This invention relates to electric switches, and more particularly to switches of the blade type and to the contact portions of such switches.

An object of the present invention is to provide a switch contact device which is economical to manufacture, readily and inexpensively assembled, and which furnishes a more efficient contact between its several current carrying and engaging parts.

A further object of the invention is to retain the high conductivity advantages inherent in the use of silver switch contact elements, while materially dispensing with their high cost disadvantage.

Another object of the invention is to provide a switch contact having a very short current carrying path and a high degree of conductivity.

Yet another object of the invention is to provide a switch contact assembly which is self-aligning, thus insuring more efficient contact between the several switch parts.

Still another object of the invention is to provide a switch assembly in which the contact force between the relatively movable and stationary switch parts is increased automatically in accordance with increase in the current passing through the switch.

The invention is exemplified in the following description and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a side elevation of a blade type of switch embodying the invention.

Fig. 2 is a top plan view of the switch disclosed in Fig. 1.

Fig. 3 is a longitudinal section on an enlarged scale of part of the switch mechanism shown in Figs. 1 and 2.

Fig. 4 is a cross-section of the switch taken along the line 4—4 in Fig. 3.

Fig. 5 is a cross-section taken along the line 5—5 in Fig. 3; and

Fig. 6 is a cross-section through a modified form of switch contact.

As shown in the drawings, the switch consists of relatively fixed and movable contacts 10, 11, suitably supported upon a main base 12. The fixed contacts 11 are secured to a conductive terminal pad or base 13, suitably affixed to an insulator 14 attached to the main base 12. The movable portion of the switch consists of a blade, formed of two spaced apart arms 15, 16 suitably mounted on a stud 17 carried by a conductive terminal pad or base 17 suitably secured to an insulator 18 fixed to the main base 12.

The fixed switch contacts 11 includes a sup-
the blade arms 15, 16 engage the upper ends 19b of the channel webs 19a which serve as stops limiting the extent of inward movement of the blade within the relatively fixed switch contacts 24. The faces 15a of the movable arms are also preferably silvered to provide an efficient contact and current carrying path between the arm and the silvered faces 27 of the upper rivets 26.

When the blade 15 is in closed position, current may flow from it onto and through the silvered rivets 26, thence through the main conductor shoes 24 into the lower rivets 25, passing through the silver rivet and channel coating 30, 31 into the supporting member 19 from which it flows through the silver base coating 32 onto the terminal pad 13.

Contact between the various parts is maintained by the springs 33 pressing the conductor shoes 24 towards one another and the rivets 25, 26 into close engagement with the arms 15, 16 of the blade and the outer faces 31 of the channel 19. Although not indispensable, if desired, laminations 41 of copper shim stock of generally U-shape may be disposed in engagement with the central portion 24a of each shoe with their bases 42 clamped between the base portion of the channel 19 and terminal pad 13. These layers 41 of high conductivity copper are firmly clamped to the main conductors 24 by the upper copper rivets 26 whose outer head portions engage respective brass cover plates 44 bearing against the outer laminations, and through the lower portions of which the screws 36 extend.

The shim stock 41 serves as a shunt, conveying some of the current between the upper silvered copper rivets 26 and the terminal pad 13. In addition, and because of its particular shape, it adds its spring force to that exerted by the helical springs 33 in urging the movable main contact elements 24 and rivets 26, 25 toward one another into firm contact with the silvered surfaces 15a, 31 of the blade arms and channel webs. It is to be understood, however, that the switch contact device may be used without the copper shim stock 41 and brass cover plates 44, in which form it is represented in Fig. 6.

By virtue of the arrangement described, effective contact is made between the various parts of the switch device. The main conductors 24 and the silvered copper rivets 26, 29 secured to them, are capable of their ability to move on the assembly screws 36 and locating pins 38, adjusting themselves automatically to any irregularities or distortions that might exist in the blade 15 and channel 19. This self-aligning feature and the ability of the shoes and rivets to move toward one another, provides an engagement in which the contact force between the rivets 26, 29 and the blade 15 and channel 19 is increased automatically upon increase in current flowing through the apparatus. The flow of current provides a magnetic force attracting the main contacts 24 toward one another, supplementing the force of the springs 36 urging them against the blade 15 and channel 19. This is of particular advantage in heavy current applications wherein the effectiveness of the contacts is automatically enhanced and insures efficient transmission of the current between the blade 15 through the contacts 26, 24, 29, 19, to the terminal pad or base 13.

The switch contact device heretofore described is relatively economical to manufacture since it can be made from punched and formed parts from relatively inexpensive materials, such as high conductivity copper and brass, the only precious metals employed being the small amount of silver deposited on the contact faces of the rivets 26, 29 arms 15 and channel 19. The opposed parts are duplicates of one another, which further tends to reduction in the cost of manufacture since it can be made from punched and formed parts.

The switch device provides all of the advantages of silver contact elements, while retaining the relatively low cost advantage of copper, which is an efficient conductor of electricity between the silver contact points. The current carrying path through the switch is extremely short, with losses of heat or energy being obtained at a minimum. Current flows through the silver base coating 32 onto the terminal pad 13.

The switch contact units 11 may be arranged on the terminal pad 13 in any number for engagement with the switch blades 15, depending upon the current carrying capacity of the switch. Two switch contacts are disclosed in the drawings arranged side by side, and this number may be increased, depending upon the length of the terminal pad, simply by bolting additional units 11 to the latter member.

When the blade 15 is in closed position between the channel webs 19a of the switch, the upper ends 19b of the channel webs, it may be held in such closed position by a latch device mounted on one of the switch contact assembly members 11. This device consists of a latch 45 pivoted on the tubular spacer 31 and having an upstanding head 46 provided with a tapered face 47 and a nose 48 adapted to extend over a latch pin 49 secured to and between the arms 15, 15 of the blade, when the latter engages the channel webs 19a. The blade 15, in moving to closed position, engages the tapered face 47 and forces the latch 45 from the path of the pin 49 until the blade 15 has been fully closed, whereupon the pin 49 is positioned below the nose 48, permitting the latch 45 to be returned to its locked position with its nose 49 disposed over the pin 49. This is accomplished by one or more suitable coil springs 56 encompassing the tubular spacer 31, one end 51 of each spring being located pin 38 and its other end 52 against a latch 53, tending to swing the head 46 and its nose 48 over the latch pin 49. When in closed position, the blade cannot be elevated unless the latch nose 48 is first removed from above the pin 49.

Release of the latch 45 is accomplished by mounting a releasing lever 54 on a pivot pin 55 extending between the blade arms 15, 15. This lever has an operating arm 56 extending outwardly of the blade 15 on one side of its pivot 55 and a latch releasing finger 57 extending inwardly of the blade on the other side of its pivot 55. The finger 57 is engageable with the tapered face 47 of the latch upon upward movement of the arm 56 to swing the latch nose 48 from engagement with the latch pin 49, permitting the switch to be opened by removal of the blade 15 from contact with the upper rivets 26 and shown 24.

The latch arrangement not only holds the blade 15 in place and obtains release of the latter upon removal of the latch head 46 from the latch pin 49, but also provides a mechanical advantage means assisting in the breaking of the contact between the arms 15 and rivets 26. The lever finger 57 acts on the tapered face 47 of the latch head 46 to swing its nose 48 clear of the blade pin 49 until the latch leg 53 engages the base
of the channel supports 15. The latch 45 acts as a fixed abutment, the point of engagement between the finger 51 and latch face 47 serving as a fulcrum for the releasing lever 54 whose upward movement then acts on its pivot pin 55 to urge the blade 15 upwardly to open position. The force applied to the pivot pin 55 fixed to the blade 15 is greater than the force applied to the lever arm 56 since the distance between the end of the releasing arm 56 and the fulcrum point of engagement between the finger 51 and latch face 47 is much greater than the distance between the pivot pin 55 and such fulcrum point of engagement. Thus, the latch and lever arrangement 45, 54 has a two-fold purpose; it provides a releasable lock to hold the switch blade 15 in closed position, preventing inadvertent opening of the switch, and it also facilitates opening of the switch when desired.

While I have shown the preferred form of my invention, it is to be understood that various changes may be made in its construction by those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. An electric switch device, including a supporting member, opposed conductors on opposite sides of said supporting member, a generally U-shaped laminated structure having a base portion and side portions engaged by said supporting member and opposed arms engaging the exteriors of said opposed conductors, a high conductivity pin extending through and securing a laminated arm to each conductor and having a silver coating on its inner end, a second high conductivity pin secured to each conductor and having a silver coating engageable with said supporting member, and means for urging said conductors toward each other.

2. A switch contact device of the character described comprising: a base, a pair of spaced upright fixed contact members mounted on the base and having their upper edges in the same plane, said upper edges being adapted to receive the lower edges of a pair of spaced, parallel movable switch blades and to serve as stop members therefor, a pair of upright U-shaped conductors each having a base portion and side portions and mounted on opposite sides of the fixed contact members to make contact between their base portions and the fixed contact members and blades, and a spring for each conductor member mounted between the side portions thereof for urging its base portion inwardly independently of the other spring member.

3. A switch contact device of the character described comprising: a base, a pair of spaced upright fixed contact members mounted on the base and having their upper edges in the same plane, said upper edges being adapted to receive the lower edges of a pair of spaced, parallel movable switch blades and to serve as stop members therefor, a pair of upright U-shaped conductors each having a base portion and side portions and mounted on opposite sides of the fixed contact members to make contact between their base portions and the fixed contact members and blades, and a pair of contact buttons fixed to the base portion of each conductor member and having a silvered, rounded head making contact with the adjacent fixed contact member and blade.

4. A switch contact device of the character described comprising: a base; a pair of spaced, upright fixed contact members mounted on the base and having their upper edges in the same plane, said upper edges being adapted to receive the lower edges of a pair of spaced, parallel movable switch blades and to serve as stop members therefor; a threaded spacer member fixed to and extending between said fixed contact members; a pair of U-shaped conductors each having a base portion and spaced side portions; a screw having a head for each conductor, extending therethrough and in threaded engagement at its inner end with said spacer member, and serving to mount its conductor on said fixed contact member with the base portion of the conductor in contact therewith and with the adjacent blade; and a spring carried by said screw compressed between the head thereof and said base portion to press the latter inwardly.

5. A switch of the character described comprising a movable contact element and a fixed contact element; said movable element comprising a pair of parallel spaced blades; said fixed element comprising: a base; a U-shaped contact member having a base portion and spaced upright legs mounted on said base with its base portion in contact with and supported by the base; a threaded tubular spacer fixed to and extending between said legs, said legs being formed with passages in registry with the tubular spacer; a pair of U-shaped conductors each having a base portion and spaced side portions; a screw having a head for each conductor and extending through the base portion of its conductor and in threaded engagement with said spacer to mount the conductor with its base portion in contact with a leg of the contact member and with a switch blade; and a spring for each screw compressed between the head of the screw and base portion to urge the latter inwardly into contact with the contact member and a blade.

6. In a switch comprising a movable contact member and a fixed contact member, means for establishing electrical contact between said members comprising a pair of opposing U-shaped conductors each having a base portion and spaced side portions and mounted with the base portion in contact with opposite sides of said fixed contact member and in contact with the movable contact member, and a spring element for each conductor located between the side portions thereof to urge the base portion of each conductor toward the opposite conductor.

7. In a switch comprising a movable contact member and a fixed contact member, means for establishing electrical contact between said members comprising a pair of opposing U-shaped conductors each having a base portion and spaced side portions and mounted with the base portion in contact with the movable contact member, and a spring element for each conductor located between the side portions thereof to urge the base portion of each conductor toward the opposing conductor, a contact button extending through the base portion of each said U-shaped conductor having a silver-coated head in contact with said movable contact member, and a second contact button extending through said base portion and having
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a silver-coated head in contact with said fixed contact member.

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