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J. T. WELSH

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CONTROL APPARATUS

Filed March 2, 1927

2 Sheets-Sheet 1

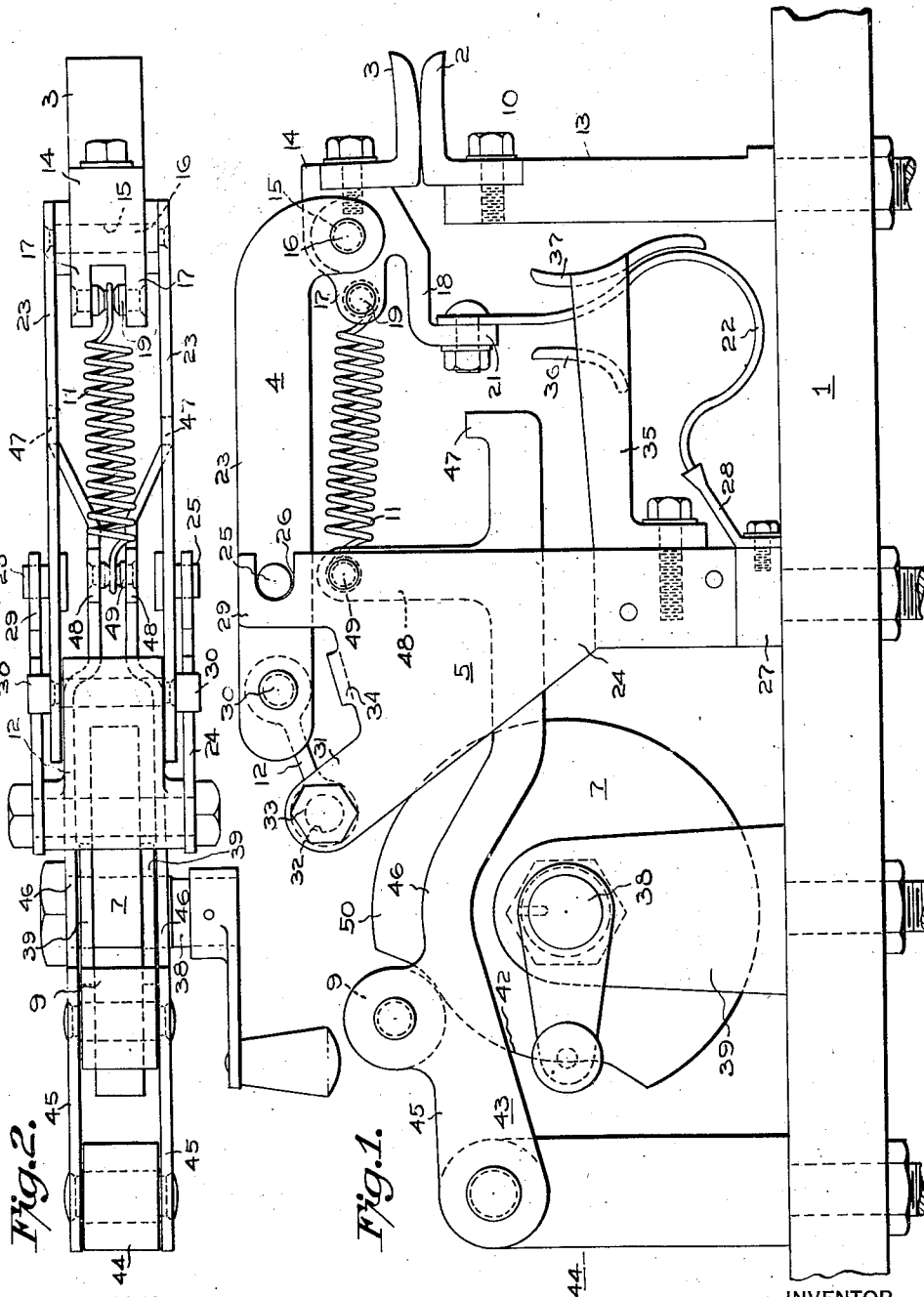


Fig. 2.

Fig. 1.

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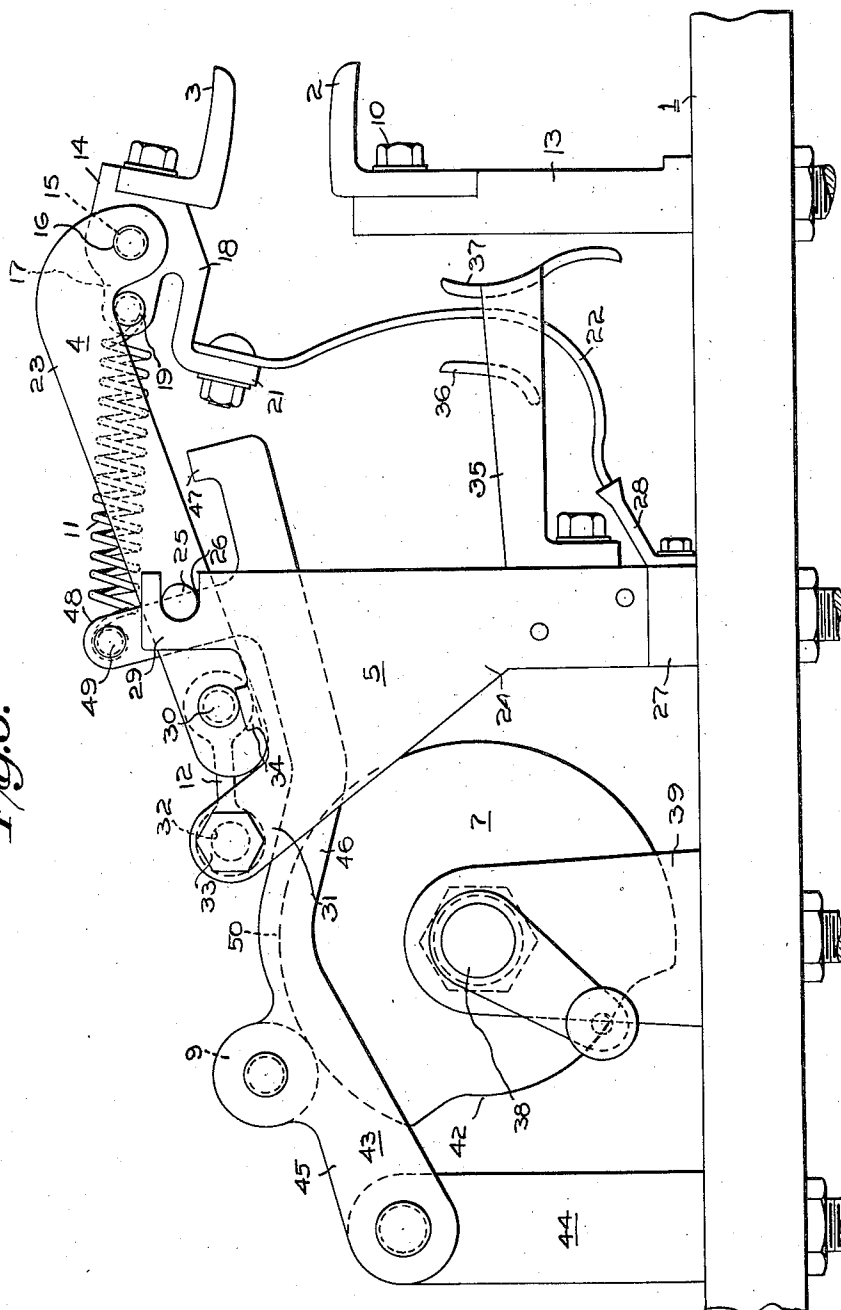
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Fig. 3.



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CONTROL APPARATUS

Application filed March 2, 1927. Serial No. 172,040.

My invention relates to control apparatus and more particularly to cam-actuated contactors, or the like.

One object of my invention is to provide a contactor of the cam-actuated type wherein there are no sliding contacts.

Another object of my invention is to provide a contactor that shall reduce arcing by having a quick opening movement of the contact members.

Another object of my invention is to provide a contactor in which a single resilient member shall be employed to obtain a quick opening movement of the contact members with a rolling motion.

A further object of my invention is to provide a contactor that shall positively separate the contact members in case they become welded or if, for any reason, the resilient member fails to act.

Another object of my invention is to provide a cam-actuated contactor having a snap action and which is relatively simple in construction, effective in operation and economical to manufacture.

A further object of my invention is to provide a contactor, as above described, in which all the parts are individually readily accessible for the purpose of making replacements without disturbing any other parts of the controller.

Other objects of my invention will become evident from the following description when taken in connection with the accompanying drawings.

The parts of my contactor may be made of any material and form that are suitable to such use; and it will be understood, therefore, that the apparatus illustrated in the accompanying drawings may be variously modified within the scope of my invention.

Fig. 1 is a view, in side elevation, of a contactor embodying my invention, showing the parts thereof in their respective positions when the contactor is in its circuit-closing position;

Fig. 2 is a plan view of the contactor shown in Fig. 1; and

Fig. 3 is a view, in side elevation, of the contactor showing the respective positions of

the parts when the contactor is in its open-circuit position.

Referring to the drawings, my invention is shown as comprising, in general, a base member 1 of insulating material on which is mounted a stationary contact member 2 and a cooperating movable contact member 3 carried by a lever arm 4 which, in turn, is supported by a bracket 5.

The bracket 5 is secured to the base member 1, and a cam 7 is rotatably mounted on the base member for actuating the lever arm 4 through a lost-motion connection which comprises a roller 9 that rides on the surface of the cam 7, together with a spring 11 that is associated with a toggle mechanism 12 and with the movable contact member 3 for imparting a snap movement to the latter.

The stationary contact member or tip 2 is supported by a post 13 and is firmly secured thereto by a bolt 10 which may also be utilized as a terminal for a leading-in wire of conductor.

The movable contact member 3 is secured to a contact-carrying element 14 that is provided with a transverse opening 15 for the reception of a pin 16 and further comprises a bifurcated lug 17 and a bent lug or arm 18 that are disposed on the opposite side of the opening 15 from the movable contact member 3. The two parts of lug 17 are provided with a pin 19 for the attachment of one end of the spring 11. The lug 18 extends outwardly for a short distance in parallelism with the lugs 17 and is then bent downwardly to provide a terminal 21 for securing one end of a flexible conductor 22 thereto.

The lever arm 4 is constructed from a pair of plates 23 of stamped material which are held in position by the pin 16 and the joint action of the pair of plates 24 that constitute the bracket 5 and a portion of the toggle 12. The plates 23 are disposed within the plates 24 and are pressed outwardly against the latter by one of the enlarged end members of the toggle 12. The plates 23 are provided with outwardly extending pins 25 that are seated in notches 26 in the plates 24 and thereby serve as fulcrum points for the lever arm 4.

The bracket 5 comprises the plates 24, heretofore mentioned, which are made of stamped material and are roughly of Y-shape. A lower leg on each of the plates 24 extends downwardly and is attached to any suitable securing block 27 that is firmly fixed to the base member 1. The securing block 27 is provided with a terminal 28 for receiving one end of the flexible conductor 22. An arm or branch 29 of each of the plates extends upwardly and is provided with the above-mentioned notch 26; and the other arm 31 of each of the plates is provided with an opening 32 for the reception of a bolt 33 that secures one end of the toggle 12 in place. Each of the plates 24, between the arms 29 and 31, is provided with a projection or boss 34 that serves as a limiting stop for a pin 30 that secures the toggle 12 to the lever 4. The securing block 27 is provided with a pair of laterally extending portions 35 that serve as guides for the flexible conductor 22. Secondary guide members 36 and 37 may be mounted on the guide members 35, if desired. The cam 7 is supported by a shaft 38 that is mounted in standards 39. Any suitable actuating mechanism, such as the usual controller handle, (not shown) may be secured to the shaft 38 for actuating the cam 7. The periphery of the cam 7 is provided with a segmental portion 42 of irregular contour for actuating the roller 9 which is mounted on a work arm 43.

The work arm 43 is pivoted, at one end, to a supporting member 44 that is mounted on the base member 1. The work arm 43 consists of a pair of complementary members 45 of sheet metal which surround the cam 7 and are bent downwardly, at an intermediate portion 46, in order to permit them to pass between the plates 24 of the bracket 5. The extremities of the plates 45 are bent outwardly and upwardly to provide hammer portions 47 that are placed in alinement with the plates 23 of the lever 4 and outside of the spring 11, to thus partially protect it. The ends 47 of the plates 45 are adapted to impinge upon the plates 23 with a hammer action. The plates 45 are also provided with upwardly projecting arms 48 that extend between the plates 24 of the bracket 5 and are provided, at their outer ends, with a pin 49 to which one end of the spring 11 is connected.

Assuming the contactor to be in the circuit-closing position shown in Fig. 1 and that it is desired to open the circuit, the shaft 38 is rotated in the counter-clockwise direction which causes the cam 7 to turn and the roller 9 to move first along the irregular portion 42 of the cam 7 and then engage the cylindrical portion 50. The cam 7 thus moves the work arm 43 upwardly to the position shown in Fig. 3. In doing so, the spring-carrying arms 48 are projected up between the side

plates 23 of the contact-carrying lever 4, as illustrated.

The pins 25 are secured to the side plates 23 of the contact-carrying lever 4 in such manner that they in no way interfere with the movement of these arms. At the time the contact-carrying lever 4 is forced to the open position, the toggle 12 is forced downward, as shown, and, to permit this cooperating action, the pins 25 on the contact lever 4 slide along the notches 26 located in the bracket 5. When this operation takes place, the spring 11 will shift its position in harmony with the work arm 43, inasmuch as it is secured to that element at the extremities of the projections 48. As the spring 11 passes over a dead-center position, which coincides with a line drawn between the point of contact of the contact members and the point where the contact lever 4 is pivoted on the bracket 5, the spring will be biased in a manner to exert a tension to urge the contact members apart and will cause them to separate with a snap movement, thereby reducing the arcing and sparking between these members.

When the cam is rotated in the opposite or clockwise direction, the roller 9 will again return to the initially described "closed" position and, at the same time, the spring 11 will also be returned to the corresponding position. A snap action similar to that described above will take place when the spring passes the aforementioned dead-center line, the tension in this case being differently applied, so that the spring is biased in a manner to urge the contact members together, in which position it remains until further movement of the cam as desired.

The spring 11, being attached to the contact-carrying element 14 which is pivotally mounted upon the arm 4 and carries the movable contact member 3 thereon, a rolling action is provided for that contact member, whereby definite lines of initial and final contact between the contact members are assured when the circuit is being opened or closed. The notches 26 are arranged in the bracket 5, as illustrated, to permit movement parallel to the contact lever 4 to also permit this member to be easily assembled. The projection 34 upon the bracket which makes contact with the pin 30 as a limiting means, determines the distance that the contact lever 4 can be opened.

By means of the hammer elements 47 on the work arm 43 which are adapted to impinge upon the side arms 23 of the contact member 4, this lever will be positively forced open when the work arm 43 is actuated to the open position, in case the contact members should become welded together or, for any reason, the spring 11 or its associated parts should fail.

It will be noted that, by connecting the

spring 11, as illustrated, between the pivoted contact-carrying member 14 that is coupled to the contact lever 4 and the projections 48 on the work arm 43, two results are accomplished by the single spring, in that it provides a controlled rolling action for the contact members and also functions to effect the rapid opening and closing of the switch.

While I have shown my invention in a preferred form, it is apparent that various modifications may be made in the arrangement and construction of the parts without departing from its spirit. It will be understood, therefore, that I do not limit my invention to the specific arrangement illustrated, but desire that only such limitations shall be placed thereon as are indicated in the appended claims.

I claim as my invention:

1. A switch comprising cooperating contact members, a single spring pivotally connected to one of said contact members, and means associated with said spring for providing a snap opening and closing movement of said contact members through the action of said spring, and for also providing rolling action between said contact members.

2. A switch comprising a fixed and a movable contact member, a resilient element for normally urging said members together, and means comprising a cam for moving said resilient element to a position urging said contact members apart, said resilient element also acting to return said contact members together when said cam is moved to its normally closed position.

3. A switch comprising a fixed and a movable contact member, a contact lever, said movable contact member being pivotally mounted at one end of said contact lever, a work arm, a bracket and a toggle element being pivotally connected to said lever at the other end, a support, said work arm being pivotally mounted on said support at one end and having a projection near the other end, a spring coupled to said projection on said work arm and to the movable contact member, said spring normally urging said contact members together, means comprising a cam for actuating said work arm to the "open" position, said spring being responsive to the change in position of said work arm for forcing said contact members rapidly apart, said cam being adapted to hold said spring biased in the last-named position.

4. A switch comprising a fixed and a movable contact member, a contact lever, said movable contact member being pivotally mounted on one end of the contact lever, the other end of said lever being pivotally mounted on a bracket and a toggle, a pivotally mounted and bifurcated work arm having a roller mounted thereon and a projection near its free end, a spring connected between said projection on said work arm and the

movable contact member, a controller shaft, a cam mounted thereon, and means for actuating said cam, said roller on said work arm being adapted to ride on said cam and cause said work arm to shift the position of said spring with the movement of said cam, said spring normally urging said contact members together and responsive to urge said contact members apart when it has been biased through the action of said cam and work arm past a critical position with relation to said contact lever and said toggle, thereby forcing said contact members rapidly apart.

5. A switch comprising two cooperating contact members, a contact lever having one end secured to one of said members, a bracket and a toggle pivotally associated with the other end of said lever, a shunt for connecting said bracket to said movable contact member, a shunt guide arm on said bracket, a pivotally mounted work arm, a spring connected between said work arm and said contact member in a manner to urge said contact members together in their normally closed positions, and means for moving said work arm to bias said spring toward the "open" position and cause said contact members to separate with a snap action.

6. A switch comprising a fixed and a movable contact member, a pivotally mounted contact lever for carrying said movable contact member, a fixed bracket and a toggle being pivotally associated with said lever, a pivotally mounted work arm, actuating means therefor, and a spring connected between said work arm and said movable contact member, said spring being adapted to control the rolling action of said contact member and provide a snap action to separate said contact members when said spring is biased to the "open" position through the action of said work arm and its actuating means.

7. A switch comprising a fixed and a movable contact member, a contact lever carrying said movable contact member on one end, a fixed bracket and a toggle pivotally associated with the other end thereof, a pivotally mounted bifurcated work arm, a spring connecting said work arm and said contact lever together, means for actuating said work arm, said spring normally urging said contact members together, and being responsive to movements of said work arm for causing said contact members to open with a snap action and also close them in the same manner when said work arm is returned to its normal position, the free end of said work arm terminating in two hammer elements for impinging upon said contact lever to positively open said contact members in the event of sticking thereof or failure of said spring, said hammer elements also acting as a protective means for said spring.

8. A switch comprising a stationary contact member, a contact lever, a movable contact member pivotally mounted on the contact lever and disposed to engage the fixed contact member, a bracket for supporting the contact lever, and a toggle element for pivotally connecting the contact lever to the bracket, a pivotally mounted work arm, means for actuating the arm to different positions, a spring connected between the movable contact member and the work arm for biasing the contact lever to different positions as the work arm is moved to different positions, also for permitting a rolling action to the movable contact member when the switch closes and a quick separating action to the movable contact member when the switch opens.

9. A switch comprising cooperating contact members, a contact lever for carrying one of the contact members, a work arm, means for actuating said work arm, a spring connected to the work arm and to the contact lever, said spring normally effecting movement of the contact lever as the spring is moved to different positions by the work arm, said work arm being provided with hammer elements for impinging upon the contact lever to cause it to positively open said contact members in the event of sticking of the contacts or the failure to open in response to the spring.

10. In a switch in combination, a pivotally mounted contact member, a pivotally mounted work arm for actuating the contact member, a spring connected between the work arm and contact member, the connections between the contact member, work arm and spring being so disposed relative to the pivot points that the work arm is continuously biased to a predetermined position and the contact member is biased to different positions as the work arm is actuated.

In testimony whereof, I have hereunto subscribed my name this twenty-fifth day of February 1927.

JOHN T. WELSH.

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