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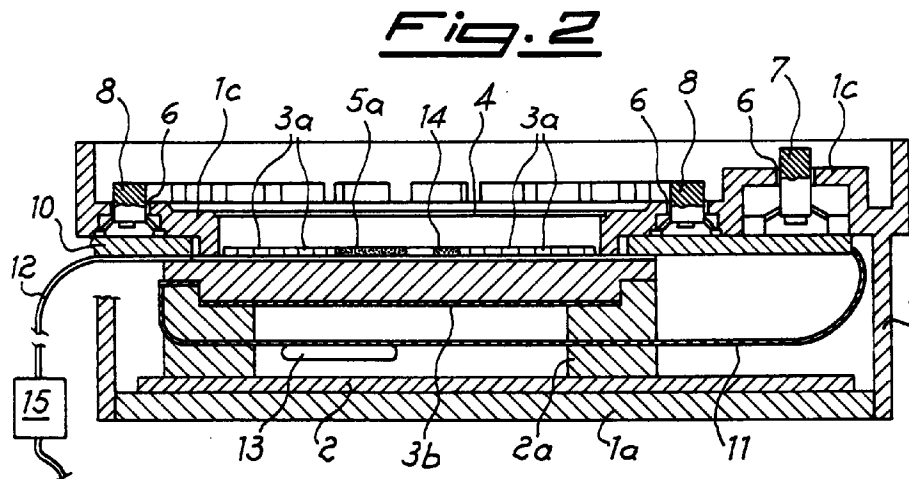
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(54) **Electronic timer switch for programming the energization/de-energization time intervals of relays or the like**

(57) Timer switch for programming the energization/de-energization time intervals of a relay (15) and the like comprising, in combination, electronic time counting means (5, 14) provided with associated activation and control means (9), electronic means (13) for programming the energization or de-energization time interval of the relay (15), which means can be activated

by means of associated buttons (7, 8), electronic means (3, 3a) for displaying the said energization/de-energization time interval programmed for the relay (15) and means (10, 11) for electrically connecting said buttons (7, 8) to said programming means (13) and display means (3).



Description

The present invention relates to a timer switch for programming the energization/de-energization time intervals of relays and the like comprising, in combination, electronic time counting means, electronic means for programming the energization or de-energization time interval of the relay and electronic digital means for displaying the said energization/de-energization time interval programmed.

In the art numerous types of timer or clock switches are known, it being possible to program said switches so as to send an energization signal to a relay controlling higher-capacity electrical equipment at predetermined time intervals and vice versa de-energize the relay itself during other time intervals.

More particularly, in the art so-called rider clocks are widely used, these being basically electro-mechanical timing mechanisms in which the relay energization signal is maintained during the time period set by the user via mechanical arms which are referred to as "riders".

Basically, raising/lowering the riders causes energization/de-energization of the relays commanding the equipment to be controlled.

Said rider clocks, however, have several drawbacks including the large number of mechanical parts such as: riders, levers, drive mechanisms, toothed wheels and transmission spindles, which are particularly difficult to manufacture, assemble and test since they require specially designed equipment and moulds as well as specialized personnel.

In addition to the above, for obvious cost- and weight-related reasons, said mechanical parts are made of plastic which is subject to wear with time, hence requiring the need for spare-parts warehouses with a consequent increase in the costs.

A further limitation of the aforementioned rider clocks consists in the fact that subdivision of the time period which can be programmed for energization/ de-energization is limited by their physical dimensions, thus making it necessary to manufacture many types of switches with different configurations and sizes according to the time period to be programmed, without, however, the possibility of switching from one programming period to another unless the type of switch is changed - something which is not always possible owing to the different dimensions of the said switches.

It is also known of programming devices of the electronic type which have a certain number of buttons by means of which it is possible to perform the desired programming operation. These types of programming devices, however, are difficult for the end user to use since the programming sequence must be learned and no form of physical correlation exists between the choice of the time periods which one wishes to program, the programming sequence and the result obtained. Examples of these types of electronic programming

devices are for example described in EP-A-0,563,972 and EP-A-0,141,655.

The technical problem which is posed, therefore, is that of providing a programmable timer switch, consisting of a small number of parts, with a low cost and small dimensions, which allows easy programming of the operating time and moreover allows one to have the possibility of programming both whole time periods and fractions thereof, without the need for further parts and/or mechanisms.

Within the scope of said technical problem it is required moreover that operation of the switch should be similar to that of conventional switches, being easy and obvious even for a person who is inexperienced and making it possible to program whole time intervals and/or fractions thereof, without the need for structural modifications of the switch itself.

These results are obtained by the present invention, which envisages a timer switch for programming the energization/de-energization time intervals of a relay and the like comprising, in combination, electronic time counting means provided with associated activation and control means; electronic means for programming the energization/de-energization time interval of the relay, which means can be activated by means of associated control buttons; electronic means for displaying said energization/de-energization time interval programmed for the relay and means for electrically connecting said buttons to said programming means and display means.

Further details can be obtained from the following description, with reference to the accompanying drawings, in which:

Figure 1 shows a plan view of the clock according to the invention and;

Figure 2 shows a diagrammatic cross-section along the plane II-II of Figure 1.

As shown in the Figures, the timer switch according to the invention is composed of a container 1 closed at the bottom by a base-piece 1a which has mounted on its internal surface a screen 2 providing protection against electro-magnetic interference; the base-piece 1a is provided moreover with extensions 2a for supporting a printed circuit 3b which has incorporated in its upper surface a liquid-crystal display 3 containing segments 3a arranged in two concentric rings, as illustrated in Figure 1 and for the purposes which will become clear in the description below.

The liquid-crystal display 3 comprises, configured in a so-called seven-code arrangement, segments for forming the digits 5a of a digital clock 5 (Fig. 1) which counts the minutes and a further clock 14 which counts the days.

The liquid crystals are protected at the top by a small pane of glass 4 or similar transparent material fixed to corresponding seats on the casing 1.

The upper surface 1c of the casing 1 moreover has formed in it openings 6 designed to accommodate buttons 7, 8 and 9 acting on suitable contact zones of a rigid printed circuit 10 electrically connected to the digital display 3 by means of a first flexible connecting printed circuit 11 which also has on it a microprocessor 13 which programs the time interval set for energization of the relay 15.

In particular the buttons 7 and 8 are used for programming the hourly period and/or for a fraction thereof, so as to obtain a programmable time interval which is as small as possible and increase the programming possibilities, as will be further described below.

The buttons 9, on the other hand, are used to adjust and start the digital clock 5 using techniques and procedures which are known per se and therefore not further described and illustrated.

As can be seen from Figure 2, the hour counter comprises a further flexible printed circuit 12 which is connected to the relay schematically indicated by 15, for programmed energization/de-energization thereof.

The hour counter according to the invention operates as follows: after starting and adjusting via the buttons 9 both the digital clock 5 and the day counter 14, programming of the periods for activation of the relay is performed by pressing the buttons 7 and 8, in particular:

- if one wishes to activate the relay for a time interval equal to one hour or multiples of an hour, one presses once the button 8 corresponding to the required number of hours' operation shown on the counter dial; if, for example, one wishes to energize the relay from 23.00 to 24.00 hours the button 108 is pressed once and correspondingly all four segments 103a relating to the prechosen hour light up so as to display the programming operation performed;
- if, on the other hand, one wishes to activate the relay for periods of half an hour only it is necessary to distinguish whether the half hour chosen is the first or second one: correspondingly one presses the relevant button two or three times, causing the first two segments or the second two segments, respectively, to light up (Fig. 1, ref. 208; 203 and 308; 303);
- if one wishes to further reduce the period of activation of the relay, it is necessary to operate also the button 7, observing the following sequence: after pressing twice or three times the button 408; 508 relating to the prechosen time interval in order to determine which half-hour period is to be further subdivided, the button 408 or 508 itself is kept pressed and the button 9 is pressed once so as to activate the relay during the first quarter of an hour and twice so as to activate the relay during the second quarter of an hour; correspondingly only one of

the four segments (Fig. 1, ref. 403;503) corresponding to the programmed hourly period will light up.

It is therefore obvious how with a timer switch according to the invention it is possible to reduce the parts which make up the switch itself, said parts being moreover substantially subject to rapid wear, and also increase the precision of the hour count and obtain great programming flexibility, without the need for structural modifications of the switch, while maintaining the programming simplicity which is typical of electro-mechanical switches.

Many variations may be introduced as regards the manufacture of the parts making up the invention, without thereby departing from the protective scope of the present invention as defined in the claims which follow; for example, it is possible to envisage remote control of the timer switch which can be performed by means of radio transmission, with conveyed or telephone waves, or "E.I. BUS", it being sufficient in this case to provide a suitable receiver incorporated in the switch.

Claims

1. Timer switch for programming the energization/ de-energization time intervals of a relay (15) and the like, characterized in that it comprises, in combination, electronic time counting means (5, 14) provided with associated activation and control means (9), electronic means (13) for programming the energization or de-energization time interval of the relay (15), which means can be activated by means of associated buttons (7, 8), electronic means (3, 3a) for displaying said energization/de-energization time interval programmed for the relay (15), and means (10, 11) for electrically connecting said buttons (7, 8) to said programming means (13) and display means (3).
2. Timer switch according to Claim 1, characterized in that said electronic means are of the digital type.
3. Timer switch according to Claim 1, characterized in that said electronic time counting means consist of a digital clock (5) which counts the minutes and a digital day clock (14).
4. Timer switch according to Claim 1, characterized in that said electronic programming means consist of a microprocessor (13).
5. Timer switch according to Claim 1, characterized in that said electronic programming display means consist of a digital liquid-crystal display (3) configured in accordance with continuous display segments and/or sectors (3a) arranged along at least one circumference.

6. Timer switch according to Claim 1, characterized in that said programming display segments are arranged along at least two concentric circumferences. 5
7. Timer switch according to Claim 1, characterized in that said means for electrically connecting said programming control buttons (7, 8) and said micro-processor (13) consist of a rigid printed circuit (10) against which the buttons make contact and a flexible connecting printed circuit (11). 10
8. Timer switch according to Claim 1, characterized in that it comprises at least one button for programming the energization/de-energization interval of the relay (15). 15
9. Timer switch according to Claim 1, characterized in that the minimum programmable time interval is equal to one hour. 20
10. Timer switch according to Claim 1, characterized in that the minimum programmable time interval is equal to half an hour. 25
11. Timer switch according to Claim 1, characterized in that the minimum programmable time interval is equal to a fraction of an hour.
12. Timer switch according to Claims 1 to 6, characterized in that the minimum programmable time interval is equal to an hour fraction equivalent to fifteen minutes. 30
13. Timer switch according to Claim 1, characterized in that it comprises means for receiving radio, telephone or conveyed wave signals for remote control of the switch itself. 35
14. Timer switch according to Claim 1, characterized in that said timer is programmable for cycle periods equal to one day. 40
15. Timer switch according to Claim 1, characterized in that said timer is programmable for cycle periods equal to one week. 45
16. Timer switch according to Claim 1, characterized in that said timer is programmable for cycle periods equal to one year. 50
17. Timer switch according to Claim 1, characterized in that said digital counting, programming and display components are integrated in flexible printed circuits. 55

Fig. 1

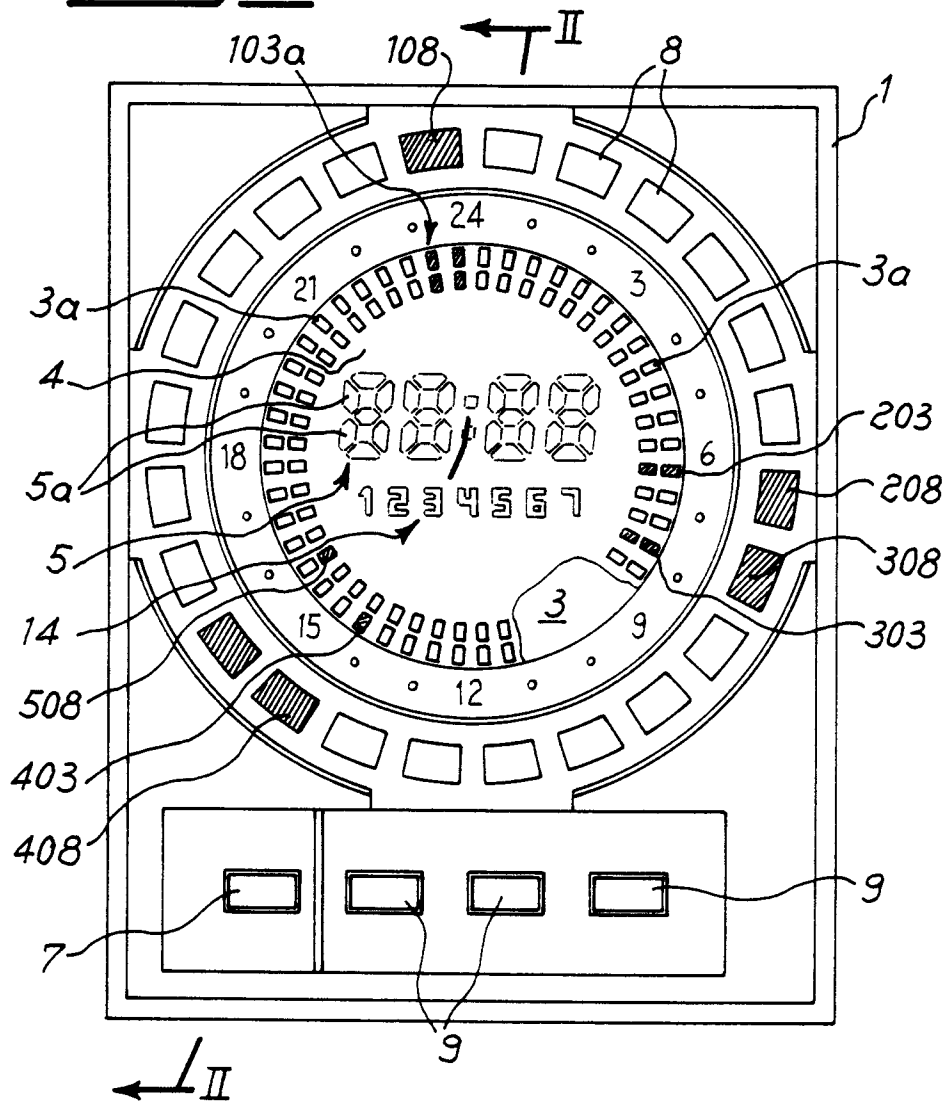
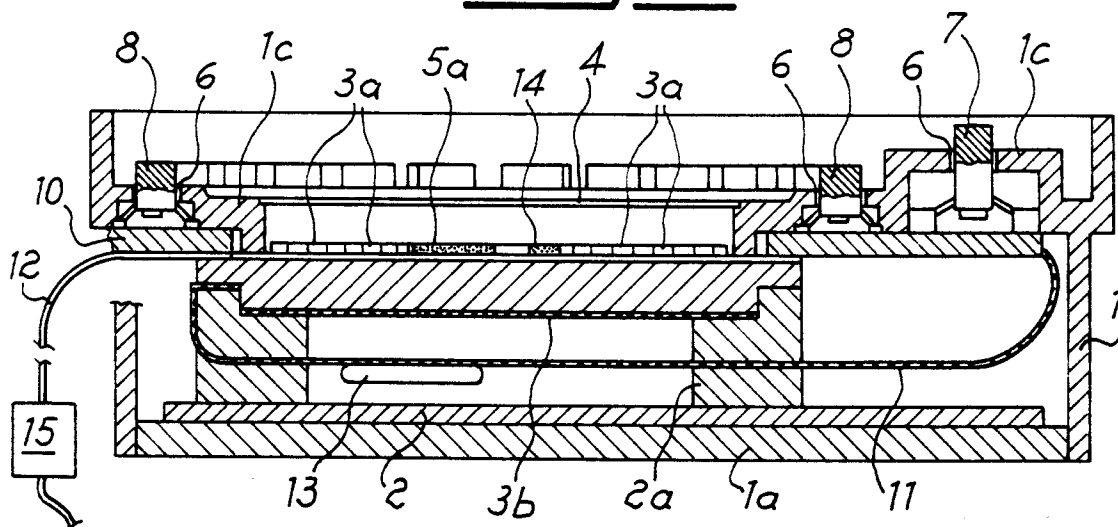


Fig. 2





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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 3529

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-A-0 563 972 (LEGRAND GMBH) * page 2, line 1 - page 3, line 31; figure 1 *	1-17	G04G15/00
Y	--- EP-A-0 141 655 (SCHLUMBERGER ELECTRONICS (U.K.) LIMITED) * figure 1 *	1-17	
A	--- EP-A-0 119 312 (VIESSMAN WERKE KG) * figure 1 *	1	
A	--- DE-A-41 07 936 (JOH. VAILLANT GMBH) -----	1	
			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 25 April 1996	Examiner Exelmans, U
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