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CUTTING AND CRIMPING DEVICE

Filed Sept. 16, 1958

Fig. 1

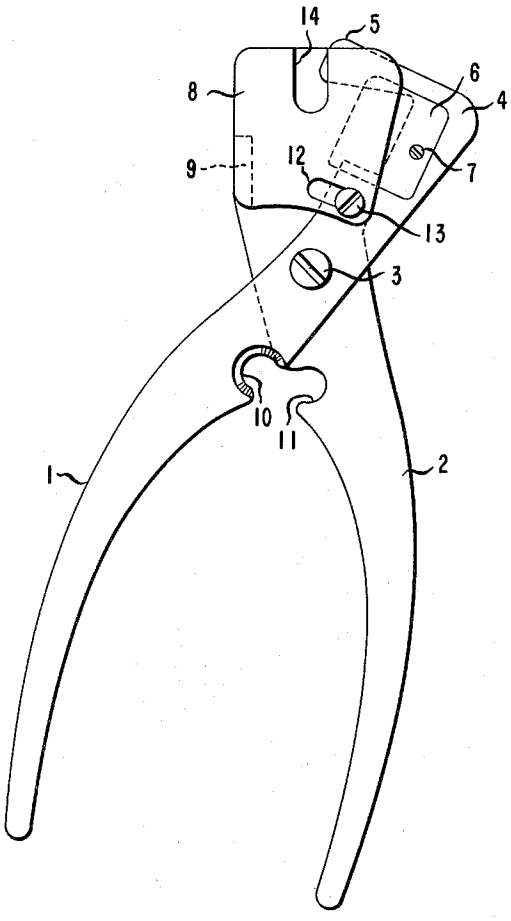


Fig. 3

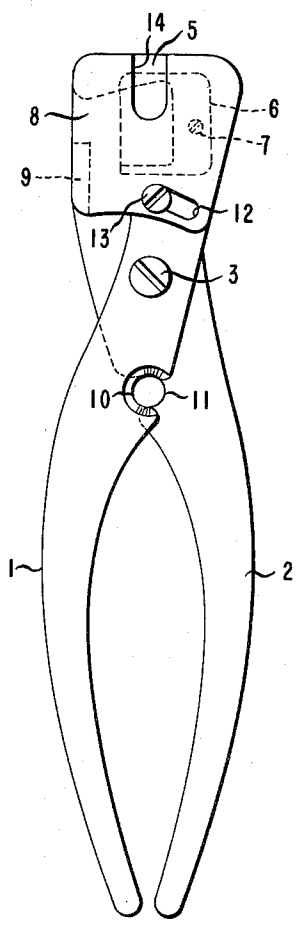


Fig. 2

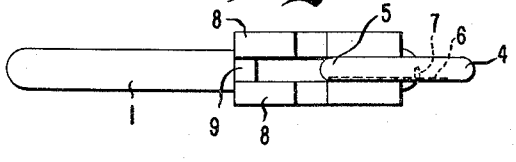
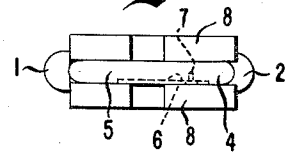


Fig. 4



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CUTTING AND CRIMPING DEVICE

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The present invention relates to a combination tool for cutting low-energy detonating cord and for securing detonator caps, end connectors, blasting caps, and other blasting accessories to such cord.

Recently, a low-energy detonating cord has been developed which comprises a core having from 0.1 to 2 grains of a high-velocity detonating explosive per foot of length encased in a flexible metal sheath and countered by a thermoplastic composition. This cord, which is described in copending U.S. application Serial No. 611,972, filed by D. J. Andrew, R. W. Felch, and G. A. Noddin, now abandoned, is characterized by low brisance, uniform high velocity (ca. 7000 meters/second), and little noise. Because of these properties, the detonating cord is useful as a main-line for blasting in or near residential areas, for bottom-hole initiation of explosives, for short delay firings, for certain mechanical applications, and in seismic prospecting.

In blasting operations which utilize the low-energy detonating cord, one end of the cord is attached to a detonator cap which initiates the explosive. The other end of the cord is attached to an electric initiator. End connectors containing booster charges are used to make surface connections between two or more lengths of the cord or between the low-energy detonating cord and detonating fuse such as "Primacord" to insure propagation of the detonation. To insure proper initiation of the accessory or the cord, the low-energy detonating cord must be cut squarely and cleanly such that the metal sheath will not be forced down over the explosive core and will not interfere with the propagation of the detonation. Also, a clean cut is desirable such that the ends will fit into the detonator caps, blasting caps, and/or end connectors and no excessive air gaps will exist between the end of the detonating cord and the fittings. Additionally, the fittings must be crimped tightly around the outer periphery of the cord such that the cord will not become removed from the fittings during loading operations and such that the explosive contents of the detonator caps, blasting caps, and/or end connectors will be protected from moisture.

Conventional cutting devices such as knives, shears and cutting pliers do not produce the uniformly clean cut necessary for successful use of the cord in blasting operations. Moreover, the conventional cutting devices tends to crush and deform the cord thereby forcing the metal sheath over the explosive core. Obviously, this deformation of the detonating cord impairs the propagation properties of the cord and is detrimental to the blasting operation. When cord having a jagged end is used with metal fittings, an excessive air gap is formed between the cord and the fittings so that the explosive energy will not be propagated or the propagation is diverted at an angle and is not transferred to the explosive contents of the fittings. Although there is a need for a device to produce a smooth cut essentially perpendicular to the axis of the cord, no such device is available. For maximum utility, the cutting device should incorporate a means for attaching metal fittings such as detonator caps, blasting caps and end connectors to the cord.

Accordingly, an object of the present invention is to provide an easily manipulated device which will produce in low-energy detonating cord a smooth, clean cut

perpendicular to the axis of the cord. Another object of this invention is to provide a device which will rapidly and effectually attach a metallic tube or case upon the cord by a simple closing movement of the device. A further object is to provide a manually operable device for facilitating blasting operations in the mining, quarrying, and construction industries.

Other objects not specifically referred to herein will be obvious to those skilled in the art upon employment of the invention in practice.

In accordance with the present invention, there is provided an implement for cutting low-energy detonating cord and for securing metallic tubes or cases such as those of detonator caps, blasting caps, or end connectors to said cord. The implement of this invention comprises a device for cutting explosive cord, fuse and the like comprising a pair of pivotally connected lever arms, a segment of each between one end and the pivot point forming a handle, and a segment of each between the other end and the pivot point forming a jaw, said jaws being opposed to each other, in one jaw a tongue projecting substantially perpendicularly to the face thereof, a cutting blade positioned immediately below said tongue, the cutting edge facing in the same direction as said tongue, in the other jaw a tongue-receiving groove of essentially the width of said tongue, and a cord retaining groove transverse to said tongue-receiving groove, said cord-retaining groove having a width approximately equal to the diameter of the cord and a depth approximately equal to its width plus the depth of said tongue.

In order to more fully describe the invention, reference is now made to the accompanying drawings in which:

FIGURE 1 is a frontal view of the implement open to its full extent,

FIGURE 2 is a top view of the implement in the open position,

FIGURE 3 is a frontal view of the implement in the closed position, and

FIGURE 4 is a top view of the implement in the closed position.

In the drawings, 1 and 2 represent a pair of lever arms pivotally connected by pivot pin 3. Lever arm 1 has at one end a jaw 4 having a projecting tongue 5 and mounted under tongue 5, a sharp-edge blade 6 held in place by screw 7, the sharp edge of said blade 6 being directed in the same direction as the end of tongue 5. Lever arm 2 has at one end a U-shaped jaw 8, the two main portions of jaw 8 being joined by portion 9. The spacing between the two major segments of the jaw 8 is essentially equal to the width of tongue 5. Below the pivot pin 3, lever arm 1 contains a crimping recess 10, and lever arm 2 contains a corresponding recess 11. In one segment of the jaw 8 is a limiting groove 12 and in the corresponding portion of jaw 4 is a limiting screw 13. Transversing the two major segments of jaw 8 is cord retaining groove 14. The portions of the lever arms 1 and 2 opposite the jaws form the handles of the device.

To use the described device to cut cord, the device is held in the open position shown in FIGURE 1, and the cylindrical cord is inserted in groove 14. As lever arms 1 and 2 are squeezed, tongue 5 passes over the cord in groove 14, aligning and locking the cord at the bottom of groove 14. Upon further squeezing, blade 6 passes through the cord, cutting it squarely and cleanly.

To use the device to crimp a fitting on an end of cord, the fitting is first inserted over the end of the cord, the portion to be crimped is centered between crimping recesses 10 and 11 while the device is in the open position of FIGURE 1, and the lever arms again squeezed until the device is in the closed position shown in FIGURE 2. The

semicircular crimping recesses will have a diameter essentially equal to the diameter of the cord.

To remove the cutting blade, limiting screw **13** is removed, so that the jaws can be spread wider apart, i.e., until blade **6** is fully exposed. The holding screw **7** is then removed, loosening blade **6**. The blade **6** is a conventional commercially available cutting blade, and a new blade can readily be substituted when needed. To provide for the deep narrow peripheral crimps usually used to seal a fitting on cord, the inner edges of the crimping recesses **10** and **11** will be tapered.

The groove **14** will have a width equal to the outer diameter of the cord to be cut and a depth equal to its width plus the depth of the tongue **5** so that the cord will be firmly positioned during the cutting operation. The design is such that an angle cut cannot be made inasmuch as the cord is held exactly perpendicular to the cutting blade.

In the embodiment shown, the jaw **8** is shown as being of unitary construction. If desired, the segment which acts as a shield for the cutting blade, i.e., the segment which is attached through portion **9** to the lever arm **2**, can be a separate piece joined to the remainder of jaw **8** at portion **9**. In such case, the limiting screw **13** could be replaced with a non-removable pin since the entire shield could be removed to make blade **6** accessible for replacement. Obviously, alternate limiting means may be used, such as raised bosses on the lever arms.

Although the implement hereinbefore described is disclosed as being particularly suitable for use with low-energy detonating cord, it is to be understood that its usefulness is not limited to cutting and crimping said cord but that said implement may be used in cutting and crimping other cords and fuses, e.g., safety fuse and "Primacord." This aspect of the device is advantageous since the same device may be used for all cutting and crimping operations in the field.

The invention has been described in detail in the foregoing discussion. Obviously, modifications and variations of the present invention are possible without departure from the scope of the invention. We intend, therefore, to be limited only by the following claim.

We claim:

A device for cutting explosive cord, fuse, and the like comprising a pair of pivotally connected lever arms, a segment of each from one end to the pivot point forming a handle and a segment of each from the other end to the pivot point forming a jaw, said jaws being opposed to each other, one jaw containing a cutting blade having its cutting edge facing the opposing jaw and an elongated tongue adjacent to the end of said cutting blade farthest from said pivot point and substantially perpendicular to the face of said jaw, said tongue extending beyond the cutting edge of said cutting blade, and the opposing jaw containing at its extremity a tongue receiving groove adapted to receive said tongue and being of essentially the width of said tongue, a cutting blade receiving recess, and a fuse retaining groove at the extremity of said jaw intersecting and transverse to said tongue receiving groove, said fuse retaining groove having a width approximately equal to the diameter of the fuse and a depth approximately equal to its width plus the depth of said tongue, said fuse retaining groove being so located that its open end is uncovered when the said jaws are fully apart but closed by the said tongue when the jaws are partially closed and the tongue is received in said tongue receiving groove whereby said fuse is locked essentially perpendicular to the plane of said pair of lever arms when the cutting edge of said cutting blade makes contact with said fuse.

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