

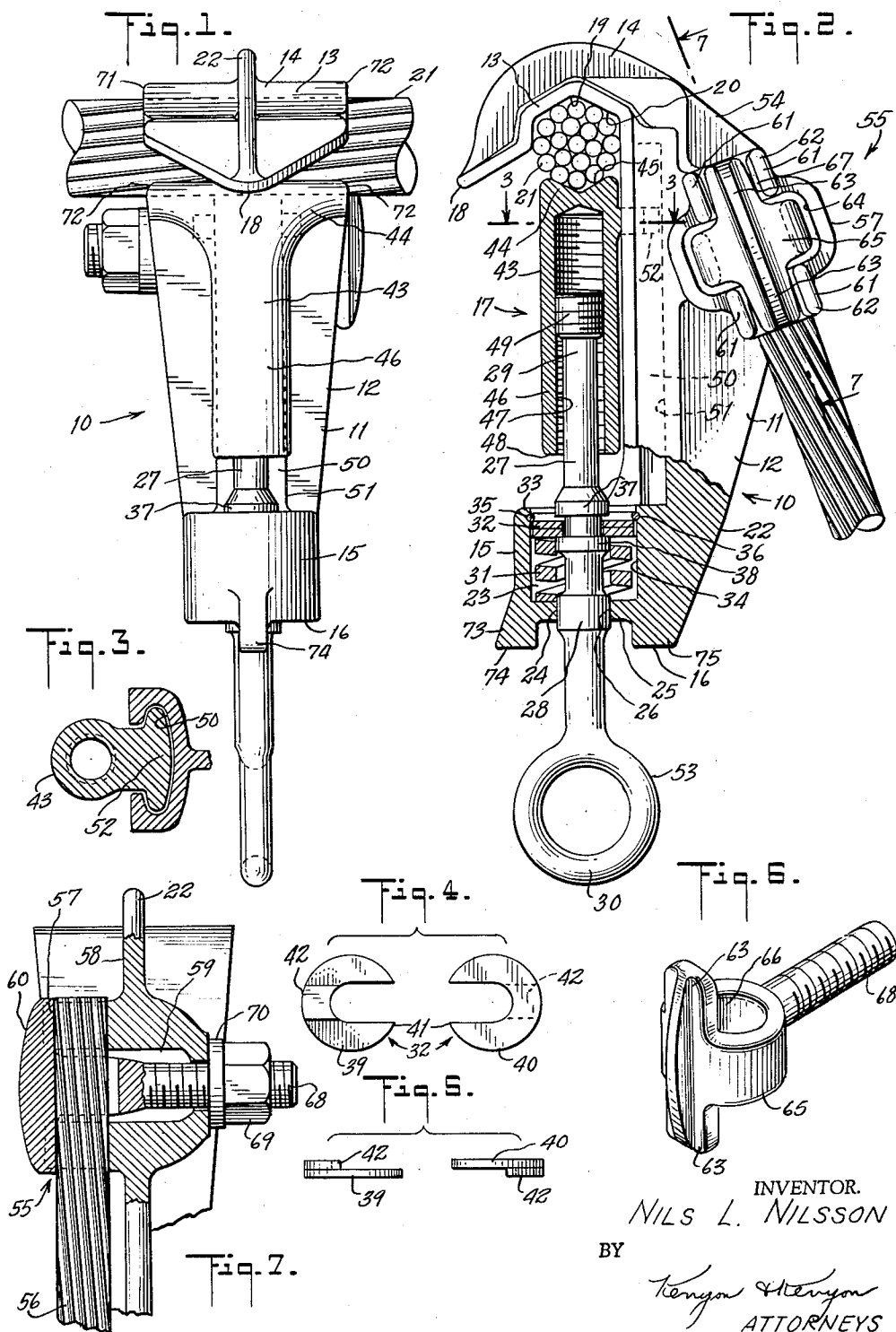
Jan. 6, 1959

N. L. NILSSON

2,867,787

HOT LINE CLAMP

Filed March 11, 1958



INVENTOR.
NILS L. NILSSON

BY

Kenyon & Kenyon
ATTORNEYS

1

2,867,787

HOT LINE CLAMP

Nils L. Nilsson, Birmingham, Ala., assignor to Anderson Electric Corporation, Birmingham, Ala., a corporation of Alabama

Application March 11, 1958, Serial No. 720,612

9 Claims. (Cl. 339—264)

This invention relates to electrical wire clamps, and more particularly to an electrical clamp or connector especially adapted for making a temporary or permanent connection to a live wire power transmission or distribution line.

It is common practice in the art to utilize detachable clamps for making temporary or shiftable connections to a main power line while the line is hot, i. e. voltage is on the line, in order to interconnect various types of equipment with the circuit, such as transformers, lightning arresters and other types of equipment used by linemen in their maintenance work. Each clamp has the branch or tap line securely fastened to it and by means of a long insulated pole or other device having a suitable holding means on one of its ends, the clamp is hooked onto the power line and by appropriate manipulation of the pole, the fastening means of the clamp is actuated to secure it in place.

The basic requirements for these so called hot line clamps are that they should be quickly and easily secured to and removed from the power line, they should have a minimum of parts, be of sturdy construction and maintain their clamping pressure on the line under all conditions of use. Furthermore, it is important that the clamps be constructed of non-corrosive metal while at the same time having low electrical resistance.

One of the main difficulties encountered in prior devices of this type is that by virtue of exposure to the atmospheric elements, such as rain, sleet and snow, as well as industrial contaminants and corrosive fumes, for extended periods of time, the components of the clamp become corroded and deteriorated, and consequently it frequently is difficult to remove the clamp from the line when desired. Since the corroded parts stick to each other as well as even to the conductor itself, attempted removal often results in breaking of the clamp and parts may remain secured to the transmission or distribution line which are not only difficult to remove, but also present hazards to the workman who attempt to remove them. Usually the most vulnerable parts of the clamp are the screw threads and springs, if any, which are all susceptible to such corrosion and their deterioration causes malfunctioning of the devices as mentioned above.

Another difficulty is caused by the exposure of the threads, springs, and other parts to electric arcing encountered by virtue of the high tension voltages employed. Such arcing contributes to accelerated deterioration of such parts.

In addition to the above problems, prior clamps have also been found to be ineffective in maintaining adequate clamping pressure on the line with the result that they have worked loose for one reason or another, for example, because of vibration of the line, or because of radial contraction of the line due to temperature change. Many types of these clamps have presented another operational difficulty by virtue of the fact that the adjusting stem is of the rising type and, especially where the distance between the lineman and the point of attachment

2

is critical, the tightening of the stem has resulted in decreasing the available working distance on the pole.

It is an object of the present invention to provide a hot line clamp for the above purposes which has its screw threads protected from the atmospheric elements and from electrical arcing effects.

It is another object to provide such a clamp which applies clamping pressure to the main conductor in a straight axial direction from the stem through the center of the conductor to transmit direct maximum clamping pressure to the conductor.

An additional object is to provide such a clamp which transmits clamping pressure from the adjusting stem to the main conductor without a moment arm and consequently substantially eliminates any binding tendency of the movable jaw with respect to the guideway.

Another object is to provide such a clamp having a non-rising adjusting stem to provide greater safety and efficiency in operation.

Still another object is to provide a hot line clamp of the above type having an enclosed spring means for biasing the adjusting stem and movable jaw toward the fixed or stationary jaw to allow for expansion or contraction of the main conductor while clamped and to allow for vibration of the conductor in service without release thereof, and to protect such spring means from the atmospheric elements as well as electric arcing to insure prolonged life and operation thereof.

Briefly, the present invention comprises an electrical hot line clamp having a C-shaped body constituted by an elongated shank portion. The shank portion has a guideway disposed along its inner surface, a stationary jaw portion projecting laterally from one end thereof and integrally formed therewith, and a receiver arm portion projecting laterally from the other end of the shank portion and integrally formed therewith, to define an operating region between said ends. A movable jaw member is reciprocally disposed in the operating region and has a complementary jaw portion attached to coast with the stationary jaw portion and has an internal threaded sleeve portion extending from such jaw portion. A guide arm is affixed to the complementary jaw portion of the movable jaw member and is interlocked to the guideway to provide sliding movement of the movable jaw along the shank portion and prevents rotary movement thereof. An adjusting stem extends through the receiver arm and threadably engages the sleeve at its inner end. The receiver arm has an inwardly facing cylindrical recess therein defining a spring chamber and has a spring disposed therein concentrically about the adjusting stem. Washer means is reciprocally disposed in such chamber about the stem to confine the spring therein, the stem having a pair of spaced collars secured thereto on either side of the washer whereby the spring bearing on the washer urges the stem axially in the direction of the movable jaw member. The movable jaw member is adjustable toward the stationary jaw portion by rotary movement of the stem without elevation of the stem, which transmits clamping pressure in a direct line axially of the stem and through the center of the conductor being clamped. Suitable connector means is affixed to the shank portion of the clamp for connecting the branch conductor thereto.

Other objects and features of the invention will become apparent in the following detailed specification and in the claims, as well as in the drawings, in which:

Fig. 1 is an elevation of the clamp;

Fig. 2 is a profile view of the clamp;

Fig. 3 is a section taken along lines 3—3 of Fig. 2;

Fig. 4 is a plan view of the split washer;

Fig. 5 is an elevation of the split washer;

Fig. 6 is an isometric view of the eye bolt; and

Fig. 7 is a fragmentary section taken along lines 7—7 of Fig. 2.

A clamp according to the invention is shown in Figs. 1 and 2 and designated generally by the reference number 10. It has a C-shaped body portion 11 which has an elongated shank portion 12, a stationary jaw portion or hook 13 formed integrally therewith at one end 14 of the shank portion 12, and an extension or receiver housing portion 15 formed integrally with said shank portion 12 at the other end 16 thereof, all of which define an operating region 17 between said ends 14, 16.

The stationary jaw portion 13 projects laterally from the shank portion 12 and terminates in a downwardly and outwardly extending angular nose portion 18. The underside 19 of the stationary jaw portion 13, as viewed in Fig. 2, has a transversely disposed gripping surface 20 of semi-hexagonal configuration and is adapted to receive an electrical cable or conductor 21 as shown. Reinforcing rib or web 22 is centrally disposed along the body portion 11 and extends from the outer end or nose portion 18, along the shank portion 12 and terminates at the lower end 16 thereof as viewed in Fig. 2.

Receiver housing 15 is provided with an inwardly facing cylindrical recess 23 which underlies the gripping surface 20 and has hole 24 in its bottom surface 25 providing a lateral bearing surface 26. Elongated adjusting stem 27 extends through the receiver housing 15 and has a hub, flange or bearing collar 28, intermediate of its respective upper and lower ends 29, 30, disposed in said hole 24 in rotatable and axial sliding relation with bearing surface 26. Helical spring 31 is disposed within the cylindrical recess 23 concentrically about the stem 27 as shown. Washer 32 is disposed at the upper end 33 of the recess 23, as viewed in Fig. 2, concentrically about the stem 27 and in sliding contact with the recess wall 34 to confine the spring 31 within the recess 23. Retaining ring 35 is inserted within peripheral groove 36 at the upper end 33 of recess 23 and provides an upper sliding limit for washer 32.

A pair of axially spaced flanges or collars 37, 38 are provided on stem 27 between the bearing collar 28 and the upper end 29 for disposition on either side of washer 32 to provide spring biasing of the stem 27 in an axial direction toward said stationary jaw 13.

As shown in Figs. 4 and 5, the washer 32 is split, i. e. has two overlapping U-shaped complementary parts 39, 40, the open ends 41 thereof engaging respective lugs 42 to maintain the parts 39, 40 in appropriate registration with one another and provide a completely circular washer when assembled. The split washer is utilized to enable assembly of the device as shown.

The bearing collar 28 is of sufficient axial dimension so that a portion of its surface is in contact with bearing surface 26 at all times, and axial movement of the stem 27 against the spring bias is permitted without loss of the radial stabilization provided by the alignment of the bearing collar 28 in the hole 24. As shown in Fig. 2, the limit of axial play of the adjusting stem 27 is in an upward direction, the position shown with the washer 32 bearing against retaining ring 35, and in a downward direction, with the washer 32 moved downwardly into the recess 23 and holding the spring 31 in a compressed condition (not shown).

A movable jaw member 43 is disposed in the operating region 17 and has an enlarged transversely disposed jaw portion 44 adapted to coact with the stationary jaw portion 13. The jaw portion 44 has a complementary gripping surface 45 oppositely disposed from the gripping surface 20 of the stationary jaw portion 13 and has a partial hexagonal configuration complementary to that of the stationary jaw portion 13. The movable jaw member 43 has a sleeve portion 46 extending downwardly from the jaw portion 44 which has an internally threaded bore 47 opening at its lower end 48 adjacent the receiver housing 15. The bore 47 is disposed in concentric axial alignment

with the stem 27 and its internally threaded portion 47 operatively engages the threaded stem end portion 49.

The elongated shank portion 12 has a grooved guideway 50 longitudinally disposed along the inner surface 51 thereof and slidably receives guide arm 52 affixed to the movable jaw member 43 adjacent the jaw portion 44. The guide arm 52 is locked in the guideway 50 to permit sliding movement of the movable jaw member 43 along the shank portion 12 and to prevent relative rotary movement thereof. (See also Fig. 3.)

The movable jaw member 43 is adjustable toward the stationary jaw portion 13 by rotary movement of handle means 53 at the lower end 30 of the stem 27 in the appropriate direction.

Integrally formed with an enlarged portion 54 of web 22 is connector means 55 for attachment of a tap-off or branch line 56. (See also Fig. 7.) Such connector means is comprised of a receiver portion 57 facing outwardly from one side 58 of the web 22 and having a bore 59 extending through the web 22 adapted to receive eye bolt 60 (see also Fig. 6). The receiver portion 57 has a pair of spaced projections 61 at opposite ends 62 thereof, adapted to receive the elongated ends 63 of eye bolt 60, and an enlarged central recess portion 64 adapted to receive the eye bolt head portion 65 as shown. The branch line 56 extends through the receiving hole 66 in head portion 65 and is gripped between the elongated ends 63 and the respective adjacent channels 67 defined by the pairs of projections 61 on receiver portion 57. The eye bolt is provided with a threaded portion 68 which extends through the bore 59 and threadably engages nut 69 for tightening of the latter against washer 70 to secure the eye bolt 60 and branch line 56 in place.

The gripping surfaces 20, 45 of the jaw portions 13, 46 are each rounded at their ends 71, 72 to eliminate sharp edges and permit limited radial motion of the conductor 21 at such ends 71, 72 when clamped.

At the bottom front end 73 and back end 75 of the receiver housing 15 are respective projections 74 which serve as locking and unlocking means for the insulated pole mechanical clamp stick head (not shown). The mechanical head on the insulated pole is moved upwardly with respect to the projections 74 and the pole turned about forty degrees relative thereto to lock the head over the handle 53 when the device 10 is being clamped onto or removed from the line 21.

The clamp 10 is or can be adapted for use with various types of insulated poles or clamping sticks, including the kind having a sliding hand grip which actuates a clamp and ferrule type locking and unlocking means on the upper end of the pole.

In operation the above clamp is used as follows. The branch line 56 is first secured to the connector means 55 by insertion thereof through the channels 67 in receiver portion 57 and also through the receiving hole 66 of eye bolt 60, and then nut 69 is tightened against washer 70 until the eye bolt 60 and branch line 56 are tightly anchored in place. Then with the adjacent stem 27 properly rotated to withdraw the movable jaw member 43 away from the stationary jaw portion 13, so that sufficient space exists therebetween to receive the conductor 21, the clamp 10 is engaged with the holding mechanism of the elongated pole or other conventional insulated tool (not shown), and the hook or stationary jaw portion 13 of clamp 10 is brought into engagement with the conductor 21, so that the latter fits within the gripping surface 20 as shown in Fig. 2. Then the handle means 53 is rotated so that movable jaw member 43 is moved along the shank portion 12 to bring its gripping surface 45 into engagement with the conductor 21. The handle means 53 is further adjusted against the bias of spring 31 until the desired clamping pressure is achieved. By such adjustment it is to be noted that the clamping pressure is transmitted from the stem 27 in a direct line along its axis directly through the gripping surface 45 of movable

5

jaw member 43 and then directly through the center of conductor 21. Furthermore, it is to be noted that rotary adjustment of the stem 27 is effected toward the clamping position shown in Fig. 2 without rising of the stem 27 with respect to the body 11 of the clamp. Thus, it is unnecessary for the lineman to change his grip location on the adjusting pole.

The entire device described, exclusive of the helical spring 31 and possibly the retaining ring 35, can be cast or otherwise constructed from any suitable material, such as aluminum or bronze alloys, which provides good electrical properties as well as strength.

By virtue of the bias supplied by spring 31, when the clamp 10 is connected in place as previously described, vibratory motion of the conductor 21, or contraction or expansion thereof is compensated for and the desired clamping pressure of the clamp 10 on the conductor 21 is maintained at all times.

While one embodiment of the invention has been shown and described herein, it is to be understood that certain changes and additions can be made by those skilled in the art without departing from the scope and spirit of this invention.

I claim:

1. An electrical hot line clamp comprising a body portion having a stationary jaw thereon, a movable jaw disposed adjacent said stationary jaw and having a clamping surface thereon and a downwardly facing internally threaded bore therein, an operating stem rotatably disposed on said body portion in axial alignment with said movable jaw and in direct underlying relation with said clamping surface, said stem threadably engageable with said bore to effect adjustment of said movable jaw toward said stationary jaw without elevation of said stem, means slidably connecting said movable jaw and said body portion to prevent rotation of said movable jaw relative to said body portion, enclosed resilient means interconnecting said stem and said body portion for permitting limited yielding movement of said stem and said movable jaw away from said stationary jaw in response to forces exerted by the electrical line being clamped, and connector means on said body portion for connecting a branch conductor thereto.

2. An electrical hot line clamp comprising a body constituted by an elongated shank portion, a stationary jaw portion projecting laterally from said shank portion, and a receiver housing portion projecting laterally from said shank portion at a spaced position from said stationary jaw portion to define an operating region therebetween, a movable jaw member reciprocable in said region and having a complementary jaw portion adapted to coact with said stationary jaw portion and having an internally threaded bore, means slidably connecting said movable jaw and said body to prevent rotation of said movable jaw relative to said body, a stem extending through said housing and threadably engaging said bore, said housing having a recess therein to define a spring chamber, spring means disposed within said chamber, a washer reciprocally disposed in said chamber about said stem to confine said spring means therein, means for interconnecting said washer with said stem whereby said spring bearing on said washer urges said stem axially in the direction of said movable jaw member, said movable jaw member being adjustable toward said stationary jaw portion by rotary movement of said stem, and connector means affixed to said shank portion for connecting a branch conductor thereto.

3. An electrical hot line clamp comprising a C-shaped body constituted by an elongated shank portion, a stationary jaw portion projecting laterally from said shank portion and integral therewith, and a receiver housing portion projecting laterally from said shank portion at a spaced position from said stationary jaw portion and integral therewith to define an operating region therebetween, a movable jaw member reciprocable in said region and

6

having a complementary jaw portion adapted to coact with said stationary jaw portion and having an internally threaded bore, means slidably connecting said movable jaw and said shank portion to prevent rotation of said movable jaw relative to said shank portion, a stem extending through said housing and threadably engaging said bore, said housing having a recess therein to define a spring chamber, spring means disposed within said chamber, a washer reciprocally disposed in said chamber about said stem and in sliding contact with said chamber to confine said spring means therein, means for interconnecting said washer with said stem whereby said spring bearing on said washer urges said stem axially in the direction of said movable jaw member, said movable jaw member being adjustable toward said stationary jaw portion by rotary movement of said stem, and connector means affixed to said shank portion for connecting a branch conductor thereto.

4. An electrical hot line clamp comprising a C-shaped body constituted by an elongated shank portion, a stationary jaw portion projecting laterally from one end of said shank portion and integral therewith, and a receiver housing portion projecting laterally from the other end of said shank portion and integral therewith to define an operating region between said ends, a movable jaw member reciprocable in said region and having a complementary jaw portion adapted to coact with said stationary jaw portion and having an internally threaded bore, means slidably connecting said movable jaw and said shank portion to prevent rotation of said movable jaw relative to said shank portion, a stem extending through said housing and threadably engaging said bore, said housing having a recess therein to define a spring chamber, a spring disposed within said chamber, a washer reciprocally disposed in said chamber about said stem and in sliding contact with said chamber to confine said spring means therein, means for interconnecting said washer with said stem whereby said spring bearing on said washer urges said stem axially in the direction of said movable jaw member, said movable jaw member being adjustable toward said stationary jaw portion by rotary movement of said stem without elevation of said stem, and connector means affixed to said shank portion for connecting a branch conductor thereto.

5. An electrical hot line clamp comprising a C-shaped body constituted by an elongated shank portion, a stationary jaw portion projecting laterally from one end of said shank portion and integral therewith, and a receiver housing portion projecting laterally from the other end of said shank portion and integral therewith to define an operating region between said ends, a movable jaw member reciprocable in said region and having a complementary jaw portion adapted to coact with said stationary jaw portion and having an internally threaded sleeve portion extending from said jaw portion, means slidably connecting said movable jaw and said shank portion to prevent rotation of said movable jaw relative to said shank portion, a stem extending through said housing and threadably engaging said sleeve, said housing having a recess therein to define a spring chamber, a spring disposed within said chamber, a washer reciprocally disposed in said chamber about said stem and in sliding contact with said chamber to confine said spring therein, means for interconnecting said washer with said stem whereby said spring bearing on said washer urges said stem axially in the direction of said sleeve, said movable jaw member being adjustable toward said stationary jaw portion by rotary movement of said stem without elevation of said stem for transmission of clamping pressure in a direct line axially of said stem through the center of the conductor being clamped, and connector means affixed to said shank portion for connecting a branch conductor thereto.

6. An electrical hot line clamp comprising a C-shaped body constituted by an elongated shank portion having a guideway disposed along the inner surface thereof, a stationary jaw portion projecting laterally from one end of said shank portion and integral therewith, and a receiver arm portion projecting laterally from the other end of said shank portion and integral therewith to define an operating region between said ends, a movable jaw member reciprocable in said region and having a complementary jaw portion adapted to coact with said stationary jaw portion and having an internally threaded sleeve portion extending from said jaw portion, a guide arm affixed to said complementary jaw portion and keyed to said guideway to permit sliding movement of said movable jaw member along said shank portion and to prevent rotary movement thereof, a stem extending through said housing and threadably engaging said sleeve, said housing having a recess therein to define a spring chamber, a spring disposed within said chamber about said stem and in sliding contact with said chamber to confine said spring therein, means for interconnecting said washer with said stem whereby said spring bearing on said washer urges said stem axially in the direction of said sleeve, said movable jaw member being adjustable toward said stationary jaw portion by rotary movement of said stem without elevation of said stem for transmission of clamping pressure in a direct line axially of said stem through the center of the conductor being clamped, and connector means affixed to said shank portion for connecting a branch conductor thereto.

7. An electrical hot line clamp comprising a C-shaped body constituted by an elongated shank portion having a guideway disposed along the inner surface thereof, a stationary jaw portion projecting laterally from one end of said shank portion and integral therewith, and a receiver housing portion projecting laterally from the other end of said shank portion and integral therewith to define an operating region between said ends, a movable jaw portion reciprocable in said region and having a complementary jaw portion adapted to coact with said stationary jaw portion and having an internally threaded sleeve portion extending from said jaw portion, a guide arm affixed to said complementary jaw portion and keyed to said guideway to permit sliding movement of said movable jaw member along said shank portion and to prevent rotary movement thereof, a stem extending through said housing and threadably engaging said sleeve, said housing having a recess therein to define a spring chamber, a spring disposed within said chamber about said stem and in sliding contact with said chamber to confine said spring therein, a pair of spaced collars secured to said stem on either side of said washer whereby said spring bearing on said washer urges said stem axially in the direction of said sleeve, said movable jaw member being adjustable toward said stationary jaw portion by rotary movement of said stem without elevation of said stem for transmission of clamping pressure in a direct line axially of said stem through the center of the conductor being clamped, and connector means affixed to said shank portion for connecting a branch conductor thereto.

8. An electrical hot line clamp comprising a C-shaped body constituted by an elongated shank portion having a guideway disposed along the inner surface thereof, a stationary jaw portion projecting laterally from one end of said shank portion and integral therewith, and a receiver

housing portion projecting laterally from the other end of said shank portion and integral therewith to define an operating region between said ends, a movable jaw member reciprocable in said region and having a complementary jaw portion adapted to coact with said stationary jaw portion and having an internally threaded sleeve portion extending from said jaw portion, a guide arm affixed to said complementary jaw portion and keyed to said guideway to permit sliding movement of said movable jaw member along said shank portion and to prevent rotary movement thereof, a stem extending through said housing and threadably engaging said sleeve at its inner end, said housing having an inwardly facing cylindrical recess therein to define a spring chamber, a helical spring disposed within said chamber concentrically about said stem, a washer reciprocably disposed in said chamber about said stem and in sliding contact with said chamber to confine said spring therein, a pair of spaced collars secured to said stem on either side of said washer whereby said spring bearing on said washer urges said stem axially in the direction of said sleeve, said movable jaw member being adjustable toward said stationary jaw portion by rotary movement of said stem without elevation of said stem for transmission of clamping pressure in a direct line axially of said stem through the center of the conductor being clamped, and connector means affixed to said shank portion for connecting a branch conductor thereto.

9. An electrical hot line clamp having a C-shaped body and comprising an elongated shank portion having a grooved guideway disposed along the inner surface thereof, a stationary jaw member integrally formed therewith at one end of said shank portion, a receiver housing affixed at the other end of said shank portion to define an operating region between said ends, a movable jaw member having a laterally enlarged end adjacent said stationary jaw member and a longitudinally disposed sleeve portion extending therefrom and having an internally threaded bore opening at the other end thereof adjacent said receiver housing, a guide arm affixed to said enlarged end and keyed with said guideway for sliding movement of said movable jaw along said shank portion, said jaw members having opposed complementary gripping surfaces thereon, said receiver arm provided with a cylindrical recess in its inner surface having a hole in the bottom thereof, an elongated stem extending through said housing and having a bearing collar rotatably disposed in said hole, a pair of spaced collars on said stem and located within said recess, spring means disposed within said recess concentric with said stem, washer means affixed between said collars and slidably closing said recess to retain said spring therein, means for retaining said washer means within said recess, handle means at the outer end of said stem and a threaded portion at the other end of said stem operatively engaged with said threaded bore, said movable jaw being reciprocally slidable along said guideway toward said stationary jaw by rotary movement of said stem for clamping action of said gripping surfaces in direct axial alignment with said stem, said spring means permitting limited yielding axial movement of said stem and movable jaw in response to forces exerted by the line being clamped, and connector means affixed to said shank portion for connecting a branch conductor thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

2,508,778	Spears	May 23, 1950
2,811,703	Becker	Oct. 29, 1957