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(11)

EP 0 846 990 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.06.1998 Bulletin 1998/24

(51) Int. Cl.⁶: **G04G 15/00**

(21) Application number: **97115643.5**

(22) Date of filing: **09.09.1997**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

(30) Priority: **06.12.1996 GB 9625437**

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(54) A time clock arrangement

(57) In a time clock arrangement a clock(5) is controlled by a broadcaster or transmitted timing signals so as to be very accurate. A control means(6) is provided associated with setting means(8) to enable the control means to be set to switch on a switch(7) at a selected time, and to turn the switch off at another selected time. The switch(7) is connected between a source(1) for mains electricity and electrical apparatus(4). The arrangement incorporates off-set means(10,12) so that

the time at which the electrical apparatus is actually activated, and the time at which the electrical apparatus is actually de-activated, are off-set from the time actually set by the setting means(8). This prevents a large number of time switches turning on apparatus at precisely the same instant and causing an undesirable power surge.

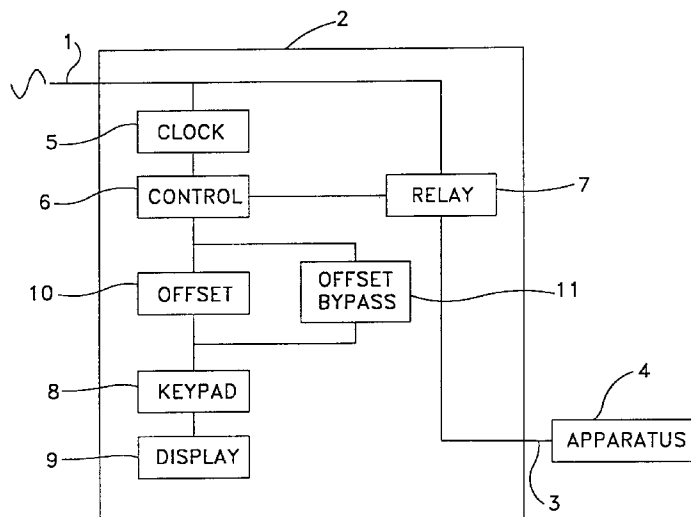


FIG 1

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Description

THE PRESENT INVENTION relates to a time clock arrangement, and more particularly relates to a time clock arrangement adapted to control the operation of electrical apparatus.

It has been known to provide a time clock arrangement to control the operation of electrical apparatus such as immersion heaters, storage heaters and central heating systems, electric or gas cookers, street lighting and other electrical devices. Such time clocks may also be used for a wide range of other purposes.

Whilst mechanical time clocks were in use for a number of years, a substantial proportion of time clocks now available are so-called digital clocks.

A typical time clock of this type comprises an electronic clock which is associated with a control device for turning the electrical appliance on at a pre-set time and for turning the electrical appliance off at a pre-set time.

The control device may comprise a micro-processor or the like which is effectively programmed by the operator of the time clock using a key-pad and a display to enter the desired times for turning the appliance on and off.

Typically, such a time clock, once it has been set by the operator, is left to run for a long period of time.

In the interest of accurate time-keeping, it has now been proposed that the clock used in a time clock arrangement should be of the type that is regulated by time signals that are regularly broadcast for that purpose. Clocks of this type are becoming more commonplace for many uses, and have the advantage of possessing an extremely high degree of accuracy, even if the clock itself is less than perfect, since if the clock should "drift" from the correct time, the time signal will serve to re-set the clock. Thus, such clocks are generally accurate to within a very small tolerance of, typically, less than one second.

It has been found that when people set time clocks, there is a tendency for them to set the time clock to turn electrical appliance on and to turn the electrical appliance off either at the hour, or at the quarter or half-hour. Thus, when a person is setting a time clock for a domestic immersion heater, they may set the immersion heater to come on at 6.00 a.m., and to go off again at 10.15 a.m.

It is envisaged that a problem will arise, should a substantial number of time clocks be of the type that are regulated by a broadcast time signal. The problem would be one of a surge in demand for electric power at certain times during the day, and also sudden falls in the demand for electric power at other times during the day.

Since time clocks are often used to control central heating systems, which do consume electricity, but which primarily use gas as a fuel, it is envisaged that there may also be similar surges in demand and drops in demand for gas at certain times during the day.

It is to be understood that the control of electrically

activated water valves by such time clocks may also lead to surges in the water mains.

It is very difficult for the utility companies to cope with very sudden surges in demand and very sudden falls in demand.

The present invention seeks to provide an improved time clock.

According to one aspect of this invention there is provided a time clock arrangement, the time clock arrangement comprising a clock, the clock being controlled by broadcast or transmitted timing signals, so as to exhibit a high degree of accurate time-keeping; control means and setting means provided to enable the control means to be set, and a switch controlled by the control means and adapted to be connected between a source of mains electricity and an electrical apparatus, the operation of which is to be controlled, the setting means being operable to set the time at which the electrical apparatus is to be activated, and the time at which the electrical apparatus is to be de-activated, wherein the arrangement incorporates off-set means so that the time at which the electrical apparatus is actually activated, and the time at which the electrical apparatus is actually de-activated, are off-set from the time actually set by the setting means.

Preferably the setting means comprise a key-pad and display.

Conveniently the control means comprises a micro-processor or the like.

Advantageously the off-set means are embodied in software or programming within the micro-processor.

Alternatively the off-set means comprise means effectively connected between the key-pad and the micro-processor.

In a further embodiment the off-set means comprise a delay timer connected between the control means and said switch.

The switch may be an electro-mechanical switch or an electronic switch.

Preferably the time off-sets of said times of activation and de-activation are substantially randomly distributed.

The invention also relates to a method of making a plurality of time switches of the type described above, the method comprising the steps of randomly or quasi-randomly selecting the time off-sets for the times of activation and de-activation.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which

FIGURE 1 is a block diagram of one embodiment of the invention, and

FIGURE 2 is a block diagram of a second, alternative, embodiment of the invention.

Referring initially to Figure 1 of the accompanying drawings, a mains electric supply 1 is illustrated which is connected to a time clock arrangement 2. The time clock arrangement 2 has a power outlet 3 which is connected to electrical apparatus 4. The electrical apparatus 4 may comprise electrically powered apparatus or electrically controlled apparatus.

The time clock arrangement includes a clock 5 of the type that is regulated by broadcast time signals. The clock 5 is thus, in operation, very accurate and keeps time extremely well.

The time clock 5 is associated with a control arrangement 6 in the form of a micro-processor or the like. The micro-processor controls a switch such as a relay switch 7 which is connected between the mains supply 1 and the power outlet 3. The relay switch may be of any appropriate design and may comprise an electro-mechanical switch, such as a solenoid activated relay switch, or an electronic switch, such as a power transistor switch.

The micro-processor 6 is programmed to set the time clock by means of setting means in the form of a key-pad 7 and an associated display 9. Connected between the key-pad 8 and the control arrangement 6 is an off-set generating device 10.

The off-set generating device 10 is adapted to generate an off-set which may, typically, be of between minus 60 seconds and plus 60 seconds.

When the key-pad 8 and display 9 are utilised to enter a time, either for switching the electrical apparatus 4 on, or for switching the electrical apparatus 4 off, the off-set is automatically added to or subtracted from that time.

Thus, for example if the key-pad and display are operated to set the time clock so that the electrical apparatus 4 is switched on at 6.00 a.m. and is switched off at 10.15 a.m., and if the off-set provided by the off-set device is plus 30 seconds, the electrical apparatus 4 will actually be activated at 6.00.30 and will actually be de-activated at 10.15.30.

It is envisaged that when a number of time clocks are manufactured, the off-sets provided by the off-set devices will, effectively, be "randomly" selected. The off-set devices may be such that the off-set times may be purely "randomly" selected, or, alternatively, may be quasi-randomly selected by manufacturing a number of devices with different off-sets within the available range of off-sets.

It is to be understood that by use of this expedient, the risk of a sudden surge in demand for electric power or for gas, or for water, may be obviated.

In the illustrated embodiment an off-set by-pass is illustrated. In some circumstances it may be essential for the time clock to activate the electrical appliance at precisely the set time. The by-pass may be controlled by a switch selectively to over-ride the effect of the off-set generating device.

Whilst, for purposes of explanation, the off-set

device has been shown in Figure 1 as a separate device, it is to be understood that the function of the off-set could be incorporated within the software or programming present within the micro-processor that constitutes the control arrangement 6.

In an alternative embodiment of the invention, as illustrated in Figure 2 of the accompanying drawings, there is no off-set device associated with the control arrangement. Instead, the control arrangement is connected to the switch 7 by means of a delay timer 12. The duration of the delay provided by the delay timer may be randomly or quasi-randomly selected. Thus the times utilised may each measure a time that is randomly selected. Alternatively, each delay may be determined by a number whenever the timer is activated. The delay is proportional to the random number generated.

Thus, in operation of the embodiment as shown in Figure 2, under the conditions given by way of example above, the electrical apparatus will be switched on shortly after 6.00 a.m., after a delay determined by the delay timer and will be switched off a short period of time after 10.15 a.m., again in accordance with a period of time measured by the delay timer.

A time by-pass 13 is provided which can be selectively activated to over-ride the delay effect of the timer.

It is to be understood that alternative expedients may be utilised to achieve the same effect including having an off-set provided between the part of the clock that receives the timing signals, and the actual timing mechanism.

It is to be appreciated that a time clock as described may be used with any type of electrical apparatus, or electrically controlled apparatus, that is to be turned on at a pre-set time such as, for example, a storage heater, an electric or gas oven, a gas or electric central heating system, or an electrically powered water pump.

The features disclosed in foregoing description, in the following Claims and/or in the accompanying drawings may, both separately and in combination thereof, be material for realising the invention in diverse forms thereof.

Claims

1. A time clock arrangement, the time clock arrangement comprising a clock(5), the clock being controlled by broadcast or transmitted timing signals, so as to exhibit a high degree of accurate time-keeping; control means(6) and setting means(8) provided to enable the control means to be set, and a switch(7) controlled by the control means and adapted to be connected between a source(1) of mains electricity and an electrical apparatus(4), the operation of which is to be controlled, the setting means(8) being operable to set the time at which the electrical apparatus is to be activated, and the time at which the electrical apparatus is to be de-activated, characterised in that the arrangement incorporates off-

set means(10,12) so that the time at which the electrical apparatus(4) is actually activated, and the time at which the electrical apparatus(4) is actually de-activated, are off-set from the time actually set by the setting means(8).

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2. An arrangement according to Claim 1 wherein the setting means comprise a key-pad(8) and display(9).

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3. An arrangement according to any one of the preceding Claims wherein the control means(6) comprises a micro-processor or the like.

4. An arrangement according to Claim 3 wherein the off-set means are embodied in software or programming within the micro-processor(6).

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5. An arrangement according to Claim 3 wherein the off-set means comprise means(10) effectively connected between the key-pad and the micro-processor(6).

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6. An arrangement according to any one of Claims 1 to 3 wherein the off-set means comprise a delay timer(12) connected between the control means and said switch.

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7. An arrangement according to any one of the preceding Claims wherein the switch is an electro-mechanical switch(4).

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8. An arrangement according to any one of Claims 1 to 7 wherein the switch is an electronic switch.

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9. A plurality of time control arrangements according to any one of the preceding Claims wherein the time off-sets of said times of activation and de-activation are randomly distributed.

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10. A method of making a plurality of time switches according to any one of Claims 1 to 9 comprising the steps of randomly or quasi-randomly selecting the time off-sets for the times of activation and de-activation.

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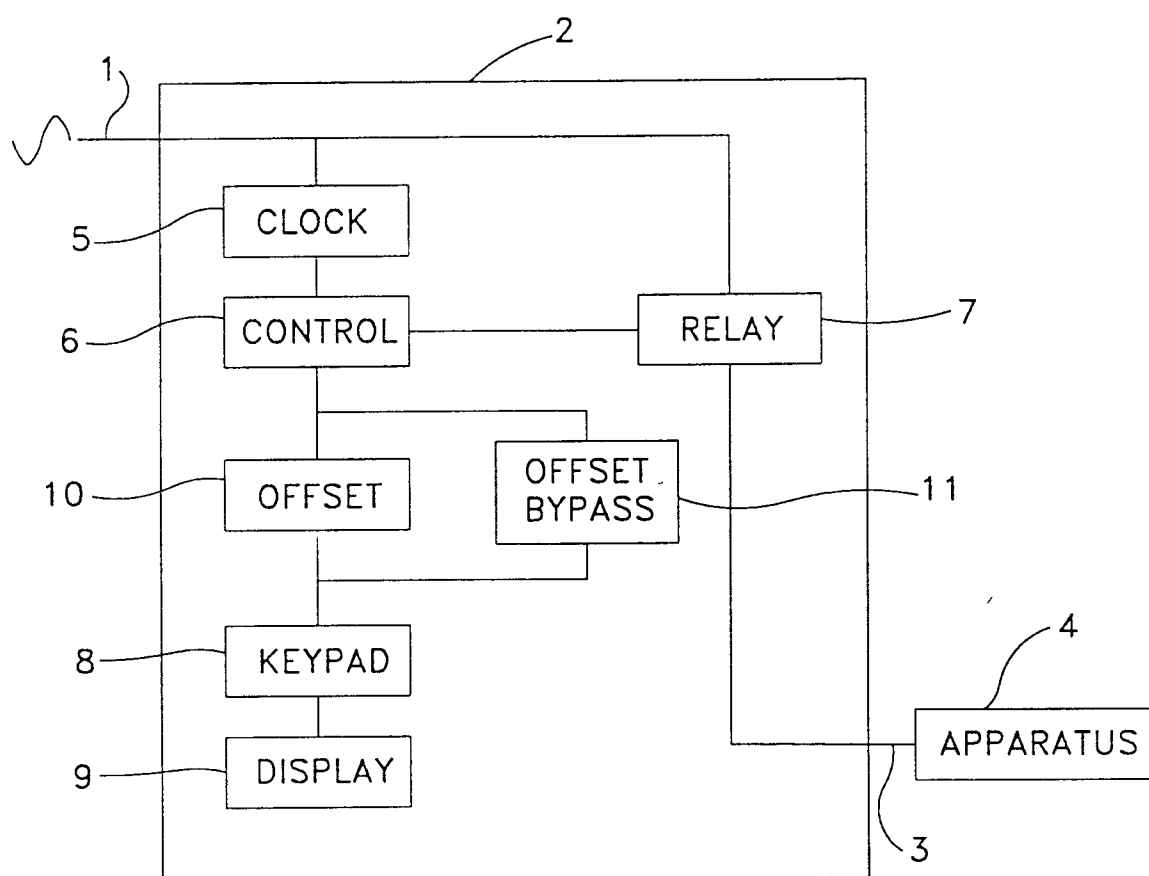


FIG 1

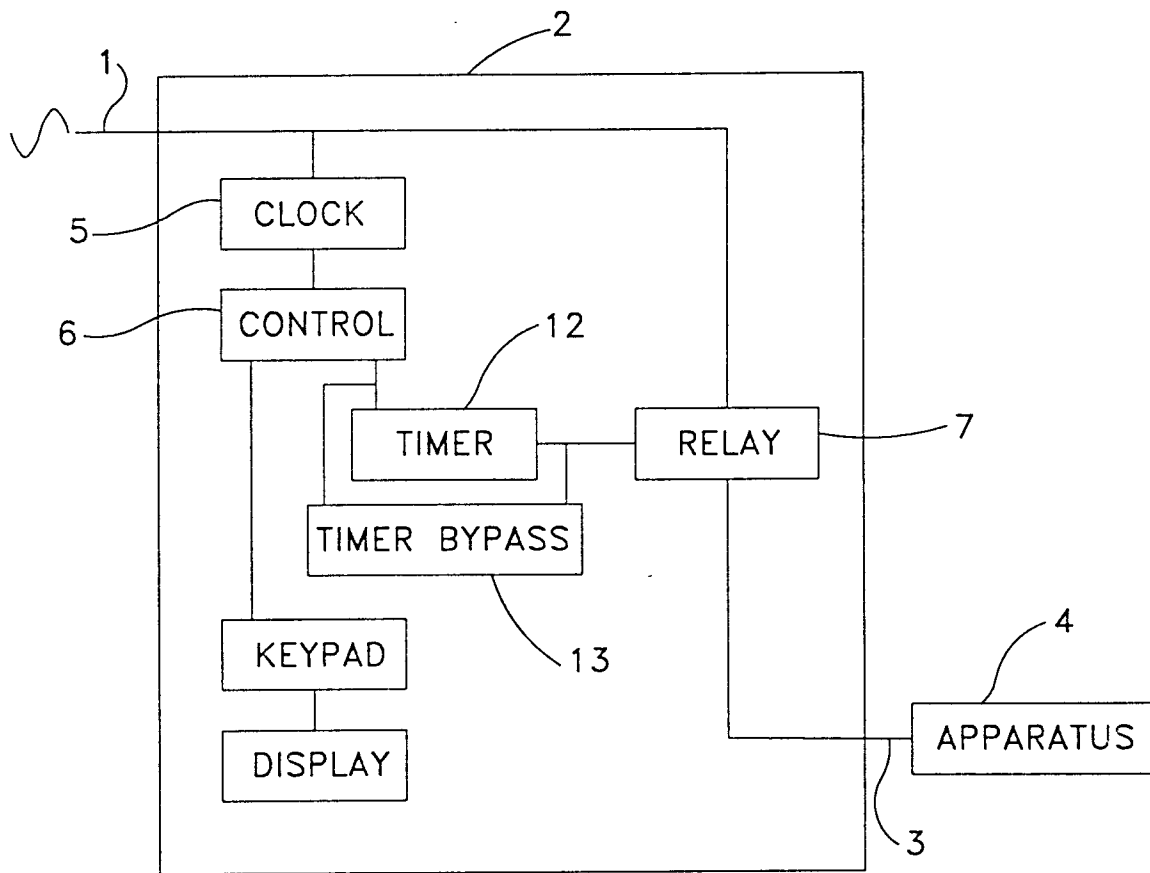


FIG 2



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EUROPEAN SEARCH REPORT

Application Number
EP 97 11 5643

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.6)
Y	EP 0 436 163 A (MARTIN GERHARD) * column 1, line 1 - column 5, line 53 *	1-10	G04G15/00
Y	GB 2 293 465 A (SMITHS INDUSTRIES PLC) * page 1, paragraph 1 - page 3, last paragraph *	1-10	
Y	GB 2 060 953 A (CENTRAL ELECTR GENERAT BOARD) * page 1, line 5 - page 2, line 47 *	1-10	
A	DE 32 02 323 A (GASSMANN GERHARD G) * claim 1 *	1-10	
A	DE 34 07 393 A (BAUER RAINER) * page 4, line 5 - page 6, line 25 *	1-10	
A	US 4 213 063 A (JONES JOHN L SR) * column 1, line 29 - column 2, line 60 *	1-10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G04G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 March 1998	Examiner Exelmans, U
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