AUSTRALIA

Patents Act 1990

645667

PATENT REQUEST : STANDARD PATENT

We being the person identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying standard complete specification.

Full application details follow:

[71/70] Applicant/Nominated Person:

CONCORD LIGHTING LIMITED
Avis Way
Newhaven, Sussex BN9 0HX
ENGLAND

[54] Invention Title:

Electric Current Distribution Apparatus

[72] Name of actual inventor:

Terence Alan WOODGATE

[74] Address for service in Australia:

DAVIES COLLISON CAVE, Patent Attorneys, of 1 Little Collins Street, Melbourne, Victoria, Australia. Attorney Code: DM

DIVISIONAL APPLICATION DETAILS:

[62] Original Application No(38365/89

.....Keith Davies.....

(a member of the firm of DAVIES COLLISON CAVE for and on behalf of the Applicant).

11 March, 1992

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NOTICE OF ENTITLEMENT

We, **CONCORD LIGHTING LIMITED,** the applicant/Nominated Person in respect of Application No. 12865/92 state the following:-

The Nominated Person is entitled to the grant of patent because the Nominated Person derives title to the invention from the inventor by assignment. The inventor assigned the rights in the invention to GTE Rotaflex Limited, who subsequently assigned their rights in the invention to the Nominated Person.

The Nominated Person is entitled to make a request under Section 113 of the Act in relation to the original application by assignment from GTE Rotaflex Limited to Concord Lighting Limited.

DATED this 25th day of October 1993

.....
a member of the firm of
DAVIES COLLISON CAVE
for and on behalf of the
applicant/s

(DCC ref: 1486084/KL/ME)

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(54) Title
ELECTRIC CURRENT DISTRIBUTION APPARATUS

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(56) Prior Art Documents
EP 291989
EP 241318
US 3736417

(57) Claim

1. A coupling for a low voltage electric distribution system, comprising an elongate track member defining a channel with inner wall means and opposed side walls having means defining inwardly facing abutment surfaces, a conductor extending along and insulated from the channel and supported by the inner wall means, a connector for electrical and mechanical connection to the track member, the connector including a screw threaded part and a contact insulated therefrom and projecting therethrough for electrically contacting the track conductor, and a clamping element received in the channel and in screw threaded engagement with said connector part, the element abutting said abutment surfaces and the reaction force acting thereon causing the contact to be pressed into engagement with the conductor.

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Regulation 3.2

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Patents Act 1952

COMPLETE SPECIFICATION

FOR A STANDARD PATENT

(ORIGINAL)

Name of Applicant: CONCORD LIGHTING LIMITED

Actual Inventor: Terence Alan WOODGATE

Address for Service: DAVIES COLLISON CAVE, Patent Attorneys,
1 Little Collins Street, Melbourne, 3000.

Invention Title: Electric Current Distribution Apparatus

The following statement is a full description of this invention, including the best method of performing it known to us:

ELECTRIC CURRENT DISTRIBUTION APPARATUS

This invention relates generally to electric current distribution apparatus, and is concerned especially, but not necessarily exclusively, with devices and equipment for a low voltage distribution track system and lighting installations.

In accordance with the invention there is provided a coupling for a low voltage electric distribution system, comprising an elongate track member defining a channel with inner wall means and opposed side walls having means defining inwardly facing abutment surfaces, a conductor extending along and insulated from the channel and supported by the inner wall means, a connector for electrical and mechanical connection to the track member, the connector including a screw threaded part and a contact insulated therefrom and projecting therethrough for electrically contacting the track conductor, and a clamping element received in the channel and in screw threaded engagement with said connector part, the element abutting said abutment surfaces and the reaction force acting thereon causing the contact to be pressed into engagement with the conductor.

The coupling of the invention is suitable for supplying electric current to a track and/or taking current off from the track, e.g. by a cable rod, for supply to an appliance or another track section.

Electric distribution tracks are well known and generally comprise elongate channels along which elongate conducts extend. A supply connector is fitted to the track channel, most frequently at one end of a track length, for connecting the track to a source of electric power. Other connectors, commonly known as "adaptors", can be engaged with the track at any position along its length for connecting electric appliances, usually but not necessarily light fittings, to the track. The adaptors are designed to provide mechanical support for the light fittings, so that they are supported by the track. The most common arrangement is for a track to be supported below a ceiling and for the light fittings to be suspended beneath the track, but other arrangements are possible. By tradition the supply connectors and adaptors tend to be of different constructions in view of their differing duties, although they do fit together with the same track. Hitherto supply connectors and adaptors have been of relatively complicated designs with bodies of insulating material carrying contacts for engagement with the track conductors and means to ensure mechanical securement with the track channel. In recent years there has been a trend towards low voltage track lighting systems and in some cases the channel configuration for the track has been abandoned, which has been made possible because the need for the conductors to be concealed is removed as there are no shock hazards with low voltage systems. Nonetheless, the supply connectors and adaptors have remained of relatively complicated construction.

A better understanding of the invention in its various aspects will be gained from the following detailed description of some specific embodiments, reference being made to the accompanying drawings, in which:

Figure 1 shows schematically a light fitting suspended from a ceiling by an assembly of cable rods;

Figure 2 is a similar view of a light fitting supported by means of a single cable rod;

Figure 3 is a side elevation of a cable rod;

Figure 4 shows the cable rod of Figure 3 in axial cross section;

Figure 5 is an axial section through a second embodiment of a cable rod;

Figure 6 is an axial cross section through a rotating coupling unit or adaptor for use with the cable rod of Figure 5;

Figure 7 is an end view of an electric track coupling embodying the invention;

Figure 8 is a side view of the coupling shown in Figure 7 with the track shown partly in cross section; and

Figure 9 is a top plan view of the coupling in Figure 7.

In Figure 1, a light fitting 1 is shown suspended from a ceiling by means of a rigid rectilinear support formed by a string of three cable rods 2 connected end-to-end. The upper end of the cable rod string is secured to a suitable socket 3 to provide the necessary electrical connections and mechanical support, and the lower end of the string is connected to a suitable coupling provided on the light fitting 1. It will be appreciated that the length of the support can be selected by increasing or reducing the number of cable rods used, and to allow greater choice over the length of the string, cable rods of different lengths may be provided. Figure 2 also shows a light fitting 1 suspended from a ceiling socket 3, in this case by a single cable rod 2. As will become clear from the description which follows, the cable rods have male and female screw threaded couplings at their respective ends enabling them to be screwed together end-to-end and to be threadedly engaged with the sockets 3 and fittings 1 to provide the necessary mechanical connection and with the electrical connections being completed automatically upon screwing the parts together. The cable rods of the invention can be used for other applications besides those shown in Figs. 1 and 2 and they may be employed with particular advantage in electric track distribution systems in which the cable rods may be used to support and supply current to a track length as well as to support an

appliance, such as a light fitting, from the track so that it is powered from the track. In such installations the cable rods may be coupled to the track by means of the coupling arrangement described in more detail below and shown in Figures 7 to 9.

Turning to Figures 3 and 4 there is shown an exemplary embodiment of a cable rod 2 having coaxial conductors. The outer conductor comprises a metal tube 5 which is internally screw threaded at both ends, and an externally threaded bush 6 screwed into one end of the tube. The bush projects from the tube to form a male coupling while the opposite end of the tube defines a female coupling or socket adapted to receive the male coupling of another identical cable rod. The inner conductor is held axially within the outer conductor by a layer of insulation 7, and the inner conductor comprises a metal rod 8 extending from the socket, into which it protrudes a little to form a contact pin, to a spring pin assembly which includes a cylindrical cup 9 having its base fixed to the end of rod 8, a metal pin 10 having an enlarged head held captive by an inturned flange on the cup 9, and a coil spring 11 interposed between the base of the cup and the pin for urging the pin to an outermost position (as shown) in which it projects beyond the insulation 7 and the end of bush 6.

When the cable rod is screwed together end-to-end with another rod of the same form, the pin 10 bears against the exposed end of the inner conductor rod 8 of the second rod and becomes pushed back into the cup 9 as the threaded joint is screwed up tight. In this way firm abutting contact is ensured between the inner conductors to ensure their electrical continuity along the length of the cable rod assembly, such continuity of the outer conductors being similarly

ensured by the conductive bush and abutment between the ends of the metal tubes 5. Any number of cable rods can be connected together to form a cable rod string of required length.

A modified cable rod is shown in Figure 5. It has an outer metal tube 15 into one end of which is inserted a insulating spacer 16 followed by an internally screw threaded bush 17. To secure the spacer in the tube it has a spigot which is screwed into the inner end of the bush 17. Inserted into the other end of tube 15 is a metal plug 18 formed with an externally threaded boss and having an axial through bore accommodating a spring housing 19 and an insulating sleeve 20. The sleeve 20 has a flange in abutment with the end of the boss and serves to close the end of the spring housing. A stiff metal rod or bar 21 extends continuously through the length of the cable rod with one end exposed in the female socket defined by bush 17 and the other end projecting beyond sleeve 20 to define a contact pin 24. At a position within the spring housing the rod 21 is provided with a spring abutment 22, conveniently formed by flattening a short section of the rod. A coil spring 23 surrounds the bar and acts between the inner end of the spring housing and the abutment 22 to urge the latter against the sleeve 20. By providing a continuous unitary inner conductor electrical continuity through the cable rod is more easily ensured. When the male coupling of the cable rod is screwed into the socket of another similar rod, the inner conductor of the latter engages the protruding pin 24 and pushes it inwardly against the force of the spring 23, the whole inner conductor in this case being displaced longitudinally.

With the cable rod as shown in Figure 5 it may

be desirable, in order to avoid having to maintain very tight manufacturing tolerances, to provide in a device connected to the socket at the end of a cable rod or string of a cable rods means for taking up the longitudinal movement of the inner conductor. For example such means could be included in a connection part of a light fitting or in a ceiling socket. Alternatively, it could be incorporated in a separate connection device e.g. for connecting the cable rod to a socket, light fitting, distribution track or the like. The means in question may take the form of a pair of contacts electrically interconnected by a flexible conductor such as a braided wire conductor, and a spring urging the contacts apart. The end of the inner conductor of the cable rod will be arranged to press on one contact which will move towards the other contact against the spring action to take up the excess projection length of the cable rod conductor.

A device which combines the function of such a means and a rotary coupling unit is shown in Figure 6.

This device, which will be referred to as an adaptor, has at each end a male coupling of substantially the same form as that of the cable rod shown in Figure 5, allowing either or both ends of the adaptor to be connected to cable rods with the adaptor being capable of accommodating the displacement of their inner conductors. The adaptor has a two-part housing, an inner end of one part 31 being telescoped into the inner end of the other part 32, with a circlip 33 holding the two parts axially together so that they are relatively rotatable. A generally cylindrical chamber within the housing is lined by a sleeve 34 of insulating material. The threaded boss of each housing part is fitted with an insulating insert 35 through which a pin contact 36 passes, the contact

having an enlarged head which abuts the insert 35 to limit outward movement of the contact, and a collar on the head providing an abutment shoulder for one end of a spring 37 which urges the contacts apart. The contacts are interconnected by a flexible, braided wire conductor 38. Each pin contact can slide inwardly against the action of the spring under a force applied against the outer tip, and hence the adaptor will absorb the longitudinal displacement of the inner conductors of cable rods secured to the adaptor. The electrical continuity is completed by the housing 31, 32 for the outer conductors and by the contacts 36 and flexible wire 38 for the inner conductors. Furthermore, by virtue of its split housing the adaptor enables axially rotative adjustment of a device or cable rod attached to one side of the adaptor relative to the cable rod or device attached to the other side of the adaptor, and such rotation may be continuous as there are no stops, which can be of benefit such as when adjusting the beam direction of a light fitting supported by the adaptor. A further advantage of the adaptor is that it allows male couplings to be located at both ends of a cable rod assembly, which simplifies the connections of the assembly to devices at both ends thereof.

It will be appreciated that a device, such as a light fitting, could be constructed to incorporate a connector including a rotatable coupling of essentially the same form as the adaptor of Figure 6, but in that case one housing part 31, 32 may be fixed to the light fitting and means other than a pin may be used for electrical connection to the corresponding contact 36 of the assembly.

It should be noted that the male couplings of the cable rod shown in Figure 5 and the adaptor shown

in Figure 6 are of suitable design to enable connection to a distribution track by a coupling assembly as shown in Figures 7 to 9.

The electrical coupling illustrated in these Figures forms part of a low voltage distribution system including a length of track 101, a member 102 for supplying electric current to the track and supporting the track, e.g. from a ceiling, and a similar member 103 for connecting a light fitting, or other appliance, both electrically and mechanically to the track so that it is supported by and powered from the track. The track 101 is of double channel configuration and shaped symmetrically with respect to a medial, horizontal plane. Each channel includes an inner end wall formed by a transverse web 105, and a pair of opposed side walls 106, 107 each of which is undercut to form inturned lips or flanges 108, 109 at the sides of the channel mouth. Supported on the inner wall of the channel and electrically isolated therefrom by a strip 112 of insulating material is a conductor 110. The track is of uniform cross section along its length and at a convenient location, such as at one end, the two conductors 110 are connected together by a bridging element extending through or around the edge of the web 105. The main body of the track is conductive, e.g. made of aluminium and serves as the second conductor of the track for transmitting electric power.

Each member 102, 103 may consist of a rigid cable rod or a rotation joint as described hereinabove. Projecting at the end of the member 102, 103 is an externally threaded tubular part or sleeve 115 which also constitutes a first contact. A second contact is provided by an axial pin 116 projecting through and beyond the sleeve 115 to make contact with

the track conductor 110. The pin 116 is spaced from the outer contact 115 by an insulating sleeve 117 which has an enlarged head at its outer end in abutment with the end of the contact 115. The pin 116 is spring loaded and normally projects a little beyond the end of the insulator sleeve 117. Screwed onto the threaded contact 115 is a square nut 118 which on both sides and on all four edges is rebated to define a central land on each side. The land is dimensioned to be received non-rotatably between the track lips 108, 109 while the shoulder surfaces at opposite edges of the nut engage the abutment shoulders defined by the lips. It will be appreciated that the shape of the nut means that it can be inverted and fitted either way round in the track, whereby correct assembly of the coupling is facilitated.

With the nut unscrewed to the edge of the contact 115, the nut can be introduced into the track channel by a tilting movement of the member 102, 103. The member 102, 103 is then rotated so that the nut 118 is driven into firm abutment with the track lips 108, 109 while the reaction force acts to clamp the insulator 117 against the conductor 110. The pin contact 116 retracting due to its spring loading but still being pressed against the conductor 110. Consequently, the outer contact 115 is connected to the main body of the track through the nut 118, and the pin 16 connects directly to the conductor 110, good contact pressure being ensured in both cases by the clamping action produced by the threaded connection of the nut on the contact 115.

The clamping action secures the conductor rod 102, 103 rigidly to the track with the rod extending at right angles from the track so that firm support is ensured either for the track itself when carried by

the rod 102 or for an electric appliance when carried from the track on the rod 103.

The described electrical coupling is of simple construction, but it is also easy to assemble and is effective in use. In addition it can be used for both current supply and take-off connections. Furthermore, all the connection parts are housed within the track channel so that the visual appearance is improved.

It should be understood that in an electrical distribution system the or each track member 101 may be carried by two or more supporting rods 102 spaced apart along the track member, but not all of these supporting rods are necessarily used for current supply purposes.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A coupling for a low voltage electric distribution system, comprising an elongate track member defining a channel with inner wall means and opposed side walls having means defining inwardly facing abutment surfaces, a conductor extending along and insulated from the channel and supported by the inner wall means, a connector for electrical and mechanical connection to the track member, the connector including a screw threaded part and a contact insulated therefrom and projecting therethrough for electrically contacting the track conductor, and a clamping element received in the channel and in screw threaded engagement with said connector part, the element abutting said abutment surfaces and the reaction force acting thereon causing the contact to be pressed into engagement with the conductor.

2. A coupling according to claim 1 wherein said reaction force on the clamping element causes the end of the screw threaded part of the connector to be pressed firmly against the inner wall means via insulating means interposed therebetween.

3. A coupling according to claim 2 wherein said insulating means is integral with an insulator which is interposed between and insulates the contact from the screw threaded part.

4. A coupling according to claim 1, 2 or 3, wherein the track member constitutes a second track conductor, the screw threaded connector part constitutes a second contact, and the element acts to connect electrically the said second contact to the track member.

5. A coupling according to any of claims 1 to 4, wherein the connector part is externally screw threaded and the element is a nut.

6. A coupling according to claim 5, wherein the nut is non-rotatable in the channel.

7. A coupling according to claim 6 wherein the nut has means engageable in the channel mouth to prevent rotation of the nut.

8. A coupling according to claim 5, 6 or 7, wherein the nut is square.

9. A coupling according to any one of claims 5 to 8, wherein the nut can be introduced into the channel through the channel mouth and then moved into engagement with the abutment surfaces.

10. A coupling according to claim 9, wherein the nut is insertable into the channel when loosened but still screwed on the threaded connector part.

11. A coupling according to any one of claims 1 to 10, wherein the abutment surfaces are defined by inturned lips on the side walls of the channel.

12. A coupling according to any one of the preceding claims wherein the connector is elongated and stiff, and the said clamping action secures the connector rigidly to the track and substantially perpendicular thereto.

13. An electric coupling substantially as hereinbefore described with reference to the accompanying drawings.

14. A coupling according to any one of the preceding claims wherein the track member is of double channel form and the connector is engageable in either channel to support mechanically the track from either above or below and to supply electric current to the track.

DATED this 11th day of March, 1992
CONCORD LIGHTING LIMITED
By its Patent Attorneys
DAVIES COLLISON CAVE

ABSTRACT

A coupling for a low voltage electric distribution system, comprising an elongate track member (101) defining a channel with inner wall means (105) and opposed side walls (106,107) having means (108) defining inwardly facing abutment surfaces, a conductor (110) extending along the channel and supported by the inner wall, a connector including a screw threaded part (115) and a contact (116) projecting therethrough for contacting the track conductor, and a clamping element (118) received in the channel and in screw threaded engagement with the connector part, the element abutting the abutment surfaces and the reaction force acting thereon causing the contact to be pressed into engagement with the conductor.

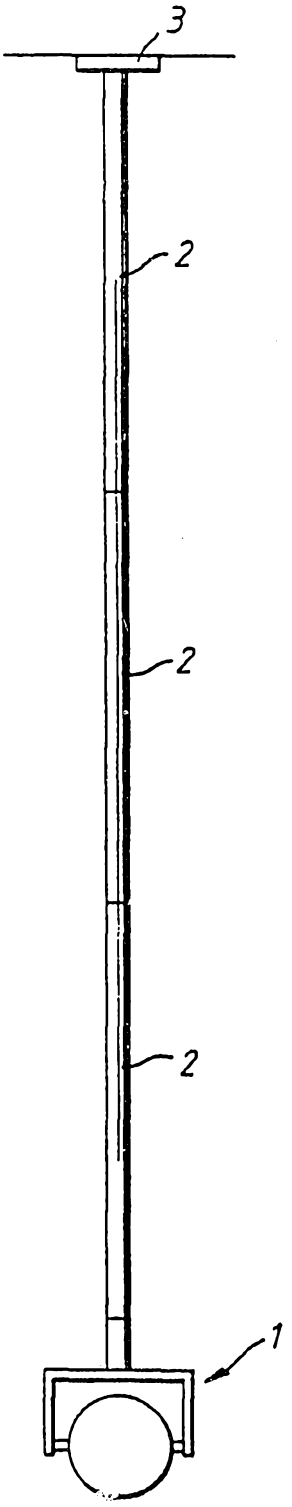

Fig.1.

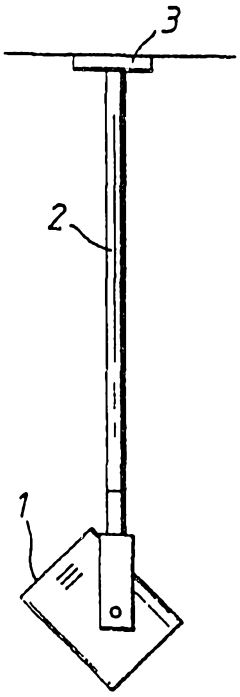

Fig.2.

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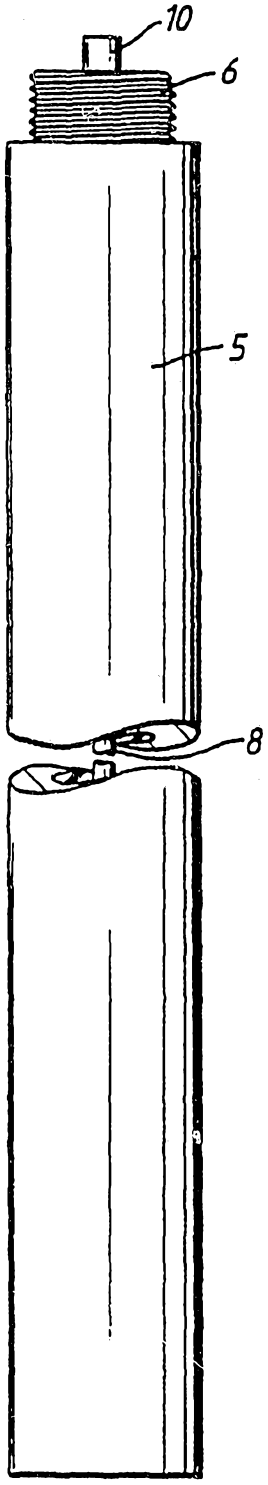

Fig. 3.

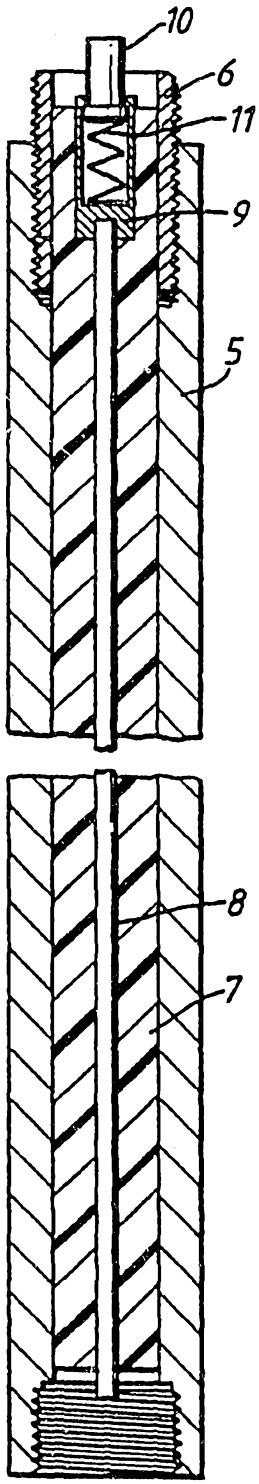

Fig. 4.

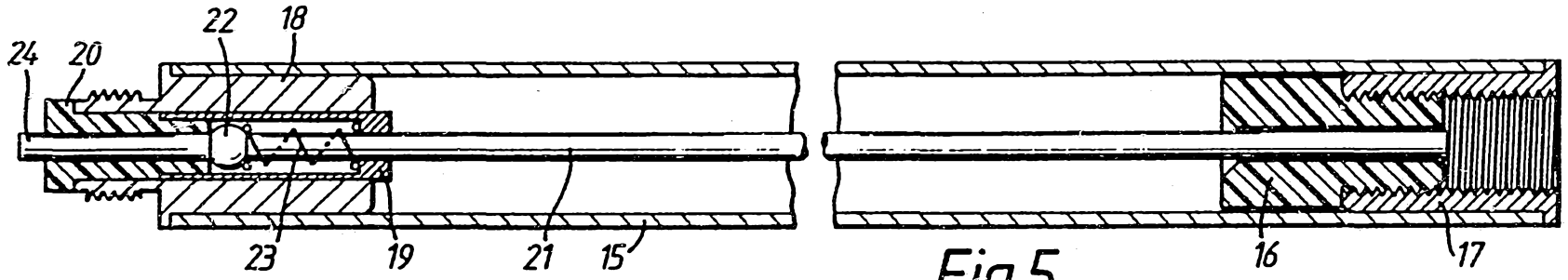

Fig.5.

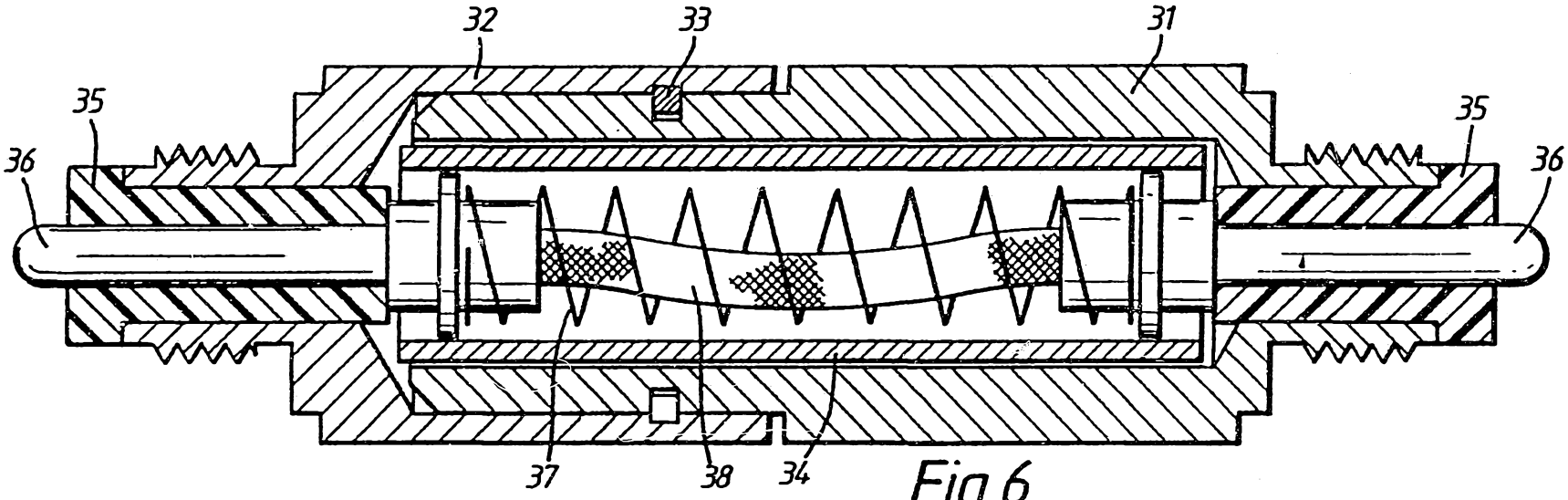

Fig.6.

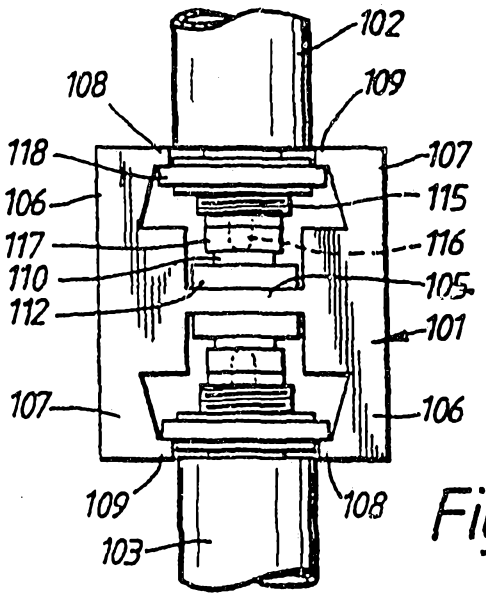

Fig.7.

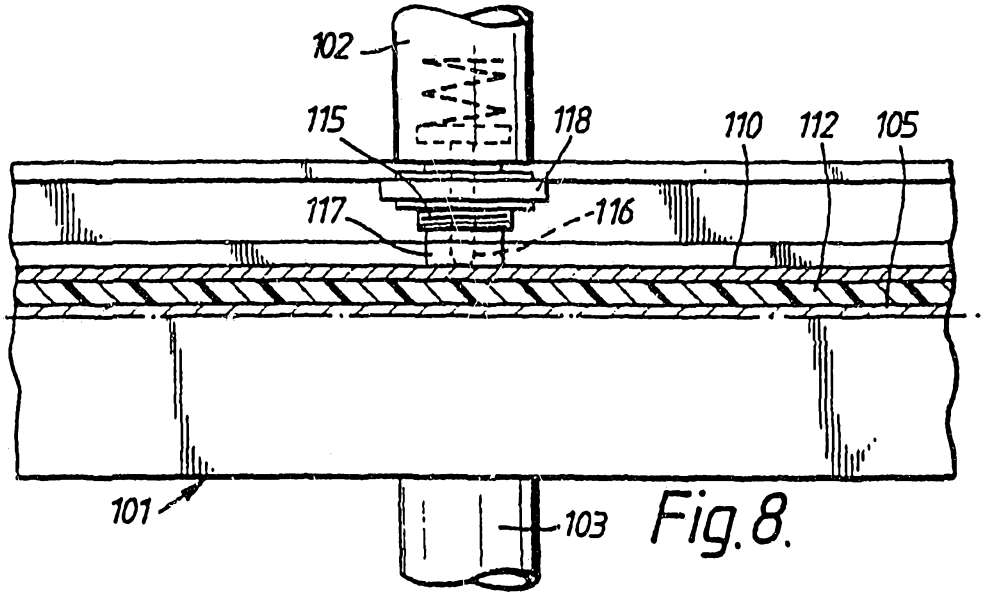

Fig.8.

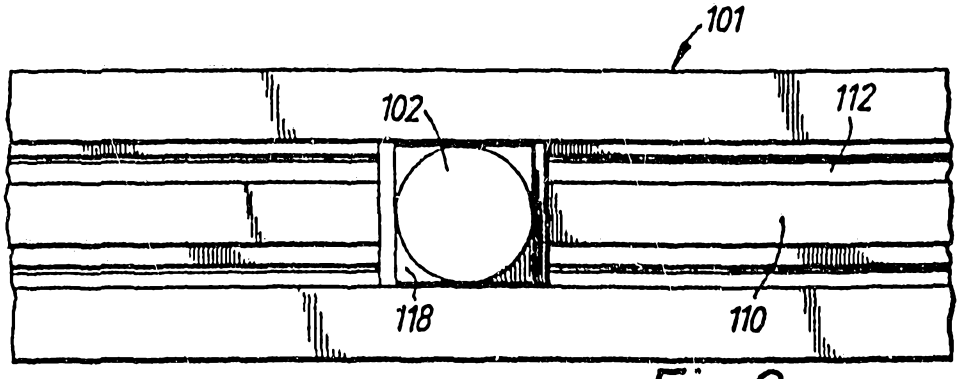

Fig.9.