SECTION F

GEARBOX

ILLUSTRATIONS

F.1. - GENERAL DESCRIPTION

The gearbox fitted is equipped with four forward speeds which are all of the constant mesh type and provided with synchromesh engagement. A reverse gear of the normal spur type is also fitted in the box whilst all the forward constant mesh gears are of the helical type, to ensure quiet operation. The gears are selected manually by a floor mounted gear lever.

There are three selector shafts and a selector fork is attached to each shaft by a setscrew. The forks on the left-hand and centre shafts engage in a groove machined in the periphery of the third and top gear and the first and second gear synchroniser sleeves respectively. A fork attached to the right-hand shaft engages with a groove in the reverse idler gear hub.

The selector shafts are free to slide in the gearbox case but an interlocking plunger device situated in the front of the gearbox case prevents more than one shaft being moved at a time, thus preventing the engagement of two gears simultaneously. Index notches corresponding to the neutral and gear positions are machined in the respective shafts and are engaged by spring-loaded locking balls in the gearbox top face and cover to positively locate the gears.

The rear ends of the forged selector shafts protrude into the gearbox extension housing. The first and second gear and the reverse gear selector shafts both being hooked. The third and top gear selector shaft is slotted on the inner face of the forged end and is bent so that the slot is adjacent to the hook in the first and second gear selector shaft. A relay lever engages with the reverse selector shaft hook and forms a gear selector gate with the forward gear selector shaft ends, by means of a slotted lug adjacent to the first and second selector shaft hook.

Description

The gearbox and clutch housing are bolted to the engine. The drive from the engine is through the clutch to the gearbox by a splined shaft integral with the main drive gear, the clutch disc being free to slide on these splines. The main drive gear runs in a ball race in the gearbox case and the shaft is supported at the forward end by a spigot located in a bearing fitted in the end of the engine crankshaft.

The main drive gear bearing is retained on the shaft by a circlip, the main drive gear and bearing assembly being retained in the gearbox by another circlip located in a groove in the bearing outer race and a retainer bolted to the gearbox case front face.

An oil seal in the bearing retainer prevents oil leaking out onto the clutch disc. The main drive gear is in mesh with the countershaft cluster gear which runs on needle roller bearings divided equally between each end of the countershaft.

The mainshaft is supported in the main drive gear by a spigot located in needle roller bearings and runs in a ball race mounted in a carrier sandwiched between the gearbox and the extension housing. The mainshaft extension is supported at the rear end by the drive shaft sliding joint, which runs in a bearing bush fitted in the rear end of the extension housing. An oil seal is also fitted at this location.

The first, second and third gears are in constant mesh with the countershaft cluster gear and are free to rotate on the mainshaft, the first gear on a steel bush, which is positively located by a steel ball, and the other two directly on the shaft itself. The forward gears are engaged by blocker type synchroniser assemblies splined to the mainshaft, between the first and second gears and between the third and main drive gears. The mainshaft bearing, first gear and bush, first and second gear synchroniser and the second gear, together with the speedometer drive gear and spacer are retained by a nut locked with a tab washer, on the mainshaft extension, the speedometer drive gear being positively located by a steel ball. The third gear and the third and top gear synchroniser are retained at the forward end of the mainshaft by a circlip.

The reverse spur gear is machined on the outside of the first and second gear synchroniser sleeve and a reverse idler spur gear is mounted parallel to the mainshaft and countershaft.

Lubrication and Maintenance

The gears are lubricated by an extreme pressure gear oil, (see Section 'O'), which partially fills the gearbox case; a combined filler and level plug and a drain plug being provided to facilitate service. The countershaft cluster gear, which is almost completely submerged, picks up oil as it revolves to lubricate the mainshaft and main drive gears and bearings and also the selector shafts and forks. Oil passing through the main drive gear bearing is returned to the gearbox case by a slot in the bearing retainer and an oil drain hole in the gearbox case front face. An oil seal in the bearing retainer prevents the oil from leaking out along the main gear shaft and onto the clutch disc.

Oil thrown up by the gears is collected in a channel in the left-hand side of the gearbox case and runs back into the extension housing to lubricate the speedometer gears and the mainshaft extension bush. An oil seal in the end of the extension housing prevents the oil from leaking out around the drive shaft sliding joint. Oil trapped by the

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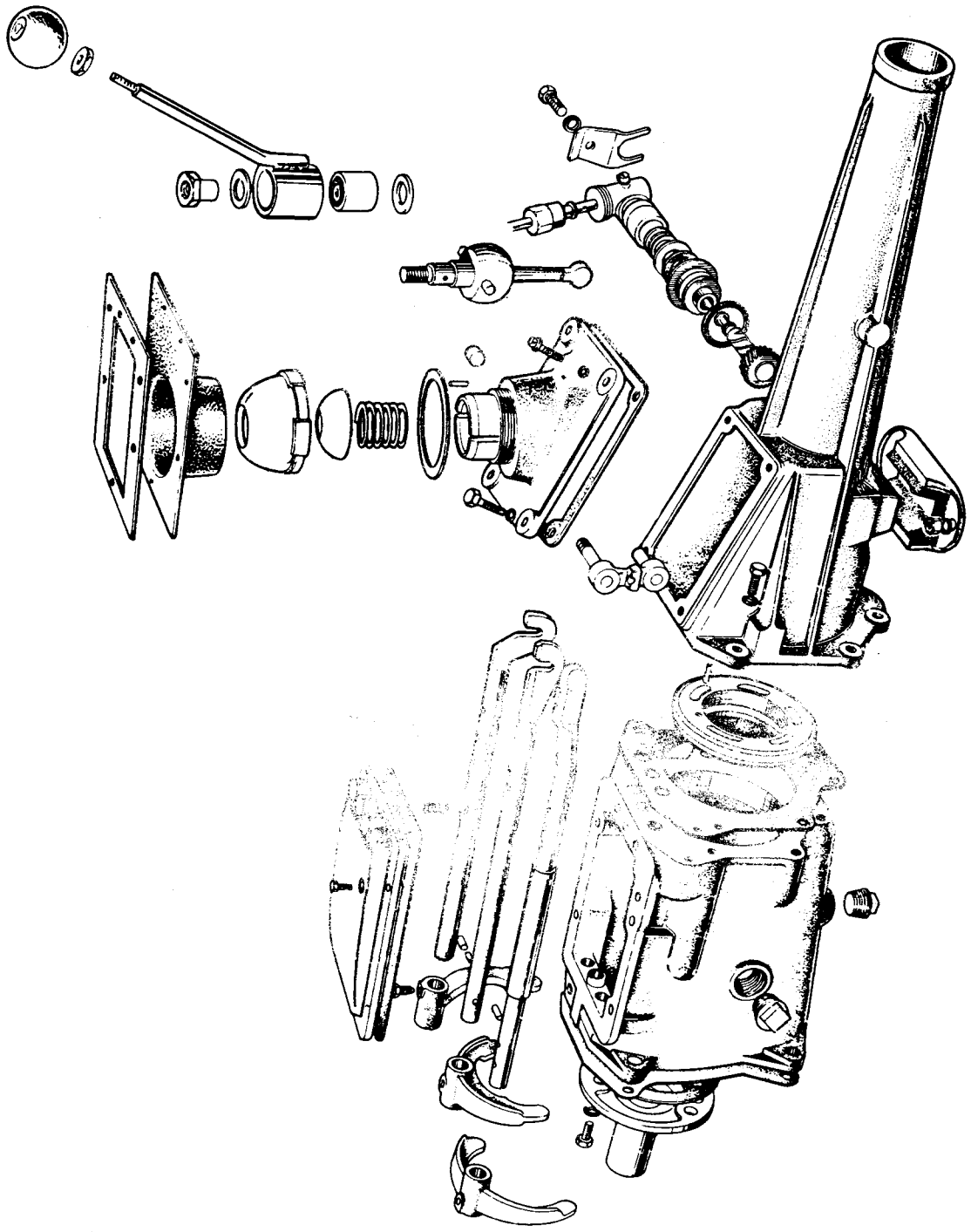

Fig. 1 GEARBOX EXTERNAL COMPONENTS

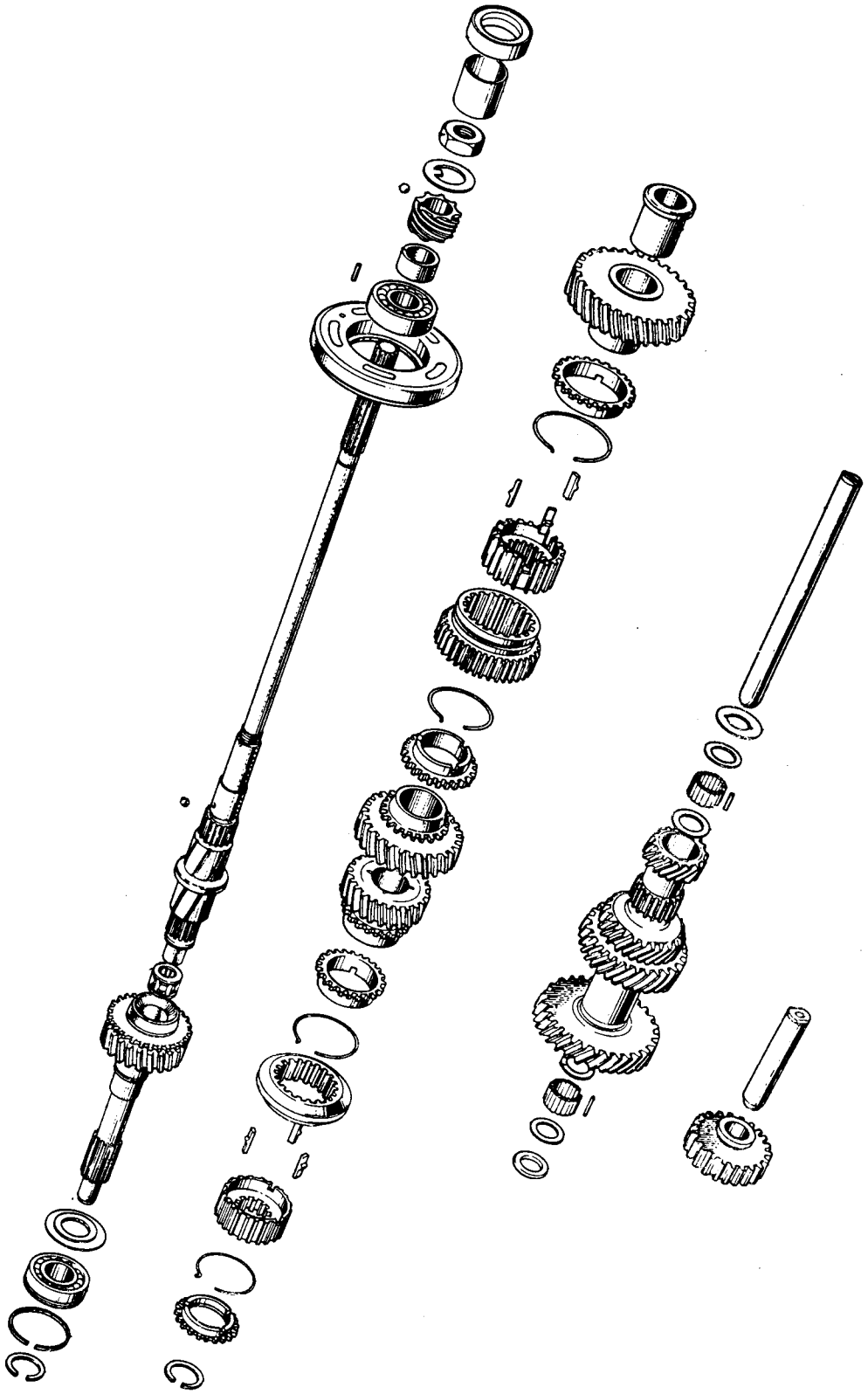

Fig. 2. GEARBOX INTERNAL COMPONENTS

seal returns to the extension housing through a slot under the bush. A pocket of oil is retained in the extension housing by the front face which is recessed to locate the mainshaft bearing carrier plate. An oil hole, in the front face, drains surplus oil back into the gearbox case via annular grooves and a slot in the mainshaft bearing carrier plate.

The gearbox is ventilated by a breather incorporated in the rear left-hand bolt retaining the remote control housing to the extension housing. Ventilation slots in the extension housing front face and the mainshaft bearing carrier plate being provided for air to flow between the gearbox case and the extension housing.

The Synchronisers.

The synchronisers are of the 'blocker ring' type and consist of a hub, which is splined to the mainshaft and an outer sleeve splined to the hub. The hub has three inserts or blocker bars supported by two light circular springs, which hold the blocker bars against the synchroniser sleeve and, in the neutral position, in engagement with notches machined in the internal splines of the sleeve. The blocker bar springs, which are positioned on either side of the hub, have tags at one end located in a common insert, the other end being free. The springs are fitted so that the free ends run in opposite directions. A bronze blocker ring is interposed between the synchroniser and each forward gear, having a tapered face to mate with the corresponding face on the gear.

The blocker rings have dog teeth die-cast on their external diameter and are cut away at three equal points to locate on the blocker bars. Radial clearance, to give approximately half a pitch of the dog teeth on the blocker ring and gear, exists between the slots and blocker bars.

When engaging a forward gear, the respective synchroniser is moved towards the required gear. The blocker bars, which are in engagement with the sleeve, also move and push the blocker ring into contact with the tapered face of the gear, which revolves at a different speed to the mainshaft and synchroniser. The frictional drag which exists between the tapered face of the blocker ring and gear will keep one side of the slots against the blocker bars, so that the dog teeth will be out of line with teeth on the sleeve. This prevents gear engagement as long as there is any difference in the speeds between the mating cones.

As the speeds equalise, however, the blocker ring centralises itself, allowing the sleeve to move fully to engage the dog teeth of the gear.

The Power Flow

Neutral

In neutral, with the engine running, the main drive gear and countershaft gear revolve and the first, second and third gears revolve on the mainshaft. The mainshaft, reverse idler gear and first and second gear synchroniser are, of course, stationary.

First

To engage first gear, the first and second gear synchroniser (which is also the reverse mainshaft gear) is moved rearwards so that the internal teeth engage the dog teeth on the gear, so locking the first gear to the mainshaft. Power is transmitted from the main drive gear to the front countershaft gear, to the first gear, then to the first and second gear synchroniser and mainshaft.

Second

Second gear is engaged by moving the first and second gear sychroniser forward, to lock the second gear to the mainshaft. Power is then transmitted from the main drive gear, to the front countershaft gear, to the second gear, then to the first and second gear synchroniser and mainshaft.

Third

Third gear is engaged by sliding the sleeve of the third and top gear synchroniser rearwards to engage with the dog teeth on the third gear, so locking it to the mainshaft. The power train is then from the main drive gear to the countershaft gear, to the third gear then to the third and top gear synchroniser and mainshaft.

Top

Top gear is direct drive, the main drive gear being locked to the mainshaft by the action of the third and top gear synchroniser, which has been moved forward so that the internal teeth on the sleeve engage the dog teeth on the main drive gear.

Reverse

Reverse is engaged by moving the reverse idler gear forward so that it meshes with a spur gear on the countershaft (located between the first and second gear) and also with the spur gear machined on the outer diameter of the first and second gear synchroniser. Power is transmitted from the main drive gear to the front countershaft gear, up to the reverse idler gear and then the reverse mainshaft gear on the first and second gear synchroniser and mainshaft.

F.2. - GEARCHANGE ASSEMBLY

To Remove

1. From inside the car, remove the tunnel top (see Section 'B'), followed by the gear change lever grommet.
2. Unscrew the nylon gearchange lever cap. Lift out the assembly.

To Replace

1. Use a new gasket between the gearchange cover and the lever cap.
2. Replace the gearchange lever assembly. Ensure the cap is tight by tapping with a suitable drift.
3. Refit the gearchange lever grommet. Refit the tunnel top (see Section 'B').

Anti-Vibration Gearchange Lever

During the latter part of the Series 3 production, an anti-vibration gearchange lever (Part No. 36 F 724), was introduced. If it is desired to fit this new lever to earlier cars, the following action is recommended:-

1. Remove the existing gearchange lever.
2. Assemble the gearshift lever from the lower end in the following sequence:-
   Ball-end (Part No. 36 F 129), spring (existing part), seat (existing part), cap (existing part), washer (Part No. W 024), lockwasher (Part No. W 0072), upper gear lever, lockwasher (Part No. W 0072), washer (Part No. W 024) and finally the sleeve nut (Part No. 36 F 0150) liberally coated with Loctite 'AV' on the threads of both the nut and the threaded part of the lever. Tighten the sleeve nut to a torque loading of 18 lbs.ft. (2.5 kg.m.)
3. Push the upper part of the now assembled gearchange lever through the floor aperture sealing grommet, ensure that the lever is correctly aligned, then secure. Transfer locknut and lever knob from the discarded lever.

F.3. - GEARBOX ASSEMBLY

To Remove

1. Remove bonnet (see Section 'B').
2. Disconnect the battery.
3. Remove the radiator (see Section 'K').
4. Remove the engine (see Section 'E'), together with the gearbox, after first removing gearbox mounting bracket.
5. Remove gearbox from engine.

To Replace

1. Fit gearbox to engine.
2. Replace engine into car.
3. Refit radiator.
4. Reconnect battery.
5. Refit bonnet.

F.4. - GEARBOX ASSEMBLY - OVERHAUL

1. Remove the gearbox (Section 'F.3').
2. Drain the oil into a suitable receptacle.
3. Before commencing dismantling, ensure that gears are in the neutral position.
4. Remove the clutch release bearing mechanism (see Section 'Q').
5. Remove the clutch housing by unscrewing and removing the four bolts and lockwashers securing the housing to the gearbox case. If required, drive out the clutch release arm fulcrum pin.
6. Remove the gearbox top cover plate, by unscrewing four bolts and lockwashers securing the cover plate to the gearbox and carefully lift off the cover plate as the selector shaft locking springs are located in the cover plate and can be lost when the cover is removed.
7. Withdraw the selector shaft locking springs and balls from their locations.
8. Ensure that the gearbox is in the neutral position and remove the locking wire from the bolt heads. Unscrew the square-headed taper bolts securing the selector forks to the selector shafts.
9. Withdraw the third and top selector shaft to the rear, supporting the sleeve fitted to the third and top selector shaft. Lift out the sleeve.
10. Withdraw the first and second gear selector shaft and remove the floating pin from the cross drilling at the forward end of the shaft. Rotate the shaft through 90° and remove it from the gearbox casing.
11. Withdraw the reverse selector shaft to the rear rotating it 90° clockwise to prevent it fouling the extension housing.
12. Lift the selector forks from the locating grooves on their respective gears.
13. If required, remove the interlock plungers from their location in the gearbox casing.
14. Remove the extension housing and mainshaft assembly by unscrewing the bolts and spring washers securing the housing to the gearbox casing.
15. Remove the speedometer driven gear and the gear bearing from the extension housing.