United States Patent

Kilgore

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[54] **ENURESIS PREVENTION TRAINING DEVICE**

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[52] **U.S. Cl.** .....**340/235,** 179/107 R

[51] **Int. Cl.** **G08b 21/00**

[58] **Field of Search**.....340/235, 279, 224, 407; 128/138, 138 A; 179/156, 1 AA, 1 VE, 107; 325/118, 361

[56] **References Cited**

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3,530,855	9/1970	Balding	340/235 X
2,685,224	8/1954	Mueller	340/224 UX
268,554	12/1882	Shaw	179/156
2,498,239	2/1950	Berkeley	179/107 R
2,641,327	6/1953	Balmer	179/107 E
2,722,681	11/1955	Hersh	340/407 X

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Assistant Examiner—Daniel Myer
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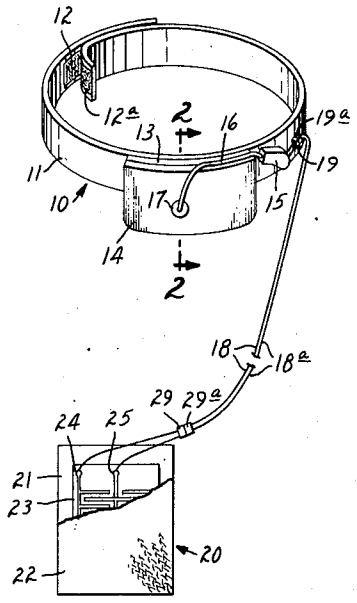
[57] **ABSTRACT**

Enuresis prevention training devices, of the type wherein urine bridges an open electrical circuit and thereby actuates an audible signal generator, are made more effective and less distracting to others if the signal generated is of low volume and directed into the ear of the trainee. The signal generator is desirably carried on a headband.

9 Claims, 3 Drawing Figures



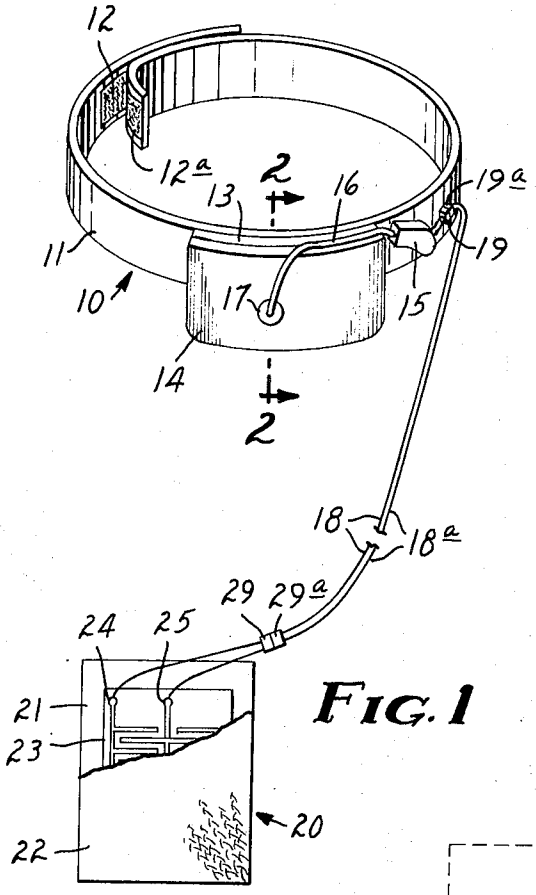


FIG. 1

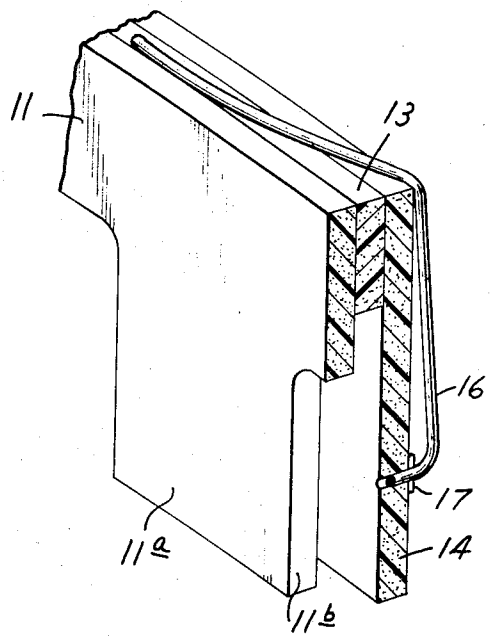


FIG. 2

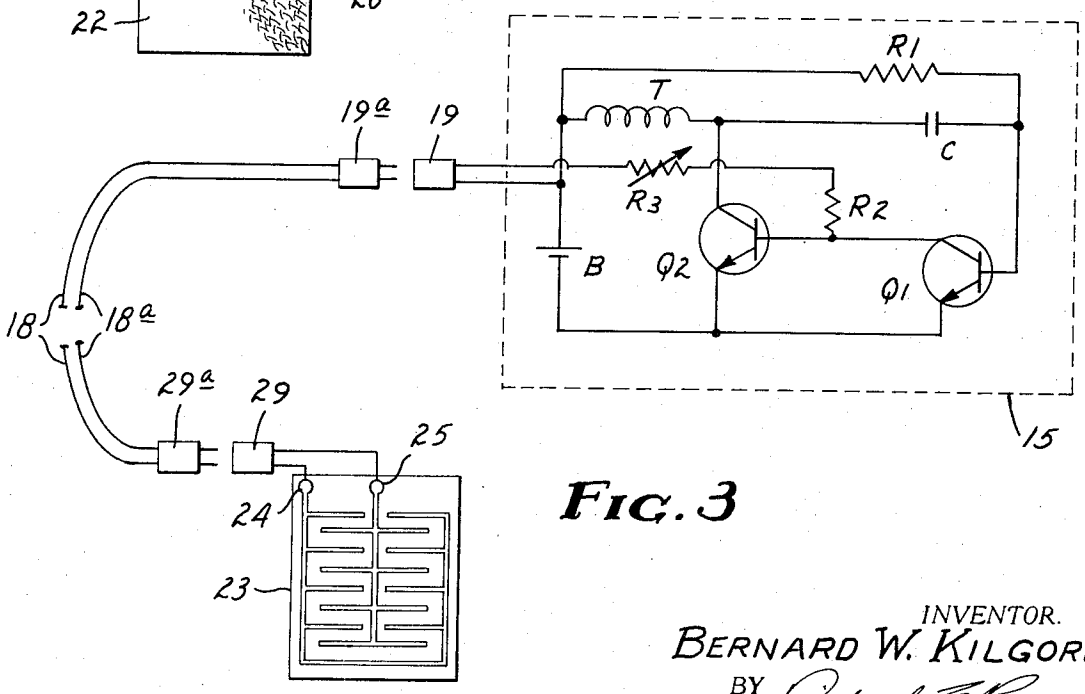


FIG. 3

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ENURESIS PREVENTION TRAINING DEVICE

BACKGROUND OF THE INVENTION

This invention relates to body fluid detecting devices, especially for the prevention and correction of enuresis.

Enuresis, particularly bed wetting among children, is an annoying and embarrassing condition for the individual concerned, as well as for his family. This condition is often the course of a wide variety of anxieties, neuroses and other psychological problems and the subject of considerable research. In an attempt to cope with enuresis, many systems have been developed, the most popular of which incorporate an electrical circuit connected to a power supply and a signal such as a bell or buzzer. The circuit contains a switch that is normally open, but urine, which contains dissolved salts, shorts across the switch terminals, closing the circuit and thus actuating the signal. U.S. Pat. No. 2,127,538 and 2,644,050 show devices of this type, incorporating an absorbent pad which contains spaced electrodes, is placed on the bed. Another version of this device in common use today includes a pair of superposed foraminous aluminum foil sheets which are separated by a moisture-absorbent insulative material and placed under the enuretic individual; alligator clips attach to the metal sheets and are connected to wires in an external electrically powered alarm circuit. Although the alarm attracts the attention of the sleeping enuretic, it also disturbs or awakens others who may be nearby. Unless the pad is rather large, the enuretic may not always remain in contact with it as he sleeps, thereby essentially destroying the device's effectiveness. Large pads tend to be expensive and (particularly in the case of the aforementioned aluminum sheets) cold, nonconformable, uncomfortable, crackling, excessively fragile and erratic in operation. Depending on the enuretic's sleeping position, a considerable amount of urine may escape before the device is actuated.

Another device which embodies the general system discussed in the preceding paragraph, is shown in U. S. Pat. No. 2,874,695. Here the spaced electrodes are mounted in an absorbent pad incorporated in a pair of shorts worn by the enuretic, closing of the circuit actuating a vibrator which is mounted on the wearer's belt. Unfortunately, this arrangement does not readily attract the attention of the wearer unless the vibrator produces a rather loud noise, which again tends to annoy those who are nearby.

All known prior art devices draw a considerable amount of current, a fact which sometimes leads to electrolytic skin burns and ulceration. Such researchers as Borrie and Fenton, reporting in the July 30, 1966 issue of British Medical Journal, have shown that a current of as little as 3 milliamperes at 3 volts may cause ulceration.

SUMMARY

The present invention provides a simple, safe, lightweight, sturdy, convenient, self-contained, completely portable and highly effective training device for enuretic individuals. Although this device attracts the attention of the trainee almost instantaneously, it does not disturb other persons who are in the immediate vicinity.

In some ways, this invention resembles prior art devices in that it includes an audible signal generator incorporated in an electrical circuit containing an open switch which is bridged by escaping urine. Significantly, however, the instant device directs an extremely low volume signal directly to the ear of the trainee, desirably by mounting the audible signal generator on a headband. This device requires extremely low current drain and requires only a few drops of urine to close the switch and produce an immediate alarm response, regardless of the trainee's sleeping position. The low current effectively prevents any electrolytic ulceration, while the extremely brief time lag between emission of urine and communication of the alarm to the trainee, constitutes a classically effective learning situation.

BRIEF DESCRIPTION OF THE DRAWING

Understanding of the invention will be facilitated by referring to the accompanying drawing, in which like numbers refer to like parts in the several views, and in which:

FIG. **1** is a perspective view of a preferred embodiment of the invention;

FIG. **2** is a cross-sectional perspective view of the device shown in FIG. **1**, taken along section line **2—2** and looking in the direction of the arrows; and

FIG. **3** is a schematic drawing indicating electrical circuitry useful for the signal generating means of the invention.

DESCRIPTION OF PRESENTLY PREFERRED EMBODIMENT

Understanding of the invention will be further aided by examining a specific embodiment of the foregoing device in somewhat greater detail.

The device comprises headband assembly **10** and switch means **20**, electrically and mechanically connected by way of flexible stranded wire pair **18**, **18***a*. Headband assembly **10** comprises headband **11**, which is at least partially an elastic material. A suitable material is an elastomeric polyurethane foam, which is both light in weight and resistant to slippage on the head of the wearer; one suitable foam is ¼ inch thick and 1 inch wide. The foam may be either closed cell or open cell, although the latter is porous and may be lighter in weight and cooler. Headband **11** may comprise an endless strip, but it is preferred to employ an unjoined strip which is longer than necessary. The two ends of the strip can then be overlapped to any desired extent; one end of the strip is desirably provided with fastening material **12** which includes a multiplicity of short stiff polymer hooks, while the other end is provided with a fastenable material **12***a* which includes a multiplicity of loops. (Cooperating hook and loop fastener material of the **12**, **12***a* type is commercially available under the tradename "Velcro.")

Extending downward from headband **11** is depending tab **11***a* having a shoulder **11***b*, with a radius, designed to fit snugly behind the ear of the wearer. Ear cover **14** is positioned at approximately this same place, extending farther forward than tab **11***a* and preferably being separated therefrom by spacer strip **13**. It will be noted that this arrangement provides means for accommodating the ear of the wearer and helping maintain headband **11** in fixed position, all without discomfort.

Also mounted on headband **11** is signal generating means **15**, preferably positioned adjacent one end of spacer **13** and ear cover **14**. Signal generating means **15**, which is advantageously incorporated in a small device of the type used in compact modern hearing aids, is attached to headband **11** in any suitable manner, e.g., by clipping, adhering, or otherwise fastening. Extending from signal generating means **15** is signal guide means **16**, which is advantageously in the form of a No. 13 vinyl tube, the distal end thereof extending inward from the outer surface of ear cover **14** through a hole therein so as to terminate just through, or nearly through, the inner surface thereof. To insure that tube **16** is held firmly in place, it is desirably surrounded by grommet **17**, which grips it snugly and may itself be adhered to ear cover **14**.

Extending from signal generating means **15** to switch means **20** are flexible stranded paired wires **18** and **18*a***. To facilitate assembly and disassembly of the component parts of the device, each wire may be made up of shorter wires which are separably joined by connectors **19**, **19*a*** and **29**, **29*a***. The wires may be pinned or clipped to the pajama tops of a wearer, pass through appropriately located loops therein, etc.

Switch means **20** comprises moisture-absorbent sheets **21** and **22**, which surround a strong but flexible insulative sheet material **23**, (e.g., 2– or 3–mil glass fiber-reinforced epoxy resin or biaxially oriented polyethylene terephthalate film), advantageously forming a disposable envelope open at one edge. Insulative sheet material **23** bears on one face an open, interdigitated printed circuit having terminals **24** and **25** to which wires **18** and **18*a*** are soldered. Switch means **20** may be carried in a pocket mounted in the groin area of pajamas or shorts, or it may be attached thereto with adhesive or other suitable means, with the printed circuit facing the body of the trainee. Even a few drops of urine contacting sheet **22** quickly wick out to bridge the interdigitated spaced fingers connected to terminals **24** and **25**, closing the circuit and actuating signal generating means **15**.

The electrical circuitry in FIG. **3** shows a fairly conventional miniaturized solid state oscillator which has been found suitable for devices made with the invention. In this circuit, B represents a dry cell, e.g., of the silver oxide type and typically having a voltage of 1.5, R_1 and R_2 are fixed resistors, typically having values of 1.5 megohms and 6.8 K-ohms respectively. R_3 is a variable resistance, especially a 25 K-ohm rheostat. C is a capacitor, preferably 0.0002 microfarad; T is a transducer, and Q_1 and Q_2 are transistors. The resistance of switch means **20** exceeds 100 megohms in the normal dry condition, but promptly drops to 200 ohms when the interdigitated spaced fingers of switch means **20** are bridged by a small amount of urine. Idle current in the circuit is approximately 0.7 microampere, and maximum current through switch means **20** is only about 0.5 milliampere under deadshort conditions. As the current through switch means **20** increases, the current in Q_2 similarly increases; by positive feedback through C, the circuit begins to oscillate, the amplitude of oscillation being controlled by R_3. The frequency of oscillation of the circuit described is about 2,000–3,000 Hz, being converted to sound by transducer T at a sound pressure level (SPL, measured in units of 0.2 millidynes/cm^2) on the order of 80.

It will be readily appreciated that those of normal skill in the art can make various modifications of the specific embodiment illustrated and described, without thereby departing from the spirit of the invention. Thus the signal generating means **15** can be associated with a receiver carried on headband **11** and electrically connected to a transmitter associated with switch means **20**, thereby eliminating the necessity for wires **18**, **18*a***. Similarly, variation in constructional materials, shapes, etc., may be desirable in specific circumstances.

In like manner, the sound provided by the signal generating means may be continuous or intermittent, of constant or varying frequency, level or changing volume, etc.

What I claim is:

1. In a body fluid detecting device of the type which includes an open switch means having spaced terminals and adapted for wearing by a person adjacent the source of said body fluid, said switch means being closed when said body fluid bridges said terminals, and an electrically driven audible signal generating means which is normally inoperative but is actuated when said switch means is closed,

the improvement which comprises a headband having mounted thereon an audible signal generating means that will generate only a low volume signal which is substantially inaudible at a distance of a few feet, said headband being adapted to completely cover one ear of the wearer, tubular signal guide means for directing substantially all of said signal into the ear of said person, one end of said signal guide means being connected to said signal generating means and the other end of said signal guide means terminating in the portion of said headband which is adapted to cover the ear of said wearer, whereby said signal promptly attracts the attention of said person without attracting the attention of others, and means to support said signal guide means on the head of said person whereby said signal guide means is retained outside the person's ear.

2. The device of claim **1** wherein the switch means comprises a thin, strong, flexible, insulative film bearing a printed circuit with closely interdigitated terminals, said film being enclosed in a porous moisture-absorbent sheet material.

3. The device of claim **1** wherein the portion of the headband adapted to cover the wearer's ear is spaced outward from the inner surface of the headband.

4. The device of claim **1** wherein the signal generating means is connected to the switch means by a pair of flexible stranded wires.

5. The device of claim **4** wherein the circuit containing said wires contains at least one pair of separable connectors.

6. The device of claim **1** wherein the headband includes an elastic material.

7. The device of claim **6** wherein the headband is made of light weight polyurethane foam.

8. The device of claim **6** wherein the headband is discontinuous and has two ends which can be overlapped to the desired extent and separably connected, one of said ends being provided at the surface which contacts the other end with a multiplicity of small filamentary hooks, and said other end being provided at

the surface which contacts said one end with a napped material adapted to be engaged by said hooks.

9. In a body fluid detecting device of the type which includes an open switch means having spaced terminals and adapted for wearing by a person adjacent the source of said body fluid, said switch means being closed when said body fluid bridges said terminals, and an electrically driven audible signal generating means which is normally inoperative but is actuated when said switch means is closed,

the improvement which comprises a headband having mounted thereon an audible signal generating means that will generate only a low volume signal which is substantially inaudible at a distance of a few feet, said headband being adapted to completely cover one ear of the wearer, and signal guide means for directing substantially all of said signal into the ear of said person, said signal guide means extending from said signal generating means to the portion of said headband adapted to cover the ear of said wearer, whereby said signal promptly attracts the attention of said person without attracting the attention of others, and means to support said signal guide means on the head of said person in the immediate vicinity of his ear.

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