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Tyrey

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[54] **APPARATUS FOR HEATING A WATER BED**

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[52] **U.S. Cl.** ..... **219/217**, 5/348 WB, 219/307, 219/328, 219/330

[51] **Int. Cl.** **H05b 3/78**

[58] **Field of Search** ..... 219/217, 297, 307, 219/314, 319, 327, 328, 330, 331; 5/348 WB, 348 R, 347; 128/376-378

[56] **References Cited**

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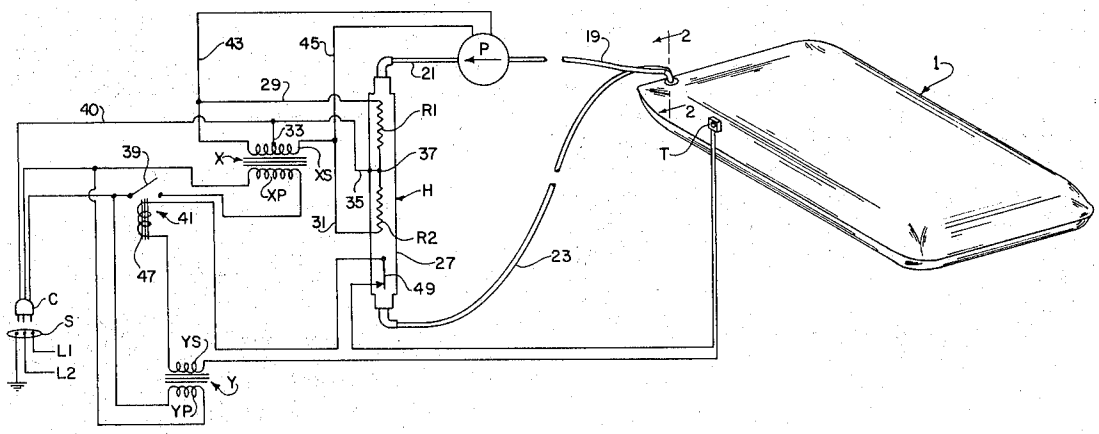
[57] **ABSTRACT**

Apparatus for heating a water bed in which an electrical fluid pump circulates water from a water bed through an electrical heater interposed in a conduit system interconnecting the pump to the water bed. The electrical heater includes a resistance wholly immersed in and exposed to water flowing through the conduit system. A transformer having a primary winding connected to an a.c. line voltage power source has a secondary winding connected to supply low voltage a.c. power of approximately 30 v. or less to the resistance thereby eliminating electrical shock hazard to the user of the water bed.

6 Claims, 4 Drawing Figures



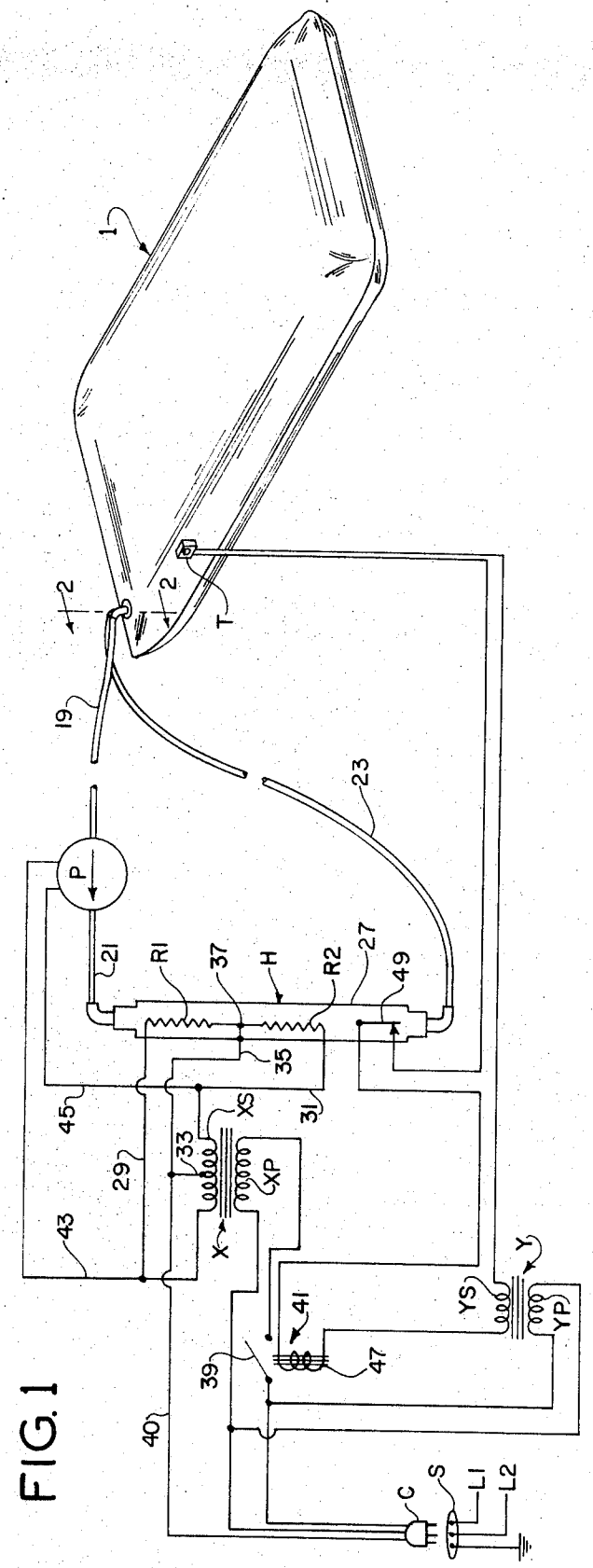


FIG. 1

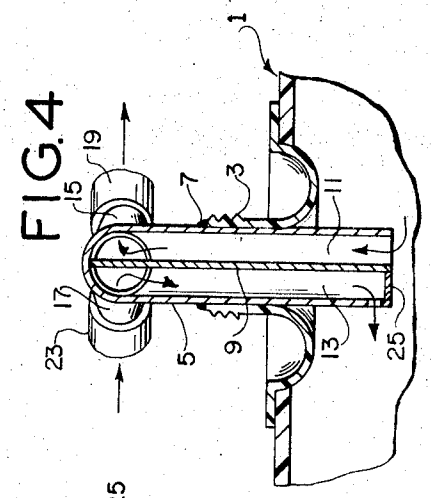


FIG. 4

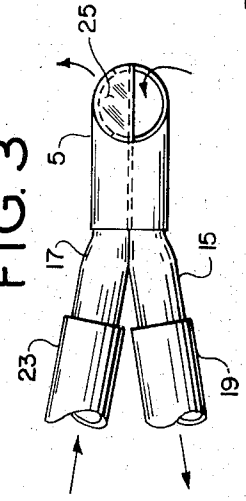


FIG. 3

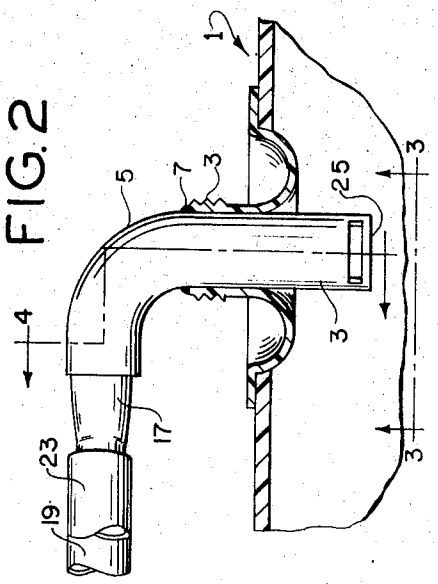


FIG. 2

APPARATUS FOR HEATING A WATER BED

BACKGROUND OF THE INVENTION

This invention relates to heating apparatus for water beds and more particularly to said apparatus which eliminates electrical shock hazard to the bed user.

While the increasing number of water beds being marketed attests to the growing popularity of this type of mattress or support for the human body, the users generally find that unless the bed's water contents is heated to a temperature above normal room ambients they are uncomfortable. As such beds frequently contain as much as a ton of water, this mass or contents of water at room temperatures 20° F. or more below body temperature acts as a heat sump or sink. The thermal conductivity of water being many times greater than that of air contributes to this uncomfortable cooling effect on the body of the water bed user. Thus most users require for their comfort that the water bed's contents be heated so as to maintain the temperature of the water at about 85° F. or so.

Electrical heater pads are generally used to supply the heat needed to maintain this desirable wate temperature range. These pads are positioned in contact with the underside of the bed and connected to the usual a.c. line voltage power source of about 115–120 v. and include a thermostat to control the heating. Such a system presents some significant hazards. Any leakage loss of water provides a conductive path between the user and the electrical line voltage potential thus exposing the user to the danger of serious or fatal electric shock. Further, if the heater pad or its thermostat(s) malfunction so the temperature of the thermoplastic material used to fabricate these water beds is raised locally above its relatively low melting point, the resulting hole can cause catastrophic damage as the contents of the water bed are suddenly released.

SUMMARY OF THE INVENTION

Among the several objects of this invention may be noted the provision of apparatus for heating the contents of a water bed in which electrical shock hazard to the user of the water bed is eliminated; the provision of apparatus of the class described in which rupture of the water bed due to localized overheating is avoided; and the provision of such apparatus which is economical to manufacture, relatively simple in construction and safe and reliable in operation. Other objects and features will be in part apparent and in part pointed out hereinafter.

Briefly, the water bed heating apparatus of this invention includes an electrical fluid pump having an inlet and an outlet, a first conduit for supplying water from the bed to the pump inlet and a second conduit for returning water from the pump outlet to the water bed. Electrical heater means is interposed in one of said conduits to heat the water passing therethrough. This heater is constituted by a resistance wholly immersed in and exposed to water flowing through the conduits. The resistance is powered by a transformer having a primary winding which is connected to an a.c. line voltage power source and a secondary winding which is interconnected to an a.c. line voltage power source and a secondary winding which is interconnected to said resistance to supply to the resistance low-voltage a.c. power of approximately 30 v. or less, thus eliminating electrical shock hazard to the user of the water bed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a generally schematic diagram of the apparatus of the present invention attached to a water bed;

FIG. 2 is an enlarged cross section along line 2—2 of FIG. 1 of a fitting of the apparatus of the present invention, showing its connection with the port of a water bed;

FIG. 3 is a bottom plan view of the fitting taken on line 3—3 of FIG. 2; and

FIG. 4 is a cross section on line 4—4 of FIG. 3.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, a water bed formed from relatively heavy thermoplastic sheet material, such as polyethylene or the like, is indicated generally at reference numeral 1. Located near one corner is a threaded neck or port 3 for filling and emptying the water bed. Normally this is closed with a threaded cap or other closure to seal the water contents of the bed. In accordance with this invention, a fitting 5 is inserted into port 3 and sealed thereto with a silicone resin or a similar bonding agent as indicated at 7. Fitting 5 has an inner end portion projecting into the interior of the water bed and is provided with a central dividing wall 9 so as to form two parallel passages 11 and 13 terminating at the outer ends in nipples 15 and 17. A first flexible tube or conduit 19 supplies water from the bed via passage 11 to an inlet of a pump P. The pump outlet is connected by a tubing or conduit section 21 to an inlet of an electric heating means H, the outlet thereof being connected by a second flexible tube or conduit 23 to nipple 17 to return heated water to the bed via passage 13. A baffle 25 is positioned over the interior end of passage 13 to deflect or direct the heated water (as indicated by an arrow in FIG. 4) away from the direction that water is being drawn into the fitting.

Heater means H comprises a tube 27 inside of which is a resistance constituted by two resistors R1 and R2 of conventional ceramic coated tubular shape disposed in end-to-end alignment to permit the water to flow both around the outer surfaces and through the hollow central bores thereof. The resistors are connected serially across a secondary XS of a transformer X by conductors 29 and 31. An intermediate or center tap 33 of transformer X is connected by a wire 35 to the junction between the resistors R1 and R2. The conductors 29, 31 and wire 35 are sealed at their points of passage into the heater tube 27 by the use of any customary feedthrough connectors and, if tube 27 is conductive, suitable insulation is provided. Primary winding XP is connected to two terminals of a conventional three-conductor line plug C via contacts 39 of a relay 41. The transformer center tap 33 is connected by a conductor 40 to the grounding pin of line plug C. The plug is connected to a conventional three-contact convenience outlet socket S with line voltage of about 118 vac. being supplied to two contacts by conductors L1, L2, and with the third contact being grounded as as indicated.

Pump P, which may be any conventional impeller or other type of fluid pump, is powered by an electrical motor energized from either low-voltage a.c. as illus-

trated (by conductors 43 and 45 connected across the transformer secondary XS) or, as these small fluid pumps are available with completely sealed impregnated motor windings approved by the Underwriter's Laboratories, it may be connected to line voltage L1, L2 without any electrical shock hazard. Connected in parallel with the line voltage primary of transformer X is a primary winding YP of a transformer Y which has its secondary winding YS connected in a series loop circuit with coil 47 of relay 41, a safety thermostatic switch 49 positioned within heater tube 27 downstream from the heater resistance and another adjustable thermostatic switch T positioned adjacent and in heat-exchange relationship with the contents of the water bed.

The operation of the water bed heating apparatus is as follows: After filling the water bed 1 and inserting and sealing the elbow fitting in the neck or port 3, plug C is inserted in socket S to supply line voltage to the apparatus. Assuming the water contents of bed 1 have a temperature corresponding to a typical ambient temperature of about 70° to 75° F., thermostat T is adjusted to a temperature of about 85° F., thereby closing its contacts and energizing the low-voltage a.c. loop circuit through normally closed safety thermostatic switch 49 and applying low voltage to relay coil 41 to close relay contacts 39. This completes the line voltage circuit to primary winding XP and applies low-voltage a.c. to the resistors R1 and R2. The term low voltage as used herein has the same meaning as recognized by Underwriter's Laboratories, i.e., a voltage of not more than about 30 volts. The use of such a low-voltage source to supply the heater resistance provides electrical isolation and eliminates shock hazard.

A typical or exemplary value for resistors R1 and R2 is one ohm each and 30 watt dissipation size resistors have been found to operate quite adequately even though when connected across 30 vac. the current will be about 15 amps and the power dissipated will be about 450 watts. These resistors will operate satisfactorily at heat dissipation levels many times exceeding their dissipation ratings because pump P, which is always energized concurrently with the heater, insures the continued flow of the water in which the resistors R1 and R2 are immersed and carries off the heat thereby to raise the temperature of the water returned to water bed 1.

Due to the diverting action of baffle 25, the heated water is discharged into the bed in a direction away from the water being drawn into inlet passage 11 which, because of the counterflow arrangement of passages 11 and 13 and heat exchange through wall 9, provides some preheating of the inlet water. This arrangement insures good circulation of water throughout the bed so as to maintain a generally even temperature across the surface of the bed.

The water continues to be circulated by pump P and heated by heater means H until the contents of the water bed rises to the temperature setting of thermostat T which then opens to deenergize relay coil 41 and open the circuit to pump P and heater H. Thus the pump and heater will be intermittently energized by operation of thermostat T to maintain the water bed at the desired comfortable temperature, supplying only sufficient heat to balance the thermal loss or heat dissipated from the bed.

Safety thermostat 49 optionally provides a further safeguard in the event there is a blockage of water flow through heater H. This normally closed switch will open at a predetermined temperature well under the boiling point of water.

It is important to note that electrical shock hazard has been eliminated. This is due to the use of low voltage to supply heater H and the thermostatic circuit. Moreover, the use of two serially connected resistors with the center tap of the low-voltage transformer winding being connected commonly to the junction therebetween and to ground, further insures the elimination of shock hazard. This arrangement reduces the potential above ground to one-half the low voltage supplied by transformer secondary winding XS. Thus regardless of any water leakage or conductor insulation breakdown, the user cannot be exposed to a lethal voltage but only to low voltage which does not constitute any electrical shock hazard.

It is also to be noted that the use of a single fitting to both remove the cooler water from the bed and return the heated water thereto is particularly advantageous inasmuch as it permits this apparatus to be used with all types of water beds which are typically equipped with single ports or necks sized to fit a standard garden hose coupling.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In apparatus for electrically heating the contents of a water bed the improvement comprising:
   - an electrical fluid pump having an inlet and an outlet;
   - a first conduit for supplying water from the bed to the pump inlet;
   - a second conduit for returning water from the pump outlet to the water bed;
   - the ends of the first and second conduits remote from said pump being attached to a single fitting adapted to be sealingly fitted into a single port in said water bed;
   - electrical heater means in one of said conduits and adapted to heat the water passing therethrough, said heater means including a resistance wholly immersed in and exposed to water flowing therethrough; and
   - a transformer having a primary winding adapted to be connected to an a.c. line voltage power source and a secondary winding interconnected to said resistance to supply thereto low-voltage a.c. power whereby electrical shock hazard to the user of the water bed is eliminated.

2. Apparatus as set forth in claim 1 in which said fitting has a central dividing wall for maintaining segregated for counterflow the water being drawn from the bed to said pump and the heated water being returned thereto.

3. Apparatus as set forth in claim 2 in which said fitting has an end adapted to project into the interior of said water bed and a baffle over one portion of said projecting end through which the heated water is re-

turned to the bed, said baffle directing the heated water angularly away from the direction that water is being drawn into said fitting from said bed.

4. In apparatus for electrically heating the contents of a water bed the improvement comprising:

an electrical fluid pump having an inlet and an outlet;

a first conduit for supplying water from the bed to the pump inlet;

a second conduit for returning water from the pump outlet to the water bed;

electrical heater means in one of said conduits and adapted to heat the water passing therethrough, said heater means including a resistance wholly immersed in and exposed to water flowing therethrough, said resistance comprising a pair of resistors connected together at a junction;

a transformer having a primary winding adapted to be connected to an a.c. line voltage power source and a secondary winding interconnected to said resistance to supply thereto low-voltage a.c. power, said secondary winding having an intermediate tap interconnected to the junction between said resistors whereby the maximum voltage applied across either of said resistors is substantially less than that developed across said secondary winding, said intermediate tap being connected to the grounding pin of an electrical connector adapted to be connected to an a.c. voltage power source and ground, whereby electrical shock hazard to the user of the water bed is eliminated;

a first thermostatic switch positioned in heat-exchange relationship with the resistors, said switch being connected in a circuit which supplies electrical power to said resistors, said thermostatic switch adapted to open and break said circuit in response to the temperature being sensed by said thermostatic switch rising above a predetermined level; and

a second thermostatic switch positioned in heat-exchange relationship with the contents of the water bed and adapted to sense the temperature thereof, said second thermostatic switch being serially connected with the first thermostatic switch whereby the temperature of the bed may be maintained at a desired level.

5. Apparatus as set forth in claim 4 in which the resistance has a heat dissipation rating which is substantially less than the heat actually dissipated thereby during operation of this apparatus.

6. Apparatus as set forth in claim 4 wherein the circuit in which said thermostatic switch is interconnected supplies low-voltage a.c. power.

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