The invention relates in general to a crimping tool for use in deforming a cylindrical metal tube into a form square in cross section in crimping engagement with conductors therein and the invention specifically relates to such a tool of the type in which the tool can be equipped with any one of a set of dies which distinguish from each other in that they are provided with different sizes of recesses to accommodate the tool to operate on different sizes of work.

It has been known in the art to provide crimping tools with rotatable dies having marginal work-receiving recesses of different diameters to receive stock tubes of different sizes. In those cases the dies are mounted in the tools by means of axles or spindles integral with the dies and turning snugly in bearings provided therefor in the tools. This means that all the pressure on these rotatable dies is transmitted through their thin spindles to the tool. The spindles must be made sufficiently thick and rugged to withstand the incidental bending strains imposed thereon incidental to changing the work cylinder to its desired cramped form square in cross section.

The primary object of the invention is two-fold: first, to provide a mounting for these multiple contoured dies which will provide for any of the several rotatable positions of the dies, a broad bearing for transmitting pressure thereon directly to the body of the tool and thus eliminate any necessity for transmitting pressures through the spindle; and second, transmit the squeeze pressure through broad interbearing pressure surfaces and thus avoid transmission of pressures through various bearing spindles, as in the prior art.

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 replaceable nest for crimping tools embodying the invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings:

Fig. 1 is a view in side elevation of the head end of a tool constituting a preferred embodiment of the invention equipped with one of a set of multiple nest dies with a shiftable jaw in fully closed position engaging the nest die;

Fig. 2 is a plan view of the device shown in Fig. 1; Figs. 3-5, inclusive, are views in side elevation of the die in place and the jaw shown in successive closing positions relative to the die, and with part of the nearest cheek plate broken out to show the replaceable die;

Fig. 6 is a transverse sectional view of the die and its mounting and taken on the line 6—6 of Fig. 1;

Figs. 7 and 8 are views each in side elevation of two of the replaceable nests designed to be used with the tool;

Fig. 9 is a view in elevation of the shiftable or movable jaw per se, showing a replaceable die nest in co-actable relation therewith;

Fig. 10 is a similar view showing the fixed die holding block and the shiftable or movable jaw, shown in Fig. 3, with a replaceable die nest in co-actable relation therebetween; and

Fig. 11 is a fragmentary view in elevation illustrating how the replaceable die nests may be utilized in a punch press equipped with complementary die blocks, mounted in opposed matching relation, corresponding to the fixed die-holding block and shiftable pressure jaw of the hand tool shown in Fig. 1.

Referring first to the disclosure in Fig. 1, there is shown a tool designed to be equipped with any one of a set of similar multifacet dies of which two are disclosed in Figs. 7 and 8. The tool is provided at one end with a head 10 formed of two cheek plates 11 and 12, with a die holding block 13 acting as a filler block, fitting between the advance ends of the cheek plates and spacing them apart. The cheek plates form a die-receiving space therebetween. The cheek plates and filler block are permanently secured by through bolts 14 and 15. The cheek plates are also secured together in spaced apart relation by a jaw bolt 16 at the lower portion of the head 10. The top edges of the cheek plates are provided with a pair of parallel slots 17 and 18. The inner face of the die-holding block 13 is provided with a pair of stop faces designed to receive replaceable dies 19 whose hubs are replaceably received in the slots 17 and 18, and for this purpose the die-holding block 13 is provided with two pressure-receiving faces 20 and 21 spaced from the slots 17 and 18, as controlled by the dimensions of the die 19.

The dies which are intended to be used with the tool constitute a set, each different from the other but each having certain common structure. Each die is rectangular in plan, of uniform thickness as shown in Fig. 6, and of uniform width in two directions at right angles to each other as measured along the lines a—b and c—d in Figs. 7 and 8. Each die has a square stud 22 projecting axially from its center and having a sliding fit in one of the slots 17. Each die has a threaded hub 23 projecting from the center of its opposite side and having a sliding fit in the other slot 18. The threaded hub 23 is adapted to be engaged by a nut 24 which bears on the adjacent cheek plate and acts to clamp the die currently in use to the head 10.

The dies distinguish from each other in that each die has its corner cut out to form a nest 25, thus forming four nests to each nest die. Each nest has two faces 26 and 27 extending at right angles to each other and facing outwardly when its associated die is in position. In the case of each nest the lengths of its associated sides 26 and 27 are equal.

A shiftable pressure jaw 28 has one end pivoted to the bolt 16 and extends outwardly from the head. The head and the shiftable jaw are operated to move to and from each other by means of a pair of cheek plates 29, 30, to one of which is secured an end stub 31 with one end pivotally connected to the shiftable jaw through a pivot 32. The other handle 30 is connected to a stub 33 provided with a pair of pivots 34 and 35. Pivot 34 is connected to the head and pivot 35 is connected to stub 31 by link 36 and pivot 37 to form a toggle connection between the handles.

The portion of the shiftable jaw which faces the die 19 is recessed to provide a groove 37 which coacts with the exposed recess in the die to form a crimping recess, square in cross section, as best shown in Fig. 5. The groove 37 is formed of two faces 38 and 39 at right angles to each
other and opposing, respectively, the faces 26 and 27 of the nest for the time being facing the groove 37.

In operation it will be understood that that die is selected from the set of dies which will provide that size of nest called for by the size of work on which it is intended to work. For instance each work is shown in its initial form at W in Fig. 3. As the handles are separated from the closed position, as shown in Fig. 3, and with the work to be crimped located in the nest, the toggle action causes the groove 37 to engage the work at two points 90 degree apart, marked e and f in Fig. 3, and the work is progressively deformed from the circular position shown in Fig. 3, through the four-sided and rounded corner position shown in Fig. 4, into the final square-in-cross-section form shown in Fig. 5. This completes the deformation of the work from its initial circular form into its intended final square form.

Should it be desired to deform a stock piece having a size different from that just described but still within the capacity of the die currently in use, the handles are spread apart to remove the shiftable jaw away from the die currently in use, the nut 24 is loosened, the die is removed from the slots and rotated in space to bring the proper size peripheral nest into exposed operative position. The die is then re-inserted in position with its hubs in the slots and the nut tightened.

The crimp with the different size nest is performed as above outlined.

Should it be desired to crimp a piece of work not within the capacity of the die currently in use, the die with the proper size nest for the work desired is selected from the set and inserted in the tool, as previously described. Moreover, should the work in hand be of such size or weight as to require power actuated means for effecting a crimping operation as aforesaid, a conventional punch press, for example, may be equipped with a pair of complementary die blocks mounted in opposed matching relation, as indicated at 42 and 43 in Fig. 11, corresponding to the fixed die holding block 13 and shiftable pressure jaw 38 of the hand tool illustrated in Fig. 1, for example.

It is a particular feature of this disclosure that the pressure imposed by the shiftable jaw operating through the work onto the die currently in use is transmitted through whatever may be the two inner faces 40 and 41 of the die 27 onto both of the right angularly related faces of the flange block and no pressure is transmitted through the extensive pressure areas and there is avoided the possibility prevalent in other similar devices of shearing off the hubs.

While the invention has been illustrated and described with respect to a preferred embodiment thereof, it is to be expressly understood that various changes and modifications may be made therein without departing from the inventive concept underlying the same. Therefore, the invention is not to be limited except as is necessitated by the prior art and the scope of the appended claims.

We claim:
1. A crimping tool having a head including two check plates in spaced parallel relation with a die-seating block secured to and between said check plates, said check plates being provided at their edges with parallel open ended slots, a rotatably adjustable multi-die block disposed for the most part between the check plates and in abutting engagement with the die-seating block and presenting a pair of angularly related pressure surfaces facing rearwardly thereof, said die block being provided at its axial center on one side thereof with a square stud fitted non-rotatably in one of the slots to prevent the die block from rotating accidentally and provided at the other side of its axial center with a square stud fitted non-rotatably in the other slot, a clamping nut engaging the threaded stud to lock the die block to and between said check plates, two of the edge faces of said die-blocks bearing on said die-seating block in all operative positions of the same to transmit to the head of said tool pressures imposed on the multi-die block, and a coacting shiftable die presenting angularly related pressure surfaces in opposed facing relation with the rearwardly facing pressure surfaces of said multi-die block for crimping articles therebetween in any one of the operative positions of said multi-die block.
2. The tool defined in claim 1, wherein the die is of rectangular block-like form with four flat edge faces形成ing two pairs of opposing flat faces and with the corner portions thereof recessed to give form to a crimp to be imposed on a portion of the recesses being of different sizes, and in any of its operative positions said die disposed with one pair of said flat faces in bearing engagement with the die-seating block and with the opposing pair of flat faces exposed in part to form a stop for limiting the movement of the coacting shiftable die in its movement towards said multi-die block.
3. A crimping tool including a head portion provided with a fixed jaw having an L-shaped marginal recess therein, a shiftable pressure jaw pivoted to the head in spaced relation to said fixed jaw and provided with an L-shaped recess presenting plane surfaces at right angles to each other, said die-block secured in said head in nested engagement with said fixed jaw in abutting engagement with said fixed jaw, said multi-die block being provided with an L-shaped recess in each of its corner-defining portions square therewith and adapted to coact with the recess in said shiftable jaw to form a work-receiving space rectangular in cross section when the shiftable die is in bearing engagement with the removable die block.
4. The tool defined in claim 3, wherein both the shiftable jaw and the removable multi-die block are provided with extended interengaging flat contacting surfaces for limiting the approach of the shiftable jaw and the removable die-block in its position of nearest approach.
5. In a crimping tool for use in deforming a cylindrical body into a form rectangular in cross section, a head formed of a pair of cheek plates including a fixed jaw member therebetween provided with a marginal recess defining flat surfaces normal to each other, one of the spaced parallel cheek plates provided with an open-ended slot, a set of rectangular multi-die blocks each in the form of a cross, and having the same all-over dimension as every other die-block, and with their corner defining recesses being in depth from every other corner recess, each die block being provided at its axial center beyond a screw-threaded stud slidably fitted in said slot whereby a die-block is seated in the marginal recess provided therefor in said jaw member, and a nut secured on said threaded stud for clamping a die-block between said cheek plates to retain it in abutting engagement with said jaw member.
6. In a crimping tool for use in deforming a cylindrical body into a form rectangular in cross section and into one of a plurality of different dimensions of cross section, the combination of a head formed of a pair of parallel cheek plates and a die-seating block secured between the cheek plates, said check plates provided at one edge with a pair of aligned slots, a relatively fixed die-block having a plurality of sets of flat bearing faces, each having an associate recess opposite the same for engaging the work to be cramped, each bearing face fashioned to present a wide bearing surface in engagement with the die-seating block and provided adjacent thereto with a recess forming one-half of a square in cross section projecting outwardly from its axial center and replaceable and non-rotationally positioned in one of the slots, said die-block also provided with a threaded hub projecting outwardly from its opposite size and bearing loosely in the other slot, a nut engaging the portion of the threaded projecting portion and the adjacent cheek plate for securing the die-block in place in the head with a pair of its flat bearing surfaces bearing on the die-seating block while its opposing recess is...
exposed for crimping, and a shiftable pressure jaw pivoted to the head and having a recess forming one-half of a square in cross section for engaging the work on the side thereof opposite the side engaging the exposed recess in said die-block and coacting therewith to form the work rectangular in cross section.

7. A crimping tool of the pliers type including a fixed head and a relatively movable jaw each provided with a right angular marginal recess in opposed matching alignment lengthwise of said tool, and a square die block provided with relatively small right angular marginal recesses of varying depth in its corner defining portions seated in said head in abutment with its angular recess defining surfaces for angular adjustment relative to the angular recess in said jaw whereby to selectively align its recesses in opposed matching relation with the recess in said jaw to form a square crimping surface therebetween upon movement of said jaw into abutment with a corner-defining portion of said die block.

8. In a crimping tool of the character described, the combination of a relatively movable jaw presenting flat work faces normal to each other, a fixed die-seating block presenting relatively large supplemental thrust opposing faces normal to each other and aligned in opposed, matching relation with the faces of said movable jaw in spaced relation thereto, a screw-threaded die block provided with a square stud axially thereof, and pairs of flat work faces normal to each other and varying in depth at each of its corner defining portions, said die block being disposed in abutting relation with the faces of said die-seating block, slotted means associated with said die-seating block for receiving said stud, and a thumb screw secured on said stud to maintain said die block in selected positions of relative angular adjustment whereby its respective corner portions are aligned in opposed matching relation with the faces of said jaw for abutting engagement therewith.

9. In combination, a pair of complementary die seating members each defining a pair of flat faces normal to each other and mounted in opposed matching relation for relative movement therebetween, and a square die block provided in each of its corner defining portions with a pair of flat work faces normal to each other and varying in depth, said die block being positionable between said die seating members with a selected pair of its work faces in matching relation with the faces of one of said die seating members whereby to provide a square opening of predetermined size between said one die block and said die member when in closed position on said die block.

10. In a crimping tool of the character described, the combination with a pair of complementary die seating members mounted to have relative movement therebetween, said die seating members being each provided with flat work faces normal to each other and defining a primary rectangular opening therebetween when in closed position, of a rectangular die block provided in each of its corner defining portions with flat work faces normal to each other and varying in depth, said die block being positionable between said die seating members with its work faces in selectively opposed matching relation with the faces of said die seating members whereby to define relatively smaller secondary rectangular openings between said die seating block and said die members when in closed position on said die block, the root of the angular faces of said die seating members being aligned lengthwise of said crimping tool.

11. A replaceable die nest for use in a compression tool having a fixed head and a movable jaw each provided with a marginal recess defining flat surfaces normal to each other, comprising a square die block adapted to seat in said head with edge faces thereof in abutment with the recess defining surfaces in said head, said die block being provided with flat work faces normal to each other and of varying depth in each of its corner defining portions, and a square stud projecting axially from said die block adapted to be received in a slot provided therefor in said head for locating said die block in angular positions of adjustment to selectively present its work faces in opposed matching relation with the surfaces defining the marginal recess in said jaw.

12. In a crimping device of the character described, the combination with a pair of complementary die-block nesting members mounted to have relative movement therebetween, said nesting members being each provided with a pair of uniform flat faces at right angles to each other and disposed in matching relation to define a primary rectangular opening therebetween when in closed position, of a rectangular die-block provided in each of its corner-defining portions with a pair of flat pressure surfaces at right angles to each other with said die-block, the respective pairs of pressure surfaces in said die-block varying in depth and said die-block positionable between the respective angular faces of said nesting members with the pressure surfaces in a selected corner portion of said die-block in opposed matching relation with the angular faces of the relatively movable one of said nesting members whereby to define a relatively smaller secondary rectangular opening between said die-block and said movable nesting member when said nesting member is in closed position on the selected corner portion of said die block, the root of the respective angular faces of said complementary nesting members and the root of the angular pressure surfaces in a selected corner portion of said die-block being in alignment with the line of force exerted on said die block by the relatively movable one of said complementary nesting members.

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