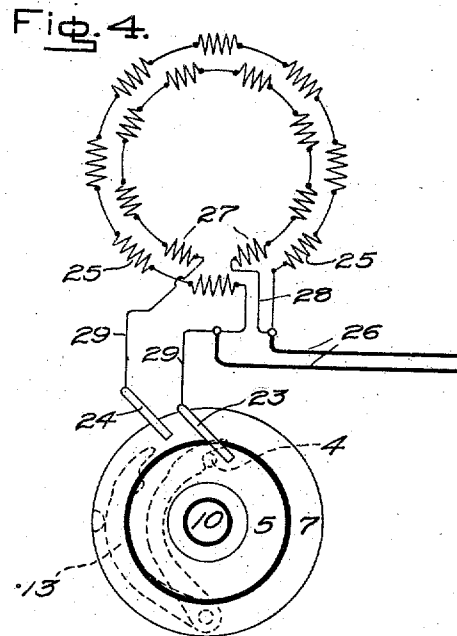
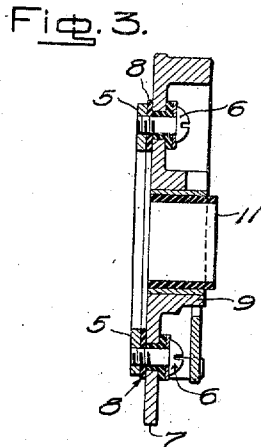
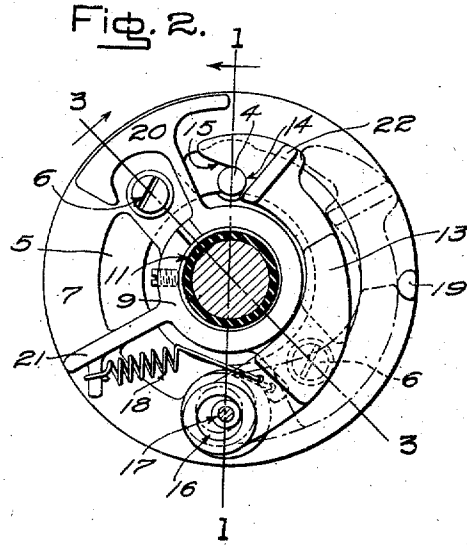
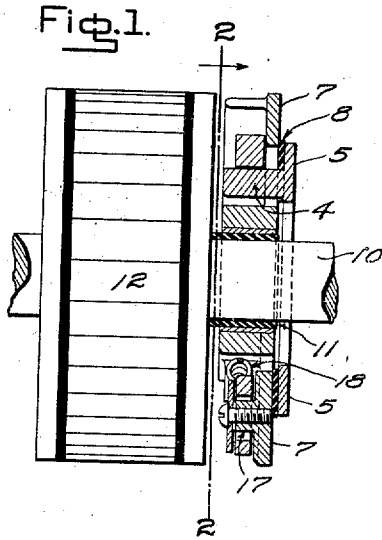


C. L. KENNEDY.
AUTOMATIC SWITCH.
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1,018,196.

Patented Feb. 20, 1912.



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AUTOMATIC SWITCH.

1,018,196.

Specification of Letters Patent.

Patented Feb. 20, 1912.

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To all whom it may concern:

Be it known that I, CARLTON L. KENNEDY, a citizen of the United States, residing at South Braintree, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Automatic Switches; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to automatic switches for use in connection with induction motors of the split-phase type. In a motor of this type an auxiliary stator winding is employed in starting the motor, this stator winding being energized by a current in which the phase is displaced relatively to the phase of the current in the normally-operative or working winding if the stator in order to produce, in cooperation with the working winding, a rotary field. When the motor has attained a predetermined speed the starting winding is cut out by the operation of the automatic switch.

A switch of the type above referred to is disclosed in the patent to Donald M. Bliss, No. 860,124, granted July 16, 1907, and the present invention is an improvement upon the switch disclosed in said patent.

In the patent above referred to the switch comprises a base member adapted to be mounted upon the shaft of the motor so as to be rotated thereby. This base member carries a fixed contact member and a movable contact member. The movable contact member comprises an arm pivoted at one end to the base member and carrying it at its free end, and a pivoted contact piece adapted to engage the fixed contact member. A spring connected with the pivoted arm holds the contact members normally in engagement, but upon the attainment of a predetermined speed of rotation, the centrifugal force acting upon the arm causes it to swing outwardly so as to disengage the fixed contact member and thereby break the circuit through the starting winding.

The function of the pivoted contact piece mounted upon the arm is to secure a sliding engagement with the fixed contact member

previous to their complete disengagement in order that the breaking of the circuit may occur at a different point on the fixed contact member from that normally engaged by the movable contact member, and in this way injury to the surface of the fixed contact member due to the arcing which occurs at the breaking of the contact is prevented from affecting the contact surface normally engaged by the movable contact member.

The object of the present invention is to secure the advantages of the construction above described in a simple manner and by the use of only a single moving part constituting the movable contact member. To this end I use a single rigid movable contact member and connect it with the base of the switch in such a manner that it has capacity for moving in two directions. By its movement in one direction it maintains electrical engagement with the fixed contact member during the first portion of its disengaging movement, while at the same time moving in the general direction to cause disengagement, so as to have a sliding contact with the fixed contact member until disengagement occurs.

Other features of the invention will be set forth in connection with the description of the illustrated embodiment thereof.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section of an automatic switch mounted upon a motor shaft, the section being taken on the line 1—1, in Fig. 2. Fig. 2 is an elevation of the switch, partly in section on line 2—2, in Fig. 1. Fig. 3 is a section of the switch on line 3—3, in Fig. 2. Fig. 4 is a diagram illustrating the electrical connections between the switch and the motor.

The switch illustrated in the drawings is provided with a fixed contact member 4 in the form of a metal pin projecting inwardly from a flat ring 5. The ring 5 is secured by screws 6 to a flat ring 7 of conducting material, but is insulated therefrom by insulating material 8. The ring 7, which constitutes the base or main supporting member of the switch, is integral with arms projecting from a central hub 9, and this hub is

mounted upon the shaft 10 of the motor, being insulated therefrom by means of a bushing 11 of insulating material. The shaft 10 carries the rotor 12 of the motor, so that the switch rotates as a whole at the same speed as the rotor.

The movable contact member is in the form of a curved arm 13. This arm is provided at its free extremity with a recess 14 which conforms to the surface of the fixed contact member 4 and constitutes a butting-contact surface through which electrical contact is normally made between the contact members. Extending from the contact surface 14 to the extremity of the arm 13 is a sliding-contact surface 15 which is adapted to engage the fixed contact member slidably as the arm moves to disengage itself from the fixed contact member. The arm 13 is connected with the base or ring 7 in such a manner as to cause it to be actuated by the latter but to permit it to have movements in two directions thereon. To this end the arm is provided with an opening or recess 16 which is engaged by a pivot pin or abutment 17 projecting from the base ring 7. The pivot pin is substantially smaller than the opening 16, so that the arm may have not only a pivotal or angular movement about this connection, but may also have a lateral movement or movement of translation for the purpose of securing the sliding engagement hereinbefore referred to.

The contact members are normally held in engagement, when the motor is at rest, by means of a spring 18 connected at one end to the base member and at the other end to the arm 13 near its pivotal support. When the switch is in rotation the centrifugal force acting upon the movable contact member tends to swing it outwardly about its pivotal support so as to disengage it from the fixed contact member. The position of the sliding-contact surface 15 with relation to the position of the opening 16, and the shape of the latter opening, and the relation of these to the positions of the fixed-contact member 4 and the pivot pin 17, the point of application of the spring 18 and its direction of pull on the curved arm 13, together with the position of the center of gravity of the arm 13, are such that when the arm 13 is moved in an outward direction the tendency is to hold the sliding-contact surface 15 in engagement with the fixed-contact member 4 until the swinging movement of the arm separates the contact members entirely. The result of the centrifugal action is, therefore, to cause the movable contact member first to swing outwardly so that the butting-contact surface 14 is disengaged from the fixed contact member but to continue in engagement with the contact member, through the sliding-contact surface 15,

until the extremity of this surface is separated from the fixed contact member by the continued outward swinging movement of the arm. The circuit is then broken at the extremity of the moving contact member, so that any arcing which occurs at the instant of breaking will not affect the butting contact surface 14, and the normal electrical contact between the contact members will not, therefore, be impaired by the burning of the movable contact member due to the arcing.

The arm 13 has its sliding-contact surface 15 inclined at a comparatively small angle to the arc of movement of the free end of said arm about the pivotal connection 16-17 so that when the arm 13 is moved to close the circuit the surface 15 will ride over the opposing parallel sliding-contact surface of the round fixed contact member 4 until the butting-contact surface 14 is brought into engagement with the fixed contact member 4. The recess 16 is larger than the pin 17 in a direction substantially normal to the arc of contacting movement of the free end of the arm 13 so that a sufficient outward radial movement is permitted the arm 13 to allow the inclined sliding-contact surfaces of the movable and fixed contact members to ride over each other. It is to be observed that the two contact members are relatively movably mounted upon the base, that one of them is an integral arm pivoted on the base and adapted to be actuated by the rotation thereof, and that said contact members have sliding-contact surfaces somewhat inclined to the direction of the arc of the movement of the pivoted arm, and also that one of the contact members is provided with a mounting comprising a recess and a pin engaging the recess which recess is larger than the pin in a direction which is substantially normal to the arc of contacting movement of the arm so as to allow the two cooperating sliding-contact surfaces to ride over each other, and that the sliding-contact surfaces are yieldably held in engagement during their riding or wiping engagement. Since the sliding-contact surfaces are inclined at a comparatively small angle to the arc of swing of the arm, the movement of the sliding-contact surfaces, which is due to the transverse movement of the pin in the recess, is in a direction which is substantially inclined to said sliding-contact surfaces.

The outward movement of the movable contact member is limited by a stop 19 projecting from the base ring 7. The base ring is counter-balanced by means of a weight 20 integral therewith to compensate for the centrifugal action of the movable contact member. A vane 21 is fixed to the base ring to promote the circulation of air between the switch and the rotor, and a vane 22 is

fixed to the movable contact member for a similar purpose.

The manner in which the switch is used is illustrated diagrammatically in Fig. 4.

Two brushes 23 and 24 are arranged to engage the outer surfaces of the rings 5 and 7 to make electrical contact therewith, and these brushes are connected, through wires 29, respectively, with one of the feed terminals 26 through which the motor is supplied with current, and with one terminal of the starting winding 27 of the motor. The working winding 25 of the stator is permanently connected with the feed terminals 26, and one terminal of the starting winding 27 is also connected, by a wire 28, with one feed terminal.

The above-described connections are such that when the switch is in the closed-circuit position illustrated in the drawings, the starting winding 27 is energized from the feed terminals; but as soon as the switch operates through centrifugal force, as above described, the circuit is broken through the starting winding and the motor operates under the influence of the working winding alone. An electrical connection is formed through the joint 17 from the ring 7 to the arm 13 which consists of an integral piece of metal, and has a contacting surface 14-15 formed directly thereon.

By my improved construction above described I dispense with the use of the jointed arrangement of the two-part movable contact member employed in the construction disclosed in the Bliss patent before referred to, thereby rendering the device more simple in construction and also avoiding the necessity of conducting electricity through a mechanical joint in the movable contact member. Owing to the same simplification in construction, the operation of the device is rendered more reliable, since the entire weight of the movable contact member is utilized to maintain the sliding engagement with the fixed contact member, and since this action does not depend upon an additional joint which is liable to stick, due to the presence of lubricating oil or dirt.

My invention is not limited to the embodiment hereinbefore described and illustrated in the accompanying drawings, but it may be embodied in other forms within the nature of the invention and the scope of the following claims.

I claim:—

1. An automatic switch, having, in combination, a base, a fixed contact member and a movable rigid contact member mounted thereon, one of the contact members being provided with a sliding-contact surface adapted to engage the other contact member, the moving contact member having direct mechanical connection with the base so as to be actuated by the rotation thereof, and such

connection having provision for movement of the movable contact member, by centrifugal action, both in a direction to secure sliding engagement between the sliding-contact surface and the cooperating contact member and in a direction to cause the movable contact member to slide beyond and disengage the fixed contact member.

2. An automatic switch, having, in combination, a base, a fixed contact member and a movable integral contact member, one of the contact members having a butting-contact surface and a sliding-contact surface arranged at an angle with each other, the movable contact member having direct mechanical connection with the base so as to be actuated by the rotation thereof, and such connection having provision for movement of the movable contact member under centrifugal action both in a direction to secure sliding engagement between the sliding-contact surface and the cooperating member, and in a direction to slide out of engagement with the fixed contact member.

3. An automatic switch having, in combination, a base, two relatively movable contact members mounted thereon, one of which comprises an arm pivoted on the base and adapted to be actuated by the rotation thereof, one of said contact members having a pin and recess connection with the base, the recess being larger than the pin in a direction substantially inclined to the surfaces of the contact members which first engage each other, to allow the contact members to have a wiping engagement when they make and break contact, and means to yieldingly hold said surfaces in contact during their wiping engagement.

4. An automatic switch, having, in combination, a base, a fixed contact member, a movable contact member and a spring connected with the movable contact member and tending normally to maintain it in engagement with the fixed contact member, the movable contact member being in the form of an arm pivotally connected at one end with the base, the pivotal connection having provision both for angular movement of the arm to permit it to be disengaged from the fixed contact member by centrifugal action, and for transverse movement of the arm to permit a sliding engagement between the arm and the fixed contact member.

5. An automatic switch, having, in combination, a base, a fixed contact member, a movable contact member, the movable contact member being in the form of an arm adapted to engage the fixed contact member at one end and connected at the other end with the base by a connection comprising a recess and a pin engaging the recess, the recess being substantially larger than the pin to allow the movable contact member to have a wiping engagement with the fixed contact

member when the two members make or break contact, and a spring connected to the movable contact member and having a component of its force in a direction normal to that part of the surface of the fixed contact member which is first engaged by the movable contact member to insure the wiping engagement of these two members.

6. An automatic switch having, in combination, a base, a fixed contact member, and a movable contact member pivotally mounted on the base, said contact members having opposing sliding-contact surfaces inclined at a comparatively small angle to the arc of contacting movement of the pivoted member, and said movable member having included in its connection with the base a pin and recess, the recess being larger than the pin in a direction substantially normal to

said arc of movement, to permit said inclined sliding-contact surfaces to ride over each other.

7. An automatic switch having, in combination, a base, two relatively movable contact members, one of which is pivotally mounted on the base, said members having opposing sliding-contact surfaces inclined to the arc of contacting movement of the pivoted member, and one of said members having a pin and recess connection with the base, the recess being larger than the pin in a direction substantially normal to said arc of movement, to permit said inclined sliding-contact surfaces to ride over each other.

CARLTON L. KENNEDY.

Witnesses:

ROY T. WELLS,

MATTHEW POROSKY.

It is hereby certified that in Letters Patent No. 1,018,196, granted February 20, 1912, upon the application of Carlton L. Kennedy, of South Braintree, Massachusetts, for an improvement in "Automatic Switches," an error appears in the printed specification requiring correction as follows: Page 1, line 21, for the word "if" read *of*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of March, A. D., 1912.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.