United States Patent [19]

Kinemura et al.

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[45] **Jan. 29, 1974**

[54] **NUMBER OF DAYS INTEGRATING TYPE TIME SWITCH**

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[73] Assignee: **Koshei Arita**, Tokyo, Japan

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[30] **Foreign Application Priority Data**

July 3, 1971 Japan 46/49123

[52] **U.S. Cl.** ..... **235/132 A**, 235/132 E, 58/152 B

[51] **Int. Cl.** **G06m 3/02**

[58] **Field of Search** ..... 235/132 R, 132 E, 91 D; 58/145 A, 147, 152 B

[56] **References Cited**

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[57] **ABSTRACT**

The time switch comprises a clock mechanism operating at a constant speed and a mechanical counter driven by the clock mechanism. The counter comprises a plurality of digit wheels for counting the number of days and a signal generator which is operated by the counter when it has counted a predetermined number of days.

3 Claims, 4 Drawing Figures

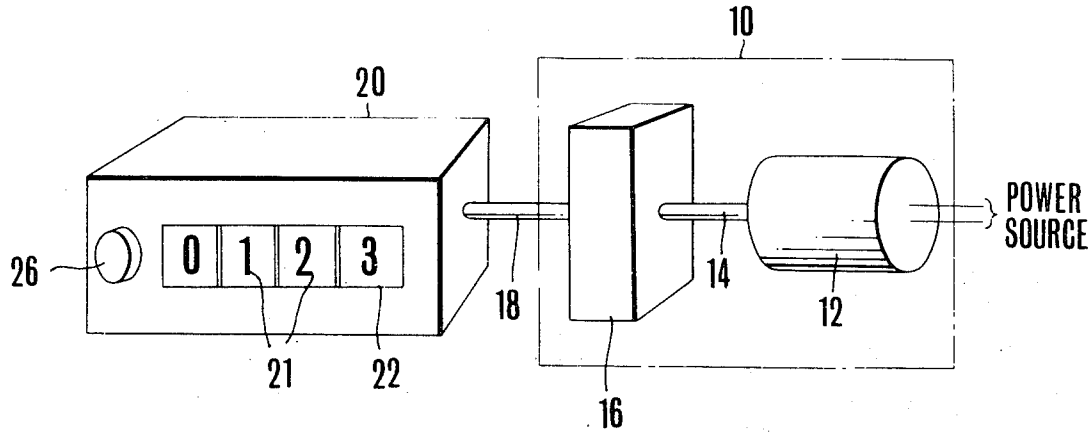
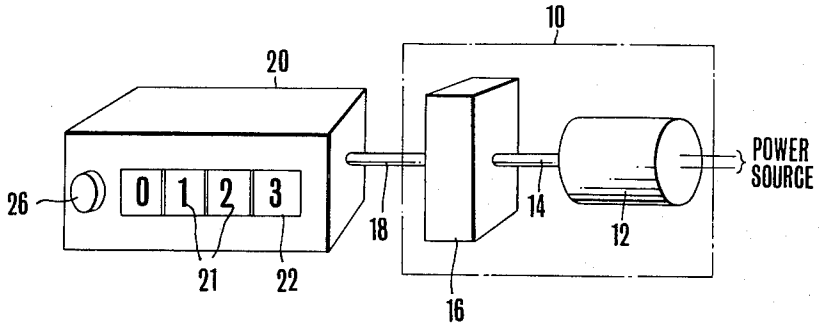


FIG. 1



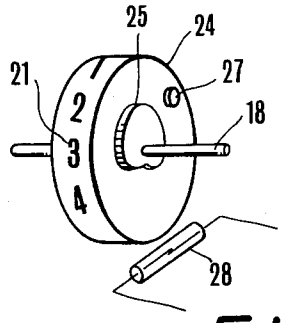


FIG. 2

FIG. 3

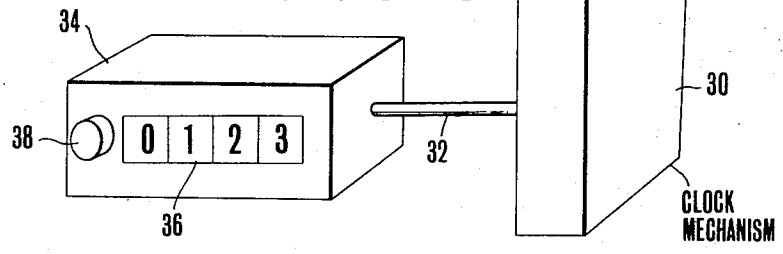
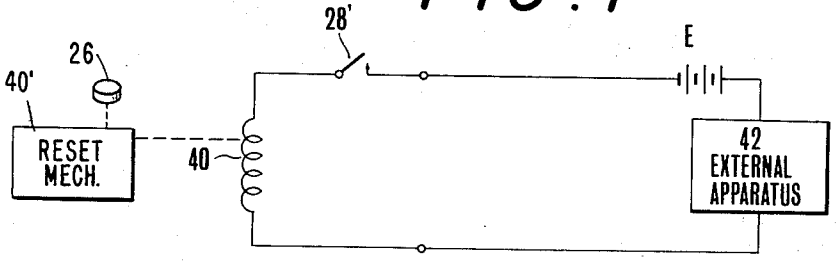


FIG. 4



NUMBER OF DAYS INTEGRATING TYPE TIME SWITCH

BACKGROUND OF THE INVENTION

This invention relates to a novel number of days integrating type time switch constructed to produce an electric signal when it counts a preset number of days, and more particularly to a number of days integrating type time switch especially suitable for the automatic collection of flat service rates or the administration of the number of days of using an instrument.

Conventional time switches are operated by clock mechanisms and are set to operate at a predetermined number of seconds, minutes or hours. For this reason, to operate them on the basis of the number of days, it is necessary to convert the number of hours into the number of days. Accordingly, it has been desired to develop a number of days integrating type time switch capable of setting any desired number of days.

In a flat rate service system such for example as a wired television broadcasting system or a wired telephone system or a flat rate electric power supply system, the service rate is calculated on the basis of a predetermined number of days irrespective of the quantity of the service supplied during the period. Notwithstanding the advantage of the flat rate service system that the service rate is calculated on the basis of the predetermined number of days, collection of the service rates requires a large number of money collectors as well as a large expense. To overcome these difficulties, it has been proposed to provide a new service system wherein customers thereof purchase special "coins" from dealers of the system and insert these coins into control devices installed in their houses for controlling the supply of the service so as to enjoy the service over a period prescribed by the special coin. In order to continue the service the control device should generate an alarm signal a short time before termination of the effective period of the coin. Since the effective date of such a coin is set relatively long, one month, three months or one year, for example, it is impossible to use time switches of the conventional design which operate on the basis of minutes or hours.

SUMMARY OF THE INVENTION

Accordingly, it is the principal object of this invention to provide a novel time switch of the number of days integrating type capable of setting a large number of days.

A further object of this invention is to provide an inexpensive digital type time switch of simple construction capable of setting any desired number of days.

Still further object of this invention is to provide a novel time switch which can be reset by a push button or by a one touch operation. With this feature, provision of an electromagnetic reset means interlocked with the reset push button enables the time switch to be reset automatically by a signal generated by itself.

Another object of this invention is to provide a novel time switch capable of setting a large number of days and hence is suitable for use in the control devices installed in the flat rate electrical service systems and control devices for collecting parking rates on the basis of one month or various monthly payments, etc.

In accordance with this invention there is provided a number of days integrating type time switch comprising

a clock mechanism operating at a constant speed, and a mechanical counter driven by the clock mechanism, the counter including a plurality of digit wheels for counting a number of days and a signal generator operated by the counter when it has counted a predetermined number of days.

The counter is provided with a manually operated reset button. In a modified embodiment, a coil is provided to be operated by a signal from the signal generator for automatically resetting the counter when it counts the predetermined number of days. The signal is used to operate an alarm informing that a predetermined time is reached at which insertion of a new coin, inspection or maintenance of various machines and apparatus should be made.

Further objects and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawings:

FIG. **1** is a diagrammatic perspective view of one embodiment of this invention;

FIG. **2** shows a perspective view of a signal generating mechanism employed in this invention;

FIG. **3** is a diagrammatic perspective view of a modified embodiment of this invention and

FIG. **4** shows a simplified connection diagram of an electric circuit used in the embodiment shown in FIG. **3.**

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The time switch shown in FIG. **1** comprises a clock mechanism **10** including an electric motor **12** connected to an AC source and a reduction gear train **16** connected to the output shaft **14** of motor **12.** Reduction gear train **16** reduces the number of revolution of output shaft **14** such that the output shaft **18** of the reduction gear train rotates at a rate of 1/10 rotation per 24 hours.

There is also provided a mechanical counter **20** driven by the output shaft **18.** The counter comprises a plurality of digit wheels **24** each marked with equally spaced apart digits **21** of **0** through **9** on its peripheral surface. These digit wheels **24** are mounted side by side on output shaft **18.** As is well known in the art these digit wheels are coupled together through shift gears (not shown) so as to rotate one step a digit wheel of the higher order by one complete revolution of a digit wheel of the lower order. Consequently, the number of days counted is displayed in window **22** of counter **20.**

At the center of one side of each digit wheel is secured a heart shaped cam **25** and the counter is constructed to reset all digit wheels to zero positions by the operation of a reset button **26,** in a manner well known in the art. As shown in FIG. **2,** a predetermined one of the digit wheels is provided with a permanent magnet **27** adapted to operate a stationary reed switch **28** installed close to the digit wheel. Thus the reed switch is operated by the permanent magnet signal to produce an electrical signal whenever the predetermined number of days has been counted.

In a modified embodiment of this invention shown in FIG. **3,** clock mechanism **30** comprises a DC motor energized from a battery, for example, or a spring motor

and speed reduction means, not shown. Again, the output shaft **32** of the clock mechanism drives the digit wheel of the lowest order of counter **24** at a rate of 1/10 revolution per 24 hours, thereby displaying the number of days counted through display window **36.**

Referring now to FIG. **4** counter **34** is provided with an electromagnetic coil **40** which is connected across a source E in series with an external apparatus **42** and a contact **28'**. The coil **40** is used to operate a reset mechanism **40'** which is also operated by a reset push button **38,** the contact **28'** being arranged to be closed when the predetermined number of days has been counted, in the same manner as in the previous embodiment. Thus, in this modification, whenever the predetermined number of days is counted, contact **28'** is closed to operate the external apparatus **42** and to energize coil **40** thereby to reset the counter automatically.

Instead of using a permanent magnet and a reed switch any suitable device may be used which can generate an electrical signal when the predetermined number of days has been counted by the digit wheels of the counter. In the case of a flat rate electric service system, the external apparatus comprises a control device which interrupts the supply of the service to the household appliances or an alarm informing that the new coin should be inserted for the continuous service.

We claim:

1. A number of days integrating type time switch comprising a clock mechanism operating at a constant speed, said clock mechanism including a constant speed motor and a gear reduction mechanism driven by said motor for converting the rotations of said motor for a 24–hour day into a decimal unit rotation, and a mechanical counter driven by said gear reduction mechanism, said counter including a plurality of decimal digit wheels for counting and indicating a number of days and a signal generator operated by said counter when it has counted a predetermined number of days.

2. The time switch according to claim **1** which further includes manual means and an electromagnetic coil means for operating a reset means, said coil being connected to an external device through said signal generator whereby when said predetermined number of days has been counted said signal generator energizes said external device and said electromagnetic coil to automatically reset said counter.

3. The time switch according to claim **1** wherein said signal generator comprises a permanent magnet mounted on one of said digit wheels and a reed switch installed close to said one digit wheel to be operated by said permanent magnet.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,789,196 Dated January 29, 1974

Inventor(s) Masao Kinemura

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

"[75] Inventors: Masao Kinemura, Matsue; Koshei Arita, Tokyo both of Japan" should be -- "[75] Inventors: Masao Kinemura, Matsue City, Shimane Prefecture, Japan --.

"[73] Assignee: Koshei Arita, Tokyo, Japan" should be -- Koshei Arita, Tokyo, Japan, a part interest --.

Signed and sealed this 10th day of December 1974.

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