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(54) Bayonet connector.

(57) A bayonet connector includes a part (1) having grooves (2) which receive cams (13a, 13b, 13c ; 14a, 14b, 14c) respectively on a member (10) and a locking ring (11) forming the other part of the bayonet connector. Member (10) can be rotated relative to ring (11) to align the cams (13, 14) so that the parts can be fitted together. Member (10) is then rotated so as to space cams (13) from cams (14) which makes the bayonet connection. This causes lugs (17a, 17b, 17c) to be aligned so that a wire seal (27, 28) can be applied to secure the parts together.

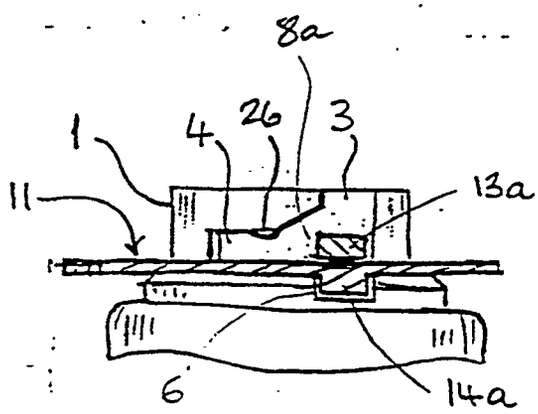

Fig 10

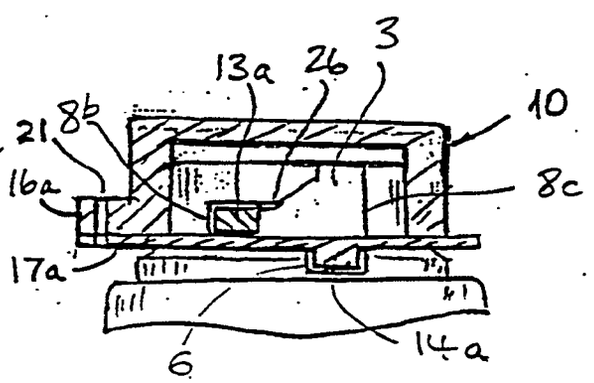

Fig. 11

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This invention relates to a bayonet connector which can be used, for example, in joining an electrical plug and socket. However, it may be used for other purposes, e.g. joining hoses.

In the field of vehicle tachographs, it is customary to provide a sensor on a vehicle gearbox which generates electrical pulses that are supplied, by a cable, to the tachograph itself where the pulses are processed in order to cause speed and distance traces to be drawn on a recording chart. The sensor includes a head which is fitted to a gearbox on the vehicle. An electrical plug and socket connects the head to the cable, the plug and socket being suitably coupled by means of a releasable coupling, such as a bayonet connector. This enables the components to be readily installed and maintained. However, in order to counteract a problem that the coupling may be disconnected by a dishonest driver of the vehicle, in order to prevent the tachograph from recording speed and distance traces, the bayonet connector is also secured in its connected state, so that disconnection is impossible without breaking a component or a seal which would thereby indicate that some abuse has occurred.

The present invention seeks to provide an effective lockable bayonet connector which can be more cheaply and easily mass produced.

In accordance with the invention, a bayonet connector comprises:

a first part including a member having at least one cam track,

a second part including a member having at least one cam for engaging the cam track, the first and second members being connectable to make a bayonet connection, and

a securing ring attached to the second member so that the second member is capable of independent rotation relative to the securing ring, the second member being rotatable between a releasing position, (where the first and second members can be disconnected) and a securing position, (where the first and second members are secured together), the securing ring having a cam or cams corresponding with the cam or cams on the second member, the arrangement being such that corresponding cams can be aligned when the second member is in its releasing position, and that said corresponding cams can be spaced apart when the second member is in its securing position; the first member having stops to limit the latter spacing and the second member and the securing ring having fastening means which cooperate to enable the second member to be secured in its securing position after said cams abut said stops and the bayonet connection has been made.

The second cylindrical member and the securing ring can both be made of plastics, e.g. such as nylon, which is strong and resilient, and can be easily moulded. Preferably, the securing ring is attached to the second member by snap connecting means. For example, the second member may have an internal circumferential shoulder and the securing ring may have a plurality of resilient axial catches such as cantilevered arms with hooked portions at their free ends. These arms first flex to enable the locking ring to be fitted to the second member and the hooked portions then snap into position on the shoulder to retain the securing ring on the second member. Preferably, resilient means on the second member, such as integral arcuate portions overlying the shoulder, assist in securing the snap engagement of the axial catches on the shoulder. At least the preferred arrangement has the advantage that the securing ring can be quickly snap fitted into the second member to form an assembly which is part of a bayonet connector.

Rotation of the second member relative to the securing ring spaces the cams apart so that they engage respective spaced stops on the cam track. These stops may be defined by portions of a groove forming the cam track. Whilst this relative rotation makes the bayonet connection, the fastening means on the second member and on the securing ring additionally enable these two components to be securely fastened together thereby peventing reverse relative rotation which would otherwise enable the first and second members to be disconnected. Such fastening means may be constructed so that elements, such as apertured lugs, are aligned on both the second member and the securing ring when the second member is in its securing position. This enables a wire to be passed through the apertured lugs and secured to a seal.

Other fastening means may be employed to ensure that the second member and the securing ring cooperate to enable the second member to be fastened in its securing position. Such means may be provided, for example, on the interior of the second member, e.g. where a cam or catch moves into a locking position when the second member is turned into its securing position. Such fastening means may not be accessible from the exterior. In this case, the fastening means may be released, for example, by breaking the cam, catch or a frangible stop or by drilling the connector to remove such components or by removing a seal to gain access, all of which indicate that an abuse has occurred.

An example of the invention will now be described with reference to the accompanying Drawings in which:

Figs. 1-4 represent top plan, side elevation, underside and partly sectioned elevational views respective of a member forming part of a bayonet connector,

Figs. 5-7 represent similar views of a securing ring also forming the same part of the bayonet connector,

Fig. 8 is a view, in perspective, of a portion of the

latter part,

Fig. 9 is a side elevation of the other part of the bayonet connector showing a cam track,

Figs. 10-13 schematically illustrate releasing and securing positions of the second member relative to the securing ring and the cam track, and

Fig. 14 shows a detail of member 10 with a modification.

Referring first to Fig. 9 of the accompanying drawings, a first cylindrical member 1 which is part of a plastics electrical socket, is provided with three cam tracks 2 (only one of which is visible). Each cam track 2 has an axially directed portion 3 and a circumferentially directed portion 4. Axial portion 3 has an open end 5 and a closed end 6 in the form of a shallow recess in a shoulder portion 7 of member 1. Circumferential portion 4 has an open end 8a and a closed end 8b. A chamfered portion 9 acts as a ramp to facilitate making the bayonet connection as will be described below.

The device illustrated in Fig. 9 is a sensing head which is fitted to the gearbox of a vehicle. As it is of generally known construction, no further details need be described (since only an understanding of the cam track 2 is necessary to the present invention).

Referring now to Figs. 1-8, second cylindrical member 10 and a securing ring 11 are assembled together, in use, to form a second part of the bayonet connection. The second member 10 has a generally cylindrical body 12 with three radially inwardly directed cams 13a, 13b and 13c. These cams are received initially by the open ends of the axial portions 3 of the grooves 2 (Fig. 9) and subsequently by circumferential portions 4 of the grooves 1 due to the push and twist fitting of member 19 on member 1. Chamfered portion 9 helps to guide cams 13a, 13b and 13c into the circumferential portions of the cam track thereby drawing members 1 and 10 more closely together, as member 10 is twisted relative to member 1.

Corresponding cams 14a, 14b and 14c extend radially inwardly of an annular disc shaped body 15 of the securing ring 11. These cams 14a, 14b and 14c, when aligned with cams 13a, 13b and 13c (as shown in Fig. 10) also enter the axial portion of the camming groove when the members 1 and 10 are fitted together. However, cams 14a, 14b and 14c are retained in the recesses 6 so that when member 10 is twisted, only cams 13a, 13b and 13c rotate, relative to the stationary securing ring 11, into the circumferential portions 4 where they abut the closed ends 8b of the circumferential portions 4 of each groove 2 (Fig. 11). When the second member is in this "securing position", apertured lugs 16a, 16b, and 16c on member 10 are aligned with similar apertured lugs 17a, 17b and 17c on the securing ring 11 whereby a wire 27 can be passed through the apertures 21, and its ends can be twisted together and secured to, e.g. a crimped seal 28 as shown in Fig. 8. This wire 27 prevents relative rotation of a member 10 and securing ring 11 so that the bayonet connection is securely fastened. Only when the wire is cut and removed, can member 10 be twisted back to its "releasing position" where the aligned cams (13a, 14a in Fig. 10) can then be withdrawn through the axial portion 3 of the cam groove.

Securing ring 11 can be fitted to member 10 by first introducing the free ends of cantilevered arms 18a, 18b and 18c into the interior of member 10. Each free end of these arms terminates in a hooked portion 19a, 19b and 19c which has an inclined face that is guided by chamfered grooves 20a, 20b and 20c into the body 12 of member 10 when the securing ring 11 is fitted thereto. The arms 18a, 18b, and 18c therefore first flex inwardly as portins 19a, 19b, 19c ride over the corresponding grooved wall portion of the body 12 before they snap into position and thereby engage a circumferential shoulder 22 as shown in the part cross-sectional elevational view of the assembly shown in Fig. 4. (Fig. 4 has been simplified to show this engagement and not the cam 13a.) In order to ensure that the portions 19a, 19b and 19c stay engaged with the shoulder 22, the end of the body 12, shown in Fig. 3, has a generally annular disc-shaped flange 23 which extends radially inwardly and in which arcuate slots 24 are formed so that arcuate portions 25, opposite the slots, have a degree of resilience and thereby act as flexible stops against the terminal ends of portions 19a, 19b and 19c. Once the potions 19a, 19b, 19c have been engaged with the shoulder 22, it is not possible to remove the securing ring 11 from member 10 unless the arms 18a, 18b and 18c are forcibly deformed in order to enable the securing ring to be extracted from the inside of member 10. However, there is no way of deforming the arms 18a, 18b and 18c when the assembly of ring 11 and member 10 has been fitted to the other member of the bayonet connector (unless the bayonet connector is cut, or broken, or otherwise abused).

Fig. 9 also illustrates a small prominence or cam 26 on the side wall of the circumferentially directed groove portion 4 which provides a kind of over-centre action as the assembly of the securing ring 11 and member 10 is twisted relative to member 1 in order to make the bayonet connection. As the cams 13a, 13b and 13c move arcuately around the circumferential portions 4 of the groove 2, they engage with the respective prominences 26. The structure of member 10 (which may be made of nylon) is such as to enable some resilient deflection to occur as the cams 13a, 13b, 13c are rotated towards their final position where they abut the end walls 8 of the circumferential groove portions 4 which act as stops. The cams 13a, 13b, 13c therefore need to be squeezed into their final position whereby the final twisting action is-one which requires sufficient force to achieve the "securing position" of member 10, hence ensuring a tight fit of the member 10 when on member 1 when the bayonet connection

is made. The apertured lugs (16a, 17a in Fig. 10) are then aligned in order to enable the wire to be inserted and its ends sealed together. This ensures that the bayonet connection is securely fastened.

Figs. 10-13 schematically illustrate the relative position of the cams (13, 14) and the apertured lugs (16, 17) in releasing and securing positions of member 10. Only one pair of cams has been illustrated (in Figs. 10 and 11) to show the operation of the bayonet connector. Figs. 12 and 13 are also schematic underside views to show how the cams (13, 14) align (Fig. 12) and the lugs align (Fig. 13).

The member 10 and securing ring 11 may be made of nylon which is strong, durable and resilient. Member 1, which is of conventional construction can be made of an injection moulded plastics which has sufficient strength and rigidity.

The bayonet connector of the preferred embodiment is used to join an electrical plug and socket (not shown). In this case, a cable sleeve 30 (Fig. 9) having an outwardly directed circular flange (not shown) is fitted to member 10 before the securing ring 11 is snap fitted. However, the bayonet connector of the invention has other uses, for example, it can be used to connect hoses together.

Whilst the preferred embodiment employs apertured lugs (16, 17) for use with wires and seals, it is possible to employ other means for securing the two parts of the bayonet connector together. For example, a hidden detent or detents (not shown) within the body 12, may engage a stop surface or surfaces on the annular portion 15 of the ring 11 so that when member 10 is twisted, the detent or detents snap into position over the respective stop surfaces, when member 10 is in its securing position, thereby fastening member 10 to member 11. Such detents may be inaccessible so that member 10 must be cut, e.g. with a special tool, in order to release the connection. Alternatively, the detent or detents may be only accessible by a special tool, or after removing a special covering seal (not shown), in the body 12, so that the detents could be released whereby the parts of the bayonet fitting can be disconnected. Fig. 14 also shows a modification in the form of three recesses 31 (only one of which is shown) in member 10 which are provided to facilitate tooling so that a constant wall thickness can be maintained.

Claims

1. A bayonet connector comprising:

a first part including a first member (1) having at least one cam track (2),

a second part including a second member (10) having at least one cam (13) for engaging the cam track (2), the first and second members (1, 10) being connectable to make a bayonet connection, and

a securing ring (11) attached to the second member (10) so that the second member (10) is capable of independent rotation relative to the securing ring (11), the second member (10) being rotatable between a releasing position, where the first and second members (1, 10) can be disconnected, and a securing position, where the first and second members (1, 10) are secured together, the securing ring (11) having a cam or cams (14) corresponding with the cam or cams (13) on the second member (10), the arrangement being such that corresponding cams (13, 14) can be spaced apart when the second member (10) is in its securing position; the first member (1) having stops (8) to limit the latter spacing and the second member (10) and the securing ring (11) having fastening means (16, 17) which cooperate to enable the second member (10) to be secured in its securing position and the bayonet connection has been made.

2. A bayonet connection according to Claim 1 wherein the securing ring (11) is attached to the second member (10) by snap connecting means (18, 19, 22).

3. A bayonet connector according to Claim 1 or 2 wherein said fastening means (16, 17) enables a wire and/or seal (27, 28) to be applied which prevents relative rotation between the securing ring (11) and the second member (10) and thereby maintains the second member (10) in its securing position.

4. A bayonet connector according to Claim 3 wherein said fastening means (16, 17) comprises apertured lugs.

5. A bayonet connector according to any of the preceding Claims wherein the cam track on the first member is a groove having an axially directed portion (3) and a circumferentially directed portion (4) which each have an open end (5, 8a) and a closed end (6, 8b), the closed end (6) of the axially directed portion forming a recess and said stops being defined by the closed end (8b) of the circumferentially directed portion (4) and by a wall portion (8c) of the axially directed portion (3); and wherein the cams (13, 14) on the second member (10) and on the locking member (11) are both directed radially inwardly, said cams (13, 14) being received by the open end (5) of the axially directed portion (3) of the groove when the second member (10) is in its releasing position, the cam (14) on the securing ring (11) being received by the recess (6) in the axially directed portion (3) of the groove whereby the securing ring (11) is

prevented from rotating when the second member (10) is rotated relative thereto, the cam (13) on the second member (10) engaging the closed end (8b) of the circumferentially directed portion (4) of the groove when the second member (10) is in its securing position.

6. A bayonet connector according to Claim 5 wherein the circumferentially directed portion (4) of the groove includes a projecting surface (26) under which the cam (13) on the second member (10) is forcibly moved before reaching said securing position, the latter cam (13) and/or the structure of the second member (10) being sufficiently resilient to provide an over-center action before the second member (10) reaches its securing position.

7. A bayonet connector according to any preceding Claim wherein the second member (10) has an internal circumferential shoulder (22) and the securing ring (11) has a plurality of resilient axial catches (18, 19) which first flex to enable the securing ring (11) to be fitted to the second member (10) and then to snap into position on the shoulder (22) to retain the securing ring (11) on the second member (10).

8. A bayonet connector according to Claim 7 wherein the second member (10) includes resilient means (25) to assist in retaining the snap engagement of the axial catches (18, 19) on the shoulder (22).

9. A bayonet connector according to Claim 8 wherein said resilient means comprises integral arcuate portions (25) of the second member (10) which overlie the shoulder (22).

10. A bayonet connector according to Claim 8 and 9 wherein chamfered grooves (20) are provided in the second member (10) to facilitate flexing of said axial catches (18, 19) when the securing ring (11) is fitted to the second member (10).

11. A first part of a bayonet connector which is adapted to fit a second part of said connector, said second part comprising a cylindrical body (1) having an external surface on which are provided a plurality of camming grooves (3, 4), each groove having an axially directed portion (3) which communicates with a circumferentially directed portion (4), each of said portions (3, 4) having an open end (5, 8a) and a closed end (6, 8b), the closed end (6) of the axially directed portion (3) forming a recess, said first part of the bayonet connector comprising:

a generally hollow body (10) having

(a) a plurality of radially inwardly directed lugs (13a, 13b, 13c) to fit into the respective axially directed portions (3) of said groove, said lugs (13a, 13b, 13c) extending inwardly from an internal wall surface of said body, said internal wall surface also defining a circumferential shoulder (22),

(b) an integral annular inwardly directed flange (23) spaced from said shoulder (22), arcuate slots (24) being provided in said flange (23) to define flexible arcuate portions (25) overlying portions of said shoulder (22),

(c) a plurality of outwardly extending projections (16a, 16b, 16c), and

a securing ring (11) in the form of an annular disc (15) having

(d) a plurality of inwardly directed radial lugs (14a, 14b, 14c) corresponding with the lugs (13a, 13b, 13c) on the hollow body (10),

(e) a plurality of axially extending cantilevered arms (18a, 18b, 18c) terminating in hooked portions (19a, 19b, 19c), the securing ring (11) being fitted to the hollow body (10) by first inserting the cantilevered arms (18a, 18b, 18c), which then flex so that the hooked portions (19a, 19b, 19c) ride over the interior wall surface (20) of the hollow body (10) and then engage with shoulder (22), said arcuate portions (25) resiliently urging said hooked portions (19a, 19b, 19c) into contact with said shoulder (22), and

(f) a plurality of outwardly extending projections (17a, 17b, 17c) corresponding with the projections (16a, 16b, 16c) on said hollow body (10) to enable corresponding pairs of said projections (16, 17) to be fastened together.

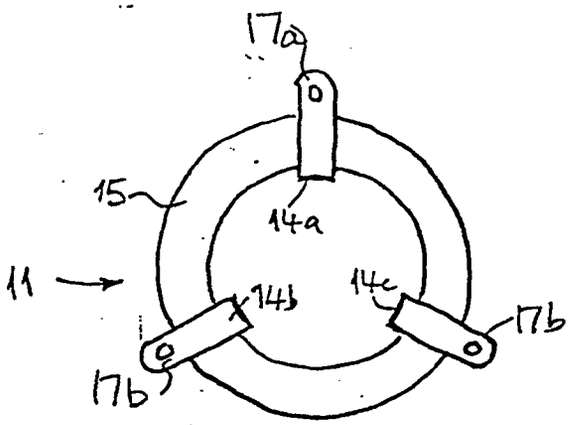

FIG. 5

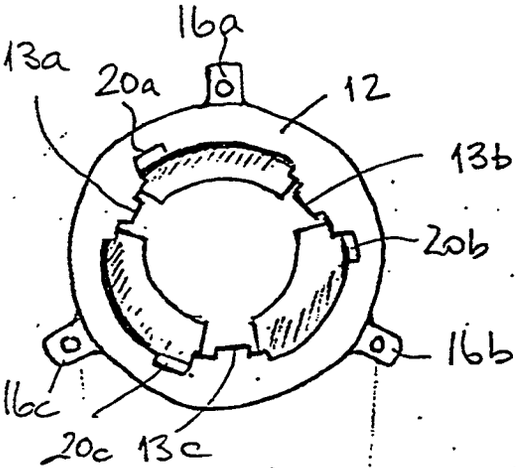

FIG. 1

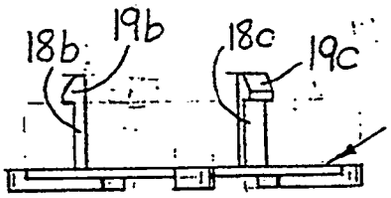

FIG. 6

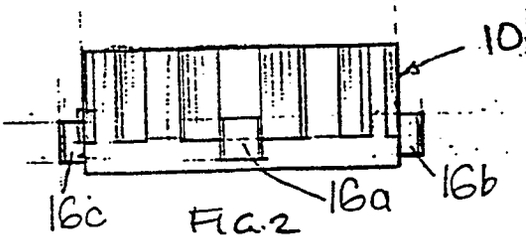

FIG. 2

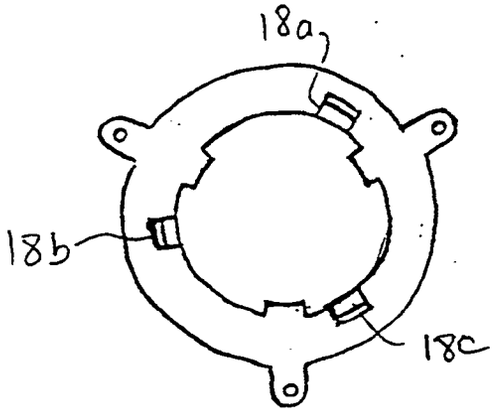

FIG. 7.

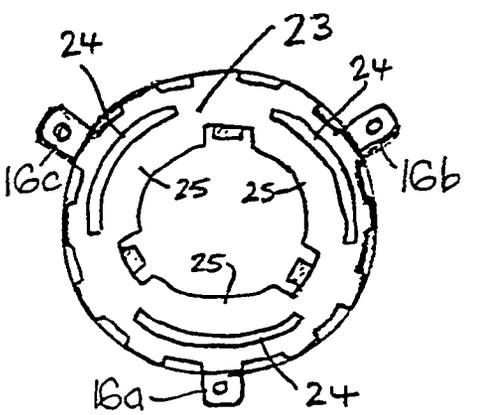

FIG. 3.

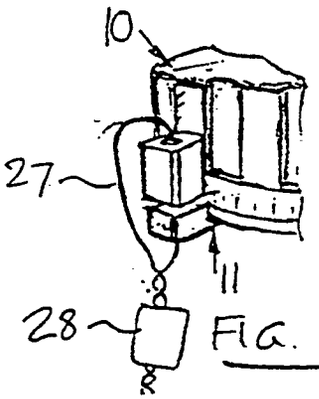

FIG. 8

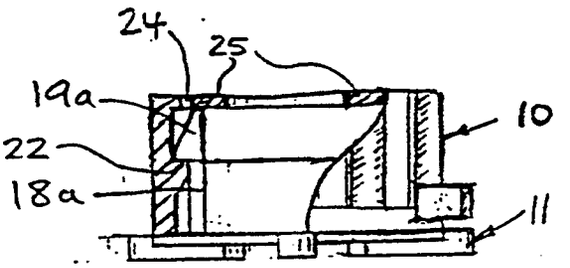

FIG. 4

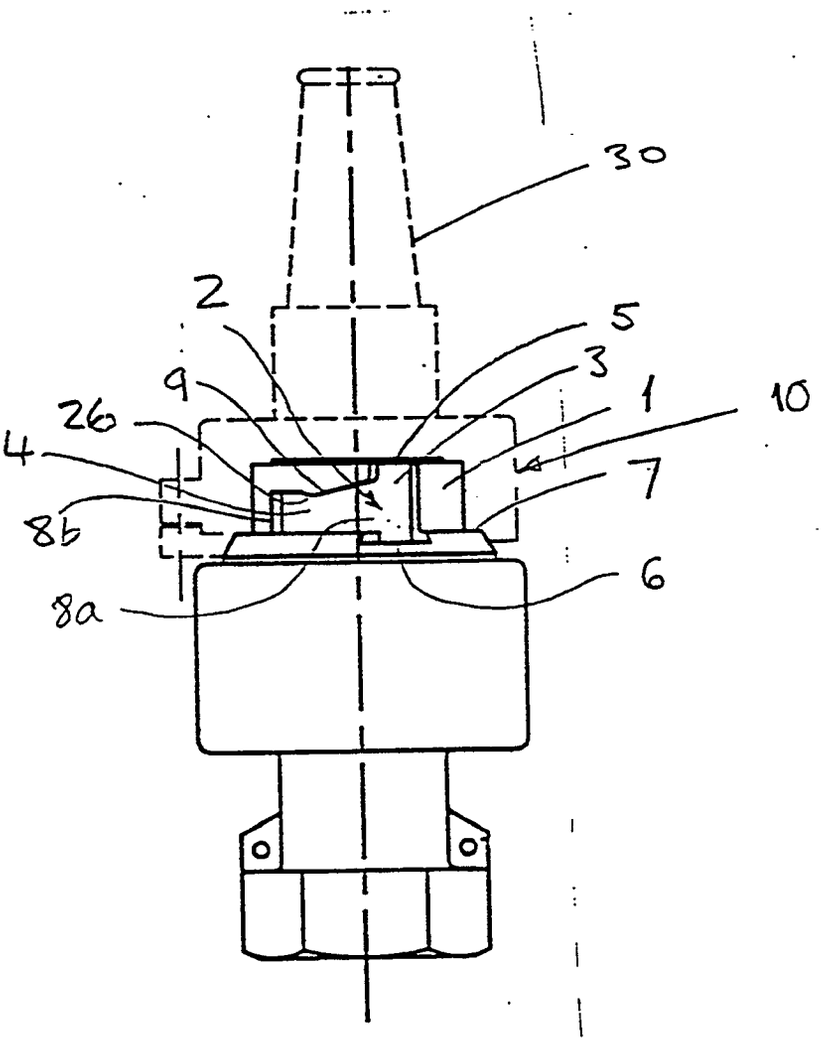

FIG. 9

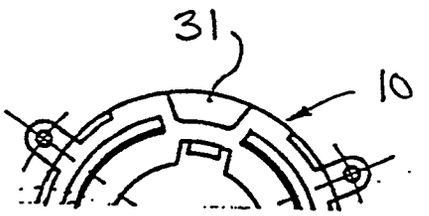

FIG 14

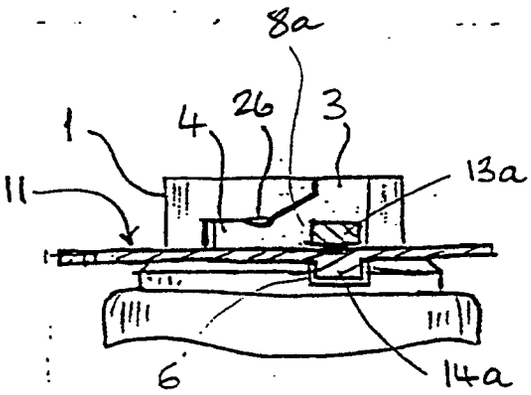

FIG 10

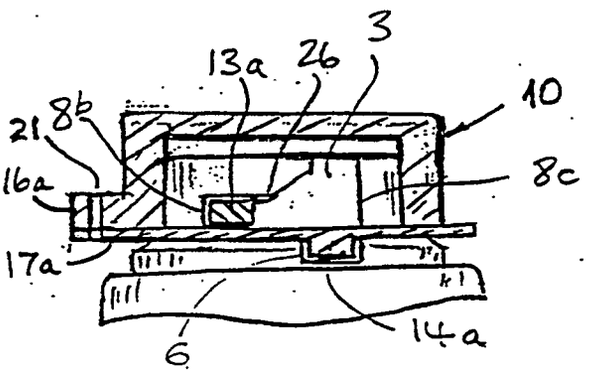

FIG. 11

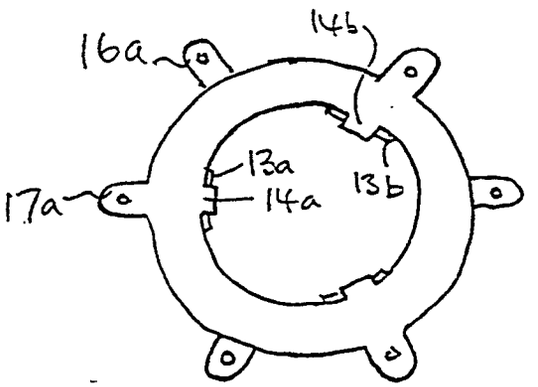

FIG 12

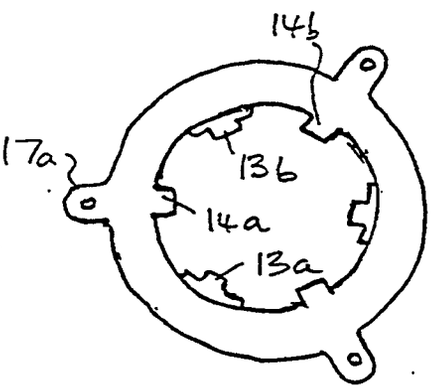

FIG. 13

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 4265

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.5)
A	EP-A-324104 (MANNESMANN KIENZLE GMBH) * column 3, line 52 - column 4, line 11; figures 1, 2 *	1, 11	H01R13/625
A	DE-A-1947344 (AMP) * pages 4 - 8; figures 1-5 *	1, 11	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H01R
F16B
F16L

- The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	23 AUGUST 1991	CLOSA, D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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P : intermediate document

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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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EPO FORM 1503 03.82 (P0401)