

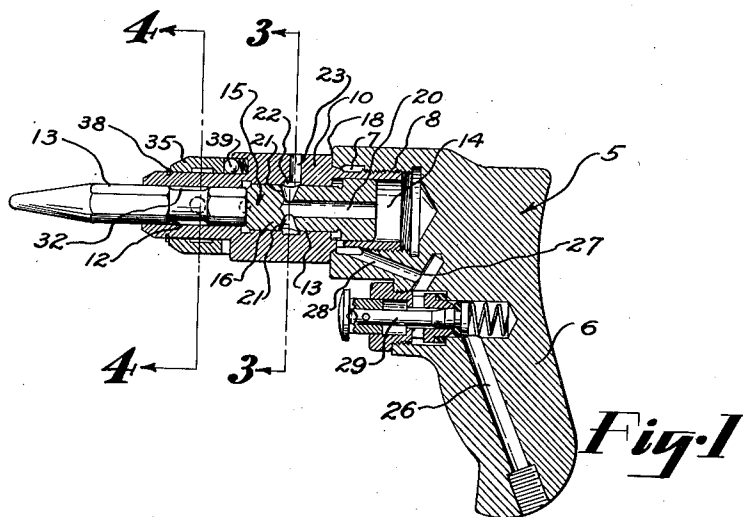
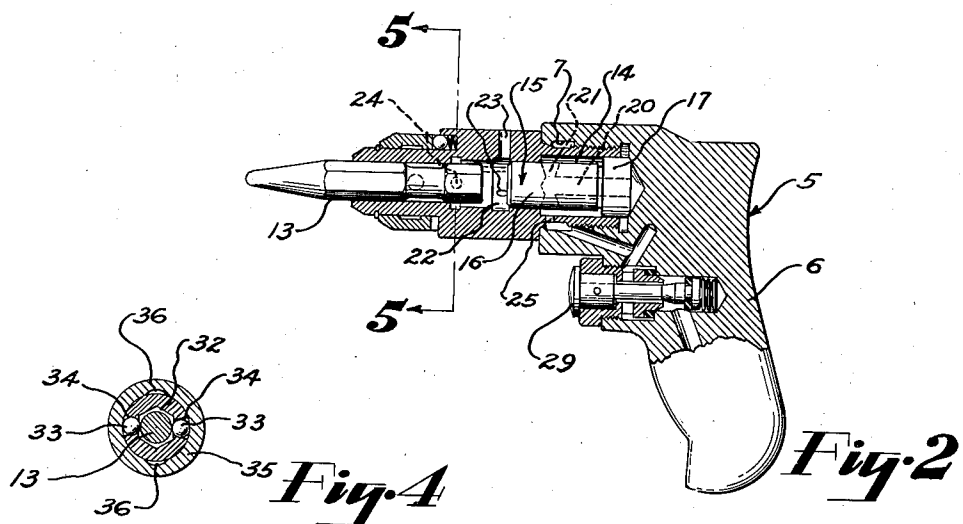
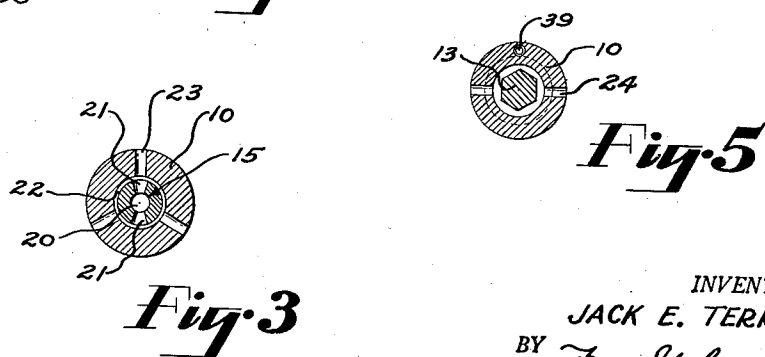
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2,585,975

PNEUMATIC HAMMER

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PNEUMATIC HAMMER

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2 Claims. (Cl. 121-17)

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The present invention relates to a pneumatic hammer and more particularly to a pneumatic hammer of a type which may be manipulated by one hand of the operator.

An object of the invention is to provide a pneumatically operated hammer in which the hammer is operated with a maximum of efficiency and in which the air is exhausted from the hammer in such a manner that practically all cushioning of the hammer due to building up of unexhausted air is eliminated.

Another object of the invention is to provide a pneumatic hammer in which the hammer reciprocates in a cylinder freely outwardly of the cylinder to deliver the hammer blow but which is checked on the inward stroke by an air cushion to prevent striking the inner end of the cylinder.

Other objects and advantages of the invention will be apparent from the following description of a preferred form of the invention, reference being made to the accompanying drawings wherein:

Fig. 1 is a view in section of a pneumatic hammer;

Fig. 2 is a view similar to that of Fig. 1 but showing certain parts of the hammer piston in different positions;

Fig. 3 is a view in section taken on line 3-3 of the drawings;

Fig. 4 is a view in section taken on line 4-4 of Fig. 1; and

Fig. 5 is a view in section taken on line 5-5 of Fig. 2.

For the purposes of illustrating my invention I have shown it in the form of an air powered hammer indicated generally at 5, which hammer may be of a size to be readily manipulated by one hand of the operator. The hammer consists of a handle member 6, which may be made of any suitable material such as cast aluminum and it is formed similar to well known pistol type grips. The upper part of the handle is bored as indicated at 7, and the bore is threaded internally as indicated at 8. A barrel member 10 is threaded into the bore, and this member 10 is preferably made of a heat treated steel and it includes an axial bore extending therethrough and the bore has three sections of different diameters. The first section of the bore having the smallest diameter as indicated at 12 and this section is adapted to accommodate a tool member 13, which may be a chisel, or peening tool, for example, and which is adapted to reciprocate in this section. Preferably, the bore is broached to form a hexagonal cross section so that the tool may be of hexagonal stock to prevent rotation thereof. The

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second or intermediate section of the bore is indicated at 13 and the third section is indicated at 14. Mounted in the sections 13 and 14 of the bore in the barrel is a hammer piston 15 which includes a shank portion 16 and a head 17. The shank portion closely fits the walls of the section 13 of the bore and the head 17 closely fits the walls of the section 14 of the bore. It will be noted that an annular shoulder 18 will be formed by the head 17. This hammer piston is adapted to be reciprocated by air pressure, in a manner to be described hereinafter, and it strikes the inner end of the tool 40 to impart a hammer blow to the tool.

The piston 15 is adapted to strike the tool 40 as it is moved to the left and the tool is mounted in the section 12 of the bore in the barrel member so that it may have a limited longitudinal freedom of movement. This is accomplished by forming a wide groove 32 in the tool and providing two opposed ball members 33 in tapered openings 34 in the barrel member, which ball members may partially project into the groove 32 for co-operating with the edges of the groove to limit the longitudinal movement of the tool. The ball members 33 may be retained in this position by a collar 35 surrounding the barrel member. The collar is provided with detents 36 on opposite sides, which detents when aligned with the balls 33 will permit the balls to recede in the openings 34 to unlock the tool to permit its insertion or removal from the barrel. The collar 35 is maintained in place by a split ring 38 and it is normally retained in tool locking position by a detent ball 39.

The piston 15 has an axial bore 20 therein which opens in the end of the piston head 17 facing the end of the cylinder formed by the bores in the barrel member and the handle member, part of which cylinder is the section 14 of the bore in the barrel member. The bore 20 terminates within the shank portion of the piston and two tapered ports 21 lead radially from the bore 20 and open in the side surfaces of the shank.

An annular groove 22 is formed about the interior of the barrel member and in the section 13 of the bore of the barrel member, and the groove is located so that it will be aligned with the ports 21 when the piston 15 is in the left hand extremity of its stroke, as viewed in Fig. 1. Three outlet passages 23 are drilled through the barrel member for forming an outlet from the groove 22, which outlets lead to the atmosphere. When the piston 15 is at the opposite extremity of its stroke as shown in Fig. 2, the ports 21 will be positioned at the left hand end of the cylinder

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formed by the section 14 of the barrel member. Preferably, two opposed passages 24 are formed in the barrel member and lead from section 13 of the bore to permit breathing when the hammer piston reciprocates.

Air under pressure is fed into the bore 14 through a port 25, which port is located remote from the closed end of the cylinder in which the piston head operates and adjacent to the end of the cylinder which communicates with the section 13 of the bore in the barrel member. Air is fed to the port 25 through drilled passages 26, 27 and 28 in the handle member 6, and a finger actuated valve mechanism is disposed intermediate passages 26 and 27 for controlling the flow of air through the passages. This valve mechanism is described in my co-pending application, Serial No. 780,633, filed October 18, 1947, although it may be of any suitable type, many of which are well known in the art. Therefore, the valve will not be described in detail here as it forms no novel part of this invention.

When the valve 29 is open, air will enter the bore 14 through port 25 and when the piston 17 is in the position shown in Fig. 1, the pressure against shoulder 18 will force the piston to the right until ports 21 enter into the cylinder 14. At this time the air will then enter ports 21, pass through the bore 20 and into the end of the cylinder 14 where it will cause piston 15 to be rapidly propelled to the left. As the piston moves to the left, bores 21 are momentarily closed by the walls of the section 13 of the bore in the barrel member until these bores are brought in registration with the groove 22 at which time the air will be exhausted from the piston through the groove 22 and out the outlets 23. When the air is thus exhausted the piston will move to the right again as described.

I have found that by providing the annular groove 22 in the bore of the barrel member air is exhausted from the piston more efficiently than if the groove would be formed in the piston as has been the practice in the past. Furthermore, I have found that the ratio of the volume of the bore 20 to the volume of the annular groove 22 materially affects the efficiency of operation of the piston as a hammer and that this ratio is quite critical. I have found that the volume of the annular groove 22 should be 1.65 times the volume of the bore 20 in the piston and that this ratio must be adhered to within 5% plus or minus the figure given. Furthermore, I have found that the combined cross-sectional area of the ports 21 leading from the bore 20 should be greater than that of the cross-sectional area of the bore and preferably this ratio is 1.5 so that the air may be rapidly exhausted. Similarly, it is desirable to have the combined volumes of the outlets 23 greater than the cross-sectional areas of the annular groove 22, and this ratio is preferably 1.5. When these ratios are maintained, the air is exhausted rapidly enough to prevent cushioning of the

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hammer blow. Thus, the efficiency of the hammer is at a maximum and pounding of the piston against the cylinder end is prevented.

Although I have described but one form of the invention it is apparent that other forms might be adopted, all falling within the scope of the claims which follow.

I claim:

1. A pneumatic hammer comprising a barrel member having a bore therein and a cylinder at the inner end of the bore extending coaxially of the bore and being of greater diameter than the bore, said cylinder being closed at the end opposite the bore; a hammer piston in the bore and cylinder, said piston having a head closely fitting the walls of the cylinder and a shank closely fitting the walls of the bore, said piston being adapted to reciprocate in the barrel member to produce hammer strokes; an air inlet passage opening into the cylinder at a point spaced from the closed end of the cylinder whereby the piston head may reciprocate in the cylinder without closing said opening more than momentarily, said piston having a longitudinal bore therein extending from the end of the piston head surface facing the closed end of the cylinder to a point in the shank; air ports leading from the inner end of said longitudinal bore to the side surface of the shank portion of the piston, said ports in the side surface of said shank being located to be exposed to the interior of the cylinder when the piston approaches one extremity of its stroke in the direction of the closed end of the cylinder and to be closed by the walls of the bore when the piston is intermediate the extremities of its stroke; an exhaust passage leading from said bore and consisting of an annular groove in the walls of said bore and having one or more outlet passages extending from the groove to the atmosphere sufficient to exhaust said air through the piston exhaust port, said groove being located to be in registration with the opening in the side surface of said piston shank and being of approximately the same longitudinal length as said opening when the piston is in said opposite extremity of its stroke.

2. A pneumatic hammer of the character defined in claim 1 in which the air ports of the piston are divergently shaped from the inner end of the bore to the side surface of the shank portion of the piston in order to exhaust the air through these ports rapidly.

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The following references are of record in the file of this patent:

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