June 20, 1933. L. C. NICHOLS 1,914,924

SWITCH

Filed Jan. 21, 1932

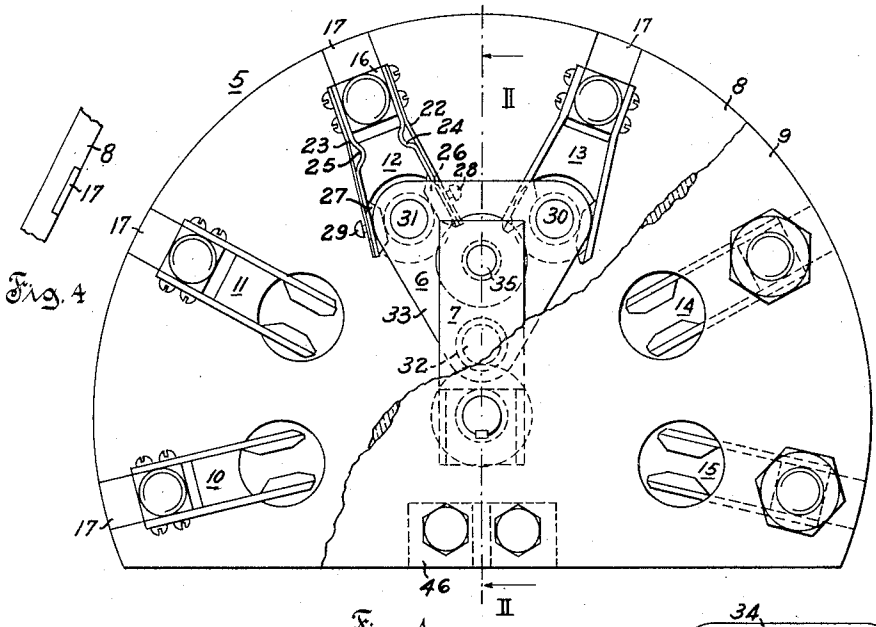


Fig. 1

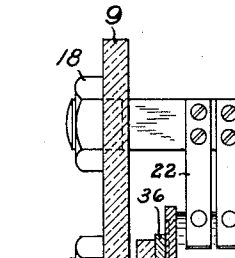


Fig. 4

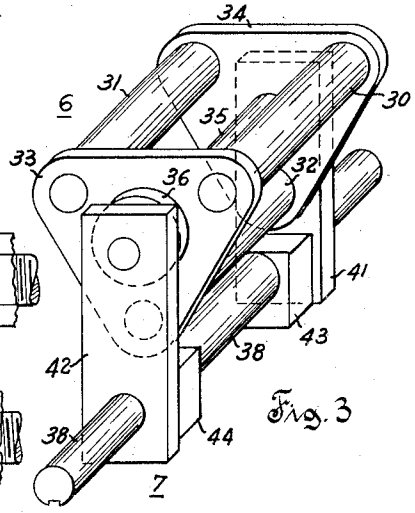


Fig. 3

Fig. 2

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Patented June 20, 1933 1,914,924

UNITED STATES PATENT OFFICE

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SWITCH

Application filed January 21, 1932. Serial No. 587,850.

This invention relates in general to circuit makers and breakers and more in particular to a switch having movable contacts adapted to roll into engagement with successive pairs of stationary contacts.

The utility of this invention is best understood by reference to the tap-changing art, wherein switches embodying this invention are particularly useful, however, it is to be understood that this invention has a much wider field of application.

An object of this invention is to provide a switch in which a cage-like movable contact assembly is moved along a straight or a curved path into contacting relation with a plurality of stationary contacts.

Another object of this invention is to provide a switch in which stationary contacts having resilient jaws are spaced around a circle and a movable contact assembly moves into engagement with the stationary contacts in the manner of a planet pinion and internal ring gear.

These and other objects are attained by this invention, various novel features of which will be apparent from the description and drawing herein, and will be more particularly pointed out in the claims.

An illustrative example of the application of this invention is shown in the accompanying drawing, in which:

Figure 1 is an end view of a switch embodying the invention and having a portion cut away to expose the interior mechanism;

Figure 2 is a sectional view taken on line II—II of Figure 1;

Figure 3 is an isometric view of the movable contact assembly and operating means therefor; and

Figure 4 is a fragmentary view of the insulating plate shown in Figure 1.

Referring more particularly to the drawing, 5 indicates in general a stationary contact assembly. A movable contact assembly is indicated generally by 6, and the operating mechanism for moving the latter assembly is designated by reference character 7. The stationary contact assembly 5 comprises a pair of insulating plates 8 and 9 which are held in spaced parallel relation by means of a plurality of stationary contacts 10 to 15, inclusive. One or both of the insulating plates 8 and 9 are provided with slots 17, noting Figure 4, which serve to receive the shoulder portions of contact studs 16 of the stationary contacts 10 to 15, inclusive. These contacts are each attached to plates 8 and 9 by means of nuts such as 18 and 19, on threaded shank portions of the contact studs. Connections to external circuits are made by means of terminal lugs 20 which are connected to the respective contact studs by means of coupling nuts 21 and lock nuts 21'.

The preferred form of the stationary contacts is shown in connection with contact 12, noting that the remaining contacts are merely schematically illustrated. Each contact comprises a plurality of springs 22 and contact strips 24 attached to one side of contact stud 16 and a plurality of springs 23 and contact strips 25 attached to the opposite side of stud 16. The contact strips serve to conduct current to and from the contact stud 16 to a plurality of contact jaws 26 and 27 which are held in place relative to the contact springs by means of pins 28 and 29. Inasmuch as switches of the type herein disclosed are often immersed in oil, a plurality of holes are drilled in insulating plates 8 and 9 in the vicinity of the contact jaws for the purpose of permitting free circulation of oil and inspection of the contact jaws.

The movable contact assembly 6 comprises three cylindrical contacts 30, 31 and 32, which are held in parallel spaced relation by means of triangular plates 33 and 34 to which they are brazed or otherwise attached. It will be obvious as the description proceeds that more than three cylindrical contacts may be used provided they are symmetrically arranged relative to the axle about which they rotate. An anxle member 35 extends through the center of the triangular plates. An operating shaft 38 is journaled in the insulating plates 8 and 9 at a point which is central relative to the circularly spaced contacts 10 to 15, inclusive. A pair of arms 41, 42 are keyed to operating shaft 38 by means of keys 39 and 40 and strengthening members 43 and 44. Axle member 35 of

movable contact assembly 6 is journaled in the arm members 41, 42, with spacer members 36 and 37 inserted between the arms 41, 42 and the triangular plates 33 and 34. Operating shaft 38 may be driven from either end, noting keys 45 and 45'. A base member 46 is bolted between insulating members 8 and 9 and is provided with holes by means of which the switch may be mounted in any desirable position. Operating arms 41 and 42 are shown as of insulation, however, these arms may be of metal in which event the operating shaft 38 must be insulated from the external operating mechanism by means of any well known insulator.

The operation of the invention is as follows: With the movable contact assembly in the position shown in Figure 1, stationary contacts 12 and 13 are bridged by cylindrical contacts 30 and 31 through the triangular plates 33 and 34. Upon rotation of operating shaft 38 in a clockwise direction, cylindrical contact 30 will pivot by sliding on the elongated jaw surfaces of contact 13 and cylindrical contact member 31 will move out of engagement with contact jaws 26 and 27, noting that at the same time cylindrical contact 32 will move toward stationary contact 14 and finally engage the jaws thereof, thus breaking the circuit between contacts 12 and 13 and establishing a new circuit by bridging contacts 13 and 14. It is thus seen that the cylindrical contacts 30, 31 and 32 describe paths which are substantially hypocycloidal in form, that is, the cage-like movable contact assembly will successively roll into engagement with the adjacent pairs of stationary contacts in a manner similar to the manner in which a planet pinion cooperates with an internal ring gear.

Applicant's invention, in its broadest aspects is not limited to a stationary contact assembly in which the contact jaws are arranged on the arc of a circle, but, obviously, may be arranged in a straight or curved line. In this connection, the term cycloidal as used herein is considered to mean the path described by a point on the radius of a circle which rolls in a straight or curved line.

Although only the preferred embodiment of the invention has been described and illustrated, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus within the scope of the appended claims without departing from the spirit of the invention.

It is claimed and desired to secure by Letters Patent:

1. In a switch, a plurality of circumferentially spaced stationary contacts each comprising a plurality of axially alined jaw members electrically connected together, a rotatable contact assembly comprising an axle member, more than two pin shaped movable contacts, and also comprising means for supporting said movable contacts in circularly spaced relation relative to said axle member, and means for moving said axle member along a fixed path whereby said movable contacts roll into successive engagement with said stationary contacts solely by reason of the successive engagement of said movable contacts with said stationary contacts.

2. In a switch, a stationary contact assembly comprising substantially parallel jaw contacts arranged in circumferentially spaced relation to each other, a rotatable contact assembly comprising more than two cylindrical contact members and means for holding said contact members in circularly spaced relation, and means for moving said holding means along a fixed path so that successive pairs of said cylindrical contacts roll into engagement with successive pairs of said parallel jaw contacts and chordally bridge adjacent pairs of said parallel jaw contacts.

3. In a switch, a plurality of stationary contacts circumferentially spaced around a circle, each contact having a plurality of electrically connected pairs of spring biased jaws opening toward the center of said circle, a movable contact assembly comprising at least three contact elements circumferentially spaced around a circle of smaller diameter than said first mentioned circle and adapted to successively bridge circumferentially adjacent stationary contacts, and means for moving said contact assembly so that the center of said last mentioned circle moves in a circular path of smaller diameter than said first mentioned circle.

4. A switch comprising a pair of spaced insulating plates, a plurality of stationary contacts having jaws held in spaced circular relation by said plates, a rotatable operating shaft journaled in said plates, a pair of spaced insulating members attached to said shaft, a rotatable pin journaled in said members, a pair of spaced metallic plates attached to said pin, and a plurality of cylindrical contact members mounted between said metallic plates whereby said contact members successively bridge circumferentially adjacent contacts of said stationary contacts when said shaft is rotated.

5. In combination, a stationary contact assembly comprising spaced insulating plates each having a bearing hole therein, a plurality of circumferentially spaced contact members each having pairs of contact spring biased toward each other and extending substantially radially of said bearing holes, a movable contact assembly journaled in said bearing holes comprising an axle member, a plurality of cylindrical contact members and means for holding said contact members in circularly spaced parallel relation relative to said axle member, and means for causing said axle member to move in a circular path relative to said bearing holes whereby said

first mentioned circularly spaced contact members are circumferentially bridged two at a time by two of the circularly spaced contacts of said movable contact assembly.

In testimony whereof, the signature of the inventor is affixed hereto.

LOUIS C. NICHOLS.