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SYNCHRONIZED CLOCK SYSTEM AND SECONDARY CLOCKS THEREFOR

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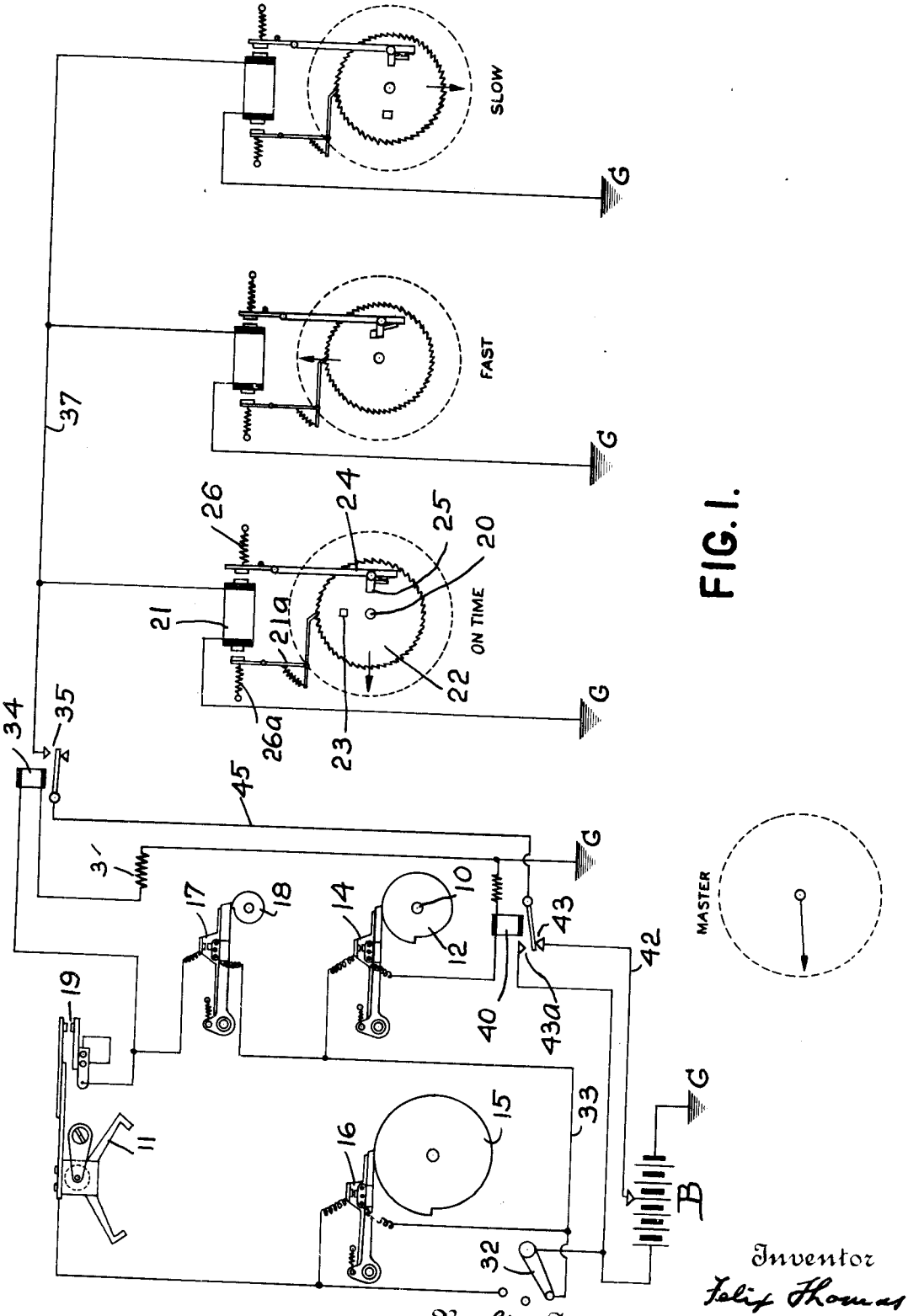


FIG. 1.

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SYNCHRONIZED CLOCK SYSTEM AND SECONDARY CLOCKS THEREFOR

Application filed May 2, 1929. Serial No. 359,752.

This invention relates to improvements in synchronized clock systems and in secondary clocks for use in such systems, and has for its object the provision of an improvement and simplification of the system and of the secondary clocks which is shown and described in the co-pending application of J. W. Bryce, Serial No. 17,683, filed March 23, 1925 and now Patent No. 1,825,575, dated September 29, 1931.

In the aforesaid application, a synchronized clock system is disclosed having secondaries of the impulse type and the secondaries were provided with means for mechanically restraining impulse advance of the clock under certain conditions.

One object of the present invention resides in the improvement of such system to provide for the effecting of all control of said clocks from the master clock over a single line circuit.

Another object of the present invention resides in the provision of an improved form of secondary clock for use in a synchronized clock system in which contacts and like devices in the secondary clocks are eliminated and in which the impulse magnet of each secondary clock functions in a dual manner to either operate in its normal way or to operate in a supplemental way to remove an obstruction to further impulse advance of the clock.

Other objects and advantages will be hereinafter set forth in the accompanying specification and claims and shown in the drawing which by way of illustration show one and what I now consider to be a preferred embodiment of the invention.

In the drawing:

Figure 1 shows a diagram of a clock system incorporating the present embodiments.

The diagram shows a master clock which is of any conventional type provided with the usual time train adapted to drive a minute arbor 10 which makes one revolution per hour. 11 is the usual verge or escapement mechanism, 12 and 15 are cams associated with the minute arbor 15 and adapted to control the opening and closing of contacts 14 and 16 respectively. There is also provided a minute cam 18 which controls the minute impulse contacts 17. For sending out the stepping up rapid or accelerating impulses quick acting contacts 19 are provided. Such contacts may be disposed so as to be controlled by the verge or escapement mechanism 11. The secondary clocks of which three are shown, include a minute arbor shaft 20 which preferably makes one revolution per hour. The shaft or arbor 20 is advanced in a step by step manner by means of a spring restored pawl device operated from an impulse magnet and cooperating with a ratchet wheel 22. 21 is the impulse magnet and 21*a* designates the spring restored pawl structure. Each secondary clock is also provided for example upon the ratchet wheel 22 with an abutment member 23. Adapted to cooperate with this abutment is a spring pressed pawl or finger which is pivotally mounted upon a pivoted arm 24 which constitutes a supplemental armature for the impulse magnet.

It will be understood that the blade spring of the pawl or finger 25 normally rocks finger 25 in a clockwise direction. A spring 26 is provided for the pivot armature member 24 which normally holds such armature in a position away from the core of the impulse magnet and preferably this spring is designed with greater tension than that of spring 26*a* so that the armature part 24 will be ineffective when the usual minute impulses are being received by magnet 21.

Connecting the master clock with the various secondaries is a single line circuit 37 and the return to the master clock is provided by a ground connection designated G. Obviously a full metallic return could be used in lieu of the ground return. 34 is the minute impulse relay which once a minute is energized so as to close relay contacts 35 and to send out minute impulses to the secondaries over line 37. The circuit for the normal minute impulse advance is traced as follows:

From ground G through the source (i. e. battery B or other source of current supply), thence via switch 32, line 33, through minute impulse contacts 17, relay coil 34 and back to ground. Energization of 34 once per minute

transmits low voltage impulses to the secondary clocks over a circuit traced as follows: From ground G through a part of the battery (thereby providing a relatively low source of voltage potential), via line 42, contacts 43 now closed, wire 45, through contacts 35 (which close once a minute) thence over line 37 to the impulse magnets of all the secondary clocks and back to battery through ground G. In this way the normal step by step advance of the clocks is secured.

Once an hour, for example for a thirty-second period before the 59th minute as is determined by the chronological condition of the master clock, contacts 16 close, thereby permitting current supply to pass to and through fast contacts 19 thereby sending a series of fast impulses at say every one second or two second intervals over the line 37 to all of the secondary clocks. When the fast impulses are received by the secondary clocks any slow clocks will be stepped ahead rapidly by the received impulse and such advance of slow clocks will continue until the abutment 23 encounters pawl or restraining finger 25. Subsequently, notwithstanding that impulses are being received by the impulse magnet, the clock will not advance beyond the 59th minute position as determined by the hands of the secondary clock because of such restraint being effected by pawl or finger 25.

It will also be understood that the clocks which are on time will also receive in their impulse magnets the fast stepping up impulses, but such clocks will not advance beyond the 59th minute position on account of the restraint imposed by pawls 25. Also all clocks that are fast and ahead of time will not advance beyond the 59th minute position on account of the restraint imposed by pawl 25.

Release of the clocks after they have been thus restrained against impulse advance is effected by and in accordance with the chronological control from the master clock in the following manner. At exactly the 59th minute as determined by the chronological condition of the master clock contacts 14 will close. Such closure of contacts 14 will energize 40 closing contacts 43*a* whereby there will be sent out to the line 37, at the 59th minute, at least one releasing impulse of relatively higher voltage. Such higher voltage impulse is sent at a time after the last of the fast impulse is sent, i. e. contacts 16 must reopen before 14 close. The impulse or impulses going over line 37 being of higher voltage cause more current to flow through the magnets 21 of the secondaries than flowed previously when low voltage impulses were being sent. This additional current flow is sufficient to cause the arm 24 to be attracted, spring 26 now being overcome so that the pawls 25 are swung clear of the abutments 23. After the pawls have been swung clear of the abutments, the spring action in the pawls causes each pawl to rest upon the top of the abutment, thereupon upon de-energization of 21 which occurs when the relay 34 is de-energized, a pawl device 21*a* again imparts a step of advance to the clocks. All mechanical restraint to advance of the clocks is now removed and the clock advance now continues until finally the pawl devices again re-assume an arresting position after the abutment 23 has passed from under the pawl.

It will be understood that only one higher voltage impulse may be sent or more than one high voltage impulse may be sent. It is only necessary that ultimately and before the rapid impulses are again sent that the high voltage of impulse supply should be cut off. Preferably one or a few of such high voltage impulses are all that are sent out.

The construction described, affords a single line circuit to all of the secondary clocks and provides for a single impulse magnet in each clock and obviates the use of controlling contacts in the secondary clocks. The magnet 21 functions to either actuate the pawl devices 21*a* only or conjointly actuate 21*a* and 24. When parts 24 of all secondaries are actuated the secondary clocks which were previously under mechanical restraint against impulse advance can again advance in synchronism with the master clock.

What I claim is:

1. A secondary clock for use in synchronized impulse type clock systems comprising an impulse magnet and dual devices operated thereby, one set of devices effecting impulse advance of the clock parts and the other set of devices effecting mechanical restraint of advance of the clock parts beyond a predetermined point of time and being displaced from said restraining position by increased energization of the impulse magnet.

2. A secondary clock for use in synchronized clock systems including an impulse magnet, pawl devices operated thereby, a ratchet device operated by said pawl devices and provided with a stopping abutment, and means adapted for cooperation with said abutment to stop advance of the ratchet device, said means being displaced from arresting position by said impulse magnet upon increased energization thereof.

3. A synchronized clock system including a master clock, a single line circuit extending to all the secondary clocks from the master clock, means in the master clock for sending out over the same common line circuit to the secondary clocks, normal impulses and more rapidly recurring stepping up impulses and including provisions for sending out certain current impulses at one voltage and another impulse at another and higher voltage, and means in the secondary clock adapted to mechanically restrain the said clock against impulse advance under certain chronological conditions of the clock and until increased

voltage is sent to the secondary from the master clock whereupon said restraint against impulse advance is removed.

4. An impulse clock movement adapted for use in a synchronized clock system comprising an impulse magnet provided with a dual armature structure, clock advancing means operable from one armature structure, and parts for restraining advance of the clock controlled by the other armature structure for displacement to non-restraining position by and upon increased energization of the impulse magnet.

5. A synchronized impulse clock system including a single line circuit from the master clocks to the secondaries which receives and transmits to said secondaries impulses of one voltage and of another voltage and including normal impulses and more rapid stepping up impulses, means including an impulse magnet in the secondary clock for imparting step by step impulse advance thereto under the influence of received impulses, means for restraining impulse advance under certain chronological conditions of the clock, said means having provisions for imposing a mechanical restraint to the advance of the clock, and means brought into operation under the influence of energization of the impulse magnet by an impulse of increased voltage for removing the mechanical restraint against advance.

6. A secondary clock for use in an impulse type of synchronized clock system including an impulse magnet for operating the clock parts, means for restraining the clock parts mechanically against advance under certain chronological conditions of the clock, and means including a supplemental armature for the impulse magnet for displacing said last mentioned means to a position in which mechanical restraint is not imposed.

7. The invention set forth in claim 6 in which the means for operating the clock parts from the impulse magnet comprises a spring restored pawl structure and in which a supplemental spring is provided for the supplemental armature and in which the spring of the spring restored pawl parts and the spring for the supplemental armature have different tensions for the purpose described.

8. A secondary clock of the impulse type suitable for single circuit operation and synchronization control from a master clock, including an impulse magnet for advancing the secondary clock, means in the secondary clock for mechanically restraining the clock against advance beyond a certain point of time as determined by the secondary clock and while advancing impulses are received by such magnet, and means called into action by an impulse of higher voltage for removing said restraining means from restraining position to thereafter permit continued advance of the clock under the driving action of the impulse magnet.

9. A secondary clock of the impulse type suitable for single circuit operation and synchronization control from a master clock and including in combination an impulse magnet which irrespective of the chronological condition of the secondary clock is connected to always receive current impulses from the single circuit, means in the secondary clock for mechanically restraining the clock against advance beyond a certain point of time so that a fast clock can be retarded and a clock when slow will not be advanced beyond the definite time point by received impulses, and means susceptible to an impulse of increased voltage for removing the mechanical restraining means from restraining position to thereafter permit resumed advance of the secondary clock.

10. A secondary clock of the impulse type, operated over a single circuit by unidirectional impulses and having an impulse magnet associated therewith to advance the clock, said clock including a mechanical restraining means which is removed from restraining position by the aforesaid same impulse magnet upon receipt of an impulse which is unidirectional with all of the other advancing impulses, but which impulse has another distinguishing characteristic, said mechanical restraining means including means for mechanically blocking the clock against advance beyond a determined time until the releasing impulse is received by the impulse magnet.

11. An impulse type of secondary clock including an impulse magnet connected to a single line circuit to receive all impulses sent thereover, means in the secondary clock for mechanically restraining its advance beyond a predetermined time point, and means susceptible to an impulse of increased voltage received by the same impulse magnet for displacing the restraining means from restraining position to non-restraining position.

12. A secondary clock of the impulse type including a single impulse magnet, means operated thereby for advancing the clock, mechanical restraining means for mechanically restraining the clock against advance beyond a determined time point, means for operating said mechanical restraining means by said single impulse magnet, the aforesaid single impulse magnet being operated always by uni-directional impulses and by certain of said impulses being effective to advance the clock by the first mentioned means, said single impulse magnet receiving a special kind of energization by another of said impulses which is uni-directional with said previously mentioned clock advancing impulses, but which other impulse has another distinguishing characteristic so

that upon the special kind of energization of the aforesaid single impulse magnet the aforesaid mentioned restraining means is removed from restraining position permitting the clock to continue its advance by the first mentioned means.

In testimony whereof I hereto affix my signature.

FELIX THOMAS.