TOOL FOR COMpressing SLEEVES UPoN WIRES


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13 Claims. (Cl. 140—112)

This invention relates to improvements in tools for compressing sleeves of malleable metal upon wires for the purpose of making strong and durable joints between them.

An object of the invention is to provide a novel and advantageous combination of forming and compressing dies, levers, and hand operated parts, whereby high degrees of compressing forces may be applied to sleeves to compress them upon wires.

Another object of the invention is to provide a novel combination and arrangement of adjustable parts whereby two die blocks having two spaced pairs of oppositely disposed compressing grooves may be adjusted to bring either pair into operative relation to the force applying levers of the tool.

Another object is to provide a novel construction of work-engaging stop parts in novel relation to the compressing dies, whereby the dies and the sleeves to be compressed thereby may be set in proper relative positions for a compressing operation upon a sleeve or for a plurality of compressing operations at different places upon a sleeve.

The invention resides in the elements and the combinations of them hereinafter described and claimed.

In the accompanying drawings, illustrating the invention,

Figure 1 is a front view of a sleeve compressing tool constructed in accordance with the invention, showing the parts thereof in the closed position.

Figure 2 is a front view of the upper portion of the tool, showing the parts thereof in the open position.

Figure 3 is a side view of the upper portion of the tool.

Figure 4 is a sectional detail, showing the die blocks, the lever members carrying the same and one of the links on which the members are pivoted.

Figure 5 is a sectional detail, on line 5—5 of Fig. 1, showing the dies and the work-engaging stop parts and a sleeve and wires therein with the sleeve in position to have a part thereof acted upon by the dies.

Figure 6 is a view similar to Fig. 5, showing the tool moved to another position relatively to the sleeve to have another part of the sleeve acted upon by the dies.

Figure 7 is a view similar to Fig. 5, showing the parts of the tool in a reversed position with relation to the sleeve and wires and showing the sleeve in a position to have a third part thereof acted upon by the dies.

Figure 8 is a view similar to Fig. 7, showing the tool moved to another position relatively to the sleeve to have a fourth part thereof acted upon by the dies.

Referring to the drawings 2, 2 designate two lever arms having their upper ends pivoted together, at 4, centrally of the tool and having their lower ends provided with handles 4, 4 by means of which the arms may be moved from and toward each other.

The upper end portions of the lever arms 2, 2 are provided with adjacent sections 5, 5 whose lower end portions are pivoted thereto, at 6, 6. The upper end portions of the sections are pivoted, at 7, 7, to the lower ends of two lever members 8, 8, and the sections 5, 5 are locked in fixed positions relatively to the lever arms 2, 2 by set screws 10, 10 which are screwed into and through lug 9, 9 on the arms 2, 2 and engage lugs 11, 11 on the sections 5, 5, and by set screws 12, 12 which are screwed into and through parts 13, 13 of the sections 5, 5 and engage parts 14, 14 of the arms 2, 2.

By loosening the set screws 12, 12 and turning the set screws 9, 9, 9 forwardly the pivoted upper ends of the sections 5, 5 may be adjusted toward the pivot 3 of the arms 2, 2, and by loosening the set screws 8, 8 and turning the set screws 12, 12 forwardly the pivoted upper ends of the sections 5, 5 may be adjusted away from the pivot 3 of the arms 2, 2; otherwise the sections 5, 5 form, in effect, integral parts of the arms 2, 2, the arms 2, 2, and sections 5, 5 constituting toggle levers.

The lever members 6, 6 are located between two links 15 and 16 on which the members are fulcrummed by means of bolts 17, 17. The links 15 and 16 are spaced above the arms 2, 2 and their adjusting sections 5, 5, and the members 6, 6 have free end portions 18, 18 which extend above the links 15 and 16.

The pivots 7, 7 of the sections 5, 5 of the arms 2, 2, and the fulcrum bolts 17, 17 of the lever members 6, 6 are related to each other and to the pivot 3 of the arms 2, 2 so that, when the arms are moved apart or from each other, the pivots 7, 7 will be moved toward each other above the pivot 3 and thereby move the lower ends of the lever members 6, 6 toward each other and the upper free end portions 18, 18 of the members away from each other to move the parts of the tool to the open position, as shown in Fig. 2, and so that when the arms 2, 2 are
thereafter moved toward each other, the pivots 15, 15 will be moved away from each other and thereby move the lower ends of the lever members 8, 8, away from each other and the upper ends of the members toward each other to move the parts of the tool to the closed position, as shown in Fig. 1. The arms 2, 2 are provided with suitable stop parts 19, 19 to limit the extent of movement of the arms 2, 2 when they are moved toward each other.

The lever members 8, 8 are provided with coacting gear teeth 20, 20, see Fig. 4, between their fulcrum bolts 17, 17 which serve to preserve equal movements of the lever members 8, 8 on their fulcrum bolts when the parts of the tool are moved from one to the other of their closed and open positions.

The lever members 8, 8 carry two die blocks 21, 21 which are seated against the inner, opposing surfaces of the free end, portions 18, 19 thereof. The die blocks 21, 21 are carried by the inner ends of pivot pins 22, 22 which are fitted to turn and to slide longitudinally in the end portions 16, 18 of the members 8, 8, and which are in axial alignment, or substantially so, when the parts of the tool are in the closed position shown in Figs. 1 and 4.

The die blocks 21, 21 are constructed to extend normally to the axes of their pivot pins 22, 22 and to be in parallel relation, or substantially so, when the parts of the tool are in the closed position, and they are provided with two spaced pairs of oppositely disposed grooves 23, 23 to 24, 24 into the operative position which is near the fulcrums of the members 8, 8 and between the links 15 and 16 and the pivot pins 22, 22.

The outer end portions of the pivot pins 22, 22 are surrounded by helical springs 25, 25 which are housed within openings 26, 26 in the end portions 18, 18 of the members 8, 8. These springs 25, 25 bear against the inner end walls of the openings 26, 26 and against heads 27, 27 on the outer ends of the pins 22, 22 and urge the die blocks 21, 21 in firm engagement with the opposing inner surfaces of the member end portions 18, 18. When the die blocks 21, 21 are thus held by the springs, transverse grooves 28, 28 in the outer walls of the blocks embrace and engage corresponding projecting ribs 29, 29 on the member end portions 18, 18, and thereby lock the blocks in normal position with respect to the said end portions by preventing the blocks from being turned about the axes of their pivot pins.

When it is desired to reverse the ends of the die blocks 21, 21 to bring either pair of grooves 23, 23 or 24, 24 into the operative position in close relation to the fulcrums of the members 8, 8, the pins 22, 22 and blocks 21, 21 are pressed inwardly against the action of the springs 25, 25 until the walls of the grooves 28, 28 clear the ribs 23, 23, whereupon the blocks may be turned on their pivot pins to effect the adjustment desired. After the adjustment has been effected, the walls of the grooves 23, 23 re-engage the ribs 23, 23 to lock the blocks in place.

Each pair of compressing grooves 23, 23 and 24, 24 is provided to receive and compress a sleeve when the pair is in the operative position, and the grooves of the pair 24, 24 are larger than grooves of the pair 23, 23 to act upon a larger sleeve than that acted upon by the pair 23, 23, and thus it will be understood that by adjusting the die blocks 21, 21, as previously explained, the tool may be used to compress sleeves of at least two different sizes.

In Figs. 4 to 8, inclusive, there are illustrated the meeting ends of another pair of wires 30, 30 inserted into the respective end portions of a connecting sleeve 31, and there are illustrated therein different positions of parts of the tool relatively to the wires and the sleeve during several operations of the tool in compressing the sleeve upon the wires, as will be hereinafter explained.

The links 15 and 16 carry two parallel, work-engaging stop plates 32 and 33, respectively, located on the respective sides of the die blocks 21, 21 in spaced relation thereto, the plate 32 being spaced farther from the die blocks than the plate 33, as clearly shown in Figs. 6, 7, and 8. The plate 32 is secured to the link 15 by means of a screw 34, and the plate 33 is provided with a flange 35 which is seated in a groove 36 in a bracket 37 which is secured to the link 16 by a screw 38. The flange 35 is adjustable in the groove 36 to move the plate 33 closer to or farther from the die blocks 21, 21, and the flange 35 and plate 33 are secured to the bracket 37 in different positions of adjustment thereon by means of a screw 39 which extends through a slot 40 in the bracket 37 and is screwed into the flange 35.

The stop plates 32 and 33 are arranged to receive the sleeve 31 between them, and they are provided with slots 41 and 42, respectively, which receive the wires 30, 30 when the sleeve 31 is placed between the plates.

When the die blocks 21, 21 are adjusted to have their compressing grooves 23, 23 in the operative position, a pin 43 receives the sleeve 31 and forms a stop to properly position it between the grooves 23, 23 to be acted upon thereby; and when the die blocks are adjusted to have their larger compressing grooves 24, 24 in the operative position, the bottom walls of the slots 41 and 42 receive the wires projecting from the sleeve to be acted upon and form stops to properly position the sleeve between the grooves 24, 24. When the compressing grooves 24, 24 are in the operative position the lever arms 2, 2 are moved apart to a position in which the space between the upper or outer longitudinal edges of the grooves 24, 24 is equal to or slightly in excess of the diameter of the sleeve to be compressed between the grooves 24, 24, the lower or inner longitudinal edges thereof are close enough to form stops which are contacted by the sleeve to properly position it between the grooves if any irregularities in the wires projecting from the sleeve prevent the proper positioning of the sleeve by the engagement of the wires with the bottom walls of the slots 41 and 42.

The parts of the tool, as heretofore illustrated, are constructed and arranged to compress a sleeve on the meeting end portions of two wires in four compressing operations of the tool, two of such operations compressing one end portion of the sleeve upon one of the wires, and the remaining two of such operations compressing the other end portion that acted upon by the pair 23, 23 of the wires, and we shall now describe the operation of the tool in effecting these four compressing operations, the die blocks 21, 21 being adjusted to...
set the compression grooves 23, 23 in the operative position.

The end portions of the wires 30, 30 are first inserted into the respective end portions of the sleeve 31 and the end portions of the sleeve are indented by the aid of suitable hand pliers to cause sufficient binding action between the wire end portions and the sleeve to hold them in assembled condition, and in the operative position of the tool.

The lever arms 2, 2 of the tool are then moved apart to set the tool in the open position and the tool is then moved relatively to the wires 30, 30 and sleeve 31 to bring the wires 30, 30 into the slots 41 and 42 and to bring the sleeve 31 to a position between the grooves 23, 23 of the die blocks 21, 21, and between the stop plates 32 and 33, with one end of the sleeve in contact with the stop plate 32, to properly position the sleeve with respect to the die blocks for the first compression action thereof upon the sleeve, as shown in Fig. 5. This being done the handles 4 of the lever arms 2, 2 of the tool are forced toward each other to move the parts of the tool to the closed position shown in Fig. 1. As the parts of the tool are thus moved to the closed position, the pivots 7, 7 of the lower ends of the lever members 8, 8 are moved outwardly by means of the key 5 to positions on opposite sides of the pivot 3 of the arms 2, 2, in a toggle-like action, to move the upper free end portions 15, 18 of the lever arms 8, 8 and the die blocks 21, 21 carried thereby to the closed position with great force. As the die blocks are thus closed, the walls of the grooves 23, 23 thereof are moved toward each other and toward the space between the axes of the full crum bolts 17, 17 by a toggle-like action of the free end portions of the lever members 8, 8, so that the free portions of the grooves receive full act upon the sleeve to compress the same upon the wire therein with a high degree of force, for the production of the first compressed portion 44 of the sleeve. During the compression of the sleeve by the die blocks, some of the metal of the part plates and the sleeve outwardly in the space between the die blocks 21, 21, outwardly of the grooves 23, 23, and some of the metal flows lengthwise of the sleeve and elongates it slightly.

After the portion 44 of the sleeve 31 has been compressed, as just described, the tool is opened and moved longitudinally of the wires 30, 30 to bring the stop plate 33 into position in contact with the adjacent end of the sleeve 31, as shown in Fig. 6, whereupon the tool is closed for a second compression operation upon the sleeve, for the production of the second compressed portion 45 of the sleeve. After the two compressed portions 44 and 45 have been produced, the tool is opened and withdrawn or removed from the wires 30, 30 and sleeve 31, and the tool is turned or reversed to bring its stop plates 32 and 33 into reversed positions with respect to the ends of the sleeve, as shown in Figs. 7 and 8. Following this reversal of the positions of the stop plates, the tool is reapplied to the wires and sleeve with the wires in the slots of the stop plate in the third compressed position between the grooves 23, 23 of the die blocks and between the stop plates and with one end of the sleeve in contact with the stop plate 32, as shown in Fig. 7, whereupon the tool is again closed for a third compression operation upon the sleeve for the production of the third compressed portion 46 of the sleeve.

After the portion 46 of the sleeve has been compressed, as just described, the tool is again opened and moved longitudinally of the wires to bring the stop plate 33 into position in contact with the adjacent end of the sleeve 31, as shown in Fig. 8, whereupon the tool is closed for a fourth compression operation for the production of the fourth compressed portion 47 of the sleeve. The tool is then opened and withdrawn or removed from the wires and the sleeve, leaving the sleeve compressed or swaged upon the wires at the four places 44, 45, 46 and 47.

As the die blocks 21, 21 are moved toward each other on arcuate lines struck from the fulcrums 17, 17 of the lever members 8, 8, during the compressing operations, there is a tendency for more metal of the sleeve being compressed to flow outwardly from the compressing grooves 23, 23 and 15, the adjacent spaces between the die blocks 21, 21 farthest from the fulcrums 17, 17, and, therefore, such adjacent space is provided with offset portions having walls which diverge outwardly from the adjacent walls of the grooves 23, 23, as clearly shown in Fig. 4, and thus provide additional space for the reception of the metal forced from within the confines of the grooves 23, 23.

What is claimed is:

1. The combination of two lever members, a link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move toward and from each other when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks carried by said free end portions and having opposing compressing parts, and a work-engaging stop part carried by said link on one side of the die blocks.

2. The combination of two lever members, two links between which the members are located and on which they are fulcrumed on parallel axes, whereby free end portions of the members are guided to move toward and from each other when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks carried by said free end portions and having opposing compressing parts, and a work-engaging stop part carried by said links, one on one side of the die blocks and the other on the other side thereof.

3. The combination of two lever members, a link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move toward and from each other when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks carried by said free end portions and having opposing compressing parts, and a slotted work-engaging stop part carried by said link on one side of the die blocks.

4. The combination of two lever members, two links between which the members are located and on which they are fulcrumed on parallel axes, whereby free end portions of the members are guided to move toward and from each other when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks carried by said free end portions and having opposing compressing parts, and two slotted work-engaging stop parts carried by said links, one on one side of the die blocks and the other on the other side thereof.

5. The combination of two lever members, a
link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move toward and from each other when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks carried by said free end portions and having opposing compressing parts, and a work-engaging stop part carried by said link on one side of the die blocks; one of said stop parts being located farther from the die blocks than the other.

6. The combination of two lever members, two links between which the members are located and on which they are fulcrumed on parallel axes, whereby free end portions of the members are guided to move toward and from each other when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks carried by said free end portions and having opposing compressing parts, and two work-engaging stop parts carried by said links, one on one side of the die blocks and the other on the other side thereof; one of said stop parts being located farther from the die blocks than the other.

7. The combination of two lever members, a link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move to and from a closed position when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks carried by said free end portions and having opposing compressing parts, and two work-engaging stop parts carried by said links, one on one side of the die blocks and the other on the other side thereof; one of said stop parts being located farther from the die blocks than the other.

8. The combination of two lever members, a link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move to and from a closed position when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks carried by pivot pins mounted in said end portions and having two spaced pairs of oppositely disposed compressing grooves either pair of which may be brought into operative relation to the fulcrums of said members, and means to lock said blocks in positions of adjustment.

9. The combination of two lever members, a link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move to and from a closed position when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks carried by pivot pins mounted in said end portions and having two spaced pairs of oppositely disposed compressing grooves either pair of which may be brought into operative relation to the fulcrums of said members by the turning adjustment of the blocks on the axes of said pins, said pins being moveable longitudinally to move their die blocks from and to said pins and positions, and means to lock said blocks against adjustment when they are in their normal positions.

10. The combination of two lever members, a link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move toward and from a closed position when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, and two die blocks adjustably pivoted on said end portions on axes which are at right angles to the first and named loci and substantially in alignment when said end portions are in said closed position, said blocks having two spaced pairs of oppositely disposed compressing grooves on opposite sides of their pivots, whereby the blocks may be adjusted to bring either pair of grooves into a position between said pivots and said link, and means to lock said blocks in positions of adjustment.

11. The combination of two lever members, a link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move to and from a closed position when the opposite end portions thereof are moved from and toward each other, means operable to move said opposite end portions from and toward each other, two die blocks adjustably pivoted on said end portions on axes which are at right angles to the first and named axes and substantially in alignment when said end portions are in said closed position, said blocks having two spaced pairs of oppositely disposed compressing grooves on opposite sides of their pivots, whereby the blocks may be adjusted to bring either pair of grooves into a position between said pivots and said link, and means to lock said blocks in positions of adjustment.

12. The combination of two lever members, a link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move toward each other to a closed position and from each other to an open position, when the opposite end portions thereof are moved from and toward each other; hand operated toggle levers connected together and to said members and operable to move the said opposite end portions of the members from and toward each other, and means preserving equal movement of said members on their axes when moved by said toggle levers, the free end portions of said members having parts provided with oppositely disposed compressing grooves in parallel relation to each other and to said axes and constructed and arranged to be moved toward each other and toward the space between said axes to compress a sleeve between said grooves when said members are moved to the closed position.

13. The combination of two lever members, a link on which the members are fulcrumed on parallel axes, whereby free end portions of the members are guided to move toward each other to a closed position and from each other to an open position when the opposite end portions thereof are moved from and toward each other, hand operated toggle levers connected together and to said members and operable to move the said opposite end portions of the members from and toward each other, and means preserving equal movement of said members on their axes when moved by said toggle levers, the free end portions of said members having parts provided with oppositely disposed compressing grooves in parallel relation to each other and to said axes and constructed and arranged to be moved toward each other and toward the space between said
axes to compress a sleeve between said grooves when said members are moved to the closed position, the outer longitudinal edges of said grooves remote from said link being more widely separated than the inner longitudinal edges of said grooves close to said link in the open position of said members, and said inner and outer longitudinal edges being substantially equally separated in the closed position of said members.

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