May 11, 1965 W. SUND 3,182,485

COMPRESSION TOOL

Filed Dec. 31, 1962

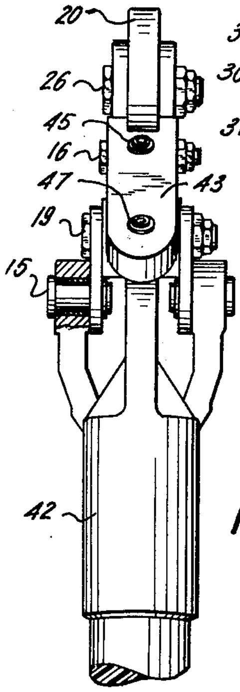


FIG. 2

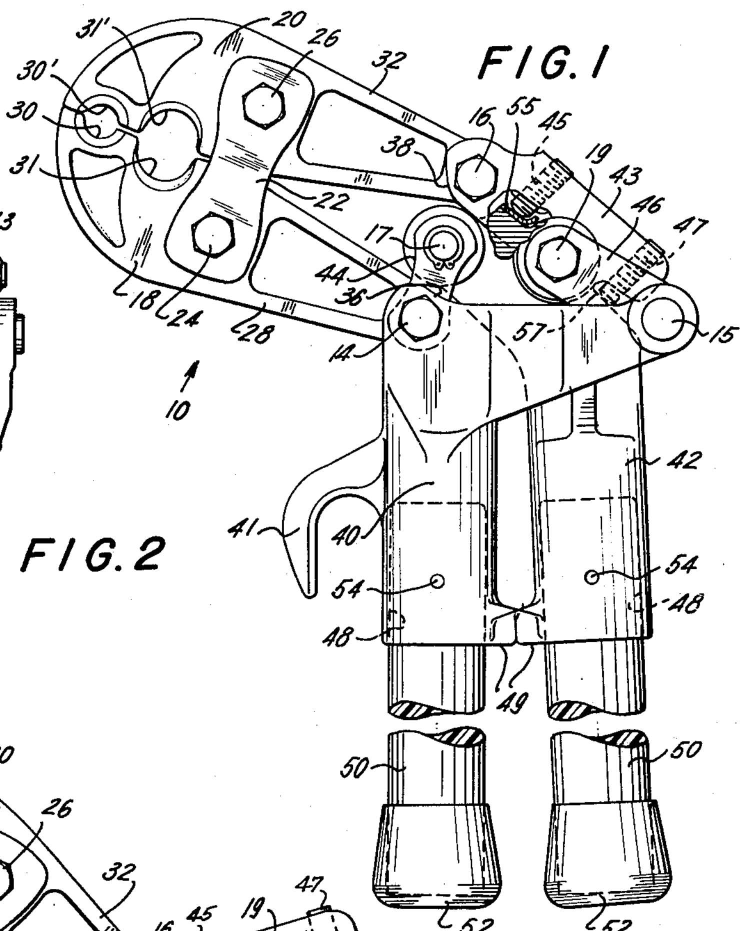


FIG. 1

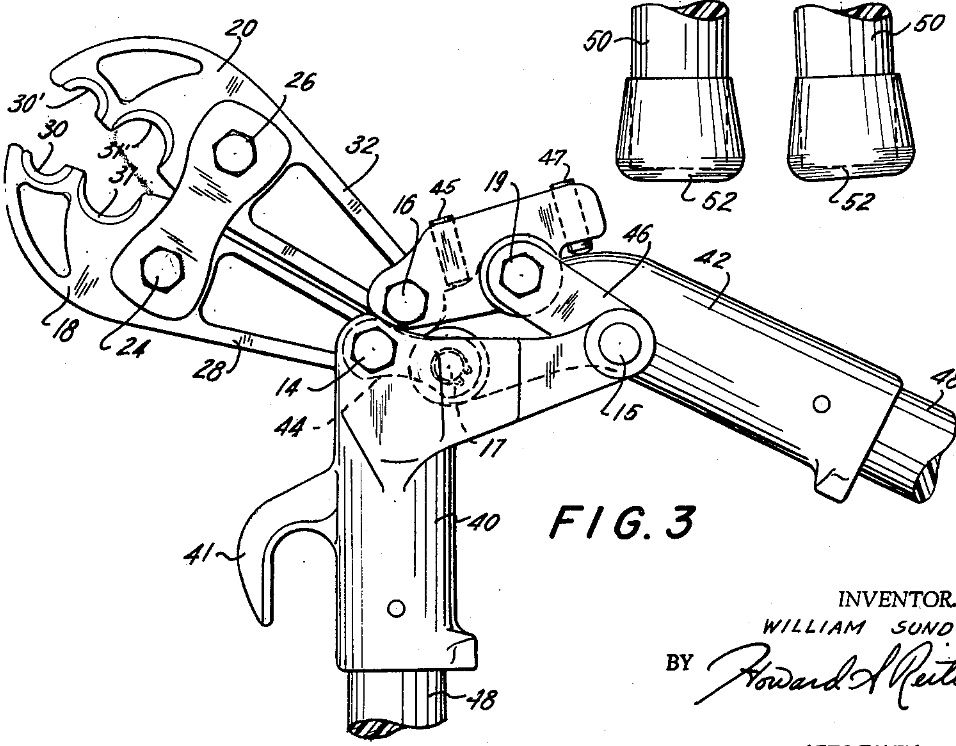


FIG. 3

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United States Patent Office 3,182,485
Patented May 11, 1965

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3,182,485
COMPRESSION TOOL
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Filed Dec. 31, 1962, Ser. No. 248,364
3 Claims. (Cl. 72—410)

This invention relates to hot line compression tools, commonly called "hot sticks," which are used for applying compression-type electrical connectors to energized electrical conductors, and has particular reference to tools of this type having removable jaws.

Hot line compression tools commonly employ a pair of pivotally attached mating compression jaws which are designed to compress only one or a limited number of specific connector sizes. Accordingly, removal of the jaws from a particular tool is often required to adapt it to connectors of different sizes, as well as to facilitate cleaning, repair, and replacement. In tools of generally known design it is customary to fasten one jaw to an arm or link in fixed position by means of two or more spaced apart bolts or pins inserted through the link and the jaw member. The other jaw is in turn pivotally attached to another arm or link which transmits the requisite force for compressing the movable jaw against the fixed jaw. As a result of the total forces and high unit pressures encountered in use, however, the bolts or pin means securing the fixed jaw are often bent or otherwise deformed and the jaw becomes wedged or jammed into position, making its removal and exchange extremely difficult. The pivotally attached jaw, due to continued movement, remains consistently free and is generally easy to remove.

Although compression tools in which both jaws are pivotally mounted are known, the force applying mechanisms of these tools are not well adapted to the long handles required for use on overhead lines, due to the relatively large angular movement required for their operation.

Accordingly, it is an object of this invention to provide a hot stick tool in which both compression jaws are pivotally mounted for easy removal.

It is a further object to provide a hot stick tool having a simplified force transmitting linkage mechanism adapted for use on overhead lines;

Still another object is the provision of a hot stick tool of the type described, which further includes adjustable pressure-locking means.

This invention and other objects, features and advantages thereof are further described in the following specification, particularly pointed out in the claims and illustrated in the accompanying drawings, in which:

FIGURE 1 is a front elevation view of a hot stick tool constructed in accordance with this invention and shown in closed or crimping position;

FIGURE 2 is a side view of the tool taken from the right of FIGURE 1;

FIGURE 3 is a front elevation view of the tool of FIGURE 1 shown in open position.

Referring now more particularly to the drawings, the tool may be seen to comprise a pair of pivotally coupled compression jaws, indicated generally by reference numeral 10, and a compression force applying mechanism pivotally attached to the pair of jaws by pivot bolts at points 14 and 16.

The two jaw members 18 and 20 are coupled for pivotal motion relative to connecting link 22, which is pivotally attached to each jaw at pivot axes 24 and 26. Pivot axes 14 and 24 on jaw member 18 are separated by a lever arm portion 28, through which compression forces are transmitted to the compression die surfaces 30 and 31 using pivot 24 as a fulcrum. Pivot axes 16 and 26 on jaw member 20 are similarly separated by a lever arm 32 for transmitting forces to cooperating die surfaces 30′ and 31′ using pivot 26 as a fulcrum. Thus, oppositely directed forces applied separately to points 14 and 16 and acting to force them apart, in turn act to force die surfaces 30, 30′ and 31, 31′ together to compress a work piece, e.g. an electrical connector, disposed between them. Bringing points 14 and 16 together as shown in FIGURE 3, causes a corresponding separation of the cooperating die surfaces to permit positioning and removal of a work piece.

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Force applying mechanism 12 translates the manual motion supplied by an operator into the necessary motion and force required to move points 14 and 16 as described. The essential elements of the force applying mechanism may be seen to include a frame or support 40 having two spaced apart pivot axes 14 and 15, an actuating arm 42 carrying at least three spaced-apart pivot points 16, 17 and 19, and two connecting links 44 and 46 each separately pivotally attached to the frame 40 and to the actuating arm 42 at points 14, 17 and 15, 19 respectively. Pivot point 16 on arm 42 is formed on adjustment member 43 which may be angularly moved relative to the arm over a limited range, for a purpose explained subsequently herein.

A hook portion 41 may be provided on support 40 to aid in manipulating overhead wires and as a means for hanging the tool in use and in storage. The opposed surfaces of support 40 and actuating arm 42 may be provided with a pair of fixed stops 49 to maintain a separation between the surfaces when the tool is closed, for protecting the hands and fingers of an operator.

For convenience in use and maintenance, support 40 and arm 42 are each provided with a socket 48 for receiving one of a pair of removable operating handles 50. To insulate the operator of the tool from the energized conductors and connectors engaged by the customarily metallic jaws and force applying mechanism, the handles may be formed of any suitable dielectric material such as tubular Fiberglas rods or specially varnished wooden poles, and may each be provided with a cap 52 at the exposed end. The cap is preferably formed of a material suitable for protecting the handle and the surfaces with which it comes in contact from chipping and marring. Knockout pins 54 or equivalent bolts or screws may be inserted through the wall of each socket and into the handle to lock the two together.

In operation, as the handles 50 are spread apart by an operator, actuating arm 42 tends to rotate counterclockwise about pivot points 17 and 19 relative to support 40. The initial position of links 44 and 46 when they are "at rest" with the tool in closed position as shown in FIGURE 1, requires that they rotate clockwise about pivot points 14 and 15 respectively in response to the initial motion of arm 42. Since point 16, fixedly carried by arm 42, thus rotates about point 17, and the entire pivot point 17 carried on arm 42 and link 44, moves clockwise relative to point 14, the effective resultant motion is equivalent to rotation of points 14 and 16 in opposite directions, i.e. clockwise and counterclockwise respectively, about point 17. Starting from approximately diametrically opposed positions relative to point 17, the two points 14 and 16 thus in effect approach each other to "open" the jaws 18 and 20. When surface 36 of support 40 and surface 38 of arm 42 reach the abutting relation shown in FIGURE 3, further motion of arm 42 is prevented, and cooperating die surfaces 30, 30′ and 31, 31′ are in fully separated or open position.

It is essential to the operation of the illustrated tool that the motion of all parts as the handles 50 are brought together be substantially the reverse of the motion produced by separating them. This is assured by dimensioning the pivoting parts so that no two may rotate about their common pivot point more than 180° relative to each other, between the fully open and fully closed positions of the tool. Thus, as handles 50 are moved toward each other from the position shown in FIGURE 3, arm 42 tends to rotate clockwise about points 17 and 19, links 44 and 46 rotate substantially counterclockwise about points 14 and 15 respectively although a slight initial clockwise movement of link 46 will take place, and points 14 and 16 separate by rotating in effect respectively counterclockwise and clockwise about point 17. The dimensions and spacing of the pivot points on parts 40, 42, 44 and 46 are chosen so that as the maximum pressure-applying, fully closed position of support 40 and arm 42 is achieved as shown in FIGURE 1, point 17 passes through the line drawn between points 14 and 16 and comes to rest with the two points spaced just slightly over 180° apart (measured clockwise from point 14 to 16). Further widening of this greater-than 180° arc to relieve crimping pressure by opening the jaws 18, 20, would require further clockwise rotation of arm 42 relative to support 40, but this is prevented by engagement of abutting stop portions 49. The reaction forces of the tightly closed jaws acting through lever arms 28 and 32, and tending to bring points 14 and 16 together along the shorter portion of their circular path about point 17, thus effectively lock the tool in closed position. Release from this locked position is readily accomplished by forcibly separating handles 50 to rotate arm 42 counterclockwise.

To facilitate adaptation of the tool to different pairs of compression jaws, and to permit adjustment of the amount of force required to close and lock the tool and to release it from closed position, provision is made for varying the distance between points 16 and 17 over a limited range. This adjustment determines the maximum distance between points 14 and 16, which in turn controls the maximum pressure applied in closed position. Adjustment is accomplished by forming pivot point 16 on adjustable pivot member 43, which is pivotally attached to arm 42 at point 19. Adjustment screws 45 and 47 are threadedly engaged to member 43 and bear against arm 42 at surfaces 55 and 57 respectively. The member may thus be tilted about point 19 relative to arm 42 to increase or decrease the spacing between points 16 and 17, and screws 45 and 47 may be tightened against surfaces 55 and 57 to position the member in a given desired attitude relative to the arm. Alternatively, point 16 may be fixedly formed on arm 42 at a distance from point 17 preferably equal to the spacing between points 14 and 17 on link 44.

A hot line compression tool having the physical characteristics and mode of operation herein described, offers the advantages of a simplified force applying mechanism, a readily separable, pivotal mounting for both compression jaws, and an overall reduction in cost and complexity of maintenance and repairs.

The invention has thus been described but it is desired to be understood that it is not confined to the particular forms or usages shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of the invention; therefore, the right is broadly claimed to



employ all equivalent instrumentalities coming within the scope of the appendent claims, and by means of which objects of this invention are attained and new results accomplished, as it is obvious that the particular embodiments herein shown and described are only some of the many that can be employed to obtain these objects and accomplish these results.

I claim:

1. A compression force applying tool, comprising: a pair of pivotally attached compressing jaws; an elongate support member pivotally attached to one of said compressing jaws at a first pivot point proximate one end of said member and having a dielectric handle portion at the other end thereof; an actuating arm pivotally attached to the other of said compressing jaws at a first pivot point proximate one end of said arm and having a dielectric handle portion proximate the other end thereof; said support member having a second pivot point proximate said one end thereof; said actuating arm having second and third pivot points proximate said one end thereof, said second pivot point being spaced a given distance from said first pivot point; a first connecting link having a pair of pivot points spaced substantially said given distance apart, said link being pivotally connected to said support member first pivot point and said actuating arm second pivot point; a second connecting link having a pair of pivot points pivotally connected to said support member second pivot point and said actuating arm third pivot point respectively; the center line of said jaws being positioned substantially coincident with a line equidistant from said support member first pivot point and said actuating arm first pivot point, and said actuating arm second pivot point being positioned on said line for movement substantially coincident therewith in response to movement of said actuating arm.

2. The compression tool of claim 1 further including adjustable means for selectively varying the distance between said actuating arm first and second pivot points over a given range, wherein the spacing distance between the pivot points of said first connecting link corresponds to a selected value substantially within said range.

3. The compression tool of claim 2 wherein said adjustable means comprises: an adjustment member having said third pivot point formed thereon, and screw means engaging both said adjustment member and said actuating arm for positioning said member on said arm in a selected position.


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