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

(11) EP 0 494 963 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
20.03.1996 Bulletin 1996/12

(21) Application number: **90915605.1**

(22) Date of filing: **02.10.1990**

(51) Int Cl.[6]: **H01R 4/24**

(86) International application number:
PCT/US90/05613

(87) International publication number:
WO 91/05377 (18.04.1991 Gazette 1991/09)

(54) ELECTRICAL HEATING ELEMENT WITH ELECTRICAL CONNECTOR

ELEKTRISCHES HEIZELEMENT MIT ELEKTRISCHEM VERBINDER

ELEMENT DE CHAUFFAGE AVEC CONNECTEUR ELECTRIQUE

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB IT LI NL SE

(30) Priority: **02.10.1989 US 415757**
02.10.1989 US 415820

(43) Date of publication of application:
22.07.1992 Bulletin 1992/30

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Description

This invention relates to an heating assembly comprising an electrical connector and an electrical lead to electrical plugs which make an electrical connection between an electrical heater and an electrical power outlet.

It is often necessary to make an electrical connection to an electrical lead, e.g. to splice two leads together or to attach an electrical plug to a lead in order to apply power. It is also known to insert a light, or other signal, into an electrical circuit so that it is easy to determine whether current is flowing through a heater or other operational electrical device which forms part of the circuit. The light can, for example, be placed in a plug through which the device is connected to a wall outlet in a building or to another power source. It is also known to insert a fuse, circuit breaker, ground fault circuit interrupter (GFCI), or other circuit protection device into an electrical circuit so that if the current exceeds a safe level or otherwise behaves in an abnormal fashion, the protection device is converted from its normal state into an abnormal state in which it disconnects the circuit from the power supply or otherwise prevents maintenance of the abnormal current. The protection device can, for example, be placed in a plug through which a heater or other operational device is connected to a wall outlet in a building or to another power source. When an electrical circuit contains both a signal light and a protection device, absence of the signal light may signify failure of the operational device itself, or failure of the electrical connections to the operational device, or conversion of the protective device into its abnormal state, e.g. failure ("blowing") of the fuse.

Self-regulating strip heaters which comprise elongate electrodes connected by a conductive polymer resistive element are well-known. In operation, the thermal output of these strip heaters varies in response to changes in the thermal environment and thus serves to limit the maximum temperature which the heater achieves. Such heaters are often used to provide freeze protection of pipes, such as domestic or commercial water lines, or to maintain a constant temperature for pipes in process industries. A number of measures have been proposed for assisting the safe operation of such heaters. Reference may be made, for example, to U.S. Patent No. 4,436,986 (Carlson) and U.S. Patent No. 4,822,983 (Bremner et al).

DE-A-320-3651 discloses a two part connector. Conductors are positioned in bores in the first part. Cut-clamps are positioned in the second part. When the first and second parts are placed together, the cut-clamps cut through the insulation of the conductors and make electrical contact. The connector is described as being useful for cables such as flat cables which have multiple conductors (see Figure 1).

US-A-4,684,195 discloses an electrical connector in which a solderless connection can be made to a wire by inserting the wire into a wire-receiving tunnel and then making connection via U-shaped contact member. The connector is particularly useful for making in-line splices.

US-A-3,184,569 discloses an electrical plug which provides overload protection by means of two fuses. In order to tell whether the overload protection is active, the plug includes a signal light which goes out when the fuse blows as a result of an overcurrent condition. The light is installed within a transparent plastic portion which is provided with an opaque hinged cover for use when it is desired that the light not be visible. This plug is specifically designed to be connected to another plug.

I have now realised that when a conductive polymer strip heater is connected to a power supply through an electrical plug which is inserted into a convential wall outlet and which contains a fuse or other protective device, it is very useful to include, as a part of the plug, a signal device, e.g. a light-emitting diode, which is connected between the two legs of the heater circuit so that it will provide a signal (e.g. will be lit up) only when the power is on and the protective device is in its normal state.

In accordance with the present invention, there is provided a heating assembly which comprises :

(A) an electrical lead comprising a first conductor and a second conductor; and

(B) an electrical connector comprising :

(I) a conductor-receiving member which comprises :

(a) a first channel in which the first conductor can be placed, and

(b) a second channel in which the second conductor can be placed, and

(II) a conductor -connecting member which comprises :

(a) a first contact member which comprises a first prong,

(b) a second contact member which comprises a first conductor-contact section,

(c) a third contact member which comprises (i) a second conductor-contact section and (ii) a second prong;

the conductor-receiving member and the conductor-connecting member being

(i) movable relative to each other between mated and demated configurations;

(ii) such that if the first conductor has been placed in the first channel and the second conductor has

been placed in the second channel, the conductor-receiving member with the conductors placed therein and the conductor-connecting member can then be brought into the mated configuration, in which mated configuration the first conductor makes physical and electrical contact with the first conductor-contact section and the second conductor makes physical and electrical contact with the second conductor-contact section; and

(iii) such that they can be brought into the mated configuration only if the first conductor or the second conductor has been placed in direct physical contact with the respective channel;

the assembly being characterised in that :

(e) the electrical lead is an elongate heater comprising :

(i) a resistive element, and

(ii) the first conductor and the second conductor which are connected to the resistive element;

(f) the electrical connector is an electrical plug for connecting the first conductor and the second conductor to an electrical power outlet;

(g) the first prong is suitable for insertion into one socket of the power outlet, and the second prong is suitable for insertion into the other socket of the power outlet;

(h) the first contact member comprises a first fuse-contact section, and the second contact member comprises a second fuse-contact section;

(i) the conductor-connecting member comprises a signal member which is connected between the second and third contact members and which provides a signal when current is passing therethrough;

(j) the first and second prongs are arranged so that when they are inserted into the power outlet, the signal member provides a signal if a fuse connects the first and second fuse-contact sections and does not provide a signal if there is not electrical connection between the first and second fuse-contact sections;

(k) the conductor-receiving member and the conductor-connecting member are (i) movable relative to each other between a mated configuration that is unique and a plurality of demated configurations; and (ii) are such that in at least some of the demated configurations, the first conductor can be placed in the first channel and the second conductor can be placed in the second channel; and in that

(l) the electrical connector comprises (III) closure means for maintaining the conductor-receiving member and the conductor-connecting member in the mated configuration.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a schematic circuit diagram of an electrical connector of a heating assembly that is exemplary the invention in the form of an electrical plug;

Figure 2 shows an exploded view of a plug of a heating assembly that is exemplary of the invention; and

Figure 3 shows a top view of another connector of a heating assembly that is exemplary of the invention.

DETAILED DESCRIPTION OF THE INVENTION

The heating assembly of the invention is in the form of an electrical plug which is used to connect an elongate electrical heater to an electrical power outlet. The power outlet may be a wall outlet either inside or outside of a building, or it may be part of a power supply or other suitable source of power. The outlet may be two-hole for connection to a phase and a neutral wire, or three-hole for connection to a phase, a neutral, and a ground (earth) wire. The electrical lead may be any electrical component with a first conductor and a second conductor, e.g. an electrical power cord. The plug is particularly useful in making an electrical connection to a strip heater, i.e. an elongate heating element which comprises at least two electrodes. For a connection made with this type of heater, the first conductor is one electrode of the heater and the second conductor is the other electrode of the heater. The strip heater may comprise a conductive polymer, i.e. a composition in which a particulate conductive filler is dispersed or otherwise distributed in a polymeric component. Particularly preferred are self-regulating conductive polymer heaters, i.e. those which exhibit PTC (positive temperature coefficient) behavior. The electrodes of a self-regulating heater are generally elongate metal wires or braid which are parallel and spaced apart. They are attached to or embedded in a resistive element which comprises the conductive polymer and is often in the form of a continuous strip. In order to provide environmental protection and electrical insulation, it is common for the resistive element and the electrodes to be covered by a dielectric layer, e.g. a polymeric jacket. A metallic grounding braid is often present over the dielectric layer in order to provide physical reinforcement and a means of electrically grounding the strip heater.

The term "PTC behavior" is used in this specification to denote a composition or an electrical device which has an R_{14} value of at least 2.5 or an R_{100} value of at least 10, and preferably both, and particularly one which has an R_{30} value of at least 6, where R_{14} is the ratio of the

resistivities at the end and the beginning of a 14°C range, R_{100} is the ratio of the resistivities at the end and the beginning of a 100°C range, and R_{30} is the ratio of the resistivities at the end and the beginning of a 30°C range. Self-regulating conductive polymer heaters which exhibit PTC behavior, and appropriate conductive polymer compositions, are disclosed in U.S. Patents Nos. 3,858,144 (Bedard et al), 3,861,029 9 (Smith-Johannsen et al), 4,188,276 (Lyons et al), 4,388,607 (Toy et al), and 4,426,339 (Kamath et al).

The invention is illustrated by the drawings. Figure 1 shows a schematic circuit diagram for an electrical connector in the form of a plug which is designed for insertion into an electrical power outlet. A first contact member 2 comprises a first prong 4 which can be inserted into one socket of the outlet and a first fuse-contact section 6. A second contact member 8 comprises a second fuse-contact section 10 and a first conductor-contact section 12 to which a first conductor of an electrical lead can be physically and electrically connected. A third contact member 14 comprises a second conductor-contact section 16 to which the second conductor of an electrical lead can be physically and electrically connected and a second prong 18 which can be inserted into the other socket of the outlet. A signal member 20 is electrically connected between the second and third contact members. In this embodiment, the signal member 20 is electrically in series with a first resistor 22 and a second resistor 24. When the first and second prongs 4,18 are inserted into the power outlet, the signal member 20 provides a signal if a fuse 26 connects the first and second fuse-contact sections 6,10. No signal is provided if there is no electrical connection between the first and second fuse-contact sections 6,10. The signal member 20 may be a light, e.g. a light emitting diode (LED) which provides a visual signal, a bell or other apparatus which provides an audio signal, or an electrical switch which can generate an alarm signal. Other types of signal members may be appropriate in different circumstances.

The first and second fuse-contact sections 6,10 are positioned to receive a fuse 26. The selection of a specific fuse is dependent on the normal operating conditions and the anticipated fault conditions. Since the connection is made to a strip heater a very fast acting fuse, i.e. a fuse which has little, if any intentional delay in the overload region and which "trips" (opens) very rapidly when the current in the circuit comprising the fuse exceeds the rated value of the fuse. Appropriate fuses are very fast-acting ceramic ferrule fuses with a current rating of 10 amperes and a voltage rating of 125/250 volts. Such fuses are available, for example, from the Bussman Division of Cooper Industries under the name Buss GBB™-10. While it is possible to use one of the measures disclosed in U.S. Patent No. 4,822,983 (Bremner et al) in conjunction with this invention, I have found that, when a fuse as just described is employed, excellent results can be obtained without using a sensor conductor as disclosed in that patent.

Figure 2 shows an exploded view of one specific embodiment of a connector in the form of a plug which is designed to connect the conductors of a first electrical lead 28 to an electrical power outlet. The electrical lead 28 is a strip heater which comprises a resistive element 30, and embedded therein, a first conductor 32 and a second conductor 34. The heater is surrounded by a metallic grounding braid 36. Both the first conductor 32 and the second conductor 34 have been stripped of the conductive polymer which comprises the resistive element 30 to allow easy insertion into the conductor-receiving member 38. The conductor-receiving member 38 comprises a first channel 40, a second channel 42, and a third channel 44, designed for insertion of the first conductor 32, the second conductor 34, and the grounding lead 36, respectively. Each channel is a tunnel which has a frusto-conical opening, both features sized so that the conductors inserted in them can be held by frictional forces. The walls of the channels serve to prevent contact between the conductors. A radial opening 46,48,50 is cut through each tunnel to allow electrical connection of the inserted conductor to the conductor-contact sections. Once the conductors are inserted into the conductor-receiving member 38, it is mated to the conductor-connecting member 52. As a result of the design of the conductor-receiving member, which may include positioning pins or other design elements which are not shown, there is a unique mated configuration. When the two pieces are mated, the first conductor 32 is in physical and electrical contact with the first conductor-contact section 12, the second conductor 34 is in physical and electrical contact with the second conductor-contact section 16, and the grounding lead 36 is in physical and electrical contact with the grounding contact section 54. The first and second conductor-contact sections 12, 16 and the grounding contact section 54 may comprise insulation-piercing means for use when the conductors are insulated with a polymeric jacket. The conductor-connecting member further comprises first and second fuse-contact sections 6,10 designed to receive a fuse. The first connection-making section 4 corresponds to the first prong of Figure 1 and the second connection-making section 18 corresponds to the second prong. A ground-connection-making section 56 is also present to connect to the ground in the outlet. The embodiment shown also comprises a base 58 for the conductor-connecting member 52 which can be welded, glued, or snapped into place. A signal port 60 is positioned so that the signal member 20 will be visible. Figure 2B shows the bottom of the conductor-connecting member 52 with the base 58 removed. The signal member 20, an LED, and first and second resistors 22,24 are visible. It is apparent that the first fuse-contact section 6 and the first connection-making section 4 are made from a single piece of metal, e.g. brass. In this embodiment, the second conductor-contact section 16 and the second connection-making section 18 are also made from a single piece of metal, as are the second fuse-contact section 10 and the fuse con-

ductor-contact section 12.

The conductor-receiving member 38 is preferably made from an insulating material, e.g. a polymer. It is particularly preferred that it be made from a transparent polymer, e.g. polycarbonate, so that there is a visual indication that the conductors are properly positioned. The conductor-receiving member 38 and the conductor-connecting member 52 are maintained in position by a closure means 62, e.g. a screw or a clamp. When mated properly, the plug provides adequate strain relief to the electrical lead. A minimum pull force of 20 pounds on the electrical lead is achieved. (The "pull force" or "pullout force" measures the amount of force required to pull the electrical lead 0.125 inch (0.318 cm) out of the plug. This procedure is described in U.S. Patent No. 4,883,945 (Bautista)). Proper mating of the conductor-receiving member 38 and the conductor-connecting member 52 cannot be achieved if either the first conductor 32 or the second conductor 34 has been directly connected to the respective conductor-contact section 12,16.

When the fuse 26 is in place but no conductors are inserted into the conductor-receiving member, the plug may be used to determine whether wall outlets are properly wired and/or live. If the fuse is electrically intact and there is no signal when the plug is placed into the outlet, that is an indication that the outlet is defective. Additional signal members can be incorporated into the plug to signal whether the phase and neutral wires are wired correctly. When there is a ground connection to the plug, additional signal members will indicate whether there is actually a ground.

Figure 3 illustrates a connector 64 which is designed to connect a first electrical lead 28 of a heater comprising first and second conductors 32,34 and a second electrical lead 66 comprising third and fourth conductors 68,70. In this connector 64, there are two conductor-receiving members 38,72. The second conductor-receiving member 72 comprises two channels 74,76 for insertion of the third and fourth conductors 66,68. A second closure means 78 maintains the second conductor-receiving member 72 in the mated configuration. In the mated configuration, the third conductor 68 makes physical and electrical contact with the first connection-making section 4 and the fourth conductor 70 makes physical and electrical contact with the second connection-making section 18.

Claims

1. A heating assembly which comprises :

(A) an electrical lead (28) comprising a first conductor (32) and a second conductor (34); and

(B) an electrical connector comprising :

(I) a conductor-receiving member (38) which comprises :

(a) a first channel (40) in which the first conductor (32) can be placed, and

(b) a second channel (42) in which the second conductor (34) can be placed, and

(II) a conductor -connecting member (52) which comprises :

(a) a first contact member (2) which comprises a first prong (4),

(b) a second contact member (8) which comprises a first conductor-contact section (12),

(c) a third contact member (14) which comprises (i) a second conductor-contact section (16) and (ii) a second prong (18);

the conductor-receiving member (38) and the conductor-connecting member (52) being

(i) movable relative to each other between mated and demated configurations;

(ii) such that if the first conductor (32) has been placed in the first channel (40) and the second conductor (34) has been placed in the second channel (42), the conductor-receiving member (38) with the conductors placed therein and the conductor-connecting member (52) can then be brought into the mated configuration, in which mated configuration the first conductor (32) makes physical and electrical contact with the first conductor-contact section (12) and the second conductor (34) makes physical and electrical contact with the second conductor-contact section (16); and

(iii) such that they can be brought into the mated configuration only if the first conductor (32) or the second conductor (34) has been placed in direct physical contact with the respective channel;

the assembly being characterised in that :

(e) the electrical lead (28) is an elongate heater comprising :

(i) a resistive element (30), and

(ii) the first conductor (32) and the second

conductor (34) which are connected to the resistive element (30) ;

(f) the electrical connector is an electrical plug for connecting the first conductor (32) and the second conductor (34) to an electrical power outlet;

(g) the first prong (4) is suitable for insertion into one socket of the power outlet, and the second prong (18) is suitable for insertion into the other socket of the power outlet;

(h) the first contact member (2) comprises a first fuse-contact section (6), and the second contact member (8) comprises a second fuse-contact section (10);

(i) the conductor-connecting member (52) comprises a signal member (20) which is connected between the second and third contact members (2, 8) and which provides a signal when current is passing therethrough;

(j) the first and second prongs (4, 18) are arranged so that when they are inserted into the power outlet, the signal member (20) provides a signal if a fuse (26) connects the first and second fuse-contact sections (6, 10) and does not provide a signal if there is not electrical connection between the first and second fuse-contact sections (6, 10);

(k) the conductor-receiving member (38) and the conductor-connecting member (52) are (i) movable relative to each other between a mated configuration that is unique and a plurality of demated configurations; and (ii) are such that in at least some of the demated configurations, the first conductor (32) can be placed in the first channel (40) and the second conductor (34) can be placed in the second channel (42); and in that

(l) the electrical connector comprises (III) closure means (62) for maintaining the conductor-receiving member (38) and the conductor-connecting member (52) in the mated configuration.

2. A heating assembly according to claim 1 wherein the conductor-receiving member (38) is composed of insulating material, preferably a transparent insulating material.

3. A heating assembly according to claim 1 or claim 2 wherein the signal member (20) comprises a light.

4. A heating assembly according to any one of the preceding claims wherein each of the first and second channels (40, 42) is in the form of a tunnel having a radial opening therein and when the conductor-receiving member (38) and the conductor-connecting member (52) are in the mated configuration, the respective conductor-receiving sections pass through the radial openings.

5. A heating assembly according to any one of the preceding claims wherein the conductor-receiving member (38) comprises a third channel (44) in which a ground lead 36 can be placed when the conductor-receiving member (38) and the conductor-connecting member (52) are in at least some of the demated configurations, and wherein the conductor-connecting member (52) comprises a grounding-contact section (54) which contacts the grounding lead (36) in the mated configuration and a ground connection-making section (56).

6. A heating assembly according to claim 1 wherein at least one of (a) the first conductor-contact section (12) and the first prong (4), and (b) the second conductor-contact section (16) and the second prong (18), is made from a single piece of metal.

7. A heating assembly according to any one of the preceding claims wherein (a) the first and second channels (40, 42) are sized to receive the first and second conductors (32, 34) which are insulated with an electrically insulating material and (b) the first and second conductor-contact sections (12, 16) comprise insulation-piercing means which pierce the electrically insulating material when the first and second conductors are inserted in the conductor-receiving member (38) and when the conductor-receiving member (38) and the conductor-connecting member (52) are brought into the mated configuration.

8. A heating assembly according to any one of the preceding claims wherein the conductor-receiving member (38) and the conductor-connecting member (52) are in the mated configuration.

9. A heating assembly according to any one of the preceding claims wherein the resistive element comprises a conductive polymer.

10. A heating assembly according to any one of the preceding claims comprising a fuse (26) mounted between the first and second fuse-contact sections (6, 10).

Patentansprüche

1. Heizanordnung, die folgendes aufweist:

(A) eine elektrische Leitung (28), die einen ersten Leiter (32) und einen zweiten Leiter (34) aufweist; und

(B) einen elektrischen Verbinder, umfassend:

(I) ein Leiteraufnahmeteil (38), das folgendes aufweist:

(a) einen ersten Kanal (40), in den der erste Leiter (32) eingelegt werden kann, und

(b) einen zweiten Kanal (42), in den der zweite Leiter (34) eingelegt werden kann, und

(II) ein Leiterverbindungsteil (52), das folgendes aufweist:

(a) ein erstes Kontaktelement (2), das einen ersten Stift (4) aufweist,

(b) ein zweites Kontaktelement (8), das einen ersten Leiter-Kontaktabschnitt (12) aufweist,

(c) ein drittes Kontaktelement (14), das (i) einen zweiten Leiter-Kontaktabschnitt (16) und (ii) einen zweiten Stift (18) aufweist;

wobei das Leiteraufnahmeteil (38) und das Leiterverbindungsteil (52) derart vorgesehen sind,

(i) daß sie zwischen einer zusammengefügten und einer getrennten Konfiguration relativ zueinander bewegbar sind;

(ii) so daß dann, wenn der erste Leiter (32) in den ersten Kanal (40) eingelegt worden ist und der zweite Leiter (34) in den zweiten Kanal (42) eingelegt worden ist, das Leiteraufnahmeteil (38) mit den darin angeordneten Leitungsdrähten und das Leiterverbindungsteil (52) dann in die zusammengefügte Konfiguration gebracht werden können, wobei in dieser zusammengefügten Konfiguration der erste Leiter (32) einen körperlichen und elektrischen Kontakt mit dem ersten Leiter-Kontaktabschnitt (12) und der zweite Leiter (34) körperlichen und elektrischen Kontakt mit dem zweiten Leiter-Kontaktabschnitt (16) herstellt; und

(iii) so daß sie nur dann in die zusammengesetzte Konfiguration gebracht werden können, wenn der erste Leiter (32) oder der zweite Leiter (34) mit dem jeweiligen Kanal in direktem körperlichen Kontakt angeordnet worden ist;

wobei die Anordnung dadurch gekennzeichnet ist, daß:

(e) die elektrische Leitung (28) eine langgestreckte Heizung ist, die folgendes aufweist:

(i) ein Widerstandselement (30) und

(ii) den ersten Leiter (32) und den zweiten Leiter (34), die mit dem Widerstandselement (30) verbunden sind;

(f) der elektrische Verbinder ein elektrischer Stecker ist, um den ersten Leiter (32) und den zweiten Leiter (34) mit einer elektrischen Steckdose zu verbinden;

(g) der erste Stift (4) zum Einführen in die eine Buchse der Steckdose geeignet ist und der zweite Stift (18) zum Einführen in die andere Buchse der Steckdose geeignet ist;

(h) das erste Kontaktelement (2) einen ersten Sicherungskontaktabschnitt (6) und das zweite Kontaktelement (8) einen zweiten Sicherungskontaktabschnitt (10) aufweist;

(i) das Leiterverbindungsteil (52) ein Signalelement (20) aufweist, das zwischen das zweite und das dritte Kontaktelement (2, 8) geschaltet ist und ein Signal abgibt, wenn es von Strom durchflossen wird;

(j) der erste und der zweite Stift (4, 18) so angeordnet sind, daß dann, wenn sie in die Steckdose eingesteckt sind, das Signalelement (20) ein Signal abgibt, wenn eine Sicherung (26) den ersten und den zweiten Sicherungskontaktabschnitt (6, 10) verbindet, und kein Signal abgibt, wenn keine elektrische Verbindung zwischen dem ersten und dem zweiten Sicherungskontaktabschnitt (6, 10) besteht;

(k) das Leiteraufnahmeteil (38) und das Leiterverbindungsteil (52) (i) zwischen einer zusammengefügten Konfiguration, die unverwechselbar ist, und einer Vielzahl von getrennten Konfigurationen relativ zueinander bewegbar sind; und (ii) derart ausgebildet sind, daß zumindest in einigen der getrennten Konfigurationen der erste Leiter (32) in den ersten Kanal (40) und der zweite Leiter (34) in den zweiten Kanal (42) eingelegt werden können; und daß

(I) der elektrische Verbinder (III) eine Verschlußeinrichtung (62) aufweist, um das Leiteraufnahmeteil (38) und das Leiterverbindungsteil (52) in der zusammengefügten Konfiguration zu halten.

2. Heizanordnung nach Anspruch 1, wobei das Leiteraufnahmeteil (38) aus Isoliermaterial, bevorzugt einem transparenten Isoliermaterial besteht.

3. Heizanordnung nach Anspruch 1 oder Anspruch 2, wobei das Signalelement (20) eine Lampe aufweist.

4. Heizanordnung nach einem der vorhergehenden Ansprüche, wobei jeder von dem ersten und dem zweiten Kanal (40, 42) in Form eines Tunnels ausgebildet ist, in dem eine radiale Öffnung vorhanden ist, und wobei dann, wenn das Leiteraufnahmeteil (38) und das Leiterverbindungsteil (52) in der zusammengefügten Konfiguration sind, die jeweiligen Leiteraufnahmeabschnitte durch die radialen Öffnungen hindurchgehen.

5. Heizanordnung nach einem der vorhergehenden Ansprüche, wobei das Leiteraufnahmeteil (38) einen dritten Kanal (44) aufweist, in den ein Masseleiter (36) eingelegt werden kann, wenn das Leiteraufnahmeteil (38) und das Leiterverbindungsteil (52) sich zumindest in einigen der getrennten Konfigurationen befinden, und wobei das Leiterverbindungsteil (52) einen Massekontaktabschnitt (54), der mit dem Masseleiter (36) in der zusammengefügten Konfiguration Kontakt herstellt, und einen Masseverbindungsabschnitt (56) zur Herstellung der Masseverbindung aufweist.

6. Heizanordnung nach Anspruch 1, wobei wenigstens einer von (a) dem ersten Leiter-Kontaktabschnitt (12) und dem ersten Stift (4) und (b) von dem zweiten Leiter-Kontaktabschnitt (16) und dem zweiten Stift (18) aus einem einzigen Metallstück besteht.

7. Heizanordnung nach einem der vorhergehenden Ansprüche, wobei (a) der erste und der zweite Kanal (40, 42) eine Größe haben, um den ersten und den zweiten Leiter (32, 34) aufzunehmen, die mit einem elektrischen Isoliermaterial isoliert sind, und (b) der erste und der zweite Leiter-Kontaktabschnitt (12, 16) isolationsdurchdringende Mittel aufweisen, die das elektrische Isoliermaterial durchdringen, wenn der erste und der zweite Leiter in das Leiteraufnahmeteil (38) eingelegt sind und wenn das Leiteraufnahmeteil (38) und das Leiterverbindungsteil (52) in die zusammengefügte Konfiguration gebracht werden.

8. Heizanordnung nach einem der vorhergehenden Ansprüche, wobei das Leiteraufnahmeteil (38) und das Leiterverbindungsteil (52) in der zusammengefügten Konfiguration sind.

9. Heizanordnung nach einem der vorhergehenden Ansprüche, wobei das Widerstandselement ein leitfähiges Polymer aufweist.

10. Heizanordnung nach einem der vorhergehenden Ansprüche, die eine Sicherung (26) aufweist, die zwischen dem ersten und dem zweiten Sicherungskontaktabschnitt (6, 10) angebracht ist.

Revendications

1. Assemblage chauffant qui comporte :

(A) un câble électrique (28) comportant un premier conducteur (32) et un second conducteur (34) ; et
(B) un connecteur électrique comportant :
(I) un élément (38) de réception de conducteurs qui comporte :
(a) une première rainure (40) dans laquelle le premier conducteur (32) peut être placé, et
(b) une seconde rainure (42) dans laquelle le second conducteur (34) peut être placé, et
(II) un élément (52) de connexion de conducteurs qui comporte :
(a) un premier élément de contact (2) qui comprend une première broche (4),
(b) un deuxième élément de contact (8) qui comprend une première section (12) de contact avec un conducteur,
(c) un troisième élément de contact (14) qui comprend (i) une seconde section (16) de contact avec un conducteur et (ii) une seconde broche (18) ;
l'élément (38) de réception de conducteurs et l'élément (52) de connexion de conducteurs étant
(i) mobiles l'un par rapport à l'autre entre des configurations d'accouplement et de désaccouplement ;
(ii) tels que si le premier conducteur (32) a été placé dans la première rainure (40) et le second conducteur (34) a été placé dans la deuxième rainure (42), l'élément (38) de réception de conducteurs, dans lequel les conducteurs sont placés, et l'élément (52) de connexion de conducteurs peuvent alors être amenés dans la confi-

guration d'accouplement, configuration d'accouplement dans laquelle le premier conducteur (32) établit un contact physique et électrique avec la première section (12) de contact avec un conducteur et le second conducteur (34) établit un contact physique et électrique avec la seconde section (16) de contact avec un conducteur ;
(iii) tels qu'ils peuvent être amenés dans la configuration d'accouplement uniquement si le premier conducteur (32) ou le second conducteur (34) a été placé en contact physique direct avec la rainure respective ;
l'assemblage étant caractérisé en ce que :
(e) le câble électrique (28) est un élément chauffant allongé comprenant :
(i) un élément résistif (30), et
(ii) le premier conducteur (32) et le second conducteur (34) qui sont connectés à l'élément résistif (30) ;
(f) le connecteur électrique est une fiche électrique pour connecter le premier conducteur (32) et le second conducteur (34) à une prise d'énergie électrique ;
(g) la première broche (4) convient à une insertion dans une douille de la prise d'énergie, et la seconde broche (18) convient à une insertion dans l'autre douille de la prise d'énergie ;
(h) le premier élément de contact (2) comporte une première section (6) de contact avec un fusible et le deuxième élément (8) de contact comporte une seconde section (10) de contact avec un fusible ;
(i) l'élément (52) de connexion de conducteurs comporte un élément (20) de signalisation qui est connecté entre les deuxième et troisième éléments (2, 8) de contact et qui produit un signal lorsqu'un courant le parcourt ;
(j) les première et seconde broches (4, 18) sont agencées de manière que, lorsqu'elles sont insérées dans la prise d'énergie, l'élément (20) de signalisation produise un signal si un fusible (26) connecte les première et seconde sections (6, 10) de contact avec un fusible et ne produise pas de signal en l'absence d'une connexion électrique entre les première et seconde sections (6, 10) de contact avec un fusible ;
(k) l'élément (38) de réception de conducteurs et l'élément (52) de connexion de conducteurs sont (i) mobiles l'un par rapport à l'autre entre une configuration d'accouplement qui est unique et plusieurs configurations de désaccouplement ; et (ii) sont tels que, dans au moins certaines configurations de désaccouplement, le premier conducteur (32) peut être placé dans la première rainure (40) et le second conducteur (34) peut être placé dans la deuxième rainure (42) ; et en ce que
(l) le connecteur électrique comporte (III) des moyens de fermeture (62) destinés à maintenir l'élément (38) de réception de conducteurs et l'élément (52) de connexion de conducteurs dans la configuration d'accouplement.

2. Assemblage chauffant selon la revendication 1, dans lequel l'élément (38) de réception de conducteurs est composé d'une matière isolante, avantageusement une matière isolante transparente.

3. Assemblage chauffant selon la revendication 1 ou la revendication 2, dans lequel l'élément (20) de signalisation comprend une lampe.

4. Assemblage chauffant selon l'une quelconque des revendications précédentes, dans lequel chacune des première et deuxième rainures (40, 42) se présente sous la forme d'un tunnel ayant une ouverture radiale et, lorsque l'élément (38) de réception de conducteurs et l'élément (52) de connexion de conducteurs sont dans la configuration d'accouplement, les sections respectives de réception de conducteurs passent dans les ouvertures radiales.

5. Assemblage chauffant selon l'une quelconque des revendications précédentes, dans lequel l'élément (38) de réception de conducteurs comporte une troisième rainure (44) dans laquelle un conducteur (36) de masse peut être placé lorsque l'élément (38) de réception de conducteurs et l'élément (52) de connexion de conducteurs sont dans au moins certaines des configurations de désaccouplement, et dans lequel l'élément (52) de connexion de conducteurs comporte une section (54) de contact de mise à la masse qui établit un contact avec le conducteur (36) de mise à la masse dans la configuration d'accouplement et une section (56) de réalisation d'une connexion de masse.

6. Assemblage chauffant selon la revendication 1, dans lequel l'une au moins de (a) la première section (12) de contact avec un conducteur et la première broche (4), et (b) la seconde section (16) de contact avec un conducteur et la seconde broche (18),est formée d'une seule pièce en métal.

7. Assemblage chauffant selon l'une quelconque des revendications précédentes, dans lequel (a) les première et deuxième rainures (40, 42) sont dimensionnées pour recevoir les premier et second conducteurs (32, 34) qui sont isolés avec une matière électriquement isolante, et (b) les première et seconde sections (12, 16) de contact avec des conducteurs comprennent des moyens de percement d'isolant qui percent la matière électriquement isolante lorsque les premier et second conducteurs sont insérés dans l'élément (38) de réception de conducteurs et

lorsque l'élément (38) de réception de conducteurs et l'élément (52) de connexion de conducteurs sont amenés dans la configuration d'accouplement.

8. Assemblage chauffant selon l'une quelconque des revendications précédentes, dans lequel l'élément (38) de réception de conducteurs et l'élément (52) de connexion de conducteurs sont dans la configuration d'accouplement.

9. Assemblage chauffant selon l'une quelconque des revendications précédentes, dans lequel l'élément résistif comprend un polymère conducteur.

10. Assemblage chauffant selon l'une quelconque des revendications précédentes, comportant un fusible (26) monté entre les première et seconde sections (6, 10) de contact avec un fusible.

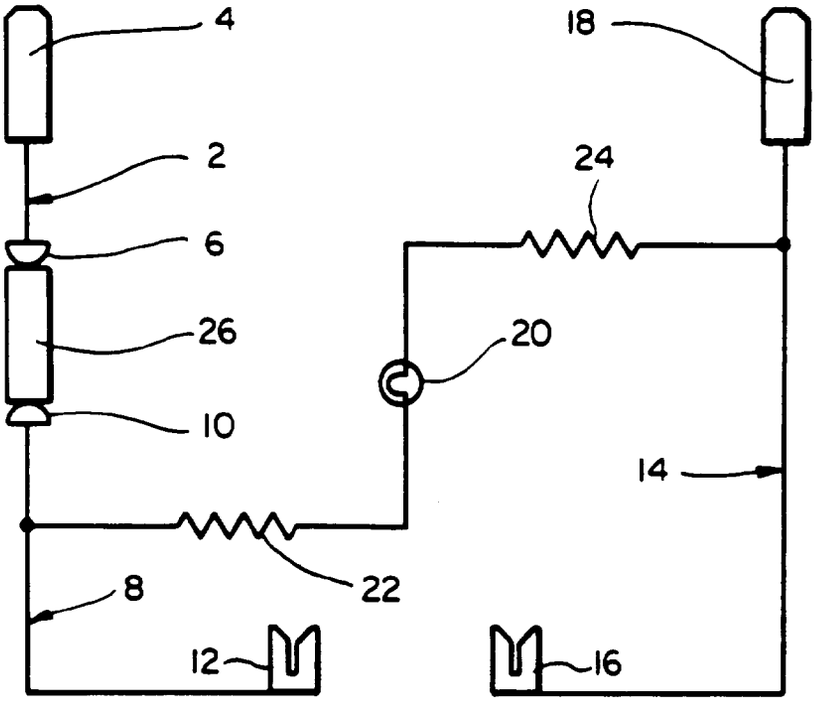


FIG_1

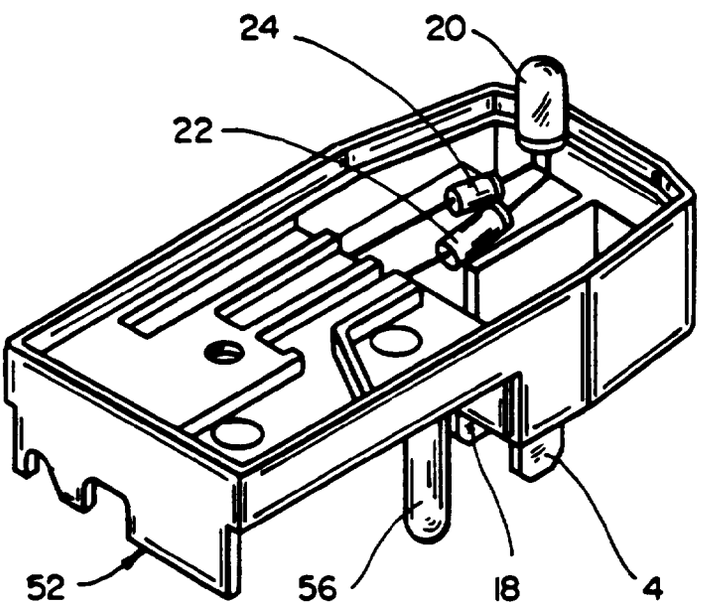


FIG_2B

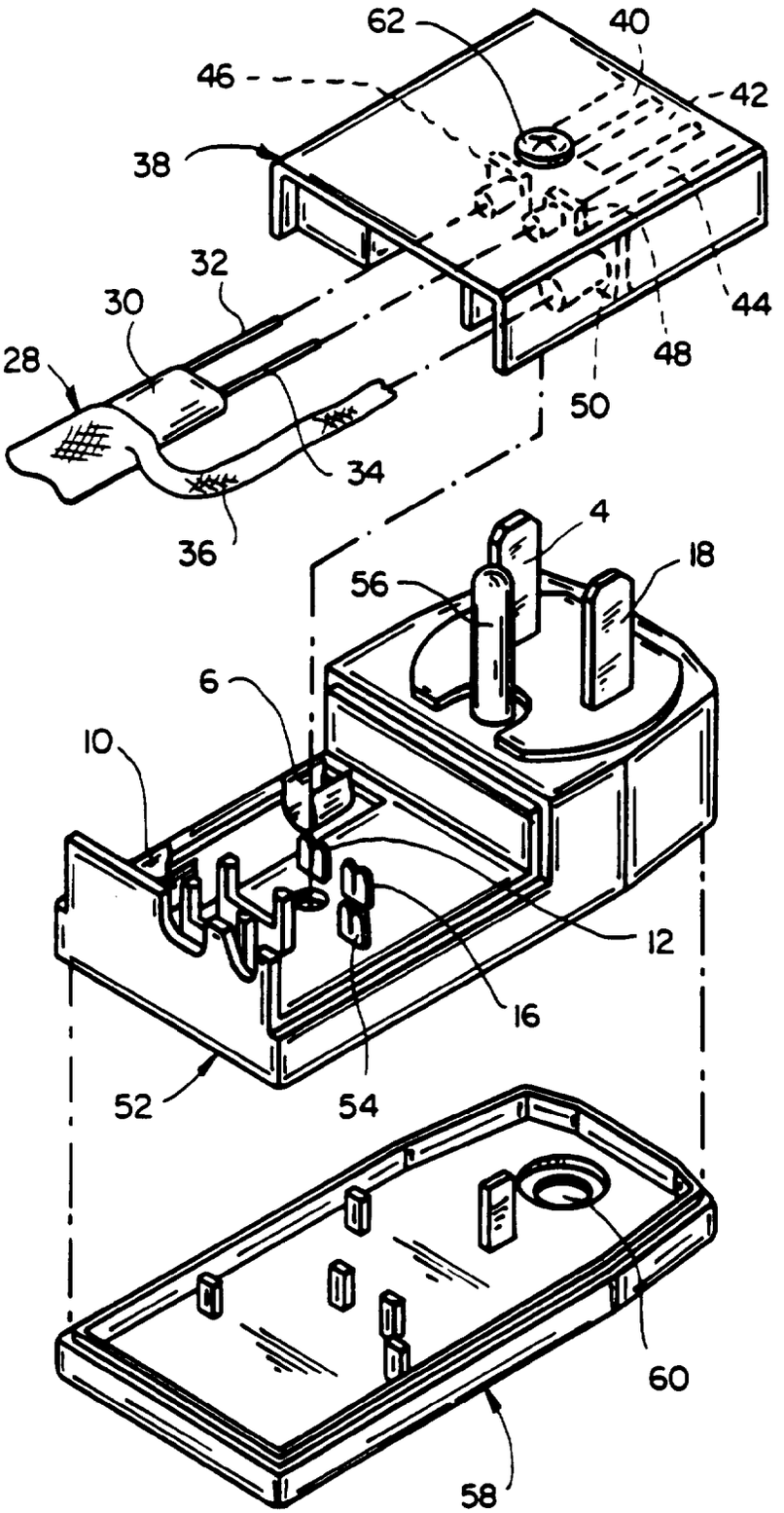


FIG_2A

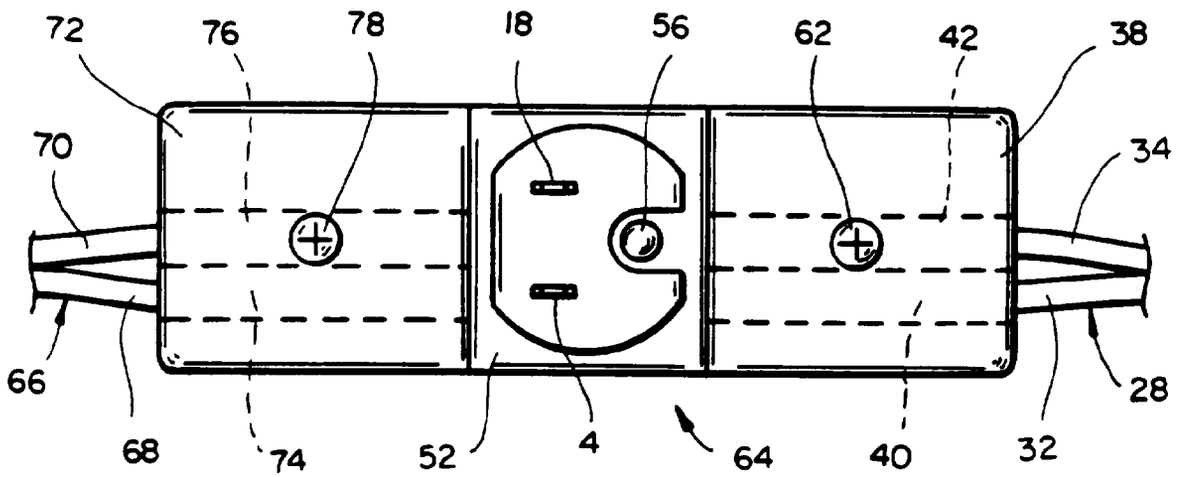


FIG_3