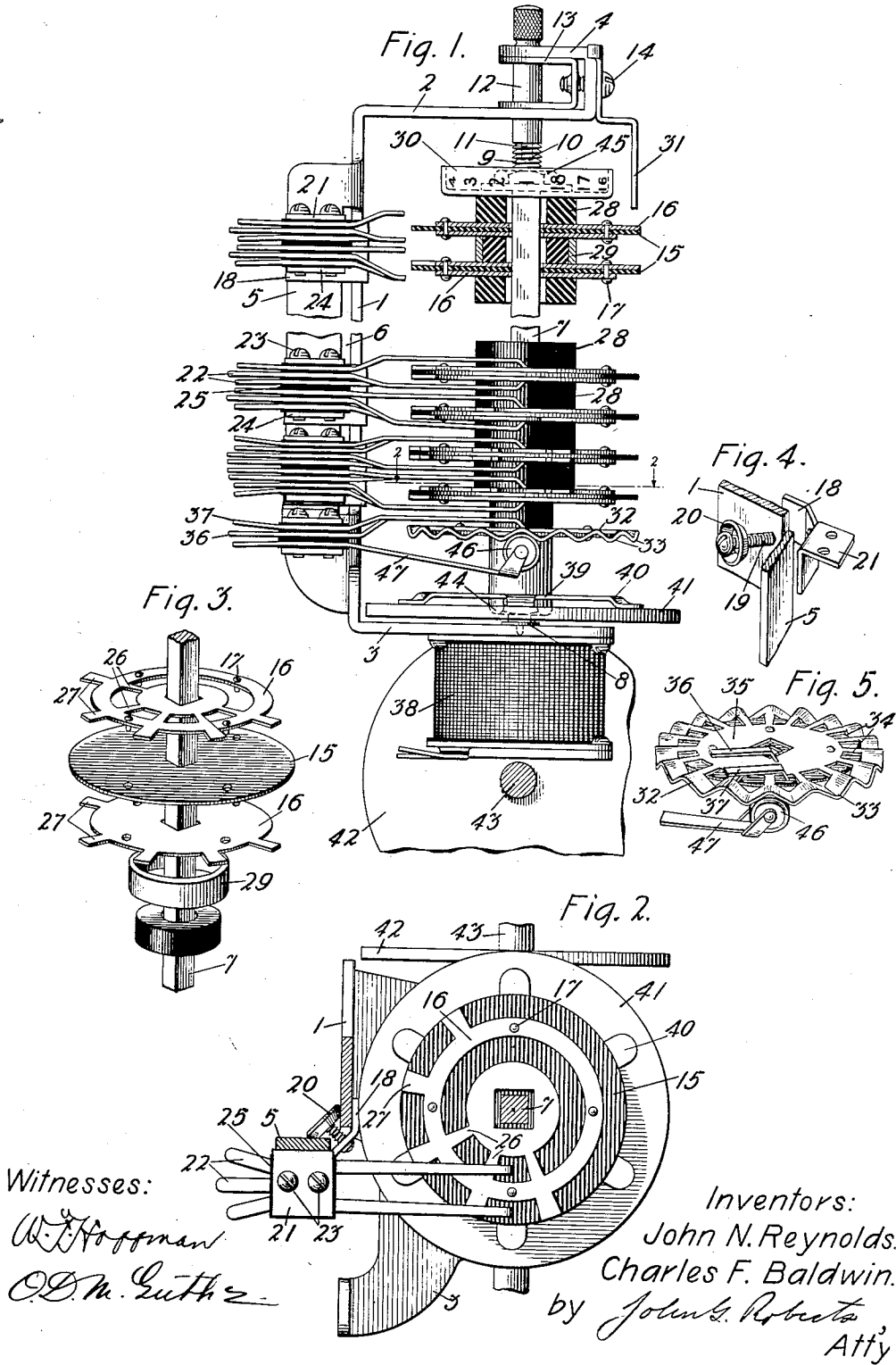


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SEQUENCE SWITCH.

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1,127,808.

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UNITED STATES PATENT OFFICE.

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SEQUENCE-SWITCH.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, JOHN N. REYNOLDS and CHARLES F. BALDWIN, citizens of the United States, residing at Greenwich, in the county of Fairfield and State of Connecticut, and at Montclair, in the county of Essex and State of New Jersey, respectively, have invented a certain new and useful Improvement in Sequence-Switches, of which the following is a full, clear, concise, and exact description.

This invention relates to circuit controlling apparatus commonly called sequence switches, whereby means are provided for automatically controlling a series of circuit changes either of the same device or of different devices in a definite and predetermined sequence.

One of the objects of this invention is the provision of a device of this character which is light in weight, cheap of construction and certain in action, and by means of which a large number of circuit changes may be effected with a minimum amount of apparatus.

Another object is the provision of a device of this character having contacts which are readily accessible for examination and so arranged that they will require little or no adjustment or attention after being once set up.

Further objects and advantages will appear as the description of the device progresses.

This invention will be found useful for controlling electrical apparatus of many kinds, but is particularly designed for use in automatic telephone systems wherein certain operations must always occur in a definite predetermined sequence.

The device consists briefly of a suitable frame wherein is mounted a rotatable shaft having a series of disks of fiber or other insulating material secured in fixed relation thereon. On each side of each insulating disk is a disk or circular plate of conducting material which is cut away or skeletonized in such a manner as to provide any desired arrangement of contacts. The two plates associated with each insulating disk may and in practice generally will be electrically united by their securing rivets. A plurality of springs or brushes is provided for co-

operation with each conducting disk and it is obvious that by properly cutting away and arranging the plates on the insulating disk, any two or more of the brushes arranged for engagement therewith may be electrically united at any stage of rotation of the shaft. In the arrangement of the device for use in an automatic telephone system, the several conducting plates would be variously fashioned and the circuit combinations performed by the separate sets of springs would in general be entirely different. Motor mechanism is provided for rotating the shaft through its successive step by step movements. This mechanism comprises a continuously rotating power member, a pair of friction disks carried by the power member and the shaft, respectively, and an electromagnet for causing effective engagement of said friction disks whereby the switch shaft may be rotated. In practice the rotation of the switch shaft at certain points of its revolution will be interrupted and means are provided for definitely positioning the shaft at these times.

For a more complete description of this invention, reference is now made to the accompanying drawings wherein,—Figure 1 is a side elevation of the device partly in section; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is a view showing the shaft with one of the insulating disks thereon and the conducting plates arranged for engagement with each side of the disk; Fig. 4 is a detached perspective view showing the mounting clip for a brush set; and Fig. 5 is a perspective view of the positioning device detached.

Referring now to the drawings in which the same reference character is applied to the same part in the various figures, 1 represents a frame member having the right-angul- 95
angularly extending portions 2 and 3. The arm 2 at one end thereof is rebent to form the yoke shaped member 4. The member 1 carries at the forward edge thereof a right-angul- 100
angularly projecting shelf or ledge 5. The ledge 5 is separated from the member 1 except at the ends thereof by the slot 6, the purpose of which will be hereinafter disclosed. Mounted between the members 2 and 3 is a square shaft 7 one end of which has 105
a bearing 8 in the member 3. The other

end of this shaft is reduced and screw threaded. This screw threaded portion 9 has an opening 10 at the end thereof adapted to receive the reduced portion 11 on the end of the pin 12. The pin 12 extends through openings in the frame member 2 and the rebent portion 4 and is clamped therein by the yoke 13 and screw 14, as clearly shown in Fig. 1.

Non-rotatably mounted on the shaft in spaced relation is a plurality of disks 15 of fiber or other insulating material. On each side of each of these insulating disks is secured a disk or plate of conducting material 16. These conducting plates are formed with segmental projections and arcuate cut out portions whereby movable contacts are provided as shown most clearly in Fig. 2. It is to be understood, of course, that the various conducting plates employed in a single device will in general differ from each other although obviously this will depend upon the system in which the device is employed or the use to which it is put. The plates 16 may be secured to the disk 15 by any suitable means, that shown being rivets 17 which extend through the disk 15 and both plates 16, whereby the plates 16 are electrically united.

Secured at the angle between member 1 and the ledge 5 is a plurality of clips 18. These clips have portions arranged to engage with each of said plates 1 and 5 and are held in position by screws 19 which extend through the slot 6. Each screw is provided with a washer 20 in order that the head thereof may be prevented from passing through the slot. By this arrangement the sets of brushes may be readily adjusted longitudinally of the shaft. The portion of the clip 18 which is in engagement with the ledge 5 is provided with the right-angularly extending portion 21 to which the springs or brushes 22 are secured by means of the screws 23 and clamping plates 24. The several springs 22 are insulated from each other and from the screws 23 by the plates of insulating material 25. These springs are arranged at different levels as shown most clearly in Fig. 2. In the embodiment of the invention herein disclosed, two brushes are provided for engagement with the contacts on each side of each disk 15 and all the contacts arranged on one side of the disk 15 are shown as being electrically united. However, it is obvious that in practice more brushes and additional series of contacts may be provided, or that any number of these contacts may be insulated from each other, or that the conducting plates on the opposite sides of the disks may be electrically separated if it is so desired. Each clip 18 is arranged to support two sets of brushes of four each, thus each clip will accommodate the brushes having engagement with the contacts car-

ried by two adjacent disks 15. As shown in Fig. 2, the brushes which engage the contacts carried by the same metallic plate have their ends positioned at different radial distances from the shaft 7 so that one will engage one set of contacts as 26, while the other will engage the other or outer series of contacts 27. The several disks 15 are separated from each other and from the devices at opposite ends of the shaft by the spacing sleeves 28. Between certain of the disks, however, sleeves 29 of conducting material are provided, whereby the conducting plates of these disks may be electrically united. While only one conducting sleeve 29 is shown on the drawing, it is obvious that as many of these sleeves as desired may be used and consequently any number of metallic plates may be electrically united in one group or separate groups of these electrically united plates may be provided if desired.

This construction may be used for a variety of purposes, for instance, if it is desired to impress electrical energy on a plurality of circuits at one time, one brush may be used to connect the current generator to one of the plates 16 and the other brushes associated with the electrically connected group of plates may be used to distribute the energy to the circuits which it is desired to supply. At one end of the shaft 7 is located a disk with a cylindrical rim 30 having a scale thereon which, taken in connection with the pointed 31 secured to the yoke 4 by means of the screw 14, may be used to indicate the various positions which the switch assumes during one complete revolution. Near the other end of the shaft 7 is a disk 32 having a fluted edge 33. This disk in addition to the fluted edge is formed near the circumference thereof with a series of cut away portions 34. Arranged to cooperate with the imperforate portion 35 of the disk 32 is a brush, 36, and correspondingly arranged to cooperate with the interruptions 34 of the disk 32 is a brush 37. This construction may be used to complete the circuit for the magnet 38 by means of which the rotation of the switch shaft is controlled while the switch is passing from one position of rest to another. The function of this device is to assure the passage of the switch from one position of rest to the next.

Mounted adjacent to the positioning device just described and at the end of the shaft is a disk 39 of flexible metal having a plurality of substantially radially extending arms 40 to the outer ends of which is secured an annular disk 41 of magnetic material. Arranged with its edge adjacent to said disk 41 near the circumference thereof and at right angles thereto is a friction disk 42 which is rigidly fixed to the power shaft 43. The controlling magnet 38 is located adja-

cent to the disk 41 and is so arranged that upon its energization said disk will be attracted against the resiliency of its supporting arms 40 into forcible engagement with the rotating member 42 and the shaft 7 will thus be rotated. Each of the several elements which are non-rotatably mounted on the shaft is provided with a square opening through which the shaft extends, and are separated from each other by spacing sleeves, as previously described, all being rigidly clamped together by the nuts 44 and 45 threaded on the opposite ends of said shaft. Coöperating with the fluted edge 33 of the disk 32 is a roller 46 held in forcible engagement with said disk by the spring arm 47. This operates to bring the switch member to its exact position of rest in case the energizing current for the controlling magnet 38 should be cut off too soon, thus exactly positioning the contacts under the brushes. It also operates to prevent accidental displacement of the switch member. When it is desired that the switch member pass over certain positions so that certain brushes may merely make passing engagement with their contacts or for other purposes which will be obvious to one skilled in the art, certain of the interruptions or perforations 34 may be omitted.

As it is obvious that many changes could be made in the minor details of this invention without departing from the spirit thereof, we wish it understood that we contemplate all such modifications and that the invention is to be limited merely by the scope of the appended claims.

We claim—

1. In a sequence switch, a rotatable shaft, a plurality of insulating disks mounted thereon, a conducting plate on each side of each insulating disk, means for electrically uniting each pair of conducting plates, certain of said plates being formed with slots and projections to provide a plurality of series of integral contact portions, and a brush arranged to coöperate with the contacts of each series.

2. In a sequence switch, a rotatable shaft, a plurality of disks of insulating material fixed thereto, a metallic disk secured to each side of each insulating disk, said metallic disks having arcuate slots and segmental projections whereby a plurality of series of contacts are provided, and brushes adapted to successively engage the contacts of said series upon rotation of said shaft.

3. In a sequence switch, a shaft, disks of insulating material fixed thereto, a metallic plate secured on each side of each disk, each of said plates being cut away to provide a series of contact portions, means for electrically connecting said metallic plates in pairs, means for electrically connecting a plurality of pairs of metallic plates, means

whereby certain other pairs of metallic plates are insulated, and brushes adapted to coöperate with the contact portions of said metallic plates whereby a series of circuit changes may be effected.

4. In a mechanical switch, a rotatable shaft, a plurality of insulating disks fixed thereto, contacts on opposite sides of said disks, said contacts being electrically connected, spacing sleeves of conducting material between said disks whereby all the contacts on said several disks are electrically connected, and brushes arranged for engagement with said contacts whereby a series of circuit changes may be effected.

5. In a mechanical switch, a rotatable shaft, a plurality of insulating disks fixed thereto, contacts on opposite sides of each of said disks, means for electrically connecting the contacts on said plurality of disks, and brushes arranged for engagement with said contacts whereby a series of circuit changes may be effected.

6. In a mechanical switch, a rotatable shaft having a plurality of operative positions, an insulating disk fixed to said shaft, electrically connected metallic disks one secured to each side of said insulating disk, each metallic disk being cut away to provide a plurality of series of electrically connected contact portions, and brushes one for engagement with each of said series of contacts, said contacts being so arranged that different pairs of brushes will engage contacts at different positions of said shaft.

7. In a mechanical switch, a rotatable shaft, a plurality of insulating disks fixed thereto, contacts on opposite sides of each insulating disk, said contacts being electrically connected, spacing sleeves of conducting material electrically uniting the contacts of a plurality of disks, spacing sleeves of insulating material whereby the contacts of certain other disks are insulated, and brushes arranged for engagement with all of said contacts whereby a series of circuit changes may be effected.

8. In a mechanical switch, a shaft, means for rotating said shaft to a plurality of positions of rest, a disk on said shaft, a series of contacts on said disk, a brush for engaging said contacts upon rotation of said shaft, said brush being in engagement with said contacts except when the shaft is in one of its positions of rest, said disk being fluted adjacent to the circumference thereof, and a spring pressed roller arranged for engagement with the flutes of said disk when said shaft is in a position of rest.

9. In a mechanical switch, a rotatable disk of insulating material, a metallic disk secured thereto, a series of concentric arcuate slots in said metallic disk, the integral portions between adjacent ends of said slots forming electrical contacts, and a brush ar-

ranged to cooperate with said contacts upon the rotation of said disk.

10. In a mechanical switch, a rotatable disk of insulating material; a metallic disk
5 secured to said insulating disk, concentric arcuate slots in said metallic disk, the integral portions between adjacent ends of said slots forming a series of electrical contacts, projections at the circumference of
10 said metallic disk forming a second series of contacts, and brushes arranged to cooperate

respectively with each of said series of contacts upon the rotation of said disk.

In witness whereof, we hereunto subscribe our names this 26th day of February A. D., 15
1913.

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Witnesses:

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