



US00RE37590E

(19) **United States**  
(12) **Reissued Patent**  
**Leyden et al.**

(10) **Patent Number: US RE37,590 E**  
(45) **Date of Reissued Patent: Mar. 19, 2002**

(54) **RETRACTABLE SENSOR FOR AN ALARM SYSTEM**

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(\* ) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

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(21) Appl. No.: **08/807,120**

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(22) Filed: **Feb. 19, 1997**

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Reissue of:

(64) Patent No.: **5,552,771**  
Issued: **Sep. 3, 1996**  
Appl. No.: **08/258,663**  
Filed: **Jun. 10, 1994**

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(51) **Int. Cl.<sup>7</sup>** ..... **G08B 13/14**  
(52) **U.S. Cl.** ..... **340/568; 340/548; 340/563.4; 340/571; 340/665**  
(58) **Field of Search** ..... 340/568, 691, 340/651, 652, 665, 548, 571; 200/61.13, 61.93; 191/12.1 R, 12.2 R, 12.4

(57) **ABSTRACT**

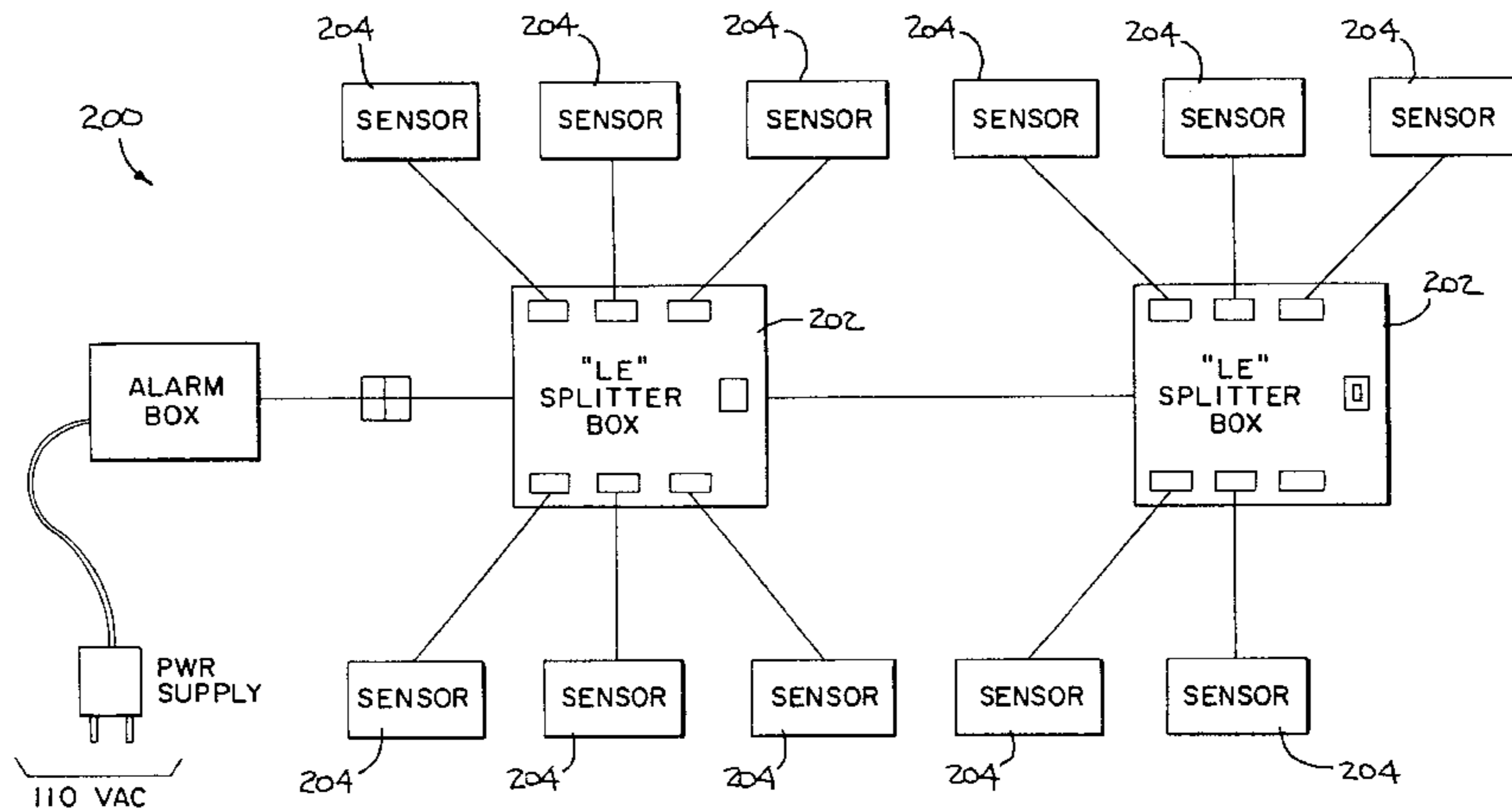
A retractable sensor assembly for use with an alarm system to prevent theft of valuable products while eliminating the problem of entangled and unsightly sensor cords is disclosed. The retractable sensor allows the user to grasp the product and pull it to a comfortable position. The invention consists of a housing, a retraction means contained in the housing, a sensor having two states, 1) secured when attached to the product and 2) unsecured when detached from the product, a multiconductor cable having a first end connected to the sensor, cooperating with the retraction means and a second end extending out of the housing, where the retraction means urges the sensor to the housing, yet allows the sensor to be pulled from the housing when an external force is exerted on the sensor, while maintaining a continuous electrical path from the first, sensor end of the cable to the second end of the cable.

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**14 Claims, 4 Drawing Sheets**



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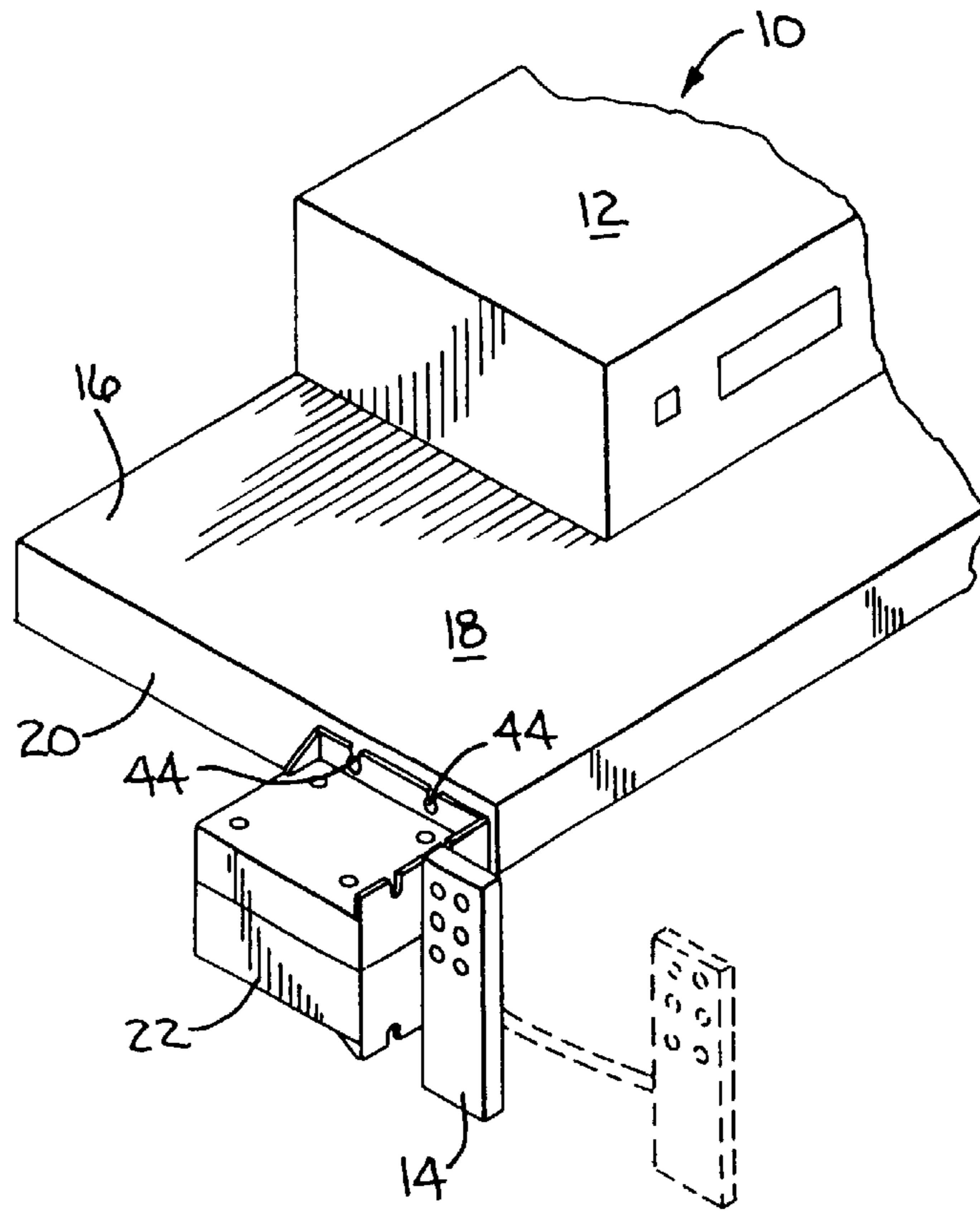


FIG. 1

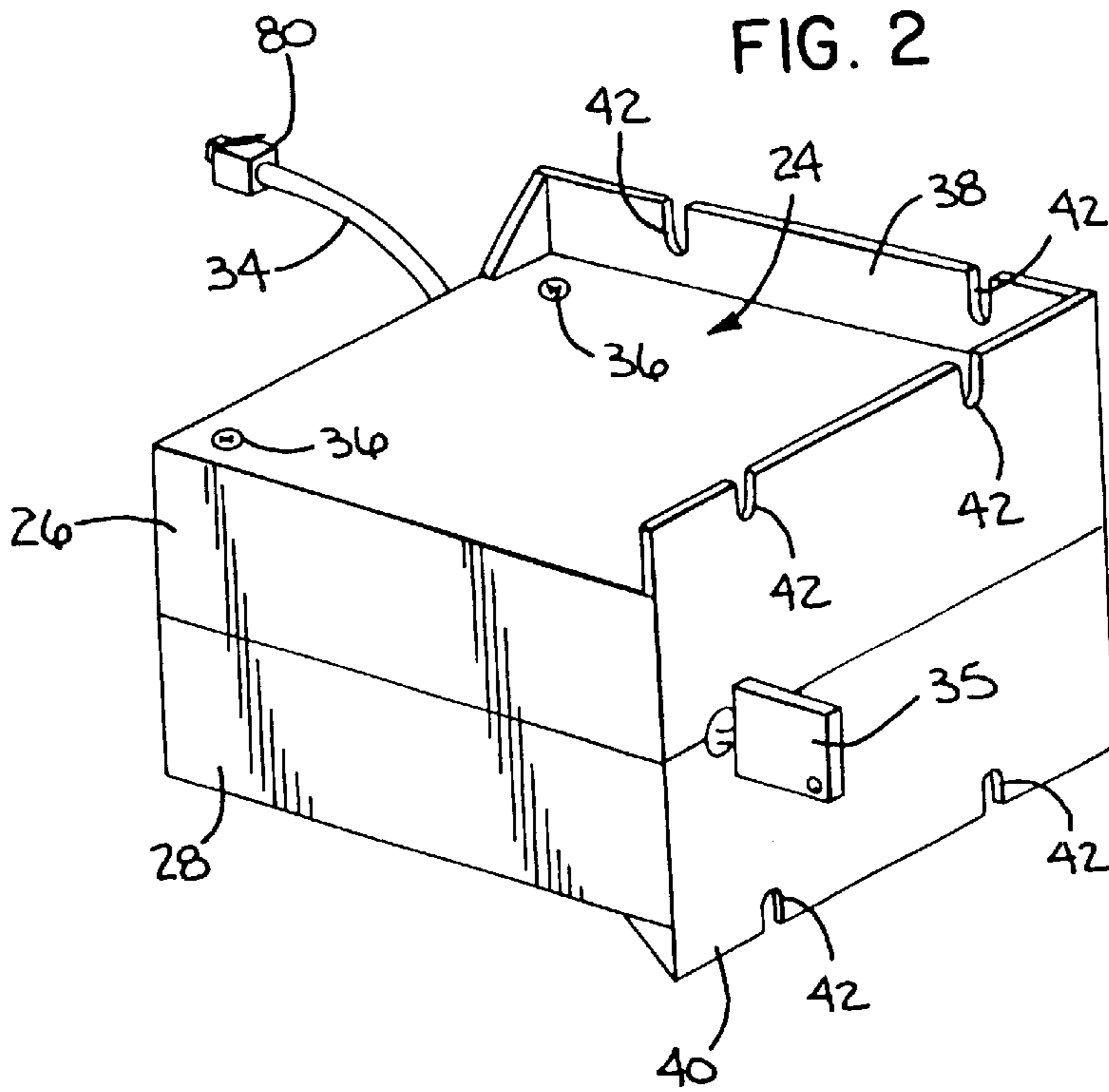
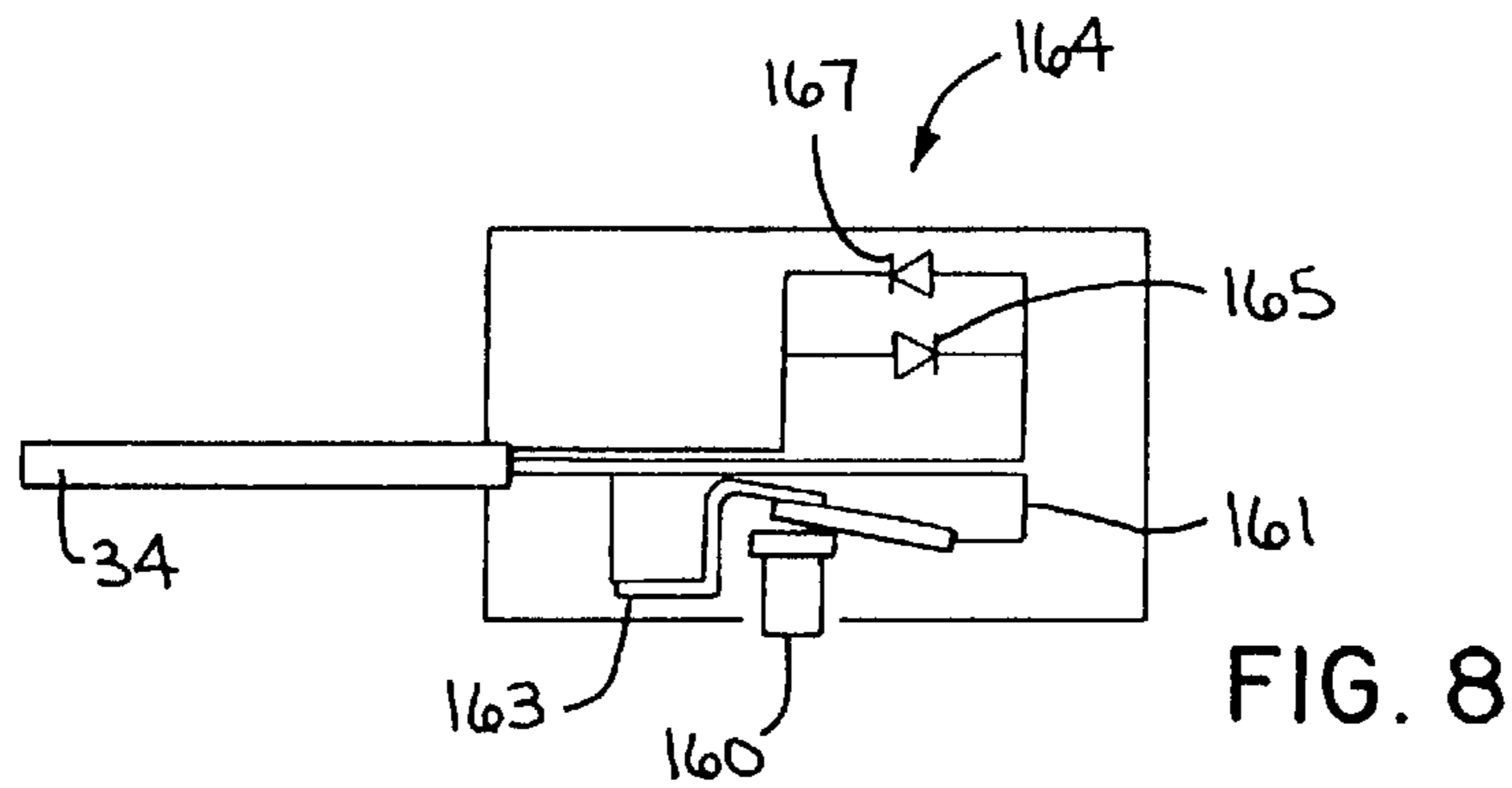
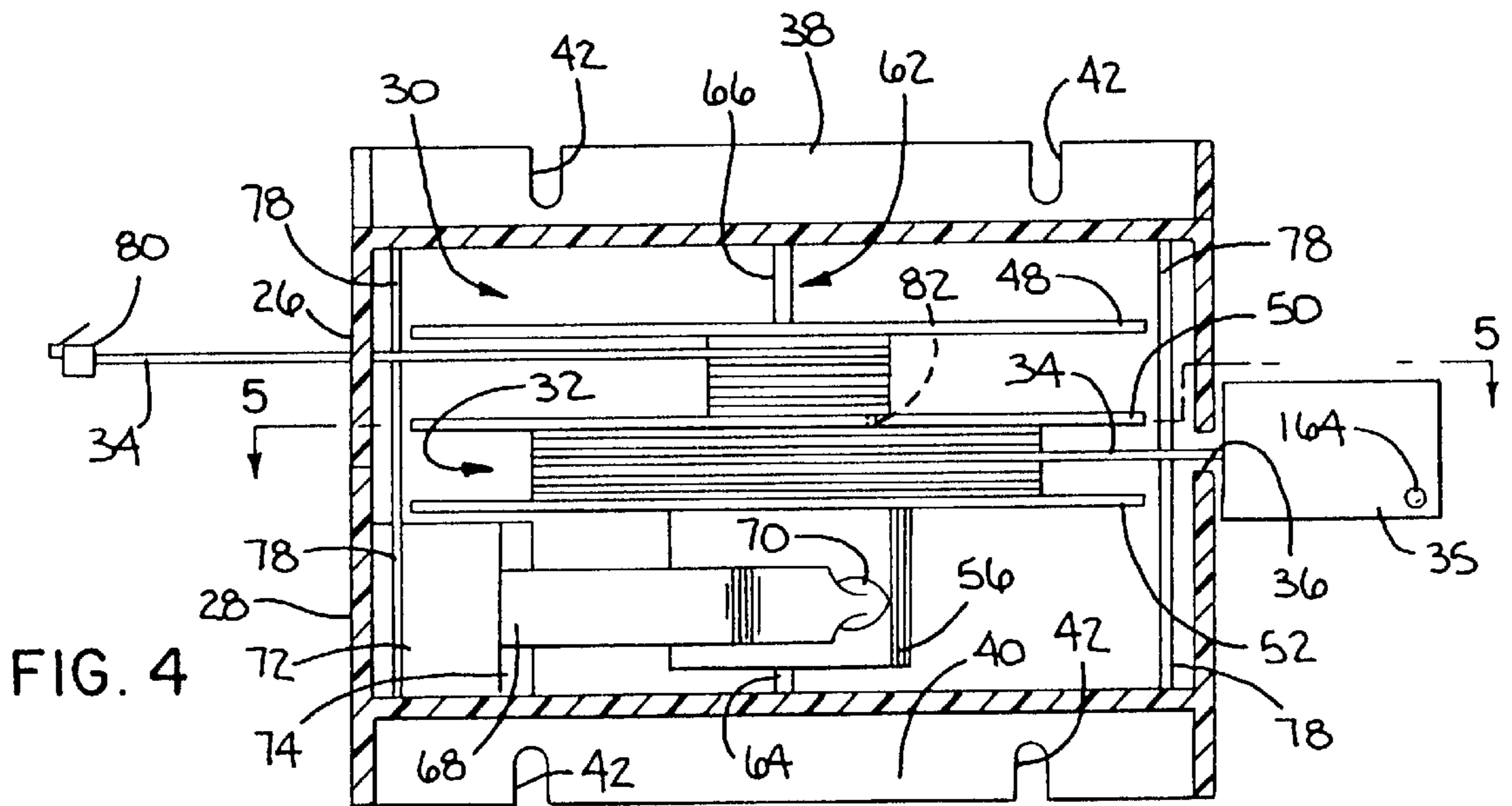
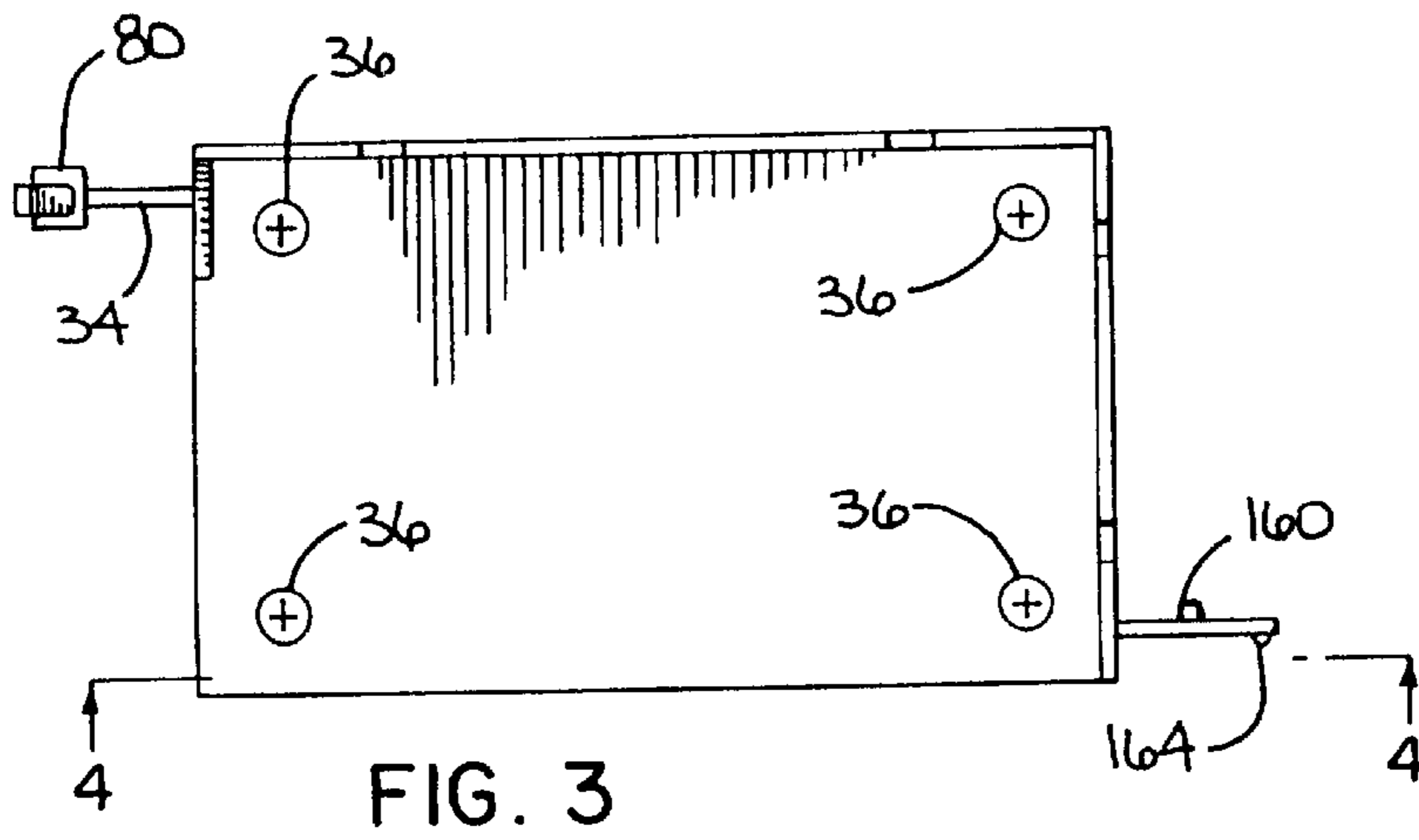
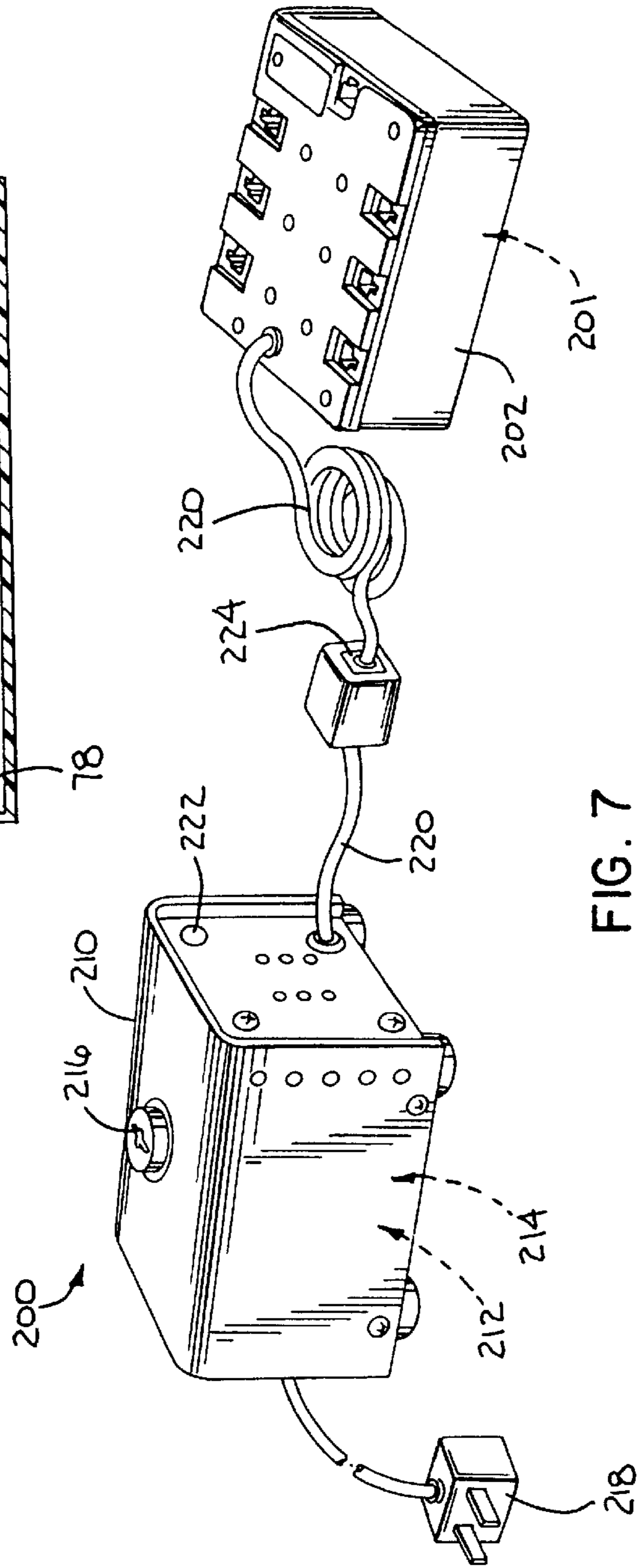
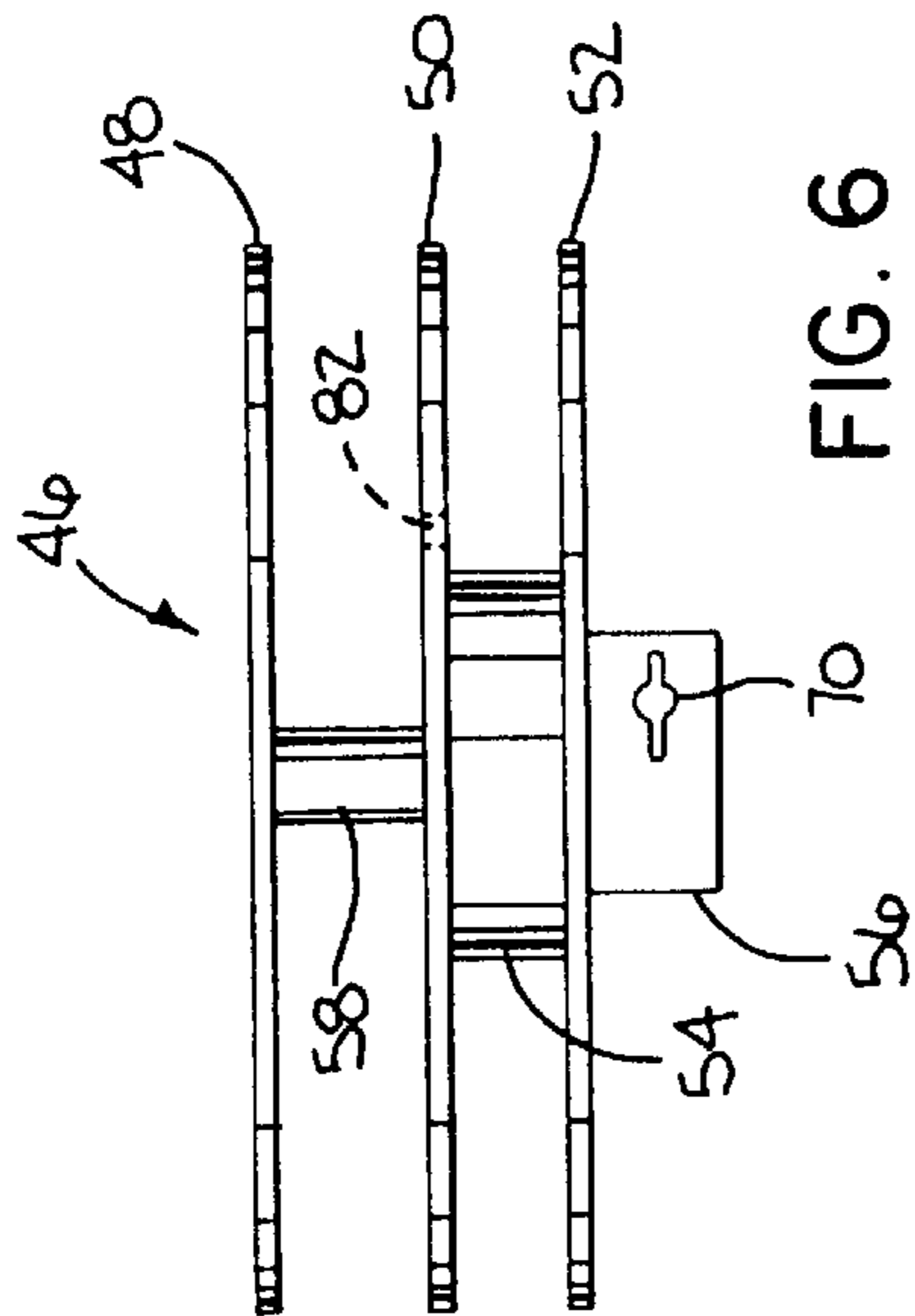
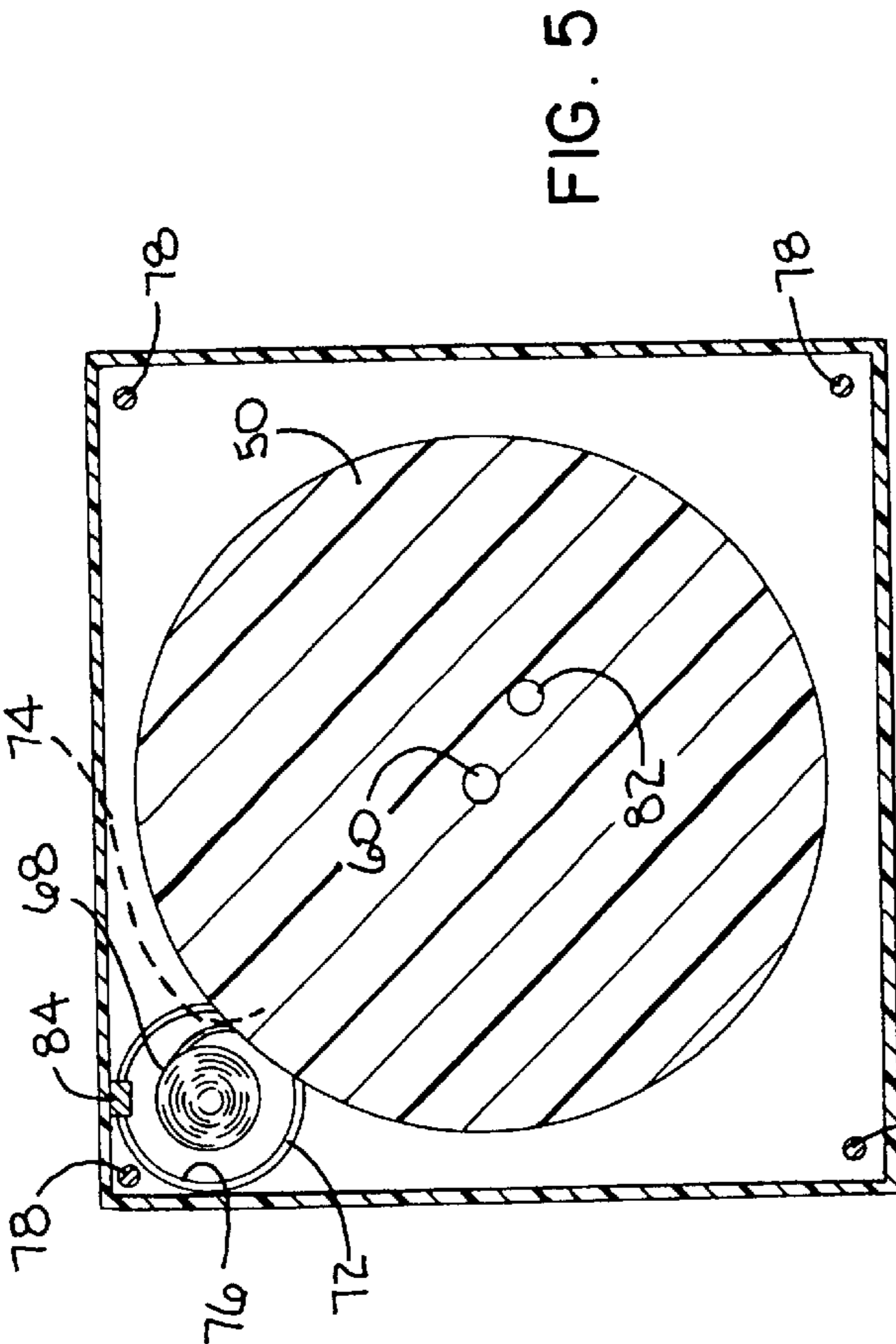


FIG. 2







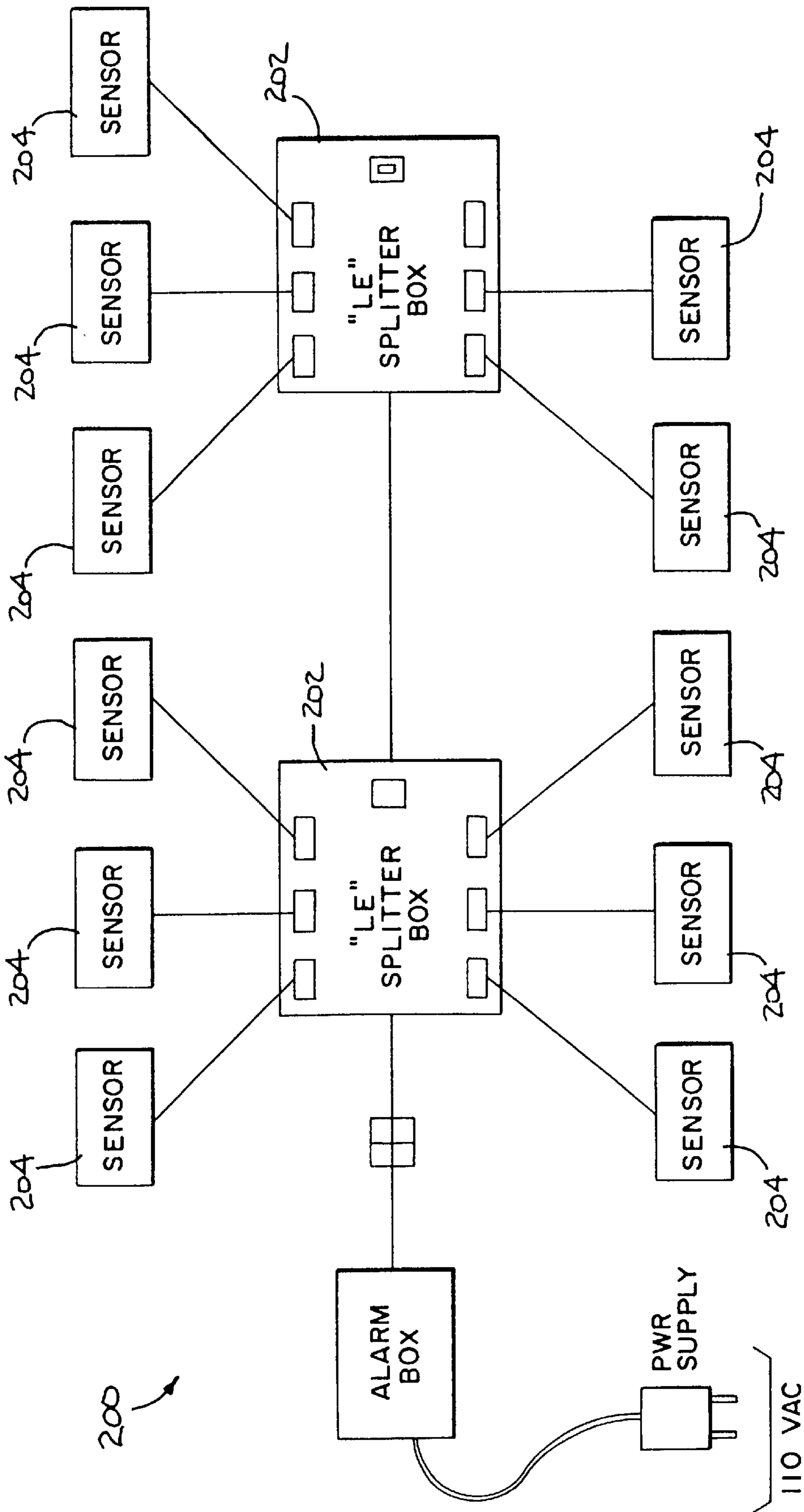


FIG. 9



## RETRACTABLE SENSOR FOR AN ALARM SYSTEM

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

### FIELD OF THE INVENTION

The present invention relates to security alarms and anti-theft devices and, particularly, to an improved sensor design which allows limited freedom of movement of a consumer item to which it is attached.

### BACKGROUND OF THE INVENTION

In recent years, retail and wholesale merchandisers have directed substantial attention to the nagging and costly problem associated with the theft and/or damage of costly display products on their premises. With the advent of smaller and more portable electronic apparatus, the ease with which pilferers and shoplifters can quickly and easily remove such goods from display cases and display racks has intensified. At the same time, the availability of new products, such as video cassette recorders, small portable radios and televisions, calculators and the like has skyrocketed, resulting in more and more valuable products being taken or tampered with. As locks and other security devices have become more sophisticated, so too have the individuals and methods for circumventing the operation of conventional security devices and, particularly, alarm sensing devices. The alarm system described in U.S. Pat. No. 5,172,098, to Leyden, has solved many of these problems. Some products, such as remote controls, are designed to be held and moved about. A sensor which can move freely with the product for a limited distance but returns the product and sensor to a set position when not being handled by a customer is optimal.

### SUMMARY OF THE INVENTION

The above invention is specifically directed to overcoming the above problems in a novel and simple manner. The invention is particularly directed to use with remote controls but is not limited to this use.

According to the present invention, a retractable sensor is provided for use with an alarm system to prevent the theft of valuable products, such as video cassette recorders, small portable radios and televisions. The retractable sensor consists of a housing, a retraction device contained in the housing, a sensor having two states, 1) secured when attached to the product and 2) unsecured when detached from the product, and a multiconductor cable with one end attached to the sensor, then extending into the housing, cooperating with the retraction device and the second end extending out of the housing, the retraction device urging the sensor to the housing, yet allowing the sensor to be pulled from the housing when an external force is exerted on the sensor while maintaining a continuous electrical path from the first end to the second end of the cable.

Preferably, the sensor has an indicating device on its housing for displaying the state of the sensor. In a highly preferred form, the indicator is a light-emitting diode.

One embodiment uses a phone cord as the multiconductor cord.

Preferably the second end of the cable contains a connecting device to mate with an alarm system, such as the alarm system described in U.S. Pat. No. 5,172,098.

A preferred form of the invention has a retraction structure consisting of a spool mounted for rotation in the housing

on which the multiconductor cable is wound and a device operatively associated with the spool for urging the spool in a direction to wind the cable onto the spool, yet permitting the unwinding of the cable when a user pulls the product, attached to the cable by the sensor, away from the housing.

With the above apparatus, the user can grasp and pull a product to a comfortable position. But if the user attempts to detach the product from the sensor, the alarm system detects this and warns the merchant.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial perspective view of a shelf with an electronic device thereon, a remote control for operating the electronic device and a retractable sensor according to the present invention attached to the remote control for allowing movement of the remote control from the solid position of FIG. 1 to the phantom line position;

FIG. 2 is an enlarged perspective view of the retractable sensor according to the present invention;

FIG. 3 is a top view of the retractable sensor with a remote control attached thereto and shown in phantom;

FIG. 4 is a sectional view of the retractable sensor taken along line 4—4 of FIG. 3;

FIG. 5 is a sectional view of the retractable sensor taken along line 5—5 of FIG. 4;

FIG. 6 is a side view of the pulley as used in the retractable sensor of the present invention;

FIG. 7 is a perspective view of an alarm system which cooperates with the retractable sensor of the present invention;

FIG. 8 is a partial schematic view of the retractable sensor showing one embodiment of the sensor; and

FIG. 9 is a schematic view of the alarm system shown in FIG. 7.

### DETAILED DESCRIPTION OF THE DRAWINGS

The disclosed invention is shown as used with a remote control for an electronic device. The invention can be used with a wide variety of products and the choice of a remote control is just for convenience. It is understood that the particular product used to illustrate the invention is shown by way of example only and not as a limitation of the invention.

In FIG. 1, a typical point-of-purchase display is shown at 10 for an electronic device 12 which is operable through a portable, hand-held control 14 from a location remote from the device 12. A display shelf 16 defines an upwardly-facing surface 18 for supporting the device 12. The shelf 16 has a peripheral, vertically-extending edge 20 to which the remote control 14 is attached through a retractable sensor assembly 22, according to the present invention. The retractable sensor assembly 22 is designed to allow free movement of the remote control 14 thereon from the stored/solid line position of FIG. 1, to the phantom position in FIG. 1, wherein it can be conveniently manipulated by the consumer.

The details of the retractable sensor assembly 22 are shown in FIGS. 2-6. The retractable sensor assembly 22 consists of a rectangular housing 24 defined by first, and second housing parts 26, 28 respectively. The first and second housing parts 26, 28, operatively connected as in FIGS. 2-4, define an internal space 30 which contains a retraction mechanism at 32 for a multiconductor cable 34, see FIG. 4. A sensor 35 is connected to the cable 34 and attaches to the remote control 14. For a description of several methods of attaching the sensor to a product, see U.S. Pat. No. 5,172,098 which is incorporated herein by reference.



The first and second housing parts **26, 28** are held together by a plurality of screws **36**. To facilitate anchoring of the housing **24**, flanges **38, 40** are integrally formed thereon and have openings **42** therein to accept conventional fasteners, such as screws and nails **44** (FIG. 1).

A plurality of threaded posts **78** are provided for the screws **36** to secure the two housing parts **26, 28**. The posts **78** are made of two halves, one half extending from housing part **26** and the other half extending from housing part **28** and meeting in the middle.

The retraction mechanism **32** has a double pulley **46**, with a top disk **48**, middle disk **50** and bottom disk **52**. The double pulley **46** has three hubs with three different radii, a sensor hub **54**, a recoil hub **56** and an alarm system hub **58**. In the preferred embodiment the radius of the alarm system hub **58** is smaller than the sensor hub **54**. The double pulley **46** has a tube **60** running through the center of the hubs **54, 56, 58**, as shown in FIG. 5. The double pulley **46** rotates around a rod **62** (see FIG. 4) which is formed by a male post **64**, attached to the housing part **28**, mating with a female post **66**, attached to the housing part **26**.

A coil spring **68** attaches to the double pulley **46** at the recoil hub **56**. In an embodiment, the coil spring **68** has a T-shaped end (not shown) which is inserted in a slot **70** in the recoil hub **56**. The end is then rotated so that it cannot be removed from the slot **70**.

The coil spring **68** sits in a circular cup **72**. The cup has an opening **74** through which the end of the coil spring **68** extends out onto the recoil hub **56**. When the coil spring **68** is placed in the cup **72**, it expands until it meets an interior surface **76** of the cup **72**, where it is held. The opening **74** is chosen so that the coil spring **68** cannot pass through the opening **74** when the sensor **35** is fully extended.

The cable **34** is continuous through the housing **24**, from the sensor **35** to a phone plug **80**. From the sensor **35** the cable **34** winds around and spirals into the sensor hub **54**. Then the cable **34** extends through a hole **82** (shown in FIGS. 4-6), near the edge of sensor hub **54**, in middle disk **50** where the cable **34** winds around and spirals out from the alarm system hub **58**, and then extends out of the housing **24** to the phone plug **80**. The cable **34** is wrapped on the sensor hub **54** and the alarm system hub **58** in such a way that when the sensor **35** is pulled from the housing **24**, the cable **34** unwinds around the alarm system hub **58** (i.e. the cable **34** unwinds from the hubs **54, 58** simultaneously). This unwinding results in the cable **34** forming a looser spiral around the alarm system hub **58**. The cable **34** is prevented from extending out towards the phone plug **80** by a U-shaped catch **84**. The catch **84** is designed so that cable **34** tightly engages the catch **84**.

The retractable sensor assembly **22** is designed to work with an alarm system **200** of FIG. 7. The retractable sensor assembly **22** has a cable **34** that mates with a splitter box **202** of the alarm system **200**. The details of the alarm system are described in U.S. Pat. No. 5,172,098.

Each splitter box **202** can control up to six sensors **204** as best seen in FIG. 9. The splitter boxes **202** can be daisy-chained to add additional sensors **204**. The sensors **204** can be the retractable sensor assembly **22** disclosed herein or any of the variety of sensors described in U.S. Pat. No. 5,172,098.

The alarm system **200** includes an alarm housing **210** enclosing an alarm circuit **212** having a horn **214**. A lock **216** enables and disables the alarm circuit **212** via a key (not shown). An AC adapter **218** provides a nine volt DC voltage from a **110** VAC source. The electrical cord **220** connects the alarm circuit **212** to the splitter box **202**. The alarm housing **210** also includes an LED **222** in addition to the horn **214** to indicate the state of the alarm circuit **212**. The electrical cord

**220** may consist of a phone cord and include a connector **224** (one shown), one from the splitter box **202** and the other form the alarm circuit **212**.

FIG. 8 shows a schematic view of the sensor **35**. When the sensor **35** is adhered to the remote control **14** the button **160** is depressed as shown in FIG. 8 and FIG 3. The depression of button **160** causes a first conductor **161** to come into contact with a second conductor **163** to complete an electrical circuit. Due to the completion of the electrical circuit, a detector circuit **201**, contained in the splitter box **202** (as shown in FIG. 7), determines that the sensor **35** is attached to the remote control **14**. The detector circuit **201** is described in U.S. Pat. No. 5,172,098 which is incorporated by reference herein. The detector circuit **201** induces an electrical current to flow in one direction through indicator **164**. Since the indicator **164** has two LED's **165,167** connected in antiparallel, one of the LED's **165** is conducting and emits red light. The red light indicates the sensor **35** is in the secured state. Alternatively, when the sensor **35** is removed from the remote control, the button **160** is released and the first conductor **161** breaks contact with the second conductor **163** to break the electrical circuit. The detector circuit **201** induces an electrical current to flow in a second direction through the indicator **164**. This results in LED **167** conducting and emitting a green light, which indicates the sensor **35** is in the unsecured state.

With the above structure, it can be seen that consumers can conveniently grasp the remote control **14** and operate it in a normal manner. At the same time, the merchant is afforded the security of knowing that the remote control **14** cannot be removed from the premises. The device can be made sufficiently low in cost that it can be affordably purchased and used for even low-price remote controls.

The foregoing disclosure of specific embodiments is intended to be illustrative of the broad concepts comprehended by the invention and is not intended to limit the scope of the invention.

We claim:

1. A retractable sensor assembly, as used with an alarm system, comprising;
  - a housing;
  - means for retraction contained in said housing;
  - a sensor having two states, 1) secured when attached to a product and 2) unsecured when detached from said product, said sensor being outside the housing;
  - a multiconductor cable, having a first end attached to the sensor then extending into the housing, cooperating with the retraction means and a second end extending out of the housing;
  - said retraction means urging the cable into the housing and thereby urging the sensor to the retraction means, yet allowing the sensor to be pulled from the housing when an external force is exerted on the sensor, while maintaining a continuous electrical path from the first, sensor end of the cable to the second end of the cable; and
  - means for connecting said second end of the cable to an alarm system able to detect if said sensor is in the secured or unsecured state,
  - whereby a user can grasp and pull on a product attached to the sensor to place the product in a comfortable position, but if the user detaches the product from the sensor the alarm system detects the unsecured state.
2. The retractable sensor assembly of claim 1 wherein said sensor has an indicating means for indicating the state of the sensor.
3. The retractable sensor assembly of claim 2 wherein said indicating means is a light-emitting diode.



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4. The retractable sensor assembly of claim 1 wherein said multiconductor cable is a phone cord.

5. The retractable sensor assembly of claim 1 wherein said retraction means includes;

a spool mounted in the housing upon which said multiconductor cable is wound; and

biasing means operatively associated with said spool in said housing for urging said spool in a direction to wind the cable on the spool, yet to permit unwinding of the cable when an external force is exerted on the sensor.

6. A retractable sensor assembly, as used with an alarm system, comprising;

a housing;

a pulley mounted for rotation in said housing, having a pair of hubs, a sensor hub and an alarm system hub, and a disk between the sensor and the alarm system hub has a hole;

a multiconductor cable wound about the sensor hub through said hole in said disk and then wound around the alarm system hub of said pulley, the cable having opposite near and remote ends;

a sensor, outside the housing, connected to the remote end of said cable and being attachable to a product, said sensor having two states, 1) secured when attached to the product and 2) unsecured when detached from the product, and the sensor including means for electrically connecting or disconnecting conductors in said cable according to the state of the sensor;

biasing means operatively associated with said pulley in said housing for urging said pulley and the pair of hubs in a direction to wind the cable around the sensor hub and thereby pull the sensor to the housing yet to permit the sensor to extend from the housing when an external force is exerted on the sensor; and

a connector, outside the housing, attached to the near end of the cable, for connecting to an alarm system,

whereby a user can grasp and pull on a product attached to the sensor to place the product in a comfortable position, but if the user detaches the product from the sensor the alarm system detects the unsecured state.

7. The retractable sensor assembly of claim 6 wherein said sensor includes a means for visually indicating whether the sensor is in the secured or unsecured state.

8. The retractable sensor assembly of claim 7 wherein said indicating means is a light-emitting diode.

9. The retractable sensor assembly of claim 6 in combination with a product and including means for attaching the sensor to the product so that the sensor is in the secured state.

10. The retractable sensor assembly of claim 9 wherein the sensor and cable are the only elements connecting between the product and housing.

11. A retractable cable assembly, as used with an alarm system, comprising;

a housing;

means for retraction contained in said housing;

a multiconductor cable, having a first end attached to a sensor attachable to a product then extending into the housing, cooperating with the retraction means and a second end extending out of the housing, said sensor having two states, 1) secured when attached to the product with at least two conductors of the cable electrically connected and 2) unsecured when detached from the product with said at least two conductors electrically disconnected;

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said retraction means urging the cable into the housing and thereby urging the first end connected to [a product] the sensor to the retraction means, yet allowing the first end to be pulled from the housing when an external force is exerted on the first end, while maintaining a continuous electrical path in said at least two conductors from the first end of the cable to the second end of the cable; and

means for connecting the second end of the cable to an alarm system which detects a) [a] the secured state with the [electrical path continuous between the first and second ends of the cable] at least two conductors of the cable electrically connected and b) an unsecured state with the [continuity of the electrical path between the first and second cable ends broken] at least two conductors of the cable electrically disconnected,

whereby a user can grasp and pull on a product attached to the first cable end to place the product in a comfortable position, but if the user breaks the [continuity of the electrical path] electric connection of the at least two conductors of the cable the alarm system detects the unsecured state.

12. A retractable cable assembly, as used with an alarm system, comprising;

a housing;

a cable having first and second conductors extending between opposite first and second ends of said cable;

means for attaching said cable first end to a product;

means for electrically connecting said first and second conductors at said first end of said cable whereby 1) said first and second conductors form an alarm loop extending from said cable second end through said first conductor to said cable first end and back through said second conductor to said cable second end when said attaching means attach said cable to a product and 2) said alarm loop is broken by detaching said cable from a product;

a connector for connecting said cable second end to an alarm system responsive to any break of the alarm loop; and

a retracting mechanism in said housing continuously urging the cable first end toward the housing yet allowing the cable first end to be pulled away from the housing when an external force is exerted on the cable first end.

13. The retractable cable assembly of claim 12, wherein said retracting mechanism continuously urges the cable first end toward the housing, whereby a user can grasp and pull on a product attached to the cable first end to place the product in a comfortable position with a minimum amount of cable extending from said housing.

14. The retractable cable assembly of claim 13, wherein said retracting mechanism comprises:

a pulley mounted for free rotation relative to said housing and including a sensor hub and an alarm system hub separated by a disk, said disk having a hole therein, whereby said cable extends from said cable first end into said housing where it winds around said sensor hub then extends through said pulley disk hole and winds about said alarm system hub then extends from said housing to said cable second end; and

a spring continuously biasing said pulley toward winding said cable onto said sensor hub.

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