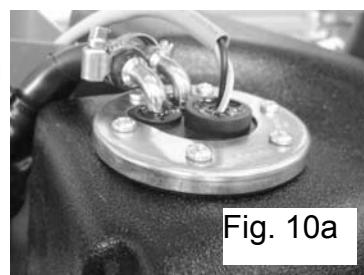
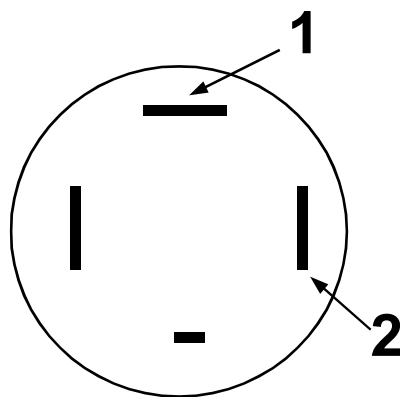
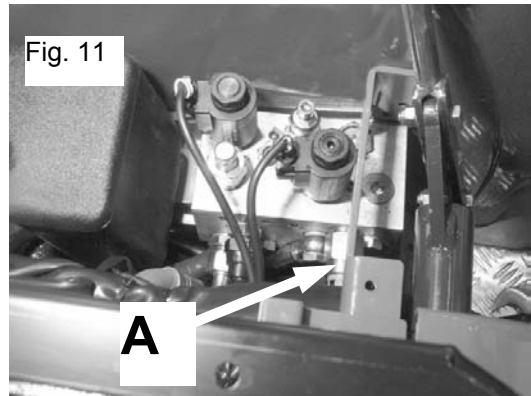


Fig. 10a

Fig. 11 and 12 show the solenoid valve assembly of the IST version, which has already been mentioned in the chapter on the hydraulic system.

The pressure switch factory set to 50 bar is on the solenoid valve assembly, in the position indicated with letter **A** on Fig. 11 and marked with letter **A** on the block.

On the pressure switch the wires are connected to the pins according to the diagram shown here.



The wires must be connected to contacts 1 and 2. of the pressure switch, seen from the contacts side.

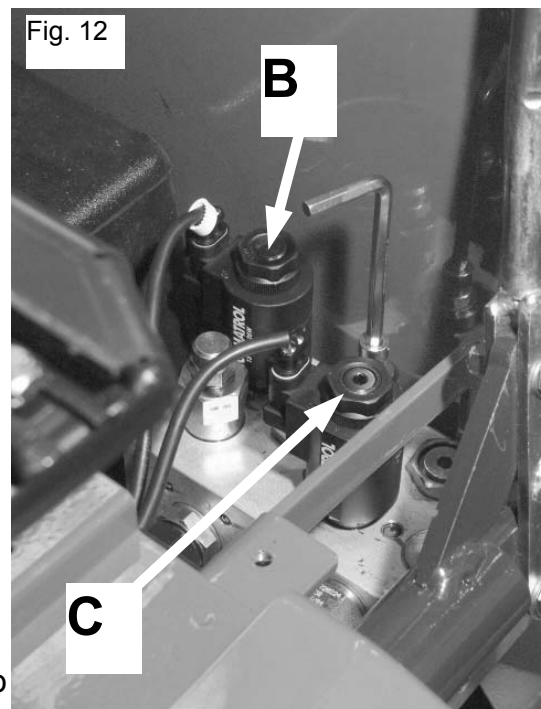
The pressure switch supplies a ground signal to a relay that disconnects the power supply to the solenoid valve, indicated with **B** in Fig. 12 when the pressure inside the accumulator reaches 50 bar.

The solenoid valve **C** of Fig. 12 is normally always energized and sends the oil under pressure, in the accumulator, to oppose the pack of Belleville washers that would make the drive engage.

If you brake or press the four-wheel drive engagement switch, the solenoid valve **C** is no longer energized and the four-wheel drive is engaged (the pressurized oil inside the accumulator is discharged).

Remember, also in this circumstance, that the fastest way to check whether a solenoid valve is energized is to test its magnetism by moving a screwdriver near the top of the coil.

As already explained in the chapter on the hydraulic system, the solenoid valve **B** of Fig. 12, when operated by the pressure switch, shuts off a portion of the oil delivery from the power steering and charges the accumulator to reach 50 bar.



TROUBLESHOOTING - CAUSES, REMEDIES



FAULTS	POSSIBLE CAUSES	REMEDIES
CLUTCH		
The clutch slips	1) - Clutch plate dirtied with oil 2) - Clutch play incorrect	1) - Eliminate any oil leaks (replace the oil retainer of the main shaft if necessary). Thoroughly clean the flywheel and clutch casing. Replace the clutch plate if necessary. 2) - Adjust the clutch rod. Overhaul the clutch plate if the fault persists.
The clutch fails to disengage	1) - Wavy clutch plate. 2) - Bent clutch disengaging lever. 3) - Incorrectly adjusted pressure plate levers. 4) - PTO clutch plate jammed on flywheel. 5) - Clutch with too much play.	1) - Replace the clutch plate. 2) - Replace the clutch disengaging lever. 3) - Make sure that the levers are not worn. If this is not the case, adjust them. 4) - Start the machine, repeatedly engage and disengage the PTO clutch with a large implement hitched. If the result is negative, disassemble the clutch and clean it. 5) - Adjust the external links and the internal ones if necessary.
GEARBOX		
The gears disengage	1) - Synchromesh pack and speed gears with excessive float. 2) - Incorrect synchronism between speed selector rod and sliding engagement sleeve. 3) - Sliding speed engaging sleeve and gear with worn teeth causing the synchromesh to operate in a faulty way.	1) - Restore the prescribed play. 2) - Adjust the drive transmission by eliminating the play and replacing the rod, spring and selector ball, and rod control sleeves if necessary. 3) - Replace the complete synchromesh units and selector gears if necessary.
The gears fail to engage.	1) - The clutch does not disengage. 2) - Synchromesh with wavy brake ring 3) - Synchromesh with excessively forceful brake preloading springs. 4) - Synchromesh pack and speed gears with little float.	1) - Adjust the clutch as indicated. 2) - replace the brake rings. 3) - Replace the springs and chamfer the parts that contact them on the sliding sleeve. 4) - Adjust the play to the correct value.
The final drive - reverse shuttle disengages	1) - Incorrect synchronism between the final drive selector rod and sliding gear. 2) -Reverse gear with bush that creates an axial thrust.	1) - Adjust the drive transmission, eliminating the play and replacing the rod, ball and selector spring if necessary. 2) - Replace the gear + bush assembly.

FAULTS	POSSIBLE CAUSES	REMEDIES
FRONT AXLE		
The final drive - reverse shuttle fails to engage.	1)- The clutch fails to disengage. 2)- Ratio separator badly adjusted.	1)- Adjust the clutch as indicated. 2)- Adjust the separator function by replacing the components of the device.
Noisy axle	1)- Axle bearing bushes with too much play. 2)- Worn transmission sleeve. 3)- Bevel gear pair not adjusted. 4)- Differential lock not adjusted.	1) - Replace the bushes of the support and the sleeve of the transmission. 2)- Replace the sleeve and check the alignment of the transmission shaft 3)- Adjust the pinion - ring gear assembly correctly 4)- Adjust the differential lock correctly.
REAR DIFFERENTIAL		
Noisy axle	1)- Differential lock control not adjusted. 2)- Linkage inside differential lock not adjusted 3)- Bevel gear pair not adjusted.	1)- Adjust the control 2)- Adjust the linkages 3)- Adjust the pinion - ring gear assembly
The differential lock fails to engage	1)- External control blocked. 2)- Internal linkage not regulated 3)- Sliding locking ring with impediment on crown wheel	1)- Release and adjust the control. 2)- Adjust the linkage. 3)- make the ring slide correctly on the crown wheel.
The differential lock fails to disengage	1)- External control blocked. 2)- Internal linkage not regulated. 3)- Sliding locking ring with impediment on crown wheel.	1) - Release and adjust the control. 2)- Adjust the linkage. 3)- make the ring slide correctly on the crown wheel.
FRONT FINAL DRIVES		
Noisy wheels	1)- Slack flange and rim fixing screws. 2)- Float on the axle shafts	1)- Torque the screws. 2)- Eliminate the play as described..
REAR FINAL DRIVES		
Noisy wheels	1)- Slack flange and rim fixing screws. 2)- Float on the axle shafts	1)- Torque the screws. 2)- Eliminate the play as described.

FAULTS	POSSIBLE CAUSES	REMEDIES
POWER TAKE-OFF		
The power take-off disengages	1) - Independent or synchronized PTO control not adjusted 2) - 540-540E-1000 rpm selection control not adjusted.	1) - Adjust the selection mechanism as prescribed. 2) - Replace the selection control.
The power take-off fails to engage.	1) - The clutch fails to disengage. 2) - Independent or synchronized PTO control not adjusted	1) - Adjust the clutch as prescribed 2) - Adjust the selection mechanism as prescribed
The power take-off is noisy	1) - When implements that require little draft and turn in an uneven way are hitched. 2) - Selection of the 540-540E-1000 rpm ratio not proportional to that of the implement. 3) - PTO shaft with axial float.	1) - There is no type of remedy to a fault that concerns a modification to the implement. 2) - Select an appropriate ratio. 3) - Adjust the shaft as prescribed and make sure that the drivelines to which it is connected operate smoothly
DRIVE TRANSMISSION UNIT		
The drive disengages	1) - Pressure too low 2) - Leaking cylinder seal 3) - Internal selector (fork, gear...) worn or not adjusted	1) - Adjust the pressure to the correct value 2) - Replace the seal 3) - Check the adjustment and replace any worn parts
The drive fails to engage	1) - Pressure too low 2) - Leaking cylinder seal 3) - Internal selector worn 4) - The electrical system or solenoid valve unit fail to function 5) - Hydraulic service pump out of service	1) - Adjust the pressure to the correct value 2) - Replace the seal 3) - Replace the parts 4) - Check the fuses, check the power supplied to the valve unit, check the components of the electrical system (4WD switch, relays, etc.) using the diagram as a reference. 5) - Replace the hydraulic service pump
Noisy drive	1) - Wrong tyre pairing. 2) - Irregular tyre pressure. 3) - Worn transmission sleeves.	1) - Pair the tyres correctly. 2) - Adjust the tyre pressure correctly. 3) - Replace the sleeves.

FAULTS	POSSIBLE CAUSES	REMEDIES
BRAKES		
The machine fails to brake	1)- Brakes not adjusted. 2)- Worn brake discs	1)- Adjust the emergency and parking brakes. 2)- Replace the discs
The machine remains braked	1)- Brakes not adjusted. 2)- Return springs broken. 3)- Controls hardened because they are not lubricated.	1)- Adjust the emergency and parking brakes. 2)- Replace the springs. 3)- Make sure that the controls operate smoothly.
Irregular braking action	1)- Brakes not adjusted	1)- Adjust the main brake and make sure that the braking action is simultaneous.
STEERING SYSTEM		
Lack of control when driving the machine	1)- Steering cylinder with worn retention rings. 2)- Power steering system with badly adjusted anti-shock valves.	1)- Replace the retention rings on the cylinder. 2)- After thoroughly cleaning the valves, make sure that the pressure values are correct. Replace the power steering system if these values are not reached
Oil leaks from the power steering system.	1)- Loosened unions. 2)- Worn retention rings. 3)- Clogged power steering discharge.	1)- Tighten the unions. 2)- Restore the seal for the power steering system 3)- Check the condition of the discharge pipe and make sure that the power lift's valve system operates correctly.
Difficult steering	1)- Lower pressure in the power steering system. 2)- Air in the circuit. 3)- LS priority valve badly adjusted. 4)- Gear pump efficiency poor.	1)- Check and restore the maximum pressure in the circuit. 2)- Carefully clean the intake circuit and make sure it is tight. 3)- Clean and carefully refit the valve. Check it for wear and make sure that it operates smoothly 4)- Overhaul.

FAULTS	POSSIBLE CAUSES	REMEDIES
POWER LIFT		
The power lift lifts in a jerky way	1)- Clogged pump inlet filter. 2)- Air in the inlet pipe of the hydraulic pump.	1)- Clean or replace the filter. 2)- Check the inlet pipe and unions.
The power lift fails to operate	1)- Jammed pilot valve.	1)- Remove the valve system and release the pilot valve.
The power lift starts to lift but stops as soon as it senses the load, without the overpressure valve operating	1)- Draft rod badly adjusted.	1)- Adjust the draft control function.
The power lift fails to fully lower	1)- Position control lever badly adjusted	1)- Adjust the position control lever.
The power lift fails to lower	1)- Hydraulic lock engaged	1)- Unscrew the adjuster.
The lifting capacity fails to correspond to the prescribed value	1) - Worn retention rings on the valve gear. 2) - Safety and overpressure valves badly adjusted. 3) - Pump efficiency poor 4) - Valve gear efficiency poor	1) - Remove the valve gear and replace the external retention rings 2) - Adjust the valves. 3) - Overhaul the pump 4) - Overhaul the valve gear
The power lift has difficulty in bearing the load: there is a rhythmical swing when the engine is running while the load lowers when the engine is at a standstill	1)- Worn piston seal. 2)- Cylinder overpressure valve badly adjusted. 3)- Check valve badly adjusted.	1)- Replace the seal. 2)- Remove the casing and adjust the valve. 3)- Remove the valve gear and adjust the valve.
Rhythmic swinging occurs with the links in the end of upward travel position and the engine running. The load fails to lower when the engine is at a standstill.	1)- Incorrect adjustment of the position control lever's limit switch.	1)- Adjust the position control function by limiting the upward travel of the links.
The draft control function fails to operate: the power lift only lifts and lowers by means of the position lever	1)- Badly adjusted draft control lever.	1)- Adjust the draft control lever.

FAULTS	POSSIBLE CAUSES	REMEDIES
POWER LIFT		
The position control function fails to operate. The power lift only lifts and lowers by means of the draft control lever	1)- Position control lever not adjusted. 2)- Faulty internal linkages.	1)- Adjust the position control lever. 2)- Overhaul the linkages.
Pump overheated	1)- Excessive pressure 2)- Cavitation.	1)- Lower the pressure 2)- Clean the inlet components and check the unions.
Pump with null pressure	1)- Pump shaft broken.	1)- Replace the pump.
Noisy pump	1)- Cavitation. 2)- Imperfect seal on pump shaft. 3)- Pump casing not hermetic.	1)- Clean components on the inlet side and check the unions. 2)- Replace the oil seal. 3)- Tighten the screws on the pump casing and replace the retention rings.
Oil in the circuit that becomes foamy and increases in volume in an abnormal way.	1)- Air in the circuit. 2)- Pump cavitation.	1)- Check the oil level and bleed off the air. 2)- Clean the inlet components.
ELECTRICAL SYSTEM		
The starter motor fails to operate	1)- Battery discharged or faulty. 2)- Defective starter motor. 3)- Defective ignition switch. 4)- Battery cables tarnished or broken off at terminals. 5)- Ignition switches on machine badly adjusted..	1)- Recharge the battery. Replace it if it fails to remain charged. 2)- Overhaul the starter motor or replace it. 3)- Replace the switch 4)- Clean the tarnished terminals or replace them. 5)- Adjust the ignition switches or replace them if necessary.
The generator indicator light fails to go out even at a high engine rate	1)- Regulator inefficient. 2)- The alternator fails to charge sufficiently.	1)- Replace the regulator. 2)- Overhaul or replace the alternator.
The battery becomes deformed	1)- The battery is charged too much.	1)- Advise customers who work for many consecutive hours to turn on the headlights during work in order to lower the battery charge.
The water in the battery turns black.	1)- Faulty element.	1)- Replace the battery.
The revolution counter fails to operate.	1)- It is not receiving the power-pulse. 2)- Instrument with irregular setting. 3)- Faulty instrument.	1)- Repair the circuit. 2)- Adjust the instrument. 3)- Replace the instrument
The solenoid valves of the differential lock or 4WD fail to magnetize	1)- Control switches broken. 2)- Solenoid valve coils broken. 3)- Electrical system broken in some point.	1)- Replace the switches. 2)- Replace the coils. 3)- Repair the electrical system.

FAULTS	POSSIBLE CAUSES	REMEDIES
PLATFORM		
Vibrations on the platform	1)- The bodywork and chassis are touching each other. 2)- The bodywork and power lift are touching each other	1)- Eliminate the contact. 2)- Insert spacers between the bodywork and its supports.
Vibrations on the bonnet	1)- Precarious contact between bonnet and dashboard. 2)- Contact between bonnet and fixed parts of the engine.	1)- Adjust the front supports of the bonnet. 2)- Adjust the front supports of the bonnet.
ENGINE		
Engine efficiency poor	1)- Fuel filter clogged. 2)- Partially clogged injector return. 3)- Air in the circuit. 4)- Injectors badly adjusted. 5)- Air filter clogged.	1)- Replace the filter. 2)- Remove the obstruction. 3)- Make the circuit hermetic. 4)- Overhaul the injectors. 5)- Clean the filter. Replace the cartridge if necessary.
The engine starts badly	1)- Injection pump badly adjusted. 2)- Injectors badly adjusted. 3)- Fuel pump inefficient.	1)- Overhaul the pump. 2)- Overhaul the injectors. 3)- Replace the pump.