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COMBINATION PLIERS FOR TWISTING WIRE

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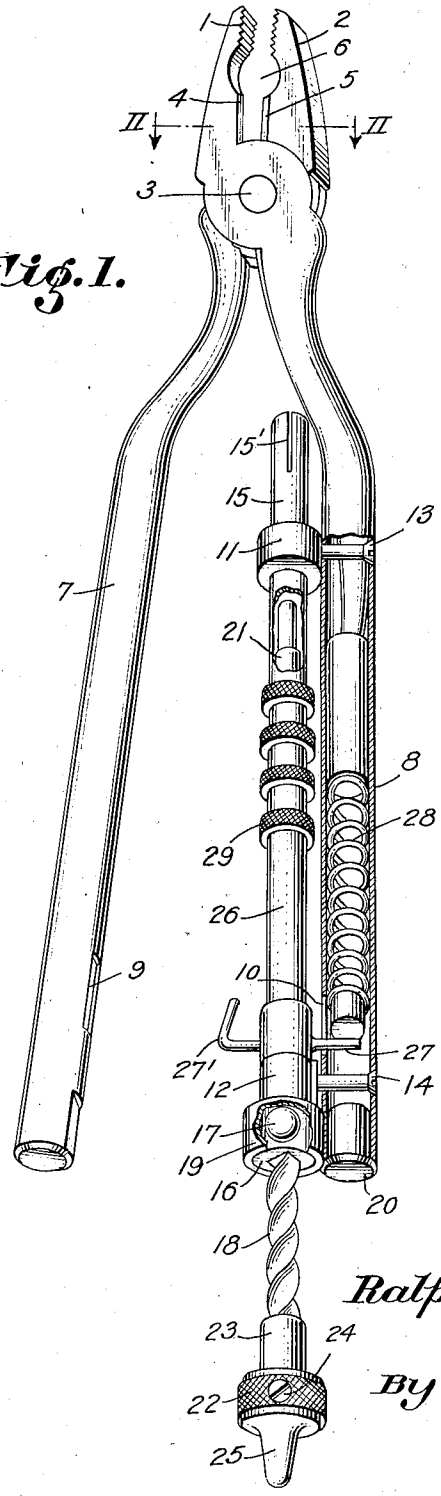


Fig. 1.

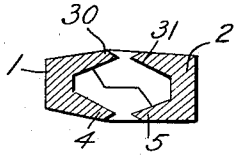


Fig. 2.

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COMBINATION PLIERS FOR TWISTING WIRE

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2 Claims. (Cl. 7—4)

This invention relates to "combination pliers" for twisting wire.

Among the objects of the invention is to provide a tool for reeving wire through holes in inaccessible places.

Another object is to automatically twist wire ends together with a manual tool.

A further object is to facilitate the cutting off of opposed wire ends without reversing the tool.

Other objects and advantages will appear as the description proceeds.

This invention is particularly advantageous in safely wiring the nuts on stud bolts holding the cylinder flange of cylinders on the engine base of radial and V type aeroplane engines. Many of such bolts and nuts are in practically inaccessible positions on the assembly, due to intervening parts. It is at present a tedious, time consuming effort to reeve the wire through a series of holes and then twist the wire ends together for permanence and to comply with safety rules.

Heretofore it has required from one and one-half to two hours to so wire the nuts on an engine. With this invention it is possible to do a better and safer operation in about one-third the time.

In the specification and drawing the invention is disclosed in its preferred form. But it is to be understood that it is not limited to this form because it may be embodied in modifications, within the spirit of the invention as defined in the claims following the description.

In the one sheet of drawings:

Fig. 1 is a side elevation of a combination pliers constructed in accordance with this invention, in operative condition, and partially broken away to disclose underlying structure.

Fig. 2 is a side view detail of the clamping head, showing the cutters therein, in opposed relation to the similar cutters on the opposite side of the head.

In detail the structure illustrated in the drawing comprises the opposed knurled jaws 1, 2, cross pivoted at 3, in the usual manner. The jaws have the meeting cutting edges 4, 5, and the transverse opening 6 between the jaws.

These crossed jaws have the extended tubular handles 7, 8, closed at their ends respectively. The handle 7 has the longitudinal slot 9, on its inner side near its end. The handle 8 has the similar slot 10.

The collets 11, 12 are attached to the inner side of the handle 8, by the countersunk screws 13, 14, passing therethrough and threaded into their respective collets. The guide tube 15 is fixed in these collets on the longitudinal center between the two handles on the inner side of the handle 8. The protruding outer end of this tube has the annular ball bearing 16 fixed thereto and having recesses to receive the loose balls such as 17 therein, on opposite sides of the axis of the socket. The spiral spindle 18, preferably formed of a twisted square rod, having its fluted opposite sides engaging the balls 17, so that it is caused to rotate when moved inwardly and outwardly within the tube 15.

The balls 17 are retained in their respective sockets by the tight sleeve 19 surrounding the bearing 16. This bearing is held against rotation by the flat sided plug 20, driven snugly into the end of the handle 8, and has a head overhanging the sleeve 19, that is gained into the end of the handle so that it cannot move inwardly.

The inner end of the spindle 18 is reduced and has the tubular stop 21 fixed thereon. This unfluted stop overhangs the spiral flute in the spindle and acts against the balls 17, to prevent withdrawal of the spindle from the tube 15. The upper end of this spindle is slightly reduced in diameter to frictionally engage the slotted end of the sleeve at 15', and retain the spindle within the tube 15, when not functioning.

The outer end of the spindle 18 has the knurled head 22, with a shank 23, fixed to the end of the spindle by the countersunk set screw 24. The head 22 has the pivot 25, that will rotate in the palm of the hand of the operator when the spindle is forced inwardly through the ball bearing 16—19.

The latch sleeve 26 is slidable on the tube 16, between the collets 11, 12, and has the projecting pin 27 fixed therein and projecting through the slot 10, in the handle 8. The expansive spring 28, within the handle 8, expands between the screw 13, and the pin 27, to normally hold the sleeve 26, in against the collet 12. The latch hook 27' extends laterally from the sleeve 26, opposite the pin 27, and enters the slot 9, in the handle 7, and overhangs the end of the slot to latch the two handles 7, 8 in closed position when the sleeve 26 is slid inwardly. This sleeve has the knurled finger grips, such as 29, to provide better traction when grasped by the fingers of the operator.

The cutting edges 30, 31, are provided on the opposite side of the plier jaws 1, 2, in opposed relation to the similar cutting edges 4, 5, so that wire cutting can be done without reversing the tool. The average length of the combined tool is about twelve inches over all. However, the

length can be proportioned to the working conditions, determined largely by the distance from the cylinder head to the engine base upon which the cylinder is bolted. The tool is less than two inches wide and can be inserted into the narrowest space encountered on such engines.

The round cylinders of the engine have flanges meeting the polygonal engine base. The base has stud bolts that pass through the cylinder flange and receive nuts bearing against the flange. These stud bolts have transverse holes therethrough, aligning with radial slots in the tops of the castellated nuts; or the transverse hole may pass through both the nut and the bolt, structural conditions permitting.

The invention operates substantially as follows: A length of soft flexible wire is reeved through the holes in the bolts and the nuts seriatim around the cylinder flange, until the ends of the wire meet and overlap. The combination pliers are handy in reeving the wire in spaces too small for the fingers of the operator. The tool weighs less than twelve ounces and is easily manipulated, even by women, as in war time.

The operation of twisting the meeting wire ends consists of overlapping these ends between two bolts, leaving some slack in the wire. The plier jaws **1**, **2**, are then closed over the juncture of the meeting wires, with the wire ends projecting in opposite directions through the transverse opening or gap **6**. The projecting handles **7**, **8**, are then squeezed together until the hook **27'** enters the slot **9**, the sleeve **26**, is then pushed inward until the hook engages the handle **7**, beyond the end of the slot **9**. This securely attaches the jaws **1**, **2**, to the overlapping ends of the wire.

The knurled head **22**, is then grasped by the free hand of the operator and the handles **7**, **8**, are released. When the head **22**, is pulled outward, the spiral spindle **18** causes the rest of the tool to spin around and wind up the crossed wire ends. Pressure is then applied to the pivot end **25**, which rotates the spindle through the bearing block **16**, until the stop **21**, frictionally engages the split end **15'** of the tube **15**.

The handles **7**, **8**, are then squeezed together to release the hook **27'** from the slot **9**, permitting the sleeve **26**, to be retracted by the expansion of the spring **28**. This frees the jaws **1**, **2**, so that the cutters **4**, **5**, and **30**, **31**, can be used to cut off the excess wire behind the twisted portion, without reversing the pliers, by simply pushing the cutters forward until the wire ends protruding through the gap **6**, enter between their respective pairs of cutters **4**, **5**, and **30**, **31**, there to be severed close to the end of the twisted portion, by gripping the handles **7**, **8**. In severing the ends the tool is moved laterally until the twisted portion is clear of the jaws **4**, **5**, and lies in the gap **6**, permitting the cutters **4**, **5**, and **30**, **31**, to meet and sever the wire ends, respectively.

A smaller tool constructed as described, is useful in twisting wire ends for sealing locks, and other uses; such as wire hoods on bottles, where it is inconvenient for the operator to neatly twist wire by turning the pliers in the hand with each turn.

Having thus described this invention and its mode of operation, what is claimed and desired to secure by Letters Patent is:

1. A combination tool comprising a pliers head having cross pivoted tubular handles; a tube fixed to one of said handles; a sleeve slidable on said tube and having a latch engaging both of said handles; a spring within one of said handles and bearing against said latch; a bearing fixed on the outer end of said tube; and a spiral spindle slidable in said bearing and tube and rotating said head.

2. A combination tool comprising a pliers head having cross pivoted handles; a tube fixed to one of said handles on a centerline between said handles; a sleeve slidable on said tube and having a latch engaging both of said handles; a bearing fixed on the outer end of said tube; opposed balls in recesses in said bearing, respectively; and a spiral spindle slidable in said bearing and having fluted grooves engaging said balls.

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