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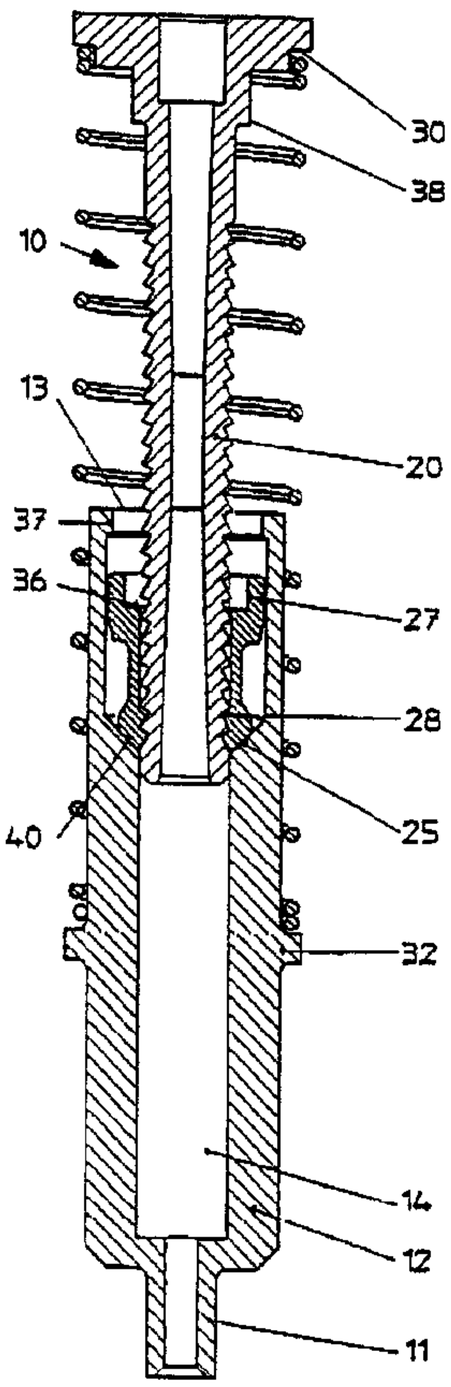
(54) Titre : DISPOSITIF DE COMPENSATION AUTOMATIQUE DE LA LONGUEUR D'ELEMENTS FLEXIBLES DE COMMNANDE PAR CABLE, EN PARTICULIER DISPOSITIF DE REGLAGE DU CABLE

(54) Title: DEVICE FOR AUTOMATICALLY COMPENSATING THE LENGTH OF FLEXIBLE CABLE CONTROL MEANS, ESPECIALLY CABLE ADJUSTERS



(57) Abrégé/Abstract:
A device is provided herein for the automatic length-correction of flexible cable drives. In particular, it provides a cable adjusting device with a tube fitting. The tube fitting includes a seat for a cable-drive tube and a duct for the cable proper of the cable drive.

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(57) Abrégé(suite)/Abstract(continued):
The outside wall in the region of the integral extension is fitted with radial teeth. An essentially bush-shaped casing constitutes a longitudinal borehole inside of which the integral extension is displaceably-guided in the longitudinal direction. The essentially-bush-shaped casing includes a receiving recess at a rear segment, adjoining the front segment with the longitudinal borehole and receiving in displaceable manner within two limit positions. A detent cooperates with the radial teeth and is able to move from a locked position into an unlocked position. A compression spring is mounted between the essentially-bush-shaped casing and the tube fitting and may act on the tube fitting to move it out of the essentially-bush-shaped casing for the purpose of length correction.

ABSTRACT

A device is provided herein for the automatic length-correction of flexible cable drives. In particular, it provides a cable adjusting device with a tube fitting. The tube fitting includes a seat for a cable-drive tube and a duct for the cable proper of the cable drive. The outside wall in the region of the integral extension is fitted with radial teeth. An essentially bush-shaped casing constitutes a longitudinal borehole inside of which the integral extension is displaceably-guided in the longitudinal direction. The essentially-bush-shaped casing includes a receiving recess at a rear segment, adjoining the front segment with the longitudinal borehole and receiving in displaceable manner within two limit positions. A detent cooperates with the radial teeth and is able to move from a locked position into an unlocked position. A compression spring is mounted between the essentially-bush-shaped casing and the tube fitting and may act on the tube fitting to move it out of the essentially-bush-shaped casing for the purpose of length correction.

(a) TITLE OF THE INVENTION

DEVICE FOR AUTOMATICALLY COMPENSATING THE LENGTH OF FLEXIBLE CABLE CONTROL MEANS, ESPECIALLY CABLE ADJUSTERS

(b) TECHNICAL FIELD TO WHICH THE INVENTION RELATES

The invention relates to an automatic cable-length adjusting device for flexible cable drives or the like.

(c) BACKGROUND ART

Such a device to correct the length of mechanically-flexible, remote drives is known, for instance, from published patent document WO93/22571, in particular its Fig. 4 and the associated description. This length-correcting device automatically carries out length-adjustment as soon as the required prestressing, for instance of the tube of a mechanically-flexible remote control means, has vanished. Operationally, this known device has been found quite satisfactory. However, its design is fairly complex and the detent is susceptible to soiling. As a result, the operation of the device may be degraded.

(d) DESCRIPTION OF THE INVENTION

An object of a broad aspect of the present invention is to provide a device as described above that offers simpler design and whose operational reliability is increased.

The present invention, in one broad aspect, provides a cable-adjusting device, including a tube fitting with a seat receiving a tube of the drive cable and also including a duct for the cable proper which is located in the area of an integrated extension. The outer wall of the fitting includes radial teeth in the region of the integral extension, the device also including an essentially bush-shaped casing including a longitudinal borehole, wherein the integral extension is guided in a longitudinally-displaceable manner, and also includes a detent cooperating with the radial teeth.

Thus, by one embodiment of this invention, an automatic length-correcting device is provided for a flexible cable drive, the device including an essentially-bush-shaped casing with a longitudinal borehole. A tube fitting has a seat for engaging the essentially-bush-shaped casing. A duct is provided in the region of an integral extension for receiving a cable of the cable drive. An outside wall of the integral extension is fitted with radial teeth. The integral extension is guided in a longitudinally-displaceable manner in the borehole. A compression spring is mounted between the essentially-bush-

shaped casing and the tube fitting to act on the tube fitting to displace the tube fitting longitudinally out of the essentially-bush-shaped casing. A detent cooperates with the radial teeth. The essentially-bush-shaped casing includes a receiving recess at a rear segment. The detent is entirely-disposed within the receiving recess and is displaceable between two limit positions, from a locked position into an unlocked position. The detent also cooperates with the radial teeth within the receiving recess.

By one variant of this first embodiment of this invention, the detent is essentially-bush-shaped, enclosing the integral extension and comprises integral spring arms which are fitted with inside detent teeth at their ends. By one variation thereof, an end portion of the integral spring arms includes an external bevel which rests against an essentially-conical support of the receiving recess in the locked position of the detent.

By a second variant of this first embodiment of this invention, and/or the above variant, and/or the above variation thereof, the detent includes a circumferential annular wall, the circumferential annular wall being fitted with at least one of an inner circumferential step, and an outside run-up surface.

By a third variant of this first embodiment of this invention, and/or the above variants, and/or the above variation thereof, the receiving recess is bounded by an outer circumferential step, in the region of the rear segment of the essentially-bush-shaped casing, the outer circumferential step acting as a stop for the detent in its unlocked position.

By a fourth variant of this first embodiment of this invention, and/or the above variants, and/or the above variation thereof, the compression spring is clamped between a terminal collar of the tube fitting and an external annular support of the essentially-bush-shaped casing.

By a fifth variant of this first embodiment of this invention, and/or the above variants, and/or the above variation thereof, the device includes an external circumferential offset present in a transition region between the tube fitting and the integral extension, the offset being adapted for resting against an inner circumferential step of the detent.

By a sixth variant of this first embodiment of this invention, and/or the above variants, and/or the above variation thereof, a length of the path between the two limit positions of the detent is defined by adjusting a predetermined slack of the cable.

By a second embodiment of this invention, an automatic length-correcting device is provided for a flexible cable drive. The device includes an essentially-bush-shaped casing with a longitudinal borehole, and a rear segment, and a rear end adjacent to the rear segment. A tube fitting has a seat for engaging the rear end of the essentially-bush-shaped casing and a duct in the region of an integral extension to receive a cable of the cable drive. An outside wall of the integral extension is fitted with radial teeth, so that the integral extension is guided in a longitudinally-displaceable manner in the longitudinal borehole to allow the seat to engage the rear end of the essentially-bush-shaped casing. A compression spring is disposed about the essentially-bush-shaped casing and is seated against an external annular support of the essentially-bush-shaped casing, and a terminal collar of the tube fitting to act on the tube fitting to displace the tube fitting longitudinally out of the essentially-bush-shaped casing. A detent is disposed about, and cooperatively engages, the radial teeth of the tube fitting. The rear segment of the essentially-bush-shaped casing defines a receiving recess between a essentially-conical support and an inner circumferential step adjacent to the rear end. The detent is received in the receiving recess between the essentially-conical support and the inner circumferential step for limited displacement therebetween. The essentially-conical support is a transition from the receiving recess and the longitudinal borehole and acts as a stop to prevent displacement of the detent when the device is in a locked position.

Essentially, in other words, the invention in a broad aspect, provides a essentially-bush-shaped casing which includes a receiving recess in a rear zone adjoining the front zone with the longitudinal borehole. The detent is displaceably-received between two limit positions and it may be moved from a locked position into an unlocked position. A compression spring is mounted between the essentially-bush-shaped casing and the tube fitting. The compression spring moves the tube fitting out of the essentially-bush-shaped casing for the purpose of effecting length adjustment.

This aspect of this invention provides an exceedingly-simple construction of length-correcting devices which, on one hand, are constituted only of a very few components, and, on the other hand, protect the detent against soiling within a receiving recess in the essentially-bush-shaped casing, thus opposing the danger of soiling and increasing operational reliability.

In one advantageous embodiment of an aspect of this invention, the detent is essentially-bush-shaped and encloses the integral extension and includes integral spring arms which are fitted unilaterally with inside detent teeth. The essentially-bush-shaped detent thereby is guided reliably and safely between the inside wall of the receiving recess of the essentially-bush-shaped casing and the outside wall of the integral extension of the tube fitting.

In another advantageous embodiment of an aspect of this invention, the integral spring arms include an external bevel surface at their ends which rests on an essentially-conical support of the recess in the locked position of the detent. As a result, length adjustment of the device is precluded when the detent is in the locked position.

Advantageously, by another aspect of this invention, the detent comprises a circumferential annular wall in one end zone which may be fitted with slots and which is fitted with an inner circumferential step and/or which is fitted with a run-up bevel on the outside. Whereas the inner circumferential step serves to receive a portion of the tube fitting in the telescoped position and hence makes the device more compact, the circumferential annular wall *per se* acts as a stop for the detent when it is present in the recess to limit the excursion. The run-up bevels facilitate the initial insertion of the detent into the receiving recess of the essentially-bush-shaped casing when the device of aspects of this invention is being installed.

By another aspect of this invention, to limit the excursion of the detent, the receiving recess of the essentially-bush-shaped casing includes an outer circumferential step at its rear to act as a stop for the detent when it is in the unlocked position.

Advantageously, by yet another aspect of this invention, an externally-pointing terminal collar is present at an end segment of the tube fitting, the compression spring

is clamped between the terminal collar and an external annular support of the essentially-bush-shaped casing.

By still another aspect of this invention, a circumferential, annular offset is formed in the transition region between the tube fitting and the integral extension and can be made to rest against the circumferential step of the detent when the device of aspects of this invention is in its telescoped position.

In a further advantageous embodiment of an aspect of this invention, the path length of the excursion of the detent between the two limit position is defined by a predetermined slack in the cable proper. Accordingly, a defined residual cable slack is assured in the drive system, and thereby stressing due to adjustment motions is precluded.

(e) BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings,

Fig. 1 is an illustrative embodiment of the cable adjusting device of one aspect of this invention in sectional perspective, the detent is in the unlocked position; and

Fig. 2 is a view of the cable adjusting device of Fig. 1, in the spring-driven position with the detent in its locked position.

(f) AT LEAST ONE MODE FOR CARRYING OUT THE INVENTION

The cable-adjusting device 10 shown in an aspect of this invention Fig. 1 for flexible drive cables or the like comprises a tube fitting 16. The tube fitting 16 comprises a seat 18 for a tube of the drive cable and furthermore, in the region of an integral extension 20, it includes a duct 46 passing the cable proper. Preferably, the duct 46 flares conically at the end of the integral extension 20. The outside wall of the integral extension 20 is fitted at least in some zones with radial teeth 22.

An essentially-bush-shaped casing 12, which may be affixed, for example, rigidly to the output of a cable-drum of a cable window lift, but which also may be affixed to a brake or clutch cable, is fitted with a longitudinal borehole 14 inside of which the integral extension 20 is guided in a longitudinally-displaceable manner. In a rear zone 13, the essentially-bush-shaped casing 12 comprises a receiving recess 15 adjoining the front segment 11 with the longitudinal borehole 14. A detent 23 cooperates with the

radial teeth 22 of the integral extension 20 and is displaceably-received in the receiving recess 15 between the two limit positions. The right limit position shown in Fig. 1 corresponds to the unlocked position, the detent 23 shown in the left limit position in Fig. 2 being in the locked position.

A compression spring 34 is mounted between the essentially-bush-shaped casing 12 and the tube fitting 16, and allows driving the tube fitting 16 out of the essentially-bush-shaped casing 12 for the purpose of length adjustment.

The detent 23 is designed as essentially-bush-shaped, 24, enclosing the integral extension 20 and comprises integral spring arms 26 which are fitted at their ends with inside teeth 28 of the detent 23. At their ends, the integral spring arms 26 include external bevels 42 which, in the locked position of the detent 23, rest on an essentially-conical support 40 of the receiving recess 15 of the essentially-bush-shaped casing 12.

The detent 23 comprises a circumferential annular wall 27, which, where called-for, is fitted with slots, in an end segment 35. The circumferential annular wall 27 is fitted internally with an inner circumferential step 36, and externally with a run-up bevel 25.

In the region of the rear segment 13 of the essentially-bush-shaped casing 12, the receiving recess 15 is bounded by an outer circumferential step 37 acting as a stop for the detent 23 when in its unlocked position. There is an external annular support 32 for the compression spring 34 in the central zone of the essentially-bush-shaped casing 12. Furthermore, the compression spring 34 rests against a terminal collar 30 of the tube fitting 16. An external circumferential offset 38 is formed in a transition region between the tube fitting 16 and the integral extension 20 and can be placed against the inner circumferential step 36 of the detent 23. The length of the excursion path 44 of the detent 23 between the two limit positions is used to set a predetermined slack of the cable proper in the cable drive.

The cable-adjusting device 10 operates as follows:

If slack arises in the cable proper of the cable drive and accordingly, if the tube enclosing the cable proper of the cable drive must be lengthened, the tube fitting 16 must be displaced out of the essentially-bush-shaped casing 12. In other words, an elongation

of the cable-adjusting device 10 is required to achieve length correction. This displacement of the tube fitting 16 out of the essentially-bush-shaped casing 12 is implemented by the compression spring 34 which is present between the two components. During the displacement of the tube fitting 16 out of the essentially-bush-shaped casing 12, the detent 23 initially is carried along by the radial teeth 22 engaging the tube fitting 16 until the end segment 35 of the circumferential annular wall 27 of the detent 23 hits the outer circumferential step 37 bounding the receiving recess 15 of the essentially-bush-shaped casing 12. If the tube fitting 16 stressed by the compression spring 34 can be displaced farther than the excursion path 44 out of the essentially-bush-shaped casing 12, then the integral spring arms 26 of the detent 23 will be spread apart, whereby the radial teeth 22 of the integral extension 20 slips under the inside teeth 28 of the detent 23.

Now, if a force in the direction of front segment 11 of the essentially-bush-shaped casing 12 is applied on the cable proper of the cable drive, the spring force of the compression spring 34 will be overcome. As a result, the tube fitting 16, together with the integral extension 20 as well as with the detent 23 which is mounted on the integral extension 20, will be displaced in the receiving recess 15 of the essentially-bush-shaped casing 12 toward the essentially-conical support 40. At the end of the excursion path 44, the external bevels 42 of the integral spring arms 26 of the detent 23 will rest on the essentially-conical support 40 of the receiving recess 15, whereupon the detent 23 is in the locked position.

Thereafter, the force which is further exerted on the cable proper is converted into a displacement of the cable proper inside the tube of the cable drive. Only then is the required compression between the essentially-bush-shaped casing 12, detent 23 and tube fitting 16 effective as a counter-force to the tension of the cable proper. In other words, a defined slack of the cable proper in the cable drive remains over the excursion path 44 of the detent 23 in the receiving recess 15, whereby stressing by adjusting displacements is precluded.

List of references

10	cable adjusting device
11	front segment
12	casing
13	rear segment
14	longitudinal borehole
15	receiving recess
16	tube fitting
18	seat
20	extension
22	radial toothing
23	detent means
24	bush
25	run-up surface
26	spring arm
27	annular wall
28	detent tooth
30	collar
32	support
34	compression spring
35	end segment
36	step
37	step
38	offset
40	conical support
42	bevel
44	length of path
46	duct6//

CLAIMS

1. An automatic length-correcting device for a flexible cable drive, said device comprising:

an essentially-bush-shaped casing with a longitudinal borehole;

a tube fitting having a seat for engaging said essentially-bush-shaped casing and a duct in the region of an integral extension thereof for receiving a cable of said cable drive, an outside wall of said integral extension being fitted with radial teeth, wherein said integral extension is guided in a longitudinally-displaceable manner in said borehole;

a compression spring which is mounted between said essentially-bush-shaped casing and said tube fitting to act on said tube fitting to displace said tube fitting longitudinally out of said essentially-bush-shaped casing; and

a detent cooperating with said radial teeth;

wherein said essentially-bush-shaped casing comprises a receiving recess at a rear segment;

said detent being entirely disposed within said receiving recess and being displaceable between two limit positions from a locked position into an unlocked position, said detent cooperating with said radial teeth within said receiving recess.

2. The automatic length-correcting device as claimed in Claim 1, wherein said detent is essentially-bush-shaped enclosing said integral extension, and comprises integral spring arms which are fitted with inside detent teeth at their ends.

3. The automatic length-correcting device as claimed in Claim 2, wherein an end portion of said integral spring arms includes an external bevel which rests against an essentially-conical support of said receiving recess in the locked position of said detent.

4. The automatic length-correcting device as claimed in Claims 1 to 3, wherein said detent includes a circumferential annular wall, said circumferential annular wall being fitted with at least one of an inner circumferential step, and an outside run-up bevel.

5. The automatic length-correcting device as claimed in Claims 1 to 4, wherein said receiving recess is bounded by an outer circumferential step, in the region of the rear segment of said essentially-bush-shaped casing, said outer circumferential step acting as a stop for said detent in its unlocked position.

6. The automatic length-correcting device as claimed in Claims 1 to 5, wherein said compression spring is clamped between a terminal collar of said tube fitting and an external annular support of said essentially-bush-shaped casing.

7. The automatic length-correcting device as claimed in Claims 1 to 6, including an external circumferential offset present in a transition region between said tube fitting and said integral extension, said external circumferential offset being for resting against an inner circumferential step of said detent.

8. The automatic length-correcting device as claimed in Claims 1 to 7, wherein a length of a path between said two limit positions of said detent is defined by adjusting a predetermined slack of said cable.

9. An automatic length-correcting device for a flexible cable drive, said device comprising:

an essentially bush-shaped essentially-bush-shaped casing with a longitudinal borehole, a rear segment, and a rear end adjacent to said rear segment;

a tube fitting having a seat for engaging said rear end of said essentially-bush-shaped casing and a duct in the region of an integral extension to receive a cable of said cable drive, an outside wall of said integral extension being fitted with radial teeth, wherein said extension is guided in a longitudinally-displaceable manner in said longitudinal borehole to allow said seat to engage said rear end of said essentially-bush-shaped casing;

a compression spring which is disposed about said essentially-bush-shaped casing and which is seated against an external annular support of said essentially-bush-shaped

casing and a terminal collar of said tube fitting to act on said tube fitting to displace said tube fitting longitudinally out of said essentially-bush-shaped casing; and

a detent which is disposed about, and cooperatively-engages, said radial teeth of said tube fitting;

wherein said rear segment of said essentially-bush-shaped casing defines a receiving recess between an essentially-conical support and an inner circumferential step adjacent to said rear end, said detent being received in said receiving recess between said essentially-conical support and said inner circumferential step for limited displacement therebetween, said essentially-conical support being a transition from said receiving recess and said longitudinal borehole and acting as a stop to prevent displacement of said detent when said device is in a locked position.

Fig 1

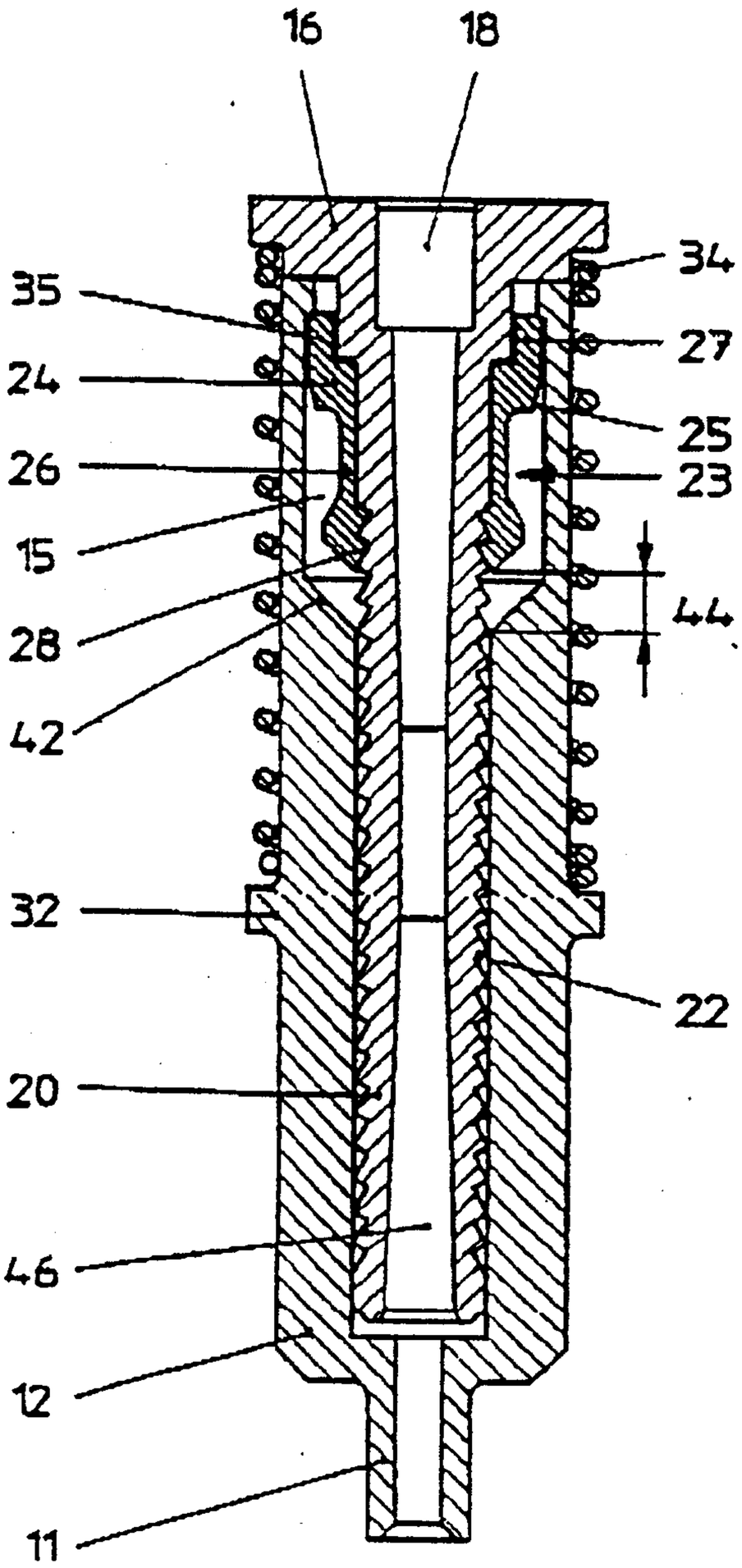
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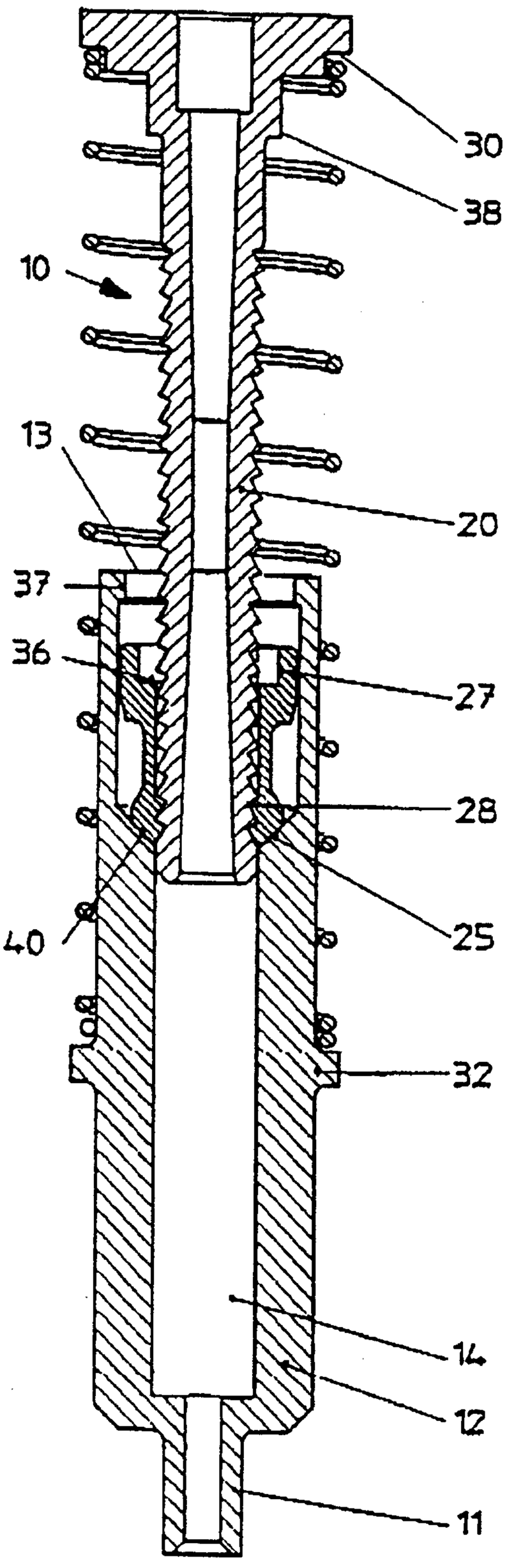
Fig 2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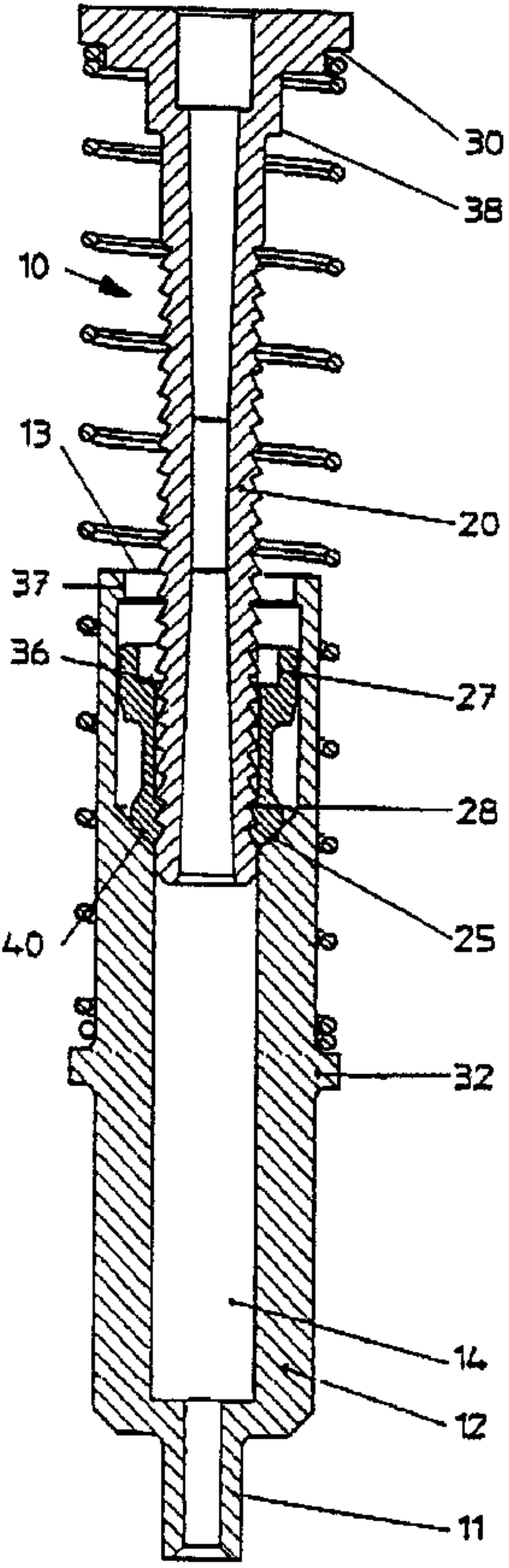
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