May 14, 1940.

C. F. WELCH

2,200,662

RIVETING TOOL

Filed June 20, 1939

2 Sheets-Sheet 1

Fig. 1.

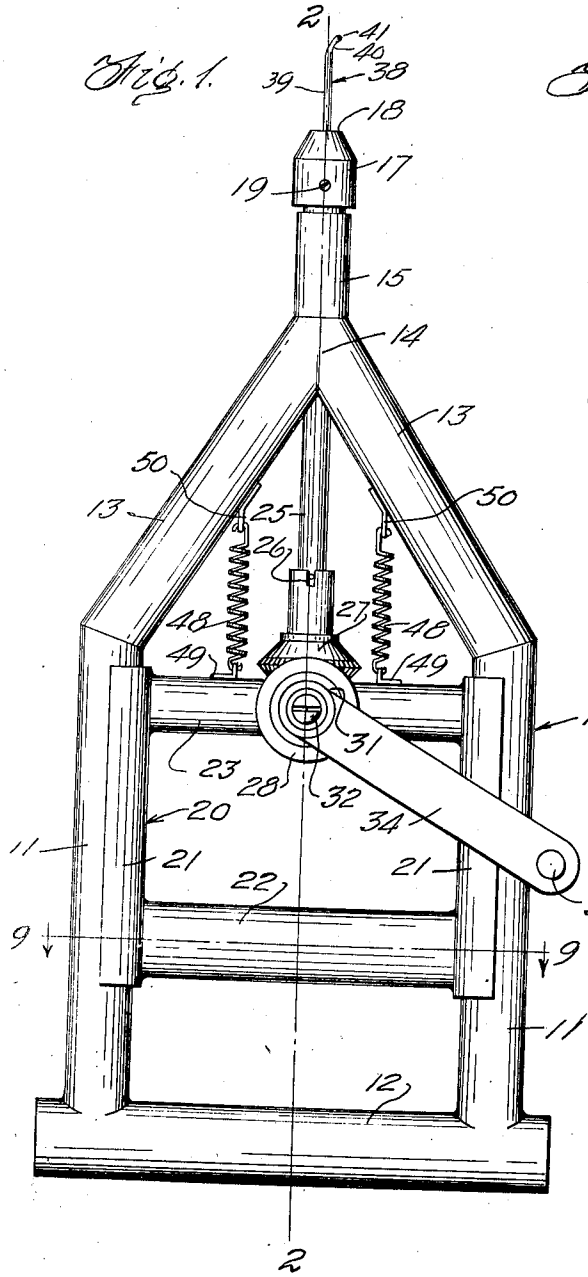
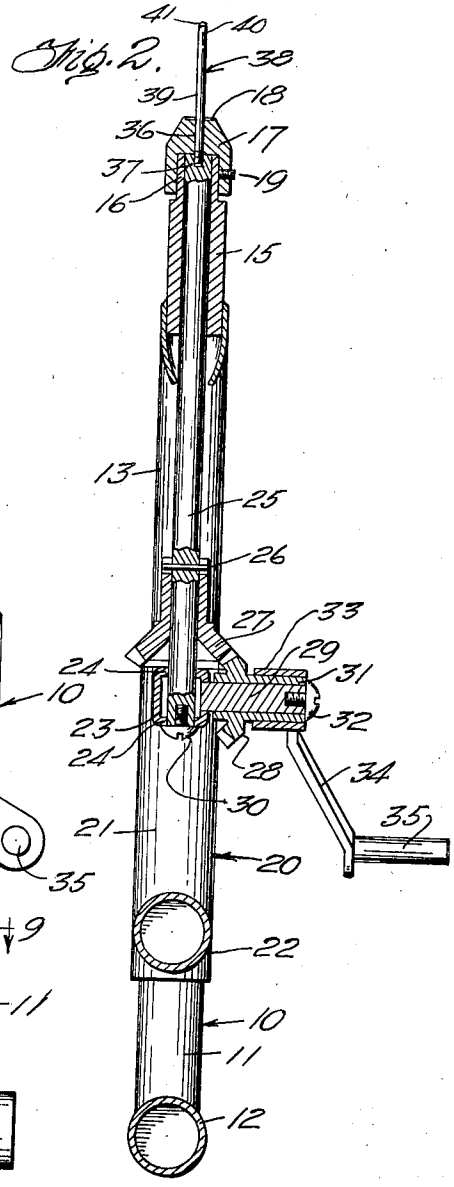


Fig. 2.



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Fig. 3.

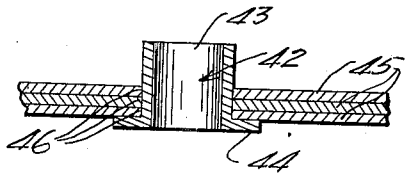


Fig. 4.

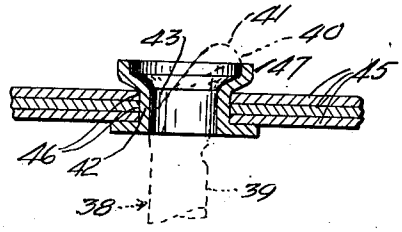


Fig. 6.

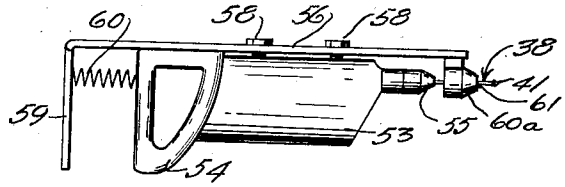


Fig. 5.

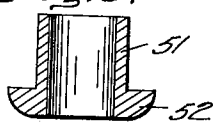


Fig. 7.

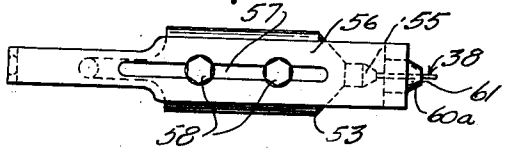


Fig. 8.

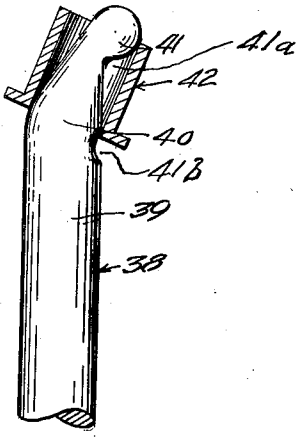
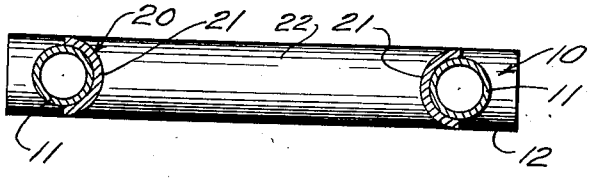


Fig. 9.



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Patented May 14, 1940 2,200,662

UNITED STATES PATENT OFFICE

2,200,662

RIVETING TOOL

Columbus Forrest Welch, Hialeah, Fla.

Application June 20, 1939, Serial No. 280,162

8 Claims. (Cl. 218—19)

This invention relates to riveting machines and has special reference to a machine for utilizing hollow or tubular rivets.

In many mechanical operations it is necessary to perform a riveting operation in a place where it is very difficult or often impossible to insert a rivet and support the same by a dolly so that the projecting end may be hammered for riveting. In other instances it is similarly impossible to insert a rivet for its end to be projected for upsetting by a riveting hammer or die.

I am aware that attempts have been made to utilize a riveting machine which will employ hollow or tubular rivets having the preformed heads on the outside of the structures to be riveted together, the heads to be subsequently formed being located on the inside. In such machines however two classes are employed. In one of these classes the riveting is done between a pair of jaws which are forced together, one of these jaws carrying an upsetting die for the inner unexpanded end of the rivets. In the other of these classes an implement has been inserted through the hollow rivet and spun around to upset the rivet. In the latter class it has been attempted to affect the spinning over of the tubular end by means of a loosely supported spinning member. I have found by experience that this loosely supported spinning member does not make a uniform riveting of the projecting inward end with the consequence that one side or the other is loose and the rivet does not hold properly.

One of the important objects of the present invention is to provide a novel arrangement of the latter class wherein the spinning member is so mounted that no looseness or play will occur and that the shank of the spinning member will so closely fit the tubular rivets that a perfectly uniform spinning of the projecting end will occur so that the rivet will be held uniformly on all sides firmly against the material to be riveted.

A second object of this invention is to provide a device of this character wherein the main and sliding frames are so arranged that by increasing the grip of the hand the riveting member will be forced into riveting position.

A third important object of the invention is to provide a novel device of this character wherein spring means of improved arrangement will restore the riveting member to non-riveting position after the riveting is accomplished.

A fourth important object of the invention is to provide a novel form of riveting nose or head wherein the hollow rivet may slip over and yet fit firmly on the shank of the riveting head.

A further important object of the invention is to provide a device of this character wherein the riveting shaft may be driven either manually or by motor means.

With the above and other objects in view, as will be presently understood, the invention consists in general of certain novel details of construction and combination of parts hereinafter fully described, illustrated in the accompanying drawings, and specifically pointed out in the appended claims.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and:

Figure 1 is a side elevation of the preferred form of the mechanism.

Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is a transverse section illustrating several sheets of fabric or metal with a hollow or tubular rivet inserted therein.

Figure 4 is a view similar to Figure 3 but with the hollow rivet spun into riveting position.

Figure 5 is a sectional view through a modified form of rivet adapted for use in connection with this machine.

Figure 6 is a side elevation of a machine of this character wherein the main frame constitutes the body of an electrical drill or the like.

Figure 7 is a view similar to Figure 6 but showing the top plan view thereof.

Figure 8 is a detailed view showing the end of the riveting member.

Figure 9 is a transverse section of Figure 1 on the line 9—9 thereof.

In the preferred embodiment of the invention there is provided a frame indicated generally at 10. This frame includes a pair of parallel side members 11 of tubular construction and connected at their rear ends by a transverse tubular member 12 which is suitably connected to the rear ends of the members 11 as by welding or the like. The side members 11 extend forwardly from the member 12 and from the forward ends of these members 11 extend converging members 13 which meet as at 14. The forward ends of the members 13 unite to clasp a tubular bearing 15 which extends forwardly and has a reduced forward end 16 to receive the rear portion of a nipple 17 having a flat bearing surface 18 for the headed end of a rivet as will presently be explained. The nipple 17 is secured to the reduced end 16 and is held from accidental rotation thereon by a set screw 19.

Mounted within the frame formed by the

members 11, 12 and 13 is a rectangular frame indicated at 20 in general. This rectangular frame is formed of a pair of segmento-cylindrical side members 21 which are connected at the rear by a transverse tubular member 22 which constitutes a hand grip. The forward ends of the members 21 are similarly connected by a tubular member 23. Thus the inner or sliding frame 20 can slide longitudinally on the members 11 whereon the members 21 are mounted. The tubular member 23 is of generally rectangular cross section and the forward and rear sides of this member 23 are provided respectively with bearing openings 24 wherein is journaled a shaft 25 which is aligned with the opening in the member 15 and extends forwardly therein to the nipple 17.

On the rear end of the shaft 25 is fixed, by a pin 26 or the like, a bevelled gear 27 which meshes with a bevelled gear 28 rotatably mounted on a stub-shaft 29 fixed in one of the side walls of the member 23. In order to prevent forward displacement of the shaft 25 the latter is provided with a keeper screw 30 which is screwed into the rear end of the member 25 and bears against the rear face of the member 23 as best shown in Figure 2. As has been previously stated, the gear 28 revolves upon the shaft 29. This shaft 29 is fixed in the side of the member 23 and the gear 28 is provided with a hub 31 which extends out to the outer end of the stub-shaft 29 and is there secured by a screw 32. On the hub 31 is mounted the hub 33 of a crank arm 34 which has at its outer end a crank handle 35. By this means whenever the crank handle 35 is rotated the gear 28 will be rotated and consequently the gear 27 will be likewise rotated. The rotation of the gear 27 will cause rotation of the shaft 25.

The nipple 17 is provided with an axial relatively small opening 36 and the forward end of the shaft 35 is similarly provided with a relatively small screw threaded opening 37 wherein is screwed the rear end of a riveting member indicated in general at 38. This riveting member consists of a shank 39 which fits snugly into the nipple 17 so that it revolves, upon such motion being imparted to it, without any looseness in the nipple 17. Furthermore the shaft 25 fits so closely in the member 15 that it also revolves without any looseness. Under these circumstances when the shaft 25 is revolved there will be no vibration or lateral movement of the riveting member with respect to the entire device.

The member 38 consists of a body or shank 39 of cylindrical form and projecting angularly from this member is an arm 40 of generally conical form so that the arm reduces in diameter from its connection with the body 39 outwardly. At the terminal portion of this arm is provided a ball member 41 which projects laterally from the body 39 and thus overhangs that body. The proportions of the parts 41, 40 and 39 are such that a tubular rivet may be slipped over the parts 41 and 40 and slide down on the part 39 to closely engage the same so that there can be no rattling or lateral displacement of the rivet with respect to the body 39. In other words the nose 41 is, by this construction, so positioned that when the body 39 is rotated on a fixed axis the ball 41 will press down uniformly on all sides of the hollow rivet.

As shown in Figures 3 and 4 there is disclosed a hollow or tubular rivet indicated in general at 42. This rivet has a cylindrical body portion 43 of uniform internal and external diameters and at one end is provided with a flange or head 44 which projects outwardly from the periphery of the body 43. In performing the riveting operation with this type of rivet there has been indicated a series of plates or laminae 45 having openings 46 therein through which the rivet may be projected so that the body 33 extends therethrough and the flange 44 rests upon the outside of these laminae. Now when the member 38 is, by suitable manipulation, slid into the rivet 42 the ball 41 lies inwardly on the inner end of said rivet. Then, upon gripping the members 12 and 22 in one hand and pressing nose 17 against the head 44 and drawing member 22 toward member 12, the crank 35 may be rotated, pressure being maintained at all times between the members 12 and 22 to urge member 22 toward member 12. The consequence of this is that the ball 41 will engage on the inner edge of the bore of the rivet 42 and will spread the latter out into position such as is shown at Figure 4. Obviously the exact conformation of this rivet will depend largely upon the conformation of the ball 41 so that it is not to be understood that in all cases the rivet will assume the exact position shown in Figure 4. However, since the member 38 revolves around its axis, which axis is held by the operator in substantial coincidence with the axis of the rivet 42, it will be obvious that the riveting flange 47 of the rivet will be uniformly distributed around the inside of the members 45 and will tightly grip these members together. While there has here been shown three members it is obvious that any two or more members may be thus riveted together. It is further obvious that all of this riveting may be accomplished from the exterior of the rivet, that is, the side on which the flange 44 is located. After the riveting is accomplished, it is merely necessary to relax the pressure on the members 22 and 12. Now these members 22 and 12 are so arranged that the member 20 is drawn forwardly upon relaxation of the members 22 and 12. This is accomplished by a pair of coiled tension springs 48 each of which has its rear end connected to a bracket 49 fixed on the member 23 and has its forward end connected on a bracket 50 fixed on the respective member 13. Consequently these springs 48 urge the member 20 forwardly at all times.

It is to be observed that when the device is operated the face 18 contacts with the flange 44 and thus compresses the rivet between the ball 41 and the face 18 of the nipple 17.

While in Figures 3 and 4 the rivet has been shown as having a flat flange 44 yet it is by no means necessary that this flange should have any particular conformation. As in Figure 5, the flange may have a tubular portion 51 and a button-head flange 52 on its outer side. Furthermore the flange may be varied under various conditions since the device is intended particularly for the use of riveting parts of aeroplanes together and under those circumstances the flange such as shown in 44 and 52 may be streamlined in any desired manner.

In Figures 6 and 7 is shown a form of the device adapted for use in connection with an electric or hydraulic drill, the body of the drill being indicated in general at 53. As is usual in such drills there is provided a handle member 54 at the rear end thereof and at the forward end of the drill is provided a collet 55 adapted to grasp the member 38. This collet corresponds to the forward end of the member 15 and the member 38 revolves with the collet. On top of the drill

53 is provided a slide member 56 having a longitudinal slot 57 and member 56 is held to the body 53 by means of suitable bolts 58. The body 56 extends rearwardly of the handle 54 and is provided with a downwardly extending handle portion 59 between which and the rear of the handle 54 is arranged spring means 60 which normally urges the handle 59 away from the handle 54. On the forward end of the body 56 is carried a nipple 66a which corresponds under all conditions to the member 17, having a forward face 61 which forms the abutment for the riveting device when the handle 54 is drawn rearwardly of the handle 59 so that the ball 41 clamps the rivet and, by the rotation effected by the drill 53, causes that ball to rotate around on the inwardly projecting portion of the rivet so as to expand that inward portion in the manner generally indicated in Figure 4.

Obviously, under these circumstances, the device may either be manipulated by hand or be driven by a standard drill apparatus such as is worked by the use of electric current or by hydraulic means.

It has been carefully explained how the device operates with the handle or manually driven device as shown in Figures 1 and 2 and it will be observed that the device may be equally well operated by the mechanism shown in Figures 6 and 7. The head 41 joins the part 40 by a curve 41a and a notch 41b is provided to allow the edge of the member 42 to pass onto the member 38.

In view of what has been described there has been provided a simple and efficient device of the kind set forth and for the purpose intended.

It is obvious that many minor changes may be made in the form and construction of the invention without departing from the material principles thereof. It is not therefore desired to confine the invention to the exact form herein shown and described but it is desired to include all forms which are properly included within the appended claims.

Having thus described the invention, what is claimed as new, is:

1. A main frame, a sliding frame slidably mounted on the main frame to move forwardly and backwardly thereon, a shaft journalled in said frame and slideable longitudinally of the main frame, a guide at the forward end of the main frame, means to rotate said shaft about an axis fixed in respect to said frame, an abutment member fixed on the main frame, and a riveting member carried by said shaft to oppose said abutment member and revoluble with said shaft.

2. In a device of the kind described, a main frame comprising a rear handle grip and a pair of side members extending forwardly therefrom, a sliding frame mounted between said forwardly extending members and composing a pair of sliding members mounted on said forwardly extending members and transverse members connecting the forward and rearward ends of said sliding members, converging members extending forwardly from said main frame slide members, a shaft having its rear end journalled in said sliding frame and its forward end journalled in the converging ends of said converging members, means to rotate said shaft, a bearing carried on said shaft to hold the same in constant axial position relative to said main frame, means urging said sliding frame forwardly, a fixed nipple carried on the forward end of said main frame and constituting a rivet abutment, and a riveting member extending forwardly of said sliding frame and main frame and movable with the former, said riveting member having a nose thereon to engage inside of a tubular rivet.

3. In a device of the kind described, a main frame comprising a rear handle member, a pair of spaced side members extending forwardly from said rear handle member, a pair of converging side members extending forwardly from the front end of side members, a sliding frame consisting of a pair of side members engaging the side members of the main frame and of a pair of transverse members connecting the side members of the sliding frame, a tubular guide carried by the forward ends of the converging members, a nipple fixed on the forward end of the tubular guide and having an axial opening therethrough, a shaft closely fitting said tubular guide for revolution and sliding movement therein, a rod fixed on the forward end of said shaft and closely fitting in the opening of the said nipple, said rod being revoluble in and slideable through said nipple opening, a spinning head on said rod offset laterally from the axis thereof, and means to rotate said shaft.

4. In a device of the kind described, a main frame comprising a rear handle member, a pair of spaced side members extending forwardly from said rear handle member, a pair of converging side members extending forwardly from the front end of side members, a sliding frame consisting of a pair of side members engaging the side members of the main frame and of a pair of transverse members connecting the side members of the sliding frame, a tubular guide carried by the forward ends of the converging members, a nipple fixed on the forward end of the tubular guide and having an axial opening therethrough, a shaft closely fitting said tubular guide for revolution and sliding movement therein, a rod fixed on the forward end of said shaft and closely fitting in the opening of the said nipple, said rod being revoluble in and slideable through said nipple opening, a spinning head on said rod offset laterally from the axis thereof, journalled openings in the forward transverse slide member and receiving the rear end of said shaft, a stub-shaft extending laterally from the central portion of the forward transverse slide member, a bevel gear fixed on the rear portion of said first mentioned shaft, a second bevel gear revolubly mounted on the stub-shaft and meshing with the first bevel gear, and a crank handle attached to the second bevel gear.

5. In a device of the kind described, a main frame comprising a rear handle members, a pair of spaced side members extending forwardly from said rear handle member, a pair of converging side members extending forwardly from the front end of said side members, a sliding frame consisting of a pair of side members engaging the side members of the main frame and of a pair of transverse members connecting the side members of the sliding frame, a tubular guide carried by the forward ends of the converging members, a nipple fixed on the forward end of the tubular guide and having an axial opening therethrough, a shaft closely fitting said tubular guide for revolution and sliding movement therein, a rod fixed on the forward end of said shaft and closely fitting in the opening of the said nipple, said rod being revolvable in and slidable through said nipple opening, a spinning head on said rod offset laterally from the axis thereof, journalled openings in the forward transverse slide member and receiving the rear

end of said shaft, a stub-shaft extending laterally from the central portion of the forward transverse slide member, a bevel gear fixed on the rear portion of said first mentioned shaft, a second bevel gear revolvably mounted on the stub-shaft and meshing with the first bevel gear, and spring means urging said slide forwardly.

6. A spinning head for a riveting machine of the class described and comprising a cylindrical body portion, a conical portion, and a ball end, said conical portion connecting said ball end and said body portion, the axis of said conical portion extending at an angle to the axis of said body portion, the ball end projecting laterally from the conical portion in the direction of tilt of said conical portion.

7. A spinning head for a riveting machine of the class described and comprising a cylindrical body portion, a conical portion, and a ball end, said conical portion connecting said ball end and said body portion, the axis of said conical portion extending at an angle to the axis of said body portion, the ball end projecting laterally from the conical portion in the direction of tilt of said conical portion, there being a small recess on one side of said body portion where said body portion merges with said conical portion.

8. A spinning head for a riveting machine of the class described, and comprising a cylindrical body portion, a conical portion, and a ball end, said conical portion connecting said ball end and said body portion, the axis of said conical portion extending at an angle to the axis of said body portion, the ball end projecting laterally from the conical portion in the direction of tilt of said conical portion, there being a small recess on one side of said body portion where said body portion merges with said conical portion, said side being radially alined with said ball end.

COLUMBUS FORREST WELCH.