Feb. 26, 1946. C. R. BUCHET 2,395,721

APPARATUS FOR MAKING RIVETS

Filed Sept. 20, 1944 2 Sheets-Sheet 1

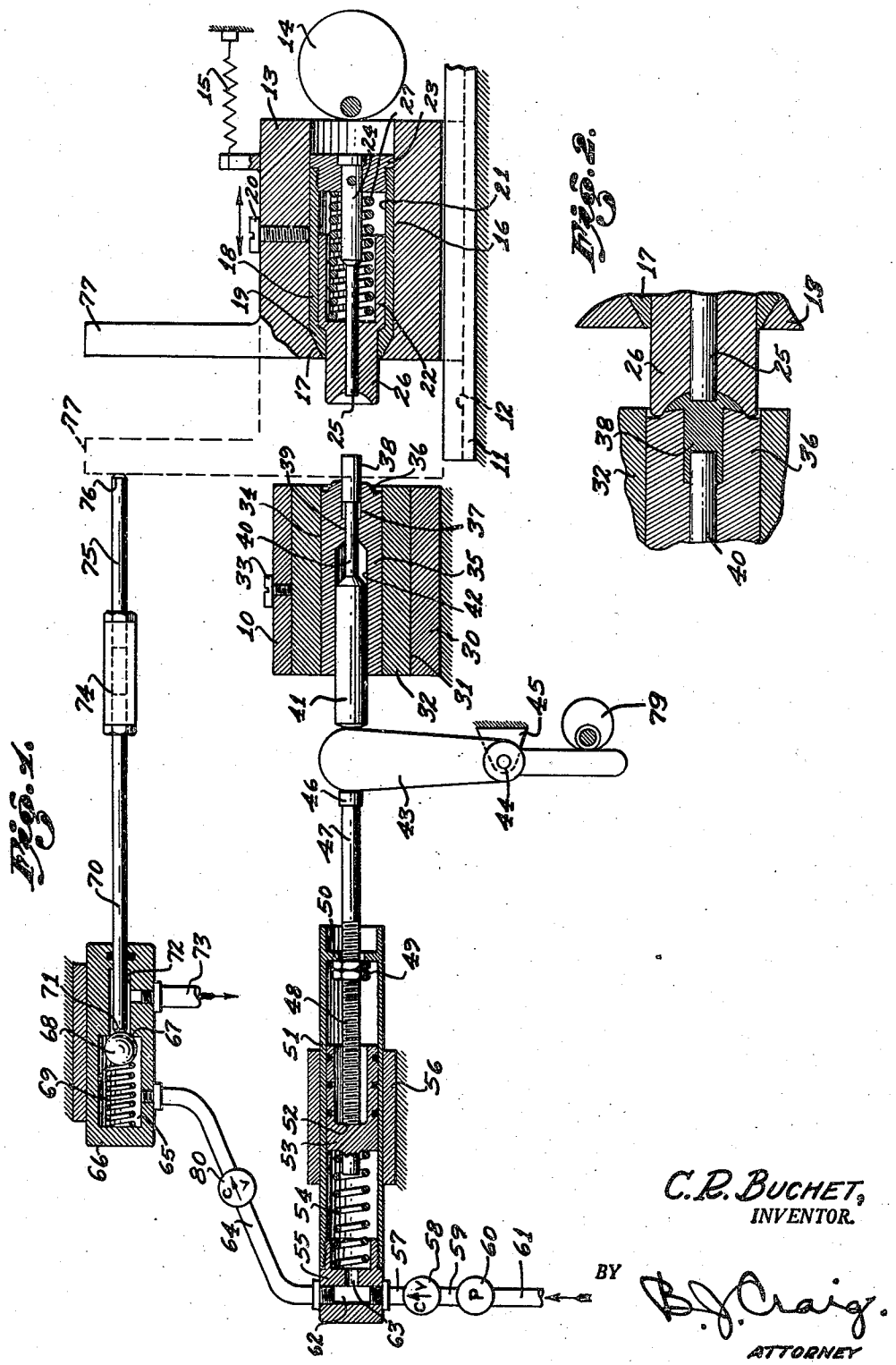


Fig. 1.

Fig. 2.

C. R. BUCHET,
INVENTOR.

BY B. J. Craig.
ATTORNEY

Feb. 26, 1946. C. R. BUCHET 2,395,721

APPARATUS FOR MAKING RIVETS

Filed Sept. 20, 1944 2 Sheets-Sheet 2

Fig. 3.

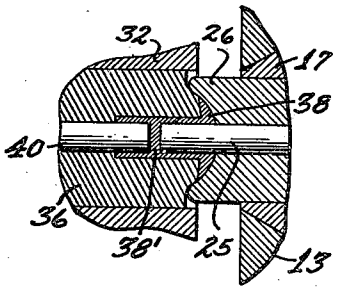


Fig. 4.

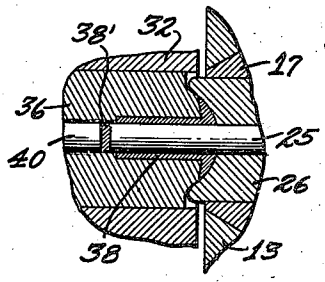


Fig. 5.

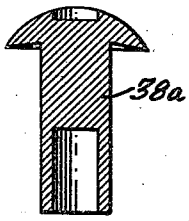


Fig. 6.

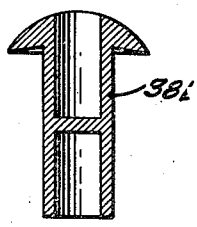


Fig. 7.

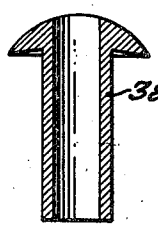


Fig. 8.

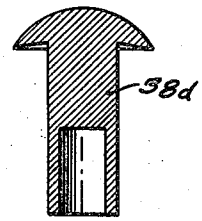


Fig. 9.

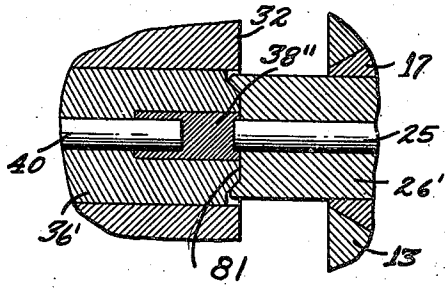


Fig. 10.

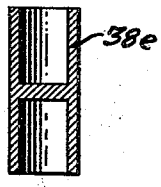
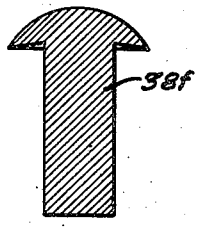


Fig. 11.



C. R. BUCHET,
INVENTOR.

BY B. J. Craig,
ATTORNEY

Patented Feb. 26, 1946 2,395,721

UNITED STATES PATENT OFFICE

2,395,721

APPARATUS FOR MAKING RIVETS

Conrad R. Buchet, Pasadena, Calif., assignor of one-half to Milton H. Lees, Jr.

Application September 20, 1944, Serial No. 554,993

7 Claims. (Cl. 10—11)

This invention relates to a method and apparatus for forming rivets.

A general object of the invention is to provide a novel apparatus for forming rivets which is particularly adapted for use in making rivets of the tubular type.

A more specific object of the invention is to provide a rivet making apparatus including novel die members.

Another object of the invention is to provide a rivet making apparatus wherein novel means is provided for operating the rivet forming parts.

An additional object of the invention is to provide a novel hydraulic control means for operating a rivet making apparatus.

Other objects and the advantages of my invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a central sectional, partially schematic, view, with parts in elevation, showing an apparatus embodying the features of my invention;

Fig. 2 is an enlarged, fragmentary, sectional view showing the die members and associated parts in the position occupied after the rivet is formed;

Fig. 3 is a view similar to Fig. 2 showing the intermediate step in the forming of the rivet;

Fig. 4 is a view similar to Fig. 2 showing the final position of the die members;

Fig. 5 to Fig. 7, inclusive, are enlarged, sectional views showing the steps in the forming of the rivet;

Fig. 8 is an enlarged, sectional view of a modified form of rivet which may be formed by the apparatus of Fig. 1;

Fig. 9 is an enlarged, sectional view of modified die members which may be used in connection with the apparatus of my invention;

Fig. 10 is an enlarged, sectional view of the rivet made by the apparatus of Fig. 9, and

Fig. 11 is an enlarged, sectional view of another rivet which may also be formed by my apparatus after slight adjustments have been made.

Referring to the drawings by reference characters, I have shown my invention as embodied in a rivet making apparatus which is indicated generally at 10.

The usual rivet making machine heretofore employed includes means for feeding stock material, such as wire, to a shear, where the material is cut to the proper length. In these old machines the cut length is inserted in a die member and is then completed and later removed. Mechanism of this type is old and well known and forms no part of the present invention. My improved method and apparatus may be used with these old machines. It is to be understood, however, that the apparatus of this invention may be used in other machines such as a punch press or other metal working machines.

As shown, my apparatus includes a base 11 supporting a track 12 which reciprocatingly supports a carriage 13. The carriage is shown as moved forwardly by a cam 14 and as moved rearwardly by a spring 15.

The carriage is provided with a bore 16. The cam 14 engages the carriage 13 at each side of the bore 16.

The bore 16 has a frusto-conical forward end 17. A die support member 18 is arranged within the bore 16 and has a tapered forward portion 19. A set screw 20 serves to hold the die support member in place. The die support member has a cylindrical bore 21 in which a die 22 is mounted to reciprocate. The rear end of the bore 21 is closed by a plug 23 which is threaded in place. The member 23 supports a stem 24 which has a reduced forward plunger portion 25 slidably arranged within a reduced portion 26 of the plunger 22. A spring 27 engages the plug 23 and also engages the die 22 to normally urge the parts to the position shown in Fig. 1.

Mounted on the base 11 in alignment with the carriage 13, I provide a fixed die support 30 which has a bore 31 receiving a die support 32. The die support 32 is held in place by a set screw 33. The die support has a bore 34 which receives a die member 35. The member 35 is held in place by a press fit within the bore 34. The die member 35 includes an end 36 which forms the under surface of the rivet head and is provided with a bore 37 in which a rivet blank 38 is inserted. The rear end of the bore 37 is reduced as at 39 and receives a plunger 40 which has an enlarged operating portion 41 slidably mounted in a bore 42 in the member 35.

The portion 41 is normally engaged by the upper portion of a plunger operating member or arm 43 which is pivoted at 44 on a support 45. The arm is engaged by a head 46 on a rod 47. The end of the rod 47, remote from the head 46, is threaded as at 48 to receive adjusting nuts 49 which engage the rear face of the shoulder 50 on a pressure cylinder 51. The extreme end 52 of the rod 57 engages a piston 53 which moves in the cylinder 51.

The piston is engaged by one end of a spring 54. The other end of the spring 54 engages the cap

member 55 threadedly engaging the end of the cylinder. The cylinder is mounted on a support 56 and is connected by a pipe 57 with a check valve 58 which communicates through a pipe 59 with a pump 60 from which a pipe 61 extends to a sump (not shown).

The pipe 57 communicates with a chamber 62 in the cylinder and this chamber through an opening 63 communicates with the interior of the cylinder 51 so that fluid under pressure may act upon the piston 53. The chamber communicates through a pipe 64 with a chamber 65 in a relief valve member 66 which has a valve seat 67 engaged by a ball valve 68. A spring 69 normally urges the ball valve 68 to its seat.

A rod 70 enters the member 66 and at its end 71 is adapted to engage the ball valve 68 to unseat the latter. The chamber 65 communicates with the chamber 72 and the chamber 72 communicates through a pipe 73 with the sump previously mentioned.

The rod 70 threadedly engages an adjusting sleeve 74 and the sleeve 74 in turn threadedly engages a second rod 75. The end 76 of the rod 75 engages an arm 77 on the carriage 13.

In operation it will be seen that the blank, after having been placed in the bore 37, is in a position to be formed by the die member 26. The cam 14 acting against the rearward end of the carriage 13 forces the die member 26 into engagement with the blank 38 and the die member 36 to form the head of the rivet as indicated in Fig. 2. It will be seen that at the same time the head is being formed, the lower end of the blank is forced inwardly and extruded about the pin 40. The described operation takes place against compression of the spring 27 and without compressing the spring. As the carriage 13 continues to move forward the reciprocating die 22 is forced to recede and as it does so it compresses the spring 27, allowing the forward plunger portion 25 of the stem 24 to protrude further beyond the portion 26 and to be forced further into the head end of the rivet until it is at a location near the pin 40. This position is shown in Fig. 3. The pin 40 is retained in fixed position during the forming operation by means of the pressure cylinder 51 and the piston 53, the latter being acted upon by fluid under pressure from the pump 60. The ball valve 68, up to this time, is closed.

At the time the plunger 25 reaches the position as shown in Fig. 3, the arm 77 of the carriage 13 engages the rod 75 at 76 and opens the ball valve 68, allowing the oil under pressure from the pump 60 to by-pass the pressure cylinder 51 and to flow, by means of the pipe 64, past the ball valve 68 and back to the sump. It will now be seen that this will allow the plunger 25 to continue to move through the rivet without the danger of damaging the plunger 40, and to take the position as shown in Fig. 4.

The carriage 13 is next withdrawn to the right by the spring 15. This allows the plunger 25 to be withdrawn, leaving the newly formed rivet in the die 36.

The adjustment of the sleeve 74 on the rod 70 is such as to release the plunger 40 when the plunger 25 is slightly spaced from the plunger 40. This allows a web 38' to be formed in the rivet between the plungers as shown in Fig. 3. With the continued movement of the plunger 25 the web 38' is forced through and out of the rivet as shown in Fig. 4. Upon movement of the arm 43, as by the cam 79, to eject the completed rivet, the web 38' is between the plungers 40 and 25 and is caused to expand slightly in diameter. The web then drags the rivet from the die after which the web drops out of the way.

A one-way check valve 80 is arranged in the line 64 between the pressure cylinder 51 and the release valve to prevent the flow of oil back into the pressure cylinder. This valve may also act as a metering valve to control the speed at which the plunger 40 is allowed to retract.

It will be seen that by adjusting the nuts 49 on the rod 47 the normal position of the plunger 40 may be altered. Also, by varying the movement of the cam 14, as by substituting another cam, any of the rivets, as shown in Figs. 5 to 7 and indicated at 38*a* 38*b* and 38*c*, may be formed. By the use of a die which omits the plunger 25 the rivet 38*d*, as shown in Fig. 8, may be formed.

Referring now primarily to Figs. 9 and 10, I show a modified form of my invention which differs only in the shape of the die faces. As shown the plunger 26' has a flat face 81 and the apparatus is such that it may be used to form a rivet 38*e* as shown in Fig. 10.

Fig. 11 shows a type of conventional rivet 38*f* which may be formed by my apparatus by fully retracting the plunger 40 and omitting the plunger 25.

Having thus described my invention and the present preferred embodiments thereof I desire to emphasize the fact that many modifications may be resorted to in a manner limited only by a just interpretation of the following claims.

Having thus described my invention, I claim:

1. In a rivet making machine, a carriage, means to mount said carriage for reciprocation, means to reciprocate said carriage, a die member slidably mounted on said carriage, said die member having a recessed end adapted to engage a blank to form a rivet head, said sliding die member having a bore therein, a plunger slidable in said bore, means to hold said plunger against axial movement in said die member, means urging said slidable die member forward, a second die member aligned with said first die member, said second die member having a recess adapted to receive a rivet forming blank, said recess having a reduced portion, a second plunger slidable through said reduced recess, said second slidable plunger having an operating end, a pivoted arm engaging said end, a cylinder, a piston in said cylinder, a rod engaged by said piston, adjustable means to limit the forward movement of said rod, said rod engaging said arm, means to supply fluid under pressure to said cylinder, a relief valve communicating with said cylinder, means to release said relief valve, said relief valve releasing means including an end portion adjacent said carriage, means on said carriage engaging said end portion when the carriage reaches its forward limit of movement, and means to rock said arm to remove a formed rivet from said recess.

2. In a rivet making machine, a carriage, means to mount said carriage for reciprocation, means to reciprocate said carriage, a die member slidably mounted on said carriage, said die member having a recessed end adapted to engage a blank to form a rivet head, said sliding die member having a bore therein, a plunger slidable in said bore, means to hold said plunger against axial movement in said die member, means urging said slidable die member forward, a second

die member aligned with said first die member, said second die member having a recess adapted to receive a rivet forming blank, said recess having a reduced portion, a second plunger slidable through said reduced recess, said second slidable plunger having an operating end, a pivoted arm engaging said end, a cylinder, a piston in said cylinder, a rod engaged by said piston, means to limit the forward movement of said rod, said rod engaging said arm, means to supply fluid under pressure to said cylinder, a relief valve communicating with said cylinder, means operated by said carriage to release said relief valve, and means to rock said arm to remove a formed rivet from said recess.

3. In a rivet making machine, a carriage, means to mount said carriage for reciprocation, means to reciprocate said carriage, a die support member on said carriage, a die member slidable in said support member, said die member having a recessed end adapted to engage a blank to form a rivet head, means urging said slidable die member forward in said support, a fixed die support aligned with said die support member, a second die member in said fixed die support, said second die member having a recess adapted to receive a rivet forming blank, said recess having a reduced portion, a plunger slidable through said reduced recess, said slidable plunger having an operating end, a pivoted arm engaging said end, a cylinder, a piston in said cylinder, a rod engaged by said piston, said rod engaging said arm, means to supply fluid under pressure to said cylinder, a relief valve communicating with said cylinder, means to release said relief valve, said relief valve releasing means including an end portion adjacent said carriage, means on said carriage engaging said end portion when the carriage reaches its forward limit of movement, and means to rock said arm to remove a formed rivet from said recess.

4. In a rivet making machine, a carriage, means to mount said carriage for reciprocation, means to reciprocate said carriage, a die support member on said carriage, a die member slidable in said support member, said die member having a recessed end adapted to engage a blank to form a rivet head, said sliding die member having a bore therein, a plunger slidable in said bore, means to hold said plunger against axial movement in said die member support, means urging said slidable die member forward in said support, a fixed die support aligned with said die support member, a second die member in said fixed die support, said second die member having a recess adapted to receive a rivet forming blank, said recess having a reduced portion, a second plunger slidable through said reduced recess, said second slidable plunger having an operating end, a pivoted arm engaging said end, a cylinder, a piston in said cylinder, a rod engaged by said piston, said rod engaging said arm, means to supply fluid under pressure to said cylinder, a relief valve communicating with said cylinder, means to release said relief valve, said relief valve releasing means including an end portion adjacent said carriage, an arm on said carriage engaging said end portion when the carriage reaches its forward limit of movement, and means to rock said arm to remove a formed rivet from said recess.

5. In a rivet making machine, a carriage, means to mount said carriage for reciprocation, means to reciprocate said carriage, a die member mounted on said carriage, a second die member axially aligned with said first die member, said second die member having a recess, a plunger slidable through said recess, a plunger operating member for actuating the plunger, a cylinder, a piston in said cylinder, a rod engaged by said piston and controlling movement of said plunger operating member, means to supply fluid under pressure to said cylinder, a relief valve communicating with said cylinder, and means operated by said carriage to release said relief valve.

6. In a rivet making machine, a carriage, means to mount said carriage for reciprocation, means to reciprocate said carriage, a die member slidably mounted on said carriage, said die member having an end adapted to engage a blank to form a rivet head, said sliding die member having a bore therein, a plunger slidable in said bore, means to hold said plunger against axial movement in said die member, means urging said slidable die member forward, a second die member axially aligned with said first die member, said second die member having a recess adapted to receive a rivet forming blank, a second plunger slidable through said recess, said second slidable plunger having an operating end, a plunger operating member engaging said end, a cylinder, a piston in said cylinder, a rod engaged by said piston, said rod engaging said plunger operating member, means to supply fluid under pressure to said cylinder, a relief valve communicating with said cylinder, means to release said relief valve, said relief valve releasing means including a portion adjacent said carriage, and means on said carriage engaging said end portion to shift the relief valve releasing means when the carriage reaches its forward limit of movement.

7. In a rivet making machine, a carriage, means to mount said carriage for reciprocation, means to reciprocate said carriage, a die member slidably mounted on said carriage, said die member having an end adapted to engage a blank to form a rivet head, said sliding die member having a bore therein, a plunger slidable in said bore, means to hold said plunger against axial movement in said die member, means urging said slidable die member forward, a second die member axially aligned with said first die member, said second die member having a recess adapted to receive a rivet forming blank, a second plunger slidable through said recess, said second slidable plunger having an operating end, a plunger operating member engaging said end, a cylinder, a piston in said cylinder, a rod engaged by said piston, adjustable means to limit the forward movement of said rod, said rod engaging said plunger operating member, means to supply fluid under pressure to said cylinder, a relief valve communicating with said cylinder, means to release said relief valve, said relief valve releasing means including an end portion adjacent said carriage, means on said carriage engaging said end portion to shift the relief valve releasing means when the carriage reaches its forward limit of movement, and means to shift said plunger operating member to remove a formed rivet from said recess.

CONRAD R. BUCHET.