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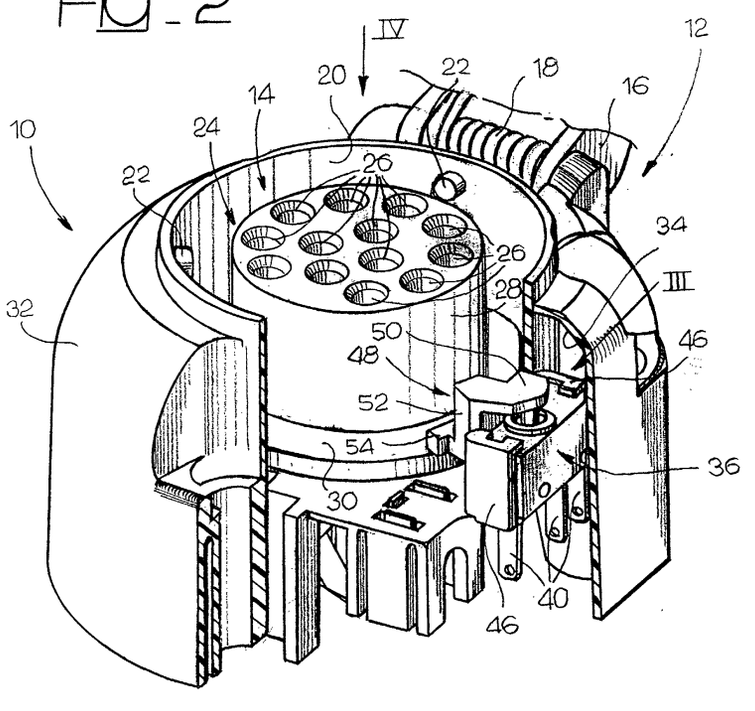
(54) Socket for electrical connection between a vehicle and a trailer

(57) A socket for electrical connection between a vehicle and a trailer, comprising:

- a casing (12) made of plastic material and having a cylindrical wall (20) which defines a seat (14) designed to receive a tubular portion of a complementary plug;
- a contact-bearing body (24) including a cylindrical portion (28) set coaxially inside said cylindrical wall (20) in such a way that an annular space is defined between the cylindrical wall (20) of the casing (12) and the cylindrical portion (28) of the contact-bearing body (24).

At least one electrical switch (36) is housed in a gap (34) defined between an outer wall (32) of the casing (12) and the aforesaid cylindrical wall (20). The switch is associated to at least one operating member (48) having a central portion (52) slidably mounted in a slot (56) of the cylindrical wall (20) and two operating portions (50, 54) which extend respectively in the aforesaid annular space and in the aforesaid gap (34).

Fig. 2



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Description

[0001] The present invention relates in general to electrical connectors designed to establish electrical connection between a towing vehicle and a trailer, and in particular relates to a socket for this type of connectors. More precisely, the invention relates to a socket according to the preamble of the main claim.

[0002] Sockets for electrical connection between a vehicle and a trailer comprise a plurality of female electrical contacts carried by a contact-bearing body integral with a casing made of plastic material which is designed to be applied at the rear of the tractor. In addition to the aforesaid electrical contacts, the sockets may be equipped with one or more microswitches and with one or more plate-type electrical contacts designed to perform auxiliary functions, such as disabling switching-on of the fog lights or disabling the anti-collision sensors when the trailer is hitched to the vehicle. To perform these functions, one or more switches are provided, which are carried by the contact-bearing body and are arranged in such a way as to switch their operating state according to whether the plug is plugged into the socket or not.

[0003] The purpose of the present invention is to provide a constructionally simple solution which enables the condition of coupling of the socket to a complementary plug to be detected and the operating state of a switch designed to carry out one of the aforesaid supplementary functions of the socket to be switched.

[0004] According to the present invention, the above purpose is achieved by a socket having the characteristics that form the subject of the main claim.

[0005] The characteristics and advantages of the present invention will emerge clearly from the ensuing description, provided purely by way of non-limiting example, with reference to the attached drawings, in which:

- Figure 1 is a schematic perspective view of a socket according to the present invention;
- Figure 2 is a perspective view at a larger scale and partially sectioned of the socket of Figure 1;
- Figure 3 is a perspective view of the components indicated by the arrow III in Figure 2;
- Figure 4 is a plan view according to the arrow IV of Figure 2; and
- Figure 5 is a partial cross-sectional view at a larger scale according to the line V-V of Figure 4.

[0006] With reference to Figures 1 and 2, the number 10 designates a socket for electrical connection between a vehicle and a trailer. The socket 10 comprises a casing 12, made of plastic material, which defines a cylindrical seat 14 designed to receive a tubular portion of a plug (not illustrated). In a way of itself known, the socket 10 comprises a lid 16 designed to close the cylindrical seat 14 when the socket 12 is not engaged with a complementary plug. In an altogether conventional way, the lid 16 is hinged to the casing 12 and is associated to a spring 18 which tends to keep it in the closed position. The casing 12 has an integral cylindrical wall 20 which defines the outer perimeter of the cavity 14. On the wall 20 are formed small pins 22 which protrude radially inwards and constitute engagement portions designed to co-operate, in a way of itself known, with bayonet-coupling surfaces provided on the plug (not illustrated) that is complementary to the socket 10.

[0007] The socket 10 comprises a contact-bearing body 24, made of plastic material, which carries a plurality of female electrical contacts 26, each of which is housed within a respective longitudinal hole of the contact-bearing body 24. The contact-bearing body 24 can be formed in an integral way with the casing 12, or else can consist of a separate element that can be fixed in various ways to the casing 12. The contact-bearing body 24 has a cylindrical portion 28 that extends inside the seat 24. A front seal element 30, made of compliant material, is applied to the contact-bearing body 24 at the base of the cylindrical portion 28. In a conventional way, a front portion of the plug that is complementary to the socket 12 is designed to compress the front seal element 30 axially in the condition of engagement between the plug and the socket. Inside the seat 14 there is defined an annular space delimited, on the outside, by the cylindrical wall 20 of the casing 12 and, on the inside, by the outer cylindrical surface of the portion 28 of the contact-bearing body 24. The said annular space is moreover delimited at the bottom by the top surface of the front seal element 30. This annular space is designed to receive a tubular portion with bayonet-coupling means of the plug, there extending inside the plug the male contacts which are to be inserted into the female contacts 26.

[0008] The casing 12 has an outer wall 32, which forms a shell surrounding the cylindrical wall 20. As may be seen in Figures 2, 4 and 5, a gap 34 is defined between the outer wall 32 and the inner cylindrical wall 20 of the casing 12. Set in the aforesaid gap 34 is at least one microswitch 36 carried by the contact-bearing body 24. With particular reference to Figure 3, the microswitch 36 comprises a shell 38 having a parallelepipedal shape, which contains the switch proper and from which there project electrical terminals 40 and an operating push-button 42, which can move in the direction indicated by the double-headed arrow 44 to switch the operating state of the switch. The contact-bearing body 24 is equipped with integral retention elements 44 (Figure 2), which define a seat within which the microswitch 36 is withheld. The body 38 of the microswitch 36 may, for example, be inserted and blocked by snap-action into the seat formed by the retention elements 46.

[0009] The operating push-button 42 of the microswitch 36 co-operates with an operating member 48 having a first plane portion 50, a central portion 52, and a second plane portion 54 which extends from the side

opposite to the first plane portion 50 with respect to the central portion 52. The central portion 52 of the operating member 48 is inserted with play in a longitudinal groove 56 formed in the cylindrical wall 20 of the casing 12 (Figures 4 and 5) in such a way that the operating member 48 can move in a direction parallel to the direction 44 of operation of the push-button 42 of the microswitch 36. As illustrated in Figure 5, the first plane portion 50 of the operating member 48 rests on the push-button 42, whilst the second plane portion 54 rests above the front seal 30 made of compliant material. In this way, when the plug that is complementary to the socket 10 is in the plugged-in position, a front portion of the plug compresses the front seal 30 and pushes the second plane portion 54 of the operating member 48 downwards. Consequently, the second plane portion 50 of the operating member 48 pushes the control button 42 of the microswitch 36 downwards, so changing the operating state of the microswitch. When the plug is unplugged from the socket 10, the microswitch 36 returns to its resting operating state under the action of an internal return spring. The operating member 48 returns to its resting position illustrated in Figure 5 under the action of elastic return of the control button 42 and of the front seal 30, which returns into its undeformed resting condition after extraction of the socket.

[0010] The solution according to the present invention is particularly advantageous because it makes available one or more microswitches 36 in a radially external position with respect to the cylindrical wall 20 of the casing 12. In this position, the microswitch or the microswitches do not interfere with the electrical conductors connected to the contacts 26. Operation of the microswitch 36 (or of each microswitch 36) by means of a sliding operating member 48 renders detection of the presence of the plug in the plugged-in condition reliable. The operating member 48 is simple and sturdy and does not present any parts that are subject to the risk of breakage or jamming.

[0011] A further advantage of the solution according to the invention lies in the fact that it is possible to make a series of sockets having a different number of switches 36 without having to envisage substantial modifications to the dies and moulds and to the production equipment. In particular, solutions may be envisaged with one or more microswitches 36. In addition or as an alternative to the microswitches 36, one or more switches with an elastic plate-type contact may be provided.

Claims

1. A socket for electrical connection between a vehicle and a trailer, comprising:

   - a casing (12) made of plastic material and having a cylindrical wall (20) which defines a seat (14) designed to receive a tubular portion of a complementary plug;
   - a contact-bearing body (24) carrying a plurality of electrical contacts (26), the contact-bearing body including a cylindrical portion (28) set coaxially inside said cylindrical wall (20) in such a way that an annular space is defined between the cylindrical wall (20) of the casing (12) and the cylindrical portion (28) of the contact-bearing body (24) ;
   - at least one electrical switch (36) carried by the contact-bearing body (24); and
   - operating means co-operating with said switch (36) and set in such a way as to detect the condition of engagement or disengagement between the socket and a complementary plug and to change the operating state of the switch,

   characterized in that said at least one electrical switch (36) is housed in a gap (34) defined between an outer wall (32) of the casing (12) and the aforesaid cylindrical wall (20), and **in that** the aforesaid operating means comprise at least one operating member (48) having a central portion (52) slidably mounted in a slot (56) of the cylindrical wall (54) and two operating portions (50, 54), which extend respectively in the aforesaid annular space and in the aforesaid gap (34).

2. The socket according to Claim 1, **characterized in that** the contact-bearing body (24) carries a front seal (30), made of deformable material, which constitutes a bottom wall of said annular space, and **in that** one (54) of said operating portions of said operating member (48) rests on a surface of said front seal (30).

3. The socket according to Claim 1, **characterized in that** the aforesaid operating member (48) comprises two plane portions (50, 54) which extend on opposite sides with respect to the aforesaid central portion (52).

4. The socket according to Claim 1, **characterized in that** the aforesaid switch (36) is a microswitch including a control push-button (42), which co-operates with one (50) of said operating portions.

Fig. 1

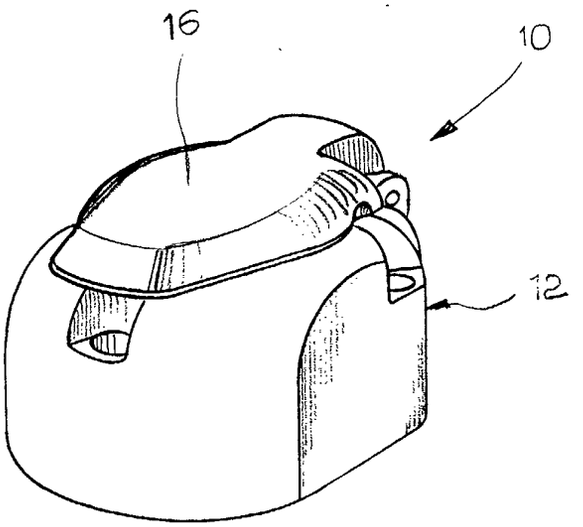
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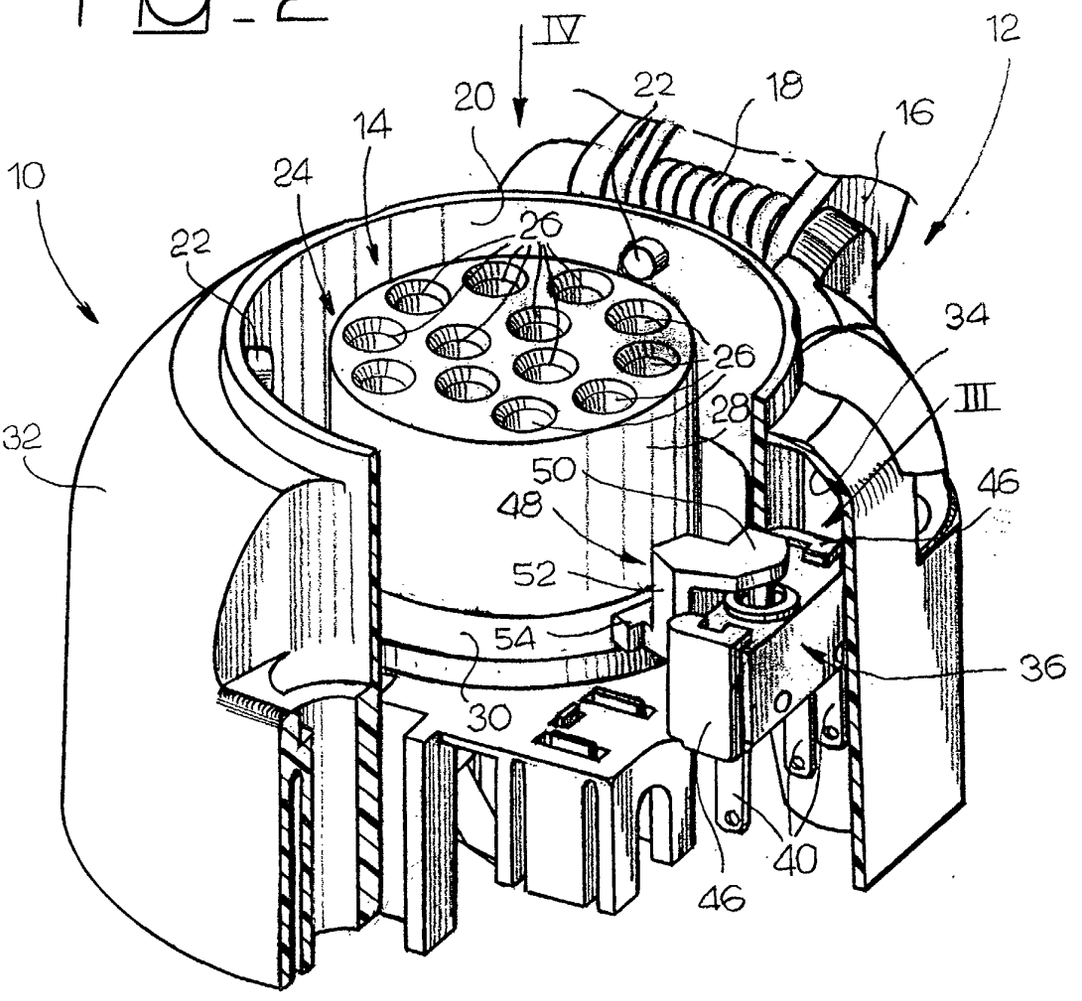
Fig. 2


IV
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III
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Fig_3

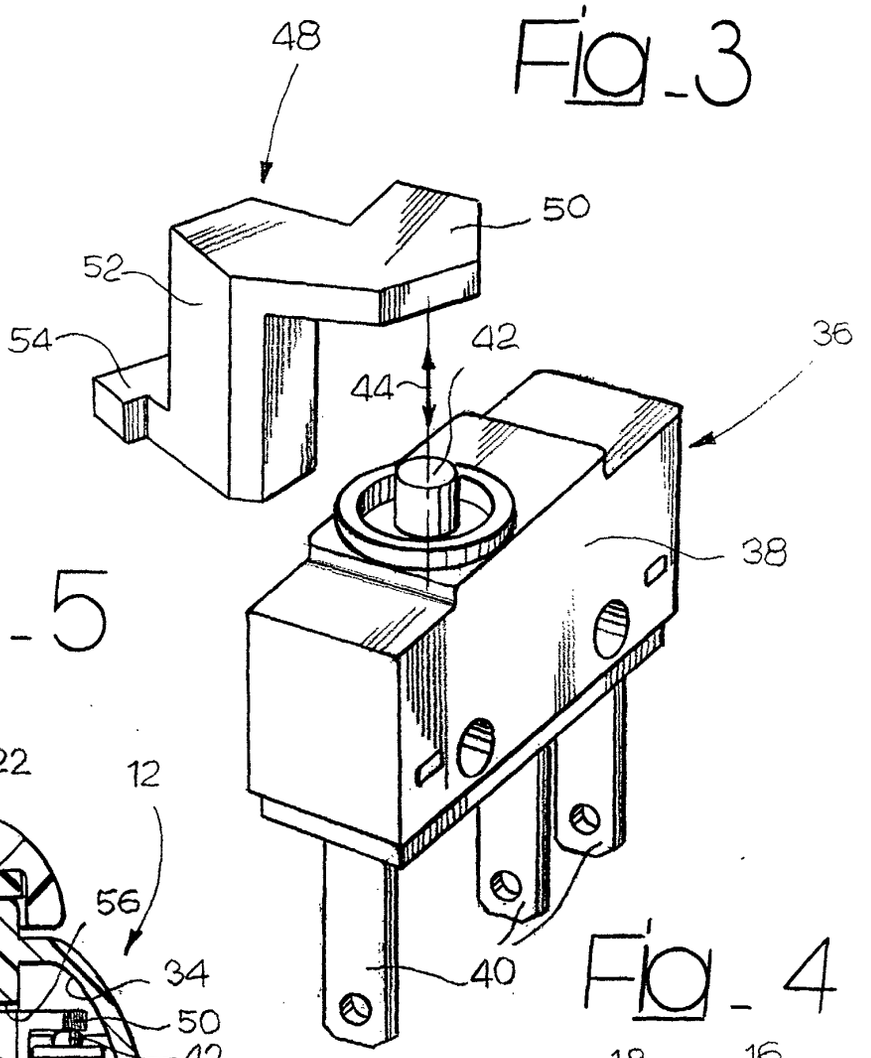


Fig_5

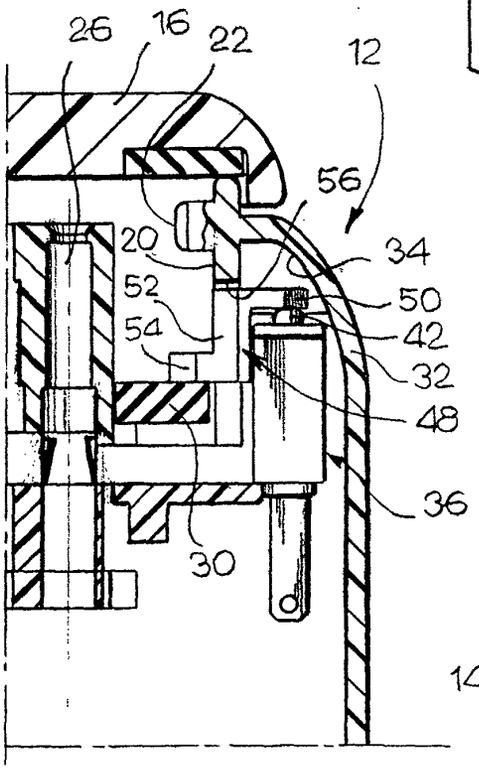
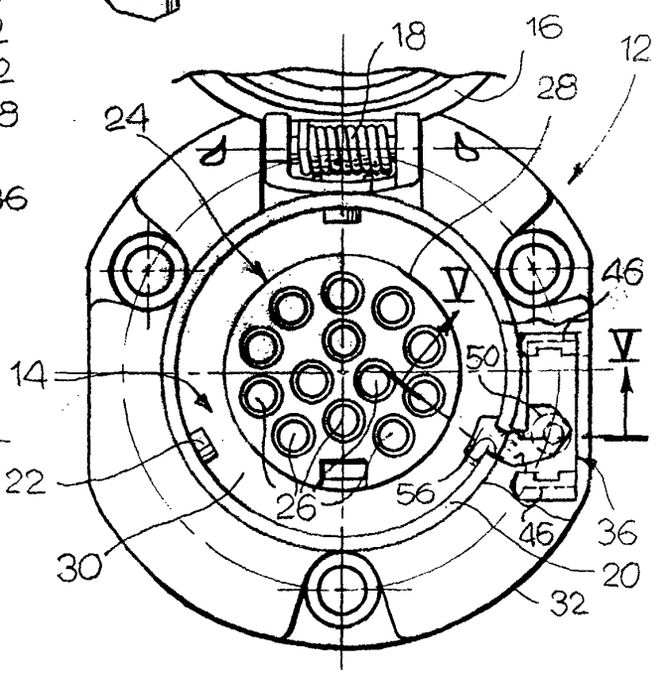


Fig_4



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EUROPEAN SEARCH REPORT

Application Number
EP 01 83 0386

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)
X	DE 197 36 629 C (VOLTA KRAFTFAHRZEUG ELEKTROZUB) 4 February 1999 (1999-02-04) * column 6, line 21 - line 33; figures 1-9 *	1-4	H01R13/703
X	EP 0 952 639 A (MAEHLER & KAEGE AG) 27 October 1999 (1999-10-27) * column 3, line 45 - column 4, line 37; figures 1-4 *	1,3,4	
X	EP 0 795 439 A (ECS ELECTRONICS N V) 17 September 1997 (1997-09-17) * column 5, line 54 - column 6, line 10; figures 1,2 *	1,4	
			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
MUNICH	6 November 2001	Tappeiner, R

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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06-11-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19736629 C	04-02-1999	DE 19736629 C1	04-02-1999
EP 0952639 A	27-10-1999	DE 19817871 A1	04-11-1999
		EP 0952639 A2	27-10-1999
EP 0795439 A	17-09-1997	NL 1002340 C2	15-08-1997
		EP 0795439 A1	17-09-1997

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