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(54) Electric iron.

(57) An electric iron 1 includes a main body portion 2 and a rear end portion 3 detachably connectable to the main body portion by means of releasable positive interlocking means 4. The rear end portion 3 serves as a base upon which the iron may be stood to form a free standing assembly both with the base interlocked with and disconnected from the main body portion. The main body portion 2 and rear end portion 3 respectively incorporate the parts 6,7 of a two part electrical connector so that electrical connection is automatically made when the two parts are interlocked. An electric cable connection is made to the rear end portion. The relationship between the two portions 2,3 and the two parts 6,7 is such that substantially no restraint is offered to the main body portion being lifted from the base when the interlocking means 4 is released.

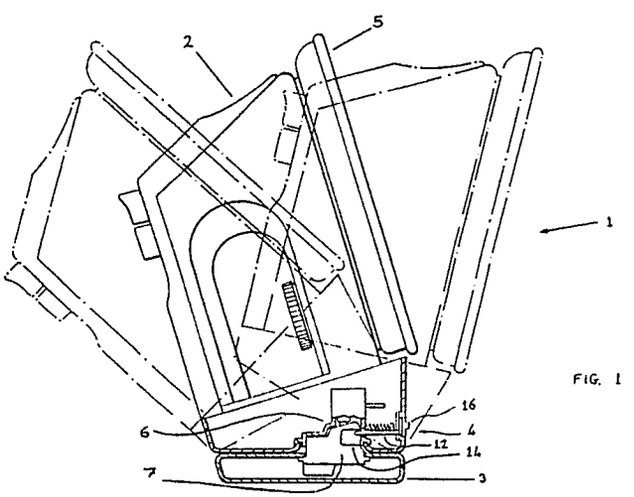

FIG. 1

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Electric Iron

This invention relates to electric irons which facilitate ironing in either a "corded" or a "cordless" mode, that is with an electric cable attached to the iron or detached from the iron as desired.

Conventionally electric irons have a permanently attached electrical cable through which an electric current is supplied in use to heat the iron. However it is often found that the electric cable can be obstructive during ironing and hence it has been suggested to provide "cordless" irons from which the electrical cable is detached during ironing. When not in use, for example when clothing is being arranged on an ironing board, cordless irons are generally placed on end on a stand to which an electric cable is attached, and through which an electric current is supplied to heat the iron. Stands for cordless irons are either relatively large and heavy or are fixed to a surface such as an ironing board, and are thus inherently unsuited to attachment to the iron for ironing in a corded mode.

A drawback with cordless irons is that the iron cools down rapidly when it is removed from its stand, which is particularly disadvantageous when ironing larger items. In order to overcome this difficulty there have been proposals to provide irons which may be operated either in a corded or a cordless mode as desired depending on the size and nature of the item to be ironed.

For example it has been proposed to provide a "corded cordless" iron which is placed on a stand when not in use and is lifted from the stand for ironing, there being an electric cable with a plug at one end and a connector at the other end which is selectively connected into the iron for ironing in a corded mode and into the stand for ironing in a cordless mode or when the iron is not in use. In this proposal the stand is relatively heavy and bulky and it is necessary when changing to, or from ironing in a cordless mode to physically disconnect the electric cable from the stand and connect it into the iron or vice versa, which is clearly inconvenient.

In another proposal an iron is provided with a connector which is attached to the rear end of the iron for ironing in a corded mode, and is detached from the iron and attached to a base unit when the iron is not in use or when it is being used in a cordless mode. When the iron is not in use it is placed on its rear end on the connector with the connector itself being supported by a larger base unit. The iron and connector alone in combination are not adapted to form a free-standing assembly in an end-on configuration, and a separate base unit is provided for engagement with the connector.

It is therefore still inconvenient with such an arrangement, when ironing in a corded mode is selected, to be required to detach the connector from a base unit and attach it to the iron, and vice versa when corded operation is no longer required.

The above arrangements are also costly having regard to the number of components required.

Viewed from one aspect the present invention provides an electric iron including a main body portion and a rear end portion detachably connectable thereto by means of releasable positive interlocking means, said rear end portion serving as a base upon which the iron may be stood to form a free standing assembly both with said interlocking means engaged and released, said main body portion and rear end portion respectively incorporating the parts of a two part electrical connector so that electrical connection is automatically made between said parts when said rear end portion is interlocked with said main body portion and when said main body portion is stood on said rear end portion, an electric cable connection being provided to said rear end portion, the relationship between said two portions and the parts of said two part electrical connector being such that substantially no restraint is offered to said main body portion being lifted from said rear end portion when serving as a detachable base with said interlocking means released.

There is thus provided a particularly convenient electric iron which may be used in either a corded or a cordless mode as desired, and wherein at least some of the drawbacks associated with known irons of this type are avoided.

No further base unit or stand additional to the rear end portion of the iron is required in this arrangement, since the rear end portion is adapted to be free standing with or without the main body portion supported thereon, and in the absence of any substantial restraint offered to the main body portion being lifted from the rear end portion when such is intended to serve as a detached base, no further heavy stand or a base secured e.g. to an ironing board is needed to retain the rear end portion when ironing in a cordless mode is selected.

In the absence of any such additional stand the inconvenience of having to detach a connector from the stand before attaching it to the iron is avoided.

The rear end portion of the iron may be relatively lightweight whilst still being detachable from the main body portion under its own weight. Releasable positive interlocking means are required to connect the two portions of the iron together in the

absence of substantial friction between the two portions and respective parts of the electrical connector.

Preferably manually operable actuating means are provided for engaging or releasing said positive interlocking means, which actuating means are exposed for operation when the iron is standing on its rear end portion. This arrangement is particularly convenient and requires little effort from the user to lock the main body portion and the rear end portion in connection or to disconnect these two portions.

Any suitable releasable positive interlocking means may be used. In one iron said means comprises a spring loaded pin associated with either one of said main body portion or said rear end portion, and a complementary recess associated with the other of said portions. Such is a particularly simple and reliable construction, in which for example in order to connect the main body portion to the rear end portion manually operable actuating means such as a sliding switch may be effective to insert the pin into a complementary recess against the bias of a spring.

In general, one of said respective parts of the two-part electrical connector may comprise a male terminal pin connector and the other may comprise a female socket connector. It may be inappropriate for the electrical contacts of the connectors to be matingly engaged as such may not facilitate a substantially frictionless connection between the iron and the base adaptor.

In one arrangement the part of the electrical connector incorporated in said main body portion of the iron comprises a male terminal pin connector and the other part associated with said rear end portion comprises a female socket connector, said parts being adapted for engagement by insertion of each pin into a socket chamber via respective apertures formed in the forward end of the socket connector, there being a leaf spring contact provided in each socket aperture for contact with a respective terminal pin. Such a connection may provide substantially no restraint to the main body portion of the iron being lifted from the rear end portion and is also advantageous in that the leaf spring may act to assist disconnection of the rear end portion of the iron from the main body portion.

The natural line of movement when lifting an iron from a horizontal surface such as a surface of the rear end portion when such is intended to serve as a detached base is to tilt the iron onto one edge and lift it along an arc or a diagonal inclined to the horizontal surface at an angle considerably less than 90°. It is also natural when placing an iron on such a surface to approach the surface at such an angle inclined to the horizontal surface, and possibly also to rotate the iron to a varying degree about a vertical axis with respect to the rear end portion so that respective parts of the electrical connector on the main body portion of iron and the rear end portion may not be aligned. Preferably therefore the parts of the connector are configured to accommodate an angled i.e. non-vertical approach of the main body portion towards or away from the rear end portion when such is serving as a detached base, preferably in both forwards and sideways senses. This not only enables a more natural line of movement to be followed, but can also help to ensure that the rear end portion is always detached in the cordless mode in that relative tilting of the main body portion relative to the rear end portion onto one side edge before or during lifting tends partially to promote separation of the portions.

An electrical connector suitable for use in such an iron and which accommodates pivotal movement of the iron with respect to a base adaptor is described in our co-pending United Kingdom patent application number 8811380. An electrical connector is described in this application wherein the relative dimensions of the pins and socket chamber(s) allow the free end of each pin some freedom of movement within the socket chamber, the terminal pin connector including a guide means which co-operates with the socket connector to provide alignment between the pins and respective socket openings at least in the lateral direction with respect to the pins wherein the walls of the socket connector are a close fit within the guide means only in the region of their forward edges so as to permit limited pivotal movement of the pins with respect to the socket connector whilst maintaining said lateral alignment between the pins and apertures at the forward end of the connector. Thus alignment and guidance of the pins is provided at least in the lateral direction, thereby avoiding distortion or bending of the pins, whilst allowing limited pivotal movement of the pins with respect to the socket connector. The user may therefore use a more natural line of movement to remove the iron from the base, or to place it on said base.

In a convenient arrangement the guide means is a shroud forming part of the male connector and at least partly surrounding the terminal pins, the shroud defining a recess within which the female connector may be engaged. In this case the longitudinal side walls of the socket connector may be recessed in the lateral direction with respect to the forward end part thereof so that the shroud closely embraces the forward end part to maintain lateral alignment of the pins within the socket apertures whilst a clearance is defined between the shroud and side walls below the forward end part to permit limited relative pivotal movement in the lateral plane.

In a longitudinal plane it is often less critical for the guide means to align the terminal pins with the

sockets since the pins may be less vulnerable to bending in this plane. Thus the forward edge of the socket connector need not be a close fit with the forward edge of the shroud in a longitudinal plane. Preferably limited pivotal movement in a longitudinal direction is accommodated by socket openings being substantially longer in a longitudinal direction than the breadth of the terminal pins and by at least part of the lateral walls of the socket connector and shroud being tapered and/or loose fitting. Thus angling of the main body portion of the iron with respect to the rear end portion on connection or disconnection is accommodated.

It is to be understood that for reasons of safety such socket openings may be lengthened substantially in a longitudinal direction whereas less of an increase in the width in a lateral direction is allowable.

Provision of tapers on the lateral walls of the shroud and the socket connector also assists in aligning the respective parts of the connector when the main body portion approaches the rear end portion rotated at some angle about a vertical axis. In one arrangement the lateral and longitudinal inwardly facing walls of the shroud and outwardly facing walls of the socket connector are tapered to accommodate approach of the main body portion of the iron to the rear end portion rotated at a limited angle with respect to the rear end portion about a vertical axis. Thus the user need not precisely locate the iron at any particular angle on the base.

Further locating means may also be provided in the form of tabs and/or ribs protruding from the rear end portion and adapted to engage with complementary recesses provided on a rear face of the main body portion of the iron. Alternatively tabs and/or ribs may be provided on the rear face of the iron to engage with recesses on the base.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings wherein:-

Fig. 1 shows a partially sectioned side view of the iron of this embodiment standing on its rear portion end with base connected;

Fig. 2 shows a partially sectioned view of the under-side of the iron of Fig. 1;

Fig. 3 shows a section through part of the iron viewed from one side corresponding to Fig. 1, in which the base is disconnected from the iron and the respective parts of the connector are shown in more detail;

Fig. 4 shows a partial section corresponding to Fig. 3 in which the respective parts of the connector are engaged;

Fig. 5 shows a partially sectioned view corresponding to Fig. 2, in which the respective parts of the connector are shown in more detail;

Fig. 6 shows a partially sectioned view from above of a part towards the rear of the iron of this embodiment.

The iron 1 appearing in Figs. 1 and 2 has a main body portion 2 and a rear end portion 3 which is connectable to the main body portion by means of releasable positive interlocking means 4. The main body portion 2 includes a hotplate 5 and an electrical heater (not shown), and the rear end portion 3 is provided with an electrical cable (not shown) which enters this portion from above, i.e. from the left in Fig. 1. The main body portion 2 and the rear end portion 3 incorporate respective parts 6, 7 of a two-part electrical connector such that electrical connection is automatically made between these respective parts 6, 7 when the rear end portion 3 is engaged with the main body portion 2. Thus when the appliance is plugged into the mains and the portions 2, 3 of the iron are connected, an electric current is automatically supplied to the main body portion 2 to heat the hotplate 5. The respective parts of the electrical connector are shown in more detail in Figs. 3 to 5.

The rear end portion 3 forms a base on which the main body portion 2 may be stood to form a free standing assembly which may be placed on an ironing board or other surface. For ironing in a corded mode the rear end portion 3 remains connected to the main body portion 2, and for ironing in a cordless mode the rear end portion 3 is disconnected from the iron and remains on a surface such as an ironing board.

The part 6 of the electrical connector incorporated in the main body portion 2 of the iron comprises a male terminal pin connector, and the other part 7 incorporated in the rear end portion 3 comprises a female socket connector. Each pin 8 is received in a respective aperture 9 of the female socket connector 7 and is arranged to contact a leaf spring contact 10 located within the aperture 9. The pins 8 are a relatively loose fit within the socket apertures 9 since the electrical connection relies on contact of the pins 8 with leaf spring contacts 10 rather than on mating contact between the pins 8 and the apertures 9. The leaf spring contacts 10 act to urge the rear end portion 3 of the iron to remain on a surface when the main body 2 of the iron is lifted for ironing in a cordless mode.

The main body portion 2 of the iron includes a shroud 11 which defines a recess within which the female socket connector 7 may be engaged. The surfaces of the shroud 11 and the socket connector 7 are smooth and in general are relatively loose fitting so that a minimal frictional force is exerted between these surfaces when the main body portion 2 is lifted from the rear end portion 3. The rear end portion 3 may therefore be relatively ligh-

tweight whilst still remaining on the ironing board under its own weight when the iron is lifted therefrom for use in a cordless mode.

Whilst there is substantially no restraint offered to the iron 2 being lifted from the base 3 due to friction between the respective parts 6, 7 of the electrical connector and between the shroud 11 and the socket connector 7, a positive interlocking means 4 is provided to selectively securely connect the two portions 2,3 in an engaged position for ironing in a corded mode. The positive interlocking means 4 (shown from above in Fig. 6) comprise a pair of spring loaded pins 12 joined by a linking member 13 which are adapted to be received by undercuts 14 provided in the longitudinal walls of the socket connector 7. The pins 12 extend through apertures in the shroud 11 and a compression spring 15 bearing on shroud 11 and linking member 13 is adapted to urge the pins 12 out of undercuts 14. A sliding switch 16 on the underside of the iron is actuated manually to insert the pins 12 into undercuts 14 against the bias of spring 15 to interlock the respective portions 2, 3 of the iron when they are engaged so that the iron may be used in a corded mode. Fig. 1 shows an iron 1 resting on its rear end on a surface in which pins 12 are received in undercuts 14 so that the rear end portion 3 will remain connected to the main body portion 2 if the iron is lifted from the surface for ironing in a corded mode. Sliding switch 16 has been moved upwardly in Fig. 4 so that pins 12 are withdrawn from undercuts 14 and the rear end portion 3 will remain under its own weight on the surface if the main body portion 2 is lifted for ironing in a cordless mode, as shown in Fig. 3.

A function of the shroud 11 is to guide the terminal pins 8 into the respective apertures 9. The pins 8 of this embodiment have a rectangular cross-section and are thus more vulnerable to bending or distortion if they are not effectively guided into the apertures 9 in a lateral plane. Hence at least a part of the lateral walls of shroud 11 and socket connector 7 must be a close fit, and in this embodiment the forward edges 17 of the socket connector 7 are a close fit with the shroud 11 to align the parts 6,7 of the electrical connector and guide the pins 8 into the apertures 9. It is not necessary for the socket connector 7 to be a close fit with the shroud 11 in a longitudinal direction, since the openings of the socket connector for receiving the pins can be increased in length with respect to the breadth of the pins to accommodate a degree of misalignment, provided that the openings are sufficiently narrow to preclude easy access to the internal live parts.

In order to facilitate limited pivotal movement of the iron 2 on its base 3 to accommodate a more natural angle of approach of the iron 2 to the base 3, and of withdrawal of the iron from the base, the relative dimensions of the pins 8 and the socket chambers 9 are such to allow each pin some freedom of movement within a chamber. In a lateral direction pivoting is accommodated in part by provision of the undercuts 14 in the lateral walls of the socket connector 7 which allow the lower part of the shroud to pivot whilst accurate alignment of the pins and openings at the top of the socket connector is maintained. In a longitudinal direction the socket connector 7 and shroud 11 are tapered and relatively loose fitting to allow pivoting, and the length of the socket openings 9 are substantially longer than the breadth of the pins 8 in this direction so that pivoting does not cause the pins to foul at the top of the socket connector. The socket connector 6 includes raised ribs 20 in the region to one side of the contact openings arranged for location in complementary recesses 21 in the shroud to assist correct relative alignment of the parts. The approximate limits of the front and rear withdrawal and approach locii of the iron 2 with respect to the base 3 are shown in broken lines in Fig. 1, and similarly the limits of sideways withdrawal and approach locii are shown in Fig. 2.

It can be seen in Fig. 5 that the end of the central earthed pin is displaced downwardly slightly with respect to the other two pins, whereas the spring leaf contacts 10 lie in the same horizontal plane when the parts are disengaged, so that the earth connection is made first and broken last even when an angled approach of the iron to the base is made.

The forward edges of shroud 11 are rounded to assist in location of the main body portion of the iron 2 on the rear end portion 3. A combination of rounded edges to the shroud 11 and tapered longitudinal walls of the socket connector 6 also allow an approach where the main body portion 2 is rotated to a limited degree about a vertical axis so that the pins and apertures are initially not aligned.

Claims

1. An electric iron including a main body portion and a rear end portion detachably connectable thereto by means of releasable positive interlocking means, said rear end portion serving as a base upon which the iron may be stood to form a free standing assembly both with said interlocking means engaged and released, said main body portion and rear end portion respectively incorporating the parts of a two part electrical connector so that electrical connection is automatically made between said parts when said rear end portion is interlocked with said main body portion and when said main body portion is stood on said rear end

portion, an electric cable connection being provided to said rear end portion, the relationship between said two portions and the parts of said two part electrical connector being such that substantially no restraint is offered to said main body portion being lifted from said rear end portion when serving as a detachable base with said interlocking means released.

2. An electric iron as claimed in claim 1 wherein manually operable actuating means are provided for engaging or releasing said positive interlocking means, which actuating means are exposed for operation when the iron is standing on its rear end portion.

3. An electric iron as claimed in claim 1 or 2 wherein said releasable positive interlocking means comprises a spring loaded pin associated with either one of said main body portion or said rear end portion, and a complementary recess associated with the other of said portions.

4. An electric iron as claimed in claim 3 further comprising a manually operable sliding switch effective to insert said pin into said complementary recess against the bias of a spring.

5. An electric iron as claimed in any preceding claim wherein one of said respective parts of said two-part electrical connector comprises a male terminal pin connector and the other comprises a female socket connector.

6. An electric iron as claimed in claim 5 wherein the part of the electrical connector incorporated in said main body portion of the iron comprises a male terminal pin connector and the other part associated with said rear end portion comprises a female socket connector, said parts being adapted for engagement by insertion of each pin into a socket chamber via respective apertures formed in the forward end of the socket connector, there being a leaf spring contact provided in each socket aperture for contact with a respective terminal pin.

7. An electric iron as claimed in claim 5 or 6 wherein the relative dimensions of the pins and socket chamber(s) allow the free end of each pin some freedom of movement within the socket chamber, the terminal pin connector including a guide means which co-operates with the socket connector to provide alignment between the pins and respective socket openings at least in the lateral direction with respect to the pins wherein the walls of the socket connector are a close fit within the guide means only in the region of their forward edges so as to permit limited pivotal movement of the pins with respect to the socket connector whilst maintaining said lateral alignment between the pins and apertures at the forward end of the connector.

8. An electric iron as claimed in claim 7 wherein said guide means is a shroud forming part of the male connector and at least partly surrounding the terminal pins, the shroud defining a recess within which the female connector may be engaged.

9. An electric iron as claimed in claim 8 wherein the longitudinal side walls of said socket connector are recessed in the lateral direction with respect to the forward end part thereof, whereby a clearance is defined between said shroud and said side walls behind said forward end part to permit limited relative pivotal movement in the lateral plane.

10. An electrical iron as claimed in claim 8 or 9 wherein said socket openings are substantially longer in a longitudinal direction than the breadth of the respective terminal pins and at least part of the lateral walls of the socket connector and shroud are tapered and/or loose fitting to permit limited relative pivotal movement in a longitudinal plane.

11. An electric iron as claimed in any preceding claim wherein the parts of said two part electrical connector are configured to accommodate an angled approach of the main body portion towards or away from the rear end portion when said rear end portion is serving as a detached base.

12. An electric iron as claimed in any of claims 8 to 10 wherein at least part of the lateral and longitudinal inwardly facing walls of the shroud and outwardly facing walls of the socket connector are tapered to accommodate approach of the main body portion towards or away from the rear end portion rotated at a limited angle about a vertical axis with respect to the rear end portion.

13. An electric iron as claimed in any preceding claim wherein there is provided on said main body portion and/or on said rear end portion at least one protrusion adapted to engage with a complementary recess on the other of said portions whereby to locate said portions.

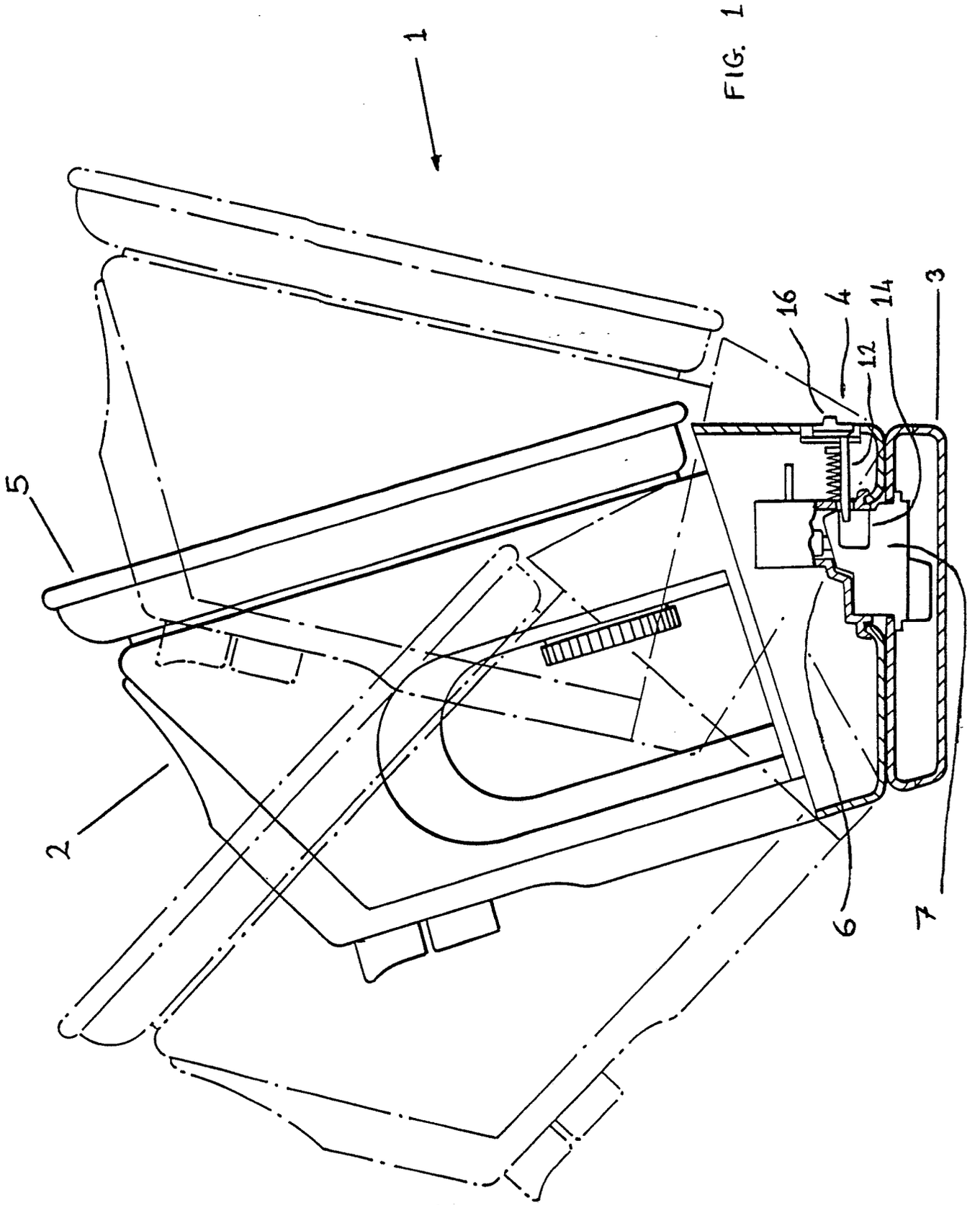

FIG. 1

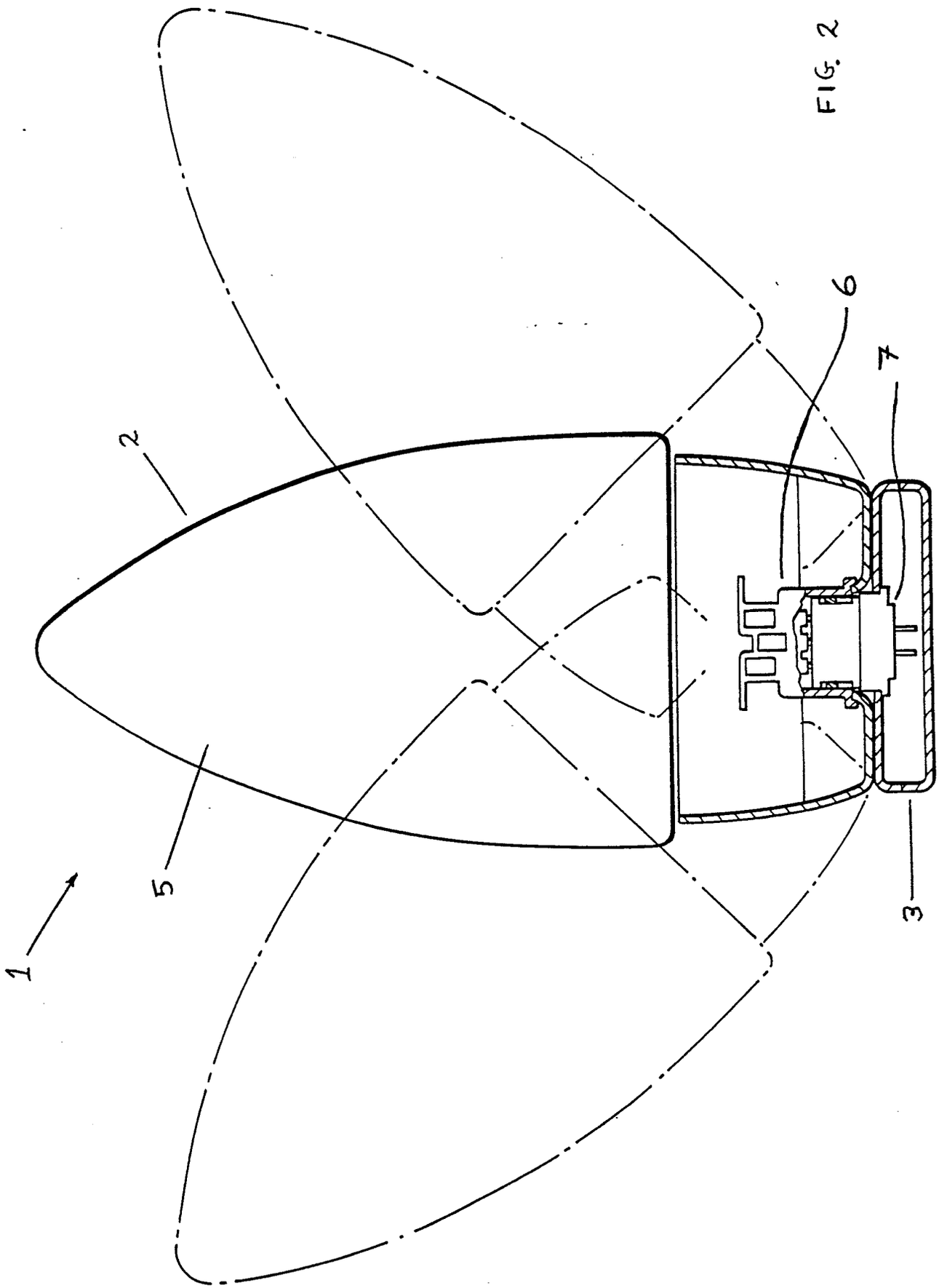

FIG. 2

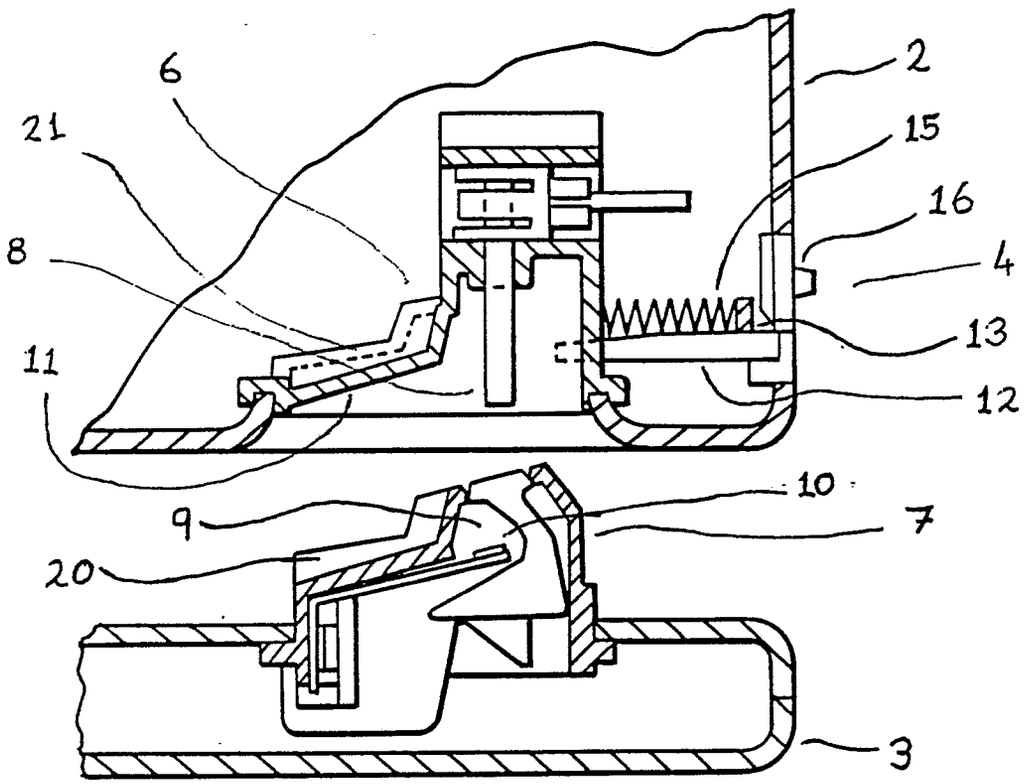

FIG. 3

FIG. 4

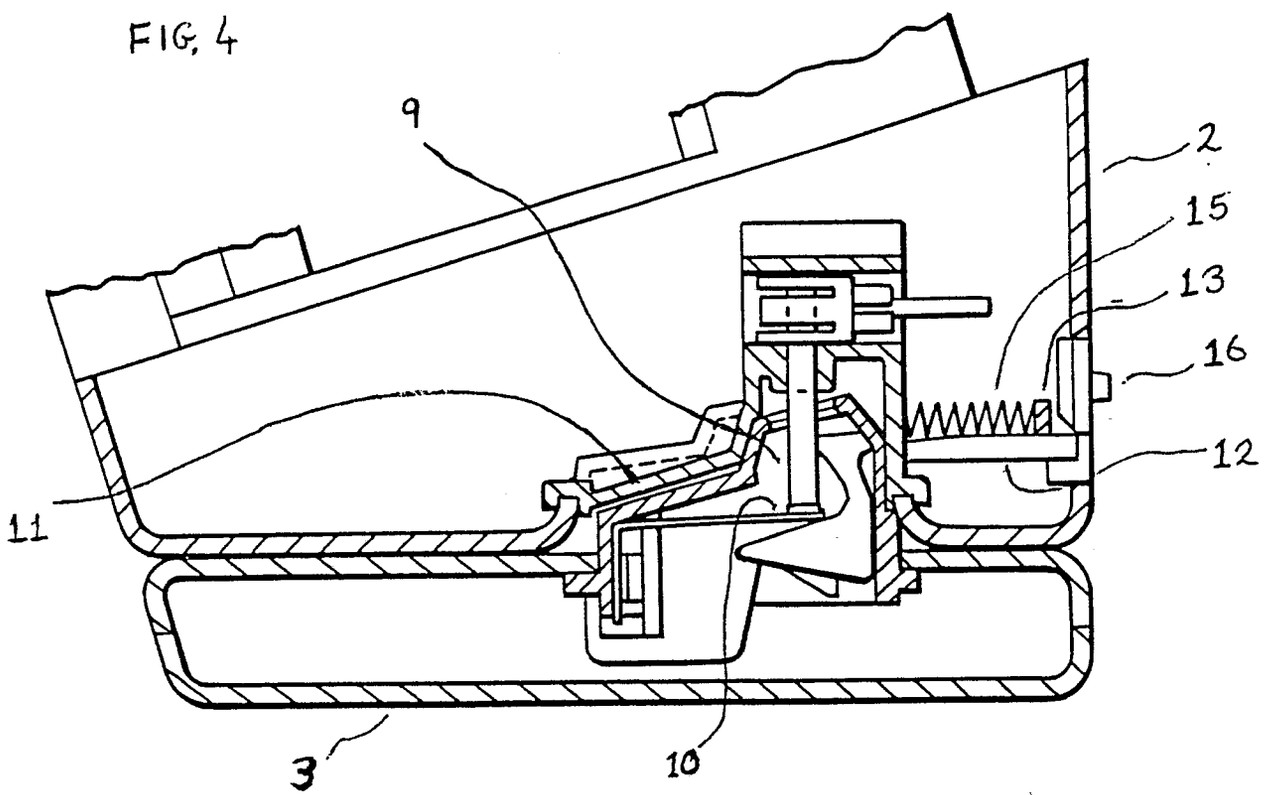

FIG. 6

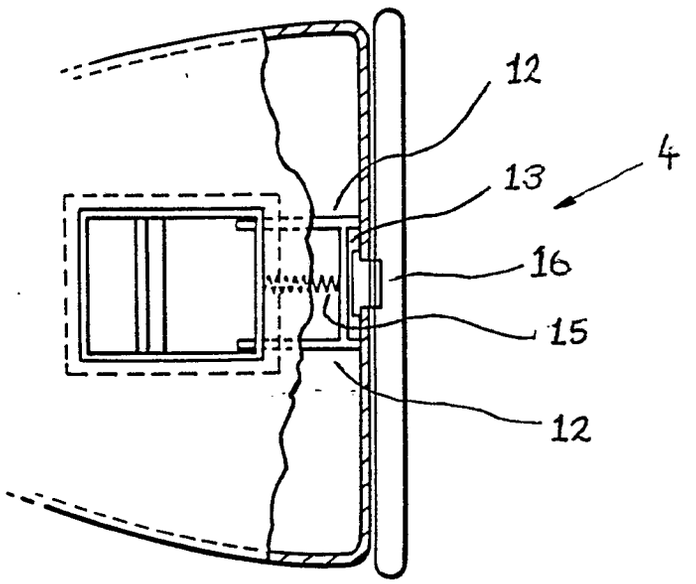

FIG. 5