J. BIJUR.

AUTOMATIC SWITCH.

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1,222,720. Patented Apr. 17, 1917.

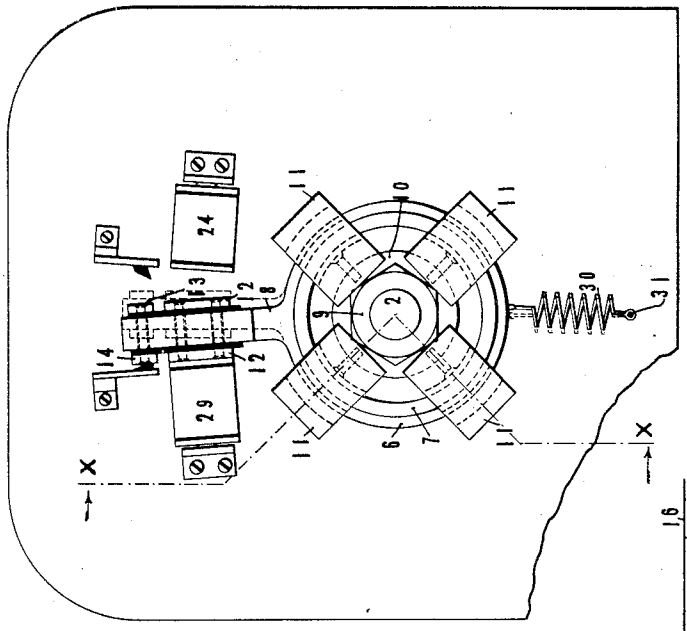


Fig. 3.

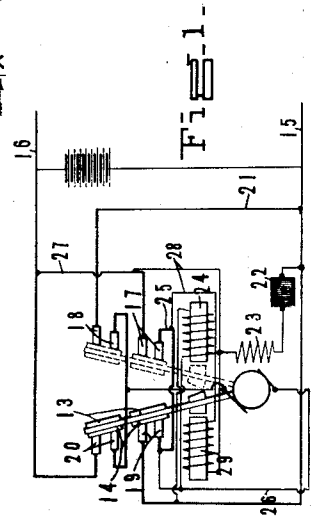


Fig. 1.

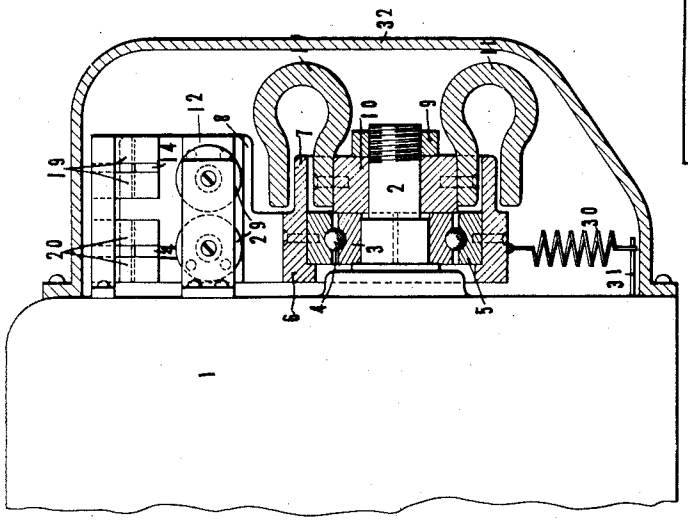


Fig. 2.

WITNESSES

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AUTOMATIC SWITCH.

1,222,720. Specification of Letters Patent. Patented Apr. 17, 1917.

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To all whom it may concern:

Be it known that I, JOSEPH BIJUR, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Automatic Switches, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to switches, and with regard to certain more specific features thereof, to automatic reversing switches for generators. One of the objects thereof is to provide an automatically acting switch mechanism of durable and non-complicated construction. Another object is to provide efficient and practical means for maintaining the polarity of a dynamo upon reverse in its direction of drive. Another object is to provide means of the above type characterized by simple construction and action which is reliable and unaffected by wear or adjustment of parts. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In the acompanying drawing, wherein is shown one of various possible embodiments of this invention.

Figure 1 is a diagrammatic view of circuits;

Fig. 2 is a sectional elevation of switch mechanism taken substantially on the line X—X of Fig. 3; and

Fig. 3 is an end view of the same with certain parts removed.

Similar reference characters refer to similar parts throughout the several views of the drawing.

Referring now to Fig. 2 of the drawing, there is shown at 1 the casing of a dynamo having an armature shaft 2 upon which is fixed a ring 3 having a suitable raceway for the balls 4. Journaled upon this ring and having a coacting raceway for the balls is an outer collar 5 provided with a sleeve 6 of copper or other readily conducting material. This sleeve is provided with an annular extension 7 and with an arm 8, hereinafter described.

Also mounted upon shaft 2 and held in position, as by means of the nut 9, is a ring 10 having secured thereto a plurality of permanent magnets 11, here shown as four in number. These magnets are so formed and mounted as to embrace the extension 7 between their poles, as indicated in Fig. 2 of the drawings, and upon any tendency to relative movement between these parts, as by rotation of the shaft 2, the magnets will tend to drag the ring 6 along with them, following the well known laws of magneto electric induction.

Mounted upon opposite sides of the arm 8 are armatures 12 and spaced from these armatures, as well as insulated from the arm, are pairs of contact members 13 and 14, respectively positioned upon opposite sides. Coacting with these contacts are stationary contacts arranged in such manner that each contact 13 and each contact 14 will, upon being swung into proper position, bridge and electrically connect a pair of these fixed members. In the embodiment shown the contacts 13 and contacts 14 are placed in alinement and accordingly the four stationary contacts upon each side of the arm are alined, as indicated in Fig. 2 of the drawings. These latter contacts are preferably of the laminated brush type, so disposed as to present an advanced edge of a yielding character in order that they may be reliably bridged by the corresponding swinging contacts 13 and 14.

Turning now to Fig. 1 of the drawings, in which the electric connections are shown, the mains leading from the dynamo are indicated at 15 and 16. In this view the two pairs of fixed contacts coacting with the movable contacts 13 are respectively indicated at 17 and 18 and the two pairs coacting with the contacts 14 are shown at 19 and 20. One of the contacts 18 is connected with what may be assumed to be the positive generator terminal, and from the remaining contact 18 a conductor 21 leads to the main

15 of the external circuit, which may comprise a storage-battery, as indicated in Fig. 1 of the drawings. The field circuit comprises a variable resistance device 22, which may be automatically controlled in any well known manner, and the field winding 23. Bridged across the contacts 19 is the magnet 24, which is so wound as to present a high ohmic resistance and acts as a voltage magnet. One of the contacts 19 is connected directly with the main 15 and the other is in connection with one of the pairs of contacts 17 through conductor 25 and through conductor 26 with the negative terminal of the dynamo. The remaining contact 17 is connected by the wire 27 with the main 16, the latter leading also to one of the pairs of contacts 20. The remaining contact 20 is connected directly with the positive terminal of the dynamo, and, by means of the wires 28, the voltage coil 29, similar to coil 24, is bridged across the contacts 17.

Recurring to Fig. 3 of the drawings, it will be seen that the magnets 24 and 29, which are preferably of the double-spool variety, are removably mounted upon the casing 1 in such position as to coact respectively with the two armatures 12, and there is provided a spring 30 stretched between the sleeve 6 and a fixed pin 31 in such position as normally to tend to hold the arm 8 in an intermediate position as indicated by the dotted lines. With the parts in this latter position, it will be seen that all of the contacts 13 and 14 are out of engagement with their coacting fixed members, and hence, the several circuits referred to in connection with Fig. 1 are open.

It may be noted that the entire swinging element including the collar 6, arm 8 and associated parts is preferably so formed and proportioned as by suitable counterweighting, if necessary, to bring its center of gravity substantially within its axis, thus avoiding the effect of jarring thereon.

A dust-proof casing 32 is removably secured to the end of the dynamo casing and is shaped, as shown in Fig. 2, to inclose this entire mechanism.

The operation of the above-described embodiment of this invention is substantially as follows:—Assuming that the generator is stationary, the arm 8 will occupy the position indicated in dotted lines and the several circuits will be open. If now the generator be driven in one direction, say, for example, left-handed or counter-clockwise, with respect to Fig. 3 of the drawings, the magnets 11 will immediately drag the sleeve 6 in the same direction of rotation and throw contacts 14 into circuit-completing relation to the pairs of contacts 19 and 20. This will complete a circuit from the positive generator terminal to the main 16, and from the negative terminal to the main 15, at the same time short-circuiting the voltage magnet 24, which consequently increases the effectiveness of the magnet 29 by withdrawing the attraction of the former upon its armature 12. The parts will remain in this condition as long as the dynamo is given any appreciable speed of drive, but when the drive is stopped or substantially stopped, the current in magnet 29 falls correspondingly and its field, as well as the dragging effect upon sleeve 6, becomes substantially zero. The spring 30 will then draw the arm 8 into an intermediate inoperative position, breaking the circuits. If now the generator be started in the reverse direction, the arm 8 will be swung toward magnet 24, the contacts 13 respectively bridging the pairs of contacts 17 and 18. Since the polarity of the generator has been reversed, the main 16 is now connected with the positive generator terminal through conductors 25 and 26, and the main 15 is connected through contacts 18 with the negative terminal of the generator. Also the voltage magnet 29 is short-circuited, thus increasing the effectiveness of the magnet 24 in holding the parts in this position. In this condition the direction of drive of the generator is reversed, but its connections with its external circuit are also reversed, and, hence, due to this double reversal, the direction of current in the external circuit is maintained constant. It is to be noted that there is substantially no tendency to spark at the contacts, inasmuch as at the instant of making or breaking contact, the speed of the generator is extremely low, as above noted, and the external circuit opened by the usual main switch. The contacts, moreover, are not only of such a nature as to insure a complete bridging, but are of such size as to adapt them readily to carry the external current of the generator under all conditions of use. It will thus be seen that by this simple device the output of a generator may be maintained constant in direction irrespective of a reversal in drive, and it will also be seen that this result is accomplished without depending upon such uncertain factors as frictional engagement, which would, of course, vary with character and condition of surfaces and extent of wear. Obviously, however frequently or suddenly the direction of rotation of the armature is changed, its speed must always pass through zero, thus permitting the parts to assume a neutral condition before the changed connection is made. Not only is the action reliable and the contacts brought firmly and securely in position, but the device is simple and cheap in construction and readily accessible as for purposes of inspection or renewal of parts.

As many changes could be made in the above construction and many apparently widely different embodiments of this inven-

tion could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is;

1. In apparatus of the class described, in combination, a dynamo comprising field magnet, armature and armature shaft, a member mounted adjacent one end of said shaft to swing freely with respect thereto, switching means connected with said member whereby it is adapted to reverse the connections of said dynamo as it swings from one extreme position to another, and means mounted to turn with said armature shaft and adapted to coact inductively with said member to drag it in one or the other direction in accordance with the direction of rotation of said shaft.

2. In apparatus of the class described, in combination, a dynamo comprising field magnet, armature and armature shaft, a member mounted adjacent one end of said shaft to swing freely with respect thereto, switching means connected with said member whereby it is adapted to reverse the connections of said dynamo as it swings from one extreme position to another, means mounted to turn with said armature shaft and adapted to coact inductively with said member to drag it in one or the other direction in accordance with the direction of rotation of said shaft, and means tending to hold said member in a neutral position.

3. In apparatus of the class described, in combination, a dynamo comprising field magnet, armature and armature shaft, a member mounted adjacent one end of said shaft to swing freely with respect thereto, switching means connected with said member whereby it is adapted to reverse the connections of said dynamo as it swings from one extreme position to another, means mounted to turn with said armature shaft and adapted to coact inductively with said member to drag it in one or the other direction in accordance with the direction of rotation of said shaft, means tending to hold said member in a neutral position, and means adapted to hold said member in each contact-making position.

4. In apparatus of the class described, in combination, a contact, a movable member adapted to co-act therewith, means tending to urge said member away from said contact, an electro-magnetic device tending, when energized, to hold said member against said contact to complete thereby an electrical connection, and means adapted to render effective said device as said member comes into operative relation with said contact.

5. In apparatus of the class described, in combination, two relatively movable members adapted to contact with each other, means tending to urge one member away from the other, an electro-magnetic device tending to hold said first member against the other and means adapted to increase the effectiveness of said device as said first member makes contact with the other.

6. In apparatus of the class described, in combination, a pair of contacts, means comprising a movable member adapted to move from one to the other of said contacts and to coact therewith, means tending to hold said member in an intermediate position, electro-magnetic means tending to hold said member in operative relation to the contact against which it rests, and means increasing the effectiveness of said electro-magnetic means substantially as said member comes into operative relation to the corresponding contact.

7. In apparatus of the class described, in combination, a dynamo comprising field magnets, an armature and an armature shaft, a member mounted upon said armature shaft, a relatively movable member adapted to be acted upon inductively to tend to move with said first member, and means controlled by said relatively movable member and adapted to reverse the connections between said dynamo and its external circuit.

8. In apparatus of the class described, in combination, a dynamo comprising an armature winding, an armature shaft, a member mounted upon said armature shaft, a relatively movable member, one of said members forming a magnet and the other being adapted to have currents induced therein by said magnet whereby said second member is moved as said armature shaft rotates, and means controlled by said second member adapted to reverse the connection between said dynamo and its external circuit as the direction of drive of said armature shaft is reversed.

9. In apparatus of the class described, in combination, a switch, a pair of relatively movable members, one of which is provided with a magnet and the other of which is adapted to have currents induced therein by said magnet, a connection between said switch and one of said members whereby said switch is operated upon the other of said members being moved, a dynamo-electric machine with which one of said members is connected, and connections whereby

said machine may be reversed with respect to its external circuit upon said switch being operated.

10. In apparatus of the class described, in combination, a dynamo-electric machine, a pair of members, one of which is secured to the armature shaft of said machine to rotate therewith and the other of which is mounted to move relatively to said member, one of said members forming a magnet and the other being adapted to have currents induced therein by said magnet, a pair of sets of contacts between which said second member moves and with which it coacts, and connections from the contacts of each set to said machine and its external circuit whereby said dynamo is reversed with respect to said external circuit as said member moves from one to the other of said sets of contacts.

11. In apparatus of the class described, in combination, a dynamo-electric machine, a member mounted upon the end of the armature shaft of said machine to oscillate with respect thereto and providing a sleeve, a second member mounted upon said shaft to turn therewith and embracing said sleeve, one of said members forming a magnet and the other being adapted to have currents induced therein by said magnet, and means controlled by the movement of said first member adapted to reverse said machine with respect to its external circuit.

12. In apparatus of the class described, in combination, a dynamo, an external circuit, a plurality of contacts connected to said dynamo and circuit, a member mounted to oscillate upon the shaft of said dynamo between said contacts and reverse the connections of said dynamo with respect to said circuit as it moves from one to another set of contacts, and electro-magnetic means tending to hold said member against said contacts and having its effectiveness increased substantially as said member comes into operative relation with the corresponding contacts.

13. In apparatus of the class described, in combination, a dynamo-electric machine, a pair of members, one of which is secured to the armature shaft of said machine to rotate therewith and the other of which is mounted to move relatively to said member, one of said members forming a magnet and the other being adapted to have currents induced therein by said magnet, a pair of sets of contacts between which said second member moves and with which it coacts, connections from the contacts of each set to said machine and its external circuit whereby said machine is reversed with respect to its external circuit as said member moves from one to the other of said sets of contacts, and electro-magnetic means tending to hold said member against the contacts with which it is in engagement.

14. In apparatus of the class described, in combination, a dynamo-electric mechine, a pair of members, one of which is secured to the armature shaft of said machine to rotate therewith and the other of which is mounted to move relatively to said member, one of said members forming a magnet and the other being adapted to have currents induced therein by said magnet, a pair of sets of contacts between which said second member moves and with which it coacts, connections from the contacts of each set to said machine and its external circuit whereby said machine is reversed with respect to its external circuit as said member moves from one to the other of said sets of contacts, electro-magnetic means tending to hold said member against the contacts with which it is in engagement, and a spring tending to hold said member in an intermediate position.

15. In a car lighting system, the combination with a generator to be driven in either direction, of an automatic pole-changer therefor including a contact carrying element having a limited rocking movement, means to effect movement of said element in accordance with the direction of drive of said generator for maintaining constant polarity at the terminals of the latter, and electro-magnetic means operative on said element with an increasing attractive force as the latter approaches either rocking limit.

16. In apparatus of the class described, in combination, an automatic switch gear comprising a rocking support, switch parts thereon, contacts supported in the paths of said switch parts, a part revolving with the dynamo armature and adapted to move said switch parts against certain of said contacts, and electromagnetic means operative upon said rocking support in unison with the movement of said switch parts by said revolving part and adapted to give said support an additional rotating movement for maintaining a circuit closed.

17. In apparatus of the class described, in combination, an automatic switch gear comprising a movable support, switch parts on said support, contacts mounted in the paths of respective switch parts, a part revolving with the dynamo armature and adapted to move said support against one set or another set of said contacts depending upon the direction of rotation of said armature, and electromagnetic means operative upon said support in the same direction said support is moved by said rotating part.

18. In a dynamo-electric machine comprising a rotatable armature, in combination, a holder adapted for limited movement, reversing switch parts carried thereon, switch brushes arranged in the paths of said switch parts, a member revoluble with the dynamo armature and adapted to move said holder

in one direction or the other, according to the direction of rotation of the armature, and electromagnetic means operative upon said holder in the same direction as said holder is moved by said member.

19. In a dynamo-electric machine comprising a rotatable armature, in combination, a holder adapted for limited movement, reversing switch parts carried thereon, switch brushes arranged in the paths of said switch parts, a member revoluble with the dynamo armature and adapted to move said holder in one direction or the other, according to the direction of rotation of the armature, electromagnetic means operative upon said holder in the same direction as said holder is moved by said member, and means effective when the dynamo speed falls below a predetermined value, to disconnect the switch parts and brushes.

20. In a dynamo-electric machine comprising a rotatable armature, in combination, a rocking reversing switch arranged to rock in one direction or the other according to the direction of rotation of the armature, flexible switch brushes arranged so that certain of them contact when the switch is rocked by the revolution of the armature, electromagnetic means operative upon said rocking switch in either direction of running, and a circuit closed by the brushes making said contact, the electromagnetic means being energized to an effective value by the closing of said circuit.

21. In a dynamo-electric machine comprising a rotatable armature, in combination, a reversing switch arranged to move in one direction or the other according to the direction of rotation of the armature, flexible switch brushes arranged so that certain of them contact when the switch is moved by the revolution of the armature, and electromagnetic means operative upon said switch in either direction of running to tend to hold said switch in one or the other of its circuit-closing positions, the brushes when in circuit-closing position being distorted to tend to move said switch into circuit-opening position.

22. In a dynamo-electric machine comprising a rotatable armature, in combination, a rocker, means rotating with the dynamo armature and adapted to rock said rocker in the direction of rotation of said armature, contacts fixed on said means, switch brushes fixed to the framing of said dynamo and extending into the paths of said contacts in such manner that each brush will engage a different contact when the direction of running is reversed, and electromagnetic means operative upon said rocker, the windings of said means being energized to working strength by the engagement of said contacts with said brushes.

23. In a dynamo-electric machine comprising a rotatable armature, in combination, an automatic switch gear comprising a movable support, means carried by the dynamo armature for moving said support in one direction or another, depending upon the direction of rotation of said armature, switch parts on said support, contacts mounted on the switch parts, coöperative contacts mounted in the paths of respective switch parts, and electromagnetic means operative upon said support in the same direction as the support is operated by the rotation of the armature, and connected to attain normal working strength by the closing of said switch.

24. In a dynamo-electric machine comprising a rotatable armature, in combination, an automatic switch gear comprising a rocking support, means carried by the dynamo armature for rocking said support in the same direction that the armature rotates, switch parts on said support, contacts mounted on the switch parts, coöperative contacts mounted in the paths of respective switch parts, and electromagnetic means operative upon said support in the same direction as the support is operated by the rotation of the armature.

25. In a dynamo-electric machine comprising a rotatable armature, in combination, a rocker frame, means for rocking said frame in one direction or the other depending upon the direction of rotation of the dynamo armature, insulated switch contacts on said frame, an electromagnet operative upon said rocker frame in the same direction that said frame is influenced by the said means in either direction of running, a work circuit, a switch brush fixed on said dynamo and having an arm extending within the paths of said contacts, said brush constituting a negative terminal of the work circuit, and a second switch brush fixed on said dynamo and having an arm extending within the paths of said contacts, said second switch brush constituting the positive terminal of the work circuit.

26. In apparatus of the class described, in combination, an armature, rotatable pole-changing means associated therewith for maintaining the same polarity of current when the armature is rotated in either direction, means operated by the movement of the armature for rotating said pole-changing means in one direction or another according to the direction of rotation of the armature, and magnetic means tending to rotate said pole-changing means and holding the same in circuit-closing position.

27. In apparatus of the class described, in combination, a reversible dynamo, a contact-carrying element having a limited rocking movement, means to effect movement of said element in accordance with the direction of drive of said dynamo for maintain-

ing constant polarity at the terminals of the latter, and electromagnetic means for holding said element in either of its normal running positions and adapted to attain its normal attraction for said element as said element attains either of said running positions.

28. In apparatus of the class described, in combination, a contact-carrying element having a limited rocking movement, means to effect movement of said element in accordance with the direction of drive of the dynamo for maintaining constant polarity at the terminals of the latter, and electromagnetic means operative on said element with an increasing attractive force as the latter approaches either rocking limit.

29. In apparatus of the class described, in combination, a contact, a reversible dynamo, a member moved by the dynamo armature into contact therewith, means tending to urge said member away from said contact, an electromagnetic device tending, when energized, to hold said member against said contact to complete thereby an electrical connection, and means adapted to render effective said device as said member comes into operative relation with said contact.

30. In apparatus of the class described, in combination, a reversible dynamo, a pair of contacts, means comprising a member moved by the rotation of the armature from one to the other of said contacts to coact therewith and thereby maintain constant the polarity of the dynamo, electromagnetic means tending to hold said member in operative relation to the contact against which it rests, and means increasing the effectiveness of said electromagnetic means substantially as said member comes into operative relation to the corresponding contact.

In testimony whereof I affix my signature, in the presence of two witnesses.

JOSEPH BIJUR.

Witnesses:
R. A. BLAIR,
L. A. WATSON.