

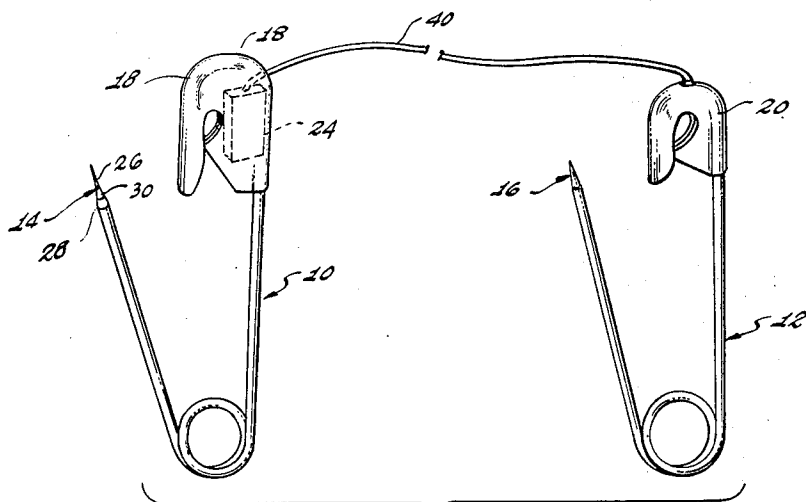
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J. B. BAISDEN

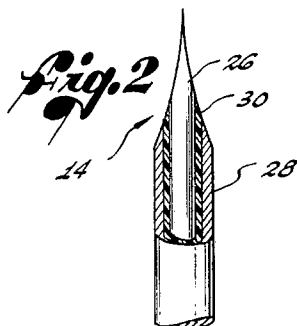
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COMBINED DIAPER FASTENER AND SIGNALLING DEVICE

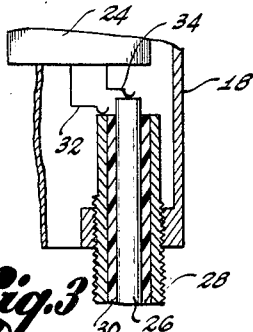
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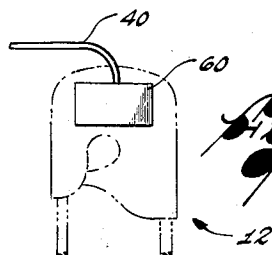
*Fig. 1*



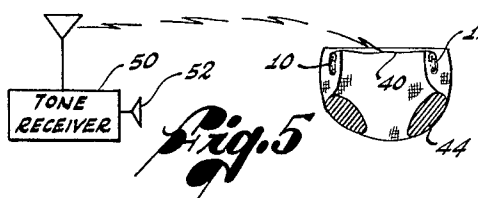
*Fig. 2*



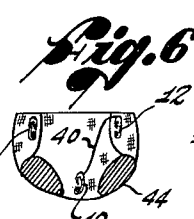
*Fig. 3*



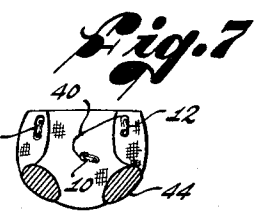
*Fig. 4*



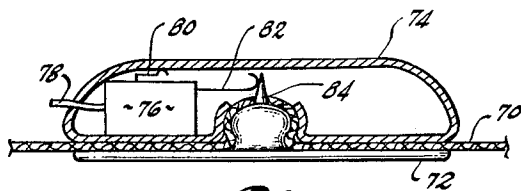
*Fig. 5*



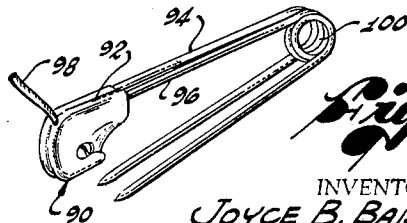
*Fig. 6*



*Fig. 7*



*Fig. 8*



*Fig. 9*

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**COMBINED DIAPER FASTENER AND  
SIGNALLING DEVICE**

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9 Claims

**ABSTRACT OF THE DISCLOSURE**

Diaper pin constructions are made to form galvanic couples, as a single pin with portions of different metals, or separate pins of different metals. A radio frequency transmitter is housed in the enlarged head of such a pin. When the diaper becomes wet, the galvanic couple is activated to energize the broadcast transmitter.

**BACKGROUND OF THE INVENTION**

**Field of the invention**

This invention relates to alarm apparatus to warn of the occurrence of an infant's discharge of urine or excrement, and more particularly to unique diaper fastener devices which also serve to transmit an alarm.

**Description of the prior art**

A variety of devices have heretofore been made for use in detecting when an infant's diaper has become wet with urine or excrement. Typically, such devices employ electrodes to be positioned on the infant's mattress or in its diaper. Wire connections from such electrodes extend from the infant's bed to an adjacent alarm mechanism, which is activated to provide an audible or visual indication when the electrodes are coupled via urine or excrement.

With the diaper attachment, the wire cord is an obvious impedance to the infant's freedom of movement. Further, the electrodes can readily be dislodged during vigorous movements, so that the alarm mechanism will not give an indication, if at all, until the infant's diaper is saturated. In addition, such movements may sever the connections between the electrodes and wire cord, and prevent any indication at all.

With the mattress type device, a typical experience is that no indication is given until after the diaper is saturated. Furthermore, where such a device covers only a portion of the mattress, it will fail to give any indication at all of a wet diaper when the infant is lying on some other portion of the mattress.

The objection to indications given only after diaper saturation is that numerous skin conditions need much more prompt notification of the skin being wetted, and thereby injured, by urine and/or excrement. As is well known, excrement of a baby with an intestinal disorder or rash has an irritating effect on the infant's skin. Under such circumstances, it is imperative to immediately cleanse the baby and change its diaper. Unless the warning device can reliably give the mother immediate notification of the baby's diaper being wet, she must still make frequent checks on the baby as though she had no warning device at all.

**SUMMARY OF THE INVENTION**

Mechanism adapted for fastening an infant's diaper also functions to transmit a warning signal. It includes fastener means which houses signalling means, and which forms part of a galvanic couple. The couple is activated by urine or excrement to energize the signalling means. External wire connections are eliminated, and the fas-

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tener means can be secured to any desired part of the diaper to activate the broadcast signalling means immediately upon that part of the diaper being wetted.

**BRIEF DESCRIPTION OF DRAWING**

5 FIGURE 1 is a perspective view of a pair of safety pin fasteners for diapers, for transmitting a warning signal to a remote receiver in accordance with my invention;

10 FIGURE 2 is an enlarged, fragmentary sectional view of the point of one of the pins of FIGURE 1, showing concentric dissimilar metal electrodes separated by insulation material;

15 FIGURE 3 is an enlarged, fragmentary sectional view of the end of the electrode construction of FIGURE 2 which is located in a safety pin head, and showing connections from the electrodes to the housing of a radio frequency generator;

20 FIGURE 4 is a phantom view of a safety pin head illustrating a micro-alarm contained within the head;

25 FIGURE 5 is an elevation view of a diaper with both pins of FIGURE 1 arranged for fastening the diaper of an infant having no skin trouble, and illustrating a radio receiver to which a signal is transmitted when the infant's diaper is wet with urine;

30 FIGURES 6 and 7 are views similar to FIGURE 5, but wherein the pin made of dissimilar metals is fastened to the diaper at different points for infants having skin rashes and diarrhea, so that the presence of urine or excrement is detected and warning given immediately;

35 FIGURE 8 is a side elevation view of a snap-type fastener for diapers which houses transmitting means for radiating warning signals in accordance with my invention; and

40 FIGURE 9 is a pin structure wherein a safety pin has two prongs of dissimilar metals to provide a combined fastener and warning device in accordance with my invention.

**DETAILED DESCRIPTION OF THE INVENTION**

45 Referring to FIGURE 1, there is shown a pair of safety pins 10, 12 with pointed ends 14, 16 to be thrust through diaper material and forced into locking engagement with the clasp heads 18, 20, all in a conventional manner.

50 In addition to functioning as fasteners, the pins 10, 12 also serve as electrodes which pass an electrical current when the baby's diaper is moistened by urine or excrement. This current can be galvanically generated by the pin-fastener-electrodes, or can be drawn from the battery power source mentioned below. In this connection, the head 18 of one of the pins 10 houses an electronic radio frequency generator 24, which may be a conventional oscillator and amplifier integrated network that employs solid state devices for generating and amplifying a signal. Preferably, the integrated circuit is encased in an insulating housing, e.g., as by being potted in plastic material. In this particular example, it is also preferred that the housing for the generator include a small battery to provide a power source for the generator.

60 Referring to FIGURES 2 and 3 along with FIGURE 1, the pin 10 is adapted to function as galvanic couple when the portion of the diaper to which it is attached becomes wet. To this end the prong of the pin is formed of an inner rod 26 surrounded by a tubular element 28, such rod and element being separated by a sleeve 30 of suitable insulating material. As shown in FIGURE 2, the elements 26, 28, 30 are suitably ground to form the point of the pin. The rod 26 and tubular element 28 are formed of dissimilar metals, e.g., silver for the rod and zinc for the tubular element, so as to function as electrodes of a galvanic couple in the presence of an electrolyte—urine or excrement.

At their opposite ends, the electrodes 26, 28 are secured in the head 18. If desired, they can be secured to the head by crimping the head material around the end of the assembly in the same manner as for conventional safety pins. However, I prefer to make the assembly replaceable, and to this end (see FIGURE 3), the electrode 28 is threaded into the head 18.

When the tubular element 28 is inserted in the head 18, the inner ends of the tubular element 28 and the rod 26 engage respective spring contacts 32, 34 that extend from the housing of the tone generator 24. Within the housing of the tone generator 24, the contacts 32, 34 may be connected directly to the leads (not shown) for the integrated circuit through which operating current must be supplied. Alternatively, a battery may be included in the housing of the tone generator, with one lead of the generator being connected to one terminal of the battery, the other lead of the generator connected to one of the contacts 32, 34, and the other of such contacts being connected to the remaining terminal of the battery. In either case, operation of the tone generator 24 will not take place until the electrodes 26, 28 are electrically connected at their outer ends, i.e., in the vicinity of the point 14.

Such a D.C. path is established by urine or excrement that wets the diaper in the vicinity of the point 14 of the pin 10. In essence, such liquid bridges the insulation material 30 and provides an electrolytic conductive path between the electrodes 26, 28. Where the leads of the tone generator are connected directly to the spring contacts 32, 34, the galvanic couple constitutes the power source for the generator. Where a separate battery is utilized as above described, it is poled so that the directions of current flow through the battery and the electrodes 26, 28 are the same.

Referring again to FIGURE 1, an electrical lead 40 is connected to the tone generator 24, and extends out of the head 18. Such lead 40 functions as an antenna, from which to radiate the signal. The antenna 40 need not be connected to a support. However, I prefer that the outer end of the antenna be connected to the head 20 of the pin 12, and that both pins 10, 12 be inserted in an infant's diaper at points sufficiently spaced to keep the antenna 40 reasonably extended. With this arrangement, one can fasten the pins to a diaper with the detecting pin 10 appropriately positioned for the particular skin condition of the baby.

FIGURES 5-7 illustrates how the pins 10, 12 are positioned for various skin conditions. Referring to FIGURE 5, the pins 10, 12 are both shown in use in fastening a diaper 44 in place on an infant that has no skin problems. Once the diaper 44 becomes sufficiently saturated at the location of the pin 10, the above-described galvanic action or reduction in electrical resistance occurs, whereupon signals are radiated from the antenna 40 to a receiver 50, which may be located nearby, either in the same room or an adjacent room, whereupon the receiver causes an audible sound to be reproduced in its loudspeaker 52. Such a sound alerts the mother to the baby's condition, and she can then proceed to remove the wet diaper and cleanse the baby, and then put on a new diaper.

Preparatory to reinserting the pins 10, 12 in the new diaper, the point 14 of the pin 10 (FIG. 1) is cleansed so as to remove the urine coating thereon and thereby minimize chemical action on the electrodes 26, 28. On this latter point, if it is discovered after numerous uses that the detecting pin 10 is not functioning properly, i.e., the needed galvanic action no longer occurs, it is a simple matter to remove the prong and thread a new one into the head 18.

FIGURES 6 and 7 show arrangements wherein the pin 12 is used along with the conventional safety pin 54 for fastening purposes, and the pin 10 is fastened elsewhere on the diaper 44 for more rapid detection. In FIGURE 6, for example, the pin 10 is fastened near the crotch of the diaper 44, which is a location chosen for an infant that is suffering from diarrhea, so that a discharge can be de-

tected instantly and attention given immediately so that aggravation of the extremely painful skin condition normally associated with diarrhea is minimized.

The arrangements of the pins 10, 12 in FIGURE 7 is like that of FIGURE 6, except that the pin 10 is located further from the crotch of the diaper 44, which may be a suitable position for a normal infant having only a slight rash caused by urine. Again, detection is substantially instantaneous upon discharge of urine, thereby giving the mother immediate warning so that the diaper can be changed and further aggravation of the rash can be prevented or minimized.

The same pin arrangements are useful in accordance with my invention to provide a self-contained warning system, i.e., one that does not require transmission to an adjacent radio receiver. Referring to FIGURE 4, the pin 12 of FIGURES 1 and 4-7 is replaced with a pin 12' having a head clasp 20' of sufficient size to house a micro-alarm unit 60. The wire lead 40 in this instance does not function as an antenna, but rather as an electrical connection from the oscillator-amplifier network to the alarm unit 60. When the galvanic action takes place as above described, the alarm unit 60 is set into operation, and thereby broadcasts an audible tone, which can be heard over some distance.

Another modification of my invention is one in which the pin 10 is like the pin 12, in that the prong of the pin 10 is made of a single metal. However, in such embodiment the metals of the pins 10, 12 are dissimilar. With such an arrangement, galvanic action takes place when the part of the diaper extending between the pins is wet. Further, in such arrangement, the power leads for the tone generator 24 are connected to the prong of the head clasp in which it is housed, and to the wire 40 extending therefrom. Thus, a D-C loop is established through the diaper material between the dissimilar metals (when such diaper material is wet), the generator 24, and the wire 40 connecting the two pins. Additionally, the wire 40 in such case additionally functions as an antenna where the signal is to be radiated to adjacent receiver, or as a transmission line to an alarm unit housed in the other pin.

FIGURE 8 illustrates the use of a snap-type fastener incorporating my invention. In this arrangement, the diaper material 70 is located between the male and female parts 72, 74 of a snap fastener device. The female part 74 houses a generator 76, from which a lead 78 extends to the exterior, which lead 78 is adapted to function as the wire 40 of FIGURE 1. The parts 72, 74 are of dissimilar metals, and galvanic action takes place when the diaper material 70 between them is wet. Thereupon, the generator 76 is set into operation for radiating a radio frequency signal from the lead 78, or transmitting such signal through the lead 78 to an alarm unit housed in the female section of a similar snap device.

To provide the desired D-C path, the generator 76 had leads (not shown) which are connected to spring contacts 80, 82. One contact 80 engages the inner surface of the female part 74, and the other contact 82 engages a pointed projection 84 on the male head. The projection 84 is provided to pierce the diaper material 70, and enter the female part 74 and into wiping engagement with the contact 82. Thus, when the material 70 is wet, current flows between the fastener parts 72, 74, and places the contacts 80, 82 at opposite polarities.

As is apparent, the above-described snap fastener can be attached to the diaper material at any desired location. However, my invention is also adapted to function the same way with a snap fastener that has both male and female parts permanently fastened to different portions of diaper material that are to be connected. In such case, the portions of the male and female parts that come into direct contact can be coated with insulation material, e.g., a plastic film. The male head in such case needs no projection, and is adapted to engage the

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spring contact 82 directly upon entering the opening in the female part.

FIGURE 9 illustrates another safety pin construction of my invention. In this embodiment, a safety pin 90 is formed having a head 92 which supports two prongs 94, 96 of dissimilar metals, which within the head 92 are connected to the power leads for a tone generator (not shown), from which a wire lead 98 extends to the exterior of the head. The prongs 94, 96 are separated along their length, and to this end their intermediate loops may be secured to the opposite faces of an insulating ring 100. The pointed ends of the prongs are adapted to fit in respective halves of the clasp portion of the head 92. In this connection, the head 92 is made of non-conductive material. Accordingly, when the prongs of the pin 90 are inserted in diaper material and latched in their portions of the clasp, and the diaper material between such prongs becomes saturated, a relatively strong galvanic current flows between the prongs, and is sufficient to power the generator located in the head 92.

The pin 90, as with the pin 10 of FIGURE 1, can be used alone for the desired purpose of radiating a signal from the wire 98, i.e., the wire 98 does not have to be connected to another pin. Further, it will be appreciated that my invention embraces the use of such a single pin galvanic couple, wherein both a tone generator and a micro-alarm unit are housed in the head.

I claim:

1. In combination:

a pair of electrodes of different metals having pin and pin capturing portions to be releasably secured to a diaper, said electrodes forming a galvanic couple in the presence of a conductive fluid between them, said pin capturing portion forming a hollow housing; broadcast signalling means in said housing; and electrical connections between said signalling means and said electrodes, said signalling means being activated in the presence of such conductive fluid to broadcast a warning signal of the presence thereof.

2. The combination of claim 1, wherein said electrodes are formed as respective safety pins, said housing constituting the head of one of said safety pins.

3. The combination of claim 2, wherein one electrical connection extends through the head of said one pin to

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the head of the other pin, said one electrical connection also serving as an antenna for radiating the warning signal.

4. The combination of claim 2, including a battery power source in said one head for said signalling means; and a wire connection between the pins serving to close the circuit including said pins and battery, said wire connection simultaneously serving as a radiating antenna for the warning signal.

5. The combination of claim 1, wherein one electrode is a pin and the other electrode is a tubular element surrounding said pin;

an insulating sleeve intermediate said electrodes, and said pin, tubular element and insulating sleeve at one end being tapered to define a pointed end to be inserted in a diaper.

6. The combination of claim 1, wherein said electrodes and housing are formed as a safety pin, said housing being the head of the safety pin.

7. The combination of claim 5, wherein said electrical connections are inside said housing.

8. The combination of claim 7, including a length of wire extending from said signalling means through said housing, said length of wire serving as an antenna to radiate the warning signal.

9. The combination of claim 1, wherein said electrodes form cooperative elements of a snap fastener, said housing constituting an enlarged portion of one of said elements.

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U.S. Cl. X.R.

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