Feb. 24, 1959 C. A. VANIMAN 2,874,695

ENURESIS NAPKIN ASSEMBLY

Filed July 20, 1956 2 Sheets-Sheet 1

FIG.1

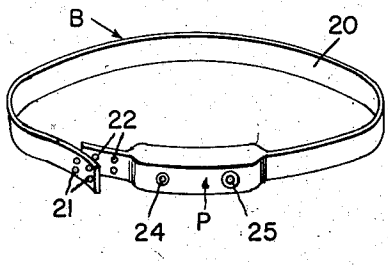


FIG.2

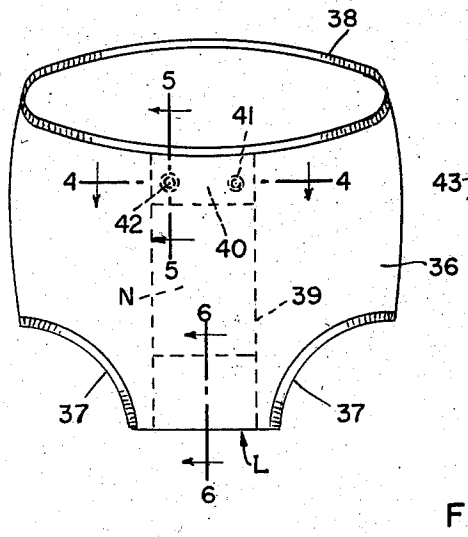


FIG.5

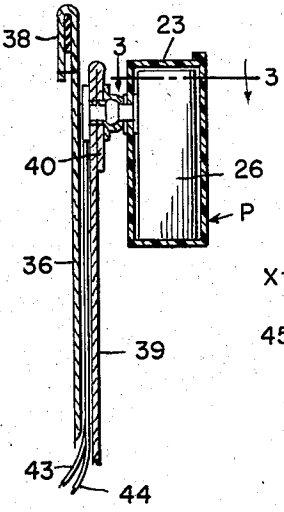


FIG.6

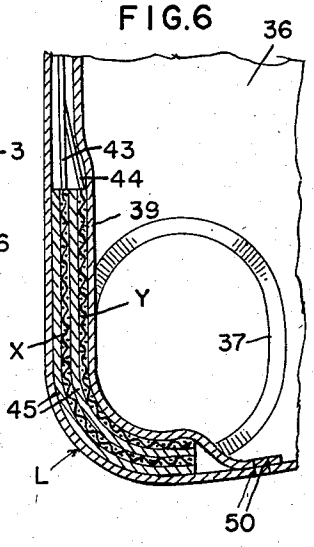


FIG.7

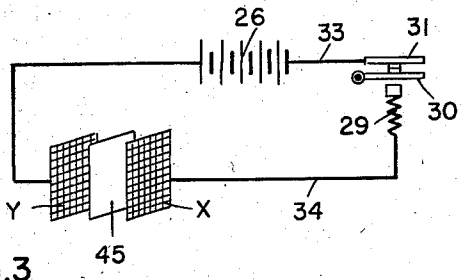
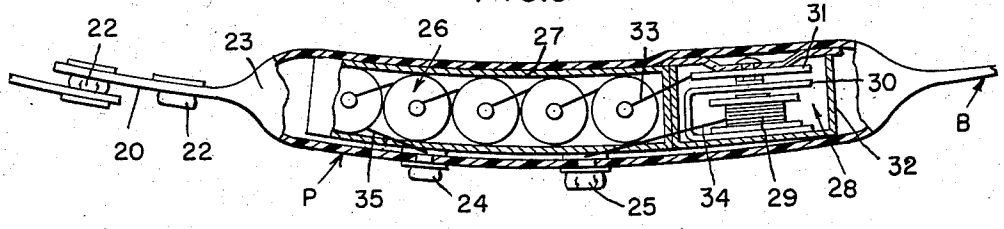


FIG.3



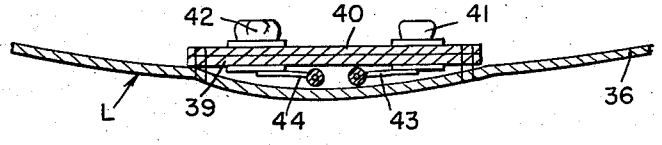


FIG.4

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ENURESIS NAPKIN ASSEMBLY

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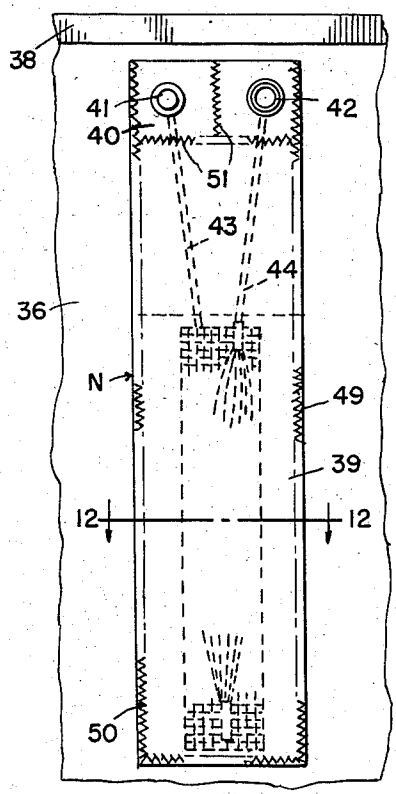


FIG.8

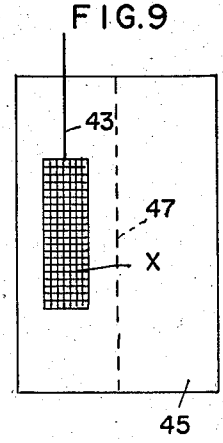


FIG.9

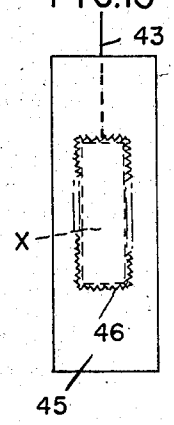


FIG.10

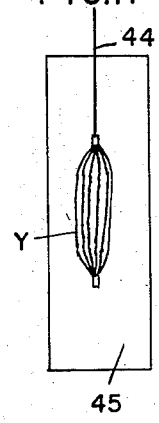


FIG.11

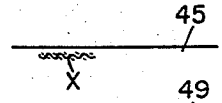


FIG.9a

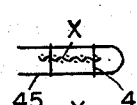


FIG.10a

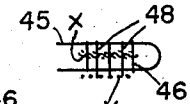


FIG.11a

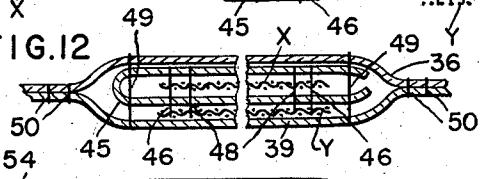


FIG.12

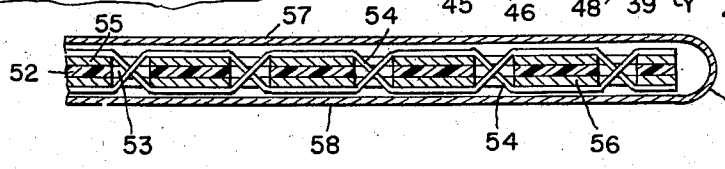


FIG.13

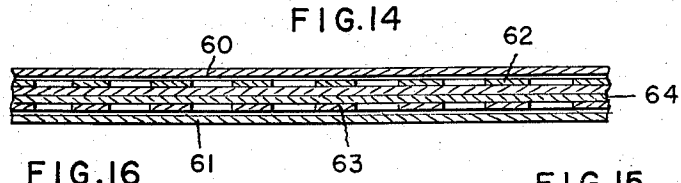


FIG.14

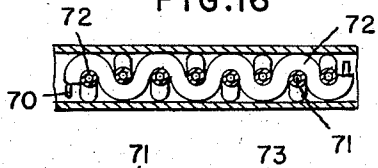


FIG.16

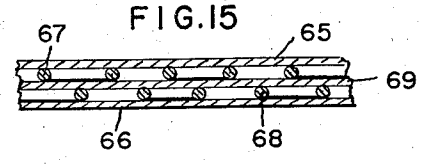


FIG.15

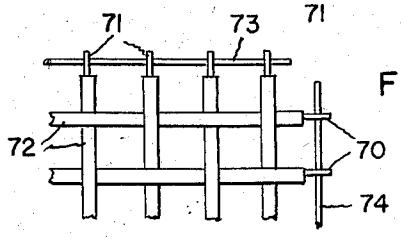


FIG.16a

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United States Patent Office

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ENURESIS NAPKIN ASSEMBLY

Charles A. Vaniman, Fort Lauderdale, Fla.

Application July 20, 1956, Serial No. 599,051

14 Claims. (Cl. 128—138)

This invention relates to an enuresis napkin assembly adapted to be worn upon the body of a sleeping child, the purpose being to induce a prompt cessation of any involuntary voiding of his bladder. The assembly comprises a self-contained power pack in electrical circuit with a vibrator and a napkin having a pair of juxtaposed electrodes spaced from each other by a moisture-absorbent insulator. The electrodes and insulator are so arranged that the absorbent insulator will be wetted by even a small discharge of urine whose salt content will then act to complete a circuit between the electrodes and produce operation of the vibrator. Such a napkin is effective to aid a person with enuresis in overcoming the mental condition which is mainly responsible for his disagreeable habit.

The napkin of this invention, to be acceptable for wearing upon the body, must be light, soft, flexible and comfortable. It must also be easy of application to and removal from the body, and be provided with its own power pack whereby to dispense with connections to any external source of power. It is also requisite that it be readily washable so as to be restored to clean and sanitary condition following each use. The present napkin is endowed with all these important attributes and also numerous others as will hereinafter appear.

A suggestive exemplification of this invention is illustrated in the accompanying drawings wherein

Fig. 1 is a front perspective view of the belt unit per se; Fig. 2 is a similar view of the loin unit; Fig. 3 is a longitudinal section through the power pack, taken on line 3—3 of Fig. 5; Fig. 4 is an enlarged detail in horizontal section, taken on line 4—4 of Fig. 2; Fig. 5 is an enlarged fragmentary detail in vertical section, taken on line 5—5 of Fig. 2, with the power pack in its operative position also shown therein; Fig. 6 is an enlarged fragmentary detail in vertical section, taken on line 6—6 of Fig. 2; Fig. 7 is a diagram of the electrical circuit employed for operation of the vibrator; Fig. 8 is a fragmentary detail in elevation, looking toward the inside front of the loin unit; Figs. 9–11, supplemented by Figs. 9*a*–11*a*, are diagrammatic views in front and end elevations, respectively, showing three successive stages in assembling the napkin components in a preferred construction; Fig. 12 is an enlarged transverse section through the napkin assembly, taken on line 12—12 of Fig. 8; Figs. 13–16 are fragmentary details in section, partly diagrammatic, showing four modifications in the form of electrodes that may optionally be incorporated into the napkin of this invention; and Fig. 16*a* is a fragmentary elevation of the electrode shown in Fig. 16.

The belt unit B, as shown, comprises a body-encircling strap 20, elastic if desired, having one end portion fitted with a pair of snap-fastener elements 21 complementary to one or more pair of cooperating fastener elements 22, which are carried upon the opposite end portion of the strap. When interengaged, the fastener elements will releasably secure the two end portions of the strap to provide a continuous belt of predetermined length. A belt so made is well known at the present time.

A power pack P which is relatively thin and light is also incorporated in the belt unit. I provide for such a pack a flexible two-ply covering 23 of plastic or the like (see Fig. 3) which may have an intermediate cushioning play of cotton batting. Such a covering affords an adequate protection, and is also soft and comfortable when in contact with the skin at a sensitive point. The belt when applied to the body will position the power pack at the front center, slightly above the pelvic region. Affixed to the power pack covering 23 is a button 24 in spaced relation to a socket 25, each constituting one terminal of an electrical circuit which is diagrammed fully in Fig. 7.

As indicated clearly in Fig. 3, the power pack contains a battery 26 made up of several interconnected dry cells aligned within a paper carton 27, and adjacent one end of the carton a vibrator 28 having an electromagnet 29 and vibrating arm 30 which is movable between the electromagnet and a diaphragm 31 with which it tends to remain in contact. The components of the vibrator are housed within a cylindrical metallic box 32 opposite ends of which abut the power pack enclosure 23. The electromagnet 29 and diaphragm 31 are fixedly mounted within the box and fully protected thereby. From the negative pole of the battery 26 a wire conductor 33 connects with the diaphragm 31, and from the electromagnet 29 a further wire conductor 34 leads to the fastner element 25 which constitutes one terminal that is exposed upon the exterior of the power back covering 23. The other terminal, constituted by the second fastener element 24 upon the exterior of the covering 23, is connected by a wire conductor 35 to the positive pole of the battery 26. The circuit thus provided extends continuously from the fastener terminal 25 through the vibrator 28 and battery 26 to the other fastener terminal 24, but between the two terminals there is normally a gap which is closed only by operation of moisture-responsive means (to be described at a later point) contained within the loin unit L.

As suggested in Fig. 2, the loin unit L may take the form of light, flexible pants 36 with leg holes 37 and an elastic waist band 38. Extending downwardly from a point just below the waist band and between the leg holes is an elongated facing strip 39 of textile material having a turned upper end portion 40 which provides a mounting for a button 41 and a socket 42 in a spaced relation corresponding to that of the button 24 and socket 25 extending from the power pack covering 23, and for which they constitute complementary components of the snap fasteners hereinbefore referred to. When the loin unit is properly fitted upon the body, the buttons 24 and 41 will occupy coacting positions relative to the sockets 42 and 25, respectively, and be adapted for releasable snap connection therewith.

Leading downwardly from the button 41 and socket 42 are flexible wire conductors 43 and 44 which are covered over by the elongated facing strip 39. These conductors are in electrical connection with the buttton 41 and socket 42 and with mutually insulated electrodes X and Y, respectively, which are incorporated in and made a part of the present napkin N. This napkin utilizes certain components of soft textile material which, when dry, are high in insulating and moisture absorption values; when wet, however, as by urine, they readily become conductors. Closely woven poplin having a substantial cotton content is well suited for this purpose. When assembled with the electrodes X and Y, the poplin or other like material will be thin, flexible and sensitive to any change in moisture conditions resulting from dis-

charge of urine. A detailed description of the napkin assembly N now follows.

In Fig. 9 there is shown a textile carrier sheet **45** extended flat to receive thereon in one side portion the electrode X which, according to Figs. 9–12, may be in the form of a thin flexible rectangular woven wire screen of aluminum or the like. This electrode, through the conductors **43** and **34**, is desirably in electrical connection with the negative pole of the battery **26** comprised in the power pack P. As by a line of zigzag stitching **46** extending around its borders, the electrode X is secured to the carrier sheet **45** with the sharp rough edges of the electrode completely enclosed for protection.

The assembly of the napkin having proceeded up to this point (see Figs. 9 and 9*a*), the carrier sheet **45** is folded upon itself along the dotted line **47** with the electrode enclosed between its two plies (see Figs. 10 and 10*a*). To the outer face of the unoccupied ply is then affixed the second electrode Y at a point substantially in register with the electrode X which is then disposed between the two plies of the folded carrier sheet **45** (see Figs. 11 and 11*a*). While it is feasible to have the electrode Y in the form of a screen, the same as electrode X, I prefer for reasons of greater flexibility, reduced weight, and lesser tendency to discolor adjacent textile components, to utilize a plurality of fine copper strands interconnected at their ends and spread irregularly across the selected face of the carrier sheet within an area corresponding roughly to that occupied by the rectangular electrode X. Several lines of stitching **48** are then extended crosswise of the electrode Y and through the folded carrier sheet **45** to hold the strands of this electrode in place. The stitching **48** is confined to an area within the confines of the closely spaced stitching **46** which borders the electrode X. It will be noted that the threads comprised in the two stitchings **46** and **48** are disposed in non-registering areas so as to avoid difficulties in the sewing operation, etc.

The two electrodes X and Y, when so assembled and secured upon the folded carrier sheet **45**, are ready to be fitted in the loin unit L at its front to occupy a position in the crotch of the wearer directly opposite his urinal organ. Previously the conductor wires **43** and **44** will have been connected to the electrodes and fastener elements **41** and **42** which are mounted on the elongated facing strip **39** at its turned upper end **40**. This facing strip which widely overlies and protects the conductor wires **43** and **44** and other components of the napkin assembly, is joined to the latter by a line of closely spaced zigzag stitching **49** extending through itself and through the carrier sheet **45** around its border (see Fig. 12) and by further zigzag stitching **50** extending through itself around its own border and through the loin unit with which it is inseparably associated. In addition, one or more lines of stitching **51** are extended through the turned upper end portion **40** of the facing strip and the loin unit (see Fig. 8) to strengthen the latter at the point where the fastener elements **41** and **42** are carried.

When assembled and joined together substantially as herein described, the napkin assembly and also the loin unit wherein it is mounted, will remain light, soft and comfortable, for wearing; it will also withstand repeated washing, air-drying and handling without detriment or impairment. Other alternative forms of electrodes may optionally be availed of, however, and without sacrifice of the advantages inherent in this invention, as will now be noted by reference to Figs. 13–16*a*.

According to Fig. 13, the napkin comprises a thin, light and flexible plate **52** of plastic or the like, formed with a plurality of perforations **53** through which threads **54** serving as wicks are passed to engage extended linear areas of electrodes **55** and **56** which are carried on opposite faces of the plate. These electrodes may be in the form of metallic coatings applied by electrodepositions, or hot spray process, or otherwise, and as shown are perforated in register with the openings **53** in the plate. The electrodes are enclosed between two plies **57** and **58** of a napkin carrier sheet **59** and are electrically connected in the circuit leading to the battery and vibrator to cause operation of the latter in the manner already described.

In Fig. 14 there is shown two napkin plies **60** and **61** enclosing between them a pair of electrodes **62** and **63** in the form of metallic foils which are separated by one or more sheet insulators **64** desirably of light textile material. And in Fig. 15 the napkin plies **65** and **66** enclose between them two woven screens or monoplanar grids **67** and **68** having an intervening textile sheet insulator **69**. Desirably each pair of electrodes in each of the constructions just described is characterized by confronting faces of extended area, and is produced from two dissimilar metals having unequal atomic weights, aluminum and copper being suggested by way of example. The reasons for this will be explained shortly. In each of the napkin assemblies disclosed in Figures 13–15 suitable stitching may be employed to secure the several components permanently together and to the loin unit (not shown) in the manner heretofore described in connection with Figures 9–12.

Figures 16 and 16*a* depict a flexible screen of woven wires of small gauge which are coated with an insulation, e. g., cotton wrapping, which is moisture absorbent but with capacity, when wet, for conducting current therebetween. The wires **70** which run one way are desirably aluminum whereas the remaining wires **71** extending crosswise thereof are desirably copper. At one end portion of each set of wires the insulation **72** is stripped to expose the wires for interconnection with cross wires **73** and **74**, and it is to the latter that conductors, similar to those designated as **43** and **44** in Figure 8, are connected. In this construction the wires **70** and **71** constitute two facing electrodes normally separated by the insulation **72** which remains effective only so long as it stays dry. It has the advantage of combining into one woven structure, with consequent enhanced flexibility, the two electrodes which elsewhere herein are disclosed as separate entities.

A napkin assembly which utilizes its own power pack, as herein disclosed, must necessarily, because of weight and space limitations, operate on a low battery current; also, because of the nature of the conductor which bridges the two electrodes, the flow of current therebetween will necessarily be weak. Presumably several current paths will be opened up at or about the same time to complete the circuit which is tenuous at best. To facilitate the flow of current between the electrodes I propose that they be produced from dissimilar metals having unequal atomic weights, thereby, by electrolytic action in the presence of urine salts, to constitute a second battery whose potential, even though slight, will be effective at the point where most needed. It will accordingly act to facilitate the flow of current between the electrodes when a wet condition arises. This is one reason why aluminum and copper are recommended as desirable materials for the two electrodes since their combined effect is not merely to serve as electrical contact areas in a circuit, but also to improve the conductivity therethrough by electro-chemical action as well. Another reason is the tendency of two electrodes of the same metal to react with urine in producing a discoloration of the adjacent textile components of the napkin. With copper, for example, the stain is offensively brown in color. By utilizing aluminum for the anode electrode in combination with a copper electrode for the cathode, the presence of urine causes aluminum to be transferred to the copper electrode and deposited thereupon in the form of a thin coating which acts effectively to prevent any discoloration of the textile components of the napkin. To prevent premature exhaustion of metal in the electrode X, it may

be desirable to utilize therefor wires or coatings of slightly larger gauge size than those chosen for the electrode Y.

When the device of this invention is first put to use, the power pack may be bent endwise to an arcuate form as suggested in Figure 3, thereby to conform better to the contour of the wearer's body. The battery carton **27** and the covering **23** therefor will readily yield for this purpose and remain curved in substantially their new positions. The vibrator **28** lies close to the body and its percussions will be readily transmitted thereto in almost undiminished volume to produce a very ticklish sensation over the impacted area. Even though the child may be sound asleep, an involuntary contraction of the abdominal muscles then takes place accompanied in most cases by a prompt cessation of the bladder voiding. By the time the child has awakened, the discharge of urine will usually have been interrupted, thereby minimizing the escaped quantity thereof. There will be, of course, some noise attending operation of the vibrator, but this is largely muffled by the enclosing covering **23** and is not an important factor in the treatment designed to overcome the enuretic condition. An adult who may be sleeping near by will usually be awakened so as to take care of the child promptly upon initial voiding of his bladder.

Experience has proven that the napkin assembly of this invention is very effective in arresting voiding of the bladder in an incipient stage thereof, whether or not the child be fully awakened; and that initially as many as three napkin changes in succession may be required in a single night, this number soon dropping off to two and later to one, with finally no further recourse to the napkin at all as the enuretic condition disappears. A practical outfit will consist of one belt unit and three loin units, each complete with napkin assembly. The loin units, when washed early in the day, will air-dry and be ready for re-use well before bedtime. The belt unit will normally remain dry at all times, and its power pack will continue to have life throughout the usual period of treatment. No switch is required to open or close the circuit since the coacting snap fasteners alone serve effectively to make or break the circuit as needed in normal handling of the napkin device.

In summary, the present invention is characterized by a high degree of flexibility for all the components of the napkin assembly whereby it is soft and comfortable to be worn on the person; by a ready separation of the napkin assembly along with the loin unit from the power pack to facilitate changes of the former whenever necessary to avoid continuance of a wet condition; by the provision of combined supporting and electrical connections between the belt and loin units which will assure at all times restoration of the power circuit with the current flow proceeding through the electrodes in a predetermined direction; by adequate protection afforded to the fixedly assembled components of the napkin so that they may undergo repeated washing and drying operations without detriment in order to remain in a clean and sanitary condition; by a percussive device which operates upon a sensitive area of the body to assure awakening of the sleeper; and by an overall compactness and lightness in weight which makes for easier handling, wearing, storage and shipment.

I claim:

1. An enuresis napkin assembly comprising in a single unit adapted to be worn upon the body a pair of flexible, relatively flat, juxtaposed electrodes, a flexible moisture-absorbent sheet insulator interposed between the two electrodes, a pair of flexible, moisture-absorbent and insulating plies enclosing the two electrodes, flexible, normally-insulating means interconnecting the two plies, two electrodes and interposed sheet in unitary relation, and a flexible loin unit in which the napkin assembly is carried, in combination with a flexible belt unit in supporting connection with the loin unit for maintaining the napkin assembly therein in a position upon the wearer opposite the urinal organ, a power pack including a battery and a vibrator comprised in the belt unit, and an electrical circuit interconnecting the vibrator and power pack and in connection with each electrode, and operable with discharge of urin upon the napkin assembly to complete the circuit between the electrodes whereby to operate the vibrator.

2. An enuresis napkin assembly according to claim 1 wherein the belt unit supporting connection with the loin unit is detachable and its electrical connection with the napkin assembly is also detachable to permit complete separation of the belt and napkin assembly units and washing of the latter for maintenance thereof in a clean and sanitary state.

3. An enuresis napkin assembly according to claim 1 wherein the belt unit supporting connection with the loin unit is combined with the electrical connections from the power pack to the napkin assembly.

4. An enuresis napkin assembly according to claim 1 wherein the electrodes are made of dissimilar metals of unequal atomic weights with capacity, in the presence of urine, for electro-chemical interaction to produce an electrical current tending to facilitate its own flow between the electrodes.

5. An enuresis napkin assembly according to claim 1 in which the electrodes are made of dissimilar metals of unequal atomic weights with capacity, in the presence of urine, for electro-chemical interaction to produce an electrical current tending to facilitate its own flow between the electrodes and wherein the belt unit supporting connection with the loin unit utilizes two pairs of coacting detachable fasteners, one pair at the terminals of the battery-vibrator circuit and the other pair at the terminals of the electrodes circuit, and each cooperable non-reversibly with the other to complete therebetween a circuit path through which current may flow in only a predetermined direction.

6. An enuresis napkin assembly according to claim 1 wherein the power pack is so positioned on the belt unit as normally to rest upon the wearer's body at a point slightly above the pelvic region with the vibrator next to the body of the wearer for transmitting percussive impacts thereto.

7. The combination with a body-fitting loin unit of a fixedly mounted enuresis napkin assembly having a pair of relatively flat, juxtaposed, flexible electrodes, a flexible moisture-absorbent sheet overlying the exposed face of one electrode within the loin unit, a moisture-absorbent flexible insulator means separating the two electrodes, two outwardly extending spaced fastening elements, one male and the other female and each insulated from the other, carried by the loin unit at a point close to the waist line of the wearer, an electrical conductor extended from each electrode to one of the fastening elements, and a belt unit comprising in itself an electrical power pack having a battery in circuit connection with a vibrator and with two terminals each in the form of a fastening element, one male and the other female, complementary to those on the loin unit and disconnectably engageable therewith to (*a*) support the loin unit in a predetermined position with its napkin assembly opposite the urinal organ of the wearer and (*b*) complete the electrical circuit to the two electrodes therein, the arrangement being such that urine, when discharged, will wet the absorbent insulator means between the electrodes to conduct current from one to the other thereby to complete the electrical circuit back to the power pack for operation of the vibrator, the loin unit, belt unit and all electrical elements herein recited being combined into a single, self-contained apparatus suitable for wearing upon the body.

8. An enuresis napkin assembly according to claim 7 in which the electrodes are made of dissimilar metals of unequal atomic weights with capacity, in the presence

of urine, for electro-chemical interaction to produce an electrical current tending to facilitate its own flow between the electrodes.

9. An enuresis napkin assembly according to claim 7 in which the vibrator is so disposed in the power pack as to rest next to the body in the abdominal area for transmitting thereto in the fullest measure the percussive impacts emanating therefrom.

10. The combination with means for supporting an enclosure containing a power pack having a battery and electrically connected thereto a vibrator operable thereby disposed upon the body of a wearer at a point slightly above and in close proximity to his pelvic region, of a flexible enuresis napkin assembly associated with the power pack and in detachable connection therewith to be held thereby upon the body at a point opposite the urinal organ, and comprising two flexible, closely spaced, juxtaposed electrodes each in circuit connection with the power pack and vibrator, and flexible insulating means of absorbent material interposed between the two electrodes and acting, when dry, to prevent flow of current from one to the other but, when wet, to conduct current therebetween to complete the electrical circuit for operation of the vibrator, all of the means herein recited being combined into a single, self-contained apparatus suitable for wearing upon the body.

11. An enuresis napkin assembly according to claim 10 in which there is a loin unit in the form of pants to carry the napkin assembly, an elongated facing strip is fitted over the napkin assembly and joined thereto and to the pants and extended upwardly therein at the front to a point close to the waist line, electrical conductors are led from the electrodes upwardly between the pants front and the facing strip to be protected by the latter, and terminals for the conductors are carried by the facing strip near its top for connection with other coacting terminals in electrical connection with the power pack.

12. An enuresis napkin assembly according to claim 10 in which the electrodes are made of dissimilar metals of unequal atomic weights with capacity, in the presence of urine, for electro-chemical interaction to produce an electrical current tending to facilitate its own flow between the electrodes.

13. An enuresis napkin assembly according to claim 10 in which each electrode comprises two interengaging sets of wires connected electrically to each other and to opposite poles of the battery and the flexible moisture absorbent insulating material comprises a covering around each wire.

14. An enuresis napkin assembly according to claim 10 in which the flexible insulating means of absorbent material is a textile sheet folded upon itself to carry the two electrodes, spaced from each other, upon different faces of the sheet and in which flexible means are provided to join the electrodes to each other through the medium of the sheet to provide a flexible napkin assembly.

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