Aug. 7, 1962 H. HEIDENWOLF 3,048,296

HAND-OPERATED TOOL FOR RIVETING BY MEANS OF TUBULAR RIVETS RECEIVING A SHANK

Filed Jan. 15, 1957 2 Sheets-Sheet 1

FIG. 1.

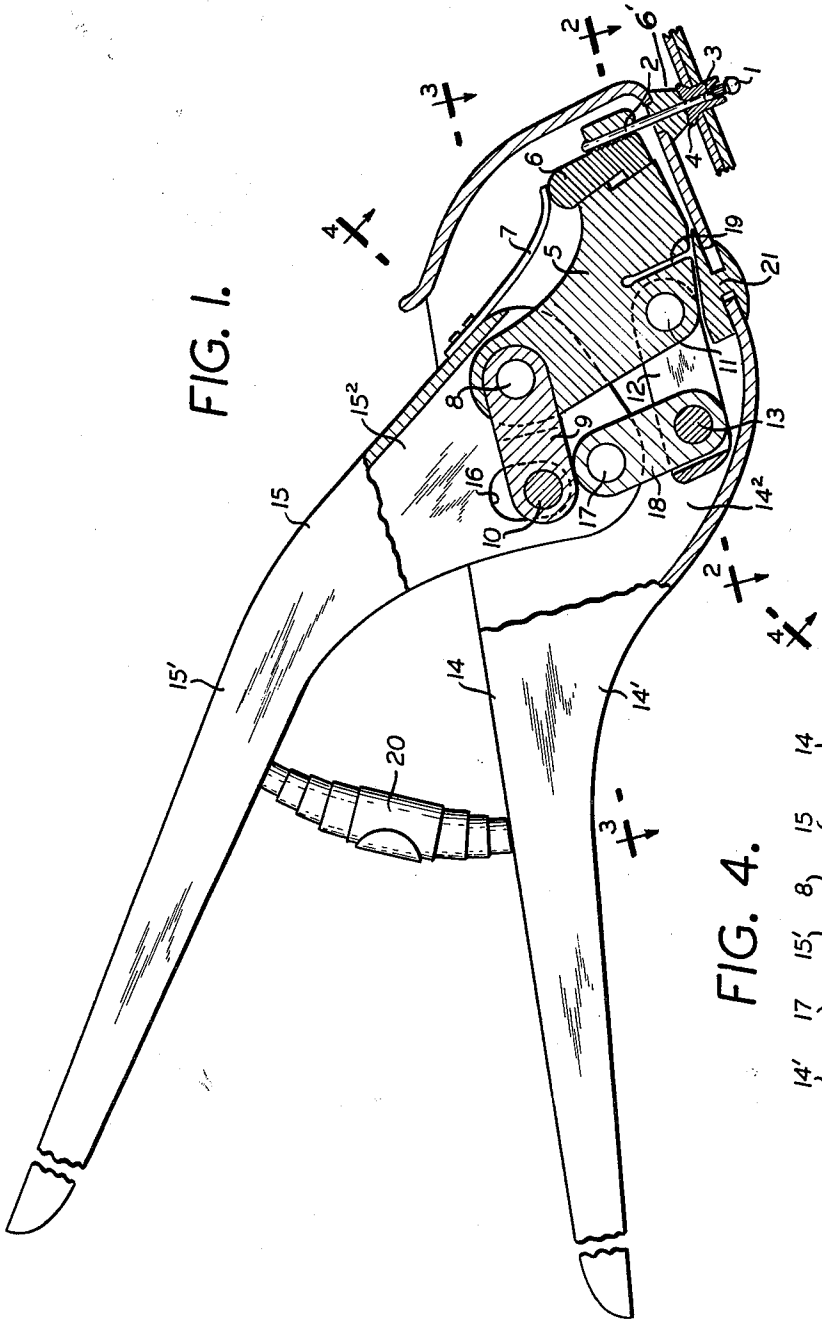
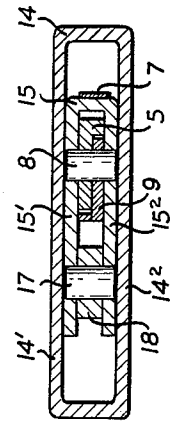


FIG. 4.



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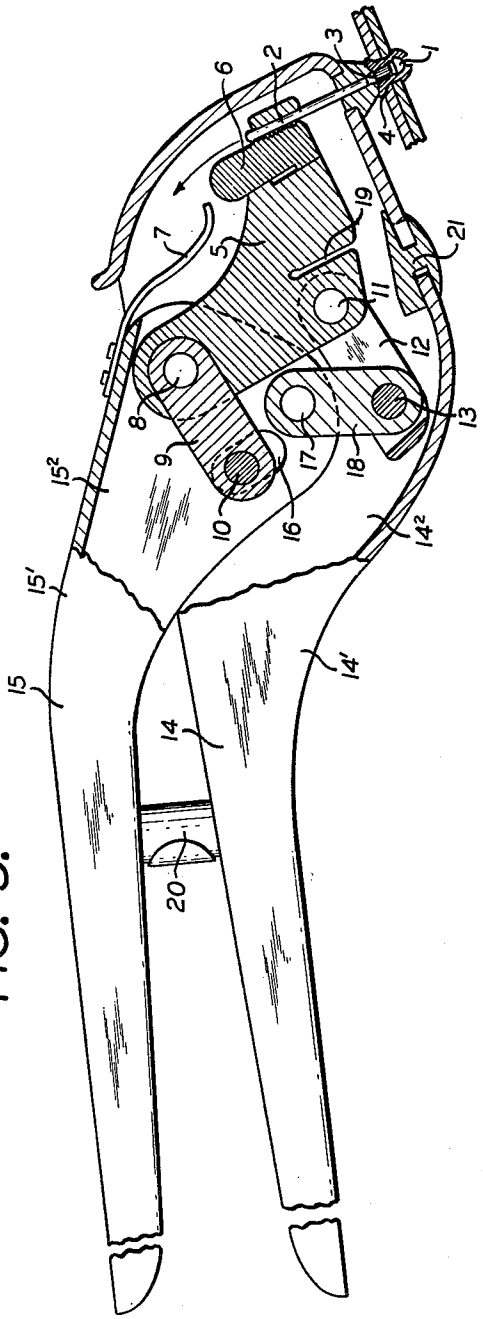

FIG. 5.

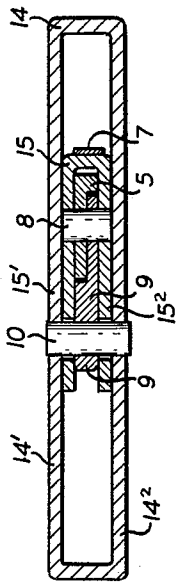

FIG. 3.

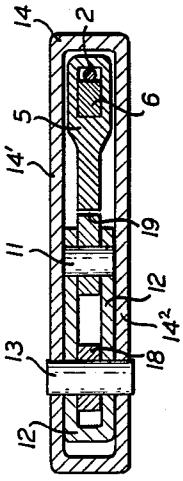

FIG. 2.

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HAND-OPERATED TOOL FOR RIVETING BY MEANS OF TUBULAR RIVETS RECEIVING A SHANK

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5 Claims. (Cl. 218—42)

The present invention relates to a hand-operated riveting tool for performing a riveting operation on a tubular rivet having a shank, the latter being received in and extending beyond one end of the tubular rivet.

It is known to form riveted connections of a plurality of work pieces, one face of which is not easily accessible or not accessible at all. In such situations blind rivets are used which consist of a tubular rivet and of a shank or mandrel received in the tubular rivet. The riveting process is brought about by pulling the shank through the tubular rivet. This is brought about by gripping and pulling the shank portion extending from the tubular rivet from the accessible side of the work pieces, simultaneously upsetting the tubular rivet.

It is one object of the present invention to provide a manually operated riveting tool for performing a riveting operation on a tubular rivet which receives a shank extending beyond one end of the tubular rivet, which tool permits a completely automatic operation of breaking off and ejecting the extending shank portion and which tool may be adjusted for a plurality of rivet sizes.

It is another object of the present invention to provide a manually operated riveting tool of the type set forth above which comprises two tool arms, one of which is provided at one end thereof with spaced, substantially parallel walls to define a housing. One end of the other tool arm moves in the housing and has a longitudinal slot. A bolt is disposed crosswise between and secured to the spaced walls and through the slot of the other tool arm, to constitute the pivot between the tool arms and permitting, due to the longitudinal slot, relative angular movement, as well as limited longitudinal movement between the tool arms. A load arm is pivotally secured to the other tool arm, and means are disposed in the housing which moves the load arm parallel to itself in the housing. The load arm forms jointly with a clamping jaw a chuck which grips the shank portion extending from the tubular rivet and brings about the riveting operation upon moving the other, free ends of the tool arms towards each other.

It is also another object of the present invention to provide a manually operated riveting tool of the type set forth above, wherein the load arm has a lower pivot means and an upper pivot means, the upper pivot means mounting the load arm pivotally on the other tool arm and both pivot means are freely movable in the housing. Two pivot bolts are spaced apart from each other and extend crosswise of the spaced walls of the housing, and lower and upper cross links connect each of the pivot means with the corresponding pivot bolts, so that the load arm together with both cross links and with a connecting link, connecting the lower pivot bolt with the other tool arm, form a parallelogram causing a movement of the load arm which is parallel to itself, upon moving the free ends of the tool arms towards each other.

It is yet another object of the present invention to provide a manually operated riveting tool of the type set forth above, which includes means for biasing the clamping jaw on the load arm.

It is a further object of the present invention to provide a manually operated riveting tool of the type set forth above, wherein the load arm is equipped with a slot opening at the bottom periphery thereof, to provide resiliency therein.

It is also an object of the present invention to provide a manually operated riveting tool of the type set forth above, which includes a spring secured to the other tool arm and engaging the clamping jaw in order to bias the latter.

With these and other objects in view, which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIGURE 1 is a front elevation of the tool at the start of the operation, partly in section;

FIG. 2 is a section along the lines 2—2 of FIG. 1;

FIG. 3 is a section along the lines 3—3 of FIG. 1;

FIG. 4 is a section along the lines 4—4 of FIG. 1; and

FIG. 5 is a front elevation similar to that of FIG. 1, partly in section, the tool arms being shown in their position near the end of the riveting operation.

Referring now to the drawings, and in particular to FIGS. 1 to 4, the combined tubular rivet comprises a wedging head 1, a drawing shank 2 having a notch 3 intermediate its ends to mark the breaking point of the shank portion extending from the tubular rivet 4 which receives the shank 2. The tubular rivet 4 is shown in FIG. 1, in its starting position, inserted in corresponding bores of the work pieces to be riveted prior to the upsetting of the tubular member 4.

The drawing shank 2, in the use of the tool, extends through a bore of a supporting member 6' mounted on the tool arm 14. The drawing shank 2 is intended to be secured to a load arm 5 which forms jointly with a clamping jaw 6 a chuck.

In order to bring about the clamping action as a function of the drawing force exerted upon the shank 2, the clamping jaw is obliquely guided in the load arm 5 and is wedged to the shank 2 by means of a spring blade 7, whereby the clamping jaw, moving along the guiding face of the load arm 5, acts as a conventional wedge clamp. The guide face is formed in a bow-shaped, forked outer end of the load arm 5 (FIG. 2).

The manually operated riveting tool for performing the riveting operation comprises two tool arms 14 and 15. One end of the tool arm 14 forms oppositely disposed, substantially parallel walls 14' and 14^2 spaced apart from each other and defining a housing, in which the other tool arm 15 moves.

An upper pivot bolt 10 and a lower pivot bolt 13 are disposed crosswise between and secured to the walls 14' and 14^2.

One end of the tool arm 15 forms oppositely disposed, substantially parallel walls 15' and 15^2 (FIGS. 3 and 4) to define a second housing moving in the first mentioned housing of the tool arm 14. The tool arm 15 has a longi-

tudinal slot **16** in the opposite walls **15'** and **15²** through which the bolt **10** extends, so that the latter operates as a pivot between the tool arms **14** and **15**, permitting relative angular movement, as well as limited longitudinal movement due to the slot **16** in the tool arm **15**.

An upper link **9** connects the upper pivot bolt **10** with the upper end of the load arm **5** by means of a pivot means **8** formed, for instance, by a pin disposed crosswise between the walls **15'** and **15²** of the tool arm **15**, while a lower link **12** connects the lower pivot bolt **13** with the lower end of the load arm **5** by means of a lower pivot means **11** formed, for instance, by a pin. The lower link **12** is of U-cross section (FIG. 2), receiving the load arm **5** between its leg members, and the lower pivot means **11** is disposed crosswise between and secured to the leg members of the lower link **12** and extends through the load arm **5**, the base of the U of the lower pivot means **12** being arranged at the end thereof remote from the load arm **5**.

In addition a connecting link **18** is pivotally secured at one of its ends to the lower pivot bolt **13** and, thereby, to the tool arm **14** and is also pivotally secured at the other of its ends to the tool arm **15** by means of a bolt **17** disposed crosswise between and secured to the opposite walls **15'** and **15²**.

The upper link **9**, the load arm **5**, the lower link **12** and the connecting link **18** form substantially a parallelogram having the pivot bolts **10** and **13** as fixed corner points, so that the load arm **5** moves substantially parallel to itself upon moving the tool arms **14** and **15** towards each other, while the links **9** and **12** swing about the fixed pivot bolts **10** and **13**. Due to the connection of the tool arm **15** with the fixed pivot bolt **13** by means of the connecting link **18**, the slot **16** is provided in the opposite walls **15'** and **15²**, so that a relative angular and a required limited longitudinal movement between the tool arms **14** and **15** is made possible.

Referring now again to the drawings, and in particular to FIG. 5, the riveting tool is shown in a position prior to the final stage of the riveting operation, which terminates with the breaking-off of the extension of the shank **2**.

Since rivets of different lengths are required for work pieces of varying thickness, accordingly the stroke for clinching the rivet will vary in accommodation to the length of the rivet. In order to bring about the required variation of the clinching stroke, an abutment member **21** is adjustably disposed in the bottom wall of the housing formed by the tool arm **14**. The abutment member **21** has an inclined inner face complementary to the inclination of the lower face of the load arm **5**. Upon adjusting the abutment member **21** by movement thereof along said bottom wall of the tool arm **14**, the load arm **5** will assume a starting position for the clinching stroke of the rivet which is at a higher or lower level, depending upon the position of the abutment member **21** relative to said bottom wall, since the load arm **5** engages the abutment member **21** in its starting position. By this arrangement the break-off point of the shank extension is always reached at a point of application of the greatest force upon the shank **2**.

The riveting tool, designed in accordance with the present invention, includes also means for automatically clamping the shank extension in the chuck formed in combination with the load arm **5**, as well as for automatically ejecting the broken-off shank extension upon termination of the riveting operation. The means for this end comprises a slot **19** disposed and extending upwardly from the bottom face of the load arm **5**, so that the shank gripping portion of the load arm **5** has a certain degree of resiliency, the modulus of which is responsive to the length of the slot **19**. The shank gripping portion of the load arm **5** is, thus, capable of yielding resiliently during the riveting operation, so that after reaching the breaking point for the extending shank portion and releasing the tool arms **14** and **15** to their original position by the action

of the spring **20** disposed therebetween, and, thereby, moving the clamping jaw by the spring **7** along the inclined face of the load arm **5** into a non-clamping position, the broken-off shank portion is ejected through an upper opening in the housing of the tool arm **14**, as indicated by an arrow in FIG. 5, due to the sudden return movement of the shank gripping portion of the load arm **5** into its original position.

In order to assure or ease the release and ejection of the broken-off shank portion, the gripping face of the clamping jaw **6** is equipped with grooves disposed obliquely (not shown) and extending in the direction of the ejection.

The riveting tool, designed in accordance with the present invention, permits for the first time, the use of the same tool for the working of tubular rivets of different diameters and of different lengths.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. A manually operated riveting tool for performing a riveting operation on a tubular rivet having a shank received therein and extending beyond one end thereof, said tool comprising:
two tool arms angularly movable relative to each other,
one of said tool arms being provided with spaced walls to define a housing formed at one end thereof,
a load arm carrying a clamping jaw to form jointly therewith a chuck,
said chuck being adapted to engage the free end of said shank,
said load arm being disposed within said housing and having a lower pivot means and an upper pivot means,
said upper pivot means mounting said load arm pivotally on the other of said tool arms,
and both of said pivot means being freely movable in said housing,
two pivot bolts spaced apart from each other and extending crosswise through said spaced walls of said housing,
a lower cross link connecting said lower pivot means with one of said pivot bolts,
and an upper cross link connecting said upper pivot means with the other of said pivot bolts,
and a connecting link,
one end of the latter being pivotally securd to said one of said pivot bolts and the other end of said connecting link pivotally secured to said other of said tool arms,
said load arm together with said lower and upper cross links and with said connecting link forming a parallelogram,
and said lower and upper cross links and said connecting link being pivotable about said pivot bolts, to provide the pulling stroke of said chuck within said housing.

2. The tool, as set forth in claim 1,
which includes means for biasing said clamping jaw on said load arm.

3. The tool, as set forth in claim 1,
wherein said load arm is formed with a slot opening at the periphery of said load arm, to provide a resiliency therein,
and an abutment means is disposed in said housing and engages the lower face of said load arm, to determine the starting point of the pulling stroke of said load arm.

4. The tool, as set forth in claim 3,
which includes means for adjustment of said abutment means.

5. The tool, as set forth in claim 1,

which includes a spring secured to said other of said tool arms and engaging said clamping jaw,
in order to bias the latter in a direction opposite to that in which said shank is drawn during said pulling stroke.

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