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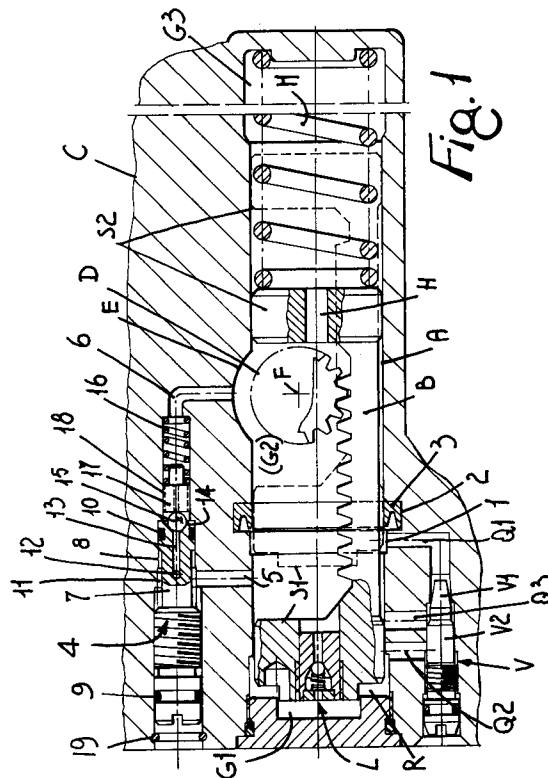
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(54) **Door closer.**

(57) The door closer is provided at its interior with seal means (3-3') and with other means, which are such that owing to these means, when the door closer moving element is in its opened door-locking position, the pressure chambers (G1-G3) between which oil should be allowed to flow, are thoroughly isolated from each other. Connected between these chambers is at least one unlocking valve (4) which normally is in closed condition, while when a door is being pushed into its closed position, and an over-pressure is formed in chamber (G1), whose volume decreases during the door-closing stroke of the door closer, the said valve is affected by the said pressure peak and is set in open condition, thus allowing the door closer moving element to be returned into rest position. During the door-closing stroke of the said moving element, the unlocking valve is isolated from the pressure chamber (G1) whose volume is decreasing, and is automatically reset, and the door closer moving element will complete its door-closing stroke under the control of conventional, adjustable valve means (V) provided in the same. The setting of the unlocking valve (4) can be removed any time a door closer should be used without the locking of a door in opened position being required.



The invention relates to a door closer, or damper, which normally is hydraulically operated, and is connected with a door in order to promote and control the door closing movement.

The door closers of known type are provided with a device for keeping doors in opened position, and such a device normally is mechanically operated, and is entirely or partly arranged on the outside of a door closer, so that problems arise as to the space occupied by this device and to its look, and problems concerning its reliability, on account of a possible wear which may occur owing to a lack of lubrication.

The invention relates to a door closer by which these and other problems are solved, since the locking device is of the hydrostatic type, and is fitted in the door closer body. The locking device comprises means which are such that with the moving element within the door closer being in a determinate position, the two pressure chambers between which oil is normally circulated, are thoroughly isolated from each other, also owing to the provision of suitable seal means at the cylinder-and-piston unit for the said moving element. Provided in the circuit within the door closer is an unlocking valve which is for restoring and maintaining the connection between the said two pressure chambers, at the time a pushing action is being exerted on a door for closing the same. It is preferably provided for the door closer moving element to function, while performing its door-closing stroke, in the fashion of a slide valve, and for this moving element to isolate the said unlocking valve, so that the last part of the said moving element door-closing stroke will be controlled by the adjustable throttling means currently provided in a door closer.

It is also contemplated that the setting of the unlocking valve may be removed, and that the unlocking valve may be eliminated, so as to cause a door closer to be used, when required, without a door being locked thereby in opened position.

These and other features of the invention, and the advantages arising therefrom, will clearly appear in the following specification of some preferred embodiments thereof, which are shown merely by way of non-limiting examples in the Figures of the two annexed sheets of drawing, in which:

Figures 1 and 2 respectively show one embodiment of a door closer, with the locking device fitted on the stationary element of the door closer.

Figures 3 and 4 respectively show one embodiment of a door closer, with the locking device fitted on the moving element of the door closer.

In Figure 1, reference C denotes the door closer body, with the cylinder A being closed at

both ends, and with two pistons S1, S2 being caused to axially slide therein, and being interconnected by a rack B which is in mesh with a pinion D rotatably fitted in the suitably enlarged intermediate section E of cylinder A. The shaft F of pinion D is rotatably supported by the door closer body C, and is connected to a door either directly, or by means of levers, so as to be rotated concomitantly with the door being swung about its hinges. At the time a door is being swung from its closed position to the desired opened position, the members S1, S2, B of the door closer moving element will be respectively moved from the position shown by solid lines, to the position shown by dash lines, against the action of a spring M tending to return the moving element into rest position, and so to close the door.

The door closer pressure chambers G1, G2, G3 are entirely filled with a suitable liquid. A through bore or any like through opening H is provided in piston S2, and a single-acting valve L is fitted in piston S1, and during the door opening step, this valve will allow the chambers G1, G2, G3 to freely communicate with each other, while during the reverse step, this valve will be set in closed condition, so that the oil contained in chamber G1 is compelled to flow into the intermediary chamber and into the trailing chamber, through valve means V of known type, which are currently fitted with adjustable throttling means. In Figure 1, reference Q1 denotes the delivery duct for the valve means V, which in the conventional door closers is always connected with the chamber G2 or with the chamber G3. References Q2 and Q3 denote two delivery ducts which extend across the valve means V, with the former of these ducts being open toward a suitably enlarged end portion of chamber G1, as shown at R. During the door closing step, the oil will flow from the chamber G1 into the chamber G2, through the ducts Q3, Q1 and through the adjustably throttled portion V1 in the valve means V. During the last part of the door closing movement, the oil will flow from the chamber G1 into the chamber G2, through the ducts Q2, Q3 and through the adjustably throttled portion V2 in the valve means V. Such a condition allows the door closing movement to be accelerated according to predetermined values, which are such as to allow the door lock possibly provided in the door, to be reset.

In order that the door closer may be kept locked in the required door opened position, the following provisions have been made. The delivery duct Q3 for the valve means V delivers the oil into a small annular recess 1 formed in cylinder A, upstream of a wider recess 2, in which there is fitted at least one annular seal 3 of any suitable shape, which is caused to cooperate by its periph-

eral edges with piston S1, in a sealing relation therewith. When the piston S1 is moved into the position in which it cooperates with the annular seal 3, as shown by dash lines in Figure 1, the ducts Q2, Q3 cannot be set in communication with the chamber G2, so that the door closer moving element will be held in an axially locked condition.

Good results have been afforded by a seal 3 of the type as shown in Figure 1, which is made with a substantially U-shaped profile, and has its concave portion turned toward the recess 1, so that when the door closer is in its opened door-locking condition, the pressure in chamber G1 will reach this concave portion of the seal, and will tend to expand this seal, so as to cause the same to more closely bear against the piston.

In order to allow a door to be re-closed, an unlocking valve means 4 is provided, which through the ducts 5 and 6 can connect the chamber G1 with the chamber G2, and/or with the chamber G3, when a pushing action is being exerted on a door, which is higher than the bias as applied by the spring M on the door closer moving element.

The orifice of duct 5 is set at such a distance from the annular recess 1 that when the said orifice is closed, or is about to be closed, the duct Q1 will be already set in communication with the intermediary chamber G2, whereby the door closer is allowed to carry out its door-closing stroke in the usual manner, under the control of the previously considered valve means V. Before the door closer moving element having reached its rest position, both of the ducts 5 and 6 will be set in communication with the chamber G2, and this condition surely guarantees the resetting of the unlocking valve 4 which, for example, consists of the following members.

Reference numeral 7 denotes a stem which is screwed down into a housing 8 of body C, and is provided with two annular seals 9 and 10, which together with a smaller diameter section of this stem, define an annular chamber 11 set in communication with the duct 5. Radially formed bores 12 and an axially formed bore 13 in stem 7 are set in communication with the said chamber 11, and this latter bore opens into the stem inward end by a conical mouth 14 which is normally closed by a ball 15, or by any equivalent means. By a spring 16 with suitable features, the ball 15 is urged against the stem 7, with the interposition of a small piston 17 having a suitable cross-sectional dimension, which is provided in its periphery, and/or axially, with small through openings 18 which are set in communication with the housing for the spring 16, which in turn is set in communication with the duct 6.

When the door closer is in its opened door-locking position, the pressure being applied

through the axial bore 13 on the surface of ball 15 from the chamber G1, gives rise to a force of a lower value than the load in the opposite direction, as applied on the said ball by the spring 16, whereby the door closer is kept in its opened door-locking position. When a door is being pushed into its closed position, a pressure peak will be produced in chamber G1, whereby the ball 15 will be shifted against the bias of spring 16, so that the pressure in chamber G1 is allowed to arrive at the small piston 17. This pressure before being caused to flow through the suitably sized outlet opening or openings 18, applies on the suitably sized surface of the small piston a force of a higher value than the load as applied in the opposite direction by the spring 16, so that the valve 4 will be held in open condition, which allows the door closer to be moved into its closed condition. As aforesaid, as soon as the piston S1 has been caused to close the duct 5, the valve 4 will be reset, and the chamber G1 will be set in communication with the chamber G1, through the duct Q1 in valve V.

Numerals 19 denotes a retaining ring arranged in the housing in which the pin 7 is threaded. By unthreading the pin 7 up to cause the same to abut against the ring 19, the spring 16 will be released, and the valve 4 will be kept in open condition. By this simple operation it is possible to neutralize the device that locks the door closer in the position in which a door is in opened condition.

Referring now to Figure 2, a modified embodiment is disclosed, in which the seal 3 is caused to cooperate with the piston S2 when the door closer is in its opened-door-locking position. Apart from the seal 3 being differently positioned in the cylinder A, the embodiment according to Figure 2 differs from the embodiment shown in Figure 1, as to the following features. The delivery from duct 6 is into the chamber G3. Also the piston S2 is provided with a single-acting valve L', that is like the valve L in piston S1. Upstream of the seal 3, a suitably sized longitudinal channel 20 is provided in the cylinder A, and when the channel is affected by the piston S2, this channel will directly connect the intermediary chamber G2 with the trailing chamber G3. The delivery from duct Q1 may be into the cylinder A, just as in the embodiment shown in Figure 1, or this duct may be constantly set in communication with the chamber G2.

The operation of the modified embodiment according to Figure 2 is simple and apparent.

When a door is being swung into its opened position, the door closer moving element will be moved to the right, when looking at Figure 2, and the valves L, L' will be opened, so that the oil is allowed to freely flow from the chamber G3 into the chamber G1. Once the piston has been caused to come into the seal 3, as shown by dash lines, the

door will be kept opened, when the hold of the door is left, owing to the valves L, L' being set in closed condition.

When a door is being pushed into its closed position, the unlocking valve will be actuated, and the oil is thus allowed to flow from the chamber G1 into the chamber G3. When the piston S2 is moved away from the seal 3, the connection between the chambers G2 and G3 will be established through the channel 20, so that the operation of the door closer is exactly the same as in the embodiment shown in Figure 1.

Within the limits of protection of this Patent Application, are also those modified embodiments in which the seal 3, or a seal of an equivalent type, instead of being fitted on the cylinder A, is fitted on the piston S1 (as an alternative to the embodiment according to Figure 1), or on the piston S2 (as an alternative to the embodiment according to Figure 2). It is apparent that if the piston S1 should be provided with such a seal for sealing the cylinder A, the door closer would be kept in its opened door-locking condition, at the time this piston is moved into the position shown in Figure 1 by dash lines, with the seal having been moved beyond the orifice of duct Q1. The same considerations apply for the modified embodiment according to Figure 2.

The modified embodiment shown in Figure 3, is derived from the embodiment according to Figure 1, and in this modified embodiment the seal appears to be fitted in an annular recess which instead of being formed in the cylinder A, is formed in the piston S1. The seal 3' preferably is of a composite type. This seal 3' is fitted with an external, leakage-preventing ring made, for example, of Teflon, and with an internal ring 203 that performs the real and proper sealing function. When the piston S1 has been moved into the position shown by dash lines, beyond the orifice of the delivery duct Q1, the chamber G1 will be thoroughly isolated from the other chambers of the unit, and the door closer will be held in its opened door-locking condition.

In Figure 3 there is shown also the modified embodiment in which the unlocking valve 4 may be integrated with the single-acting valve L fitted in piston S1, however with the restriction that the unlocking valve cannot be neutralized.

A bushing 21 is screwed into a through bore formed in the piston S1, in a tight sealing relation therewith by its inner surface, and the same is provided at its end edge that is turned toward the chamber G1, with an annular seal 22 which can be acted upon by the flat head of a mushroom-like plug 23 being caused to abut thereagainst, the said plug being axially movable within the housing for the said bushing 21, which is provided with longitudinal grooves 24. Reference numeral 25 denotes a

small appendix which is integral with the inward end of plug 23, and is provided for restraining the axial stroke of this plug. This assembly replaces the single-acting valve L provided in the preceding embodiments, since it allows the liquid to flow from G2 into G1, and not vice-versa. Fitted in plug 23 is the unlocking valve 4, with its components being designated by the same reference numerals as for the analogous unlocking valve shown in Figures 1 and 2. When a door is being pushed into its closed position, the pressure peak being produced in chamber G1, will set in open condition the valve 4, wherethrough the chamber G1 will be set in communication with the chamber G2, which results in the door closer being unlocked. When the duct Q1 is set in communication with the chamber G2, the oil will flow from G1 into G2 also through the valve V, which should lower the pressure to a sufficient degree for allowing the valve 4 to be reset.

Figure 4 finally shows the modified embodiment in which the seal 3' is fitted on piston S2. The single-acting valve L is fitted in piston S1, and the integrated single-acting valve L' (which is like the valve L) and unlocking valve 4 are fitted in piston S2, as previously disclosed in connection with the embodiment according to Figure 3. In the modified embodiment shown in Figure 4, the delivery of duct Q1 is through the branched duct Q1' into the chamber G2, and through the branched duct Q'' into the chamber G3, the said duct Q1 being closed by the piston S2 fitted with the seal 3', when the door closer is in its opened door-locking position. In the door unlocking step, the oil will flow from G1 into G2, through the valve V and the branched duct Q1', and then from G2 into G3, through the unlocking valve 4. When the delivery duct Q1'' is not obstructed by the piston S2, the oil is allowed to flow through this duct into G3, and the unlocking valve will be reset.

It should be understood that the specification relates to some preferred embodiments of the invention, to which numerous changes and modifications may be made, the more so in construction. Within the limits of the invention are, for example, those modified means which while using the disclosed solutions, will indirectly act upon the door closer moving element through at least one appendix or extension connected thereto, which is slidable in a cylinder formed in the body C or in an additional body. These and all those changes which are however conceivable by those skilled in the art, do not depart from the scope of the invention, as set forth above, as shown, and as claimed hereinafter.

Claims

1. A door closer of the hydraulic type, fitted with

a device for locking a door beyond a predetermined opened position, characterized in that the said device is of the hydrostatic type, and is preferably incorporated in the door closer itself, whereby the door closer overall dimensions are not substantially altered, and comprises seal means (3, 3') and other means, which are such that owing to these means, when the door closer moving element (S1, S2, B) is in the position in which a door is locked in opened condition, the pressure chambers (G1, G2) between which oil should be allowed to flow, are thoroughly isolated from each other, and at least one unlocking valve means (4) is provided for being connected with the said pressure chambers, the said valve means being normally in closed condition, while when a door is being pushed into its closed position, and an over-pressure is formed in the chamber which decreases in volume during the closing stroke of the door closer, the said valve is affected by the said pressure peak, and is set in open condition, whereby the door closer is allowed to return into its rest position.

2. The door closer according to Claim 1, in which the unlocking valve (4) is connected to circuits within the door closer itself, in such a manner that this valve will be isolated from the pressure chamber (G1), which decreases in volume at the time the door closer moving element has been caused to go beyond a determinate position, when a door is being closed, so that the said valve will be automatically reset, and the door closer will perform the most of, and will complete its door closing stroke under the control of the conventional valve means (V) usually provided in a door closer.
3. The door closer according to the preceding Claims, in which the unlocking valve (4) can be neutralized, if desired, so that the door closer can be used in a conventional manner, without a door being locked in opened position.
4. The door closer according to the preceding Claims, which is of the type comprising at least one piston (S1 or S2) fitted with a single-acting valve (L or L') that is set in closed condition during the door closing stroke of the door closer, so that the liquid contained in that chamber in which the pressure is decreasing, is compelled to flow through a valve means (V) that conveniently slows down the door closing stroke, and ensures a slight acceleration in the final part of this stroke, which is useful for the door lock to be reset, characterized in that the delivery duct (Q1) for the said valve means (V)

opens upstream of an annular seal (3) fitted in a seating (2) coaxially formed in the cylinder in which the said piston is caused to slide, so that when a door is in the desired opened position, and the piston has been caused to come into the said seal, the said delivery duct will be included in, and will be isolated from that chamber which increases in volume, the door closer being thus kept in its opened door-locking position, until the action of the unlocking valve (4) will be promoted.

5. The door closer according to the preceding Claims, but for Claim 4, characterized in that on at least one of pistons (S1, S2) of the door closer moving element, there is fitted an annular seal (3'), which preferably is of the composite type, and is provided with a leakage-preventing ring, it being contemplated that when the moving element is in the position in which a door is in the desired opened condition, this seal will be beyond the delivery duct for the valve (V) that slows down the travel of the said moving element, while the same is being caused to perform its door closing stroke, whereby the door closer will be held in its opened door-locking condition.
6. The door closer according to any one or more of the preceding Claims, characterized in that the unlocking valve (4) comprises a single-acting valve (14, 15) which is urged into its closed condition by a set spring (16), with the interposition of a control piston (17), into which a throttling means (18) is incorporated, and having a surface turned toward the plug of the single-acting valve, of such an extent that when the said plug is opened by the pressure peak being generated in the door closer by the action being manually exerted on a door for closing the same, the control piston will keep the said set spring in the position in which the valve is open condition, whereby the required door closer-unlocking movement is allowed.
7. The door closer according to Claim 6, in which the unlocking valve (4) is fitted in the door closer body, and preferably comprises means (7) for allowing the setting of the counteracting spring (16) in said valve to be removed, so that this valve will be always kept in open condition, and the opened door-locking action by the door closer will be neutralized, any time such an action is not required.
8. The door closer according to Claim 6, in which the unlocking valve (4) is fitted in one of the pistons (S1, S2) of the door closer moving

element, and is integrated in the plug (21) of a single-acting valve which neutralizes the action of the said valve (4) during the door closer door-opening stroke.

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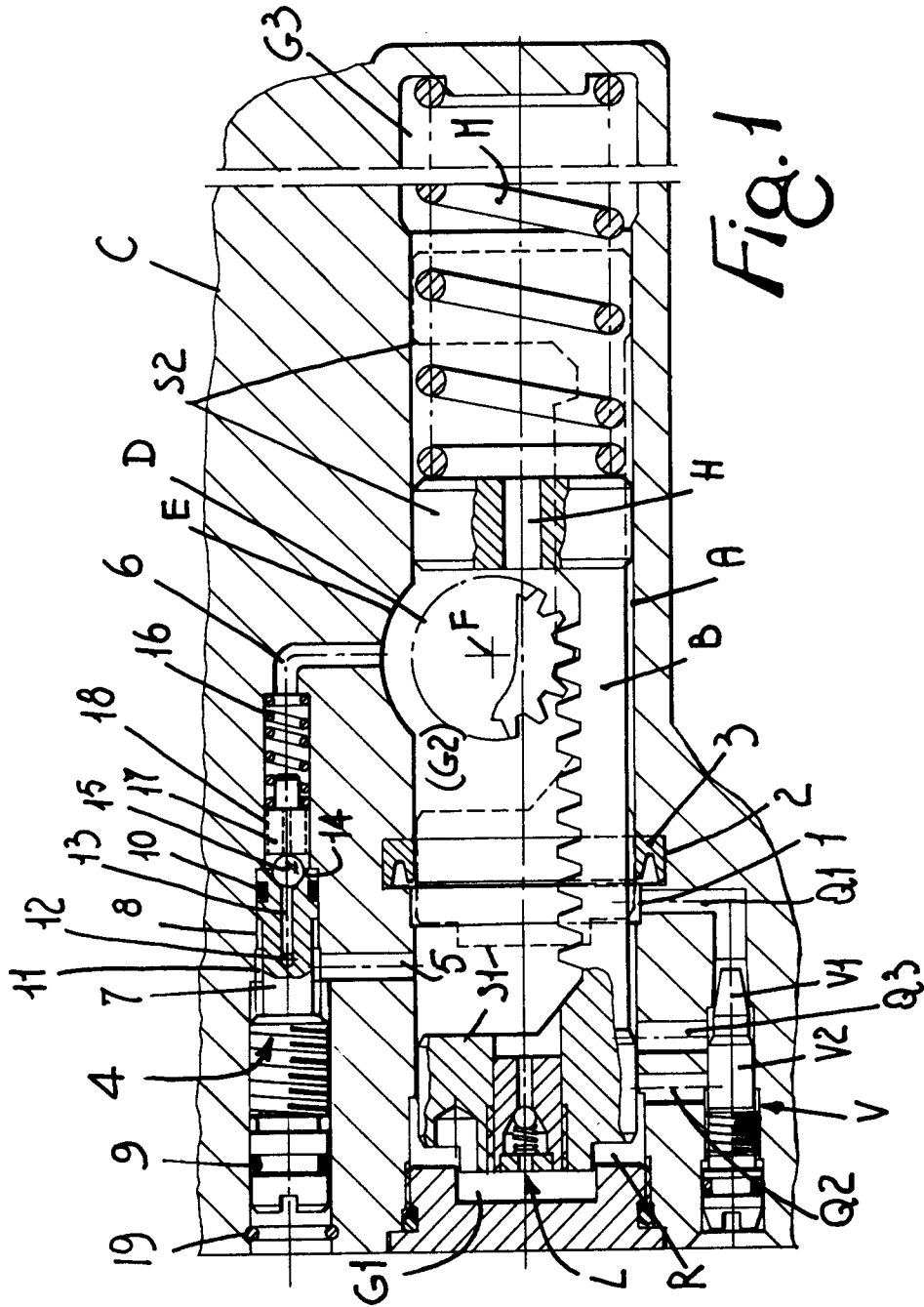
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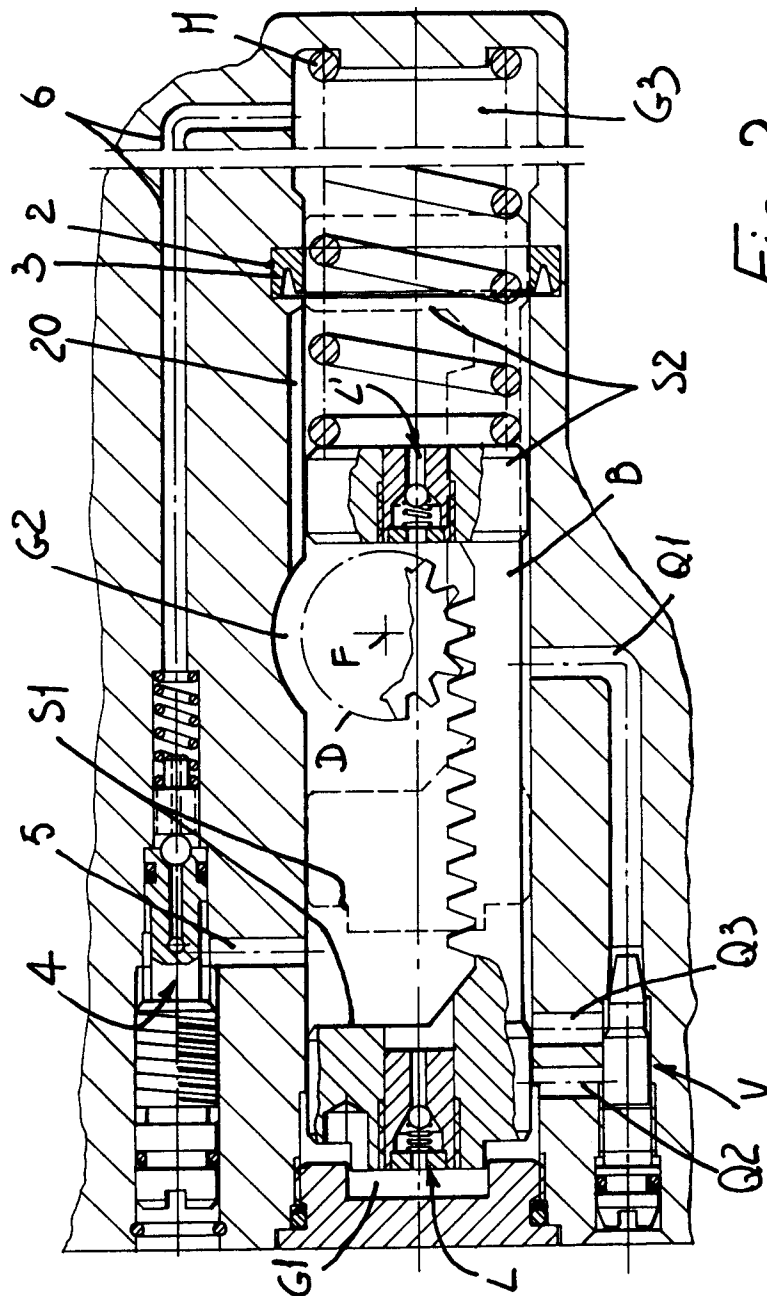
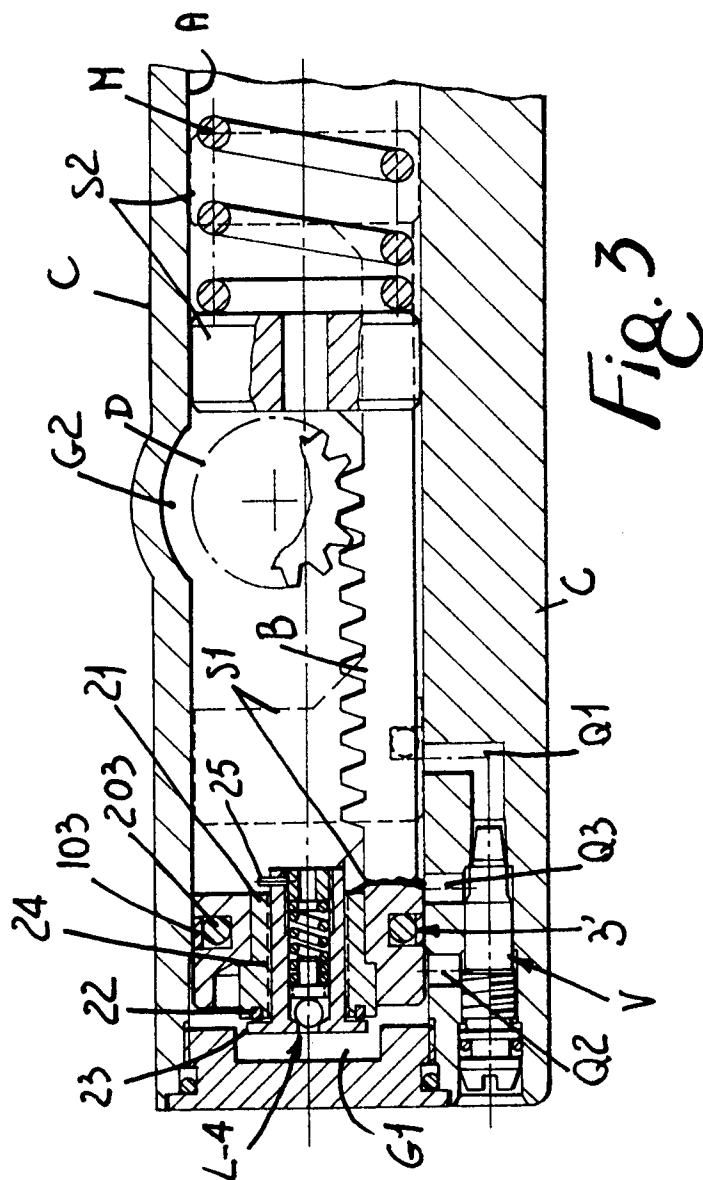


Fig. 2



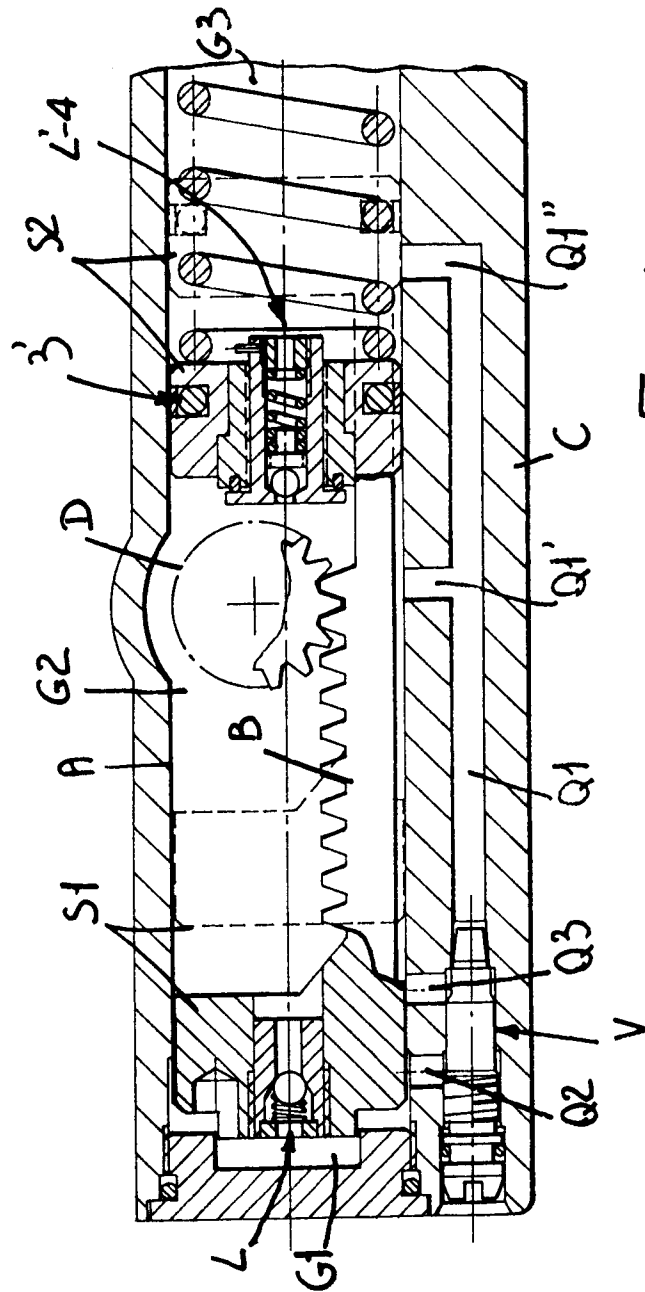


Fig. 4



EUROPEAN SEARCH REPORT

EP 91 11 0726

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	FR-A-2 421 260 (DORMA) — — —	1,2	E 05 F 3/22
Y	FR-A-2 421 260 (* page 6, line 11 - line 23 *) — — —	6	E 05 F 3/10 E 05 F 3/12
A	FR-A-2 421 260 (* page 9, line 21 - page 10, line 28; figures 1-6 *) — — —	3-5,7	
X	GB-A-672 432 (BILLETER) — — —	1	
A	GB-A-672 432 (* page 2, line 60 - line 112; figure 1 *) — — —	2-7	
Y	BE-A-468 257 (COWEY) * page 6, line 3 - page 7, line 2; figure 3 ** — — —	6	
A	FR-A-2 099 216 (GRETSCH) * page 3, line 27 - line 34 *** page 4, line 9 - page 5, line 9; figure 2 ** — — —	4,5,8	
A	GB-A-2 156 950 (NEWMAN - TONKS) * abstract; figure 1 ** — — —	3,7	
A	US-A-3 979 790 (CHIARAPPA) * column 4, line 42 - line 52; figure 3 ** — — — — —	5	TECHNICAL FIELDS SEARCHED (Int. Cl.5) E 05 F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of search 24 October 91	Examiner GUILLAUME G.E.P.
CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document			