Nov. 13, 1934. K. BODDEN 1,980,181

AUTOMATIC RIVETER

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Fig. 1.

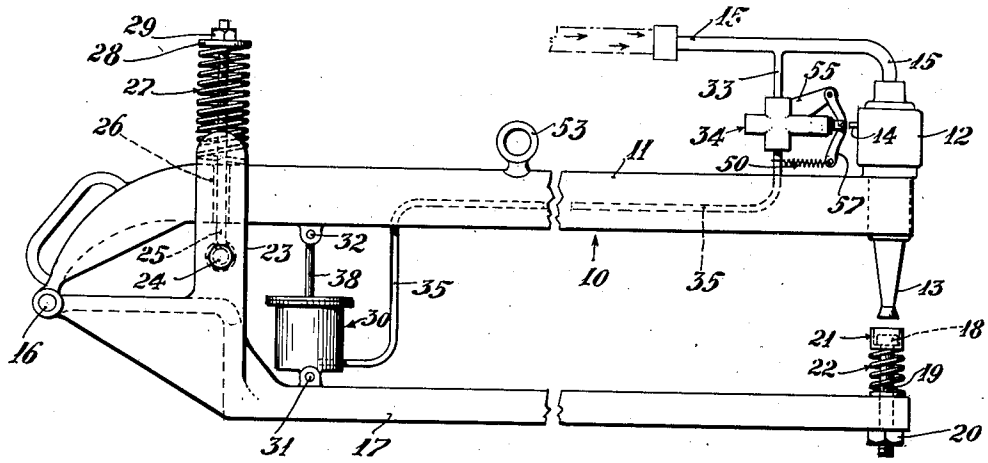
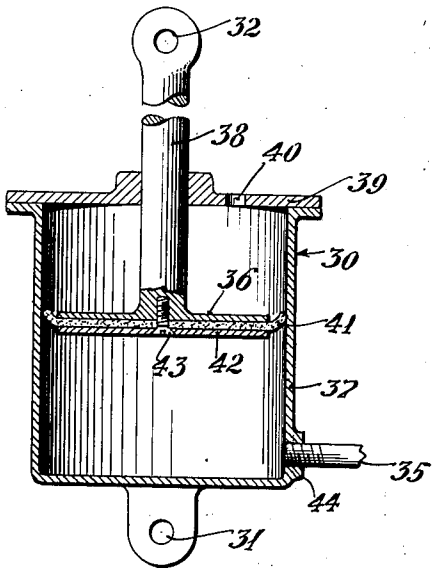


Fig. 2.



INVENTOR
Karl Bodden
BY W. E. Stalk Jr.
ATTORNEY

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Fig. 3.

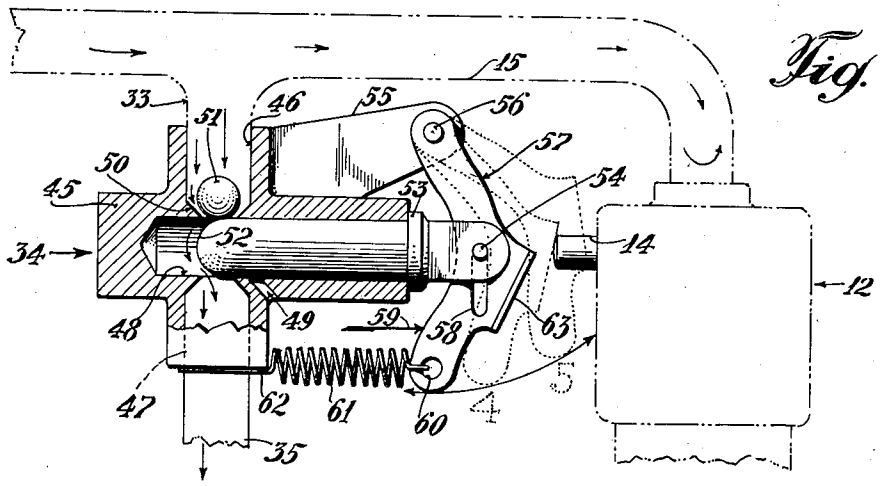


Fig. 4.

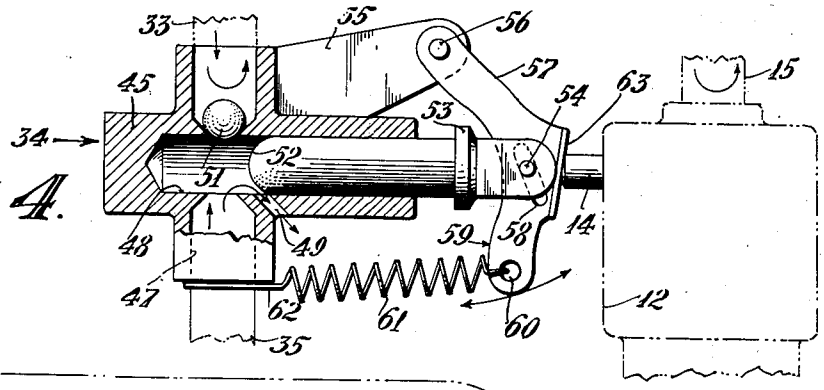
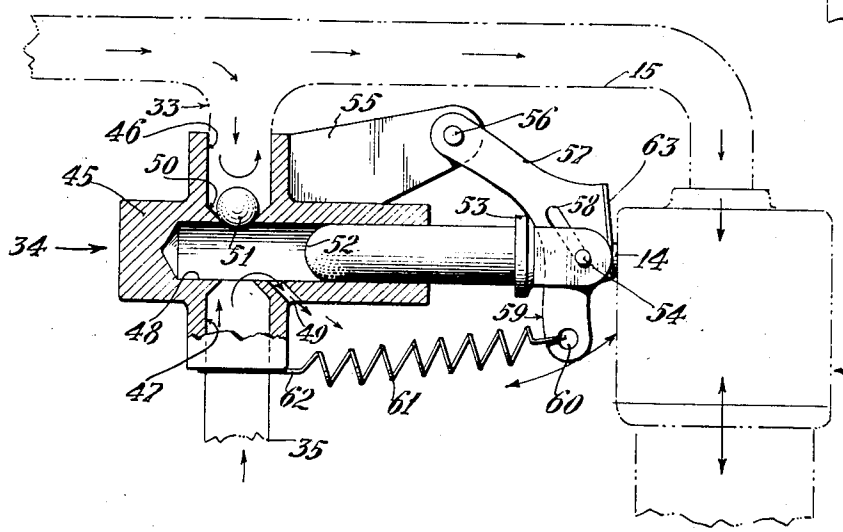


Fig. 5.



INVENTOR
Karl Bodden
BY W. Stack
ATTORNEY

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UNITED STATES PATENT OFFICE

1,980,181

AUTOMATIC RIVETER

Karl Bodden, Bristol, Pa., assignor to Keystone Aircraft Corporation, a corporation of Delaware

Application June 8, 1932, Serial No. 615,993

3 Claims. (Cl. 78—52)

My invention relates to pneumatic tools and more particularly to an automatic self-bucking pneumatic rivet hammer.

Objects of my invention are: (1) To provide a portable unitary automatic riveter so constructed that one man may simultaneously drive and buck the rivet; (2) To provide a control means on an automatic riveter whereby the operator may selectively separate the bucking bar from the work, clamp the bar against the work, and operate the rivet gun; (3) To provide a simple unitary control means for a pneumatic automatic riveter; (4) To provide an automatic riveter operable by one man, capable of fast manipulation; (5) To provide an automatic riveter with self-bucking features which may be used to drive rivets spaced at a considerable distance from the edge of material to be riveted; and (6) To provide an automatic riveter capable of complete riveting operations in limited spaces.

Further objects will be apparent from a reading of the subjoined specification and claims and from a consideration of the accompanying drawings.

Particularly in the fabrication of aircraft parts, small duralumin rivets find great utility. Permanent structures may be rigidly and effectively assembled by rivets which otherwise would require more expensive bolts and nuts, and more particularly in the fabrication of seaplane hulls rivets are particularly adaptable to assemble and join covering plates on such hulls with a minimum possibility of leakage. Prior to my invention, it has been necessary to employ the services of two operators in driving rivets for assembling the various structures. One operator operates a hammer or a pneumatic reciprocating hammer to head the rivets, while the other operator must hold a bar on the opposite side of the work being assembled in order to brace the rivet against the impact of the rivet hammer. Although two men can do this work effectively, it is obvious that if the work can be done with equal facility by one man, considerable saving in time and cost of production will result.

It is well known that automatic riveting machines have been used for the fabrication of subassemblies wherein such machines are fixed to the floor of the shops or are semi-portable. Such machines usually operate to squeeze hot rivets in place and are useful only where the work may be brought to the machine. I am not aware of any portable device employing a reciprocating pneumatic rivet gun wherein a bucking bar is an inherent part of the tool, wherein the tool may reach a considerable distance from the edge of work, wherein the bucking bar is so arranged with respect to the rivet hammer that it can be released from the work independently of the action of said rivet hammer, and wherein it can be easily handled by a single operator. My invention aids the fabrication of airplane parts, particularly when such parts are being assembled to their final form. The tool may be used in conjunction with curved surfaces and partially enclosed surfaces which would otherwise require loss of time where a second man must enter the structure to back up the rivets, and, not being visible to the hammer operator, must necessarily feel around in the dark to determine that portion of the structure where rivets are to be driven. By my tool, the bucking bar automatically centers itself at the exact point where the rivet is to be driven—when the rivet hammer is applied to a particular rivet, the bucking bar must necessarily be applied to the opposite end of the rivet, and loss of time is eliminated.

By the novel construction of my tool, I am able to provide a riveter with a reach up to four feet; that is, rivets can be driven by one man as far as four feet from the edge of a sheet of material. At the same time, the riveter is light in weight, thereby being easily manipulated. I avoid the rigid and heavy structure that would be mandatory for a rivet squeezing machine, using instead a bar hinged to an arm carrying the rivet hammer and urged toward the arm by resilient means. Such flexible construction lends itself to lightness, and still makes a tool that is fast and efficient in operation.

In order to explain my invention more clearly, an embodiment thereof is shown in the accompanying drawings, wherein similar numbers designate similar parts, and in which:

Fig. 1 is an elevation of the riveter;

Fig. 2 is a section of a portion of Fig. 1; and

Figs. 3, 4 and 5 are partial sections of a part of Fig. 1, in various positions of adjustment.

More particularly, my automatic riveter 10 comprises a reciprocating pneumatic rivet hammer 12 of any conventional design, having a trigger 14 and an air inlet hose 15 supplied with compressed air from an external source, mounted at one end of an arm 11. Such a pneumatic rivet hammer 12 comprises a body portion containing air valves automatically operable to cause reciprocation of a head 13 when compressed air is admitted to said valves through the air hose 15. Stopping and starting of the reciprocating action is controlled by the trigger 14 mounted conveniently on the

body of the hammer 12. Rivet hammers of such a nature are commercially available in a variety of sizes and from several manufacturers. The opposite end of the arm 11 is supplied with a hinge fitting 16 to which is hinged a bucking bar 17. The bucking bar 17 is adapted to register with the head 13 of the pneumatic rivet hammer 12, and is provided with a contact device at its end comprising an anvil 18 on a bolt 19, secured to the bucking bar 17 by means of a nut 20. A sleeve 21 is formed around the anvil 18 and is adapted to slide on the bolt 19. This sleeve 21 is backed up by a spring 22, resiliently urging the sleeve 21 toward the head 13. As the bucking bar 17 is brought closer to the arm 11 in a manner hereinafter to be described, the sleeve 21 first engages the metal sheets to be riveted, said sheets having previously been inserted between the head 13 and the anvil 18. Upon further movement of the bucking bar 17 toward the arm 11, the sleeve 21 slides upon the bolt 19 against the compression of the spring 22 and the anvil 18 is brought into contact with the lower end of a rivet inserted in an opening in the plates (not shown). By actuating the trigger 14, the head 13 is caused to reciprocate and to head the rivet against the anvil 18.

The bar 17 is constantly resiliently urged toward the arm 11 by the action of the spring 27. The bar 17 is supplied with members 23 extending on either side of the arm 11, acting as sliding guides therefor. Thus, the bar 17 may swing about the hinge 16 with relation to the arm 11 and the guide members 23 serve to align the anvil 18 and the head 13. Between the arm 11 and the bar 17, through the guide members 23, is a pivot 24. On the pivot 24 is an eye-bolt 26, extending through the opening 25 formed in the arm 11. The spring 27 surrounds the exposed portion of the eye-bolt 26 and bears at one end against the arm 11, and bears at its other end against a washer 28 retained on the rod 26 by means of the nut 29. Thus, the bar 17 is constantly resiliently urged toward the arm 11 by compression of the spring 27. Adjustment of the compression of the spring 27 is effected by screwing the nut 29 down on the eye-bolt 26.

In order to cause separation of the bar 17 from the arm 11, to insert work to be riveted between the head 13 and the anvil 18, a pneumatic device 30 is pivoted at 31 to the bar 17, and at 32 to the arm 11. Air under pressure is supplied to the device 30 through the passage 35, which air in turn is controlled by the valve 34 which receives air through the passage 33 from the inlet hose 15.

The construction of the pneumatic device 30 is shown in detail in Fig. 2. A cylinder 37 closed at one end and open at its other end, carries a pivot boss 31 at its closed end. The open end of the cylinder is covered by a cap 39 having formed therein an air vent 40 and having formed therein an opening through which the piston rod 38 may slide. The piston rod 38 is supplied at one end with an eye 32 adapted for engagement with the arm 11. At its opposite end it carries a piston head 36 resembling a disc in form. Over the head 36 is a packing disc 41 held in place by a retaining disc 42. The disc 42 is retained in proper position by means of a screw 43 engaging the piston rod 38. An opening 44 toward the closed end of the cylinder 37 allows air to enter from the passage 35 into the closed space bounded by the piston head 36 and the cylinder 37. By admission of compressed air through the opening 44, the piston is driven toward the open end of the cylinder, and 31 and 32 are caused to separate thereby causing separation of the arm 11 from the bar 17 about the hinge 16. Releasing of pressure from the cylinder 37 causes movement of the arm 11 toward the arm 17 through the resilient action of the spring 27.

Entrance of compressed air to and release of air from the cylinder 37 is controlled by the valve 34 which is mounted on the arm 11 adjacent the rivet hammer 12. The valve 34, shown in its three operating positions in Figs. 3, 4 and 5, comprises a valve body 45 having formed therein an air inlet opening 46, an air opening 47, a plunger guide opening 48 and an exhaust opening 49. The opening 46 is connected through 33 to the compressed air supply and is provided at its inner end with a valve seat 50 and a ball check valve 51. The ball 51 in its seated position lies partially within the plunger guide opening 48. A plunger 52 is adapted to slide within the plunger guide opening 48. The plunger 52 is rounded at its inner end and is provided with a stop 53 and a pin 54 toward its opposite end. The valve body 45 is provided with a bracket 55 having a pivot 56 which engages an operating arm 57. The arm 57 has an opening 58 adapted to engage the pin 54 on the plunger 52. At its lower end, the operating arm 57 is provided with a finger space 59 and an opening 60 engageable with a spring 61 which at its opposite end engages the valve body 45 at 62. The spring 61 resiliently urges the operating arm 57 toward the valve body 45, and thereby urges the plunger 52 into the plunger guide opening 48. The stop 53 may abut the valve body 45, limiting the travel of the plunger 52.

Fig. 3 shows the valve mechanism in the position adapted for separation of the arm 11 from the bar 17. The plunger 52 at its inner end unseats the ball 51 from its seat 50, allowing compressed air from the connection 33 to pass the ball 51, enter the plunger guide opening 48, and pass through the air opening 47, through the passage 35 to the cylinder 37. The bar 17 and the arm 11 are then separated as heretofore described.

Upon finger pressure on the operating arm 57, the arm 57 is moved to the position of Fig. 4. In this position, the plunger 52 is withdrawn so that the ball 51 is allowed to contact its seat 50, thus stopping the flow of compressed air through the valve. Likewise, in the position of Fig. 4 the plunger 52 is withdrawn sufficiently to uncover the opening 49, thereby allowing compressed air in the cylinder 37 to pass through the passage 35, through the opening 47 and out to the atmosphere through the passage 49, allowing the arm 11 and the bar 17 to be drawn toward each other by the action of the spring 27.

Further finger pressure on the operating arm 57 withdraws the plunger 52 without effecting the entrance or egress of air from the cylinder 37. However, the operating arm 57 has formed thereon a contact surface 63 registering with the trigger 14 of the pneumatic hammer 12. In the position of Fig. 4, the contact surface 63 just touches the trigger 14. In the position of Fig. 5, the contact surface 63 engages and depresses the trigger 14, causing entry of air to and reciprocation of the rivet hammer 12.

In operating the automatic riveter 10, the operator locates the device, without pressure on the operating arm 57, whereby the arm 11 and the bar 17 are separated, so that the head 13 is over the rivet which he desires to drive. Then, by

pressing the operating arm 57 to the position of Fig. 4, the anvil 18 of the bucking bar 17 is caused to abut the lower end of the rivet. By further pressure on the operating arm 57 to the position shown in Fig. 5, the rivet hammer 12 is actuated through the trigger 14 and the rivet is driven. After the rivet is driven, the operator releases pressure on the operating arm 57, causing the trigger 14 to be released to the position of Fig. 3, thereby causing compressed air to flow to the cylinder 37, separating the arm 11 from the bar 17, whereupon the riveter 10 may be moved along to the next rivet to be driven.

By the unique construction of the riveter 10, an operator can move the riveter relative to the work, with the bucking bar abutting the rivet, without actuating the rivet gun. Prior devices of somewhat similar nature have not provided for such selective operation. They require the driving of the rivet simultaneously with actuation of the bucking bar or bucking member. Likewise, prior devices have not provided for a long reach over the work to be riveted as provided for by the arm 11 and the bar 17 which may be made of any reasonable length to accommodate the work.

In addition to the mechanism already described, an eye 53 may be attached to the arm 11 whereby the whole riveter may be suspended on a counter-balanced cable supported on a portable sheave, and readily moved around to accommodate any type of work which may be in process.

While I have described my invention in detail in its present preferred embodiment, it will be obvious to those skilled in the art, after understanding my invention, that various changes and modifications may be made therein without departing from the spirit or scope thereof. I aim in the appended claims to cover all such modifications and changes.

I claim as my invention:

1. An automatic riveter comprising in combination, a reciprocating pneumatic rivet hammer having a trigger, a bar associated with and movable with respect to said hammer, a pneumatic device adapted to move said bar with respect to said hammer, an air control valve for controlling air flow to and from said pneumatic device, and an operating member selectively operable to move said valve and said trigger.

2. An automatic riveter comprising in combination, a reciprocating pneumatic rivet hammer having a trigger, an arm on which said hammer is mounted, a bar hinged to said arm and aligned with a portion of said hammer, resilient means for urging said bar toward said hammer, pneumatic means for urging said bar away from said hammer, a valve body close to said hammer having a plurality of mutually communicating openings, one said opening being connected to an air supply, another said opening being connected to said pneumatic means, another said opening communicating with the atmosphere, a movable member engaging within still another said opening and adapted at times to operate said hammer trigger, and means for selectively operating said movable member and to depress said trigger, to connect said air supply with said pneumatic device, or to connect said pneumatic device with the atmosphere.

3. In an automatic riveter having a member carrying a pneumatic rivet hammer; a member for bucking said hammer; a pneumatic device for separating said members; and a control valve for said device comprising a valve body mounted on one said member, said body having an opening for communication with an air supply, a check valve seating in a portion of said body normally arranged to prevent entrance of air into said body, said body having a second opening within which a movable member is adapted to slide, said member in a first position of adjustment being adapted to open said check valve to permit entrance of air from said supply to said body, and having a second position of adjustment adapted to allow said check valve to close, said body having a third opening communicating with said pneumatic device and adapted to communicate with said body in both said positions of adjustment of said member, said body having a fourth opening communicating with the atmosphere and with said body only when said member is in said second position of adjustment; and a trigger on said hammer, said movable member having a third position of adjustment for operating said trigger.

KARL BODDEN.