United States Patent

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[54] COIN-LOCKER CONTROL DEVICE

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[52] **U.S. Cl.**.....**307/141.4,** 194/9 T

[51] **Int. Cl.**.....**G07f 5/18,** H01h 43/00

[58] **Field of Search**.....317/139, 140; 307/141.4, 141; 194/9 T

[56] **References Cited**

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[57] **ABSTRACT**

A coin-locker control device comprising a signal generator which produces a control signal when a unitary period of time has passed, a control circuit which successively generates operating signals by utilizing the control signal produced by the signal generator for every predetermined time difference, and a plurality of locker group circuits which are connected to the control circuit, and whose charge-day (or hour) - indication shifting operations are controlled by the operating signals produced for every predetermined time difference. After the locker group circuit of a preceding stage has been controlled, the locker group circuits of the following stages are individually and successively controlled without duplicate control.

8 Claims, 6 Drawing Figures

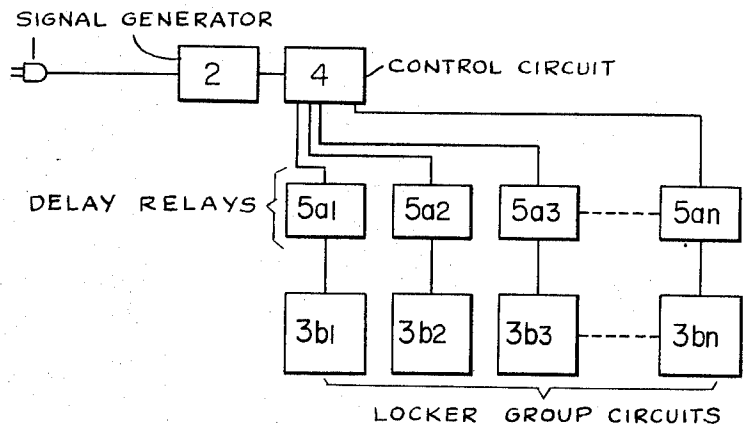


FIG. 1

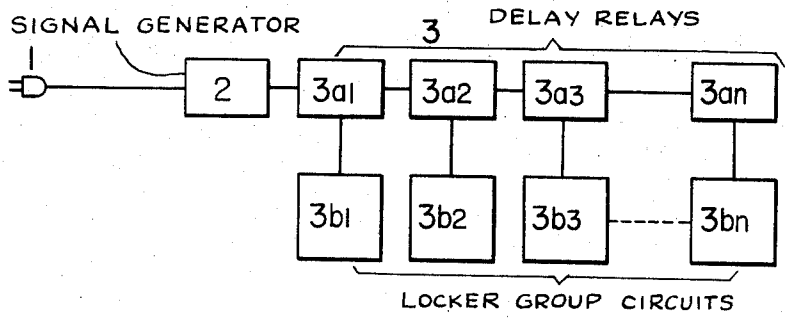
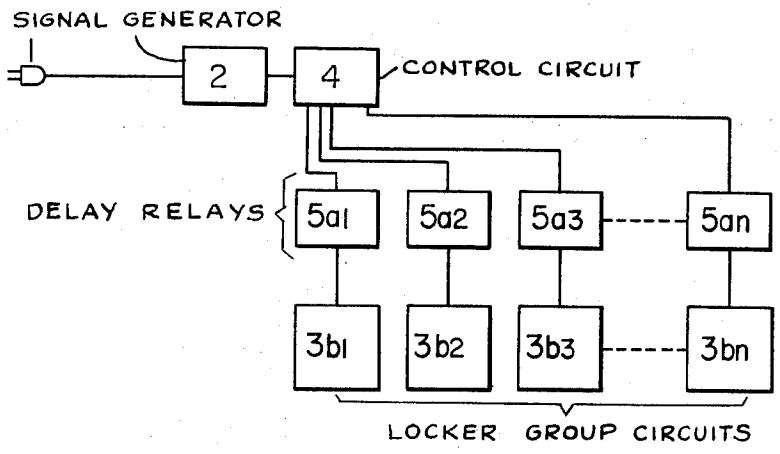


FIG. 4



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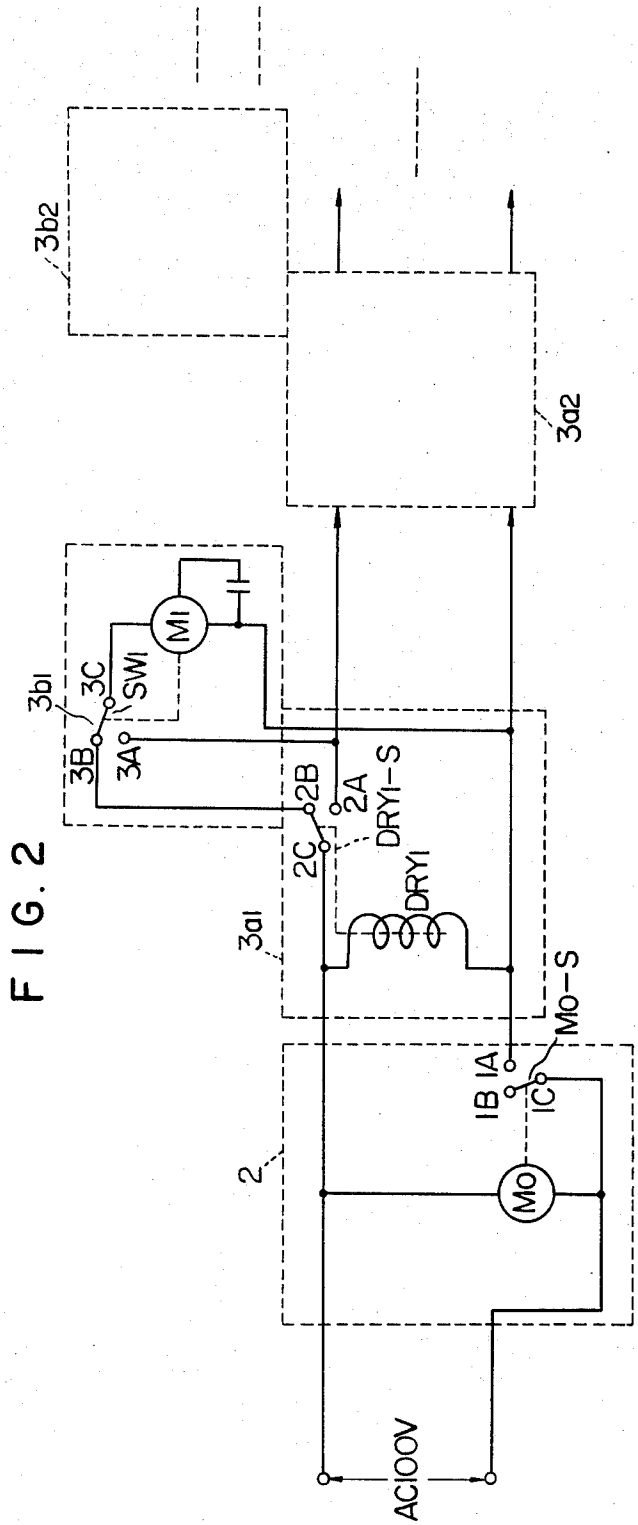

FIG. 2

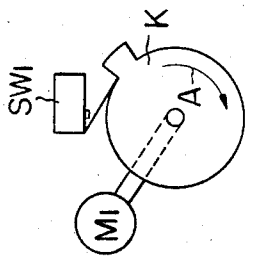

FIG. 3

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FIG. 5

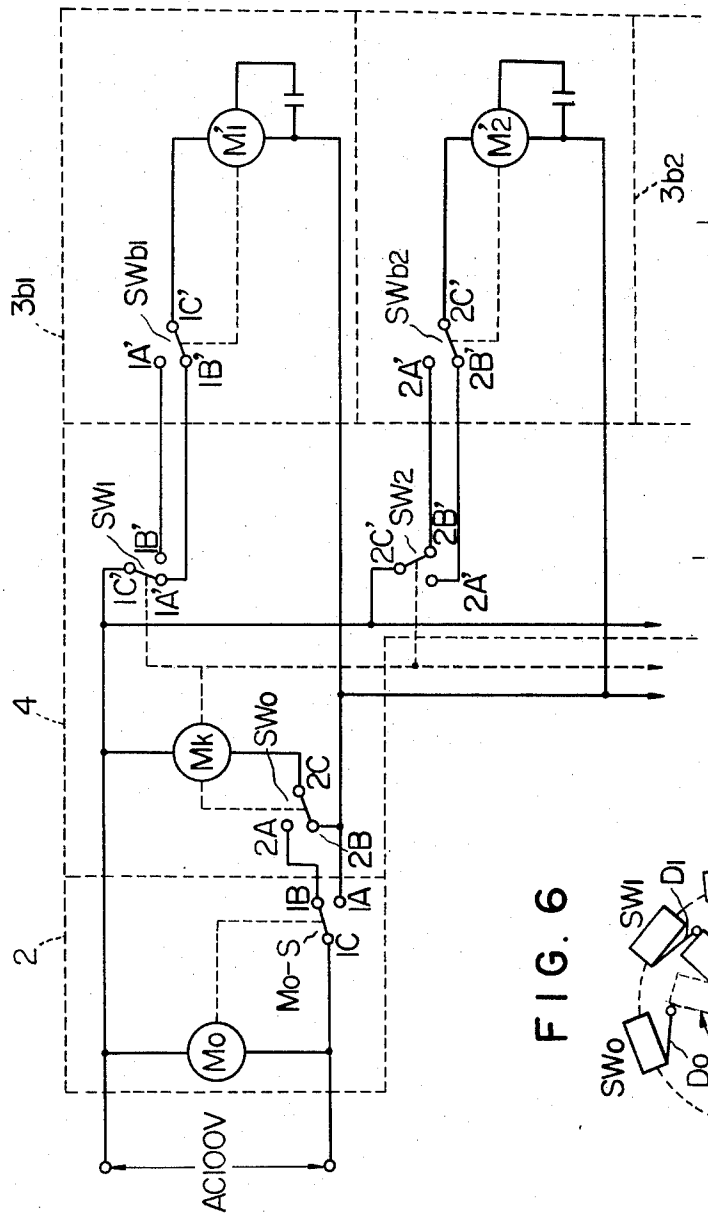
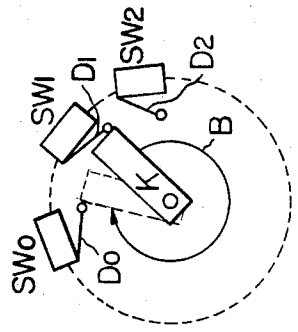


FIG. 6



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COIN-LOCKER CONTROL DEVICE

BACKGROUND OF THE INVENTION

This invention generally relates to a coin-locker control device adapted to vary the indicators of charge-hours of use provided on each of a plurality of coin-lockers. Such coin-lockers are of the type which are provided in public places for rental and which can be locked and unlocked by a key upon the insertion of a coin, for example.

Such coin-operated devices are often rented with the rental charges being based upon the time duration of use of the locker in terms of specified time units such as one day or one hour. Whenever these specified time units are exceeded, it is necessary to record the excess time so that a corresponding additional rental charge can be collected. The lock mechanisms of typical public coin lockers are usually provided with an indicator of charge-hours of use for the locker and such indicators can be electronically controlled or switched through the utilization of timer mechanisms.

In general, timers employed for the charge-day-shifting operation of a lock mechanism adapted to conduct a switching operation every unitary time interval and of a coin-locker which integrates the charge for use are limited in electrical current capacity. The number of lockers which can be controlled by one timer is not more than about 20. Therefore, in the case where more than 20 lockers are set in one place, at least two timers are required.

However, if at least two timers were used in one place, there would be a time lag involved. An electrical power plug socket or receptacle is required for each of the locker group circuits. So, if the number of the power plug sockets are not adequate for installation of the required number of locker group circuits, several tens or several hundreds of lockers cannot be controlled at the same time because the power plug sockets and the indoor wiring have a limitation in electrical current capacity. Such disadvantages as mentioned above are entailed in charge-day-indication-shifting conventional device.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a coin-locker control device wherein the lockers are divided into a plurality of locker group circuits and the charge-day-indiation-shifting operation for each of the locker group circuits is accomplished with a time lag.

Another object of the present invention is to provide a coin-locker control device wherein a plurality of locker group circuits are controlled by using one timer successively at intervals of time of a certain length.

A further object of the present invention is to provide a coin-locker control device wherein even if a number of locker group circuits are connected to the control device, electrical power plug sockets are not over-loaded, and all of the lockers can be operated by using the power capacity employed for one group of lockers at all times.

A still further object of the present invention is to provide a coin-locker control device wherein the possibility of accidents due to over-loading of wiring, relays, a timer, and the like is greatly reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a block-diagram illustrating an example of a coin-locker control device according to the present invention;

FIG. 2 is a circuit diagram showing a concrete example of the device of FIG. 1 according to the present invention;

FIG. 3 is a plan view illustrating positional relationships between a keep switch SW_1 shown in FIG. 2 and a cam K driven by an electric motor M_1;

FIG. 4 is a block diagram exhibiting another example of a coin-locker control device according to the present invention;

FIG. 5 is a circuit diagram showing detail of the concrete embodiment of the control device shown in FIG. 4;

FIG. 6 is a plan view illustrating positional relationships between the keep switches SW_0, SW_1, through SW_n shown in FIG. 5 and a cam K.

DETAILED DESCRIPTION OF THE INVENTION

With reference now to the drawings, and more particularly to FIG. 1; a signal generator 2 which is adapted to produce a control signal having a predetermined time width and which has a manual push button switch or a timer operable every unitary time (for instance 1 day) of use is connected to a plug connected to an electrical power plug socket, and a control circuit 3 comprising a plurality of delay relays $3a_1$, $3a_2$, $3a_3$ through $3a_n$ is connected to the signal generator 2.

The control circuit is so designed that firstly the delay relay $3a_1$ is closed by the action of the signal generator 2, then the delay relay $3a_2$ of the following stage is closed after a certain time (for instance several seconds) from the closing of the delay relay $3a_1$, and the delay relays $3a_3$ through $3a_n$ are successively closed in the same manner. Further, locker group circuits (a group of lockers consists of about 20 lockers, in general) $3b_1$, $3b_2$, $3b_3$ through $3b_n$ are respectively connected to the delay relays $3a_1$, $3a_2$, $3a_3$ through $3a_n$, corresponding to the electrical current capacities of the delay relays $3a_1$, $3a_2$, $3a_3$ through $3a_n$.

The above described device operates as follows:

After a certain period of time (for instance one day), the signal generator 2 is operated manually or automatically to close first the delay relay $3a_1$, whereupon a current flow to a driving motor provided in the locker group $3b_1$ thereby to operate a lever mechanism provided in the locker group circuit $3b_1$ so as to accomplish a charge-day-shifting operation thereto. It takes about 2 or 3 seconds for completion of the charge-day-shifting operation from the closing of the delay relay $3a_1$.

Therefore, after about five seconds from the closing of the delay relay $3a_1$, the delay relay $3a_2$ of the following stage is closed thereby to complete the charge-day-shifting operation of the locker group circuit $3b_2$, and the charge-day-shifting operations of up to the locker group circuit $3b_n$ are successively conducted.

FIG. 2 illustrates a specific and detailed circuit diagram of the example shown in FIG. 1. Hereinafter, the circuit composition of FIG. 2 will be explained in detail. In addition, FIG. 3 shows positional relationships between a keep switch SW_1 and a cam K driven by a charge-date-shifting motor M_1.

The signal generator 2 comprises a 24-hour timer Mo and its switch Mo—S. When the generator 2 is preset to a certain time intended for a charge-day-shifting operation, the switch Mo—S is changed over to the 1C—1A side when the time comes up. The delay relay $3a$ comprises a delay relay coil DRY_1 and a relay armature DRY_1—S. When the coil DRY_1 is excited, the relay armature DRY_1–S is thrown over to the 2C—2A side.

The locker group circuit $3b_1$ is provided with a charge-day-shifting motor M_1 and a keep switch SW_1. When the motor M_1 is driven to make one revolution, the keep switch SW_1 is switched over to the 3A—3C side whereby rotation of the motor is stopped. The circuit compositions made by both the delay relays $3a_2$ through $3a_n$ and the locker group circuits $3b_2$ through $3b_n$ are the same as that made by both the delay relay $3a_1$ and the locker group circuit $3b_1$ in all respects.

When the power switch is closed, the power voltage is applied to the timer Mo, and the switch Mo—S is changed over to the 1C—1A side at the preset time. Therefore, the power voltage is applied across the relay coil DRY_1 thereby to excite the coil DRY_1. After a certain time from the excitation of the coil DRY_1, the relay armature DRY_1—S is thrown over to the 2C—2A side. Now, the coil DRY_1 is maintained excited to keep the armature DRY_1—S at the 2C—2A side until the relay coil of the timer Mo is deenergized thereby to switch back the switch to the 1C—1B side.

When the switch Mo-S is changed over to the 1C—1A side, there is formed a circuit comprising the power source, contact

DRY_1—S (2C—2B) keep switch SW_1 (3B—3C), charge-date-shifting motor M_1, switch Mo—S (1C—1A), and power source in the order given, as a result of which the motor M_1 is started. When the switch is changed over to the 3C—3A side by the keep switch SW_1 when it is pushed by the cam K driven by the thus rotated motor M_1, the motor M_1 is stopped.

Then, after the coil DRY_1 of the above-mentioned delay relay has been excited, the relay armature is thrown over to the 2C—2C side with a delay of a certain period of time. At the same time, a circuit comprising the power source, relay armature DRY_1—S (2C—2A), keep switch SW_1 (3C—3A), Motor M_1, switch Mo-S (1A—1C), and power source, is completed in the order enunerated, and the motor M_1 is rotated again.

When the motor is rotated through exactly one revolution starting from the position shown in FIG. 3 whereby the switch SW_1 is changed over to the 3C—3B side, disengaging from the cam K, the motor M_1 is stopped. (The position where the motor is stopped is the normal position of the motor.) By this one revolution of the motor, the charge-day indication for the locker group circuit $3b_1$ is shifted to the following charge-day indication. In addition; when the relay armature DRY_1—S of the delay relay DRY_1 is changed over to the 2C—2A side, a signal is furnished to the succeeding stage circuit $3a_2$ and $3b_2$, and the circuit operates in the same manner as described above.

The circuits of $3b_3$ through $3an$ and $3b_3$ through $3bn$ operate also in the same manner thereby to conduct the charge-day-indication-shifting operations of the locker group circuits $3b_3$ through $3bn$.

Now, with reference to FIG. 4, another embodiment, of the present invention will now be described.

A signal generator 2 of the character as described above is connected to a plug which is inserted into a power plug socket. A control circuit 4 whose contact means are successively switched at certain intervals of time (for instance several seconds), is connected to the signal generator 2. Employed in the control circuit 4 are a cam mechanism which is turned by a motor, for instance, and a rotary switch in order to successively switch the contact means thereby to transmit a signal. Relays $5a_1$, $5a_2$, $5a_3$ through $5an$ are connected to respective contacts of the control circuit 4, and locker group circuits $3b_1$, $3b_2$, $3b_3$ through $3b_n$ are connected to these relays, respectively.

The control device of the above described organization operates in the following manner. After a certain period of time (for instance, 1 day), the first contact means of the control circuit is closed thereby to close the relay $5a_1$, whereupon an electric current flows to a motor provided in the locker group circuit $3b_1$ to operate a lever mechanism of the locker group circuit $3b_1$ whereby a charge-day-indication-shifting operation is accomplished. When the charge-day-indication-shifting operation has been completed, the succeeding switch of the control circuit 4 is activated, and the charge-day-indication-shifting operation is accomplished with the aid of the relay $5a_2$. Further, the charge-day-indication-shifting operations of the locker group circuits 3b$_3$ through 3bn are performed successively in the same manner as described above.

In addition; the relays $5a_1$, $5a_2$, $5a_3$ through 5an may be removed from the control device shown in FIG. 4, and the locker group circuits $3b_1$, $3b_2$, $3b_3$ through $3bn$ may be connected directly to respective contacts of the control circuit 4.

FIG. 5 illustrates an example of a concrete circuit in which locker group circuits are connected directly to respective contacts of the control circuit 4. FIG. 6 exhibits the positional relationships between keep switches SW_0, SW_1 through SWn and a cam K as shown in FIG. 5.

Hereinafter, the organization and operation of the circuit will be described in detail:

The organization of the signal generator and the locker group circuits $3b_1$ through $3bn$ is exactly the same as that of that illustrated in FIG. 2. The control circuit 4 comprises the keep switches SW_0, SW_1 through SWn which are opened and closed by a motor M_k and a cam K driven by the motor M_k. In each locker group circuit the switches SWb_1 through SWbn are opened and closed by respective cams M_1' through Mn' of the charge-day-indication-shift motors M_1' through Mn' in the same manner as the keep switch SW of FIG. 2.

In FIG. 6, reference character K designates a cam which rotates at a slow speed in the direction shown by an arrow mark in coupled relationship with the rotation of the motor Mk. The normal position of the cam is a position assumed thereby slightly before the contact piece D_1 of the keep switch SW_1 is depressed, that is, the contact piece D_0 disengages from the cam K. When the motor M_k is rotated, the cam K, being driven by the motor, turns in the direction indicated by an arrow mark B and depresses the contact pieces K_1, D_2, through Dn of the keep switches SW_1, SW_2, through SW_n thereby to close each switch.

Therefore, when the contact piece D_1 is depressed, the switch SW_1 is changed over to the 1C'—1A' side, and when the contact piece D_1 disengages from the cam, the switch SW_1 is changed over to the 1C'—1B' side. Next, when the contact piece D_2 is depressed, the switch SW_2 is changed over to the 2C'—2A' side, and then when the contact piece D_2 disengages from the cam, the switch SW_2 is switched back to 2C'—2B'.

As described above, all of the switches SW_1 through SWn are successively switched over and switched back to their respective contacts. The keep switch SW_0 is switched over and switched back after the switch SWn has been switched back.

When a preset time is reached, the timer Mo operates to change the switch Mo-S over to the 1C—1A side. As a result, there is formed a circuit comprising the power source, motor M_k, SW_0 (2C—2B), switch Mo—S (1C—1A) and power source in the over enumerated whereby the motor Mk is rotated. The cam K is rotated by the rotation of the motor Mk, whereby, first, the contact piece D_1 of the keep switch SW_1 is depressed by the cam, and the switch SW_1 is changed over to the 1C'—1A' side. As a result, a circuit comprising the power source, SW_1 (1C'—1A'), SWb_1 (1B'-1C'), motor M_1', switch Mo—S (1A—1C) and power source is completed in the order enumerated, and therefore the charge-day-indication-shifting motor M_1' is rotated.

The keep switch SWb_1 is changed over to the 1C'—1A' side by the action of the cam driven by the motor M1' immediately before the motor M_1' rotates through one revolution and the motor is stopped. When the cam K disengages from the contact piece of the keep switch SW_1, the switch SW_1 is switched back to the 1C'-1B' side, whereby a circuit comprising the power source, SW_1(1'C-1B'), SW_{b1} (1C'—1A'), charge-day-shifting motor M_1', switch Mo—S (1C—1A) and power source is formed in the order named, as a result of which the motor M_1' is rotated again.

When the cam of the motor M_1' rotates through one revolution starting from its initial position to reach its normal position, the contact piece of the switch SWb_1 disengages from the cam, and the switch SW_{b1} is switched back to the 1C'—1B' side, whereby the charge-day-indication-shifting motor is stopped.

Similarly, when the contact piece D_2 of the keep switch SW_2 is depressed by the cam K, the switch SW_2 is changed over to the 2C'—2A' side, so that a circuit comprising the power source, SW_2 (2C'—2A'), SW_{b2} (2C'-2B'), charge-day-shifting motor M_2', switch Mo—S (1C—1A) and power source is formed in the order enumerated, whereby the motor M_2' is rotated. Before the motor M_2' rotates through one revolution, the contact piece of the switch SW_{b2} is depressed by the cam, whereby the switch SW_{b2} is changed over to the 2C'-2A' side, and the motor M_2' is stopped.

When the cam K disengages from the contact piece D_2 of the switch SW_2, the switch SW_2 is switched back to the 2C'—2B' side so that a circuit comprising the power source, SW_2 (2C'—2B'), SW_{b2} (2C'-2A'), charge-day-shifting motor M_2', switch Mo—S (1C—1A) and power switch is established in the order named, whereby the motor M_2' is started again. Accordingly, at the position where the motor M_2' completes ex-

actly one revolution, the SW_{b2} is switched back to the 2C'—2B' side and the motor M2' is stopped.

In the above described manner, each of the charge-day-shifting motors M3' through Mn' successively rotates through one revolution so as to accomplish the charge-day-shifting operation.

After the last charge-day-shifting motor Mn' has rotated through one revolution and has stopped at its normal position, the switch SW_0 is changed over to the 2C—2A side when the cam k depresses the contact piece D_0 of the switch SW_0, whereby the motor M_K is stopped. When the relay coil of the timer Mo which has been working for a certain period of time is de-energized, the switch Mo—S is switched back to the 1C—1B side. Therefore, a circuit comprising the power source, motor M_1, SW_0 (2C—2A), switch M_0—S (1C—1B) and power source is formed in the order enumerated so that the motor M_1 is rotated.

When the motor has rotated through exactly one revolution to assume its normal position, the contact piece D_o of the switch SW_o disengages from the cam K, so that the switch SW_o is switched back to the 2C—2B side, whereby the motor M_1 is stopped and the original state indicated in FIG. 5 is attained. All of the change-day-indication-shifting operations of the locker group circuits $3b_1$, $3b_2$ through $3b_n$ are thus completed.

The operating period of time of each locker group circuit is ordinarily of the order of two or three seconds. Therefore, an operational time interval of the control circuit of 5 seconds is satisfactory for the operation. Accordingly, even if all lockers of ten locker group circuits (a total of 200 lockers if one locker group circuit consists of 20 lockers) were arranged in one place, the total time lag would be within 1 minute and, therefore, would not be detremental in a practical use.

While a few embodiments of the present invention have been illustrated and described in detail, it is particularly understood that the invention is not limited thereto or thereby.

We claim:

1. A coin-locker control device adapted to vary the indicators of charge-hours of use provided on each of a plurality of coin lockers arranged in a plurality of different locker groups under the control of a single timer means, which device comprises a control signal generating means periodically operable during each given time period of locker-use to produce a control signal having a predetermined time duration, a control circuit connected to said control signal generating means so as to be energized thereby during said predetermined time duration, said control circuit successively producing operating signals with each signal being separated by a predetermined time difference, and plurality of locker group circuit means, each group circuit means being operable by a different successive operating signal, each group circuit means being coupled to the indicators of a plurality of lockers within a given group to respectively effect shifting operations of the indicators of said plurality of lockers within said given group, whereby said indicators of lockers within different locker groups are separately and successively controlled.

2. A control device as claimed in claim 1, in which said control circuit consists of a plurality of delay relays which are successively series connected to the control signal generating means.

3. A control device as claimed in claim 1, in which the control signal generating means is a manual push button switch.

4. A control device as claimed in claim 1, in which the control signal generating means is a timer.

5. A control device as claimed in claim 1, in which the control circuit consists of a circuit connected at its input side to the control signal generating means and provided with a plurality of contact means which are successively switched at certain intervals of time.

6. A control device as claimed in claim 5, in which the control circuit is provided with a cam mechanism which successively switches over the contact means of the control circuit.

7. A control device as claimed in claim 5, in which the control circuit is provided with a rotary switch which successively switches over the contact means of the control circuit.

8. A coin-locker control device adapted to vary the indication of use hours of a plurality of coin lockers under the control of one timer means; which device comprises a control signal generating means operable at every unitary time of locker-use and adapted to periodically produce a control signal having a predetermined time width at said unitary time intervals; a control circuit connected to said control signal generating means so as to be energized thereby, said control circuit being provided with a plurality of switch means which are successively switched by said control signal and which produce operating signals successively for every predetermined time difference by said successive switching of said switch means; relays connected to respective contacts of said control circuit so as to be successively closed by said operating signals; and a plurality of locker group circuits connected to said relays of said control circuit and adapted to cause respectively and successively charge-day-indication-shifting operations of a plurality of locker groups upon closure of said relays, whereby said locker groups are made to be controlled individually and successively without duplicate control of said charge-day-indication-shifting operations.

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