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SYSTEM OF ELECTRICAL CONTROL.

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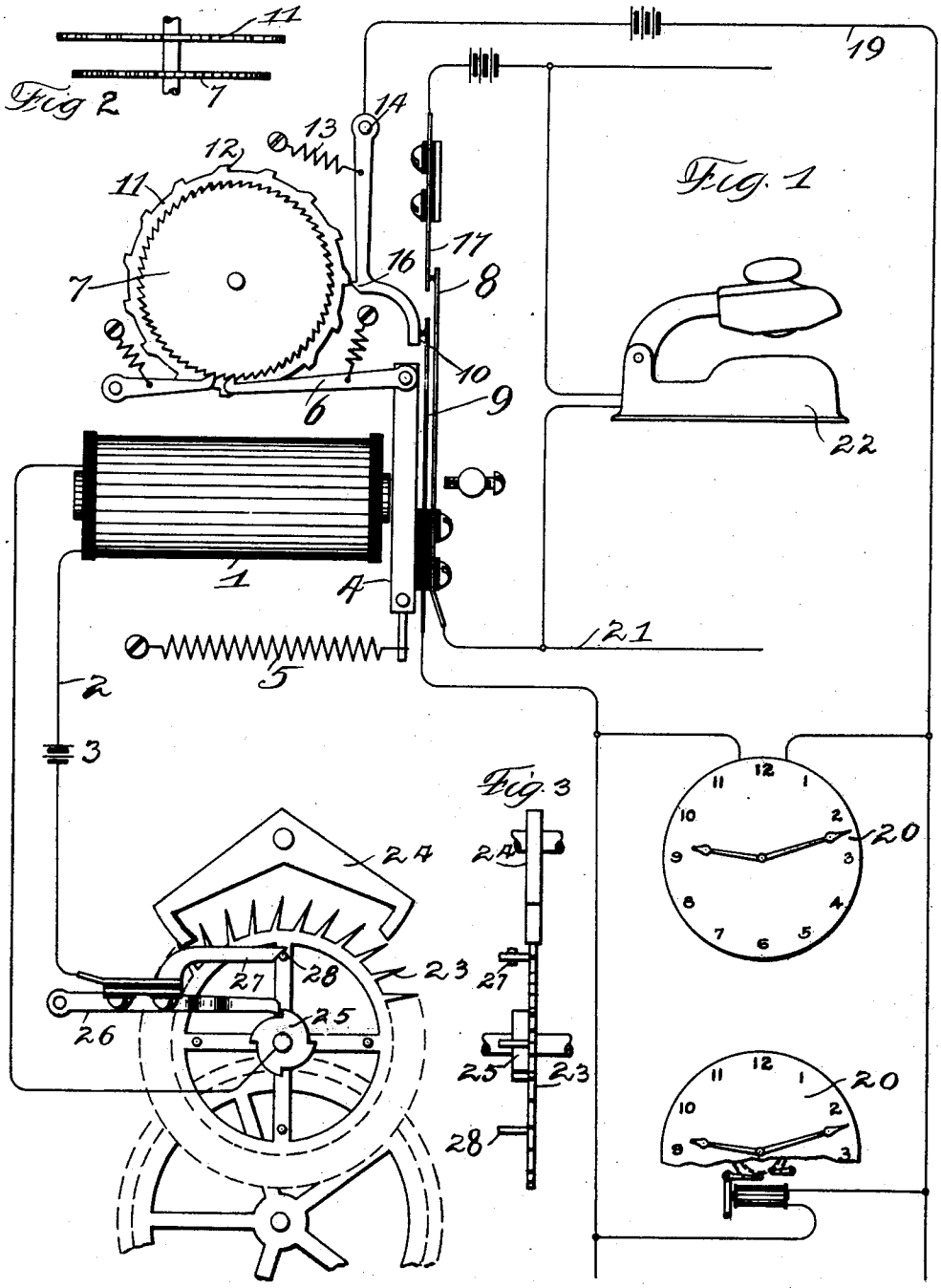
1,019,112. Patented Mar. 5, 1912.



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SYSTEM OF ELECTRICAL CONTROL.

1,019,112. Specification of Letters Patent. Patented Mar. 5, 1912.

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To all whom it may concern:

Be it known that I, ERNEST E. YAXLEY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Systems of Electrical Control, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to relay controlled circuits and circuit closing mechanism, and has for one of its objects the provision of improved mechanism whereby one electromagnet may operate a plurality of switches at relatively different intervals, and for another of its objects the provision of switching mechanism that may be periodically operated by a prime mover without imposing extra load upon the prime mover when operated.

My invention has other objects and advantages which will be well understood by reference to the accompanying drawing showing one embodiment, the preferred embodiment, and in which—

Figure 1 is a diagram showing the apparatus of my invention and a set of circuits that may be associated therewith; Fig. 2 is a plan view of a part of the mechanism, and Fig. 3 is a side elevation of another part of the mechanism.

Like parts are indicated by similar characters of reference throughout the different figures.

The electromagnet or relay winding 1 is included in a circuit 2 that is preferably normally open, a source of current 3 and a circuit closing switch which desirably operates at even periods, and the preferred form of which will later be set forth. Said electromagnet winding is coöperatively related with an armature 4, which is moved against the force of a retractile spring 5 when said winding has circuit closed therethrough. The armature 4 is in actuating relation with a pawl 6 that is employed to turn a toothed wheel 7, the spring 5 operating upon the pawl each time the armature 4 is released to turn said wheel a step, the pawl riding over a tooth each time armature 4 is attracted to enable the pawl to have fresh tooth engagement, whereafter it may again be operated by the spring 5 to rotate the wheel 7 another step, said pawl thus preferably having regularly recurring fresh tooth engagement in order that the wheel 7 may be moved step by step at regular intervals.

Two switch members or armature switches 8 and 9 are adapted to be operated by the armature 4 when attracted. As shown in the embodiment of the invention illustrated the switch member 8 is actuated each time the armature 4 is attracted. While the switch 9 is also preferably actuated each time the armature is attracted, I cause some of its movements to be inconsequential by automatic adjustment of its complemental contact in order that it may sometimes be in position to be engaged by the contact 9 and at other times to be out of such position. In carrying out this feature of my invention, I preferably employ a wheel 11 that is coaxial with and rotates with the ratchet wheel 7 and is provided with a series of peripheral cams or teeth 12 that are shown as being evenly distributed in order that my apparatus may be adapted to certain classes of service. The cams or teeth upon the wheel 11 move the contact structure 10 against the force of a spring 13 and place said element 10 within reach of the switch spring 9. Said spring 13 constantly presses the contact 10 upon the periphery of the wheel 11, whereby said contact is removed from the range of operation of the spring 9 each time said contact 10 escapes a cam or tooth 12. In the embodiment of the invention illustrated, the contact element 10 is in the form of a swinging arm pivoted at 14 and having a sharp nose 16 adapted to ride upon the cams or teeth 12, and preferably so positioned with respect thereto that the contact 10 will be moved in position to be engaged by contact 9 simultaneously with the engagement of the contact 8 with its complemental contact 17. By means of my invention the same magnet may operate a plurality of switches with different frequencies. As shown the contacts 8 and 17 are engaged four times as frequently as the contacts 9 and 10, there being four times as many teeth upon the wheel 7 as there are upon the wheel 11. It thus requires four steps in the rotation of the wheel 7 each time a tooth 12 is to position the contact 10 so that it may be engaged by the armature switch contact spring 9. While the switches 8 and 9 engage their contacts 17 10 with the rela-

tive frequencies stated, I do not wish to be limited to these relative frequencies, nor to the more frequent contact engagements of the switch element 8 as compared to the contact engagements of the switch element 9.

Fig. 1 of the drawing illustrates a very important use to which my invention may be put, there being shown one circuit 19 including secondary clocks 20 and the switch parts 9 and 10, and a distinct circuit 21 including a time stamp 22 and contacts 8 and 17. By energizing the winding 1 four times a minute, the time stamping characters of the device 22 are adjusted four times a minute, while the secondary clocks 20 are operated once a minute, relative frequencies with which the devices 20 and 22 depending upon the relative numbers of teeth upon the wheels 7 and 11 as will now be understood. By means of my invention each circuit 19 and 21 does not require an individual relay, the single relay that operates the pawl 6 serving to control both circuits. It is obvious that additional circuits may also be controlled by the same relay by placing wheels similar to wheels 11 with teeth or cams in suitable number, and causing these added wheels to govern switching mechanism that directly control the additional circuits.

The preferred form of mechanism that I employ for governing the circuit of the magnet winding 1 includes a spring driven verge wheel 23, a verge 24, a cam structure 25, a cam lever 26, a switch arm 27, constituting one terminal of the circuit for magnet 1, and coöperating contact pins 28 constituting multiple related terminals of said circuit complemental to the aforesaid terminal.

The cam element 25 periodically permits the cam lever 26 to fall putting the contact arm 27 into engagement with a contact pin 28. In the embodiment of the invention illustrated, the verge wheel 23 is supposed to make one revolution each minute and as the cam structure 25 is shown as being coaxial with and in fixed relation to the verge wheel, said cam structure is provided with four cam projections or teeth, spaced equal distances apart, and serving to actuate the cam lever 26 four times each minute, which lever in turn gradually raises the switch member 27 four times each minute to positions where the switch member may fall into contact making engagement with a presented pin 28 when the lever 26 escapes a cam.

There are four pins 28 mounted upon and electrically connected with the verge wheel 23 and through the verge wheel with the magnet winding 1, said verge wheel thus in itself constituting a circuit terminal of which the pins 28 constitute multiple related branches serving better to afford connection between the verge wheel and switch member 27. The pins 28 are so positioned that each time the lever 26 falls a pin will be within striking distance of the contact 27.

The portion of the apparatus now being described is preferably so designed as not to increase the load upon the spring motor or other prime mover, employed to turn the verge wheel, whenever the element 27 makes contact. This portion of the apparatus is also preferably so designed as to reduce the portion of the load contributed by the switch actuating mechanism to a minimum. The latter object is gained by locating the cam device or wheel 25 upon or coaxial with the shaft of the verge wheel, making it of small size and so shaping the cams that the lever 26 will be raised step by step through equal distances while riding upon each cam. Thus the friction load at 25, in addition to being small, is constant for each beat of the clock or spring motor.

The verge, verge wheel, cam element, cam lever, switch arm and contacts 28 are so interrelated that four times in each revolution of the verge wheel a beat of the motor will position a pin 28 beneath the switch arm 27 just before the cam lever drops to permit the arm 27 to engage the presented pin 28. The end portion of the arm 27 is desirably the part that engages the pins 28, and in order that the arm 27 may add no load to the clock or spring motor, this end portion slopes so as slightly to push upon the verge wheel in the direction in which it is rotating, the degree of the pushing force equaling, if not exceeding, the extra load occasioned by the switch closure. In order that the arm 27 may be free to have the stated pushing action, the cam lever is not immediately permitted to engage one cam after escaping another, the cam lever thus being permitted to fall after its escaping movement thereby to pull the arm 27 farther down after said arm has engaged a pin. The cam lever 26 is thus held in suspense until the next beat occurring after the lever 26 has escaped a cam. When this next beat occurs the lever 26 completes its dropping movement and in so doing carries the switch arm 27 down, said switch arm then exerting the required amount of push upon the verge wheel.

By the mechanism just described as firm a contact may be made at 27 and 28 as desired, the load occasioned by the lever 26 and the parts it moves being uniform and therefore amply compensated by a suitable increase in the power of motor.

While I have herein shown and particularly described one embodiment of my invention, it is very obvious that changes may be readily made in such embodiment without departing from the spirit of the invention. I do not therefore wish to be limited to the precise details of construction shown, but

Having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

1. A system of electrical control including a magnet, means for intermittently energizing the same, two switches operated thereby and mechanism also operated by the magnet and serving to make unequal the relative frequencies with which the switches are operated.

2. A system of electrical control including a magnet, means for intermittently energizing the same, two switches each possessing two contacts, said magnet serving to operate a contact of each switch, and mechanism for advancing and withdrawing a contact complemental to one of the magnet actuated contacts whereby the relative frequencies with which the switches are effectively operated are made to differ.

3. A system of electrical control including a magnet, means for intermittently energizing the same, two switches each possessing two contacts, said magnet serving to operate a contact of each switch, and mechanism operated by the magnet for advancing and withdrawing a contact complemental to one of the magnet actuated contacts whereby the relative frequencies with which the switches are effectively operated are made to differ.

4. A system of electrical control including a magnet, means for intermittently energizing the same, two switches each possessing two contacts, said magnet serving to operate a contact of each switch, and a cam or toothed wheel coöperatively related with a contact complemental to one of the magnet actuated contacts and serving to advance and withdraw said complemental contact to render the frequencies with which the switches are operated unequal.

5. A system of electrical control including a magnet, means for intermittently energizing the same, two switches each possessing two contacts, said magnet serving to operate a contact of each switch, and a cam or toothed wheel operated by the magnet and coöperatively related with a contact complemental to one of the magnet actuated contacts and serving to advance and withdraw said complemental contact to render the frequencies with which the switches are operated unequal.

6. A system of electrical control including a driven cam, a contact member mechanically coupled therewith, a cam lever or member engaging the cam, and a switch member carried by the cam lever or member and permitted to drop by the cam into engagement with the aforesaid contact, said switch member exerting propelling action upon said contact in the direction of movement of said contact.

7. A system of electrical control including a driven cam, a contact member mechanically coupled therewith, a switch member operated by the cam and serving to bring it into engagement with the aforesaid contact, said switch member exerting propelling action upon said contact in the direction of movement of said contact.

8. A system of electrical control including a driven cam, a contact member mechanically coupled therewith, a switch member operated by the cam and permitted by the cam to drop into engagement with the aforesaid contact, said switch member exerting propelling action upon said contact in the direction of movement of said contact.

9. A system of electrical control including a traveling contact, a switch member, and means for raising the switch member from the contact and permitting it to fall upon the contact, said switch exerting propelling action upon the contact in the direction of movement of the contact.

10. A system of electrical control including a verge wheel carrying a contact, a cam moved by the verge wheel, a switch member raised and lowered by the cam and adapted to engage the place of contact carried by the verge wheel, said switch member exerting propelling action upon the verge wheel in the direction of its rotation.

11. The combination with a clock, of a contact piece rotated thereby, a coöperating contact member, movable into and out of the path of said contact piece, means for intermittently moving said contact member out of the path of said contact piece, the co-engaging surfaces of said contact piece and contact member being so formed that propelling action is exerted by the contact member on the contact piece in the direction of motion of the latter.

In witness whereof, I hereunto subscribe my name this fourth day of September A. D. 1909.

ERNEST E. YAXLEY.

Witnesses:
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