

Feb. 21, 1967

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3,304,962

EXPLOSIVELY-OPERATED TERMINATING DEVICE

Filed Dec. 18, 1964

2 Sheets-Sheet 1

Fig. 1

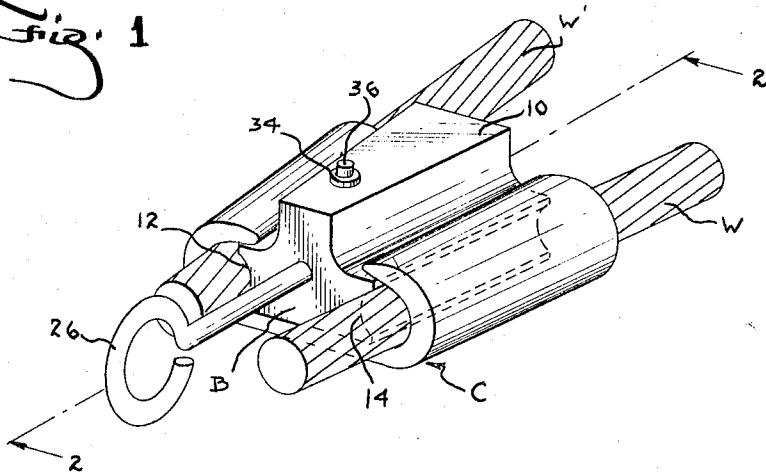


Fig. 2

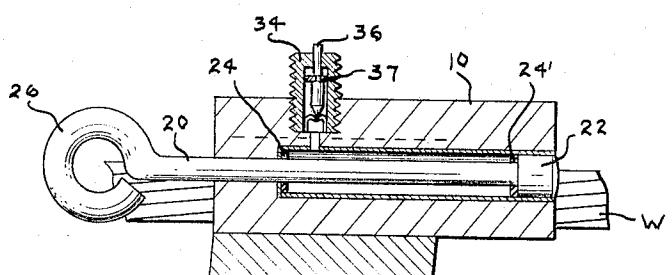
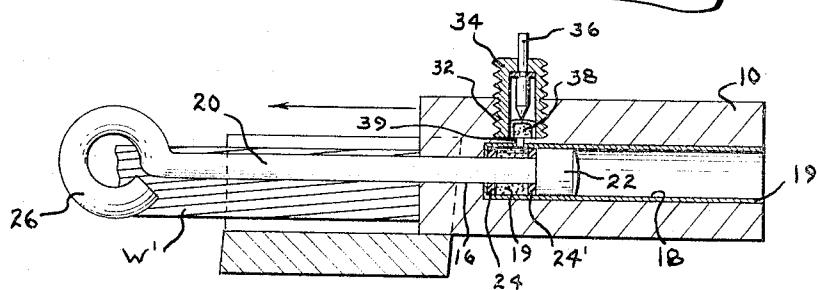


Fig. 3

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Fig. 4

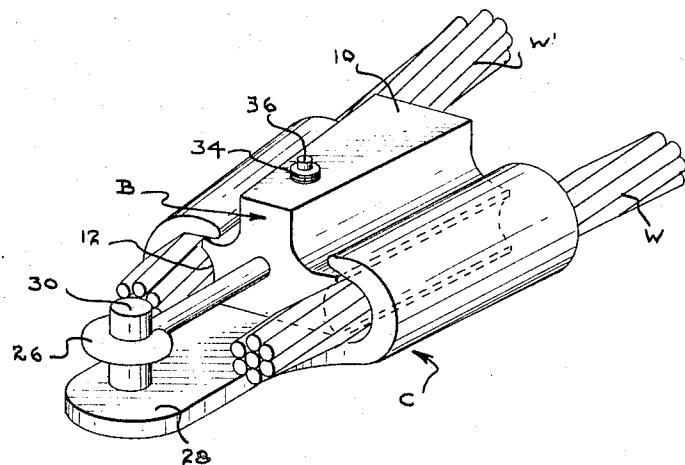


Fig. 5

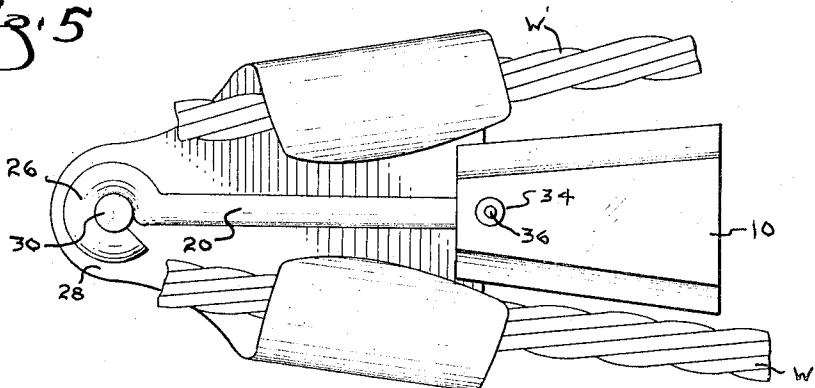
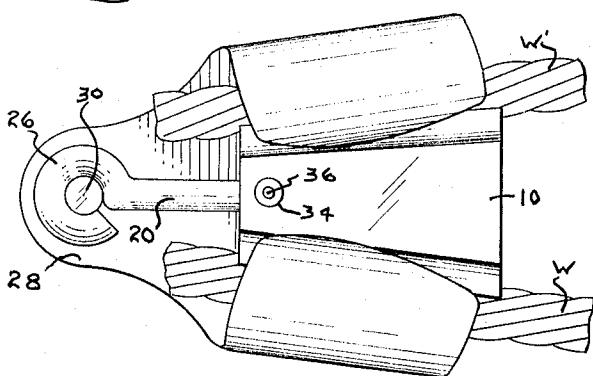


Fig. 6



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United States Patent Office

3,304,962

Patented Feb. 21, 1967

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3,304,962
EXPLOSIVELY-OPERATED TERMINATING
DEVICE
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Filed Dec. 18, 1964, Ser. No. 419,521
7 Claims. (Cl. 140—113)

The technique of splicing electrical cables requires a secure connection between the cables to be joined, whereby the joint will withstand vibration forces, expansion and contraction, resist corrosion, and have excellent conductive properties. Cold-forging, properly performed, will provide these attributes by causing an intimate junction of metal to effect a cold-welding of the items to be joined.

A difficulty in cold-forging techniques occurs in attempting to join large-sized wires (e.g., 1/O wire and larger), especially in remote locations such as might be experienced by a power company lineman. One remedy has been the development of a powder-actuated tool to achieve the high crimping forces necessary in such applications, and concurrently reducing the size of the device required for effecting the cold-forged connection.

It is an object of this invention to provide a means for cold-forging a connection between a pair of wires whereby the force-generating means is stored within the connector. It is also an object of this invention to provide a self-contained, explosive charge in an electrical connector whereby the charge may be detonated to actuate the connector and thereby join a plurality of wires.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIGURE 1 is a perspective view illustrating a preferred embodiment of the invention, clamping a pair of wires;

FIGURE 2 is a sectional view, taken through plane 2—2 on FIGURE 1, prior to actuation of the device;

FIGURE 3 is a view similar to FIGURE 2, illustrating the device after it is actuated; and

FIGURES 4—6 are views corresponding to FIGURES 1—3, illustrating one embodiment of a means for restraining the piston against longitudinal movement.

As shown in FIGURE 1, the connector comprises an outer C-shaped clamp member, generally indicated "C," adapted to accommodate a pair of wires W and W'. In assembled position, each of the wires is adapted to fit into the upper and lower bights, respectively, of the clamp member C. A wedge-shaped block B is likewise adapted to fit between the wires W and W' and, due to the taper on the upper and lower surfaces of the block, the block is designed to secure the wires W and W' in the clamp means B. (One of the wires, for example, might be the through-wire strung between utility poles, and the other wire would be a tap wire.)

The block B comprises a body member 10 having arcuately-curved portions 12 and 14 on opposed surfaces of the body member. These surfaces 12 and 14 are concave and designed to match the particular sized wire designed to be connected.

The body member 10 (FIGURE 2) also includes an opening 16 axially aligned with the body member. The

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aperture 16 is undercut at 18 to provide a piston chamber, which is partially disposed within the body member 10. The piston chamber 18 may be lined with stainless steel 19 for protective purposes and contains an explosive charge 19 therein.

5 A piston rod 20 partially extends through the aperture 16 and is secured to a piston 22, movably fitted within the chamber 18. A pair of washers 24 and 24' surround the piston rod 20 and have an outer diameter equivalent to the inner diameter of the piston chamber 18. The explosive charge 19 is disposed between the washers 24, 24' and retained in place by the piston 22. The other end of the piston rod has a baling eye 26 which is capable of being secured to means for restraining the piston against longitudinal movement.

10 One way of restraining longitudinal movement of the piston comprises a tongue-shaped member 28 (FIGURES 4—6) projecting integrally from one end of the clamp member C. A pin 30 extends laterally from the tongue 28 and provides a pivot for the baling eye 26. It is noted that this arrangement permits the piston rod 20, piston 22, and the wedge block B to pivot about the pin 30 while restraining the piston rod 20 and piston 22 against longitudinal movement.

15 20 25 30 35 40 45 50 55 60 65 70

One way of restraining longitudinal movement of the piston comprises a tongue-shaped member 28 (FIGURES 4—6) projecting integrally from one end of the clamp member C. A pin 30 extends laterally from the tongue 28 and provides a pivot for the baling eye 26. It is noted that this arrangement permits the piston rod 20, piston 22, and the wedge block B to pivot about the pin 30 while restraining the piston rod 20 and piston 22 against longitudinal movement.

Actuation means includes a second aperture 32 which forms a passageway between the chamber 18 and the outer surface of the block B. A bushing 34 is threaded into this aperture and a firing pin 36 is slidably disposed within the bushing 34. A washer 37 on the firing pin 36 retains the firing pin in the bushing 34. The inner end of the firing pin 36 is adapted to strike a primer 38 which is press-fitted into the bushing 34 and communicates with the interior of the piston chamber 18 through an aperture 39 between the piston 22 and the undercut portion.

Operation: When it is desired to secure a pair of wires W and W' in conductive relationship, the device is assembled in the relationship illustrated by FIGURE 2. The wires are positioned within the C-shaped member with the body member B placed therebetween. Pivotal motion of the block B (FIGURE 5) facilitates positioning the wires within the C-shaped member. The body member B is moved forwardly until it frictionally engages each of the wires W, W'. In this position (FIGURE 2), the piston 22 is near the outer forward end of the chamber 18.

Detonation of the primer 38, by striking a blow upon the firing pin 36, causes the primer 38 to ignite the powder 19 in the chamber adjacent the piston 22. Since the piston rod 20, piston 22, and the outer shell C are all fixed relative to each other, the reaction force causes the body member B to be driven relative to the clamp C, thereby tightly engaging the wires W, W' between the clamp C and the body member B. The force generated by the explosive results in wire deformation whereby the wire W' is squeezed between the arcuate surface 12 and the corresponding bight of the C-shaped member to form a strong, intimate bonding of the material of the wire to the material of the connector. The same effect occurs with regard to the material of the wire W and the arcuate surface 14.

It will be observed that this device provides a simple means for securing large-sized wires together with the power-generating means contained within the device.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

I claim:

1. A device for securing wires together comprising: a pair of relatively movable connecting members adapted to secure a wire therebetween, and explosively-operated means disposed in one of said members for causing relative motion between said members.

2. A device for securing wires together comprising: a C-shaped clamp, a wedge means adapted to fit into said clamp to retain wires therebetween, a chamber in said wedge, explosive means in said chamber, a piston in said chamber, means securing said piston to said C-shaped clamp, whereby detonation of said explosive means causes the wedge to travel relative to the C-shaped member.

3. A device for securing wires including an outer clamp member, a wedge means adapted to fit into said clamp, a piston chamber in said wedge means, a piston in said chamber, a piston rod secured at one end to the piston and at the other end to the clamp and explosive means in said wedge for actuating the wedge relative to the clamp.

4. A connecting device for wire comprising: a C-shaped outer member, a wedge adapted to fit into said C-shaped member, a chamber extending axially of said wedge, piston means in said chamber, means securing said piston to said outer member, and explosively-actuating means

in said wedge for driving said wedge relative to the piston.

5. An actuating device for utilizing explosively-generated power comprising: a cylinder, a piston disposed in said cylinder, a piston rod secured to said piston extending outside the cylinder, explosive means on the working side of the piston, and means for restraining the piston against axial movement whereby detonation of the explosive means causes the cylinder to move relative to the piston.

10 6. A wire-connecting device comprising: a C-shaped clamp, a wedge means adapted to fit into said clamp, a cylinder in said wedge, a piston in said cylinder, means for securing said piston to said clamp, and means in said device for driving said wedge relative to said clamp.

15 7. The device of claim 6 wherein the means in the device for driving said wedge comprises explosive means in said wedge and means for detonating said explosive means.

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25 WILLIAM J. STEPHENSON, Primary Examiner.