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(54) Mechanical travel regulator with controlled operation.

(57) A mechanical regulator suitable for application on armchairs, easychairs, shutters and similar items, furniture generally speaking, consisting of a tubular casing (I4) with central area housing a sealed cell (I0) or a tubular body (5I) containing a viscous fluid like oil or grease, in which the end area (20) or (5) having a protruding annular body (2I) or gasket (54) of a coaxial item such as a central rod (I8) provided with several concave annular seats (I9) or external sleeve (29) or other similar members, is left free to slide.

The inferior extremity of the aforesaid internal tubular casing (I4) is constrained or linked with a piston (I6) provided of a trunk-conic flare (I7) on its top, matching the trunk-conic flare of the lower end of a second piston (24) also coaxial with the above mentioned rod (I8), linked with the sliding sleeve (29). The superior piston (24) is provided of radial holes (26) housing some spheres (27), pushed inside the concave annular seats (I9) on the central rod (I8), when the trunk-conic flares (I7), (25) are matching together.

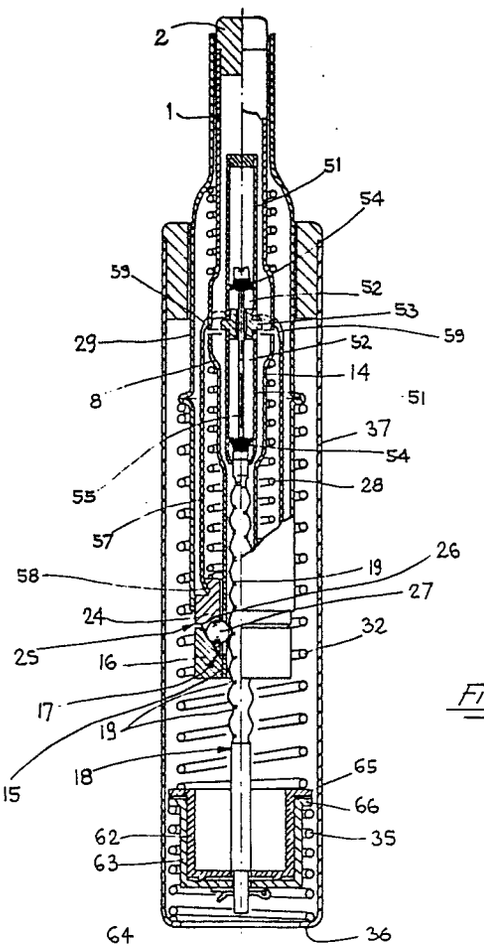

Fig. 3

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"MECHANICAL TRAVEL REGULATOR WITH CONTROLLED OPERATION"

The present invention concerns a mechanical travel regulator with controlled operation, particularly suitable for application on armchairs, easychairs, anatomical car-seats, shutters and similar items and furniture generally speaking, consisting of an internal tubular casing whose central area houses a sealed cell or tubular body containing a viscous fluid, such as oil or grease, where an end is left free to slide, being fitted with a protruding annular body or a gasket, of a coaxial central rod provided with a plurality of concave annular seats at its extremity. The lower extremity of the aforesaid internal tubular casing is constrained or linked to a piston having top trunk-conic flare that matches the trunk-conic flare of the lower end of a second piston, also coaxial to the aforesaid rod, constrained to the upper external sleeve where seats or similar items to the sustained and regulated are applied. Some elastic means, such as helical springs, are applied between the internal tubular casing and the second piston, between the sleeve containing the first piston and the sliding intermediate tubular body, and between the same and the external container, with the function of regulating and guiding the action of the travel regulator members mentioned above and damping the system upon loading.

The means in the intermediate part of coaxial central rod, have through holes or annular passage areas, so as to allow a regulated oozing of viscous fluid contained in the aforesaid cell, thus obtaining a regulated, continous and controlled sliding of the internal tubular casing along the same rod, in one direction as well as the opposite. The second piston presents some through holes housing an equal number of spheres which, in condition of engagement of the male and female trunk-conic parts of the aforesaid first and second piston engage themselves in the concave annular seats of the aforesaid central rod whilst they are disengaged, freeing themselves when the said pistons are moved away from one another by means of a pressure exerted on the regulating push-button, on the superior part of the same internal tubular casing.

The position regulation devices more widely known non, consist of gas piston or mixed gas and spring pistons, instead of the traditional spring regulators. Those pistons though having good technical characteristics, presented some defects and it was particularly remarked that their short life was caused by unavoidable losses of gas.

For this reason they must be totally and periodically replaced, present technique not providing any possibility of reloading. To eliminate these rather annoying and expensive defects, some regulation devices only consisting of mechanical means have been studied, which are:
capable of offering substantially equal or better performances compared with those obtained by gas regulators. In some of these mechanical regulators, the sleeve regulating the course slides inside a tubular intermediate body.

During disengagement stages of regulation devices, the travel of the sliding sleeve, although slowed by shock absorbing springs, is still too fast, difficult to regulate and control, even when provided with braking means such as elastic bodies choked into annular seats in a funnel shape. Furthermore the same devices are not provided with shock absorbing means sufficiently efficient to react under the action of the loads applied.

Another disadvantage is constituted by the need for constructing regulators of different dimensions to adapt them to the different heights of the elements they have to be applied on, such as armchairs, easychairs, stools, furniture and so on.

The scope of the present invention is to obviate the aforesaid disadvantages.

The invention, as specified in the claims, solves the problem by means of a mechanical travel regulator with controlled operation, allowing the following results and advantages: the internal casing slides along the central coaxial rod with a controlled and slowing regulating mo vement, by means of a viscous fluid contained in an intermediate sealed cell, oozing through the holes present on an annular body of the rod or along peripheric annular areas; the oozing of the viscous fluid imposes a slower but more regular mou ement, thus each regulation is performed in a smooth and continuous manner, with no shoving, darting or shocks; the regulation devices are housed in a seat which is left free to slide into an intermediate tubular body, and is guided and positioned by means of a shock absorbing spring; the whole inside system is sustained, in relation to the external tubular body, fixed and containing the system, by a lower spring with shock absorbing function in relation to the loads to which the mechanical regulator is submitted; excluding some details, the regulation organs are always the same, whatever application is made of the present invention.

A detailed report of the invention will be given below, with reference to the enclosed drawing, where:

fig. I shows a partial longitudinal section of a mechanical travel regulator with controlled operation, following its first preferred form of realisation:

fig. 2 shows a partial section of a second form of realisation of the viscous fluid cell.

fig. 3 shows a longitudinal section of a third solution for the realisation of the mechanical regulator; and

fig. 4 shows, in detail, the passage sleeve section of the sliding rod, with valve, applied on the solution shown in fig. 3.

Figures I and 2 show a first realisation of a mechanical travel regulator with controlled operation, including essentially an internal tubular casing, preferably consisting in several components suitably assembled together, and prcisely: a superior trunk (I), on the top of which is applied the push-button (2), that engages itself on the superior part of an intermediate junction (3) fitted with a peripheric annular shoulder (4), an inferior external threading (5) and at least one internal peripheric groove where at least one elastic seal ring (6) is fitted. The superior part of an intermediate tubular trunk (7) is screwed on the threading (5), until the annular shoulder (4) strikes the superior ledge (8). In this condition the inferior edge (9) of the connection (3) forms inside the intermediate trunk (7) a superior boundary of the cell (I0), whose inferior boundary is obtained by the egde (9') formed by screwing the inferior part of the same trunk (7) on the threading (II) on the superior extremity of an inferior tubular trunk (I2).

The inside part of the inferior tubular trunk (I2) has also at least one groove fitting at least one elastic ring (I3).

The internal tubular casing thus constituted substantially constitutes the hollow regulating pivot (I4), engaging itself on (I5) a first piston (I6), with a superior trunk-conic flare (I7).

Inside the same hollow regulating pivot (I4), and coaxially to it, a central rod (I8) passes, with a plurality of concave seats (I9) on its lower part and a prolonged shank (20) on its superior part, with at least one integral annullar body (2I), that can take several position in the cell (I0).

On the prolonged shank (20) the elastic rings (6) and (I3) keep the cell (I0) preferably sealed so it may be partially filled with a viscous fluid such as oil or similar items, preferably grease, and maintained in such conditions. The inferior tubular trunk (I2) of the hollow regulating pivot (I4) has an annular ledge (23) which is the stop of the same pivot (I4) against the top of the piston (24), in the stage of disengagement of the lower piston (I6). The present invention has also a superior piston (24) engaged with the lower part of the external sliding sleeve (29). This piston (24) has in its lower trunk-conic extremity (25) two or more radial holes (26), possibly inclined, lodging an equal number of spheres (27) that can protrude at extremities.

The top female trunk-conic flare (I7), on the first pis ton (I6), and the lower male trunk-conic flare (25), on the second piston (24), are coaxially allineated, complementary, and can be coupled one with the other.

In matching condition of trunk-conic flares (I7) and (25) of pistons (I6) and (24), the spheres (27) are pushed inside the radial holes (26) and protrude in the internal part, engaging them in one of the annular concave seats (I9) of the central coaxial rod (I8).

When the trunk-conic flares (I7) and (25) are disengaged, the pressure operated by the lower piston (I6) recalled by the spring (28) fitted between the upper ledge (8) and the top of the piston (24), is annuled and they can retreat from their position, releasing hold on central rod (I8).

The disengagement between the aforesaid flares (I7) and (25) is obtained operating a pressure on the top push-button (2) or on the apposite lever, not shown here, that push down the hollow regulating pivot (I4).

With spheres (27) disengaged from any annular seat (I9), the external sleeve (29) constrained in its lower part to the piston (24), is allowed to slide up and down, changing position. Stopping pressure on push-button (2), or special lever, the trunk-conic parts (I7) and (25) are recalled one against the other by action of spring (28), matching together again and pushing spheres protrusions (27) into other annular seats (I9), and engaging the rod (I8) again. While the external sleeve (29) changes position, the hollow regulating pivot (I4) slides in one or the other direction, along the rod (I8) and the fluid or grease contained in the cell (I0) has to ooze from one side to the other of the annular body (29).

This action brakes and regulates the aforesaid movement, thus any regulation of position is carried out smoothly and continuously, with no shoving, darting or shocks. Any position regulation travel, slowed down and regulated by the braking effect of oozing viscous fluid, is made even more precise and fluent by the fact of having the inferior piston (24) linked with the base of a sleeve (30), left free to slide in an intermediate tubular body (3I), but having its movement regulated by a shock absorbing spring (32), in between the two ledges (33) and (34) made on the sleeve (30) and intermediate tubular body (3I). A third spring (35) is positioned between the ledge (34) of the intermediate tubular body (3I) and the base (36) with bottom opening of external casing (37), with the function of absorbing all the shocks received by the whole complex with regard to the loads to which it is submitted. The same springs (32) and (35) and the coaxial tubular bodies (30),(3I) and (37), guide and allineate the regulator complex during stages of change of position and conditions of use.

A flat ball bearing, consisting in spheres (38) between the fifth wheel (39) of central rod (I8) and

the bottom (40) of intermediate tubular body (3I), allows for revolving movements of the regulating complex, round its vertical axis.

The sliding sleeve (30) in the intermediate tubular body (3I), besides permitting the positioning and travel regulation functions mentioned above, allows adaptation of the regulation complex to several height requirements. As a matter of fact it is sufficient to provide cutting to measure of upper part of the intermediate tubular body (3I), with its corresponding external casing (37) and shock absorbing spring (32) while all other components remain with unchanged dimensions and characteristics in all models.

The cell containing the viscous braking fluid in which the annular body (2I) is totally immersed, can also be built in another position, mantaining the same characteristics, as shown in fig.2. In fact in this case the cell (I0) is obtained in the interspace between the external casing (37) and the external sleeve (29).

Figures 3 and 4 show another form of realisation of a mechanical regulator of travel with controlled operation, composed essentially of an internal tubular body (5I) divided into two distinct areas (52) as intermediate sleeve (53) and two gaskets (54) applied at the ends of a rod(55) sliding through the center of said sleeve (53). The distinct areas are completely filled with a fluid, such as: oil, grease or similar items, only allowed to ooze from one area to the other (52) and viceversa through the annular gap (56) between the surface of the aforesaid rod (55) and aforesaid through hole in the center of the intermediate sleeve (53).

The fluid is not allowed to get out nor to ooze at the extremity of tubular body (5I), as the gaskets (54) seal perfectly the inside walls of the aforesaid distinct areas (52).

The intermediate sleeve (5") is linked with the upper extremity of a second coaxial tubular body (57) whose inferior extremity is connected with the edge (58) of a piston (24) also linked with the external sliding sleeve (29) sustaining the seats, or whatever else.

As for the preceding realisations, the final part of said piston (24) has a male trunk-conic shape (25), matching with a similar female trunk-conic shape obtained on a second piston (I6) constrained to the lower extremity (I5) of a third tubular body (I4), coaxial and intermediate to the others (5I) and (57), allineated with a superior sleeve (I) on top of which is situated an operating push-button (2).

The lower extremity of the rod (55) is linked with a second central rod (I8) provided with a plurality of concave annular seats (I9).

Similarly to what has already been shown and described, also with regard to the present solution, the superior piston (24) is provided in its lower trunk-conic extremity(25) with two or more radial holes (26), preferably inclined, housing an equal number of spheres (27) allowed to protrude at the extremities.

When the trunk-conic flares (I7) and (25) of the pistons (I6) and (24) are matching together, the spheres (27) are pushed into the radial holes (26) so that they protrude internally engaged in one of the concave annular seats (I9) on the coaxial central rod (I8).

When the trunk-conic flares (I7) and (25) are disengaged, the pushing action on the spheres (27) of the lower piston (24), is annuled and they can receed from their position, leaving the central rod free.

The detachement of the aforesaid flares (I7) and (25) is obtained by exerting a pressure on the superior button (2) or on the special lever, which in its turn will push the top extremity of the third tubular body (I4).

The aforesaid contact between superior sleeve (I) and third tubular body (I4) is obtained through lateral slits (59) on the superior part of the second tubular body (57). When detached the external sliding sleeve (29) is free to move in the two directions, up and down.

In the case of descent, when a downwards charge is exerted upon the sleeve (29), the movement is contrasted by the spiral spring (32) as well as the central rod (55) with end gaskets (54). During the descent the tubular body (5I) is dragged down and the fluid in the inferior area (52) is pushed in the upper one through the annular gap (56) between the passage hole and the rod (55). Thanks to the natural viscosity of the fluid used for this purpose, like oil or grease, the oozing through the annular gap is gradual and regular, with no jerk nor stick-slip motion, thus slowing the speed of descent. In case of ascent, meaning that it is intended to unload the sleeve (29) or regulate its position at an higher level, the external sleeve (29) is pushed upwards by the spiral spring (32) whilst the fluid in the superior area (52) goes into the inferior one oozing through the gap between the passage hole and rod. (55), or through the lateral valve (60), fitted with a sphere (6I), which only opens, allowing passage of fluid during upward movement, whilst it is closed for the pressure exerted by the fluid itself, during downward movement.

The lower extremity of the central rod (I8) is linked with two small cups (62) and(63), fitted one into the other and left free to revolve one inside the other, slipping on a lower ring (64) The upper edges (65) and (66) of the cups support a superior spiral spring (32) and a lower spring (35) sustained by the base of the external casing (37) The cups (62) and (63) are preferably made of self-lubricating

material, the lower contact ring (64) being thus the element that allows revolving movements of the regulation complex, round its vertical axis.

Claims

I) Mechanical travel regulator with controlled operation, characterised by the fact of including holding means consisting in spheres (27) which became engaged, through the action of complementary trunk-conic flares (I7) and (25), coupled and kept in position by an elastic spring means (28), in concave annular seats (I9) in the lower part of a coaxial central rod (I8) and characterised by the fact of including a prolonged shank (20) or (55) presenting at least one integral annular body (2I) or some gaskets (54), located inside a cell (I0), delimited by superior and inferior edges (9) and (9') or inside areas (52) delimited by an intermediate sleeve (53) and the gaskets themselves (54), filled with a viscous fluid, such as oil or grease.

2) Mechanical regulator following claim I, characterised by the fact thet the external dimension of the integral annular body (2I) on the prolonged shank (20), and the internal dimension of the cell (I0) are next to one another, except for a pre-established peripheric interspace provided for the oozing of viscous fluid during the relative movement between the two aforesaid objects.

3) Mechanical regulator following claims I and 2, characterised by the fact that at least one axial hole (22) is made on the integral annular body (2I).

4) Mechanical regulator following claims from I to 3, characterised by the fact that the area of the through holes of the prolonged shank extremities (20) are provided with upper and lower internal peripheric grooves where elastic rings (6) and (I3) are fitted, therefore sealing the end areas of the aforesaid shank (20).

5) Mechanical regulator following claim I, characterised by the fact that the aforesaid cell (I0) is obtained inside the hollow regulating pivot (I4) moving coaxially relatively to the central rod (I8).

6) Mechanical regulator following claims from I to 4, characterised by the fact that the cell (I0) is obtained in the interspace comprised between the external sleeve (29) and the external covering envelope (37).

7) Mechanical regulator following claims from I to 5, characterised by the fact that the hollow regulating pivot (I4) consists of a plurality of coaxial allineated components, comprising a superior trunk (I) linked with an intermediate connection (3) on which an intermediate tubular trunk (7) is screwed, matching with an inferior tubular trunk (I2); in the aforesaid couplings, the cell (I0) comes into correspondence with the intermediate trunk (7) and is delimited by the lower edge (9) of the connection (3) and the upper edge (9') of the lower trunk (I2), which presents an external annular ledge (23) for travel stop of the regulating pivot (I4).

8) Mechanical regulator following claim I, characterised by the fact of comprising an internal tubular body (5I) divided into two distinct areas (52) by an intermediate sleeve (53) in whose central hole slides a rod (55) provided with extremity gaskets (54) sealing the internal walls of the aforesaid two areas (52) of the tubular body (5I), the aforesaid areas being substantially filled with a viscous fluid, such as oil, grease or similar items, and the aforesaid rod (55), directly linked with a second inferior rod (I8), being provided with a plurality of concave annular seats (I9), whilst the said tubular body (5I) is linked with a second tubular body (57) connected to the edge (58) of a piston (24) being part of holding means consisting in spheres (27) which engage themselves into concave annular seats (I9), under the action of complementary trunk-conic flares (I5) and (25) when coupled.

9) Mechanical regulator following claims I and 8, characterised by the fact that the intermediate sleeve (53) is provided with a one-way valve (60).

I0)Mechanical regulator following claims I, 8 and 9, characterised by the fact that the passage area of the viscous fluid from one zone (52) to the other, divided by the intermediate sleeve (53), consists in a gap between the through hole of the sleeve itself (53) and the sliding rod (55).

II) Mechanical regulator following claims I and from 8 to I0, characterised by the fact that, in ascending condition, the annular passage area of the fluid, between the through hole of the sleeve (53) and the sliding rod (55), is added to the passage area of the open valve (60).

I2) Mechanical regulator following claims I and from 8 to II, characterised by the fact that the opening control of pistons (I6) and (24), with complementary trunk-conic flares, comprises a superior sleeve (I) which connects, by pressure, with the superior extremity of a coaxial tubular body (I4), whose inferior extremity is linked with the lower piston (I6).

I3) Mechanical regulator following claims I and from 8 to I2, characterised by the fact that the upper piston (24) is connected with a tubular body (57) linked with the intermediate sleeve (53), of the tubular body (5I), and with the lower extremity of the sliding sleeve (29) on which seats and/or similar items are fitted.

I4) Mechanical regulator following claims I and from 8 to I3, characterised by the fact of comprising two inferior cups (62) and (63), in self-lubricant material, inserted one into the other and left free to slide between themselves, in revolution, on an in-

ferior sliding ring (64); these cups being comprised between the superior (32) and the lower (35), shock absorbing springs.

I5) Mechanical regulator following claims from I to I4, characterised by the fact of comprising two pistons (I6) and (24), that can be coupled together by means of their respective trunk-conic flares (I7) and (25), where the inferior one (I6) is connected with the lower extremity of the regulating pivot (I4) and the superior one (24) is connected to the lower extremity of the external sleeve (29).

I6) Mechanical regulator following claim I, characterised by the fact that the aforesaid piston (I6) is applied on the base of a sleeve (30) free to slide in an intermediate tubular body (3I) whose base (40) is connected with the base of the central rod (I8) by means of a flat ball bearing.

I7) Mechanical regulator following claims I and from 8 to 16, characterised by the fact that the aforesaid sleeve (30) and aforesaid intermediate tubular body (3I) slide one upon the other and are kept allineated and in position by means of a shock absorbing spring (32) in between the ledges (33) and (34), respectively obtained on the aforesaid sleeve (30) and aforesaid tubular body (3I).

I9) Mechanical regulator following claims I, 16 and I7, characterised by the fact of comprising a shock absorbing spring (35) between the ledge (34) of the intermediate tubular body (3I) and the base (36), with bottom aperture, of the external casing (37).

I9) Mechanical regulator following claims from I to I8, characterised by the fact that the control means are guided and kept in position by means of the shock absorbing spring (32) comprised in the interspace between the external casing (37) and the coaxial sleeve (30), and sliding in the intermediate tubular body (3I), or the sliding sleeve (29).

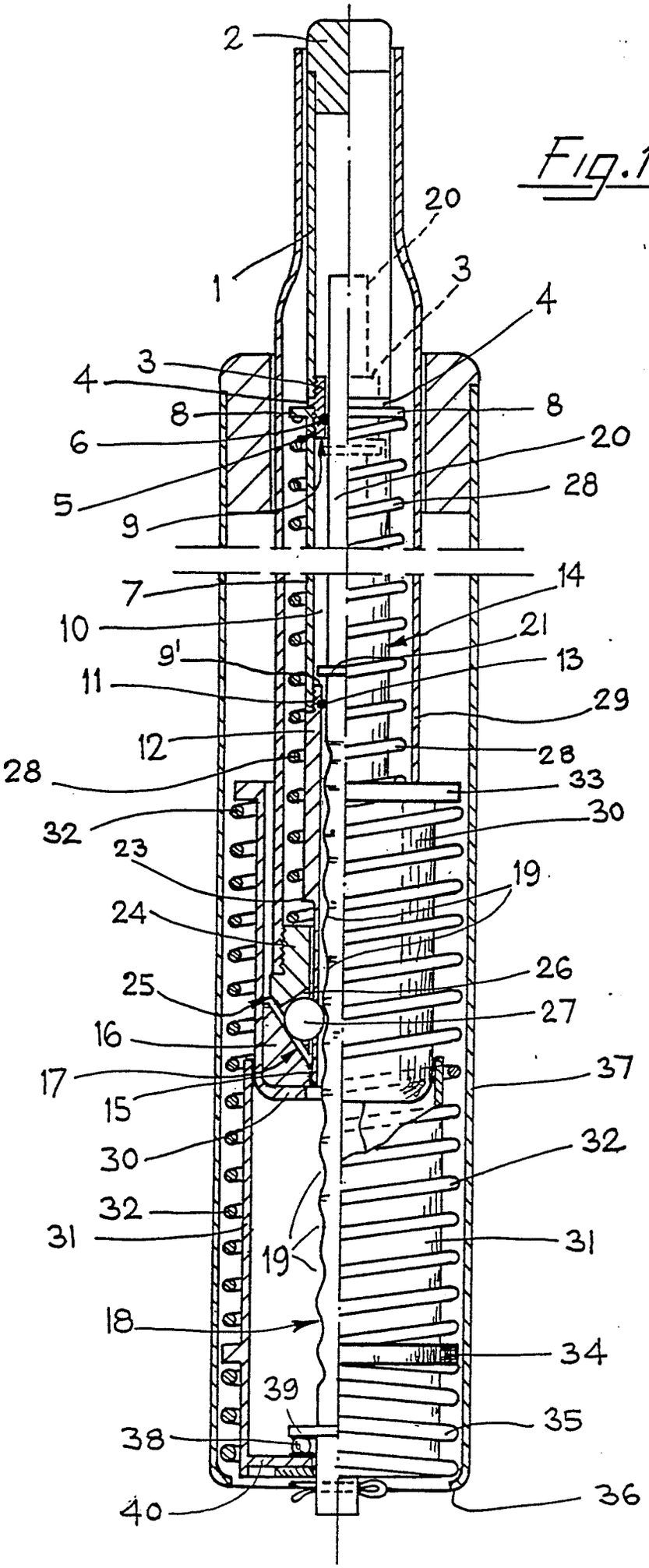
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Fig.1

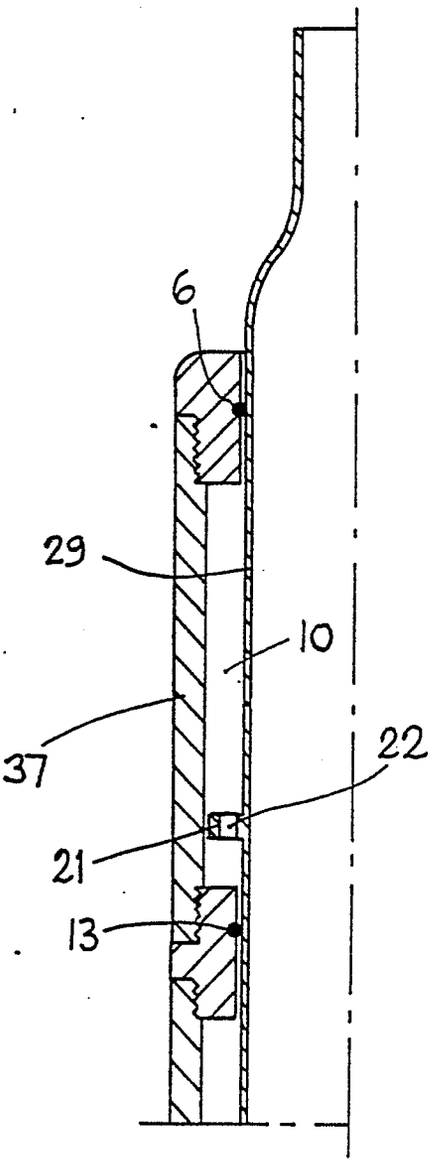
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Fig.2

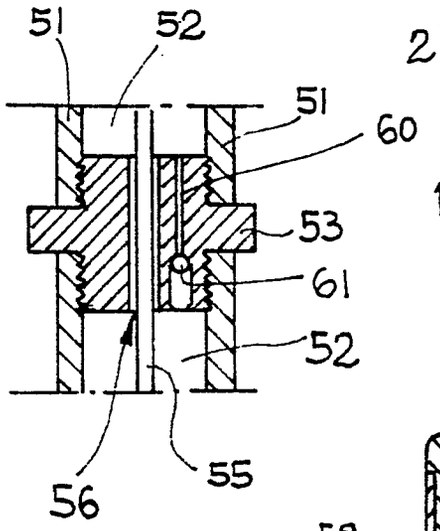
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Fig. 4

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Fig. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 10 0300

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.4)
A	GB-A-2 529 861 (ANGELL et al.) * Figures 6,7 * ---	1	A 47 C 3/28
A	GB-A-1 461 951 (JOHN FRENCH ENGINEERING) * Figure 2 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			A 47 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24-05-1988	MYSLIWETZ W.P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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& : member of the same patent family, corresponding document

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