March 30, 1954 G. E. HEBERLEIN 2,673,913

HINGE BEARING OF DISCONNECT SWITCHES

Filed Jan. 8, 1952 2 Sheets-Sheet 1

FIG. 1

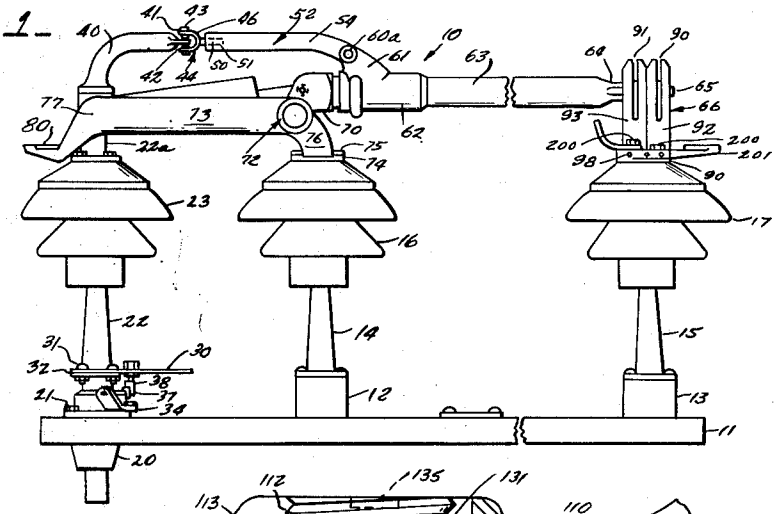


FIG. 2a

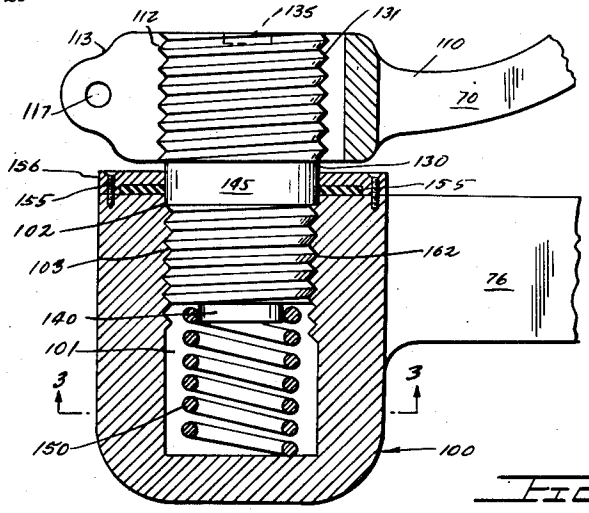


FIG. 2c

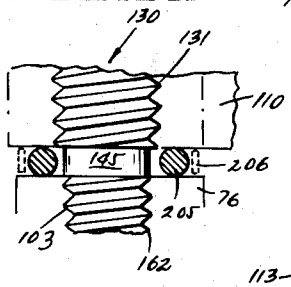


FIG. 2b

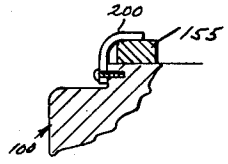
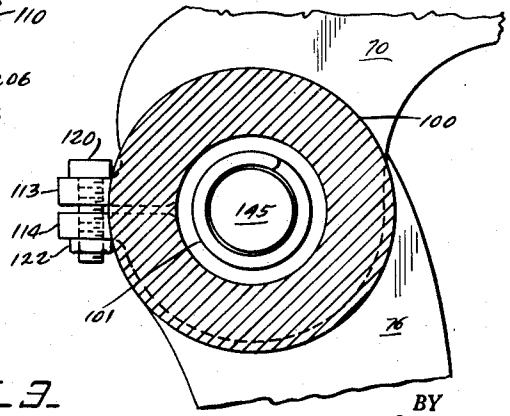


FIG. 3



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HINGE BEARING OF DISCONNECT SWITCHES

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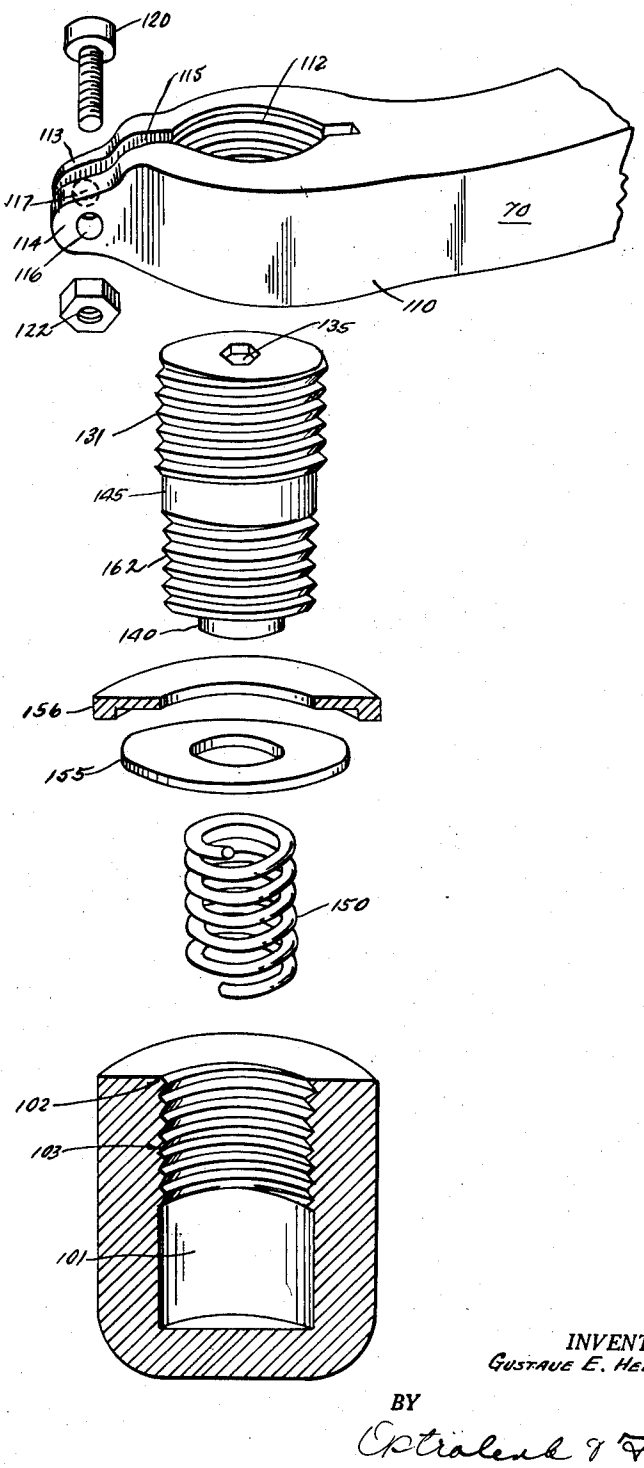


FIG. 4

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HINGE BEARING OF DISCONNECT SWITCHES

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Application January 8, 1952, Serial No. 265,409

5 Claims. (Cl. 200—166)

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My present invention relates to disconnect switches or more specifically it relates to hinge bearings of disconnect switches constructed to carry current from the movable contact arm to the frame of a disconnect switch of the type shown in patent application Serial No. 145,387.

Many prior inventions provided a flexible conductor between the movable contact arm and the frame of disconnect switches. The flexible conductor was weatherproofed or otherwise protected. But notwithstanding these protections, it sometimes happened that the flexible conductor had the tendency to corrode, crystallize and break.

The primary object of my invention is the construction of a hinge bearing adapted to efficiently carry current between a terminal and a movable contact arm of a disconnect switch obviating the need of a flexible conductor.

Another object of my invention is the provision of means whereby a threaded pin is clamped to the hinge casting so that the two parts, pin and hinge casting are in efficient electrical contact.

Another object is the provision of a spring loaded threaded hinge pin for the movable contact arm so arranged that the current may efficiently be carried through the hinge pin to the movable contact.

A further object of this invention is the provision whereby these contacts are placed in a fully weatherproofed and fully protected housing.

These and other objects and advantages of this invention will become apparent in the following description and drawings in which:

Figure 1 is a side view of the disconnect switch incorporating this invention.

Figure 2*a* is a vertical section of this invention showing charged threaded pin and pressure loaded threaded contacts.

Figure 2*b* is a detail view of a modification of the hinge bearing.

Figure 2*c* is a detail view of another modification of the hinge bearing.

Figure 3 is a plan view of this invention.

Figure 4 is an exploded view of this invention showing the various members of this invention.

Referring now to Figure 1, I have here shown a disconnect of the type disclosed in application Serial No. 145,389, filed February 21, 1950, in which the disconnect switch **10** is mounted on the base **11** which is a suitable longitudinal structural support, in this case shown horizontally arranged for a horizontally or upright mounted disconnect switch.

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The base **11** has secured thereto in any suitable manner as by the insulator spacers **12** and **13** the stationary upright supporting posts **14**, **15** on the upper portions of which are mounted insulators **16**, **17**.

Base **11** is also provided with the bearing **20** appropriately secured thereto in any suitable manner as by the bolts **21** and carrying the rotatable vertical shaft **22** to the upper end of which is keyed the insulator **23** for rotation with the vertical shaft or post **22**.

Below insulator **23** there is keyed to the shaft **22** the crank **30** secured thereto in any suitable manner as by the bolts **31** connected to the flange or crank plate **32**. Bolts **21** which secure the bearing **20** in position also secure the stop plate **34** in position, the stop plate being provided at opposite ends with the adjustable stops **36**, **37** which engage at either end with the stop **38** on the operating crank **30**.

While stops **36**, **37** are herein provided, the construction and operation of my novel switch is such that it may operate properly without the stops at individual poles; in such case, the stops would be provided at the operating means for the entire switch.

Where stops are eliminated at all points, then the switch may be operated by crank **30** to close and then open by a single continuous movement in one direction to establish a contact momentarily and then break it.

Shaft **22***a* extends above the insulator **23** as effectively a continuation of vertical shaft **22** being, however, spaced therefrom by insulator **23**. Crank **40** at the upper end of shaft **22***a* is preferably integral therewith and, therefore, rotates therewith.

Crank **40** extends horizontally or at least parallel with the base supporting structure **11** and rotates in the horizontal plane. Crank **40** is shown herein as tubular although it may have any desired cross-section consistent with the mechanical loads imposed thereon. The outer end of crank **40** is flattened at **41** and is provided with a circular opening **42** through which pin **43** may pass.

A clevis member **44** receives extension **41**, connection being made by pin **42**. Clevis **44** is integral with the threaded extension **50** which enters into the tapped opening **51** in the forked link **52**. The threaded extension **50** is so arranged that as the threaded extension **50** rotates with respect to the forked link **52** and its tapped opening **51**, it has linear movement with respect thereto. Forked link **52** has a pair of arms **54**

at the ends opposite the tapped opening 61 which are secured to the blade crank 61 of sleeve casting 62 by pin 60a. The blade support sleeve casting 62 carries the tubular switch blade 63 secured therein and rotatable therewith.

The outer end of the tubular switch blade is flattened at 64 (Figure 1) and is provided with appropriate contacts 65 engageable with the stationary contact jaws 66. The blade support sleeve casting 62 is mounted for rotation around its longitudinal axis on an extension of the hinge casting 70. The hinge casting 70 is in turn rotatably mounted by the hinge bearings indicated generally at 72 on the forked frame casting 73.

The particular hinge bearing utilized for this purpose at this point constitutes the essence of the present invention and will be discussed in detail below.

The frame casting 73 has a horizontal section 74 secured in any suitable manner as by the bolts 75 to the top of insulator 16. The sides 76 extend back to the solid portion 77 which is provided with an opening 78 appropriately recessed to form a bearing for crank 40 and its shaft.

The solid portion 77 of the base casting 62 then extends beyond to form the terminal 80 to which appropriate leads may be connected.

The stationary contact 66 comprises the plurality of contact blades 90, 91 on each side biased toward each other by the spring support members 92, 93 and so arranged that when the blade 65 enters at an angle to the horizontal position during the closing operation, it will clear the blades 90 on each side.

These contact members are so arranged, however, that when the blade is rotated from the open to the closed position, the blade 65 in turning to the horizontal position will spread the contacts 90 and 91 on each side against the tension of springs 92 and 93, creating the desired contact pressure.

The spring blades 92, 93 are current conducting and are connected in any suitable manner as by the bolts 98 to the base plate 99, which in turn is mounted in any suitable manner as by bolts 100 at the top of insulator 17. The base 99 of stationary contact structure 66 has an extension 101 which serves as a terminal block or connecting member.

Thus, when the disconnect switch is in the closed position of Figure 1, current enters the terminal 80, passes through the frame casting 73 to the hinge bearing 72, then through the current carrying connection in the hinge bearing 72 to the hinge casting 70, from the hinge casting 70 to the contact valve 63, then through the contact 65 on the contact blade 63 to the stationary contact elements 90, 91 and then through the base 99 to the terminal extension 101.

The particular hinge bearing utilized for this purpose at this point constitutes the essence of the present invention. This hinge bearing which constitutes the current carrying connection between the frame and the hinge casting for the tubular blade 63 is shown specifically in the cross-sectional view of Figure 2, the side view of Figure 3 and the exploded view of Figure 4.

Referring, therefore, to these figures, the legs 76 of the frame 73 are each provided with a substantially cylindrical cup 100 at the upper right hand corner of each thereof.

Each of the cups 100 is provided with a cylindrical recess 101, each of the members 100 being also counterbored at 102 and internally threaded at 103 at the counterbore to receive the contacting pin 130.

The hinge casting 70 is also essentially a bifurcated member having the arm 110. Each of the arms 110 of the hinge casting 70 is provided adjacent its free end with an internally threaded circular opening 112, the arm 110 beyond the openings 112 on each side having the extension lugs 113, 114 and the openings 112 being divided or slotted at 115.

Lugs 113, 114 are provided with the openings 116, 117. A threaded bolt 120 may be passed through the openings and tightened in place by the nut 122 or any suitable arrangement of lock nuts, thereby clamping the lugs 113 and 114 together and diminishing the size of the main threaded opening 112 on each arm 110.

In assembling the hinge casting 70 on the frame 73, the arms 110 of the hinge casting are aligned with sections 76 of the frame 73 so that openings 112 on each side of the arms 110 are aligned with the bore opening 103.

The hinge pin 130 on each side is then passed through opening 112 and when the threads 131 of hinge pin 130 engage threads of opening 112, the hinge pin 130 is rotated further through opening 112 until the hinge pin 130 passes through opening 102 and projects beyond the same as shown in Figure 2 to engage the threads 103 of the cup 100.

This operation is performed on each side, the end of each hinge pin 130 being provided with any appropriate means for rotating the same as, for instance, a hexagonal recess 135.

After each of the hinge pins 130 is in the appropriate position indicated in Figures 2 and 3, ends 112 are tightened on bolt 120 clamping the lugs 113 and 114 together, thereby diminishing the size of opening 112 and clamping the surface of opening 112 tightly onto the threaded surface 131 of hinge pin 130; by this means the hinge pin 130 is at 131 substantially integrated for current conducting purposes with the arm 110 so that an efficient current carrying connection is established, the pin 130 being essentially rigid with the arm 110.

The end 140 of the hinge pin 130 projecting into the cylindrical recess 101 of the cup 100 is of smaller diameter than the main portion of the hinge pin 130 so that it can engage a heavy compression spring 150.

As the pin 130 is rotated into the cup 100, it compresses the spring 150 so that the threads 103 of the cup 100 are in close contact carrying engagement on one side with the threads 162 of the hinge pin 130. In this type of connection, as compared to a well-known annular contact, four times the contact area is available where four threads are in engagement; hence the screw contact is more effective and can be proportioned to meet the current interchange duty of the contact assembly.

To seal the cup 100 and protect the current carrying connections, a circular gasket 155 and a protective non-corrosive ring 156 are placed around the pin at the opening of the cup.

Referring to Figure 2b, it is there seen that instead of the protective ring 156, a press fit cap 200 can be used to retain gasket 155 in place.

And finally referring to Figure 2c, threaded contact surfaces 103 and 162 of cup 100 and pin 130, respectively, are shown here protected by means of a round O ring of synthetic material squeezed between ends 110 and cup 100 to effect a seal. It is easily seen, in fact, that if member

70 and with it pin 130 is rotated with respect to member 76 from the position shown in Figure 2c, O ring 205 will be squeezed and becomes oval in shape to effect a good seal.

To further protect O ring 205, a shield 206 may be used around ring 205 as shown in Figure 2c.

Appropriate no-oxid or other material which will protect the contacts from corrosion may be included in the member 101. The current path from the main disconnect contact block from the hinge casting 70 to the frame 73 is, therefore, through each of the arms 110 and surfaces 112 and 131 to the hinge pin 130, then from contact surface 162 to contact surface 103 of the cup 100 on each of the arms 76, through the arms 76 to the frame 73 and then to the terminal 80.

Thus, pigtails or shunts of any kind are avoided. The current carrying connection at the hinge is through fully enclosed weatherproofed and fully protected movable contact members.

In the foregoing I have described my invention solely in connection with specific illustrative embodiments thereof. Since many variations and modifications of my invention will now be obvious to those skilled in the art, I prefer to be bound not by the specific disclosures herein contained but only by the appended claims.

I claim:

1. A switch for large current magnitudes having a frame and a movable contact arm; said contact arm being radially and axially rotatable with respect to said frame; a current carrying connection between said frame and said movable contact arm; said contact arm including a current carrying threaded pin; means securing one end of said pin to said contact arm; a cylindrical recess in said frame having a partly threaded surface receiving the other end of said threaded pin; means biasing said pin in one direction in said cylindrical recess and effecting a close engagement between the surfaces of said threads on one side of each thread, the surface to surface engagement of annular portions of said threads forming the said current carrying connection; said current carrying threaded pin connected for relative movement with respect to said frame when said switch is moved from open to closed position; means sealing said engaged annular surfaces of said threads within said recess.

2. A switch for large current magnitudes having a frame and a movable contact arm; said contact arm being radially and axially rotatable with respect to said frame; a current carrying connection between said frame and said movable contact arm; said contact arm including a current carrying threaded pin; means securing one end of said pin to said contact arm; a cylindrical recess in said frame having a partly threaded surface receiving the other end of said threaded pin; means biasing said pin in one direction in said cylindrical recess and effecting a close engagement between the surfaces of said threads on one side of each thread, the surface to surface engagement of annular portions of said threads forming the said current carrying connection; said current carrying threaded pin connected for relative movement with respect to said frame when said switch is moved from open to closed position.

3. A switch for large current magnitudes having a frame and a movable contact arm; said contact arm being radially and axially rotatable with respect to said frame; a current carrying connection between said frame and said movable contact arm; said contact arm including a current carrying threaded pin; means securing one end of said pin to said contact arm; a cylindrical recess in said frame having a partly threaded surface receiving the other end of said threaded pin; a compression spring in said recess and effecting a close engagement between the surfaces of said threads on one side of each thread, the surface to surface engagement of annular portions of said threads forming the said current carrying connection; said current carrying threaded pin connected for relative movement with respect to said frame when said switch is moved from open to closed position; means sealing said engaged annular surfaces of said threads within said recess.

4. A switch for large current magnitudes having a frame and a movable contact arm; said contact arm being radially and axially rotatable with respect to said frame; a current carrying connection between said frame and said movable contact arm; said contact arm including a current carrying threaded pin; means securing one end of said pin to said contact arm; a cylindrical recess in said frame having a partly threaded surface receiving the other end of said threaded pin; means biasing said pin in one direction in said cylindrical recess and effecting a close engagement between the surfaces of said threads on one side of each thread, the surface to surface engagement of annular portions of said threads forming the said current carrying connection; said current carrying threaded pin connected for relative movement with respect to said frame when said switch is moved from open to closed position; the end of said cylindrical recess opposite that which receives the threaded pin being closed and a sealing member between the other end of said recess and the said pin; said current carrying threads being enclosed between said closed end and said sealing member.

5. A current carrying connection for conducting large current magnitudes having a fixed and a movable member, one of said members carrying a threaded pin, the other of said members having a partly threaded cylindrical recess, said threads of said recess engaging the threads of said pin, means biasing said pin in one direction with said cylindrical recess and effecting a close engagement between the surfaces of said threads on one side of each thread, the surface to surface engagement of annular portions of said threads forming the said current carrying connection, said threaded pin being relatively movable with respect to said other of said members.

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