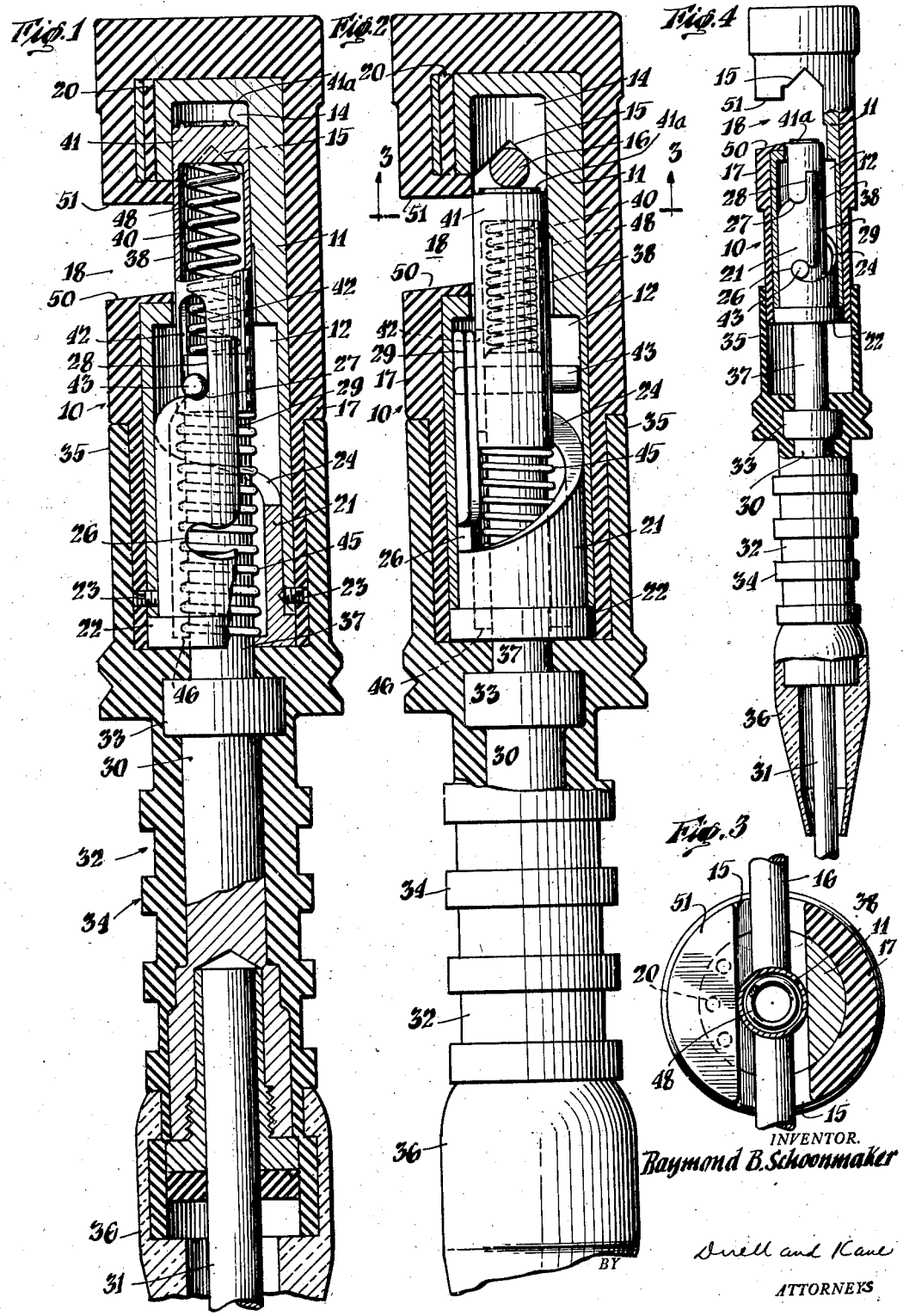
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HOT LINE JUMPER CLAMP

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HOT LINE JUMPER CLAMP

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11 Claims. (Cl. 173—273)

1

This invention relates to an improved snap-action clamping device for temporarily connecting tap wires or "jumpers" to live electrical circuits.

It is sometimes necessary to provide a temporary by-pass around switches or other power distribution control apparatus to maintain service during the replacement or repair of such apparatus. The lineman makes his temporary connection to live or "hot" conductors and it is, therefore, of the utmost importance to provide connection means that will reduce arcing or sparking to a minimum. The lineman may have to reach outwardly from a pole or tower to place the jumper clamp on the "hot wire" and it is also of importance to provide a hot line clamp which may be operated with a minimum of manipulation or adjustment.

In my presently co-pending application Serial No. 575,178, entitled "Electrical jumpers," filed January 29, 1945, of which the instant application is a continuation in part, I have disclosed a snap action jumper clamp having a hook-like jaw engageable over the "hot wire" and a spring driven pressure plunger which snaps upwardly into engagement with the hot wire to clamp it firmly against the jaw. I have found it desirable to provide a second, stronger, clamping spring effective after the plunger has engaged the hot wire to more tightly urge the plunger against the hot wire and, therefore, increase the clamping pressure thereon. Such a secondary spring is made effective after the first spring has operated to make the initial closure, and the lineman brings said second spring into play by simple twisting of the handle of the unit.

It is, therefore, an object of the invention to provide a snap action hot wire clamp which may be operated by one hand and which when in clamping position exerts sufficient pressure against the hot wire to hold the clamp constantly tight regardless of vibrations of the wire.

It is another object of the invention to provide a hot wire jumper clamp which includes a spring driven plunger effective to make immediate contact against the hot wire and having a secondary stronger spring to increase the clamping pressure to perfect the connection.

It is still another object of the invention to provide a hot line jumper clamp so constructed that the lineman's movements in fastening or removing the clamp on the hot wire are away from the wire, thus minimizing the possibility of the lineman striking the hot wire during such attachment or removal.

2

It is another object of the invention to provide a jumper clamp having internal resistances so low that the IR drop when the clamp is in use is negligible.

Other features and advantages of the invention will be apparent from the following detailed description.

Fig. 1 is a cross-section in elevation of a hot line jumper clamp embodying the present invention.

Fig. 2 is a view similar to Fig. 1, but rotated through 90°, and showing the conductor or "hot line" in position therein.

Fig. 3 is a plan section taken on lines 3—3 of Fig. 2; and

Fig. 4 is a partial vertical section of the clamp operating elements when in open position.

Referring to the drawings my improved hot wire jumper clamp 10 includes a metallic head or jaw portion 11, which is preferably of age hardenable aluminum alloy or bronze. Said jaw portion is advantageously cylindrical, and is formed with a relatively large diameter chamber 12 extending concentrically from which is a smaller diameter cylindrical chamber 14. A side wall of chamber 14 is cut away intermediate its ends to permit the head to be placed over an electricity conductor. Preferably, the wall of said chamber is formed with a V notch 15 adjacent its end so that the conductor or hot wire 16 is engaged by the sides of said notch. Under most conditions of installation, the conductor will extend completely through the housing, as shown in Fig. 3.

An insulating cover, preferably of natural or synthetic rubber of equivalent, is molded about the head portion to completely envelop the same. The cover is shaped to afford the relatively wide entrance passage 18. I prefer to drill a plurality of holes 20 axially through the wall of the jaw member so that the molded cover will key with or enter said holes for bond therewith.

Fitting tightly within the chamber 12 and in surface contact with the inner wall thereof there is a cylindrical or sleeve-like cam 21, a lower shoulder 22 of which abuts against the lower edge of the head portion 11. Set screws 23 or equivalent prevent relative movement of the head portion and cam sleeve.

A side wall opening of the cam sleeve provides a cam track 24 which drops downwardly from a short rise to form a detent 26, and then climbs helically to an upper detent notch 27. The upper wall 28 provides a stop.

It will be seen from Fig. 1 that shortly after

the commencement of climb of the cam track, the cam sleeve opening is bounded by a vertical wall 29, for a purpose later explained.

The handle of the jumper clamp has a rigid conductor core 30 having provision at its lower end for the attachment of a tap wire 31, said tap wire being secured by compression means or equivalent (not shown) to insure proper electrical connection.

A handle cover 32 also preferably of neoprene or equivalent insulation material, is molded about the conductive core 30, and I prefer to form said core member with an enlarged body 33 about which the cover 32 is molded, and which serves to key the cover against movement. The cover is molded with corrugations 34 which prevent the cover from slipping in the hand when it is grasped during the affixing or removal of the jumper to the conductor. The upper end of the handle cover has a skirt 35 which slidably and rotatably overlies the lower outer wall of cover 17. A suitable cable insulating sleeve 36 is affixed to the end of the handle cover 32 to seal the lower end thereof about the tap wire 31, and to restrain the bending of said tap wire at the connection with the conductive core 30.

Handle conductor 30 has a rigid cylindrical extension 37 on which is telescopically mounted a tubular pressure plunger 38. Said plunger is preferably of silicon bronze or equivalent and provides an internal spring chamber 40. A relatively thick end wall forms a heavy head 41. Immediately above the lower edge of said plunger, the side walls thereof are provided with mutually aligned diametrically opposed slots 42. For cooperation with said slots the cylindrical extension 37 is diametrically drilled to tightly receive a heavy cross-pin 43 which extends through the said slots substantially to the wall of the chamber 12. The pin is electrically conductive and is preferably of stainless steel.

A helical spring 45 is disposed about the member 37 and is confined between the lower edge of pressure plunger 38 and a shoulder 46 at the base of the cam sleeve 21, said spring always urging the pressure plunger upwardly to the extent permitted by the slots 42. With no conductor 16 in position, the head 41 of the pressure plunger is above the apex of notch 15, as shown in Fig. 1.

Confined within the plunger 38 between its head 41 and the cylindrical member 31 there is a spring 48 which is substantially heavier than spring 45. For example, spring 45 may have a 35 lb. compression when its free length is reduced three-quarters of an inch, whereas the spring 48 has a 50 lb. load at free length.

Fig. 4 shows the position of the operating parts of the device in open position. The entire handle has been pulled downwardly until the pin 43 is within the detent 26. Spring 45 is under compression, whereas spring 48 is at free length. When the lineman wishes to make contact with the hot conductor 16 he hooks the clamp 10 over said conductor. The insulating surfaces 50, 51 prevent sparking until the conductor is within the chamber 14. The lineman pulls back, or down, on the handle to hook the conductor within the diametically opposed V-notches 15, which are so spaced as to hold the device against twisting on the conductor 16. He then gives handle 34 approximately a quarter turn to bring pin 43 out of the detent 26, whereupon spring 45 releases, driving the handle, and its associated member 37 and thereon mounted plunger 38 upwardly, the pin 43 following the vertical wall 29. The plunger

strikes smartly against the underside of conductor 16. In this position, pin 43 is not at the upper limit of the cam track and the spring 48 is but slightly compressed, if at all.

The lineman may thereupon increase the pressure of the plunger against the conductor by giving the handle an additional three-quarter turn so that the pin 43 is moved upwardly by the slope of the cam track, said slope being quite gradual, to obtain a relatively large mechanical advantage. The spring 48 is, therefore, placed under compression. At the completion of the rotation of the handle the pin 43 rests in the upper detent 27 of the cam slot. The clamp is then in the Fig. 2 position.

It will be noted that spring 48 urges the member 37 downwardly and cross pin 43 is maintained in firm contact with the cam sleeve 21. The main current path is through the wall of the head 11 to the cam sleeve, thence to the pin 43 and handle conductor 30 to the line tap 31. There are secondary paths which follow the coil spring 48 to the end of the member 37, as well as others which will be apparent from inspection of the figures. The respective current paths reduce the internal resistance to such extent that the IR drop when the jumper clamp is in use is negligible.

Sharp-edged ridges 31*a*, which may be arranged as a concentric series on the head 41 of the pressure plunger, penetrate the poorly-conductive oxide film on exposed conductors, and improve the frictional grip of the clamp. Obviously, the surfaces of the V-notches 15 might be provided with such sharp-edged ridges, if desired.

To disengage the clamp from the hot wire the lineman grasps the handle 32 and rotates it to the left until pin 43 strikes the vertical guide wall 29. He then pulls the handle toward himself, that is, away from the hot wire, until at last an additional short turn will bring the pin 43 into engagement with the lower detent 26. The device is then locked in full open position. During the initial stages of the downward pull the spring 48 expands, maintaining contact of the plunger head with the conductor 16 and minimizing arcing during the commencement of the disengagement operation. The spring 45 being relatively light does not offer any substantial resistance to the pull of the lineman. It will thus be seen that the double spring construction, that is the combination of the light spring 45 and the heavy spring 48, provides for very securely gripping the conductor 16 against the respective notches 15, while minimizing the amount of downward pull which the lineman must exert to release the jumper clamp.

It will be noted that the skirt 35 on the end of the handle sheathing 32 never disengages from the lower portion of the head covering 17, thus providing a continuous insulation during all stages of attachment and detachment.

After the first step of hooking the clamp over the conductor 16 all of the movements of the lineman in engaging or releasing the conductor are downward or toward himself. Therefore, he is required to make no movements under strain which are in the direction of the hot wire 16 and if his grasp on the handle should slip his hand will move away from rather than toward the hot wire.

Thus, among others, the several objects of the invention as afore noted are achieved. Obviously numerous changes in construction and rearrangement of the parts might be resorted to without

departing from the spirit of the invention as defined by the claims.

I claim:

1. A jumper clamp, comprising a fixed, electrically conductive jaw adapted to be placed over a conductor in electrical connection therewith; an open-ended, electrically conductive cylindrical structure extending from said jaw; a handle member mounted for axial and rotatable movement with respect to said cylindrical structure, said handle member having an electrically conductive core extending within said cylindrical structure and axially movable therein; a pressure plunger slidably mounted on said core and extending toward said fixed jaw to provide a movable jaw member for clamping said conductor against said fixed jaw; a spring for propelling said handle member and therewith associated pressure plunger toward said fixed jaw; a second spring disposed internally of said pressure plunger for exerting a thrust thereon; a sleeve fixed within said cylindrical structure in electrically conductive relation therewith, a wall of said sleeve being formed with a detent notch communicating with an upwardly extending wall opening; and a pin extending radially from said handle core and engageable with said detent to hold the handle in retracted position, with the first-named spring under compression and to disengage from said notch and enter said wall opening upon rotation of said handle to release said handle for propulsion toward said fixed jaw by action of said first-named spring, the extent of travel of said handle being such that the end of said pressure plunger will clamp said conductor against said fixed jaw; a cam track provided at the upper end of said sleeve in communication with said wall opening for engagement by said pin, said cam track and pin being effective, upon further rotation of said handle to move said handle additionally in the direction of said fixed jaw to place the second-named spring under compression to increase the said clamping pressure; and means for electrically connecting a lead wire to said jumper clamp in conductive relationship with said fixed jaw member.

2. A jumper clamp according to claim 1, in which the side walls of said pressure plunger are slotted to engage with said pin to limit the relative movement of said plunger with respect to said handle core.

3. A jumper clamp according to claim 1, in which the first-named spring is disposed about said handle core and abuts against the end of said pressure plunger.

4. A jumper clamp according to claim 1, in which the first-named spring is of less compressive strength than the second-named spring.

5. A jumper clamp according to claim 1, in which said jaw member has intermediate its ends an entrance for said conductor, the surfaces of said entrance being covered with insulation material.

6. A jumper clamp, comprising a fixed, electrically conductive jaw adapted to engage a conductor in electrical connection therewith; a rotatable handle portion extending from said jaw and movable toward or away from said jaw, said handle portion including an electrically conductive core and having an axially movable, electrically conductive, pressure plunger engageable with said conductor to clamp the same against said jaw; spring means for moving said handle member and therewith associated pressure plunger to bring the latter into said clamping engagement; detent means for releasably holding said handle member retracted from said jaw with said spring under compression; a second spring interposed between said handle core and the said pressure plunger to increase the clamping pressure thereof; cam means effective upon rotation of said handle to compress said second spring; and means for electrically connecting said handle core to a lead wire.

7. A jumper clamp, comprising a fixed, electrically conductive jaw adapted to engage a conductor in electrical connection therewith; a rotatable handle portion extending from said jaw and movable toward or away from said jaw, said handle portion including an electrically conductive core and having an axially movable, electrically conductive, pressure plunger engageable with said conductor to clamp the same against said jaw; spring means for moving said handle member and therewith associated pressure plunger to bring the latter into said clamping engagement; a second spring means operating on said pressure plunger to increase the clamping pressure thereof; and cam means operable on rotation of said handle member for compressing said second spring.

8. A jumper clamp, comprising a fixed, electrically conductive jaw adapted to engage a conductor in electrical connection therewith; a handle portion movable toward or away from said jaw, said handle portion including an electrically conductive core and having an axially movable pressure plunger engageable with said conductor to clamp the same against said jaw, spring means for moving said handle member and therewith associated pressure plunger to bring the latter into said clamping engagement; a second spring means operating on said pressure plunger to increase the clamping pressure thereof; and cam means for compressing said second spring.

9. A jumper clamp, comprising a fixed, electrically conductive jaw adapted to be placed over a conductor in electrical connection therewith; a handle portion movable toward or away from said jaw, and having an end structure engageable with said conductor for clamping said conductor against said jaw; spring means for urging said handle portion toward said jaw for clamping engagement with said conductor; and a second spring means for increasing the clamping pressure after the initial engagement of said jaw and structure with said conductor.

10. A jumper clamp, comprising a fixed, electrically conductive jaw adapted to be placed over a conductor in electrical connection therewith; a lead wire electrically connected to said jaw; a handle portion movable toward or away from said jaw; a pressure plunger slidably carried by said handle portion and movable toward said jaw, said plunger being engageable with said conductor to clamp the same against said jaw; spring means for urging said handle portion and associated pressure plunger in the direction of said jaw to cause said plunger to exert an initial clamping action against said conductor, a second spring acting on said plunger to increase the clamping pressure thereof; and means for compressing said last named spring for increasing the pressure exerted by said plunger against said conductor.

11. A jumper clamp, comprising a fixed, electrically conductive jaw adapted to be placed over a conductor in conductive relationship therewith; a co-operating movable jaw member for clamping said conductor against said fixed jaw,

at least one of said jaw members having sharp-edged ridges engageable with said conductor; a spring for driving said movable jaw member into said clamping engagement, a second spring acting upon said movable jaw member for increasing the clamping pressure; and means for causing said second spring to urge said movable jaw member toward said conductor independently of said first-named spring.

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