May 20, 1930. T. S. CASNER 1,759,540

SELECTOR

Filed Feb. 14, 1927

FIG. 1.

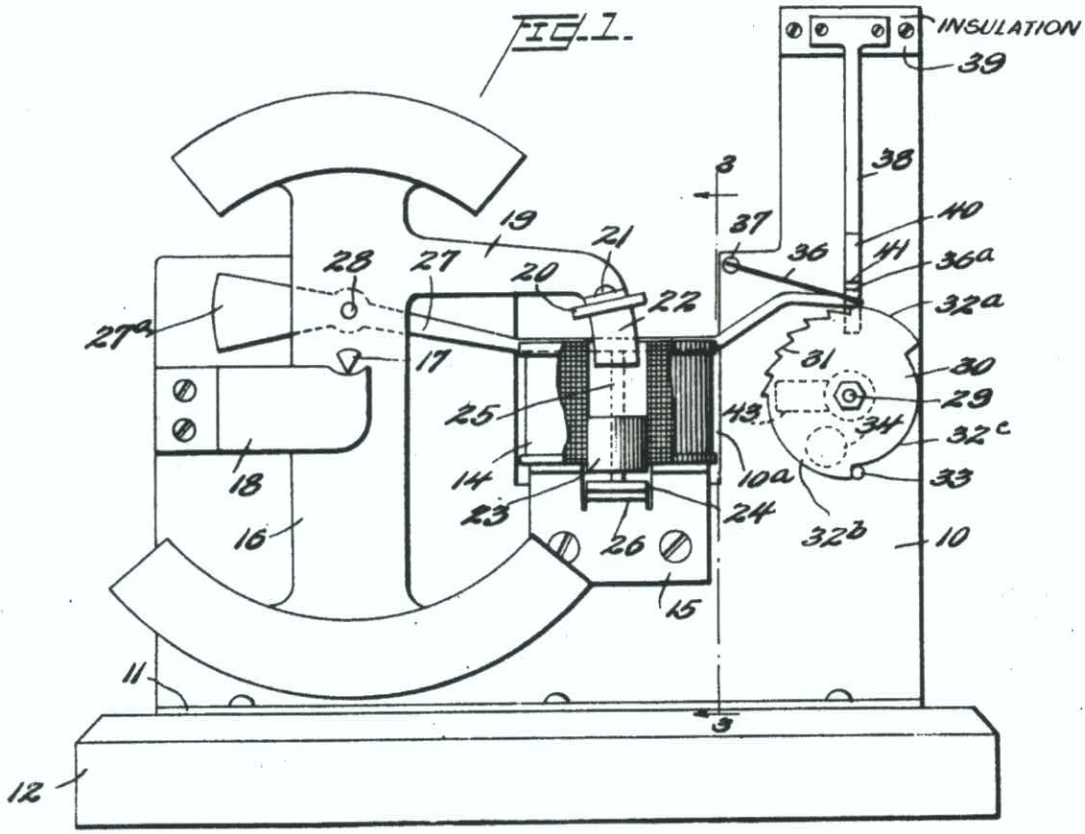


FIG. 2.

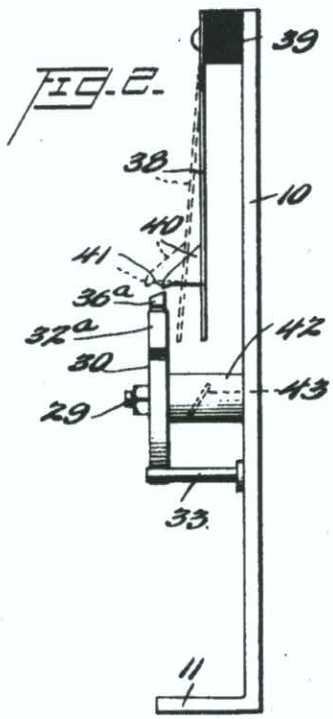
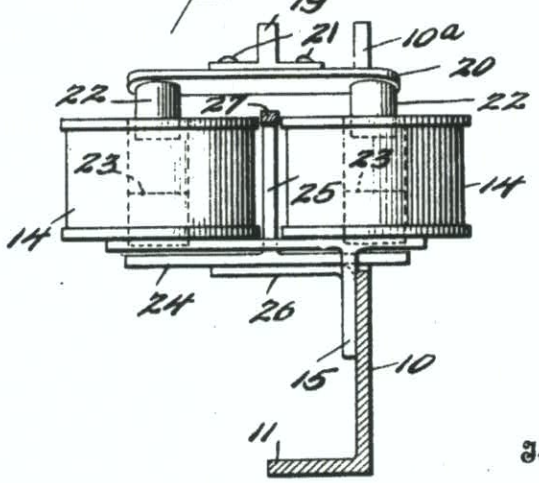


FIG. 3.



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UNITED STATES PATENT OFFICE

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SELECTOR

Application filed February 14, 1927. Serial No. 168,136.

This invention relates to an electrical decoding device and in particular to a device for correcting clocks in accordance with a code of radio electrical impulses, such for instance as those which are sent out by the United States Government from its time signal stations.

The signals as sent out by the Government comprise a plurality of series of impulses, each of about .3 second duration and each starting at the beginning of a second, followed after each series by silent intervals, each of approximately five seconds duration, except the last, which is five seconds longer, immediately preceding the beginning of the next succeeding minutes, the impulse for the second immediately preceding the beginning of the second half, that is, the 30th second, of each minute being omitted.

In my co-pending application, Serial No. 131,753, filed August 26, 1926, I have disclosed one form of electro-mechanical device which is adapted to operate directly, through a radio receiving and amplifying set, in response to a code of impulses, in such manner as to complete a certain cycle of operations and give an indication when the correct signal impulses are received, but to operate ineffectually when other than the correct impulses are received. The operation of that device generally may be said to have hinged upon the function of a gravity biased toothed disk in association with certain other devices, including an impulse controlled electromagnet operating a push rod to move the toothed disk. A shield positioned upon the disk at the operating end of the push rod compelled the push rod to move a certain distance before it might engage the disk and thus prevented actuation of the disk in response to stray impulses, static or otherwise, of shorter duration than the correct code impulses. Also, the toothed wheel was provided with a number of teeth upon which the push rod was required to act before a second step in the cycle could be reached. This guarded against unauthorized operation, even though stray impulses of proper individual duration might be received, unless a predetermined number of impulses should be received as provided by the code. Further, in even the first two safeguards proved ineffectual, the device embodied means for preventing unauthorized operation if a stray impulse was received during subsequent silent intervals of predetermined duration as provided by the code.

Whereas the operation of the above mentioned device depended largely upon the function of a gravity biased toothed disk, it may generally be said that the operation of the present device depends primarily upon the function of an inertia member, though the present device in addition avails of the use of a gravity weighted toothed wheel in association with the inertia member.

The objects of the present invention are then substantially the same as those of the co-pending application. The first and principal object is the provision in a simple, preferably unitary, unit of apparatus, of a device which will perform both the functions of a detecting device and a decoding or selecting device. A second object is the provision of such a device which will be highly reliable for the desired purposes, which will function accurately in response to the authorized code of electrical impulses and none other. A further object is the provision of a device which will embody all of the desirable features set out but which, at the same time, will be simple in its physical embodiment and, therefore, inexpensive to manufacture and maintain.

Further objects and various features of novelty residing in the present disclosed embodiment of the invention will be apparent to those skilled in the art from the following description and accompanying drawings, in which:

Figure 1 is a front elevation of a device embodying this invention;

Figure 2 is a right end elevation of Fig. 1; and

Figure 3 is a fragmentary section taken on the line 3—3 of Fig. 1.

Referring more particularly to the drawings, wherein like reference characters refer to like parts throughout the several views, 10 denotes a standard provided with a lateral

base flange 11 adapted to rest upon and be secured to a base block 12 or other suitable member serving to support the standard 10 in a substantially vertical position.

A solenoid 14 preferably comprising a pair of coils is supported on a bracket 15 attached to the standard 10. When the solenoid is of the double coil type it would extend further in front of the standard 10 than is desirable it should, having certain constructional advantages in mind, so a window 10ª is formed in the standard to accommodate both the coils and certain parts operated thereby.

Adjacent the solenoid a pendulum 16 is suspended for oscillation on knife edge journals 17 supported at one side on the standard 10 and at the other side on a bracket 18 secured to and extending from the standard. The pendulum is preferably of the compound type in order that it may be made sufficiently small and sturdy to meet the requirements of its use.

The pendulum is provided with a lateral arm 19 having a yoke 20 secured thereto in any suitable manner as by screws 21 passed through holes in flanges formed on the end of the arm 19 and into the yoke. Solenoid cores 22 are secured to the yoke 20 in position to operate within the coils of the solenoid 14. It will be understood that the windings of the solenoid cores are suitably connected to receive at stated times when time signals are being sent out, amplified signal impulses directly through any suitable receiving and amplifying device. Reference may be made to the above mentioned application Serial No. 131,753 for a description of one system of connections which may be employed, it being apparent that other similar systems will serve the present purposes. Whatever the system employed, the solenoid coils will receive signal impulses in regularly recurring order or frequency. The pendulum is constructed to have a frequency of free oscillation identical with the impulse frequency so that it will change from a condition of rest into oscillation with a given amplitude under the repeated attraction of the cores 22 by the coils of solenoid 14. The exact number of impulses required to be received before the pendulum attains the required amplitude of swing is not material but the size and mass of the pendulum is so determined in relation to the attraction of the solenoid 14 for the cores 22, that the pendulum will not function until a sufficient number of impulses have been received to give assurance that impulses of the stated frequency are being received.

The solenoid windings are also provided with fixed cores 23 at their lower ends. An armature 24 carrying intermediate the coils a rod 25, is supported directly beneath the fixed cores 23 upon a bracket 26. This bracket 26 may be formed as an extension of the bracket 15 and is so located as to prevent the moving armature 24 from falling out of the field of attraction of the solenoid.

A push rod 27 pivoted, and substantially balanced by a weight 27ª, upon a pin 28 carried by the pendulum 16, extends between the coils above the end of the rod 25.

A rotatable wheel or disk 30 is supported upon a journal 29 fixed in the standard 10. The wheel 30 has a sector provided with teeth 31, joined by a raised smooth sector 32ª at one end and by a depressed smooth sector 32ᵇ at its other end. A recess 32ᶜ is interposed between the outer ends of the sectors 32ª and 32ᵇ. This recess 32ᶜ has shoulders formed at each end adapted to abut against a stop pin 33 fixed in the standard 10 to limit the movement of the toothed wheel 30. A weight 34 is secured to the wheel 30 in any suitable manner and serves to bias the same to a given zero position, such as that in which it is shown in Figure 1. The free end of the push rod 27 rests lightly upon the peripheral surface of the wheel 30, and when the pendulum attains a sufficient amplitude of vibration the push rod is adapted to advance the wheel 30 in a clock-wise direction by engagement with the teeth 31 in succession from the edge of sector 32ª to the edge of sector 32ᵇ. A holding dog or pawl in the form of a flexible blade 36 is mounted in the slot of a pin 37 rigidly secured to the standard 10. If desired, of course, the pawl 36 may swing freely about the pin. This pawl rests upon the top surface of the end of the push rod 27 in such position that it will catch in the notch of the tooth from which the push rod is receding and hold the wheel 30 against retrograde movement.

A spring-blade 38 is secured to an insulating block 39 attached to the standard 10. Near its lower end this flexible blade carries a member 40 having an electrical contact 41 thereon. The contact 41 is electrically connected to the spring-blade 38, and if desired, the member 40 and the contact 41 may be made of a single metallic member for this purpose. A second contact 36ª is carried upon or above the end of the pawl 36 in such position that when the push rod 27 is raised above the surface of the wheel 30 the contact 36ª is moved into the path of the contact 41. The wheel 30 is provided with a sleeve or hub 42 carrying the cam-blade 43. The cam-blade 43 is mounted in such a position on the sleeve 42 with relation to the toothed sector of the wheel 30 that it will engage the lower end of the spring 38 to move the contact 41 in an axial direction when the wheel 30 has been moved by the push rod 27 into a given position which will be designated its second position. Also the number of teeth 31 provided on the wheel 30 is such that the wheel will be moved into this second position at the end of a period of time corresponding approximately to the

definite period of duration of the shorter silent intervals according to the code of time signals. Within a time shorter than this stated period the wheel will not be advanced sufficiently for the cam to act upon the spring-blade 38 and after a time longer than the stated period the wheel will have moved the cam 43 past the spring-blade 38.

The pin 25 acting in response to movement of the armature 24 when a signal is received, raises the end of the push rod from the surface of the wheel. This carries the contact 36ª into the path of the contact 41 and, if the cam 43 has been moved into proper position by the movement of the wheel 30 to press the spring-blade 38 and contact 41 outwardly, the contacts 36ª and 41 will be connected to close an electrical circuit adapted to control the setting of a clock or to control any other desired mechanism.

The operation of the device will be readily understood from the preceding disclosure. After a sufficient number of regularly recurring impulses have been received by the solenoid 14, the pendulum 16 will have been influenced from a condition of rest into a condition of oscillation in sufficient amplitude to step the wheel in clockwise direction by engagement of the push rod 27 with the teeth 31. At each impulse, however, the armature 24 carrying rod 25 is pulled upwardly and the rod 25 raises the push rod 27 above the surface of the wheel 30 so that it will have no action upon the same. Upon the cessation of the signals, as during one of the shorter silent intervals, the rod 25 will not be moved to raise the push rod 27 because the armature 24 will not be attracted during this interval. The pendulum 16 during this time, however, continues its oscillation due to its inertia in sufficient amplitude to step the wheel 30 around. If the silent interval is of 5 seconds duration, the push rod will move the wheel 30 and cam-blade 43 into just the correct position for the cam to move the spring-blade 38 and contact 41 outwardly. Then, when an impulse is received at the beginning of the next succeeding second (and minute) after the silent interval, the push rod 27, pawl 36 and contact 36ª will be raised to cause the contact 36ª to engage the contact 41 to close the circuit. The toothed-wheel 30 will, during the time the push rod and pawl are raised from engagement with its teeth, move downwardly under the influence of the weight 34 until the shoulder at one end of the recess 32ᶜ engages the stop pin 33. This position of the wheel is its zero position and the wheel is ready to be again acted upon in the manner just set forth.

It will be presumed that suitable mechanism is provided to cause the reception of impulses to be discontinued when the contacts 36ª and 41 have been connected to close the circuit so that no further effective operation of the device will be had. If, however, this arrangement is not provided no improper setting can be obtained for the reason that during any one of the three successive silent intervals (supposing the first setting operation to have been attained during the first of the four shorter silent intervals provided by the code), the above described operation will be repeated and any setting obtained will be a correct one, while during the 10 second silent interval directly preceding the beginning of the next hour, no effectual setting will take place as the cam 43 will have been moved and held, by the repeated action of the push rod against the last of the teeth 31, beyond the spring-blade 38 so that the reception of the impulse at the beginning of the hour will not close the contacts. It is to be noted that the reverse movement of the cam-blade will not influence the contact 41 toward the contact 36ª because the cam will engage the spring-blade 38 in its other side and move it in the opposite axial direction.

From the above description it will be seen that I have provided a device which is extremely simple in its construction yet one which is calculated to prove highly reliable and accurate in its operation. While I have thus described and illustrated one embodiment in this invention, it will be understood that the invention is not thus limited but may have various other embodiments within the scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a selective system responsive to a code of electrical impulses, in combination, a rotatable toothed disk, a weight secured to said disk tending to keep it in a given zero position, a push rod actuated in response to code impulses engaging the teeth of said disc to move it from its zero position, a pawl disposed above the end of said push rod and cooperating with the disc to hold said disk in advanced position, a contact carried by said pawl, a spring blade, a second contact carried by said spring blade adapted to connect with the contact on said pawl, a cam actuated by movement of said disk for moving said spring blade with its contact toward the pawl contact in a predetermined position of the disc, and means responsive to the impulses for lifting said push rod and pawl above the teeth of the disk to cause said contacts to connect when said cam moves the spring blade, said weight meanwhile acting to return said toothed disk to its zero position.

2. A device as claimed in claim 1 in which said cam consists of a flat blade inclined along its face to its plane of movement, whereby the spring blade is moved to closing position when the cam rotates past it in one

direction but is moved away from closing position when the cam rotates past it in the return direction.

3. In a selective system responsive to a code of electrical impulses, in combination, a rotatable toothed disk, a push rod actuated in response to code impulses engaging the teeth of said wheel to turn it, a pawl to hold said disk when moved by said push rod, a contact carried above the free end of the push rod, a second contact normally positioned out of the path of said first contact, means controlled by movement of said disk to a predetermined position for moving the second contact into the path of the first contact, and means responsive to the impulses for lifting said push rod to cause said contacts to connect while said second contact is in the path of the first.

4. In a selective system responsive to a code of signals including a series of equally spaced electrical impulses followed by a silent interval of a definite duration, in combination, a rotatable disk biased toward a given zero position, a switch contact, an inertia member, a switch contact operatively connected to said disk set into motion in response to the impulses and adapted during a given interval corresponding in length to the silent interval to move said disk to a second position where it is effective to bias said switch contact, a second contact and means operated in response to the impulses for preventing said inertia member from moving said disk to the second position provided an impulse is received during the given interval, said means also acting to move said second contact into engagement with the first contact when the first contact is in biased position and a signal impulse is received.

5. In a selective system responsive to a code of signals including a series of equally spaced electrical impulses followed by a silent interval of a definite duration, in combination, a rotatable disk biased toward a given zero position, a switch contact, a pendulum operatively connected to said disk having a natural period of vibration corresponding to the frequency of the impulses in the series set into motion in response to the regularly recurring impulses, and adapted during a given interval corresponding to the silent interval to move said disk to a second position where it is effective to bias said switch contact, a second contact and means operated in response to the impulses for preventing said pendulum from moving said disk to the second position provided an impulse is received during the given interval, said means also acting to move said second contact into engagement with the first contact when the first contact is in biased position and a signal impulse is received.

6. In a selective system responsive to a code of signals including a series of equally spaced electrical impulses, in combination, a switch, a circuit controlling member biased to a given zero position but operative when moved to a second position to condition said switch for closure, an inertia member operatively connected to said circuit controlling member set into movement by the regularly recurring impulses and continuing its movement after the impulses have ceased and means for returning said circuit controlling member to zero position on reception of each impulse, whereby said circuit controlling member will be moved to its second position only at the end of a certain time after cessation of the impulses.

7. A selector responsive to a code of electric impulses consisting of series of uniformly spaced impulses separated by silent intervals, in combination, a pendulum having a frequency of oscillation substantially equal to the frequency of the impulses, means momentarily acting on the pendulum upon reception of each impulse adapted to impart an oscillation thereto of predetermined amplitude only after a certain number of impulses have been received, a member moved step-by-step by the pendulum from an initial position, means returning said member to initial position upon reception of each impulse, whereby said member will move to a predetermined position only during one of said silent intervals, and a circuit controller actuated only when said member is in said predetermined position and an impulse is received.

8. A selector responsive to a code of impulses consisting of series of uniformly spaced impulses separated by silent intervals, in combination, a normally deenergized mechanism, means responsive to said impulses acting to store energy in said mechanism and adapted to effectively energize the same after reception of a certain number of impulses, whereupon said mechanism will remain effectively energized for a certain time after cessation of the impulses, a member operated by said energized mechanism from an initial position to a second position during a time substantially equal to one of the silent intervals, means for returning said member to initial position upon reception of each impulse, whereby said member will attain said second position only at the termination of one of the silent intervals, a switch and means for actuating the same only when said member is in said second position and an impulse is received.

9. In a selective system responsive to a code of signals including a series of equally spaced electrical impulses followed by a silent interval of a definite duration, in combination, a rotatable disc biased toward a given zero position, a switch contact, an inertia member operatively connected to said disc set in motion in response to the impulses

and adapted during a given interval to move said disc to a second position where it is effective to bias said switch contact, a second switch contact and means operated in response to the impulses for moving said second contact into engagement with the first contact when the first contact is in its biased position and a signal impulse is received.

10. In a selective system responsive to a code of signals including a series of equally spaced electrical impulses followed by a silent interval of a definite duration, in combination, an electro-magnet adapted to be energized directly in response to the impulses, a movable armature for said electro-magnet adapted to be moved when the magnet is energized, an inertia pendulum connected to said armature and adapted to be set into motion in response to the regularly recurring impulses, an electric switch, means operated by said pendulum tending to close said switch, further means operated by said electro-magnet for rendering said first mentioned means ineffective so long as impulses are being received in regularly recurring order, and means permitting said first mentioned means to effect the closing of said switch only at the end of a certain time after cessation of the impulses.

11. In a selective system responsive to a code of signals including a series of equally spaced electrical impulses followed by a silent interval of a definite duration, in combination, an electro-magnet adapted to be energized directly in response to the impulses, a movable armature for said electro-magnet adapted to be moved when the magnet is energized, an inertia pendulum connected to said armature and adapted to be set into motion in response to the regularly recurring impulses, a switch, means operated by said pendulum tending to close said switch, and further means operated by said electro-magnet for rendering said first mentioned means ineffective so long as impulses are being received in regularly recurring order but allowing its operation during the silent period. said second mentioned means upon receipt of an impulse following the definite silent interval cooperating with said first mentioned means to complete the closure of the switch.

12. In a selective system responsive to a code of signals including a series of equally spaced electrical impulses followed by a silent interval of a definite duration, in combination, a solenoid adapted to be energized directly by the impulses, a movable core for said solenoid, an inertia pendulum connected to said core and adapted to be set into motion by a number of regularly recurring impulses, a rotatable wheel constantly biased to a given zero position and having a toothed sector on its periphery, a push rod operated by said pendulum adapted after the pendulum has attained sufficient amplitude of oscillation to engage the teeth of said wheel and advance it step by step, a movable armature for said solenoid adapted to move said push rod off said wheel and allow the wheel to return to zero position when an impulse is received, a switch, said push rod in its off position tending to close said switch, said push rod during a silent interval being effective to move said wheel to a second position by continued oscillations of said pendulum, and a member operated by said wheel tending to close the switch in the second position of the wheel, said armature moving said push rod to off position to complete the closing of said switch when and only when an impulse is received at the end of the definite silent interval.

In testimony whereof I hereunto affix my signature.

THADDEUS S. CASNER.