(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 700 024 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.08.2020 Bulletin 2020/35

(51) Int Cl.:
H01R 13/635 *(2006.01)*

(21) Application number: **19158909.2**

(22) Date of filing: **22.02.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) ELECTRIC PLUG AND COMBINATION OF DISPLAY DEVICE AND ELECTRIC PLUG

(57) An electric plug (20) has a housing (24) and electrical contact pins (22) for making electrical connection to an electric socket (18) when the electric plug (20) is connected to the socket (18). At least one of the contact pins (22) is movable relative to the housing (24) between an extended position, in which the contact pin (22) extends relatively further out of the housing for making electrical connection to the socket (18), and a withdrawn position, in which the contact pin (22) is at least partially withdrawn into the housing (24) to prevent electrical connection to the socket (18). A biasing arrangement (36) biases the at least one contact pin (22) to the withdrawn position. A stopper (40) is operable selectively to maintain the at least one electrical contact pin (22) at the extended position and to permit the biasing arrangement (36) to withdraw the at least one contact pin (22) to the withdrawn position to break the electrical connection with the socket (18).

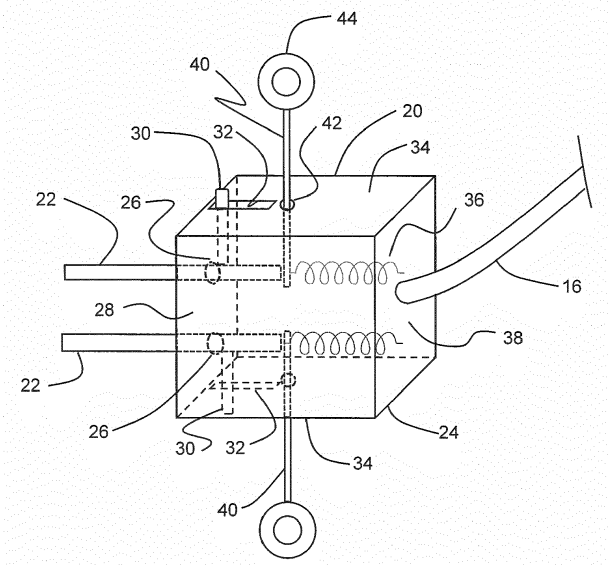

Fig. 2

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Description

Technical Field

[0001] The present disclosure relates to an electric plug and a combination of a display device and an electric plug.

Background

[0002] Display devices, such as for example television sets or display panels used for "signage" and monitors, etc., are often supported by a mount. For example a display device may be supported by a stand on a horizonal surface or fixed to a vertical wall. There is a possibility that the display device may fall, particularly if it has been mounted incorrectly or insecurely. This problem has been exacerbated by the increasing size and weight of display devices. Not only does this present a potential danger in terms of the weight of a falling display device striking someone, there is also a danger of an electrical malfunction such as arcing or shorting of electricity, which could ultimately cause fire and/or death.

Summary

[0003] According to an aspect disclosed herein, there is provided an electric plug for connection to an electric socket so as to enable electrical power to be delivered to a device connected in use to the electric plug via a power cable, the electric plug comprising:

a housing;
electrical contact pins for making electrical connection to an electric socket when the electric plug is connected to a said electric socket;
at least one of the electrical contact pins being movable relative to the housing between an extended position, in which the contact pin extends relatively further out of the housing for making electrical connection to an electric socket, and a withdrawn position, in which the contact pin is at least partially withdrawn into the housing to prevent electrical connection to an electric socket;
a biasing arrangement arranged to bias the at least one electrical contact pin to the withdrawn position; and
a stopper operable selectively to maintain the at least one electrical contact pin at the extended position and to permit the biasing arrangement to withdraw the at least one electrical contact pin to the withdrawn position.

[0004] The at least one electrical contact pin may be withdrawn entirely into the housing in the withdrawn position.

[0005] In an example, the stopper is operable from outside the housing.

[0006] In an example, the stopper is arranged so as to abut the at least one electrical contact pin to prevent movement of the at least one electrical contact pin so as to maintain the at least one electrical contact pin at the extended position, and the stopper is operable from outside the housing so as to move the stopper away from abutting the at least one electrical contact pin which permits the biasing arrangement to withdraw the at least one electrical contact pin to the withdrawn position.

[0007] In an example, the biasing arrangement is a spring which is fixed at one end to the at least one electrical contact pin and which is fixed at the other end relative to the housing, the arrangement being such that the spring is extended and under tension when the at least one electrical contact pin is at the extended position, such that the spring contracts to withdraw the at least one electrical contact pin to the withdrawn position when the stopper is operated to permit the spring to withdraw the at least one electrical contact pin.

[0008] The spring may for example be a coil spring.

[0009] In an example:
each electrical contact pin is movable relative to the housing between an extended position and a withdrawn position; and:

the stopper is operable selectively to maintain each electrical contact pin at the extended position and to permit the biasing arrangement to withdraw each electrical contact pin to the withdrawn position, or
the electrical plug comprises plural stoppers, there being a respective stopper for each electrical contact pin, each stopper being operable selectively to maintain the respective electrical contact pin at the extended position and to permit the biasing arrangement to withdraw the respective electrical contact pin to the withdrawn position.

[0010] There may also be provided in combination:

a display device; and
an electric plug as described above;
a power cable connecting the display device and the electric plug;
the display device being connected to the stopper such that the stopper is operable by movement of the display device relative to the electric plug.

[0011] In an example, the combination comprises a line which connects the display device to the stopper such that the line operates the stopper to permit the biasing arrangement to withdraw the at least one electrical contact pin to the withdrawn position in the case that the display device falls.

[0012] The line may be for example a wire or string or cord or the like. The line should preferably be non-extendible, or at least substantially non-extendible, so that it does not (significantly) stretch and can therefore operate the stopper when the display device moves sufficient-

ly far from the electric plug. Alternative arrangements to a line include for example one or more rigid levers or some other mechanical connection between the display device and the stopper.

Brief Description of the Drawings

[0013] To assist understanding of the present disclosure and to show how embodiments may be put into effect, reference is made by way of example to the accompanying drawings in which:

Figure 1 shows schematically a side elevation of an example of a display device mounted to a wall and an example of an electrical plug according to the present disclosure; and

Figure 2 shows schematically a perspective view of the electrical plug of Figure 1 in more detail.

Detailed Description

[0014] Display devices are used in many different types of consumer apparatus including for example television screens, computer displays or monitors, etc. Display devices are also used in many public environments in so-called "signage", for example, for displaying advertisements or for information or entertainment that is of interest to a larger audience.

[0015] As mentioned, display devices are often supported by a mount. For example a display device may be supported by a stand on a horizonal surface or fixed to a vertical wall. There is a possibility that the display device may fall, particularly if it has been mounted incorrectly or insecurely. This problem has been exacerbated by the increasing size and weight of display devices. Not only does this present a potential danger in terms of the weight of a falling display device striking someone, there is also a danger of an electrical malfunction such as arcing or shorting of electricity, which could ultimately cause fire and/or death. In particular, it can happen that a falling display device causes the electrical plug, which is connected to a mains power socket or the like, to be partly withdrawn from the socket. This can result in live contact pins or mains sockets being exposed to users and electrical shorting or arcing, which can present a direct hazard to anyone in the vicinity and a fire hazard.

[0016] In accordance with examples described herein, an electric plug has electrical contact pins for making electrical contact to an electric socket, such as a mains power socket. At least one of the electrical contact pins is movable relative to the housing of the plug. The pin can move between an extended position, in which the contact pin extends relatively further out of the housing for making electrical connection to the electric socket, and a withdrawn position, in which the contact pin is at least partially withdrawn into the housing to prevent electrical connection to the electric socket. The contact pin is biased to the withdrawn position by a biasing arrangement. A stopper maintains the contact pin at the extended position, and can be operated to permit the biasing arrangement to withdraw the contact pin to the withdrawn position. The at least one electrical contact pin may be withdrawn entirely into the housing in the withdrawn position.

[0017] In use in an example, the electric plug is connected to a device, such as for example a display device, by a power cable. In an example, the stopper can be operated to permit the biasing arrangement to withdraw the contact pin to the withdrawn position if the display device moves relative to the electric socket, or at least moves sufficiently relative to the electric socket such that the power cable begins to pull the electric plug from the socket.

[0018] This therefore provides a safety feature that can cut the electric connection from the mains power socket to the electric plug. The whole arrangement can be entirely mechanical, and does not require for example powered sensors or the like to detect movement of the device.

[0019] Referring now to the drawings, an example of an electric plug and a display device having an electric plug according to the present disclosure will now be described.

[0020] Referring first to Figure 1, there is shown a device 10. The device 10 in general may be any device 10 that requires electrical power and so is plugged in to a main electricity power socket. The device of this example is a display device 10. The display device 10 may be for example a television set, a display panel used for "signage", a computer monitor screen, etc. In this example, the display device 10 is shown fixed to a vertical wall 12 by a mounting bracket 14 or the like. In other examples, the display device 10 may be mounted on a horizontal surface, for example via a stand. Either way, the display device 10 is susceptible to falling, for example because of poor mounting and/or because the display device 10 may be knocked or struck.

[0021] The display device 10 has a mains power cable 16. The mains power cable 16 may be connected to the display device 10 by a plug at one end of the cable 16 which is removably connected to a corresponding power socket on the display device 16. Alternatively, the mains power cable 16 may be permanently fixed at one end to the display device 16.

[0022] The other end of the power cable 16 is connected to a mains power socket 18 via a mains electrical plug 20 for delivering electrical power to the display device 10. The electrical plug 20 may be detachably removable from the power cable 16 by a user. More commonly though, the electrical plug 20 may be fixed to the power cable 16 such that it is not normally removable from the power cable 16 (at least not without destroying the electrical plug 20 or cutting the power cable 16 say).

[0023] Referring additionally to Figure 2, the electrical plug 20 has at least two electrical contact pins 22 for making electrical connection to the mains power socket 18. The electrical contact pins 22 in this example are a

live and a neutral pin respectively. The electrical plug 20 may also have an earth pin (not shown). The electrical contact pins 22 are shown in Figure 2 projecting outwardly of the main housing or body 24 of the electrical plug 20. At least one and, in this example, both of the live and neutral electrical contact pins 22 are movable relative to the housing 24. In the case that the electrical plug 20 also has an earth pin, the earth pin may be fixed relative to the housing 24 or may also be movable relative to the housing 24.

[0024] The movement of the or each movable electrical contact pin 22 is such that, when the contact pin 22 is at an extended position and projects outwardly of the housing 24, then the contact pin 22 makes an electrical connection with the corresponding pin or socket in the mains power socket 18. On the other hand, when the contact pin 22 is at a withdrawn position relative to the housing 24, the contact pin 22 does not make an electrical connection with the corresponding pin or socket in the mains power socket 18. In the withdrawn position, the or each movable contact pin 22 in this example is withdrawn into the housing 24 so that no part of the contact pin 22 projects outwardly from the housing 24. However, in other examples, it may be sufficient for the contact pin 22 to be withdrawn only partially into the housing to break the electrical connection with the mains power socket 18.

[0025] To enable the or each movable contact pin 22 to move back and forth in the housing 24, a base wall 28 of the housing 24 (which faces the power socket 18 when the electrical plug 20 is plugged in) has respective apertures 26 through which the movable contact pins 22 project when in the extended position. The interior of the housing 24 may also have channels or ridges or other features (not shown) in its interior to guide the sliding movement of the contact pins 22.

[0026] Moreover, in this example, as will be discussed further below, the user manually sets the or each movable contact pin 22 at the extended position when the user is ready to plug the electrical plug 20 into the mains power socket 18. For this purpose, in this example the or each movable contact pin 22 has a button or slider 30 which allows the user to move the contact pin 22 to the extended position. For the or each movable contact pin 22, the button 30 is connected or fixed at one end to the contact pin 22 and projects outwardly through a slot 32 in a side wall 34 of the electrical plug 20 at the other end, with the side wall 34 being perpendicular to the base wall 28 of the housing 24 in this example. The button 34 is electrically insulated from the contact pin 22. The button 34 may be made of for example an electrically insulating material, such as a plastics for example, or at least connected to the contact pin 22 via an electrically insulating material. The user can engage the end of the button 34 that projects out of the housing 24 to move the contact pin 22 to the extended position.

[0027] The electrical plug 20 is arranged so that the or each movable contact pin 22 of the electrical plug 20 is normally biased to the withdrawn position, that is, the position when the contact pin 22 is fully or partially withdrawn into the housing 24. For this, the or each movable contact pin 22 is provided with a biasing arrangement 36 to bias the contact pin 22 to the withdrawn position. In the example shown, the biasing arrangement 36 for the or each movable the contact pin 22 is a coil spring 36. Other biasing arrangements are possible, including for example a rod or strip of elastic material. The biasing arrangement 36 for the or each movable contact pin 22 is fixed at one end to the contact pin 22 and at its other end to another wall 38 of the housing 24 that is opposite the base wall 28. The biasing arrangement 36 is arranged such that when the contact pin 22 is moved to its extended position (to the left in Figure 2), the biasing arrangement 36 is extended and stretched and therefore tends to pull the contact pin 22 to the withdrawn position (to the right in Figure 2).

[0028] In order to maintain the or each movable contact pin 22 at its extended position, a stopper 40 is provided to block the movement of the contact pin 22 to its withdrawn position. In the example shown and in the position shown in Figure 2, the stopper 40 abuts the rear end of the contact pin 22 which is opposed to the wall 38 of the housing 24 that is opposite the base wall 28. The stopper 40 can be withdrawn so that it no longer abuts the end of the contact pin 22, which allows the biasing arrangement 36 to withdraw the contact pin 22 into the housing 24.

[0029] In the example shown, the stopper 40 is in the form of a rigid rod or pin which passes through an aperture 42 in the side wall 34 that is nearest the contact pin 22. The stopper 40 can be moved through the aperture 42 into the body of the housing 24 so as to engage the rear end of the contact pin 22 and therefore prevent movement of the contact pin 22 to the withdrawn position (to the right in Figure 2). Correspondingly, the stopper 40 can be withdrawn out of engagement with the rear end of the contact pin 22 by moving the stopper 40 through the aperture 42, which allows the biasing arrangement 36 to withdraw the contact pin 22 into the housing 24.

[0030] Referring back to Figure 1, the or each stopper 40 is connected to the display device 10 such that if the display device 10 moves relative to the electrical plug 20, or at least moves sufficiently far relative to the electrical plug 20, then the stopper 40 is withdrawn. The stopper 40 may be withdrawn entirely from the electrical plug 20 or only partly from the electrical plug 20. In any event, when sufficiently withdrawn, the stopper 40 no longer blocks the movement of the movable contact pin 22. The movable contact pin 22 is therefore withdrawn by the biasing arrangement 36 into the housing 24 and therefore out of electrical contact with the mains power socket 18. This breaks the electrical connection between the display device 10 and the mains power provided at the mains power socket 18. This therefore cuts the electrical power to the display device 10, which prevents a live power socket being exposed to users and prevents shorting or arcing at the mains power socket 18 and/or the electrical

plug 18.

[0031] A number of options for connecting the stopper 40 to the display device 10 are possible. There may for example be a system of one or more connecting rods or the like which connect the stopper 40 to the display device 10. More simply and conveniently, the stopper 40 may be connected to the display device 10 by a line 50, which may be for example a wire or string or cord or the like. The line 50 is non-extendible, or at least substantially non-extendible, so that it does not (significantly) stretch when pulled. The stopper 40 in the example shown has a head 44 in the form of a closed loop to which the line 50 may be fixed, though some other engagement feature may be provided instead for fixing the line 50 to the stopper 40. The display device 10 may also have a closed loop or other engagement feature (not shown) to which the other end of the line 50 may be connected.

[0032] In use, a user mounts the display device 10. As mentioned, in the example shown, the display device 10 is mounted on a vertical wall 12, though in other examples the display device 10 may be mounted on some other surface, such as a horizontal surface. The user moves the or each movable contact pin 22 of the electrical plug 20 to the extended position (to the left in the drawings), for example by the user engaging the slider or button 30 to slide the movable contact pin 22 to the extended position. This movement of the contact pin 22 extends the biasing arrangement 36, which therefore tends to pull the contact pin 22 to the withdrawn position (to the right in the drawings). The user pushes the stopper 40 into the body of the housing 24 until the stopper 40 engages the rear end of the contact pin 22, to prevent any rearward movement of the contact pin 22 in the housing 24. This is repeated for each movable contact pin 22 and its stopper 40.

[0033] The electrical plug 20 can then be plugged into the mains power socket 18. The user then fixes the line 50 at its ends to the display device 10 and the stopper 40. Again, this is repeated for the or each movable contact pin 22. For this, the line 50 may have a little slack to enable the user easily to fix the line to the display device 10 and the stopper 40. However, the line 50 should not have too much slack so that it will pull the stopper 40 out of engagement with the contact pin 22 when necessary.

[0034] In particular, if the display device 10 becomes detached from its mount and falls down (or falls over if on a horizontal surface), then the movement of the display device 10 away from the mains power socket 18 causes the line 50 to withdraw the stopper 40 from engagement with the contact pin 22. As mentioned, the stopper 40 may be entirely or only partially withdrawn from the housing 24 of the plug 18. In any event, once the stopper 40 is no longer engaging the rear of the contact pin 22, the biasing arrangement 36 withdraws the contact pin 22 into the housing 24 and therefore out of electrical contact with the mains power socket 18. This breaks the electrical connection between the display device 10 and the mains power provided at the mains power socket 18 in the case that the display device 10 has fallen. Notably, this occurs even if the electrical plug 20 itself is not pulled so far that it would normally be pulled out of the mains power socket 18, which may occur if for example the mains power cable 16 is relatively long. This therefore provides a safety feature that cuts the electric connection from the mains power socket 18 to the electric plug 20. The whole arrangement can be entirely mechanical, and does not require for example powered sensors or the like to detect movement of the display device 10.

[0035] The examples described herein are to be understood as illustrative examples of embodiments of the invention. Further embodiments and examples are envisaged. Any feature described in relation to any one example or embodiment may be used alone or in combination with other features. In addition, any feature described in relation to any one example or embodiment may also be used in combination with one or more features of any other of the examples or embodiments, or any combination of any other of the examples or embodiments. Furthermore, equivalents and modifications not described herein may also be employed within the scope of the invention, which is defined in the claims.

Claims

1. An electric plug for connection to an electric socket so as to enable electrical power to be delivered to a device connected in use to the electric plug via a power cable, the electric plug comprising:

   a housing;
   electrical contact pins for making electrical connection to an electric socket when the electric plug is connected to a said electric socket;
   at least one of the electrical contact pins being movable relative to the housing between an extended position, in which the contact pin extends relatively further out of the housing for making electrical connection to an electric socket, and a withdrawn position, in which the contact pin is at least partially withdrawn into the housing to prevent electrical connection to an electric socket;
   a biasing arrangement arranged to bias the at least one electrical contact pin to the withdrawn position; and
   a stopper operable selectively to maintain the at least one electrical contact pin at the extended position and to permit the biasing arrangement to withdraw the at least one electrical contact pin to the withdrawn position.

2. An electric plug according to claim 1, wherein the stopper is operable from outside the housing.

3. An electric plug according to claim 2, wherein the

stopper is arranged so as to abut the at least one electrical contact pin to prevent movement of the at least one electrical contact pin so as to maintain the at least one electrical contact pin at the extended position, and the stopper is operable from outside the housing so as to move the stopper away from abutting the at least one electrical contact pin which permits the biasing arrangement to withdraw the at least one electrical contact pin to the withdrawn position.

4. An electric plug according to any of claims 1 to 3, wherein the biasing arrangement is a spring which is fixed at one end to the at least one electrical contact pin and which is fixed at the other end relative to the housing, the arrangement being such that the spring is extended and under tension when the at least one electrical contact pin is at the extended position, such that the spring contracts to withdraw the at least one electrical contact pin to the withdrawn position when the stopper is operated to permit the spring to withdraw the at least one electrical contact pin.

5. An electric plug according to any of claims 1 to 4, wherein:
each electrical contact pin is movable relative to the housing between an extended position and a withdrawn position; and wherein:

the stopper is operable selectively to maintain each electrical contact pin at the extended position and to permit the biasing arrangement to withdraw each electrical contact pin to the withdrawn position, or
the electrical plug comprises plural stoppers, there being a respective stopper for each electrical contact pin, each stopper being operable selectively to maintain the respective electrical contact pin at the extended position and to permit the biasing arrangement to withdraw the respective electrical contact pin to the withdrawn position.

6. In combination:

a display device; and
an electric plug according to any of claims 1 to 5;
a power cable connecting the display device and the electric plug;
the display device being connected to the stopper such that the stopper is operable by movement of the display device relative to the electric plug.

7. A combination according to claim 6, comprising a line which connects the display device to the stopper such that the line operates the stopper to permit the biasing arrangement to withdraw the at least one electrical contact pin to the withdrawn position in the case that the display device falls.

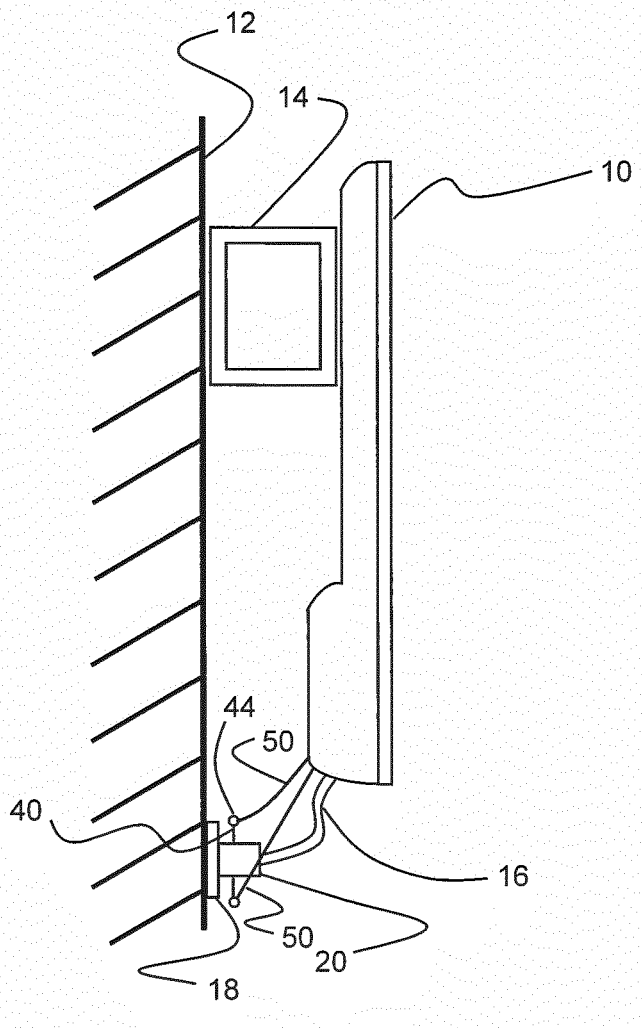

Fig. 1

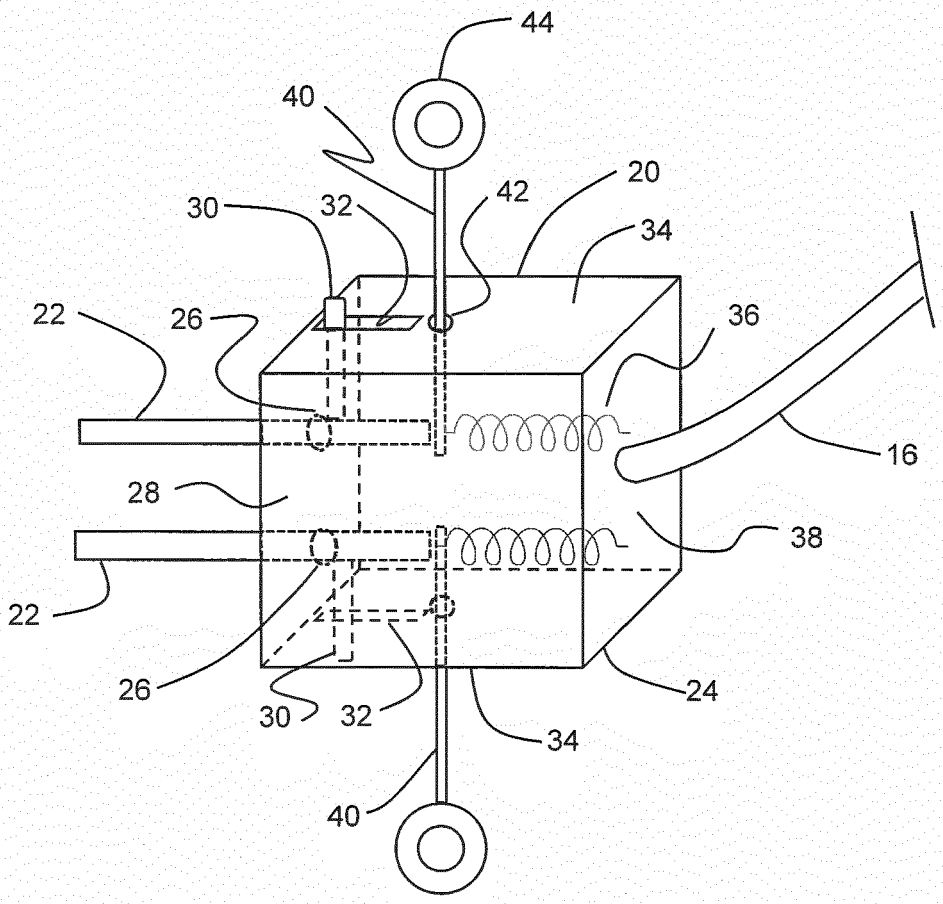

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 19 15 8909

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2002/064983 A1 (PATEY KENNETH C [US]) 30 May 2002 (2002-05-30) * paragraph [0033] - paragraph [0088]; figures 1-5 *	1-4,6,7	INV. H01R13/635
X	US 2014/176071 A1 (ALAMMARI FAHAD MOHAMMED [US]) 26 June 2014 (2014-06-26) * paragraph [0038] - paragraph [0041]; figures 9-11 * * paragraph [0016] - paragraph [0026]; figures 1-5 *	1-3,5	

TECHNICAL FIELDS SEARCHED (IPC)
H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 August 2019	Oliveira Braga K., A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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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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21-08-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002064983 A1	30-05-2002	NONE	
US 2014176071 A1	26-06-2014	NONE	

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