Sept. 8, 1936. G. M. NELL 2,053,676

RIVET SET COOLING DEVICE

Filed July 21, 1934

Fig. 1.

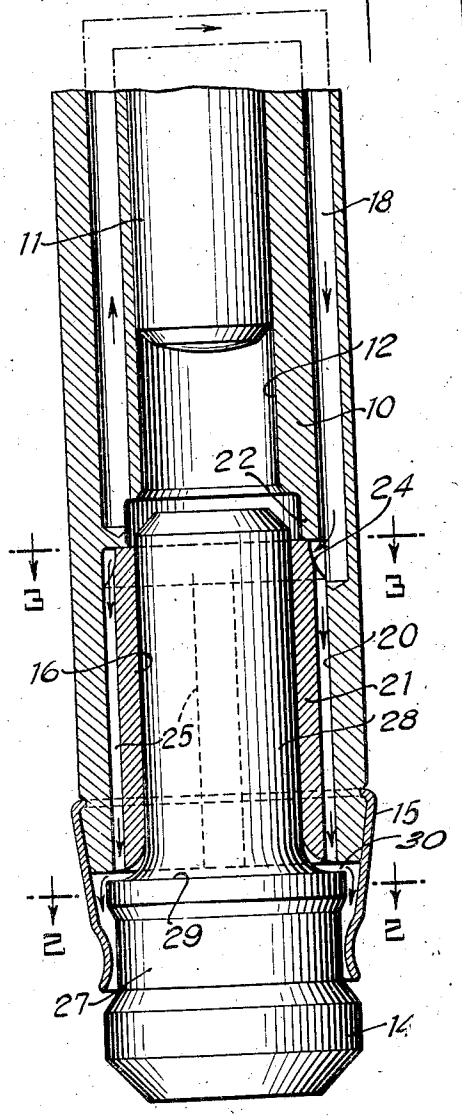


Fig. 2.

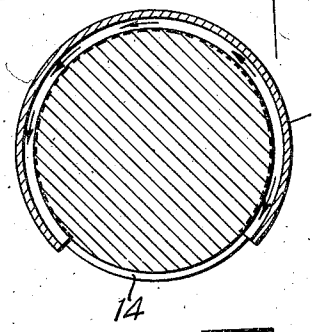


Fig. 3.

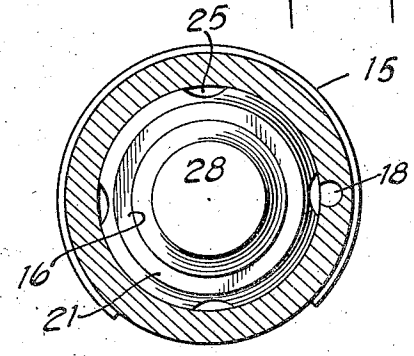
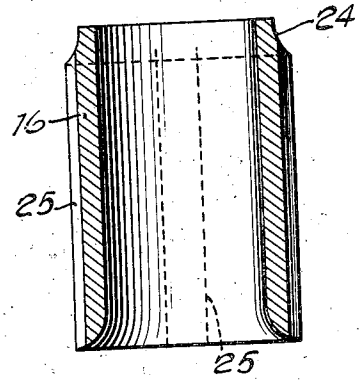


Fig. 4.



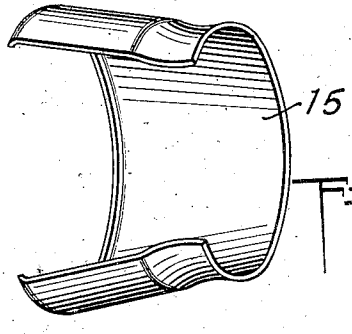


Fig. 5.

INVENTOR
GUSTAVE M. NELL.
BY
Raymond G. Mullee
ATTORNEY

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RIVET SET COOLING DEVICE

Gustave M. Nell, Detroit, Mich., assignor to Chicago Pneumatic Tool Company, New York, N. Y., a corporation of New Jersey

Application July 21, 1934, Serial No. 736,321

6 Claims. (Cl. 121—31)

This invention relates to pneumatic hammers, more particularly those hammers used for riveting wherein, owing to the heat from the rivets, the working tool, such as the rivet set and its retaining clip, as well as the front end of the cylinder, become considerably heated, sometimes to an extent requiring the temporary discontinuance of the use of the hammer. In the riveting hammer art, it is well known that breakage at the shoulder joining the rivet set body to the shank is caused by conduction of heat from the rivet to the set, drawing its temper and to a large extent destroying the fatigue resistance of the heat-treated steel.

One object of the invention is to provide means for cooling the working tool, such as a rivet set, its retainer, or clip, and the front end of the hammer cylinder. Speaking in general terms, this result is accomplished by so conducting the exhaust of the hammer that the same will be discharged through passages extending to the front end of the cylinder and exhausted between the clip, or retainer, and the working tool or rivet set.

Another object of this invention is to prevent breakage at the end of a cylinder having air passages for cooling a rivet set. In previous devices of this type longitudinal bores provided in the cylinder wall for cooling purposes have resulted in longitudinal fatigue cracks which split the cylinder, due to the excessive striking and clatter of the rivet set shoulder against the end of the cylinder. In accordance with the present invention breakage of the cylinder on its working end is prevented by arranging the cooling passages for a portion of their length between the inside surface of the cylinder and the outside surface of a bushing mounted therein. This bushing absorbs a large part of the reaction blow transmitted from the set to the cylinder and makes it possible to extend the cooling passages direct to the set shoulder without causing cracks at the surface adjacent to the passages and engaged by the rivet set shoulder.

In the drawing:

Fig. 1 is a section of a portion of a hammer embodying the present invention;

Fig. 2 is a section on the line 2—2 of Fig. 1 showing the rivet set and retaining clip;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a longitudinal section of the bushing; and

Fig. 5 is a perspective of the rivet set clip.

The illustrative embodiment comprises as its main parts the cylinder 10, piston 11 adapted to reciprocate in the piston chamber 12, the working tool which is here a rivet set 14, the tool retainer or rivet set clip 15, and the bushing 16.

The piston chamber 12 is provided with ports and passages controlled by a valve (not shown) and by the piston 11 for admitting and exhausting pressure fluid, such as compressed air, from opposite sides of the piston for causing the reciprocations of the latter. A supply passage, or bore 18, is formed in the wall of the cylinder 10. The rear end of bore 18 is connected to any suitable means for admitting pressure fluid thereto preferably, though not necessarily, the air exhausted from the cylinder. For a disclosure of a fluid pressure motor having means for diverting a portion of the exhaust air through a cooling passage, reference is made to Stevens Patent 1,615,890 issued February 1, 1927. The front end of the cylinder 10 is provided with a counterbore 20 communicating with the front end of supply passage 18. A bushing 21 is received by the cylinder counterbore 20 and secured to the cylinder by any suitable means, such as a pressfit. The rear end of bushing 21 rests against a shoulder 22 within the cylinder, the inside diameter of which is sufficiently large to facilitate removal of the bushing by means of a hook. The rear end of the bushing is also provided with a peripheral annular recess 24 adapted to register with the port at the front end of the supply bore 18 and to form an annular chamber between the bushing and cylinder supplied with air from said bore. A plurality of longitudinal recesses 25 extend along the surface of the bushing from the annular recess 24 to the front end. The longitudinal recesses provide a series of passages between the cylinder and bushing for conducting the cooling air from the annular chamber 24 to the shoulder on the rivet set.

The working tool or rivet set 14 comprises a body 27, a shank 28, and a shoulder 29 connecting the shank to the body. The shank is inserted into the bushing 21 and the shoulder is so constructed and arranged that it may engage the front end of both the bushing and cylinder. The rivet set is held in working relationship with the cylinder by means of the clip 15 which, as usual, is connected with the cylinder and also operatively connected with the set. These clips are of tempered sheet metal and it is desirable that they shall not be overheated. Therefore, in order to keep them as cool as possible, the exhaust or cooling passages 25 are arranged to discharge the exhaust air directly against the shoulder of the set from whence such exhaust air is deflected and

passes between the set body and the clip as indicated by the arrows in Figs. 1 and 2.

In operation, the reciprocations of the piston and the reaction of the work against the rivet set 14 cause the latter to reciprocate through a limited distance to open and close the space 30 between the shoulder 29 and the end of the cylinder and bushing. Movement of the shoulder away from the cylinder end opens this space to admit exhaust air which impinges directly upon the shoulder thereby preventing overheating at the point where breakage of the set is most likely to occur. Movement of air through the recesses or passages 25 cools the cylinder without necessitating the employment of passages or openings which weaken the cylinder.

What I claim is:

1. In a riveting machine, a one-piece cylinder having an open ended bore, a bushing mounted in said bore and held therein by a press fit, a rivet set received within said bushing, a retaining clip for the set connected to the outside of the cylinder, means for delivering air between the set and clip for cooling said set and clip, said means comprising one or more passages in communication with both the cylinder and bushing for cooling both cylinder and bushing at the same time, said passage or passages being formed by a groove or grooves in the exterior surface of the bushing, which surface fits within a smooth unbroken cylindrical surface on the interior of the cylinder.

2. A riveting machine comprising a one-piece cylinder member having a bore adapted to provide a piston chamber and having a counterbore at the front end of the cylinder, a bushing received within said counterbore and held rigidly therein, a rivet set having a shank supported within said bushing and having a shoulder adjacent the front end of the cylinder, said cylinder having a passage therein extending longitudinally thereof and opening into the rearward end of the counterbore, the rear end of the bushing having an annular recess at its periphery adapted to form an annular chamber between the bushing and cylinder, said annular chamber being supplied with air under pressure from the longitudinal passage, a series of passages for conveying air from said annular chamber and discharging the same at the front end of the cylinder, said last-named passages being formed by longitudinal grooves in the bushing and extending from the annular recess to the front end of the bushing and being positioned to discharge air against the rivet set, the interior of the cylinder having a smooth unbroken cylindrical surface throughout substantially the entire length of the counterbore.

3. A riveting machine comprising a cylinder member having a bore at its front end, a bushing supported within said bore, a rivet set having a shank received within the bushing, said cylinder member having a longitudinal fluid carrying passage terminating short of the front end of the cylinder, said bushing having an annular recess providing an annular chamber between the bushing and cylinder, said annular chamber being in communication with the longitudinal passage, the bushing having external longitudinal grooves arranged to coact with the bore to form fluid carrying passages terminating at the front end of the cylinder member and discharging against the rivet set, said bushing having a press fit with the cylinder member throughout substantially the entire length of the bushing.

4. A riveting machine comprising a cylinder having a bore to provide a piston chamber and having a counterbore at the front end of the cylinder, a bushing mounted in the counterbore and seated against the rear end of the counterbore with a press fit, a rivet set having a shank supported within said bushing and adapted to receive impacts from a piston in said piston chamber, said rivet set having an integral shoulder adjacent the extreme front end of the cylinder and adapted to clatter against the front end of the cylinder during the operation of the machine, a rivet set clip carried by the front end of the cylinder and adapted to be engaged by the shoulder to prevent removal of the rivet set from the cylinder, and means for cooling the front end of the cylinder, the bushing, the rivet set and the clip, said cooling means comprising a passageway in the wall of the cylinder communicating with the interior of the counterbore at a point considerably remote from the extreme front end of the cylinder, one or more longitudinal grooves on the external surface of the bushing, said grooves being positioned to receive pressure fluid from the cylinder passageway and conduct said fluid to the front end of the bushing and discharge said fluid against the shoulder of the rivet, the wall of the cylinder being imperforate near the front end thereof, and the interior of the cylinder near the front end thereof being defined by a smooth cylindrical surface, part of which surface communicates with the groove or grooves, and the remainder of which surface is tightly engaged by the bushing.

5. A riveting machine according to claim 4 in which the cylinder passageway terminates at a port adjacent the rear end of the counterbore, and the longitudinal grooves in the bushing extend forwardly from said port throughout the entire length of the bushing.

6. A riveting machine according to claim 4 in which the bushing has an annular groove connecting the grooves in the bushing at the rearward end thereof, said annular groove being supplied with pressure fluid by the cylinder passageway.

GUSTAVE M. NELL.