

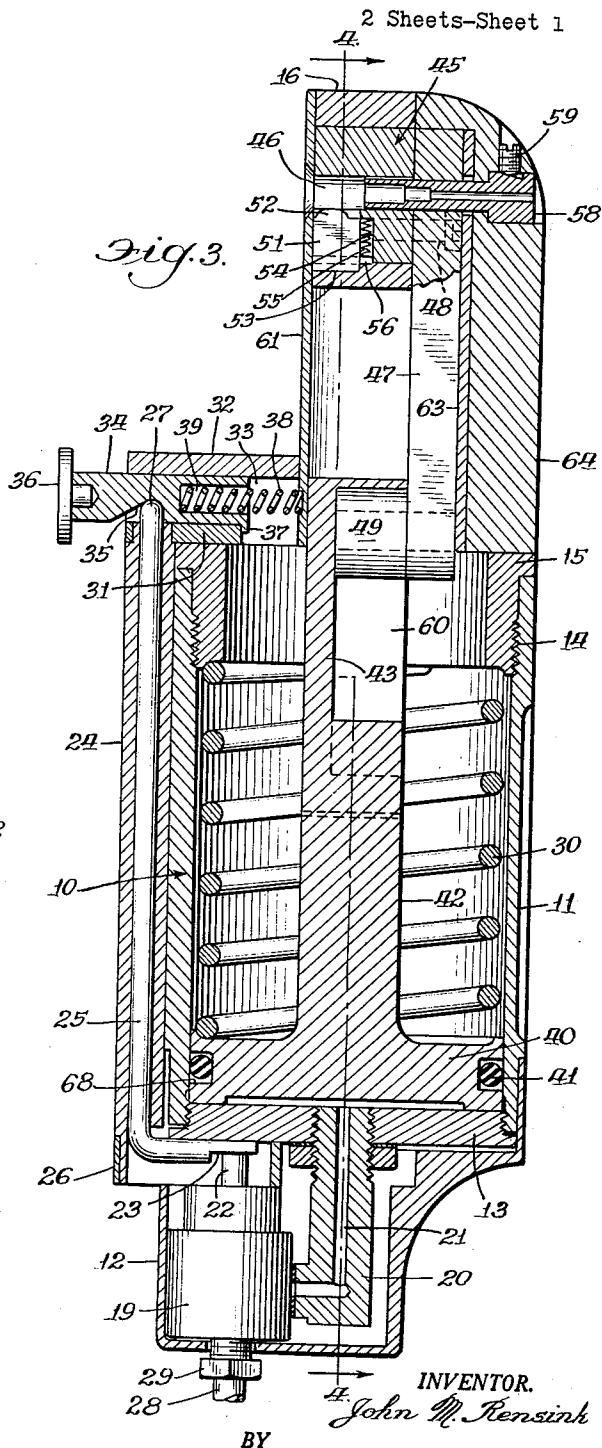
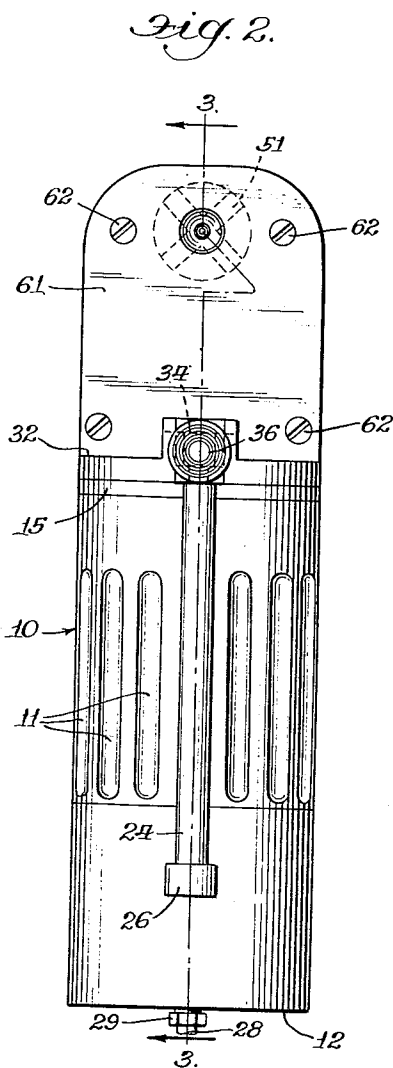
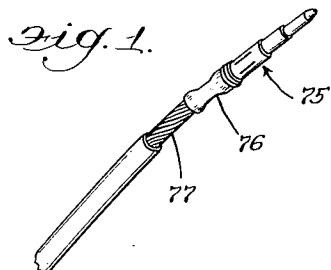
Aug. 21, 1962

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3,049,951

PORTABLE CRIMPING TOOL

Filed Oct. 25, 1960



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2 Sheets-Sheet 2

Fig. 4.

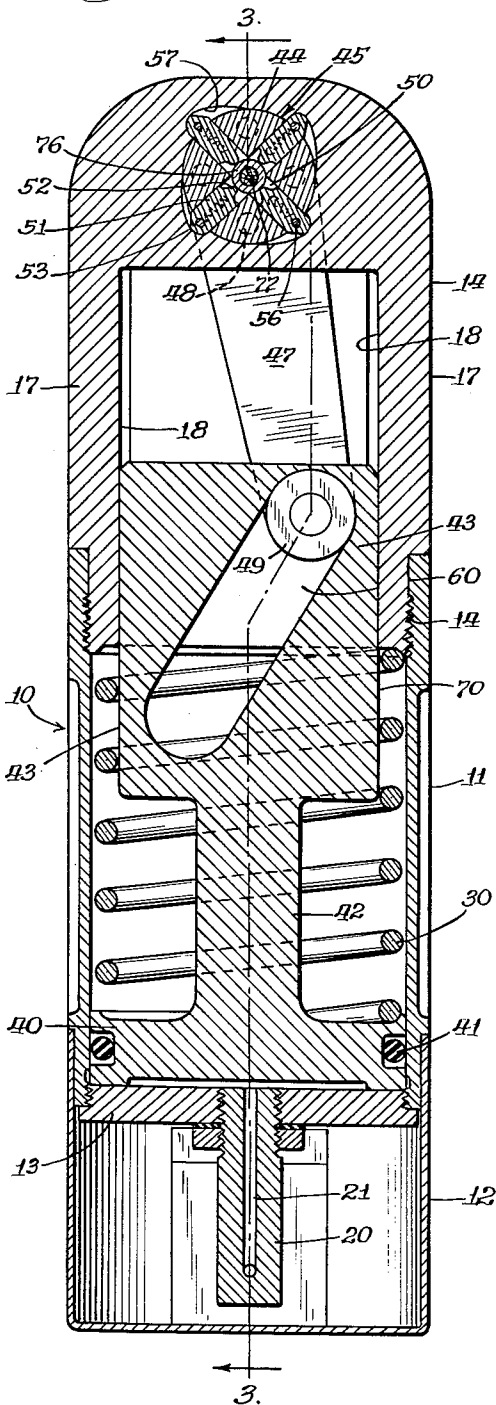


Fig. 5.

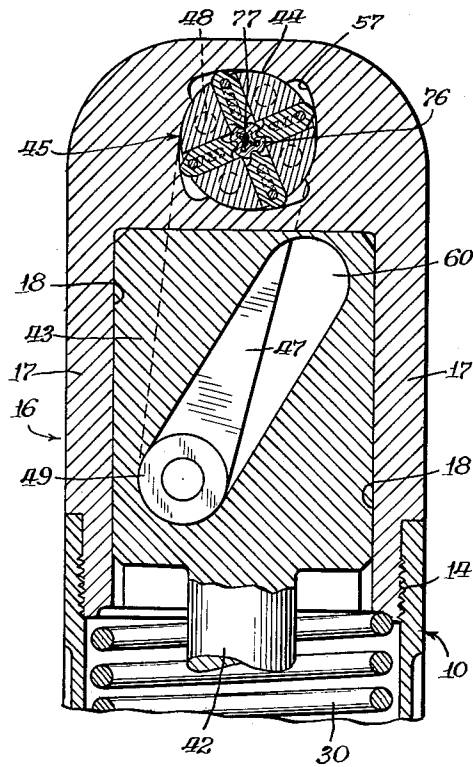
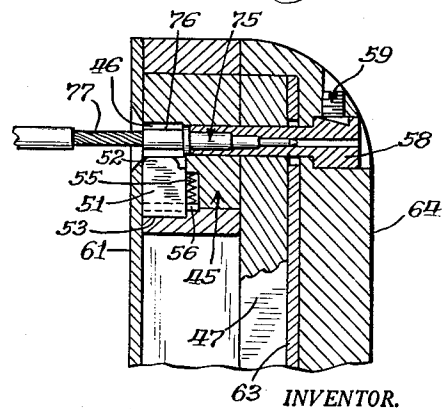


Fig. 6.



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1

3,049,951

PORTABLE CRIMPING TOOL

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Filed Oct. 25, 1960, Ser. No. 64,847

2 Claims. (Cl. 81-15)

The present invention relates to a power-actuated apparatus for crimping the contacts of electrical connectors or the like to their conductors.

Traditionally, devices for crimping electrical contacts onto the ends of wires have been hand-operated devices having the general appearance of a pair of pliers. When a worker uses such a device for securing numerous contacts to wires throughout the day, his hand becomes exceedingly tired because of the pressure that necessarily must be applied to the tool to perform the crimping operation. Still, inadequate or non-uniform force on the tool results in faulty crimps which, while not easy to detect, may result in disastrous circuit failures. To overcome this, various power-actuated crimping devices have been proposed, but those presently available have a number of disadvantages. In the first place, they tend to be bulky and awkward to use. Where the manual devices were tiresome to use because of the physical exertion in applying a crimping pressure, the power-operated devices heretofore proposed to supplant them are tiresome to use because of the weight and bulkiness that must be supported. Furthermore, in operations such as applying contacts to the wires of a preassembled "harness," the bulkiness of these devices becomes an obvious disadvantage.

The principal object of the present invention is to provide a power-actuated hand crimping tool which is compact, easily operated and produces a secure and uniform attachment of the wire to the electrical contact. As will be readily apparent, embodiments of the present invention may be held and operated by one hand, leaving the other hand free to position the wire in the sleeve of the contact to which the wire is to be secured. The compactness of the device, particularly in that region in which the wire and the contact are positioned for attachment, enables the use of the device under almost any circumstances. The embodiments are light in weight and the power supply connections are positioned so as not to interfere with the operation of the device. The devices are relatively inexpensive to manufacture and yet are exceedingly sturdy with a long operating life requiring little servicing.

The present invention permits the embodiments thereof to be securely gripped by the four fingers and palm of one hand, which permits the most effective and natural gripping of such a device. It further provides a structure in which the actuating member is operated by the thumb when the device is so gripped. This is in contrast to prior art devices having an actuating lever which must be operated by one or more of the four fingers (other than the thumb), which results in a relaxing of the grip on the device each time an actuating cycle is performed.

Further objects and advantages will become apparent from the following description taken in conjunction with the drawings, in which:

FIGURE 1 is a perspective view of the contact of an electrical connector having a wire secured to it by means of an embodiment of the present invention.

FIGURE 2 is a front elevational view of a present preferred embodiment of the invention.

FIGURE 3 is a central sectional view taken substantially on the line 3-3 of FIGURE 2 and the line 3-3 of FIGURE 4.

2

FIGURE 4 is a central sectional view along the line 4-4 of FIGURE 3;

FIGURE 5 is a fragmental sectional view similar to FIGURE 4 but illustrating an alternative position of the parts; and

FIGURE 6 is a fragmental sectional view similar to FIGURE 3 but illustrating an electrical contact and the conductor thereof in position for crimping.

The illustrated embodiment of the invention includes a body or frame of generally cylindrical shape having a tubular operating cylinder 10 which may include corrugations 11 on its outer surface to facilitate manually grasping the implement. The lower end of the cylinder 10, as viewed in the drawings, is enclosed by a hollow cap 12 disposed over a cylinder head 13 threaded into the lower end of the cylinder 10. The upper end of the cylinder is closed by a threaded ring 14 having a flange 15 and including an integral head portion 16, best shown in FIGURES 4 and 5, consisting of uprights 17 spaced apart from each other and having concavely curved interior slideways 18 as indicated.

The cylinder 10 and these slideways of the head 16 serve to house and to provide a mounting for the power piston and related operating parts of the tool hereinafter described, it being understood that the tool is arranged for pneumatic operation and is, accordingly, provided with an air valve 19 inside of the cap 12 and interconnected with the interior of the cylinder 10 by the screw threaded elbow fitting 20 which, as illustrated in FIGURE 3, includes an internal air duct or passage 21.

The air valve 19 is controlled by its operating plunger 22, the upper end of which is arranged to be engaged by the inwardly turned end portion 23 of an upright slide rod 25 housed within the slender cylindrical tube 24 which extends between the bracket 26 on the forward face of the cap 12 at the lower end of the housing and a similar bracket 32 at the upper end of the cylinder. The bracket 32 includes an interior recess 33 in which a push rod 34 is journaled, it being observed that the push rod 34 includes an operating cam surface 35 adapted to bear against the uppermost end 27 of the operating rod 25 in a manner such that application of inward force on the thumb button 36 by the operator of the device will move the slide 34 inwardly against the action of the return spring 38 in the recess 39, simultaneously pushing the rod 25 downwardly to actuate the plunger 22 and open the air valve 19. Upon release of the thumb button 36, the spring 38 will return it to its normal position, as limited by the internal stop member 37 striking the abutment 31 and the air valve 19 will accordingly close the air passage to the cylinder from the supply hose 28 and threaded fitting 29 and allow discharge of air from the lower end of the cylinder. Thus, whenever the thumb button 36 is actuated, air enters the lower end of the cylinder 10 through the control valve 19 to move the piston 40 longitudinally of the cylinder (upwardly as shown in the drawings) against the action of the return spring 30. The piston may be provided with any conventional sealing means, such as the O-ring 41 and also includes a neck portion 42 (FIGURE 4) extending upwardly to an integral operating cam 43 having semi-cylindrical surfaces on its opposite sides in slidable engagement within the concavely curved slideways 18 heretofore described.

The crimping mechanisms of the tool are housed within a generally cylindrical transverse bore 44 extending through the head portion 16 on an axis normal to the axis of the cylinder 10. Thus, as seen in FIGURES 3 and 4, the bore 44 serves as a chamber in which a crimping rotor generally designated by the numeral 45 is rotatably mounted. The rotor 45 has a central axial bore 46 and the entire rotor mechanism is secured to an op-

erating arm 47 by machine screws 48 extending through the arm into the several segments of the rotor, as best shown in FIGURES 3 and 5. The lower end of the operating arm 47 includes a cam follower roller 49 extending into and arranged for actuation by the diagonal cam slot 60 in the head portion of the piston heretofore described.

The crimping mechanism as illustrated includes a set of four crimping dies 51, each slidably mounted in a radial slot 50 in the rotor 45 and having a generally pointed tip portion 52 adapted to be driven inwardly by the engagement of the cam follower heads on the outside ends of the dies, with the cam surfaces 57 surrounding the bore 44. It follows that upon operation of the aforesaid piston in a manner to move the cam block 43 from the position of FIGURE 4 to the position of FIGURE 5, the swinging movement imposed on the arm 47 by the operation of the diagonal cam slot 60 and cam follower roller 49 will move the rotor in a clockwise direction, as viewed in the figures, and will thus drive the several crimping dies inwardly to crimp the sleeve of the contact upon the strands of the flexible conductor contained therein.

Upon return movement of the piston 40 by the return spring 30, the crimping dies 51 are also returned to their original positions by tiny compression springs 55 housed in recesses 54 behind the individual crimping dies, it being noted that the arrangement is such that the springs are held in compression between the innermost ends of these recesses and the pins 56 extending from the individual die members.

The crimping rotor 45 and its cooperating crank arm 47 are confined between parallel wear plates consisting of the front plate 61 secured on the forward faces of the head portion 16 by machine screws 62 (FIGURE 2), and a rear plate 63 carried by a back piece 64 similarly secured to the back of the head. The back piece 64 is drilled to receive a contact positioning jig 58 held in place by the set screw 59 (FIGURE 3), with the jig 58 including a central bore in alignment with the bore 46 heretofore described, and of shape and dimensions to receive the contact assembly 75 (FIGURE 1) with its sleeve portion 76 positioned between the tips 52 of the crimping dies 51.

In the operation of the device, the operator first inserts contact 75 into the bore 46 of the head, with the flexible conductor 77 inserted to the full depth of the contact sleeve 76. With the contact seated in the central bore of the jig 58, the thumb button 36 is actuated, causing the push rod 25 to open the air valve 19 and move the piston 40. The inclined cam slot 60 moves the follower 49 and rotates the crimping rotor assembly 45 forcing the dies 51 inwardly in a manner to crimp the contact sleeve firmly about the flexible conductor 77. The action is almost instantaneous and the piston and crimping rotor are immediately thereafter returned to their original positions by the compression spring 30. The crimped contact and conductor assembly may then be withdrawn from the crimping head.

From the foregoing it should be apparent that the present invention provides a simple, compact, portable crimping tool so arranged that it is easy, quick and convenient to use and capable of rapidly performing uniform crimping operations under any conditions of service. The unit is simple in its mechanical design and easily handled. Also, it is adapted to use in connection with various sizes, types and styles of contacts merely by substitution of an appropriately shaped guide jig.

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

1. A tool for facilitating a worker's crimping of electrical contacts or the like comprising a frame having a portion defining a handle with a pair of ends, said handle being of a size to be conveniently received in and gripped

by a worker's hand, said frame having an extension at one of said ends; power means in said handle, said power means including a fluid cylinder disposed about a first axis intersecting said ends, said cylinder having a cylinder head at the end thereof adjacent the other end of the handle, a piston within said cylinder, and a spring in said cylinder and bearing against said piston and said frame to urge said piston towards said cylinder head; a fluid valve in said handle adjacent said other end thereof communicating with said cylinder; a fluid supply connection at said other end communicating with said valve; an operating member operatively connected to said valve and positioned at said one end, said member being movable generally transversely of said handle to actuate said valve; a slide within said frame and movable with respect to the frame in a direction parallel to said axis, said slide having a cam slot therein, said slot being positioned angularly with respect to said axis, said slide being connected to said piston for movement therewith; crimping means in the aforesaid extension of the frame and rotatable in said frame about a second axis normal to said first axis, said crimping means having an opening along said second axis to receive a contact to be crimped; a cam follower in said cam slot; and a lever connecting said follower and said crimping means to rotate the crimping means as said slide is moved by said power means.

2. A tool for facilitating a worker's crimping of electrical contacts or the like, said apparatus comprising a frame having a portion defining a handle with a pair of ends, said handle being of a size to be conveniently received in and gripped by a worker's hand, said frame having an extension at one of said ends; power means in said handle, said power means including a fluid cylinder disposed about an axis intersecting said ends, said cylinder having a cylinder head at the end thereof adjacent the other end of the handle, a piston within said cylinder, and a spring in said cylinder and bearing against said piston and said frame to urge said piston towards said cylinder head; a fluid valve in said handle adjacent said other end thereof communicating with said cylinder; a fluid supply connection at said other end communicating with said valve; an operating member operatively connected to said valve and positioned at said one end, said member being movable generally transversely of said handle to actuate said valve; a slide within said frame and movable with respect to the frame in a direction parallel to said axis, said slide having a cam slot therein, said slot being positioned angularly with respect to said axis, said slide being connected to said piston for movement therewith; crimping means including a generally cylindrical crimping rotor mounted in the aforesaid extension of the frame for rotation about its cylindrical axis, said cylindrical axis being positioned generally normal to the axis of the fluid cylinder, said rotor having an opening along its axis to receive said contact and a plurality of radial openings intersecting its axial opening, a crimping die in each radial opening, and means to reciprocate each die toward and away from the axial opening as said rotor is rotated; a contact positioning jig releasably affixed in the axial opening of the crimping rotor; a cam follower in said cam slot; and a lever connecting said follower and said crimping means to rotate the crimping means as said slide is moved by said power means.

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