

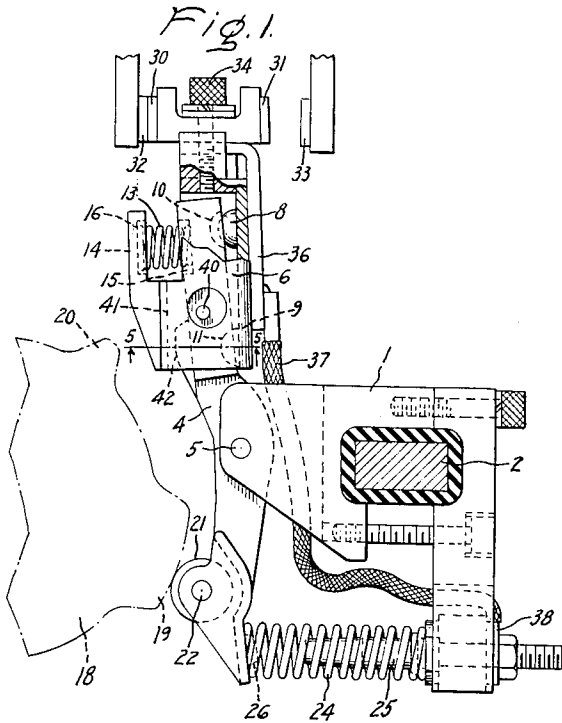
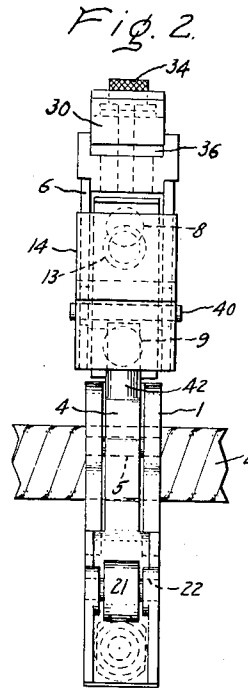
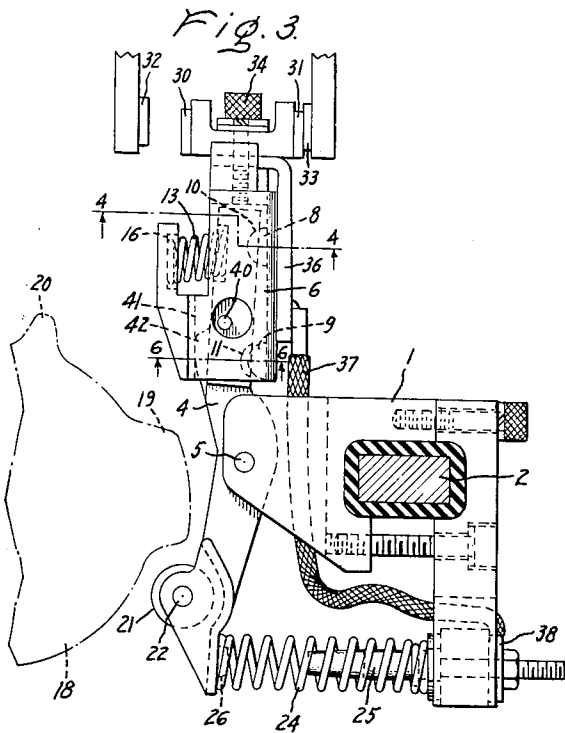
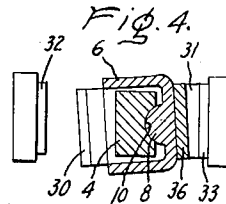
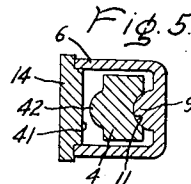
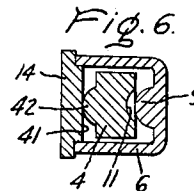
March 27, 1956

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2,740,022

ELECTRIC SWITCHING DEVICE EMBODYING SELF-ALIGNING CONTACT LEVER

Filed March 30, 1955



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ELECTRIC SWITCHING DEVICE EMBODYING SELF-ALIGNING CONTACT LEVER

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Application March 30, 1955, Serial No. 497,985

3 Claims. (Cl. 200—166)

My invention relates to an electric switching device embodying a self-aligning contact lever and more particularly to a rugged cam actuated high current capacity contact lever having new and improved means for aligning the contact and controlling the pressure thereof, and has for an object the provision of a simple, rugged and inexpensive self-aligning contact lever of high current carrying capacity.

In carrying out my invention in one form thereof, I provide a self-aligning contact lever having rigid armature pivotally mounted at its center with a box-shaped contact unit resiliently secured to one end thereof. The movable contacts are secured to the contact unit which substantially encloses one end of the armature. The contact unit engages one side of the armature by means of two longitudinally spaced ball and socket joints. The other side of the contact unit is spring biased from the armature to insure contact of at least one of said ball and socket joints regardless of the position of the contact unit. This results in a double fulcrum support of the contact unit utilizing one fulcrum in each position of the armature. In the mid-position, where neither contact is engaged, the bias spring holds the contact arm against both ball sockets. The ball and socket connection between the armature and the contact unit allows the contact unit to rotate several degrees in the plane perpendicular to the axis of the armature, thus compensating for any misalignment between the stationary and movable contacts.

Further objects and advantages of my invention will become apparent and my invention will be better understood from the accompanying description referring to the accompanying drawings. The features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of the specification.

In the drawings, Fig. 1 is a side plan view, partially broken away, of the switching device with the contact lever in one position;

Fig. 2 is an end view of the switching device shown in Fig. 1;

Fig. 3 is a side view of the device shown in Fig. 1 with a contact lever in the second position;

Fig. 4 is a sectional view taken along the section line 4—4 showing a self-aligning feature of my invention;

Fig. 5 is a sectional view taken along the section line 5—5; and

Fig. 6 is a sectional view taken along the section line 6—6.

Referring to the drawings, in Fig. 1, I have shown the switching device having a mounting member 1 insulated from and secured to a stationary support 2. The movable armature 4 of the contact lever is pivotally secured to the mounting member 1 by means of a rivet or roll pin 5. A box-shaped contact unit 6 is pivotally and rotatably mounted in a position to substantially surround one end of the armature 4. Longitudinally spaced hemispherical detents 8 and 9 are secured on one inner sur-

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face of the contact unit 6. These detents 8 and 9 are positioned in the contact unit 6 and mate with bearing sockets 10 and 11 in one side of the armature 4 to form a double fulcrum support of ball and socket joints. To maintain the detents 8 and 9 in the sockets 10 and 11, the helical spring 13 is positioned to be compressed between the armature 4 and the extension 14 on the contact unit 6. In order to maintain the spring 13 in proper alignment, it is preferred that shallow cylindrical recesses 15 and 16 be provided in the armature 4 and extension 14 respectively. The spring 13 is compressed further when the armature 4 is pivoted to close either of the sets of contacts of the self-aligning contact lever.

The armature 4 may be pivoted by any of the well-known means, but I prefer that its position be controlled by the eccentric cam member 18 having raised portions 19 and 20 which engage the following roller 21 which is rotatably mounted in the end of the armature 4 opposite the contact unit 6 by a supporting pin 22. In order to provide control of the contact unit 6 by the cam member 18, I provide a spring 24 for biasing the armature 4 toward the cam member 18. The spring 24 is maintained in proper alignment by the bolt extension 25 which is slightly tapered to facilitate the threading and to allow limited transverse movement of the spring 24. The raised detent 26 on the side of the armature 4 opposite the roller 21 prevents displacement of the spring 24 from the armature 4 even when it is violently agitated by movement of the cam 18.

The movable contacts 30 and 31 engage the fixed contacts 32 and 33, respectively, depending on the position of the armature 4 as controlled by the cam member 18. The contacts 30 and 31 are mechanically connected to the contact unit 6 by means shown as a bolt 34 and electrically connected to the mounting member 1 by the shunt 36, braided cable 37 and terminal 38 which is bolted to the mounting member 1. The mounting member 1 is connected by any convenient means to one portion of the circuit controlled. The stationary contacts 32 and 33 are mounted on some type of stationary support insulated from each other and electrically connected to other portions of the circuit controlled.

To prevent the displacement of the contact unit 6 from the end of the armature 4, the pin 40 is secured to the armature 4. This is necessary when the spring 13 has not yet been assembled or is broken or otherwise fails to maintain the contact unit 6 in its proper alignment. This pin 40 has no function in the basic alignment function of contacts. The Figs. 5 and 6 illustrate the function of the stop surfaces 41 and 42 which are provided to prevent the roller 21 from touching the cam 18 during the period when contacts 31 and 33 are closed. This arrangement saves mechanical wear on the roller 21 and the supporting pin 22.

In operation, as shown in Fig. 1, the raised portion 19 of the cam 18 engages the following roller 21 to rotate the armature 4 counterclockwise. This causes the movable contact 30 to engage the stationary contact 32. In this position, it is preferred that this switching device with the self-aligning contact lever, have sufficient movement by the rotation of the cam 18 to relieve the pressure between the hemispherical ball 8 and the spherical socket member 10. The amount of movement between the hemispherical ball 8 and a mating socket 10 should be sufficient so that when the contacts 30 and 32 are severely worn, there will be no pressure at the socket joint. Thus, I am able to control the contact pressure between the contacts 30 and 32 by the helical spring 13.

Similarly, as shown in Fig. 3 when the cam 18 is rotated so that no raised portion is under the following roller 21, movable contact 31 engages the stationary contact 33. In this position, however, the hemispherical

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detent 9 on the contact unit 6 is moved sufficiently to relieve the pressure at the socket 11 until the flat surface 41 of the contact unit 6 touches the detent 42 of the armature 4. Thus, I am able to control the contact pressure in this position by the spring 24 with the spring 13 providing sufficient pressure to cause a wiping action between the contacts 31 and 33. To accomplish this, the spring 24 should cause the spring 13 to be compressed by relative movement between the contact unit 6 and the armature 4.

Referring to Fig. 4, I have shown the contact unit 6 as rotated counterclockwise in a plane perpendicular to the axis of contact lever 4. The need for this rotation recognizes that on high current carrying devices, maximum currents can be carried by the contacts if there is line or multi-point contact. Point contact results in high current concentrations which will cause over-heating of the contacts which decreases the safe, accepted contact rating, and which in extreme cases causes elevation of temperature at the point contact sufficient to weld the mated contacts and/or cause arcing. Self-alignment results in a low resistance line or multi-point contact which gives maximum current carrying capacity for the contact materials and pressures used without the need for selective assembly or dressing-in contact surfaces. The rotation of the contact unit 6 is facilitated by the fact that detents 8 and 9 do not extend into the mating sockets 10 and 11 sufficiently to cause physical contact directly between armature 4 and contact unit 6. This unrestricted misalignment of contact unit 6 relative to the armature 4 allows line contact of contacts 31—33 and 30—32. Self-alignment also results in even mechanical wear and electrical erosion distribution across the face of the contacts and decreases the need for replacement of contacts in normal maintenance.

It is also recognized that in assembly of such an electric switching device, or in replacing contacts in maintenance, parallelism or proper alignment of contact surfaces 30, 31, 32 and 33 could not be achieved without selective assembly and/or dressing-in of these surfaces. The self-alignment achieved by the unrestricted rotation of contact unit 6 accomplishes line contact between contact surfaces 31 and 33 and 30—32 even with the surfaces normally in four different planes when no contact is made.

In summary, I have shown and described a switching device embodying a self-aligning contact lever which will automatically correct for any non-parallelism of contacts on assembly and uneven wear between the movable and fixed contacts to insure a good contact. The contact pressure between the fixed and movable contacts may be readily controlled by the bias of springs 13 and 24. The contact unit 6 will be maintained in its proper position axially on the armature 4 by the ball socket joints.

While I have illustrated and described a particular embodiment of my invention, modifications thereof will occur to those skilled in the art. I desire it to be understood, therefore, that my invention is not limited to the particular arrangement disclosed, and I intend by the appended claims to cover all such modifications which do not depart from the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric switching device embodying a self-aligning contact lever comprising a mounting member, an armature pivotally mounted on said member, means for pivoting said armature, a contact unit resiliently mounted on one end of said armature, said contact unit having a

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box-shaped member substantially surrounding said one end of said armature, a pair of longitudinally spaced sockets in one side of said armature within the region of said box-shaped member of said contact unit, a pair of hemispherical detents secured to said contact unit so as to mate with said sockets to form ball and socket joints, a spring connected between said contact unit and said armature longitudinally spaced between said joints to bias said detents to engage said sockets, a movable contact mounted on said contact unit, a mating stationary contact positioned to be engaged by said movable contact when said armature is pivoted by said means whereby said spring is tensioned with one of said socket joints acting as a fulcrum to provide a contact force by the tensioning of said spring by the rotation of said contact unit relative to said armature when contact is made.

2. An electric switching device embodying a self-aligning contact lever comprising a mounting member, an armature pivotally mounted on said member, cam means for moving said armature relative to said member, a contact unit resiliently mounted on one end of said armature, said unit having a box-shaped portion substantially surrounding said one end of said armature, a pair of longitudinally spaced arcuate sockets in one side of said armature within the region of said box portion of said contact unit, a pair of hemispherical detents secured to said contact unit so as to mate with said sockets to form ball and socket joints, a helical spring compressed between said unit and said armature opposite from said one side of said armature longitudinally spaced between said joints to bias said detents toward said mating sockets, movable contacts mounted on said unit beyond the region of said armature on said one and said opposite side thereof, mating stationary contacts positioned to be engaged by said movable contacts whereby said spring is compressed further to provide contact pressure by the rotation of said unit relative to said armature when contact is made with one of said socket joints acting as the fulcrum.

3. An electric switching device embodying a self-aligning contact lever comprising a mounting member, an armature pivotally mounted on said member, cam means for moving said armature relative to said member, a contact unit resiliently mounted on one end of said armature, said unit having an open box shaped portion substantially surrounding said one end of said armature, a pair of longitudinally spaced arcuate sockets in one side of said armature within the region of the box of said contact unit, a pair of hemispherical detents secured to said contact unit so as to mate with said sockets to form ball and socket joints, said sockets being of less depth than said detents to provide a space between said one side of said armature and said unit, a helical spring compressed between an extension on said unit and said armature on the side opposite said one side of said armature longitudinally spaced between said joints to bias said detents toward said mating sockets, shallow cylindrical recesses in said extension and said opposite side of said armature to maintain said spring in proper alignment, movable contacts mounted on said unit beyond the region of said armature on said one and said opposite side thereof, mating stationary contacts positioned to be engaged by said movable contacts whereby said spring is compressed further to provide contact pressure by the rotation of said unit relative to said armature when contact is made with one of said socket joints acting as the fulcrum.

No references cited.