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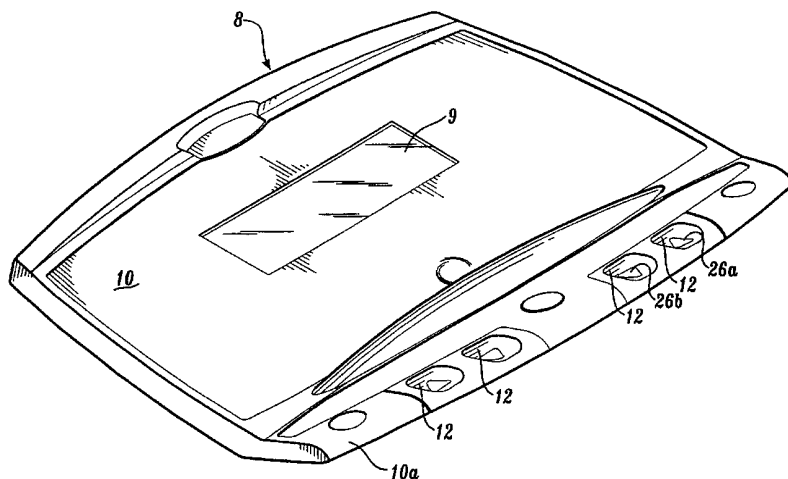
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(54) Title: **CONTROL PANEL**



(57) Abstract: A control panel (8), suitable for controlling exercise equipment, includes a substrate (10) formed of durable dielectric material, such as plastic. Depressions (12) are formed on the substrate for receiving a human fingertip therein. A proximity switch (14) is arranged on the underside of the substrate adjacent the depression. The switch includes a conductive center electrode (18) and a conductive outer electrode (20) that substantially surrounds the center electrode. An arc-shaped electric field (21) is created between the outer electrode and the center electrode on the upper surface of the substrate adjacent the depression. The switch further includes a detector for monitoring whether the electric field is disturbed and, if so, sending a detection signal. When a human touch is applied to the depression (or close to the depression), the electric field is disturbed, causing the switch to send a detection signal to activate a controlled device such as a treadmill motor. Several switches (14) typically will be utilized on the control panel (8).



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## **CONTROL PANEL**

### Field of the Invention

The present invention relates to control panels and, more particularly, to control panels for exercise equipment.

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### Background of the Invention

Control panels for exercise equipment, for instance, treadmills, typically include an LED display to output various parameters, such as speed, distance, elapsed time, heart rate, etc. Typically, such control panels have a plurality of control buttons to, for instance, start or stop the treadmill belt, increase or decrease the speed of the treadmill belt, increase or decrease the incline of the treadmill, etc. Currently, most exercise equipment control panels utilize membrane switches. Generally, these switches are covered with a thin and flexible flat layer of plastic material on which indicia, graphics, etc., have been printed. One problem with such switches is that the plastic cover material can be scratched or damaged through repeated depression, especially if exercisers use their fingernails to depress the membrane switches. In addition, it is often difficult for a user to position his or her fingertip exactly over a flat plastic cover of a membrane switch during exercise, for example, when running at high speed.

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### Summary of the Invention

The present invention provides a control panel for exercise equipment, which overcomes these problems associated with existing control panels, including control panels using membrane switches, suitable for use in exercise equipment. The control panel includes a substrate formed of, for example, durable plastic having an upper surface and a lower surface. The upper surface defines at least one depression thereon, which is adapted for receiving a human fingertip therein. The control panel further includes a

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switch arranged on the bottom surface of the substrate adjacent the depression. The switch is triggered when a human fingertip is received within the depression.

In one preferred aspect of the present invention, the switch is a proximity switch, which can be activated when a human fingertip contacts, or comes close to, the depression. The proximity switch includes a conductive center electrode, and a conductive outer electrode that substantially surrounds the center electrode. Both the center and surrounding outer electrodes are mounted on the second surface of the substrate. When opposite charges are applied to the electrodes, an arc-shaped electric field is created between the outer electrode and the center electrode on the first surface of the substrate adjacent the depression.

The switch preferably further includes a detector including an active electrical component, such as a transistor, for monitoring whether the electric field is disturbed and, if so, sending a detection signal. When a human touch is applied to the upper surface (or close to the upper surface) of the panel substrate, the electric field is disturbed, causing the switch to send a detection signal to activate a controlled device, such as a treadmill motor. Several switches typically will be utilized on a control panel.

In another aspect of the invention, the control panel includes different colored inserts of various shapes embedded within the substrate, adjacent the depressions, so as to clearly indicate the location of the switches.

#### Brief Description of the Drawings

The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1A is a control panel constructed in accordance with the present invention, including a plurality of depressions and a plurality of switches associated with the depressions, respectively;

FIGURE 1B is a partial top view of the control panel of FIGURE 1A showing one depression;

FIGURE 2A is a cross-sectional view of the depression and a switch, taken along line 2A--2A of FIGURE 1B; and

FIGURE 2B is a bottom view of the switch of FIGURE 2A.

#### Detailed Description of the Preferred Embodiment

FIGURE 1A illustrates a control panel 8 of the present invention designed for use with an exercise device, such as a treadmill. The control panel 8 includes a visual display 9 for outputting various parameters, such as speed, distance, incline, resistance level, elapsed time, heart rate, etc. The control panel 8 is ideally composed of a durable substrate 10, which can endure repeated pressing or other human contact, such as a hard plastic. Referring additionally to FIGURES 1B and 2A, the substrate 10 includes a first,

upper surface 10a and a second, lower surface 10b. The upper surface 10a defines a plurality of shallow depressions or wells 12.

On the lower surface 10b of the substrate adjacent each depression 12, a switch 14 is provided. The switch 14 may be of any type that is triggerable upon human contact or proximity, such as pressure switches and proximity switches. Each of the depressions 12 is sized and shaped so as to guide a user's finger to the proper location for operating the switch. To this end, perimeter 13 at the base of the depression may be rounded and/or the perimeter shape of the depression may be configured to generally coincide with the shape of a human fingertip, such as a circle or an eclipse. Other shapes such as a triangle or a square, preferably with rounded corners, may also be used. Regardless of how the depression is shaped, the depression is sized sufficient to receive a user's fingertip therein. For example, when a generally square-shaped depression with rounded corners is used, as shown in FIGURE 2A, an outer diameter "D1" of the depression may be between approximately 0.5 inch and 1.25 inches and a depth "D2" may be between approximately 0.1 inch and 0.4 inch.

The depression 12 is particularly useful in connection with an exercise machine control panel, as it assists a user in accurately positioning his or her fingertip over a control switch during intense exercise, for example, when running at high speed. Optionally, the upper surface of the depression 12 may be textured, so as to prevent slipping of a fingertip upon receipt and also to visually define the target area for the user's fingertip. Also, different textures may be used on different depression surfaces, so that a user can feel the difference between the textures to distinguish between different switches that are provided underneath the respective textured surfaces. In a particular situation, if there is a concern that the texture will be worn away due to repeated contact over a long period of time, then the upper surface of the depression may be left smooth rather than being textured.

When a plurality of the depressions 12 are provided on a control panel, as in FIGURE 1A, spacing between the depressions preferably is sufficient to prevent a user from inadvertently placing his or her fingertip in the wrong depression to activate the wrong switch. To this end, the minimum spacing between two depressions should be between approximately 0.2 inch and 0.5 inch.

Referring additionally to FIGURE 2B, in one preferred embodiment of the present invention, the switch 14 is a proximity switch. The substrate 10 may be composed of any dielectric substrate, such as plastic or glass, to accommodate proximity switches. The switch 14 is preferably formed on a circuit board. The circuit board includes a carrier 16, which defines thereon a center electrode 18 and an outer electrode 20 that substantially surrounds the center electrode. Opposite electric charges are applied to the center and outer electrodes 18, and 20, respectively, to produce arc-shaped electric fields

therebetween on and over the first surface 10a as shown by dotted lines 21 in FIGURE 2A. In particular, the electric fields are produced within or adjacent the depression 12.

5 The switch 14 further includes a detector for monitoring whether the electric field is disturbed due to, for example, a human fingertip contact and, if so, sends a detection signal to activate a controlled device such as a treadmill motor. For example, the detector may include a sense line 22 for carrying a detection signal and a surface-mounted transistor 24 connected between the center electrode 18, the outer electrode 20, and the sense line 22. A detailed disclosure of a proximity switch and a control circuit  
10 therefor, suitable for use in the present invention, can be found in U.S. Patent No. 5,594,222, issued January 14, 1997, which is expressly incorporated herein.

Optionally, the depression 12 may include colored inserts 26 of various shapes embedded therein to clearly indicate and distinguish each of the depressions 12 and, thus, the switches 14 provided therebeneath. The colored insert 26 may be formed of any  
15 dielectric material. In FIGURES 1A and 1B, the insert 26a is in the shape of forwardly directed triangular arrows to designate, for example, "up" or "faster," and the insert 26b is in the shape of an oppositely directed triangular arrow to designate, for example, "down" or "slower." Also, the color of the insert may be different from the color of substrate 10, to help the user properly position his/her finger into the depression 12. Further, the color  
20 of the insert may be selected to logically coincide with the function of the switch, to serve as an indicia. For example, the insert may be colored green to increase the speed of a treadmill belt or red to decrease the speed of the treadmill belt.

The insert may also include certain letter indicia such as "UP" or "DOWN" to increase or decrease speed, incline, etc. of a treadmill, for example. Still further, the  
25 insert may be formed of a transparent or translucent material, which is to be lit up by a background light provided beneath the insert (not shown), to clearly indicate the location of each depression 12. Alternatively, the background light may be configured to turn on upon activation of the switch underneath the insert, to clearly indicate which switch is activated and which switch is not.

30 The present invention allows for construction of a control panel including switches, which are covered with a sturdy material, such as a hard plastic, to withstand repeated depression, scratching, and other human contacts. Further, when depressions are provided on a control panel, they assist a user to accurately place his or her fingertip in the depressions to activate the switches provided therebeneath. Thus, a control panel  
35 of the present invention is particularly suited for use in an exercise machine, since the panel is highly durable, and easily and accurately accessible by a moving exerciser.

While the preferred embodiments of the invention have been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An exercise device control panel comprising:  
a substrate having a first surface and an opposite second surface, the first surface  
5 defining thereon at least one depression adapted for receiving a human fingertip therein;  
and  
a switch arranged on the second surface adjacent the depression, the switch being  
adapted to be activated when a human fingertip contacts or comes in close proximity to  
the depression.
- 10 2. The exercise device control panel of Claim 1, wherein the substrate  
comprises a dielectric substrate defining the first and second surfaces, and the switch  
comprises a proximity switch provided on the second surface of the dielectric substrate,  
the proximity switch comprising a center electrode and an outer, oppositely chargeable  
15 electrode, the central and outer electrodes capable of producing an electric field adjacent  
the depression on the first surface of the substrate, the proximity switch further including  
a detector adapted for monitoring whether the electric field is disturbed and, if so,  
triggering the switch.
3. The exercise device control panel of Claim 2, wherein the dielectric  
substrate comprises plastic material.
- 20 4. The exercise device control panel of Claim 2, wherein the proximity  
switch comprises a circuit board including a carrier applied on the second surface of the  
dielectric substrate, wherein the center electrode, the outer electrode, and the detector are  
mounted on the carrier.
5. The exercise device control panel of Claim 1, further including a colored  
25 insert provided within the depression, the color of the insert being different than the color  
of the substrate.
6. The exercise device control panel of Claim 1, further comprising indicia  
located within the depression, the indicia being related to the function of the switch.
7. The exercise device of Claim 6, wherein the indicia is of a color different  
30 than the color of the substrate.

8. The exercise device control panel of Claim 1, wherein a plurality of depressions are defined on the first surface of the substrate, and a plurality of switches are arranged on the second surface adjacent the plurality of depressions, respectively.

5 9. An exercise device control panel comprising:  
a dielectric substrate having a first surface and a second surface; and  
a proximity switch provided on the second surface of the dielectric substrate, the proximity switch comprising a center electrode and an outer, oppositely charged electrode, the central and outer electrodes producing an electric field adjacent the first surface of the dielectric substrate, the proximity switch further comprising a detector  
10 adapted for monitoring whether the electric field is disturbed and, if so, triggering the switch.

10. The exercise device control panel of Claim 9, further including a colored insert provided on the first surface of the dielectric substrate adjacent the switch, the colored insert indicating the location of the switch, the color of the insert differing from  
15 the color of the substrate.

11. The exercise device control panel of Claim 9, further comprising indicia located within the depression, the indicia being related to the function of the switch.

12. The exercise device of Claim 11, wherein the indicia is of a color different than the color of the substrate.

20 13. The exercise device control panel of Claim 9, wherein a plurality of proximity switches are provided on the second surface of the dielectric substrate.

14. The exercise device control panel of Claim 9, wherein the dielectric substrate comprises plastic material.

25 15. The exercise device control panel of Claim 9, wherein the proximity switch comprises a circuit board including a carrier applied on the second surface of the dielectric substrate, wherein the center electrode, the outer electrode, and the detector are applied on the carrier.

30 16. A control panel comprising:  
a dielectric substrate having a first surface and an opposing second surface, the first surface defining thereon at least one depression adapted for receiving a human fingertip therein; and



a proximity switch arranged on the second surface adjacent the depression, the proximity switch comprising a center electrode and an outer, oppositely chargeable electrode, the central and outer electrodes capable when charged of producing an electric field adjacent the depression on the first surface of the dielectric substrate, the proximity  
5 switch further comprising a detector adapted for monitoring whether the electric field is disturbed and, if so, triggering the proximity switch.

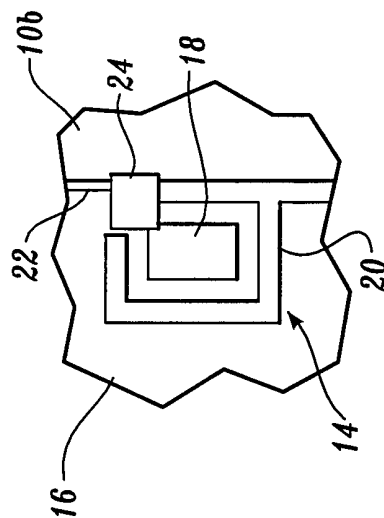
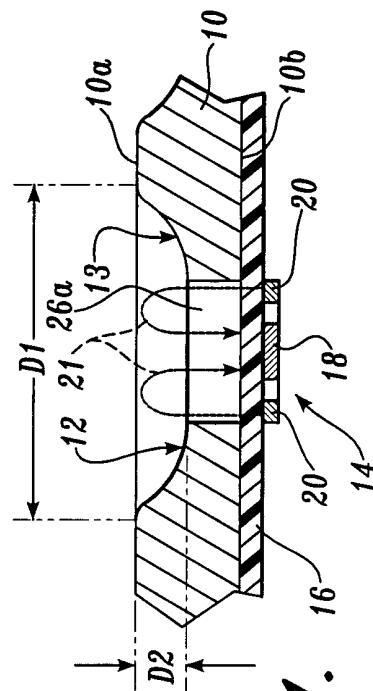
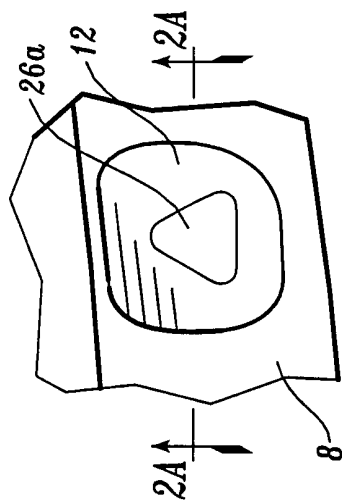
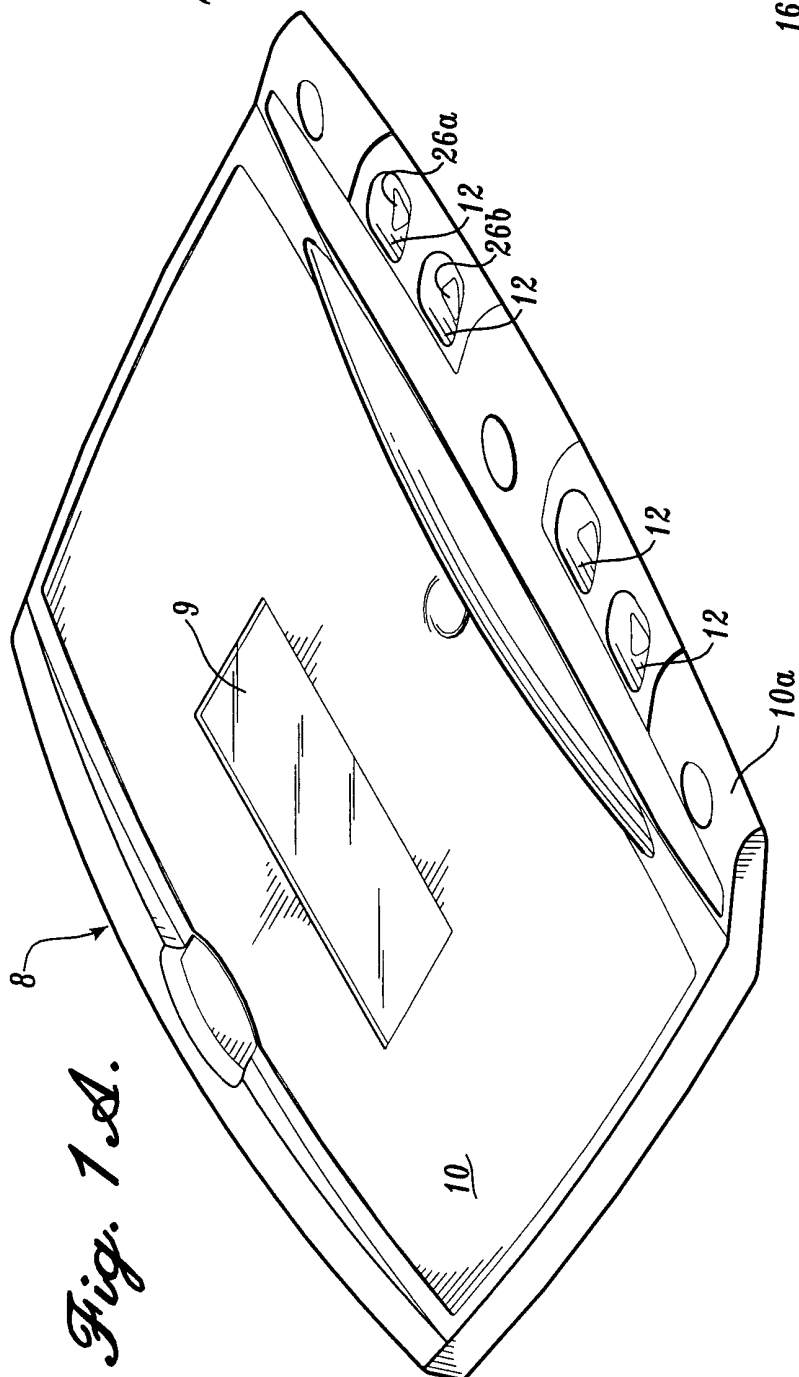
17. The control panel of Claim 16, further including a colored insert provided within the depression to indicate the location of the switch.

18. The exercise device control panel of Claim 16, further comprising indicia  
10 located within the depression, the indicia being related to the function of the switch.

19. The exercise device of Claim 18, wherein the indicia is of a color different than the color of the substrate.

20. The control panel of Claim 16, wherein the proximity switch comprises a circuit board including a carrier applied on the second surface of the dielectric substrate,  
15 wherein the center electrode, the outer electrode, and the detector are applied on the carrier.

21. The control panel of Claim 16, wherein the dielectric substrate comprises plastic material.



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/18166

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H03K17/96

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H03K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No.            |
|------------|---|----------------------------------|
| X          | GB 1 587 408 A (POST OFFICE)<br>1 April 1981 (1981-04-01)<br><br>page 1, right-hand column, line 90 -page<br>2, left-hand column, line 31; figures<br>--- | 1-3, 5-9,<br>11-14,<br>16-19, 21 |
| A          | US 4 708 338 A (POTTS LANNY L)<br>24 November 1987 (1987-11-24)<br>figure 7<br>---  | 1-21                             |
| A          | US 5 594 222 A (CALDWELL DAVID W)<br>14 January 1997 (1997-01-14)<br>column 3, line 63 -column 4, line 19;<br>figure 1<br>---                             | 3, 4, 14,<br>15, 20, 21          |
| A          | US 4 495 485 A (SMITH PETER H)<br>22 January 1985 (1985-01-22)<br>column 7, line 1 - line 13; figures 4-6<br>-----  | 5-7, 11,<br>12, 17-19            |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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| Patent document<br>cited in search report |   | Publication<br>date | Patent family<br>member(s)  | Publication<br>date  |
|---|---|---------------------|---|--|
| GB 1587408                                | A | 01-04-1981          | NONE  |  |
| US 4708338                                | A | 24-11-1987          | AT 102494 T<br>AU 1189088 A<br>EP 0401206 A<br>WO 8904696 A<br>US RE34959 E                 | 15-03-1994<br>14-06-1989<br>12-12-1990<br>01-06-1989<br>30-05-1995               |
| US 5594222                                | A | 14-01-1997          | AU 706850 B<br>AU 4134596 A<br>CA 2203695 A<br>CN 1220786 A<br>EP 0795233 A<br>WO 9613098 A | 24-06-1999<br>15-05-1996<br>02-05-1996<br>23-06-1999<br>17-09-1997<br>02-05-1996 |
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