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CIRCUIT CONTROLLING DEVICE

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REISSUED

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The present invention relates in general to circuit controlling devices, and more in particular to devices of this character which include a counting function which is necessary in order to properly co-relate a sequence of operations with a related sequence in respect of their numerical values. The object may be stated to be the production of a simple and highly efficient mechanical device of this character.

Referring to the drawing, Fig. 1 is a side view of the device, Fig. 2 is a front view, and Figs. 3 and 4 are schematic circuit diagrams illustrating how the device may be used in practice.

As shown in Fig. 2, the device comprises two stepping mechanisms supported in a common frame. The left-hand stepping mechanism, Fig. 2, also shown in Fig. 1, comprises essentially a magnet 2, an armature 3, a pawl 4, a ratchet wheel 5, and a holding detent 6. The right-hand stepping mechanism is the same. The mechanical construction may be substantially the same as shown in U. S. patent to Erickson, No. 1,794,888, granted March 3, 1931. Hence it will not be necessary to go further into details.

There is a shaft 10 extending transversely of the frame as seen in Fig. 2. The ratchet wheel 5 is rotatably supported on the shaft 10 and has a hub on which are mounted certain circuit elements. These comprise two slip rings 14 and 15 and two contact springs 16 and 17. Spring 16 is electrically connected with slip ring 15 and spring 17 with slip ring 14.

Connections are extended to the two slip rings 14 and 15 by means of two brushes 18 and 19, seen clearly in Figs. 1 and 2. These enable the springs 16 and 17 to be rotated always in the same direction.

The ratchet wheel 12 of the right-hand stepping mechanism is also rotatably mounted on shaft 10, and has a hub 11, on which is secured an arm 13. This arm carries an insulating bushing 20, which in the normal position of the device lies between and separates the two contact springs 16 and 17.

It will be seen now that if the left-hand stepping mechanism is operated, the hub carrying springs 16 and 17 will be rotated, so that on the first step these springs will leave bushing 20 and will make electrical contact with each other. The effect of this is to bridge together the brushes 18 and 19. The brushes 18 and 19 may thus be used to close a circuit for initiating some desired operation, which will continue as long as the circuit remains closed. However, the right-hand mechanism may now be operated

by some agency, usually related to the operation which has been initiated, with the result that the hub 11 carrying arm 13 will be rotated, and in the same direction as springs 16 and 17. When the steps taken by the right-hand mechanism equal those taken by the left-hand mechanism the bushing 20 will again separate springs 16 and 17 and the circuit including brushes 18 and 19 will be opened.

The utility of the device will be better appreciated by consideration of several circuit arrangements in which it is used. These arrangements shown in Figs. 3 and 4, will now be described briefly.

Fig. 3 shows a scheme for automatically starting and stopping an escalator. The reference character 30 indicates the escalator, and 31 is a motor for driving it. At the foot of the escalator there is arranged a treadle or hinged step 32 in such a way that each passenger seeking to use the escalator must necessarily pass over it. Upon being depressed by the weight of a person stepping on it, the treadle 32 will close a circuit for magnet 2, which is the stepping magnet of the left-hand stepping mechanism shown in Fig. 2. At the top of the escalator there is a similar treadle 33, which is momentarily depressed by each person leading it. The treadle 33 controls a circuit for magnet 21, which is the stepping magnet of the right-hand stepping mechanism shown in Fig. 2. There is also a relay 34, which controls the motor 31. Relay 34 is included in circuit with the springs 16 and 17. To simplify the drawing, the slip ring connections to these springs have been omitted.

Assume now that people approach the escalator to be carried up to the next floor. As each person passes over treadle 32 an impulse is transmitted to magnet 2 and after each impulse terminates the ratchet wheel 5 and hub carrying springs 16 and 17 will be advanced one step. Upon the first step being completed, the springs 16 and 17 will close, and the circuit of relay 34 will be completed. Relay 34 accordingly pulls up and starts motor 31. The escalator is now running. As the passengers arrive at the top, each of them will step on treadle 33, thus sending an impulse to stepping magnet 21. The right-hand stepping mechanism therefore begins to operate also and the ratchet 12 and hub 11 will rotate arm 13 in pursuit of the springs 16 and 17. As long as passengers keep on arriving at the escalator close enough together so that there is always someone on it, the number of steps taken by the left-hand stepping mechanism will be greater

than the number taken by the right-hand mechanism, and springs 16 and 17 will remain closed. However, in a period when no more passengers arrive, impulses to magnet 2 will cease, but the
 5 impulses to magnet 21 will continue until all the passengers have left the escalator. When the last passenger leaves, the impulses received by the two stepping magnets 2 and 21 will be equal, and the arm 13 will catch up with springs 16 and 17, separating them again by means of bushing
 10 20. This deenergizes relay 34 and stops the escalator.

Referring now to Fig. 4, this circuit drawing shows how the invention may be used as the essential part of an automatic regenerative impulse
 15 repeater. In the drawing 44 is a conductor over which incoming impulses are received, while 45 is the conductor over which it is desired to transmit a corresponding number of outgoing impulses. Also 42 is an impulse generating relay. The other parts are the same as explained hereinbefore and bear the same reference numbers. The arrangement requires, however, that the stepping magnet 21 be supplied with a pair of
 20 break contact springs, labeled 40 and 41, for controlling the circuit of relay 42.

Assume now that a series of impulses is received over conductor 44. Magnet 2 responds and rotates springs 16 and 17 step by step. When
 30 the first step is completed, springs 16 and 17 make contact, completing a circuit for relay 42. This relay energizes and closes a circuit for stepping magnet 21. Upon energizing, magnet 21 opens the circuit of relay 42 at contact springs 40 and
 35 41. Relay 42 therefore falls back and breaks the magnet circuit, with the result that the magnet is deenergized to advance ratchet 12 and arm 13, and again close springs 40 and 41. This operation continues as long as springs 16 and 17 remain closed, relay 42 and magnet 21 functioning
 40 as an automatic stepping arrangement. Each time relay 42 operates it sends an impulse over outgoing conductor 45.

Assuming now that the incoming impulses
 45 cease, the advance of springs 16 and 17 will stop. The operation of magnet 21 and relay 42 will continue, however, until the arm 13 brings its bushing 20 into position to separate springs 16 and 17. When this occurs the number of im-
 50 pulses transmitted over the outgoing conductor 45 will equal the number received over incoming conductor 44.

In a repeater as described in the foregoing, the transmission of impulses starts at once, but the
 55 arrangement is also capable of use in register sender systems for example where the transmission has to be delayed. It is merely necessary to insert a normally open contact in the circuit of relay 42, as for instance at the point X, which
 60 contact is closed by appropriate means at the time the transmission is to start. The left-hand stepping mechanism will then function as a register, and the other stepping mechanism will function as a sender to transmit impulses in accordance
 65 with the setting of the register.

Having described the invention, what is considered to be new and is desired to be protected by Letters Patent will be set forth in the following claims.

What is claimed is:

1. In a circuit controlling device, two stepping mechanisms, a pair of contact members rotated by one mechanism, and means rotated by the other stepping mechanism for mechanically controlling the engagement of said contacts.
2. In a circuit controlling device, a pair of contact members rotatable about an axis, a member controlling the engagement of said contact members and rotatable on the same axis therewith, and two stepping mechanisms for rotating said contact members and said controlling member, respectively.
3. A circuit controlling device as claimed in claim 1, characterized by the provision of brushes and slip rings for extending connections to the contact members, whereby said members may always be rotated in the same direction.
4. In a circuit controlling device, a pair of contact members rotatable about an axis, a control member rotatable about the same axis and having means for separating said contact members when the angular position of the control member bears a predetermined relation to the position of the contact members, means for advancing the contact members to a new position, thereby closing said contact members, and means for advancing said control member a like amount to again open said contact members.
5. In a circuit controlling device, two rotatable elements having a common axis of rotation, means for rotating either element independent of the other, a circuit adapted to be completed through the first element and excluding any portion of the second element, and non-conducting means included in the second element arranged to open said circuit when the angular positions of said elements correspond to equal degrees of rotation.
6. In a circuit controlling device, a ratchet wheel, an electromagnetically actuated armature and pawl for driving said wheel, a second ratchet wheel, an electromagnetically actuated armature and pawl for driving said second ratchet wheel, a pair of contact springs attached to said first wheel but insulated therefrom, and a member attached to said second wheel for separating said contact springs.
7. In a circuit controlling device, a shaft, two ratchet wheels rotatably mounted on said shaft, two stepping magnets for supplying power for driving said two ratchet wheels, respectively, a pair of contact springs secured to one of said ratchet wheels, a member attached to the other ratchet wheel for mechanically separating said contact springs when the said wheels are in positions corresponding to equal degrees of rotation, and means for energizing either stepping magnet independent of the other.

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