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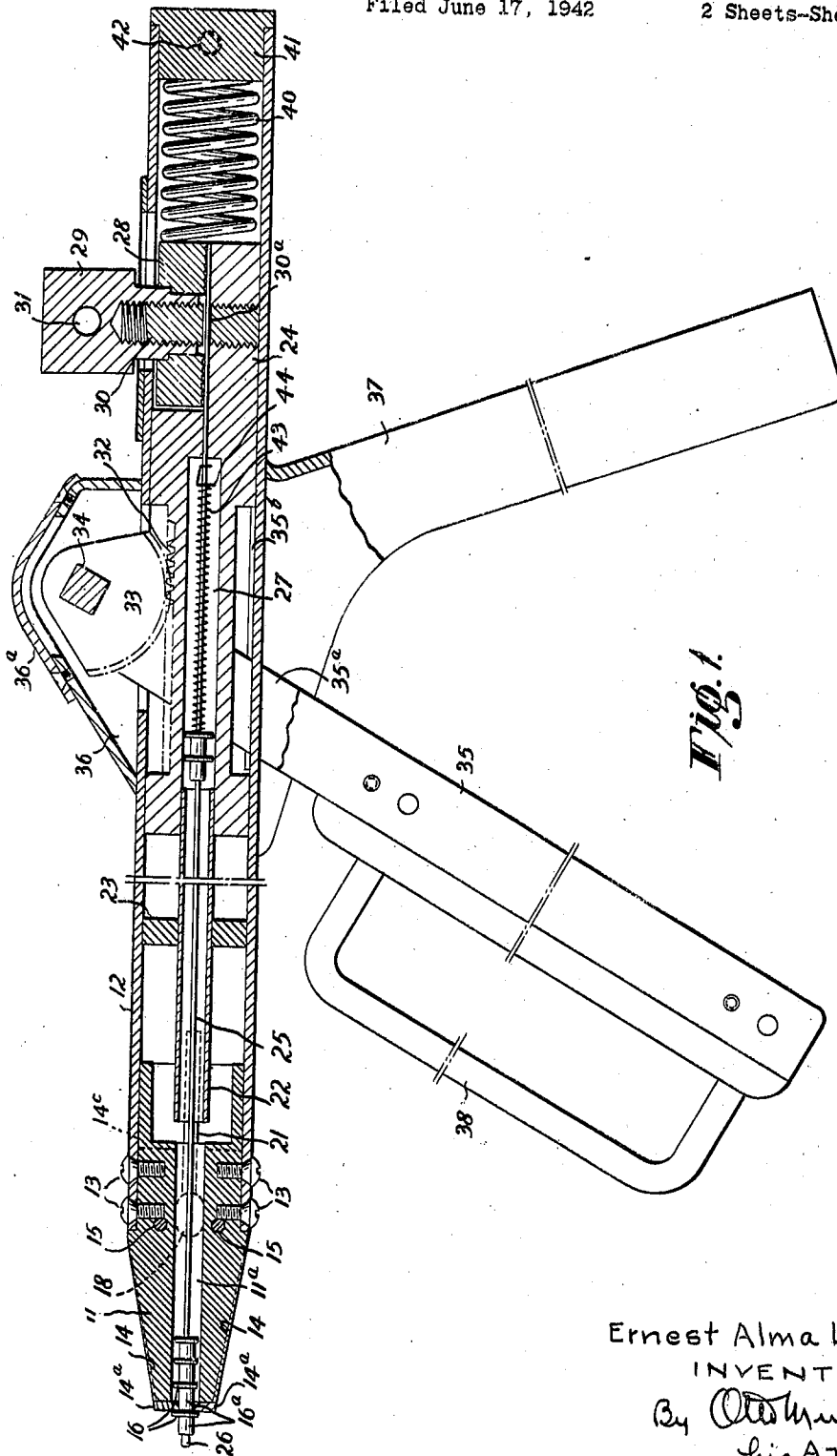
E. A. LEE

2,340,066

RIVETING GUN

Filed June 17, 1942

2 Sheets--Sheet 1



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2 Sheets-Sheet 2

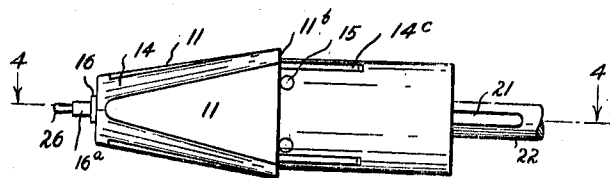


Fig. 2.

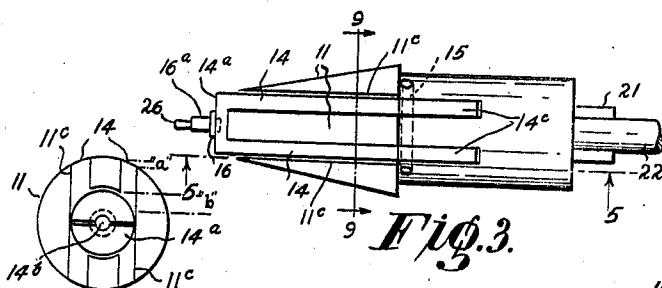


Fig. 3.

Fig. 4.

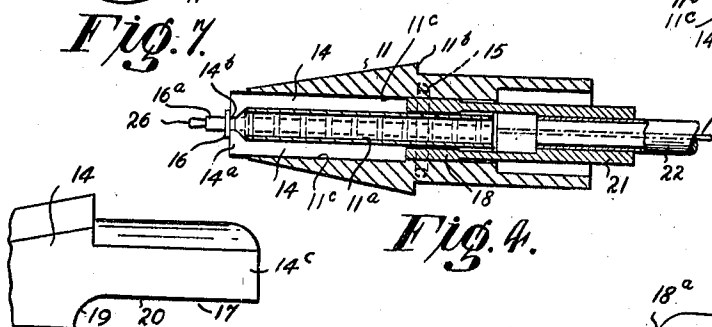


Fig. 4.

Fig. 10.

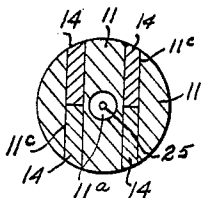


Fig. 9.

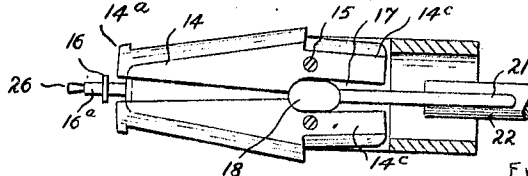


Fig. 6.

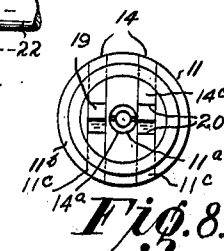


Fig. 8.

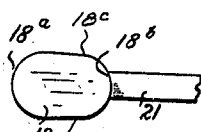


Fig. 11.

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UNITED STATES PATENT OFFICE

2,340,066

RIVETING GUN

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In Australia June 9, 1941

9 Claims. (Cl. 218—19)

This invention relates to a hand actuated riveting machine (usually called a riveting gun), for fixing pierced or tubular rivets, of the kind in which the rivet is threaded on a mandrel having an enlarged head so that when the rivet is suitably positioned, the head of the mandrel may be drawn through the rivet to expand the shank thereof for the purpose (for example) of fixing together two or more relatively thin sheets.

More particularly this invention relates to a riveting gun of magazine type wherein rivets threaded on a mandrel are automatically fed forwardly and fixed in position in succession.

A known riveting gun of magazine type, includes a body, a tubular barrel slidably supported relatively to the said body and a mandrel on which tubular rivets are threaded, the mandrel extending axially through the barrel and being connected to the body of the gun. A tubular member at the forward end of the barrel supports a pair of movable jaws adapted to be closed by movement of the barrel relatively to the body and to be opened by spring pressure. In use, the body of the gun is held by one hand while with the other hand the operator actuates mechanism which moves the barrel relatively to the body in the direction of the length of the barrel. During the riveting operation, the barrel is held stationary relatively to the work to maintain the rivet in proper position and consequently the body moves rearwardly relatively to the barrel and draws the head of the mandrel through the positioned rivet. Continued operation of the actuating means causes a return movement of the body and the mandrel relatively to the barrel until the initial position of the parts is restored in readiness for another riveting operation. The jaws are timed to open and close during the movement of the mandrel, closing to form an abutment or anvil for the foremost rivet during the retraction of the mandrel, and opening to allow another rivet to move forwardly with the mandrel. The actuating means include a rotatable cranked handle geared to a spindle on which is a cam arranged to effect rearward movement of the body and the mandrel relatively to the barrel against the constraint of a spring. The return movement under the action of the said spring causes the barrel to actuate parts which first release the jaws so that they may open to allow a rivet to travel through them and then close the jaws behind the foremost rivet.

Known riveting guns of the type referred to, have the following disadvantages:

(a) The operator must use both hands, one to support the gun and the other to actuate the control handle;

(b) The body of the gun moves relatively to the barrel thereof and during each riveting operation,

the said body moves toward the operator;

(c) The mechanism is arranged so that the manually actuated control handle must be rotated several (usually three) times in each cycle of operations to locate and fix a rivet;

(d) The operation of the jaws is positive in one direction only; and

(e) The gun is relatively heavy and cumbersome.

The primary object of this invention is to provide a compact and lightweight riveting gun of the type referred to, embodying improvements whereby the before-mentioned disadvantages are obviated.

Another object of this invention is to provide a riveting gun of the kind referred to, which is strong and durable and relatively inexpensive to manufacture.

A further object of this invention is to provide a riveting gun which is especially suitable for use in the aircraft, automobile and like industries.

One feature of a riveting gun according to this invention is that it may be operated in any position by one hand.

Another feature of a riveting gun according to this invention is that the barrel is fixed relatively to the body or equivalent support.

Another feature of a riveting gun according to this invention is that the movable jaws are positively controlled at all times and are robust and suitable for heavy duty mass production work.

A riveting gun according to this invention includes a tubular barrel, a head fixed on the forward end of said barrel, jaws pivotally supported in said head, cams arranged between the rear part of the said jaws, a mandrel and means to control said mandrel, the said cams being connected to the means that control the mandrel so that the cams open the jaws when the mandrel is moved to the forward end of its travel and close the jaws when the mandrel is retracted.

But in order that this invention may be understood more readily, a practical embodiment thereof will be described with reference to the accompanying drawings in which:

Fig. 1 is a side sectional elevation of a riveting gun according to this invention;

Fig. 2 is a side elevation of the head of the gun detached from the barrel but showing parts associated with the head;

Fig. 3 is a plan of the parts shown in Fig. 2;

Fig. 4 is a sectional plan on line 4—4 of Fig. 2;

Fig. 5 is a section on line 5—5 of Fig. 3 but with the mandrel retracted;

Fig. 6 is a similar view to Fig. 5 but with the mandrel fully advanced and the jaws open;

Fig. 7 is a front elevation of the head shown in Fig. 2;

Fig. 8 is a rear elevation of the head shown in Fig. 2;

Fig. 9 is a transverse section on line 9—9 of Fig. 3.

Fig. 10 is a detail side view of the rear part of one limb of a jaw;

Fig. 11 is an enlarged detail view of a cam.

A substantially cone shaped head 11 is fixed to the forward end of a cylindrical barrel 12 by holding screws 13. Head 11 has an axial bore 11a and is recessed at 11b to accommodate the forward part of the barrel 12 to provide a flush outer face. Slots 11c through the head 11 accommodate the limbs 14 which extend rearwardly from a pair of jaws, the two limbs of each jaw being pivoted on a pin 15. Each jaw consists of a substantially semi-circular collar 14a having therein a clearance 14b, each collar 14a connecting the forward ends of the corresponding limbs 14. When the jaws are closed the clearances 14b together form a circular opening adapted to fit about the shank 16a of a rivet 16 as hereinafter described and the collars 14a form a robust anvil. The sides of the slots 11c are parallel, but due to the taper of the head 11 they appear to diverge in the elevational view of Fig. 2, the difference in the depth of the visible part being indicated by the difference between a and b in Fig. 7.

The rear part 14c of the inner face of each limb 14 is recessed at 17 (see Fig. 10), the said recesses co-acting to form a pair of guideways for two actuating cams 18, each having a semi-circular forward end 18a, and a semi-circular rear end 18b, the said forward and rear ends being connected by flat faces 18c which taper slightly from front to rear (see Fig. 11). The forward end of each recess 17 is a cam face 19, rearwardly of which is a plane face 20. The said faces 19 and 20 on each jaw 14 are disposed relatively to the respective pivot pins 15 so that movement of the cams 18 forwardly or rearwardly relatively thereto causes the said jaws to open or close as hereinafter described.

Each cam 18 is integral with the forward end of a stem 21, the rear part of which is fixed to the forward part of a tube 22 on the outer face thereof. A collar 23 on tube 22 slidably engages the interior of the barrel 12. The rear part of tube 22 is fixed in the forward part of a piston 24 slidably arranged in the barrel 12.

A mandrel 25 having an enlarged head 26 extends rearwardly through the clearance 14b in jaw members 14a, bore 11a of the head 11, tube 22 and a clearance 27 in the piston 24. The rear part of the mandrel 25 is fixed relatively to the piston 24 by a clamp block 28 controlled by a nut 29 on a screw threaded stem 30. A clearance 30a in stem 30 allows the rear end of the mandrel 25 to pass therethrough. The head of nut 29 is apertured at 31 to receive a tommy-bar or other convenient control device, and the barrel 12 is slotted to permit sliding movement of nut 29.

A rack 32 on the upper face of piston 24 meshes with a toothed segment 33 fixed on a spindle 34. The limbs 35a of a control lever 35 are fixed on spindle 34 and pass through slots 35b in barrel 12. Segment 33 is arranged in an open topped housing 36 having a removable cover 36a, and the spindle 34 has rounded ends pivoted in aligned holes in the housing 36.

A pistol grip 37 is welded or otherwise secured to the barrel 12.

The pistol grip 37 and control lever 35 are constructed and arranged so that the said lever may be actuated by one hand, a finger loop 38 being provided on lever 35 to facilitate forward movement thereof. The piston 24 is urged forwardly by a strong spring 40 arranged in the rear part of the barrel 12 and held in position by a plug or the like 41 which is fixed in position by studs 42.

A supply of rivets as 16 of suitable shape and size is arranged on the mandrel, the said rivets being urged toward the head of the mandrel by a spring 43 in known manner. A clip as 44 forms an abutment for the rear end of spring 43.

The said mandrel and rivets may be of known construction and preferably (but not essentially) the bore of each rivet tapers towards the shank thereof. Other suitable rivets are usable, such as another known rivet having a wall inwardly thickened at the shank end.

To prepare the gun for use, the lever 35 is moved forwardly, by hand and spring 40, until the cam 18 causes the jaws to open (see Fig. 6), the nut 29 is loosened and the mandrel 25 is pulled out, whereupon the clip 44 and spring 43 are removed from the mandrel. A suitable number of rivets, for example 40 or 50, is arranged on the mandrel after which the spring 43 and clip 44 are replaced and the latter is suitably adjusted. The mandrel 25 is inserted rear end first through the apertured jaws 14a and the tube 22 until the said rear end is below the clamp block 28 and the flange of the foremost rivet is slightly forward of the jaw collars 14a (see Fig. 6), after which nut 29 is tightened to grip the mandrel firmly to piston 24. The lever 35 is then moved to retract the piston 24 sufficiently to cause the cams 18 to close the jaws with the flange of the foremost rivet 16 against the anvil face on the jaws 14a as in Figs. 1, 2 and 3. The gun is now ready for use.

In use, the gun is manipulated so that the head 26 of the mandrel 25 and the shank 16a of the foremost rivet 16 are inserted into the hole in which the rivet is to be fixed. The lever 35 is then fully retracted causing the segment 33 to move the piston 24 rearwardly against the pressure of spring 40.

The rearward movement of the piston 24 retracts the mandrel 25 beyond the position shown in Figs. 1-3 and 5, causing the head 26 of the mandrel to pass through the foremost rivet 16 and to expand the shank 16a thereof so that the said rivet is fixed in position. After passage of the head 26 through said first rivet, said head makes contact with the shank 16a of the next rivet. The lever 35 is then moved forwardly by finger pressure on the loop 38 (such movement being assisted by the pressure of spring 40), until the piston 24 and the mandrel 25 are advanced to the foremost position, the now foremost rivet moving forward only until its shank end contacts the jaws 14a. As the piston 24 travels to the position in which the faces 18a of the cams 18 meet the faces 19 of the guide recesses 17, the jaws 14 turn on their pivots 15 to the position shown in Fig. 6 and allow the rivets 16 on the mandrel 25 to move forwardly under the influence of the spring 43 until the foremost rivet again meets the head 26 of the mandrel. The lever 35 is then operated to retract the piston 24 until the cams 18 meet the plane faces 20 of the guideways and thus close the jaws 14 with the head of the foremost rivet against the anvil faces 14a as shown in Figs. 1 and 2, after which the riveting

operation as hereinbefore described may be repeated.

What I claim is:

1. A riveting gun of the type specified having a barrel, a head fixed on the forward end of said barrel, jaws pivotally supported in said head, a mandrel arranged axially in said barrel, a support for said mandrel, means for clamping said mandrel to said support, means to reciprocate said support, and cams arranged to positively open and close the said jaws, the said cams being connected to said support.

2. A riveting gun of the type specified having a barrel, a head fixed at the forward end of the said barrel, jaws pivotally supported in said head, cams to open and close said jaws, a mandrel arranged axially of said barrel, a piston in said barrel, means to clamp said mandrel to said piston, and a tube forwardly of said piston, the said jaw opening and closing cams being connected to said tube and the latter being carried by said piston.

3. A riveting gun as claimed in claim 1, and wherein each jaw is recessed internally to form guideways and has a curved face at the forward end of each said recess, the said guideways and curved faces being disposed relatively to the pivots of the respective jaws so that the jaws are opened and closed by the movement of cams along the said guideways.

4. In a riveting gun of the type specified, a head having an axial bore, a mandrel movable axially in the said bore relatively to said head, slots in said head, a pair of jaws having limbs pivotally supported in said slots, a recess in the rear part of each limb of each said jaw, a cam face at the forward part of each said recess and cams arranged to slide in guideways formed by said recesses, the said cams being movable simultaneously with the mandrel and being arranged to open the jaws when the mandrel is advanced to the foremost position and to close the jaws when the mandrel is retracted sufficiently to press the flange of the foremost rivet against the forward end of the said jaws.

5. A riveting gun of the type specified having a barrel, a head fixed on the forward end of said barrel, jaws pivotally supported in said head, cams disposed between the rear part of said jaws to control the opening and closing thereof, a piston slidably arranged in said barrel, means to support said cams on said piston, means to connect the rear end of the mandrel to said piston, a spring to resiliently urge said piston forwardly, and mechanism to reciprocate said piston relatively to said barrel.

6. A riveting gun having a barrel, a pistol grip fixed thereto, a reciprocable piston slidably arranged in said barrel, a lever pivotally supported relatively to said barrel and movable relatively to said pistol grip, gearing operable by said lever to reciprocate said piston, a tube extending forwardly from said piston, a head fixed on the forward end of said barrel, a mandrel extending through said head and said tube and having its rear end fixed relatively to said piston, a pair of jaws pivotally supported on said head, recesses in the rear part of each said jaw, cams arranged to slide in said recesses to actuate said jaws, and supports for said cams, said supports extending forwardly from and being fixed to said tube, the arrangement being such that when the lever handle is actuated to move the reciprocable pis-

ton to the foremost position, the jaw actuating cams and the mandrel travel forwardly together, the cams opening the jaws and the mandrel being advanced to a position in which the foremost rivet thereon is forwardly of the jaws, the first part of the rearward movement of the lever retracting the cams to close the jaws and retracting the mandrel so that the flange of the said foremost rivet bears against the outer end of the said jaws.

7. In a riveting gun of the type specified, a barrel, a head fixed on the forward end of said barrel, jaws each comprising a pair of limbs arranged in slots in said head, and a collar disposed forwardly of the forward end of said head, means to pivotally support the limbs of each said jaw, a recess in the inner rear part of each limb of each jaw, a curved face at the forward end of each said recess and cams arranged to be reciprocated in guideways formed by opposed recesses, said cams and said recesses being constructed and arranged so that forward movement of the cams opens said jaws and rearward movement of the cams closes said jaws.

8. In a riveting gun of the kind specified a barrel, a head fixed on the forward end of said barrel, slots in said head, jaws having limbs disposed in said slots and pivoted relatively to said head, cams to co-act with said limbs to open and close said jaws, a mandrel extending through said head, a piston reciprocable in said barrel, means to connect said mandrel and said cams to said piston and means to control the said piston, the parts being arranged so that forward movement of the piston advances the mandrel and opens the jaws and rearward movement of the piston closes the jaws and retracts the mandrel.

9. A riveting gun having a barrel, a pistol grip fixed thereto, a reciprocable piston arranged in said barrel, a spring in said barrel at the rear of said piston, a lever pivotally supported relatively to said barrel and movable relatively to said pistol grip, a toothed rack on said piston, gearing engaging said rack and operable by said lever to reciprocate said piston, a tube extending forwardly from said piston, a head fixed on the forward end of said barrel, an axial bore in said head, a mandrel extending through said bore and said tube, means to fix the rear end of said mandrel relatively to said piston, a pair of jaws pivotally supported relatively to said head, recesses in the rear part of each said jaw, cams arranged to slide in said recesses to actuate said jaws, supports for said cams extending forwardly from said tube, a head on the forward end of said mandrel and a spring about said mandrel to urge rivets on said mandrel toward said head, the arrangement being such that when the lever handle is actuated to move the piston to the foremost position, the jaw actuating cams and the mandrel travel forwardly together, the cams opening the jaws and the mandrel being advanced to a position in which the foremost rivet thereon is forwardly of the jaws, the first part of the rearward movement of the lever retracting the cams to close the jaws and retracting the mandrel so that the flange of the said foremost rivet bears against the forward face of the said jaws, and further rearward movement of the lever retracts the mandrel to draw the mandrel head through the foremost rivet to expand the shank thereof.

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