April 26, 1955 W. L. HOLLANDER 2,707,220

SHUNTS FOR SWITCH BLADE HINGES OR THE LIKE

Original Filed May 8, 1952

3 Sheets-Sheet 1

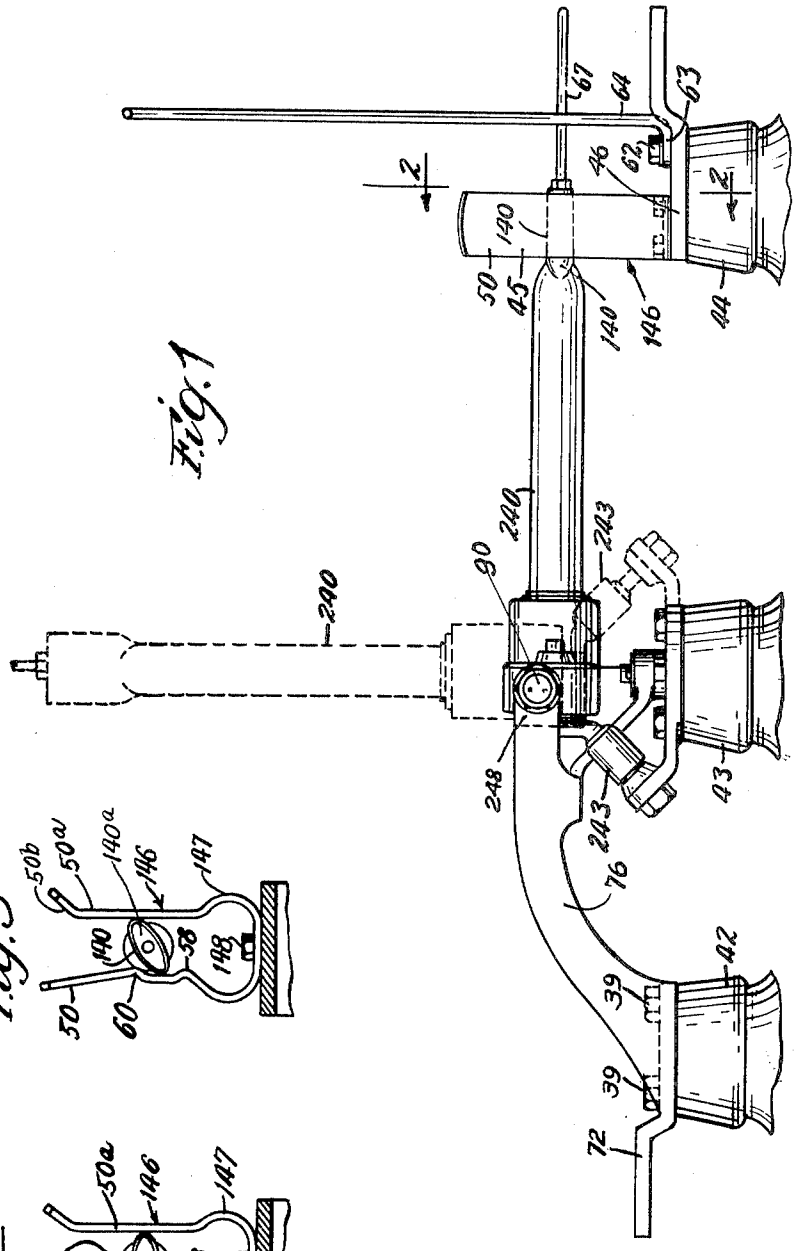


Fig. 1

Fig. 3

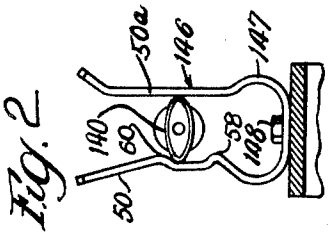


Fig. 2

INVENTOR.
William L. Hollander
BY Robert H. Veidt
Atty.

April 26, 1955 W. L. HOLLANDER 2,707,220

SHUNTS FOR SWITCH BLADE HINGES OR THE LIKE

Original Filed May 8, 1952 3 Sheets-Sheet 2

Fig. 4

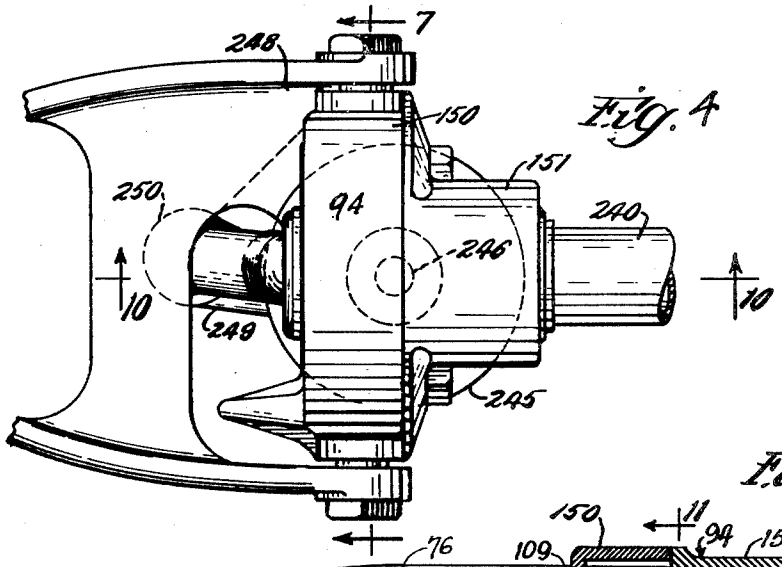


Fig. 5

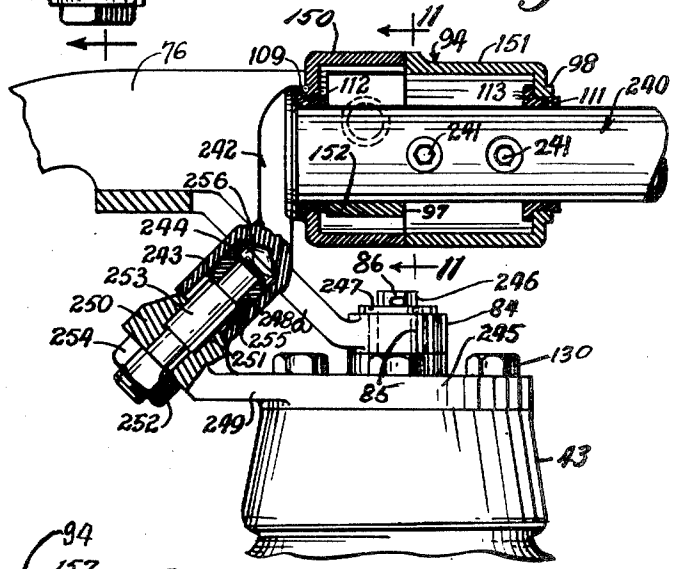
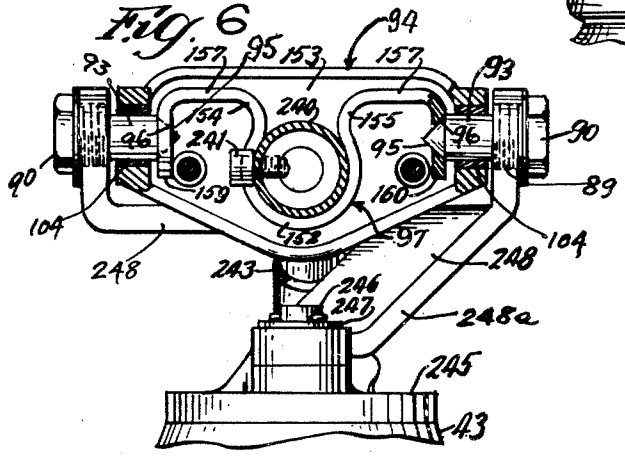


Fig. 6



INVENTOR.
William L. Hollander
BY
Robert H. Wendt

April 26, 1955 W. L. HOLLANDER 2,707,220

SHUNTS FOR SWITCH BLADE HINGES OR THE LIKE

Original Filed May 8, 1952 3 Sheets-Sheet 3

Fig 7

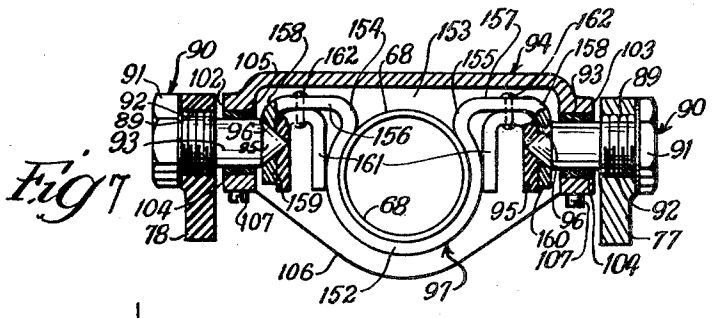
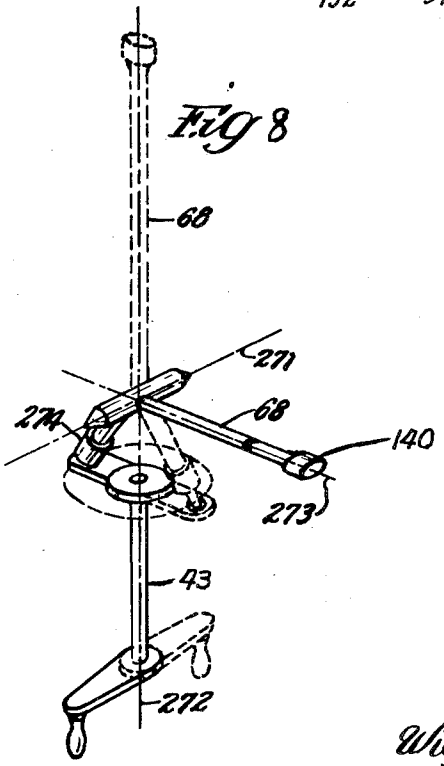


Fig 8



INVENTOR.
William L. Hollander
BY
Robert H. Wendt
Atty.

United States Patent Office 2,707,220 Patented Apr. 26, 1955

2,707,220

SHUNTS FOR SWITCH BLADE HINGES OR THE LIKE

William L. Hollander, Centralia, Mo., assignor to A. B. Chance Company, Centralia, Mo., a corporation of Missouri

Original application May 8, 1952, Serial No. 286,794. Divided and this application July 15, 1953, Serial No. 368,144

19 Claims. (Cl. 200—166)

The present invention relates to shunts for switch blade hinges or the like, and is particularly concerned with shunts for establishing a low resistance connection between a fixed support and a rotating switch blade which is also hinged.

The present application is a division of my prior application, Ser. No. 286,794, filed May 8, 1952, for high voltage air brake switch assemblies, and is particularly directed to the shunts employed in the switch of said application.

One of the objects of the invention is the provision of improved shunts for maintaining a low resistance connection between a rotating and hinged switch blade and any suitable fixed support.

Another object of the invention is the provision of an improved shunt for by-passing the hinge of the blade, which shunt is fully enclosed, and most nearly approaches the efficiency of a flexible bolted shunt without being subject to the disadvantages of fraying or damage due to exposure.

Another object of the invention is the provision of an improved one piece shunt construction which maintains a constant resilient electrical connection between the moving blade and the fixed bridge which supports it.

Another object of the invention is the provision of an improved shunt construction which provides efficient electric current transfer for high amperage currents and in which there are a minimum number of current transfers from one part to another in passing the current from the blade to the bridge, such as, for example, three contact transfers which are divided into two paths in parallel.

Another object of the invention is the provision of improved current carrying surfaces in which large surfaces are maintained under pressure without the necessity of adding external springs, so that a lifetime high electrical efficiency is provided without necessity for maintenance or adjustment.

Another object of the invention is the provision of an improved shunt for by-passing the hinge of the switch blade in which the magnetic forces, which are produced as the result of the passage of large electrical currents, tend to further increase the contact efficiency during the existence of such currents by increasing the contact pressure at the shunt.

Another object is the provision of an improved switch mechanism which is simple, sturdy, capable of economical manufacture, protected against mechanical damage, weather and ice, and adapted to function more efficiently and more dependably than any of the devices of the prior art.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings, of which there are three sheets accompanying the specification,

Fig. 1 is a fragmentary side elevational view showing one form of switch in the closed position, with which the present shunt is utilized;

Fig. 2 is a fragmentary end elevational view, taken from the right of Fig. 1, showing the end of the switch blade and the fixed contacts which it engages, with the parts in the position which they assume when the switch is closed;

Fig. 3 is a view similar to Fig. 2, showing the contacts in an intermediate position at the beginning of the twisting movement of the blade between the legs of the clip;

Fig. 4 is a fragmentary top plan view of the pivotal and actuating arrangements for the switch blade;

Fig. 5 is a fragmentary sectional view, taken on the plane of the line 10—10 of Fig. 4;

Fig. 6 is a fragmentary sectional view, taken on the plane of the line 11—11 of Fig. 5;

Fig. 7 is a view similar to Fig. 6 of a modified and improved preferred form of shunt;

Fig. 8 is a diagrammatic view showing the various axes and operating parts of the switch mechanism for explaining its operation.

Referring to Fig. 1, this is a side elevational view of one form of switch mechanism for an air brake switch embodying the shunt which is the subject of the present application. The switch installation preferably includes two fixed insulators 42 and 44 and the rotating insulator 43, all of these being mounted upon a suitable fixed support (but not shown) which holds the fixed insulators 42 and 44 in definite spaced relation and in alignment with the rotating insulator 43, which is mounted for rotation to actuate the switch.

The fixed insulator 42 supports a bridge 76, which is secured to it by means of suitable screw bolts 39, also supporting a connector member 72. The bridge 76 has an upwardly curved, laterally extending arm, which is bifurcated, being provided with a pair of spaced bearing flanges 248, each of which supports a pivot bolt 90 located in a threaded bore 89, and provided with a cylindrical shank 93 having a conically pointed end 95. The pivot bolts 90 are for the purpose of pivotally supporting the switch blade 240 by means of its housing 150.

The bridge 76 also carries a depending arm 248*a* (Fig. 5) provided with a bearing portion 84 having a vertical bore 85 for rotatably receiving the stub shaft 246, which is provided with a washer 247 and a cotter pin 86. The stub shaft is carried by a supporting plate 245, which is secured by screw bolts 130 to the top of the rotating insulator 43. The stub shaft 246 thus provides a trunnion for rotatably supporting the upper end of the rotating insulator 43 on the bridge 76.

The switch blade 240 comprises a tubular metal member preferably made of high conducting metal, such as copper, which is rotatably supported in bearings 111 and 112 in a housing 94 (Fig. 5).

The housing 94, Fig. 6, is provided at its sides with the bearings 104 for rotatably receiving the conically pointed screws 90 so that the housing is rotatably supported upon the cylindrical shanks 93. This permits the housing to pivot the blade up or down and in a vertical direction.

The blade 240 of tubular shape is provided with an elliptical solid filler plug 140*a* at its flattened end 140; and the plug 140*a* may support a longitudinally extending wire 67, which is for the purpose of an arc horn. The arc horn 67 cooperates with the wire horn 64, which is secured by screw bolts 62 and attaching flange 63 to the fixed insulator 44.

The fixed insulator 44 also supports a mounting plate 46 secured to it by screw bolts for supporting the fixed contacts 146, which are secured by means of screw bolts 148. The fixed contacts 146 are substantially U-shaped metal strips, having a partially cylindrical formation at 147, and having a pair of upwardly extending legs 50 and 50*a*.

The leg 50*a* may be straight, except for the upper diagonal portion 50*b*, which extends outward to guide the blade between the legs. The leg 50 is provided with a hump at 58 and a second hump at 60 for the purpose of assisting in the movement of the blade into a position of maximum pressure.

At its upper end the leg 50 of the contact 146 also has a diverging diagonal portion.

Referring now to Fig. 5, the blade 240 carries a cylindrical shank of a crank 242 by means of screw bolts 241. Crank 242 is located outside the housing 94 and extends downwardly and is provided with a diagonally extending portion 243 having an axial bore 244.

The plate 245 on the rotating insulator 43 has a diagonal portion 250 at right angles to the bore 244, supporting a stub shaft 253, which is secured to the flange 250

by means of a nut **254** engaging annular shoulder **252**. Stub shaft **253** has a reduced end supporting a ball **255**, which has a limited universal movement in bore **244** and is held on the shaft **253** by a split ring **256**.

The switch blade **68** is thus rotatably supported for rotation on its axis **273** in the housing **94**, which housing is pivotally supported on the fixed bridge **76** by screw bolts **93** on arms **248** for vertical pivotal movement on the axis **271**. Thus the blade is wholly supported on the fixed bridge **76**, which is carried by the fixed insulator **42**, and which is merely braced by the rotating insulator **43** at the bearing **84**.

The depending crank **242** carried by the blade **240** is rotatably engaged by the ball **255** on the stub shaft **253** and is actuated by rotating insulator **43**, which moves the blade both in its loosening or tightening rotation and in its opening or closing pivotal movement.

The foregoing is exemplary of one type of switch in which the shunts which are the subject of the present invention may be employed.

Referring to Fig. 6, **97** indicates a shunt made of high conductive resilient spring copper. The shunt **97** has a partially cylindrical portion **152**, which extends about and resiliently clamps the tubular blade **240**.

The cylindrical portion **151** is integrally joined by lateral bends **154** and **155** to the horizontal outwardly extending straight portions **157** of the shunt. The straight portions **157** carry downwardly extending vertical flanges **159**, **160**, each of which is provided with a frusto-conical bore **96** for receiving the conically pointed end **95** of the pivot screws **90**. The shunt **97** is initially tensioned and compressed, the flanges **159** and **160** being pressed toward each other so that they tend to expand and engage the conical portions **95** of the pivot screws **90**.

The compressive action of the pivot screws on the shunt also causes the cylindrical portion **152** to clamp the tubular blade **240**. Current is thus conducted directly from the blade **240** through the shunt **97** to the pivot screws **90**, which are directly connected to the bridge **76** and connector **72**.

Referring to Fig. 7, this is a similar form of shunt **97**, in which the cylindrical portion **152** has been accentuated by the bends **154** and **155**. This shunt need not be of resilient copper because it is provided with a pair of U shaped springs **161**, which may be made of steel or any suitable material because the springs **161** do not carry any current.

The springs **161** are secured at their yokes by rivets **162** to the horizontal portions **156** and **157**. The inner legs of the spring **161** bear against the cylindrical portion **152** of the shunt, while the outer legs of the spring **161** have a conical depression for receiving the points of the pivot screws **90**; and these legs force the parts **159** and **160** of the shunt outward against the pivot screws.

This preferred embodiment of the shunt utilizes non-resilient copper or copper of higher conductivity because the spring action is provided by the springs **161**.

The operation of the switch and shunt are illustrated in Fig. 8. The vertical axis of the rotating insulator **43** is the axis **272**, which is rotatable by the lower crank in Fig. 8. As the insulator **143** rotates the connection at **274** is moved laterally, tending to rotate the switch arm **68** on the axis **273** to turn the flattened end **140** from the horizontal position of Fig. 2 toward a vertical position, thus diminishing the friction and contact resistance to movement.

Continued movement of the crank **274** causes the blade to reach the position of Fig. 3; and further motion of the crank **274** causes the blade to be lifted, pivoting on the axis **271** to the dotted line position **68** shown in Fig. 8. The switch is closed merely by operating it in a reverse direction, first pivoting downward on the axis **271** to the position of Fig. 3, the end of the blade striking the stop shoulder **58**, which aids in its rotation from the position of Fig. 3 to that of Fig. 2.

The stop shoulder **58** on the leg **50** of contact **146** limits the downward closing movement of the switch blade **240** and tends to start rotation of the blade from the position of Fig. 3 to that of Fig.2, as the stop engages the wide edge of the blade end at a point radially spaced from the blade axis.

This motion causes the flattened end **140** to spread the contact legs **50** and **50***a* until the blade end **140** engages the shoulder **60**, which aids in holding the blade against opening of the switch by the magnetic forces which are caused by heavy faults currents.

The shunt **97** provides a low resistance connection between the fixed bridge **76** and the switch blade **240**, which is pivotally mounted and rotatably mounted.

In some embodiments of the invention the shunt **97** may include half of the structure shown in Figs. 6 or 7, engaging only on one side of the blade **240** and engaging only one of the pivot screws **90**.

In the preferred embodiment of the invention the copper shunt is reinforced and made more resilient by means of the two back-up springs **161** of substantially U shape, which have their yokes riveted to the yokes of the shunt by means of rivets **162**. The back-up springs need carry no current, and therefore will not lose their resiliency, while the shunt, which carries current, might in time lose its resiliency by becoming heated.

The present shunt permits the rotative motion of the blade in the hinge housing and the pivotal motion of the hinge housing on the trunnions, while maintaining a good electrical connection between the blade and trunnions at all times. The shape and structure of the shunt is such that the passage of an excessive current will tend to cause the shunt to grip the trunnions and the blade still more tightly because the magnetic field caused by such an excessive current tends to react against other portions of the same field to straighten out the shunt; and the tendency to straighten the shunt makes it grip the blade and trunnions more tightly.

The shunt may be employed, however, with or without back-up springs, the latter being omitted when the results caused by the springs are not considered necessary.

It will thus be observed that I have invented an improved shunt for maintaining a good electrical connection between pivoted and rotatably mounted blades and a fixed support. My shunt constantly maintains a good contact of low resistance by the wiping and rubbing action between the blade and the shunt and between the shunt and the pivoted screws. Excessive current tends to cause the shunt to straighten out and makes it grip the blades and the trunnions still more tightly.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. A shunt for by-passing electrically a hinged connection between two electrical parts carrying current, comprising a metal member of substantially U shape, having a pair of opposed legs urged outwardly from each other, one of said legs resiliently engaging a fixed member on one side of said hinge, and the other of said legs resiliently engaging a relatively movable member located on the other side of said hinge.

2. A shunt for by-passing electrically a hinged connection between two electrical parts carrying current, comprising a metal member of substantially U shape, having a pair of opposed legs urged outwardly from each other, one of said legs resiliently engaging a fixed member on one side of said hinge, and the other of said legs resiliently engaging a relatively movable member located on the other side of said hinge, said fixed member comprising a trunnion having rotatable engagement with the adjacent leg of said shunt.

3. A shunt for by-passing electrically a hinged connection between two electrical parts carrying current, comprising a metal member of substantially U shape, having a pair of opposed legs urged outwardly from each other, one of said legs resiliently engaging a fixed member on one side of said hinge, and the other of said legs resiliently engaging a relatively movable member located on the other side of said hinge, the latter relatively movable member comprising a switch blade having movable engagement with respect to the adjacent leg of said shunt.

4. A shunt for by-passing electrically a hinged connection between two electrical parts carrying current, comprising a metal member of substantially U shape, having a pair of opposed legs urged outwardly from each other, one of said legs resiliently engaging a fixed member on one side of said hinge, and the other of said legs resiliently engaging a relatively movable member located on the

other side of said hinge, said fixed member comprising a trunnion having rotatable engagement with the adjacent leg of said shunt, the said trunnion being provided with a tapered end portion engaging the shunt, and the said shunt having a correspondingly tapered bore for receiving said tapered portion for taking up any wear between the trunnion and shunt, and maintaining a constantly bright, tight, and efficient low resistance contact.

5. A shunt assembly for providing a good electrical connection with a rotating switch blade, comprising a support and a switch blade rotatably mounted on said support, said switch blade having a shunt-engaging surface which is at least partially cylindrical, a metal member of high conductivity provided with a pair of legs joined by a yoke, said legs being urged outwardly with respect to each other, one leg engaging said support, and the other leg being provided with a partially cylindrical surface engaging the cylindrical surface on said switch blade, the rotation of the blade tending to keep said surfaces bright and in good electrical contact, and said shunt by-passing other relatively moving supports for said blade.

6. A shunt assembly for providing a good electrical connection with a rotating switch blade, comprising a support and a switch blade rotatably mounted on said support, said switch blade having a shunt-engaging surface which is at least partially cylindrical, a metal member of high conductivity provided with a pair of legs joined by a yoke, said legs being urged outwardly with respect to each other, one leg engaging said support, and the other leg being provided with a partially cylindrical surface engaging the cylindrical surface on said switch blade, the rotation of the blade tending to keep said surfaces bright and in good electrical contact, and said shunt by-passing other relatively moving supports for said blade, the said leg engaging said support being provided with a tapered bore, and the said support comprising a trunnion having a complementary tapered surface in said bore for providing a tight, efficient electrical connection between said support and shunt, and permitting relative rotation between the shunt and the support.

7. A shunt for providing an electrical connection of low conductivity, by-passing a hinged connection for a switch blade, comprising a member of high electrical conductivity, having a central partially cylindrical formation for engaging about a complementary switch blade body, said cylindrical portion being integrally joined to a pair of lateral portions extending in opposite directions and provided with contacting flanges extending backwardly opposite to said cylindrical portion, the contacting flanges of said shunt having an outward spreading tendency for engaging a relatively fixed support for the switch blade.

8. A shunt for providing an electrical connection of low conductivity, by-passing a hinged connection for a switch blade, comprising a member of high electrical conductivity, having a central partially cylindrical formation for engaging about a complementary switch blade body, said cylindrical portion being integrally joined to a pair of lateral portions extending in opposite directions and provided with contacting flanges extending backwardly opposite to said cylindrical portion, the contacting flanges of said shunt having an outward spreading tendency for engaging a relatively fixed support for the switch blade, the said relatively fixed support comprising a pair of opposed inwardly extending trunnions having tapered surfaces at their ends, and the said contacting flanges having complementary tapered bores, the said shunt spreading into resilient engagement with both the switch blade and the trunnions and taking up wear at said tapered surfaces, and the shunt tending to engage the blade and trunnions more tightly upon passage of excessive current, the magnetic field of which tends to straighten said shunt.

9. A shunt for providing an electrical connection of low conductivity between two movably mounted members, comprising a high conductivity metal member having a pair of legs extending in the same general direction, one of said legs engaging a fixed part, and the other of said legs engaging a relatively movable part, and resilient spring means carried by a yoke joining said legs inside said legs to carry a minimum amount of current and to maintain an outward spring pressure on the legs of said shunt.

10. In a switch blade assembly of the type having a rotatable support, a fixed support, a cylindrical blade pivoted on said fixed support, said blade being also rotatable in a pivoted housing, the improvement which comprises a partially cylindrical shunt engaging said cylindrical blade and establishing contact in spite of the rotation of said blade, the said shunt being provided with spreading legs engaging said fixed support and also establishing electrical contact with said fixed support while the blade is pivoted.

11. In a switch blade assembly of the type having a rotatable support, a fixed support, a cylindrical blade pivoted on said fixed support, said blade being also rotatable in a pivoted housing, the improvement which comprises a partially cylindrical shunt engaging said cylindrical blade and establishing contact in spite of the rotation of said blade, the said shunt being provided with spreading legs engaging said fixed support and also establishing electrical contact with said fixed support while the blade is pivoted, the said shunt having its spreading legs provided with spreading springs engaging and spreading the legs of said shunt from the cylindrical portion, the springs being arranged to carry no substantial amount of current.

12. In a switch blade assembly of the type having a rotatable support, a fixed support, a cylindrical blade pivoted on said fixed support, said blade being also rotatable in a pivoted housing, the improvement which comprises a partially cylindrical shunt engaging said cylindrical blade and establishing contact in spite of the rotation of said blade, the said shunt being provided with spreading legs engaging said fixed support and also establishing electrical contact with said fixed support while the blade is pivoted, the said shunt having its spreading legs provided with spreading springs engaging and spreading the legs of said shunt from the cylindrical portion, the springs being arranged to carry no substantial amount of current, the said springs comprising U shaped resilient metal members secured to said shunt by through members at the yokes of said springs.

13. A shunt for rotating and pivoted switch blades, said shunt comprising a strip of copper bent to form a partially cylindrical portion for engaging a rotatable switch blade, said partially cylindrical portion forming part of a U formation having another leg adapted to engage a fixed part to rotate thereon to permit the pivotal movement of the switch blade.

14. A shunt for rotating and pivoted switch blades, said shunt comprising a strip of copper bent to form a partially cylindrical portion for engaging a rotatable switch blade, said partially cylindrical portion forming part of a U formation having another leg adapted to engage a fixed part to rotate thereon to permit the pivotal movement of the switch blade, said fixed part comprising a pivot bolt having a conically pointed end, and said shunt having a complementary aperture for receiving said end.

15. In a switch shunt assembly, the combination of a fixed support having a pair of opposed aligned and threaded bores, a pair of pivot bolts, one in each bore, the bolts extending inwardly in opposite directions, and having cylindrical shanks and conical ends, the said blade housing being rotatably mounted on said cylindrical shanks and having a pair of transverse bearings rotatably supporting a cylindrical switch blade, and a shunt comprising a strip of resilient metal provided with conical apertures at each of its ends engaging said pivot bolts, the said shunt also engaging partially about said switch blade.

16. In a switch shunt assembly, the combination of a fixed support having a pair of opposed aligned and threaded bores, a pair of pivot bolts, one in each bore, the bolts extending inwardly in opposite directions, and having cylindrical shanks and conical ends, the said blade housing being rotatably mounted on said cylindrical shanks and having a pair of transverse bearings rotatably supporting a cylindrical switch blade, and a shunt comprising a strip of resilient metal provided with conical apertures at each of its ends engaging said pivot bolts, the said shunt also engaging partially about said switch blade, said shunt being of substantially sinuous form, and having a tendency to straighten and to grip the blade and pivot bolts more tightly upon passage of excessive current.

17. In a switch shunt assembly, the combination of a fixed support having a pair of opposed aligned and threaded bores, a pair of pivot bolts, one in each bore, the bolts extending inwardly in opposite directions, and having cylindrical shanks and conical ends, the said blade housing being rotatably mounted on said cylindrical shanks and having a pair of transverse bearings rotatably supporting a cylindrical switch blade, and a shunt com-

prising a strip of resilient metal provided with conical apertures at each of its ends engaging said pivot bolts, the said shunt also engaging partially about said switch blade, said shunt being of substantially sinuous form, and having a tendency to straighten and to grip the blade and pivot bolts more tightly upon passage of excessive current, the said shunt having a pair of U shaped spreading springs, one between each pivot bolt and said blade, for maintaining resilient engagement of the shunt at all times.

18. In a switch blade assembly of the type having a rotatable support, a fixed support, a blade pivoted on said fixed support, and having a cylindrical portion, said blade being also rotatable in a pivoted housing, the improvement which comprises a partially cylindrical shunt engaging said cylindrical portion and establishing contact while permitting a rotation of said blade, the said shunt being provided with spreading legs engaging said fixed support and establishing electrical contact with said fixed support while the blade is pivoted.

19. In an electric switch, the combination of an insulating support with a fixed electrically conducting contact carried by said support, a fixed electrically conducting blade mounting carried by said support, a blade housing pivotally carried by said fixed mounting for arcuate movement of said blade toward and away from said fixed contact, a blade rotatably mounted in said blade housing on said fixed mounting, for rotation of the blade on its own axis, and a shunt comprising a resilient member having a large area in electrically conducting sliding engagement with said blade, and having another area in electrically conducting sliding engagement with a fixed part carried by said blade mounting, for conducting current through the switch with a minimum electrical resistance, while permitting free pivotal and rotating movement of the blade.

References Cited in the file of this patent

UNITED STATES PATENTS

2,521,484	Schmidt	Sept. 5, 1950
2,610,276	Bayer	Sept. 9, 1952