

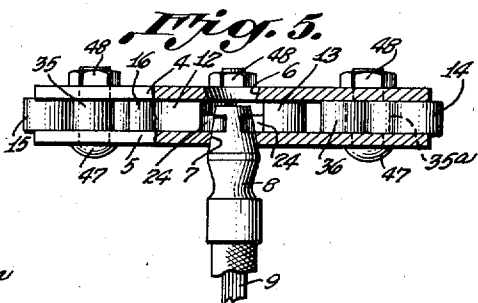
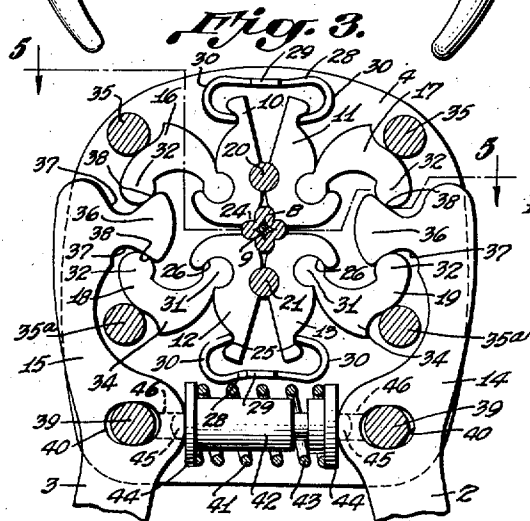
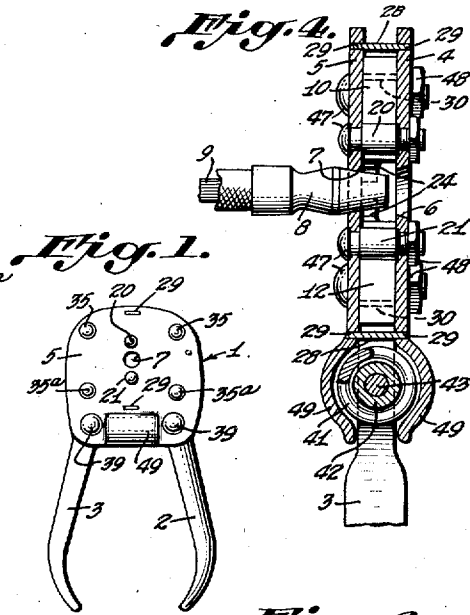
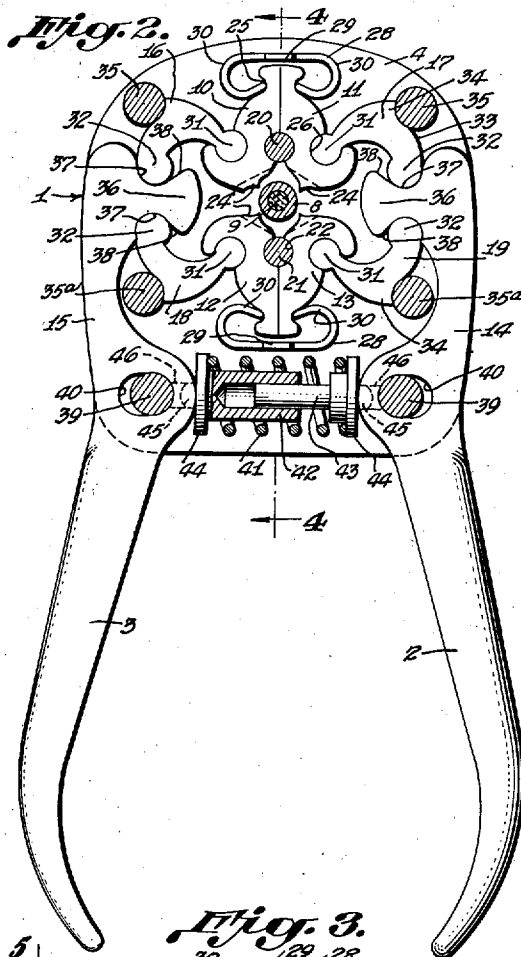
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HAND SWAGING TOOL

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2,256,457

HAND SWAGING TOOL

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This invention relates to hand tools and more particularly to hand tools for compressing metallic articles, such as terminals onto electrical conductors.

Among other objects the invention aims to provide a compressing tool embodying automatic means for limiting the pressure exerted upon the article.

The invention is of particular utility in its embodiment, as here illustrated, in a tool for swaging metallic terminal members to metallic electrical conductors to form couplings. An object in particular is to provide an efficient and convenient hand tool of this character for expeditiously and economically making electrical couplings of the character disclosed in my Patent Number 2,034,090, dated March 17, 1936.

The full objects and advantages of my invention will appear in connection with the detail description thereof and the novel features of my inventive concept will be particularly pointed out in the claims.

In the accompanying drawing which forms a part of this specification—

Figure 1 is a plan view in front elevation of an embodiment of this invention;

Figure 2 is an enlarged view similar to Figure 1, with the cover plate removed and partly in section illustrating the normal position assumed by the operating parts before the swaging begins;

Figure 3 is a view similar to Figure 2 with the handles broken away and illustrating the position assumed by the operating parts during or at the end of the swaging action;

Figure 4 is a view in section taken on the line 4—4, Figure 2, looking in the direction of the arrows;

Figure 5 is a view in section taken on the line 5—5, Figure 3, looking in the direction of the arrows; and

Figure 6 is a projected detail view of a jaw member and coacting dog.

In the embodiment of this invention as illustrated, the operating head 1 supports two similar pivoted spaced apart operating handles 2 and 3. The operating head 1 includes two similar spaced apart parallel plates 4 and 5 between which the operating parts are located, and the plates are provided with aligned apertures 6 and 7 for the reception of the terminal 8 upon the conductor 9. The terminals 8 are shown having a tapered extremity and it is desirable to swage the tapered portion near the end or otherwise to cause the metal of the terminal to flow into the metal of the conductor. The aper-

tures 6 and 7 may be of the proper size to receive terminals of uniform size on either side of the tool head to position the terminal therein so the swaging action occurs at the proper place on the terminal or, if desired, the apertures may be of proper sizes each to accommodate terminals of different sizes.

The metal of the terminal is swaged upon the metal of the conductor by causing four jaw members 10, 11, 12 and 13 to engage and compress the metal of the terminal in four oppositely disposed indentations upon the application of pressure upon the handles 2 and 3, as by the hand of the operator moving the free ends of the handles toward each other. The handles 2 and 3 are in the form of levers pivoted intermediate their length to the opposite lower corners of the head 1, and have portions 14 and 15 entering the head 1 to coact when rotated outwardly with cam dogs 16, 17, 18, and 19, which in turn coact with the jaws 10, 11, 12 and 13, respectively, to swage the terminal onto the conductor.

The jaw members 10 and 11 of complementary conformation are arranged to be oscillated about a stud 20 above the terminal receiving apertures 6 and 7, and jaws 12 and 13 of complementary conformation to members 10 and 11 are arranged to be simultaneously oscillated about a stud 21 below said apertures 6 and 7. The studs 20 and 21 are equidistant from the center of said apertures and are in alignment therewith. As shown in Figure 6, one edge of each jaw member is provided with an arcuate recess 22 of less than a semicircle in extent and concentric with the pivot stud which edge is extended in one direction to form a flat surface 23 passing through said center and from the other side of the recess in the opposite direction at an obtuse angle to said flat surface to form one side of the apex or tooth 24 of the jaw. The portion of the jaw member adjacent the outer end of the flat surface 23 is constricted and the edge thereof opposite the flat surface 23 adjacent the constricted end is provided with an arcuate recess or indentation 25, and the said edge opposite the recess 22 is provided with an arcuate recess 26 equal to or slightly greater than a semicircle to form a socket for the reception of a rounded end of the cam dog, hereinafter described. The edge of the jaw member is continued downwardly from the lower termination of the recess 26 to form a curved portion 27 continued to form the other side of the tooth 24, so that the respective sides are complementary. As shown

in Figure 2, the complementary jaw members 10 and 11 are mounted with the respective recesses 22 embracing the stud 20, and the respective flat surfaces 23 are normally maintained in engagement by a spring 28 supported at right angles to the axis of the head 1 by oppositely disposed central projections 29 received in apertures provided therefor in the plates 4 and 5, and the free ends 30 of the spring are curved downwardly and inwardly to be received by the respective indentations 25. In the position shown in Figure 2, the teeth 24 of the jaw members 10 and 11 are retracted to clear the apertures 6 and 7 for the reception of the terminal. When equal pressure is applied to the jaw members 10 and 11 by the contact with the cam dogs 16 and 17 in a generally downward direction, the jaw members 10 and 11 are rotated about the stud 20 against the tension of the spring 28 causing the teeth 24 to be brought together in a movement generally in the direction of the center of the apertures 6 and 7, as shown in Figure 3, and upon the removal of the pressure the spring 28 returns the jaw members 10 and 11 to the normal position shown in Figure 2. The jaws 12 and 13 are likewise influenced by a spring 28.

The cam dogs, as shown in detail in Figure 6, are of a generally arcuate construction having one end 31 formed on the arc of a circle concentric to the arcuate recess 26 of the jaw member and preferably of an extent equal to or greater than a semicircle to be received in said recess and form a ball and socket joint therewith. The opposite end 32 is of the same general formation adapted to be engaged by a projection of one of the handles as hereinafter described. The convex surface 33 of the dog adjacent the handle engaging end acts as an operating cam and is provided with a tangential extension 34 acting as a stop. The cam dogs 16 and 17 are of complementary formation and when assembled with the jaw members 10 and 11, as shown in Figure 2, the stop 34 of the dogs are brought into engagement with studs 35 mounted between the plates 4 and 5 arranged on the radii of a circle concentric with the apertures 6 and 7 and an equal distance from the center line passing through the studs 20 and 21.

The extremities of the portions 14 and 15 of the handles 2 and 3 extending within the head 1 are each provided with inwardly projecting complementary cam dog actuating members 36 having portions cut out on the arc of a circle concentric to the rounded ends 32 of the cam dogs 16 and 17 above the transverse center line of the apertures 6 and 7 to form seats 37 for the reception of said ends 32, and said members 36 are provided with upper edges 38 tangential to the arcuate seats 37 extending upwardly therefrom toward the vertical center line of the tool head.

The jaw members 12 and 13 and cam dogs 18 and 19 are arranged below the transverse center line of the apertures 6 and 7 in complementary relation to the corresponding parts above said center line, including complementary studs 35a and a complementary formation upon the cam dog operating members 36 of the portions 14 and 15 of the handles 2 and 3. These handles are each pivoted upon studs 39 secured at the opposite lower corners between the plates 4 and 5.

The operation of this hand swaging tool is as follows:

The terminal 8 is assembled upon the conductor 9 and inserted within the aperture 6 or 7 of the

head 1 of the tool as shown in Figures 2 and 4. The operator then grasps the handles 2 and 3 and applies pressure to bring them together, rotating the respective handles about their respective pivots 39 which movement imparts an outward rotative movement to the portions 14 and 15 causing the operating members 36 to move away from the center of the apertures 6 and 7, and the inclined surfaces 38 engaging the adjacent rounded ends 32 of the cam dog members imparts an outward movement thereto and as the cam surfaces 33 thereon travel over the studs 35 and 35a imparts through the ball and socket connection 31—26 a rotative movement to the jaw members 10, 11, 12 and 13, so that the teeth 24 thereon engage with the metal of the terminal 8 and swage the same onto the conductor 9, as shown in Figure 3. Upon the release of the pressure on the handles 2 and 3 the springs 28 return the parts to their normal position.

To insure a uniform predetermined pressure at each operation of the tool in swaging a terminal 8 onto a conductor, each handle is provided with an elongated bearing or slot 40 about the pivot 39. The inner ends of the bearings or slots 40 are normally maintained in engagement with the pivots 39 by a coil spring 41 surrounding a sleeve 42 reciprocally mounting a guide pin 43 therein. The sleeve 42 and the guide pin 43 are provided with enlarged circular heads 44, each provided with a central exterior projection 45 each adapted to be received within a similar recess 46 provided upon the adjacent surfaces of the handles 2 and 3 in alignment with the centers of the pivots 39 when the handles are in the normally extended position. The spring 41 interposed between the heads 44 exert sufficient pressure to maintain the handles in normal relation to their respective pivots, as shown in Figure 2, until the pressure exerted in swaging a terminal causes the teeth 24 of the jaw members to encounter a resistance equivalent to the predetermined pressure, so that further pressure being applied to the handles 2 and 3 overcomes the tension of the spring 41 and the elongated bearing slots 40 allow the handles to move inwardly over the respective pivot studs 39 without imparting any additional pressure to the jaw members 10, 11, 12 and 13.

The studs 20, 21, 35, 35a and 39 are preferably shouldered at each end so that a reduced portion thereof passes through the plates 4 and 5 and it is preferable to rivet these extensions on one side of the plate to form engaging heads 47 on that side and to provide the opposite reduced portions with a screw-threaded surface to receive a threaded nut 48, whereby the plate 4 may be removed from the head of the tool when desired. It is preferable to expand the metal of the plates 4 and 5 to extend about the heads 44 of the sleeve 42 and guide pin 41 to form a housing 49 about the spring 41, as shown in Figure 4.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of the invention; and, therefore, I do not wish to be understood as limiting myself to the exact form, construction, arrangement, and combination of parts, herein shown and described.

What I claim and desire to obtain by Letters Patent is:

1. A hand swaging tool including a head having an aperture for receiving the article to be swaged and having operating handles pivotally mounted thereon intermediate their ends providing similar portions on each handle entering

within the head, two pairs of jaw members having article engaging teeth, each pair arranged in complementary relation to the other and mounted for oscillatory movement about studs fixed upon the head equidistant from the center of the head aperture, complementary operating members associated with said head in alignment with said aperture extending from the end of each handle extension, and cam dogs operatively connected to the respective jaw members and adjacent operating members to coact therewith to oscillate the jaw teeth to simultaneously compress the article upon the application of pressure upon the external portions of said handles.

2. The structure of claim 1 wherein the jaw members of each complementary pair are normally held in retracted position by resilient means in engagement with the respective members and act to return the jaws to normal upon the release of the handles.

3. The structure of claim 1 wherein the cam dogs are provided with a pivotal engagement with the respective jaw members and a sliding engagement with the respective operating members.

4. The structure of claim 1 wherein the cam dogs are provided with a pivotal engagement with the respective jaw members and a sliding engagement with the respective operating members and are mounted in sliding engagement with studs carried by the head.

5. The structure of claim 1 wherein the jaw members of each pair are of complementary conformation to the other member of said pair and each is provided with a flat surface adapted to be brought into engagement when the jaws are retracted.

6. The structure of claim 1 wherein the jaw members of each pair are of complementary conformation to the other member of said pair and each is provided with a flat surface adapted to be brought into engagement when the jaws are retracted, and wherein the cam dogs are provided with a pivotal engagement with each jaw member and a sliding engagement with the respective operating members and in sliding engagement with studs carried by the head, said studs being arranged equidistant from the head aperture and in complementary relation to each other.

7. The structure of claim 1 wherein the cam dogs are provided with a pivotal engagement with each jaw member and a sliding engagement with each operating member and are mounted in sliding engagement with studs fixed upon the head with the said studs arranged equidistant from the head aperture and in complementary relation to each other, and wherein each cam dog surface in sliding engagement with said studs is provided with a stop engaging the respective stud when the jaw members are in retracted position.

8. The structure of claim 1 wherein each handle is provided with elongated bearings in alignment with each other about their respective pivots and with resilient means interposed between the handles preventing adjacent movement afforded by said slots until the jaws have encountered a predetermined resistance.

9. A hand swaging tool, including a support, a plurality of complementary jaws pivotally mounted

ed on said support, separate cam members pivotally connected to said jaws, and levers pivotally connected to said support and to said cam members whereby to pivot and direct said jaws toward each other.

10. A hand swaging tool including a support for the following combination of elements: four pairs of fixed studs, a plurality of jaw members pivotally mounted on one pair of studs, a plurality of cam dog members arranged about said jaw members and engaging two other pairs of studs and pivotally connected to said jaw members, and a pair of levers mounted on the other pair of studs and provided with means cooperating with said cam dogs whereby to pivot and direct said jaw members toward each other.

11. The structure of claim 10 wherein means are provided for normally maintaining certain of said jaw members in engagement with each other.

12. The hand swaging tool including a head supporting the following elements: a pair of studs, a pair of complementary jaws pivotally mounted on one stud and a pair of complementary jaws complementary to the other pair of jaws mounted on the other stud, a second pair of studs, a pair of cam members pivotally connected to one pair of jaw members and engageable with said second pair of stud members, a third pair of studs, a second pair of cam members cooperating with the other pair of jaw members and engaging said third pair of studs, and means cooperating with said two pairs of cam members to cause the latter to cooperate with said jaws and said second and third pair of studs whereby to pivot and direct said jaw members toward each other.

13. The structure of claim 12 wherein a lost motion connection is provided between said cooperating means and said head.

14. A hand swaging tool including a support, two pairs of complementary jaws pivotally mounted on said support, two pairs of cam members carried by said support operatively related to said jaws, and means movable back and forth between and engageable with each pair of cam members whereby to pivot and direct said jaws toward each other.

15. Swaging mechanism including in combination, a support, three pairs of fixed studs secured to said support, a plurality of jaw members operatively connected to one pair of studs, a plurality of individual cam members pivotally connected to said jaw members and engaging the other two pairs of studs, and a lever carried by said support provided with means cooperating with certain of said cam members whereby to direct said jaw members with respect to each other.

16. Swaging mechanism including a head, a pair of fixed studs secured to said head, a pair of spaced apart pivotally mounted jaws on said head, a pair of cam members engaging said studs and operatively connected to said jaws, and means associated with the head movable between and acting upon said cam members causing said cam members to swing about said studs whereby said cams will pivot in a direction opposite to that of said jaws when said movable means is moved in a certain direction.

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