



Massey Ferguson 5400

Workshop service manual

n° 3378545M5

5400

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GBA20 - Mechanical reverse shuttle - Input unit

A . General

The GBA20 input unit with mechanical reverse shuttle (Fig. 1) consists of an interchangeable module. It is located at the front of the main gearbox.

It is made of two separate parts: the mechanical reverse shuttle and the Speedshift (see chapter 5).

The input unit receives drive from the engine clutch and transmits it to the transmission via a driving gear (forward operation) or a layshaft gear (reverse operation).

These gears are located in the rear compartment of the input unit.



Fig. 1

GBA20 - Mechanical reverse shuttle - Input unit

B . Removing and refitting the input unit

Preliminary steps

1. Disconnect the tractor between the engine and the gearbox (see chapter 2).
2. Mark the PTO shaft position and remove it from the gearbox.
3. Separate the hydraulic mechanism (1) from the input unit spacer (Fig. 2 and chapter 4)
4. Drain the transmission.
5. Remove the selector cover plate (see chapter 5).
6. Remove the selector (2) from the mechanical reverse shuttle (Fig. 2).
7. Attach tool ref. 3376883M1 to the front cover plate of the input unit (Fig. 3).

IMPORTANT: To attach the tool to the front cover plate of the input unit correctly, use locally obtained screws (1) (Fig. 3) that are long enough and of suitable strength.

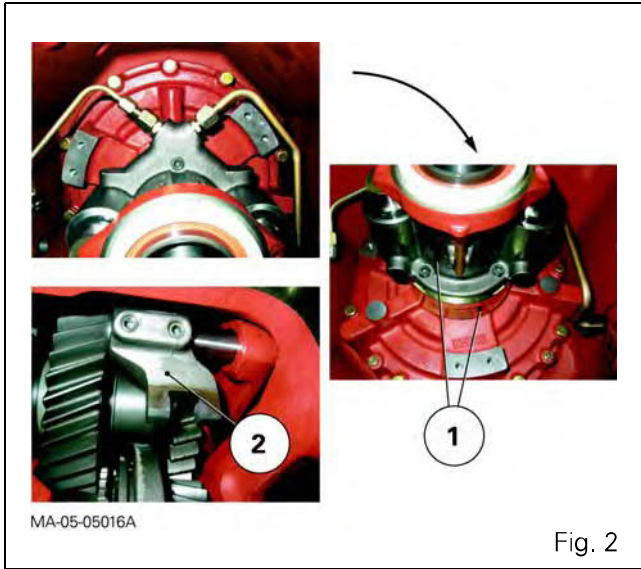


Fig. 2

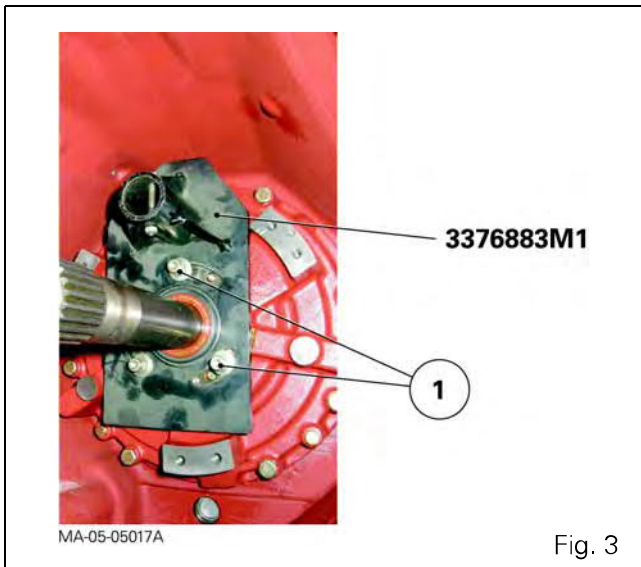


Fig. 3

GBA20 - Mechanical reverse shuttle - Input unit

Removal

8. Take out the M10 screws (1) (Fig. 4).
IMPORTANT: Do not take out the M8 screws (2) (Fig. 4) to avoid removing certain parts from the input unit.
9. Remove the gearbox input unit using tool ref. 3376883M1 (Fig. 4) and the handling bar (see § C).



Caution: Use the handling bar to prevent the input unit from tipping over during removal.

10. After removing the input unit, separate the tool from the front cover plate if necessary.
11. Discard the "O" rings (2) and (3) (Fig. 5).
12. Recover the cup (64) (Fig. 6) and the dowel (4) (Fig. 5).

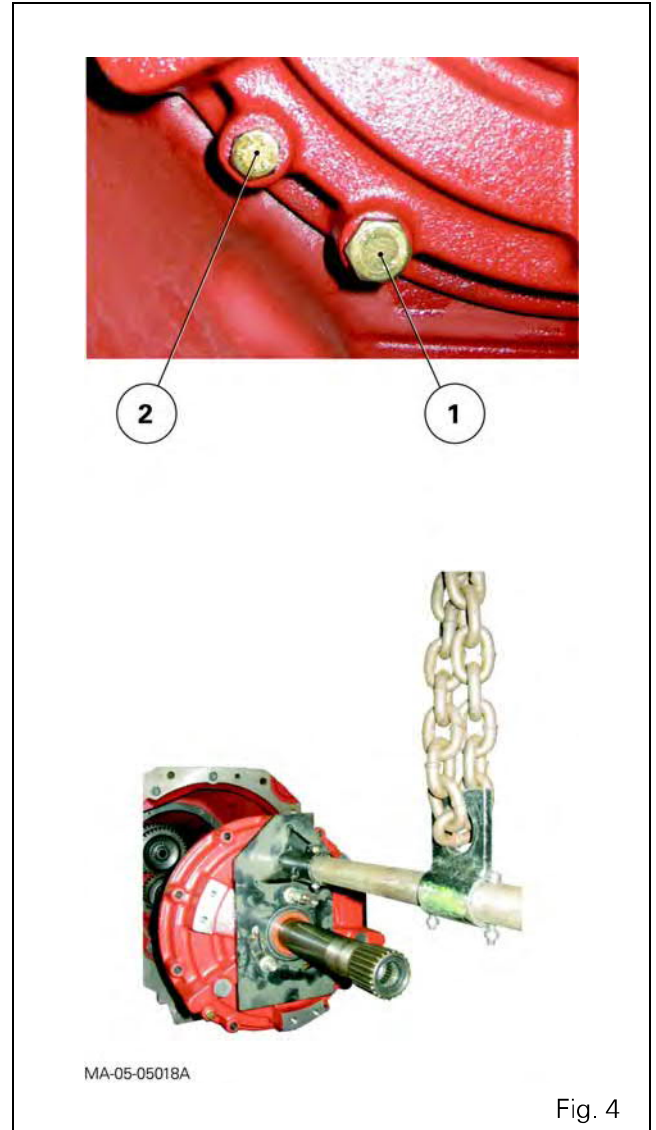


Fig. 4

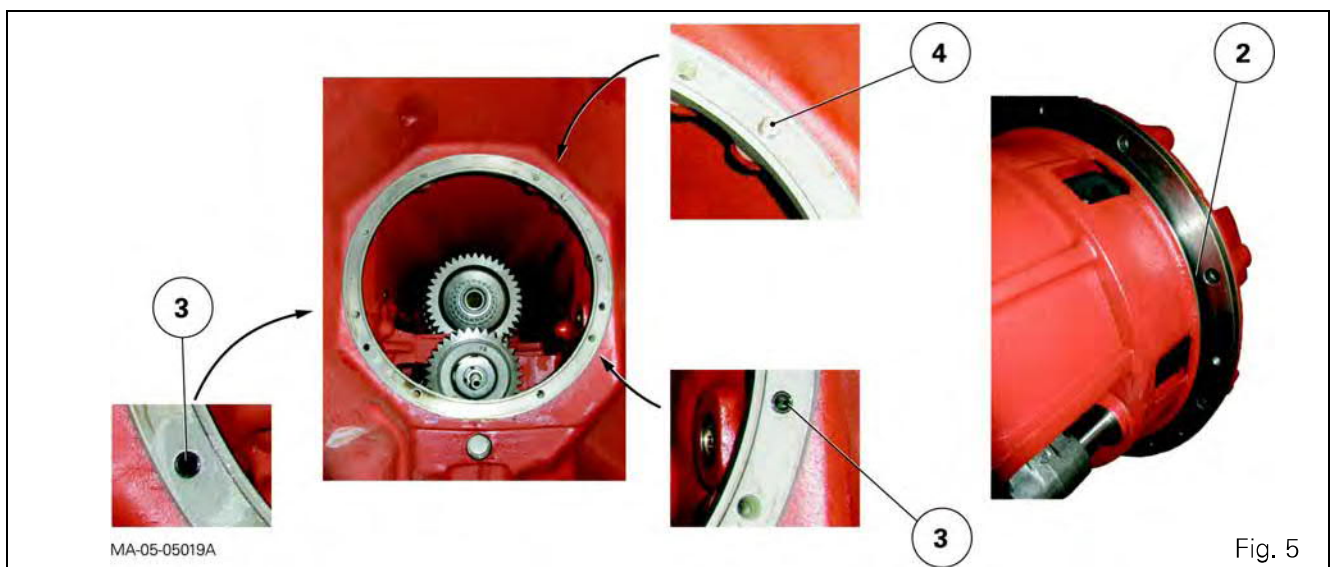
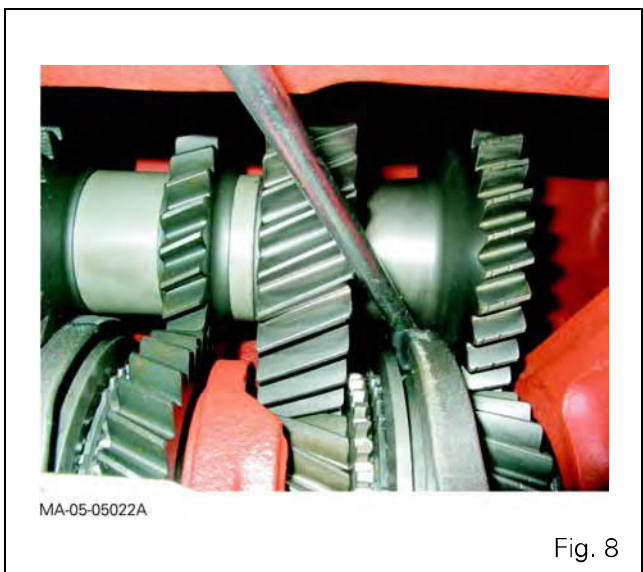
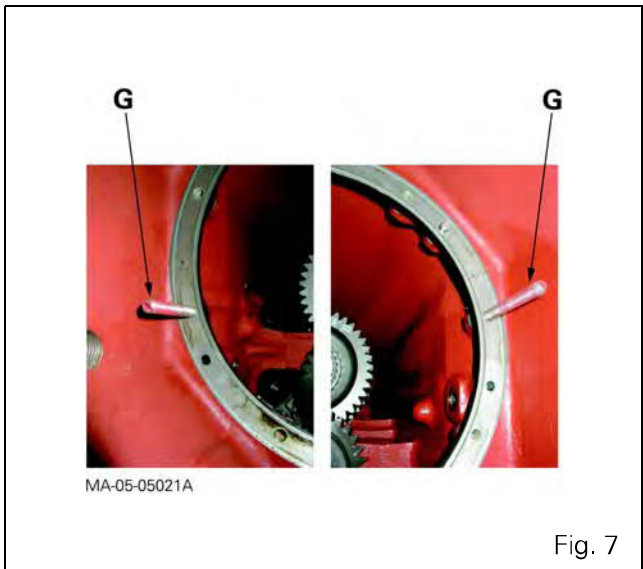
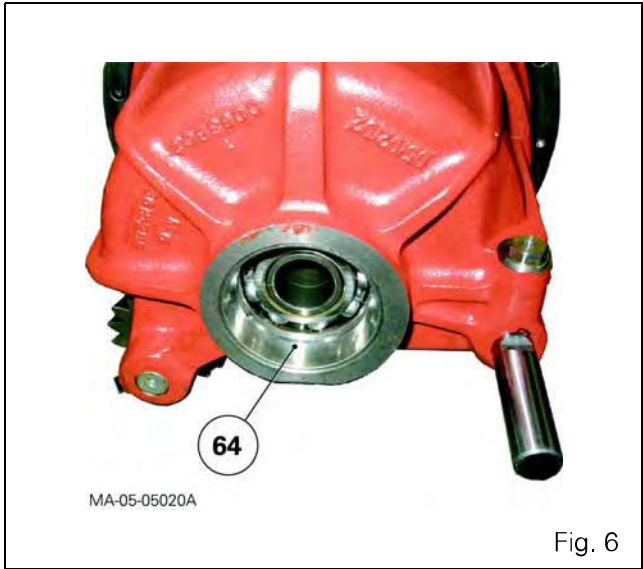


Fig. 5

GBA20 - Mechanical reverse shuttle - Input unit

Refitting the input unit

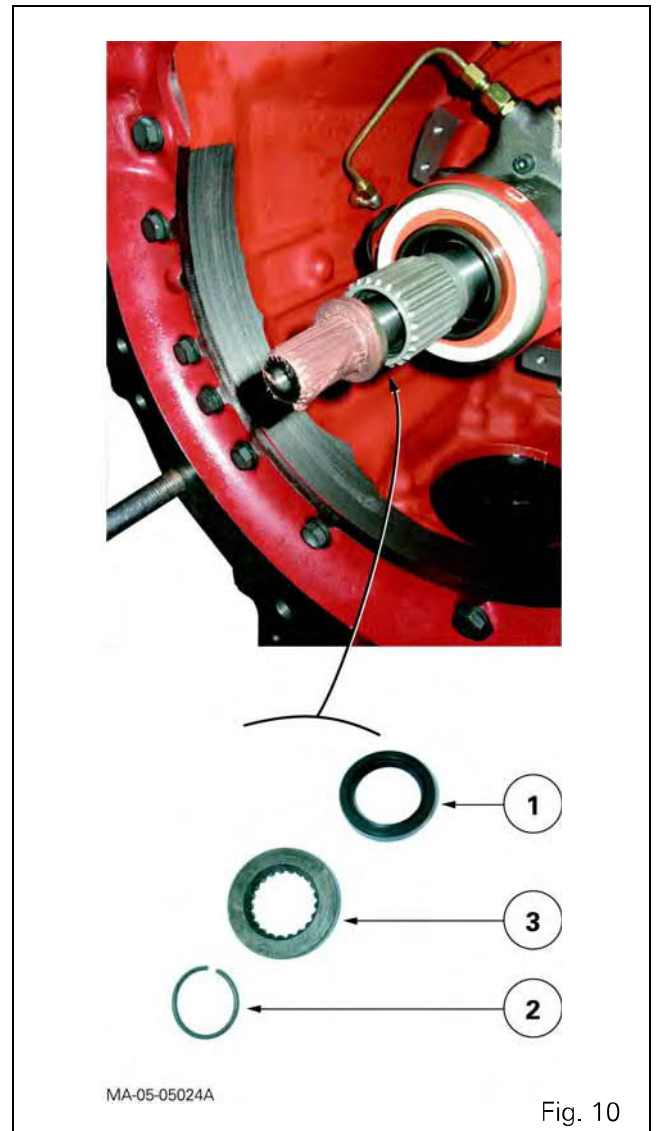
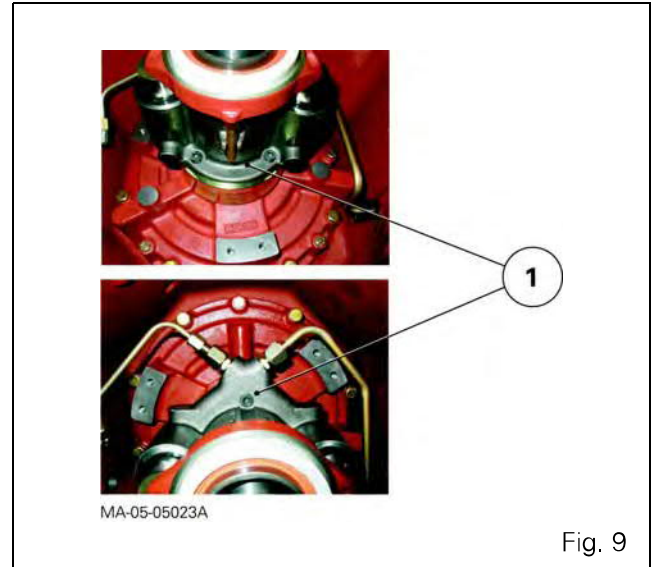
- 13. Clean the mating faces of the gearbox and input unit.
- 14. Check that the cup (64) is present (Fig. 6).
- 15. Fit the gearbox and input unit with new "O" rings (2) and (3).
Position the dowel (4) (Fig. 5).
- 16. Screw diametrically opposed guide studs "G" into the gearbox (Fig. 7).
NOTE: The guide studs "G" assist insertion of the unit into the gearbox. Their use is advisable but not mandatory.
- 17. With the help of an operator, insert the input unit into the gearbox and align the gearbox intermediate shaft with the input unit: slightly raise the intermediate shaft through the selector cover plate to ensure alignment (Fig. 8).
- 18. Turn the input shaft of the unit.
- 19. Engage the unit in the dowel (4).
Place the input unit on the gearbox bearing face.
- 20. Fit and tighten the M10 screws to a torque of 50 - 70 Nm.



GBA20 - Mechanical reverse shuttle - Input unit

Final steps

21. After refitting the input unit, remove the tool ref. 3376883M1 and the handling bar from the front cover plate.
22. Assemble the spacer and hydraulic mechanism (1) of the engine clutch on the front cover plate of the input unit (Fig. 9 and chapter 4).
23. Fit and adjust the selector (2) on the mechanical reverse shuttle (Fig. 2 and chapter 5).
24. Refit the selector cover plate (see chapter 5).
25. Refit the PTO shaft (Fig. 10 and chapter 2).
26. Reconnect the tractor between the engine and the gearbox (see chapter 2).
27. Bleed the hydraulic mechanism of the engine clutch (see chapter 9).
28. Carry out a road test of the mechanical reverse shuttle and the Speedshift (low range and high range).



GBA20 - Mechanical reverse shuttle - Input unit

C . Service tools

Tool available in the AGCO network

- **3376883M1**: Sling for input unit (Fig. 11)

Makeshift tool

- **Handling bar** (Fig. 12)

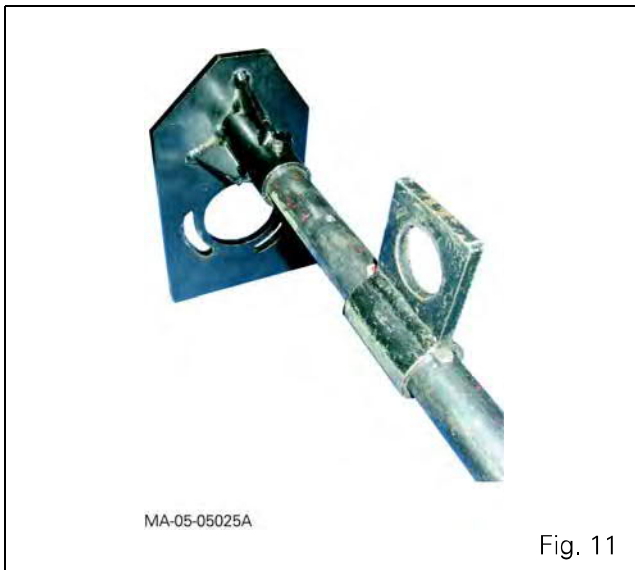


Fig. 11

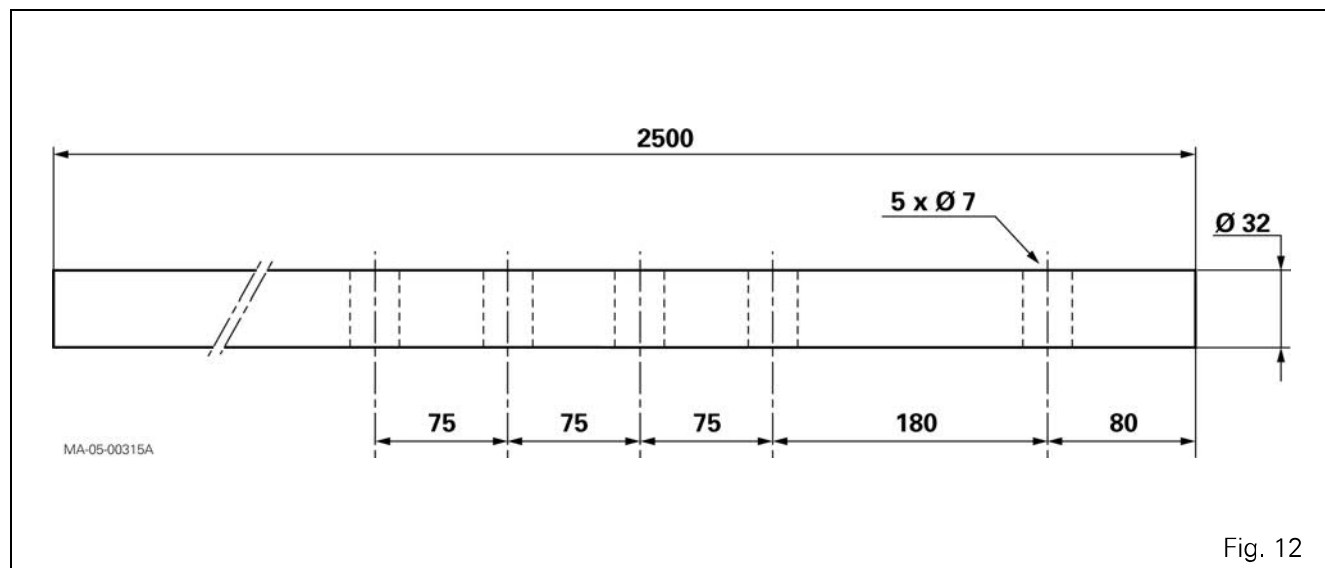


Fig. 12

5A12 - GBA20 - Mechanical reverse shuttle - Shuttle

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GBA20 - Mechanical reverse shuttle - Shuttle

A . General

The mechanical reverse shuttle transmits drive from the Speedshift to the input gear (1) of the gearbox (Fig. 1).

The mechanical reverse shuttle is located in the rear housing of the input unit, behind the Speedshift.

It comprises (Fig. 2):

- two helical gears (forward operation (5) and reverse operation (23)) fitted on the needle roller bearings (6) and (20);
- a double cone synchroniser (18) whose hub (2) is splined to the secondary shaft;
- a secondary shaft (19) fitted on two ball bearings and supported by the two bearings of the reverse shuttle unit;
- a selector rail/synchroniser control fork assembly;
- a double layshaft gear (15) constantly meshed with the reverse gear (23) and the input gear (1) of the gearbox.

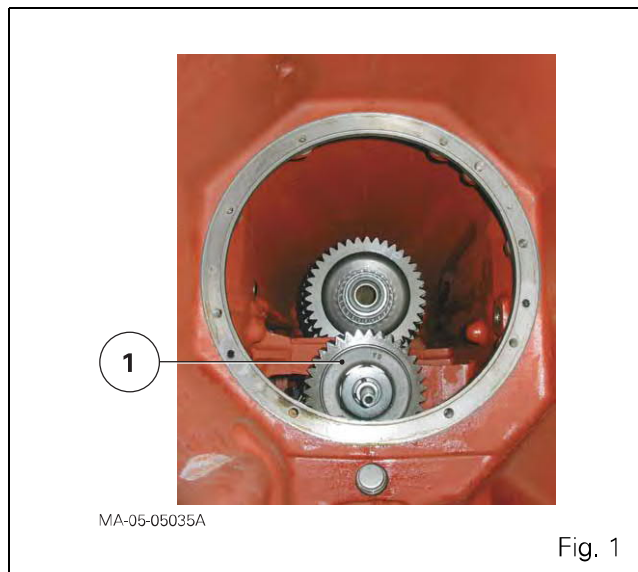


Fig. 1

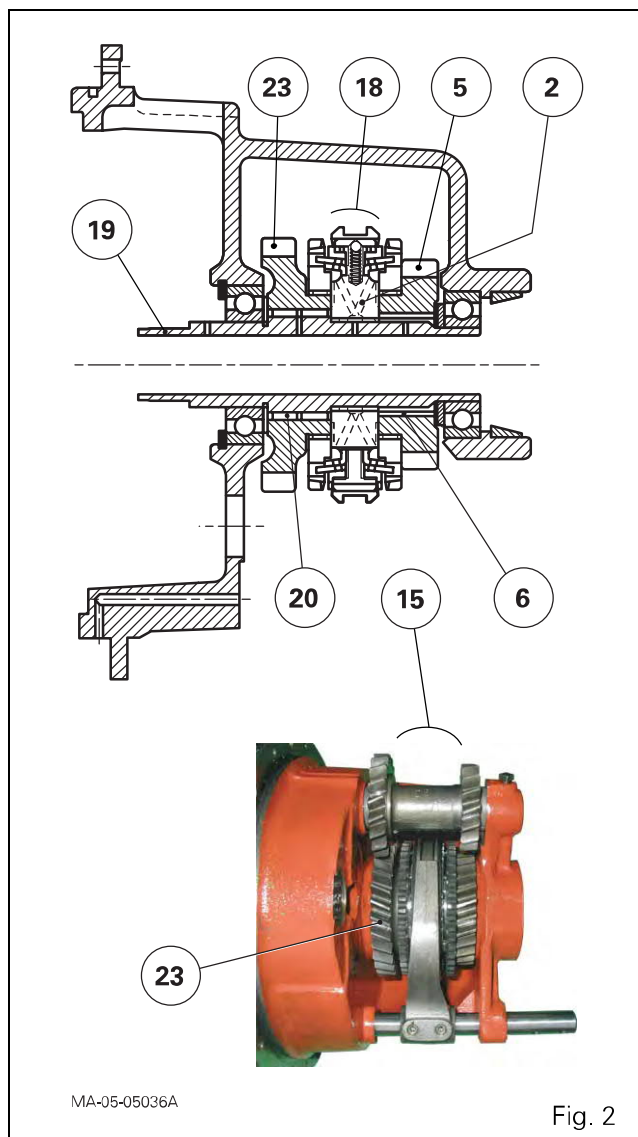


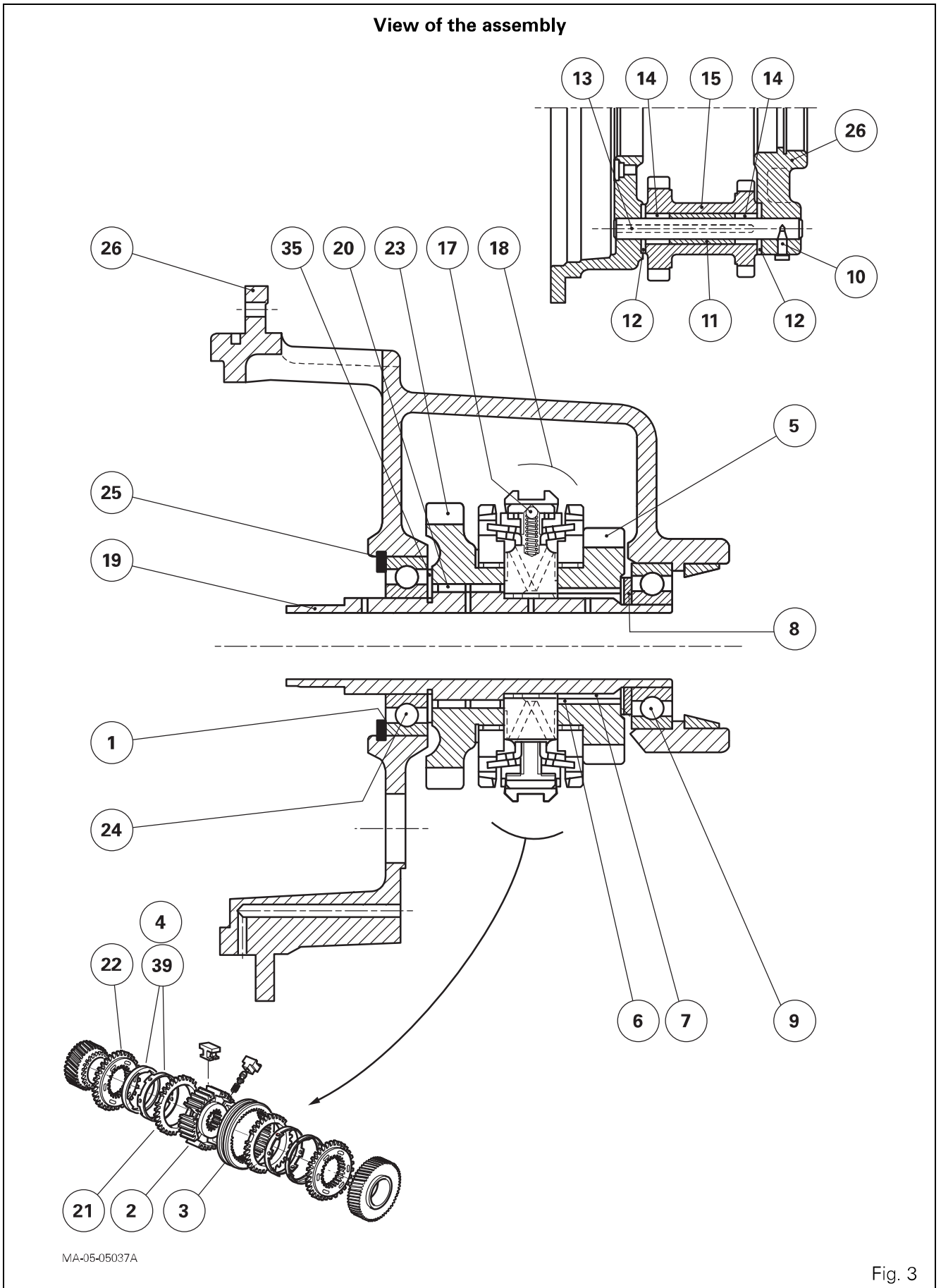
Fig. 2

GBA20 - Mechanical reverse shuttle - Shuttle

Parts list (Fig. 3)

- (1) Shim(s)
- (2) Synchroniser hub
- (3) Sliding coupler
- (4) Cone (brake)
- (5) Forward driving gear
- (6) Needle roller bearing
- (7) Ring
- (8) Friction washer
- (9) Ball bearing
- (10) Set screw
- (11) Spacer
- (12) Friction washers
- (13) Reverse gear pin
- (14) Needle roller bearings
- (15) Double reverse gear
- (17) Locking device
- (18) Synchroniser assembly
- (19) Secondary shaft
- (20) Needle roller bearing
- (21) Rings
- (22) Coupling flanges
- (23) Reverse driving gear
- (24) Ball bearing
- (25) Circlip
- (26) Housing
- (35) Friction washer
- (39) Cones (brake)

GBA20 - Mechanical reverse shuttle - Shuttle

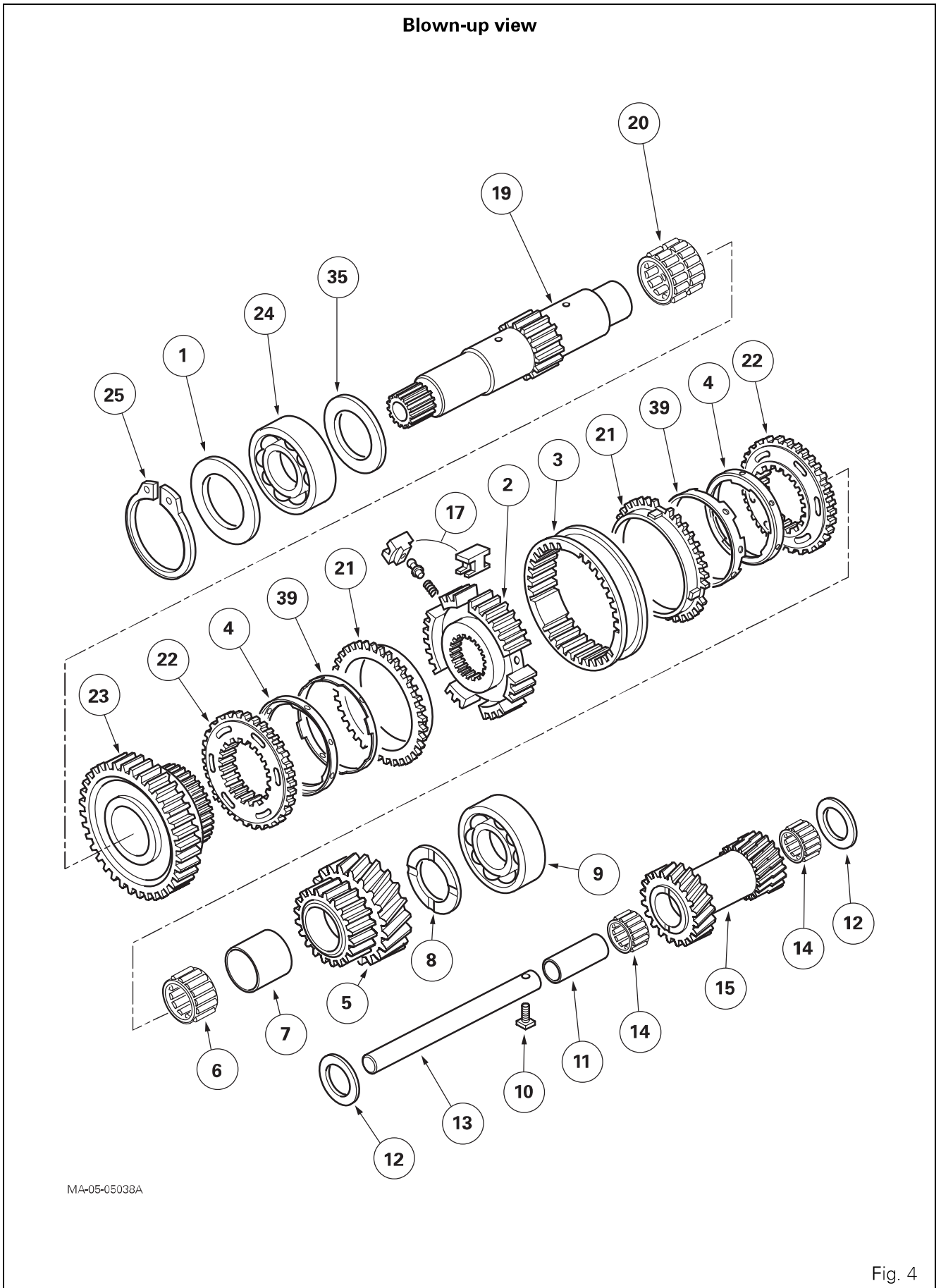


GBA20 - Mechanical reverse shuttle - Shuttle

Parts list (Fig. 4)

- (1) Shim(s)
- (2) Synchroniser hub
- (3) Sliding coupler
- (4) Cone (brake)
- (5) Forward driving gear
- (6) Needle roller bearing
- (7) Ring
- (8) Friction washer
- (9) Ball bearing
- (10) Set screw
- (11) Spacer
- (12) Friction washers
- (13) Reverse gear pin
- (14) Needle roller bearings
- (15) Double reverse gear
- (17) Locking device
- (19) Secondary shaft
- (20) Needle roller bearing
- (21) Rings
- (22) Coupling flanges
- (23) Reverse driving gear
- (24) Ball bearing
- (25) Circlip
- (35) Friction washer
- (39) Cones (brake)

GBA20 - Mechanical reverse shuttle - Shuttle



GBA20 - Mechanical reverse shuttle - Shuttle

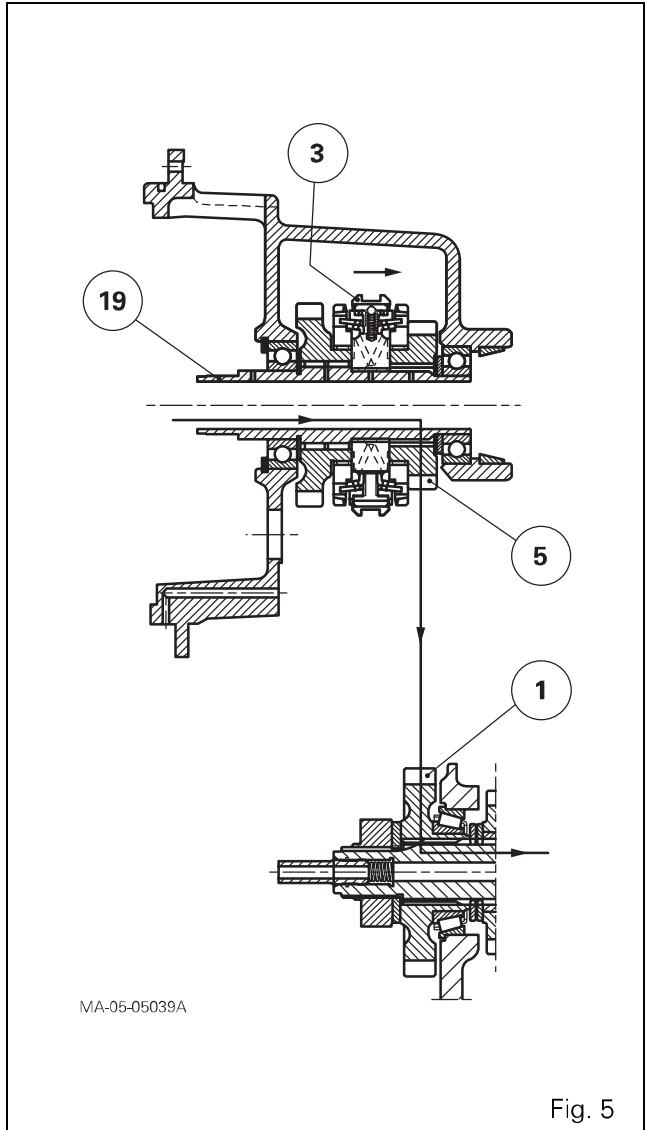
B . Operation

Forward travel kinematics (Fig. 5)

The movement of the synchroniser sliding coupler (3) to the rear joins the gear (5) with the shaft (19).

The gear (1) is splined to the layshaft.

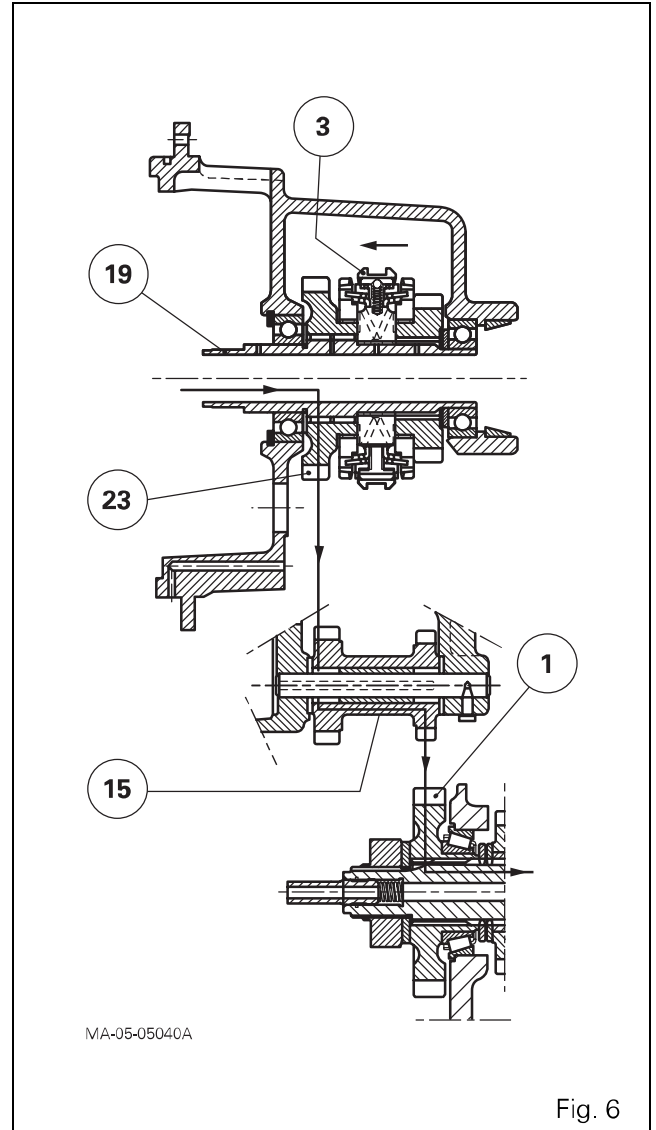
The constant meshing of gears (5) and (1) allows drive to be transmitted to the gearbox.



GBA20 - Mechanical reverse shuttle - Shuttle

Reverse travel kinematics (Fig. 6)

The movement of the synchroniser sliding coupler (3) to the front joins the gear (23) firmly with the shaft (19). Drive is transmitted via the gear (23), the teeth of the layshaft gear (15) and the gear (1). Consequently, the drive transmitted to the layshaft of the gearbox is reversed.



GBA20 - Mechanical reverse shuttle - Shuttle

C . Preliminary steps

IMPORTANT: *If the input unit is removed to replace the complete unit or just the housing (26), it is necessary to shim the intermediate shaft of the gearbox again after removing the input unit (see chapter 5).*

1. Disconnect the tractor between the engine and the gearbox (see chapter 2).
2. Drain the gearbox and the rear axle.
3. Remove the input unit (see chapter 5).
4. Remove the locking device, the selector rail and the shuttle fork (see chapter 5).
5. Remove the Speedshift (see chapter 5).

D . Disassembling and reassembling the reverse shuttle

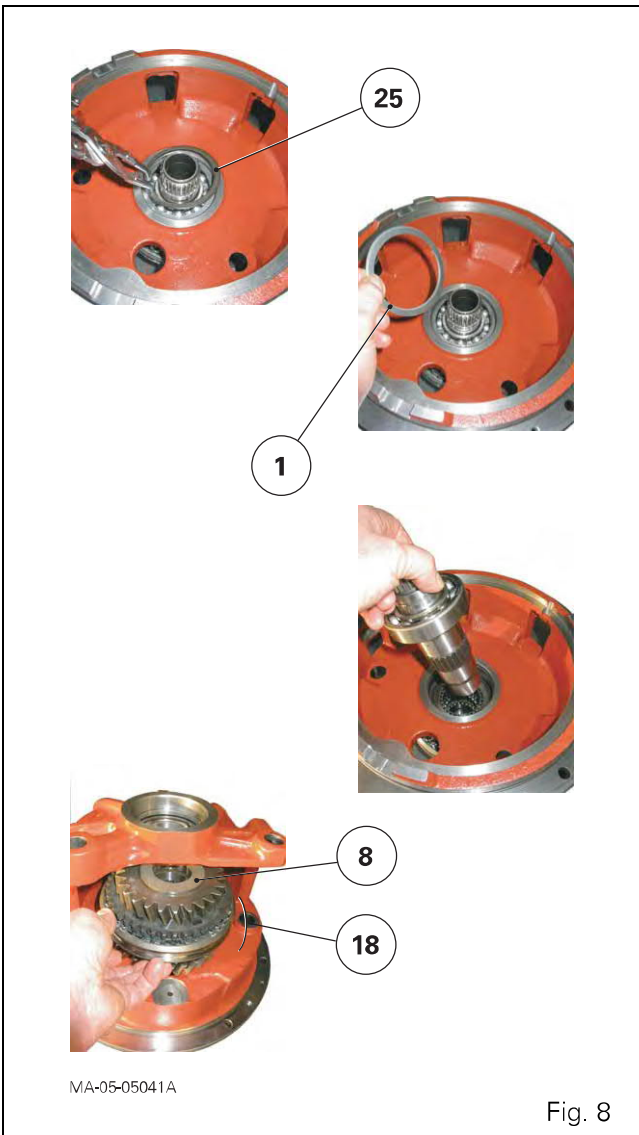
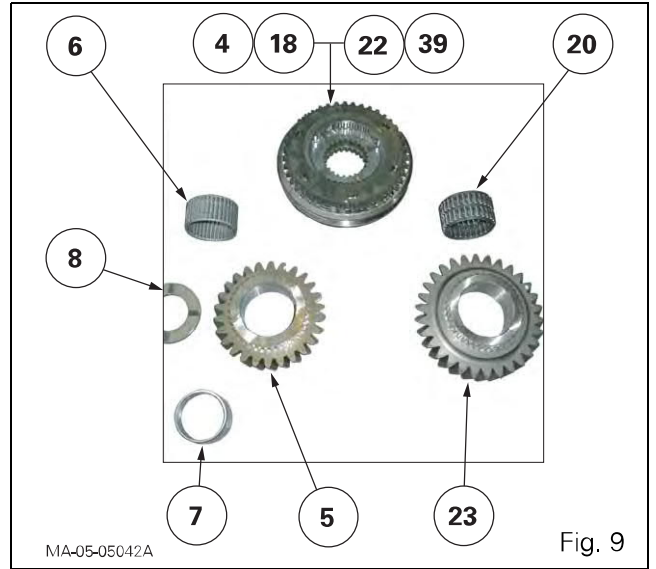
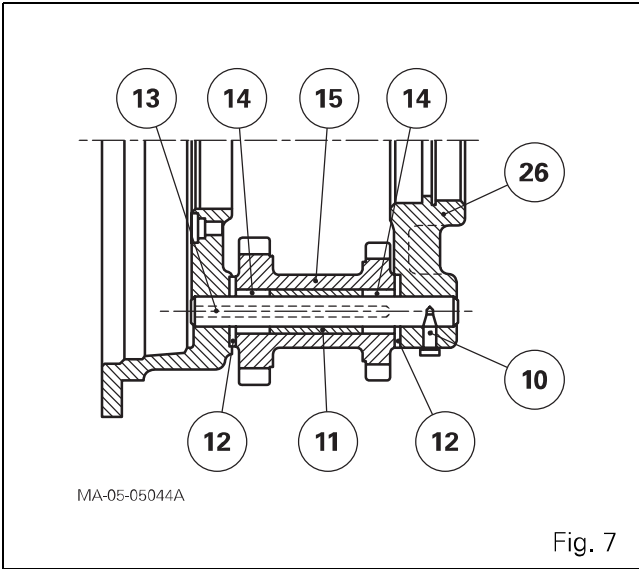
Disassembling the layshaft gear (15) for reverse travel (Fig. 7)

6. Take out the set screw (10).
7. Take out the pin (13).
8. Remove the layshaft gear (15), the washers (12), the needle roller bearings (14) and the spacer (11).

Disassembling the reverse shuttle (Fig. 8)

9. Remove the circlip (25).
10. Remove the shim(s) (1).
11. Drive the secondary shaft out of the gear/synchroniser assembly.
12. Take out the gear/synchroniser assembly (18) from the housing. Remove the washer (8), marking its positioning.
13. Place the gear/synchroniser assembly on a workbench.
14. Separate (Fig. 9):
 - the gear (5)
 - the ring (7)
 - the needle roller bearing (6)
 - the cones (brake) (4) and (39)
 - the coupling flanges (22)
 - the gear (23)
 - the needle roller bearing (20)
15. If required, extract the ball bearing (24) from the secondary shaft (19).
Remove the washer (35), marking its positioning.

GBA20 - Mechanical reverse shuttle - Shuttle



GBA20 - Mechanical reverse shuttle - Shuttle

Reassembling the reverse shuttle

16. Clean and check all components. Replace those that are defective.
17. Check that the ports and channels of the secondary shaft (19), the pin (13) and housing (26) are not blocked.
18. Lubricate the secondary shaft, the ring (7) and needle roller bearings (6) and (20).
19. If removed, place the washer (35) on the secondary shaft (19) as shown in Fig. 10.
Fit the ball bearing (24) against the washer (35) (Fig. 10), using a press and a makeshift sleeve (internal $\varnothing = 47$ mm; L = 60 mm).
IMPORTANT: The sleeve is used to push against the internal cage of the ball bearing.
20. Assemble (Fig. 11):
 - the gear (5)
 - the ring (7)
 - the needle roller bearing (6)
 - the cones (brake) (4) and (39)
 - the coupling flanges (22)
 - the gear (23)
 - the needle roller bearing (20)
21. Refit the ball bearing (9) in the housing.
22. Refit the gear (5) (23)/synchroniser (18) assembly and the washer (8) in the housing (Fig. 12).
Turn the lubricating grooves of the washer (8) towards the gear (5) (Fig. 12).
23. Position the washer centrally (8).
24. Insert the secondary shaft (19) (Fig. 12) into the gear/synchroniser (18) assembly through the bore in the front of the gearbox.
25. Turn the shaft from right to left and vice versa to partially engage the splines of the secondary shaft in those of the synchroniser.
26. With the help of an operator, install the fitted unit on a table press.
27. Position a makeshift sleeve (internal $\varnothing = 44$ mm; L = 32 mm) under the internal ring of the ball bearing (9).

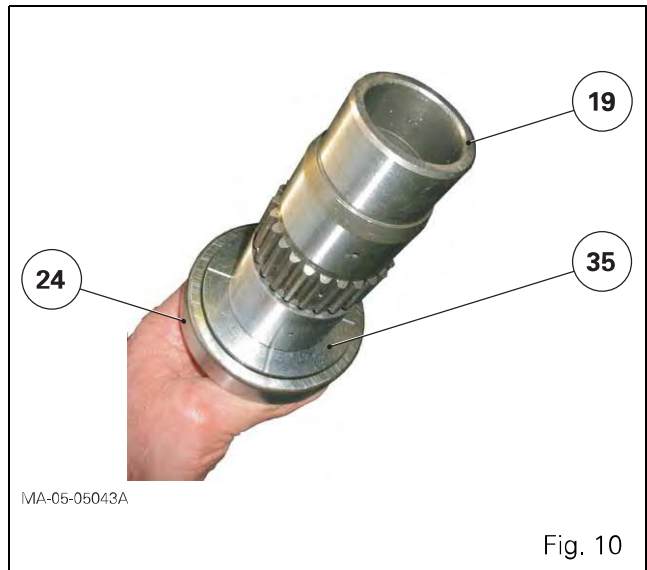


Fig. 10

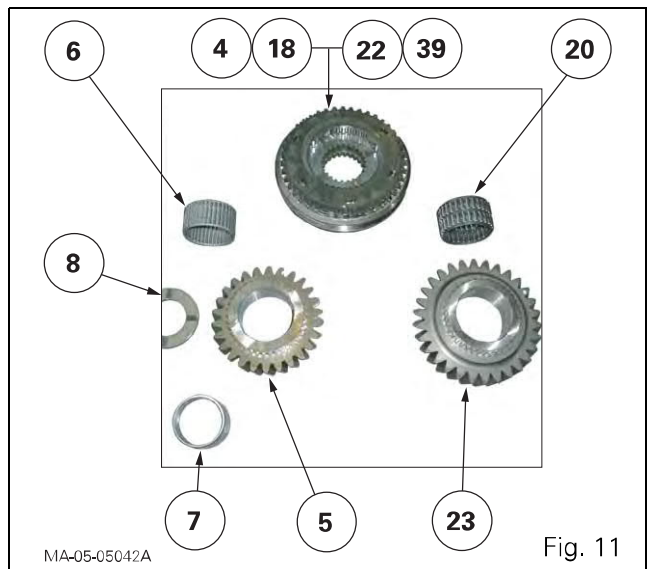


Fig. 11

GBA20 - Mechanical reverse shuttle - Shuttle

28. Position the sleeve used during step 19 on the internal ring of the ball bearing (24).
29. Gradually fit the secondary shaft (19) securely using a press until resistance is felt. Simultaneously check the gears rotate smoothly.
IMPORTANT: It is recommended to use a press and sleeves to fit the secondary shaft under the correct conditions, and to avoid exposing the ball bearings to excessive force when fitting.
30. Fit the shim(s) (1) removed during disassembly, and the circlip.
- REMINDER:** If it is necessary to shim the secondary shaft (19), see § E.
31. Check the axial clearance and rotation of the gears (5) and (23).
Manually check the rotation of the shaft (19).

Reassembling the layshaft gear (15) for reverse travel (Fig. 13)

32. Slide the needle roller bearings (14) separated by the spacer (11) into the layshaft gear (15).
33. Place the assembled layshaft gear in the housing (26). Slide a washer (12) onto each of its faces.
34. Fit the pin (13).
35. Lightly smear the thread of the set screw (10) with Loctite 242 or equivalent. Tighten to a torque of 28 - 43 Nm.
36. Manually check the axial clearance and backlash of the reverse layshaft gear.

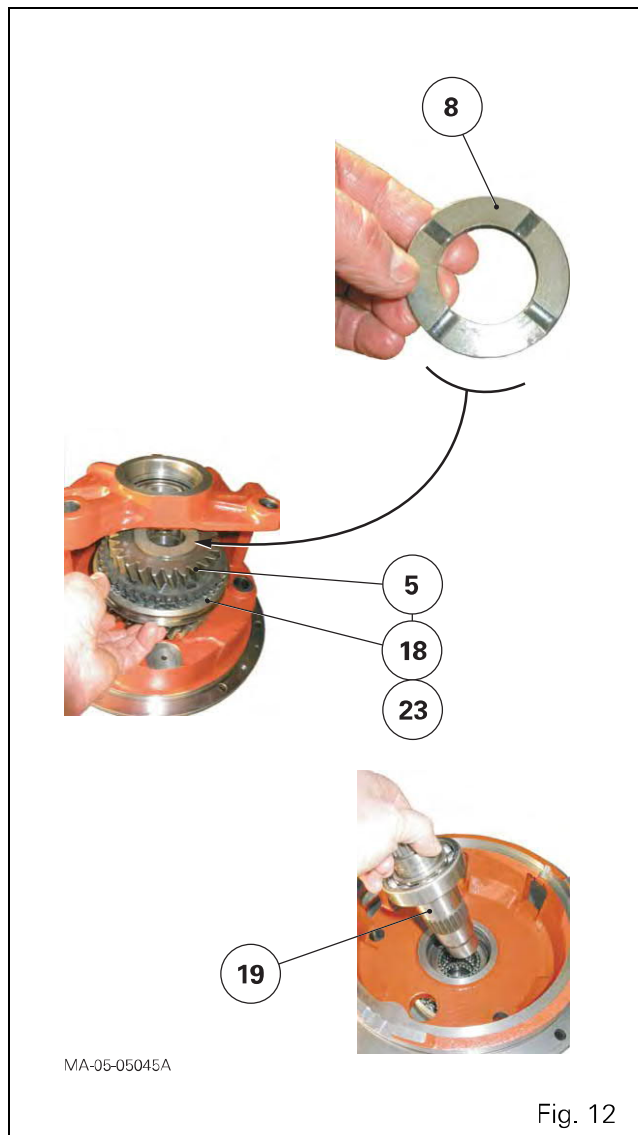


Fig. 12

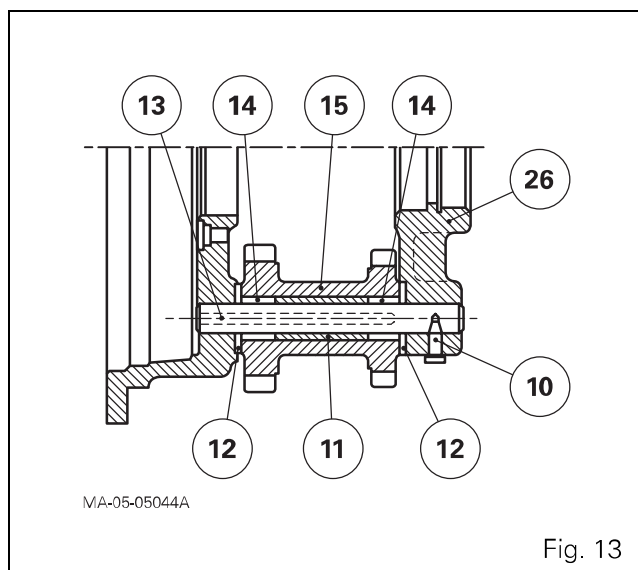


Fig. 13

GBA20 - Mechanical reverse shuttle - Shuttle

E . Shimming the secondary shaft

37. Secure the unit in a vice fitted with protected jaws.

Preparing for shimming

38. Manually check for clearance on the secondary shaft (19) in the housing (26).

If there is no clearance, temporarily remove one or several shims (1).

Shimming

39. Position the dial gauge feeler pin on the end of the shaft (19) (Fig. 14).

40. Pull hard on the secondary shaft (19) to correctly position the ball bearing (24) against the circlip (25).

41. Set the dial gauge needle to zero.

42. Repeat step 40 while pushing to bring the ball bearing (9) up against the shoulder of the housing (26).

43. Depending on the clearance measured, select a new thickness of shim(s) (1) to obtain a clearance of $J1 = 0.05$ to 0.20 mm (Fig. 15).

NOTE: If possible, shim the secondary shaft close to the minimum tolerance value.

44. Remove the circlip (25).

45. Position the definitive shim(s) (1) selected during step 43 on the bearing (24).

46. Refit the circlip (25). Check it is correctly fitted at the base of the groove.

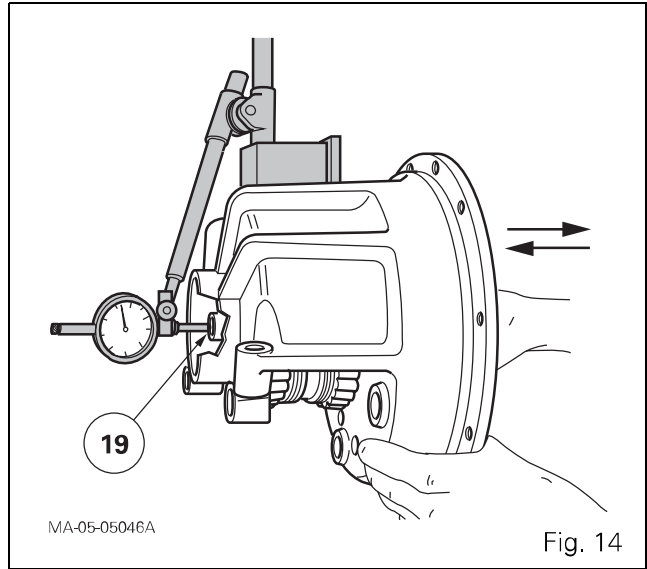


Fig. 14

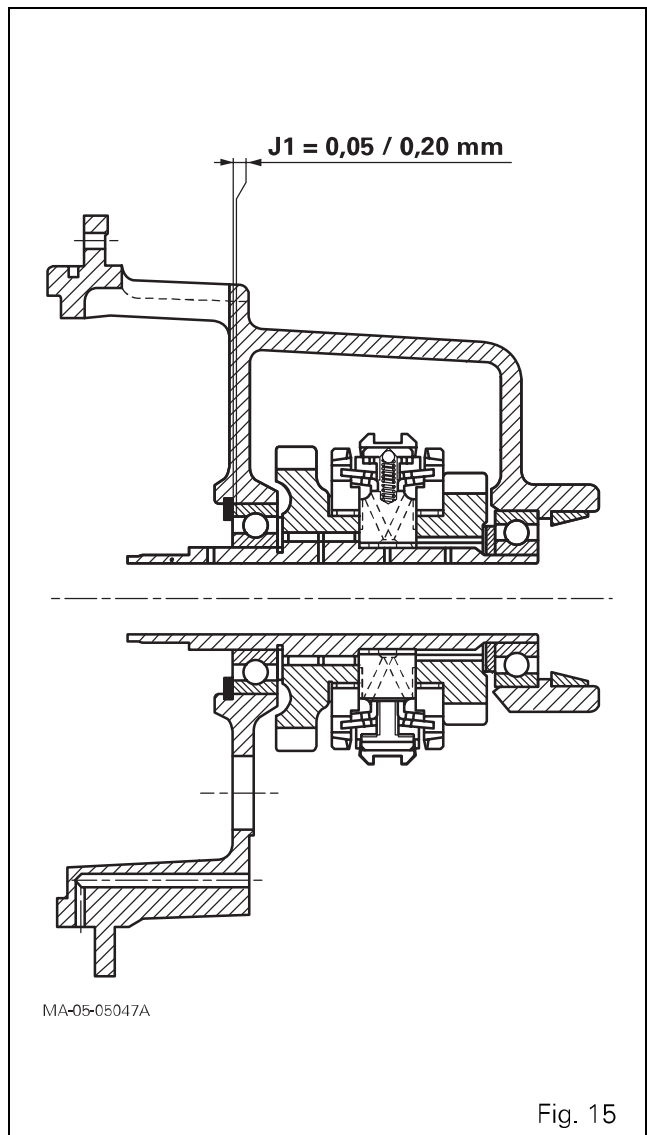


Fig. 15

F . Final steps

47. Refit:
 - the Speedshift (see chapter 5);
 - the shuttle fork, the selector rail and its locking device (see chapter 5).
48. Refit the input unit (see chapter 5).
49. Top up the oil level in the housings. Check it using the gauge at the rear of the centre housing.
50. Reconnect the tractor between the engine and the gearbox (see chapter 2).
51. Carry out a road test on all controls.
52. Check the tightness of the seals and hydraulic unions.

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