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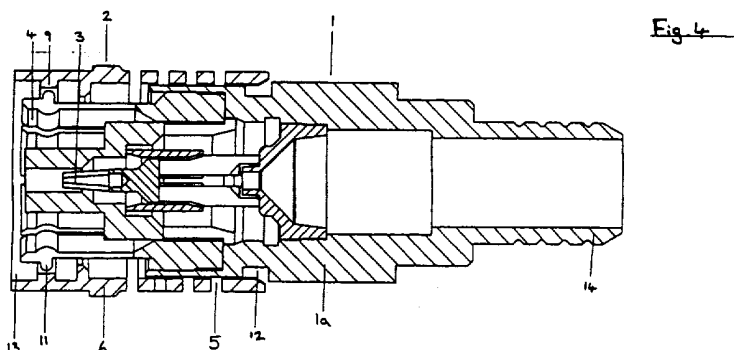
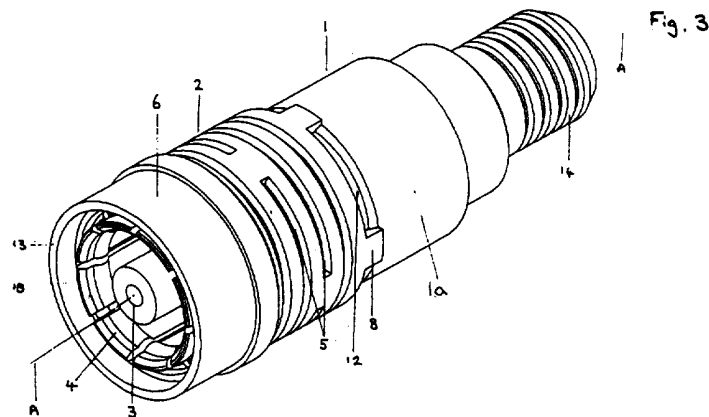
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GB 2300768 A **EP 0227288 A2** **EP 0105810 A2**
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(54) Abstract Title

Connector locking mechanism

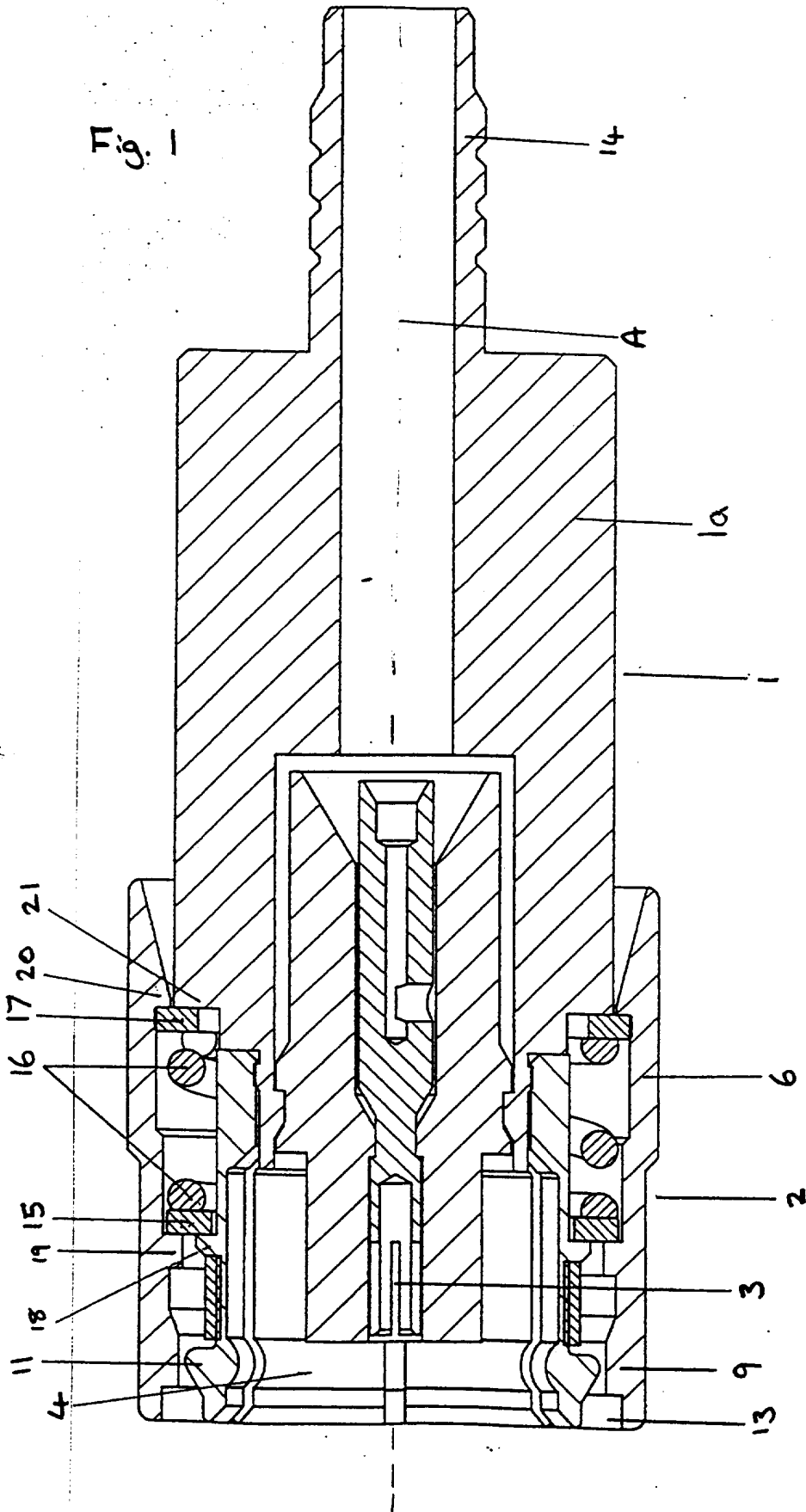
(57) A connector (1) including a contact (3) for connecting to a mating half and a locking element (2), the locking element (2) having a locked position preventing connection or disconnection of the contact (3) with the mating half and an unlocked position preventing connection or disconnection, wherein transition between the locked and unlocked positions is governed by a spring means (5) formed as an integral part of the locking element (2), the spring means (5) being unbiased when the locking element (2) is in the locked position. In the embodiment, an internal ring (9) of the locking element prevents latch arms (4) from moving. The spring means may be formed as a slotted body portion.



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Fig. 1



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Fig. 3

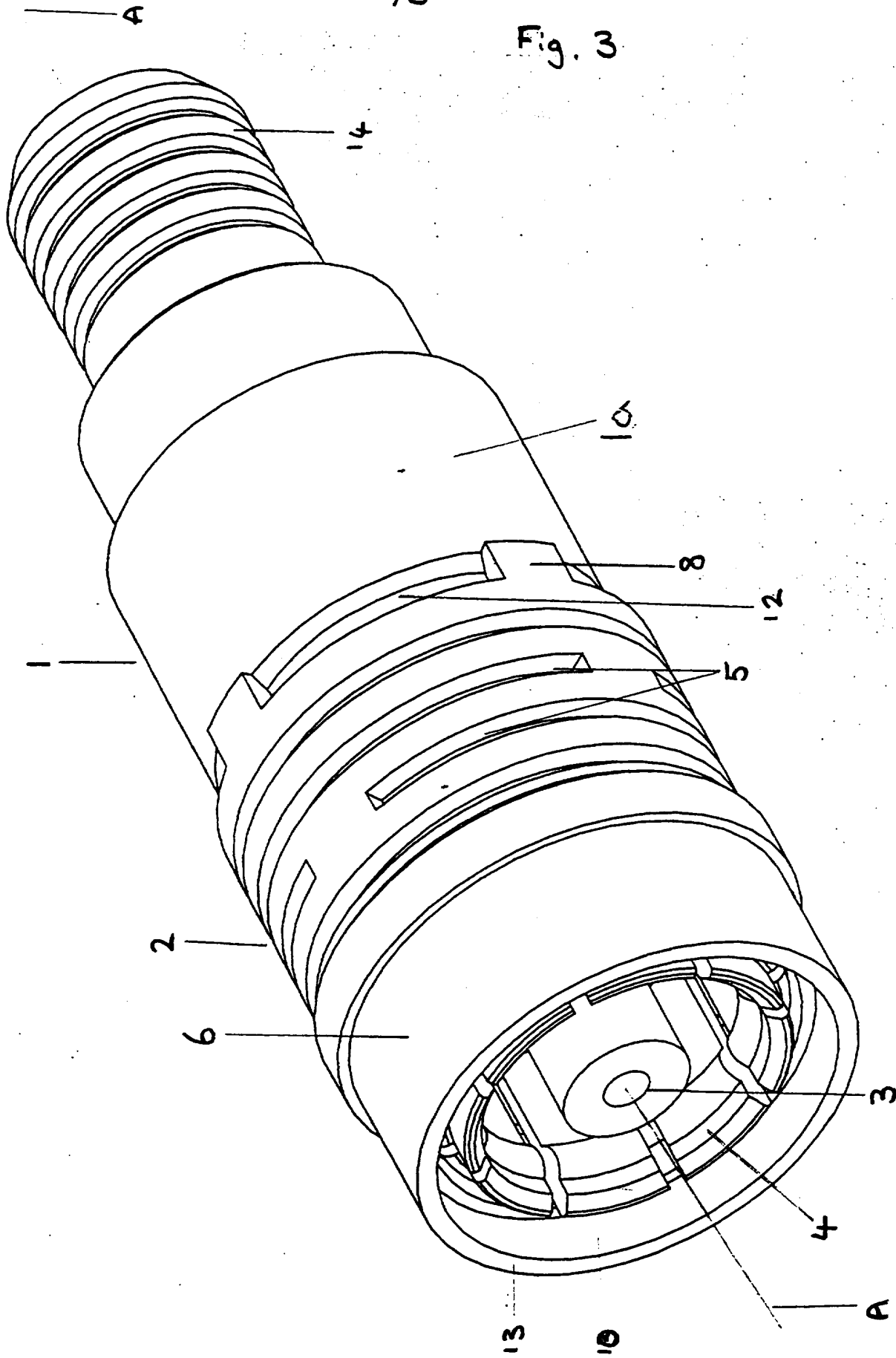
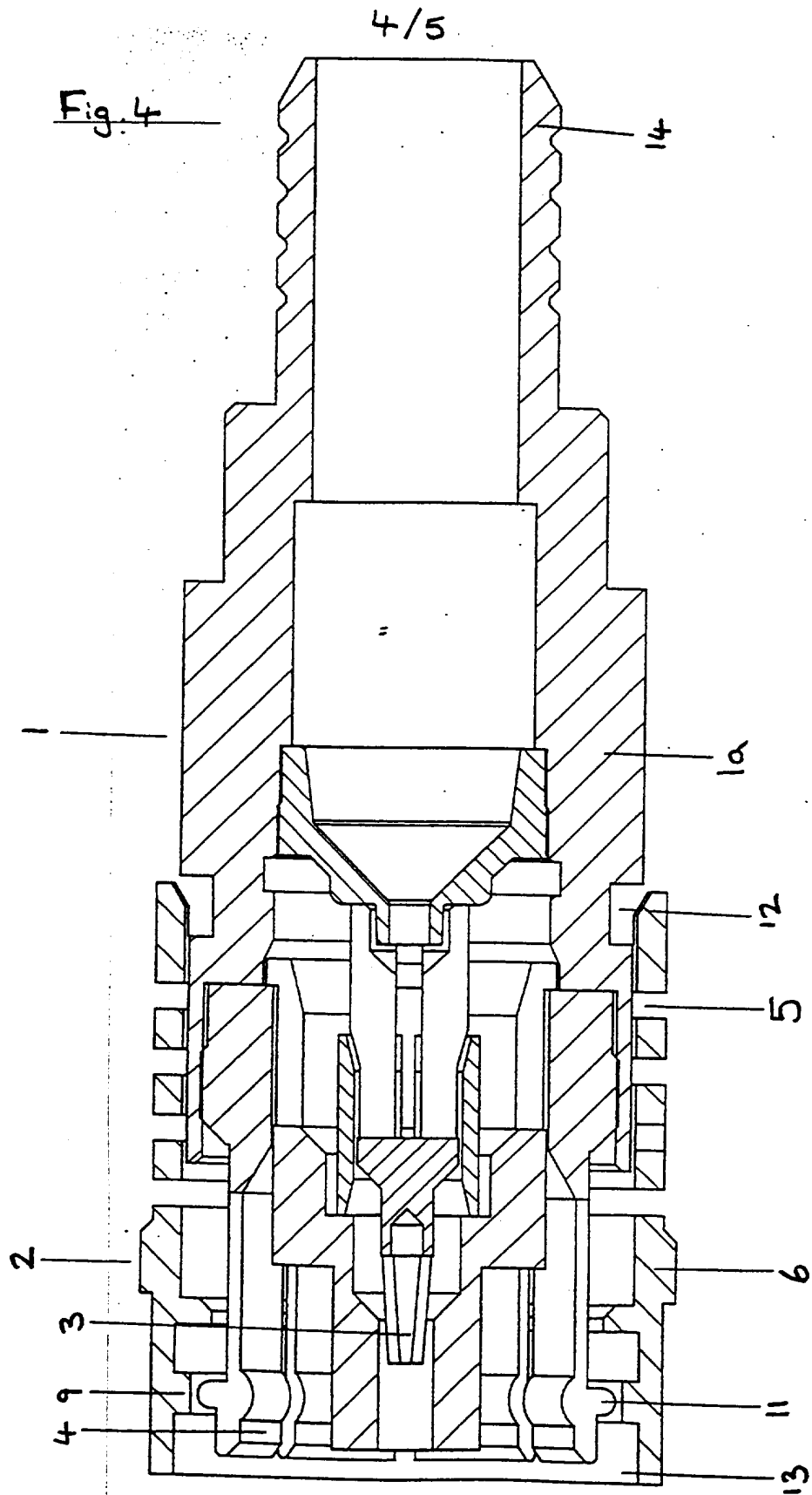
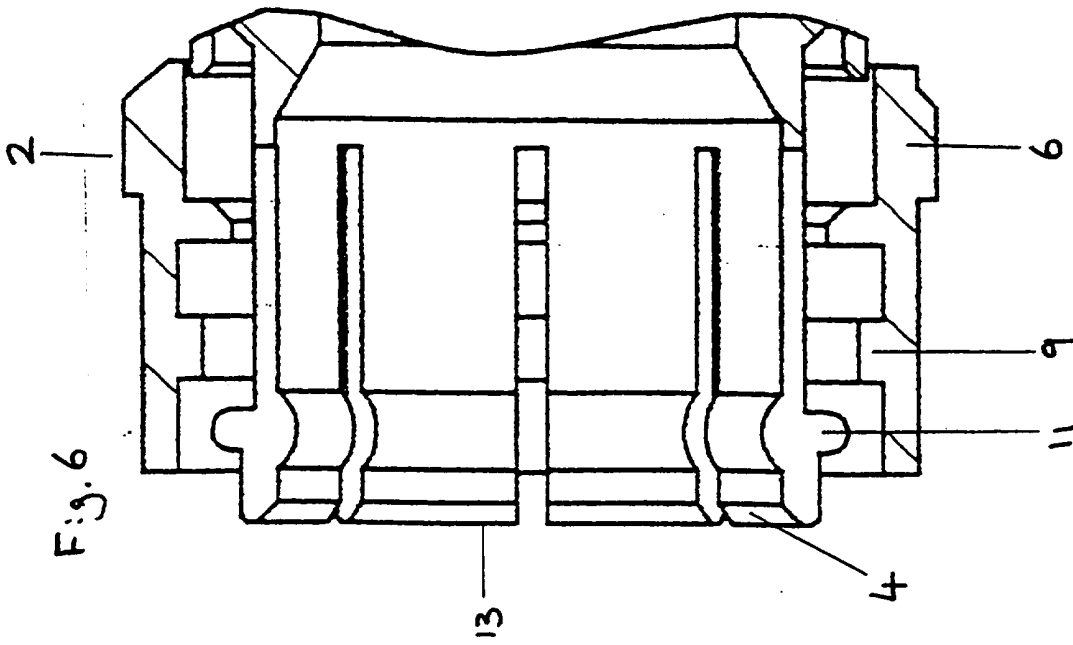
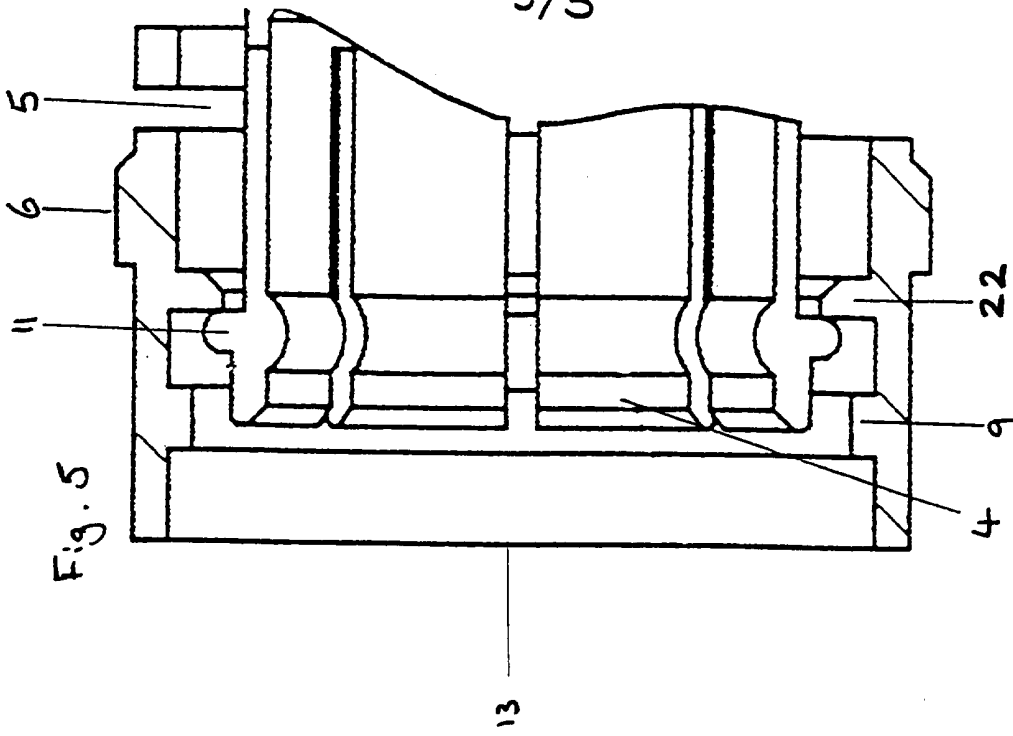


Fig. 4



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Connector Locking Mechanism

This invention relates to connector having a locking element and more particularly but not solely to a cable connector.

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Connectors used to releasably couple a cable to a piece of equipment or two cables together are well known, one such example is a standard coaxial cable connector where a cylindrical cable end connector has a diameter that fits flushly into an appliance end connector that comprises a hollow cylinder with a similar internal
10 shape but a larger diameter. Coupling two such connectors together is performed by sliding the cable end connector into the cavity defined by the larger appliance end piece.

Where accidental disconnection of a connector-connector joint is to be prevented, for
15 example where the connection is in an easily accessible position such as running across an office floor or where disconnection would prove costly or dangerous (data communications, control systems ,etc), a form of locking mechanism is needed.

In the prior art, shown in figure 1, a coaxial connector (1) includes a locking
20 mechanism (2). The locking mechanism comprises a sleeve (6) fitted around a body (1a) of the connector (1), the sleeve (6) being able to slide along the connection-cable axis (A) around the connector (1). Disposed between the sleeve(6) and the body (1a), a coiled spring (16) is held between two washers (15,17). The washers (15,17) are retained in place by shoulders (19,20) positioned on the inner surface of

the sleeve (6) and shoulders (18,21) on the outer surface of the body (1a).

The sliding of the sleeve (6) along the axis A is controlled by the spring (16), shoulders (18-21) and washers (15,17). If a force is exerted on the sleeve (6) along axis A
5 towards a cable end (14) of the body (1a), one or more sleeve shoulders (19) are pressed against the first washer (15) in the direction of the cable end (14) along axis A. This force is transferred via the spring (16) to the second washer (17). The second washer (17) is held in place against the force exerted by the spring (16) by connector shoulders (21), thus the spring (16) is compressed along the axis A and the sleeve (6)
10 moves along the same axis in the direction of the cable end (14) of the connector (1). When the force exerted on the sleeve (6) is released, the potential energy stored in the spring (16) due to its compression is released, forcing the first washer (15) and therefore the sleeve (6) back to its neutral position. An equal action and reaction occurs if a force is exerted on the sleeve (6) along axis A towards a mating end (13) of the
15 connector (1) due to the symmetrical configuration of the spring (16), washers (15,17) and shoulders (18-21).

A plurality of tines (4) form a mating means of the connector (1). The tines (4) are positioned such that they form a cavity of the same shape as the other mating half, but
20 the diameter of the cavity is slightly smaller than that of the other mating half. An example of a mating half is shown in figure 2. The mating half has a mating end (30) and a cable end (31). The mating half has an external radial groove (32) for receiving an inwardly projecting portion of protuberances (11) of the tines (4). When the two connector halves are mated together, the tines (4) are forced outwards due to the

insertion of the other mating half. Once the two mating halves are connected together, the tines (4) become situated around the mating end (30) of the mating half allowing the protuberance (11) of the tines (4) to spring into the groove (32). The sleeve (6) has a blocking portion (9) which prevents the expansion of the tines (4) when the sleeve (6) is in its neutral position due to blocking of the protuberance (11), preventing mating or disconnection. Moving the sleeve (6) in to a position towards the cable end (14) or the mating end (13) of the connector (1) along axis A allows the mating or disconnection of the two mating halves since the blocking portion (9) is no longer situated adjacent an outwardly projecting portion of the protuberance (11) around the tines (4), and no longer preventing their expansion.

Mating and disconnection of the connector (1) is possible when the sleeve (6) is moved against the spring bias either towards the cable end (14) or towards the mating end (13) of the body (1a). Movement of the sleeve (6) in both directions is permitted as it has been found that during connection it is easier to hold the sleeve (6) in position towards the mating end (13) of the connector (1), whilst during disconnection it is easier to hold the sleeve (6) in a position towards the cable end (14).

The present invention seeks to reduce the part count of the previously mentioned locking mechanisms for connectors and may simplify and/or reduce the cost of their manufacture.

According to the invention there is provided a connector including a contact for connecting to a mating half and a locking element, the locking element having a locked

position preventing connection or disconnection of the contact with the mating half and an unlocked position permitting connection or disconnection, wherein transition between the locked and unlocked positions is governed by a spring means formed as an integral part of the locking element, the spring means being unbiased when the locking element is in the locked position.

The locking element may be slotted to form the spring means. A plurality of parallel slots may be provided in the locking element to form the spring means. the slots may be mutually spaced apart along the locking element with their ends overlapping and may be parallel to a mating end of the connector. Alternatively the element may be helically slotted.

The locking element may be formed by a sleeve which may be cylindrical.

The locking element may comprise a body which is resiliently compressible to provide the spring means. The body may be corrugated to permit resilient compression.

In one advantageous refinement of the invention the contact includes a plurality of tines that expand during the connection and disconnection of the mating half and the locking element includes means for preventing the expansion of the tines.

The locking element may have a first unlocked position towards a mating end of the connector and a second unlocked position away from a mating end of the connector, the locked position being between the two unlocked positions.

The connector may be a coaxial connector.

In order that the invention and its various other preferred features may be understood more easily an embodiment thereof will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is an axial cross sectional view of a coaxial connector with a locking mechanism known from the prior art and as previously described,

Figure 2 is a side elevational view of an opposite mating half,

Figure 3 is a perspective view of an embodiment of the present invention,

Figure 4 is a cross sectional view of part of the embodiment of Figure 3 taken through axis A, where the connector is in its neutral locked position,

Figure 5 is a simplified cross sectional view of part of the embodiment of Figure 3 taken through axis A where the connector is in an unlocked position with the sleeve in a position towards the mating end of the connector, and

Figure 6 is a simplified cross sectional view of part of the embodiment of Figure 3 taken through axis A where the connector is an unlocked position with the sleeve in a position towards the cable end of the connector.

Throughout the figures, the same reference numerals are used for similar parts.

With reference to figures 3 and 4, there is shown a connector (1) with a mating end (13) and a cable end (14), the connector (1) having a locking element (2) in the form of a sleeve (6). The sleeve (6) is located around a female contact (3), the contact (3) being adapted for electrical connection to a male contact such as may be incorporated in a mating half, as shown in figure 2. A plurality of tines (4) define an outer contact. The sleeve (6) has a spring means in the form of number of slots (5) extending circumferentially in the connector body. The slots (5) extend most of the way around the sleeve and are disposed such that their ends are in spaced overlapping disposition with one or more adjacent slots so that the sleeve (6) can be extended or compressed along the axis (A). When the spring means is neither extended nor compressed, that is unbiased, the locking element is in a locked position. The sleeve (6) is attached to the body of the connector (1a) by a plurality of clips (8) that engage to a groove (12) in the body of the connector (1a). The sleeve (6) has a blocking member (9) similar to that of figures 1 and 2 on its internal surface (10).

Similarly to figures 1 and 2, the tines (4) have protuberances (11) on their outer surfaces that align with blocking portion (9) of the locking element (2) when the spring means is neither extended nor compressed, that is, it is unbiased. In this situation, the blocking member (9) prevents the tines expanding to allow the insertion of a mating half, hence the locking element is in a locked position.

By extending or compressing the spring means, by sliding the sleeve (6), as is shown

in figures 5 and 6 respectively, the blocking portion (9) is moved out of alignment with the protuberances (11) of the tines (4). In this situation, the tines are allowed to expand permitting the insertion of a mating half, hence the locking element is in an unlocked position. As the locking element (2) must be biased into an unlocked position, once the
5 biasing force is released, the spring means forces the locking element (2) to return to the locked position. A shoulder (22) on the internal surface of the sleeve (6) prevents the locking element being over-extended which could possibly damage the spring means. Such an over-extension is prevented since the path of the shoulder (22) is blocked by the protuberances (11) of the tines (4), as is shown in figure 5.

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Although the invention has been described with reference to coaxial connectors, it could equally be applied to other connectors requiring a locking mechanism. Equally, the invention should not be restricted to cylindrical connectors. For example connectors having a rectangular or polygonal cross section could have a sleeve formed around them
15 and hence could employ the features of the invention. The spring means of the embodiments is formed by a plurality of parallel slots provided in the sleeve. Other forms of spring means within the intended scope of the present invention could include helical slots or slots inclined relative to a radial plane through the connector. Alternatively the body of the sleeve could itself be resiliently compressible by being
20 corrugated or formed from a resiliently flexible material such as rubber.

Claims

1. A connector including a contact for connecting to a mating half and a locking element, the locking element having a locked position permitting connection or disconnection of the contact with the mating half and an unlocked position permitting
5 connection or disconnection, wherein transition between the locked and unlocked positions is governed by a spring means formed as an integral part of the locking element, the spring means being unbiased when the locking element is in the locked position.
- 10 2. A connector as claimed in claim 1, wherein the locking element is slotted to form the spring means.
3. A connector as claimed in claims 1 or 2, wherein a plurality of parallel slots are provided in the locking element to form the spring means.
- 15 4. A connector as claimed in claim 3, wherein the slots are mutually spaced apart along the locking element with their ends overlapping.
5. A connector as claimed in claim 3 or 4, wherein the slots extend parallel to a
20 mating end of the connector.
6. A connector as claimed in claim 2, wherein the element is helically slotted.
7. A connector as claimed in any one of the preceding claims, wherein the locking

element is formed by a sleeve.

8. A connector as claimed in claim 7, wherein the sleeve is cylindrical.

5 9. A connector as claimed in claim 1, wherein the locking element comprises a body which is resiliently compressible to provide the spring means.

10. A connector as claimed in claim 9, wherein the body is corrugated to permit resilient compression.

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11. A connector as claimed in any one of the preceding claims, wherein the contact includes a plurality of tines that expand during the connection and disconnection of the mating half and the locking element includes means for preventing the expansion of the tines.

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12. A connector as claimed in any one of the preceding claims, wherein the locking element has a first unlocked position towards a mating end of the connector and a second unlocked position away from a mating end of the connector, the locked position being between the two unlocked positions.

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13. A connector as claimed in any one of the previous claims, wherein the contact is adapted for connection to a coaxial connector.

14. A connector substantially as herein described with reference to figures 3 to 6 of

the accompanying drawings.



Application No: GB 9706540.3
Claims searched: 1 to 14

Examiner: F J Fee
Date of search: 20 May 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.O): H2E [ECCD]
Int Cl (Ed.6): H01R
Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2300768 A [INTERCONNECTION]	1-4, 6-9, 11, 12
X	EP 0227288 A2 [G.M.] each arm 53 forms spring means of member 52 and is separated from the body of the member by a slot	1, 2, 3, 9
X	EP 0105810 A2 [BENDIX] resilient arm 160 forms spring means of a locking member separated from the body of the member by slot 144	1, 2, 6, 9, 13
X	US 5445534 [ISHIZUMA] locking element 30 prevents latches 26 from being depressed: note apparently resilient engagement of barbs D by the element 30	1, 7, 8, 11
X	US 5211572 [COMSTOCK] spring means 36 on member 22 prevents operation of latch 20	1, 2, 9

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.