

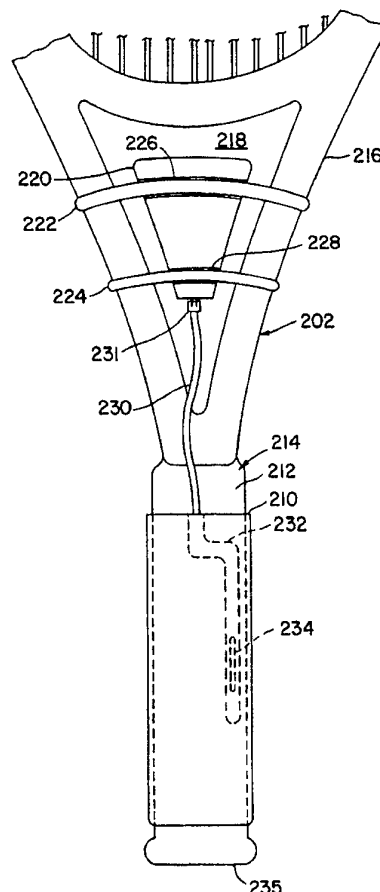


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/US94/04563 <b>(22) International Filing Date:</b> 28 April 1994 (28.04.94) <b>(30) Priority Data:</b> 08/053,485                      29 April 1993 (29.04.93)                      US <b>(71) Applicant:</b> TONE TRAINER, INC. [US/US]; 4720 S.E. 15th Avenue, Cape Coral, FL 33904 (US). <b>(72) Inventor:</b> GANGER, David, E., Sr.; 539 S.E. 26th Street, Cape Coral, FL 33904 (US). <b>(74) Agents:</b> KAIN, Robert, C., Jr. et al.; Suite 1020, 100 South Biscayne Boulevard, Miami, FL 33131-2028 (US).		<b>(81) Designated States:</b> AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KG, KP, KR, KZ, LK, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>

**(54) Title:** METHOD AND APPARATUS TO TRAIN SPORTSMEN**(57) Abstract**

The training device utilizes a thin sheet wrap (210) sized to wrap around an outside grip surface (212) of a racket handle (214). A non-domed membrane switch, in a preferred embodiment, is retained by the thin sheet wrap (210). Releasable straps (222, 224) are utilized to secure the wrap on the racket handle. A portable power source is electrically coupled to an audible alarm, both of which are in turn electrically connected to the switch. When the switch closes, the alarm sounds. Other than a switch, piezoelectric pressure sensors can be utilized. The method includes removably mounting at least one membrane switch with a wrap about a racket handle, mounting a portable power supply in an audible alarm on the racket, electrically connecting together the power supply, alarm and switch, compressibly closing the switch with a proper hand grip over a distance which does not exceed the thickness of the wrap, and audibly announcing the closure of the switch by activation of the alarm.



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**METHOD AND APPARATUS TO TRAIN SPORTSMEN****Technical Field**

2           The present invention relates to a device and its method of use that  
3           would confirm to the player, of various sports, that proper hand position, with  
4           a sufficiently firm grip, was established and was being maintained. It should  
5           be noted that a consistent hand position aids the player in establishing a  
6           proper relationship with the ball. This invention would be installed, by the  
7           user, by attaching the apparatus so as to surround the handle, and be securely  
8           attached thereto, on existing sports equipment. The purpose of the present  
9           invention is to prevent the player from attempting play without proper the  
10          form, hand position and firmness of grip. The invention would have at least  
11          one sensor device in the form of a pressure activated switch, a membrane  
12          switch or piezoelectric sensor. These switches would be such that the  
13          individual player could align, and thus adjust, them at the desired pressure  
14          points on the grip. This would allow the player to position the sensors so as  
15          to be activated by the proper pressure points at appropriate racket locations  
16          by his or her specific hand.

**Background Art**

17          Many sports use equipment that is carried by the individual players  
18          during play. Proper hand position and a firm grip are stressed during the  
19          training of players in many of these sports. Currently there is known in the art  
20          various handles that attempt to cause the player to maintain proper hand  
21          position and grip pressure. These grip locators are shaped with a variety of  
22          various indentations that cause the player to properly position his or her hands  
23          on the grip in order to comfortably hold the equipment. These grips are such  
24          that customization with respect to a particular player, i.e., hand size, is difficult  
25          and expensive. These grips also fail to address the problem of maintaining a  
26          firm grip.

27          U.S. Patent No. 4,861,034 to Lee discloses a golf grip training device.  
28          The Lee device includes an audible buzzer or alarm unit containing a battery  
29

1 and an audible alarm. The audible alarm unit is strapped to the shaft of the  
2 golf club with a VELCRO-like attachment. The switching mechanism includes  
3 a housing which is elongated and is strapped onto the handle portion of the  
4 golf club shaft. The thickness of the switch housing is generally equivalent to  
5 the radial dimension of the handle of the golf club shaft. The switch housing  
6 includes three contacts which are separated and spaced apart by a plurality of  
7 compressible foam blocks. When the golfer depresses the elongated switch  
8 assembly, opposing touch and the audible alarm issues one type of tone.  
9 Upon further compression, all three contacts are forced together to electrically  
10 connect and the audible device issues a second tone.

11 French Patent Publication No. 2,626,483 discloses a grip training device  
12 for a golf player. This device issues a visible and an audible alarm dependent  
13 upon the change in resistance or an optical transmission caused by pressure  
14 applied by the grip of the golfer.

15 U.K. Patent Publication No. 2,250,923 to Yeh discloses a sports racquet  
16 which issues visible and audible alarms whenever the ball hits the racquet.  
17 Concussion switches are mechanically connected to the racquet webbing and  
18 the center circuit issues the alarm signal upon impact of the ball on the  
19 webbing of the racquet.

20 U.S. Patent No. 3,326,367 to Searle discloses a grip device for golfers  
21 which senses the change in resistance on the grip surface.

22 U.S. Patent No. 3,762,720 to Jett discloses a golf training device which  
23 utilizes a depressible compression switch in a handle of the golf shaft.

24 U.S. Patent No. 4,027,879 to Wright discloses a tennis training device  
25 which requires the player to forcibly squeeze the tennis racquet during the  
26 stroke. If the player does not properly grip the racquet during the stroke, the  
27 neck member will move away from the end of the grip member and the stop  
28 knob, which is an internal element in the training device, will contact the slide  
29 collar. Upon such contact, a visual and audible alarm sounds. The Wright  
30 tennis training device is threadably attached to a specially configured tennis

1 racquet and includes a movable slide collar with an internal part which moves  
2 on an internal shaft within the training device.

3 U.S. Patent No. 4,101,132 to Conrey et al. discloses a tennis racquet  
4 sensory system which includes a plurality of electronic sensors coupled to  
5 selected strings on the racquet. When the sensors detect the striking of the  
6 ball on a racquet, an audible or visual alarm is sounded.

7 U.S. Patent No. 4,103,896 to Lorang discloses a golf grip training device  
8 which includes a compressible switch.

9 U.S. Patent No. 4,138,118 to Budney discloses a golf club grip training  
10 device which includes a plurality of sensors at predetermined locations on the  
11 handle of the shaft of the club. When the players hands are properly  
12 positioned on the grip and exert a specific amount of pressure, the sensors  
13 generate signals which are used to log the grip of the player on the club  
14 thereby permitting the recording of the pressure and positioning of the hand  
15 of the golfer.

16 U.S. Patent No. 5,031,909 to Pecker discloses an electronic device which  
17 uses four sensors coupled to selected strings on a tennis racquet. Upon impact  
18 of the ball and the racquet, these sensors actuate an alarm.

19 U.S. Patent No. 5,221,088 to McTeigue et al. discloses a golfing training  
20 device utilizing grip sensors and foot sensors coupled via radio frequency to  
21 a head set and a decoder.

22 U.S. Patent No. 4,822,042 to Landsman discloses a electronic device  
23 which measures the shock waves on strings of a racquet.

24 U.S. Patent No. 4,950,785 to Mills discloses a golf grip training device  
25 utilizing a compressible switch which triggers an alarm circuit in the interior  
26 of the shaft of the golf club.

27 U.K. Patent Publication No. 1,587,191 to Stewart discloses a grip  
28 pressure indicator for a golfer utilizing a compressible graduated pressure  
29 switch.

30

1     Disclosure of the Invention

2             The principal object of the invention is to assure sports persons of a  
3     proper grip on the sports equipment in use. Several other objects and  
4     advantages of the present invention are:

5             (a)    to provide a method of confirming to the player that proper  
6     hand position has been established on the sports equipment in use.

7             (b)    to provide a method of confirming to the player that a  
8     sufficiently firm grip has been established on the sports equipment in use.

9             (c)    to provide a method of alerting the player that proper hand  
10    position on the sports equipment has been lost during play.

11            (d)    to provide a method of alerting the player that his or her firm  
12    grip on the sports equipment is not being maintained during play.

13            (e)    to provide the player with the ability to position the pressure  
14    activated switches or other type of switches, incorporated in the apparatus, in  
15    such a way as to match predetermined positions of the fingers and palm of the  
16    hand of the player.

17            (f)    to provide the player with the ability to select the lower  
18    threshold of activation of the audio signal so as to allow the training device to  
19    be used by players of varying hand strengths.

20            (g)    to provide for the rehabilitation of stroke and other disabled  
21    persons by allowing the establishment of goals with the devices use in therapy.  
22    One usage would establish a lower threshold of pressure and allow the patient  
23    to repeatedly achieve this goal. It would optionally allow for monitoring of the  
24    duration of time that the goal was met with each repetition. The threshold of  
25    pressure or the duration of time achieved could then be increased as the  
26    patient progresses in the therapy.

27            (h)    to provide for a device which could be secured to the steering  
28    wheel of a vehicle where it would emit an audio signal when the pressure  
29    applied by the grip of the hand lessened. This would provide for a method of  
30    alerting the driver that their attention is diminishing.

1           It is an object of the present invention to utilize a membrane switch,  
2           and preferably a non-domed membrane switch, which detects the location and  
3           the degree of compressive force of a player's grip on a sports racket.

4           It is another object of the present invention to utilize a variable  
5           threshold detection device to sense the degree of compressive force of a  
6           player's grip and issue one or more audible alarms to the player indicative of  
7           the location and the amount of gripping force on the sports racket.

8           It is an additional object of the present invention to securely locate the  
9           power source, preferably a battery, and the audible alarm in an open yoke of  
10          a tennis or sports racket thereby positioning and locating the weight of the  
11          device close to the normal or customary center of gravity of the racket.

12          It is a further object of the present invention to releasably affix the  
13          wrap carrying the switches to the racket handle.

14          It is another object of the present invention to utilize one or more  
15          piezoelectric switches to assure adequate grip location and compressive force  
16          on a sports racket.

17          It is another object of the present invention to provide a method of  
18          electronically training a player to properly locate his or her grip and  
19          adequately compress or grip the sports racket handle.

20          Other objects and advantages of the invention will become apparent to  
21          those skilled in the art from the detailed description which follows. It should  
22          be understood, however, that the detailed description, while indicating  
23          preferred embodiments, is given as an example and not a limitation. Many  
24          changes and modifications to the invention are possible without departing from  
25          the spirit and scope of the invention, and all such modifications are included  
26          in the claims appended hereto.

#### 27          Brief Description of Drawings

28          Like references numerals refer to like elements throughout the various  
29          illustrations.

30          FIG. 1 is a plan view of a tennis racket being gripped by a hand;

1           FIG. 2 is a plan view of the opposing side of the tennis racket and hand  
2 shown in FIG. 1;

3           FIG. 3 is a plan view of one embodiment of the training device laying  
4 flat;

5           FIG. 4 is a plan view of one type of switch;

6           FIG. 5 is a plan view of a switch;

7           FIG. 6 is a plan view of a switch extended apart;

8           FIGS. 7 and 8 diagrammatically illustrate serial and parallel electrical  
9 configurations of the sensors which may be pressure sensitive switches, domed  
10 membrane switches, non-domed membrane switches or piezoelectric pressure  
11 sensors;

12           FIG. 9 diagrammatically illustrates an adjustable threshold control for  
13 the alarm;

14           FIG. 10 diagrammatically illustrates another embodiment of the  
15 invention with the power source and audible alarm mounted in an open yoke  
16 of a tennis or sports racket;

17           FIG. 11 diagrammatically illustrates a flat, strip switch, a ribbon cable  
18 connector and the grip wrap;

19           FIGS. 12 and 13 diagrammatically illustrate non-domed and domed  
20 membrane switches;

21           FIGS. 14, 15 and 16 diagrammatically illustrate various aspects of the  
22 casing, the retained battery, circuitry and sound generator; and,

23           FIG. 17 diagrammatically illustrates an adjustable threshold circuit for  
24 the audible alarm.

25           Best Mode for Carrying Out the Invention

26           It would be extremely desirable to have a device that would audibly  
27 indicate to the player that his or her grip was proper on a sports racket. This  
28 invention is designed to perform this task and thus will be an aid to players of  
29 many sports. It would allow the individual player to concentrate on the other  
30 aspects of the respective game without concern that the grip and hand location  
31 fundamentals of that game were not present.



1           In one embodiment, the training device utilizes a thin sheet wrap sized  
2       to wrap around an outside grip surface of a racket handle. A non-domed  
3       membrane switch, in a preferred embodiment, is retained by the thin sheet  
4       wrap. A releasable means, such as a glue, strap or attachment mechanism, is  
5       utilized to secure the wrap on the racket handle. This releasable means can  
6       be a releasable adherent. A portable power source is electrically coupled to  
7       an audible alarm, both of which are in turn electrically connected to the  
8       switch. When the switch closes, the alarm sounds. Piezoelectric pressure  
9       sensors can also be utilized. The method includes removably mounting at least  
10      one membrane switch with a wrap about a racket handle, mounting a portable  
11      power supply and an audible alarm on the racket, electrically connecting  
12      together the power supply, alarm and switch, compressibly closing the switch  
13      with a proper hand grip over a distance which does not exceed the thickness  
14      of the wrap, and audibly announcing the closure of the switch by activation of  
15      the alarm.

16           Referring now to the drawings, FIG. 1 shows a plan view of a racket 14  
17      being properly gripped by a hand 12 having fingers 18 at grip 16. Grip 16 has  
18      side 24, side 26 and side 28. Grip 16 has a fourth side not shown in FIG. 1.  
19      Racket 14 further has base 20 and racket body 30. Racket body 30 is utilized  
20      during play to strike a tennis ball.

21           FIG. 2 shows a plan view of the opposing side of racket 16 as  
22      illustrated in FIG. 1. Hand 12 is shown gripping racket 14 utilizing grip 16.  
23      Hand 12 and fingers 18 grip the racket handle. Grip 16 has side 22, side 26  
24      and side 28. It being understood that grip 16 has a fourth side not shown in  
25      FIG. 2. Racket 14 further has base 20 and racket body 30. FIGS. 1 and 2  
26      illustrate longitudinal alignment indicia or breaks A and A'.

27           It being understood that while a tennis racket is utilized for the  
28      preferred embodiment that many different pieces of sports equipment could  
29      be utilized with the invention.

30           FIG. 3 shows a plan view of device 10. Device 10 is illustrated flat in  
31      this view while the device would be wrapped around, enclosed and be securely

1 attached to the grip of the desired piece of sports equipment when in use. A  
2 releasable adherent or glue is used on the inside surface of the wrap such that  
3 the wrap can be attached during training sessions and removed during  
4 tournament play. Other attachment systems (straps, clips, VELCRO hook and  
5 loop strips, etc.) may be used. Shown in FIG. 3 is a wrap 32 having an inner  
6 surface 48 and an outer surface 50. Inner surface 48 would be in contact with  
7 the grip of the racket or chosen sports equipment and a portion of outer  
8 surface 50 would be in contact with the players hand. Attached to inner  
9 surface 48 are switches 36 connected together utilizing wire 34. Wire 34 is  
10 capable of conducting electricity. Wrap 32 further includes base 43 having  
11 attached thereto battery 39 and speaker 41. Battery 39 is connected to  
12 speaker 41. Battery 39 and speaker 41 are attached to switches 36 utilizing  
13 wire 34. Speaker 41 is an audio signal generating device. As stated earlier,  
14 the switch may be a pressure activated switch.

15 FIG. 3 also illustrates longitudinal alignment indicia B and B'. As  
16 stated earlier, the player may align the wrap and particularly alignment indicia  
17 B and B' with racket handle alignment indicia or breaks A and A' such that  
18 the wrap and, hence, the switches would be located at the desired grip  
19 pressure points on the racket handle.

20 FIG. 4 shows a plan view of switch 36 having two sides 44 and 46.  
21 Attached to side 46 is wire 34 and connector 40. Attached to side 44 is  
22 connector 38. Connector 38 and connector 40 are held apart by spring 42.  
23 When sufficient pressure is applied to switch 36 so as to push side 44 toward  
24 side 46 connector 38 will come in contact with connector 40. When this occurs  
25 an electric charge flows through wire 34.

26 FIG. 5 shows a second plan view of switch 36. Shown is side 46 with  
27 wire 34 connected.

28 FIG. 6 shows a plan view of switch 36 in an extended form so as to  
29 illustrate spring 42 more fully. Switch 36 having side 44 with connector 38  
30 attached. Switch 36 further having side 46 with connector 40 attached.  
31 Attached to side 46 is wire 34.

1 Device 10 would be installed on and surround the grip of existing sports  
2 equipment. Switches 36 would be positioned in such orientation so as to align  
3 with desired positions on the hand and fingers. When a sufficient pressure is  
4 applied to the switches 36 a closed circuit is formed and battery 39 sends an  
5 electric charge to speaker 41. Speaker 41 then generates an audio signal that  
6 confirms to the player that proper hand position with the desired pressure is  
7 present.

8 FIGS. 7 and 8 diagrammatically illustrate various electrical  
9 configurations for switches 110, 111, 112 (FIG. 7) and 114, 115, 116 (FIG. 8).  
10 Further, these switches can be replaced with piezoelectric sensors that  
11 generate a voltage differential or a current dependent upon the degree of  
12 pressure applied to the piezoelectric sensor. The claims appended hereto are  
13 meant to cover these types of pressure sensitive switches.

14 FIG. 7 illustrates switches 110-112 in series with a sound generator 120  
15 and a portable power source or battery 122. Of course, there might be  
16 additional electrical circuits necessary to condition the signal prior to  
17 application to sound generator or alarm 120. These components are known  
18 to persons of ordinary skill in the art.

19 FIG. 8 diagrammatically illustrates switches or pressure sensors 114-116  
20 in parallel with battery 124 and sound generator 126.

21 By serially connecting the switches or pressure sensors (FIG. 7), the  
22 player is required to apply a reasonable degree of pressure on each serially  
23 connected switch 110, 111, and 112 in order to sound alarm 120. In contrast  
24 thereto, if the switches 114, 115, and 116 are electrically connected in parallel  
25 with alarm or sound generator 126, the player need only compress one of the  
26 switches to a predetermined threshold in order to sound the training alarm.  
27 Dependent upon the type of alarm system and the type of grip to be used on  
28 a particular racket, the player or user may select the serially sensor device  
29 (FIG. 7) or the parallel sensor device (FIG. 8). Of course, a plurality of  
30 configurations can be devised utilizing pressure switches or sensors in parallel

1 with other pressures sensors or switches in serial. FIG. 3 diagrammatically  
2 illustrates switches in various configurations.

3 FIG. 9 diagrammatically illustrates the adjustable threshold circuit as  
4 described earlier in object (f). In FIG. 9, a portable power supply 160 is  
5 electrically connected to a switch bank or pressure sensor bank 162 which is  
6 further electrically connected with an adjustable threshold circuit 164 and  
7 ultimately electrically connected to sound generator or alarm 166. Adjustable  
8 threshold circuit can be a simple electrical circuit that detects when the voltage  
9 on line 163 exceeds a predetermined level. In this sense, the switch bank or  
10 pressure sensors must generate variable voltages. Other thresholding devices  
11 can be utilized including, but not limited to, microprocessor-based systems.  
12 For example, the adjustable control may "switch in" additional pressure sensors  
13 spaced apart on the wrap or web removably attached to the racket handle.

14 FIG. 10 diagrammatically illustrates another embodiment of the present  
15 invention wherein thin sheet wrap or web 210 is wrapped around grip surface  
16 212 of racket handle 214. Racket handle 214 is attached to tennis racket 202.  
17 Tennis racket 202 includes a yoke 216 which defines, on its inboard sides, an  
18 opening 218. Mounted within opening 218 is a casing 220 having, securely  
19 retained therein, the sound generator, portable power supply or battery, and  
20 associated electrical components. Casing 220 is retained within the yoke  
21 opening 218 via elastic, resilient straps 222 and 224 which are preferably  
22 heavy-duty rubberbands. Elastic straps 222 and 224 conveniently mate in  
23 channels 226 and 228 in the top and bottom faces of casing 220.

24 The portable power supply, sound generator and associated electrical  
25 components are electrically connected to the sensors or pressure switches in  
26 wrap 212 via a ribbon connector cable 230. Ribbon connector cable 230 leads  
27 to flat ribbon cable 232 located beneath thin wrap 212 and ultimately to a  
28 switch bank 234 which is better illustrated in FIG. 11. Thin wrap 210 is  
29 releasably adhered to handle 214 with an appropriate adhesive or glue. The  
30 player may want to utilize the grip detector during normal practice and  
31 remove the grip detector from his or her racket for tournaments or other types

1 of competition. By utilizing a releasable adherent, the grip detector can be  
2 removed without difficulty and later re-installed. Ribbon cable 230 and simple  
3 two-pronged jack 231 are utilized to electrically detach the grip detector from  
4 the electronics in casing 220. After detachment, the casing can be removed  
5 from yoke opening 218 by rolling elastic rubberbands 222 and 224 towards  
6 terminal end 235 of tennis racket 202. Otherwise, the player can keep casing  
7 220 in yoke opening 218 since it does add a certain degree of weight to the  
8 tennis racket. In a preferred embodiment, the weight of the casing plus  
9 associated electronics is approximately 6-8 ounces. Of course, this weight can  
10 be significantly reduced by incorporating microelectronic devices and smaller  
11 battery or power supplies. The battery is typically a 9 volt battery and is a  
12 significant contributor to the weight of the grip detector. The location of the  
13 casing and associated electronics is close to the customary center of gravity of  
14 the sports racket. This location reduces the effect of the weight of the grip  
15 detector.

16 FIG. 11 diagrammatically illustrates a laid out version of wrap 310 with  
17 relatively straight, flat, electrical cable connectors 312 and flexible ribbon cable  
18 connector 314 leading to the female portion of jack 316. Wrap 310 carries a  
19 substantially rigid strip 330 on its lower surface or inboard surface and the  
20 strip 330 has a plurality of switches 333 located in a generally central region  
21 of strip 330 as well as wrap 310. In a preferred embodiment, switches 333 are  
22 non-domed membrane switches. These membrane switches are sandwiched  
23 between two relatively rigid layers of plastic, as illustrated in FIG. 12. Wrap  
24 310 is generally a soft type of fabric or cloth that is sprayed with a releasable  
25 adherent on surface 311 prior to installation on the racket handle.

26 FIG. 12 diagrammatically illustrates a portion of the non-domed  
27 membrane switch 333 as well as wrap 310. Non-domed membrane switch 333  
28 is sandwiched between upper, rigid plastic layer 340 and lower, rigid plastic  
29 layer 342. The non-domed membrane switch is currently made by Aztec  
30 Switch Company and is actuated with pressure of approximately 10-12 on the

1 actuation gauge. Preferably, a new type of switch will be utilized in a further  
2 embodiment of the invention having an actuation levels between 8- 10.

3 Switch 33 is diagrammatically illustrated as having a base or longitudinal  
4 metallic conductor 350, a plurality of upper lateral conductors, one of which  
5 is lateral conductor 352, and a plurality insulative spacers, one of which is  
6 spacer 354. When the player exerts compressive force as shown in the  
7 direction of arrow 356, insulator 354 compresses and lateral conductor 352  
8 makes electrical connection with longitudinal conductor 350, thereby  
9 electrically closing the pressure switch. Of course, other types of switches  
10 including a domed membrane switch (shown in FIG. 13) can be utilized. FIG.  
11 13 shows a modification of the present invention wherein the thin sheet wrap  
12 is a two part wrap or web including upper wrap 420, lower wrap 424,  
13 preferably made of a flexible, soft fabric, and domed switch 426. Upon  
14 compressive force shown in the direction of arrow 428 applied by the player's  
15 grip on the tennis or sports racket handle, switch 426 closes and thereby  
16 audibly indicates the correct degree of grip on the racket handle. Further,  
17 FIG. 13 shows that the switch can be mounted within the thin sheet wrap  
18 rather than simply on the inboard surface.

19 FIG. 14 diagrammatically illustrates the casing 610 having a longitudinal  
20 split or division 612 which divides casing 610 into upper part 614 and lower  
21 part 616. As shown in FIG. 14, elastic strap channels 618 and 620 are formed  
22 in the upper and the lower (see channels 622 and 624) faces of casing 610.  
23 To replace the battery or possibly adjust the threshold, the user removes  
24 casing 610 from the yoke opening of the racket and opens the casing along  
25 longitudinal division 612. FIG. 15 diagrammatically illustrates interior  
26 components of casing 610 and, particularly, a printed circuitboard 650 having  
27 a sound generator 652, signal conditioning (SC) electrical components 654 and  
28 a portable power supply, such as a 9 volt battery, 656. The 9 volt battery is  
29 secured by an interference fit within the interior of the casing via set pins 659  
30 and 661. Further, back edge 690 of printed circuitboard 650 secures battery  
31 656 in a longitudinal fashion. Also, base 692, having male connector pins 694

1 which ultimately lead to the ribbon connector cable and the pressure sensitive  
2 switches, is mounted on the forward end of printed circuitboard 650.

3 FIG. 16 diagrammatically illustrates a type of quick release for casing  
4 610 to enable closure along longitudinal division 612. In particular, upper wall  
5 671 includes a leg 673 having a finger 675 with a ledge which in turn  
6 cooperates with lip 677 on lower wall 679. To open the casing, the user  
7 applies force in the direction shown by arrow 681, thereby moving finger 675  
8 away from lip or ledge 677 in lower side wall 679. This enables the user to lift  
9 upper side wall 671 away from lower side wall 679 along longitudinal division  
10 612. The casing would include opposing latches as shown in FIG. 16.

11 FIG. 17 diagrammatically illustrates another thresholding system for the  
12 present invention. Pressure sensors 820 are electrically connected to a  
13 thresholding device 822 having an operator input 824. The operator input can  
14 select tone T2 which is activated upon a higher pressure, or tone T1 which is  
15 activated on a lower pressure. Alarm 826 would generate two different tones  
16 or two different amplitudes of the same tone based upon the degree of  
17 pressure. This may assist the player in his or her game.

18 The preferred embodiment describes the use of the invention as it  
19 would relate to tennis. While tennis players would benefit greatly from the  
20 invention, all sports players would be able to profit from the invention. Due  
21 to the similarities between the two sports, racquetball players would equally  
22 gain from the use of the invention.

23 Golf players have often sought a method of assuring a proper grip on  
24 the golf clubs that they use. The invention will aid them greatly. Golf is a  
25 sport that the player must get beyond the basics if they wish to master the  
26 sport.

27 Baseball is another sport that requires proper hand position. Although  
28 to a lesser degree than the other sports mentioned.

29 All sports that require a grip on the equipment would benefit from the  
30 invention. It will be possible to have the device equipped with a manually  
31 operated switch. The individual user would be able to turn the device on and

1 off. The device could be modified so that the audio signal would be activated  
2 when the device was not being properly gripped. This would benefit the  
3 player greatly. This would further allow for instructors of the various sports  
4 to be notified that the proper hand position has been lost during training.

5 Similarly this device could be used for many situations that require an  
6 individual to hold an item during use where the individual must also stay  
7 attentive. The device would be capable of warning the user that his attention  
8 is diminished.

9 The claims appended hereto are meant to cover modifications and  
10 changes within the spirit and scope of the present invention.

11 What is claimed is:  
12



Claims

1. A training device for audibly indicating a proper grip on a handle of a sports racket comprising:
  - a thin sheet wrap sized to wrap around an outside grip surface of said racket handle;
  - a thin switch retained by said thin sheet wrap;
  - releasable means for securing said thin sheet wrap on said racket handle;
  - a portable power source electrically coupled to an audible alarm, both of which are retained on said racket; and
  - electrical connectors coupling said switch with said power source and said audible alarm such that upon closure of said switch, said alarm sounds.
2. A device as claimed in claim 1 wherein said switch has a thickness which does not substantially exceed a thickness of said thin sheet wrap.
3. A device as claimed in claim 2 wherein said switch is a membrane switch.
4. A device as claimed in claim 3 wherein said switch is a non-domed membrane switch.
5. A training device as claimed in claim 1 including a plurality of switches mounted beneath said wrap and electrically connected via respective connectors to said power source and said alarm and said switches being disposed at predetermined grip positions about said racket handle.
6. A training device as claimed in claim 5 wherein at least one of said switches of said plurality of switches are either in parallel with another one of said switches or in serial with another one of said switches with respect to said power source and said alarm.
7. A training device as claimed in claim 1 including a variable threshold circuit for said audible alarm to enable a player to adjust the level of activation of an audible alarm signal.

1           8.     A training device as claimed in claim 1 including a variable  
2 threshold circuit for said audible alarm to enable a player to adjust the level  
3 of activation of an audible alarm signal based upon pressure exerted by the  
4 player's grip on said racket handle.

5           9.     A training device as claimed in claim 1 including a variable  
6 threshold circuit to generate more than one predetermined alarms for said  
7 audible alarm to enable a player to adjust the level of activation of an audible  
8 alarm signal based upon pressure exerted by said grip on said racket handle.

9           10.    A training device as claimed in claim 1 wherein said racket  
10 handle includes at least one racket alignment indicator and said wrap includes  
11 at least one wrap alignment indicator whereby a player positions said wrap,  
12 and said switch at a predetermined position and said racket handle by spatial  
13 orientation of said wrap alignment indicator and said racket alignment  
14 indicator.

15           11.    A training device as claimed in claim 1 wherein said sports  
16 racket is a tennis racket which includes an open yoke, said training device  
17 including:

18               a casing removably mounted within said racket yoke, said casing  
19 retaining said portable power source and said audible alarm within its interior;  
20 and,

21               said electrical connectors configured as a ribbon connector leading from  
22 said retained casing to said switch retained by said wrap.

23           12.    A training device as claimed in claim 11 including elastic straps  
24 which retain said casing within said open yoke.

25           13.    A training device as claimed in claim 12 wherein said portable  
26 power source is a battery and said casing includes interior mounts which retain  
27 said battery with an interference fit.

28           14.    A training device as claimed in claim 1 including a releasable  
29 adherent on an inboard surface of said wrap.

30           15.    A training device as claimed in claim 1 wherein said switch is a  
31 piezoelectric switch retained by said thin sheet wrap.

1           16.    An electronic method for audibly indicating a proper hand grip  
2    by a player on a sports racket handle comprising the steps of:

3            locating at least one pressure sensitive electrical switch on a wrap  
4    surrounding said racket handle;

5            mounting a portable power supply and an audible alarm on said racket  
6    and electrically connecting said power supply, said alarm and said switch  
7    together;

8            applying pressure to said switch with said proper hand grip over a  
9    distance which does not substantially exceed a thickness of said wrap; and,

10          audibly announcing activation of said switch with said alarm.

11          17.    An electronic training method as claimed in claim 16 including  
12    the steps of:

13          removably mounting at least one membrane switch with said wrap  
14    about said racket handle; and,

15          compressibly closing said switch with said proper hand grip over said  
16    distance.

17          18.    An electronic training method as claimed in claim 17 including  
18    the step of releasably adhering said wrap on said racket handle.

19          19.    An electronic training method as claimed in claim 18 including  
20    issuing stepwise audible alarms upon detection of different levels of  
21    compression of said switch.

22          20.    An electronic training method as claimed in claim 19 including  
23    securely mounting in an open yoke of said racket said portable power source  
24    and said alarm.

25

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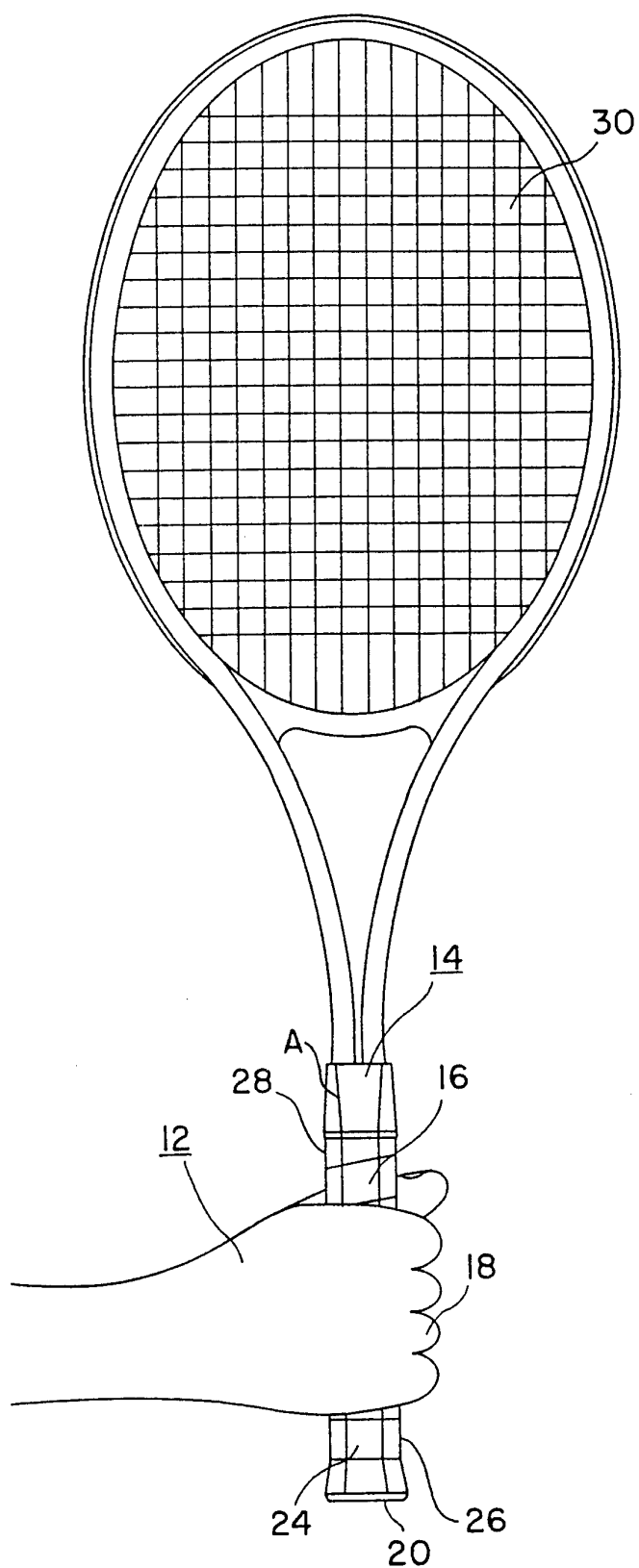


FIG. 1

SUBSTITUTE SHEET (RULE 26)

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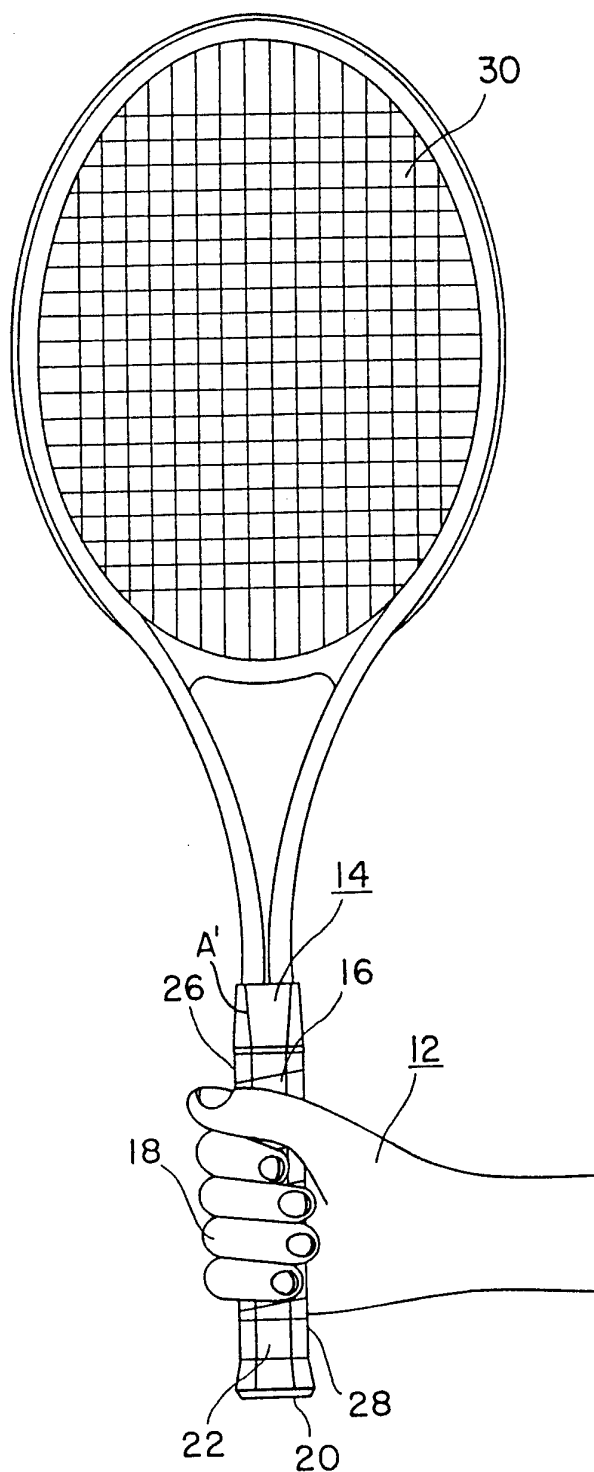


FIG. 2

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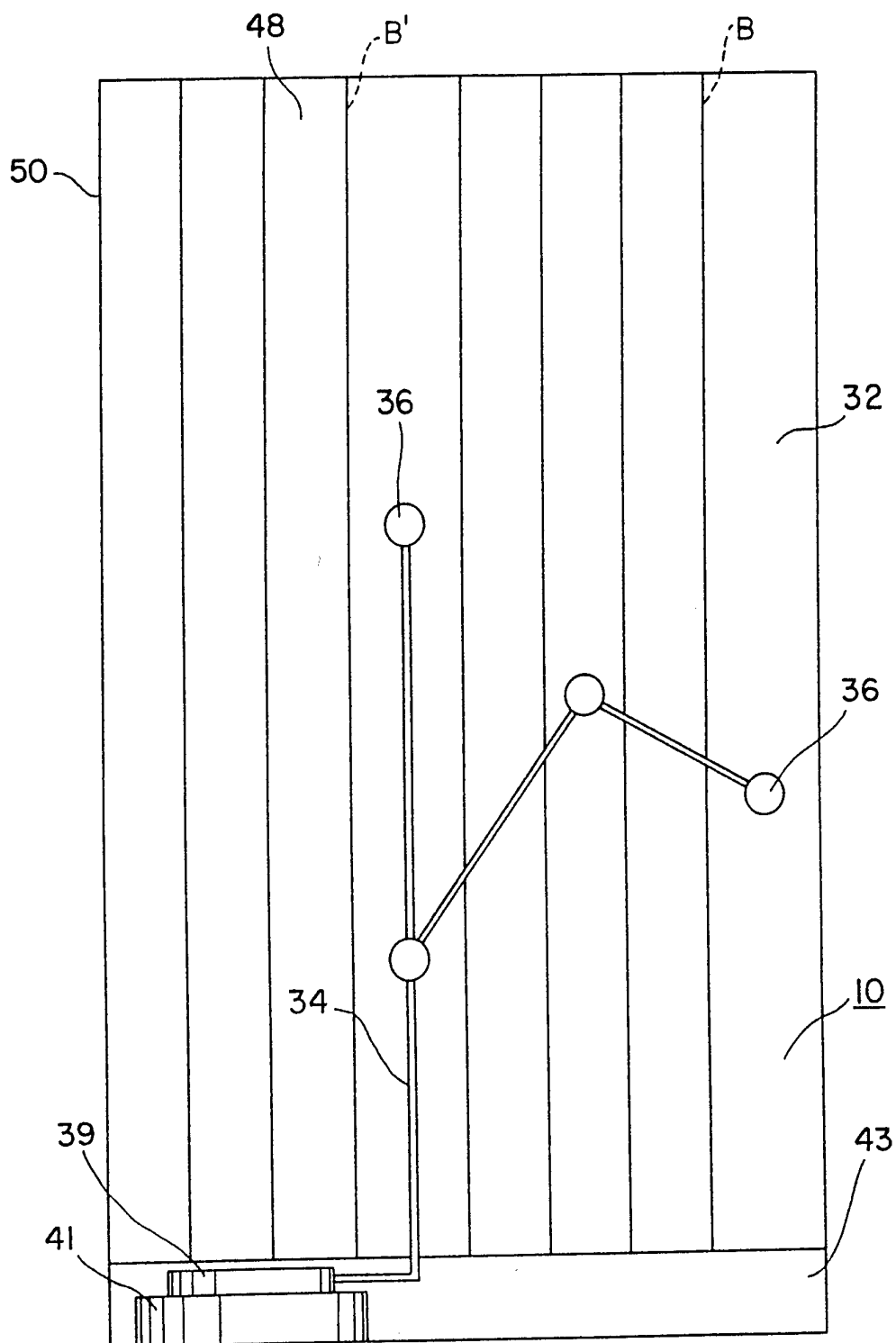


FIG. 3

SUBSTITUTE SHEET (RULE 26)

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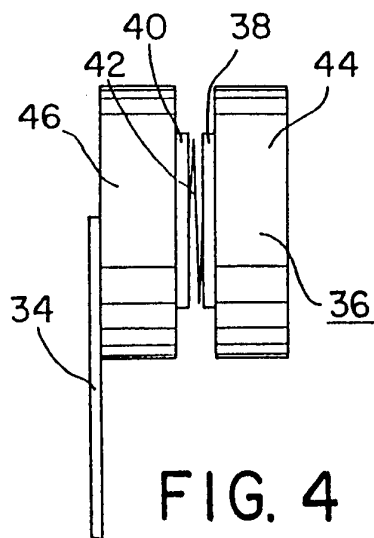


FIG. 4

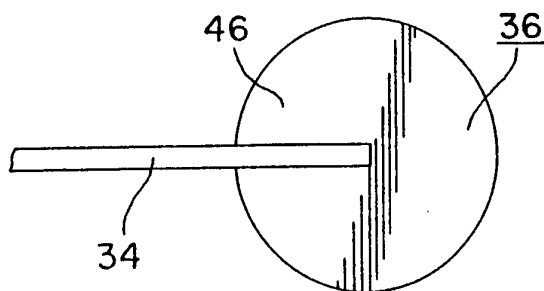


FIG. 5

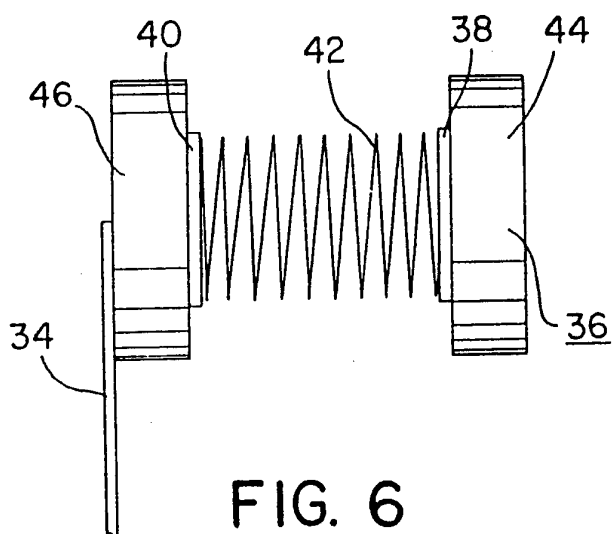


FIG. 6

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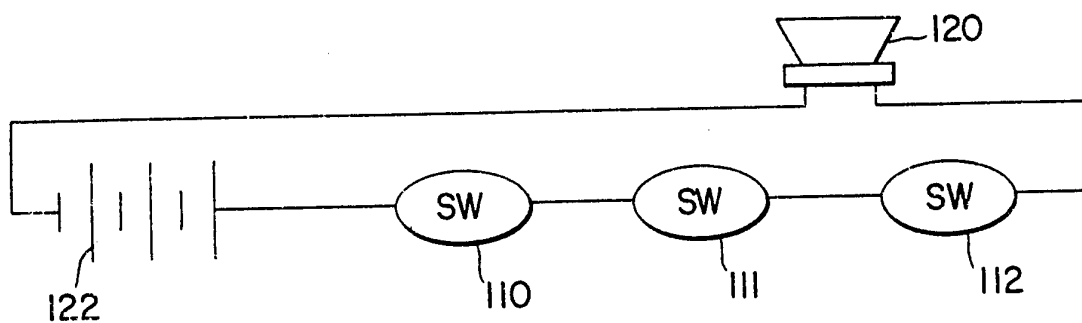


FIG. 7

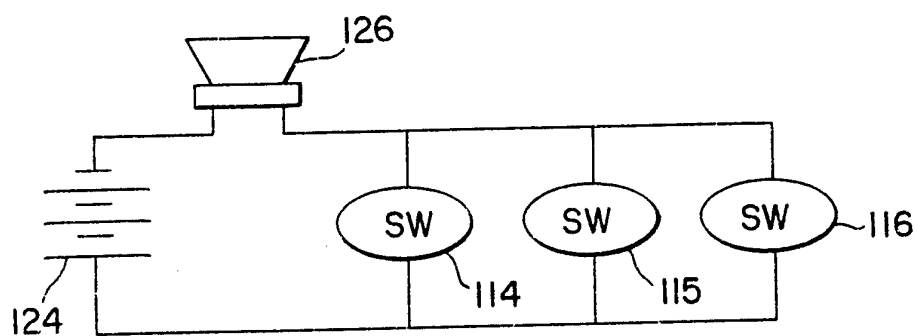


FIG. 8

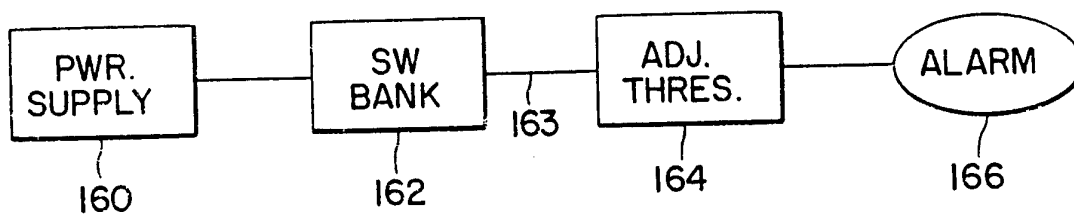


FIG. 9



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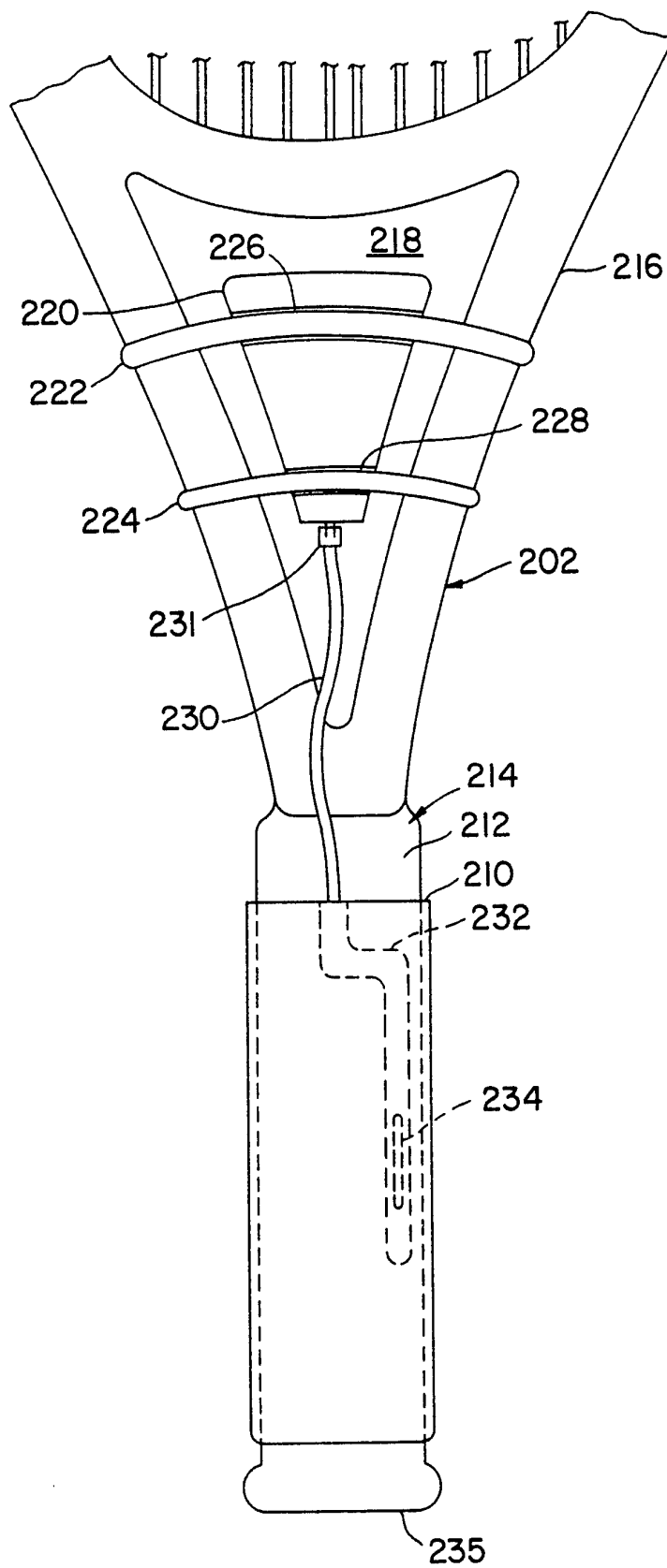


FIG. 10

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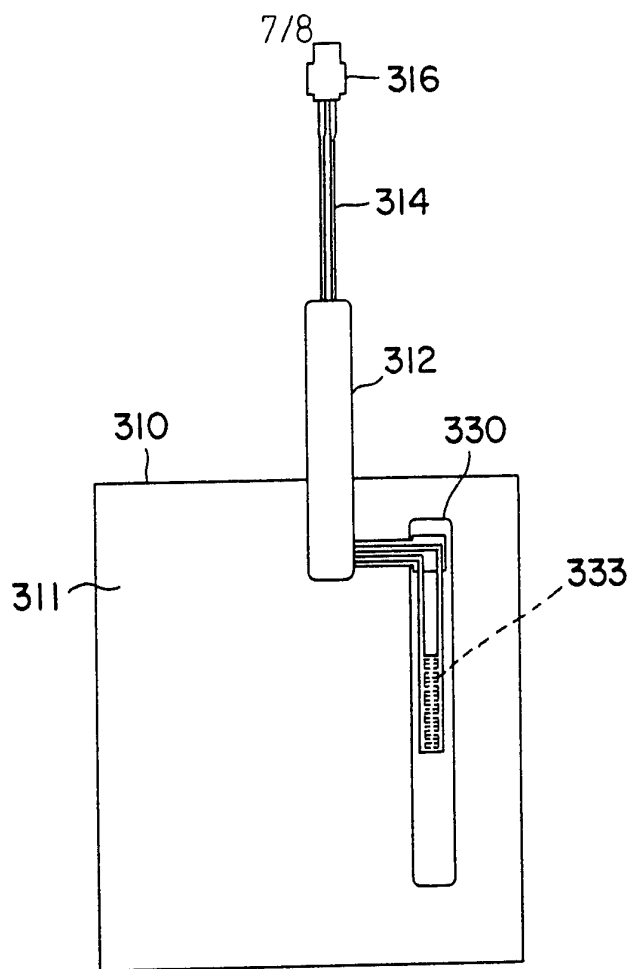


FIG. 11

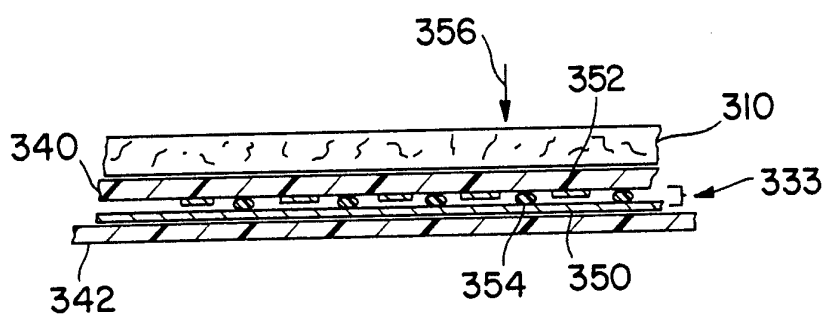


FIG. 12

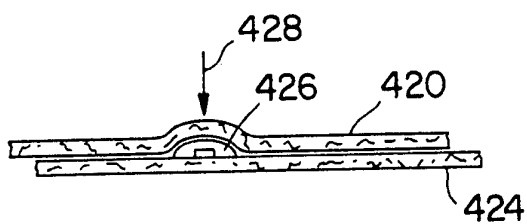


FIG. 13

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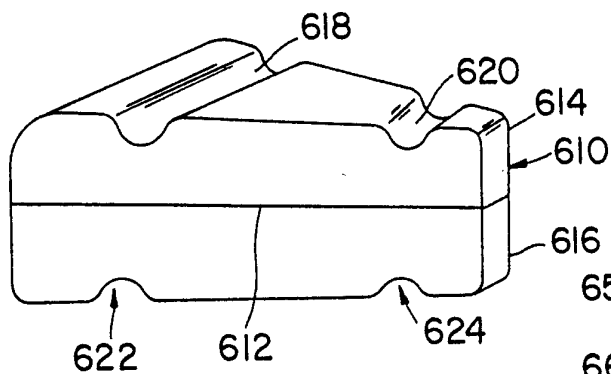


FIG. 14

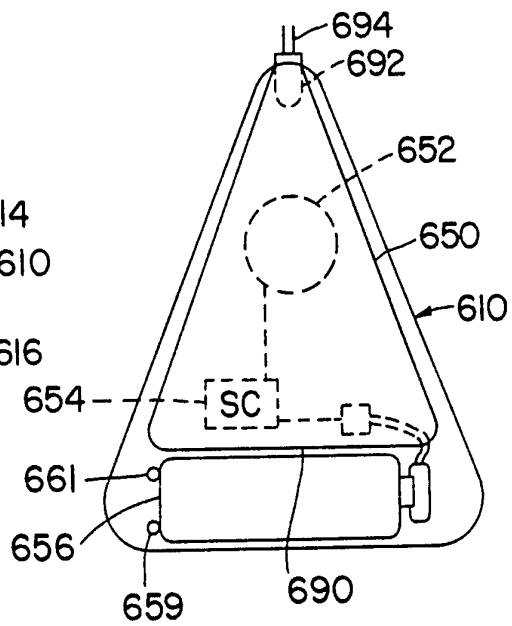


FIG. 15

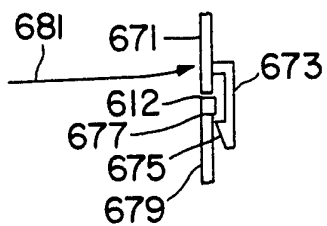


FIG. 16

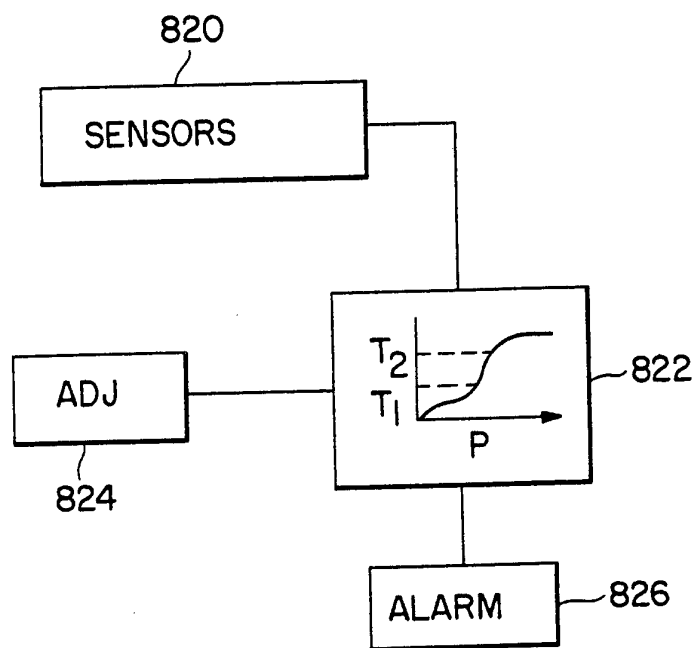


FIG. 17

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US94/04563

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(5) :A63B 49/00

US CL :273/75

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)

U.S. : 273/29A, 29R, 32R, 35R, 73J, 73R, 75, 81D, 81R, 183.1, 187.5

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

NONE

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

NONE

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,861,034, (LEE), 29 August 1989.	1-20
A	US, A, 3,762,720, (JETT), 02 October 1973.	1-20
A	US, A, 5,031,909, (PECKER), 16 July 1991.	1-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*A* document defining the general state of the art which is not considered to be part of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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*O* document referring to an oral disclosure, use, exhibition or other means		
*P* document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

28 JUNE 1994

Date of mailing of the international search report

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