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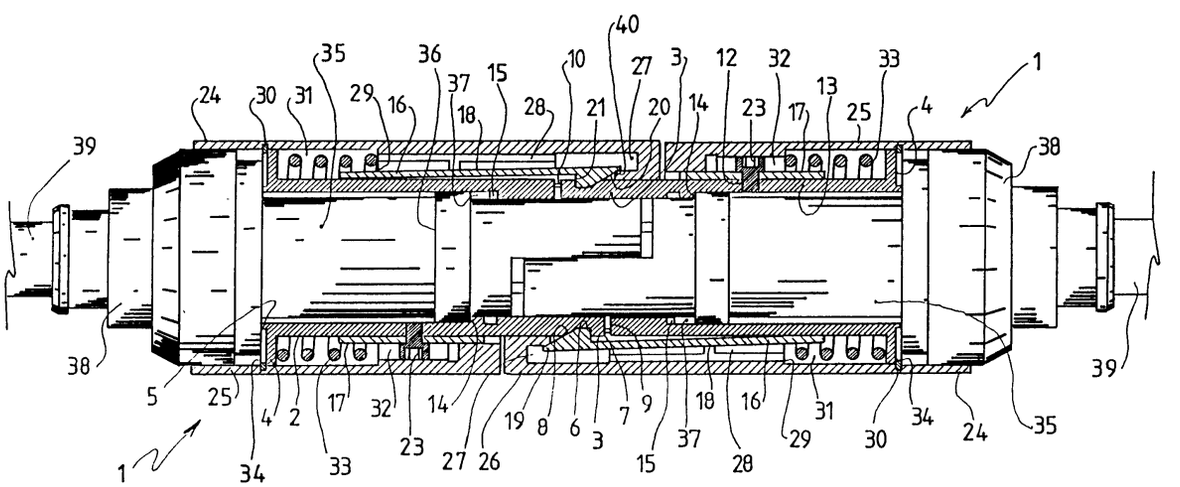
## (54) Connector system

(57) A connector unit 1 comprises a central tubular body 2 having a first longitudinally protruding half-moon front portion 3 with an outwardly opened latch catching groove 6 formed on said first longitudinally protruding half-moon front portion 3. A latching shell 16 affixed to the central tubular body has a longitudinally protruding resilient tongue 18 having an inwardly projecting latch 19 diametrically opposed to said outwardly opened latch catching groove 6. A control sleeve 24 is mounted for longitudinal movement on the central tubular body 2 and comprises a second longitudinally protruding half-moon front portion 26 diametrically opposed to the first longitudinally protruding half-moon front portion 3 and a rearwardly opened inner slot 27 partly engaged under the inwardly projecting latch 19.

FIG. 1

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## Description

**[0001]** This invention relates to a connector system for coupling signal transmission conductor means via mating means controlled by a self-latching mechanism, in which a connector unit comprises a central tubular body secured to a latching shell having resilient tongue means with radially projecting latch means, latch catching means secured to said central tubular body and circumferentially alternating with said latch means, a control sleeve mounted for longitudinal movement on said central tubular body, and wall means secured to said control sleeve for urging said latch means against resiliency of said tongue means.

**[0002]** EP-A-0 875 959 refers a connector system of that kind. In a first embodiment, there is described a connector system for coupling signal transmission conductor means via mating means controlled by a self-latching mechanism, in which a connector unit comprises a central tubular body secured to a latching shell having a plurality of resilient tongues circumferentially arranged at a same distance from one another each said tongues having a projecting latch , a catching sleeve secured to said central tubular body having latch catching means circumferentially alternating with said latches , and a control sleeve mounted for longitudinal movement on said connector unit. In this embodiment, a sleeve is slidably mounted on said latching shell said sleeve having at one end a plurality of peripheral extension arms respectively extending along said tongues and each said extension arms having ramp means for urging a corresponding latch against the resiliency thereof, said catching sleeve comprising a plurality of peripheral arms circumferentially arranged at a same distance from one another and located angularly between said tongues and extension arms said peripheral arms having each a said latch catching means, and said control sleeve being fastened to said slidable sleeve. In a second embodiment, there is provided a connector system for coupling signal transmission conductor means via mating means controlled by a self-latching mechanism, in which a connector unit comprises a central tubular body angularly secured to a latching shell having a plurality of resilient tongues circumferentially arranged at a same distance from one another each said tongues having a projecting latch, a catching sleeve secured to said central tubular body having latch catching means circumferentially alternating with said latches, and a control sleeve mounted for longitudinal movement on said connector unit. In this embodiment, said central tubular body comprises a plurality of peripheral arms respectively extending along said tongues and each having an inclined wall for urging a corresponding latch into said latch catching means, said catching sleeve comprising a plurality of peripheral arms circumferentially arranged at a same distance fron one another and located angularly between said tongues and said peripheral arms of the central tubular body and said peripheral arms of the catching sleeve having each a said latch catching means, said latching shell being slidably mounted on said central tubular body, and said control sleeve being fastened to said latching shell. In both its embodiments this system results in a hermaphroditic assembly in which self-latching and release of the connector unit with a second identical connector unit is achieved by direct push-pull action on the control sleeve. Accordingly, as the connector unit acts both as a plug body and a socket body, there are no hazardous or search manipulations of elements which differ visually, tactily or operatively from one another. Logistics are simplified and tutoring of the operators is drastically reduced. Furthermore, as the system guarantees that self-latching and release of the connector unit with a second identical connector unit is achieved by direct push-pull action on the control sleeve, a fully fail -proof operation is assured, even when the system is used in stress or so-called blind operations where the operator cannot loose time in finding out how to pick the connector units for a proper connection or disconnection as well as he cannot afford the risk of missing or delaying the connection because he did not grasp the connector units at the right place.

**[0003]** DE-A-2063258 describes a two halves connector system in which each half comprises an inner tubular body having its rear end connected to a pipe via a clamp. The front end of the body is provided with an external circular groove arranged in an enlarged end portion the rear end of which forms an abutment. Forwardly axially projecting resilient arms are formed circumferentially at the fore edge of the circular groove and at a same distance from one another. Resilient arms terminate into enlargements with inwardly oriented projections which have substantially the same shape as the transverse section of the groove, and the width of these arms and projections is such that by mating two identical connector halves the arms of the two halves interpenetrate. On the outer side of the tubular body is slidably mounted a control sleeve which is held against the abutment by a spring. This control sleeve has an enlarged forwardly projecting portion the axial length of which is equal to the axial length of the enlarged end portion of the body and the inner diameter of which is equal to the diameter of a circle surrounding the external edges of the projections of the resilient arms. The control sleeve is externally grooved for manual operation. Connection of the two halves of the system is obtained by mating the two halves with their respective arms interpenetrating, whereby the arms radially expand on the front ends of the tubular bodies and simultaneously push the fore edges of the control sleeves against the bias of the springs until their projections can fall into the corresponding circular groove whereby the control sleeves may be pushed forwardly by the springs and their enlarged forwardly projecting portions may cover the ends of the enlargements of the resilient arms. The system is thus locked and secured against draw on the respective pipes. To unlock the system, it is necessary to draw the

grooved portions of the two control sleeves in opposite directions whereby the resilient arms of both connector halves may have their projections expanded to be extracted from the corresponding grooves. In a variant aimed at avoiding holding the connector halves by the respective clamped pipes for connection purposes, the rear portion of the control sleeve is partly covered by a sleeve fixed to the inner body. In a further variant, the control sleeve is completely covered by the sleeve fixed to the body and comprises radial studs projecting through longitudinal slots of the covering sleeve. Accordingly, these structures also result in a hermaphroditic assembly, however, they do not give any possibility of having self-latching and release of the connector unit with a second identical connector unit achieved by direct push-pull action on the control sleeve. In its first embodiment, the system simply prevents any self-latching by holding the connector units by the control sleeve because the fore edges of the control sleeves would prevent any radial expansion of the arms on the front ends of the tubular bodies until their projections can fall into the corresponding circular groove. In its second embodiment, which aims at avoiding the obligation of holding the connector halves by the respective clamped pipes for connection purposes, the situation does no change if the the connector halves are held by the control sleeves. And in the third embodiment, the situation is even worse because with the control sleeve being completely covered by the sleeve fixed to the body and comprising radial studs projecting through longitudinal slots of the covering sleeve, the operator has to take care not to touch the projecting studs during the self-latching operation. Furthermore, disconnection of all the embodiments requires withdrawal of the control sleeves of both the connector halves because of the need to allow radial expansion of the latches of both halves.

**[0004]** GB-A-2155703 describes a hermaphroditic electrical connector comprising an outer housing a forward portion of which is formed so as to constitute a semicylindrical recess to enable two such electrical connectors to be mated by being pushed longitudinally together. Surrounded by outer housing, there is an insert portion which is moulded around electrical contact strips. The portions of the contact strips which are meant to contact the corresponding strips of an identical connector project into a chamber defined between the outer housing and the insert portion. The connector is provided with latch means comprising a pushbutton, a latch hook and a biasing spring, the button and the hook extending up through a slot in the outer housing, the latch hook being outwardly directed. The latch means including the spring together with the insert portion are held in the outer housing. The outer housing has adjacent its free edge a slot adapted to receive the latch hook of the latch means of an identical counterpart when two connectors are in mating relationship. So, when the two connectors are pushed together, one being disposed 180° to the other with respect to the longitudinal axis of rotation, each latch hook clics into a co-acting slot. In a variant the latch hook may be formed on a resilient arm integral with the outer housing. In both embodiments, the two push-buttons must be simultaneously pressed inwardly to pull apart the two connectors and disengage the mated connectors. The system allows self-latching by holding the connectors by their outer housings, inasmuch as the operator does not squeeze the push-buttons, which would prevent latching. Furthermore, the system does not allow disconnection by mere pulling the outer housings because the operator has to carefully press simultaneously the two push-buttons.

**[0005]** It is an object of this invention to provide a connector system aimed at miniaturization of a hermaphroditic assembly while retaining the advantage that self-latching and release of the connector unit with a second identical connector unit is achieved by direct push-pull action on the control sleeve. A further object of the invention is to achieve a connector system which is versatile and easy to manufacture with a reduced number of parts.

**[0006]** To this effect, the connector system according to the invention complies with the definitions given in the claims.

**[0007]** Accordingly, with the central tubular body having a first longitudinally protruding half-moon front portion with said latch catching means formed by an outwardly opened latch catching groove on said first longitudinally protruding half-moon front portion, the latching shell having a longitudinally protruding tongue with an inwardly projecting latch diametrically opposed to said outwardly opened latch catching groove, and said control sleeve having a second longitudinally protruding half-moon front portion diametrically opposed to said first longitudinally protruding half-moon front portion with said wall means formed by a rearwardly opened inner slot in said second longitudinally protruding half-moon front portion partly engaged under said inwardly projecting latch, a substantial reduction in diametral size is achieved as the control sleeve assures the dual function of positioning the connector units of the hermaphroditic assembly with respect to one another while simultaneously assuring the direct push-pull function of the system, and the number of functional parts to achieve that is limited to the central tubular body, latching shell and control sleeve.

**[0008]** In a preferred embodiment, said central tubular body further comprises a front semi-circular portion immediately preceding said first longitudinally protruding half-moon front portion and in which are inserted alignment protruding pin means having an axis parallel to a longitudinal axis of the central tubular body, wherein said first longitudinally protruding half-moon front portion comprises pin-hole means in parallel and diameter relationship with said pin means, said pin means and pin-hole means being respectively symmetrical with respect to a plane separating said front semi-circular portion and first longitudinally protruding half-moon front

portion.

**[0009]** Advantageously, said latching shell is affixed to said central tubular body by an element which angularly positions said second longitudinally protruding half-moon front portion of the control sleeve with respect to said first longitudinally protruding half-moon front portion of the central tubular body and said latch of the latching shell.

**[0010]** Preferably, said control sleeve slidingly bears on a portion of latching shell and on a rear circular shoulder of central tubular body, and a coil spring is compressed between rear circular shoulder and an inner shoulder of control sleeve.

**[0011]** Advantageously, said rearwardliy opened inner slot of the control sleeve is longitudinally rounded. Preferably the rearwardly opened inner slot follows the whole section of said second longitudinally protruding half-moon front portion.

**[0012]** In all the embodiments of the invention, the latch may be transversely rounded.

**[0013]** These and other objects, features and advantages of the invention will become readily apparent from the following description with reference to the accompanying drawings which show, diagrammatically and by way of example only, one preferred but still illustrative embodiment of the invention.

**[0014]** Figure 1 is a longitudinal section showing the connector unit in mating condition with an identical connector unit.

**[0015]** Figure 2 is a longitudinal half-section of a detail of Figure 1.

**[0016]** Figures 3 is a top plan view of the detail of Figure 1.

**[0017]** Figures 4 and 5 are respectively sections according to lines I-I and II-II of Figure 2.

**[0018]** Figure 6 is a longitudinal section of another detail of Figure 1.

**[0019]** Figure 7 is a longitudinal plan view of the detail of Figure 6.

**[0020]** Figure 8 is a section according to line III-III of Figure 7.

**[0021]** Figure 9 is a longitudinal half-section of a further detail of Figure 1.

**[0022]** Figure 10 is a top plan view of the detail of Figure 9.

**[0023]** Figures 11 and 12 are respectively sections according to lines IV-IV and V-V of Figure 9.

**[0024]** The connector unit 1 comprises a central tubular body 2 (Figures 1-5) having a longitudinally protruding half-moon front portion 3 and a rear circular shoulder 4 preceded by a threaded end portion 5. Over the longitudinally protruding half-moon front portion 3 is formed an outwardly opened latch catching groove 6 respectively bordered by a front semi-annular portion 7 and by a downwardly inclined surface 8 of half-moon portion 3. Within the front semi-circular portion 9 of central tubular body 2 immediately preceding longitudinally protruding half-moon front portion 3 are inserted two alignment protruding pins 10 angularly arranged at 90° from one another and with their axis parallel to the longitudinal axis of central tubular body 2. Two pin-holes 11 are drilled in the front annular portion 7 at 90° from one another and respectively in parallel and diametral relationship with pins 10. Pin-holes 11 have an inner diameter and a length adapted to house pins having the diameter and length of pins 10. Three transverse holes 12 circumferentially arranged at 120° from one another are formed in the wall 13 of central tubular body 2 with one of them having its axis in a plane containing the top diameter of longitudinally protruding half-moon front portion 3. Inside the wall 13 is a circular shoulder 14 having a longitudinal groove 15.

**[0025]** Over central tubular body 2 is mounted a latching shell 16 (Figures 1 and 6-8) formed by a circular body 17 having a longitudinally protruding resilient transversely rounded tongue 18 partly cut therein and the end of which forms an inwardly projecting latch 19. In the example shown, inwardly projecting latch 19 is transversely rounded and comprises a forward surface 20 inclined towards the end of the tongue 18 and a rearward abutment surface 21 substantially perpendicular to the tongue 18. The circular body 17 of latching shell 16 has three transverse holes 22 circumferentially arranged at 120° from one another, with one of them being diametrically opposed to resilient tongue 18 . Latching shell 16 is affixed to central tubular body 2 by three alignment screws 23 passing through transverse holes 22 and screwed and locked into the transverse holes 12 of central tubular body 2. Positioning of latching shell 16 over central tubular body 2 is such that inwardly projecting latch 19 is diametrically opposed to outwardly opened latch catching groove 6 of central tubular body 2.

**[0026]** A slidable control sleeve 24 is mounted over central tubular body 2 and latching shell 16 (Figures 1 and 9-12). Control sleeve 24 comprises a tubular main body 25 having a longitudinally protruding half-moon front portion 26 in which is formed a rearwardly opened inner slot 27 perpendicular to a longitudinal groove 28 formed in tubular main body 25. Inner slot 27 and longitudinal groove 28 are respectively longitudinally and transversely rounded, slot 27 following the whole section of longitudinally protruding half-moon front portion 26. Inside the tubular main body 25 and rearwardly of longitudinal groove 28 are a circular shoulder 29 and a circular groove 30 delimiting a chamber 31. Three longitudinal grooves 32 at 120° from one another are formed inside the tubular main body 25, with one of them being diametrically opposed to longitudinal groove 28. Positioning of control sleeve 24 on the central tubular body 2 and the latching shell 16 is such that tubular main body 25 slidingly bears on circular body 17 of latching shell 16 and on rear circular shoulder 4 of central tubular body 2, with alignment screws 23 sliding into longitudinal grooves 32, whereby longitudinally protruding half-moon front portion 26 is diametrically opposed to longitudinally protruding half-moon front portion 3 of central

tubular body 2 with resilient tongue 18 being located in longitudinal groove 28 and rearwardly opened inner slot 27 partly engaging under the edge of forward surface 20 of the inwardly projecting latch 19. A coil spring 33 is compressed in chamber 31 in abutment against circular shoulder 29 and rear circular shoulder 4 of central tubular body 2 which abuts against a circlip 34 engaged in circular groove 30.

**[0027]** Inside the central tubular body 2 is a signal transmission conductor assembly 35 which may be of any kind for transmitting electric, photonic or fluidic signals. Signal transmission conductor assembly 35 comprises a circular shoulder 36 and a key 37 for respective abutment and engagement against circular shoulder 14 and within groove 15 of central tubular body 2. A collet nut 38 meshing on threaded end portion 5 of central tubular body 2 holds the signal transmission conductor assembly 35 in place.

**[0028]** Operation of this connector unit is as follows, reference being made to Figure 1. Two identical connector units 1 are positioned in front of one another with the longitudinally protruding half-moon front portions 26 of their respective control sleeves 24 in diametral opposition, whereby the longitudinally protruding half-moon front portions 3 of the respective central tubular bodies 2 are also in diametral opposition. The connector units may then be pushed against one another, being held by the respective control sleeves 24, whereby the circlips 34 push the central tubular bodies 2 towards one another and the front semi-annular portions 7 of the outwardly opened latch catching grooves 6 of the longitudinally protruding half-moon front portions 3 of the central tubular bodies 2 respectively bear against inclined forward surfaces 20 of inwardly projecting latches 19 and expand radially the latches within the corresponding rearwardly opened inner slots 27 and longitudinal grooves 28 of the longitudinally protruding half-moon front portions 26 of the control sleeves 24 up to their reaching the respective outwardly opened latch catching grooves 6 into which they snap due to resiliency of the tongues 18 with their rearward abutment surface 21 bearing against the front semi-annular portions 7. During the aforesaid motions, the alignment protruding pins 10 are respectively inserted into the corresponding pin-holes 11. It may be noted that the same results would be achieved by pushing the connector units via the collet nuts 38 which would push the central tubular bodies 2 via the threads 5. The longitudinal and angular assembly of the two connector units 1 is thus secured and any pull on the collet nuts 38 or on the cables 39 connected to the signal transmission conductor assemblies 35 is transmitted to the latches 19 and latch catching grooves 6 via central tubular bodies 2 and latching shells 16.

**[0029]** Disassembly is achieved by mere pull on the control sleeves 24 which retract against the bias of springs 33. Retraction of the control sleeves 24 causes the rear edges 40 of the rearwardly opened inner slots 27 to slide along the forward inclined surfaces 20 of inwardly projecting latches 19, thereby lifting the latches 19 out of the outwardly opened latch catching grooves 6 of the corresponding tubular bodies 2. The connector units 1 may thus be separated from one another while the control sleeves 24 recover their initial position under the bias of springs 33 which respectively push circular shoulders 29 of the control sleeves 24 and rear circular shoulders 4 of central tubular bodies 2.

**[0030]** Variants are available.

**[0031]** For example, the latches may not be transversely rounded or they may be replaced by balls.

**[0032]** The number and relative angular positioning of alignment pins 10 and corresponding pin-holes 11 may vary, being essential that the pins along the front semi-annular portion 7 are respectively symmetrical to the pin-holes 11 along the semi-circular portion 9 with respect to the plane separating the semi-annular portions 7 and 9 to allow interpenetration as described hereinbefore. There may be also only one pin 10 with only one corresponding pin-hole 11. The pins 10 and pin-holes 11 arrangement may also be omitted.

**[0033]** The assembly of latching shell 16 and central tubular body 2 may be other than via alignment screws 23, for example by means of an adhesive, in which case angular positioning between central tubular body 2, latching shell 16 and control sleeve 24 will be achieved by studs or ridges and grooves.

## Claims

1. A connector system for coupling signal transmission conductor means (35) via mating means controlled by a self-latching mechanism, in which a connector unit (1) comprises a central tubular body (2) secured to a latching shell (16) having resilient tongue means (18) with radially projecting latch means (19), latch catching means (6) secured to said central tubular body (2) and circumferentially alternating with said latch means (19), a control sleeve (24) mounted for longitudinal movement on said central tubular body (2), and wall means (40) secured to said control sleeve (24) for urging said latch means (19) against resiliency of said tongue means (18), characterized by the central tubular body (2) having a first longitudinally protruding half-moon front portion (3) with said latch catching means (6) formed by an outwardly opened latch catching groove (6, 7, 8) on said first longitudinally protruding half-moon front portion (3), the latching shell (16) having a longitudinally protruding resilient tongue (18) with an inwardly projecting latch (19, 20 21) diametrically opposed to said outwardly opened latch catching groove (6, 7, 8), and said control sleeve (24) having a second longitudinally protruding half-moon front portion (26) diametrically opposed to said first longitudinally protruding half-moon front portion (3) with said wall means (40)

formed by a rearwardly opened inner slot (27) in said second longitudinally protruding half-moon front portion (26) partly engaged under said inwardly projecting latch (19, 20, 21).

**2.** A connector system according to claim 1, wherein said central tubular body (2) further comprises a front semi-circular portion (9) immediately preceding said first longitudinally protruding half-moon front portion (3) and in which are inserted alignment protruding pin means (10) having an axis parallel to a longitudinal axis of the central tubular body (2), wherein said first longitudinally protruding half-moon front portion (3) comprises pin-hole means (11) in parallel and diameter relationship with said pin means (10), said pin means (10) and pin-hole means (11) being respectively symmetrical with respect to a plane separating said front semi-circular portion (9) and first longitudinally protruding half-moon front portion (3).

**3.** A connector system according to claim 1 or 2, wherein said latching shell (16) is affixed to said central tubular body (2) by an element (23) which angularly positions said second longitudinally protruding half-moon front portion (26) of the control sleeve (24) with respect to said first longitudinally protruding half-moon front portion (3) of the central tubular body (2) and said latch (19) of the latching shell (16).

**4.** A connector system according to claim 1 or 2, wherein said control sleeve (24) slidingly bears on a portion (17) of latching shell (16) and on a rear circular shoulder (4) of central tubular body (2).

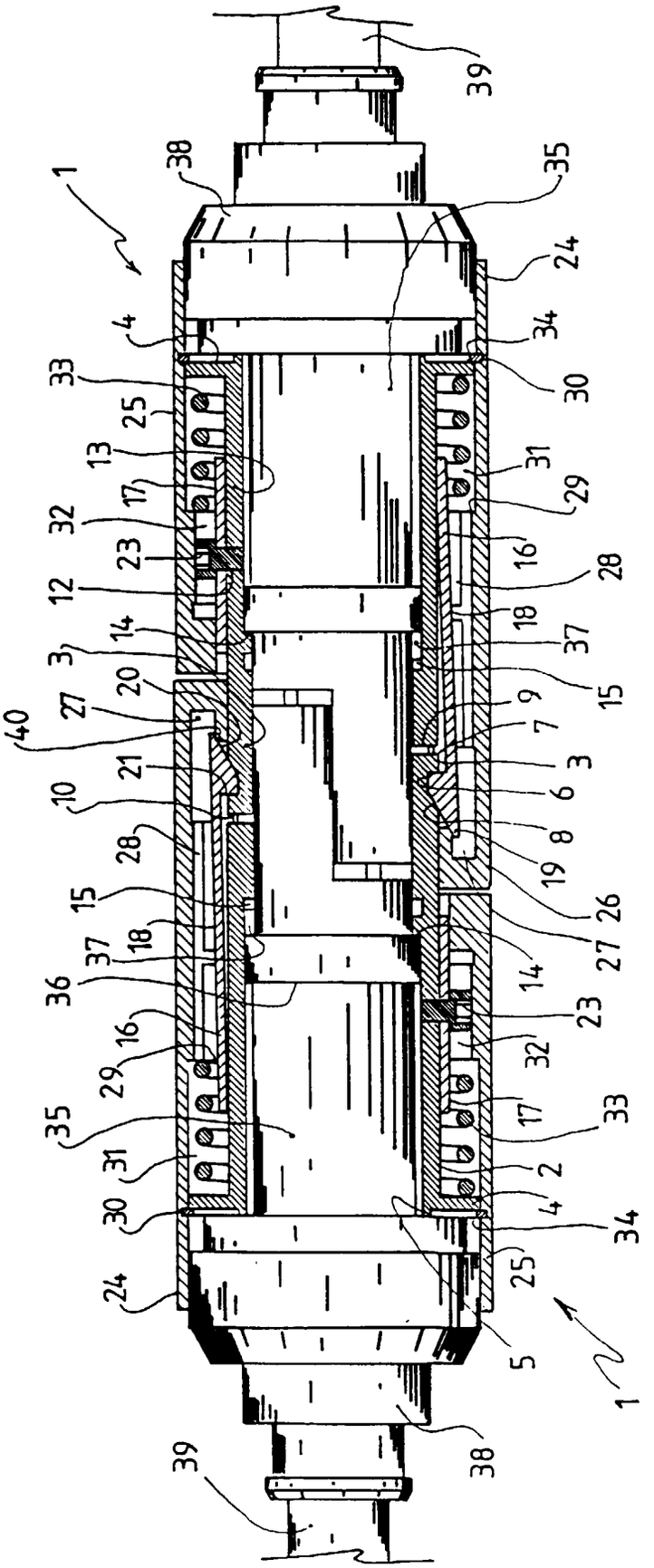
**5.** A connector system according to claim 3, wherein a coil spring (33) is compressed between rear circular shoulder and an inner shoulder (29) of control sleeve (24).

**6.** A connector system according to any of claims 1 to 5, wherein said rearwardliy opened inner slot (27) of the control sleeve (24) is longitudinally rounded.

**7.** A connector system according to claim 6, wherein the rearwardly opened inner slot (27) follows the whole section of said second longitudinally protruding half-moon front portion (26).

**8.** A connector system according to any of claims 1 to 6, wherein said latch (19) is transversely rounded.

FIG. 1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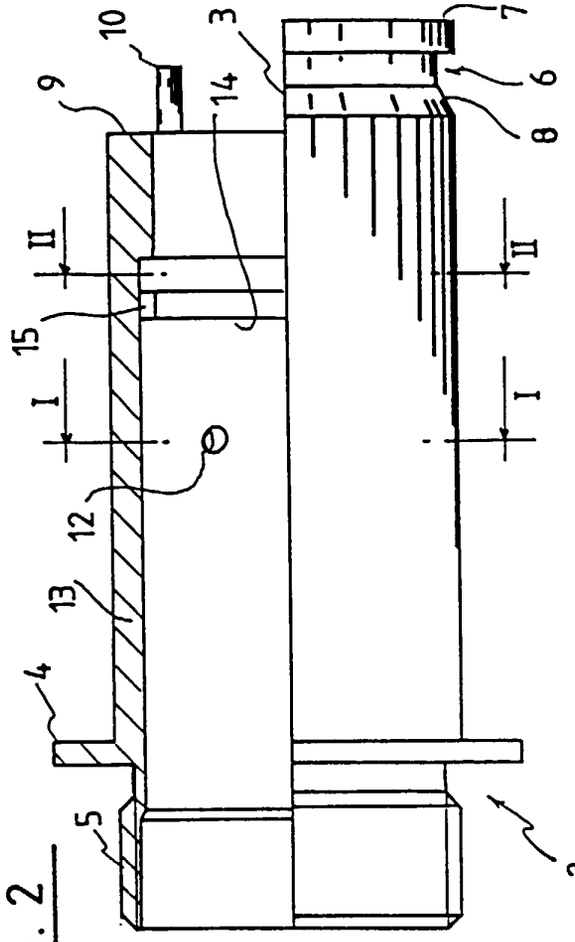


FIG. 2

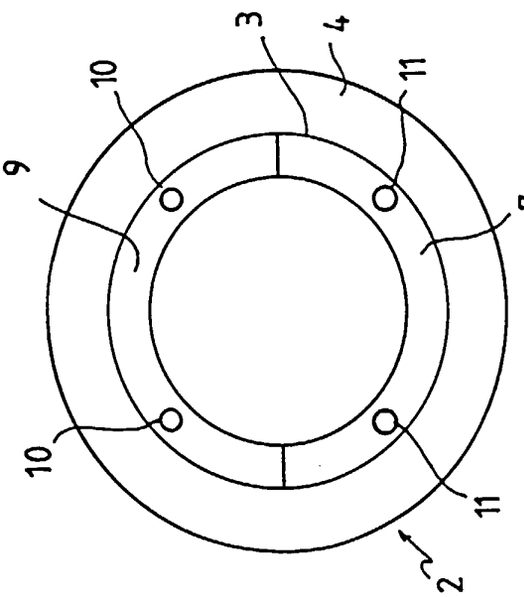


FIG. 3

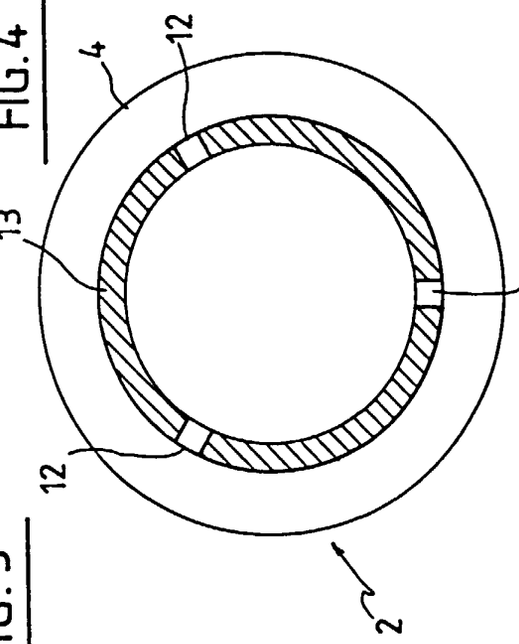


FIG. 4

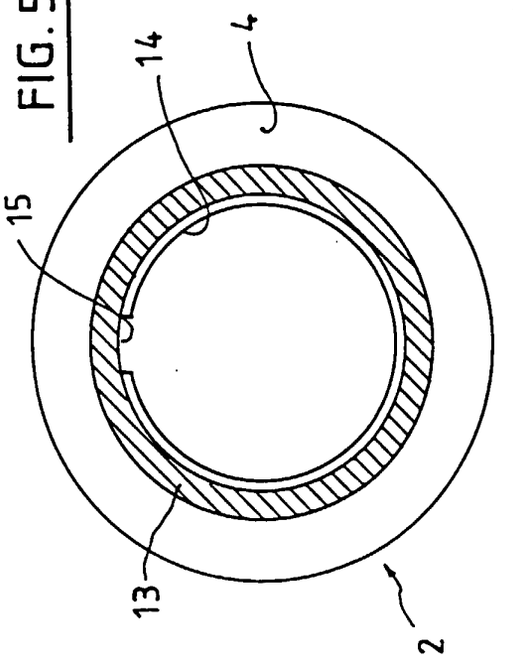


FIG. 5

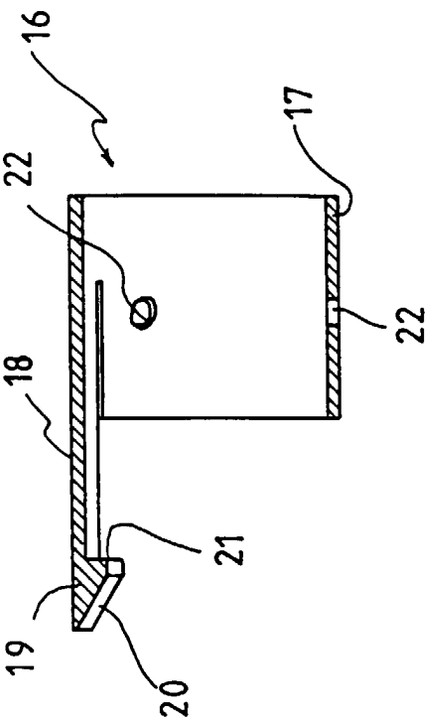


FIG. 6

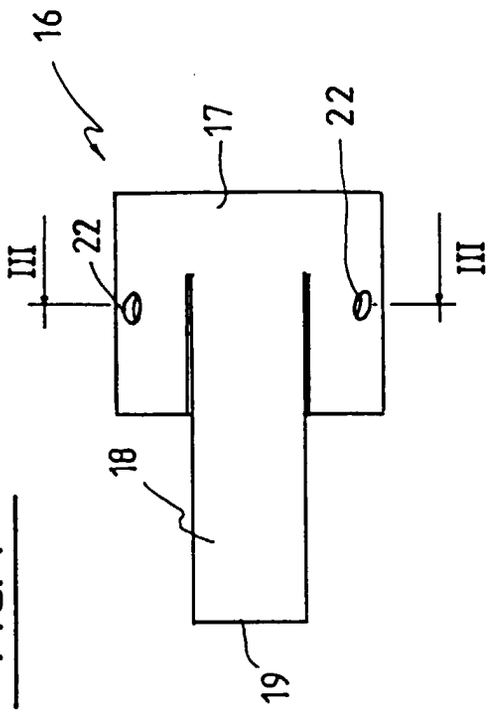


FIG. 7

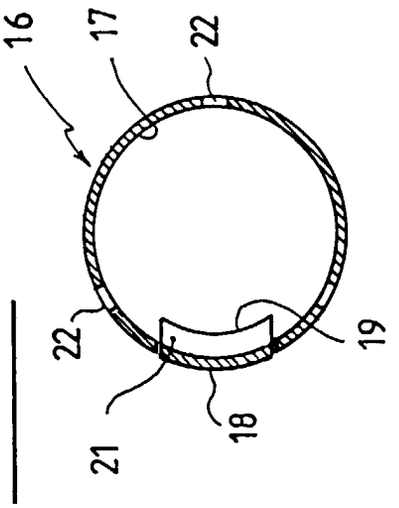


FIG. 8

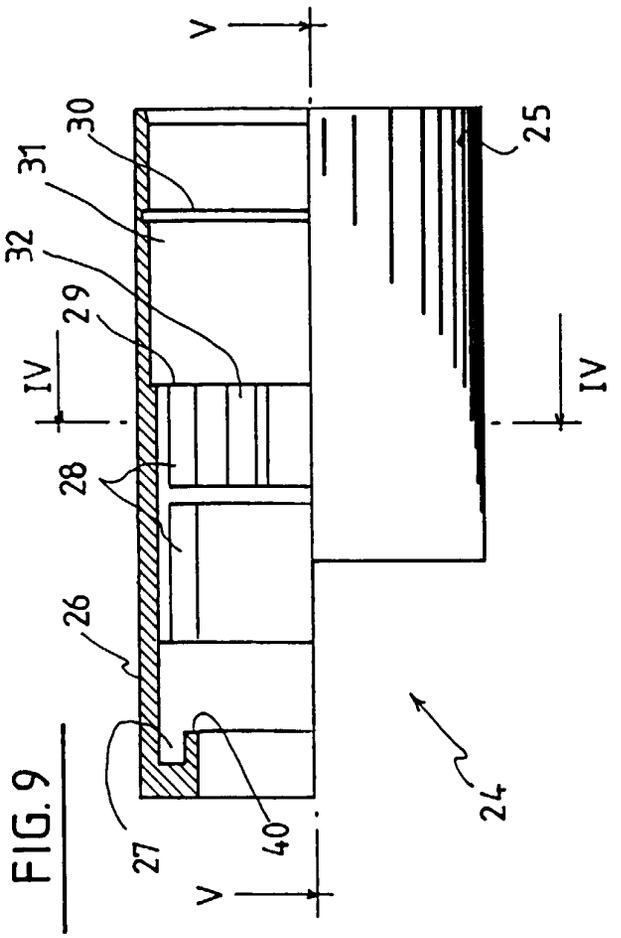


FIG. 9

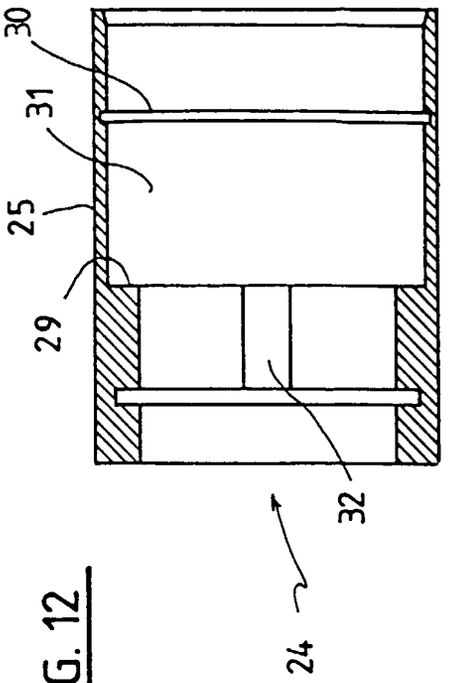


FIG. 12

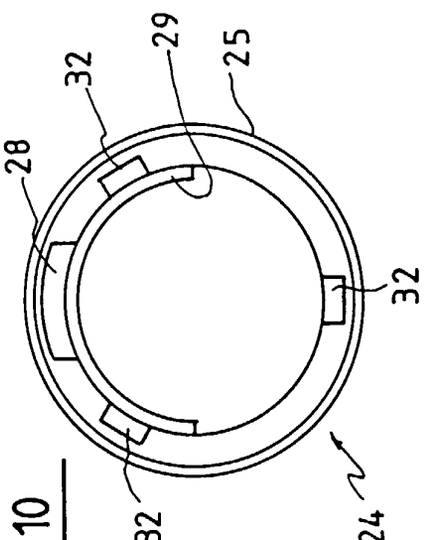


FIG. 10

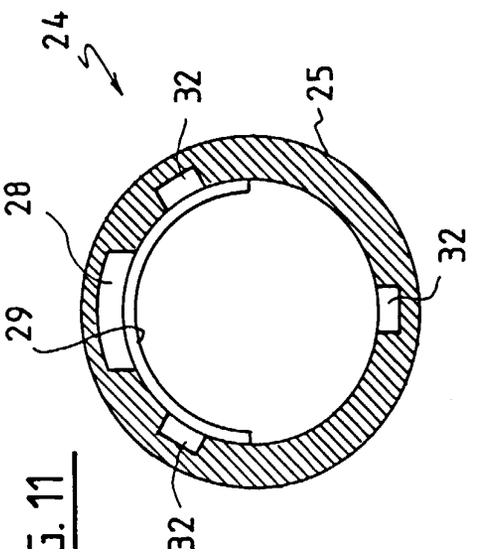


FIG. 11

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number
EP 99 11 2454

## 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.7) |
|---|---|---|---|
| D,Y | EP 0 875 959 A (INTERLEMO HOLDING SA) 4 November 1998 (1998-11-04) * the whole document * | 1,3,5-8 | H01R13/627 |
| Y | US 3 569 903 A (BRISHKA ALEXANDER R) 9 March 1971 (1971-03-09) * column 1, line 29 - column 2, line 26 * | 1,3,5-8 | |
| A | GB 1 339 801 A (BUNKER RAMO) 5 December 1973 (1973-12-05) * page 1, line 1 - page 3, line 25 * | 1 | |

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H01R

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 22 November 1999 | Demol, S |

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 11 2454

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22-11-1999

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| EP 0875959 A | 04-11-1998 | AU 7521798 A<br>WO 9849753 A | 24-11-1998<br>05-11-1998 |
| US 3569903 A | 09-03-1971 | NONE | |
| GB 1339801 A | 05-12-1973 | NONE | |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82