Aug. 24, 1954 C. A. BADEAU 2,687,149

PORTABLE CRIMPING APPARATUS

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Fig. 1.

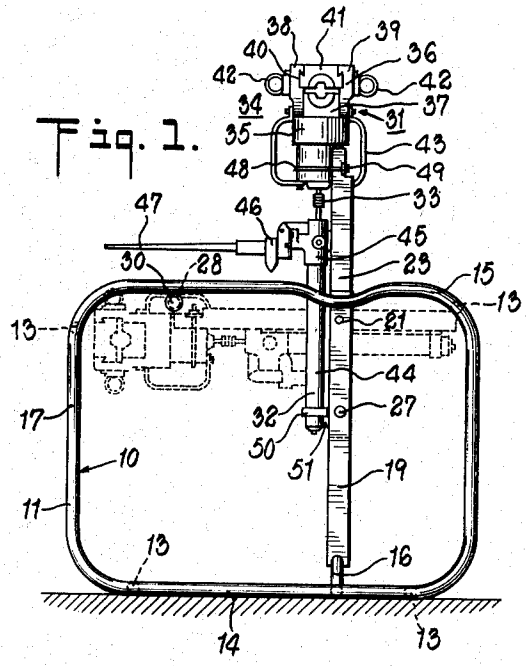


Fig. 2.

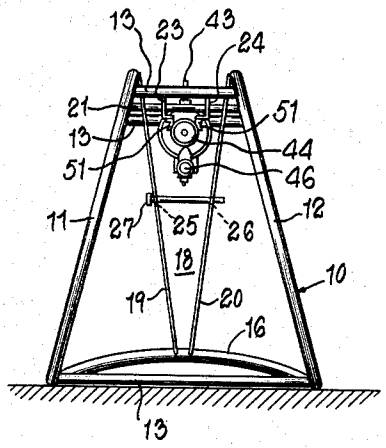
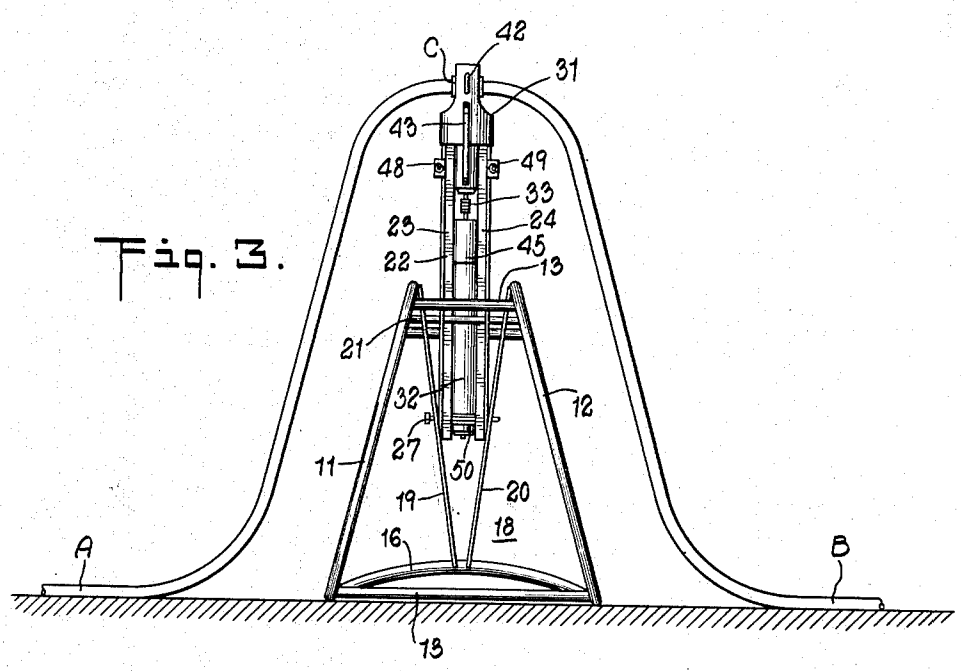


Fig. 3.



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PORTABLE CRIMPING APPARATUS

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5 Claims. (Cl. 140—113)

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The invention relates to a portable crimping apparatus of the type employed to deform tubular connectors into a crimping engagement with the ends of cables to connect them electrically and mechanically. In the art of so connecting cable ends together it is a known practice to insert the ends of the cables into a tubular, malleable metallic connector and, by means of suitable dies operating in a hydraulically actuated tool usually connected in the shop to a source of hydraulic power, to deform opposite ends of the connector onto the stripped-back cable ends. Such tools are quite heavy to handle and in their larger sizes are usually too heavy for manual lifting by a single operator. In the patent to Clapp, No. 2,568,054, September 18, 1951, one such large size crimping tool is shown suspended from an overhead support and lifted into place by a hoisting device. It so happens that in actual practice it is often required that heavy cables as they lie on the ground are required to be connected and it is quite inconvenient and expensive to bring heavy, long-length cables into a shop equipped with the necessary crimping equipment and with the necessary hydraulic power to operate such equipment.

An object of the invention is to provide a compact form of crimping apparatus which will be self-contained in that it will include both a hydraulic form of crimping apparatus as well as a hand-operated source of hydraulic power for operating the same and which assembly can be transported as a compact unit from place to place in the field where needed simply by the operator pulling it along the ground as he would a sled.

It is appreciated that such an apparatus must sometimes be transported by truck or train from place to place as needed and that it is quite liable to be damaged during any such transportation, especially as it contains a handle and other projecting parts liable to be broken off by accidental contact with adjacent articles or structures. Accordingly, the present disclosure features a portable sled-like frame, light in weight and on which an attachment comprising a crimping tool, a pump for actuating it and associated parts is demountably carried and in which the attachment can be moved at will from a low, underslung, protected position housed within the outlines of the frame, into an elevated operative position with its operative parts disposed conveniently above the frame and accessible so as to be worked by the operator without bending.

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It is required of such apparatus that when in use it must have a relatively broad base to avoid toppling over, and this indicates a necessity for an extensive area of ground-engaging support, but the requirement that it be capable of being moved about by one man means that due consideration must be given to the necessity of minimizing the weight factor of any such support, and the minimizing of ground resistance to being moved. Accordingly, the disclosure features a tool-supporting frame of open skeleton form, internally braced and in general designed to give the requisite extent of wide-spreading base while minimizing in weight.

Another object of the invention is to provide a supporting frame for the tool mechanism which makes up the crimping tool and pump and to provide readily separable fastening means fashioned to permit the easy separation of the component parts of the mechanism from each other and from the frame to facilitate repairs and replacement of the parts even while in the field.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of portable crimping apparatus, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the drawings:

Fig. 1 is a view in side elevation of a portable crimping apparatus disclosing a preferred embodiment of the invention and with the mechanical part of the apparatus shown in full lines in its upright operative position and shown in ghost outline in its inoperative housed position protected by the carrier frame;

Fig. 2 is a view in right end elevation of the device shown in Fig. 1 with the mechanism folded closed in its inoperative protected position and with the pump handle removed; and

Fig. 3 is a view similar to that shown in Fig. 2 with the mechanism in its elevated operative position for coupling a pair of cables lying for the most part on the ground, and with the ends intended to be connected elevated slightly off the ground.

There is disclosed a low, open-work skeleton form of internally braced supporting frame 10 which includes a pair of side pieces 11 and 12 with their upper parts inclined towards each other and with the side pieces connected by a

number of transverse ties 13 of which four are shown with their ends welded to the side pieces. The frame as so far described is formed of hollow steel pipes and is otherwise designed to obtain the greatest possible strength with the use of the least possible amount of material, in order to provide light weight to the device as a whole. The side pieces are of quadrilateral form as viewed in Fig. 1, and their lower struts 14 form parallel rounded runners and the upper struts 15 form parallel handles by means of which the sled-like frame may be pulled about in the field. One of the ties 16 at the bottom of the frame is arched and has its ends welded to the runners 14 at a point about two-thirds of the length from the front uprights 17 of the side pieces. An upstanding brace 18 is formed of two flat steel plates 19 and 20 with their upper ends welded to the upper struts 15 and with their lower ends welded to the arched tie 16 adjacent its center to form a V-shaped space therebetween. The plates 19 and 20 form the brace as an internal frame reinforcement of V-form.

A rugged cylindrical pivot pin 21 has its ends fitted in the plates 19—20, extends horizontally and transversely of the frame, and bridges the upper portion of the open space between the plates forming the brace 18. A long, mechanism-supporting carriage 22 is rockably supported on the pivot pin 21 for movement in the longitudinal medial planes of the frame and thus between the wide-spreading side pieces 11 and 12. The carriage is formed primarily of a pair of long steel L-bars 23, 24, extending lengthwise of the frame in parallel and slightly spaced-apart relation as shown in Fig. 2 and through the outstanding flanges of which bars the pin 21 loosely extends.

For the purpose of locking the carriage in its upright position, the plates 19—20 are provided about mid-length with transversely aligned bolt holes 25, 26, and the L-bars forming the carriage are provided with bolts holes (not shown) designed when the carriage is in its upstanding position to be in alignment with the holes 25, 26. A replaceable locking pin 27 is passed through these four bolt holes for securing the carriage and the mechanism carried thereby in their upstanding position as shown in Figs. 1 and 3. Similarly, for the purpose of locking the carriage in its horizontal position, a pair of aligned tubes, one of which is shown at 28 in Fig. 1, is secured in transverse alignment to the under side of the upper struts 15 for receiving a locking pin 30 passed through an opening in the apparatus, such as the opening in the upper handle (see Fig. 1) for securing the carriage and the mechanism carried thereby in the housed position shown in ghost outlines in Fig. 1.

The carriage is fashioned to have demountably secured thereto a crimping mechanism comprising a crimping tool 31, a pump 32 for actuating the tool and a flexible coupling 33 therebetween. The coupling contains a one-way self-closing valve (not shown) for holding pressure when needed in the crimping tool. The coupling is provided at opposite ends with threaded nipples for engaging at one end with the tool and at the other end with the pump, and the parts are otherwise designed to facilitate a ready separation of parts of the mechanism when it is desired to demount the parts for replacement and repairs.

The crimping tool 31 includes a body portion 34 formed of two parts telescopically secured together. The two parts form a hydraulic cylinder 35 forming the lower part, and an open-top yoke 36 forming the upper part as viewed in Fig. 1. A ram plunger is slidably mounted in the cylinder and is provided on its upper end with a lower die 37 working between upstanding arms 38 and 39 of the yoke. These arms are recessed in the upper portions of their inner faces to form a pair of opposing dove-tail grooves 40 in and between which is slidably fitted a relatively fixed upper die 41. The yokes are provided on opposite sides with a pair of suspension eyes 42 and therebelow the body 34 is provided with a pair of large ear-like handles 43.

The pump 32 includes a long pump cylinder 44, provided at the upper end with pump piston operating air pressure generating elements 45 including a laterally projecting reciprocable handle socket 46 fashioned to receive a long leverage replaceable handle 47.

The assembly of crimping tool plus pump is designed to be mounted on what may be regarded as the under side of the carriage as viewed in Fig. 2, and for this purpose a U-bolt 48 is looped under the plunger cylinder and tightened in place by nuts 49 bearing on reduced ends of the two L-bars 23 and 24. One or more straps, of which one is shown at 50, are looped under the pump cylinder and are demountably secured to the carriage. A pair of saddles 51 downwardly facing in Fig. 2 are carried by the under side of the L-bars and provide cooperatively a seat for receiving the pump cylinder as shown in Fig. 2, and for steadying it in position while the pump handle is being operated.

It is a feature of this disclosure that the device is designed to be low, that is, as close to the ground as possible. The parts forming the device illustrated are proportioned to bring the crimping tool when in upright position to about bench level, as this is easily accessible to the operator and does not necessitate a lifting of the cable ends so far as might put a strain on the cables. The air pump is located so as to bring its handle about knee height of the average workman, as this position has been found most effective in obtaining the greatest possible mechanical advantage in operating the pump manually. The carriage is dimensioned as shown in Fig. 3 so that its lower end snugly fits between the plates 19, 20 to assist in resisting transverse movement of the carriage and the mechanism carried thereby, and this fitting of the lower end of the carriage within the rugged brace 18 has the advantage of minimizing strains on the pivot pin 21 and on the locking pin 27. The mechanism is so located on the carriage relative to its pivot pin 21 that, when in the upright position shown in Figs. 1 and 3, the crimping tool forms the upper end of the device and locates the crimping tool in the free space above the frame and exposes the yoke when free of the upper die for insertion therein of the connector C and for the locating of the cable ends into the connector.

The parts of the mechanism are located so as to bring the pump handle 47 in the medial plane of the frame and thus in position to be operated in the vacant space above the side pieces 11 and 12 and free of any obstruction to the reciprocatory actuation of the pump handle.

In operation and assuming it is desired to connect the two cables A and B in the field, the device, with the carriage and the operative mechanism assembly carried thereby in the ghost line position shown in Fig. 1, is moved bodily as by

pulling a sled to any place conveniently accessible to the ends of the cable to be joined, and the carriage with the mechanism is then swung into the full line position shown in Figs. 1 and 3 and locked in position by means of the pin **27**; the upper die **41** is removed, thus exposing the upwardly-facing open end of the yoke to receive the tubular metallic connector C. When the connector is located in proper position with one end seated on the lower die, the upper die is then replaced by sliding it in the grooves and the operator works the pump handle for a few strokes, just sufficient to clamp the connector so as to be held gently between the dies without in any way deforming the connector.

The stripped-back end of one of the cables, either one, is inserted into the end of the connector so located and momentarily held between the dies by the operator who then vigorously actuates the pump to cause the lower die to rise from its initial clamping position to a position to close the dies and thus to deform the connector into a crimping engagement with the conductor end therein. Pressure on the lower die plunger is then released; the coupling sleeve shifted axially to locate its other or empty end between the dies, and the connector sleeve clamped by the initial advance of the lower die. The stripped-back end of the other cable is inserted in the empty connector end, with the first-mentioned cable trailing from the opposite end of the connector. The pump is again forcefully actuated as before to deform the other end of the connector into a crimping engagement with the second cable. Releasing pressure on the lower die and then removing the upper die from the yoke permits the joined cables with the crimped connector to be lifted clear of the entire device illustrated and the cables laid on the ground, for the most part extending in their original positions.

As the connector and the cable ends extend transversely of the length of the frame any tendency of the cable to rock the frame laterally is minimized and as a rule the frame rests squarely on the ground during the two crimping operations.

It is noted that, due to the low height of the device as shown in Fig. 3, it is necessary to elevate the cable ends only a slight distance off the ground and as illustrated they automatically assume the parabolic curve illustrated and are thus free of sharp bends which might otherwise damage the cables.

It is noted that only a small length of the cable end, compared to the usual long length of the cable, need be elevated off the ground and this saves in labor costs over situations where the entire lengths of the cables are involved.

It is noted that strains on the carriage incidental to the pumping operation are transferred to the rugged brace **18** at a point thereon rather low on the frame as shown in Fig. 3 and even ignoring the locking pin **27** and here again providing a support for the crimping device as close to the ground as is practical to avoid accidental tipping of the frame even if the pump handle be actuated carelessly.

It is a feature of this disclosure that the device can be easily and quickly opened in the position most convenient to the cable ends to be connected and the device is complete per se ready for use without any loose parts, coupling or uncoupling of hydraulic hoses or the practicing of any assembling operations which, if incorrectly performed, could easily damage the crimping apparatus.

When a connection is thus made at one place, the locking bolt at **27** is removed, the carriage and associated mechanism is lowered into the housed position shown in outline in Fig. 1 and in full lines in Fig. 2, locked in its folded position and ready to be slid along the ground to a position convenient to a new job. In the new position along the cable the operation is there repeated as above described.

I claim:

1. A sled for carrying a replaceable apparatus, including a skeleton frame composed of a pair of side pieces, connecting ties and ground-engaging runners, a rugged carriage support comprising a pair of upstanding plates secured top and bottom to the frame and tending to provide an internal brace for the same, and with the plates spaced apart to provide a carriage-receiving space between the plates, a tool carriage hingedly connected to the support for movement to bring one end into and from a snug-fitting in said space, means between the support and carriage for locking the carriage when it is in upstanding position fitted between the plates, and fastening means carried by the carriage for demountably securing thereto the replaceable apparatus.

2. The combination of a vehicle for moving about on the ground and including a supporting frame including an upstanding brace forming an internal reinforcement for the frame, said brace including a pair of upstanding plates disposed mainly in transversely spaced-apart relation to form a V-shaped space therebetween, a pivot pin carried by the plates, a tool supporting carriage pivotally mounted on the pivot pin for movement to and from an upstanding position in the vertical medial plane of the frame, the upper portion of the carriage when in its upright position projecting into the clear space above the frame and the lower portion located in the V-space and with the lower end of the carriage fitted between and when under load bearing on the plates, and fastening means between the carriage and brace for securing the carriage in its upright position.

3. In a device of the class described, the combination of a portable supporting frame of hollow skeleton form including a pair of upstanding side pieces and a transversely extending tie connecting the lower portions of the side pieces, an upstanding brace formed of two spaced-apart plates located between the side pieces with their lower ends secured to the tie and forming an internal reinforcement for the frame, a pivot pin carried by the brace, a carriage pivotally mounted on the pin to swing in the vertical medial plane of the frame and adapted to have a machine secured thereto, and said carriage when in an upright position having its lower end fitting between the two plates of the upstanding brace in position bearing thereon to transfer directly to the brace and through the tie to the side pieces strains imposed on the carriage by reason of the weight of the machine and by reason of forces due to the operation of the machine.

4. In a device of the class described, the combination of a vehicle including a skeleton frame providing within its outlines a machine-housing space, said frame provided with a transversely extending pivot pin located below the plane which contains the uppermost elements of the frame, a carriage mounted on the pivot pin for movement in the vertical medial plane of the frame, means depending from the carriage when

in a horizontal position for securing a machine to the carriage, said securing means being spaced from the pivot pin a distance greater than the distance between the pivot pin and said plane, said carriage and its machine-securing means contained entirely within the housing space of the frame when the carriage is in a horizontal position, fastening means for supporting the carriage from the frame when the carriage is in said horizontal position, and other fastening means for securing the carriage in a vertical position with the part of the carriage having the machine-securing means located in the space above the frame.

5. In a device of the class described, the combination of a hollow frame providing within the outlines of its upper portion a housing space, said frame provided adjacent its mid-length and within its outlines with a transversely extending pivot pin, a structure mounted on the pivot pin for movement in the vertical medial plane of the frame to and from vertical and horizontal positions, said structure including a machine having a part thereof in spaced relation to the pivot pin a distance greater than the vertical

distance between the pivot pin and the top of the frame thereby to locate said part of the machine in the space above the frame when the structure is in its vertical position, and said structure having a length less than the length of the housing space and when in its horizontal position being disposed entirely within said housing space and thus protected by the frame.

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