

12 EUROPEAN PATENT APPLICATION

21 Application number: 88311249.2

51 Int. Cl.4: H05B 1/02 , H05B 3/34

22 Date of filing: 28.11.88

30 Priority: 07.12.87 GB 8728547

43 Date of publication of application:
 14.06.89 Bulletin 89/24

64 Designated Contracting States:
 AT BE DE ES FR IT NL SE

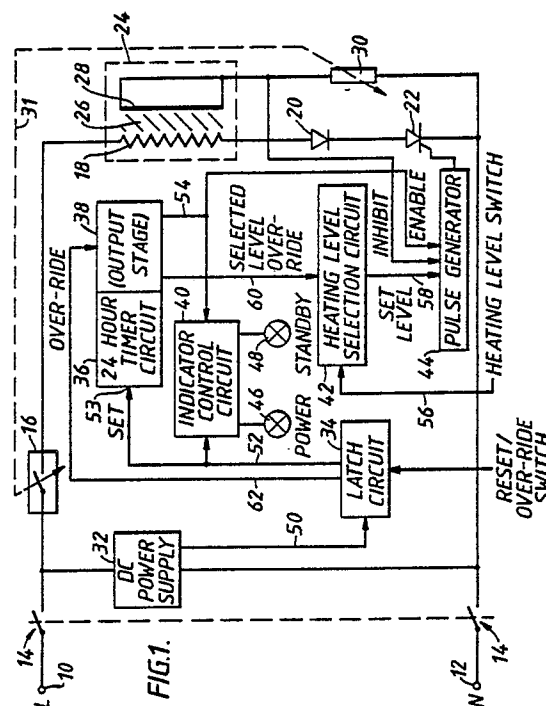
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54 Control apparatus for electric bed heating arrangements.

57 A control apparatus for an electric bed heating arrangement (24) includes a 24 hour timer circuit (36) which, after the apparatus has been energised from an electrical supply: (i) disables energisation of the bed heating arrangement (24) until a manual operation of setting the timer circuit (operation of a reset/override switch) has been performed; and (ii) responds to the manual setting operation to commence a 24 hour cycle according to which energisation of the bed heating arrangement is enabled each day, at a time determined by the time of day at which the manual setting operation was performed, and continues thereafter to be enabled for a predetermined part only (e.g. 12 hours) of the 24 hour cycle. When, for example after first purchase or at the end of the warm season, use of the bed heating arrangement is to be commenced, the user need only connect the control apparatus to an electrical supply and then perform the manual setting operation at an appropriate time of day. Thereafter, provided the apparatus is left connected to the supply, heating of the bed will be enabled each day at the same time as that determined by the time at which the setting operation was performed and will be disabled each day at the same time, namely at the end of the predetermined part of the 24 hour cycle.



CONTROL APPARATUS FOR ELECTRIC BED HEATING ARRANGEMENTS

This invention relates to control apparatus for electric bed heating arrangements, for instance electrically heated underblankets, overblankets or duvets.

Users of electric blankets or duvets generally wish to turn them on at the same time every day. The need to turn the blanket on every day can be irksome or even, for the frail and/or elderly, involve excessive effort, in that it generally will involve a trip from the living room to the bedroom. Moreover, it is easy to forget to turn the blanket on sufficiently early to warm the bed properly before retiring.

To avoid the above-mentioned disadvantages, it would be possible to connect the blanket or duvet to an electrical supply outlet via a commercially available "plug-in" timer as sold for allowing timed control of various electrical appliances. However, existing such timers are too complicated for use by the vast majority of people who use electric blankets or duvets.

According to the present invention there is provided a control apparatus for an electric bed heating arrangement, the apparatus including a 24 hour timer circuit which, after the apparatus has been energised from an electrical supply:

(i) is operative to disable energisation of the bed heating arrangement until a manual operation of setting the timer circuit has been performed; and
(ii) is responsive to said manual setting operation to commence a 24 hour cycle according to which energisation of the bed heating arrangement is enabled each day, at a time determined by the time of day at which the manual setting operation was performed, and continues thereafter to be enabled for a predetermined part only of the 24 hour cycle.

Such an apparatus is very simple to use. When, for example after first purchase or at the end of the warm season, use of the bed heating arrangement is to be commenced, the user need only connect the control apparatus to an electrical supply and then perform the manual setting operation at an appropriate time of day. Thereafter, provided the apparatus is left connected to the supply, heating of the bed will be enabled each day at the same time ("on time") as that determined by the time at which the setting operation was performed and will be disabled each day at the same time ("off time"), namely at the end of the predetermined part of the 24 hour cycle. Setting of the on time (and consequential automatic setting of the off time) is thus very simple. Unlike the case of the commercially available plug-in timer, there is no need to set both on and off times by moving

buttons or levers or the like. If the user wishes to change the time of day at which heating is commenced, he need only interrupt the supply and carry out the manual setting operation at the appropriate time.

Another advantage of the present apparatus is that, in the event of temporary supply failure, the 24 hour cycle will not recommence until the manual setting operation has been performed again, thereby preventing the on and off times being offset by an amount equal to the duration of the failure, which would be the case in the event of using a plug-in timer. This feature not only avoids the inconvenience of operation at the wrong time, but is an advantage from the point of view of fire safety in that it minimises the chance of the arrangement being heated at a time of day when the bedroom is not occupied. Preferably, in order to prevent this feature coming into effect in the event of only a momentary supply failure (or momentary deenergisation), the apparatus includes delay means which prevents disabling of the cyclical operation of the 24 hour timer unless the apparatus is de-energised for more than a predetermined interval of, for example, 30 seconds.

Preferably, the apparatus comprises a switch for performing the manual setting operation, whereby the operation can be performed by a single switch actuation. Further, the apparatus preferably comprises delay means operative to prevent the manual setting operation being performed unless the switch is actuated for at least a predetermined duration (e.g. 2.5 seconds) in order to prevent spurious or accidental operation.

The apparatus may include indicator means for indicating whether (i) the apparatus is energised and awaiting the manual setting operation or (ii) the apparatus is energised and the manual setting operation has been performed. In the case of (ii), the indication may distinguish between energisation of the bed heating arrangement being enabled and disabled.

Preferably, the 24 hour timer circuit is responsive to an override command, if received during said predetermined part of the 24 hour cycle, to disable energisation of the bed heating arrangement (whereby the heating is turned off, before the end of said predetermined part of the 24 hour cycle, without disturbing the cycle) and, if received outside of the predetermined part of the 24 hour cycle, to enable energisation of the bed heating arrangement (whereby the heating is turned on, prior to the start of said predetermined part of the 24 hour cycle, without disturbing the cycle). In this way, the user can over-ride the set on and off

times, without disturbing their settings, for example if he retires and/or rises at a different time than usual. Preferably, the over-ride command operation can be performed by a single switch actuation operation, which may comprise actuation of the above-mentioned switch preferably used to perform the manual setting operation.

The control apparatus preferably includes means for controlling energisation of the bed heating arrangement in such a manner as to enable heating at a manually selected one of a plurality of heating levels. In this event, the apparatus may include one or both of the following features.

1. The 24 hour timer circuit is operative to over-ride the selected heating level setting, if necessary, during an initial portion (e.g. 80 minutes) of the predetermined part (e.g. 12 hours) of the 24 hour cycle to provide heating at a level (e.g. the higher or highest level) which will provide a high level of heat. This enables a fast warm-up of the bed, after which heating reverts to the selected level.

2. Overheat protection means is provided, the protection means operating independently of the energisation control means to interrupt heating of the bed heating arrangement in the event of an excessive temperature (for instance a localised excessive temperature caused by rucking of the blanket or other arrangement) being attained. This feature minimises, of course, the risk of fire.

The invention will now be further described, by way of illustrative and non-limiting example, with reference to the accompanying drawings, in which:

Figure 1 is a block schematic circuit diagram of a first control apparatus embodying the invention for an electric bed heating arrangement;

Figure 2 is a schematic view of a housing containing the apparatus shown in Figure 1;

Figure 3 is a block schematic circuit diagram of a second control apparatus embodying the invention for an electric bed heating arrangement; and

Figure 4 is a schematic view of a housing containing the apparatus shown in Figure 3.

Figure 1 is a block schematic circuit diagram of a first control apparatus embodying the invention for an electric bed heating arrangement, for instance an electric blanket or electric duvet. The apparatus includes a pair of input terminals 10, 12 for connection to the live (L) and neutral (N) conductors of an a.c. power supply (not shown). The input terminals 10, 12 are connected via a two-pole isolation (on/off) switch 14 to the series combination of a thermal fuse 16, a heating conductor 18, a protective diode 20 and a thyristor 22. The heating conductor 18 forms part of a heating cable 24

which is tortuously disposed in the electric blanket or duvet. By applying pulses to the thyristor 22, as described hereinbelow, to cause the thyristor to conduct, heating current can be caused to flow from the a.c. supply through the heating conductor 18 to heat the blanket or duvet.

The cable 24 is of a dual coaxial type known in the art and comprises an inner core (not shown) on which the heating conductor 18 is wound. A layer 26 of polyethylene surrounds the heating conductor 18 and a sensor conductor 28 is wound around the polyethylene layer 26. The ends of the sensor conductor 28 are connected together and are connected via a resistor 30 and the on/off switch 14 to the input terminal 12. As represented by a dotted line 31, the resistor 30 is thermally coupled to the thermal fuse 16. As known to those skilled in the art, the thermal fuse 16 is a non-resettable thermal link and comprises a current carrying device (generally incorporating a low melting point alloy) responsive to the application of external heat to non-resetably stop the passage of current therethrough.

The apparatus illustrated in Figure 1 further comprises a d.c. power supply 32 which derives from the a.c. supply, when the switch 14 is closed, d.c. power for application to various of the circuit components illustrated in Figure 1. For the sake of clarity, the connections to the various circuit components are not shown.

The apparatus illustrated in Figure 1 also comprises a latch circuit 34, a 24 hour timer circuit 36 (which may comprise an integrated circuit similar to those conventionally used in electrical watches and which includes an output stage 38), an indicator control circuit 40, a heating level selection circuit 42 and a pulse generator 44 for supplying pulses for firing the thyristor 22. A "power" lamp 46 and a "standby" lamp 48 are each connected to the indicator control circuit 40.

A reset/over-ride switch (not shown in Figure 1) is connected to an input of the latch circuit 34, and a heating level switch (not shown in Figure 1) is connected to an input of the heating level selection circuit 42.

The control apparatus shown in Figure 1 operates in the following manner. When the apparatus is connected to an a.c. supply and the on/off switch 14 is closed, a.c. power is supplied to the d.c. power supply 32 whereby the various circuits shown in Figure 1 are energised. Also, a signal indicating the presence of d.c. power (and thereby, by implication, indicating energisation of the apparatus) is applied from the d.c. power supply 32, to the latch circuit 34, via a line 50. At this time, the level on a line 52 that connects an output of the latch circuit 34 to a "SET" input 53 of the 24 hour timer circuit 36 and to an input of the indicator

control circuit 40 is such as not to set the timer circuit 36 and such as to cause the indicator control circuit 40 to cause both the lamps 46 and 48 to flash. The fact that the timer circuit 36 is not set causes the output stage 38 thereof to produce on a line 54, which is connected to the indicator control circuit 40 and also to the pulse generator 44, a signal which is of such a level as to disable operation of the pulse generator 44. Consequently, pulses are not supplied from the pulse generator 44 to the thyristor 22 whereby heating of the blanket or duvet cannot take place. That is to say, in this state, heating is disabled, a 24 hour cycle of operation of the timer circuit 36 has not commenced, and the lights 46, 48 are caused to flash to indicate that the apparatus is in this state.

The user then operates the reset/over-ride switch to apply an input to the latch circuit 34. The latch circuit 34 includes delay means (not shown), for example a resistive-capacitive network, responsive to the reset/over-ride switch being continually operated for at least 2.5 seconds to change the level on the line 52. The change in level on the line 52 has two effects. Firstly, it causes the 24 hour timer circuit 36, via the "SET" input 53 thereof, to commence its 24 hour cycle. Secondly, it is operative on the indicator control circuit 46 to stop flashing of the lamps 46, 48, thereby indicating that the 24 hour cycle has commenced.

For a predetermined part of the 24 hour cycle, which part (hereinafter "the power part") has a duration of 12 hours and commences as of the start of the 24 hour cycle, firing of the thyristor 22 is enabled. This is accomplished by the level on the line 54 changing so as to enable operation of the pulse generator 44. The change in level on the line 54 also is applied to the indicator control circuit 40. During the power part of the 24 hour cycle, namely the part during which heating can take place, the indicator control circuit 40 is responsive to the level of the signal on the line 54 to light the "power" lamp 46. During the remaining (12 hour) part of the 24 hour cycle (hereinafter "the standby part"), the level of the line 54 is such as to disable the pulse generator 44 and to cause the indicator control circuit 40 to light the "standby" lamp 48, thereby indicating that the apparatus is in the standby part of the cycle, namely the part during which heating cannot take place.

As mentioned above, the heating level switch is connected to the heating level selection circuit 42, such connection being affected by way of a line 56 (which may in fact comprise a plurality of lines each associated with a respective heating level). The heating level selection circuit 42 is operative on the pulse generator 44, via a line 58, to control the operation of the generator 44 in such a manner as to achieve heating to a level selected by the

circuit 42. The apparatus may, for instance, have two heating level settings. In a first of the heating level settings, the pulse generator 44 produces pulses which trigger the thyristor 22 to conduct during substantially all of every alternate positive half-cycle of the a c supply, whereby a maximum degree of heating is achieved. In a second (lower) heating level setting, the heating level selection circuit 42 is operative to enable the pulse generator 44 to trigger the thyristor 22 into conduction only during alternate positive half-cycles. (To this end, the circuit 42 may comprise a delay means or a timing/gating circuit). Other heating levels may be selected by varying the number of halfcycles of the a c supply during which the thyristor 22 is triggered into conduction. For example, four heating levels may be selected, the heating levels corresponding to 100%, 75%, 50% and 25% power and corresponding to the thyristor 22 being energised during all positive half-cycles, three out of four positive half-cycles, alternate positive half-cycles and every fourth positive half-cycle, respectively.

The output stage 38 of the 24 hour timer circuit 36 is connected to the heating level selection circuit 42 by a line 60. During a predetermined initial portion (e.g. 80 minutes) of the power part of the 24 hour cycle, namely that part during which the pulse generator 44 is enabled, a signal on the line 60 is of such a level as to override the operation of the heating level selection circuit 42 in such a manner as to cause it, via the line 58, to make the pulse generator operate as if the higher or highest heating level had been selected. This enables rapid warming up of the bed. At the expiry of the predetermined initial portion (e.g. 80 minutes), the level on the line 60 changes and the heating level selection circuit 42 thereafter causes the pulse generator 44 to operate in accordance with the selected heating level.

Unless the a c power supply fails or the apparatus is switched off, it will continue indefinitely to function as described above. That is, the blanket or duvet will be switched on at the same time each day (namely the time at which the 24 hour timer circuit was set) and pre-heated at a high setting for 80 minutes, after which heating will be continued (at whichever heating level is selected or set) until 12 hours after it was switched on. After this, the blanket or duvet will be switched off for 12 hours, and the whole 24 hour cycle thereafter is repeated indefinitely.

The latch circuit 34 monitors, during operation, whether the signal on the line 50, which indicates energisation of the apparatus, is maintained. This signal is monitored via a delay means (not shown), which may be a resistive-capacitive circuit and may provide a delay of, for example, 30 seconds. If the

signal on the line 50 disappears for more than 30 seconds, indicating a power supply failure having a duration of more than 30 seconds, the latch circuit 34 changes the level on the line 52. The apparatus then reverts to its original state. That is, the 24 hour timer circuit 36 is no longer set, whereby the pulse generator 44 is disabled to prevent heating and heating cannot be enabled again until the reset/over-ride switch is operated again, for at least 2.5 seconds; and the lights 46, 48 are caused to flash to indicate that the apparatus is in this state.

If, during normal operation (i.e. without a power interruption and after the 24 hour timer circuit 36 has been set) the reset/override switch is again operated for at least 2.5 seconds, the latch circuit 34 supplies an over-ride signal to the output stage 38 of the timer 36 via a line 62. This manually over-rides the operation of the timer circuit 36, without disturbing the on time (set by the initial operation of the reset/over-ride switch) or the off time (12 hours after the on time). Specifically, if the over-ride signal is received during the power part of the 24 hour cycle, namely that part during which the operation of the pulse generator 44 is enabled, the pulse generator is disabled via the line 54 whereby the apparatus effectively "jumps" to the next part (standby part) of the 24 hour cycle. If, on the other hand, the over-ride signal on the line 62 arrives during the standby part of the 24 hour cycle, namely that part during which the pulse generator 44 is disabled, the pulse generator is enabled via the line 54 whereby the apparatus effectively "jumps" to the power part of the next 24 hour cycle. In this way, the user can over-ride the set on and off times of the timer circuit 36, without disturbing their settings, for example if he retires and/or rises at a different time than usual.

Suppose that, during operation, overheating of the cable 24 takes place. Such overheating can, for example, arise as a result of arcing across a break in the heating conductor 18 or due to intense localised overheating due to rucking of the blanket or duvet. In this event, the polyethylene layer 26 melts at the location of the overheat, enabling the heating conductor 18 and the sensor conductor 28 to come into contact with one another. In this event, the a.c. supply voltage is applied across the series combination of part of the conductor 18 and the resistor 30. In this event, the current flowing through the resistor 30 rises from a negligibly small value to a substantial value. The resistor 30 is therefore heated and heats the thermal fuse 16. The thermal fuse 16 then melts to non-resetably (permanently) interrupt the flow of current to the heating conductor. It will be noted that the operation of this overheat protection feature is independent of the operation of controlling heating provided by the heating level selection circuit 42, the

pulse generator 44 and so forth.

In addition, the voltage developed in the above event across the resistor 30 may, as shown, be fed back to the pulse generator 44 to inhibit the operation of the pulse generator and thus de-energise the heating conductor 18 immediately the voltage is developed across the resistor. Thus, current flow through the heating conductor 18, in the event of arcing of the heating conductor or intense localised overheating due to a ruck, is inhibited while the resistor 30 heats up sufficiently to activate the thermal fuse 16 to interrupt the flow of current permanently.

An external view of a housing 70 containing the apparatus of Figure 1 is shown in Figure 2. The housing 70 incorporates all the components shown in Figure 1 except, of course, the cable 24. The housing 70 is fixed in an "in-line" manner in a cord for the blanket or duvet, the cord comprising a first portion 72 which is terminated in a plug (not shown) for connection to an a.c. supply outlet (socket) and a second portion 74 which contains three wires connecting the apparatus to the two ends of the heating conductor 18 and to one end of the sensor conductor 28.

The lamps 46 and 48 are, as shown in Figure 2, mounted to the housing 70 so as readily to be visible by the user.

Figure 2 shows a slider switch mechanism 76 that enables the on/off switch 14, the reset/over-ride switch and the heating level switch to be combined. The switch mechanism 76 comprises a slider 78 movable between six positions, namely an off position, four heating level positions (1, 2, 3 and 4) and a reset/over-ride position. When the apparatus is not in use, the slider 78 is in the off position. As soon as it is moved into any of the other positions, the on/off switch 14 is closed. Also, as explained above, the lamps 46, 48 begin to flash. To set the 24 hour timer circuit 36 to commence operation at a particular time of day, the user moves the slider 78 from the off position to the reset/over-ride position at that time of day. After the slider 78 has been held in the reset/over-ride position for at least 2.5 seconds (preferably against a spring force biasing it out of that position), the timer circuit 36 is set. Also, the lamps 46, 48 stop flashing, the lamp 46 is illuminated continuously and the lamp 48 ceases to be illuminated, thereby indicating that the timer has been set and that the first (power) part of the 24 hour cycle (during which heating is enabled) has commenced. The user then moves the slider 78 to the position corresponding to the heating level he wishes to select.

Figure 3 is a block schematic circuit diagram of a second control apparatus embodying the invention for an electric bed heating arrangement such as an electric blanket or electric duvet. The appara-

tus of Figure 3 is constructed and operates very much in the same manner as that of Figure 1 and will be described only in so far as it differs therefrom. Reference numerals used in Figure 3 which are the same as reference numerals used in Figure 1 designate similar items.

In the structure shown in Figure 3, a second dual coaxial cable 80 is tortuously disposed within the electric blanket or duvet, preferably in close proximity to the cable 24, to sense the temperature to which the blanket or duvet is heated. The cable 80 comprises two sensor conductors 82, 84 separated by a layer 86 of polyvinyl chloride (PVC) which, in a manner known in the art, has been doped with a material which enhances its conductivity. The ends of the conductor 82 are connected together and are connected via the thermal fuse 16 and the on/off switch 14 to the input terminal 10. The ends of the conductor 84 are connected together and are connected via a resistor 88 and the switch 14 to the input terminal 12. Consequently, the a c supply voltage is applied in use, across the series combination of the impedance of the layer 86 and the resistor 88. The junction between the sensor conductor 84 and the resistor 88 is connected by a line 90 to an input of the heating level selection circuit, which is referenced 42' in Figure 3.

The heating level selection 42' generates (for instance by means of a variable potential divider network) a d c voltage which is proportional to the heating level selected by the heating level switch. In use, as the bed warms, the impedance of the PVC layer 86 drops, since PVC has an impedance which decreases with temperature. Consequently, an a c voltage is developed on the line 90 by a potential divider action, the level of the voltage varying in accordance with the temperature of the bed. This voltage is rectified in the heating level selection circuit 42' and is compared, in a comparator (not shown) with the d c voltage proportional to the selected heating setting. If the voltage fed back by the line 90, after rectification, is such as to indicate that the temperature is less than a temperature corresponding to the desired heating setting, the signal applied to the line 58 is made such as to enable the pulse generator 44. However, once the desired temperature has been reached, the signal on the line 58 is changed to disable the pulse generator 44. That is to say, in this embodiment, the pulse generator 44 is switched on and off as appropriate, in a manner to maintain the desired bed temperature, the pulse generator 44 being operative to trigger the thyristor 22 into conduction during all positive half-cycles when the pulse generator is enabled. Thus, the cable 80, resistor 88 and heating level selection circuit 42' act in a manner analogous to a thermostat to control heat-

ing to enable any selected one of a plurality of desired temperatures to be achieved.

Figure 4 shows a housing 70' for the apparatus shown in Figure 3. The housing 70' is in many respects similar to the housing 70 of Figure 2 and will only be described in so far as it differs therefrom. In Figure 4, reference numerals which are the same as reference numerals used in Figure 2 designate similar items. It will be appreciated that exactly the same switch arrangement as used in Figure 2 could be employed in the case of Figure 4. However, for convenience, in this case the various switches are separate. Thus, the on/off switch 14 may be a rocker switch, the heating level switch may be a separate switch operated by a rotary knob 92 and the reset/over-ride switch may be a push button switch 94 which is preferably spring biased so as to be actuated only when held depressed.

The invention can of course be embodied in other ways than those described above by way of example. For example, current flow could be controlled by other devices than a thyristor, for example a triac (in which event a c rather than half-wave rectified a c current would flow through the heating conductor). Further, the layer 26 of the cable 24 could be of other materials than polyethylene. The material could, for instance, be of PVC (possibly doped with a conductivity-enhancing substance), in which event the resistor 30 might become heated to an extent to activate the thermal fuse, without the conductors 18 and 28 contacting one another, due to a decrease in the impedance of the PVC layer 26 caused by its becoming heated by arcing or by local intense overheating caused by a ruck.

Claims

1. A control apparatus for an electric bed heating arrangement (24), the apparatus including a 24 hour timer circuit (36) which, after the apparatus has been energised from an electrical supply:

(i) is operative to disable energisation of the bed heating arrangement (24) until a manual operation of setting a timer circuit (36) has been performed; and

(ii) is responsive to said manual setting operation to commence a 24 hour cycle according to which energisation of the bed heating arrangement (24) is enabled each day, at a time determined by the time of day at which the manual setting operation was performed, and continues thereafter to be enabled for a predetermined part only of the 24 hour cycle.

2. Apparatus according to claim 1, which includes delay means (34) which prevents disabling of the cyclical operation of the 24 hour timer circuit (36) unless the apparatus is de-energised for more than a predetermined interval.

3. Apparatus according to claim 1 or claim 2, which comprises a switch (76, 94) for performing the manual setting operation, whereby the operation can be performed by a single switch actuation.

4. Apparatus according to claim 3, which comprises delay means (34) operative to prevent the manual setting operation being performed unless the switch (76, 94) is actuated for at least a predetermined duration.

5. Apparatus according to any one of the preceding claims, which includes indicator means (40, 46, 48) for indicating whether (i) the apparatus is energised and awaiting the manual setting operation or (ii) the apparatus is energised and the manual setting operation has been performed.

6. Apparatus according to claim 5, wherein, in case (ii), the indication distinguishes between energisation of the bed heating arrangement being enabled and disabled.

7. Apparatus according to any one of the preceding claims, wherein the 24 hour timer circuit (36) is responsive to an over-ride command, if received during said predetermined part of the 24 hour cycle, to disable energisation of the bed heating arrangement (whereby the heating is turned off, before the end of said predetermined part of the 24 hour cycle, without disturbing the cycle) and, if received outside of said predetermined part of the 24 hour cycle, to enable energisation of the bed heating arrangement (whereby the heating is turned on, prior to the start of said predetermined part of the 24 hour cycle, without disturbing the cycle).

8. Apparatus according to claim 7, wherein the over-ride command operation can be performed by a single switch actuation operation.

9. Apparatus according to claim 7, when appendant to claim 3 or claim 4, wherein said single switch actuation operation comprises actuation of said switch (76, 94) used to perform the manual setting operation.

10. Apparatus according to any one of the preceding claims, which includes means (42; 42', 80, 88) for controlling energisation of the bed heating arrangement (24) in such a manner as to enable heating at a manually selected one of a plurality of heating levels.

11. Apparatus according to claim 10, wherein the 24 hour timer circuit (36) is operative to override the selected heating level setting, if necessary, during an initial portion of said predetermined part of the 24 hour cycle to provide heating at a level which will provide a high level of heat.

12. Apparatus according to claim 10 or claim 11, which includes overheat protection means (26, 28, 30) operative independently of the energisation control means (42; 42', 80, 88) to interrupt heating of the bed heating arrangement (24) in the event of an excessive temperature being attained.

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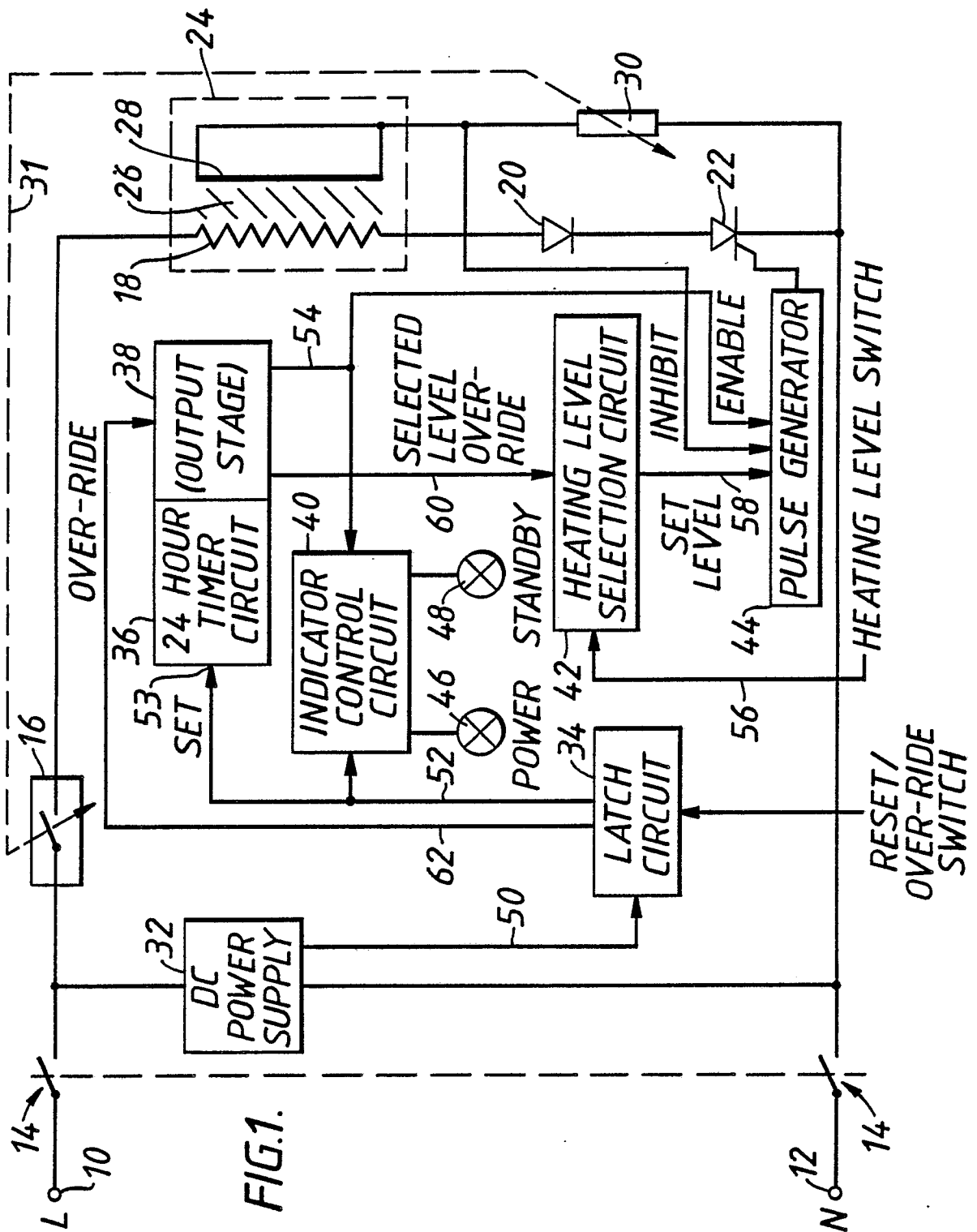
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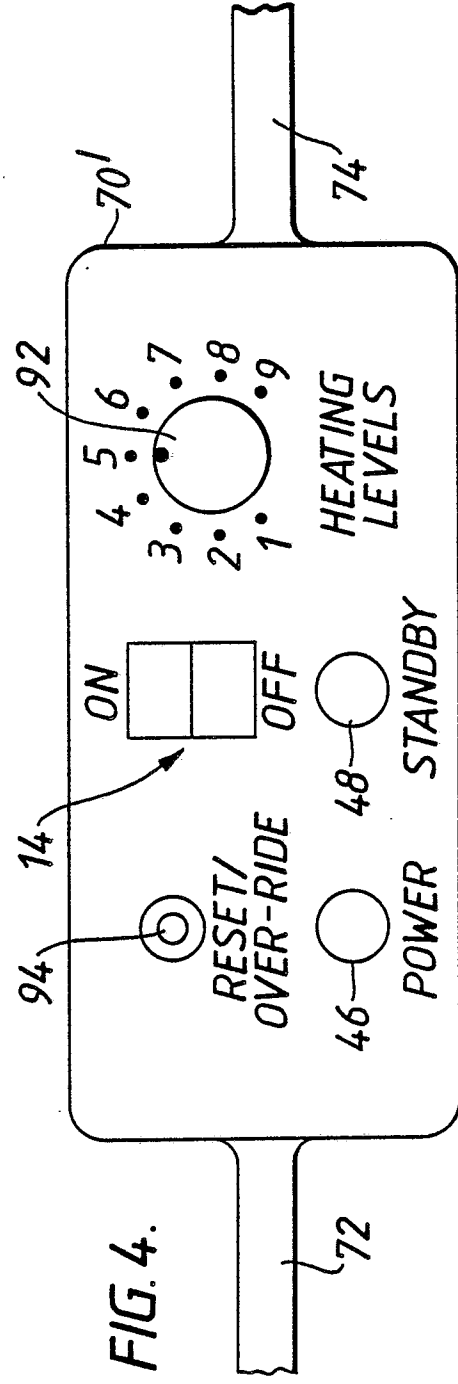
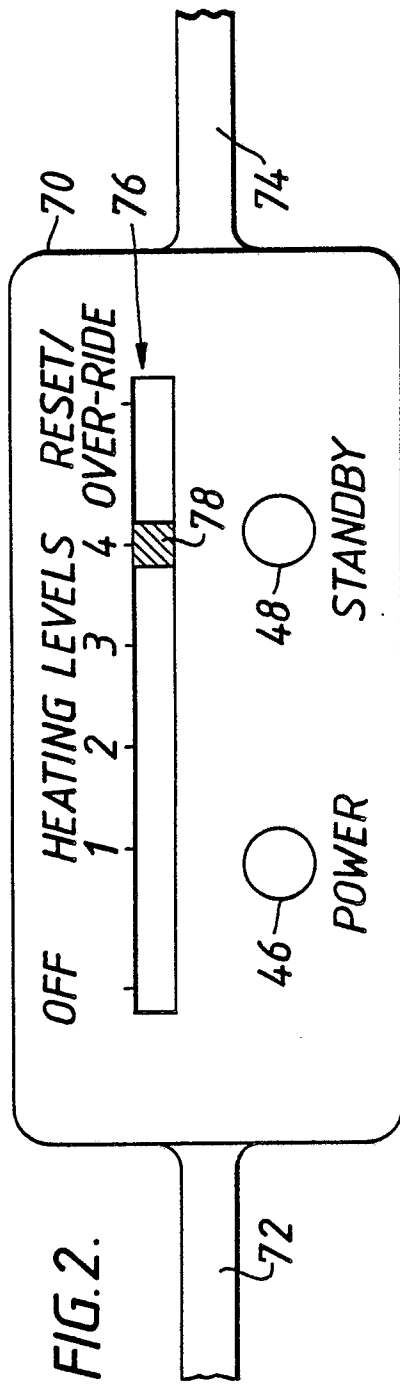
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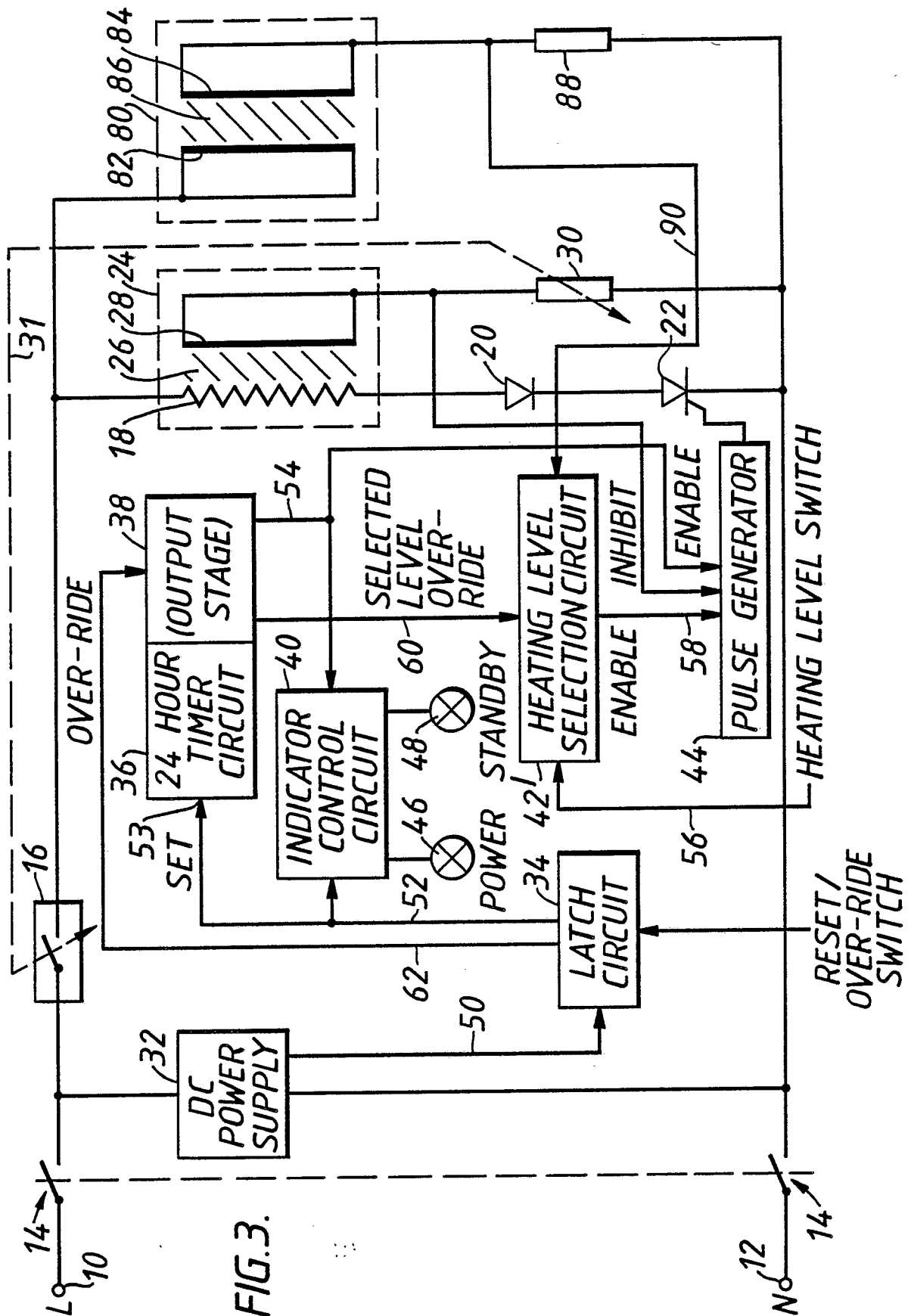
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A,P	GB-A-2 198 261 (SCAN MARTIN BURTON) * Page 3, lines 7-23; figure 1 * ---	1	H 05 B 1/02 H 05 B 3/34
A,P	FR-A-2 599 923 (DEGOIS) * Whole document * ---	1	
A	GB-A-2 157 514 (NORTHERN BLANKETS) * Figures 1,4-6 * ---	12	
A	US-A-4 176 785 (ALLARD et al.) * Column 7, lines 31-65; figure 1 * -----	1,2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			H 05 B G 05 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22-02-1989	Examiner SPEISER P.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			