

Feb. 8, 1944.

L. A. WARD

2,341,167

RIVETING MACHINE

Original Filed June 3, 1938

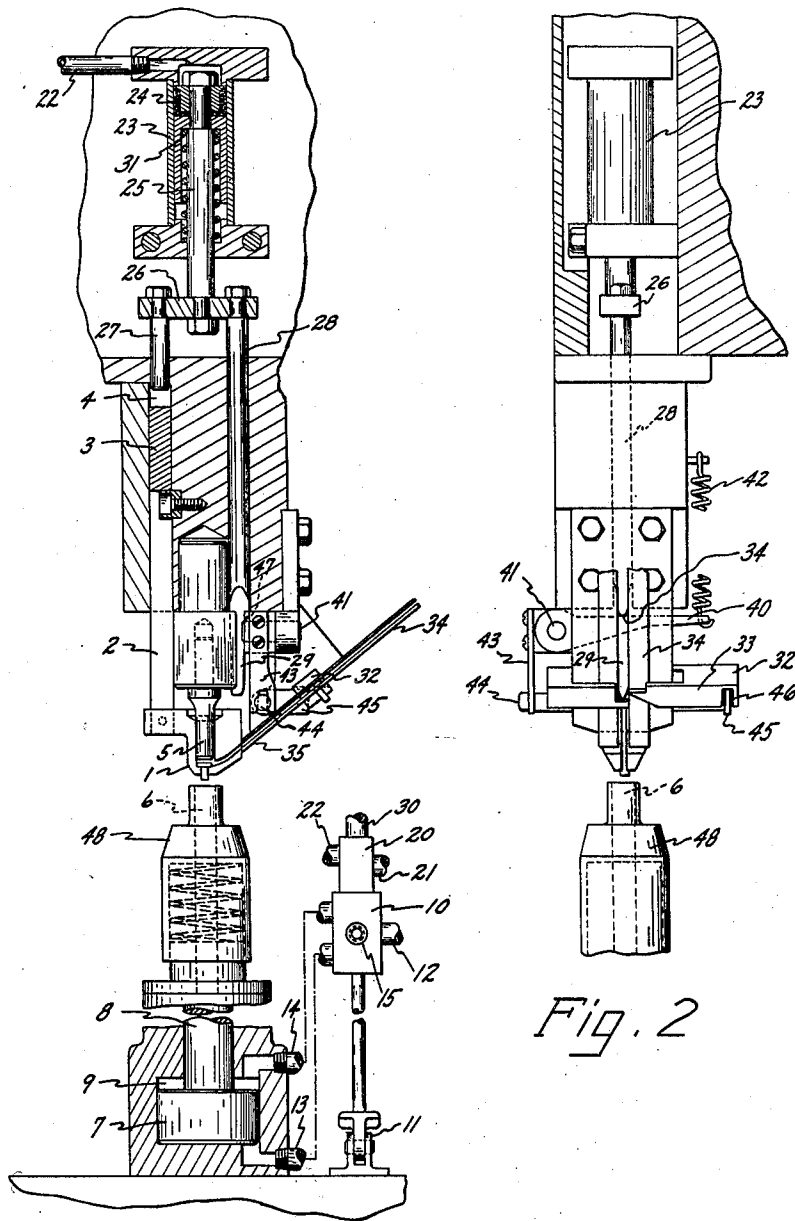


Fig. 2

Fig. 1

LLOYD A. WARD

By *Beaman & Langford*
Attorney

Inventor

UNITED STATES PATENT OFFICE

2,341,167

RIVETING MACHINE

Loyd A. Ward, Detroit, Mich., assignor to
Tomkins-Johnson Company, Jackson, Mich., a
corporation of Michigan

Original application June 3, 1938, Serial No.
211,500, now Patent No. 2,306,851, dated Decem-
ber 29, 1942. Divided and this application
March 16, 1942, Serial No. 434,840

5 Claims. (Cl. 78—48)

This invention relates to riveting machines and more particularly to riveting machines hydraulically actuated and designed for work on aluminum alloy constructions, such as in aircraft manufacture.

In the production riveting of aircraft structures and the like great uniformity and precision are essential. It has been found that these desiderata, together with speed of operation, can be obtained by the use of a riveting machine wherein the rivet is suspended beneath a downwardly facing anvil, to receive the work thereon prior to heading up, and providing an upwardly facing set which is hydraulically actuated to upset the rivet on the work. The present invention includes these features, and the structure disclosed is illustrative of a way in which the invention can be carried out. This application is a division of my copending application Serial No. 211,500, filed June 3, 1938, now Patent No. 2,306,851, dated December 29, 1942.

An object of the invention is to provide a riveting machine having structure to support a rivet beneath a downwardly facing anvil, and an upwardly movable set to head up the rivet.

Another object of the invention is to provide a fixed downwardly facing anvil having movable jaws associated therewith.

Still another object of the invention is to provide a fixed downwardly facing anvil having movable jaws associated therewith and mechanism for timing movement of the jaws and the feeding of a rivet thereto.

These and other objects residing in the arrangement, combination and construction of the parts will be apparent from the following specification when taken with the accompanying drawing in which

Fig. 1 is a partial vertical section of the invention, and

Fig. 2 is a partial side view, partly in section, of the structure illustrated in Fig. 1.

Referring particularly to the drawing, the reference character 1 indicates clamping jaws for holding a rivet while work to be riveted is manipulated to dispose a rivet held in the jaws 1 in a rivet hole in the work. The jaws 1 are of the character disclosed in my copending application, Serial No. 101,210, filed September 17, 1936, and are mounted on depending cantilever leaf springs 2 secured on opposite sides of the block 3 slidable in a vertical passageway 4. The jaws 1, the cantilever leaf springs 2 and the block 3 are arranged to move upwardly and to be spread by the anvil 5 when a set 6 is moved up-

wardly to upset the rivet. The jaws 1 are thus moved completely out of position between the anvil 5 and the set 6.

Movement of the set 6 is accomplished by a hydraulic piston 7 acting against a piston rod 8 connected to the set 6. The piston 7 reciprocates in a cylinder 9 under the control of a hydraulic distributing valve 10, which is actuated by a foot pedal 11. The valve 10 is arranged to conduct hydraulic fluid under pressure from a source 12 through a conduit 13 into the cylinder 9 beneath the piston 7 to move the piston rod 8 and thus the set 6 upwardly. At the same time, exhaust hydraulic fluid from the cylinder 9 above the piston 7 is exhausted through the conduit 14, the valve 10 and the outlet 15. When a predetermined pressure has been reached, the valve 10 automatically acts to admit hydraulic fluid from the source 12 to the conduit 14 into the cylinder 9 above the piston 7 to withdraw the set 6. At the same time fluid is exhausted from the lower side of the cylinder 9 to the conduit 13 and the outlet 15 of the valve 10.

The valve 10 is also provided with a compressed air distributing valve 20, conventional in structure and arranged to conduct air from a compressed air source 21 through the conduit 22 to the upper end of a cylinder 23, in which is disposed a piston 24 having connected thereto a piston rod 25. The piston rod 25 has connected to the lower end thereof a yoke 26, to the ends of which are connected rods 27 and 28.

The function of the piston 24, and the rods 27 and 28 which it controls, is for moving the rivet clamping jaws 1 downwardly into rivet clamping position and to prepare the jaws 1 for receiving another rivet for the next riveting operation. The rod 27 is movable vertically in the vertical passageway 4 and is arranged to engage with the top of the block 3 to force the same downwardly, thereby forcing the jaws 1 downwardly off the anvil 5, on the opposite sides of which they have been forced by the upcoming work pushed by the set 6. It will be clear that when the jaws 1 are disposed on the opposite sides of the anvil 5, they are spread apart and resiliently urged against the sides of the anvil 5 by the leaf springs 2. In order to keep the jaws 1 slightly spread apart after they have moved to their lower position so that a new rivet may be disposed therebetween, a wedge 29 at the lower end of the rod 28 is arranged to move between the jaws 1 while they are still spread apart by the anvil 5. It will thus be clear that the normal distance between the top of the jaws 1 and the bottom of the wedge 29 is less

than the distance between the bottom of the rod 27 and the top of the block 3. Thus, by the time the rod 27 strikes the top of the block 3, the wedge 29 will already have moved into position between the jaws 1 to hold them apart.

The valve 20 is arranged to operate in such a manner that as the valve 10 reverses the movement of the piston 7 to move it downwardly, compressed air is admitted through the valve 20 and the conduit 22 to the cylinder 23 to lower the piston 24 with the results described. By the time the piston 7 reaches the bottom of its stroke, the distributing valve 20 automatically operates to disconnect the inlet 21 from the conduit 22 and to connect the conduit 22 to the exhaust 30 to exhaust compressed air from the cylinder 23. The result is that the spring 31, bearing against the piston 24 and the lower end of the cylinder 23, resiliently urges the piston 24, and together with it the piston rod 25, the yoke 26 and the rods 27 and 28, into their upper positions. However, in the meantime, selecting mechanism 32 has been actuated to dispose a new rivet between the jaws 1, so that as the rod 28 is raised from between the jaws 1, the new rivet is clamped therebetween and is ready to receive the work thereover.

The rivet selecting mechanism 32 comprises a transversely movable shuttle or selector 33 of the character described in the copending application of Loyd A. Ward et al., Serial No. 192,946, filed February 28, 1938. The selector 33 is associated with a chute 34 and is moved laterally to select a rivet from the chute 34 and to let it fall by gravity down the chute 35 to position it between the jaws 1.

The mechanism for laterally reciprocating the selector 33 comprises a lever 40 oscillatable about a pivot 41 and yieldingly urged upwardly by a spring 42. The lever 40 has connected thereto a leaf spring 43, which is in operative engagement with a horizontally slidable member 44 reciprocable horizontally as the lever 40 is oscillated about the pin 41. The opposite end of the member 44 is provided with an outwardly extending cantilever leaf spring 45 disposed in a slot 46 in the selector 33. The lever 40 is oscillated about the pin 41 by a shoulder 47 comprising a portion of the rod 28. Thus, as the rod 28 moves downwardly under the action of the piston 24 and the piston rod 25, the lever 40 is oscillated downwardly against the action of the spring 42 to move the leaf spring 43 to laterally move the member 44, which, through the leaf spring 45, laterally moves the selector 33 to select a single rivet from the chute 34 to let it fall by gravity into the chute 35. It will be understood that as the piston 24 moves upwardly to move the rod 28 upwardly to remove the wedge 29 from between the jaws 1 to clamp the rivet therebetween, the lever 40 is moved upwardly under the action of the spring 42 to set the selector 33 for the next selecting operation.

The operation of the invention is as follows: The work is moved over the rivet held between the jaws 1. The operator then moves down the foot pedal 11, which admits hydraulic fluid to the cylinder 9 to move the piston 7 upwardly to upset the rivet by means of the set 6. The set 6 has operatively associated with it a conventional stripper 48. As the set 6 moves the work upwardly, the jaws 1 are spread over the anvil 5 until they are out of position between the anvil 5 and the set 6. When a predetermined pressure has been reached, the hydraulically controlled valve

10 automatically acts to return the piston 7 to its lower or starting position. At the same time the compressed air distributing valve 20 admits compressed air through the conduit 22 to the top of the cylinder 23 to move the piston 24, and together with it the rods 27 and 28, downwardly. The downward movement of the rod 28 disposes the wedge 29 between the jaws 1 to maintain them spread apart while the rod 27 abuts against the top of the block 3 to move the jaws 1 down into starting position. As the rod 28 moves downwardly, the shoulder 47 thereon actuates the selecting mechanism 32 through the lever 40 to move the selector 33 to dispose a rivet from the chute 34 into position between the jaws 1. At the time the piston 7 reaches its lowermost position, the compressed air distributing valve 20 acts to automatically exhaust the compressed air from the top of the cylinder 23 to permit the spring 31 to move the piston 24, and thus the piston rod 25, and the rods 27 and 28, upwardly to permit the leaf spring 2 to clamp the jaws 1 against the rivet held therebetween for the next riveting operation.

From the foregoing specification it will be clear that the present invention is not limited to a single form of structure, and that the disclosed embodiment of the invention is only one form that the invention may take. It will be further understood that where automatic and semiautomatic controls have been used, other controls of a like nature performing equivalent functions may be used if desired. While it has been hereinabove set forth that the present invention is particularly adaptable for use on aluminum alloy constructions and in aircraft manufacture, it is to be understood that the invention is not limited to any of these uses.

Having thus described my invention, what I desire to secure by Letters Patent and claim is:

1. In a riveting machine, an anvil; a pair of rivet clamping jaws arranged to clamp a rivet in operative relation to said anvil, means supporting said jaws arranged to permit said jaws to move over said anvil during the heading up operation of the machine, means to feed a rivet to said jaws when disposed away from said anvil, means to move said jaws after the heading up operation and at the same time to hold said jaws apart for receiving therebetween a rivet from said rivet feeding means, and means to withdraw said holding means from operative position to permit said jaws to clamp the rivet fed to them therein, a set, and means to move said set toward said anvil to upset the rivet against said anvil.

2. In a riveting machine, a downwardly facing anvil, a pair of rivet clamping jaws associated with said anvil arranged to normally clamp a rivet beneath said anvil and in operative relation thereto, means supporting said jaws arranged to permit said jaws to move upwardly over said anvil during the heading up operation of the machine, a rivet selector, means to actuate said selector, means to move said jaws downwardly after the heading up operation and at the same time to hold said jaws apart for receiving therebetween a rivet from said selector, and means to withdraw said holding means from operative position to permit said jaws to clamp the rivet fed to them therein, an upwardly facing set, and means to move said set upwardly to upset the rivet against said anvil.

3. In a riveting machine, an anvil, a pair of rivet clamping jaws arranged to clamp a rivet in operative relation to said anvil, means sup-

porting said jaws arranged to permit said jaws to move over said anvil during the heading up operation of the machine, a rivet selector, means to actuate said selector, means to move said jaws after the heading up operation and at the same time to hold said jaws apart for receiving therebetween a rivet from said selector, and means to withdraw said holding means from operative position to permit said jaws to clamp the rivet fed to them therein, a set, and means to move said set toward said anvil to upset the rivet against said anvil.

4. In a riveting machine, a downwardly facing anvil, a pair of rivet clamping jaws associated with said anvil arranged to normally hold a rivet beneath said anvil and in operative relation thereto, means supporting said jaws arranged to permit said jaws to move upwardly over said anvil during the heading up operation of the machine, a rivet selector, means to move said jaws downwardly after the heading up operation and at the same time to hold said jaws apart for receiving therebetween a rivet from said selector, means operatively connected to said holding means for actuating said selector, and means to withdraw said holding means from operative position to permit said jaws to clamp the rivet fed

to them therein, an upwardly facing set, and means to move said set upwardly to upset the rivet against said anvil.

5. In a riveting machine, an anvil, a pair of rivet clamping jaws arranged to clamp a rivet in operative relation to said anvil, means supporting said jaws arranged to permit said jaws to move over said anvil during the heading up operation of the machine, means to feed a rivet to said jaws when disposed away from said anvil, means to move said jaws after the heading up operation and at the same time to hold said jaws apart for receiving therebetween a rivet from said rivet feeding means, said last named means comprising a yoke having a projecting member for lowering said jaws and a second projecting member having a portion for insertion between said jaws for holding the same apart, and means to withdraw said yoke to withdraw said holding means from operative position to permit said jaws to clamp the rivet fed into them therein, and at the same time to withdraw said first named projecting member from jaw lowering position, a set, and means to move said set toward said anvil to upset the rivet against said anvil.

LOYD A. WARD.