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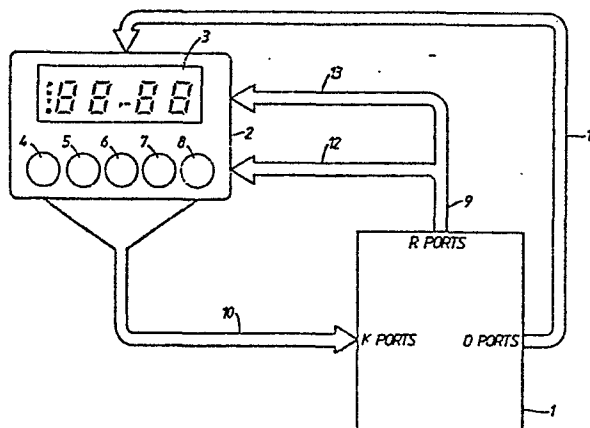
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54 **Timing control apparatus.**

57 A cooker control clock which includes a test mode accessed by operating a selected control member as the clock is being energised. The test mode permits checking of various of the clock functions by the use of its display digits.



Timing control apparatus

The present invention relates to timing control apparatus suitable for controlling equipment to which the timing control apparatus belongs.

Timing control apparatus often form part of the control system of domestic equipment, such as domestic cookers, and are arranged to provide an indication of the time of day and to accept and execute instructions resulting in the equipment being switched on at a specific time, or at specific times, for a specific duration, or for specific durations.

Timing control apparatus fitted to equipment reduces the need for a user to supervise the equipment but the increased ease of operation is generally accompanied by an increased difficulty in maintaining the equipment in a working state.

It is an object of the present invention to provide timing control apparatus which reduces difficulties of maintenance compared with known systems.

The present invention provides timing control apparatus which includes a self-test capability for facilitating maintenance of the timing control apparatus and equipment to which the timing control apparatus belongs.

In accordance with the present invention, timing control apparatus includes timing data storage means,

control data storage means and logic means for  
effecting the operation of the timing control apparatus  
control means operable to effect the entry of timing  
data into the timing data storage means, display  
5 means for displaying the timing data, and output  
means providing output signals for controlling equip-  
ment to which the timing control apparatus belongs,  
the timing control apparatus be so arranged as to go  
into a self-test mode on the operation of the control  
10 means under predetermined conditions.

One arrangement of the timing control apparatus  
is such as to go into a self-test mode on the operation  
of the control means as the apparatus is being energised.

The timing control apparatus may, with advantage, be  
15 so arranged as to execute a set test routine in the self-  
test mode. Such a set test routine may, for example,  
result in the display of a set sequence of timing data.

Alternatively, or additionally, the timing control  
apparatus may be so arranged that, in the self-test  
20 mode, energisation of selected parts of the display means  
are effected by control means.

The maintenance of equipment to which the timing  
control apparatus belongs is facilitated by the use  
of the timing apparatus self-test routine.

25 Timing control apparatus, in accordance with the

present invention, will now be described, by way of example only, with reference to the accompanying block diagram representation of the apparatus.

Referring to the drawing, the timing control-  
5 apparatus is intended for controlling a domestic  
cooker and includes five push-button control members  
4, 5, 6, 7 and 8, housed in a cover member 2 which  
has a window 3 through which four seven-segment and  
other display devices are visible. The apparatus  
10 includes a buzzer (not shown). The timing control  
apparatus also includes a digital signal generating  
and processing circuit 1, known more generally as a  
microprocessor, which includes timing data storage  
means, control data storage means and logic means,  
15 and output means for providing control output signals.

The digital signal generating and processing  
circuit 1 is connected to switch contacts operable by  
means of the push-button control members 4, 5, 6, 7  
and 8 by way of a first group of connectors 10 and a  
20 part 12 of a second group of connectors 9. The  
digital signal generating and processing circuit 1  
is connected to the display devices by way of a third  
group of connectors 11 and a part 13 of the second  
group of the connectors 9.

25 The interconnection of the switch contacts,

referred to above, the first group of connectors  
10, and the part 12 of the second group of  
connectors 9, is such as to form a cross-point  
switch matrix in which closure of one of the  
5 switches effects connection of one of the connectors  
10 with one of the connectors of the group 12. The  
digital signal generating and processing circuit 1  
is so arranged as to scan across the connectors of  
the group 12 with pulses, and to recognise which of  
10 the switch contacts is closed by the time of return  
of one of its pulses on one of the connectors 10  
when a switch contact is closed.

The digital signal generating and processing  
circuit 1 is arranged also to scan across the  
15 connectors of the group 13 to energise each display  
device in turn while applying to the segments, in  
synchronism with its scan pulses, data representative  
pulses, for effecting data display.

The five push-button control members 4, 5, 6, 7,  
20 and 8 control respective switch contacts recognised  
by the digital signal generating and processing  
circuit 1 as follows:-

Push button 4 - MANUAL - selecting manual control  
(as opposed to the normal AUTO  
25 control).

Push button 5 - READY TIME  
Push button 6 - COOK TIME  
Push button 7 - MINUTE MINDER  
Push button 8 - DECREMENT

5

The digital signal generating and processing circuit 1 is so arranged as to check the condition of the switch contacts associated with the MANUAL push button 4 immediately after the timing and control apparatus has being energised, and to go into the self-  
10 test mode if the switch contacts are closed.

With the apparatus in the self-test mode, the control data storage means and logic means controls the display devices to provide the following sequence:-

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1. The right-hand digit of the display is energised to display zero and then to display all values up to eight.

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2. The number eight then transfers to each digit in turn until all the digits hve been energised to display eight, with only one digit energised at a time.

3. The message AUTO is displayed briefly.

4. The switched output of the apparatus is energised momentarily and a display device representing output energisation is also energised.

25

5. The buzzer is energised briefly.

6. All the digits are energised to display zero.

The apparatus, still in the self-test mode, is further controlled by the control data storage means and logic means to permit energisation of the display digits by the operation of respective ones of the  
5 push-button members as follows:-

1. Operation of the push-button 5 results in the energisation of the right-but-one digit to display the value four.
  2. Operation of the push-button 6 results in the  
10 energisation of the right-but-one digit to display the value two.
  3. Operation of the push-button 7 results in the energisation of the right-but-one digit to display the value one.
  - 15 4. Operation of the push-button 8 results in the energisation of the left-but-one digit to display the value 4.
  5. Operation of the push-button 4 results in the energisation of the left digit to display the value 5.
- 20 It will be evident that one or other of self-test routine performed automatically and the self-test routine conducted by the operation of the push-button may be included, or both may be included, in the apparatus.
- 25 Also, variations in the order in which events

occur or the specific events themselves may be varied by those skilled in the art.

The timing and control apparatus is returned to its normal mode by de-energising it and re-energising it without operating the MANUAL push-button 4 at the  
5 time of re-energisation.

In the normal mode, the timing and control apparatus is operative to accept push-button controlled input timing data representing "time of day", "cook time",  
10 and "ready time". Alternative arrangements including "start time" may be used.

The timing and control apparatus, in the normal mode, is used as follows for the entry of "cook time", say:-

15 The push-button 6 is operated to select "cook time" as the timing data for entry and the apparatus will display zero value cook time, (Any previously entered "cook time" will have been replaced by a zero value immediately after energisation, in known manner).  
20 The push-button 6 is held in the operated condition and after a delay the display will show that "cook time" is incrementing. The push button 6 is held until the displayed value "cook time" is equal to the desired "cook time". Should the entered value of  
25 "cook time" overshoot the desired value, the push-



button 8 is operated to decrement the value of "cook time". There is no delay between the operation of the push-button 8 and the decrementing of the displayed value of "cook time".

5       The control of the entries of the other timing data is effected in a similar manner to that described above for the entry of "cook time", by the use of one of the other push buttons, as appropriate.

10       It will be evident from the above that the timing data entry push buttons perform the dual functions of indicating which timing data is to be entered and of incrementing the value for the data.

15       The arrangement for causing the timing data entry push buttons to perform the dual functions, referred to above, is the subject of European patent application No. 83.300686.2.

Claims:

1. Timing control apparatus including timing data storage means, control data storage means and logic means for effecting the operation of the timing control apparatus, control means operable to effect  
5 the entry of timing data into the timing data storage means, display means for displaying the timing data, and output means providing output signals for controlling equipment to which the timing apparatus belongs, the timing control apparatus being so arranged  
10 as to go into a self-test mode on the operation of the control means under predetermined conditions.

2. Timing control apparatus, as claimed in claim 1, which is so arranged as to go into a self-test mode on the operation of the control means as the apparatus  
15 is being energised.

3. Timing control apparatus, as claimed in claim 1 or claim 2, which is so arranged as to execute a set test routine in the self-test mode.

4. Timing control apparatus, as claimed in any  
20 one of claims 1 to 3, so arranged that, in the self-test mode, energisation of selected parts of the display means are effected by the control means.

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