

Chapter 2

ALIGHTING GEAR
(Completely Revised)

LIST OF CONTENTS

UNDERCARRIAGE

	Para.
Description	2
Operation	3
SERVICING	
Rubber block renewal ...	4
Dismantling the shock-absorber	5
Upper piston assembly ...	7
Lower piston assembly ...	8
Jack pads	9
Reassembling	10
Lubrication	11

TAIL WHEEL UNIT

Description	12
Operation	13
Servicing	14

	Para.
Rubber block renewal	15
Dismantling the shock-absorber	16
Reassembling	17
Wear in the castoring components	18
Excessive wear	20
Lubrication	26

MODIFIED TAIL WHEEL UNIT

Description	27
Servicing	29
Dismantling the shock-absorber ..	31
Reassembling	32
Wear in the castoring components	33
Lubrication	35
Modifying original type fork spindle	36

LIST OF ILLUSTRATIONS

	Fig.		Fig.
Undercarriage shock-absorber unit	1	Castoring mechanism	5
Upper piston assembly ...	2	Tail wheel unit lubrication ...	6
Undercarriage lubrication ...	3	Modified tail wheel shock-absorber	
Tail wheel shock-absorber unit	4	unit	7

1. This chapter describes and illustrates the servicing of the alighting gear, and includes instructions for the renewal of the shock-absorber compression rubber

blocks, together with brief descriptive matter. Details of the brake system will be found in Chapter 4 of this Section.

UNDERCARRIAGE

Description

2. The non-retractable undercarriage consists of two independent, cantilever, single-wheel units secured, one to each wing unit, at the D-nose assembly of the wing. Compression and rebound loads are absorbed by rubber blocks. Each unit comprises :-

(1) A fixed outer cylinder incorporating a fixed upper piston assembly.

(2) A lower piston assembly which slides within the cylinder.

(3) Rubber blocks in the upper and lower assemblies.

(4) Torque links, connecting the cylinder to the lower piston assembly.

(5) Detachable metal fairing, the port unit incorporating a taxiing lamp.

(6) A single wheel to each unit.

(7) A hydraulic brake to each wheel.

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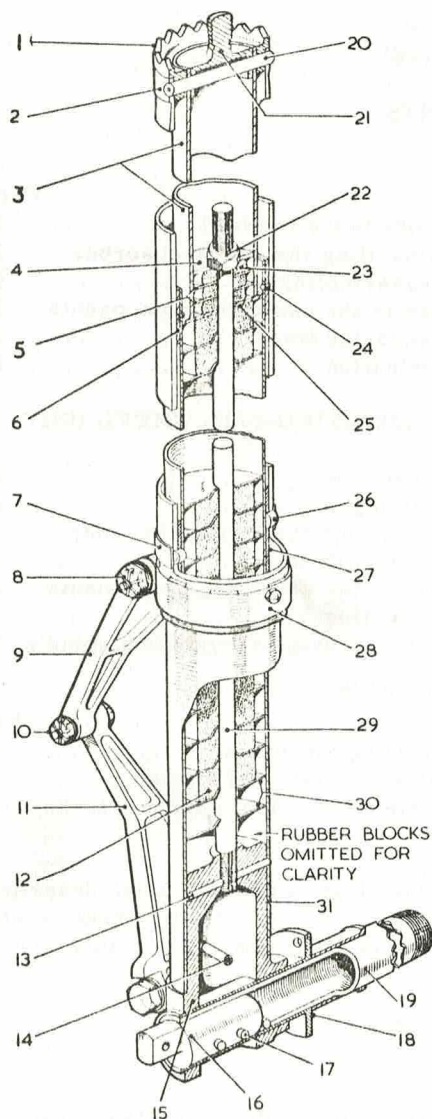


Fig. 1

Undercarriage shock-absorber strut

Operation (fig. 1)

3. The upper and lower piston assemblies are connected by a pair of torque links (9) and (11) which transmit the twisting moment of the axle (19) to the cylinder (2) and thence to the wing structure through

the serrated plug (1). The upper torque link (9) is attached by a high tensile bolt (8), to a lug fitting (28) which is welded to the cylinder (2); the lower link (11) is attached, similarly, to the plunger tube (31) which slides within the cylinder as follows :-

When a load is placed on the plunger tube, the tube slides upwards in the cylinder and, during this movement, the rubber blocks (12) are compressed against the base plate (25) of the upper piston assembly. On rebound, the washer (4) on the guide rod (29) contacts and compresses the rebound blocks (23) against the upper surface of the base plate (25) and produces the required damping action.

SERVICING

Rubber block renewal (fig. 1)

4. The condition of the rubber blocks is indicated by the measurement between the centres of the upper and lower torque link bolts. This should be checked as follows:- With the aircraft standing at approximately normal all-up weight, less crew, and the tyre pressures correct, this measurement should be approximately 9.0 in. Should this dimension be reduced to 7.25 in., a new set of rubber blocks should be substituted. Refer to Note below.

Note...

On initial assembly, the rubber blocks are fitted as a pile, consisting of a matched set of blocks (12) and spacer plates (30). To restore the leg to normal length, the old blocks should be replaced by Part No. C1. U127A/ND, which comprises a compression group pile consisting of twenty-seven main blocks and one top block.

Dismantling the shock-absorber (fig. 1)

5. To dismantle the shock-absorber unit for the renewal of rubber blocks, proceed as follows :-

- (1) Remove the complete unit from the airframe and remove the fairing, wheel and brake units from the leg (Part 2, Sect. 2, Chap. 1).
- (2) Separate the torque links (9) and

(11) by removing the split pin, slotted nut, bolt (10) and bush.

(3) Remove the plug (21) which is retained by the pin (20).

Note ...

This pin must not be confused with the two pins (32, fig.2), which are not removed for this operation; the pin (20) can be identified by a shallow drilled hole in one end.

(4) Take the initial load off the rebound blocks (23), by compressing the leg in a fixture.

(5) Remove the aerotight nut (22), using a box spanner with an extension handle.

(6) Allow the leg to extend gradually until the loading is expended.

(7) Unscrew the Jubilee clip (7) and remove the two plugs (26) which are tapped for a 4 BA screw to facilitate withdrawal.

(8) The plunger tube (31), together with the blocks (12), can now be withdrawn.

Note ...

The upper bush (6), being secured by four countersunk rivets (24) to the plunger tube (31), will push out the bush (27). The tube (3), having a base plate (25) welded to it, will retain the rebound blocks (23) and spacer plates (5); these, and the compression blocks (12) and spacer plates (30), can be ejected by inverting the assemblies.

6. Para.5 describes the procedure for the renewal of the rubber blocks only. Should a closer examination of the assembly be required, further operations are described in the following paragraphs.

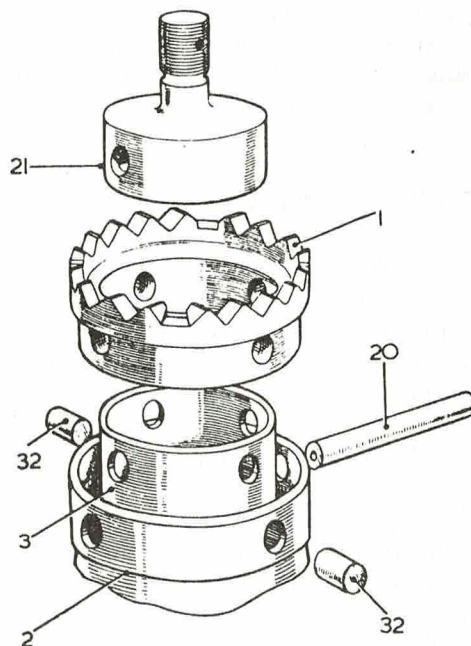


Fig.2. Upper piston assembly

UPPER PISTON ASSEMBLY (fig.2)

7. Although not normally required for routine servicing, if it is found necessary to separate the fixed upper piston assembly and serrated plug (1) from the cylinder (2), care must be taken on re-assembling to ensure that the serrated plug is fitted correctly. When mounting the plug in the cylinder, the crests of the central teeth of the groups of five serrations must lie on the fore-and-aft axis of the leg.

LOWER PISTON ASSEMBLY (fig.1)

8. To examine the lower piston assembly, first remove the axle (19) from the axle housing (18), by withdrawing the three taper pins (17), and proceed as follows :- Remove bolt (14) and withdraw piston (15). The guide rod (29) is screwed into the assembly and locked by the plain pin (13).

JACK PADS (fig.1)

9. To examine or renew a jack pad (16), it is not necessary to disturb the axle. The outer of the three taper pins (17) does not penetrate the pad, therefore, the removal of the inner and middle pins only, releases the pad.

REASSEMBLING (fig.1)

10. When reassembling the various components, the following points should be noted :-

(1) Contacting surfaces of sliding metal parts should be greased, thinly, on assembly. Care should be taken to avoid any grease contaminating the rubber blocks.

(2) If it is necessary to renew the upper bush (6), the rivets securing it must be flush fitting on both sides before assembling the tube (31).

(3) It is important that the aerotight nut (22) should be tightened until a dimension of 11.70 in. + 0.10 in. is obtained between the upper and lower torque link bolt centres.

(4) If the axle has been removed, the three new taper pins (17) should be peened on assembly.

(5) When tightening the links interconnecting bolt (10), it is important that, with the nut fully tightened (washer butting shoulder of bolt), the clearance between the small washer and the nearest link should be 0.003 in. whilst intimate contact is maintained between the links, link and large washer, and washer and bolt head.

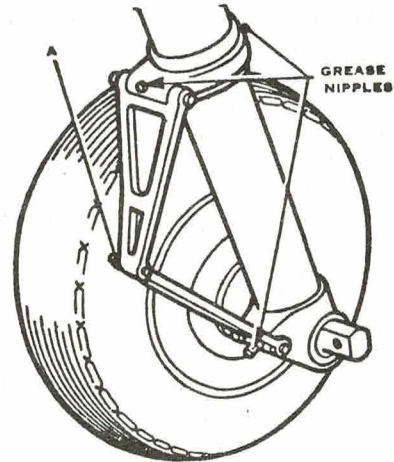


Fig.3. Undercarriage lubrication

(6) On assembly of the joint, check that the clearance quoted in sub. para. (5) is obtained if the clearance is not satisfactory, fit a new washer, assemble joint (but without fitting the split pin introduced by Mod. H.92) and check the clearance. If inadequate, reduce the thickness of the washer by removing (from one face only) sufficient material to correct the deficiency. It is essential to maintain the 0.03 in. x 45 degree chamfer on the i/d of the washer in order to ensure that fouling does not occur between the washer and the radius between the bolt head and the shank. Therefore, on assembly, subsequent to adjustment of washer thickness, this clearance must be preserved by placing the washer chamfered face against the bolt head.

(7) Apply grease XG-271 (Ref.No. 34B/9100510) to the washer face deficient of protective treatment on assembly of the joint. If the bolt is not drilled for the split pin, a No.41 drill should be used to provide a suitable hole. Coat the split pin with jointing compound (Ref.No. 33C/1264) and fit.

Note ...

Washer grease coating should be renewed at frequent intervals, particularly when operating in wet conditions.

(8) On assembly of the upper and lower links attachment bolts (8) upper only annotated), ensure that the bolt head is located against the buttress and that the special chamfered washer, located under the bolt head, is fitted with the chamfered edge toward the bolt shank.

Note ...

Ensure that the clearance between the buttress and the bolt head is not excessive. Nominal clearance is 0.005 - 0.0075 in. However, it must not be possible for the bolt to rotate relative to the torque link.

(9) After final assembly, the distance between the bottom centre of the legs should be 8 ft 0 in. $\pm$ 1.0 in. as viewed from the front.

Lubrication (fig.3)

11. In addition to the light greasing of sliding metal parts as instructed in para.10 (1), the general lubrication instructions are as follows :-

- (1) Grease XG-275 (Ref. No. 34B/9100512) should be applied, by grease gun, at the nipples shown in fig.3.
- (2) Grease XG-270 (Ref. No. 34B/9100508) should be applied to the wheel hub bearings on assembly.
- (3) The torque links hinge bolt (A) should be lubricated as necessary.

TAIL-WHEEL UNIT

Description (Fig.4)

12. The non-retractable, fully castoring tail-wheel unit is mounted on a levered suspension mechanism and is not steerable. Compression and rebound loads are absorbed by rubber blocks. Structurally, the tail-wheel shock-absorber unit is basically similar to the undercarriage units, but differs in that the guide rod, for the rubber blocks, serves as a plunger tube and the blocks are not enclosed. The unit comprises :-

- (1) A tubular steel yoke (18).
- (2) A wheel fork (23).
- (3) A shock-absorber strut comprising two telescopic tubes (5) and (7).
- (4) One rebound block (13), one top compression block (4) and seven compression blocks (6) (para. 17 (1)).
- (5) A single wheel.
- (6) A leather gaiter (3) protecting the exposed ends of the telescoping tubes.

OPERATION

13. The operation of the unit, to absorb landing and rebound loads, is similar to that of the undercarriage legs (para. 3).

SERVICING

14. The routine servicing of the tail-wheel unit consists of lubrication, periodical examination of the rubber blocks for deterioration, and of the wheel fork to ascertain if undue wear has taken place in the castoring mechanism.

Rubber block renewal (fig.4)

15. The rubber blocks on the shock-absorber unit will, in time, deteriorate, lose resiliency and need renewal. Periodically, a check should be made to determine if this is necessary, and the operation is as follows :-

Take the weight off the tail wheel and attempt to rotate the compression blocks (6) or spacer plates (16) by hand; if these can be turned, it is an indication that the blocks should be renewed.

Dismantling the shock-absorber (fig.4)

16. When renewing the rubber blocks, it is not necessary to remove the whole of the tail-wheel unit, but the tail cone must be removed (Part 2, Sect. 2, Chap.1) and the shock-absorber unit removed and dismantled as follows :-

- (1) Trestle the tail of the aircraft as described in Part 2, Sect. 1, Chap.1.
- (2) Disconnect the flanged lug (19) at the lower end of the unit, from the lug (17) on the yoke (18), by removing the split pin, slotted nut, bolt and distance tube.
- (3) Disconnect the cross tube (1) at the upper end of the unit from the bracket on the tail-plane front spar, by removing the split pin, slotted nut, bolt and distance tube.
- (4) Unfasten the locking wires (2) and (11) and remove the gaiter (3).
- (5) Take the load off the rebound block (13) by compressing the strut in a fixture.
- (6) Remove the aerotight nut (8) and bolt (10) which extends through the plug (9) and retains the flanged slide (12).

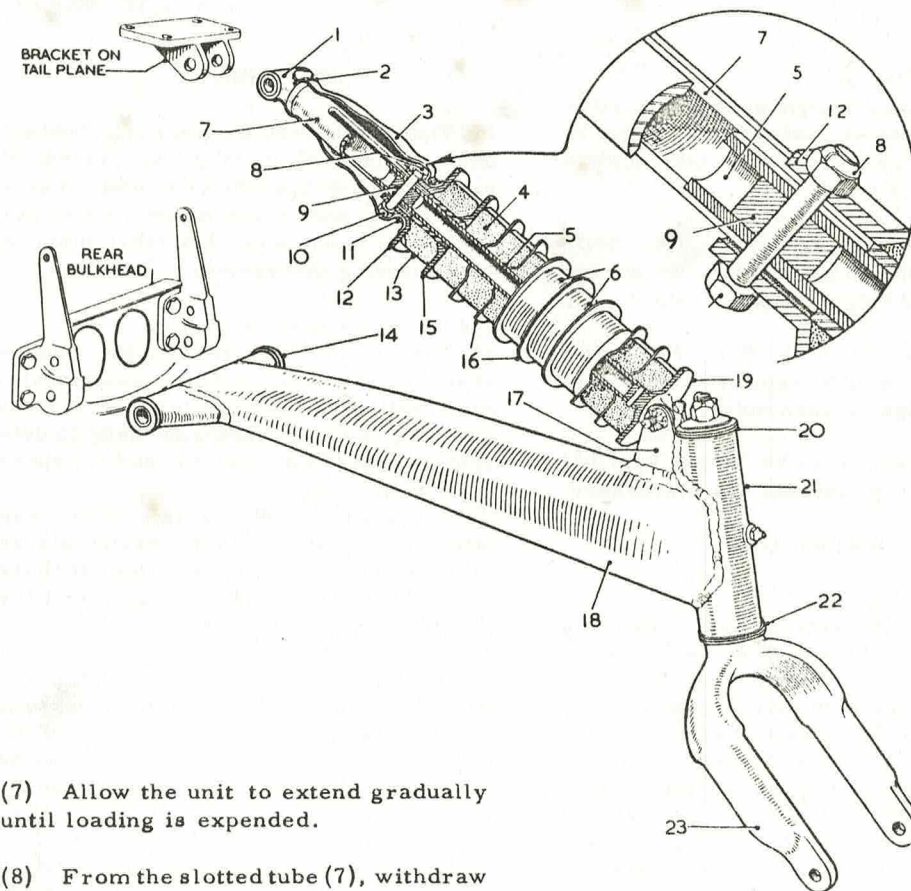


Fig. 4

Tail-wheel shock-absorber strut

(7) Allow the unit to extend gradually until loading is expended.

(8) From the slotted tube (7), withdraw the tube (5) with all compression blocks and spacer plates (16).

(9) To release a rebound block (13), unscrew the retaining disc (15).

Reassembling (fig. 4)

17. The assembling of the shock-absorber unit is in the reverse order to that given in para. 16 but, during this operation, the following points should be noted :-

(1) The top compression block (4) differs from the remaining blocks (6) in that it is moulded with a flat top surface. A similarly-shaped block must always be used in that position.

(2) The inner tube (5) should be polished before assembly.

(3) If removed the retaining disc (15)

must be locked, by caulking, on reassembly.

(4) The leather gaiter (3) must have a minimum length of 5.0 in.

Wear in the castoring components (fig. 5)
18. Wear in the castoring components may cause shimmy, setting up vibration or causing excessive tyre wear. Provided that the bushings for the yoke and fork are not worn unduly, this condition may be caused by inadequate friction in the fork spindle damper which can be adjusted as instructed in the following paragraph.

19. Wear, in its preliminary stages, can be overcome by tightening the slotted nut

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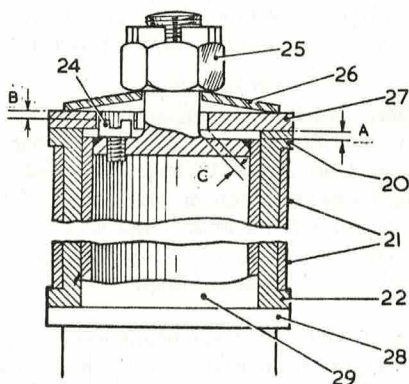


Fig. 5. Castoring mechanism

(25), at the top of the cylinder (21) which is welded to the rear end of the yoke and is fitted with bushes (20) and (22) to provide a mounting for the spindle of the castoring wheel fork. The slotted nut bears on the spring washer (26) and friction washer (27), and draws the fork spindle shoulder (28) up against the lower bush (22). As the parts wear, the nut must be tightened progressively to eliminate play and prevent shimmy.

Excessive wear

20. If excessive wear has taken place, the spring washer (26) should be examined first, to ensure that it is not soft or broken. Because of possible variations in these washers, a new one should first be tested by flattening in a smooth-jawed vice; if, after release, it does not recover to its original shape, or cracks, it should be discarded.

21. On reassembly, the spring washer must not be completely flattened in an endeavour to obtain sufficient friction; instead, an additional spring washer should be fitted. Normally, only one spring washer is required to obtain the desired friction, but two or more may be fitted if necessary. They are not flattened hard down, since this would defeat the object of the washers and would, after a short period, cause the assembly to become loose again.

22. Should the fitting of a new or additional spring washer fail to tighten the assembly sufficiently, the condition may be due to the insufficient clearance between components, which prevents the friction washer (27) from bearing firmly on the flange of the top bush (20) in the cylinder. Insufficient clearances indicate that wear has taken place between the spindle shoulder (28) and the flange of the lower bush (22).

23. To check for this condition, the slotted nut (25) and the spring washer or washers (26) should be removed and the clearances, at A, B and C, noted as follows:-

- (1) At A - Between the top of the spindle (29) and the upper surface of the flange of the top bush (20).
- (2) At B - Between the head of the screw (24) and the upper surface of the friction washer (27).
- (3) At C - Between the screw-threaded stem of the spindle (29) and the hole in the friction washer (27) on the underside.

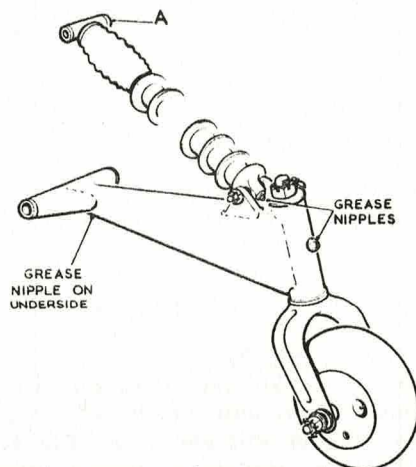


Fig. 6. Tail-wheel unit lubrication

When the spindle is held up snugly, there should be a clearance of 0.03 in. $+0.05$ in. -0.00 in. at each of the locations A, B and C.

24. If the clearance at A or B is less than 0.03 in., one or more shim washers should be fitted between the spindle shoulder (28) and the lower bush (22). These shim washers may be added, as necessary, until the flanges of the bushes (20) and (22) have worn to less than 0.06 in. thick, when they should be renewed; they are a push fit in the cylinder (21). When the clearance at C is less than 0.03 in. it may be increased by chamfering, lightly, the edge of the hole.

25. In addition to the clearances described in para. 23 and 24, the following check is important:- When the friction washers are adjusted, a pull of 12 lb. $\pm$ 3 lb. (applied with a spring balance at the axle towing spool, at right angles to the fork spindle and parallel to the rim of the wheel) must be just sufficient to rotate the tail wheel fork.

Lubrication (fig. 6)

26. General lubrication instructions are as follows:-

- (1) Grease XG-275 (Ref No. 34B/9100512) should be applied, by grease gun, at the nipples shown in fig. 6.
- (2) Grease XG-270 (Ref No. 34B/9100508) should be applied to the wheel hub bearing on assembly.
- (3) For the tail-wheel strut attachment (A) to tail plane, use oil OM-150 (Ref. No. 34B/9100550).

MODIFIED TAIL WHEEL UNIT

Description (Fig. 7)

27. Later aircraft are fitted with a modified tail wheel unit which is basically similar to the unit shown on Fig. 4, but incorporates structural improvements.

28. The modified unit comprises a welded steel yoke (19), a wheel fork (22) and a

shock-absorber strut consisting of two telescopic members with rubber blocks to absorb compression and rebound loads.

SERVICING

29. The routine servicing of the unit consists of lubrication, for which two grease nipples (18) and (21) are provided, periodical examination of the rubber blocks for deterioration and of the wheel fork to ascertain if undue wear has taken place in the casting mechanism.

30. To test for rubber block renewal, take the weight off the tail wheel and attempt to rotate the compression blocks (7) or spacer plates (8) by hand; if these can be turned it is an indication that the blocks should be renewed.

Dismantling the shock-absorber (fig. 7)

31. When renewing the rubber blocks, it is not necessary to remove the whole of the unit, but the tail cone must be removed (Part 2, Sect. 2, Chap. 1), and the shock-absorber strut removed and dismantled as follows :-

- (1) Trestle the tail of the aircraft as described in Part 2, Sect. 1, Chap. 1.
- (2) Disconnect the flanged lug (9) at the lower end of the unit, from the lug (20) on the yoke (19), by removing the split pin, slotted nut, bolt and distance tube.
- (3) Disconnect the cross-tube (1) at the upper end of the unit from the bracket on the tail plane front spar, by removing the split pin, slotted nut, bolt and distance tube.
- (4) Stretch the rubber bellows (2) over the bolt (3) and remove the bellows.
- (5) Compress the strut in a fixture to take the initial load off the rebound block (15).
- (6) Remove the nut (14) and bolt (3) which extends through the flanged slide (4), slots in telescoping tube (12), sleeve (13) and inner telescoping rod (17).

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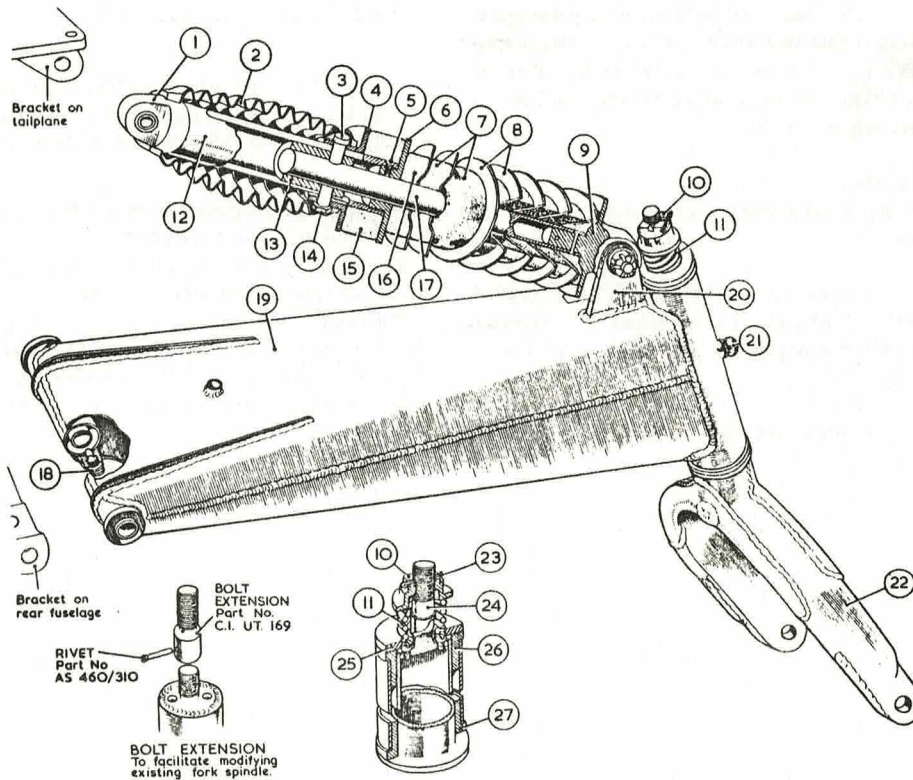


Fig. 7. Modified tail-wheel shock-absorber unit

(7) Allow the unit to extend gradually until loading is expended.

(8) From the slotted telescoping tube (12) withdraw the rod (17) with all compression blocks and spacer plates (8).

Reassembling (fig. 7)

32. The assembling of the shock-absorber strut is in the reverse order to that given in para. 31, but, during this operation, the following points should be noted:-

(1) The top compression block (16) differs from the remaining blocks (7) in that it is moulded with a flat top surface. A similarly-shaped block must always be used in that position.

(2) When assembling the rod (17) and

slotted tube (12), ensure that the surfaces are smooth and edges free from burrs.

(3) Lock the nut (14) by centre punching.

(4) If the screw (5) has been removed, to dismantle the end cap (6), ensure that it is flush with the tube on reassembly.

Wear in the casting components

33. Wear in the casting components which might cause shimmy or excessive tyre wear is taken up by the compression spring (11) which bears on the washer (25) and is retained on the fork spindle by the nut (10) and split pin (23). When the flanges of the bushes (26) and (27) have worn to less than 0.06 in. thick, the bushes should be renewed.

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34. When correctly assembled, a pull of 12 lb. $\pm$ 3 lb. (applied with a spring balance at the axle towing spool, at right angles to the fork spindle and parallel to the rim of the wheel) must be just sufficient to rotate the tail wheel fork.

Lubrication

35. General lubrication instructions are as follows :-

- (1) Grease XG-275 (Ref. No. 34B/9100512) should be applied by grease gun, to the nipples (18) and (21) shown on fig. 7.
- (2) Grease XG-270 (Ref. No. 34B/

9100508) should be applied to the wheel hub bearing on assembly.

- (3) For the shock-absorber strut attachment to the bracket on the tail plane use oil OM-150 (Ref. No. 34B/9100550).

Modifying original type fork spindle

36. The screw-threaded fork spindle (24) shown on fig. 7 is longer than that fitted to the original tail wheel unit shown on fig. 5. To facilitate adapting an existing spindle in order to incorporate the coil spring modification, a bolt extension can be screwed on and riveted to the spindle as shown on Fig. 7.

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