

Massey Ferguson 6400

Workshop service manual

n° 3378405M5

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A . General

The input unit with power shuttle is in the form of an interchangeable module on which a power shuttle is assembled. It is fitted at the gearbox input.

It is made of two separate parts: Powershuttle (see section 5) and Dynashift.

The input unit is fed with movement from the power shuttle and transmits it to the transmission by means of a drive pinion located in the rear compartment of the unit.

Dynashift

The Dynashift is used to electrohydraulically control four powershift ratios using a lever located to the left under the steering wheel.

The Dynashift function is performed by two epicyclic gear trains linked to two hydraulic clutches. For operation, see section 5.

GBA20 input unit

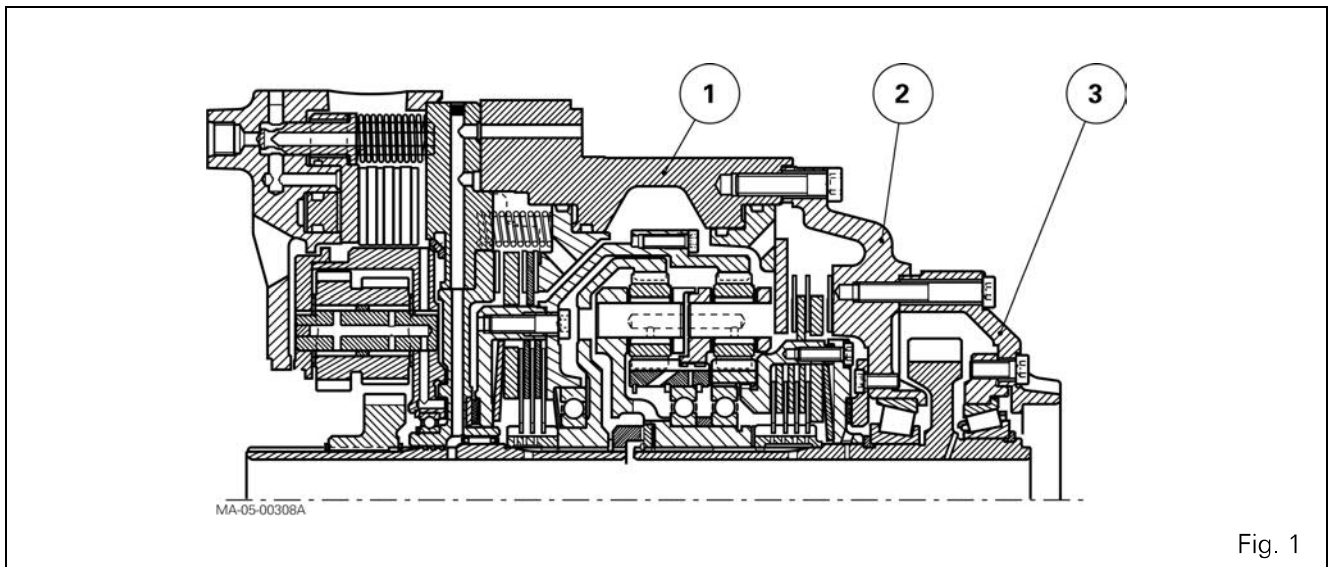
B . Preliminary operations

Note: *On all 6400 series tractors, the gearbox is fitted with an input unit with power shuttle.*

Special points

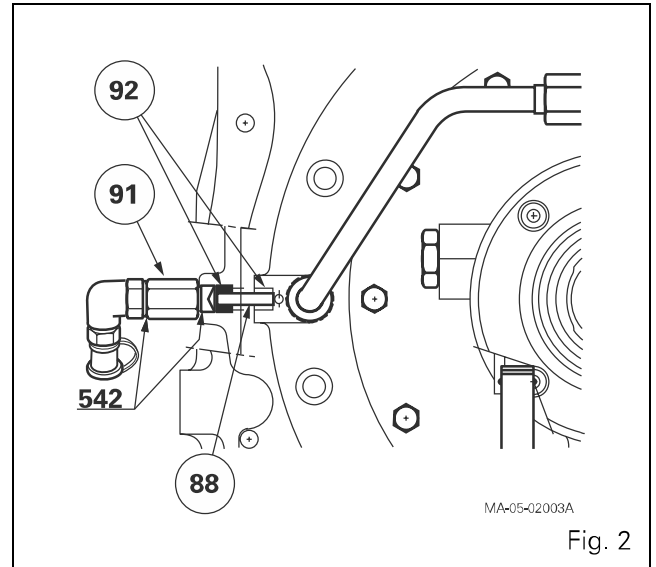
If the input unit is removed to replace the complete unit or only the units (1) (2) and the cover (3) in the Dynashift version (Fig. 1), it is necessary to adjust the layshaft of the gearbox (see section 5).

1. Disassemble the tractor between the engine and the gearbox (see section 2).
2. Drain the gearbox and the rear axle.
3. Remove the spacer (4) (see section 3).



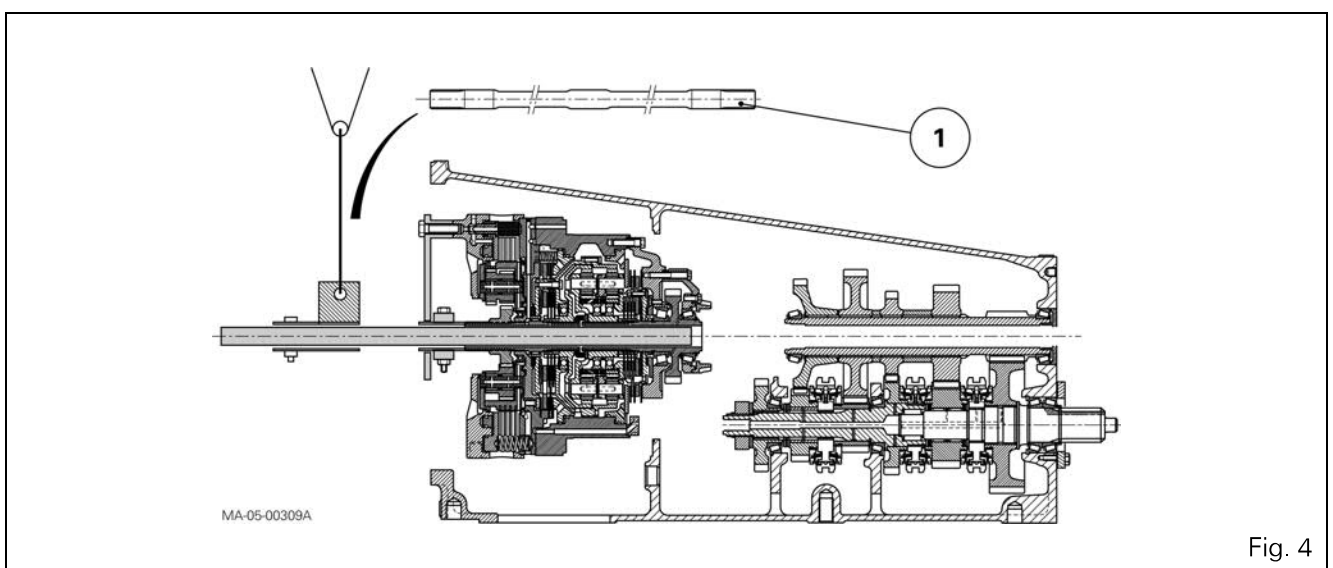
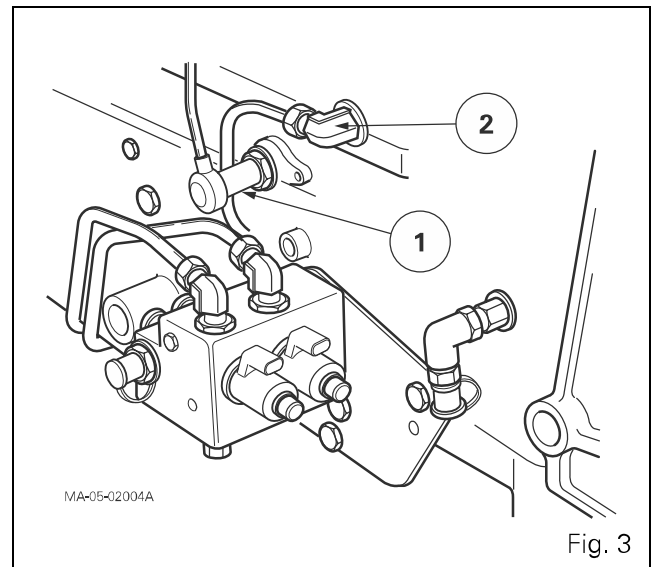
C . Removal

4. Remove the forward clutch from the power shuttle (see section 5).
5. Take out the PTO shaft (1) from the gearbox (Fig. 4) and mark its position.
6. Remove the union (91) and the transfer pipe (88) (Fig. 2), pressure line, lubrication).
7. Remove the elbow union (2) and its transfer pipe (Fig. 3).
8. Disconnect and remove the progressivity sensor (1) located under the right-hand side of the selector cover (Fig. 3).
9. Sling the input unit using tool 3378225M11, a handling bar made locally (see § G) and a suitable lifting device as in Fig. 4.



Special points

- The sling hides two diametrically opposed screws (1) on the input unit (Fig. 5). Before fitting the tool on the unit, remove these screws.



GBA20 input unit

10. Remove the remaining screws (1) securing the unit to the gearbox (Fig. 5) without touching screws (2) (8 mm Allen key) (Fig. 5).
11. With the help of an assistant, carefully pull the unit forward.
12. Pull out the unit from the gearbox and remove it.
13. Discard the O'rings (3) (Fig. 6).
14. Remove the tool and the handling bar.
15. Position the unit vertically.
16. Separate the power shuttle reverse clutch from the input box unit (see section 5).

D . Refitting

17. Install the reverse clutch previously removed (see sections above).
 18. On the Dynashift input unit (according to option), check that the cup (64) (Fig. 7) is fitted.
 19. On the gearbox housing, fit new O'rings (3) and two guide studs "G" (Fig. 6) approximately 200 mm long (optional).
- Note: On the power shuttle version, there is no locating pin between the gearbox housing and the input unit.**
20. Using the tools used for removal and with the help of an assistant, position the unit in the gearbox housing, taking the same safety steps as those used during removal.
 21. Slide the unit on the guide studs (if mounted) until they are in contact with the housing.

Special points

- If it is difficult to force fit the input unit, remove the clutch control unit and the selector cover, then check that the layshaft bearing cone of the gearbox is correctly fitted in the cup (64) (see section 5). If not, raise the shaft slightly.

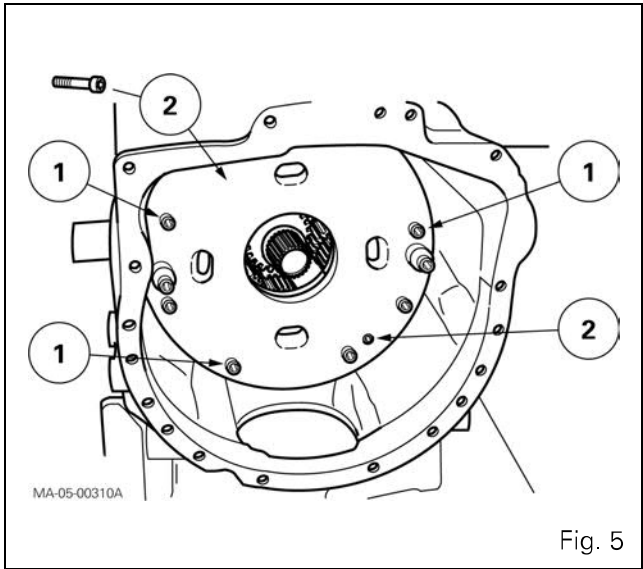


Fig. 5

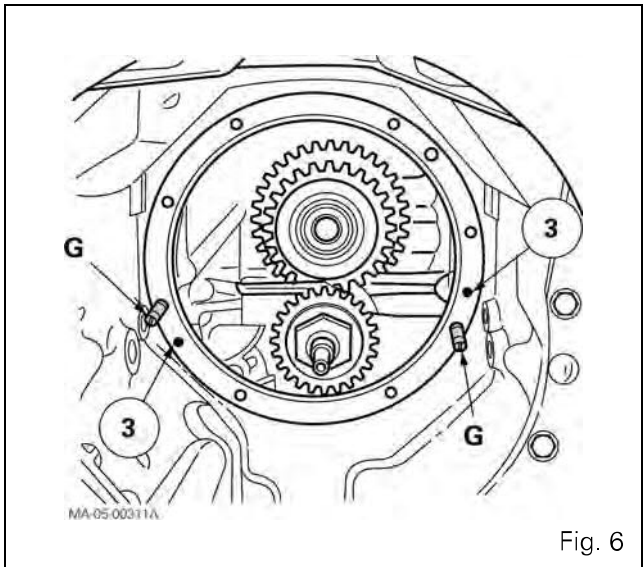


Fig. 6

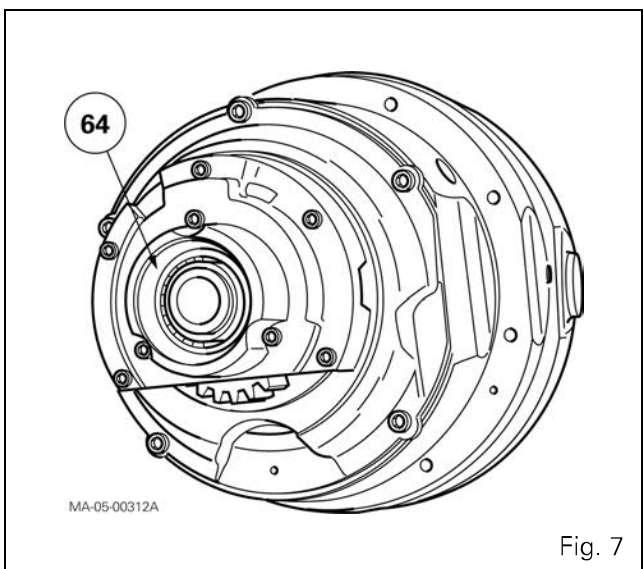


Fig. 7

22. Replace the O'rings (92) on the transfer pipe (88) (Fig. 2) and refit it along with the union (91), the thread lightly smeared with Loctite 542 or equivalent.
23. On the input unit, tighten screws (1) (Fig. 5) to 40 - 56 Nm.
24. Refit the transfer pipe and elbow union (2), the thread lightly smeared with Loctite 542 or equivalent (Fig. 9).
25. Reinstall and adjust the progressivity sensor (see § E).
26. Put the PTO shaft in the gearbox, with the longest end "E" (Fig. 8) or paint mark "P" directed towards the forward clutch of the power shuttle.
27. Install forward clutch (see section 5).

E . Adjusting the progressivity sensor

28. Smear the sensor thread with Loctite 577 (Sensor Sealing or equivalent). Install and adjust the sensor.
29. Screw the sensor (1) home (Fig. 9) without forcing it. Make sure that its end is in contact with the drive pinion (2) (see section 5).
Unscrew the sensor 1/2 to 3/4 of a turn.
Tighten the nut to a torque of 5 -10 Nm.
For operation, see section 11 - Electronics.

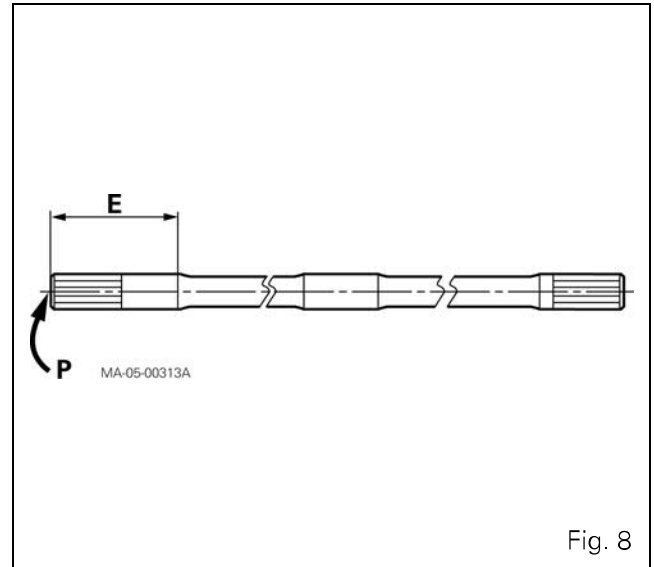


Fig. 8

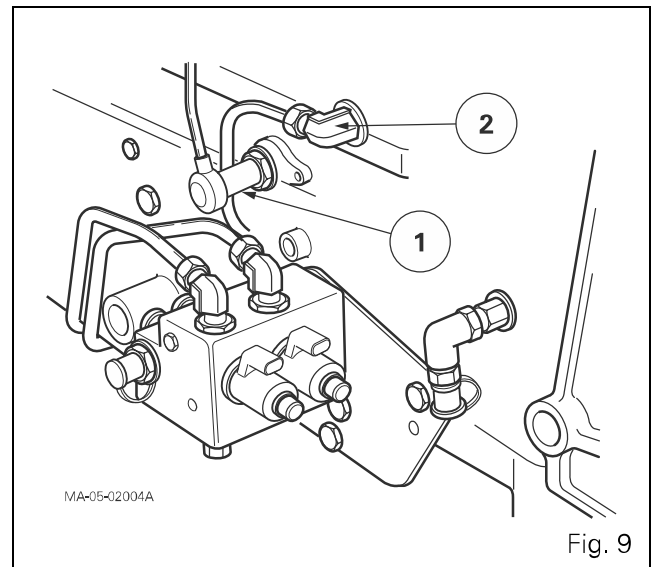
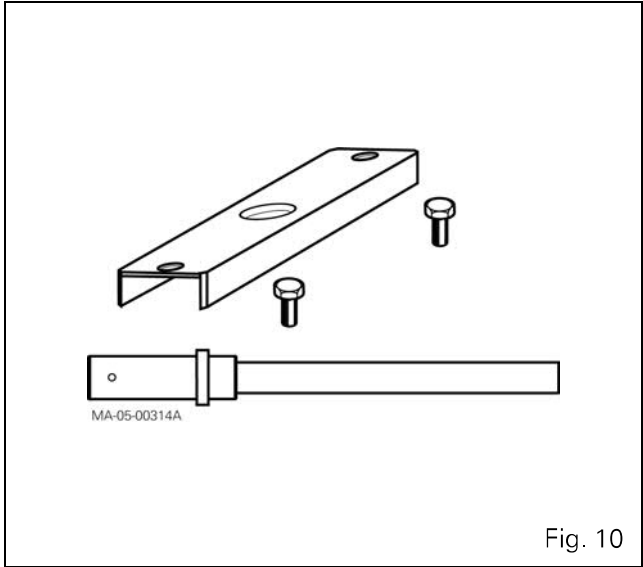


Fig. 9

GBA20 input unit

F . Final operations

- 30. Refit the spacer (4) (see section 3).
- 31. If removed, install the selector cover (see section 5).
- 32. If removed, install the power shuttle clutch control unit. Refit pipes. Reconnect the connectors (see section 9).
- 33. Top up the oil level of the housings and check using the sight glass located on the rear of the centre housing.
- 34. Assemble the tractor between the engine and the gearbox (see section 2).
- 35. Carry out a road test using the power shuttle and using ratios A, B, C and D of the Dynashift.
Check tightness of mating faces of the selector cover (if necessary), the spacer (4) and the hydraulic unions.



G . Service tools

- 1. Tool available in the AGCO network
 - 3378225M11 - Sling for input unit with power shuttle (Fig. 10)
- 2. Locally made tool
 - Handling bar (Fig. 11)

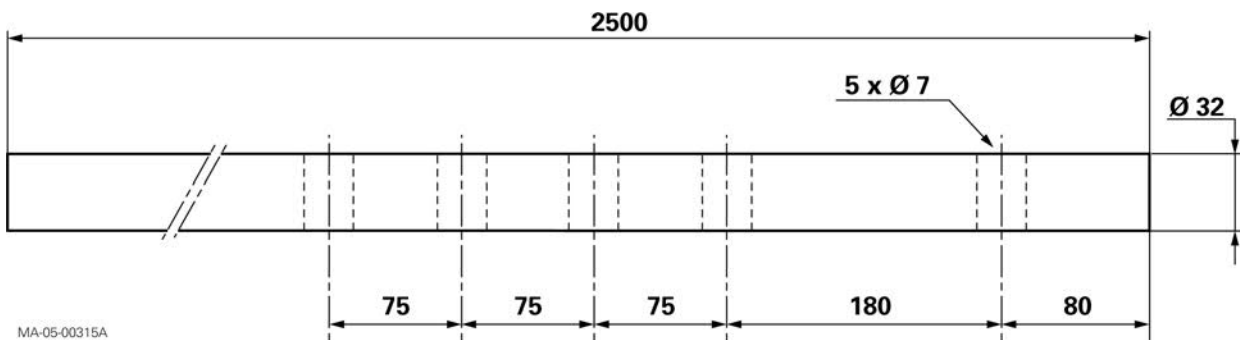


Fig. 11

5A12 - GBA20 Power shuttle

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A . General

The power shuttle, also called "I.S.C.", consists of two electrohydraulically controlled clutches. It is designed to enable operating direction reversal under load. It can be fitted to all 6400 tractors.

The power shuttle transmits the drive from the engine to the mainshaft mounted on the front of the main gearbox by means of pinions located respectively to the rear of the input unit and at the gearbox input.

A lever, mounted to the left under the steering wheel, controls both the power shuttle and A, B, C, D gear shifting of the Dynashift. It is also fitted with a position especially used for manual declutching of the transmission.

Depending on the position selected by the operator (forward, neutral, reverse or manual declutching), the lever manages the proportional solenoid valves of the forward and reverse clutches by means of the electronic system of the tractor.

The solenoid valves are located to the front and to the right of the gearbox on a clutch unit containing the Dynashift hydraulic control system.

A filter (60 microns) located under the selector cover, upstream from the clutch unit, provides complementary filtering for oil supplying the solenoid valves (clutches, Dynashift).

A progressivity sensor screwed to the box housing sends information on shaft rotational speed to the electronic system.

Shifting of any forward gear to the corresponding reverse gear, or vice versa, is easy without declutching or stopping the tractor. This "assisted" gear reversal enables gradual changing of the operating direction, even at high travel speeds without abrupt changes in speed. The clutches slow down tractor movement until the required speed is reached so that the direction of travel can be reversed.

The conventional hydraulically operated clutch pedal is replaced by an electrohydraulically operated manoeuvring pedal. This pedal modulates the pressure in the forward or reverse clutches through the electronic system of the tractor and thus facilitates precise movements such as implement hitching.

Construction

The forward and reverse clutches of the power shuttle are of different design.

The forward clutch consists of:

- a conventional type oil-bath multidisc clutch consisting of a cover (33), the rear side of which is splined to assemble the input sun gear (53),
- an input shaft (19) crossing the spacer (4) which separates the engine flywheel from the transmission oil. The shaft is constantly meshed with the damper secured to the engine flywheel. It is splined so as to rotate with the clutch unit (18) comprising the intermediate plates (30) and the discs (29) in which piston (28) moves,
- a drive hub (27) comprising the discs (29) is secured to the primary shaft (55). The forward clutch is centred in the cover (38) of the reverse clutch by ball bearing (32).

The reverse clutch consists of:

- an epicyclic gear train consisting of three double pinion gears (52) and three single pinion gears (59),
- a hydraulic braking device for the planet carrier (49),
- a cover (38) supporting the forward clutch and with an inner side machined to assemble hydraulic parts.

The double and single pinion gears (52) (59) of the epicyclic gear train mesh respectively on the input and output sun gears (53) (58). The pins (50) are mounted idle and held in the planet carrier by plates (63). A central drilled channel and radial ports supply lubrication to needle bearings (60).

The planet carrier braking device consists of an annular piston (39) and a plate (43) that is loaded by springs (62) and discs (47) integral with the planet carrier through splines.

The intermediate plates (46) are immobilised by the pins (71).

The fixed unit (1) performs two functions:

- it receives the low pressure supplying the forward clutch via the pipe (74),
- it acts as casing for the clutch lubricating and cooling pump.

GBA20 Power shuttle

The pipes (31) connecting the pump housing (1) and the cover (38) lubricate the reverse clutch braking device.

The shims (3) located between the closing spacer (4) and the fixed unit (1) provide end play for the forward clutch.

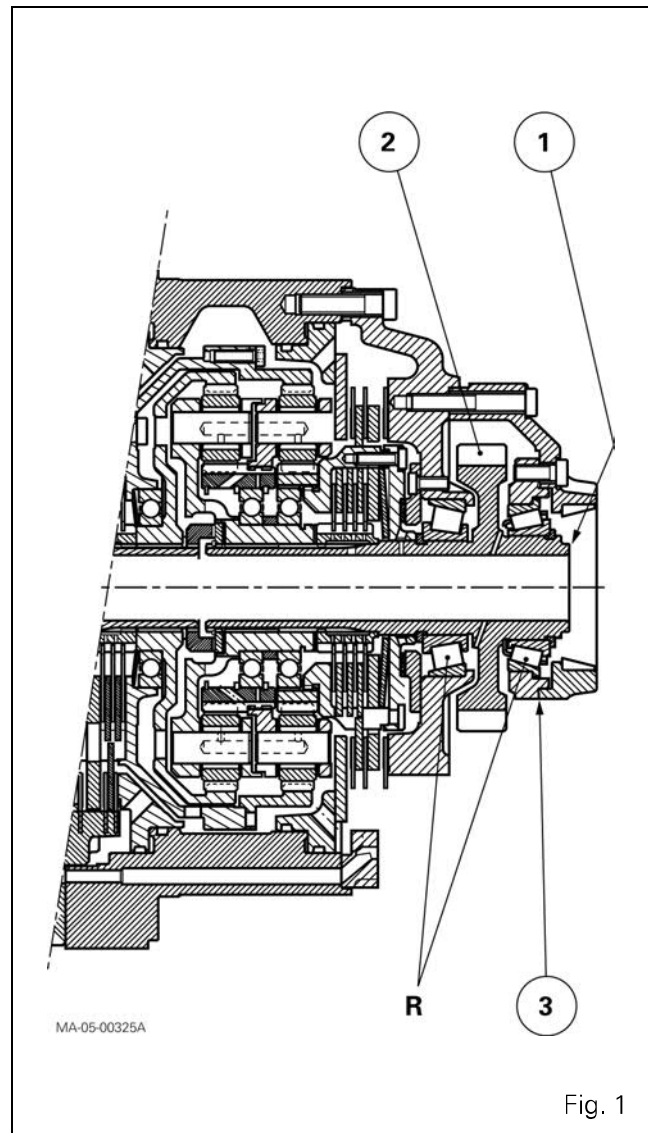
Drive from the power shuttle is transmitted to a mechanical unit located in the rear compartment of the input box.

This unit comprises:

- a secondary shaft (1) and helical pinion (2) machined in one piece (Fig. 1).

The shaft is fitted on two taper roller bearings "R", and is carried by two bearings of the input unit.

The shims (3) (Fig. 1) fitted between the cover and the unit are used to preload the bearings.



Operating principle

Forward clutch

When the lever under the steering wheel is in the Forward position, the relevant solenoid valve is activated and supplies a pressure that moves piston (28). This, in turn, compresses the intermediate plates (30) and the discs (29) against cover (33). The movement from the engine to the gearbox complies with the following kinematics:

- input shaft (19) splined to unit (18)
- unit housing (18)
- intermediate plates (30)
- discs (29) compressed by the piston (28)
- hub (27)
- primary shaft (55)
- main box mainshaft via the input pinion.

Simultaneously, the pressure applied behind the piston (39) of the braking device drops and the planet carrier assembly (discs (47), intermediate plates (46) and epicyclic gear train) rotate freely.

Remark : When the control lever is pulled towards the steering wheel, a "manual declutching" position of the forward clutch is produced.

Lubrication

During forward operation, the oil flow from the centre housing via the pump (14) is directed towards the intermediate plates (30) and the discs (29) via the ports of the forward clutch unit (18) opened by movement of piston (28).

At the same time, lubrication of the braking device of the planet carrier (discs (47) and intermediate plates (46)) of the reverse clutch is interrupted.

Reverse clutch

When the previously mentioned lever is moved from the Forward to Reverse position, the solenoid valve concerned is activated and supplies the piston (39) of the braking device of the planet carrier. The piston then presses on plate (43) which compresses discs (47) and the intermediate plates (46) against the front cover of the input unit and stops the rotation of the planet carrier. The movement from the engine is directly transmitted to the cover (33) that is integral with the input sun gear (53) via splines, without passing through the discs and intermediate plates of the forward clutch.

Simultaneously, the oil pressure in the piston chamber (28) drops and frees the discs (29) and intermediate plates (30).

The input sun gear (53) then drives the double pinion gears (52) freely mounted on the pins (50) which, in turn, drive the single pinion gear (59), integral with primary shaft (55) thus reversing rotation of the output sun gear (58) splined to the primary shaft (55). The

primary shaft then sends the movement from the engine to the mainshaft of the main gearbox via the input pinion.

Remark : As with Forward operation, simply pull the control lever towards the steering wheel to obtain the "manual declutching" of the reverse clutch. A valve screwed to the top of cover (38) ensures a small permanent bleed starting from 13 bar to provide an automatic bleed of the hydraulic supply of piston (39).

Lubrication

As the piston (39) moves, it operates spools (44) that act as valves and compress springs (45) via the plate (43). The spools have a drilled centre channel and radial ports, allowing oil to flow to the channels in the cover (38) and the channels in the front cover of the input unit, thus lubricating the discs (47) and the intermediate plates (46). Lubrication of the mechanical parts of the epicyclic gear train is via the lubricating system of the input unit.

At the same time, the lubricating oil flow to the discs (29) and intermediate plates (30) of the forward clutch is stopped, thus preventing any possible driving of the discs through a drag effect.

Neutral position

In neutral position, the supply to the solenoid valves is cut, placing the forward and reverse clutches at rest and eliminating transmission of the engine movement to the gearbox.

The oil flow is also interrupted. The pressure in the circuit opens the valve (1) (Fig. 17) and directs the oil to the housing.

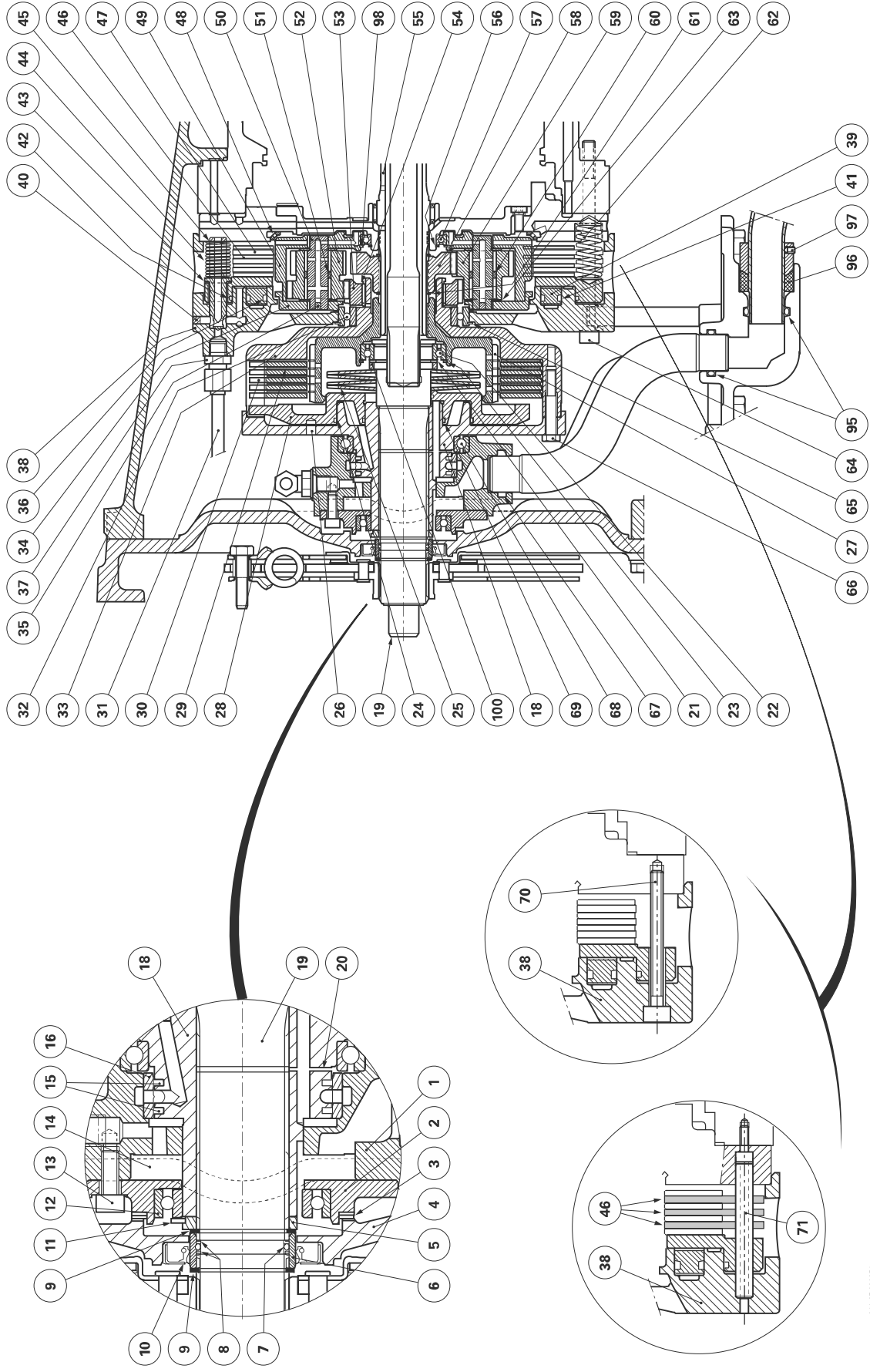
Note: After replacement of the solenoid valve or its solenoid, the power shuttle hydraulic unit, the power shuttle unit or one of its components or the transmission control unit, it is necessary to calibrate the clutch (see section 11).

GBA20 Power shuttle

Parts list

- | | |
|---|--|
| (1) Pump casing | (54) Snap ring |
| (2) Pump cover | (55) Primary shaft |
| (3) Shim(s) | (56) Snap ring |
| (4) Spacer | (57) Ball bearing |
| (5) Locking ring | (58) Output sun gear |
| (6) Splined ring | (59) Single pinion gear |
| (7) O'ring | (60) Needle bearings |
| (8) Anti-extrusion ring | (61) Snap rings |
| (9) Snap rings | (62) Springs |
| (10) Oil seal | (63) Stop plates |
| (11) Circlip | (64) Screw |
| (12) Ball bearing | (65) Snap ring |
| (13) Screw | (66) Screw |
| (14) Lubricating pump | (67) O'ring |
| (15) Sealing ring | (68) Ball bearing |
| (16) Ring | (69) Seal |
| (17) Locating pin | (70) Screw |
| (18) Forward clutch unit | (71) Pins |
| (19) Input shaft | (72) Union |
| (20) Cotter pin | (73) 1.5 bar valve |
| (21) Circlip | (74) Pipe |
| (22) Ball bearing | (75) O'rings |
| (23) Snap ring | (76) Pipe |
| (24) Seal | (77) Screw |
| (25) Belleville washers | (78) Pipe |
| (26) Indexing ports | (79) Screw |
| (27) Drive hub | (80) Flange |
| (28) Forward clutch piston | (81) Seal |
| (29) Forward clutch discs | (82) Strainer |
| (30) Forward clutch intermediate plates | (83) Cover |
| (31) Lubricating pipe | (84) Plug |
| (32) Ball bearing | (85) Seal |
| (33) Forward clutch cover | (86) Pipe |
| (34) Planet carrier cover | (87) Pipe |
| (35) Rivets | (88) Transfer pipe |
| (36) Seal | (89) Seal (Loctite) |
| (37) Cover | (90) Diagnostics connector (lubrication) |
| (38) Reverse clutch cover | (91) Union |
| (39) Reverse clutch piston | (92) O'rings |
| (40) Rivets | (93) Union |
| (41) Seal | (94) Pipe |
| (42) Seal | (95) O'rings |
| (43) Plate | (96) Dust seal |
| (44) Spools | (97) Screw |
| (45) Springs | (98) Snap ring |
| (46) Reverse clutch intermediate plates | (99) Screw |
| (47) Reverse clutch discs | (100) Ring |
| (48) Ring restrictor | (101) Elbow union |
| (49) Planet carrier | |
| (50) Pinion gear pins | |
| (51) Spacers | |
| (52) Double pinion gears | |
| (53) Input sun gear | |

Overall view

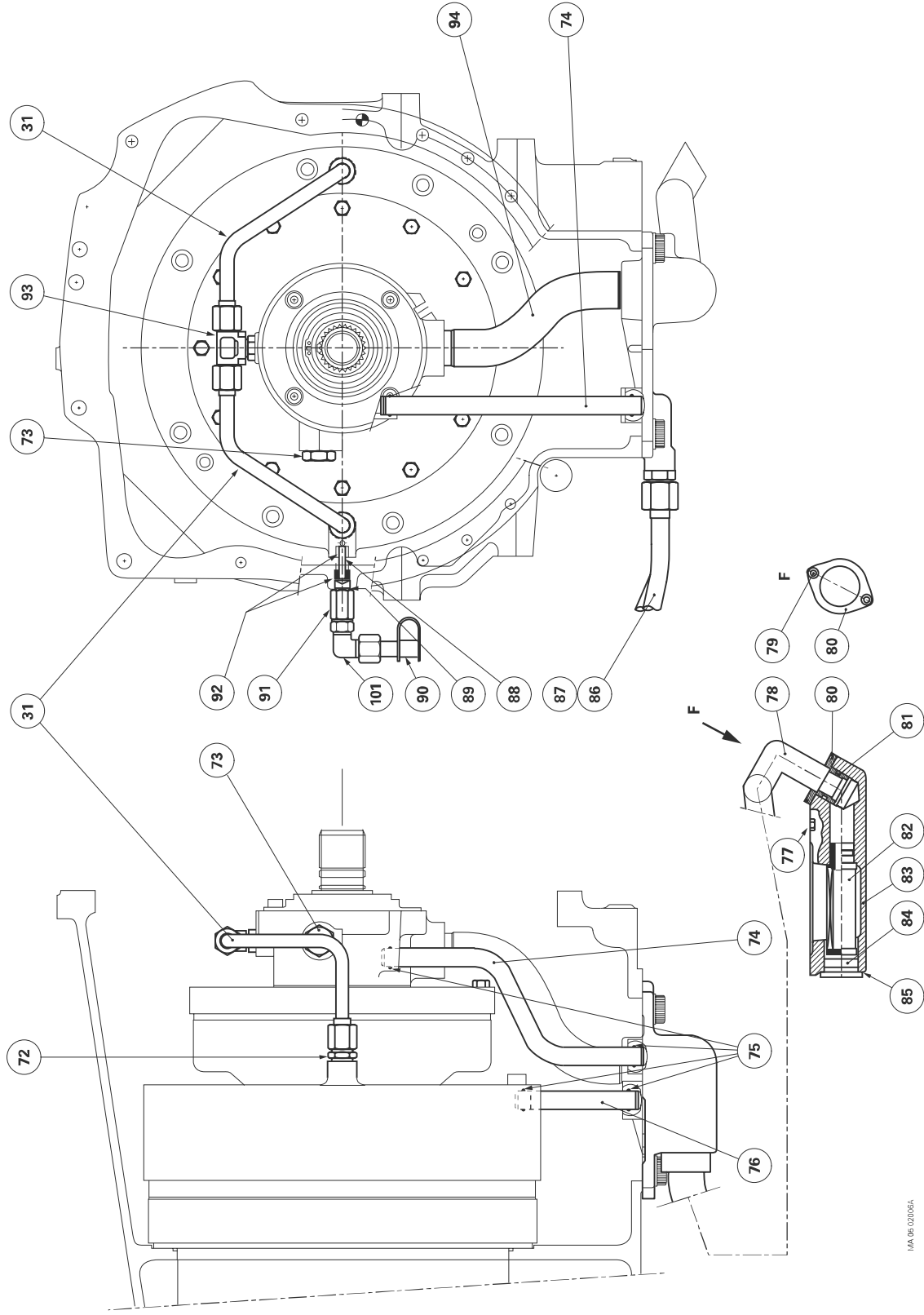


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Fig. 2

GBA20 Power shuttle

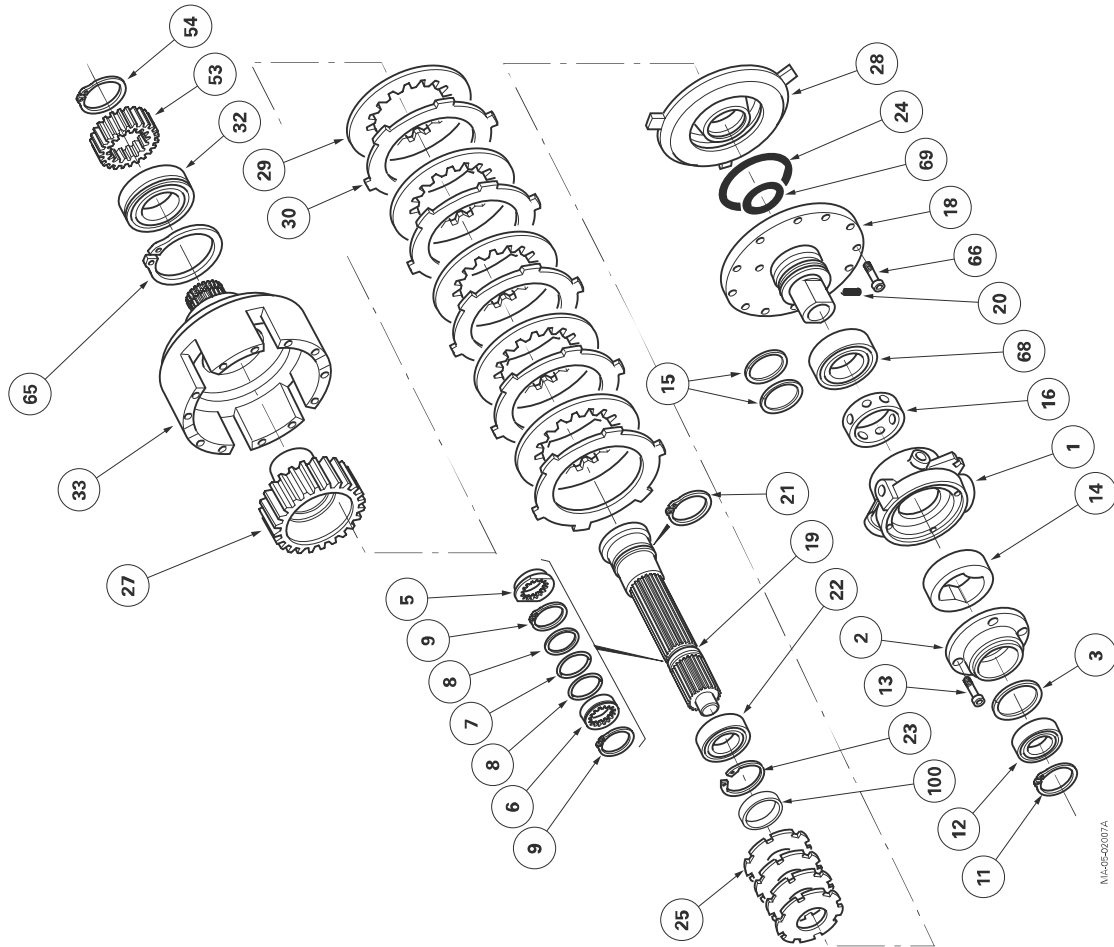
Overall view



1MA 06 021006A

Fig. 3

Exploded view



M65-2007A

Fig. 4

B . Removing and refitting the forward clutch

Preliminary operations

1. Disassemble the tractor between the engine and the gearbox (see section 2).
2. Drain the gearbox and the centre housing.
3. Remove the spacer from the gearbox (see section 3).
4. Remove the pipes (86) (87). Detach and remove the covers (37) (83), the flange (80) and the pipe (78) (Fig. 3).
5. Remove the pipes (31) (74) (76) (94) (Fig. 3).

Removal

6. Remove the forward clutch (2) (Fig. 5) and pull it from the housing using a locally made tool (see § G).

Refitting

7. Clean the components. Replace any defective parts.

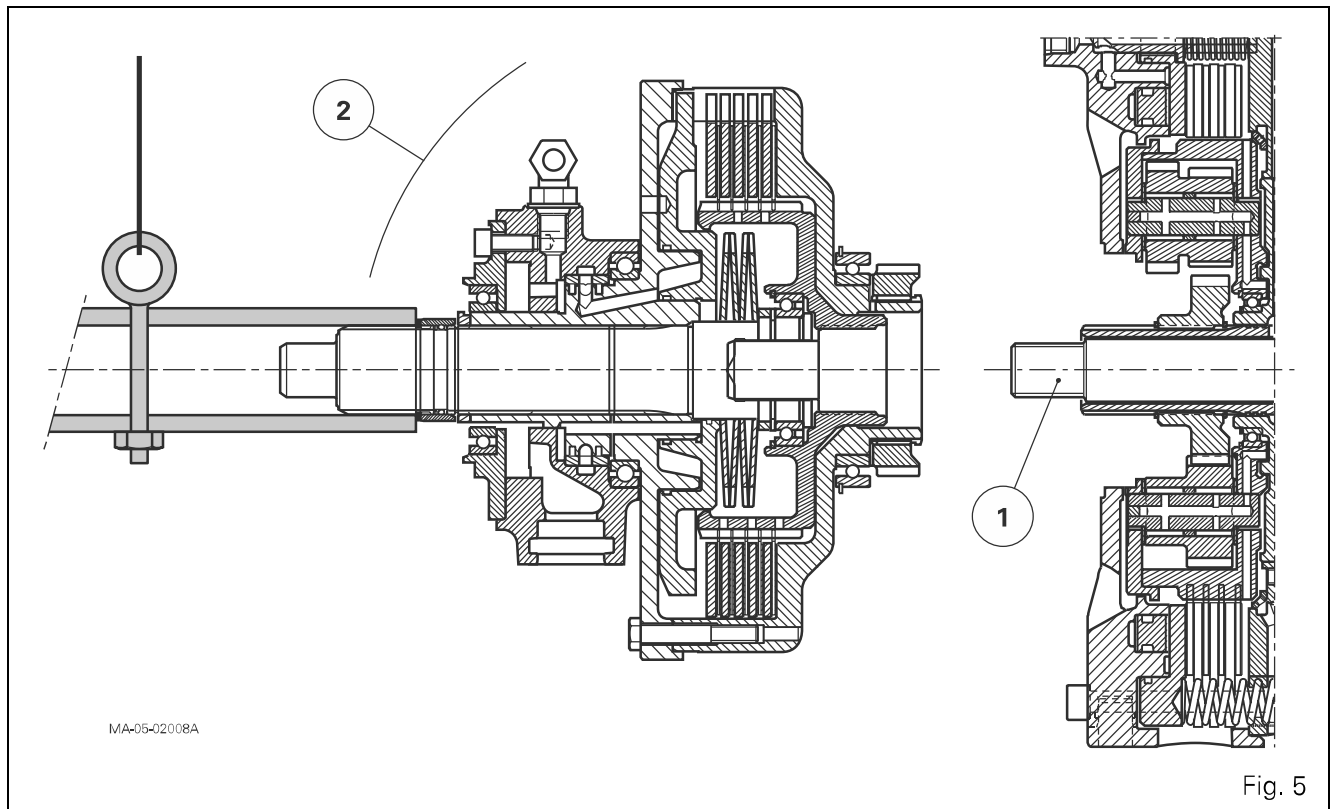
Remark

- If forward clutch shimming is necessary, refer to § D.

8. Check that PTO shaft (1) is installed (Fig. 5).
9. Refit the clutch using the tool used for removal.

Final operations

10. Replace the seals (67) (75).
11. Refit the pipes (31) (74) (76) (94).
12. Replace the O'rings (95).
13. Clean the mating faces on the gearbox housing and the cover (37). Smear the mating face of the housing with Loctite 510 or equivalent.
14. Replace the dust seal (96) and the O'ring (81).
15. Fit the pipe (78), the flange (80) and the covers (37) (83) previously coated with Loctite 510 or equivalent. Tighten the screws to a torque of 84 -110 Nm.
16. Tighten screw (97) moderately and screws (79) to 44 - 53 Nm.
17. Reconnect the pipes (86) (87).
18. Refit the gearbox spacer (see section 3).
19. Top up the oil level of the housings and check using the sight glass located on the rear of the centre housing.
20. Assemble the tractor between the engine and the gearbox (see section 2).
21. Carry out a road test using the power shuttle and using ratios A, B, C and D of the Dynashift.
22. Check tightness of the mating faces on the spacer (4), covers (37) (83) and the hydraulic unions.



C . Disassembling and reassembling the forward clutch

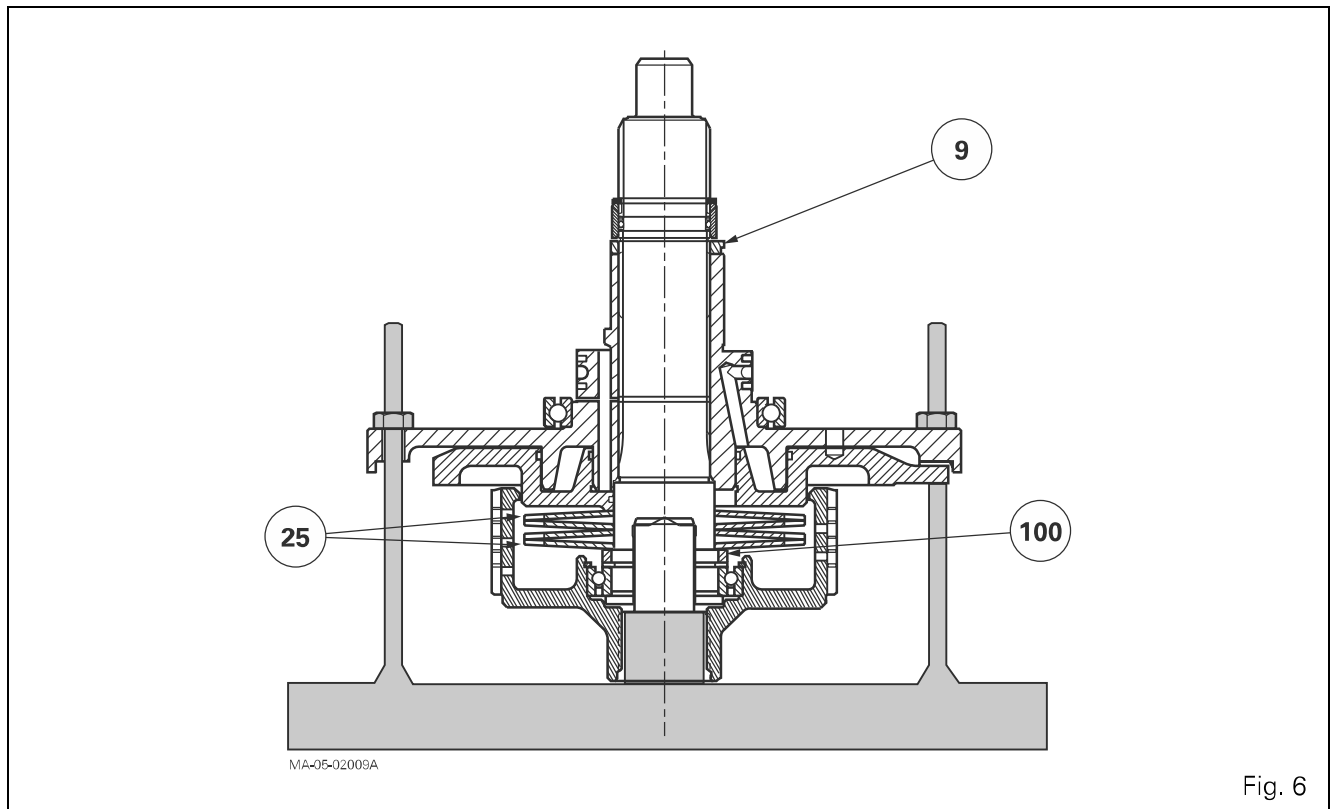
Disassembly

23. Separate cover (33) from unit (18). Remove clutch discs (29) and intermediate plates (30).
24. Remove the front snap ring (9). Remove the splined ring (6), the anti-extrusion rings (8) and seal (7).
25. Remove circlip (11), take off cover (2) from the pump (14) complete with bearing (12).
26. Pull the lubricating pump out of the pump casing (1) and take it apart from the clutch housing (18).
27. Remove seal rings (15). If necessary, extract ring (16) and remove the 1.5 bar valve (73).
28. Place the partially disassembled clutch on a suitable locally made fixture (Fig. 6) (see § G).
29. Compress the Belleville washers (25) and remove the rear snap ring (9) (Fig. 6).
30. Remove locking ring (5). Gradually release the Belleville washers.

31. Split unit (18) fitted with piston (28) from shaft (19).
32. Remove the Belleville washers and the ring (100).
33. Remove snap ring (23). Pull out the shaft (19) complete with bearing (22) from hub (27).
34. Take off circlip (21). Extract bearing (22) from shaft (19).
35. Remove the piston. Remove seals (24) (69) and discard them. If necessary, extract the bearing (68) from the unit (1) of the pump (14).
36. If necessary, remove snap ring (54) and remove the input sun gear (53). Remove snap ring (65). Extract bearing (32).

Reassembly

37. Make sure that pin (20) is fitted.
38. If removed, fit the bearing (32) on cover (33), using a press and a suitable tool. Fit snap ring (65).
39. If disassembled, refit bearing (68).
40. Lubricate the new seals (24) (69) and fit them on the piston.



41. Fit the piston (28).

Remark

The angular position of the piston depends on the position of unit (18) lubricating ports. Align the indexing holes drilled in the unit and the piston (Fig. 7). To align, use a pin of a suitable diameter. Complete the installation of the piston by gradually and alternately striking around its top rim with a plastic mallet. Check that no pieces of the seal remain after assembly.

42. Using a suitable tool, force fit bearing (22) on shaft (19), the seal side facing towards the reverse clutch. Fit the circlip (21).
43. Put the assembly (shaft, bearing, circlip) in the hub (27). Fit snap ring (23).
44. Refit the ring (100) and the Belleville washers as shown in Fig. 8.
45. Assemble unit (18) fitted with the piston (28) on shaft (19).
46. Compress the Belleville washers using the same procedure as in operation 28. Position the ring (5), aligning two of the flat sections with those of the unit (18). Replace the rear snap ring (9) and correctly position it in the bottom of the groove.
47. Remove the fixture.
48. Check that the seal rings (15) turn freely in their grooves. Fit the seal rings, lightly coated with miscible grease, making sure that they do not protrude beyond the rim of unit (18).
49. If necessary, fit the 1.5 bar valve (73) and tighten to a torque of 47 - 54 Nm. Insert ring (16) using a suitable fixture, with the chamfer "C" in the direction shown in Fig. 9.
50. Lubricate the ring. Assemble pump unit (1) on unit (18).
51. Lubricate pump (14) with transmission oil and position it aligning the flats of the rotor with those on the unit (18).
52. Manually check the angular movement of the rotor on the flat sections of unit (18).
53. Fit the bearing (12) on the cover (2) of the pump. Fit the cover. Install circlip (11) and screws (13) and tighten to a torque of 25 -35 Nm.
54. Lubricate and install a new assembly (O'ring (7) and anti-extrusion ring (8)). Slide on the splined ring (6). Fit a new front snap ring (9).
55. Soak the discs (29) in a transmission oil bath for approximately 1 hour. Check that they are correctly impregnated.

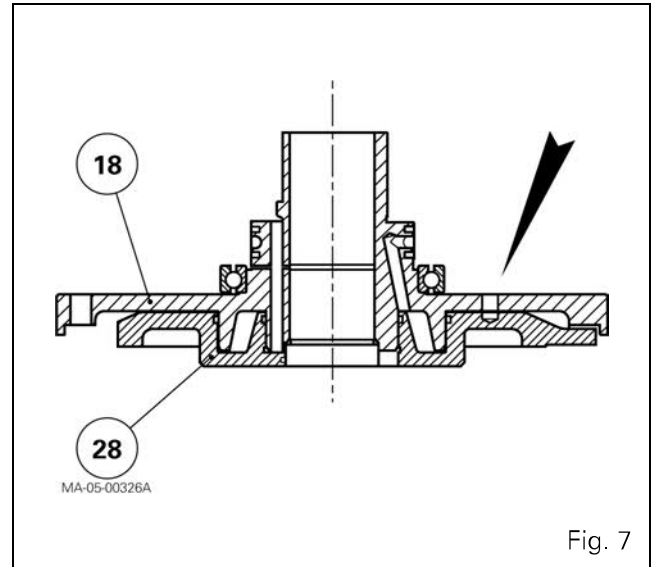


Fig. 7

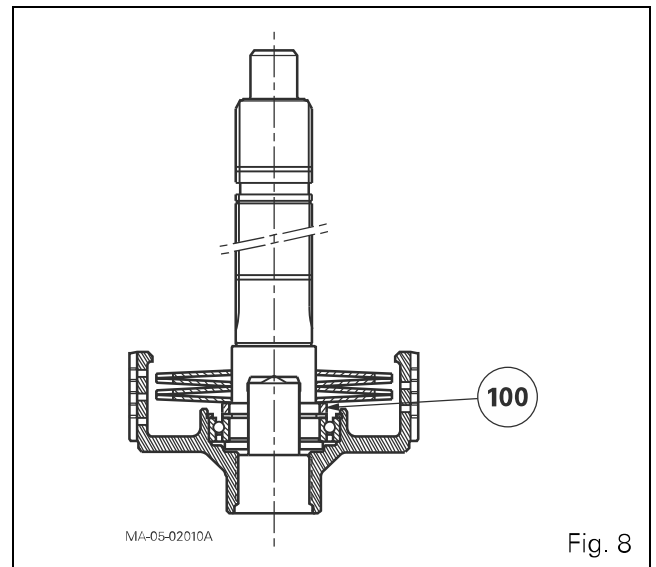


Fig. 8

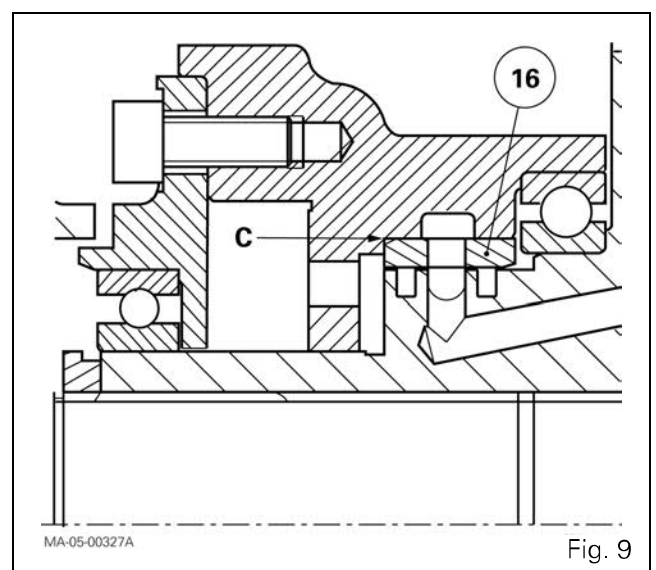


Fig. 9

GBA20 Power shuttle

56. Position the intermediate plates (30), aligning the tabs and the discs (29) on hub (27) according to the type of tractor (see remark and Fig. 10).

Remark

- The clutch comprises 5 discs and 5 intermediate plates.

57. Put the forward clutch cover (33) on the unit (18), with the pins of the intermediate plates inserted into the notches of the forward clutch cover.

Fit and tighten the screws (66) to a torque of 25.5 -34.5 Nm.

58. Manually check the rotation of the hub (27).

59. If necessary, refit the input sun gear (53) and fit snap ring (54).

D . Shimming the forward clutch

This operation consists in obtaining an end play J1 of 0.60 to 0.80 mm between the pump cover (2) and the spacer (4) (Fig. 11).

Remove the PTO shaft to perform this operation.

60. Install the clutch on the cover (38) of the reverse clutch, using the tool used in Fig. 5, § B.

61. Fit a 2 mm shim (3) on cover (2) (Fig. 11).

62. Lubricate the lip of seal (10). Protect the lip of the seal by fitting a protector (see section 3) on the splines of the shaft (19). Fit two guide screws on opposite sides of the gearbox housing and temporarily fit the spacer (4) without Loctite. Gradually tighten several screws.

63. Place a dial gauge at the end of shaft (19) and check the clearance by moving the shaft sideways (Fig. 11).

Note: Check that the snap ring (65) of the bearing (32) is correctly in contact with the cover (38) (Fig. 11).

64. Remove spacer (4). Depending on the reading previously obtained with the dial gauge, define a new thickness for shim(s) (3) in order to obtain a **J1 clearance of between 0.60 mm and 0.80 mm** (Fig. 11).

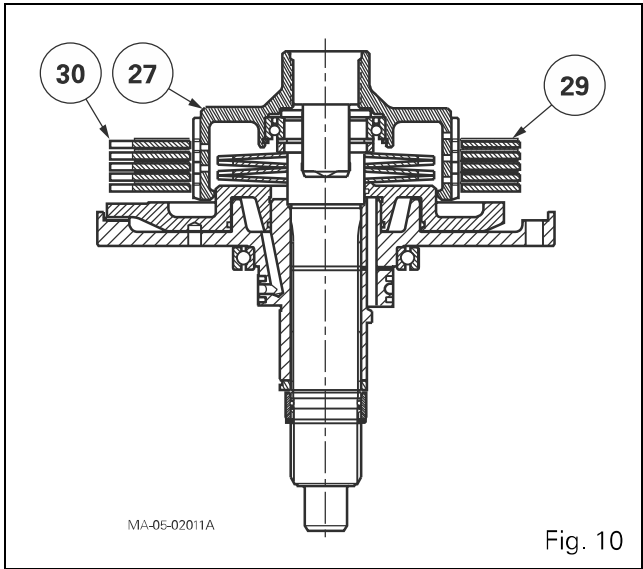


Fig. 10

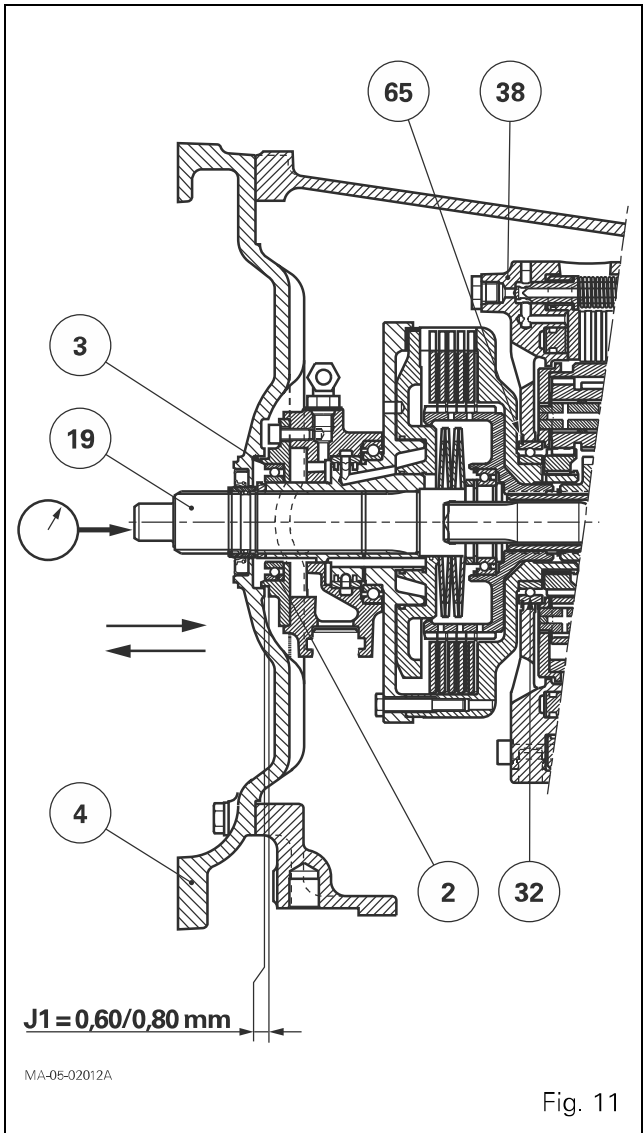


Fig. 11

E . Disassembling and reassembling the reverse clutch

Preliminary operations

65. Remove the forward clutch (see § B).

66. Remove the input unit (see section 5).

Disassembly (Fig. 12)

67. Remove the screws (70) and the cover (38).

68. Recover the spools (44) and the springs (45) (Fig. 12).

69. Remove the large springs (62) and the pins (71).

70. On cover (38), remove:

- the plate (43)
- the seal (42) and discard it
- the piston (39)
- the seals (36) (41) and discard them
- the unions (72), the valve (1) (Fig. 18) and the O'ring (75) of the 17 bar supply port (Fig. 3).

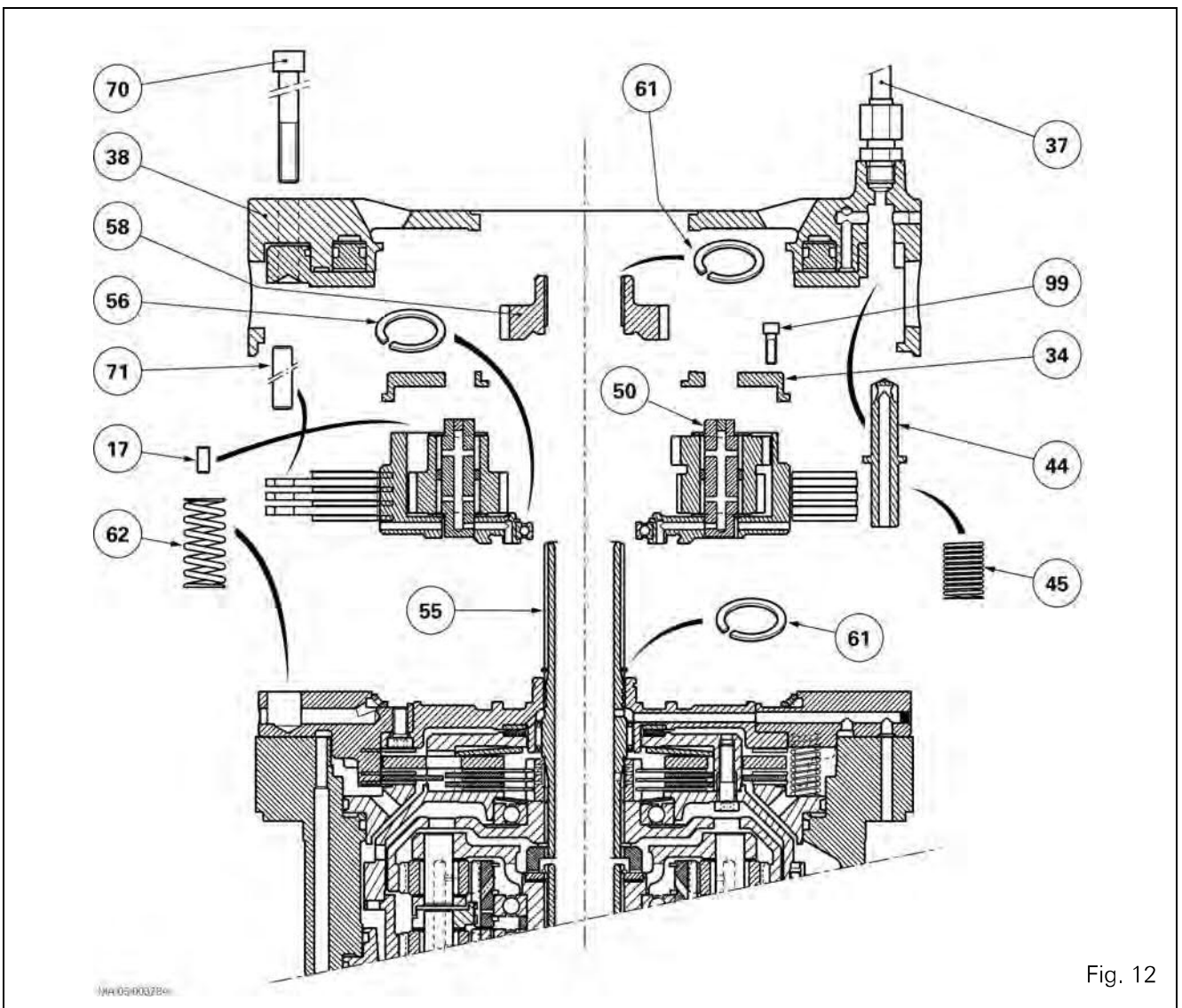


Fig. 12

82. Install the partially assembled planet carrier. Fit the snap ring (56) and the rear snap ring (61).

83. Position marks "R" (punch marks) on the double pinion gears (52) (Fig. 15) so that they pass through a centerline meeting at "O" (Fig. 15).

Remark

- The mark on the front side of the pinion gear corresponds to the alignment of the two splines. It is mandatory to respect the positions of the punch marks during assembly of the output sun gear (58).

84. Slide the output sun gear (58), correctly oriented as shown in Fig. 2, on to the primary shaft (55), making sure that the punch marks of each pinion gear remain in the required position.

85. Fit the front snap ring (61).

86. Soak the discs (47) in a transmission oil bath for approximately 1 hour. Check that they are correctly impregnated.

87. Fit the discs (47) and the intermediate plates (46) depending on the type of tractor (see Remark and Fig. 16).

Remark

- The clutch comprises 4 discs and 3 intermediate plates.

88. Check the presence of the locating pin (17) (Fig. 12).

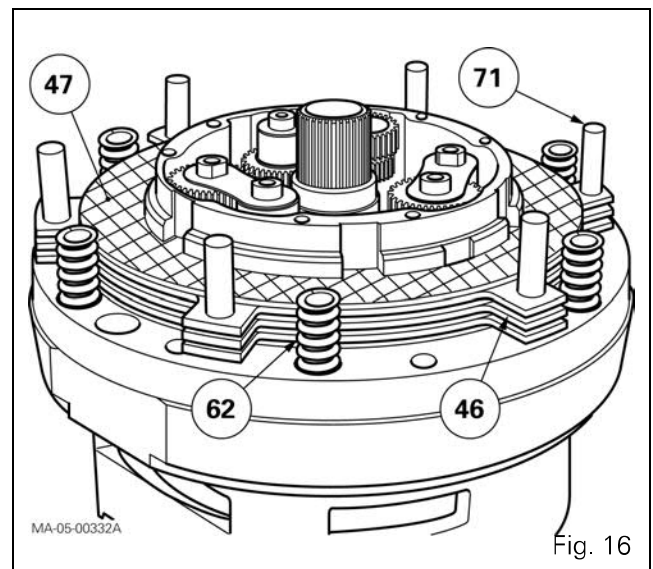
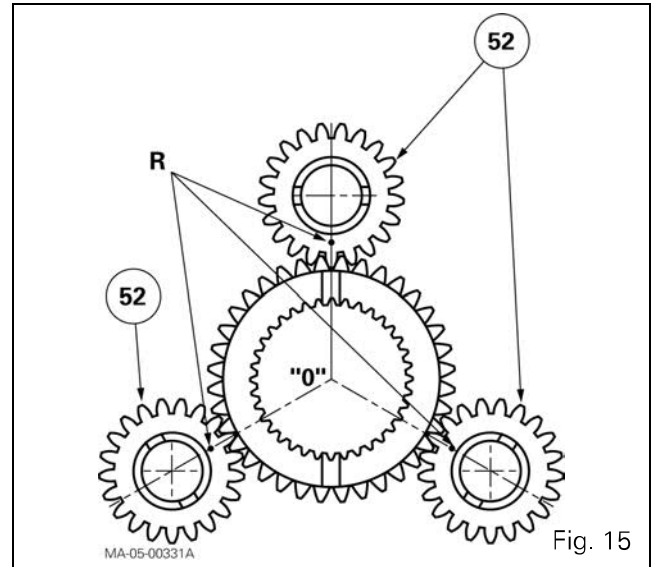
89. Refit the cover (34). Check that it is correctly positioned on the pins (50) of the pinion gears and in the locating pin (Fig. 12).

90. Immobilise the planet carrier, using the same method as used during disassembly.

91. Fit and tighten the screws (99) (Fig. 12) to a torque of 36 - 46 Nm. The thread should be previously smeared with Loctite 242 or equivalent.

92. On cover (38), check for the presence of rivets (40) at the end of the channels and refit:

- piston (39) with new lubricated seals (36) (41), gradually and alternately striking around the piston rim with a plastic mallet. Check that no fragments of the seal remain after assembly,
- plate (43) with a new lubricated seal (42), aligning the holes of the plate with those in the cover (38). Insert the plate using the same method as used for piston (39).



GBA20 Power shuttle

- 93. Install the pins (71) and the springs (62) (Fig. 17) in their respective location on the input unit.
- 94. Smear the spools (44) and the springs (45) with miscible grease. Fit and stick the spools in each compartment of the cover (38), with the points towards the unions (72) (Fig. 2). Slide and stick a spring (45) in each spool.
- 95. On the external face of the cover (38), place three sufficiently long and equally spaced studs in the holes provided for screws (64).
- 96. Install and position the cover, with the valve port (1) directed upwards (Fig. 18).

Important: Before fitting screws (70), check that the spools (44) slide freely in each compartment of the front cover on the input unit.

To do this, compress the springs (45), using a screwdriver passed through the tapped holes of the unions (72).

Remark

- If the springs cannot be compressed, investigate the cause..

- 97. Pretighten screws (70).
- 98. During pretightening, check that the spools (44) still slide freely. Also check that each end of the (large) springs (62) is correctly housed in its respective seat.
- 99. Tighten screws to a final torque of (70) (Fig. 12) 36 - 46 Nm. After completing the tightening, check again that each spool can move freely and restore its initial position.

Remark

- A spool valve blocked open can limit or interrupt lubrication of the forward clutch when operating.

- 100. It is **imperative** to install and tighten the valve (1) to 6 - 8 Nm max. (Fig. 18) after fitting its seal. Fit and tighten the unions (72).

- 101. Install the forward clutch input unit (see section 5).

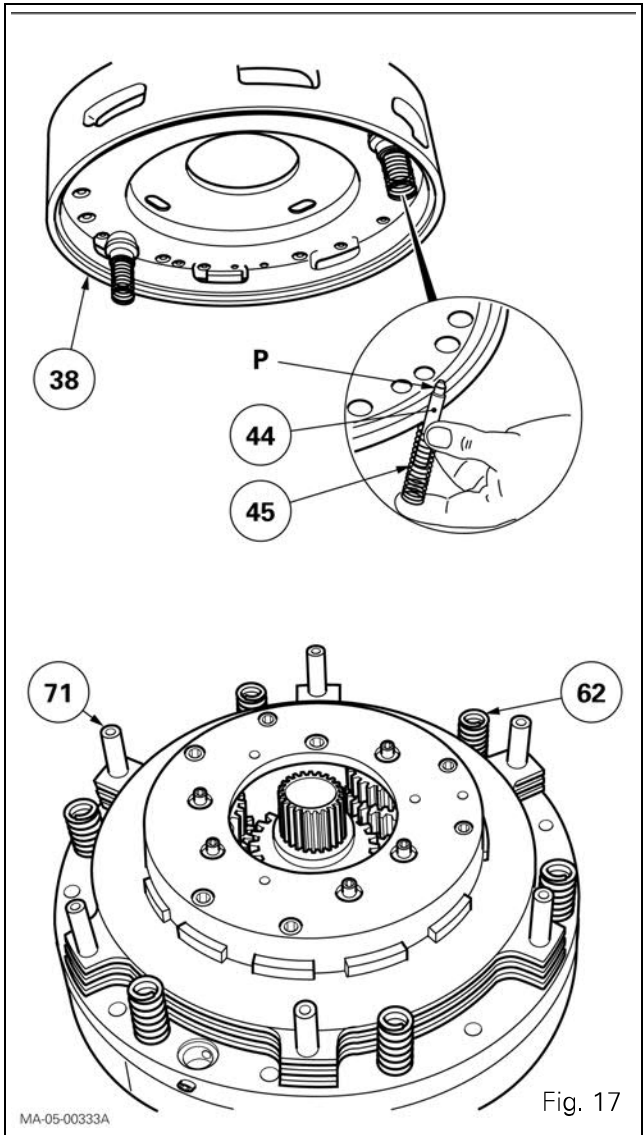


Fig. 17

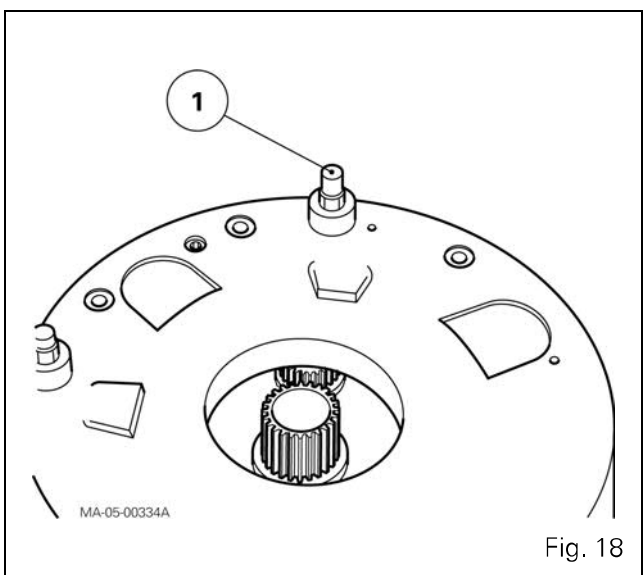


Fig. 18

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