Dec. 21, 1943. A. H. MILLER 2,337,486

SELECTIVELY OPERATED CIRCUIT CONTROLLING DEVICE

Filed Aug. 29, 1941 2 Sheets-Sheet 1

FIG. 1

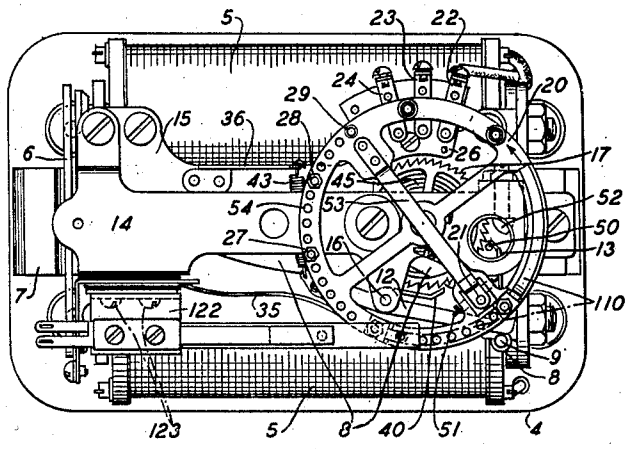


FIG. 2

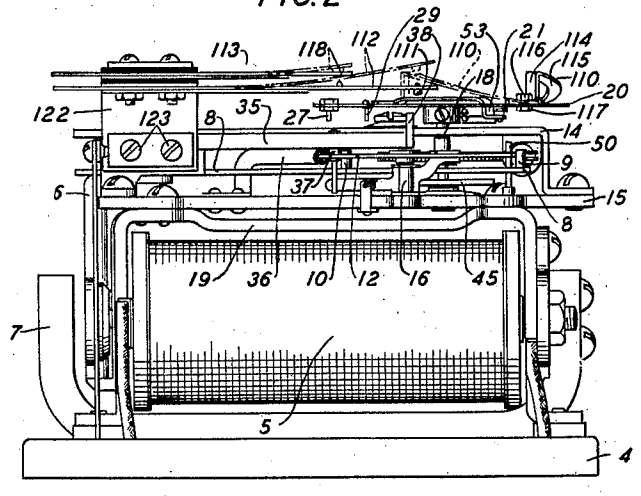
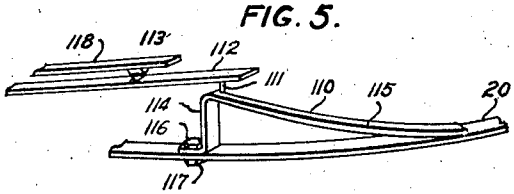


FIG. 5.



INVENTOR
A. H. MILLER
BY J. MacDonald
ATTORNEY

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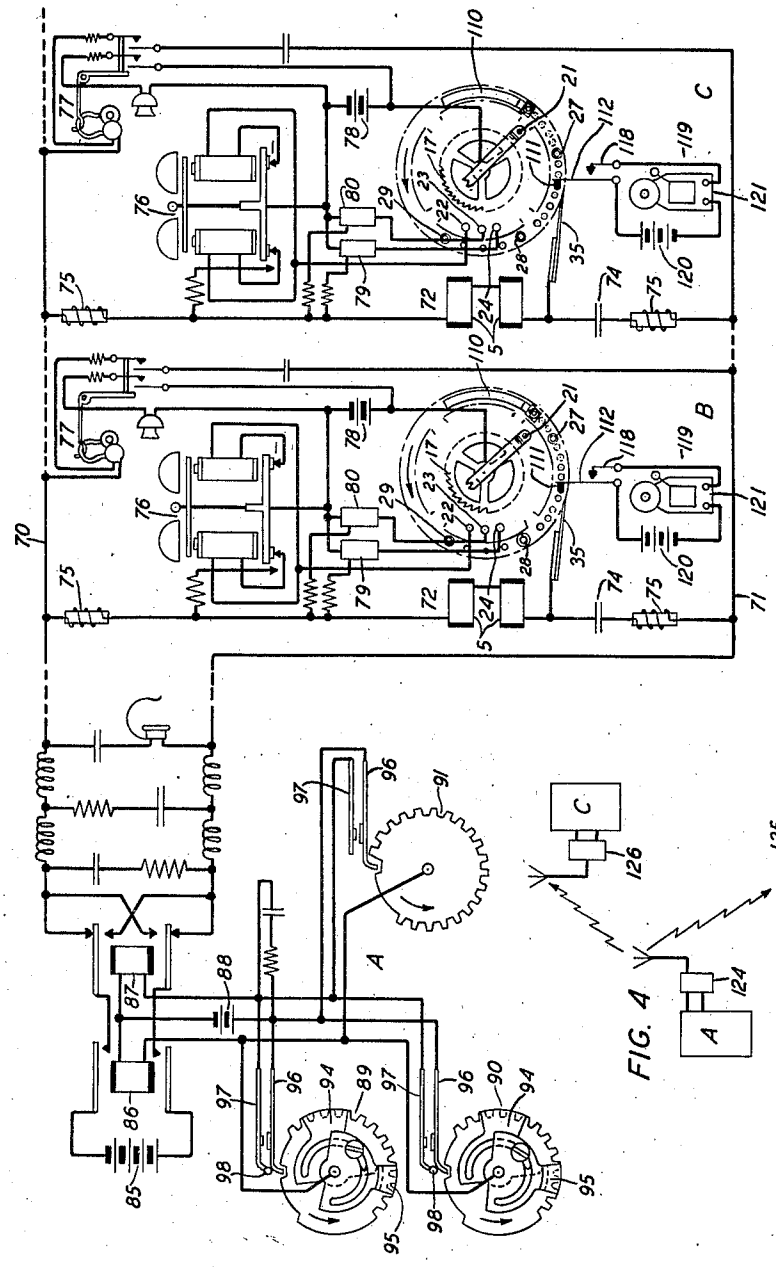

FIG. 3

FIG. 4

INVENTOR
A. H. MILLER
BY J. MacDonald
ATTORNEY

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SELECTIVELY OPERATED CIRCUIT CONTROLLING DEVICE

Albert H. Miller, Bayside, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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2 Claims. (Cl. 177—332)

This invention relates to selectively operated circuit controlling devices of the step-by-step operated type and which are commonly known as selectors.

The object of the invention is to provide improvements in a device of the type above mentioned to make the device suitable for use in an emergency signaling system.

A feature of the invention resides in a cam provided in the selector to control the operation of an emergency signal device.

In the drawings,

Figs. 1 and 2 are respectively a top view and a side elevational view of the selector with the invention embodied therein.

Fig. 3 is a schematic diagram of a signaling system showing an application of the invention.

Fig. 4 is a diagrammatic illustration of a radio signaling system in which the invention is found useful; and,

Fig. 5 is an enlarged view in perspective of a portion of the wheel of the selector and showing the cam mounted on the wheel and a set of contacts operated by means of the cam.

The selector is found useful in selective signaling systems comprising a central signaling station and a plurality of substations to be selectively signaled by the central station and provides means for controlling the operation of an emergency signaling device at each substation when an emergency signal for all substations is sent from the central station.

The improved selector may follow the general form of the selector illustrated and described in Joseph C. Field Patent 1,343,256, issued June 15, 1920, and reference may be had to that patent for an understanding of the general form and arrangement of most of the parts and the general manner in which the selector may be operated. To simplify the description and understanding of the invention and not in the sense of limiting the invention to that particular form, it will be assumed that the invention is embodied in a selector of the type shown in the above-mentioned patent.

The selector is so constructed and arranged that it may be operated rapidly and accurately in response to alternating current impulses and comprises a polarized electromagnetic driving device, a centrally pivoted armature, a stepping or actuating pawl driven by means of the armature and a wheel operated in an advanced movement by means of the pawl. The wheel carries a wiper contact and is rotated in an advanced movement to carry the wiper contact into engagement with the desired one of a group of fixed contacts, the wheel being advanced one step for each impulse received by the electromagnetic driving device. A return spring is provided in each selector to return the wheel to starting position and releasable holding means are also provided to hold the wheel in various advanced positions against the action of the return spring.

As shown in the drawings 5—5 designate the windings of the electromagnetic device, 6 the centrally pivoted armature which is polarized by means of the permanent magnet 7. Attached to the armature 6 is an elongated S-shaped arm 8 carrying at its free end a pin 9 and at a point intermedate its ends a pin 10, both pins being adapted to engage a pivoted lever 12 carrying at its outer end a stepping pawl 13. The coils 5—5 and the cores on which they are wound are supported in a bracket 19 mounted on a base 4. Carried by the supporting bracket 19 is a frame comprising upper and lower members or plates 14 and 15 fastened together and between which there is a pin 16 upon which the lever 12 is pivoted in position to move the stepping pawl 13 into engagement with a ratchet wheel 17 mounted on a shaft 18 journaled in the frame members 14 and 15. By means of a spring 45 the ratchet wheel 17 is normally retained in a position with a pin thereon (not shown) but which is supported on the under surface of the plate 14. The stepping pawl 13 is normally held against the stop pin 50 supported on the plate 15, the pawl 13 being normally held in this position by means of a spring 51 which is attached at one end to the pawl 13 and at the other to the pivoted lever 12, an adjustable pin 52 mounted in a projection of the plate 14 limiting the forward travel of the pawl 13. By means of a spring 43 secured at one end to the lever 12 and at the other to an arm 36 mounted on the plate 15, the lever 12 is normally held in the position shown in Fig. 1 and with the stepping pawl 13 out of engagement with the ratchet wheel 17. The pins 9 and 10 engage the pivoted lever 12 upon opposite sides of the pivot axis or pin 16 and upon opposite faces in such manner that with each movement of the armature 6, in either direction the stepping pawl 13 will cause a one step advance movement of the ratchet wheel 17.

Mounted upon the shaft 18 carrying the ratchet wheel 17 and movable therewith is an apertured wheel 20 carrying a contact spring 53 in the free end of which is a contact 21 adapted to cooperate

with a plurality of fixed contacts 22, 23 and 24 mounted upon an insulating plate 26 secured to the plate 15. Holding pins 27, 28 and 29 carried by the wheel 20 are adapted to cooperate with a holding spring 35 insulatingly mounted on the plate 14. The holding pin 29 is located in a definite position on the wheel 20 while the holding pins 27 and 28 are made removable so that they may be secured in any of the holes 54 provided in the rim of the wheel 20, the location of the holding pins 27 and 28 depending on the particular code of impulses to which the selector is to be made responsive. The spring 35 normally bears against the insulating knob or roller 37 carried by the lever 12 and is so tensioned or bowed that in the neutral position of the armature 6 the free end of the spring 35 which is provided with a curved projection 36 extends inside the circumference of a circle described by the holding pins 27, 28 and 29 in the movement of the wheel 20. As the armature 6 moves, however, in response to current impulses through the windings 5—5 of the electromagnets, the movements of the lever 12 will move the projection 36 outwardly beyond the periphery of the wheel 20 and when the ratchet wheel 17 is moved by means of pawl 13, in accordance with current impulses supplied to the windings 5—5, and to a position where one of the pins 27, 28 or 29 is opposite the projection 36, and the selector is deenergized, the spring 35 will move inwardly to bring the projection 36 into engagement with that pin to hold the wheel 20 in the position to which it has been advanced. A holding pawl 40 is provided to engage the ratchet wheel 17 and prevent dropping back of the ratchet wheel 17 during the time that the armature 6 is traveling from one extreme position to the other in response to a change in polarity of the energizing current.

The wheel 20 may be stepped around to bring the contact 21 into selective engagement with the fixed contacts 22, 23 and 24. Each of these contacts may be in control of a circuit including a bell or other signal device. The selector may therefore be operated to selectively control the signaling devices served by the fixed contacts 22, 23 and 24.

In the present invention, the wheel 20 is equipped with a cam of particular form and construction and a pair of normally open contact springs is mounted on the selector to be operated by means of the cam.

Selectors of the general type above described and not having the improvement provided in the present invention are commonly used in selective signaling systems employed in train dispatching. The selectors are located in substations commonly called way stations of the system and may be operated by code impulses sent from a central station, the code impulses being sent by operation of suitable code sending keys or by operation of some other suitable impulse code sending device. When the impulses are sent all selectors connected to the signaling system operate to advance the wheels 20 so that the contacts 21 are moved toward the fixed contacts of the selectors. The impulses are sent in groups with an appreciable pause between each group. The selector having its holding pins arranged for the code signal sent will be finally advanced to a position where the contact 21 engages one of the fixed contacts 22, 23 or 24. The other selectors will return to normal position during the pauses between the groups of code impulses. By use of the selectors it is therefore possible to selectively control the operation of signaling devices at the way stations.

In the present invention a cam 110 is secured to the upper surface of the wheel 20 in the selector and is rotated by means of the wheel 20 into sliding engagement with a knob 111 provided on the under-surface of a relatively long leaf spring contact 112 of a pair of contacts 113. The cam 110 is an incline type cam having an upwardly projecting portion 114 and a downwardly sloping finger portion 115. The finger portion 115 slopes downwardly from the upper end of the portion 114 and into engagement with the wheel 20 and is curved to follow the form of the rim of the wheel 20. The lower end of the portion 114 terminates in an angularly disposed apertured foot portion 116 which is secured to the wheel 20 by means of a bolt 117 which extends through the aperture in the foot portion 116 and through one of the holes 54 in the rim of the wheel 20. The cam 110 is so mounted on the wheel 20 that an almost complete cyclic movement of the wheel 20 is required to bring the cam 110 from starting position to a position in which it will engage the knob 111. The normal position of the cam 110 is shown in full lines in Figs. 1 and 2 and the final operating position in dotted lines in these figures. The wheel 20 rotates in the direction indicated by the arrow in Fig. 1 and therefore counter-clockwise. The selector may be operated to bring the cam 110 from the full line position shown in Figs. 1 and 2 to the dotted line position shown in these figures. During this movement, the finger portion 115 is gradually moved in successive steps under the knob 111 and gradually flexes the relatively long spring finger contact 112 into engagement with the shorter spring contact 118 of the pair of normally open contacts 113. The spring contacts 112 and 118 as shown in Fig. 3 may be in a local circuit 119 including a source of current supply 120 and a signal device 121.

The contacts 113 are insulatingly supported as shown in Figs. 1 and 2 on an angle bracket 122 which is supported by means of the screws 123 on a downwardly extending side portion of the plate 14. The position of the contact springs 113 relative to the cam 110 is such that the cam 110 will not only cause closing of the contact 112 against the contact 118, but will also cause upward flexing of the contacts 112 and 118 when the high point on the cam 110 is brought almost directly under and in engagement with the knob 111. The wheel 20 has a tendency to rotate back to normal position under action of its return spring 65 between each successive impulse applied to the selector. In this brief clockwise movement of the wheel 20, the extent of movement is not sufficient to cause opening of the contacts 113 since the cam 110 is not carried out of engagement with the knob 111 and the upward flexure of the contact 113 under the action of the cam 110 has built up sufficient spring tension in the contacts 112 and 113 to hold the contacts in engagement during the slight return movement of the wheel 20. The local circuit 119 will therefore remain closed during this brief period.

The cam 110 is made with the long sloping finger portion 115 sloping downwardly in the direction of the forward rotation of the wheel 20 and following the curvature of the rim of the wheel and is so arranged on the wheel 20 and relative to the knob 111 that when the wheel 20 is rotated to bring the cam 110 to the position shown in Fig. 5, the contacts 113 will be closed

before the cam 110 reaches its final operated position and that from then on until the cam 110 reaches its final operated position, the contacts 113 will be flexed upwardly to accommodate the rising form of the cam. It will be seen therefore that even when the wheel 20 rotates slightly backward between pulses, and the cam 110, in effect, slides under the knob 111, the contacts 113 still remain closed to keep the local circuit 119 closed and the bell 121 still operating. If the cam 110 were not made with the relatively long sloping finger portion 115 and the contacts 113 were not flexed by the cam 110, the contacts 113 might open on a slight return movement of the wheel 20 and the local circuit 119 would be opened and the bell signal 121 would stop ringing until the cam closed the contacts 113 again.

The selector embodying this invention may be used as shown in Fig. 3 in the selective signaling system. In this figure 70 and 71 designate line wires extending from a central transmitting or dispatcher's station A to a plurality of receiving or way stations B and C. At each way station there is a selector 72, the windings 5—5 of which are connected in bridge of the line wires and in series with a condenser 74 and two impedance coils 75—75. Each way station is also equipped with a signaling bell 76 under control of the selector thereat and a telephone set 77 included in a normally open bridge of the line wires. A single battery 78 in each way station may serve for operating the signal bell 76 and for furnishing current for talking purposes. At each way station there may be additional signaling devices such as 79 and 80 which may be exactly like the signaling bell 76 controlled by the selector and operated from the local battery 78.

At the transmitting station A there is a main battery 85 for supplying current for operating the selectors at the way stations. This battery is normally disconnected from the line wires and may be connected therewith by the operation of a relay 86. A pole-changing relay 87 is provided for reversing connections from battery 85 to the line wires. The relays 86 and 87 are connected in parallel and in circuit with a local battery 88, and are controlled by the impulse transmitters 89, 90 and 91. The transmitter 89 is for calling way station B, 90 for calling way station C, and 91 for calling both way stations in case of emergency. The transmitters are adapted to rotate in the direction of the arrow and are provided with teeth to control the operation of contact springs 96 and 97 in circuit with the pole-changing relay 87. Certain of the teeth in the transmitters 89 and 90 are blocked out by means of one or both adjustable cams 94 and 95 to obtain the particular number and combination of effective teeth for calling purposes. The free end of contact spring 97 of transmitters 89 and 90 is bent downward and carries at the extremity thereof an insulating roller 98 which, as the transmitter rotates is adapted to ride on top of the cam 95 and separate contacts 96 and 97 during the time of passage of the cam 95, and the contact spring 96 of each transmitter is normally out of engagement with the rotatable disc thereof and during the revolution of the disc of each transmitter, contact spring 96 is in engagement with the disc maintaining the circuit of relay 86 closed to connect battery 85 to the line wires 70 and 71. It is to be understood that when potential of either polarity is applied to the line for a sufficient interval, the condenser 74—74 becomes charged, whereupon the flow of current through the electromagnet coils 5—5 ceases and the selector magnets release, allowing the wheel 20 to return to normal position. These transmitters will operate to cause the sending of signal impulses divided into three groups with appreciable pauses between each group of impulses. Upon the sending of these impulses the selectors at the way stations will step their wheels 20 around in the direction indicated by the arrows, to move the wiper contacts 21 towards the fixed contacts 22, 23 and 24. The holding pins 27 and 28 on the selector at station B are so set that this selector will reach a contact-making position when the transmitter 89 is operated, the holding pins serving to hold the wheel 20 against return to normal position during the interdigital pauses between groups of impulses. All other selectors in the system will return to normal position during the interdigital pauses when the transmitter 89 is operating. The selector at way station C has its holding pins set so that this selector will reach a contact-making position when the transmitter 90 is operated. All other selectors will return to normal position during the interdigital pauses. The signaling device 76 at way station B will therefore be operated when the transmitter 89 is operated and the signal device 76 at way station C will be operated when transmitter 90 is operated. Other transmitters (not shown) may be provided at the central station A to selectively cause the selectors at the way stations B and C to advance to the contacts 23 and 24.

When the transmitter 91 is operated all selectors 72 in the system will be operated to step the wheels 20 around as far as they can go. Since the transmitter 91 has no cams 94 and 95 provided therein and will not operate to cause interdigital pauses to occur in the series of impulses sent and the impulses sent will be of sufficient number to step the wheels 20 around to bring the cams 110 into engagement with the knobs 111, the signal devices 121 at all way stations will be brought into operation to indicate that an emergency signal is being sent. The system, including selectors of this invention may therefore be used in selectively signaling way stations from a central station and in simultaneously signaling all such way stations to indicate an emergency condition.

The improved selector might also be used in a radio system for bringing into operation signal devices at remote stations to indicate that an SOS call is about to be sent. In this case as shown in Fig. 4, a central station A might send a radio signal to substations B and C to indicate an emergency condition. Station A in this case would be equipped with a transmitter 91 shown in Fig. 3 and the substations B and C would be equipped with the improved selector 72 and the signal devices 121, the only difference between the systems shown in Figs. 3 and 4 being that in Fig. 4 the central station is equipped with radio transmitting apparatus indicated by the box 124 to transmit the emergency signal by radio, and the substations B and C are equipped with radio receiving apparatus indicated by the boxes 125 and 126 to receive the radio signals and cause operation of the selectors 72 in accordance therewith. Radio signals sent to cause operation of the selectors to indicate an emergency might be continued over a relatively long period to insure operation of the selectors even when storm and other atmospheric conditions are such that radio signaling is difficult. To

take care of such conditions it is contemplated that the transmitter 91 would be arranged to send the impulses for a long enough time for the interfering atmospheric conditions to change to a more favorable condition for radio signaling. It has been found, for instance, that when the signals are continued for about three or four minutes during storm conditions the signals will get through from the transmitting station to the substations at some time during this period. The transmitter 91 in this case would be arranged to continue in operation for a long enough period to insure stepping around of the cam 110 to a circuit closing-condition for the contacts 112 and 113 at some time during the sending of the emergency signal impulses.

What is claimed is:

1. In a step-by-step operated selector comprising a wheel operating against a return spring for said wheel, and electromagnet means to advance-rotate said wheel in step-by-step movements, in combination, a cam mounted on the rim portion of said wheel and having a long curved finger portion pointing in the direction of advance movement of said wheel, said finger portion following the curvature of the rim of said wheel and gradually sloping upwardly from the plane of said wheel, a set of leaf springs supported above the plane of said wheel and arranged in normally open contact position, one of said leaf springs being relatively long and extending into the path of movement of the higher portion of said cam, said cam being operable to pass part way under said leaf springs to move said leaf springs into closed contact condition and still further flex said leaf springs to build up contact pressure therein, and the slope of the finger portion of said cam and the flexure produced in said leaf springs by means of said cam being such that a one-step return movement of said wheel will not release said leaf springs from closed contact condition.

2. In a step-by-step operated selector comprising a wheel operating against a return spring for said wheel, and electromagnet means to advance-rotate said wheel in step-by-step movements, in combination, an L-shaped cam mounted on the side of said wheel and having an end portion extending normal to the plane of said wheel, a curved finger portion continuing from the outer end of said end portion and gradually sloping downward to the plane of said wheel and in a direction of advance movement of said wheel, a set of leaf springs supported above the plane of said wheel and having normally open contact points, one of said leaf springs extending beyond the contact point thereon and into the path of movement of the higher portion of said curved finger portion of said cam and arranged to gradually ride up on said curved finger portion of said cam when said wheel is advance-rotated to bring said cam under said leaf springs, said cam operating to pass part way under said leaf springs to first move said leaf springs into such position that the contact points thereof are in closed circuit condition and then still further flex said leaf springs to build up spring pressure therein, and the slope of said finger portion of said cam and the flexure produced in said leaf springs by means of said cam being such that during a slight return movement of said wheel the contact points on said leaf springs will remain in closed circuit condition due to the follow-up spring pressure developed in said leaf springs by means of said cam.

ALBERT H. MILLER.