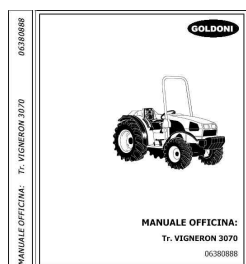




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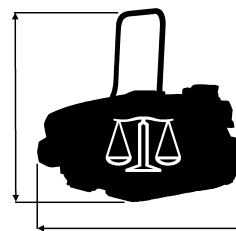


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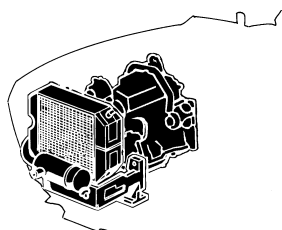
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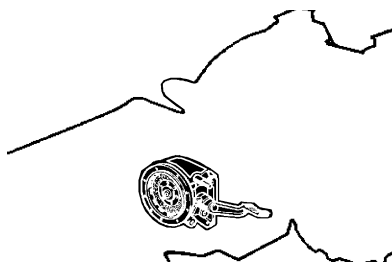
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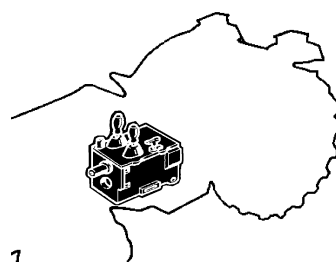
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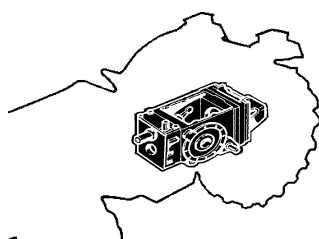
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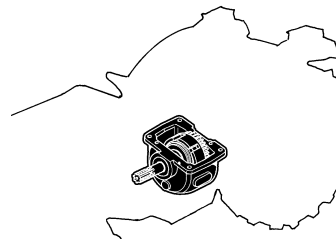
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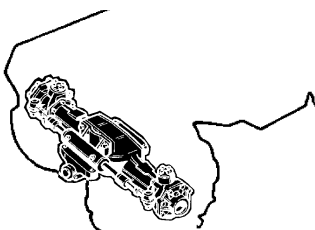
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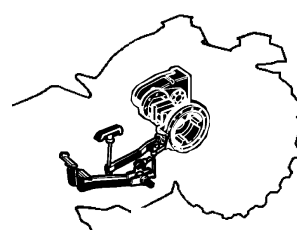
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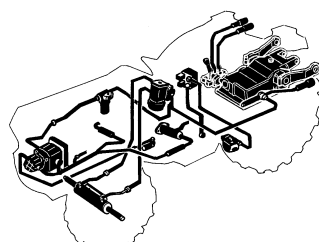
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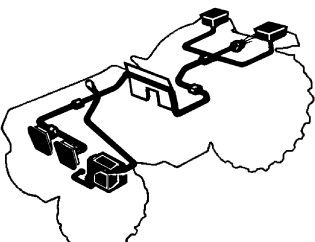
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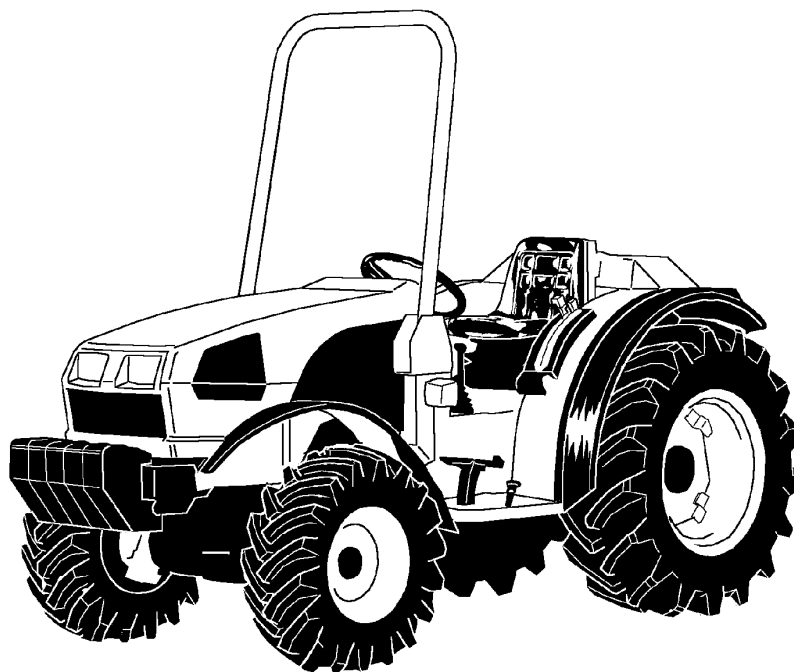


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VIGNERON 3070



GOLDONI S.p.A. FABBRICA MACCHINE AGRICOLE

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INTRODUCTION



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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 of fig. 1, attached to all machines, or are stamped on the metal data plate of 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.

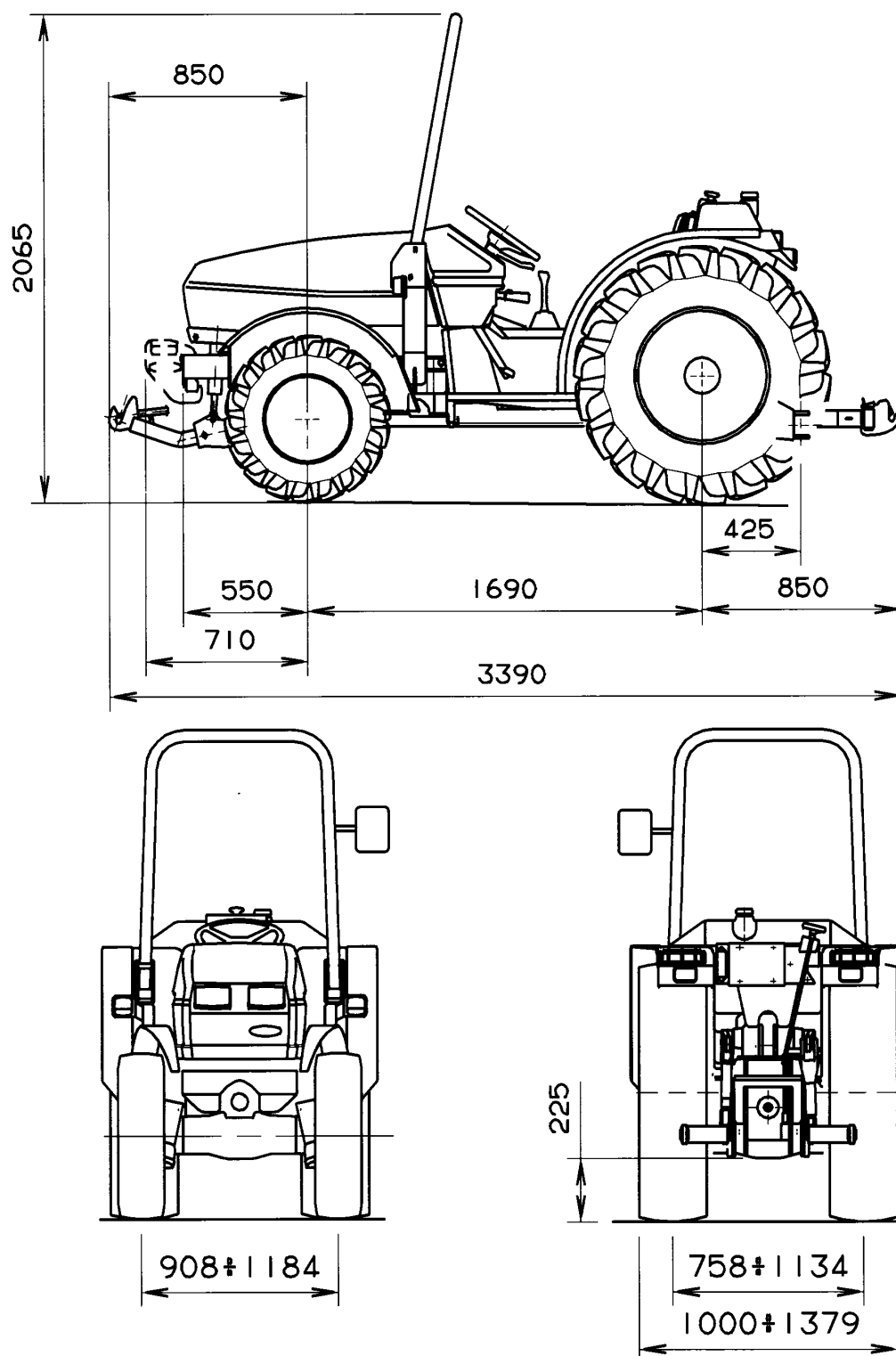
WARNING

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 SPEED, WEIGHTS



Tractor dimensions



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

TYRES	TYPE	MAX LOAD PER AXLE (Kg)	PRES- SURE (Bar)	SPEED (kph)
FRONT	11.0/65 – 12 6 PR	1520	2.9	35
REAR	360/70 R20 120 A8 (PIRELLI)	2740	1.4	35
ALTERNA- TIVE TYRES	TYPE	MAX LOAD PER AXLE (kg)	PRES- SURE (Bar)	
FRONT 1)	10.0/80 -12 6 PR	1350	2.3	35
2)	26 x 12.00 – 12 4 PR (GOOD YEAR)	1370	1.4	30
REAR 1)	320/70 R 20 113 A8	2360	1.6	35
2)	38 x 14.00-20 4 PR (GOOD YEAR)	2400	1.75	30
3)	12.4 R 20 116 A8 (PIRELLI)	2500	1.5	35

EXTERNAL WHEEL WIDTH (The values are indicative - mm)	
<i>Wheel</i>	<i>Width</i>
6.5/80x15 - 9.5R24	Front: 1081-1341 Rear: 1003-1379
7.00x12 - 12.4R20	Front: 1100-1376 Rear: 1105-1417
8.0/75x15 - 11.2R24	Front: 1043-1447 Rear: 1050-1422
11.00/65x12 - 12.4R20	Front: 1267-1347 Rear: 1105-1417
11.00/65x12 - 360170x20	Front: 1267-1347 Rear: 1142-1454

MECHANICAL TRANSMISSION 16 + 8 WITH CREEPER

GROUND SPEED WITH NO LOAD AND ENGINE AT TOP RATE								
GEAR TRANSMISSION RATIO			WITH 2600 RPM ENGINE RATE					
			Speeds with Tyres as shown (kph)					
	GEAR-BOX	TO-TALS	12.4 R20 ROLL.CIRC. mm 3096	9.5 R24 ROLL.CIRC. mm 3096	38x14.00-20 ROLL.CIRC. mm 2796	360/70 R20 ROLL.CIRC. mm 3096	320/70 R20 ROLL.CIRC. mm 2922	
NORMAL								
F O R W A R D	1	3.67	384.95	1.25	1.25	1.13	1.25	1.18
	2	2.23	233.83	2.07	2.07	1.86	2.07	1.95
	3	1.29	135.47	3.57	3.57	3.22	3.57	3.36
	4	0.89	93.64	5.16	5.16	4.66	5.16	4.87
	5	3.67	67.45	7.16	7.16	6.46	7.16	6.75
	6	2.23	40.97	11.79	11.79	10.64	11.79	11.12
	7	1.29	23.74	20.35	20.35	18.37	20.35	19.19
	8	0.89	16.41	29.44	29.44	26.57	29.44	27.76
R E V	1	3.67	161.14	3.00	3.00	2.71	3.00	2.83
	2	2.23	97.88	4.93	4.93	4.45	4.93	4.65
	3	1.29	56.71	8.52	8.52	7.69	8.52	8.03
	4	0.89	39.20	12.32	12.32	11.12	12.32	11.62
CREEPER								
F O R W A R D	1	3.67	2890.32	0.17	0.17	0.15	0.17	0.16
	2	2.23	1755.69	0.28	0.28	0.25	0.28	0.26
	3	1.29	1017.12	0.47	0.47	0.43	0.47	0.45
	4	0.89	703.05	0.69	0.69	0.62	0.69	0.65
	5	3.67	506.47	0.95	0.95	0.86	0.95	0.90
	6	2.23	307.65	1.57	1.57	1.42	1.57	1.48
	7	1.29	178.23	2.71	2.71	2.45	2.71	2.56
	8	0.89	123.20	3.92	3.92	3.54	3.92	3.70
R E V	1	3.67	1209.90	0.40	0.40	0.36	0.40	0.38
	2	2.23	734.94	0.66	0.66	0.59	0.66	0.62
	3	1.29	425.77	1.13	1.13	1.02	1.13	1.07
	4	0.89	294.30	1.64	1.64	1.48	1.64	1.55

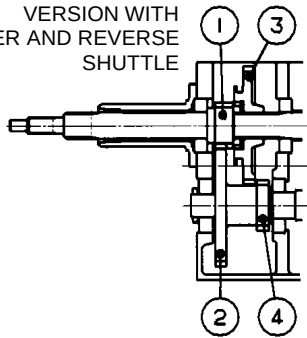
TRANSMISSION RATIOS	
GEARBOX	SEE RELATIVE TABLES
BEVEL GEAR PAIR RATIO	11 : 53
FINAL DRIVE RATIO	11 : 42
TOTAL RATIOS	SEE RELATIVE TABLES

MAXIMUM SPEED MEASURED	
Maximum speed measured on track kph :	32.4

MECHANICAL TRANSMISSION 16 + 8 DUAL POWER + REV. SHUTTLE								
GROUND SPEED WITH NO LOAD AND ENGINE AT TOP RATE								
GEAR		TRANSMIS- SION RATIOS		WITH 2600 RPM ENGINE RATE				
				Speeds with Tyres as shown (kph)				
		GEAR- BOX	TO- TALS	12.4 R20 ROLL.CIRC. mm 3096	9.5 R24 ROLL.CIRC. mm 3096	38x14.00-20 ROLL.CIRC. mm 2796	360/70 R20 ROLL.CIRC. mm 3096	320/70 R20 ROLL.CIRC. mm 2922
NORMAL								
FORWARD	1	3.67	384.95	1.25	1.25	1.13	1.25	1.18
	2	2.23	233.83	2.07	2.07	1.86	2.07	1.95
	3	1.29	135.47	3.57	3.57	3.22	3.57	3.36
	4	0.89	93.64	5.16	5.16	4.66	5.16	4.87
	5	3.67	67.45	7.16	7.16	6.46	7.16	6.75
	6	2.23	40.97	11.79	11.79	10.64	11.79	11.12
	7	1.29	23.74	20.35	20.35	18.37	20.35	19.19
	8	0.89	16.41	29.44	29.44	26.57	29.44	27.76
REVERSE	1	3.67	161.14	3.00	3.00	2.71	3.00	2.83
	2	2.23	97.88	4.93	4.93	4.45	4.93	4.65
	3	1.29	56.71	8.52	8.52	7.69	8.52	8.03
	4	0.89	39.20	12.32	12.32	11.12	12.32	11.62
20% REDUCTION								
FORWARD	1	3.67	486.18	0.99	0.99	0.90	0.99	0.94
	2	2.23	295.32	1.64	1.64	1.48	1.64	1.54
	3	1.29	171.09	2.82	2.82	2.55	2.82	2.66
	4	0.89	118.26	4.08	4.08	3.69	4.08	3.85
	5	3.67	85.19	5.67	5.67	5.12	5.67	5.35
	6	2.23	51.75	9.33	9.33	8.42	9.33	8.80
	7	1.29	29.98	16.11	16.11	14.54	16.11	15.20
	8	0.89	20.72	23.31	23.31	21.04	23.31	21.98
REVERSE	1	3.67	203.52	2.37	2.37	2.14	2.37	2.24
	2	2.23	123.62	3.91	3.91	3.53	3.91	3.68
	3	1.29	71.62	6.74	6.74	6.09	6.74	6.36
	4	0.89	49.50	9.76	9.76	8.81	9.76	9.20
REVERSE SHUTTLE								
FORWARD	1	3.67	384.95	1.25	1.25	1.13	1.25	1.18
	2	2.23	233.83	2.07	2.07	1.86	2.07	1.95
	3	1.29	135.47	3.57	3.57	3.22	3.57	3.36
	4	0.89	93.64	5.16	5.16	4.66	5.16	4.87
	5	3.67	67.45	7.16	7.16	6.46	7.16	6.75
	6	2.23	40.97	11.79	11.79	10.64	11.79	11.12
	7	1.29	23.74	20.35	20.35	18.37	20.35	19.19
	8	0.89	16.41	29.44	29.44	26.57	29.44	27.76
REVERSE	1	3.67	487.47	0.99	0.99	0.89	0.99	0.93
	2	2.23	296.11	1.63	1.63	1.47	1.63	1.54
	3	1.29	171.54	2.82	2.82	2.54	2.82	2.66
	4	0.89	118.57	4.07	4.07	3.68	4.07	3.84
	5	3.67	85.42	5.65	5.65	5.10	5.65	5.33
	6	2.23	51.89	9.31	9.31	8.40	9.31	8.78
	7	1.29	30.06	16.07	16.07	14.50	16.07	15.16
	8	0.89	20.78	23.25	23.25	20.98	23.25	21.93

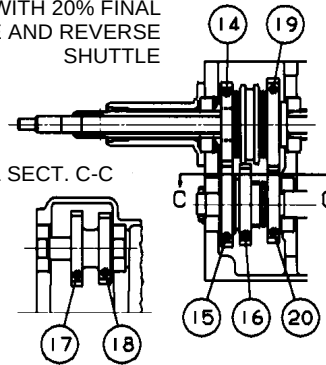
TRANSMISSION DIAGRAM

VERSION WITH
CREEPER AND REVERSE
SHUTTLE

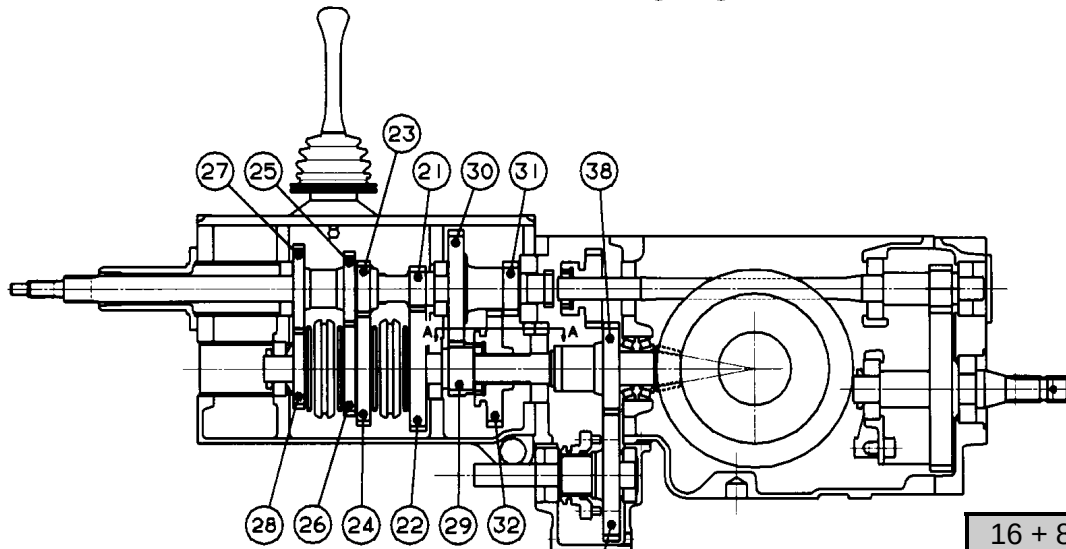


VERSION WITH 20% FINAL
DRIVE AND REVERSE
SHUTTLE

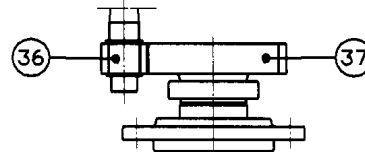
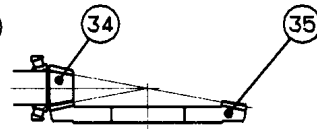
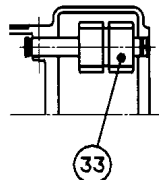
PARTIAL SECT. C-C



DUAL POWER		
POS	N° TEETH	
14	Z =	40
15	Z =	31
16	Z =	29
17	Z =	28
18	Z =	26
19	Z =	44
20	Z =	27



PARTIAL SECT. A-A



21	Z =	15
22	Z =	55
23	Z =	22
24	Z =	49
25	Z =	31
26	Z =	40
27	Z =	37
28	Z =	33
29	Z =	18
30	Z =	43
31	Z =	18
32	Z =	43
33	Z =	17
34	Z =	11
35	Z =	53
36	Z =	11
37	Z =	42
38	Z =	32
39	Z =	49

16 + 8 SUPER RIDUTTORE		
POS	N° TEETH	
1	Z =	18
2	Z =	53
3	Z =	20
4	Z =	51

DIMENSIONS AND WEIGHTS (mm and kg)

- Wheelbase: 1690 mm
- Track: Front axle: 908 – 1184 mm Rear axle: 758 – 1134 mm
- Maximum (or all out) dimensions of the tractor without the optional accessories and with hitching device

	Version with safety frame	Version with cab
Length	3390 mm	3390 mm
Width	1000 – 1379 mm	1000 – 1379 mm
Height	2065 mm	2080 mm
Front overhang	850 mm	850 mm
Rear overhang	850 mm	850 mm
Minimum ground clearance	225 mm	225 mm
- Empty weight of tractor in running order, without optional accessories but with cooling fluid, lubricants, fuel, implement and driver: 1850 kg
- Weight division between the axles: Front: 820 kg Rear: 1030 kg
- Ballast: available on request
- Ballast distribution between the axles: Front: 100 kg Rear: 134 kg
- Technical permissible weights declared by the manufacturer:

	Total	Front	Rear
BASIC VEHICLE	3100	1350	1950
OTHER VERSIONS	2930	980	1950

- Tractor weight at full load depending on the tyres mounted:

front	rear	weights
11.0/65 – 12	360/70 R20	3100
10.0/80-12	320/70 R20	3100
26x12.00 – 1238 x 14.00-20		3100
11.0/65 – 12	12.4 R20	3100
7.00-12	12.4 R20	2930
7.00-12	360/70 R20	2930
6.5/80-15	9.5 R24	2930

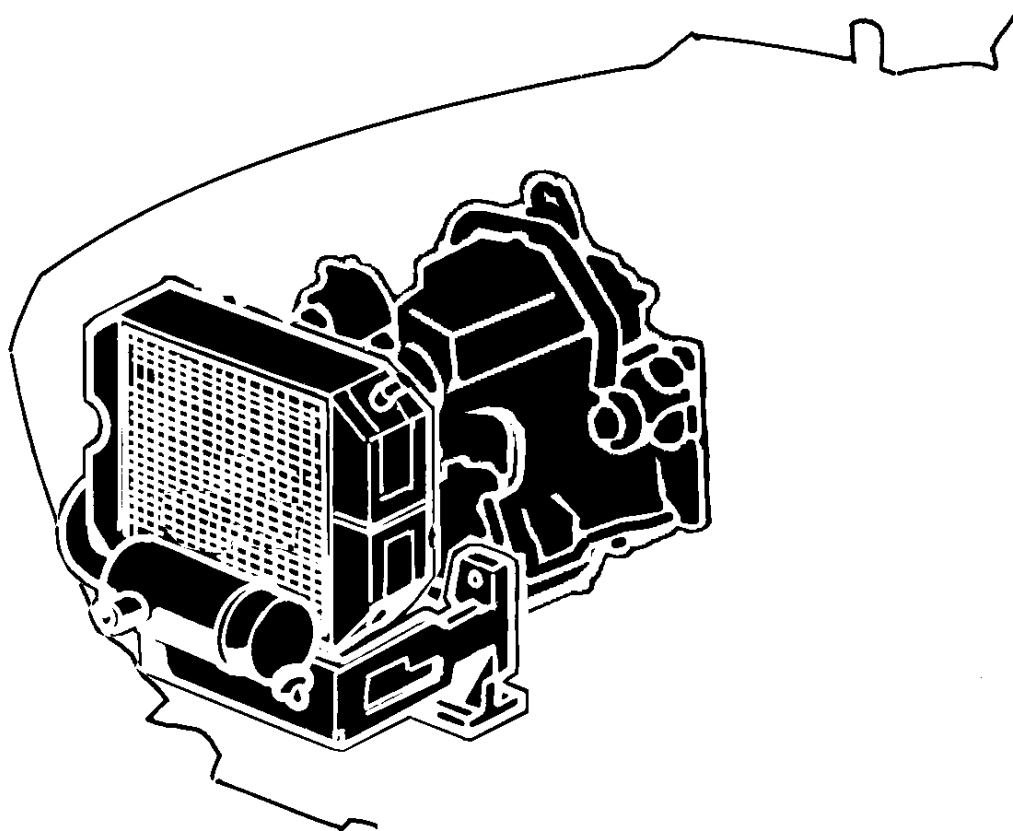
- Distribution of this weight between the axles (basic):

Front axle	Rear axle
1350 kg	1950 kg
- Distribution of this weight between the axles (other versions):

Front axle	Rear axle
980 kg	1950 kg
- Limits to weight distribution between the axles (see A1):
- Maximum weight on an axle, (A1):

Maximum weight on each of the axles:	Front axle	Rear axle
Depending on tyres mounted (basic)	1350 kg	1950 kg
Maximum weight on each of the axles:	Front axle	Rear axle
depending on tyres mounted (other versions)	980 kg	1950 kg

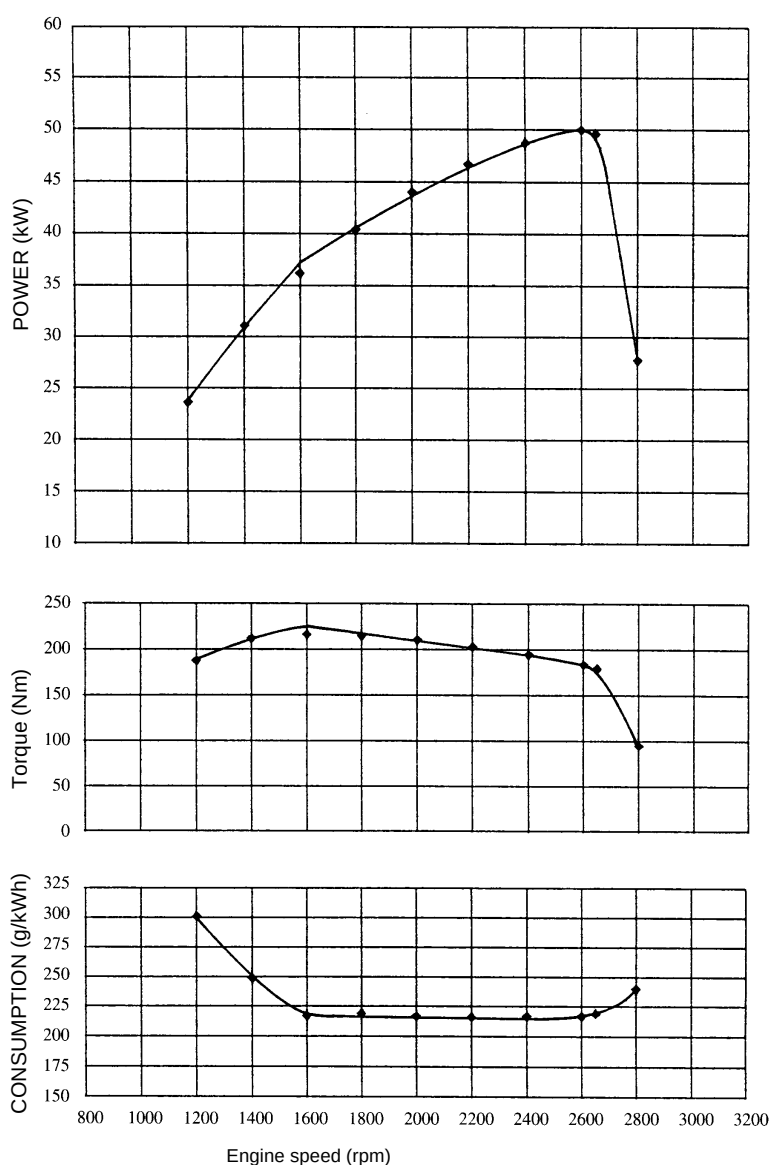
ENGINE



ENGINE SPECIFICATIONS

Engine	D 703 LT	29 B/8
Power rating	HP 68 - 50 kW	
Type	Diesel	
N° cylinders	3	
Swept volume	2082	
Cooling	Water	

Controllo della potenza del motore secondo le CEE 80/1269 e successivi aggiornamenti
 Engine power test in compliance with EEC 80/1269 and successive updates



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

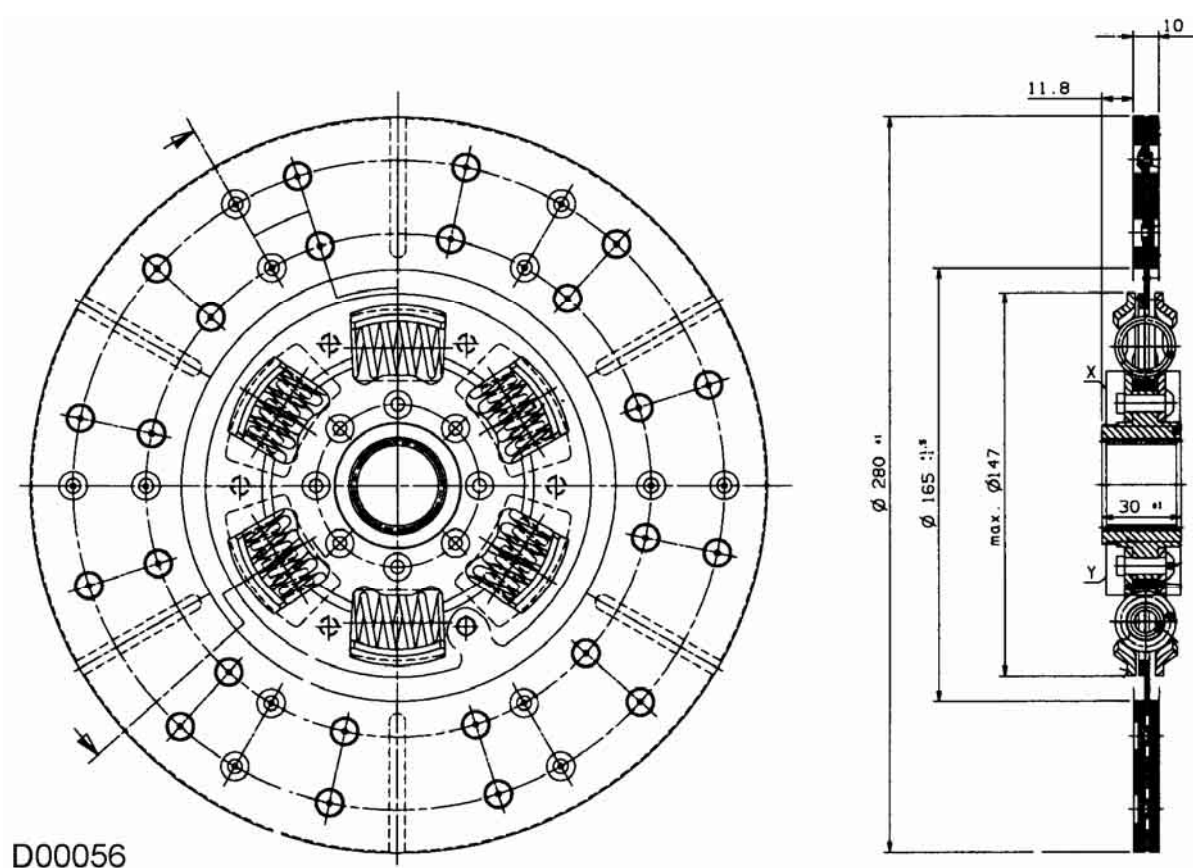
ENGINE SPECIFICATION TABLE		D 703 LT	29 B/8
Cylinders		N°	3
Swept volume		Cc.	2082
Bore		mm	94
Stroke		mm	100
Compression ratio			18:1
Rpm			2600
Power kW/HP at 2600 rpm		kW/HP	50-68
Maximum torque at 1600 rpm		Nm	183.6
Maximum torque		Nm (kgm)min/rpm	206 (21) 1600
3rd drive engine speed ratio			1:1
Idling rate rpm			900,1000
Oil consumption (Max, rpm – Power NA)		kg/h	0.025
Oil sump capacity		L.	4.5
Minimum oil pressure tolerated		kg/cm ²	1,1.5
Max. tolerated slant for discontinuous service (instantaneous)			25° (35°)
Combustion air volume at 2600 rpm		l./min	1150
Cooling air volume at 2600 rpm		l./min	15500
Dry weight		kg	190
Recommended battery		V/ah	12/80

Contact an authorized VM – Detroit Diesel Center if the engine's Workshop Manual is also required.

CLUTCH



Clutch	DRY, DOUBLE-DISC
Type	11" Luk



CHARACTERISTICS OF THE FRICTION MATERIAL:

RAYBESTOS 8402

VALEO F 202

The figure above gives the dimensions and characteristics of the drive - friction disc material.

The friction disc in direct contact with the flywheel is that of the PTO while that of the drive is the outermost one.

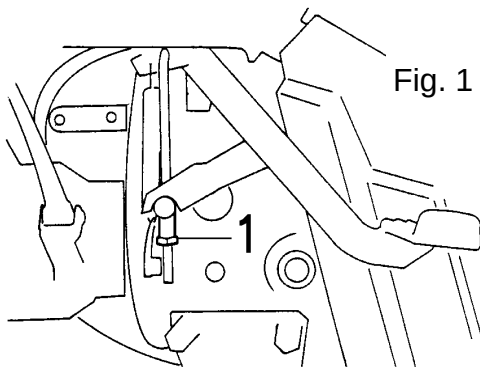
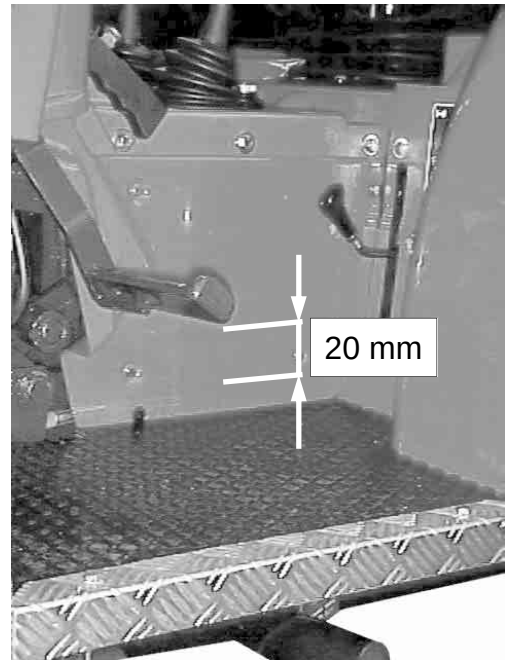


Fig. 1



HOW TO ADJUST THE DRIVE CLUTCH PEDAL (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 increase the free travel of the pedal. Tighten the screw to shorten the travel. Fit the guard back on after the adjustments have been made.

HOW TO ADJUST THE PTO CLUTCH LEVER

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

- Remove the guard;
- Unscrew the adjuster screw **1** (fig. 1) to increase the free travel of the pedal. Tighten the screw to shorten the travel.
- Fit the guard back on.

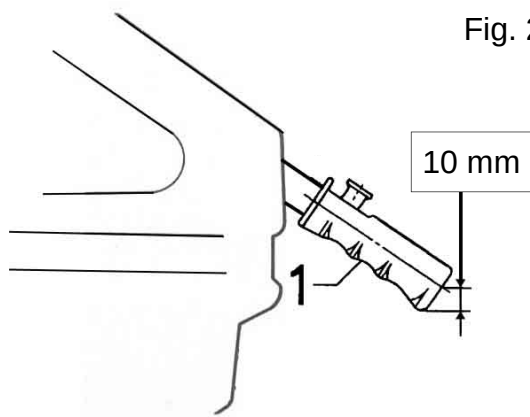
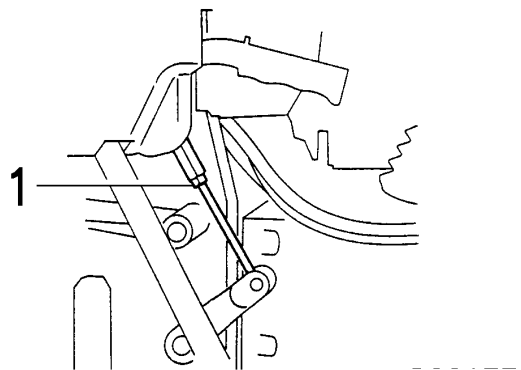
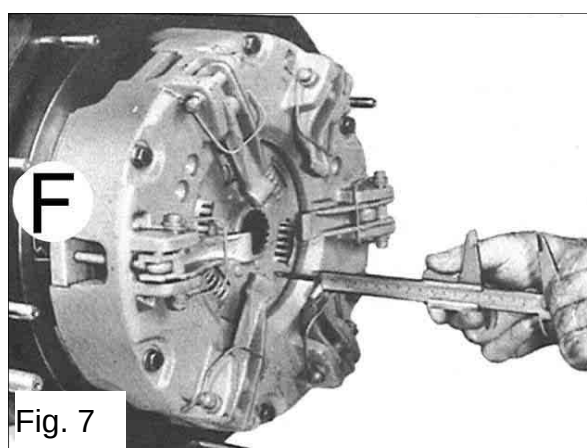
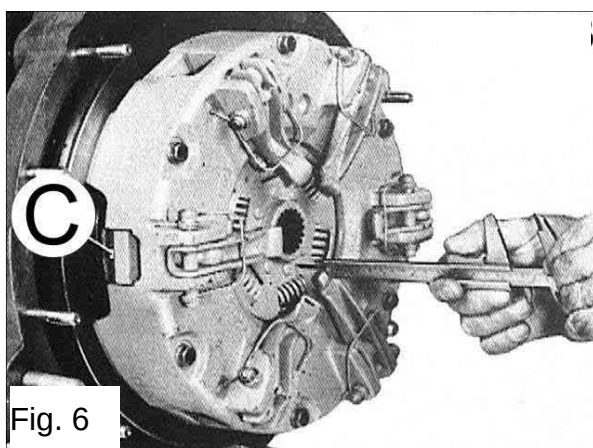
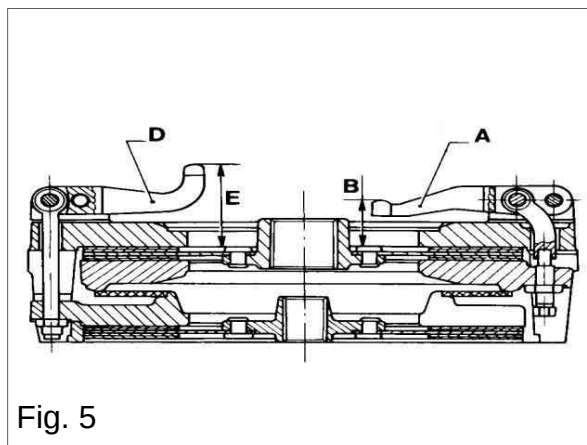
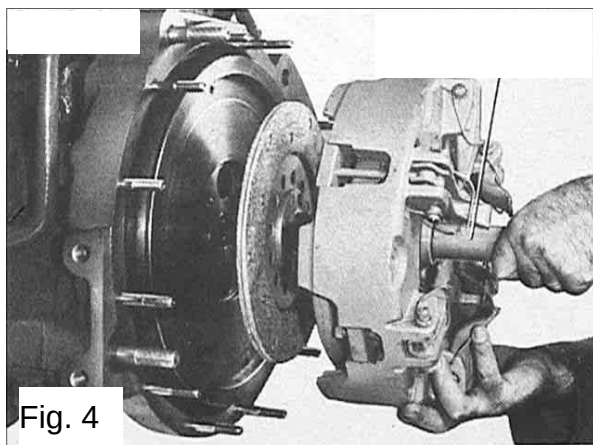


Fig. 2

Fig. 3





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.

Gearbox

The levers **A** (Fig. 5) must be adjusted so as to obtain the distance **B** = 25 mm.

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.

P.t.o.

The levers **D** (Fig. 5) must be adjusted so as to obtain the distance **E** = 50 mm.

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.

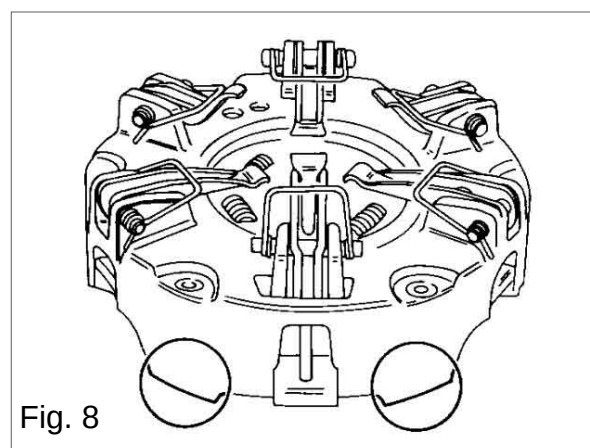
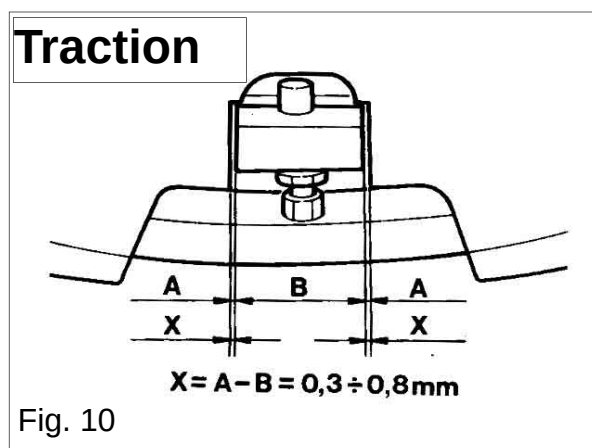
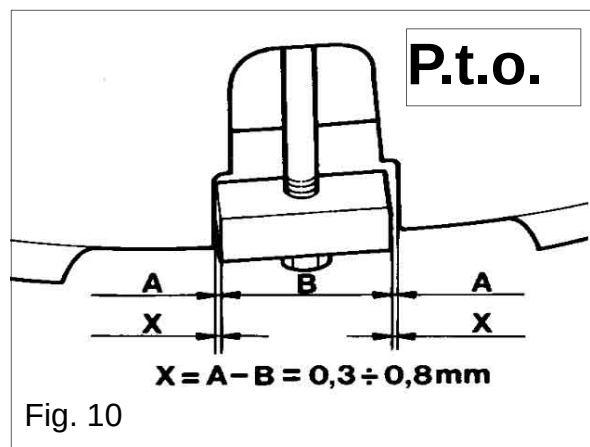
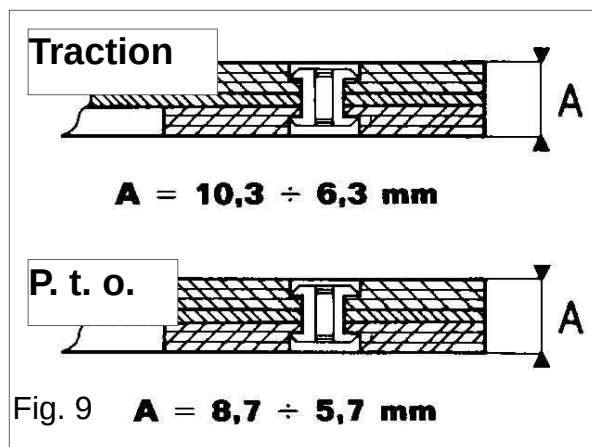


Fig. 10 shows the max range of clearance that must come to bear on the tie-rods of the two clutch assemblies: the one for the power take-off and the one for traction.

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).

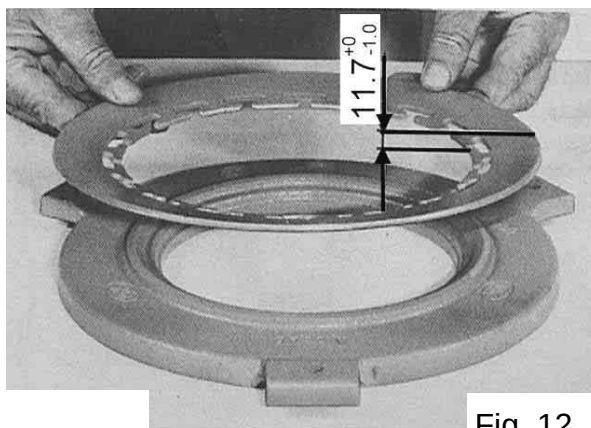


Fig. 12

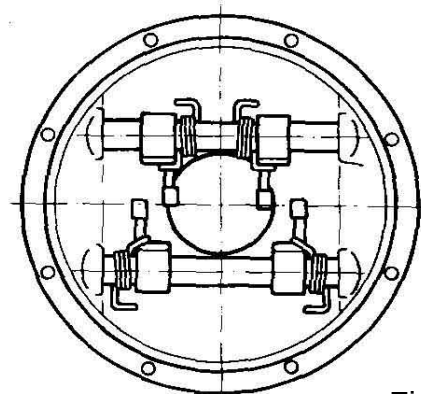


Fig. 13

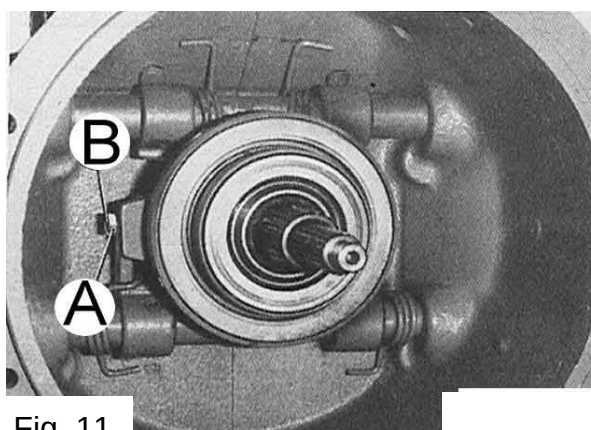


Fig. 11

DEMOUNTING THE CLUTCH ASSEMBLY

Note - Mark the various components before splitting them.

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

When on hold, the spring must have this dimension to guarantee a correct thrusting action on the clutch plate. Fig. 13 shows the correct positions of the clutch levers in the clutch bowl: both the one for the PTO clutch and the one for the drive clutch.

MOUNTING THE CLUTCH ASSEMBLY

Note - Comply with the position of the marks on the various components to keep the assembly in a balanced condition.

CLUTCH LINKAGE ASSEMBLY

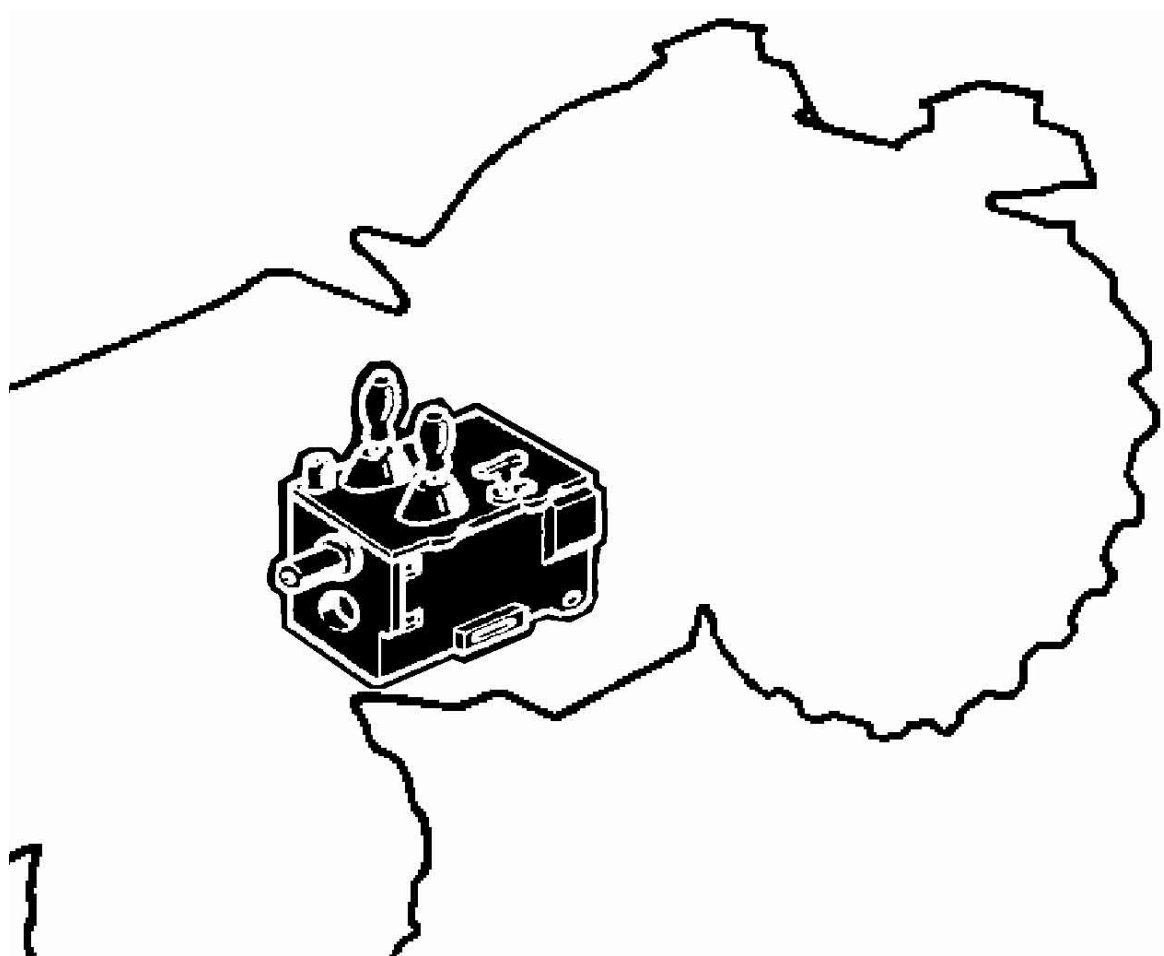
Note - To be correct, thrust bearing assembly on the levers requires slight contact of screws **B** (fig. 11) on the sleeve housings. Lock nuts **A** once this condition has been achieved.

DRIVING TORQUES

	Nm	(kgm)
M8 x 90 bolt that fixes the clutch to the flywheel	29	3
M10 x 12.5 engine flange, clutch bowl fixing nut	59	6
M8 x 20 main shaft sleeve fixing bolt	32	3.3
M12 x 35 dashboard support fixing screw	79	8
M16 x 140 clutch bowl engine flange fixing screw	196	20

GEARBOX

VALID UP TO MACHINE n°: D528784



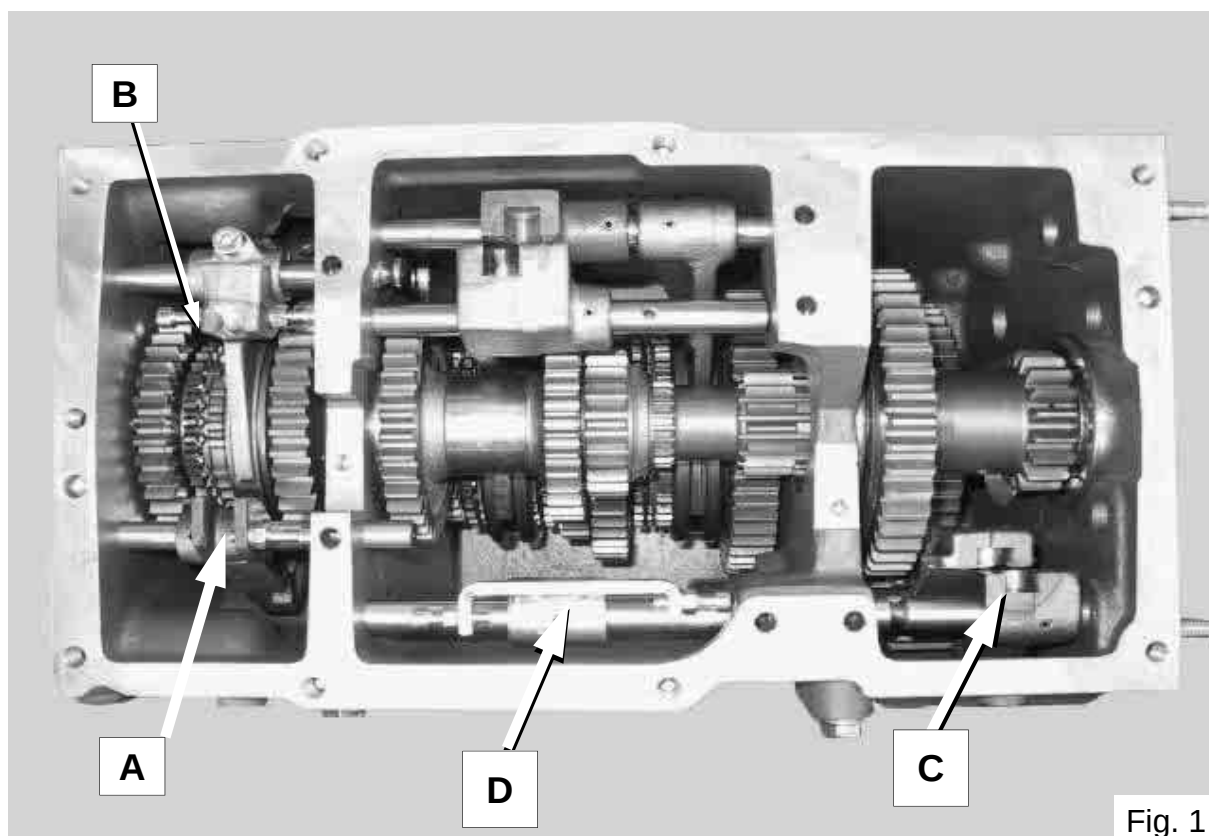


Fig. 1

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

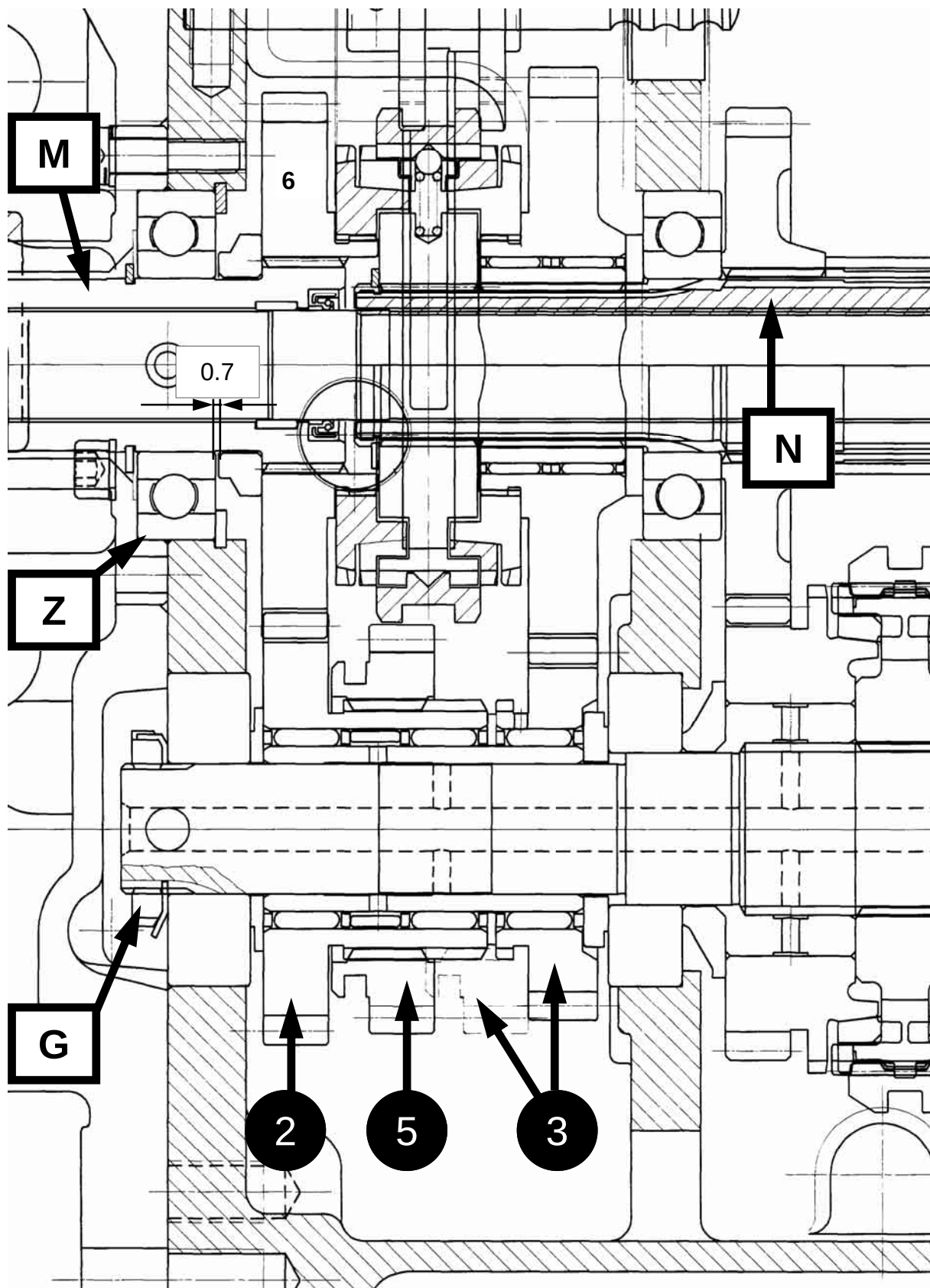
For machines with central levers, as in the case of 3070 StarV or Milenio 70 V, the selectors are in position **D** of the figure, while the end of travel adjuster screws remain in position **D**.

The following descriptions are also valid for the end of travel screw adjustments.

Screw adjustment must prevent the selection race from being by-passed at end of travel.

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

Certain specific instructions will be added to the future updates for the creeper version, even though many parts and specifications are the same as those of the version described in the following pages.



The first portion of the gearbox is depicted in the previous page, i.e. the section that houses the reverse shuttle and –20% reversing selector.

Gear Z 29 of (fig. 2) is controlled by fork **A** of (fig. 1). When it is in position 5, the reverse shuttle is selected while the –20% function is selected when it is in position 3.

Fork **B** of (fig. 1) controls selection of either the –20% function or the reverse shuttle, depending on the position of fork **A**.

Once forks **A** and **B** have been mounted, lock the fastening screws shown in (fig. 4) so that it is impossible to slip from the selection made by the balls that fit into the races of the respective rods.

For fork **B**, after having centered the synchromesh ring in the idle position, tighten the screw that locks the fork on the rod to a 35 Nm torque value.

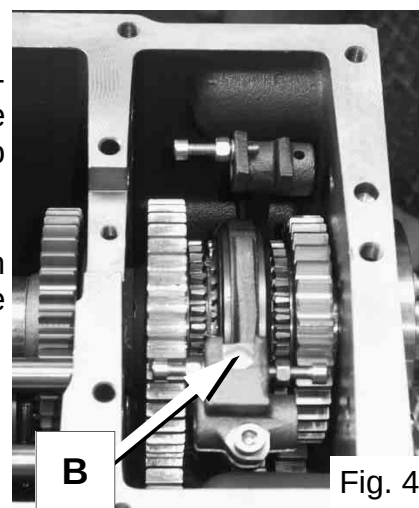


Fig. 4

It is important to shim bearing **Z**, that ensures the main and driven shafts are correctly positioned, plus the operating play of the –20% function and reverse shuttle synchromesh (fig. 2). Shimming must be made on the shaft, on the right and left of the bearing. The shimming on the left of the bearing (as shown in fig. 2) is within 0.6-0.8 mm, while it must be between 0.8-1 mm on the right.

The ring nut that closes the synchromesh pack, part **G** of (fig. 2-5) must be tightened to a 90 Nm torque value, with the retainer plate inserted and punched to ensure it is tight: it must be replaced each time it is removed.

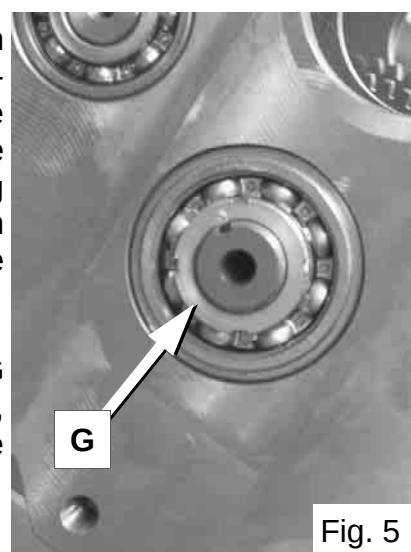


Fig. 5

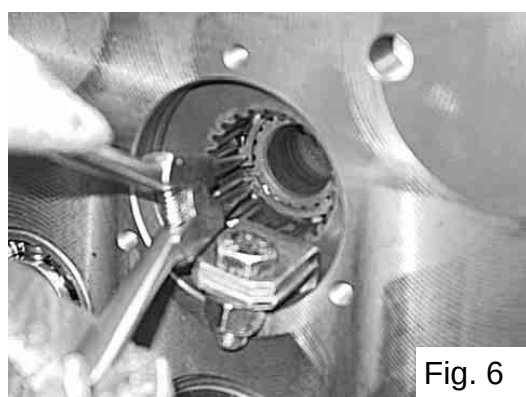


Fig. 6

Before shaft **M** of (fig. 2) is mounted, fit on the circlip as illustrated in (fig. 6) using a pair of circlip pliers and the simple tool shown in (fig. 6) which allows shaft **N** and gear 6 of (fig. 2) to be kept in position.



Before shaft **M** of (fig. 2) is positioned, do not forget to mount the guide and oil retainer illustrated in (fig. 7)

Insert the spacers that maintain the bearing in position once the clutch bowl is mounted, in position **H** (fig. 2).

To do this and determine the correct shimming, check the gap that remains between the bearing and outer stop point on the casing with a gauge (fig. 3).

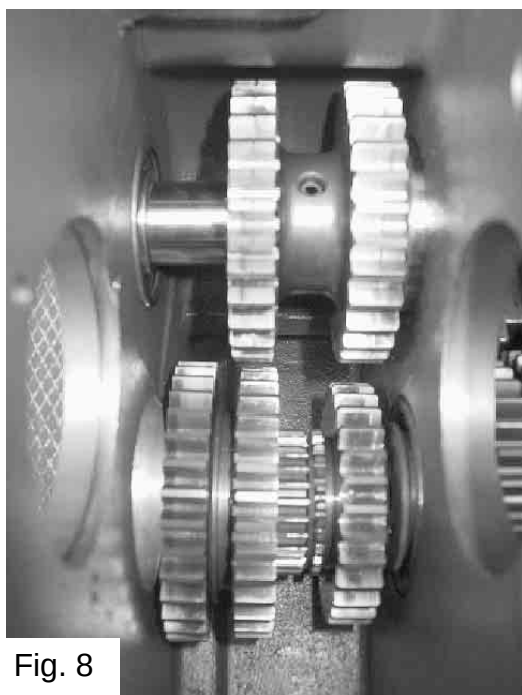


Fig. 8

Up to series D, the reverse shuttle gear was in two parts while in series E, it has been made in a single piece. This is what the pictures refer to.

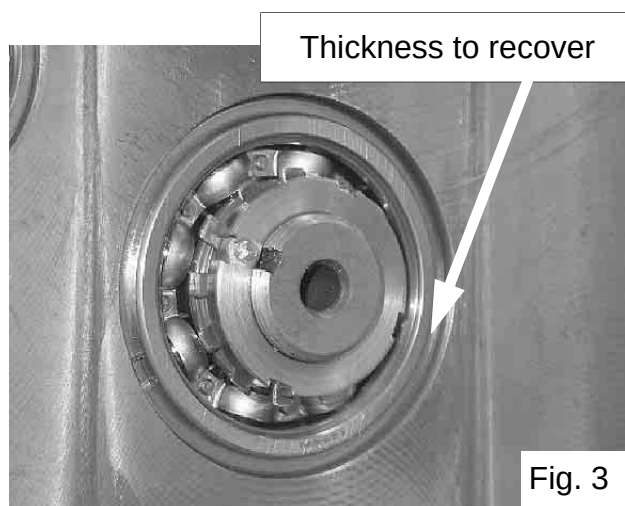


Fig. 3

Fig. 8 shows the idle transmission shaft of the reverse shuttle and its position inside the casing.

This shaft must be assembled after the parts shown in (fig. 8) have been mounted on the lower shaft, while the gear fixed by the pin must be positioned as shown in the figure, with the transmission shaft mounted inside the relative bushings in the casting.

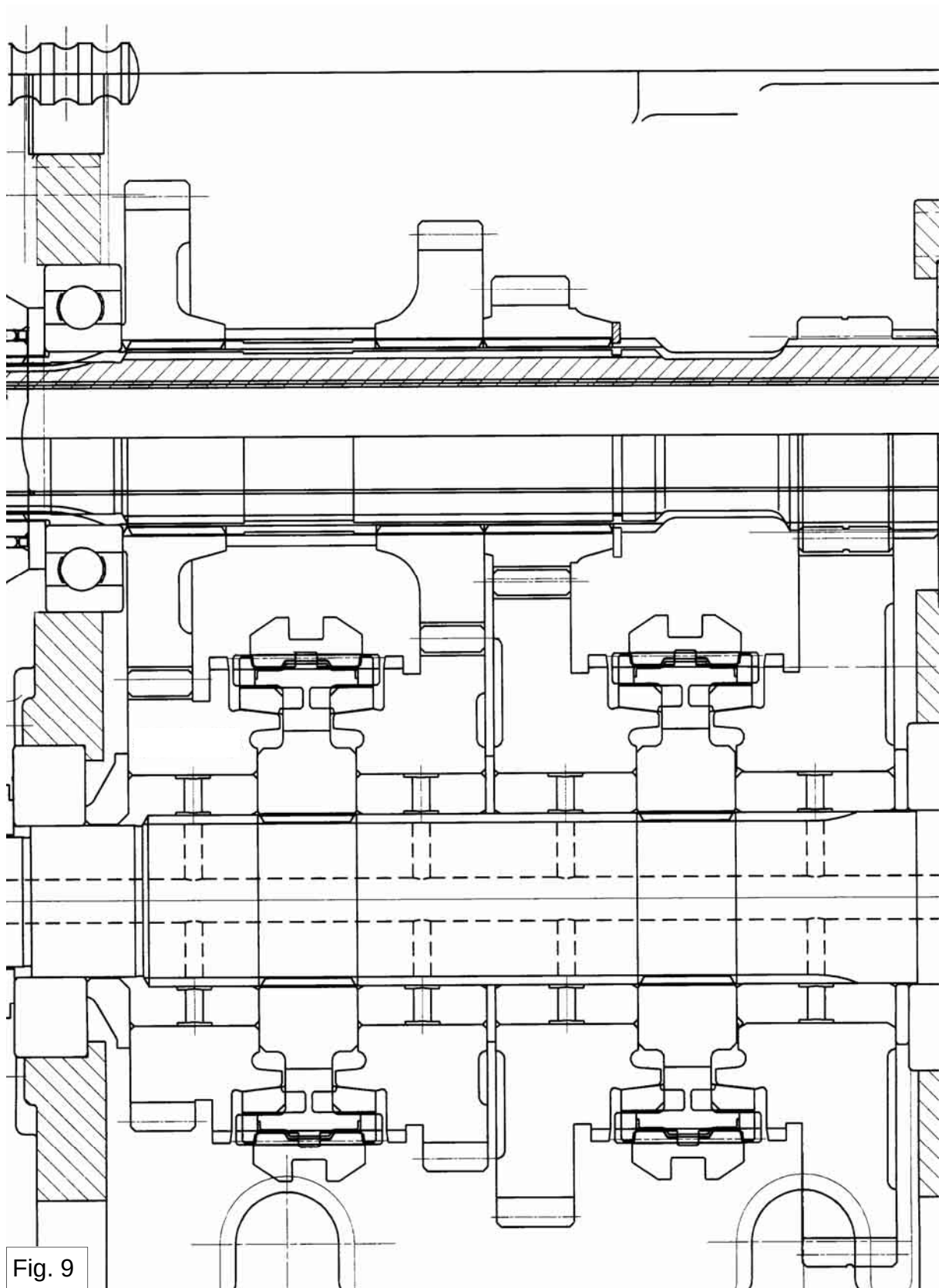


Fig. 9 shows the pair of synchromesh units that operate the gearshift.
No shimming is required in this pack since all play has been pre-determined.



Fig. 10

Using certain simple tools illustrated in fig. 10, the complete synchronesh packs can be very quickly and simply mounted as illustrated in fig. 11.

Using a pair of pointed-tipped pliers, position the spacer that divides the synchronesh packs as shown in (fig. 12). The two plugs of (fig. 10) are used to extend the lower shaft, as illustrated in fig. 13 and to ensure a reliable operating surface for the shaft so that it is able to bear the synchronesh packs during the assembly phase.

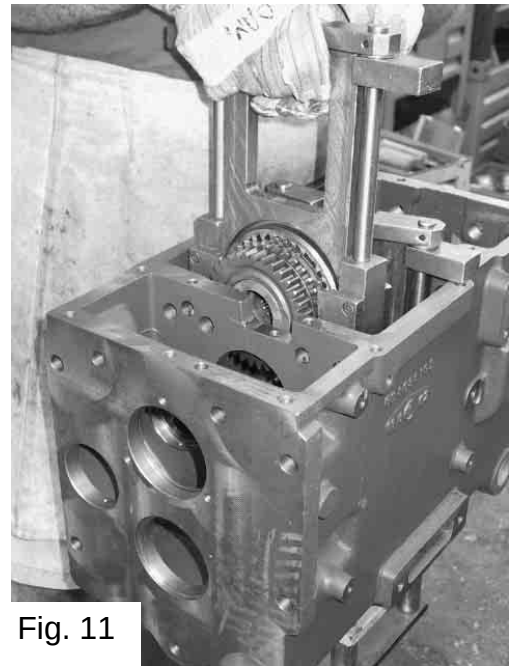


Fig. 11

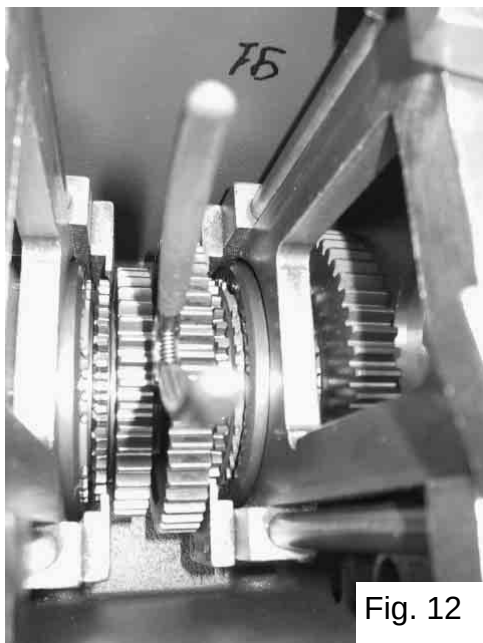


Fig. 12

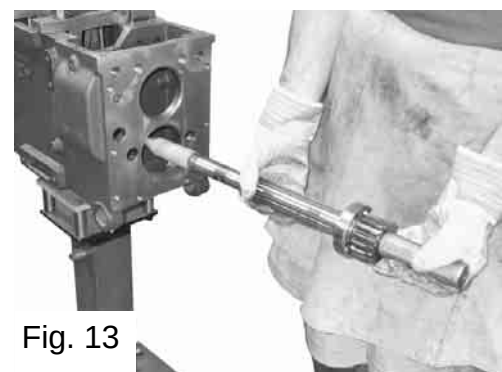


Fig. 13

To prevent the operator from accidentally engaging two gears at the same time, a safety rod is inserted between the two gear control rods to stop this from happening. Fig. 14 shows how this part (which should not be forgotten) must be mounted when the machine is remounted.

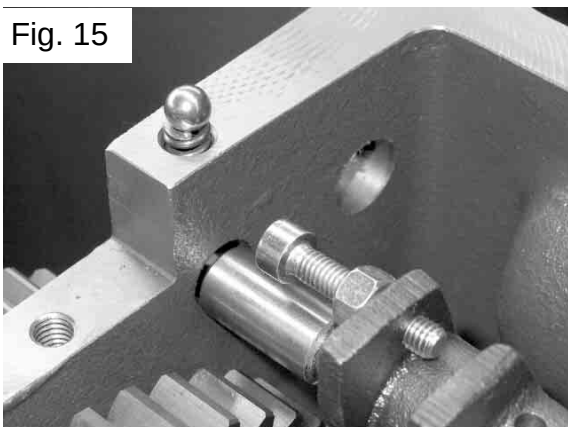


Fig. 15

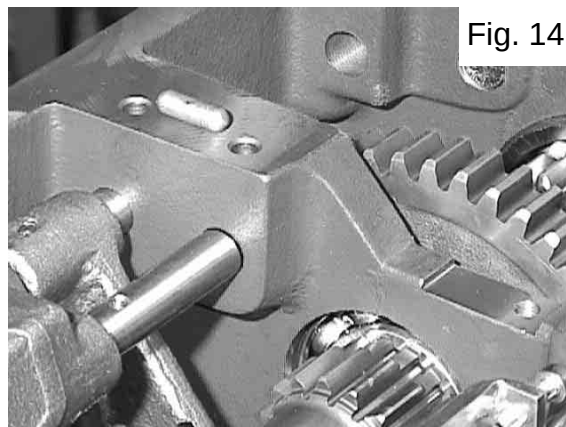


Fig. 14

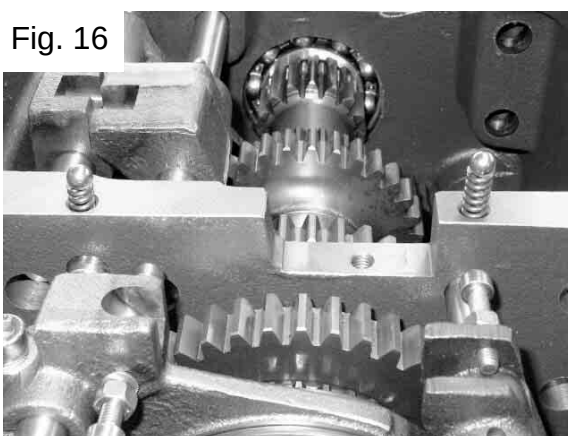


Fig. 16

Figs. 15 and 16 show the positions of the springs and relative balls that select the 20% function and reverse shuttle.

Fig. 17 shows how, with the aid of a rod, the spring+ball packs are mounted by packing the spring and allowing the rod to slide on the supports until the components have completed fitted into their housings.

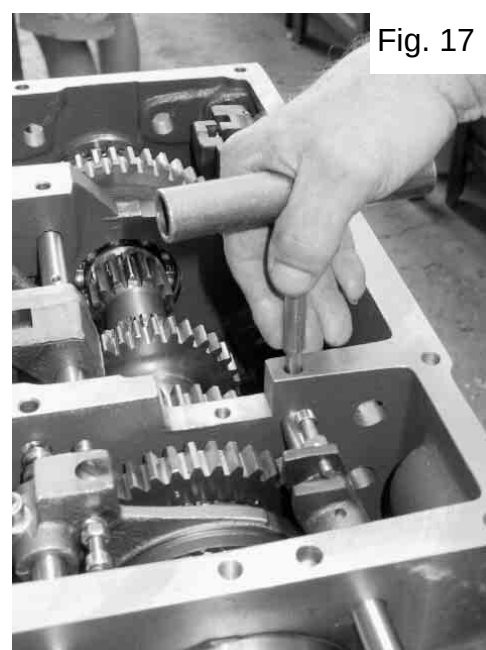


Fig. 17

Now mount the pins, aligning the hole in the rod with the one in the fork with the aid of a pin-driver.

It is advisable to test the selection, checking the various positions assumed by the selection fork and adjusting the retainer screws as explained in the previous pages.

Fig. 14 A

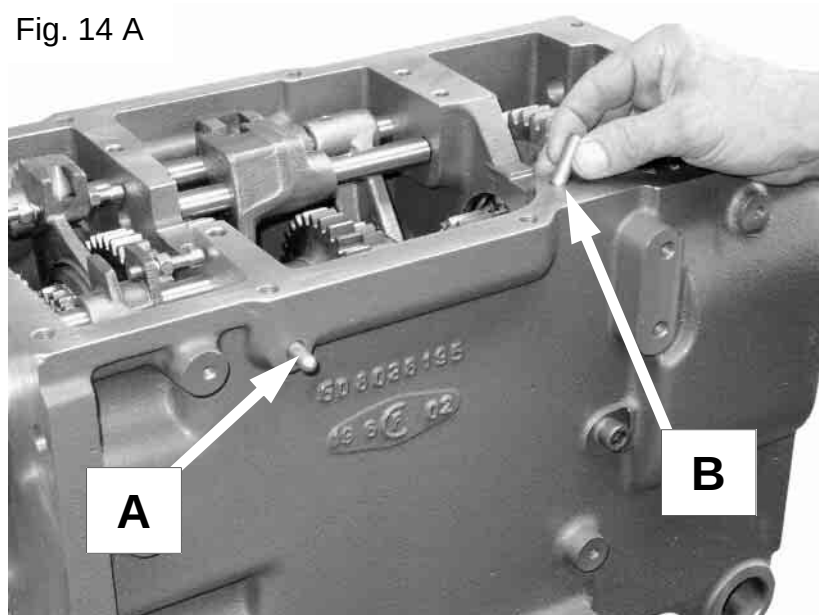


Fig. 14 A illustrates the other retainers to mount in the gearbox during the assembly phase.

Retainer **A** of fig. 14 A is the one that prevents the REV from being engaged once the reverse shuttle has been selected and that, vice versa, enables REV engagement when the 20% function has been selected.

Retainer **B** of fig. 14 A operates between the REV and final drive and prevents the two ranges from being engaged at the same time.

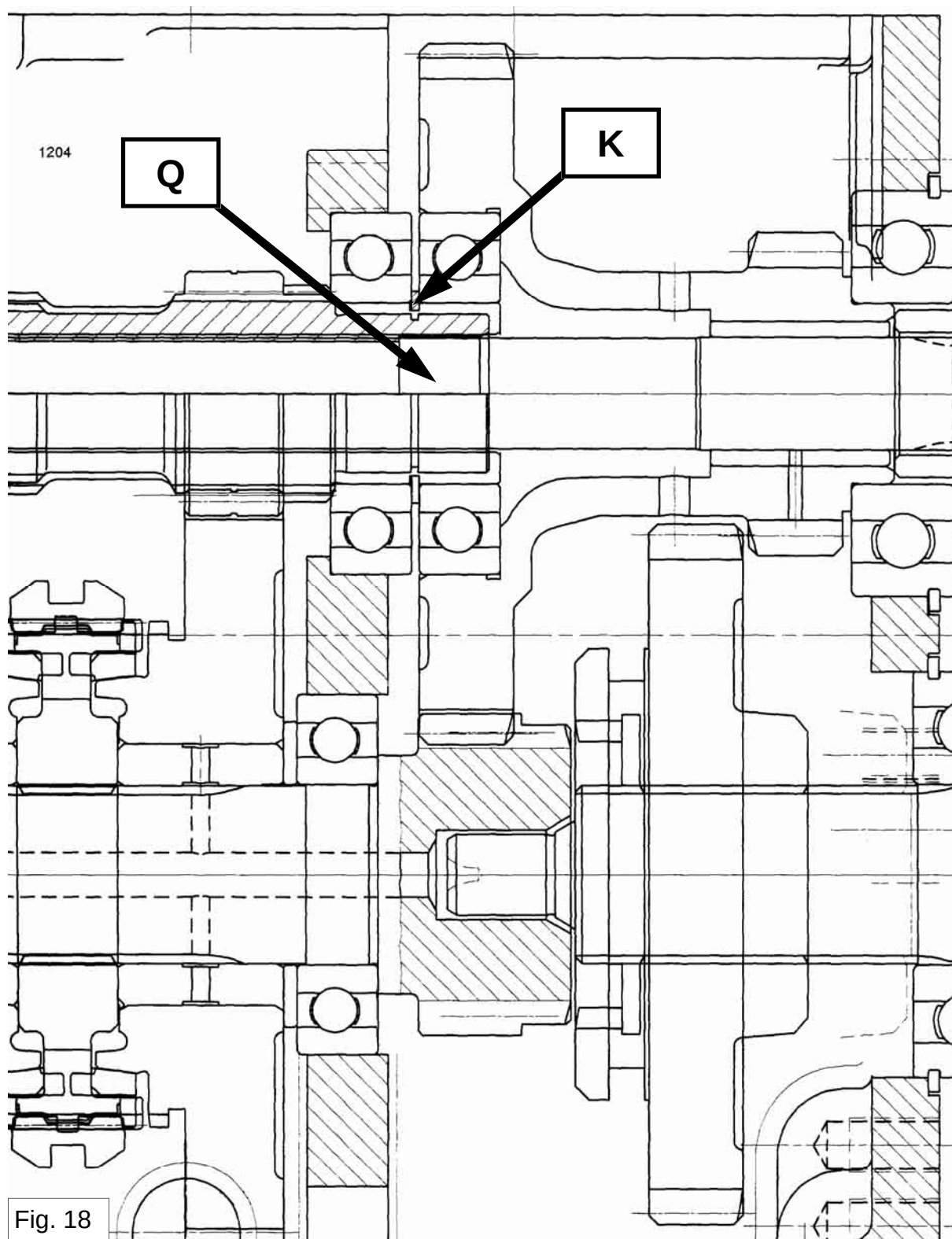


Fig. 18 illustrates the last portion of the gearbox, i.e. the final drive and REV shaft. Fig. 19 shows REV shaft assembly where care must be taken with the direction in which the gear is assembled: the engagement chamfer on the gear must point in the direction in which the machine is driven.

Fig. 20 shows how the final drive fork is mounted. Once the REV gear and relative fork have been mounted, the final drive fork must be positioned correctly as shown in fig. 20 to allow correct positioning in the casing.

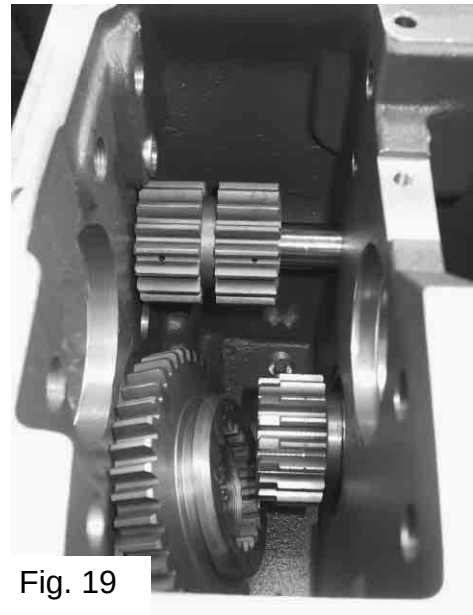


Fig. 19

Once the fork has been mounted in fig. 20, mount the final drive gear as shown in fig. 21, without forgetting to mount the intermediate circlip between the two bearings indicated by the letter K in fig. 18. See also (fig. 21).

Fig. 20

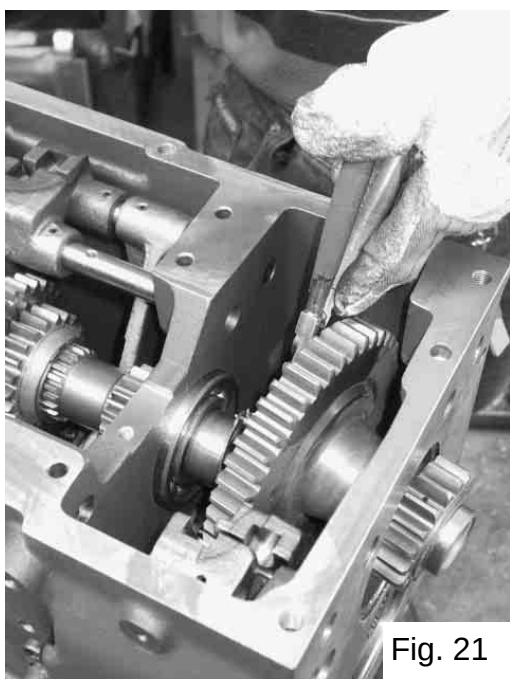
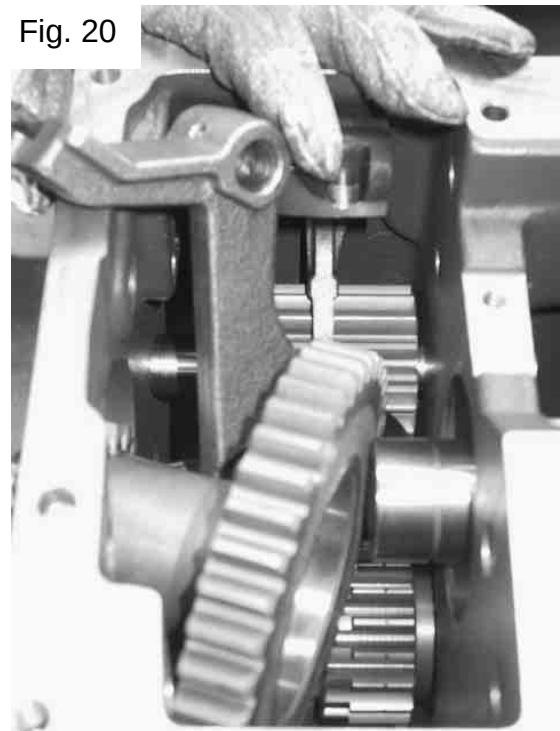


Fig. 21



Fig. 22



Fig. 23

Fig. 22 and 23 show how the final drive-REV double selection function is mounted. Seat the balls and relative springs in the casting. Fit in the M 10 x15 screws with two 1.5 mm copper washers and tighten the screws to a 30 Nm torque value.

The main shaft of the PTO must be mounted once the gearbox has been installed and before the rear differential housing have been flanged.

This shaft must be fitted inside the main shaft of the gearbox and final drive gear part **Q** of fig. 18.

Before fitting the shaft into the gearbox, premount as shown in fig. 24 and 25 with the aid of a piece of pipe when mounting the PTO gear positioning ring.

Using a pair of circlip pliers, mount the circlip that keeps the gear of fig. 25 in position.



Fig. 24

Fig. 25



The clutch control components must be pre-mounted before flanging the clutch bowl on the gearbox housing.

As illustrated in fig.26, use a pin-driver to position the lower shaft and the relative control levers.

Position the ends of the torsion springs with the aid of a shaped blade, as shown in fig.27.

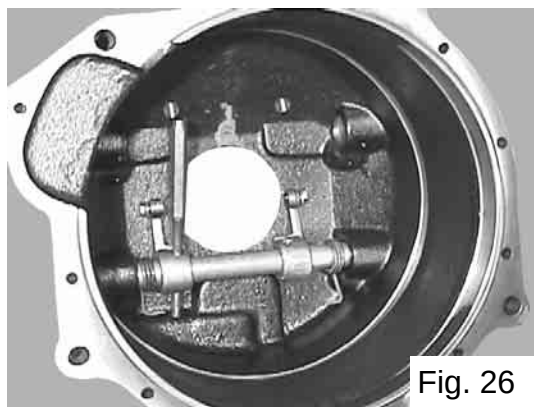


Fig. 26

Now mount the shaft and upper control levers as shown in fig.28
The levers should be positioned as shown in fig.28.

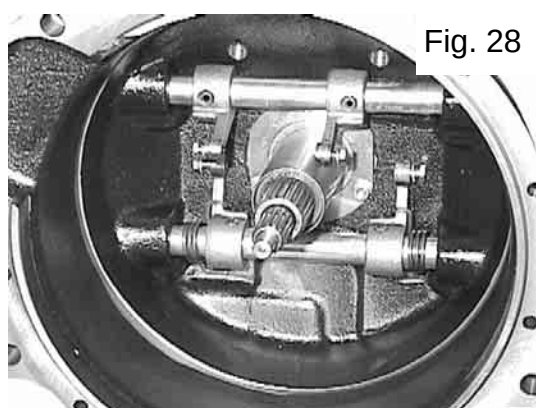


Fig. 28

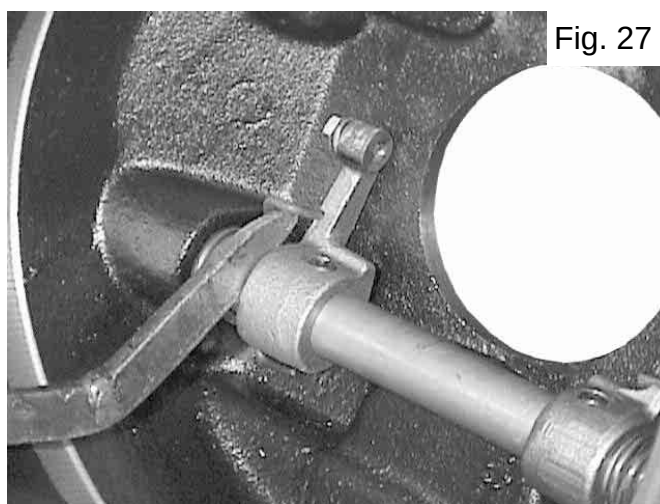


Fig. 27

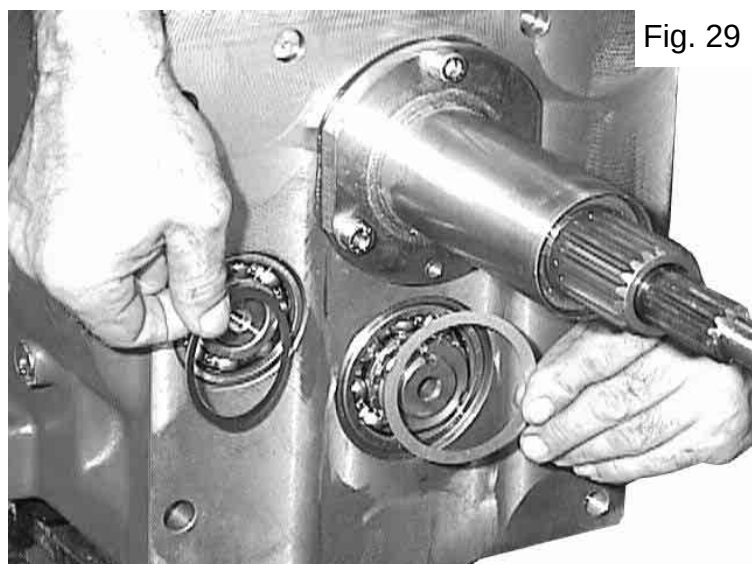


Fig. 29 After having mounted the guiding sleeve of the thrust bearings as shown in fig.29, shim the lower shaft bearing as already described on the previous pages (shimming that range from 0.2 to 0.4 mm), and mount the clutch bowl on to the gearbox housing, tightening the connection screws to a 70 Nm torque value.

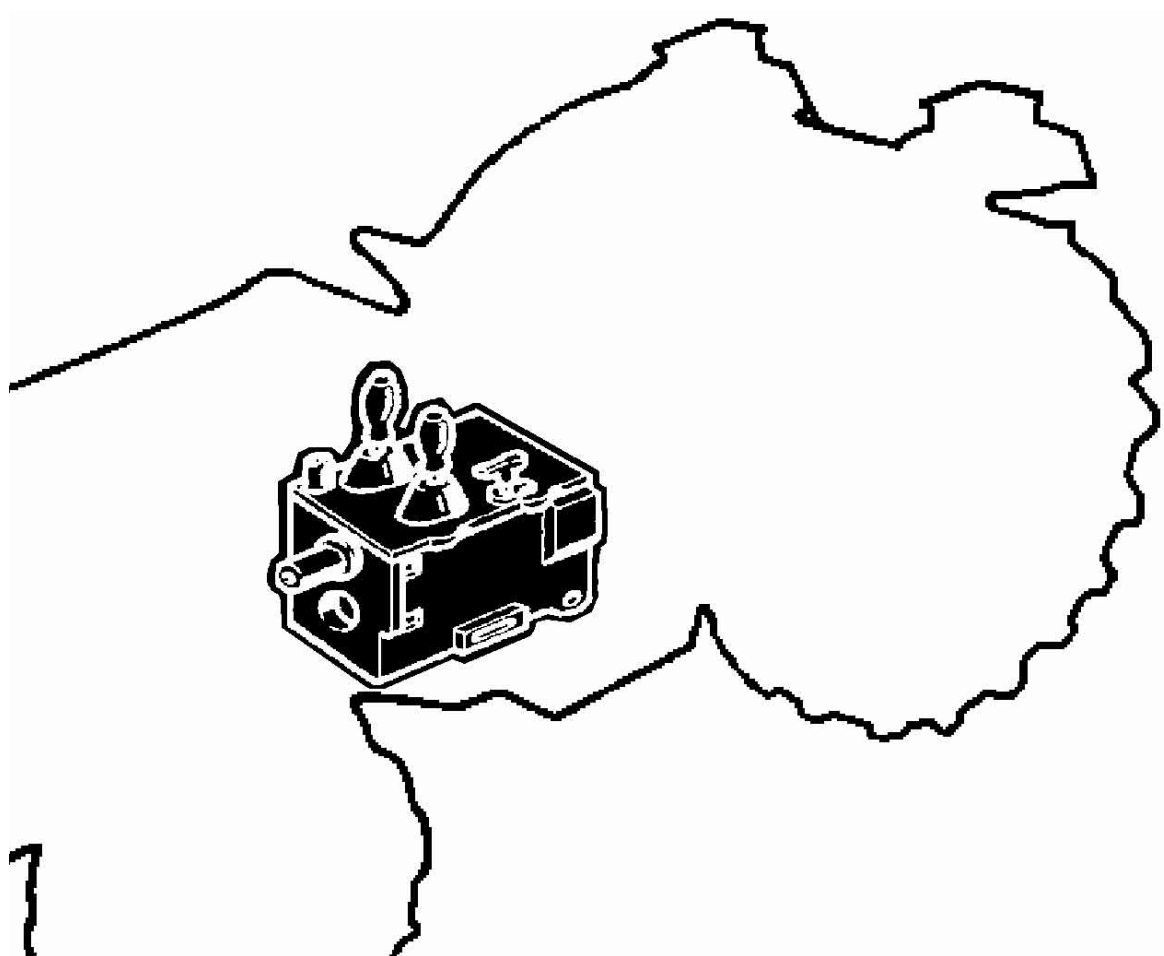
Do not forget to shim the reverse shuttle pulley shaft as illustrated in fig. 29.
The usual shimming is between 0.2 and 0.4 mm.

DRIVING TORQUES

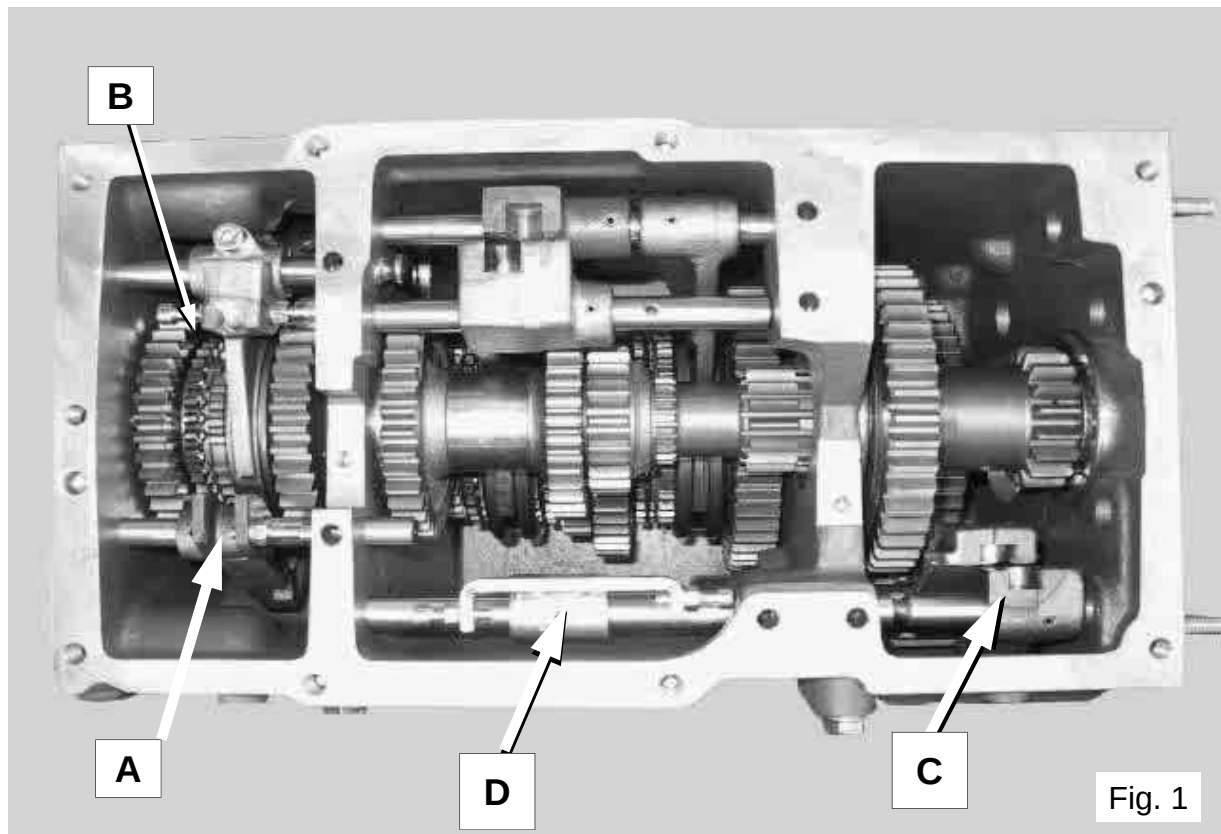
M 10 x30 screw that fixes the gearbox cover	54 Nm
M14x17 nut that fixes the clutch bowl-gearbox	89 Nm
M12x14.6 nut that fixes the gearbox-rear axle	74 Nm
M12x1.5 nut that fixes the gearbox-rear axle	147 Nm
M30x1.5 ring nut that fixes the transmission shaft	98 Nm
M35x1.5 ring nut that fixes the transmission shaft	98 Nm
M8x30 main shaft cover fixing screw	24 Nm
M8x16 retainer plate fixing screw	24 Nm
M16x140 bowl-engine flange fixing screw	196 Nm

GEARBOX

VALID FROM MACHINE n°: D528785



1



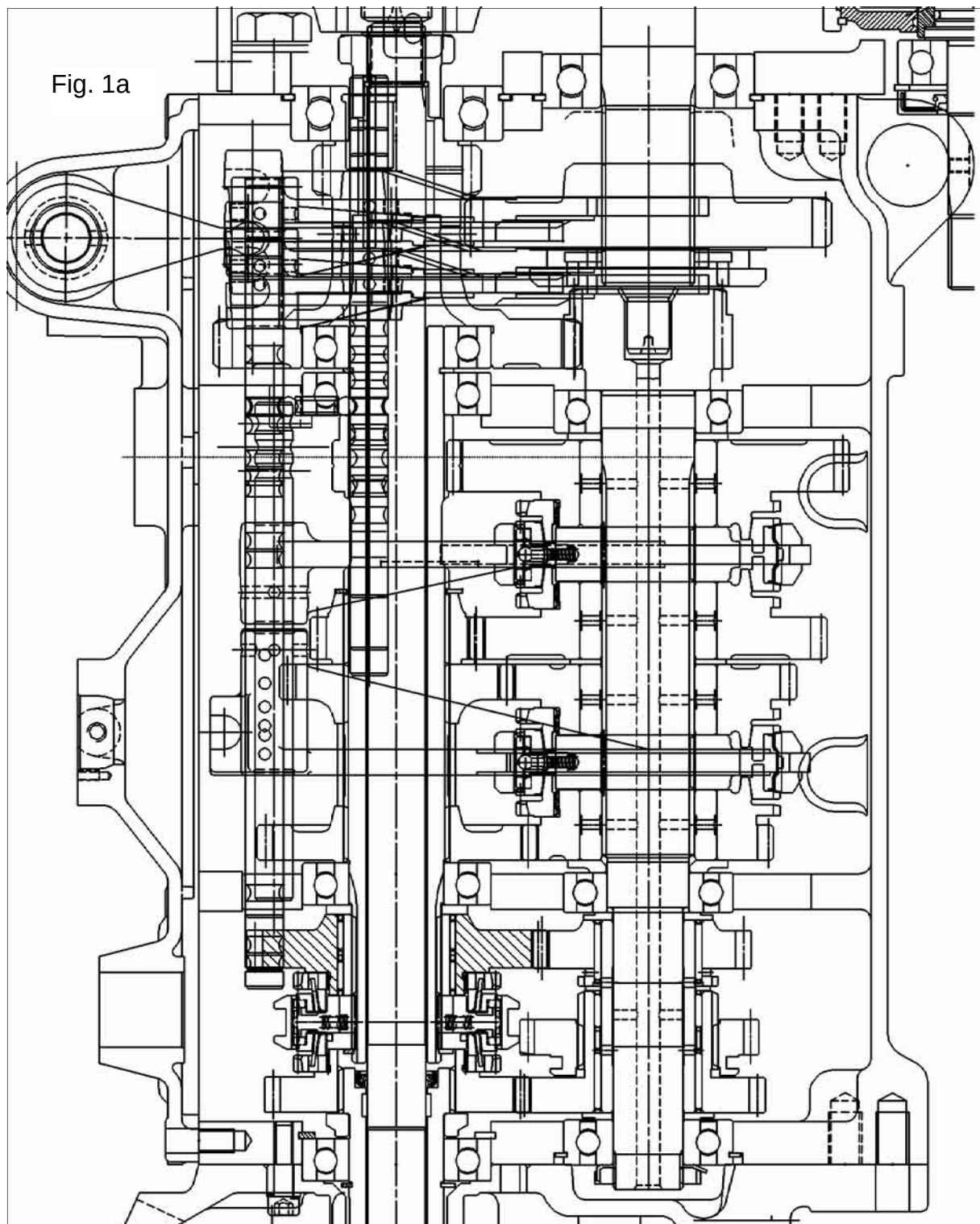
With reference to (fig. 1), the selectors indicated with the letter **C** are positioned as shown in the figure for machines with side levers.

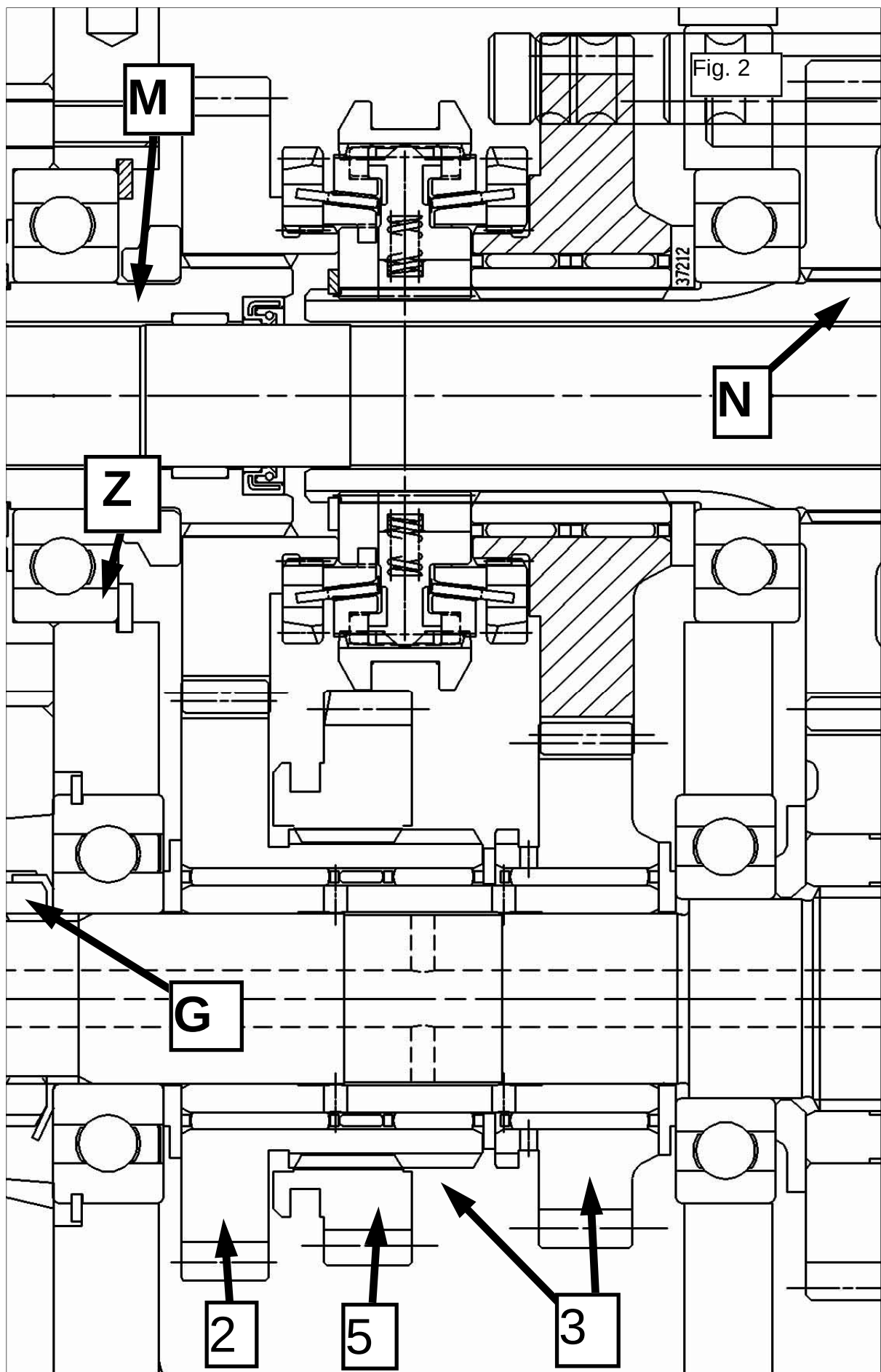
Consult the following descriptions when adjusting the end of travel screws.
The screw adjustments must prevent the levers from being pushed beyond the selector races when operated.

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.

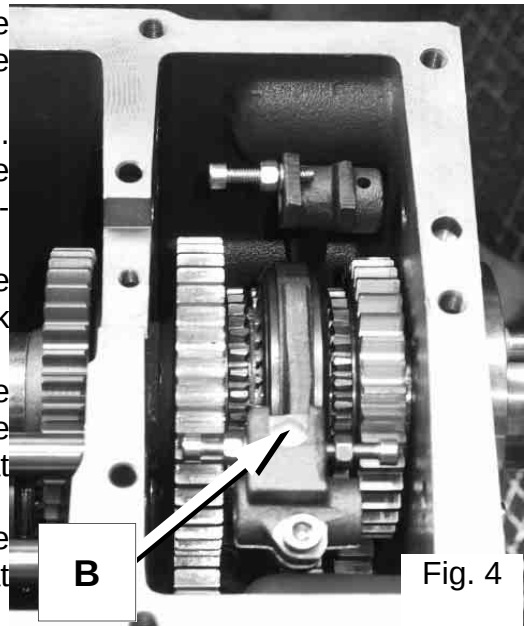


Fig. 4

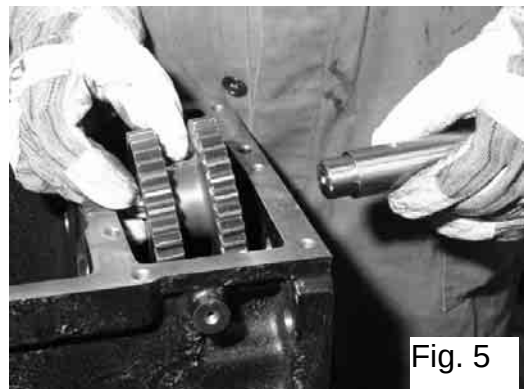


Fig. 5

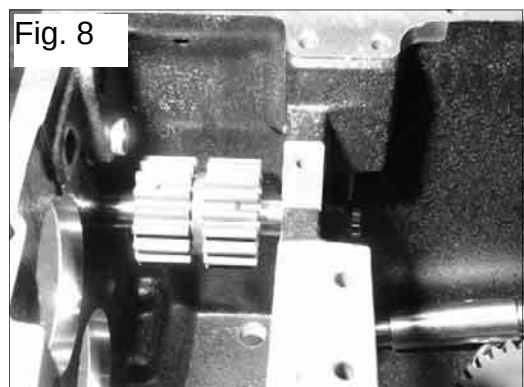
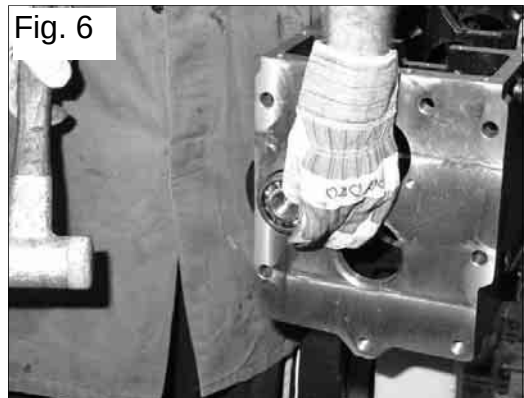


Fig. 8

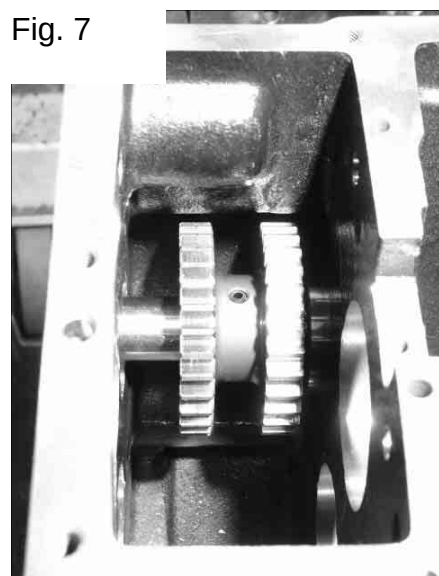


Fig. 7



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.

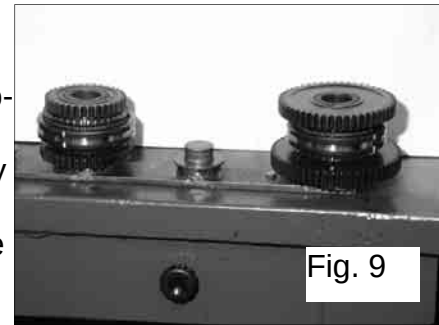


Fig. 9

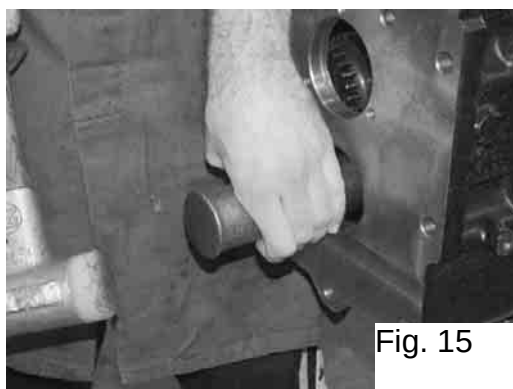


Fig. 15

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.

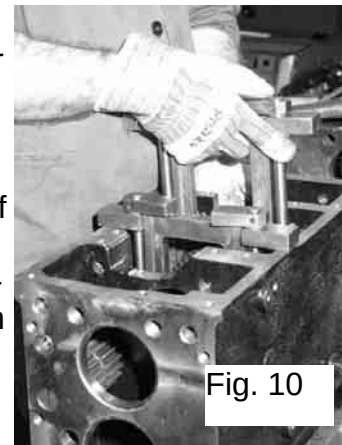


Fig. 10

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).

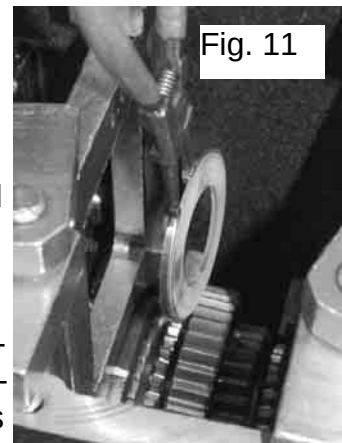


Fig. 11

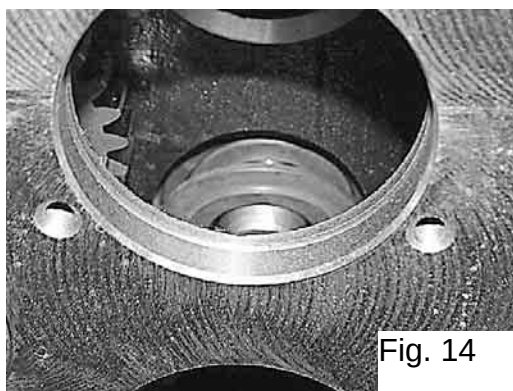


Fig. 14

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.

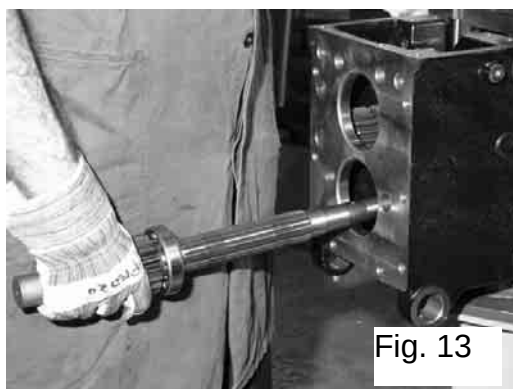


Fig. 13

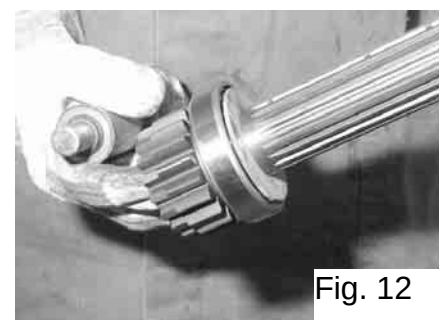


Fig. 12

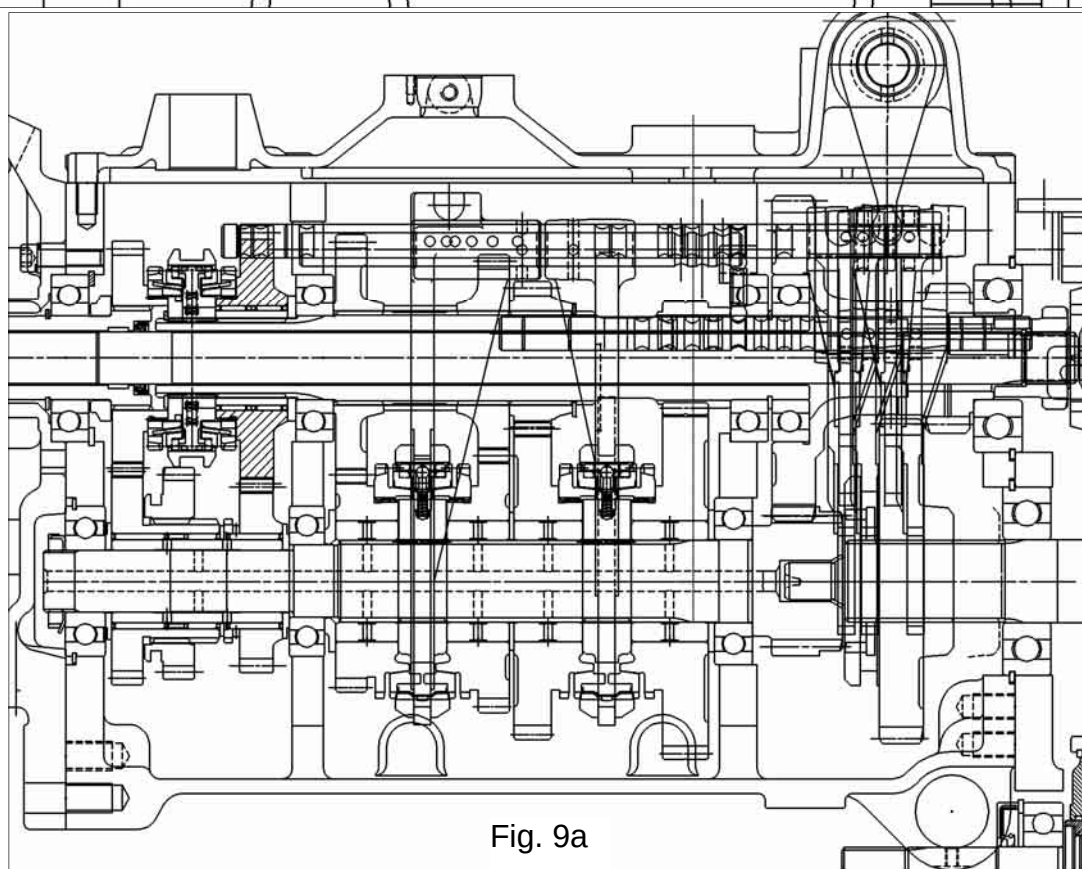
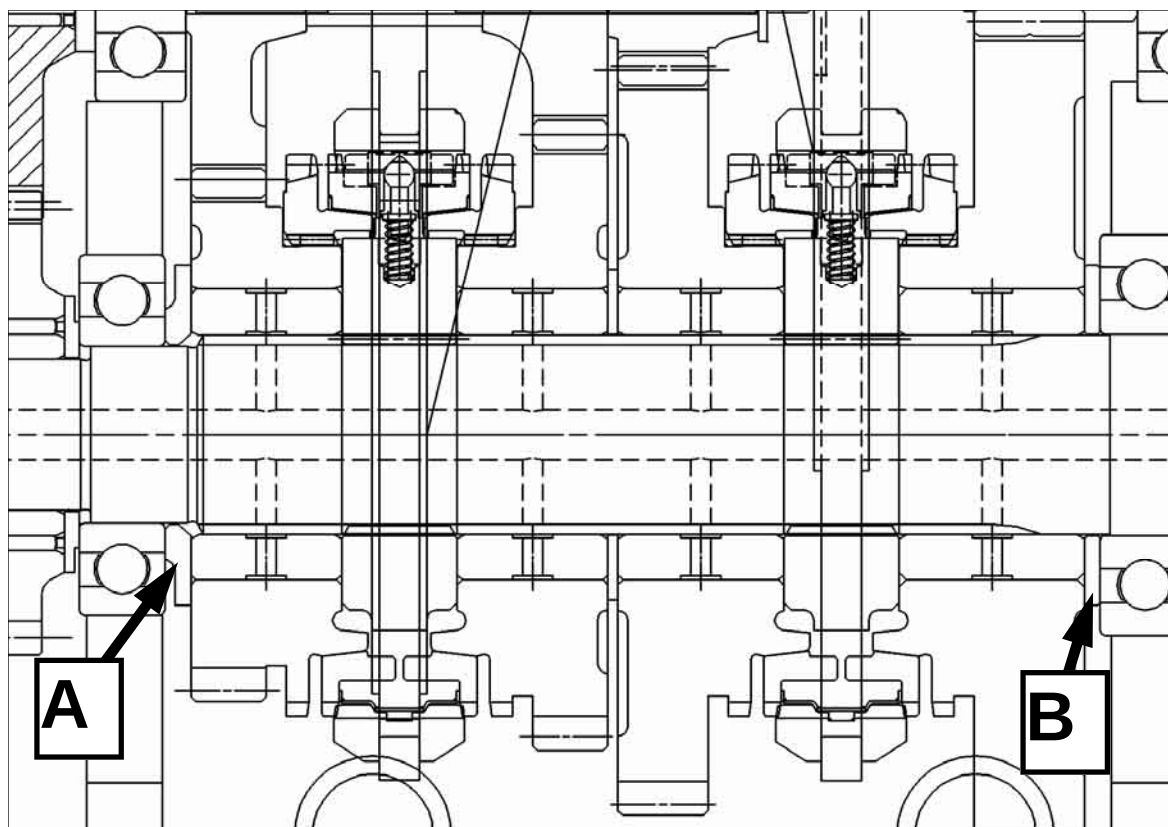


Fig. 9a

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.

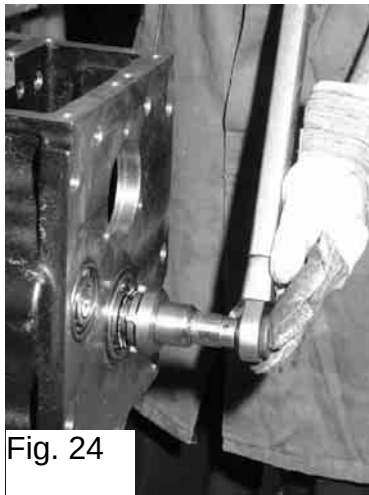


Fig. 24

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

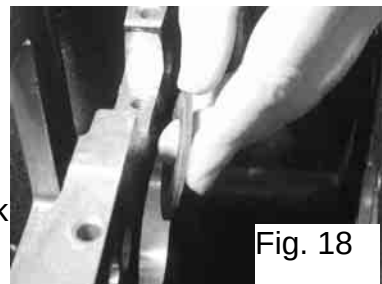


Fig. 18



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

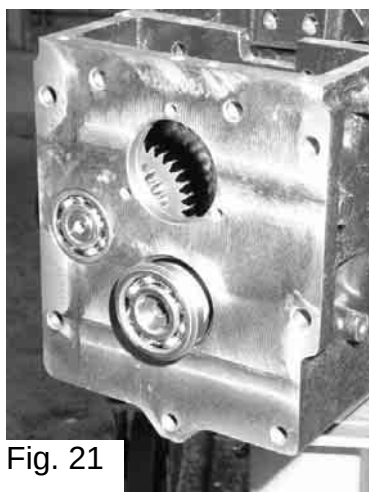


Fig. 21

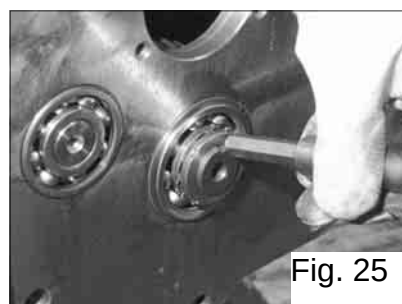


Fig. 25



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.

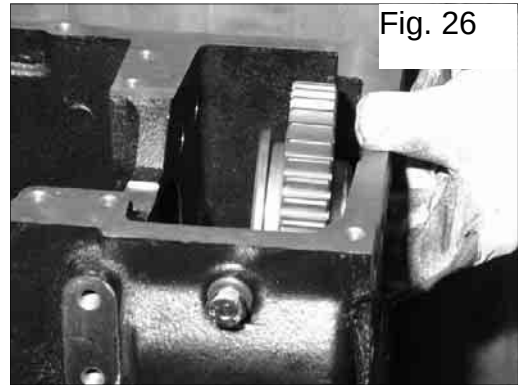


Fig. 26

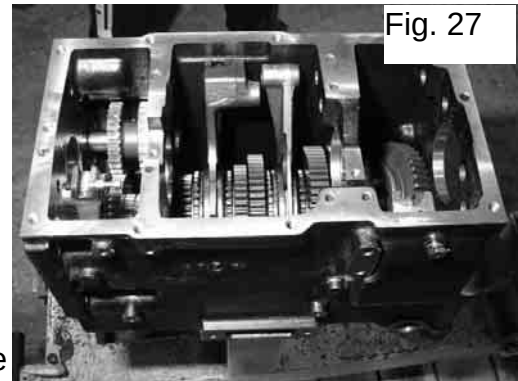


Fig. 27

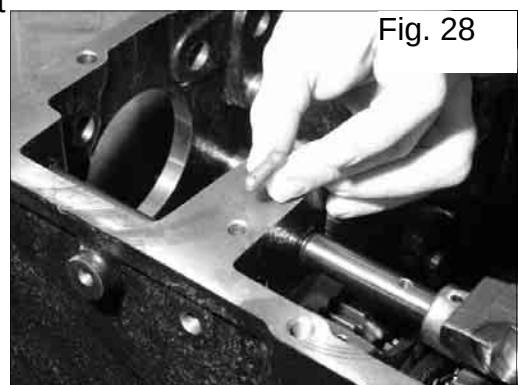


Fig. 28

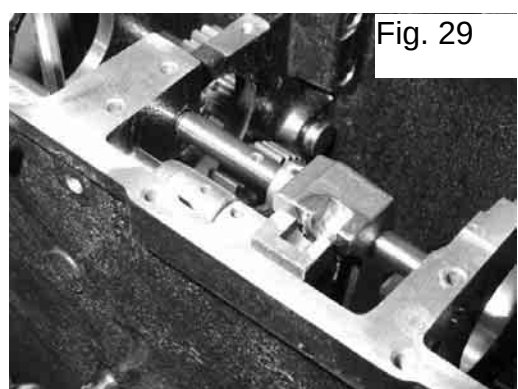


Fig. 29

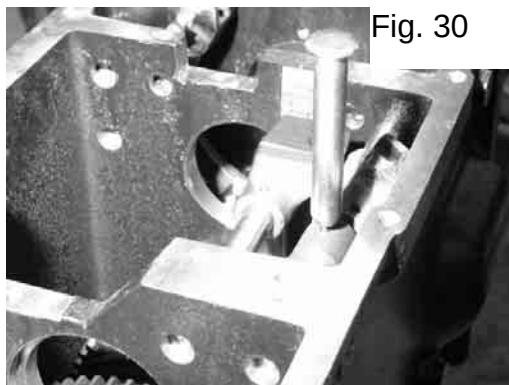


Fig. 30

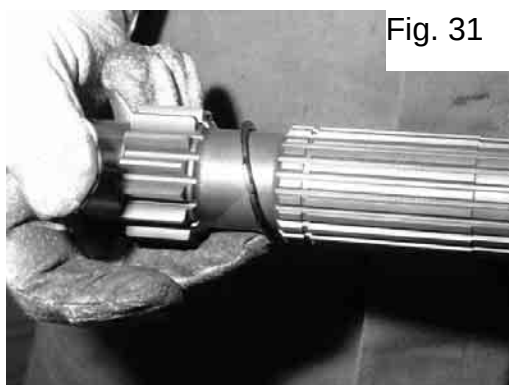
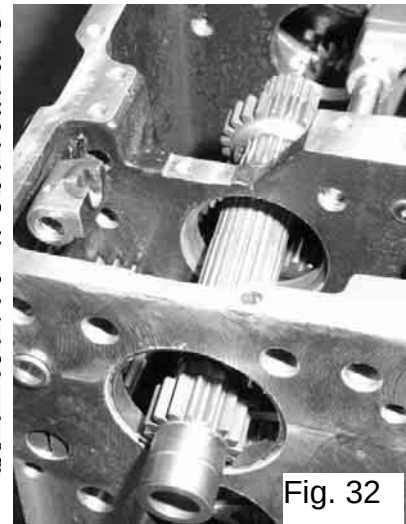
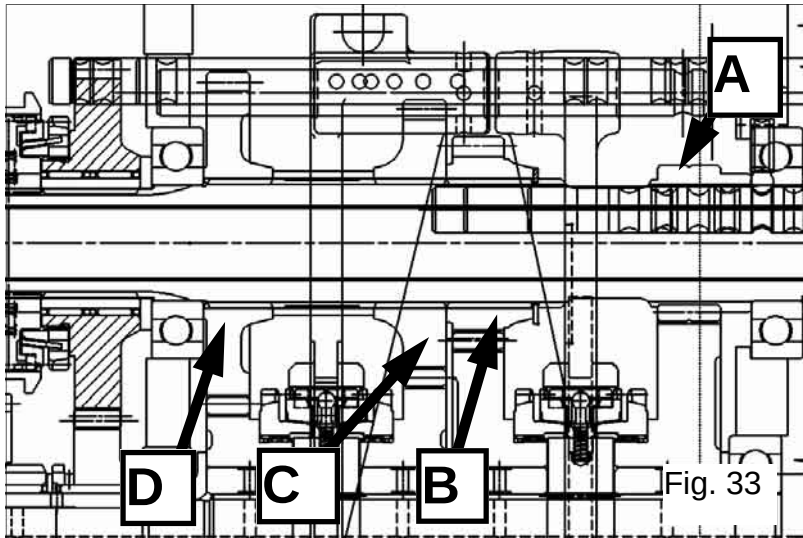


Fig. 31



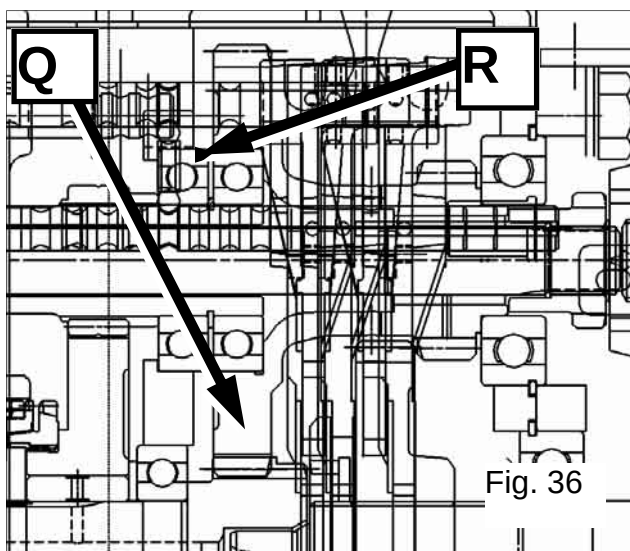
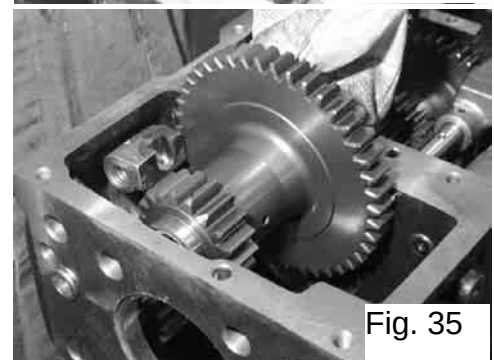
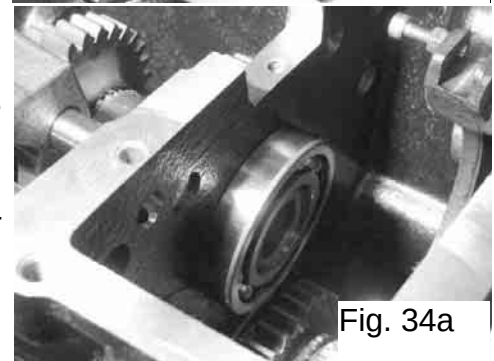
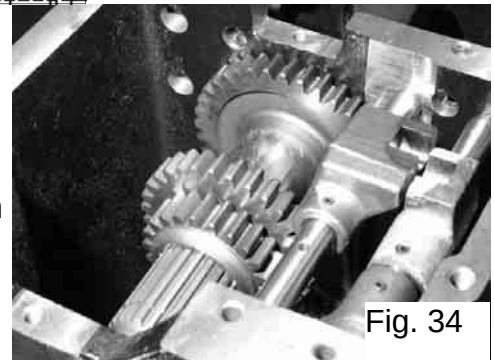
Insert the shaft (part **A** of Fig. 33) and move on to fit the gears **B-C** and **D** of Fig. 33. The gear **B** is held in position by the snap ring shown in the assembly drawing of Fig. 33. Sometimes it is necessary to insert spacers between the gear and the snap ring to position the band of gear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



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.

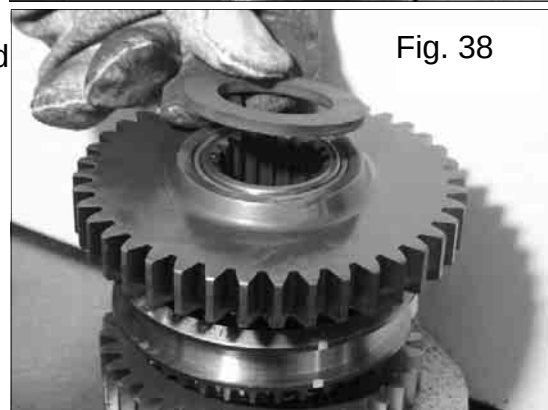


Fig. 38

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

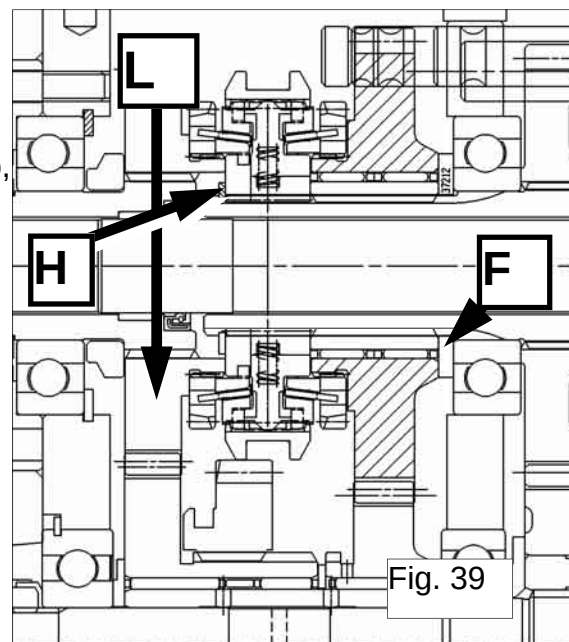


Fig. 39

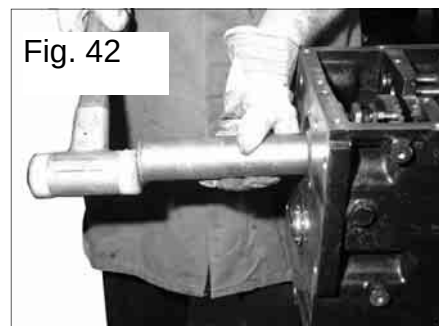


Fig. 42



Fig. 41

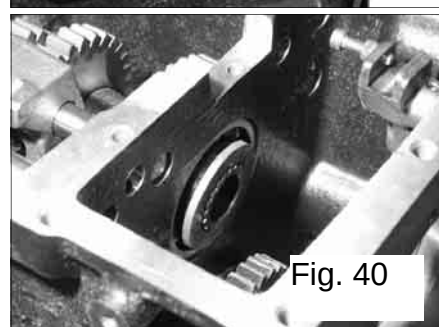


Fig. 40

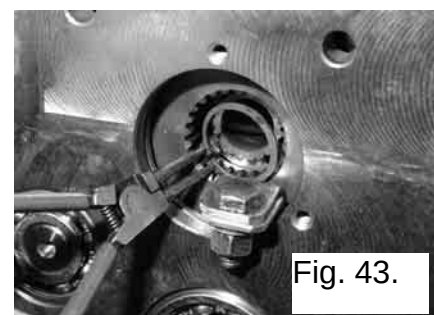


Fig. 43.

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.

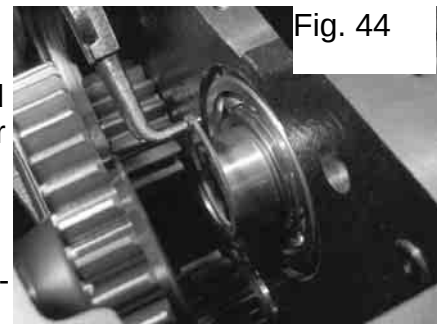


Fig. 44



Fig. 45

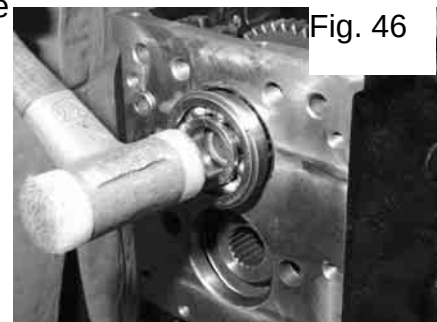


Fig. 46

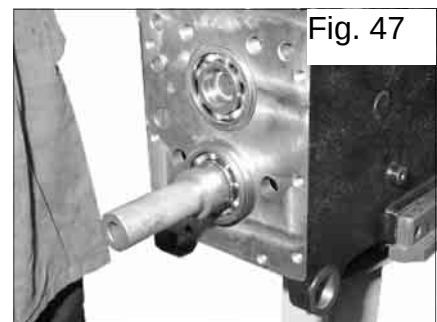


Fig. 47

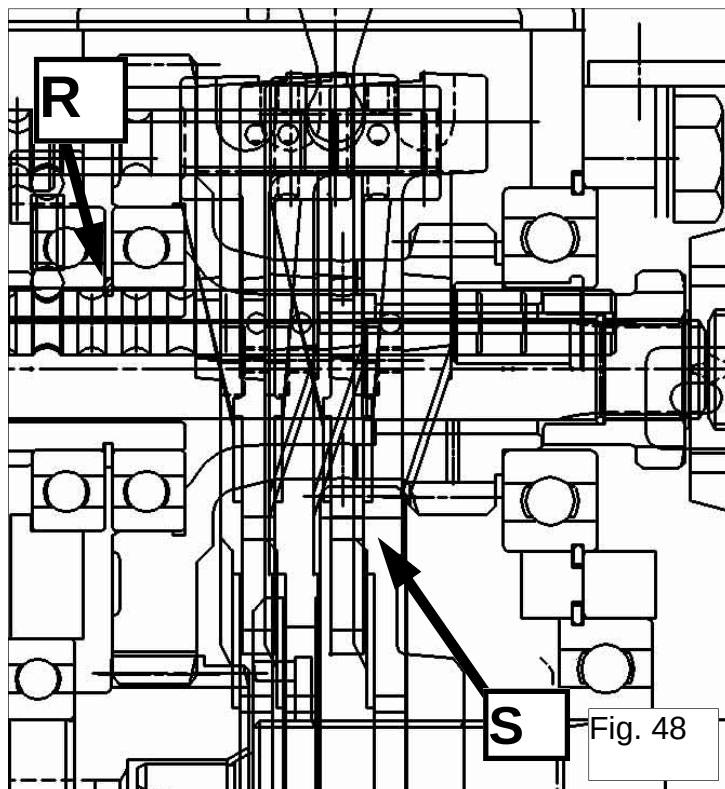


Fig. 48

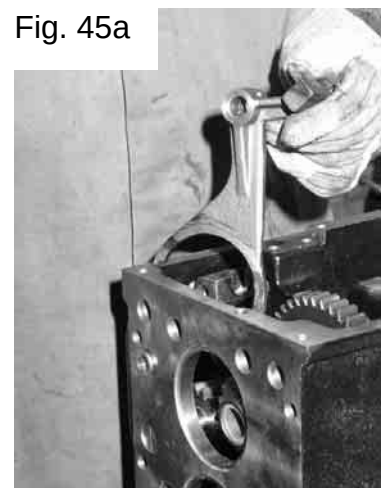


Fig. 45a

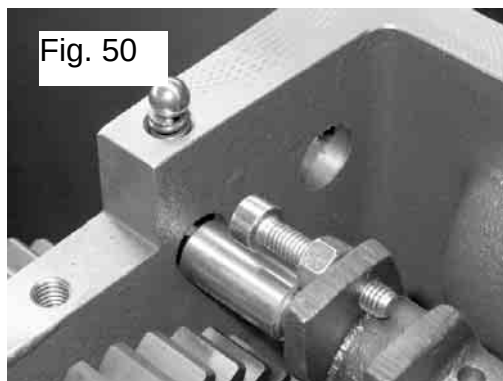


Fig. 50

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.

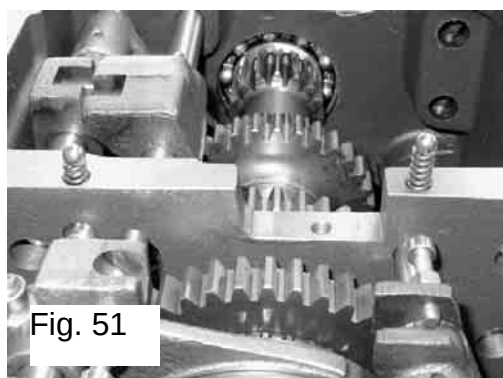


Fig. 51

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.

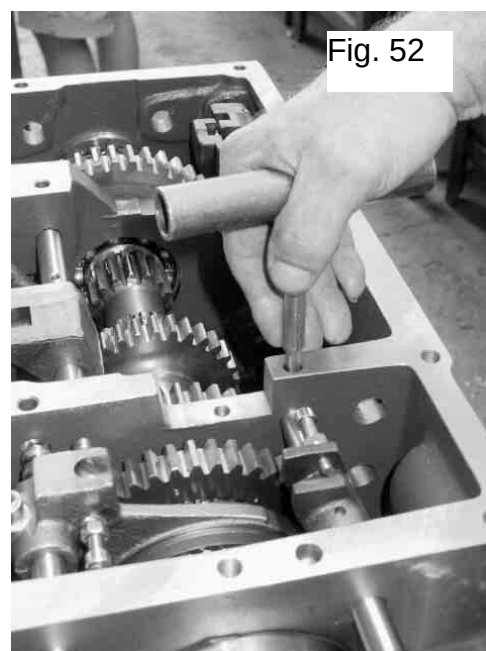


Fig. 52

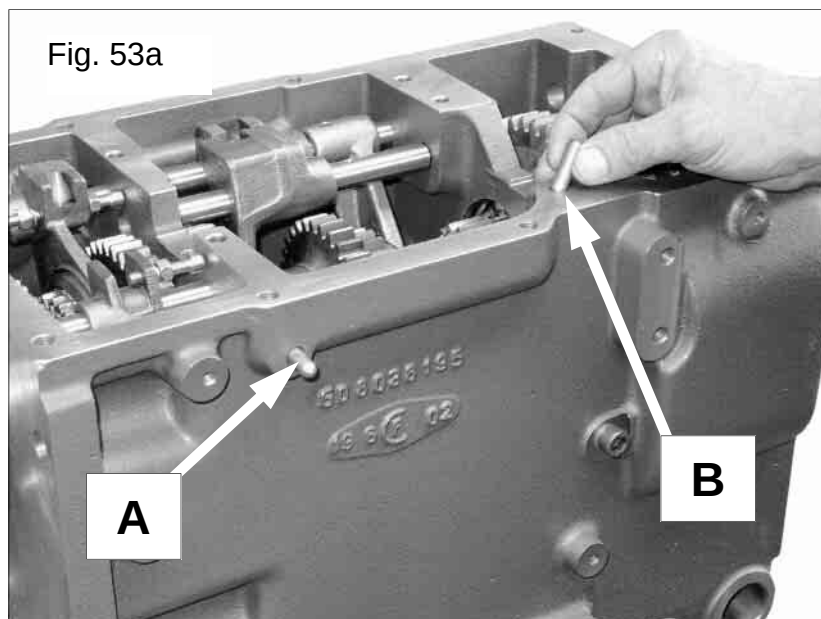


Fig. 53a illustrates the other retainers to install in the gearbox during the assembly phase.

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).

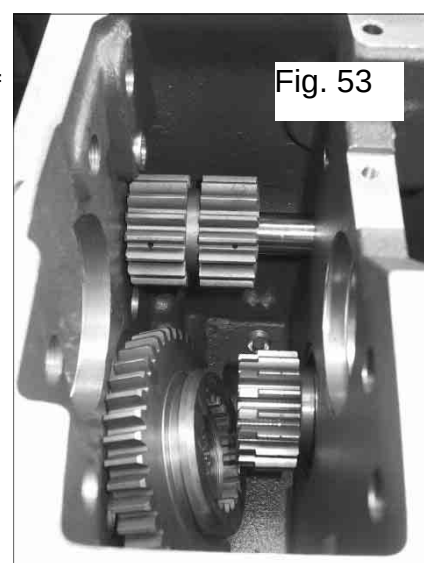


Fig. 54 illustrates assembling the final drive fork, which has been mentioned above. After fitting the reverse gear and the fork, you need to correctly direct the final drive fork as indicated in Fig. 54 to permit installing it correctly inside the casing.

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 couplings that govern engaging the reverse gear and the final drive, fitting



Fig. 55

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.

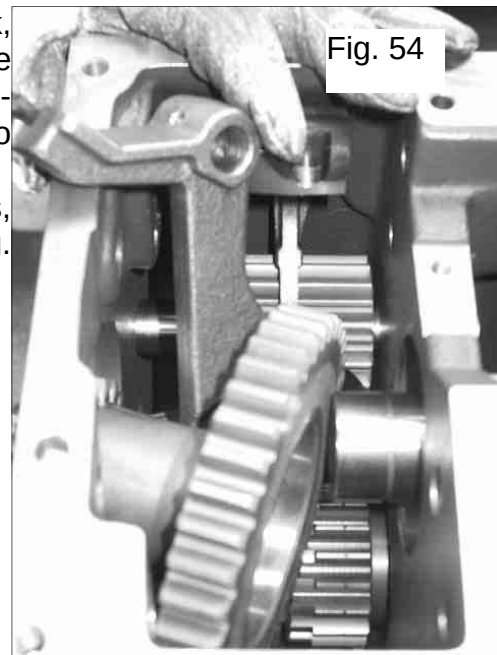


Fig. 54

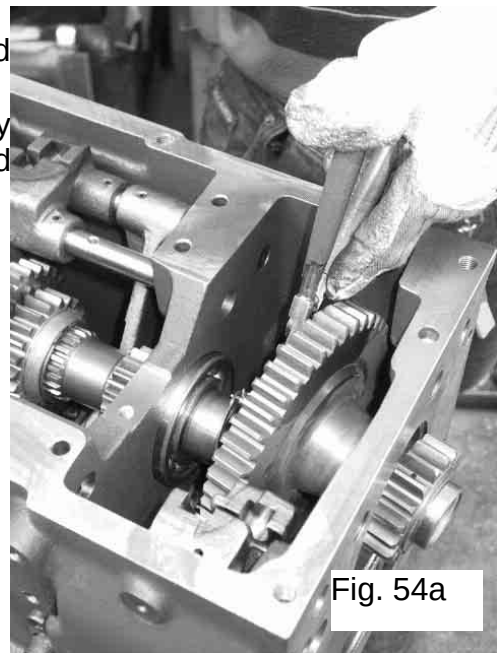


Fig. 54a

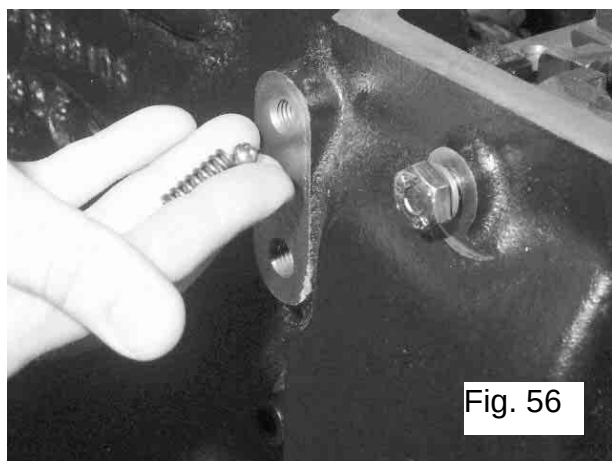


Fig. 56

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.

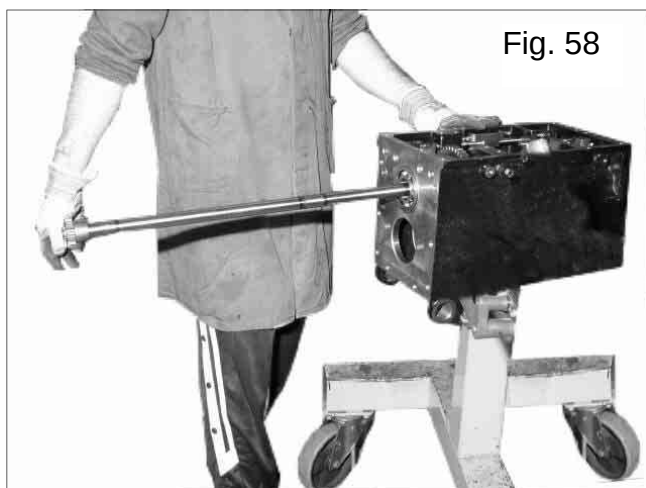


Fig. 58



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).

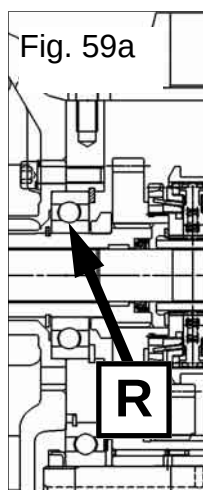


Fig. 59a

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.

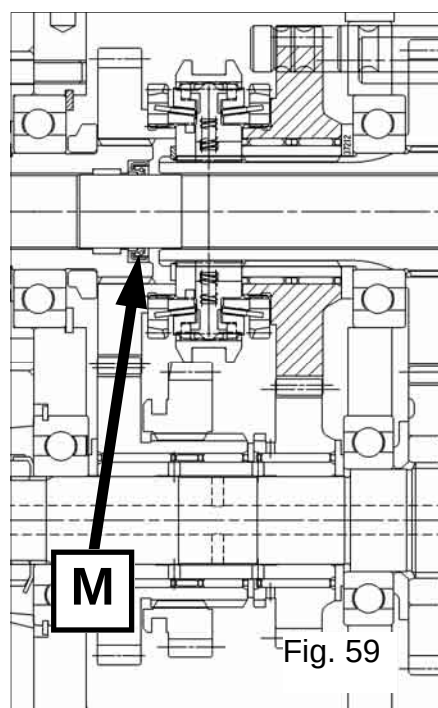


Fig. 59

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.

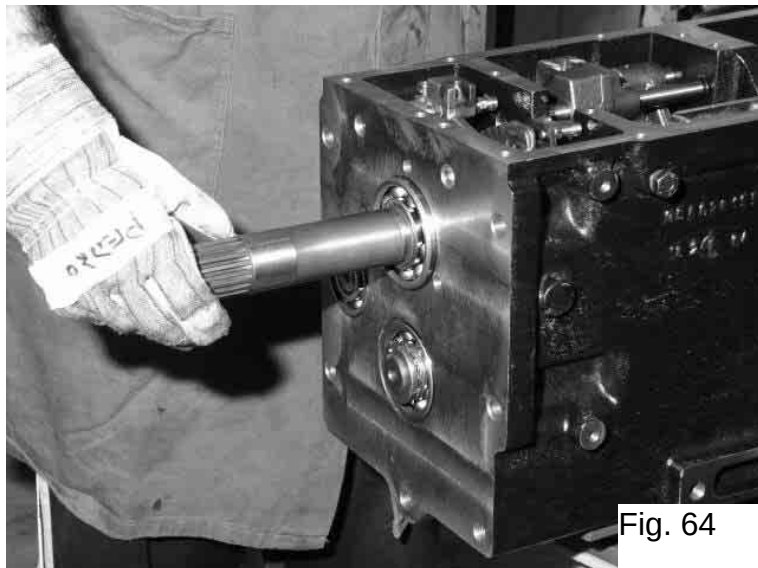


Fig. 64



Fig. 63

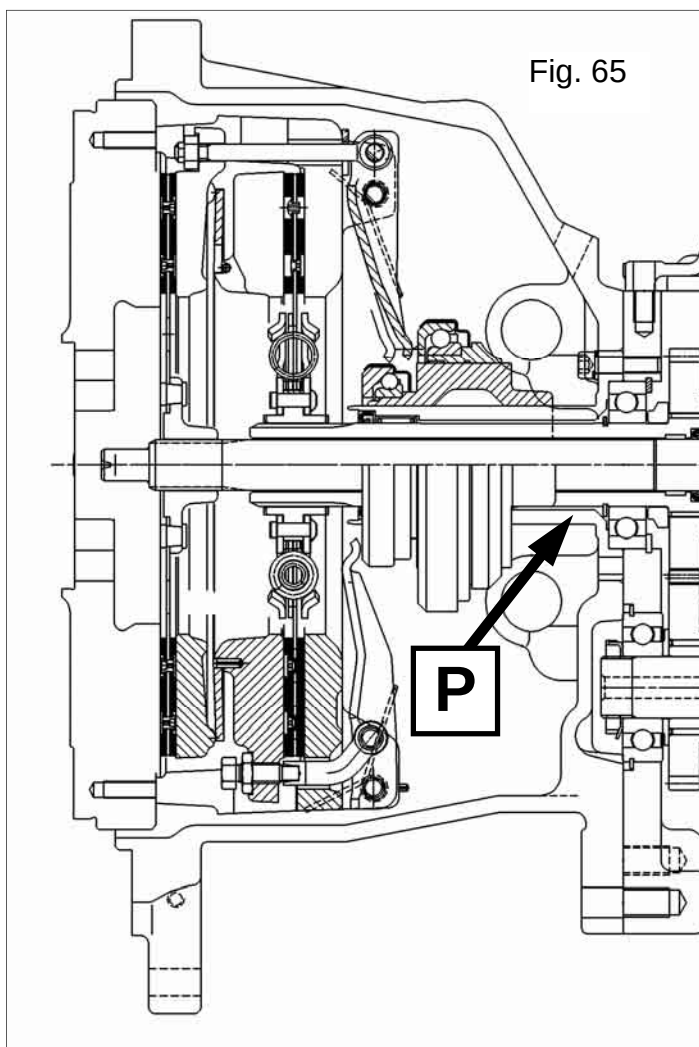


Fig. 65

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

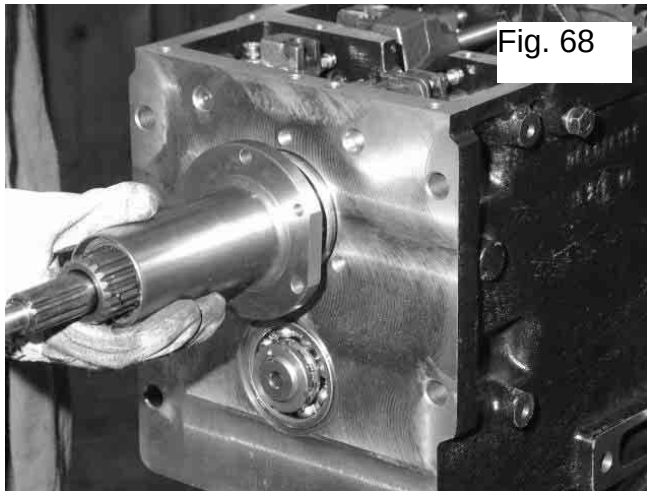


Fig. 68

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.

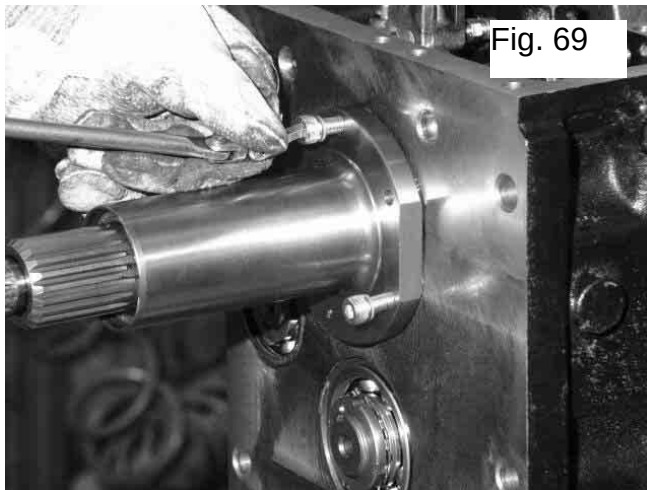


Fig. 69

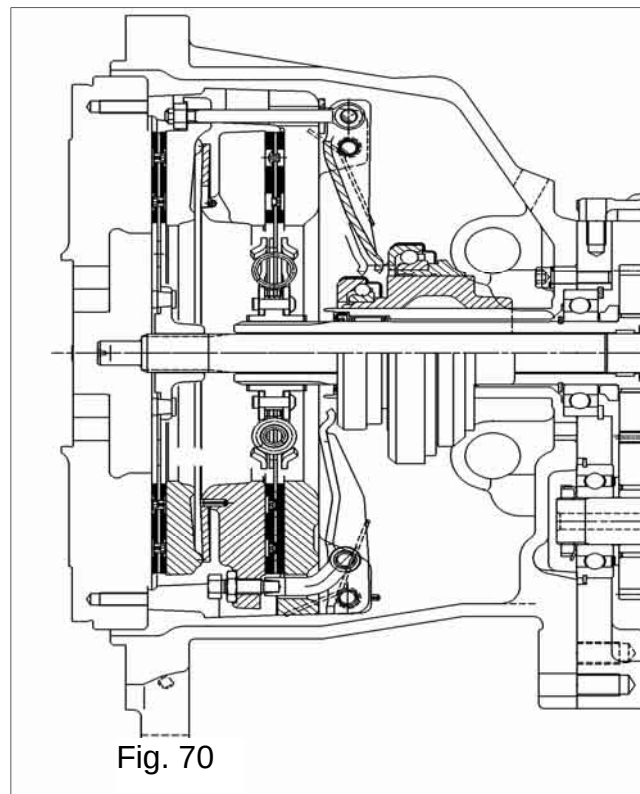


Fig. 70

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.

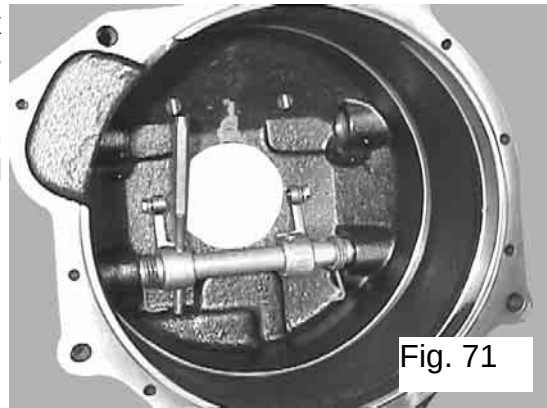


Fig. 71

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.

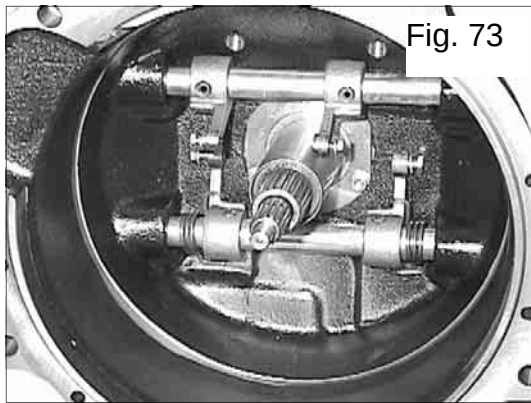


Fig. 73

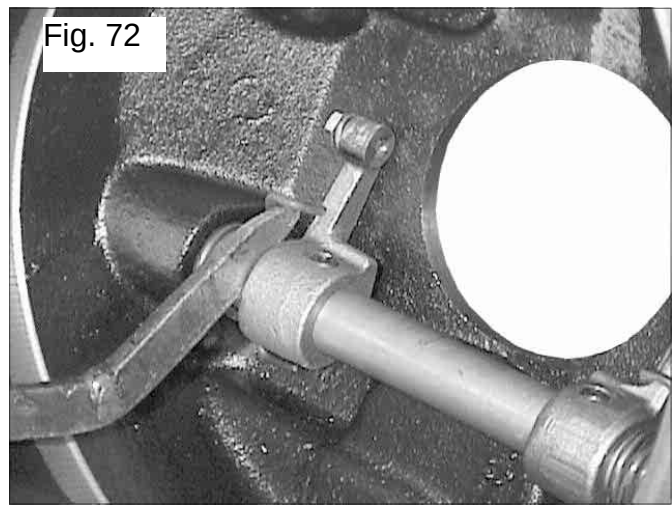


Fig. 72

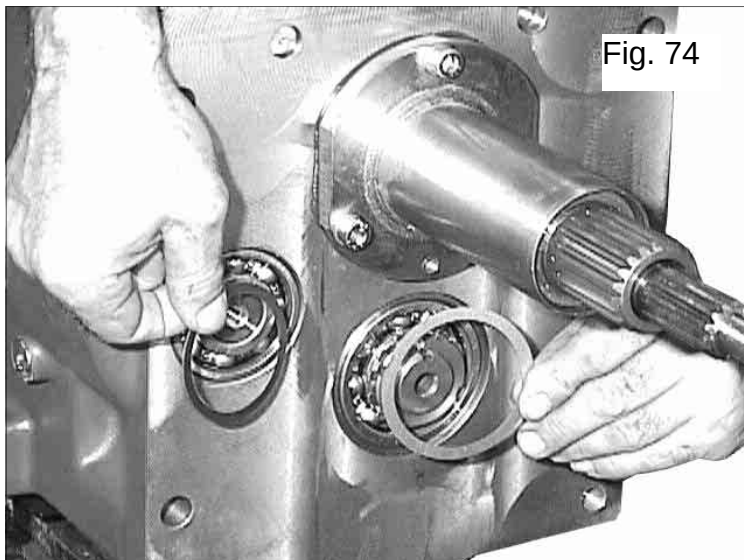


Fig. 74

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.

DRIVING TORQUES**kgm**

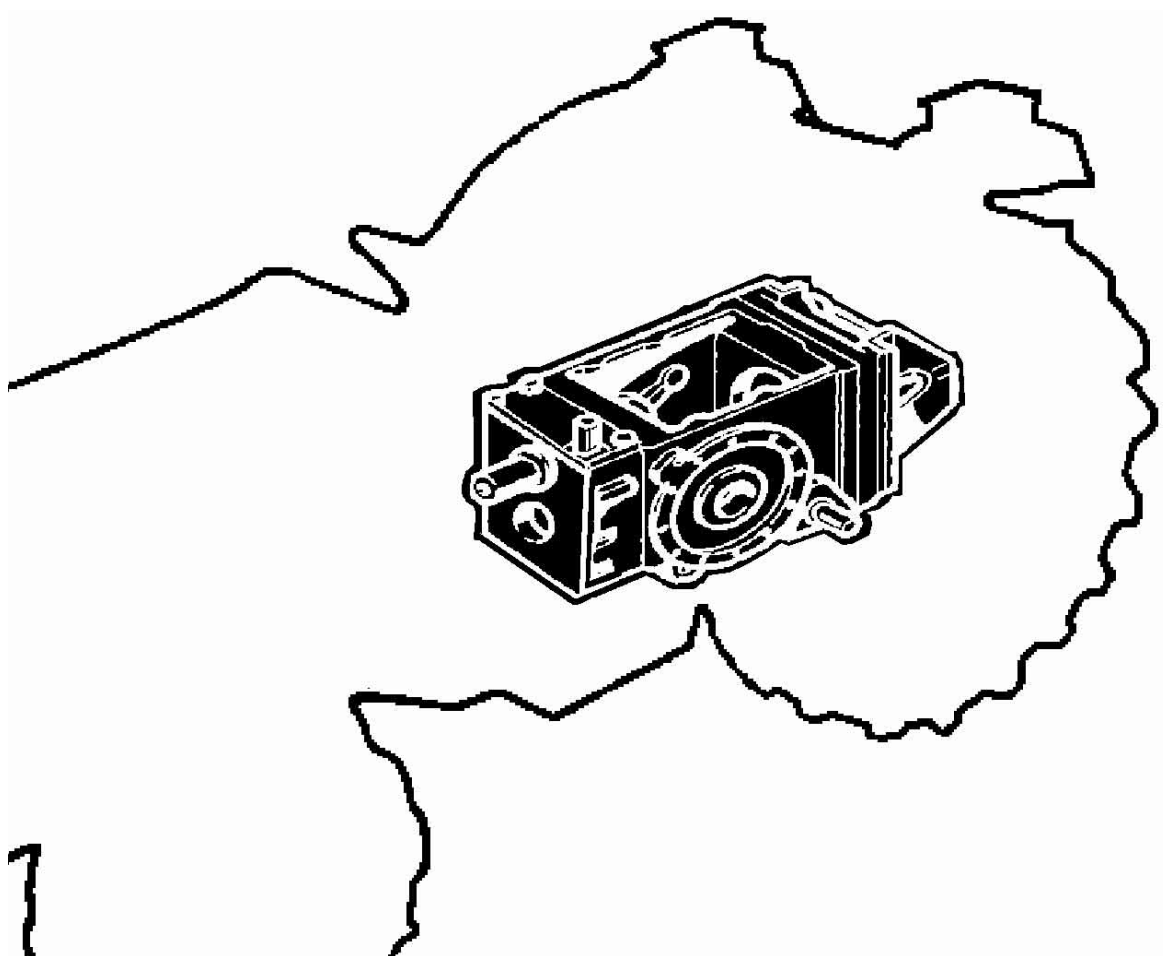
M 10 x30 gearbox cover fixing screw	5.4
M14 x 7 clutch bowl - gearbox fixing nut	8
M12 x 4.6 gearbox - rear axle fixing nut	7.4
M12 x1.5 gearbox - rear axle fixing screw	7
M 30x1.5 transmission shaft fixing ring nut	10
M 35x1.5 transmission shaft fixing ring nut	10
M 8x30 main shaft cover fixing screw	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

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 DIFFERENTIAL



REAR DIFFERENTIAL ASSEMBLY

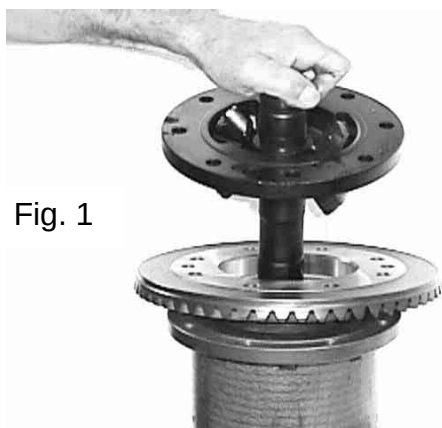


Fig. 1

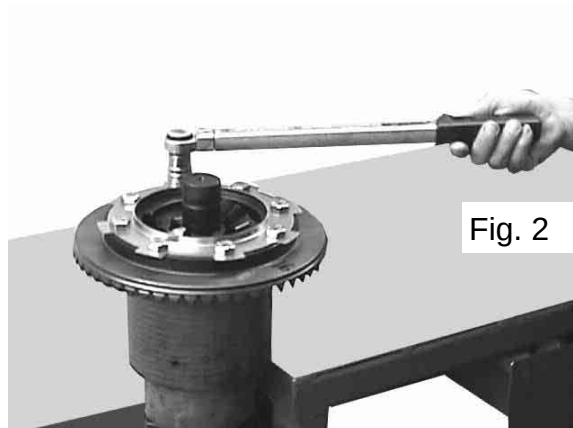


Fig. 2

The first operation required involves premounting the planetary gears and ring bevel gear as illustrated in figures 1 and 2 .

Mount the retainer plate of the screws that fix the bevel gear pair to the central shaft of the differential as shown in fig. 2, tightening the screws to a 70 Nm torque value and clinching the plate around the screws with the aid of a chisel.



Fig. 3

Using a plug, pre-mount the bearings on the crown wheels as shown in fig. 3.

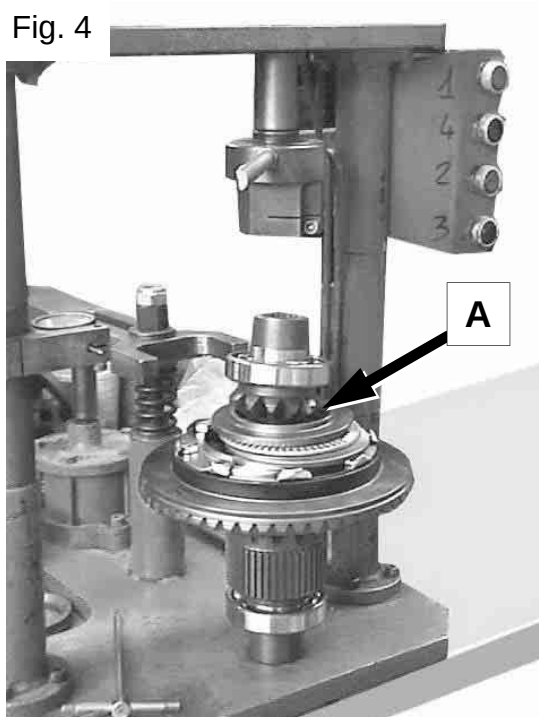


Fig. 4

To obtain the right play value between the crown wheel and planetary gear, which must be between 0.07 and 0.15 mm, use a special tool to establish the mounting conditions of the differential and determine shim **A** of fig. 4, which allows the correct play to be obtained. If this tool is not available, proceed by attempts inside the housing and try out various shims **A** of fig. 4 in order to find the right one.

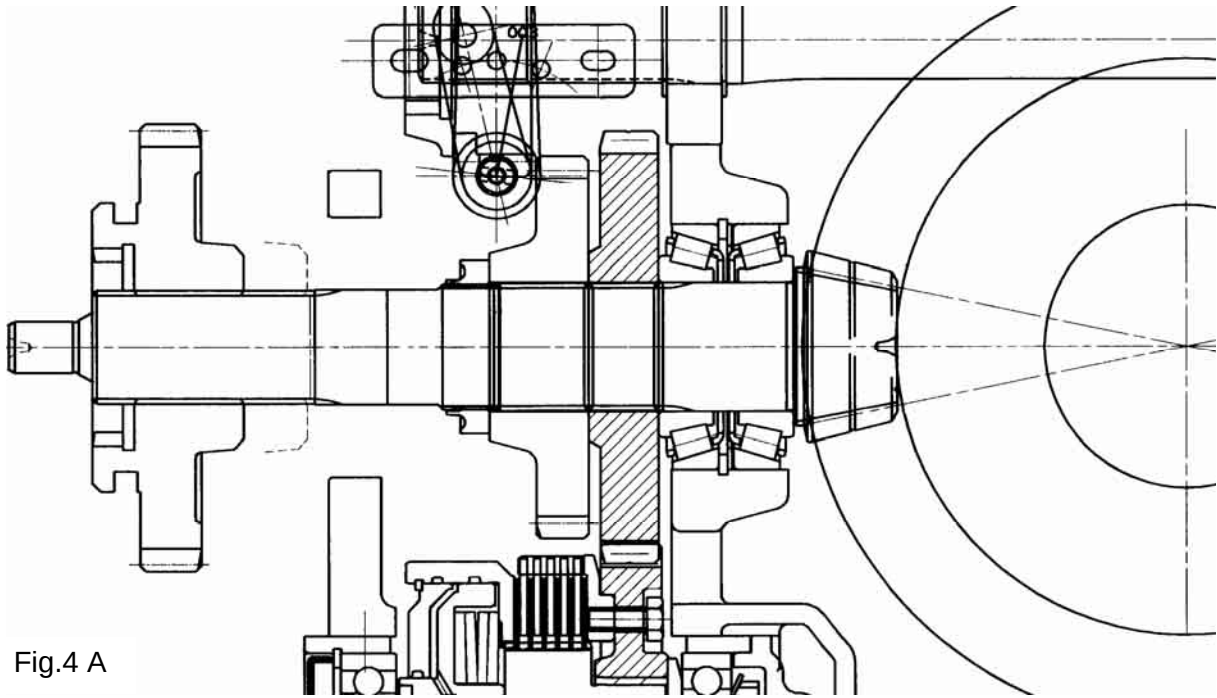


Fig.4 A

Fig. 4A illustrates the assembly layout of the bevel pinion with the two taper bearings and the ring nut that preloads the taper bearings themselves.

The play adjustments of the crown wheels and planetary gears and of the rear bevel gear pair are added when the rear differential assembly is mounted.

The explanations in the following pages show how these adjustments are carried out, checking to make sure that the correct meshing play remains in all conditions throughout the entire circular extent of the gear.

Thus, without having to repeat the concept, when checking the play of a bevel gear pair is mentioned in the text, it means checking the entire circular extent of that gear.

Using the press shown in fig. 5, load one of the taper bearings (the one behind the pinion end) that position the bevel pinion to a value that corresponds to the assembly one (ring nut that fixes the bevel pinion tightened to a 40 Nm torque value).

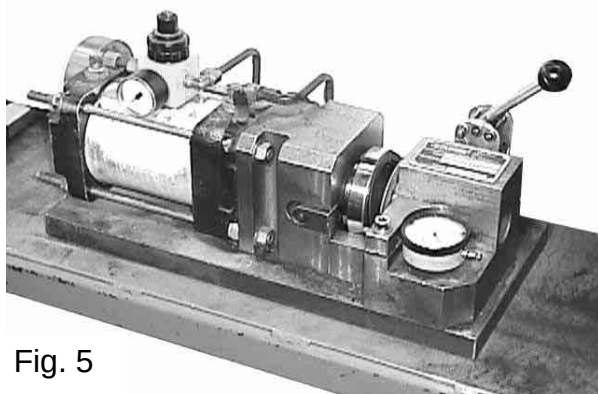


Fig. 5

In these conditions, which correspond to those of assembly, the shimming required behind the taper bearing is determined so as to correctly position it in relation to the bevel gear pair and to obtain the right meshing play.

NOTE: If the machine is demounted, all the spacers will have already been determined, thus these operations will not have to be repeated.

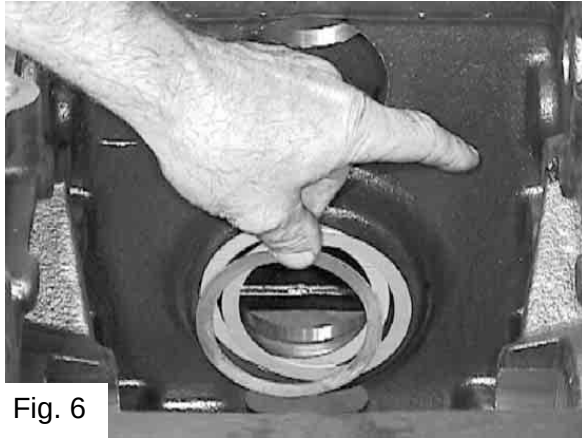


Fig. 6

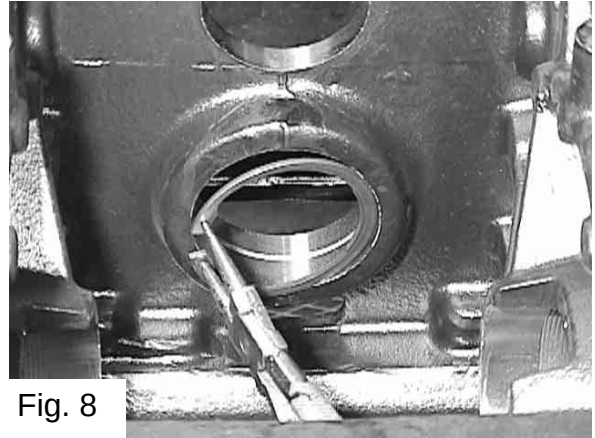


Fig. 8

Fig. 6 to 8 illustrate the assembly sequence beginning with the circlip through to shim positioning, on to the taper bearing housing and lastly, the bevel pinion shaft with the internal part of the taper bearing pre-mounted.

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

Make sure that the bearing reaches right on to the rear of the bevel pinion end: this ensures that the pre-determined shimming seats the pinion in the right position.

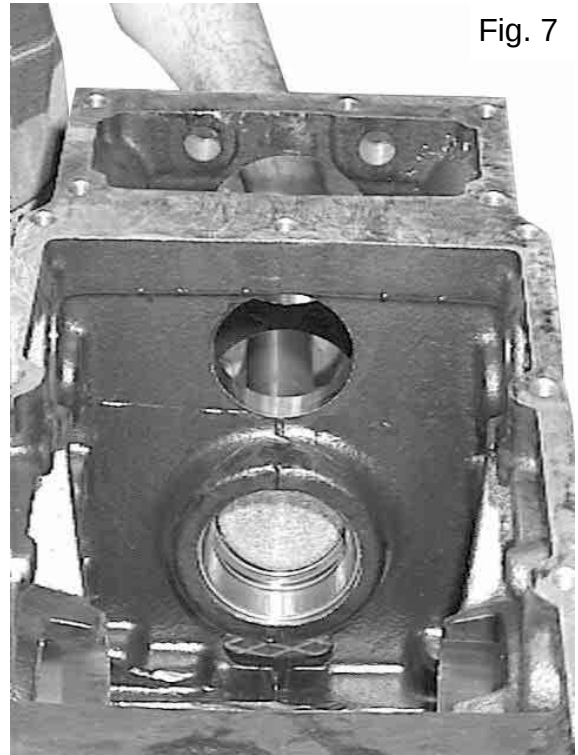


Fig. 7

Fig. 9 shows how the pinion is mounted in the differential housing.

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

Position the gears on the shaft and tighten the ring nut to a 40 Nm torque value as illustrated in fig. 10, complying with the following procedure:

After having fully tightened the ring nut to pack everything down using two large wrenches as shown in fig. 10, loosen the nut about one quarter of a turn then tighten again to a 40 Nm torque value.

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

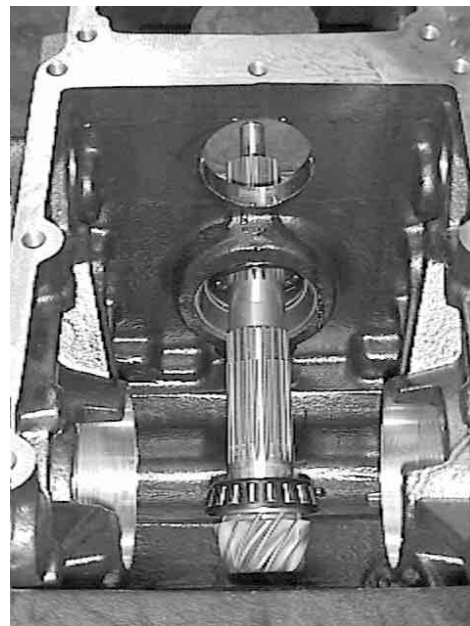


Fig. 9



Fig. 10

Once the bevel pinion has been mounted and the ring nut tightened, check to make sure that the pinion turns but that it is not too loose. If everything has been bedded correctly, rotation occurs but a certain torque is needed.

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

Fig. 11

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

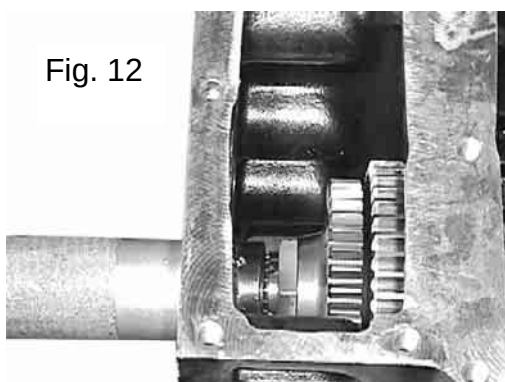


Fig. 12



Tap the bearings as illustrated in fig. 12.
Fully tighten the lh ring nut, annulling the play between the bevel pinion and bevel gear pair.

Now unscrew the lh ring nut (fig. 13) by 4 positions using the M6 hole on the differential housing of fig. 14 (part **A**) as a reference.
Fully tighten the ring nut on the rh side also.
Measure the misalignment of the ring gear with the aid of a comparator placed on the root of the tooth as illustrated in fig.15. If misalignment throughout the entire circumference is within 0,15mm, proceed with the successive phases.

Unloose the right ring nut of 5-6 notches from the hole of M6 (part **A** of pict. 14); beat with a plastic hammer on bearing **B** of pict. 16 to the external. Also beat on the bedding satellite.

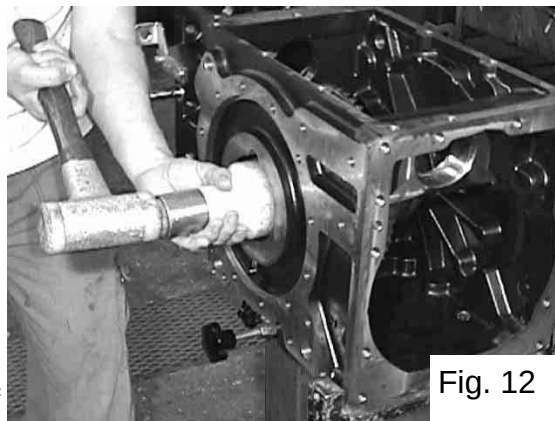


Fig. 12

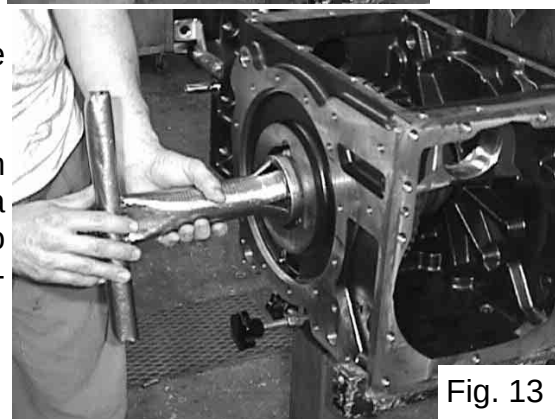


Fig. 13

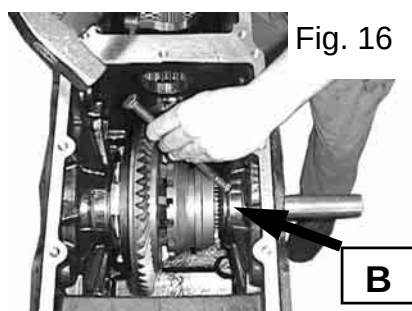


Fig. 16

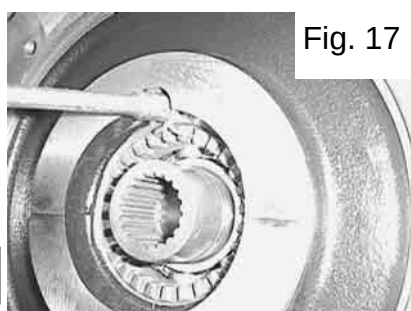


Fig. 17

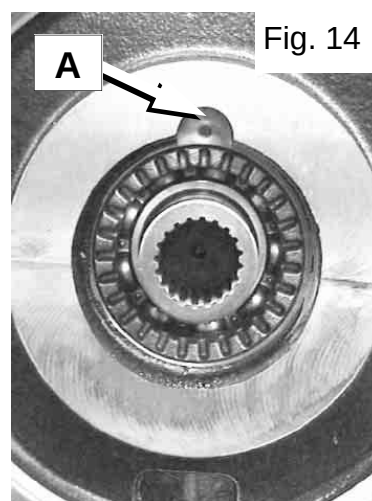


Fig. 14

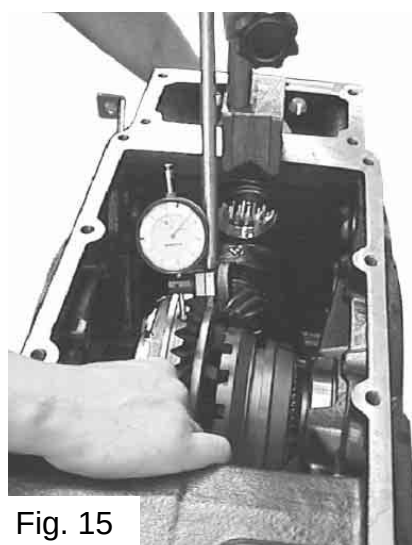


Fig. 15

The planetary leans on the ring nut, so verify that there is a clearance between 0,07 and 0,15 releasing the pression between pignon and ring bevel gear; check again that the pignon and the ring bevel gear turn with the correct mesh.

Mount the plates and the setscrews of the ring nut as shown in pict. 17.

In order to change the mesh clearance between pignon and ring bevel gear, operate on the left ring nut.

To complete the rear differential, mount the components of the rear part of the PTO and differential lock.

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

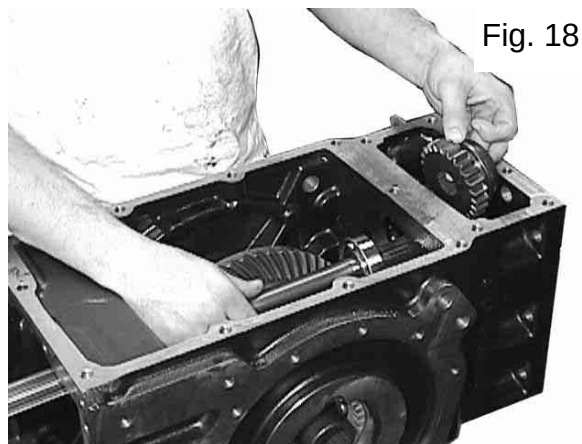


Fig. 18

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

Now mount the external PTO selector lever, checking with the position of the fork inside the adjuster casing of the external selection plate (fig. 20 A).

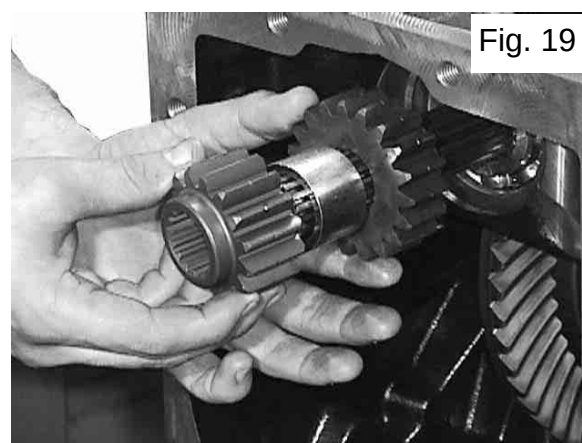


Fig. 19

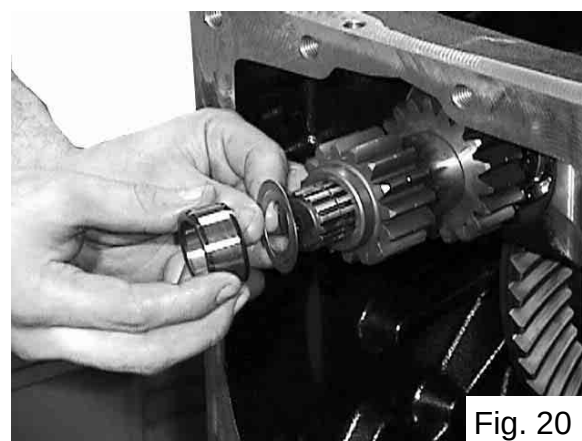
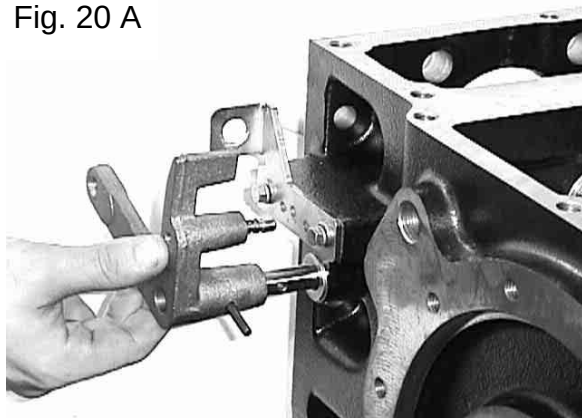


Fig. 20

Fig. 20 A



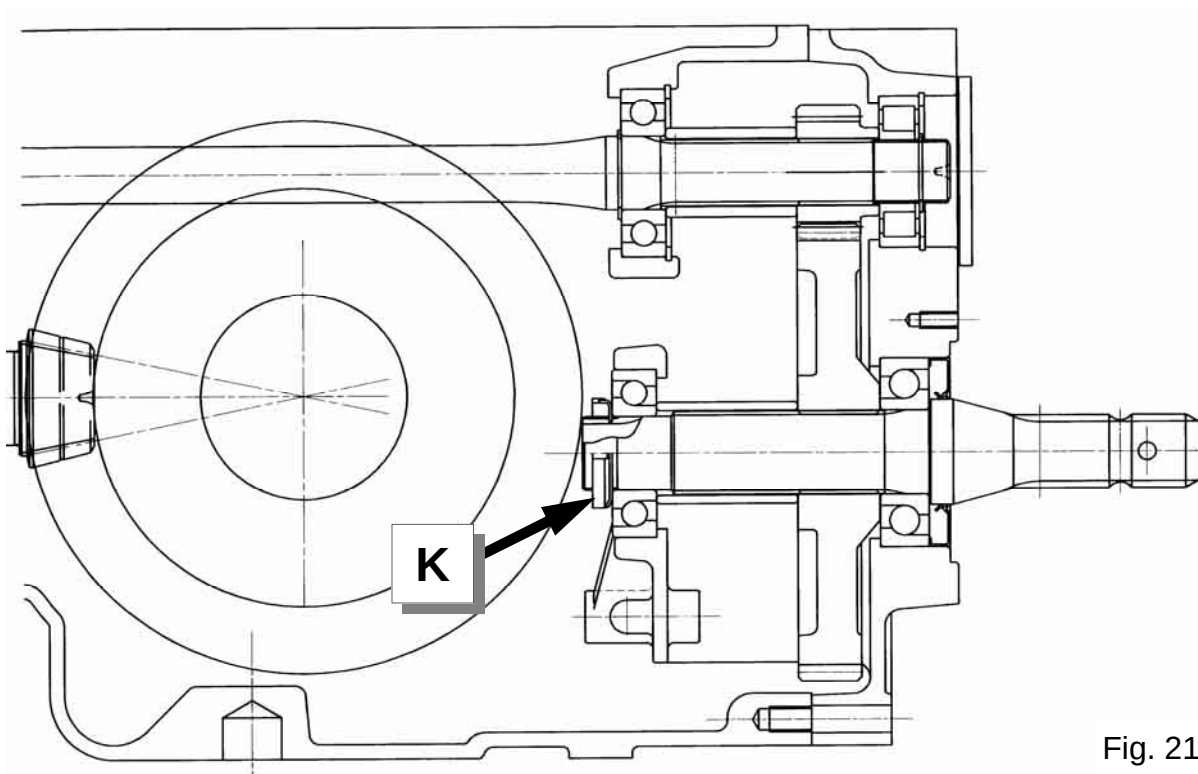


Fig. 21

Once the bearing has been pre-mounted on the upper PTO shaft, proceed by mounting the rear head which can carry the double PTO speed function or the single one as illustrated in fig. 21.

Before coupling the PTO head to the differential housing, tighten ring nut **K** of fig. 21 to a 24 Nm torque value and punch.



Fig. 22 To conclude the assembly of the rear differential housing, mount the diff lock control rod as illustrated in fig. 22 and 23.

Oil the rod on which the O-rings will be inserted. Carefully fit the rod into its housing. As it is inserted, make sure that the O-Ring does not become pinched as shown in fig. 23.

When assembling, make sure that 1.5-2 mm remain between the diff lock ring and the teeth mounted on the ring gear.

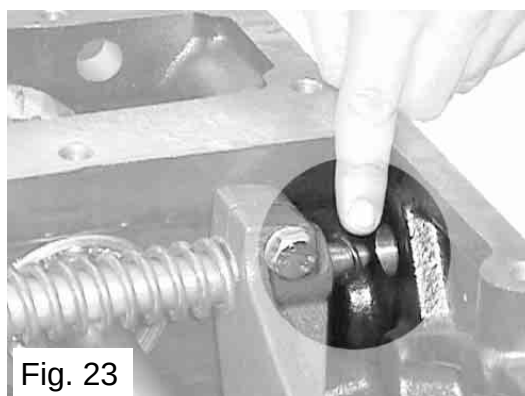


Fig. 23

DRIVING TORQUES

Kgm

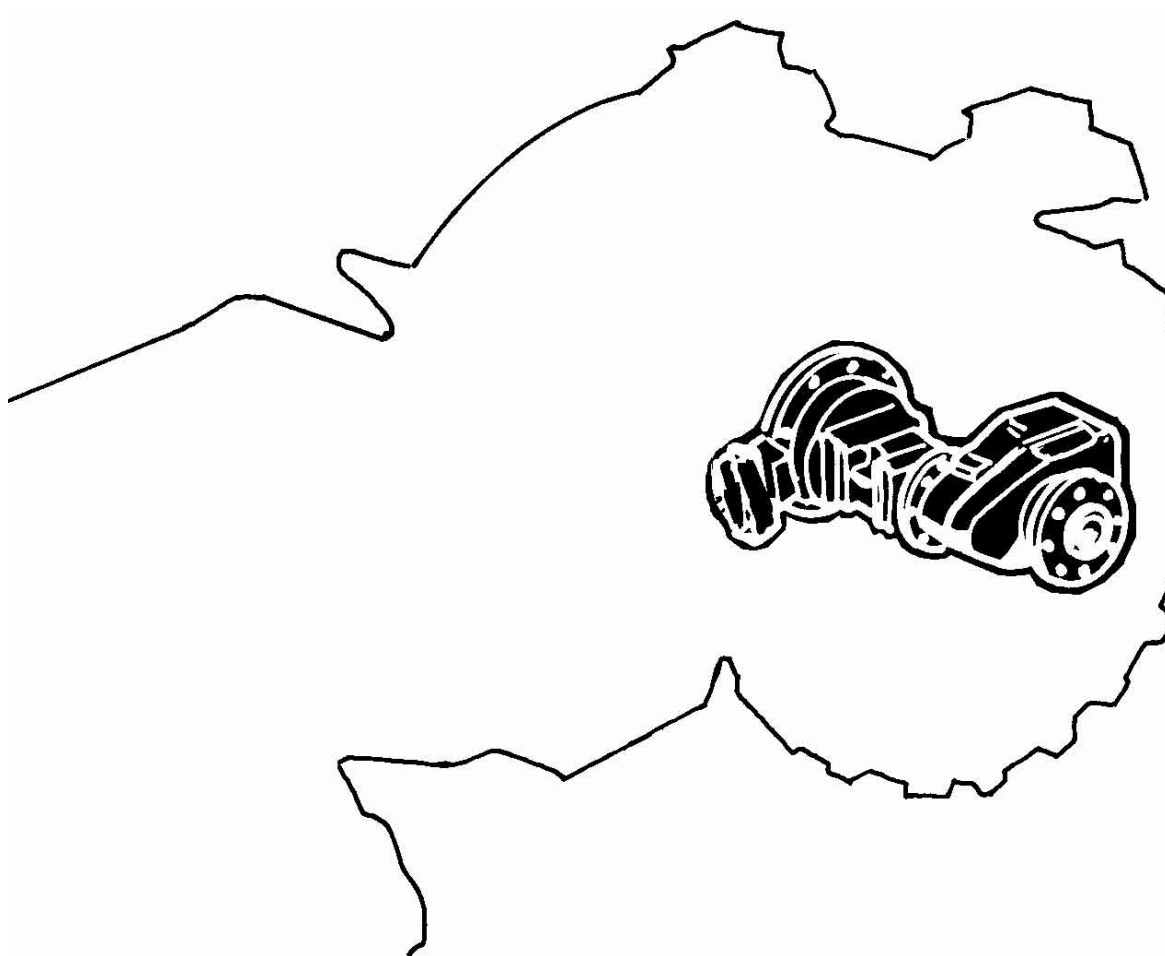
M12x14.6 nut that fixes the rear axle-gearbox	7,4
M18x1.5 Rear axle-gearbox fixing screws	11,7
M12x14.6 rear axle-power lift fixing nut	7,4
M12x30 screw that fixes the cover to the rear axle	5
M12x14.6 rear axle-PTO flange fixing nut	7,4
M12x40 screw that fixes the rear axle-hubs	7,4
M12x35 screw that fixes the rear axle-drive transmission support	6
M12x50 bevel gear pair fixing bolt	7,4
M10x35 diff lock control fork fixing bolt	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



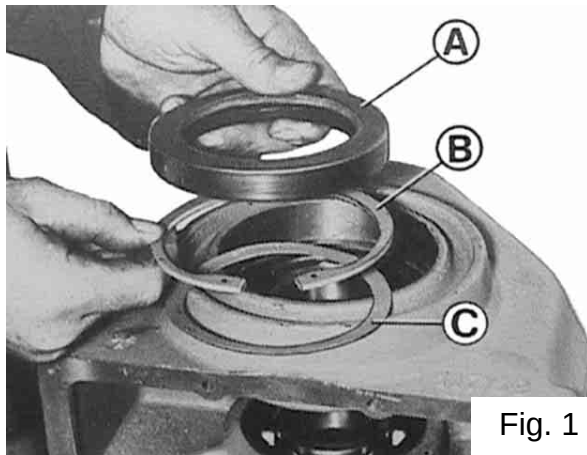


Fig. 1

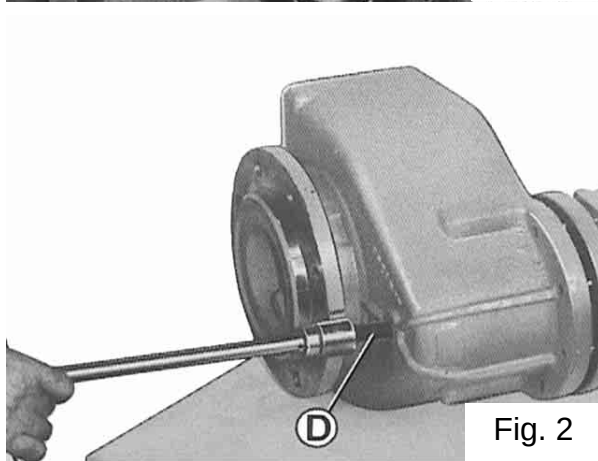


Fig. 2

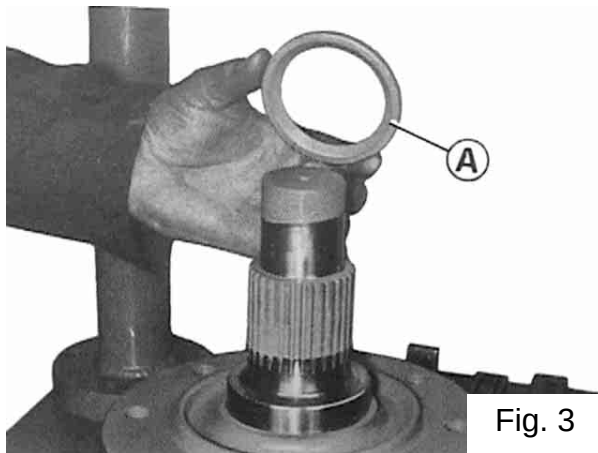


Fig. 3

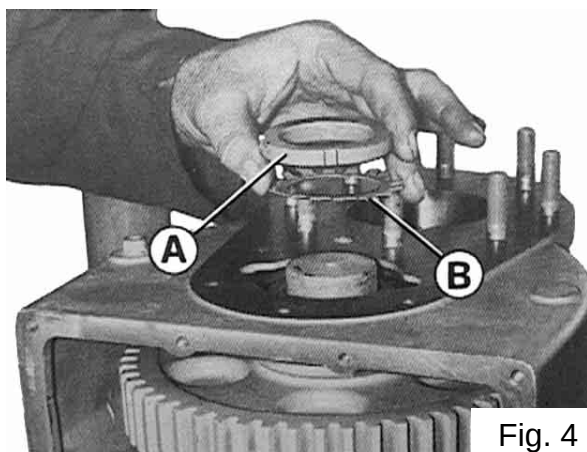


Fig. 4

FLOAT ADJUSTMENT.

Proceed with the following operations:-
jack up the machine and remove the wheel;

- apply the parking brake so as to block the brake components;
- remove the final drive complete with hub, working on bolt **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.

Remount the final drive complete with hub.

If the final drive is mounted, spacer **A** of fig. 3 must point with its chamfered part towards the flange of the axle shaft.

Tighten ring nut **A** of fig. 4 to a 170 Nm torque value, lock it with the retainer plate and punch it.

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

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

DRIVING TORQUES

Kgm

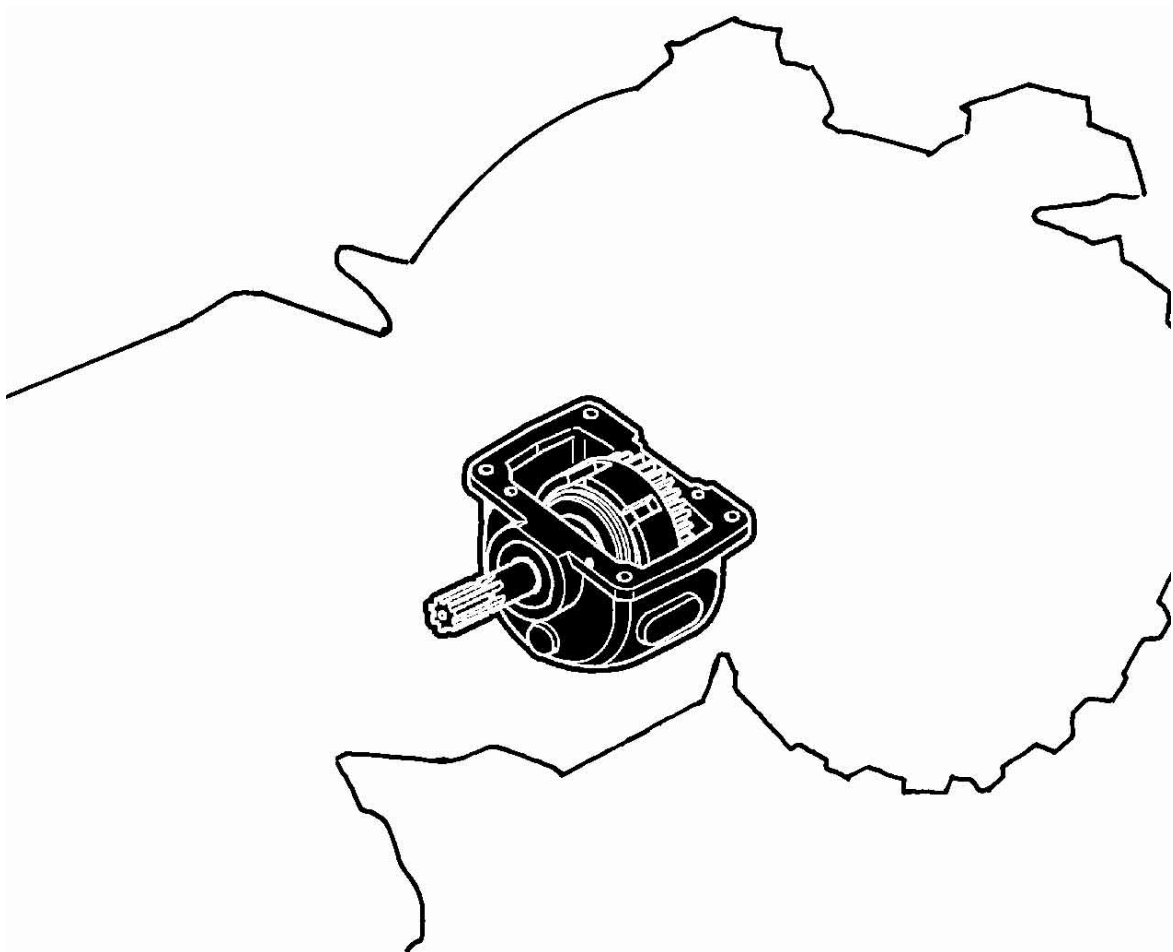
M 50 x1.5 axle shaft fixing ring nut	17
M18x1.5 bolt that fixes the wheel to the axle shaft	15
M12 nut that fixes the final drive to the axle shaft support	8
M8x20 bolt that fixes the axle shaft ring nut cover	2,4
M8x20 bolt that fixes the final drive gear cover	2,4

LUBRICATION

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

We recommend lubricants and liquid by: FL SELENIA.

DRIVE TRANSMISSION



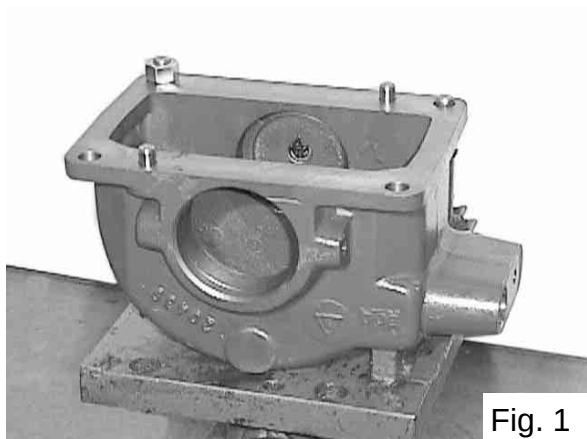


Fig. 1



Fig. 2

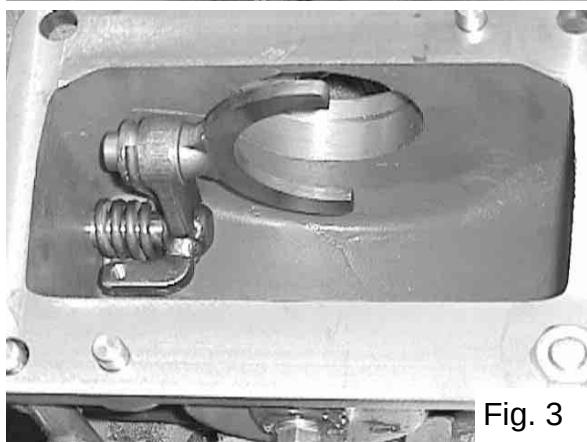


Fig. 3

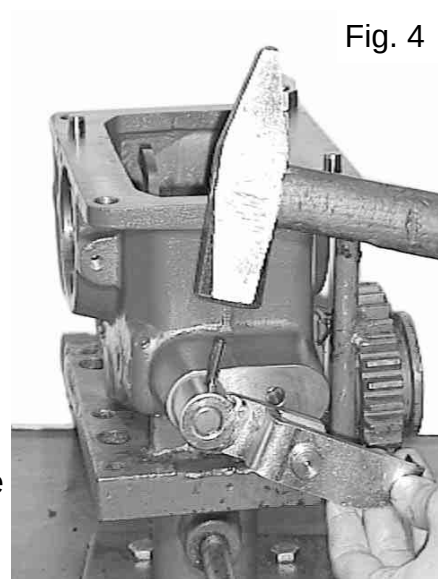


Fig. 4

Fig. 1 to fig. 5 illustrate the sequence with which the drive transmission of the housing is pre-mounted.

No particular tools are required and the assembly operations are very simple.

Take care when mounting the spacer illustrated in fig. 6

Insert the shaft, keeping it slightly tilted and projecting from the gear to a sufficient extent to bear the spacer;

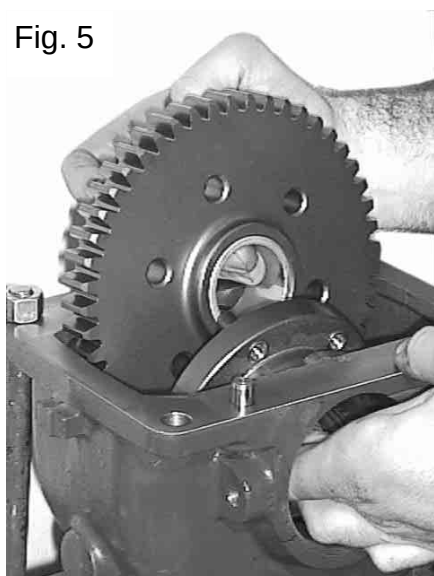


Fig. 5

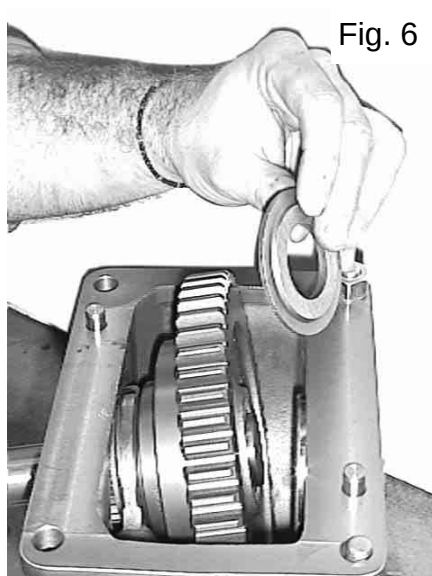
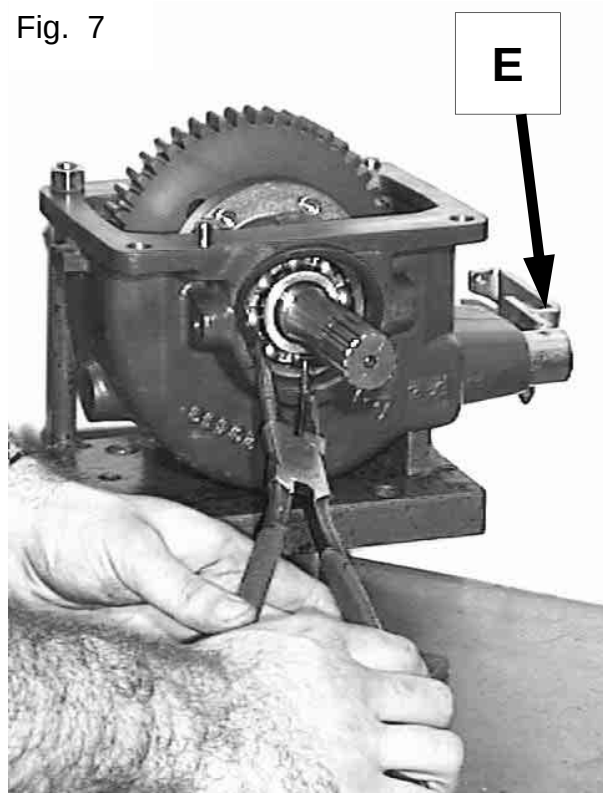


Fig. 6

Insert the spacer as shown in fig. 6, with the bearing side towards the casting.

Fig. 7



Once the pre-mounting operations have terminated, check to make sure that the device operates correctly by means of lever **E** of fig. 7. Make sure that the sleeve engages and disengages correctly and that selection occurs smoothly.

Silicone the machined surfaces of the casting so as to prepare the part for gearbox assembly.

DRIVING TORQUES

M 12 bolt that fixes the drive transmission to the gearbox housing	6 Kgm
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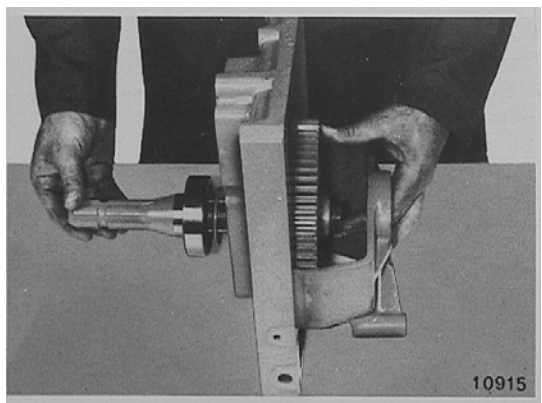
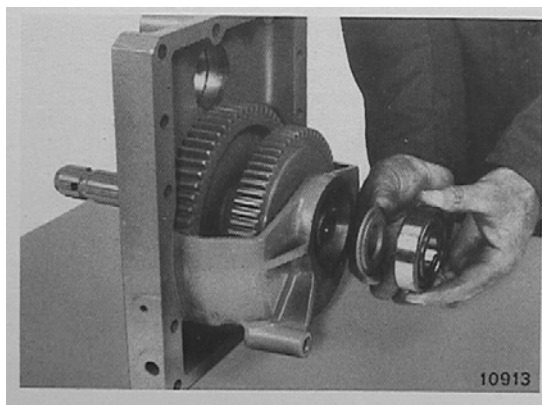
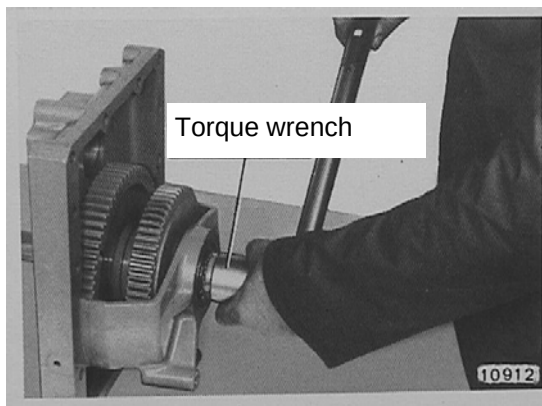
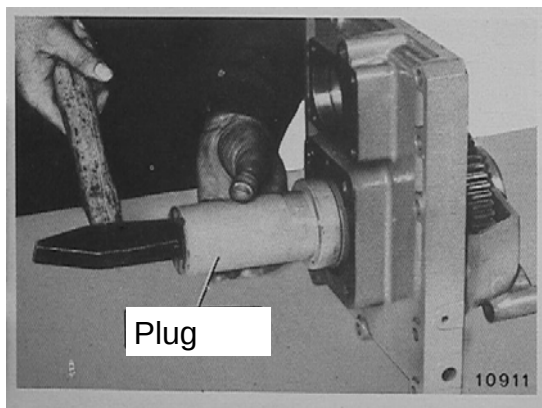
LUBRICATION

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

We recommend lubricants and liquid by: FL SELENIA.

REAR POWER TAKE-OFF





The sequence alongside shows how the power take-off head is mounted.

It is particularly important to tighten the ring nut that fixes the lower PTO shaft in the correct way.

This ring nut must be tightened to 25 Nm with a torque wrench and must be successively punched to prevent it from accidentally working loose.

Pay particular attention when adjusting the PTO selector once the PTO head has been mounted on the rear differential assembly.

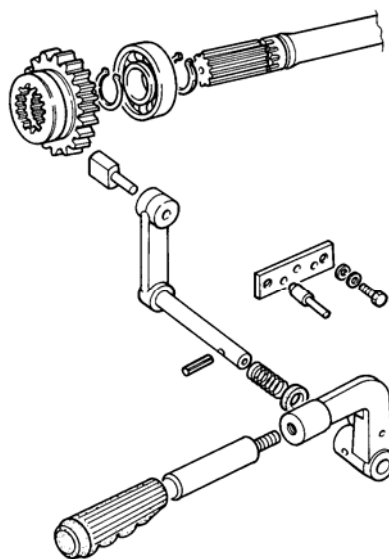
Adjust the PTO selector plate before mounting the power lift on the rear differential housing.

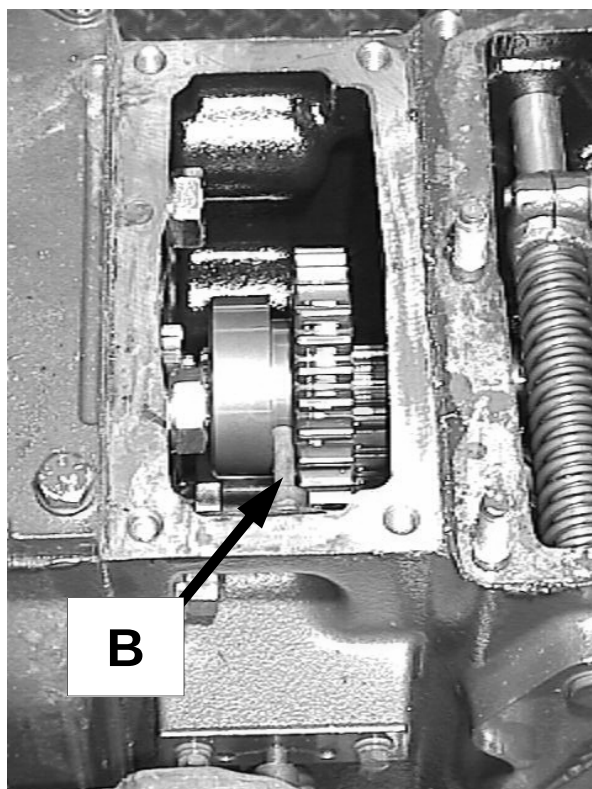
Position the plate so that the neutral position of the synchronized PTO or independent PTO is selected without the fork being forced on the gears and so that selection is correct.

The diagram below shows the control sequence of the PTO selection function.

When the external lever is down, the independent PTO is selected. When horizontal the neutral position is selected while the synchronized PTO is selected when the lever is in the upper position.

Since an enabling switch is mounted on the external lever of the PTO to prevent the engine from starting if the PTO is engaged, remember to correctly adjust this switch also.





The photos above show the parts that form the PTO selection function.

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

Part **B** shows the terminal component of the selection on the sliding gear depicted schematically on the previous page.

DRIVING TORQUES

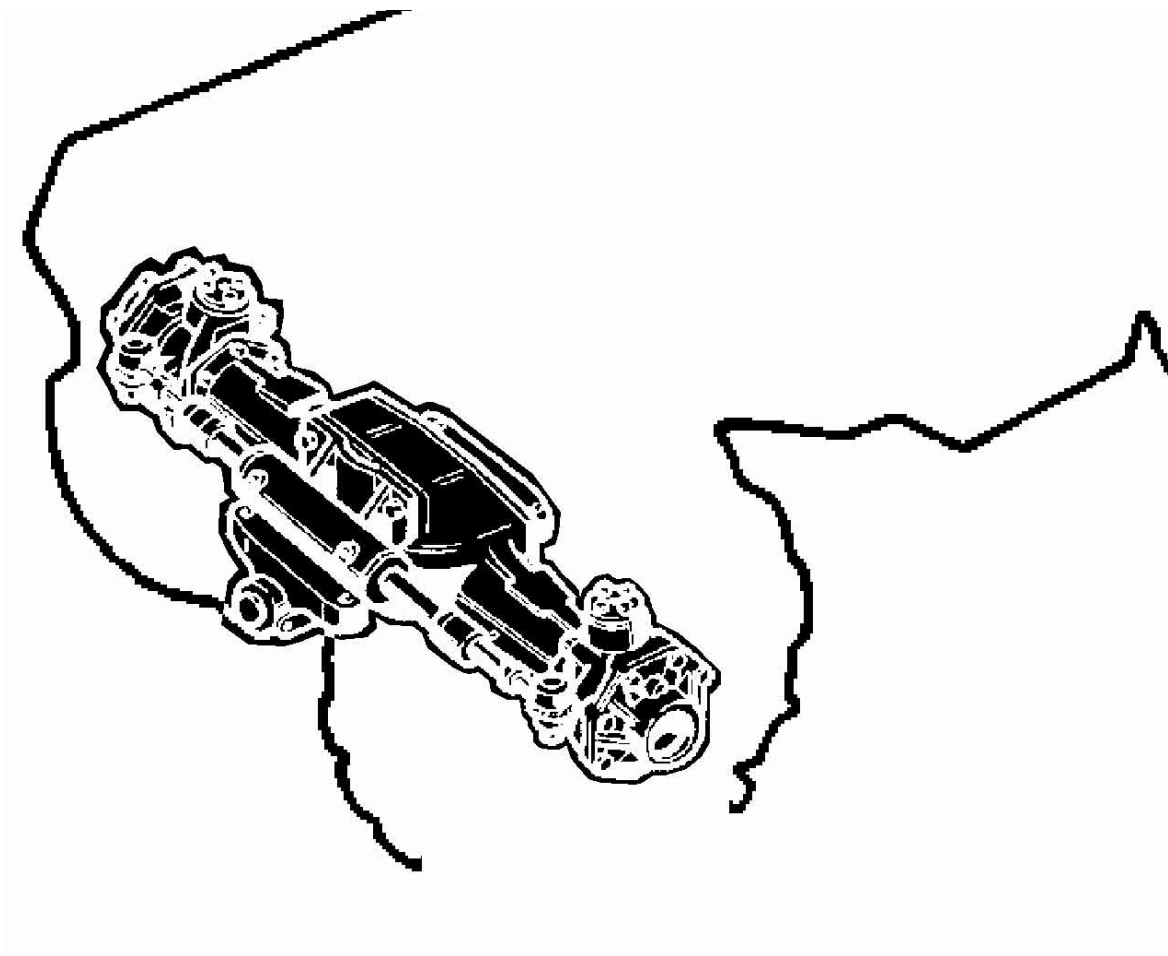
M35x1.5 ring nut that fixes the rear PTO shaft	2,5	Kgm
M12 nut that fixes the rear PTO assembly	8	
M12x30 screw that fixes the cover of the upper PTO compartment	5	
M12x35 transmission unit fixing bolt	5	
M 8x20 screw that fixes the rear PTO cover	2,4	

LUBRICATION

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

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

FRONT AXLE



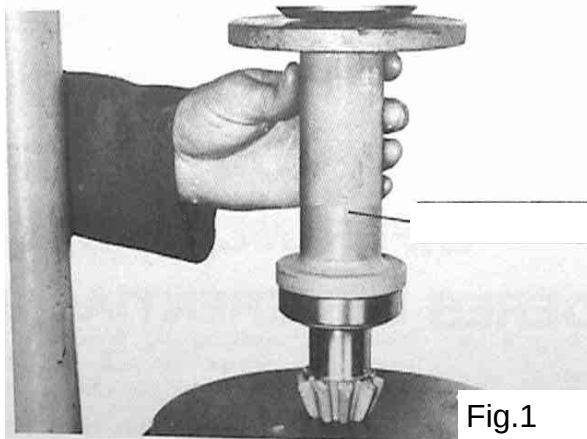


Fig.1

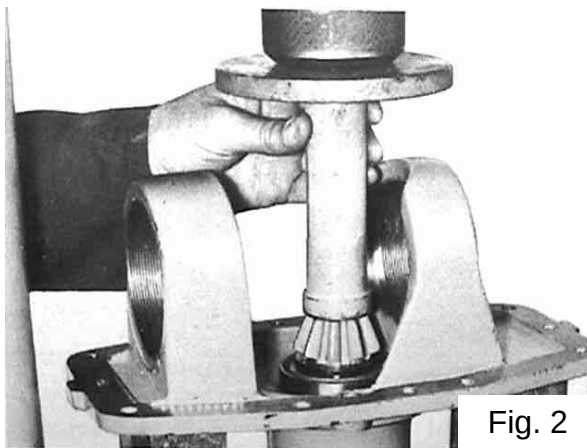


Fig. 2

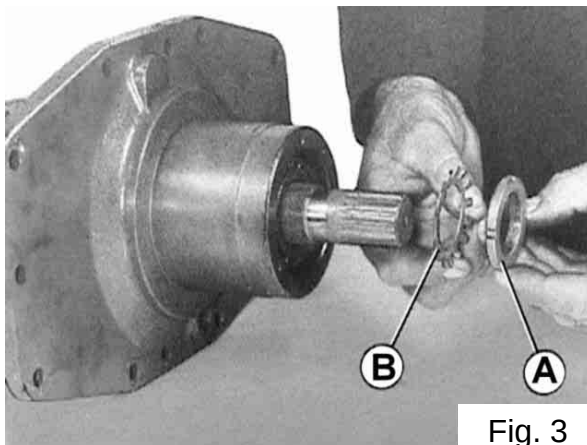


Fig. 3

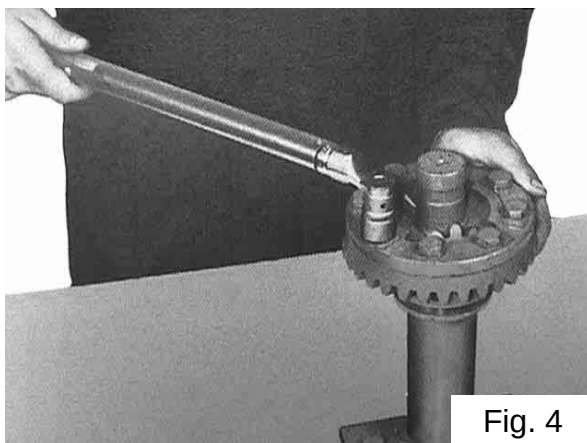


Fig. 4

First pre-mount the pinion as illustrated in fig. 1, using the plugs as shown in fig. 2. Tighten ring nut **A** of fig. 3 to a 40 Nm torque value and punch it to prevent it from loosening.

Always replace this ring nut whenever the assembly is demounted.

The next thing to do is to pre-mount the bevel gear pair as illustrated in fig. 4.

Fit the safety pins into their housings so that the safety plates remain in position.

Tighten the M 12 bolts that fix the ring gear to the shaft to an 85 Nm torque value as illustrated in fig. 4 and clinch the plates around the bolts to prevent them from accidentally working loose.

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

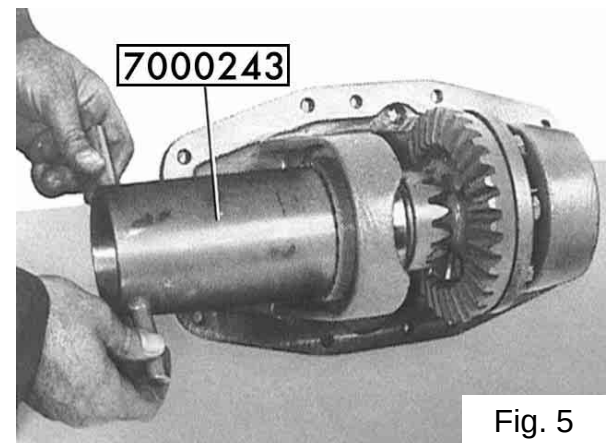


Fig. 5

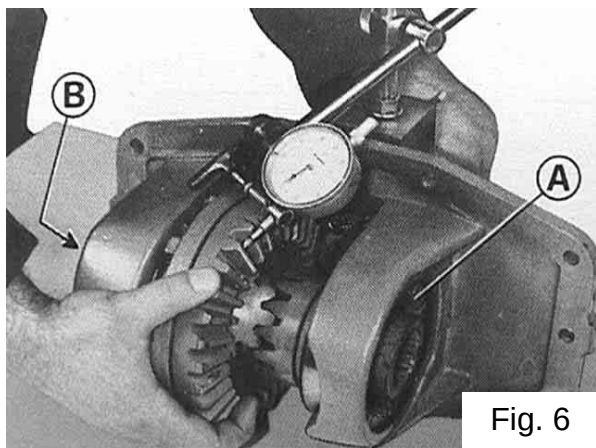


Fig. 6

To be correct, adjustment of the pinion-ring gear coupling must include a preload on the differential of 19 Nm obtained by means of ring nuts A-B.

To adjust the coupling, work on the ring nuts to an equal extent, maintaining the above mentioned preload.

The play between the pinion and bevel gear paid must extend all round the circumference and must be within 0.10-0.18 mm.

Comply with the instructions in the following pages to obtain a correct coupling. After the pinion and ring gear have been adjusted, proceed by adjusting the differential.

Unscrew ring nut **A** of fig. 6 about three positions, eliminating 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.

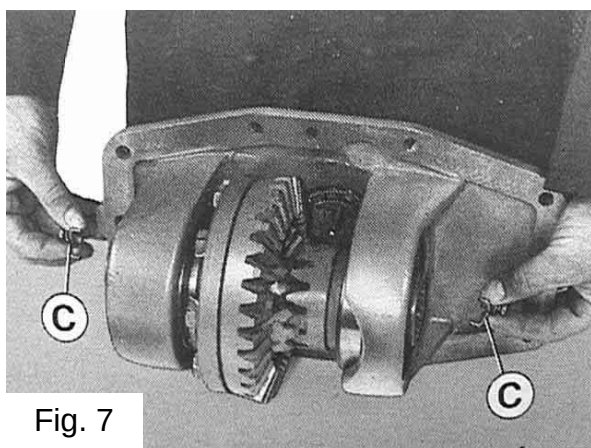


Fig. 7

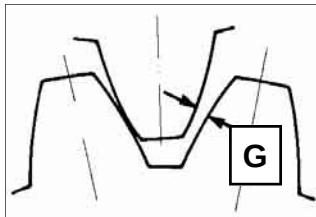


Fig. 8

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

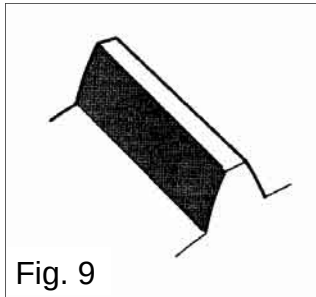


Fig. 9

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

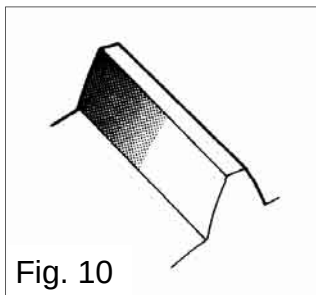


Fig. 10

Fig. 10 – If the pinion is too far forwards and works on the root of the tooth too much: in this case, the bevel gear pair must be replaced.

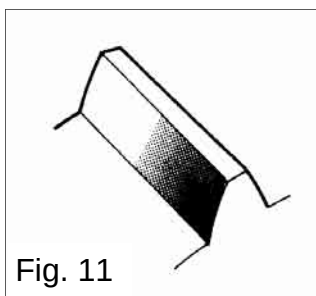


Fig. 11

Fig. 11 – The pinion is too far back and works on the crest of the tooth too much: in this case, add 0.2 mm shims between the bearing and casing;

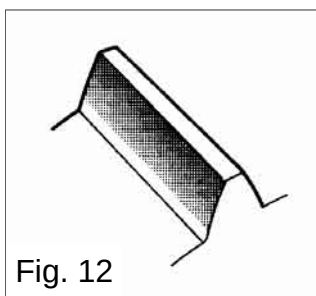


Fig. 12

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

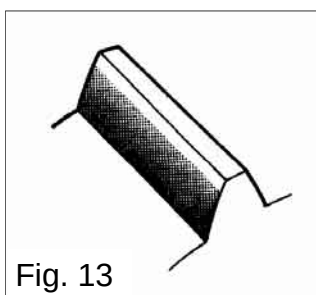


Fig. 13

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.

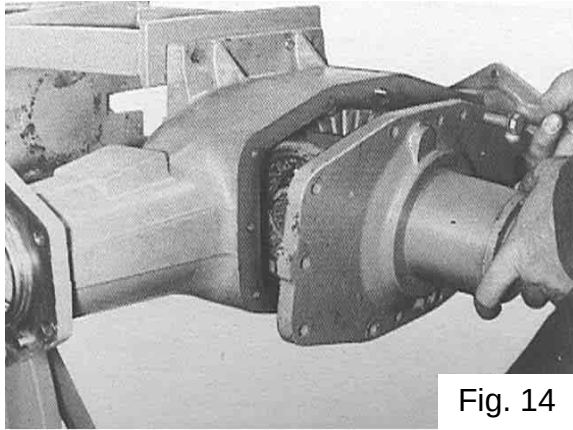


Fig. 14

Once the differential assembly has been mounted, proceed by mounting the front axle.

Fig. 14 to fig. 17 illustrate the various assembly phases. Pay particular attention to the way the front side final drives are pre-mounted. This operation will be described in the next chapter.

A description is also given of steering cylinder toe-in, to guarantee correct tyre wear and steering trim.

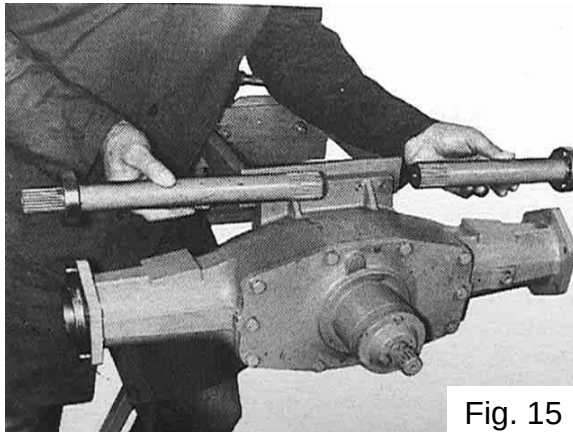


Fig. 15

Many of the seals with O-rings will be strengthened with silicone to prevent oil from oozing out. This is indicated individually.

Fig. 17 shows how adjuster screw **K** is used to adjust the end of travel points on the front axle.

This adjustment must be carried out with the tractor operating, the tyres mounted and the machine in operating conditions.

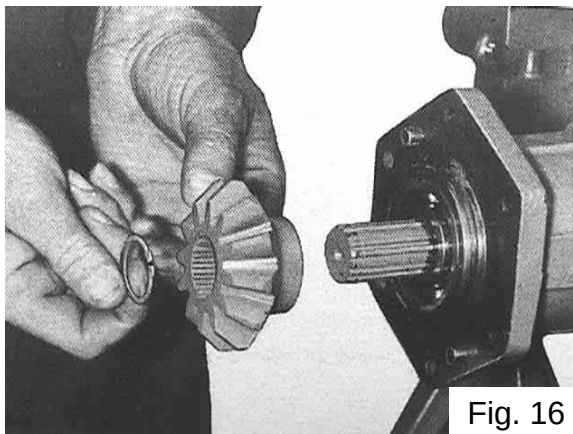


Fig. 16

The tractor's steering system can be adjusted by means of these adjuster screws and by placing spacers under the pads that limit the longitudinal pivot of the front axle, this to modify the minimum turning radius or the axle's longitudinal pivot depending on requirements (slope, soil working, implement hitched...).

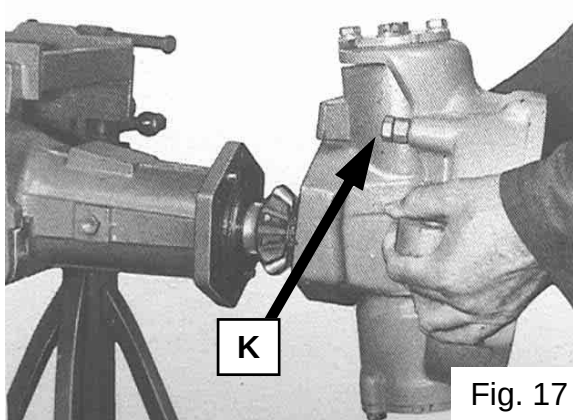


Fig. 17

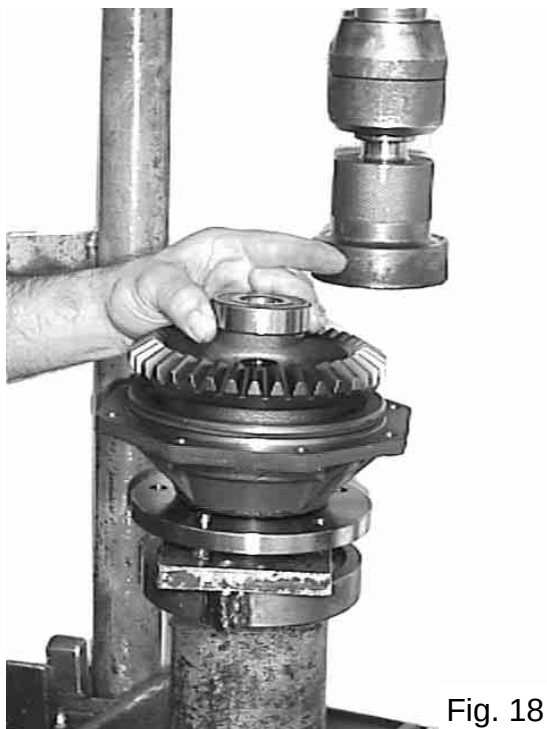


Fig. 18

The reduction bevel gear pair must be pre-mounted 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.

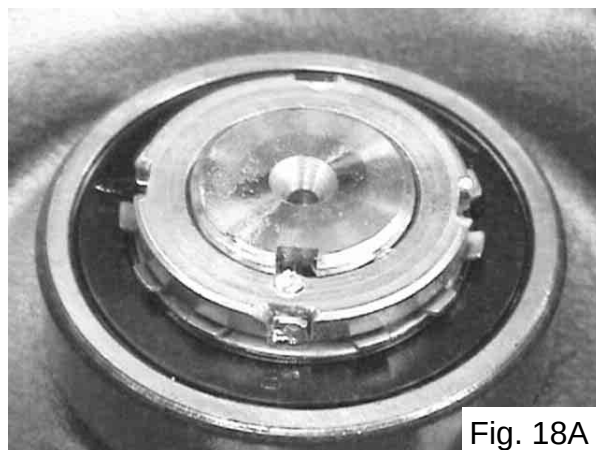


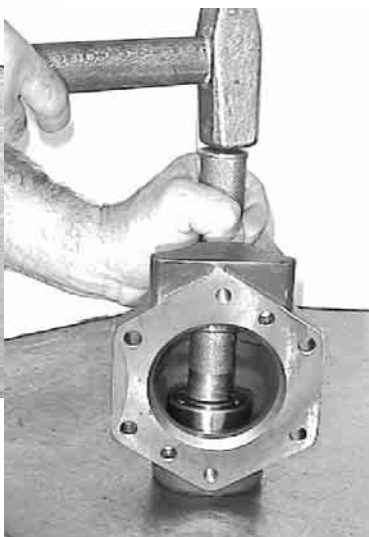
Fig. 18A

As shown in the photo, the bevel gear pair should be blocked by tightening the ring nut to a 150Nm torque and then punched to prevent it from working loose.



Fig. 19

Once the bevel gear pair has been pre-mounted, mount the central part of the front final drive by complying with the sequence illustrated alongside and using a plug and circlip pliers.



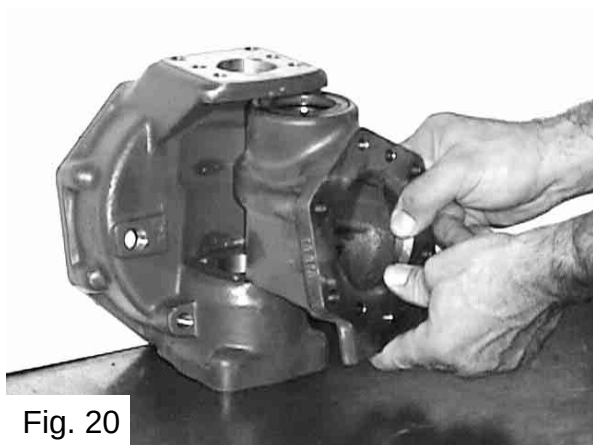


Fig. 20

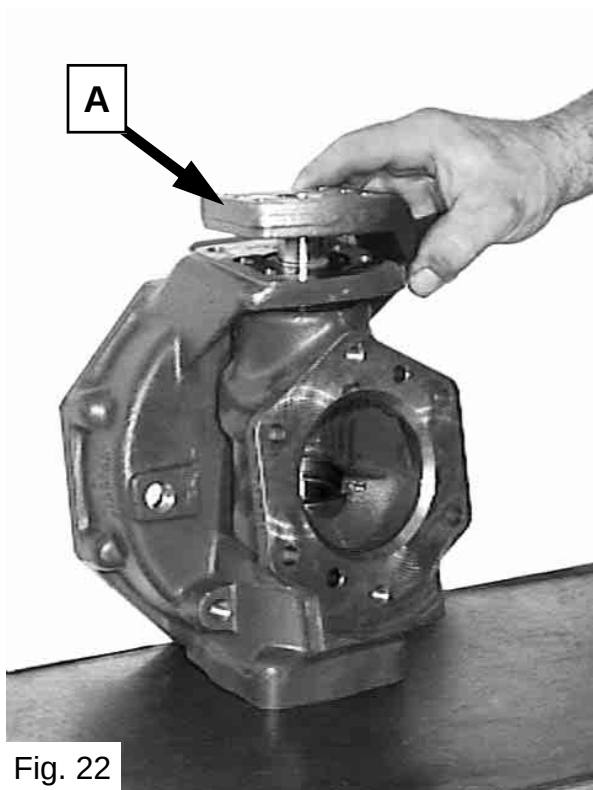
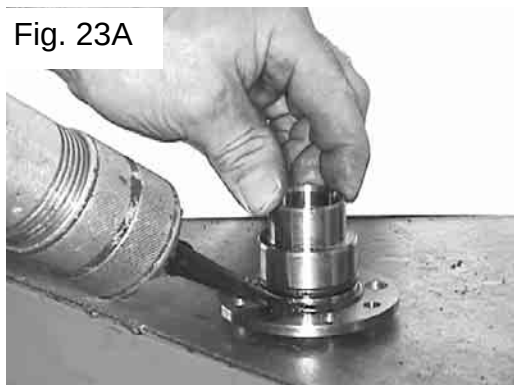


Fig. 22

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

Do not forget to silicone the pin illustrated

Fig. 23A



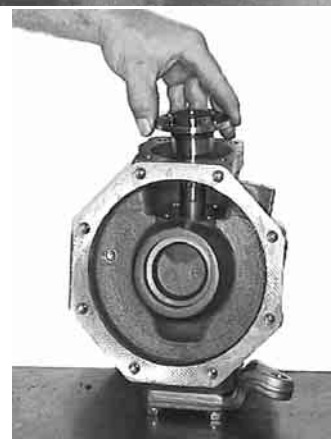
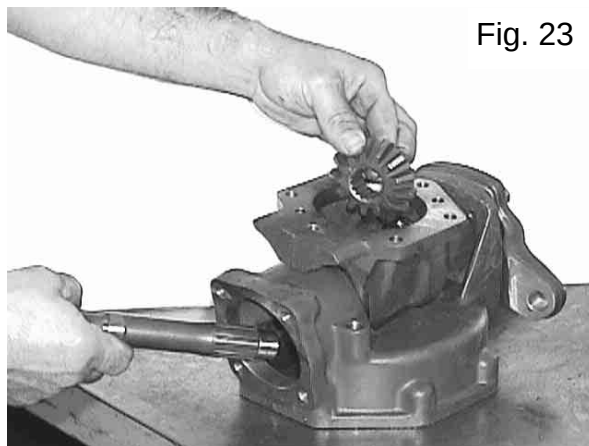
in fig. 23A and the screws that fix this pin, to prevent oil from oozing.

Fig. 21



Fig. 20 – 21 – 22 illustrate 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. Do not forget to pin part A of fig. 22. The fixing screws of this wheel control lever must be tightened to a 60 Nm torque value.

Fig. 23



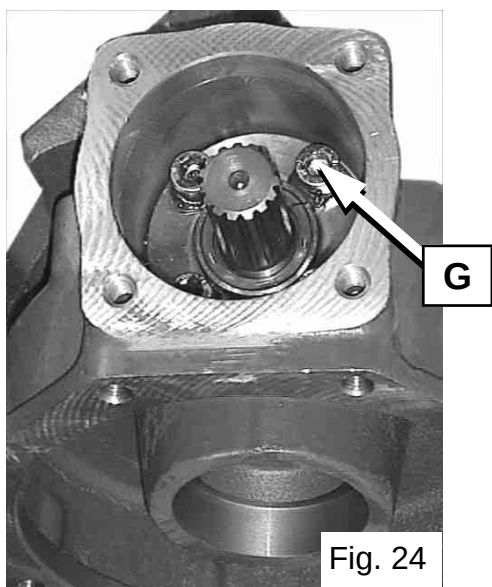


Fig. 24

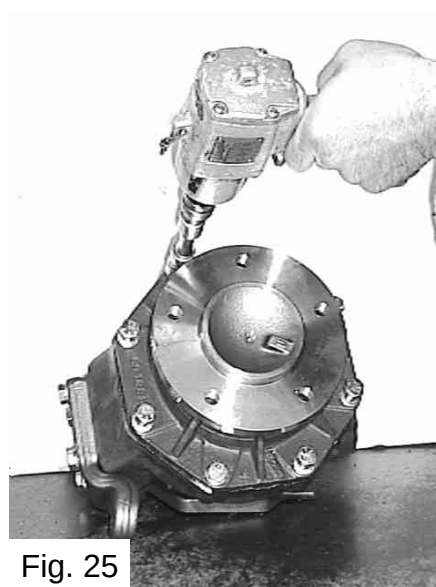


Fig. 25

After having tightened Allen screws **G** of fig. 24 to a 45 Nm torque value and impregnated them with silicone to ensure thread tightness, mount the bevel gear pair as shown in fig. 25 and tighten the screws that fix the axle shaft and bevel gear to the final drive unit to a 90 Nm torque. To correctly tighten the 8 ring gear fixing bolts, begin by tightening two opposite bolts so as to correctly distribute the torque value over the entire perimeter of the ring gear and prevent the O-ring from being pinched.

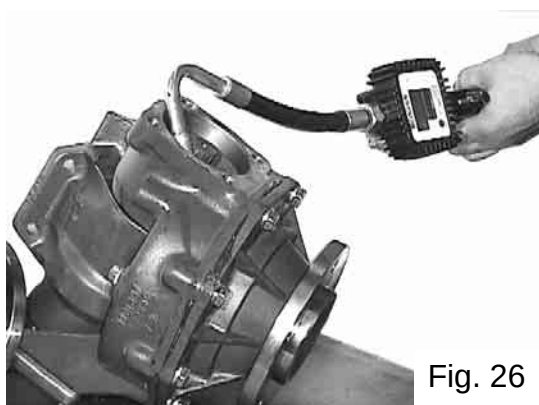


Fig. 26

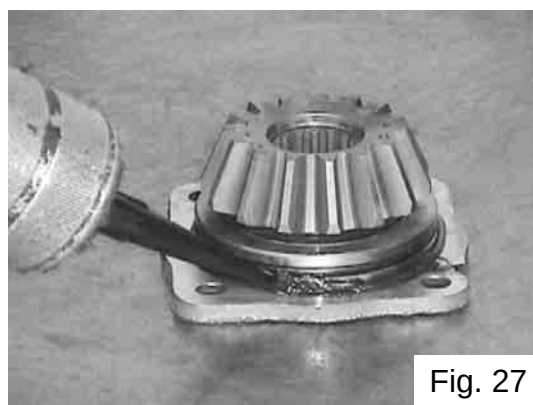


Fig. 27

Once having pre-mounted the ring gear, pour 0.8 liters of Agip Rotra SAE 80-90 W oil into the final drive as shown in fig. 26.

Pre-mount the ring gear control gear and silicone the oil retainer as shown in fig. 27.

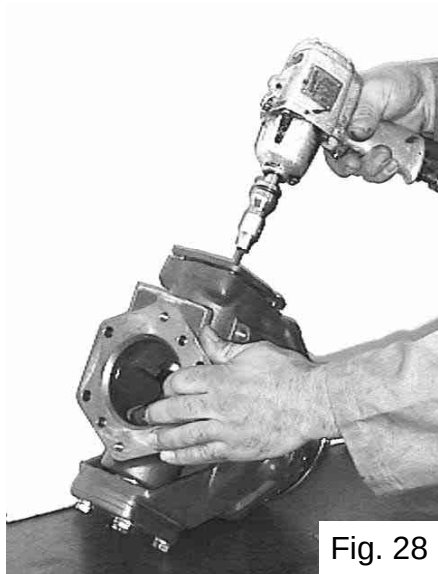


Fig. 28

Carry out the operations shown in fig. 28, tightening the bolts to a 60 Nm torque value and thus concluding the front final drive pre-mounting phase. Now proceed with final assembly of the front axle.

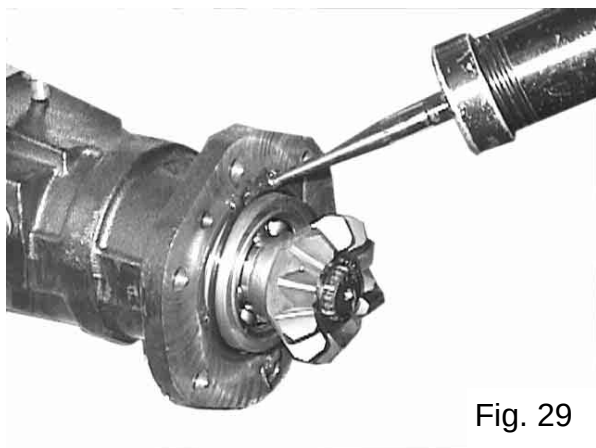


Fig. 29

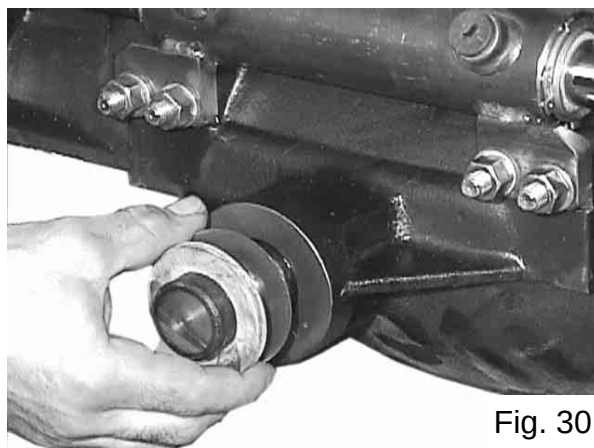


Fig. 30



Fig. 31

As illustrated in fig. 29, proceed by siliconing the axle support. Do not forget to pre-mount the spacer shown in fig. 30.

Tighten the bolts that fix the front final drive to the axle support as illustrated in in fig. 31, to a 60 Nm torque value.

Mount the notched nuts and the relative retainer split pins on the steering links illustrated in fig. 32.

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

Adjust the toe-in as shown in fig. 33, taking care to comply with the dimensions indicated in the figure.

To obtain these dimensions, adjust the steering links and, once the adjustments have been made, lock the ring nuts to an 80 Nm torque value and apply Loctite thread-locker to the threads.



Fig. 32

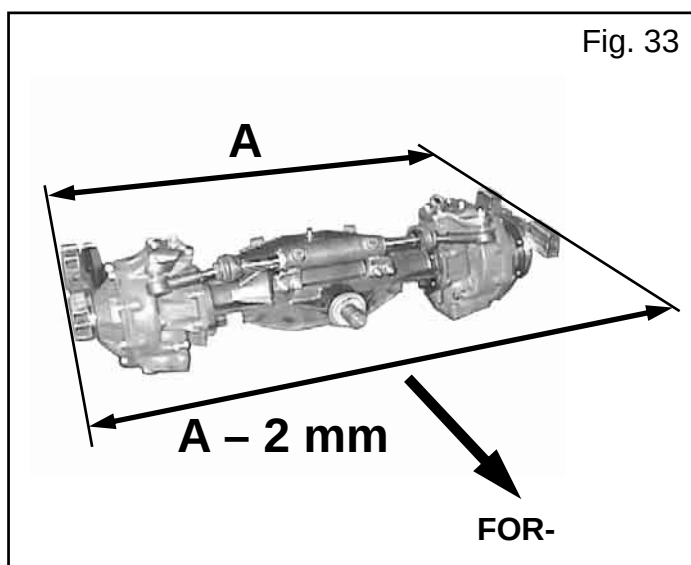


Fig. 33

DRIVING TORQUES

Kgm

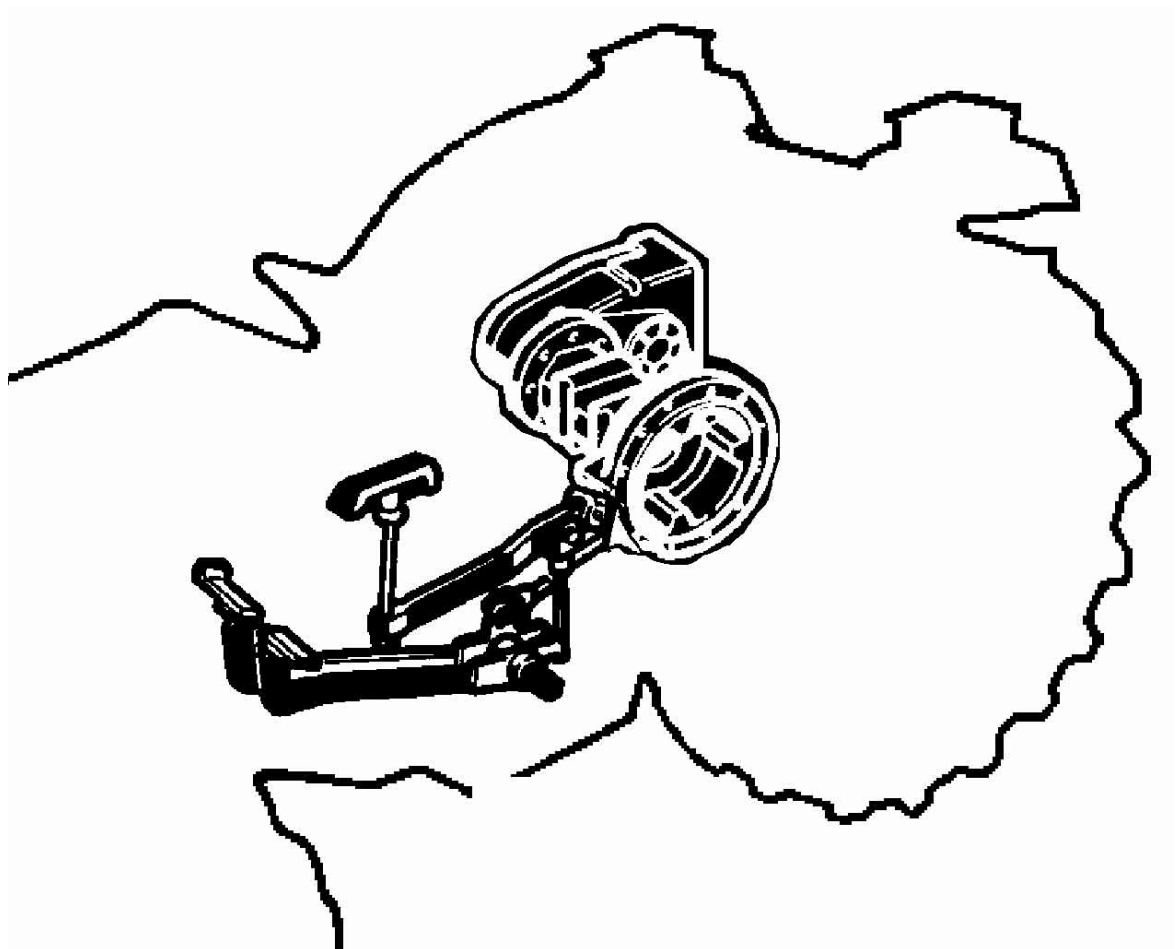
M35x1.5 bevel pinion fixing ring nut	4
M10x30 screw that fixes the differential support to the axle	6
M12 bevel gear pair fixing nut and bolt	8
M10x30 final drive axle fixing bolt	6
M6x16 bevel pinion cover fixing bolt	1,5

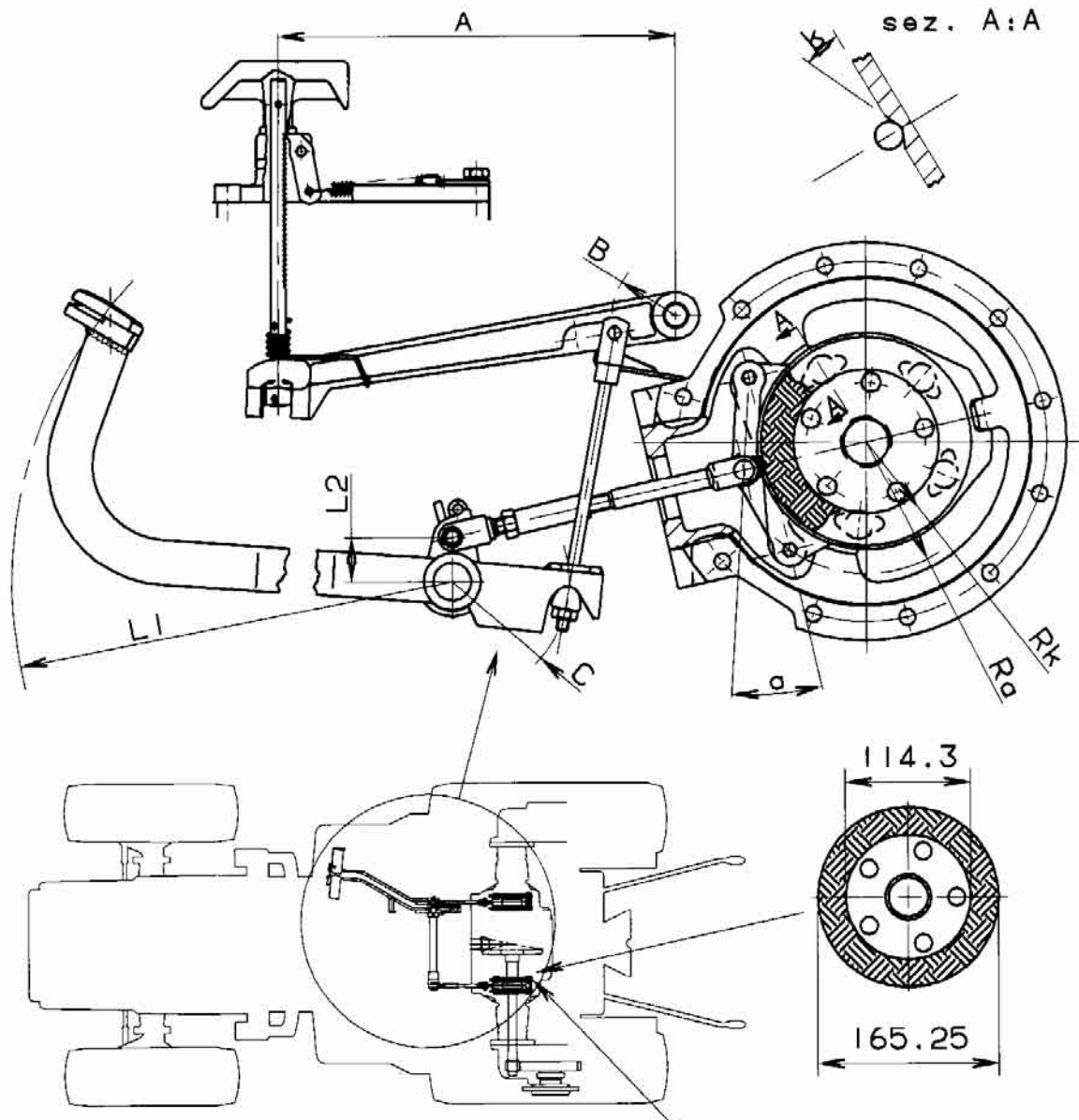
LUBRICATION

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

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

BRAKES





MAIN BRAKE

MAIN BRAKE PEDAL LEVERS		
LENGTH OF LEVER WHEN ACTIVATED (L1)	MM	508
LENGTH OF LEVER WHEN OPPOSING RESISTANCE (L2)	MM	35

PARKING BRAKE

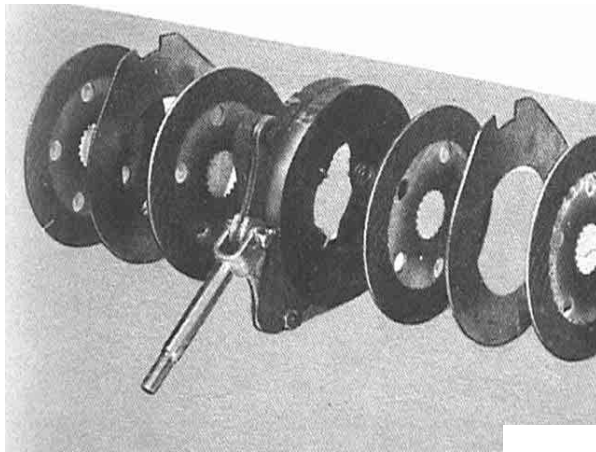
LENGTH OF LEVER WHEN ACTIVATED (A)	MM	310
LENGTH OF LEVER WHEN OPPOSING RESISTANCE (B)	MM	50
LENGTH OF ACTIVATED BRAKE PEDAL LEVER (C)	MM	92

REAR BRAKE ASSEMBLY

LENGTH OF LEVER WHEN ACTIVATED (Ra)	M M	105
LENGTH OF LEVER WHEN OPPOSING RESISTANCE (Rk)	M M	66.5
APPLIC. ANGLE WITH LEVER ACTIVATED (a)		26°
APPLIC. ANGLE WITH LEVER OPPOSING RESIS. (k)		38°
OUTER DISC DIAMETER (De)	M M	165.25
INNER DISC DIAMETER (Di)	M M	114.3

BRAKING AREAS

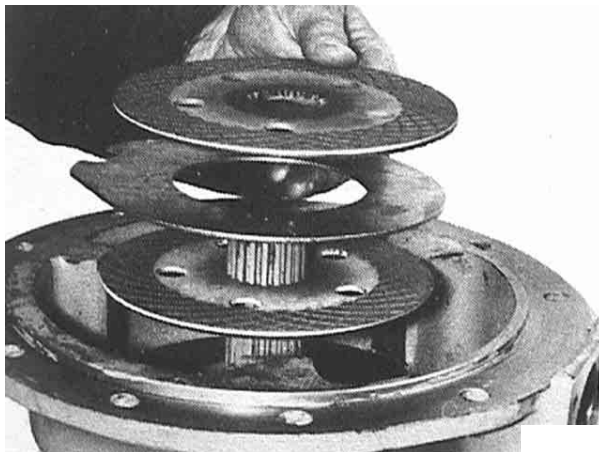
AXLE	REAR
N° DISCS PER WHEEL	4
TOTAL AREA	1788.8
MATERIAL USED	HDT 303



BRAKE ASSEMBLY.

To access the brake assembly, raise the rear part of the platform, then remove the wheels and the complete axle shaft-final drive assembly.

The thickness of the friction material in the brake discs must never be less than 3.8 mm. If the brake discs must be replaced, keep them in an oil bath for at least 12 hours before they are mounted. When the axle shaft final drive supports are fitted back on the differential housing, make sure that the metal plates are correctly positioned as shown in the sequence alongside.



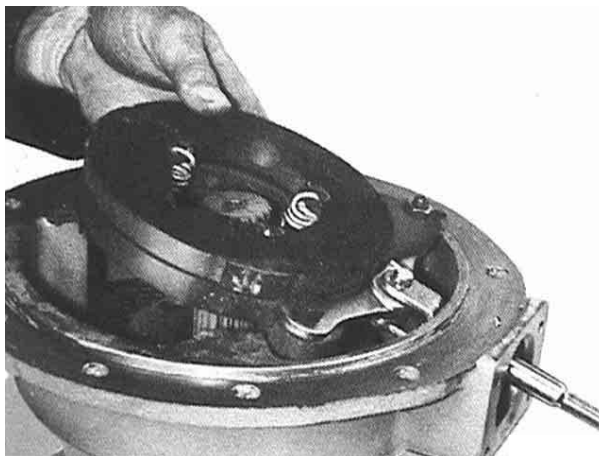
EXTERNAL BRAKE CONTROL LINKAGES

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

To operate correctly, the main brake requires the braking action to start after a free travel of the pedal of about 35-40 mm. Proceed in the following way to adjust:

- loosen nut A of fig.1 (see next page),
- work on rod B,
- lock nut A after the adjustments have been made.

Make sure that the braking action is simultaneous on the two wheels and adjust the wheel that brakes in advance (if necessary) by loosening the rod.



HOW TO ADJUST THE EMERGENCY AND PARKING BRAKE

To operate correctly, the emergency brake requires the control lever to operate in 2-3 positions. Proceed in the following way to adjust :

- position the control lever as indicated above,
- use nut C of fig.2 until block D is slightly in contact with lever E.

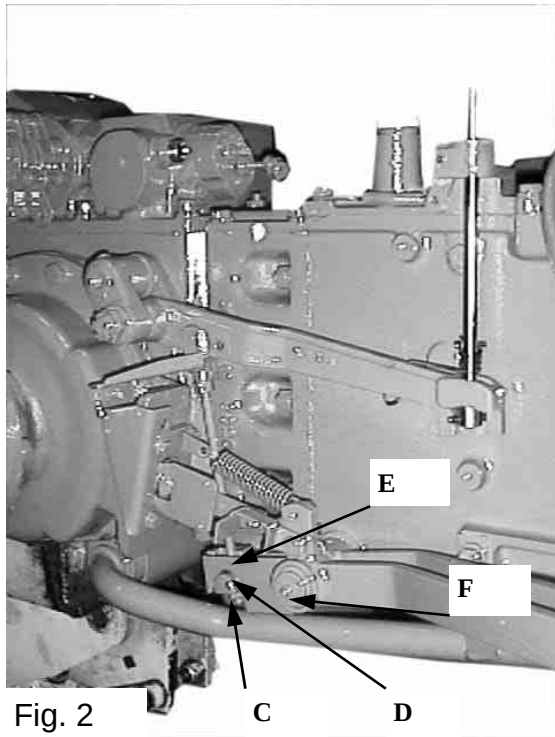


Fig. 2

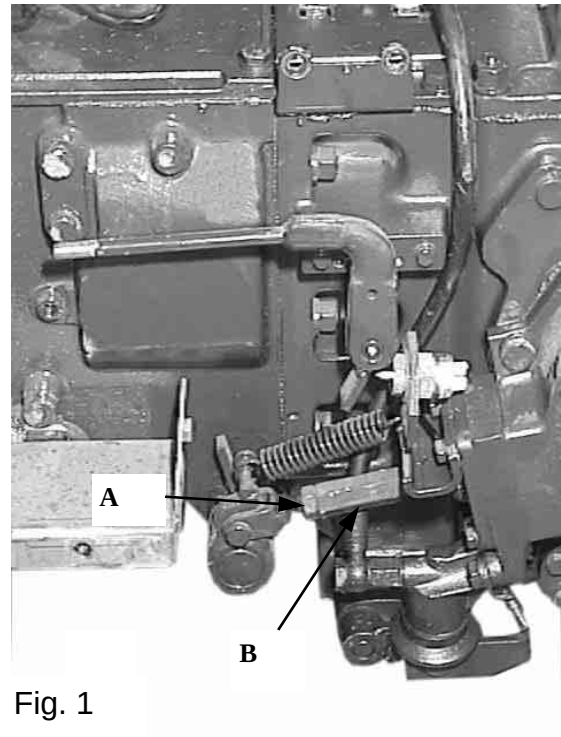
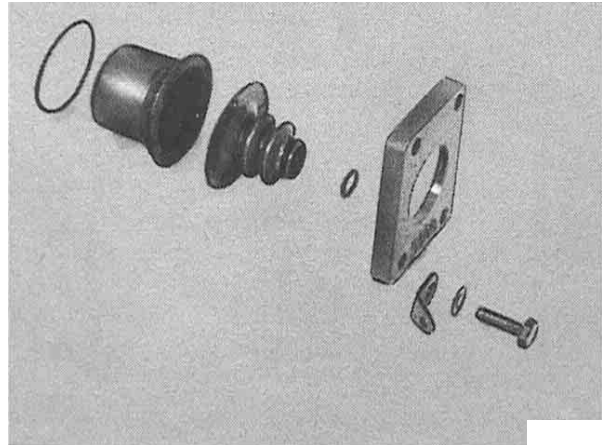
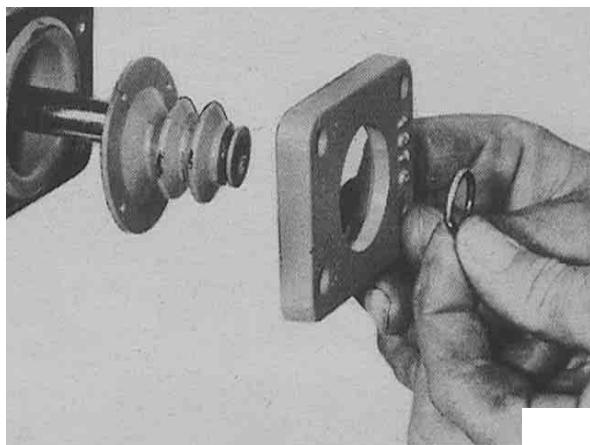
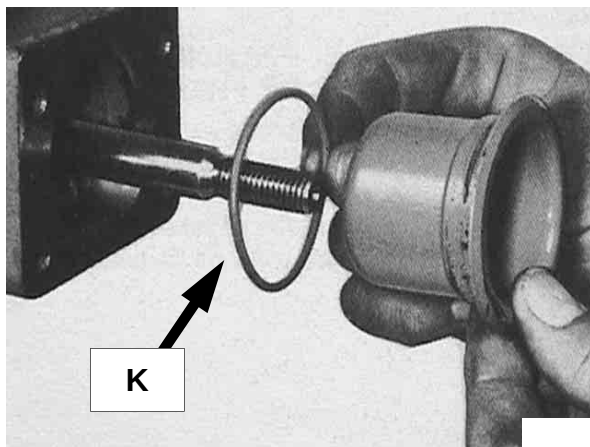


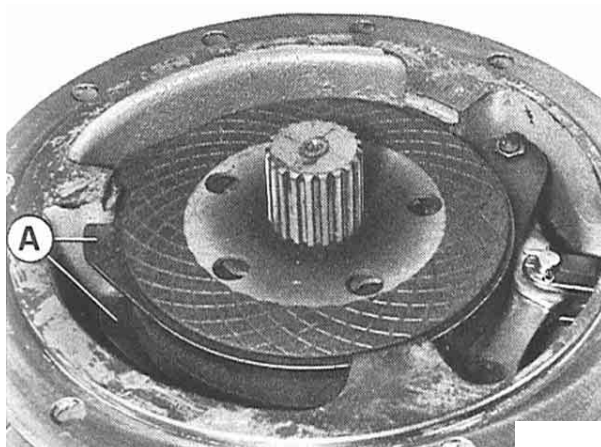
Fig. 1

To access the external linkages (with the exception of the main and parking brake adjustments) and the seals on the controls, first remove the rear wheels from the machine.

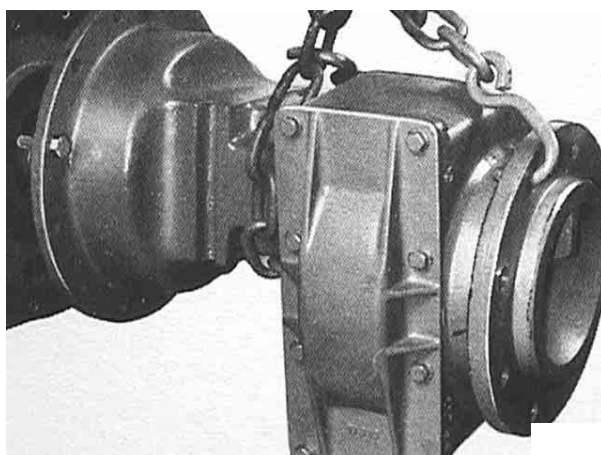
The photo alongside illustrates the sequence with which the seals are mounted on the brake rods.

Take particular care when mounting seal K in the photo alongside. Apply silicone to everything to prevent oil from oozing.





When the hub assembly is mounted on the differential housing, make sure that metal discs A are correctly positioned inside the casting.



Mount the hub with the aid of a lifting apparatus. Take care to remount the wheel hub in the initial position symmetric to that of the other hub (this is also valid for the final drive-chitarra). Or mark the position of the chitarra final drive in relation to the axle shaft support before demounting the final drive.

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

DRIVING TORQUES

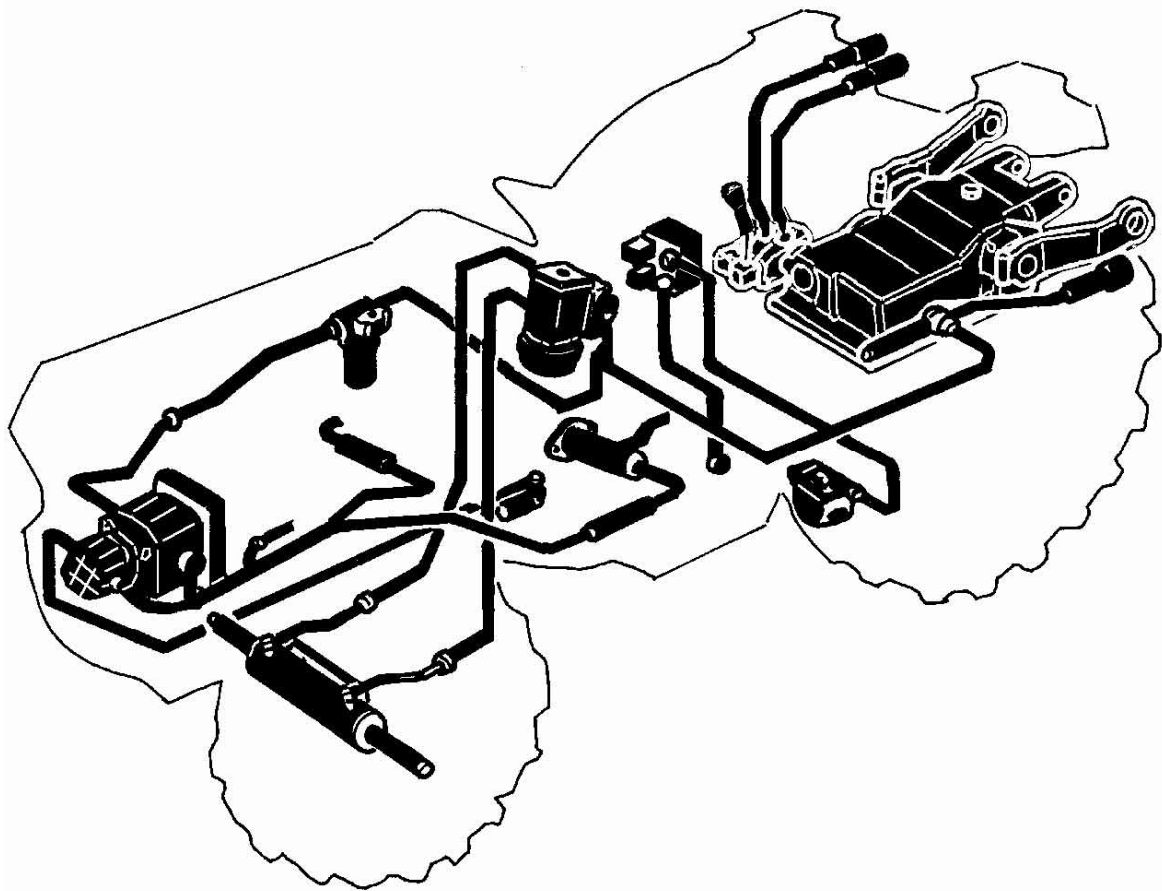
Bolt that fixes final drive axle shaft support to differential housing	8	Kgm
M 8 x 25 oil retainer cover fixing screw	2,4	

LUBRICATION

Oil	ARBOR BRAKE D4 (SAE J1704, ISO 4925)
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We recommend lubricants and liquid by: **FL SELENIA**.

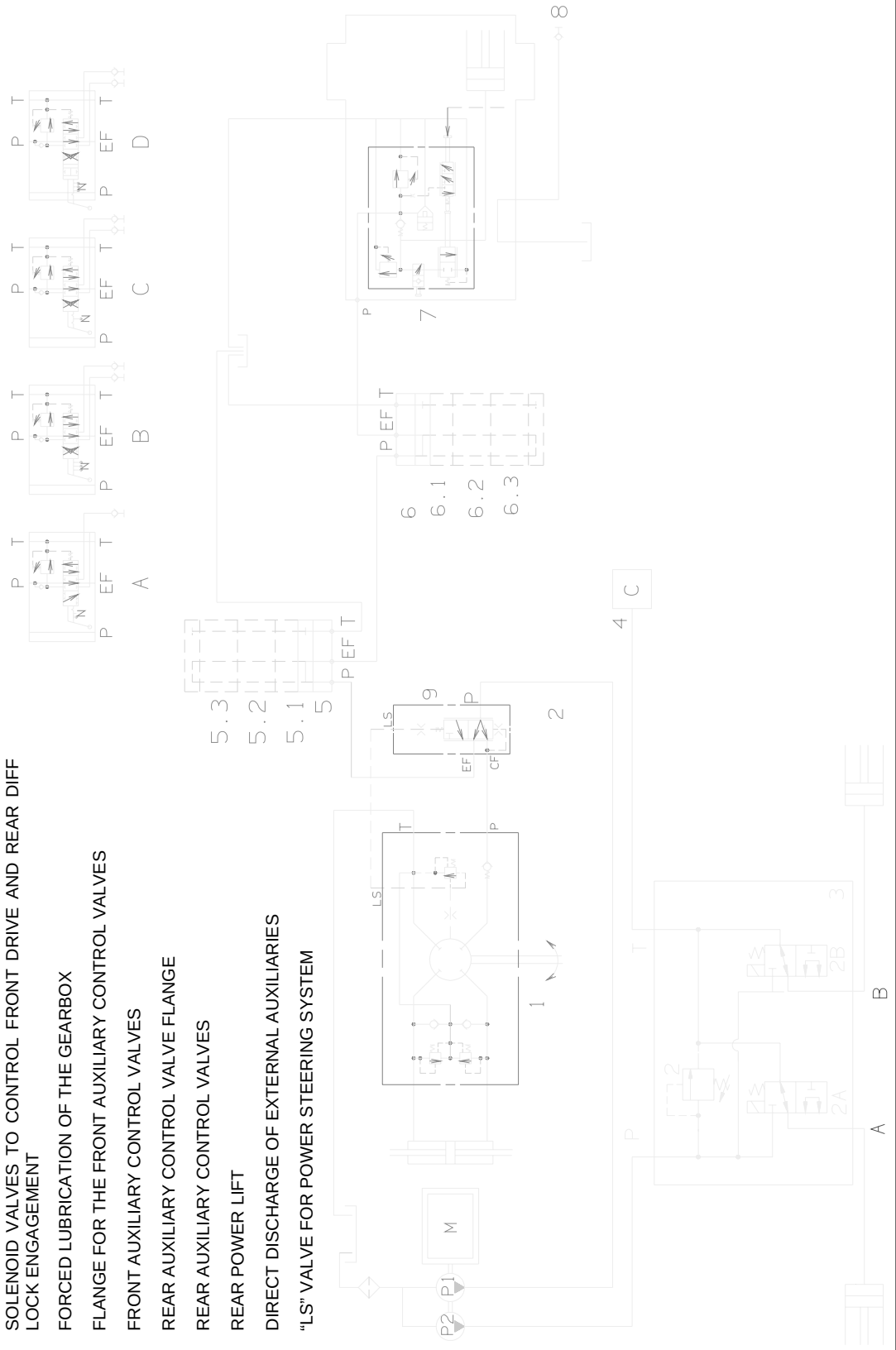
HYDRAULIC CIRCUIT



HYDRAULIC PLANT LAYOUT OF THE "BASIC" VERSION FOR 3000 V SERIES TRACTORS

- 1 - POWER STEERING
- 2 - MAXIMUM PRESSURE VALVE FOR THE UTILITIES
- 3 - SOLENOID VALVES TO CONTROL FRONT DRIVE AND REAR DIFF LOCK ENGAGEMENT
- 4 - FORCED LUBRICATION OF THE GEARBOX
- 5 - FLANGE FOR THE FRONT AUXILIARY CONTROL VALVES
- 5.1 - FRONT AUXILIARY CONTROL VALVES
- 6 - REAR AUXILIARY CONTROL VALVE FLANGE
- 6.1 - REAR AUXILIARY CONTROL VALVES
- 7 - REAR POWER LIFT
- 8 - DIRECT DISCHARGE OF EXTERNAL AUXILIARIES
- 9 - "LS" VALVE FOR POWER STEERING SYSTEM

LAYOUTS OF THE FRONT AND REAR AUXILIARY CONTROL VALVES THAT CAN BE MOUNTED



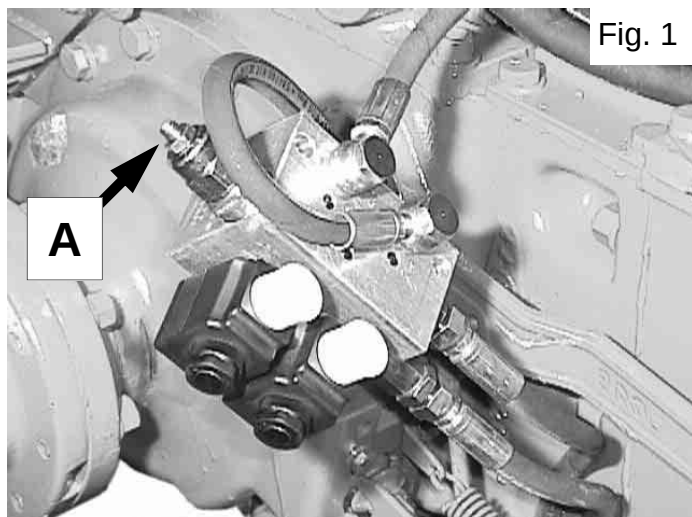


Fig. 1

Fig. 1 shows the group of solenoid valves that controls 4WD and rear diff lock engagement (Part 3 of the hydraulic layout on the previous page).

The group is installed on the rear rh mudguard.

Demount the seat and rear rh seat guard to access the group.

The pressure used to engage the 4WD and diff lock is adjusted by means of the maximum valve indicated by part A of fig. 1.

This pressure value is 35 bar. It can be controlled by applying a pressure gauge on the valve group delivery.

The oil discharged by this group of solenoid valves is used for forced lubrication of the tractor's gearbox.

The oil that supplies this group of solenoid valves is provided by the 0.5 group pump with 1.6 cc/rev swept volume installed in front of the tractor engine in tandem with the one that operates the main hydraulic circuit.

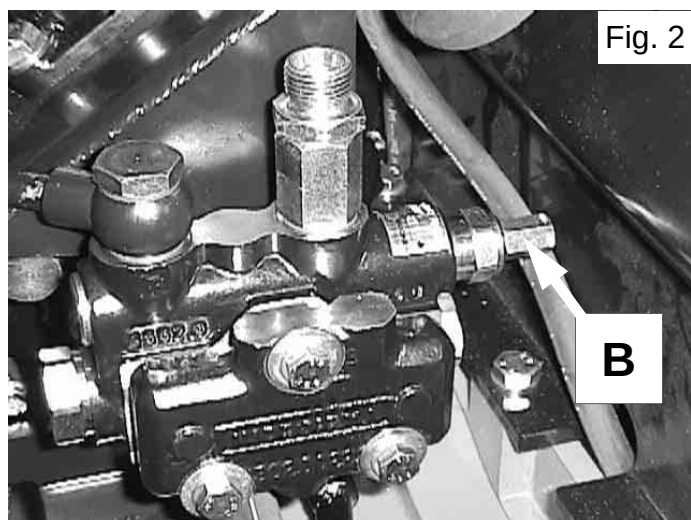


Fig. 2

Part B in fig. 2 shows the maximum valve of the main hydraulic circuit which determines the operating pressure of the front and rear control valves (190 bar). It is installed after the power steering unit on the bearing plate of the front control valves, a number of which may be installed on the tractor.

The maximum valve in fig. 2 is mounted on the plate that bears the front control valves, indicated by N° 5 in the hydraulic layout on page 2.

Fig. 3 shows how the power steering system is mounted on the tractor.
Part C indicates the maximum valve of the power steering system which must have a 130 bar setting.

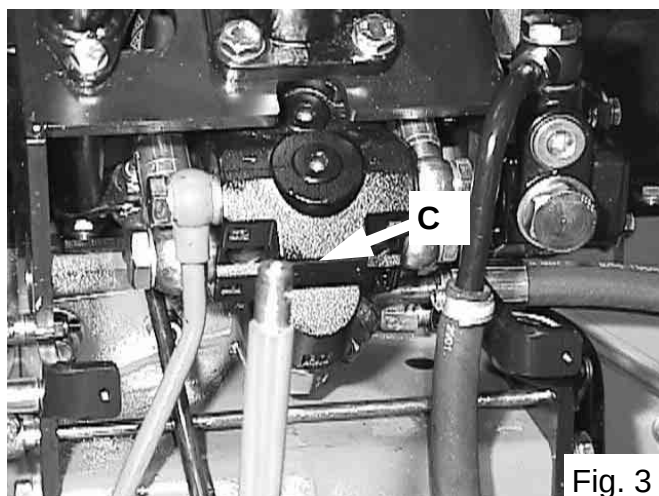


Fig. 3

To adjust the pressure, remove cover C shown in fig. 3 and work on the Allen screw under the plug.

Tighten the screw to increase the pressure value sent to the steering cylinder or unscrew to lower this value.

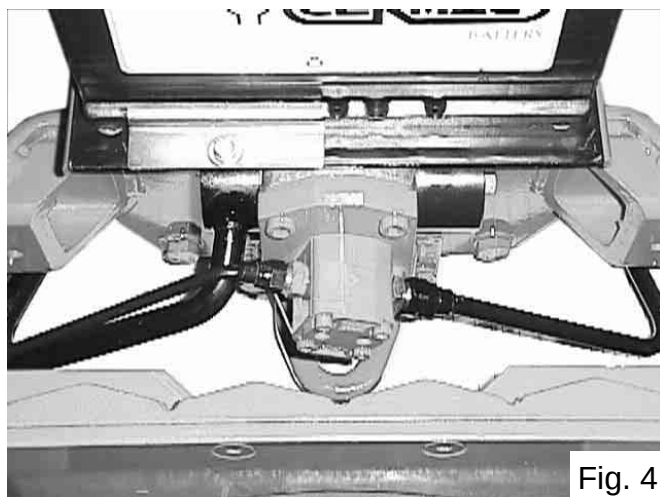


Fig. 4

To check this value, there is a pressure tap above the cylinder head into which the pressure gauge used to check all the pressure values in the circuit can be screwed.

To check the pressure in the power steering circuit, move the steering cylinder to end of stroke on the rh or lh side and read the pressure value indicated on the gauge. Naturally, no other user must be operated while this test is carried out.

Fig. 4 shows the hydraulic pump assembly: the large pump which provides a flow rate of about 34 liters at full engine rate, indicated by P1 in the hydraulic layout on page 2, supplies the main hydraulic circuit while the small pump, indicated with P2 in the layout, provides a maximum flow rate of 4.5 liters at max engine rate and supplies the diff lock, 4WD engagement and forced lubrication of the gearbox as indicated in the hydraulic layout on page 2.



Fig. 5

Fig. 5 shows the hydraulic filter on the intake with a 90 micron filtering capacity and filter clogging bulb that in-

dicates when the hydraulic filter is clogged by means of an indicator light on the dashboard.

The 4WD and diff lock are engaged by means of two cylinders illustrated in fig. 6 and 7.

When mounting the cylinders, take particular care when fitting the seals. Do not pinch or damage them and use the plugs required to calibrate them on the outer diameter.

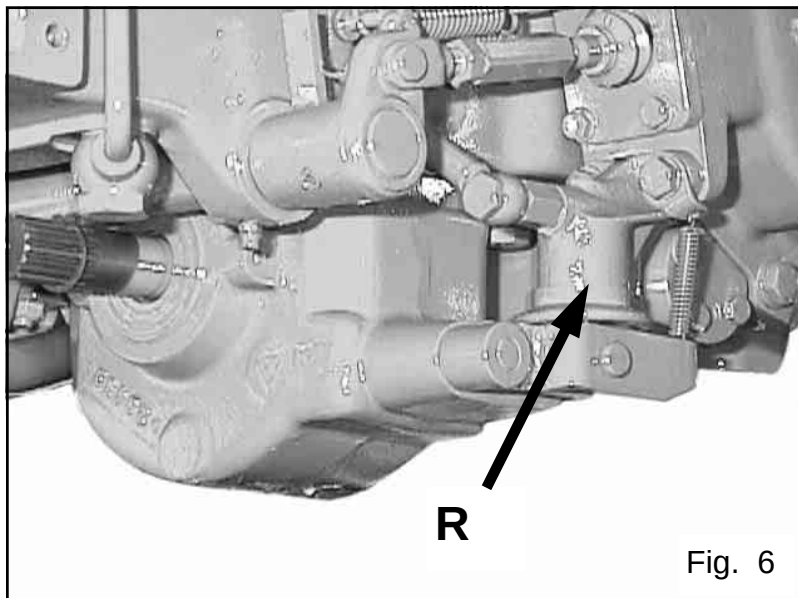


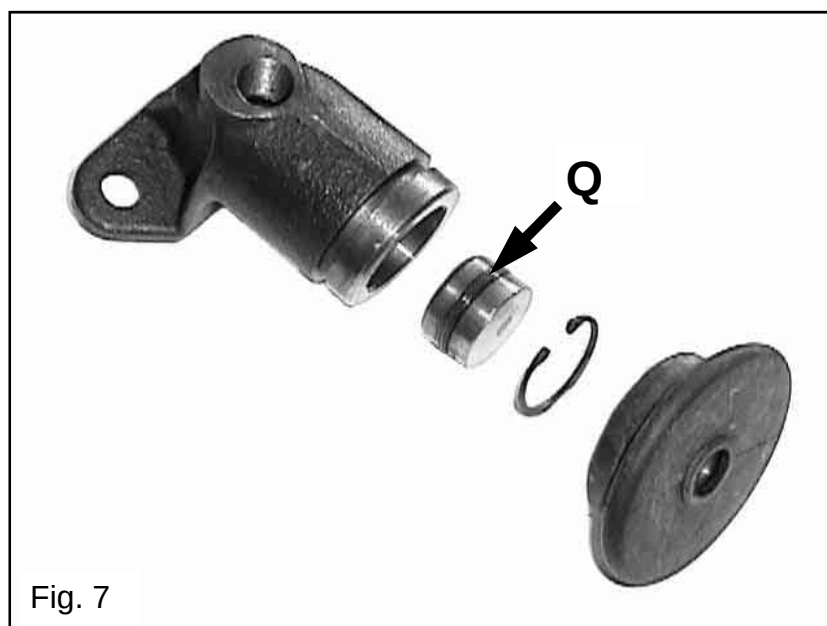
Fig. 6 illustrates the cylinder that engages the 4WD and its position under the tractor.

The outer spring and internal opposing spring overcome the residue pressure inside the plunger when the controlling solenoid valve is in the discharge phase.

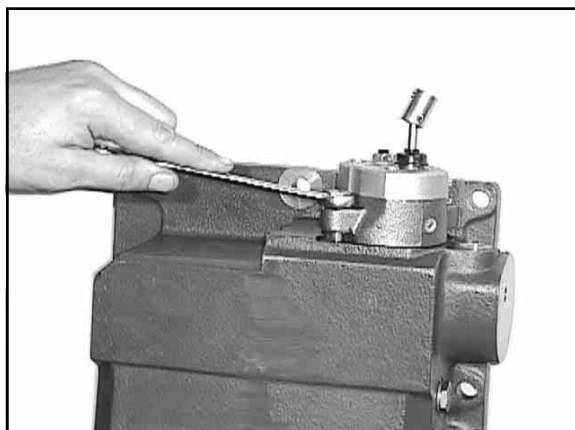
In the configuration of fig. 6, the 4WD is disengaged and the external opposing spring is in the relieved phase.

When the cylinder is fully out, the 4WD is engaged and the external opposing spring is taut.

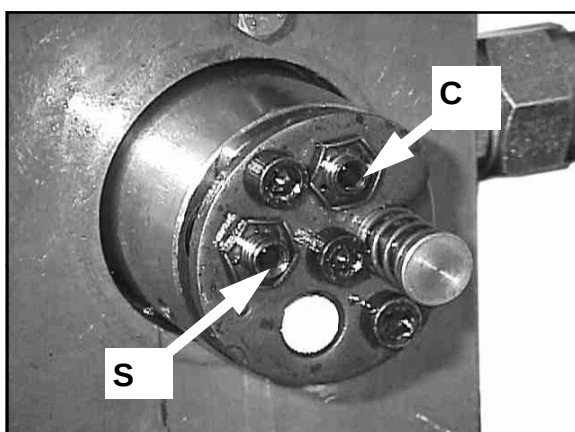
Part Q in fig. 7 is the seal for the cylinders that operate the diff lock and 4WD.



This seal should be carefully fitted into its housing to prevent it from being damaged. It should then be calibrated on the outer diameter with the aid of a tube of an adequate diameter and left in this condition for a couple of hours. After this, it should be lubricated with mineral oil and fitted inside the cylinder.



To check the pressures that act inside the power lift's valve system, demount the valve system itself as illustrated alongside. Before doing this, place a pressure gauge in the housing on the delivery pipe of the tractor's hydraulic circuit mentioned in the previous pages. As can be seen in the figure on the left, there are two valves: **C** and **S**. Valve **C** is the overpressure valve while **S** is the safety valve.



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

To increase the pressure value, tighten the screws of **S** and **C** and lock the adjustments with the check nut. When the valve system is remounted on the power lift, check the pressure value on the gauge mounted on the delivery pipe. To pressurize the power lift, lock the power lift links with a bar connected to the tow hook.

The sequence on the left shows how to check the components of valves **C** and **S**, until the entire rear part of the block has been demounted.



Take care when remounting the valve block as the longer spring should be mounted behind valve **S**.

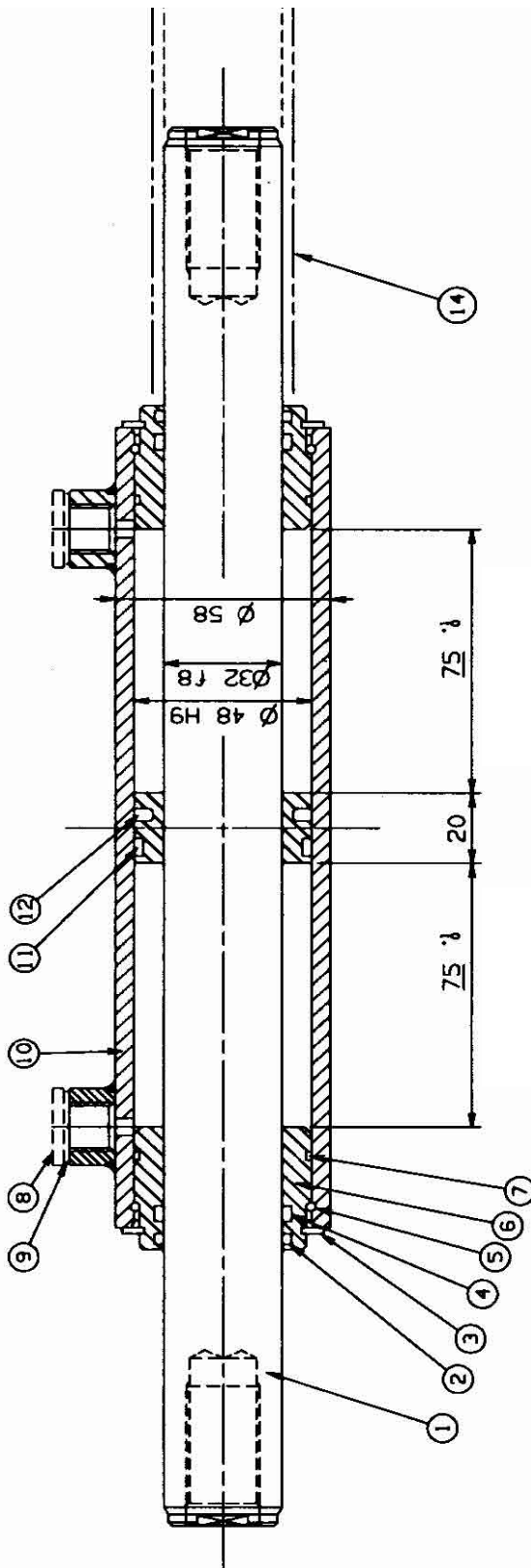
The spring mounted behind valve **C** is shorter than the one for **S**.

Take care not to invert the two springs when the valve system is remounted.



When the valve block of the power lift is re-mounted, check to make sure that all the O-rings shown in the photo alongside are in perfect conditions and that they have not been pinched.

This to prevent faulty operation requiring further work on the assembly.



The cylinder must be demounted in order to replace seals 11 and 12. Remove the circlip shown in the figure on the left.

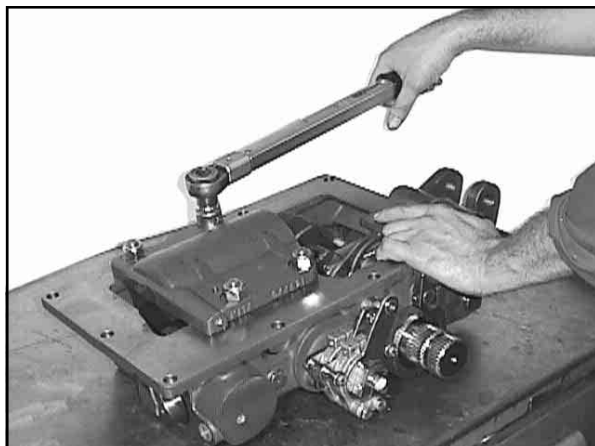
Remove the O-ring (part 5) shown in the figure on the left from its seat using a pair of pliers.

Take out the head, allowing it to slide along the stem and taking care to prevent the seals inside from being damaged.

Remove seals 11 and 12 and replace them if they are worn or damaged.

Repeat these operations in reverse order in order to remount the cylinder.

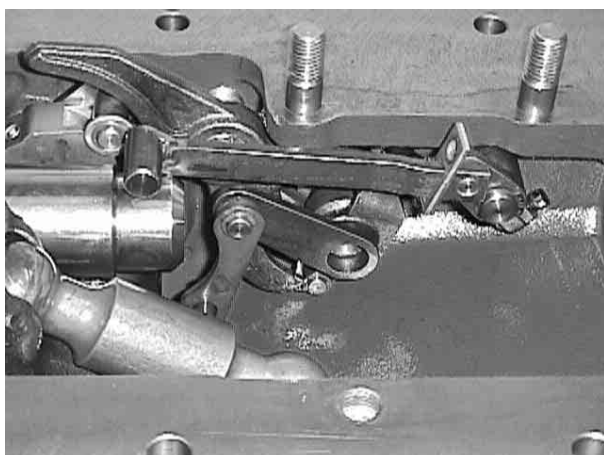
Take care to prevent the chromium plating on the stem from being damaged during the cylinder demounting and remounting operations.



Proceed as illustrated in the photos alongside in order to check and replace the lifting cylinder seals.

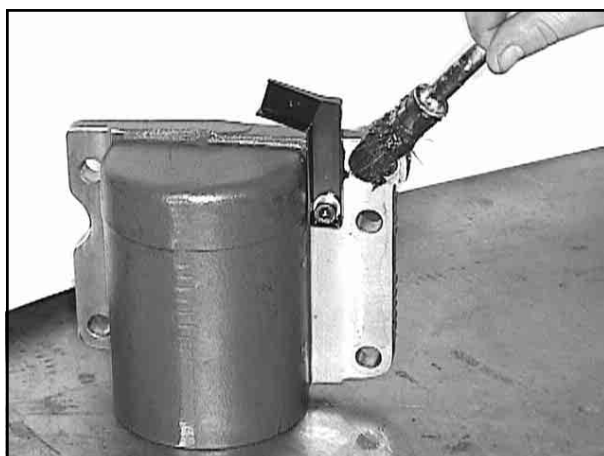
To prevent the new seals from being damaged when they are fitted, lubricate them and fit them as shown in the photograph.

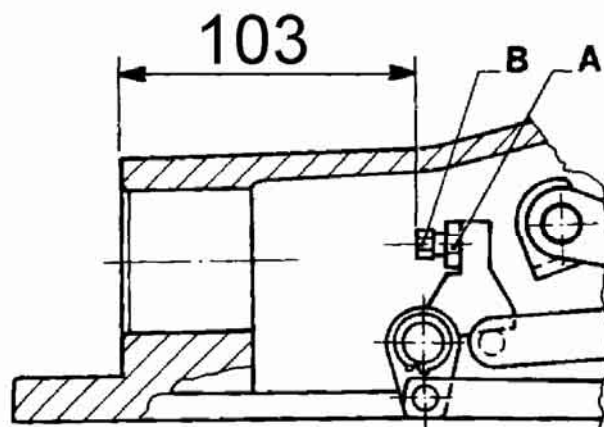
The cylinder fixing screws must be tightened to a 90 Nm torque value and locked with Loctite thread-locker.



Before remounting the parts, lubricate the cylinder seals with grease as shown in the photograph.

To make the piston easier to remove from the cylinder on the piston delivery pipe, blow in compressed air to allow the piston to slip out more easily.

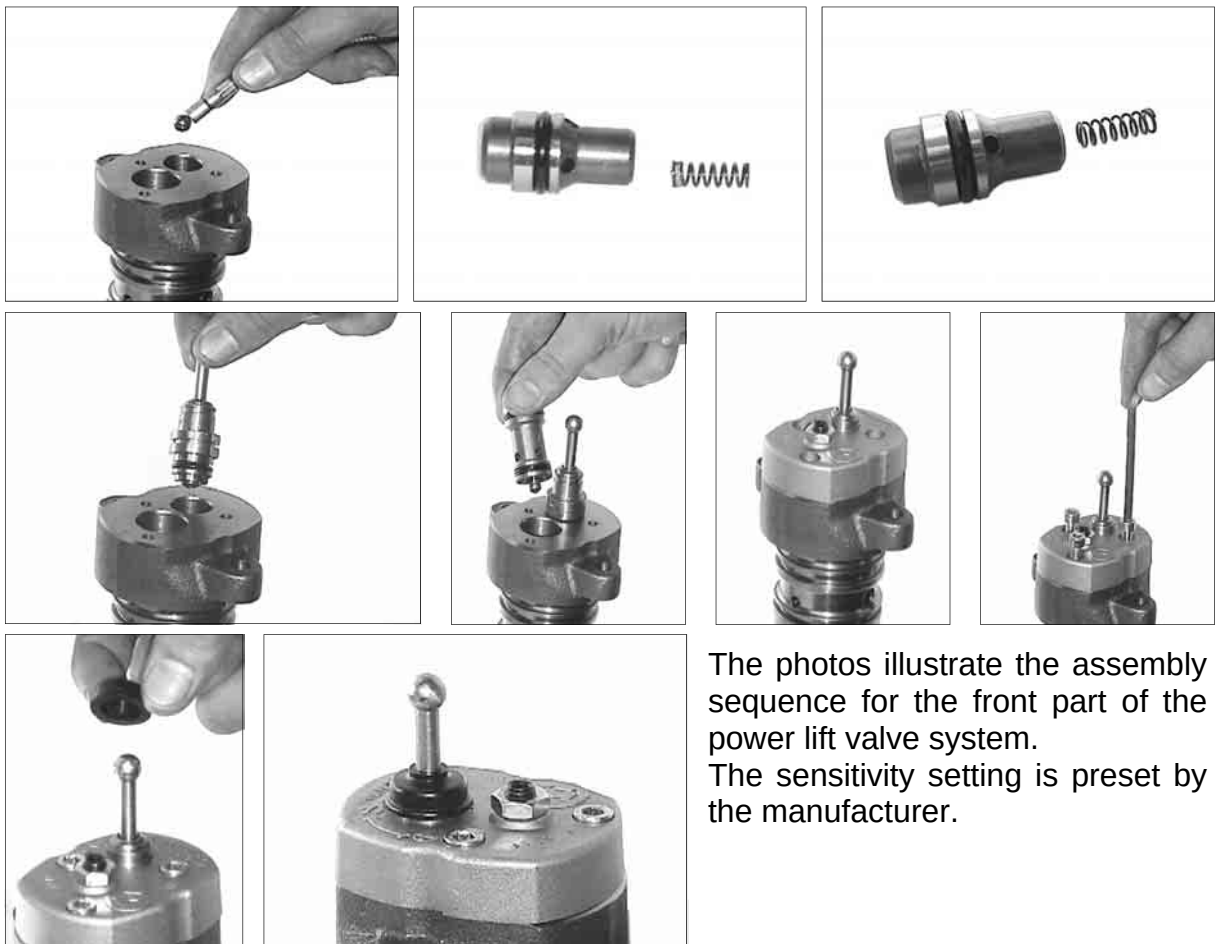




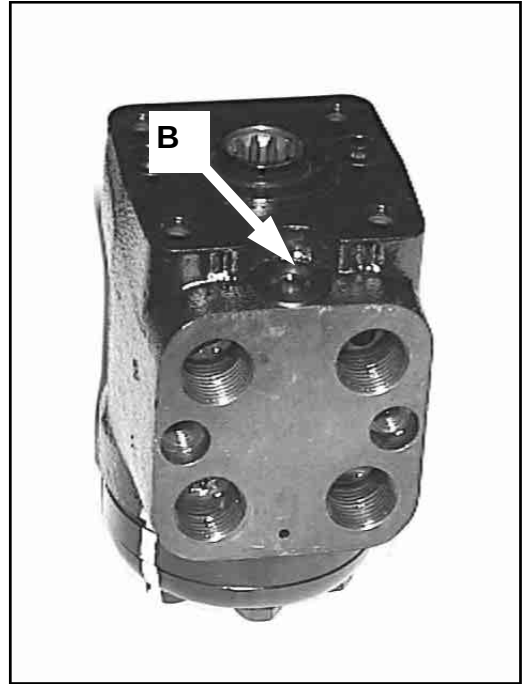
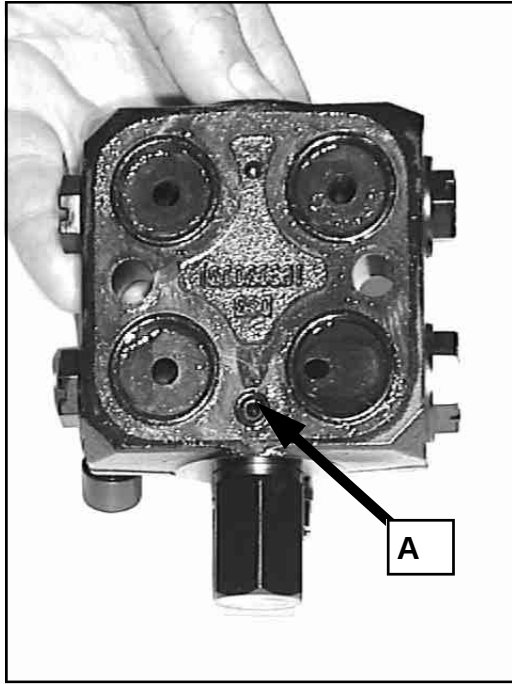
When the power lift's valve system is fitted, make sure that the measurement shown in the photo is correct.

If it is wrong, work on screw **B** and check nut **A** until the right dimension has been obtained.

This measurement must be obtained with both of the power lift levers down and with the power lift links at end of downward travel.



The photos illustrate the assembly sequence for the front part of the power lift valve system. The sensitivity setting is preset by the manufacturer.



The photos show certain parts of the power steering system that may become faulty.

Consult the workshop manual of the power steering system for more details about this assembly.

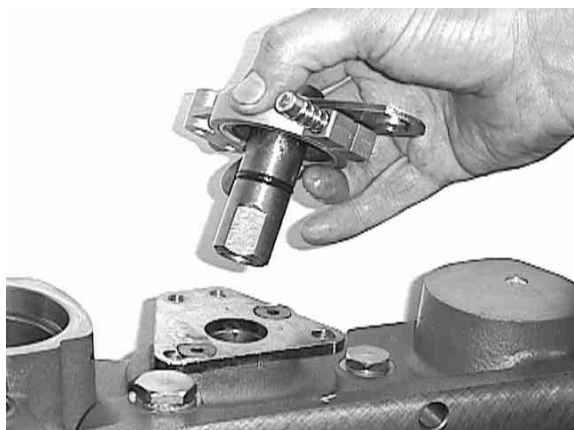
Plug **B** accesses the adjuster of the steering system's maximum valve which can be checked by fitting a pressure gauge on the tractor's delivery pipe and moving the steering cylinder to end of stroke on the rh or lh side.

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

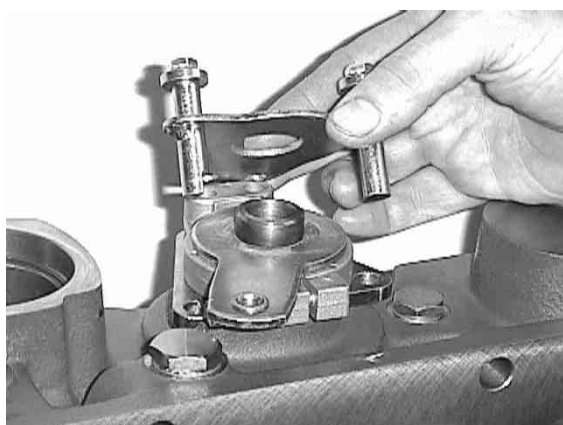
Part **A** in the figure shows the load-sensing branch of the power steering system. When the machine is new, and before the oil is changed and the filter cleaned, power steering faults may be caused by clogging in orifice **A** which prevents the component from operating correctly.

If the steering system operates in a faulty way, check the setting of valve **B** and clean orifice **A** if necessary.

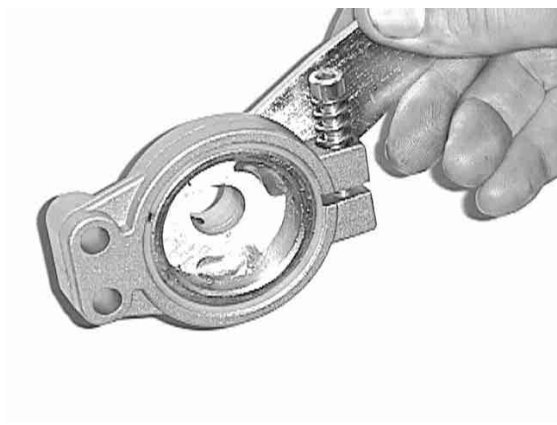
REAR POWER LIFT INTERNAL LINKAGE ASSEMBLY SEQUENCE



The sequence illustrated in the following pages, describes how to assembly the internal and external linkages of the power lift. These descriptions merely give information about the main parts of the rear power lift linkages.

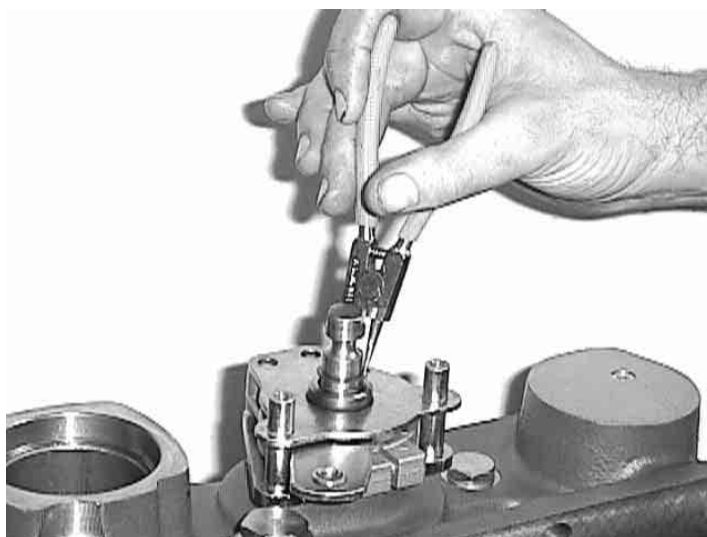
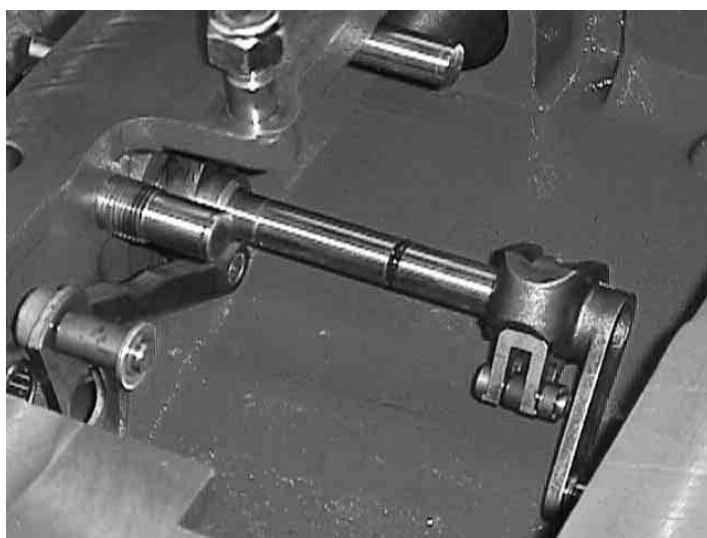
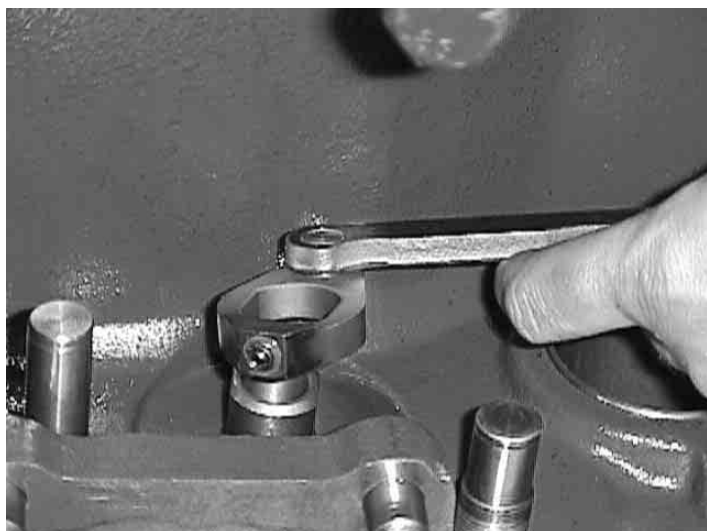


All the parts forming the power lift linkages are available from our Spare Parts Service but since the probability of these parts becoming faulty is very low and assembly very simple, the unit has been illustrated by photographs rather than a descriptive text.

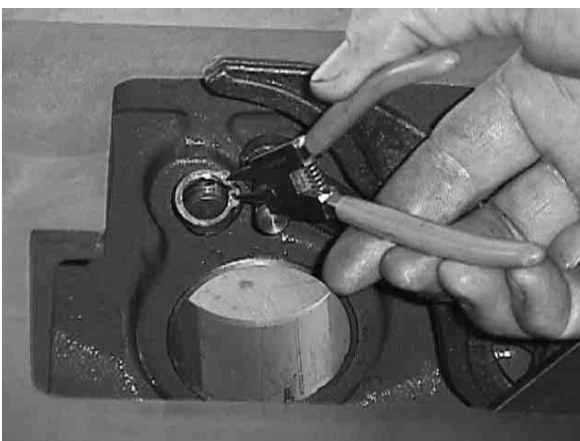
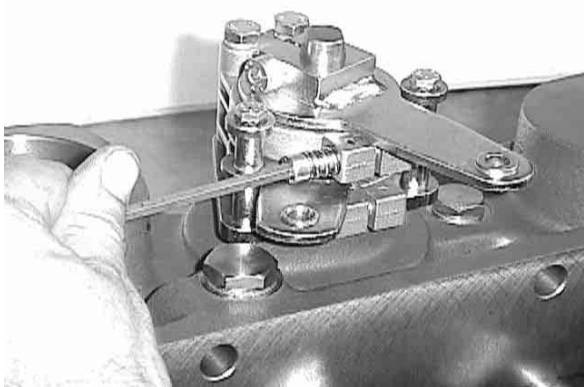
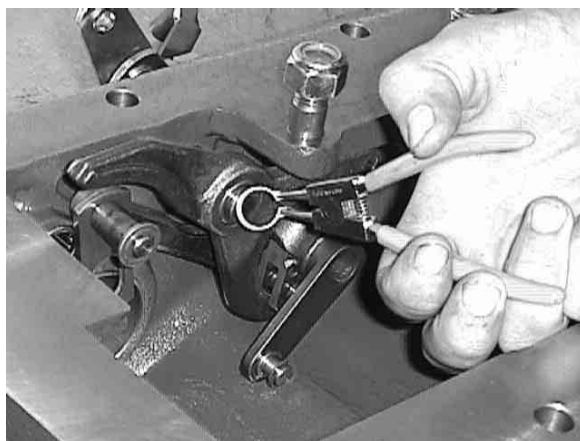


As indicated in the following pages, a specific Workshop Manual is available for the linkages and the entire rear power lift. This goes into great detail and may be of help if the explanations here are not sufficiently clear.

This page illustrates the assembly sequence for the center pivot of the levers that control the position and draft control functions on the external side of the power lift.

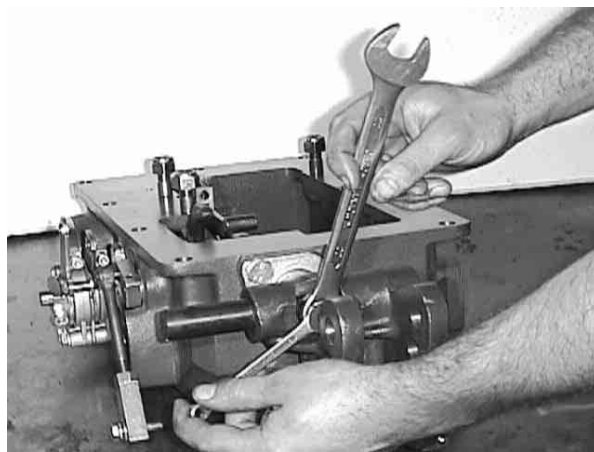
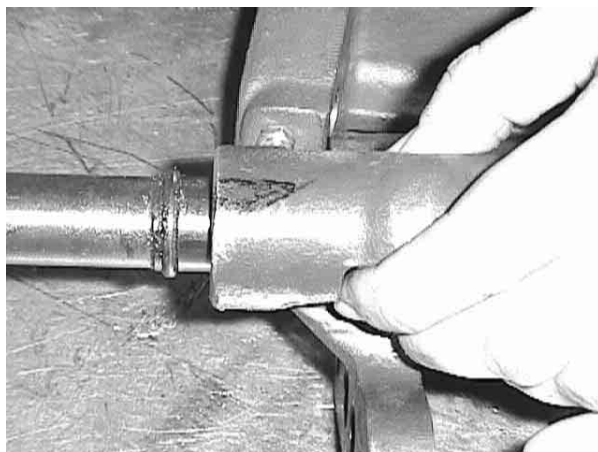
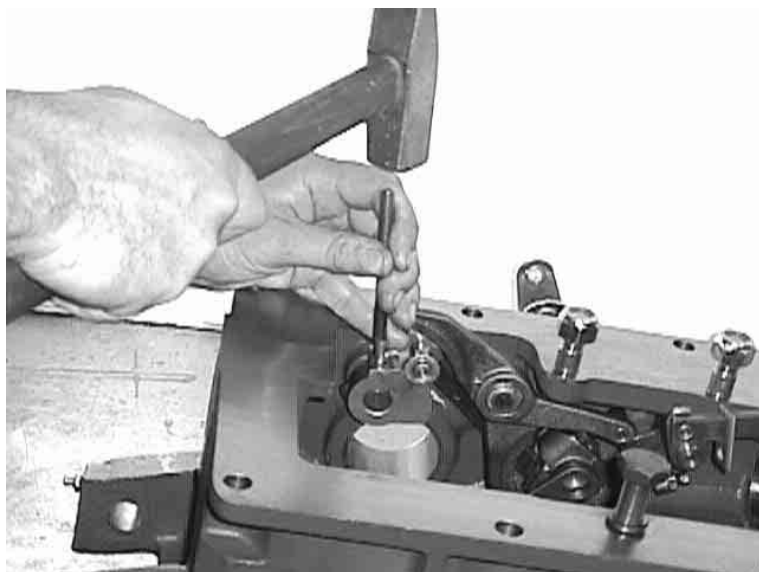


The sequence above shows the assembly sequence for the inner position control shaft.



These are the successive phases with which the inner position and draft control linkages are assembled.

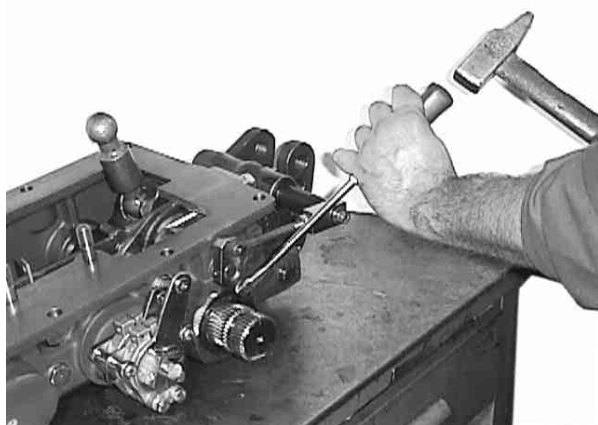
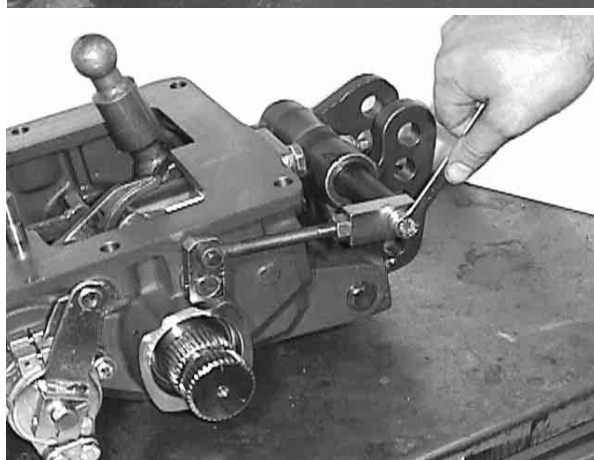
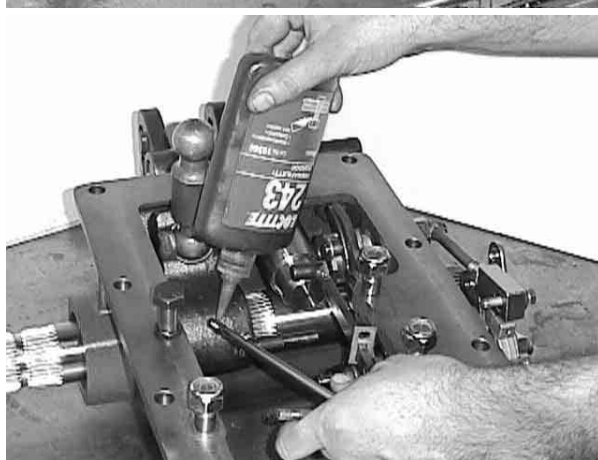
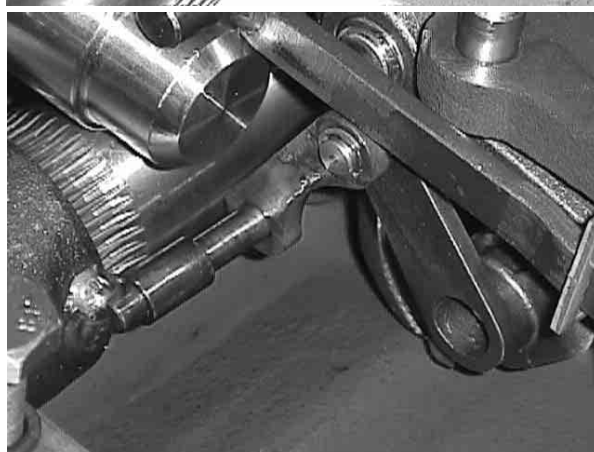
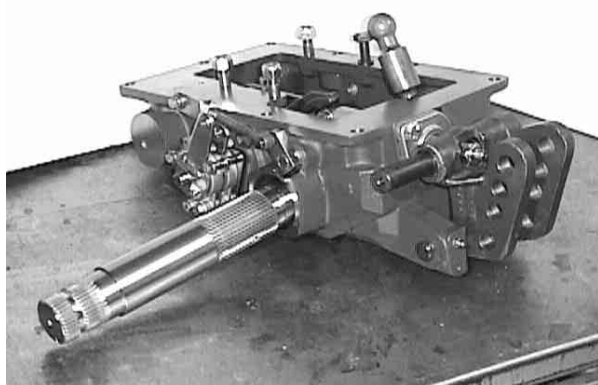
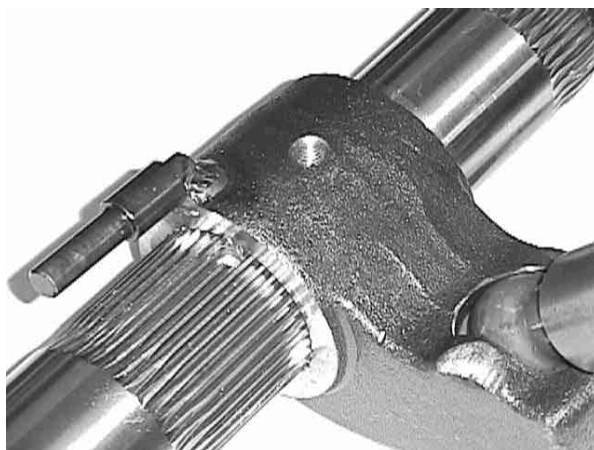
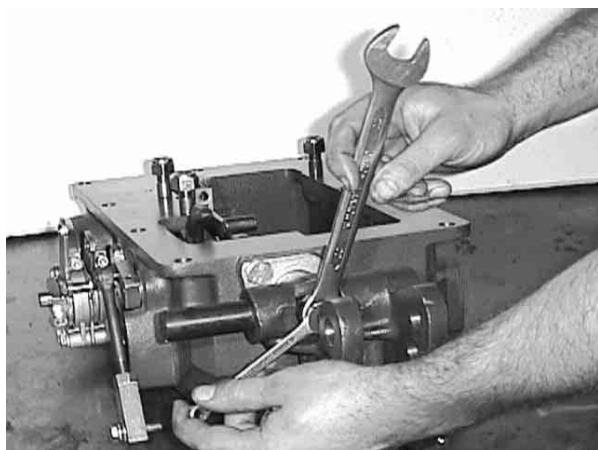




All the sequences in this page concern assembly of the sensitive draft control component.

The rod that connects the sensitive element on the rear part of the power lift with the draft control lever allows an adjustment to be made.

This adjustment allows draft adjustment by means of the lever on the power lift to correspond to the entire travel of the sensitive element on the power lift head.



The link control shaft is mounted as last operation. This will be operated by the power lift piston. Assembly of this part has already been illustrated in the previous pages.

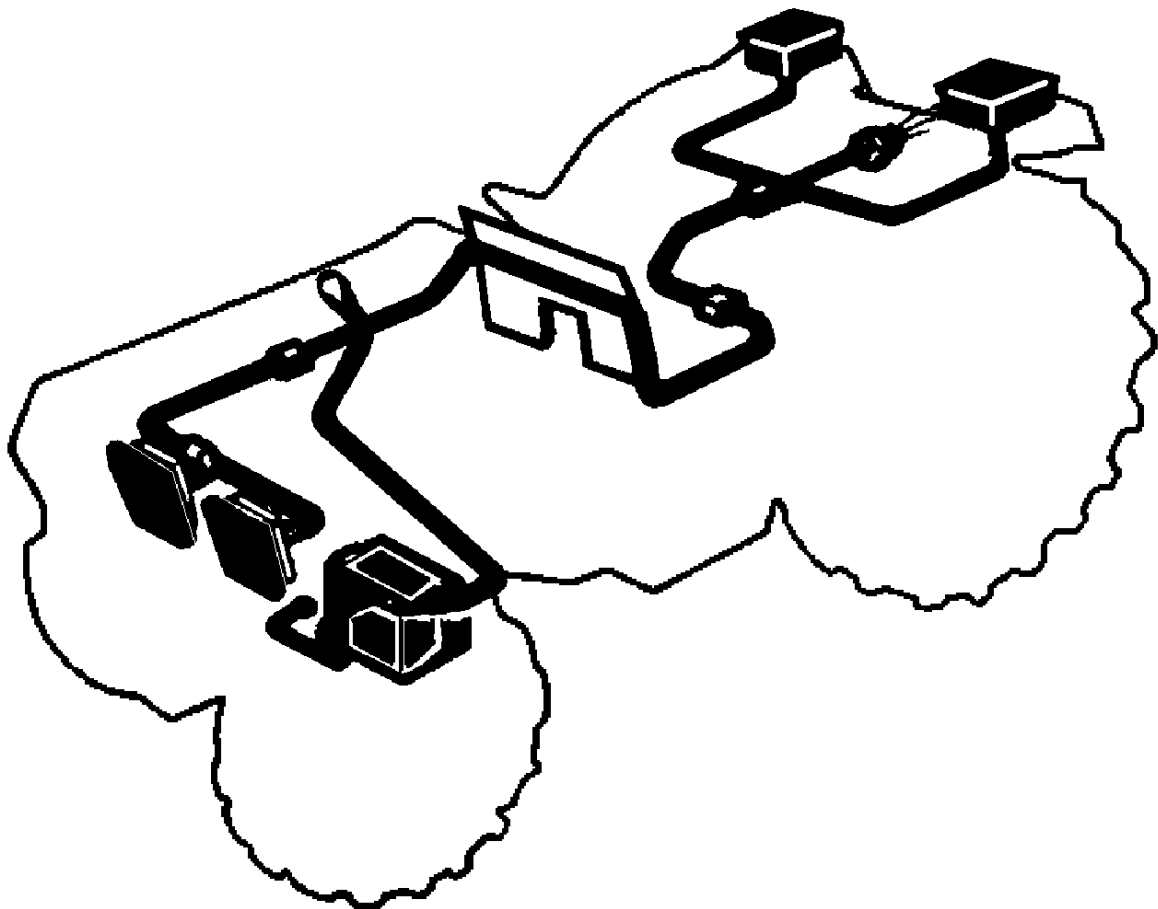
A specific Workshop Manual is available for the power lift linkages for a more detailed description of how these linkages are mounted.

LUBRIFIANT

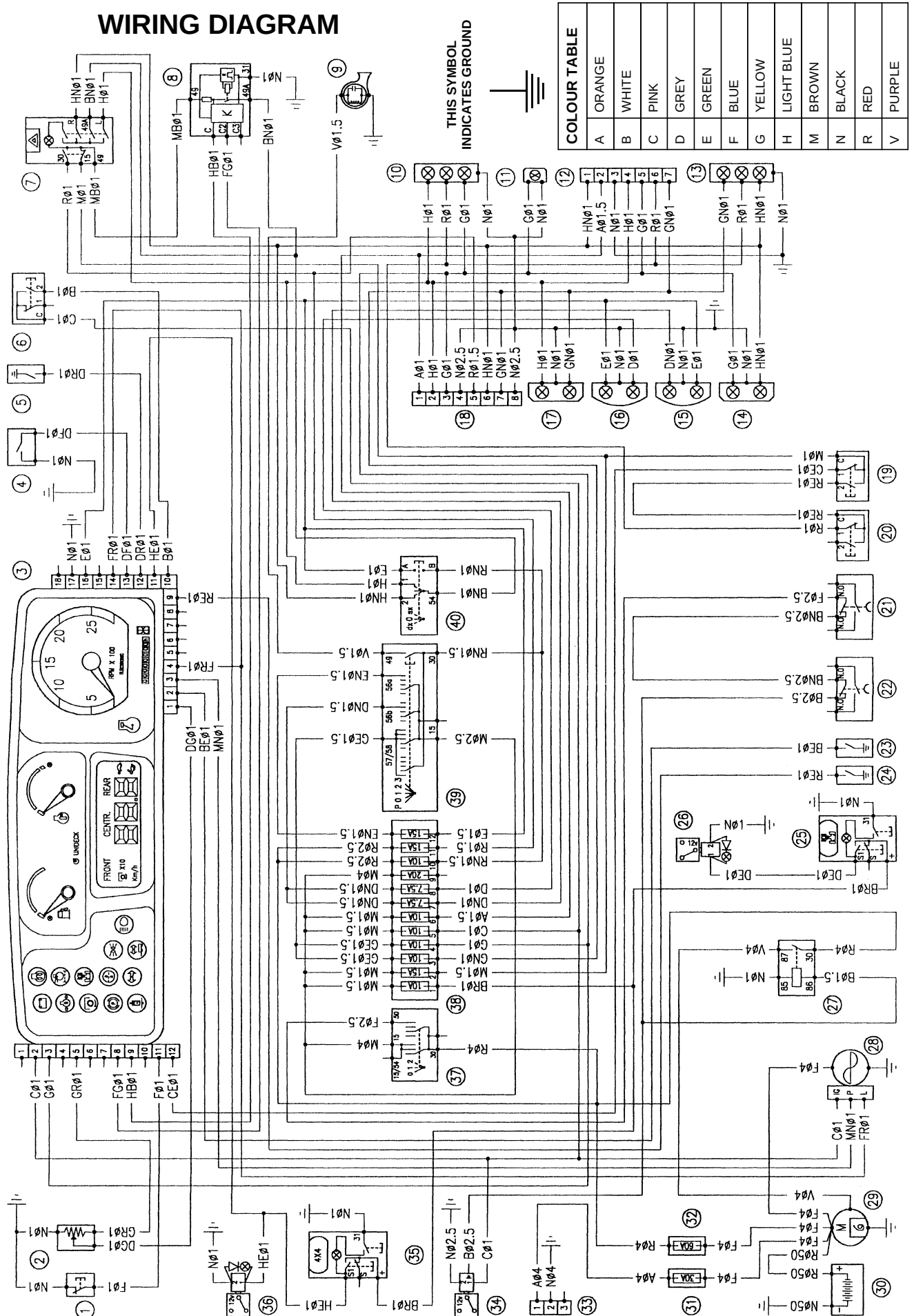
Huile	ARBOR UNIVERSAL 10W-40 (SAE 10W/40)	32	Litres
Graisse	ARBOR MP EXTRA (NLGI2)		

Nous conseillons d'utiliser lubrifiants et liquide: ***FL SELENIA***.

ELECTRICAL SYSTEM



WIRING DIAGRAM

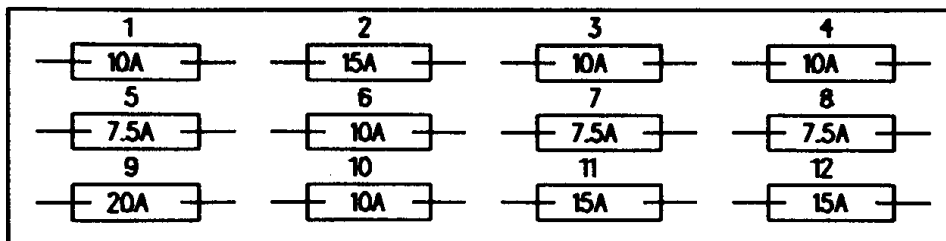


KEY

Ref.	Description
1	ROLL BAR LOWERED SWITCH
2	FUEL LEVEL FLOAT
3	CONTROL PANEL
4	AIR FILTER CLOGGED SENSOR
5	ENGINE OIL PRESSURE SENSOR
6	PTO SWITCH
7	HAZARD LIGHT SWITCH
8	TURN INDICATOR BLINKER
9	HORN
10	RH REAR LIGHT
11	LICENSE PLATE LIGHT
12	7-PIN SOCKET CONNECTOR
13	LH REAR LIGHT
14	SIDE LIGHT-LH TURN INDICATOR
15	LH HEADLIGHT
16	RH HEADLIGHT
17	SIDE LIGHT-RH TURN INDICATOR
18	8-WAY MALE CONNECTOR FOR CAB PRESETTING
19	PARKING BRAKE SWITCH
20	BRAKE LIGHT SWITCH
21	DASHBOARD IGNITION ENABLING SWITCH
22	TRACTOR IGNITION ENABLING SWITCH
23	COOLANT TEMPERATURE SENSOR
24	HYDRAULIC OIL FILTER SENSOR
25	DIFF LOCK SWITCH
26	ON-PIN SOCKET
27	POWER DENSE ALTERNATOR
28	DIFF LOCK SOLENOID VALVE
29	STARTER MOTOR
30	12V BATTERY
31	CAB PROTECTION MAXIFUSE
32	GENERAL MAXIFUSE
33	CAB PRESETTING POWER CONNECTOR
34	MOTOR STOP SOLENOID
35	4WD ENGAGING SWITCH
36	4WD SOLENOID VALVE
37	IGNITION SWITCH
38	FUSE BOX
39	LIGHT SELECTOR
40	BLINKER SWITCH AND TURN INDICATOR SWITCH

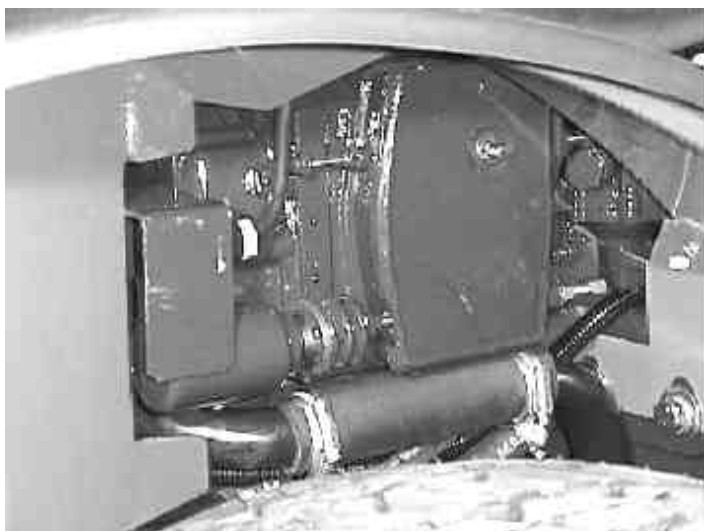
Description of the fuse box

FUSE BOX

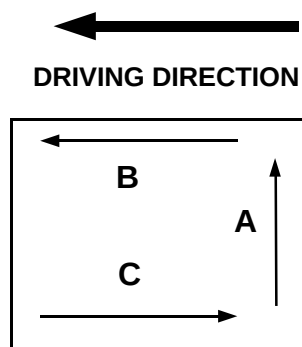


N°	USERS
1	DIFF LOCK SWITCH, 4WD ENGAGING SWITCH POWER SUPPLY
2	PARKING BRAKE (BRAKE LIGHTS), +15 HAZARD SWITCH POWER SUPPLY
3	RH FRONT-LH REAR SIDE LIGHTS, 8-WAY MALE CONNECTOR FOR CAB CONNECTOR PRESETTING, 7-PIN SOCKET, ONE-PIN SOCKET
4	LH FRONT-RH REAR SIDE LIGHTS, LICENSE PLATE LIGHT, 8-WAY MALE CONNECTOR FOR CAB PRESETTING, CONTROL PANEL LIGHTING, 7-PIN SOCKET CONNECTOR
5	ALTERNATOR ENERGIZING, MOTOR STOP SOLENOID VALVE, PTO SWITCH, CONTROL PANEL POWER SUPPLIES
6	POWER SUPPLY FOR 8-WAY MALE CONNECTOR FOR CAB CONNECTOR PRESETTING, 7-PIN SOCKET
7	LH DIPPED BEAM
8	RH DIPPED BEAM
9	OPTIONAL
10	HORN, DRIVING BEAM BLINKER POWER SUPPLY
11	POWER SUPPLY FOR +30 HAZARD LIGHT SWITCH, 8-WAY MALE CONNECTOR FOR CAB PRESETTING
12	RH-LH DRIVING BEAMS AND DRIVING BEAM INDICATOR LIGHT

Motor stop



The photo on the left depicts the electrostop.
Comply with the diagram below to connect the solenoid correctly.



Pin A of the solenoid must be connected to pin 50 of the ignition key.

Pin C must be connected to the ground point.

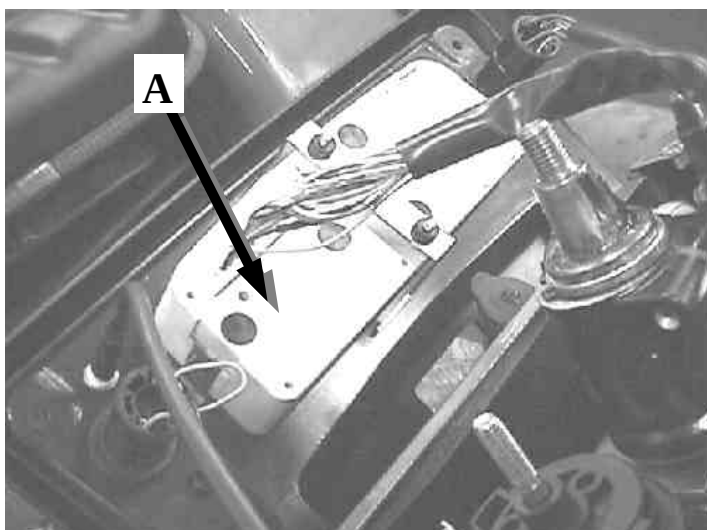
Pin B must be connected to pin 15 of the key.

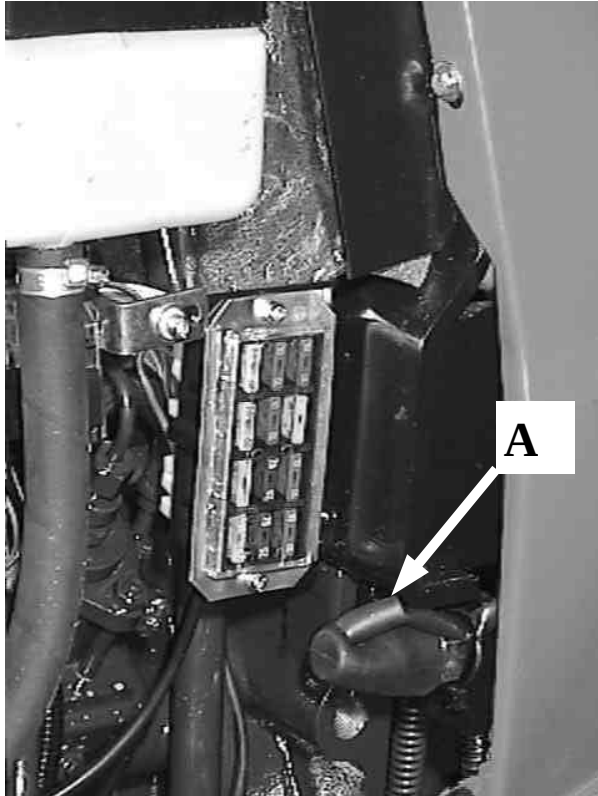
The electrostop has two circuits that are energized at the same time during the ignition phase, after which only the circuit powered by 15 remains energized and keeps the engine running.

The photo below shows the point where the revolution counter can be adjusted by means of a small screwdriver.

Allow the engine to idle (about 850 rpm) and calibrate the instrument by means of screw A in the photo, matching the indication given by the instrument with the rate shown.

More accurate checks can be made by using a speed indicator that gauges the PTO rpm rate and, using this information, the real engine rpm rate remembering that the ratio between PTO rate at 540 rpm and engine rate is 4:5.

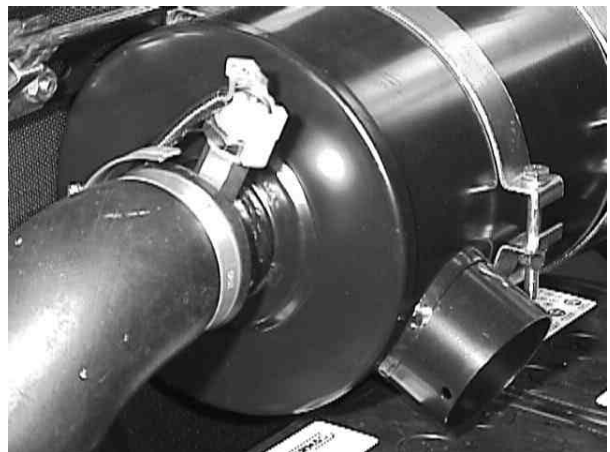




The photo on the left shows the position in the tractor of the fuse box, a description of which is given in the previous pages.

Part A is the switch that enables ignition, installed on the clutch pedal. Tractor starting may be compromised if this switch is adjusted incorrectly.

The photo below shows the bulb that indicates when the air filter is clogged by means of an indicator light in the multi-function instrument.

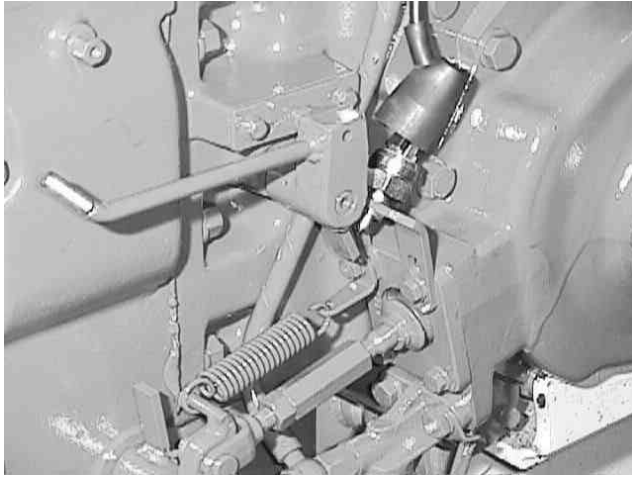


The photo above shows the switch that controls 4WD engagement by energizing the drive control solenoid valve. This switch is the stable, on-off type which controls valve energizing and the consequent flow of oil to the actuator cylinder.

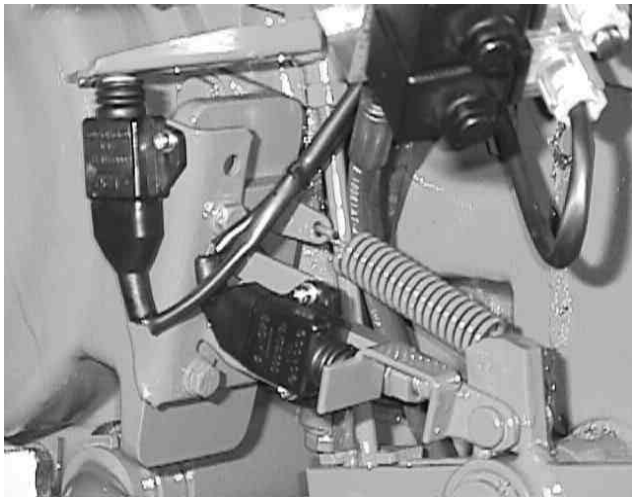
The switch that controls the diff lock is unstable and locking occurs for as long as the button is pressed.

This button is installed near the power lift levers. While 4WD engagement is indicated by a yellow light on the dashboard, 4WD engagement is not indicated by a light in view of the unstable nature of the command.





The photo alongside shows the ignition enabling switch installed on the PTO lever. It prevents the tractor from operating if the PTO is engaged. Here again, faults will occur when the tractor is started unless the ignition enabling switch on the PTO is adjusted correctly.



The photo on the left and the one below show the switches that control the hand brake light and brake lights. The slots on the switches allow these latter to be adjusted and correctly positioned. As can be seen in the photo below, the brake light switch can also be adjusted from the lower part of the machine. The main brakes described in the previous pages can also be accessed for adjustments if necessary.



The photo on the right shows the position of the hydraulic oil filter clogging bulb. An indicator light on the dashboard comes on to warn when the filter is clogged. It is worthwhile remembering that the hydraulic oil filter clogging and air filter clogging bulbs transmit a signal towards ground which turns on the warning lights on the dashboard.

INTERVENTIONS - CAUSES, REMEDIES



FAULTS	POSSIBLE CAUSES	REMEDIES
CLUTCH		
The clutch slips	1) - Clutch plate dirtied with oil 2) - Incorrect clutch play	1) - Eliminate oil leaks (replace the oil retainer of the main shaft if necessary). Thoroughly clean the flywheel and replace the clutch plate 2) - Adjust the clutch wire and replace the clutch plate if the fault persists
The clutch fails to disengage	1) - Wavy clutch plate 2) - Clutch disengaging lever bent 3) - Pressure plate levers incorrectly adjusted 4) - Clutch plate stuck to flywheel surface 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 and adjust them if this is not the case 4) - Start the machine, block it with the brake, repeatedly engage and disengage the clutch and, in the event of a negative result, remount the clutch and clean it. 5)- Adjust the external levers and internal ones if necessary.
GEARBOX		
The gears disengage	1)- Synchromesh pack and speed selector gears with too much float. 2)- Incorrect synchronism between speed selector rod and sliding meshing sleeve. 3)- Sliding speed meshing sleeve and selector gear with worn teeth owing to badly operating synchromesh.	1)- Adjust play as prescribed 2)- Adjust drive transmission, eliminating play and replacing rod, spring and selector ball if necessary. 3)- Replace synchromeshes complete with selector gears.
The gears fail to engage	1)- The clutch fails to disengage. 2)- Synchromesh with wavy brake ring 3)- Synchromesh with excessively reactive brake pre-loading springs 4)- Synchromesh pack and speed selector gears with little float	1)- Adjust clutch as prescribed 2)- Replace the brake rings 3)- Replace the springs and chamfer the parts in contact with them on the sliding sleeve 4)- Restore the prescribed play
The reduction unit—reverse shuttle disengages	1)- Incorrect synchronism between reduction unit engaging rod and sliding gear 2) -Reverse gear with axial thrust generatrix bush	1) - Restore drive transmission, eliminating play and replacing rod, ball and selector spring if necessary. 2) - Replace gear + bush assembly.

FAULTS	POSSIBLE CAU-	REMEDIES
The reduction unit—reverse shuttle fails to engage	1)- The clutch fails to disengage 2)- Ratio overlap inhibitor not adjusted.	1)- Adjust clutch assemblies as prescribed 2)- Adjust inhibitor function, replacing the components of the device.
FRONT AXLE		
Noisy axle	1)- Axle bearing bushes with excessive play 2)- Worn transmission sleeve 3)- Bevel gear play not adjusted 4)- Differential not adjusted	1) - Replace bearing bushes and transmission sleeve 2)- Replace sleeve and check transmission shaft alignment 3)- Adjust pinion—ring gear correctly 4)- Adjust differential correctly
REAR DIFFERENTIAL		
Noisy axle	1)- Diff lock control not adjusted 2)- Internal diff lock linkage not adjusted 3)- Bevel gear pair not adju-	1)- Adjust control 2)- Adjust linkages 3)- Adjust pinion—ring gear
Diff lock fails to engage	1)- External control locked 2)- Internal linkages not adjusted 3)- Lock sliding ring jams on crown wheel	1)- Release and adjust control 2)- Adjust linkages 3)- Restore smooth sliding of ring on crown wheel.
Diff lock fails to disengage	1)- External control locked 2)- Internal linkages not adjusted 3)- Lock sliding ring jams on crown wheel.	1) - Release and adjust control 2)- Adjust linkages 3)- Restore smooth sliding of ring on crown wheel
FRONT FINAL DRIVES		
Noisy wheels	1)- Loose flange and rim fixing bolts 2)- Float on axle shaft	1)- Torque the bolts 2)- Eliminate play as prescribed
REAR FINAL DRIVES		
Noisy wheels	1)- Loose flange and rim fixing bolts 2)- Float on axle shaft	1)- Torque the bolts 2)- Eliminate play as prescribed

FAULTS	POSSIBLE CAUSES	REMEDIES
POWER TAKE-OFF		
The power take-off disengages	1)- PTO selection command not adjusted 2)- 540-540E-1000 rpm command not adjusted	1)- Adjust selection as prescribed 2)- Replace command
The power take-off fails to engage	1)- The clutch does not disengage 2)- PTO selection command not adjusted	1)- Adjust clutch as prescribed 2)- Adjust selection as prescribed
Noisy power take-off	1)- When implements requiring little lugging power and with uneven rotation are hitched 2)- Selection of 540-540E-1000 rpm ratio not proportional with that of the implement 3)- PTO shaft float	1)- There is no remedy to a fault that concerns work on the implement 2)- Select an appropriate ratio 3)- Adjust the shaft as prescribed and make sure that the drivelines connected to it operate smoothly
DRIVE TRANSMISSION UNIT		
The drive disengages	1)- Pressure too low 2)- Leaking plunger seal 3)- Internal selection unit (fork, gear ...) work or not adjusted	1)- Restore correct pressure value 2)- Replace seal 3)- Check adjustment and replace worn parts if necessary.
The drive fails to engage	1)- Pressure too low 2)- Leaking plunger seal 3)- Internal selection unit worn 4)- Electrical system or solenoid valve unit fail to function 5)- Hydraulic pump out of service.	1)- Restore correct pressure value 2)- Replace seal 3)- Replace parts 4)- Check fuses, check valve unit power supply, check electric system components (4WD switch, relays, etc.), while consulting the diagram. 5)- Replace hydraulic pump

FAULTS	POSSIBLE CAUSES	REMEDIES
Noisy drive	1)- Wrong tyre combination 2)- Wrong tyre pressure 3)- Worn transmission sleeves	1)- Match tyres correctly 2)- Adjust correct tyre pressure 3)- Replace sleeves
BRAKES		
The machine fails to brake	1)- Brakes not adjusted 2)- Worn brake discs	1)- Adjust emergency and parking brakes 2)- Replace discs
The machine remains braked	1)- Brakes not adjusted 2)- Broken return springs 3)- Controls hardened as they are not lubricated	1)- Adjust emergency and parking brake 2)- Replace springs 3)- Make sure that controls operate smoothly
Braking irregular	1)- Brakes not adjusted	1)- Adjust parking brakes. Make sure they engage at the same time
STEERING SYSTEM		
Loss of control when machine is driven	1)- Steering cylinder with worn retention rings 2)- Power steering with badly adjusted antishock valves	1)- Replace retention rings on cylinder 2)- Thoroughly clean the valves and make sure that the pressure values are as prescribed. Replace power steering system if this is not the case.
Oil leaks from power steering system	1)- Loosened unions 2)- Worn retention rings 3)- Power steering outlet clogged.	1)- Tighten unions 2)- Replace retention rings 3)- Check condition of discharge tube and operation of power lift's valve system
Steering difficult	1)- Power steering system pressure low 2)- Air in the circuit 3)- LS priority valve badly adjusted 4)- Poor gear pump efficiency	1)- Check and restore max pressure in circuit 2)- Thoroughly clean intake circuit and make sure it is tight 3)- Clean and carefully remount the valve, checking for wear and smooth operation 4)- Overhaul pump

FAULTS	POSSIBLE CAUSES	REMEDIES
POWER LIFT		
The power lift lifts in a jerky way	1)- Clogged pump intake filter 2)- Air in the hydraulic pump intake tube	1)- Clean or replace the filter 2)- Check the intake tube and unions.
The power lift fails to function	1)- Pilot valve jammed	1)- Remove the valve gear and unblock the pilot valve
The power lift starts to lift but stops as soon as it senses the load without the overpressure valve having activated	1)- Draft rod badly adjusted	1)- Adjust draft control
The power lift fails to fully lower	1)- Position control lever badly adjusted	1)- Adjust 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 valve retention rings 2)- Safety and overpressure valves badly adjusted 3)- Poor pump efficiency 4)- Poor valve efficiency	1)- Remove control valve and replace the outer retention rings 2)- Adjust the valves 3)- Overhaul pump 4)- Overhaul control valve
The power lift has difficulty in supporting the load: there is a rhythmic swing when the engine runs while the load lowers when the engine stops	1)- Worn piston seal 2)- Cylinder overpressure valve badly adjusted 3)- Check valve badly adjusted	1)- Replace the seal 2)- Remove valve and calibrate valve 3)- Remove control valve and calibrate check valve
With the links in the end of upward travel position and the engine running, there is a rhythmic swing; the load fails to lower when the engine is at a standstill.	1)- Position control lever end of travel incorrectly adjusted	1)- Adjust the position control lever, limiting the upward travel of the links.
The draft control function fails to function: the power lift only lifts and lowers by means of the position control lever	1)- Draft control lever badly adjusted	1)- Adjust the draft control lever

FAULTS	POSSIBLE CAUSES	REMEDIES
POWER LIFT		
The position control fails to function. The power lift only lifts and lowers by means of the draft control lever	1)- Position control lever badly adjusted 2)- Faulty internal linkages	1)- Adjust the position control lever. 2)- Overall the linkages.
Pump overheated	1)- Pressure too high 2)- Cavitation	1)- Lower the pressure 2)- Clean the intake components and check the unions
Pump with null pressure	1)- Pump shaft broken	1)- Replace the pump
Noisy pump	1)- Cavitation 2)- Imperct seal on pump shaft 3)- Pump casing not tight	1)- Clean the intake components and check the unions 2)- Replace the oil retainer 3)- Tighten the pump casing screw and replace the retention rings
The oil in the circuit becomes frothy and increases in volume in an anomalous way	1)- Air is entering the circuit 2)- Pump cavitation	1)- Check the oil level and eliminate any air infiltrations 2)- Clean the intake components
ELECTRICAL SYSTEM		
The starter motor fails to turn	1) - Battery low or faulty 2) - Defective starter motor 3) - Defective ignition switch 4) - Battery cables faulty or broken 5) - Ignition enabling switch on clutch pedal badly adjusted or defective.	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 switch and replace it if the fault persists.
The generator indicator 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 deforms	1) - The battery is being charged too much	1) - Advise customers who work for many hours consecutively to turn on the headlights during work in order to reduce the battery charge.
The battery water becomes black	1)- Faulty element	1)- Replace the battery
The speed gauge fails to function	1)- No pulse transmitted by the powering system 2)- Instrument badly calibrated 3)- Faulty instrument	1)- Repair the circuit 2)- Adjust the instrument 3)- Replace the instrument

FAULTS	POSSIBLE CAUSES	REMEDIES
The diff lock or 4WD solenoid valves fail to magnetize	1)- Faulty control switches 2)- Solenoid valve coils faulty. 3)- Electrical circuit broken in some point.	1)- Replace the switches 2)- Replace the coils 3)- Repair the electrical circuit.
PLATFORM		
Vibrating from the platform	1)- Contact between bodywork and chassis 2)- Contact between bodywork and power lift	1)- Eliminate the contact 2)- Fit spacers between the bodywork and its supports.
Vibrating bonnet	1)- Unstable contact between bonnet and dashboard 2)- Contact between bonnet and fixed parts of engine	1)- Adjust front bonnet supports 2)- Adjust front bonnet supports
ENGINE		
Poor engine efficiency	1)- Fuel filter clogged 2)- Partially clogged injector return 3)- Air in the circuit 4)- Badly adjusted injectors 5)- Air filter clogged	1)- Replace the filter 2)- Remove the obstruction 3)- Make circuit tight 4)- Overhaul the injectors 5)- Clean filter and replace cartridge if necessary.
The engine starts badly	1)- Badly adjusted injection pump 2)- Badly adjusted injectors 3)- Fuel pump inefficient	1)- Overhaul pump 2)- Overhaul injectors 3)- Replace pump