NOTE.—*The application for a Patent has become void.*

This print shows the Specification as it became open to public inspection on 28, March 1932, under Section 91 (4) (a) of the Acts.

PATENT SPECIFICATION

Application Date: March 14, 1932. No. 7548/32. **403,351**

Complete not Accepted.

COMPLETE SPECIFICATION.

Improvements in or relating to Liquid Shock Absorbers.

We, LANCIA & C. FABBRICA AUTOMOBILI-TORINO-S.A., of 99, Via Monginevro, Turin, Italy, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to shock absorbers comprising two members in one of which is provided a space filled with liquid wherein a piston is mounted to move, said piston being connected with the other member and having valve controlled ports by which said piston is enabled to move without material resistance in the direction in which motion is not to be damped while the flow area is largely restricted in respect of its motion in the opposite direction.

In absorbers of the above type, when strokes are of sufficient extent, a material displacement of liquid takes place on account of the difference between the volumes generated by the stroke of the piston in the two chambers into which it divides said space; this fact depends upon different sections of said chambers due to the piston stem extending through only one of them.

The present invention has for its object a shock absorber of said type in which a compensation chamber is provided for the liquid which at each stroke is discharged from or drawn into the space where the piston rod is operative.

In the accompanying drawing are shown, by way of example, some embodiments of the invention in a resilient device intended to restrict the approach of its two end connecting points,

Figure 1 being a central section of a complete shock absorber,

Figure 2 a view showing on an enlarged scale a portion of the absorber near the bottom of its lower chamber,

Figure 3 a separate view of the piston, and

[*Price* 1/-]

Figures 4, 5 and 6 fragmentary sections of modified constructions.

In the embodiment shown in Figure 1 the shock absorber comprises two tubular members 1 and 2 provided with connecting means 3 and 4 at their remote ends, and having their adjacent ends telescoping in each other with the co-operation of a sleeve 5 fastened on the mouth of the tubular member 1 and embracing the other tubular member 2 with the provision of a packing member 6.

The tubular member 2 has its end lying within member 1 closed by a head 7 which provides an outer flange having a packing member 8 by means of which it slides on the internal surface of the tubular member 1. A tube 9 extends from partition 7 and embraces at its top, with the co-operation of a packing gland 10, a stem 11 which is concentric with member 1. The stem 11 has one end fastened on the head of member 1, and extends through head 7 of member 2 and carries at its opposite end a piston 12 separating two chambers 18 and 19 containing a liquid; said piston 12 being provided with ports controlled by valves consisting for example of resilient flaps 13 (see Figure 3).

Stem 11 is hollow and inside it enters a further hollow stem 14 which is fastened on the bottom of the chamber of tubular member 2, and is closed at its top and has ports 15 adjacent its bottom end.

Intermediate the closed head of member 1 and the annular head 7 of member 2 a spring 16 is located which tends to hold the tubular members 1 and 2 at the maximum distance apart, while intermediate the annular head 7 and the other head of member 1 provided by sleeve 5, there is located a spring 17 intended to damp the shock when members 1 and 2 are spaced a maximum distance apart.

Valves 13 provided on the piston 12 leave a large passage for flow from cham-

ber 18 into chamber 19 when the piston 12 moves towards the bottom head of the tubular member 2, while when said piston 12 moves in the opposite direction said valves 13 entirely shut the passage for liquid which may flow only through a clearance existing around piston 12.

The operation of this shock absorber is as follows: when the end connecting members 3 and 4 are caused to move towards each other against resistance of spring 16, the piston 12 moves down into member 2 without meeting a material resistance in the liquid which fills chamber 18, owing to the large area of the section left unobstructed by valves 13. During the return stroke produced by reaction of spring 16, the piston 12 on the contrary moves up slowly due to the restricted passage for flow of liquid around its own periphery, and thus the motion is damped.

The liquid which is required to discharge from chamber 18, or is drawn into the same, owing to the differential volume generated by the stroke of piston 12 within chambers 18 and 19 which have different cross sections, passes through passages 15 in the hollow stem 14 which has an air cushion therein and thus secures compensation.

To prevent direct contact of air and liquid being continuously in motion, a loose plunger 14^1 may be located within stem 14 (Figure 2), it providing a movable partition while having no further action in the described operation.

The liquid which may leak through the clearance around the stem 11 during compression in chamber 19, collects in the chamber inside tube 9, which thus provides a supply of liquid which is able to return into chamber 19.

To introduce the liquid into the absorber, use may be made with advantage of a fitting shown in detail in Figure 2 and which in accordance with this invention is entirely enclosed inside the tubular member 2 so as to be able to be confined in a region which may come to lie within the other member 1.

In the described construction said fitting consists of a bored piece 20 mounted at the bottom end of the hollow stem 14 and connected with a length of a radially extending tube 21 whose outlet is inside with respect to the surface of the tubular member 2. The port of the piece 20 communicates on one side with chamber 18 and on the other side with the tube 21 at the bottom of which is located a perforated screw plug 22 for closing it. Said plug 22 is provided with a point 23 which, in closed position, shuts the bore leading to the port of piece 20. When on the contrary the plug 22 is made loose, it is possible to inject liquid into chamber 18 by means of a gun connected with pipe length 21, because the liquid flows through plug 22 and the bore usually closed by the point 23.

The stem 14 entering chamber 18 acts to reduce the difference between volumes generated in the chambers 18 and 19 by the displacement of piston 12, but the provision of the same is not essential for the purposes of the present invention.

The compensating chamber for the differential amount of liquid displaced by the piston 12 in the two chambers 18 and 19 could be provided and arranged in different manners and positions.

In the embodiment shown in Figure 4 said compensating chamber is provided by stem 11 of the piston 12, said stem being then hollow and communicating with chamber 18 but being closed at its opposite end and being adapted to contain within it, if required, a movable partition to separate liquid from the air cushion.

On the other hand, irrespective of the provision or not of a stem inside chamber 18, the compensating chamber may be provided outside the chamber 18, at the top end of the stem 11, at the bottom end of the stem 14 or also round the tubular member 2.

In the embodiment of Figure 5 is shown by way of example a construction in which a compartment 24 provided in the tubular member 2 is used as a compensation chamber. Then said compartment 24 is partially filled by liquid, an air space being left thereabove. A tube 25 dips into the liquid body, said tube opening in the bottom of chamber 18. Finally the spring action which in the described construction is carried out by an air cushion, may be secured by a resiliently expansible receiver connected with the bottom of chamber 18 as illustrated by a bellows 26 shown in Figure 6.

In the remainder the constructions of Figures 4 to 6 do not differ with respect to the construction shown in Figure 1 and the operation of the absorber is exactly the same.

The described arrangement makes it possible to provide absorbers admitting very long strokes, while the transverse size is materially reduced and the absorber length is reduced to a minimum.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A liquid shock absorber in which one of the members provides a space filled

with liquid in which a piston connected with the other member is able to move, characterised by the fact that one of the chambers in which said space is divided by the piston, communicates with a closed space where the difference between volumes generated in two chambers by the motion of the piston is compensated for.

2. A liquid shock absorber according to claim 1, characterised by the fact that the compensation chamber is provided by a space which communicates with the space filled with liquid, and which is partially occupied by air.

3. A liquid shock absorber according to claims 1 and 2, characterised by the fact that the compensation chamber consists of the cavity of the piston stem, or of a hollow stem which is positioned in the piston stem.

4. A liquid shock absorber according to claim 3, characterised by the fact that a movable partition is located in said hollow stem to separate liquid from air.

5. A liquid shock absorber according to claim 1, characterised by the fact that the compensation chamber consists of a resiliently expansible receiver.

6. A liquid shock absorber according to claim 1, characterised by the fact that on the head wall passed through by the piston stem, is fastened a tube encircling said stem and providing a space for collecting liquid.

7. A liquid shock absorber according to claim 1, characterised by the fact that it is provided with a fitting for introducing liquid, said fitting having a mouth which does not project beyond the surface of the absorber member and being thus able to be fastened in a region adapted to be telescoped on by the other member.

8. The liquid shock absorbers substantially as described with reference to the accompanying drawing.

Dated this 14th day of March, 1932.

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Fig. 1.

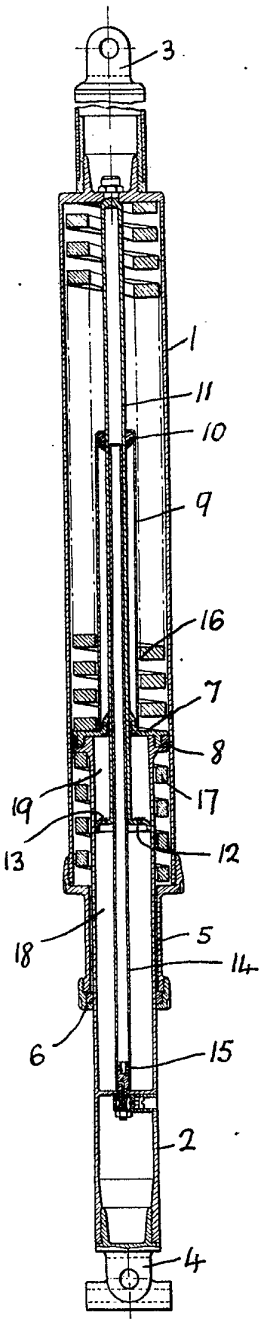


Fig. 2.

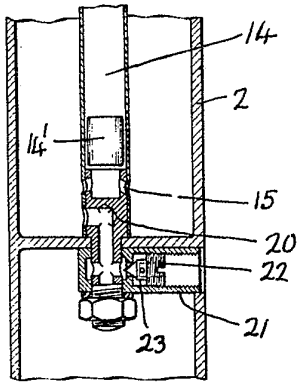


Fig. 3.

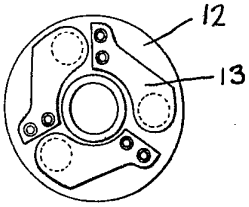


Fig. 4.

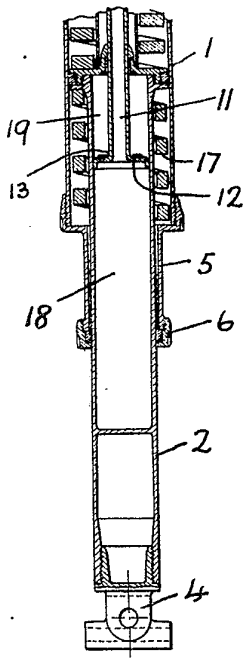


Fig. 5.

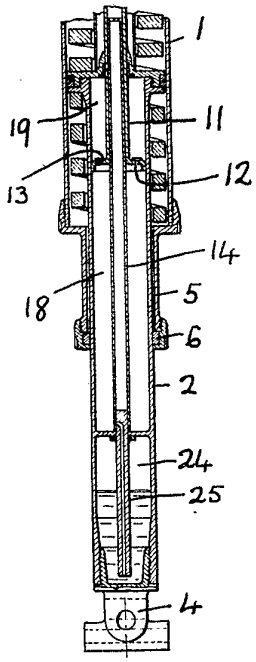
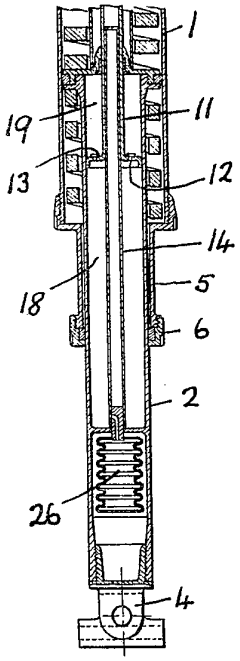


Fig. 6.



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