

June 10, 1924.

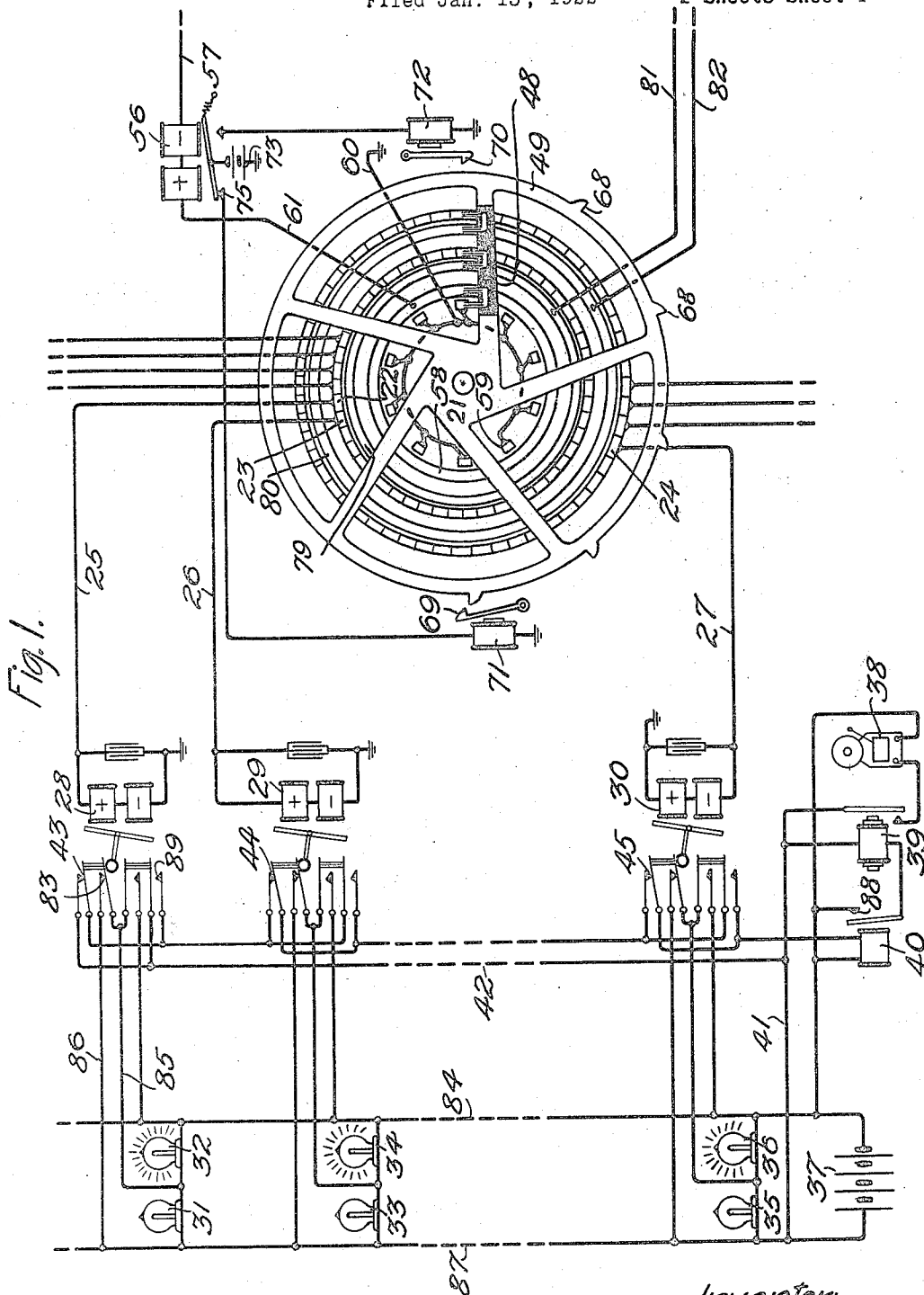
1,496,875

J. C. FIELD

IMPULSE TRANSMITTING MECHANISM

Filed Jan. 13, 1922

2 Sheets-Sheet 1



Inventor:
Joseph C. Field.
by *Jul. C. Palmer*
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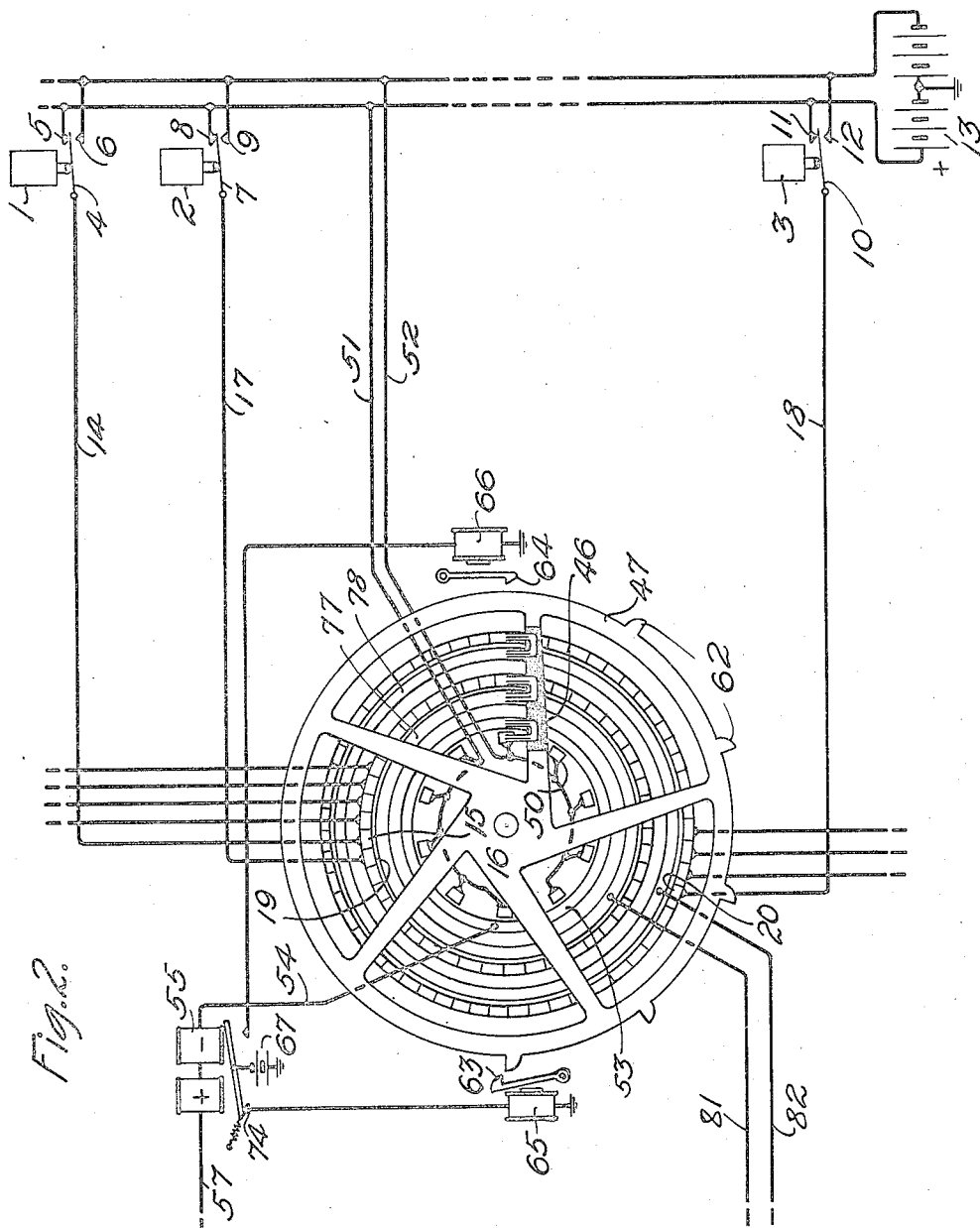
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Inventor:
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UNITED STATES PATENT OFFICE.

JOSEPH C. FIELD, OF ORANGE, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

IMPULSE-TRANSMITTING MECHANISM.

Application filed January 13, 1922. Serial No. 523,955.

To all whom it may concern:

Be it known that I, JOSEPH C. FIELD, a citizen of the United States, residing at Orange, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in Impulse-Transmitting Mechanisms, of which the following is a full, clear, concise, and exact description.

This invention relates to impulse transmitting mechanisms.

The invention comprises an impulse transmitting mechanism of the rotary distributor type employing a brush arm adapted to rotate over a plurality of rings of conducting segments; and it is an object of the invention to provide a system including two such distributors adapted to operate in unison with means provided for arresting the brush arms at a plurality of points in their revolution to cause them to keep in unison, the brushes passing over a plurality of segments between their points of rest.

More specifically, the invention provides an impulse distributing system which includes a transmitting and a receiving distributor employing, respectively, transmitting and receiving segments suitably connected by a line conductor, and a separate ring of correcting segments joined by means of a line wire through a pair of serially connected polarized relays. Each distributor is provided with a rotatable frame carrying a trailer brush adapted to make wiping contact with the conducting segments. A plurality of catch members are disposed upon each distributor frame and are adapted to be successively engaged by a release latch operated by one of a plurality of electromagnets controlled by the polarized relays to synchronize the brush arms at a plurality of points in their revolution.

The invention has wide application in situations where it is desired to automatically transfer current impulses for selectively operating devices located at a distance from the controlling point. In the embodiment of the invention herein disclosed it is employed to selectively energize circuits for devices which indicate the operation of remotely controlled electrical switches. The invention is particularly adapted for use in systems of the type disclosed in a pending application of F. Zogbaum, Serial No. 516,078 filed November 18, 1921.

Another object of the invention is to provide a system of this type which is positive and rapid in operation and which employs a minimum of operating parts.

These and other objects of the invention will clearly appear from the following description and the annexed drawings, Fig. 1 and Fig. 2 of which, when placed end to end with Fig. 1 at the left, show one embodiment of the invention as applied to a switch supervisory system.

Referring to the drawings, in which like reference numerals designate similar parts, a plurality of power switches 1, 2 and 3 are located at a substation, or at a plurality of substations and are controlled either by manual operation or by any suitable remote control system, not shown in the drawing. The power switch 1 carries a contact 4 which is adapted to engage with one or the other of contacts 5 and 6 connected to a source of current supply. The switch 2 carries a corresponding contact 7, adapted for engagement with either of contacts 8 or 9; while the switch 3 is provided with a contact 10 and associated contacts 11 and 12. Whether the contact 5 or 6 is engaged by the switch contact 4 depends upon the position of the power switch 1. Similarly, the positions of the switches 2 and 3 determine the respective positions of their contacts. The power switches are merely provided with additional contacts so that upon opening or closing, a circuit, including a battery 13, will be completed momentarily for effecting the operation of indicating mechanism at the central control station as will be hereinafter described. The contact 4 of power switch 1 is connected by means of a conductor 14 to a segment 15 of a rotary transmitting distributor 16, while contacts 7 and 10 of switches 2 and 3 are connected by means of line conductors 17 and 18 to segments 19 and 20 respectively.

The corresponding rotary receiving distributor 21 is located at the central station and its segments 22, 23 and 24, corresponding to segments 15, 19 and 20, respectively, of distributor 16, are connected through conductors 25, 26 and 27 to polarized relays 28, 29 and 30 respectively. The distributors 16 and 21 are operated continuously. The polarized relay 28 at the central station has associated with it lamps 31 and 32, while the polarized relay 29 has associated with it lamps 33, 34, and the relay

30 is suitably provided with lamps 35 and 36. One or the other of each of these pairs of lamps is normally lighted, current being supplied thereto by a battery 37 through contacts associated with the polarized relays. Thus, the attendant at the central station, by observing the lamp that is lighted, is informed of the position of any given switch. In practice, it is preferred to have the lamps 31, 33 and 35 green, and the lamps 32, 34 and 36, red. The lighting of a red lamp informs the attendant that a certain power switch is closed, while the lighting of a green lamp will indicate that a particular switch has been moved to its open position. A bell 38 which is common to all the polarized relays is provided to sound an alarm upon the operation of any power switch in the circuit. The bell 38 is controlled by the operation of a neutral relay 39 of the slow releasing type.

The relay 39, in turn, is controlled by the operation of a second neutral relay 40. The relay 40 is normally energized over a circuit extending from the positive side of battery 37, through conductors 41 and 42, through a contact such as 43 or 89 of relay 28, a contact 44 of relay 29, a contact 45 of relay 30, winding of relay 40, to the negative side of battery 37. The rotary distributors 16 and 21 are operated in synchronism, as will be hereinafter described, and current impulses are transmitted over lines 14, 17 and 18 from the auxiliary contacts of power switches 1, 2 and 3 to energize polarized relays 28, 29 and 30, respectively. These impulses will be of either positive or negative polarity depending upon whether the switches at the remote station are moved to the closed or open position.

In order to insure the proper synchronous operation of the distributors 16 and 21, in accordance with a feature of the invention, means are provided to synchronize the brush arms of the distributors at a plurality of points in their revolution. The brush arm 46 of the transmitting distributor 16 is suitably mounted on a frame 47, while the brush arm 48 of the receiving distributor 21 is correspondingly mounted on a supporting frame 49. The transmitting distributor 16 is provided with an inner ring of synchronizing segments 50, half of which are connected by means of line wire 51 to the positive side of battery 13 and the other half of which are connected through conductor 52 to the negative side of the battery. A continuous collector ring 53 is bridged by a brush of the arm 46 with the ring of segments 50, this collector ring being connected by a conductor 54 with a three position polarized relay 55 which is thus adapted to be energized by currents of either positive or negative polarity, depending up-

on the position of the brush arm. A corresponding polarized relay 56 is provided at the central station and is connected in series with the relay 55 by means of a line conductor 57 connecting the central station and the substation. The polarized relays 55 and 56 are of the well known three position type and are adapted, when deenergized, to rest in a centered or neutral position. The polarized relay 56 is connected with the collector ring 58 of receiving distributor 21 which ring is bridged by means of a brush of the arm 48 with an inner ring of segments 59, each of which is connected through conductor 60 to ground. It will thus be seen that an energizing circuit for the relays 55 and 56 may be traced from battery 13, through either of conductors 51 or 52, inner ring of segments 50, brush of arm 46, collector ring 53, conductor 54, windings of polarized relay 55, conductor 57, windings of polarized relay 56, conductor 61, collector ring 58, brush of arm 48, inner ring of segments 59, conductor 60, to ground, the relays 55 and 56 being energized by negative current when one of the lower five segments 50, as viewed in Fig. 2, is connected with collector ring 53 by the brush arm 46 and by positive current when one of the upper five segments is engaged by the brush arm.

The frame 47 of transmitting distributor 16 is provided with five evenly spaced projections or catch members 62 adapted to be successively engaged during the revolution of the frame by the release latches 63 and 64 of release magnets 65 and 66, respectively. In the embodiment shown in the drawings, the projections 62 are each in alignment with a corresponding inner segment 50 and are thus so spaced on the frame 47 that after the last projection is released by the latch 63, the first projection will be carried into engagement with the latch 64. The circuits of magnets 65 and 66 are controlled by polarized relay 55, the energizing current of such circuits being supplied by battery 67. The frame 49 of receiving distributor 21 is provided with corresponding catch members or projections 68 adapted for successive engagement with release latches 69 and 70 of release magnets 71 and 72, respectively. The energizing circuits of magnets 71 and 72 are controlled by polarized relay 56, current being supplied by battery 73. It will thus be evident that since polarized relays 55 and 56 are in series and are operated simultaneously, the release magnets 65, 66 and 71, 72 which they control will also be operated simultaneously depending upon the position assumed by the relays 55 and 56. For example, when the brush arm of the transmitting distributor 16 passes over an inner segment which is connected with the negative side of battery 13, the polarized relay 55

will be energized over a circuit previously traced, to close contact 74, and polarized relay 56 will be energized simultaneously to close contact 75. The closure of contact 74 completes an energizing circuit for the release magnet 65 which extends from battery 67, through armature and contact 74 of polarized relay 55, winding of magnet 65, to ground, thus permitting the latch 63 to release catch 62. The closure of contact 75 of polarized relay 56 at the central station likewise completes an energizing circuit for the release magnet 71 extending from battery 73, through armature and contact 75 of relay 56, winding of magnet 71 to ground, thus permitting latch 69 to release catch 68 simultaneously with the release of the corresponding catch 62. The rotating brush of distributor 16, by passing off such a segment on the inner ring 50, thus cuts off the source of current supply to polarized relays 55 and 56, permitting them to return to the neutral position. The deenergization of polarized relays 55 and 56 breaks contacts 74 and 75, respectively, thus deenergizing release magnets 65 and 71 and causing their respective latches to engage the catch which is next in line. Since the catches 62 and 68 are spaced in alignment with their respective segments 50 and 59, the release magnets will be energized before the catches are engaged by the respective latches provided the distributors are operating in exact synchronism. In the embodiment shown in the drawing, the distributors may be termed synchronous multiplex distributors but the invention is not limited to this specific design but may also be of the start-stop type. Start-stop distributors embodying the invention may be provided with catch projections spaced in advance of the synchronizing segments so that the brush arm will be brought to a stop as each catch arrives at a latch. As shown in the drawing, when a catch arrives at a latch such as 63, the brush will again come in contact with a conducting segment of the inner ring 50 again energizing the polarized relays 55 and 56 and permit the distributor frames which carry the brush arms to continue their revolution uninterrupted. If, however, the brush arm 48 should lag behind arm 46, or vice versa, the arms will be synchronized each time a catch is engaged by a release latch.

In the embodiment of the invention shown in the drawings two current distributing rings are employed, the inner ring containing segments 15 and 19 and is bridged with collector ring 77 by brush arm 46, and the outer ring, of which segment 20 is a part, is bridged with collector ring 78 by the said brush arm. The collector rings 77 and 78 are connected through line wires 81 and 82 with the respective corresponding collector rings 79 and 80 of the receiving distributor

21 which are bridged, respectively, with rings containing segments 22 and 23 on the one hand, and segment 24 on the other. It will be apparent that the number of pairs of rings of distributing segments and the number of line wires such as 81 and 82 may be reduced or increased to meet the requirements of any particular installation.

The operation of the system is as follows: The main contacts of the power switch 1 are considered to be closed, the auxiliary contact 4 being in engagement with contact 5, completing a circuit from positive side of battery 13, switch contacts 5 and 4, line 14, segment 15 of continuously operated distributor 16, brush arm 46 when segment 15 is reached, collector ring 77, line wire 81, collector ring 79 of receiving distributor 21, brush arm 48, segment 22, conductor 25, windings of polarized relay 28, to ground. Positive potential thus applied to the polarized relay 28 causes it to close its associated contacts 43 and 83, establishing an energizing circuit for the lamp 32 which extends from the negative side of battery 37, through conductor 84, lamp 32, conductor 85, contact 83 of relay 28, conductors 86 and 87 to the positive side of battery 37, lighting the lamp 32. As the contact 89 opens while the armature of relay 28 is passing from one side to the other, the neutral relay 40 is momentarily deenergized. This relay 40 in deenergizing releases its armature and establishes a circuit from the positive side of battery 37, through conductor 41, winding of relay 39, armature and contact 88 of relay 40, to negative side of battery 37. Since the relay 39 is of the slow-releasing type, it holds for a period of time sufficient to ring the bell 38. The armature of relay 28 in moving over closes contact 43, thus completing an energizing circuit for the neutral relay 40 as traced above. The operation of the system upon the change in position of any other power switch, such as switches 2 or 3, is substantially the same as that described for switch 1.

While the circuits for the answer-back signals are thus being supervised the continuously operating transmitting and receiving distributors are being synchronized in the manner described above. It will be seen that by synchronizing the brush arms of the distributors at a plurality of points in accordance with the invention it is possible to obtain the exact cooperation of transmitting and receiving elements essential in systems of this type in order that an accurate record of the position of the switches may be had at the control station.

By providing catch members evenly distributed over only half the distributor frame and two oppositely disposed release magnets, it is impossible for the distributors to remain out of synchronism for more than half a revolution of the brush frames. This will

be evident since if the last catch of the transmitting distributor 16 arrives at latch 63 at the same time that the first catch of the receiving distributor 21 arrives at latch 70 negative current will energize polarized relays 55 and 56 and release magnets 65 and 71 will be operated. The last catch 62 will thus be allowed to pass by release latch 63 but the first catch 68 will be caught by the latch 70 of magnet 72, which is not operated, allowing brush arm 46 of distributor 16 to catch up with arm 48 of distributor 21. Because of the great accuracy of these distributors it is possible to use a great many more distributing segments than has heretofore been possible, the brush being so disposed as to pass over a plurality of such segments between its several points of rest.

While the invention has been shown as applied to a remote supervisory system, it is to be understood that it is suited for many other uses, such as the control as well as the supervision of remote switches, and is not to be limited in scope except as defined by the following claims.

What is claimed is:

1. A current impulse distributor comprising continuous and segmented conducting rings, a brush for connecting the segments of the segmented ring with the continuous ring, a support for said brush, said support being provided with a plurality of stop members, means for engaging said stop members under predetermined conditions, and an electromagnet controlled by the passage of said brush over certain ones of said segments for controlling the operation of said means.

2. A current distributing device comprising a circular ring of conducting segments, a frame supporting a trailer brush adapted to rotate over said segments and to make wiping contact therewith, a plurality of catch members on said supporting frame, a plurality of electromagnets, and a release latch controlled by each such electromagnet and adapted for engagement with said catch members to control the rotation of said brush frame.

3. In a current distributing system, a pair of rotary distributors adapted to operate in unison, each distributor having a ring of conducting segments, a line circuit joining said rings of segments, a trailer brush disposed in contact with said segments and adapted for wiping engagement therewith, and electromagnetic means operated locally for synchronizing said brushes at a plurality of points in their revolution.

4. In a current distributing system, a pair of rotary distributors adapted to operate in unison, each distributor having a ring of conducting segments, a line circuit joining said rings of segments, a frame supporting a trailer brush associated with each distrib-

utor and adapted to rotate over said segments and to make wiping contact therewith, a plurality of catch members on each of said supporting frames, a plurality of electromagnets associated with each distributor, and a release latch controlled by each such electromagnet and adapted for engagement with said catch members to control the rotation of said brush frame.

5. In a current distributing system a pair of rotary distributors adapted to operate in unison, a ring of conducting segments on each distributor, a line circuit joining said rings of segments, a ring of correcting segments on each distributor, a line circuit joining said rings of correcting segments, a trailer brush disposed in contact with said conducting and said correcting segments and adapted for wiping engagement therewith, a relay included in each end of said line circuit, and electromagnetic means controlled by each of said relays for synchronizing the brush arms of said distributors at a plurality of points in their revolution whereby said brush passes over a plurality of said segments between the synchronizing points.

6. In a current distributing system, a pair of rotary distributors adapted to operate in unison, a ring of conducting segments on each distributor, a conductor joining said rings of segments, a ring of correcting segments on each distributor, a line circuit joining said rings of correcting segments, a frame supporting a trailer brush adapted to rotate over said segments and to make wiping contact therewith, a plurality of catch members disposed on each such supporting frame, a relay included in said line circuit, a plurality of electromagnets controlled by said relay, and a release latch controlled by each such electromagnet and adapted for engagement with said catch members to synchronize said brushes at a plurality of points in their revolution.

7. In a current distributing system, a pair of rotary distributors adapted to operate in unison, a ring of conducting segments on each distributor, a conductor joining said rings of segments, a ring of correcting segments on each distributor, a line circuit joining said rings of correcting segments, a frame associated with each distributor and supporting a trailer brush adapted to rotate over said segments and to make wiping contact therewith, a plurality of catch members on each supporting frame, a pair of relays included in said correcting line circuit, a plurality of electromagnets controlled by each such relay, and a release latch controlled by each such electromagnet and adapted for engagement with said catch members to synchronize said brushes at a plurality of points in their revolution.

8. A current distributing device compris-

ing a circular ring of conducting segments, a frame supporting a trailer brush adapted to rotate over said segments and to make wiping contact therewith, a plurality of catch members disposed on an arcuate section of said supporting frame, a plurality of electromagnets, and a release latch controlled by each such electromagnet and adapted for engagement with said catch members to control the rotation of said brush frame.

9. A current distributing device comprising a circular ring of conducting segments, a frame supporting a trailer brush adapted to rotate over said segments and to make wiping contact therewith, a plurality of evenly spaced catch members distributed over an arcuate section of said frame, a pair of electromagnets disposed on opposite sides of said frame, and a release latch controlled by each such electromagnet and adapted for engagement with said catch members to control the rotation of said brush frame.

10. In a current distributing system, a pair of rotary distributors adapted to operate in unison, each distributor having a ring of conducting segments, a line circuit joining said rings of segments, a frame supporting a trailer brush associated with each distributor and adapted to rotate over said segments and to make wiping contact therewith, a plurality of catch members disposed on an arcuate section of each of said supporting frames, a pair of electromagnets associated with each distributor and disposed at substantially opposite parts of said frames, and a release latch controlled by each such electromagnet and adapted for engagement with said catch members to control the rotation of said brush frame.

11. In a current distributing system, a pair of rotary distributors adapted to operate in unison, a ring of conducting segments on each distributor, a conductor joining said

rings of segments, a ring of correcting segments on each distributor, a line circuit joining said rings of correcting segments, a frame associated with each distributor and supporting a trailer brush adapted to rotate over said segments and to make wiping contact therewith, catch members in number equal to one-half the number of correcting segments disposed on each supporting frame, a pair of polarized relays included in said correcting line circuit, a pair of electromagnets controlled by each such polarized relay, and a release latch controlled by each such electromagnet and adapted for engagement with said catch members to synchronize said brushes at a plurality of points in their revolution.

12. In a current distributing system, a pair of rotary distributors adapted to operate in unison, a ring of conducting segments on each distributor, a conductor joining said rings of segments, a ring of correcting segments on each distributor, a line circuit joining said rings of correcting segments, a frame associated with each distributor and supporting a trailer brush, means for rotating said frame whereby said brush will make wiping contact with said segments, catch members equal in number to one-half the number of correcting segments disposed on an arcuate section of each supporting frame, a pair of polarized relays included in said correcting line circuit, sources of positive and negative current for controlling said relays, a pair of electromagnets controlled by each such polarized relay, and a release latch controlled by each such electromagnet and adapted for engagement with said catch members to synchronize said brushes at a plurality of points in their revolution.

In witness whereof, I hereunto subscribe my name this 11th day of January, A. D., 1922.

JOSEPH C. FIELD.