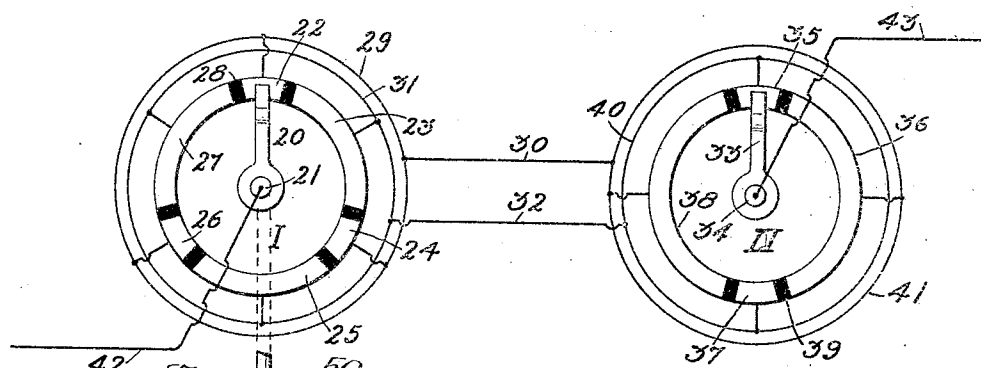
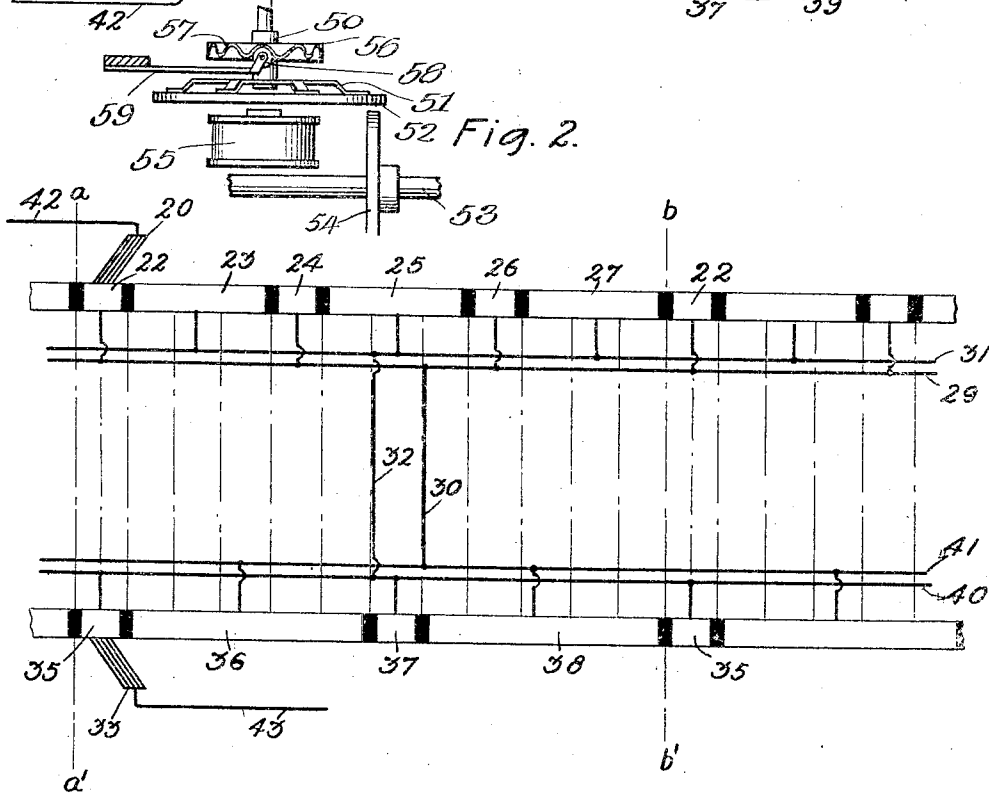


A. E. LUNDELL.
CIRCUIT INTERRUPTING DEVICE.
APPLICATION FILED AUG. 16, 1916.

1,272,279.

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Fig. 1.



Inventor:
Alben E. Lundell.
by *J. C. Munnell*. Att'y.

UNITED STATES PATENT OFFICE.

ALBEN E. LUNDELL, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

CIRCUIT-INTERRUPTING DEVICE.

1,272,279.

Specification of Letters Patent.

Patented July 9, 1918.

Application filed August 16, 1916. Serial No. 115,211.

To all whom it may concern:

Be it known that I, ALBEN E. LUNDELL, a citizen of the United States, residing at New York, in the county of Bronx and State of New York, have invented certain new and useful Improvements in Circuit-Interrupting Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to circuit interrupting devices, and more particularly to a method of interconnecting a plurality of such interrupting devices.

If a single interrupter is used and its driving mechanism fails for any reason, the resultant stopping of the interrupter may cause more or less serious difficulties to arise in the system in which it is used.

It is the object of this invention to employ a plurality of interrupters of such characteristics and so connected that interruptions of the circuit of which they are a part will continue to take place, even though one or more of such interrupters should be disabled.

A feature of this invention is the series connection of individually driven interrupters which have such characteristics that impulses may be sent while any or all such interrupters are in operation.

It is thought that the invention will be best understood from the following detailed description, reference being had to the accompanying drawings.

In the drawings, Figure 1 shows diagrammatically two interrupters and the manner in which they are interconnected. In Fig. 2 the successive positions assumed by the segments of both interrupters under their respective brushes at various time intervals are diagrammatically indicated.

In Fig. 1 are shown two interrupters I, II. Interrupter I consists of a brush 20 arranged to be driven by a shaft 21 over segments of conducting material 22, 23, 24, 25, 26 and 27, such conducting segments being separated by suitable insulating portions 28. Brush 20 is sufficiently wide to make contact across adjacent segments when passing insulating portions 28. Conductor 29 is multiplied to segments 22, 24 and 26 as shown in Fig. 1, it being extended to interrupter II by conductor 30. Conductor 31 is multiplied to conducting segments 23, 25 and 27, it being extended to interrupter II by conductor 32.

The general structure of interrupter II is similar to that of interrupter I. A brush 33 carried by the shaft 34 is arranged to swing over conducting segments 35, 36, 37 and 38, such conducting segments being separated by insulation, as indicated at 39. Conducting segments 35 and 37 are connected to a common conductor 40 having a connection to conductor 32, while conducting segments 36 and 38 are connected to a common conductor 41 having a connection to common conductor 30. An incoming portion of the circuit to be interrupted is shown at 42 and is in electrical connection with brush 20, the outgoing end of such circuit being indicated by conductor 43, which is in electrical connection with brush 33. Shafts 21 and 34 are mounted in any suitable manner, and are arranged to be driven at approximately the same speed by individual driving mechanism.

The driving and controlling mechanism for interrupter I will now be described, that for interrupter II not being shown but being identical with that of interrupter I. The shaft 21 on which brush 20 is mounted is provided with a collar 50 to which is secured a flexible spider 51 carrying a disk of magnetic material 52. A constantly rotating power shaft 53 is driven in any desired manner and carries a disk 54 rigidly secured thereto. An electromagnet 55 is positioned in operative relation to the disk 52, the arrangement being such that upon energization of magnet 55 disk 52 will be magnetically attracted, and due to the resiliency of the spider 51 will be forced into engagement with the rotating disk member 54, with the result that rotation of the shaft 21 may be accomplished. Rigidly secured to the collar 50 is a disk 56, the periphery of this disk being provided with a sinuous track portion 57 in which a roller 58 travels. The roller 58 is carried by a spring member 59 which is rigidly secured to the frame of the device in any desired manner. The purpose of roller 58 is to prevent the interrupter from stopping in an undesired position, as for instance, with the brush 20 spanning two adjacent conducting portions. The pressure on roller 58 by means of the spring member 59 is sufficient to cause the spring member to force the shaft 21 to be rotated until the roller rests in a depression in the track 57. The track 57 is arranged in such

a way that at the time brush 20 is spanning two adjacent segments, the roller 58 will just having passed or will just be approaching a peak of track 57. It is obvious that if the magnet 55 is deenergized at a time when the brush 20 is spanning two segments, the pressure of roller 58 will cause the brush to be advanced sufficiently either in a counter-clockwise or a clockwise direction to insure that the brush no longer spans both segments.

In order to more clearly understand the description, it will be assumed that it requires two-tenths of a second for brush 20 to pass over segments 22, 24 and 26, and six-tenths of a second for brush 20 to pass over segments 23, 25 and 27. The spacing of the segments in interrupter II is such that it will require two-tenths of a second for brush 33 to swing over segments 35 and 37, and one second for it to pass over segments 36 and 38. It will be noticed that in each case the time of a complete revolution will be two and four-tenths seconds.

In Fig. 2 the paths over which brushes 20 and 33 swing have been developed into a straight line, the path of each brush during a complete revolution being included between lines *a*, *a'*, and *b*, *b'*. By means of this diagram the circuit conditions at any desired point in the cycle may more readily be determined.

Assuming that a normal position of the interrupters is shown in Fig. 1 and that they start together to revolve at approximately the same speed, impulses may be sent at the following times: When brush 20 is spanning both segments 22 and 23 and brush 33 is spanning segments 35 and 36, a circuit will be completed from conductor 42, brush 20, segment 22, conductors 29, 30, 41, segment 36, brush 33, to conductor 43. No impulses will now be sent until brush 20 arrives on segment 24, at which time a circuit will be completed from conductor 42, brush 20, segment 24, conductors 29, 30, 41, segment 36, brush 33, to conductor 43. When brush 33 engages segment 37, a circuit will again be completed from conductor 42, brush 20 now on segment 25, conductors 31, 32, 40, segment 37, brush 33, to conductor 43. When brush 20 arrives on conductor 26, a circuit will be completed from conductor 42, brush 20, segment 26, conductors 29, 30, 41, segment 38 and brush 33, to conductor 43. When brush 20 spans conductors 27 and 22, brush 33 will be spanning segments 38 and 35, and a circuit will be completed from conductor 42, brush 20, segment 27, conductors 31, 32, 40, segment 35 and brush 33, to conductor 43. When the brushes are wholly on segments 22 and 35, no impulses will be sent. This cycle of circuit closures will take place for every revolution of the brushes 20 and 33.

Let us assume now that interrupter I is disabled and ceases rotation, it being further assumed that the brush 20 remains in position over one of the segments 22, 24 and 26. A circuit closure will now be made whenever brush 33 engages either segment 36 or 38. If brush 20 had stopped on one of the segments 23, 25 or 27, a circuit closure would have taken place every time brush 33 passed over segments 35 and 37. If the brush 20 should stop so as to make contact across two segments normally insulated from each other, interruptions would not take place. However, the mechanical means used in connection with the interrupters prevents the stopping of the brush in this particular position.

If, now, brush 33 should stop on either segment 35 or 37, circuit would be closed from conductor 42 to conductor 43 each time brush 20 engaged one of segments 23, 25, 27. If brush 33 should stop on one of segments 36 or 38, circuit would be closed from conductor 42 to conductor 43 each time brush 20 engages a segment 22, 24, or 26. Brush 33 is prevented from stopping in a position such that it would engage two conducting segments at the same time by mechanical means as above mentioned.

It is of course obvious that the particular time required for a brush to pass over segments, and the length of such segments is not material to the invention, since many suitable combinations might be devised. It is not necessary that the brushes 20 and 33 revolve in synchronism, nor that their starting position be that assumed in the previous description, the condition assumed being merely one of a number of possible arrangements. Since, however, the general operation under all conditions would be similar to that previously described, further description of the operation of the device has not been considered necessary.

What is claimed is:

1. In an electrical system, a plurality of interrupting devices, a circuit including said interrupting devices, and means for establishing an interconnection between said interrupting devices such that said circuit will continue to be interrupted while any or all of said interrupting devices are in operation.

2. In an electrical system, a plurality of interrupting devices, a circuit including said interrupting devices, driving mechanism individual to said interrupting devices, mechanical means for preventing said interrupting devices from stopping in certain positions, and means for establishing an interconnection between said interrupting devices such that said circuit will continue to be interrupted while any or all of said interrupting devices are in operation.

3. In an electrical system, a plurality of

interrupting devices, a circuit including said interrupting devices, each of said interrupting devices comprising a brush arranged to swing over a plurality of conducting segments, said conducting segments being of various lengths and separated by insulating segments, the conducting segments in the several interrupting devices being arranged to cause circuit closures varying in number and duration, and means for establishing an interconnection between the conducting segments of the several interrupters such that said circuit will continue to be interrupted while any or all of said interrupting devices are in operation.

4. In an electrical system; a plurality of interrupting devices, a circuit including said interrupting devices, each of said interrupting devices comprising a brush arranged to swing over a plurality of conducting segments; said conducting segments being of various lengths and separated by insulating segments, the conducting segments in the several interrupting devices being arranged to cause circuit closures varying in number and duration, said brushes being arranged to make contact across adjacent conducting segments while passing an insulating seg-

ment, mechanical means for preventing said brush from stopping in engagement with two conducting segments, and means for establishing an interconnection between said interrupting devices such that said circuit will continue to be interrupted while any or all of said interrupting devices are in operation.

5. In an electrical system, two interrupting devices, each of said interrupting devices comprising a brush arranged to swing over a plurality of conducting segments, said conducting segments being of various lengths and separated by insulating segments, the circuit closures caused by said interrupting devices when operating singly being of different characteristics, a circuit including said interrupting devices in series, and means for establishing an interconnection between said interrupting devices such that said circuit will continue to be interrupted while any or all of said interrupting devices are in operation.

In witness whereof, I hereunto subscribe my name this 15th day of August, A. D., 1916.

ALBEN E. LUNDELL.