Aug. 5, 1952 G. C. CURRENT 2,605,808

PNEUMATIC SHEET METAL HAMMER

Filed Feb. 13, 1951 2 SHEETS—SHEET 1

Fig. 1.

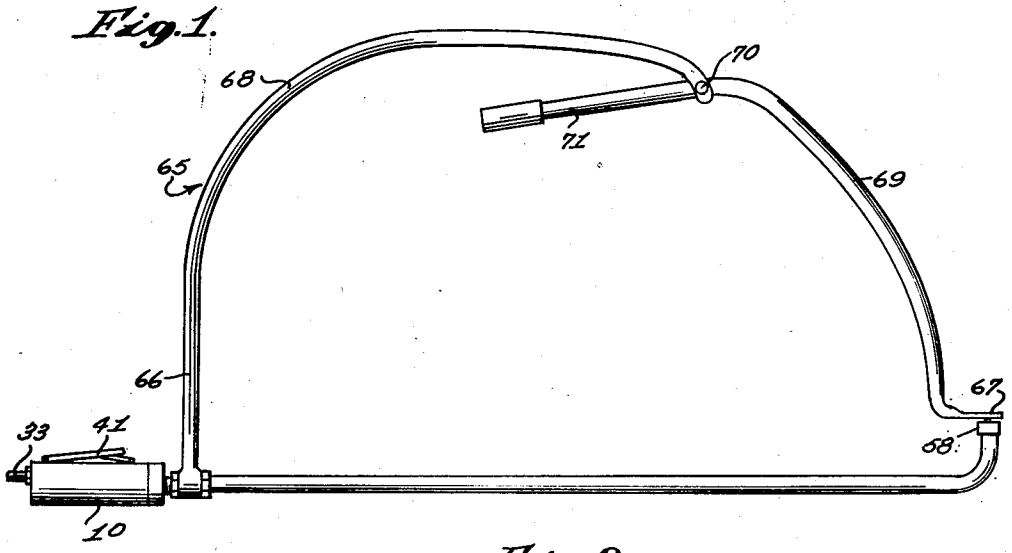


Fig. 2.

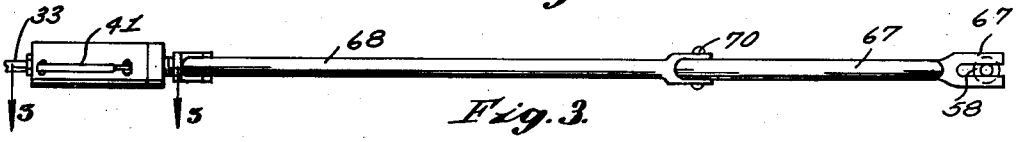


Fig. 3.

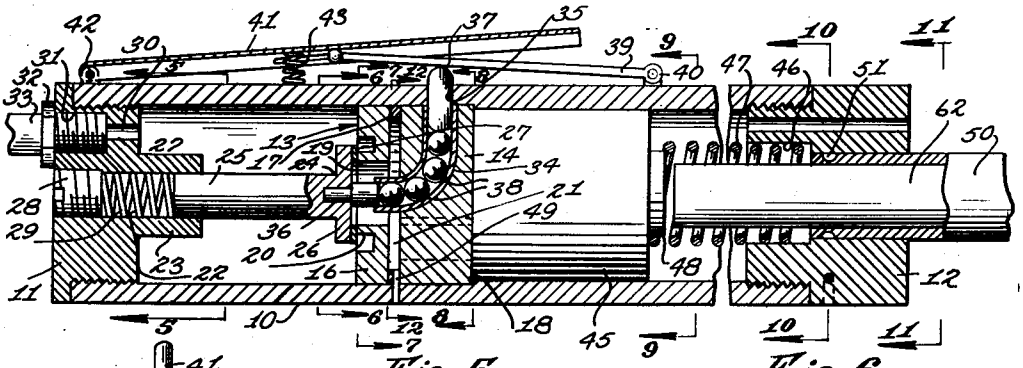


Fig. 5.

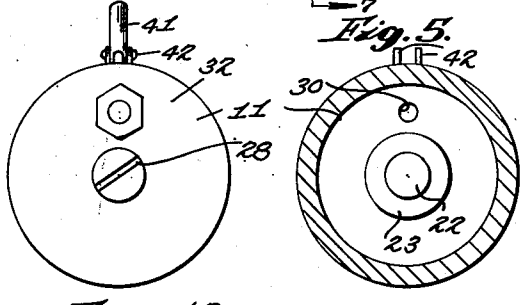


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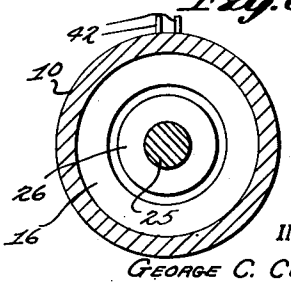


Fig. 13.

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PNEUMATIC SHEET METAL HAMMER

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Fig. 14.

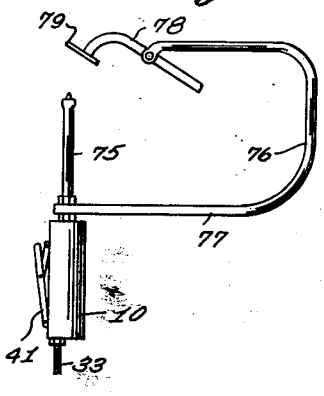


Fig. 4.

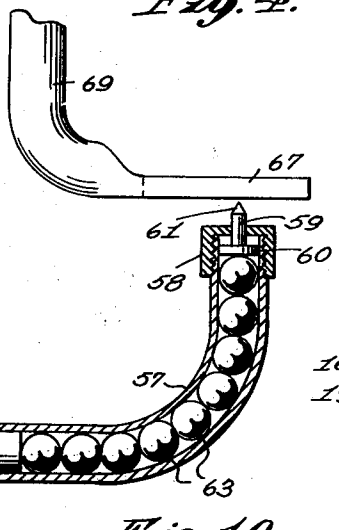


Fig. 7.

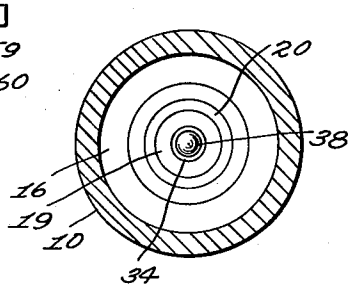
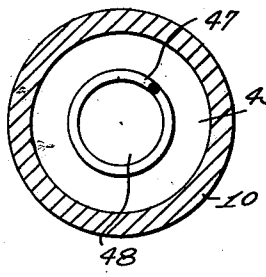
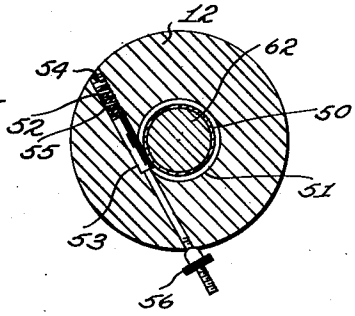


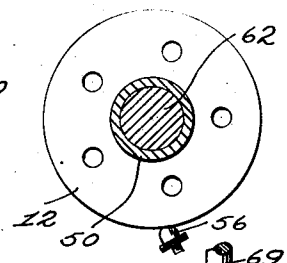
Fig. 9.

Fig. 10.

Fig. 11.







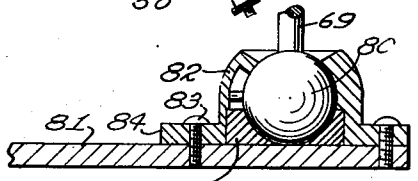


Fig. 12.

Fig. 15.

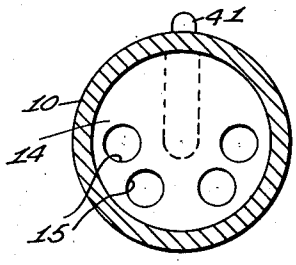
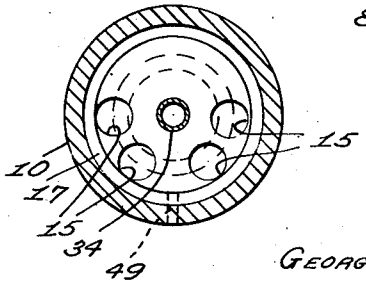


Fig. 8.



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Patented Aug. 5, 1952 2,605,808

UNITED STATES PATENT OFFICE

2,605,808

PNEUMATIC SHEET METAL HAMMER

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Application February 13, 1951, Serial No. 210,642

5 Claims. (Cl. 153—32)

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This invention relates to pneumatic sheet metal hammers or tap hammers, and more particularly to a hand supported pneumatic hammer for removing small dents from sheet metal structures, such as automobile fenders and bodies.

It is among the objects of the invention to provide an improved pneumatic tap hammer which is of light weight and easy to handle and is balanced for more convenient use with less fatigue on the part of the operator; which includes an operating and control unit and tap carrying arms of different shapes releasably connected to the operating and control unit so that the arms can be interchanged for different operating conditions; which can be used in restricted spaces, such as in automobile doors through small openings in the door frames, without removing the upholstery panels, and in automobile body tops by loosening the head lining at its edge, but without removing the lining; which includes a piston or hammer head and a tap or plunger and means for operating the tap in a direction different from the direction of operation of the piston; and which is simple and durable in construction, economical to manufacture, easy to use and positive and effective in operation.

Other objects and advantages will become apparent from a consideration of the following description and appended claims in conjunction with the accompanying drawings, wherein:

Figure 1 is a side elevational view of a pneumatic sheet metal hammer illustrative of the invention;

Figure 2 is an elevational view of the hammer looking at the upper side of the hammer as illustrated in Figure 1;

Figure 3 is a fragmentary cross-sectional view on an enlarged scale on the line 3—3 of Figure 2; showing the left-hand portion of the hammer illustrated in Figures 1 and 2;

Figure 4 is a fragmentary elevational view on an enlarged scale showing the right-hand end portion of the hammer as viewed in Figures 1 and 2, a portion being broken away and shown in cross-section to better illustrate the construction thereof;

Figures 5, 6, 7, 8, 9, 10, 11 and 12 are transverse cross-sectional views on the corresponding section lines on Figure 3;

Figure 13 is an end elevational view of the hammer looking at the left-hand end as viewed in Figure 3;

Figure 14 is a side elevational view showing a modified form of pressure arm connected to the hammer; and

Figure 15 is a cross-sectional view showing a

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modified form of frame end plate for the hammer.

With continued reference to the drawings, the hammer comprises a cylinder 10 which constitutes the handle of the hammer, screw plugs 11 and 12 threaded one into each end of the cylinder, and means, generally indicated at 13, constituting a transverse partition in the cylinder intermediate the length of the cylinder.

The transverse partition 13 comprises a circular disc 14 having spaced apart apertures, as indicated at 15 in Figure 8, extending therethrough, and spaced around the center of the disc substantially at one side of a diameter thereof, and a disc-shaped nut 16 disposed at the side of the disc 14 adjacent the end plug 11 and spaced from the disc by an annular washer 17 having its periphery in contact with the inner surface of the cylinder. The other side of the disc 14 bears against an annular shoulder 18 in the cylinder, so that the transverse partition is definitely located in the cylinder and the washer 17 is compressed between the nut 16 and the disc 14.

The nut 16 is provided with a central bore 19 constituting a fluid pasage through the nut and surrounded by an annular flange or boss 20 constituting a valve seat. The fluid passage 19 communicates with the passages 15 in the disc 14 through the space 21 provided between the disc 14 and the nut 16 by the annular washer 17.

The end plug 11 is provided with a bore 22 extending coaxially therethrough and through a sleeve or boss formation 23 at the inner side of the plug. A valve plunger 24 has a cylindrical shank 25 slidably received in the inner end of the bore 22 and a disc-shaped head 26 overlying the adjacent edge of the valve seat flange 20, a gasket 27 of resilient material being carried by the valve plunger head and engageable with the outer end or edge of the valve seat to provide a seal between the plunger head and the valve seat when the valve is closed.

A screw plug 28 is threaded into the outer end of the bore 22 and a compression spring 29 is disposed in the bore between this plug and the adjacent end of the plunger to resiliently urge the plunger into valve closing engagement with the valve seat.

A second bore 30 extends through the end plug 11 at a location spaced from the bore 22 and is provided in its outer end with a screw-threaded counterbore 31 into which a fitting 32 is threaded to connect a fluid line or conduit 33 to the hammer.

An elbow tube 34 is disposed in an opening

in the disc 14 and extends from the peripheral surface of the disc to a location at the end of the disc adjacent the nut 16 and concentric to the bore 19 in the nut. An aperture 35 in the wall of the cylinder 10 registers with the end of the tube 34 at the peripheral surface of the disc.

A cylindrical detent 36 is secured to the head end of the valve plunger and extends into the adjacent end of the tube 34, and an elongated plunger element 37 is slidably received in the aperture 35 in the cylinder and extends from the outside of the cylinder into the adjacent end of the tube 34. Ball elements 38 are disposed in the tube between the plunger element 37 and the detent 36 and are effective to move the head of the valve away from the valve seat 20 when the element 37 is forced inwardly of the cylinder.

A lever 39 is pivotally connected at one end to the cylinder by a pivotal connection 40 located at the side of the transverse partition remote from the end plug 11 and bears intermediate its length on the outer end of the element 37. A hand lever or valve trigger 41 is pivotally connected to the cylinder at one end by a connection 42 located adjacent the end plug 11 and bears intermediate its length on the end of the lever 39 remote from the pivotal connection 40, so that manual pressure forcing the lever 41 toward the cylinder will open the valve. A compression spring 43 is disposed between the lever 41 and the cylinder and resiliently urges the lever away from the cylinder.

With this arrangement, air from the conduit 33 is continuously admitted into the space within the cylinder and between the nut 16 and the end plug 11 and surrounding the valve plunger 24, and, when the lever 41 is manually pressed toward the cylinder, this compressed air is admitted through the bore 19 in the nut and the apertures 15 in the disc 14 to the space within the cylinder at the sides of the intermediate partition remote from the end plug 11.

A piston 45 is slidably mounted in the cylinder between the transverse partition 13 and the end plug 12 and the end plug 12 is provided with a coaxial bore having at its inner end a counterbore 46. A compression spring 47 is received at one end in the counterbore 46 bearing against the annular shoulder at the inner end of this counterbore and bears at its other end against the adjacent end of the piston 45 to resiliently urge the piston toward the transverse partition 13. The end of the spring 47 in engagement with the piston is maintained in center position relative to the piston by an anvil extension 48 projecting outwardly from the corresponding end of the piston and received in the spring.

A bleed opening 49 extends through the wall of the cylinder 10 and communicates with the space 21, so that when the head of the valve plunger is in valve closing engagement with the valve seat 20, air will bleed out of the space between the piston 45 and the transverse partition 13, permitting the piston to move toward and into contact with the transverse partition, as illustrated in Figure 3, under the influence of the spring 47.

An elongated, tubular arm 50 has one end telescopically received in the bore of the end plug 12 and is provided against this end with an external annular groove 51. The end plug is provided with a chordwise extending bore 52 and a locking pin 53 is slidably mounted in this bore and engages in the groove 51 of the arm 50 to releasably lock the arm in the end plug 12, as is particularly illustrated in Figure 10. The bore 52 is provided intermediate its length with an annular shoulder, and the pin 53 is provided intermediate its length with a shoulder which engages the shoulder in the bore to limit movement of the pin through the bore in one direction. One end of the bore is closed by a screw plug 54 and a compression spring 55 disposed in the bore between the screw plug and the adjacent end of the locking pin resiliently urges the locking pin to the position in which it lockingly engages in the groove 51 of the arm 50. The other end of the pin projects out of the end plug and inwardly directed manual pressure on this outwardly projecting end of the pin will force the pin inwardly of the bore 52 against the force of the spring 55 to a position at which the pin is clear of the groove 51 and releases the arm for removal from the end plug. A nut 56 is threaded onto the outwardly projecting end of the pin and secures the pin against accidental release of the arm.

At its end remote from the end plug 12, the arm is provided with an elbow bend 57, as particularly illustrated in Figure 9, and this end of the arm is externally screw-threaded and receives a flanged nut 58 provided with a central aperture. A tap pin 59 has a cylindrical shank slidably received in the aperture of the nut 58 and a disc-shaped head 60 within the tubular arm at the inner side of the end wall of the nut. The other end of the shank of the pin is rounded or pointed, as indicated at 61, to act on sheet metal work pieces to remove small dents therefrom.

A ram 62 in the form of an elongated cylindrical rod extends through the arm 50 from a location adjacent the elbow bend 57 to a location against the anvil 48 of the piston or hammer head 45, and a series of ball elements 63 are disposed in the arm between the head 60 of the tap pin and the adjacent end of the ram.

With this arrangement, when the piston 45 is forced against the adjacent end of the ram by the admission of compressed air between the piston and the transverse partition 13, this force is transmitted through the ram and the ball elements 63 to the pin 59, forcing the pin against a sheet metal work piece with which the pointed or rounded end of the pin is in contact. When the compressed air is cut off and bleeds through the vent 49, the spring 47 forces the piston away from the ram and removes the pressure of the tap pin. Thus, a hammering action is produced by the pin each time the lever 41 is operated to open and close the valve provided by the valve head 26 and valve seat 20.

A frame, generally indicated at 65, in the form of elongated metal tubes or rods, is secured at one end to the arm 50 at a location adjacent the cylinder 10, and a portion 66 of the frame projects substantially perpendicularly from the arm. At its other end the frame terminates in a flat abutment plate 67 which is enclosed in opposition to the outer end of the tap pin 59. The intermediate portion of the frame is spaced from the arm 50 to receive a work piece between the frame and the arm.

The frame is made in two parts 68 and 69, which are longitudinally curved and pivotally connected together intermediate the length of the frame by a pivot pin 70. In the arrangement illustrated, the pivot pin is located adjacent the end of the frame member 68 and intermediate

the length of the frame member 69, the frame member 69 extending from the pivot pin along the member 68 in overlapping relationship to the latter to provide a handle 71 subject to manual pressure for forcing the abutment plate 67 toward the tap pin 59.

In using the hammer, the sheet metal work piece is placed between the pin 59 and the abutment plate or foot 67 and the hammer is moved relative to the work piece until the tap pin is on a dent to be removed. Pressure is then applied between the frame member 68 and the handle portion 71 of the frame member 69 to clamp the work piece between the pin and the abutment plate or foot and the valve lever 41 is then squeezed toward the cylinder 10 to admit compressed air to the hammer and provide a hammering action by the tap pin.

In the modified arrangement illustrated in Figure 14, the parts are all the same as described above, except that a modified arm 75 carrying a modified frame 76 has been substituted for the arm 50 and frame 65 of the first-described form of the invention.

The arm 75 is straight and shorter than the arm 50 and the ball elements 63 are omitted therefrom. The frame 76 is of substantially rectangular shape and includes a frame part 77 secured at one end to the arm 75 and extending approximately around three sides of a rectangle and a frame part 58 pivotally connected intermediate its length to the other end of the part 77 and carrying an abutment or foot plate 79 at one end and in opposition to the corresponding tap pin, the other end of the part 78 overlapping the part 77 and providing a handle for manually forcing the plate 79 toward the pin carrying end of the arm 75.

In the modified arrangement shown in Figure 15, the pivotally mounted portion of the frame, indicated at 69, but which may be either the part 69 or the part 78 or the corresponding part of any other frame, has a universal connection with the associated foot or abutment plate.

In this arrangement, the frame part is provided at its plate carrying end with a ball formation 80, and the plate 81 is provided with a socket including an outer part 82 receiving the ball formation and secured to the plate by screws 83 extending through registering apertures in the plate and in an annular external flange 84 on the socket part 82, and an insert 85 disposed within the outer part 82 and completing a substantially spherical ball receiving space within the socket. The outer part 82 of the socket is provided at its end remote from the plate with a beveled opening through which the arm 69 extends.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalence of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. A pneumatic tap hammer comprising a cylinder, means providing a transverse partition in said cylinder intermediate the length thereof, end plugs secured one in each end of said cylinder, a piston slidably mounted in said cylinder between said transverse partition and one of said end plugs, a valve plunger in said cylinder between said transverse partition and the other end plug, said one end plug having a bore extending therethrough, a tubular arm having one end received in the bore of said one plug and extending outwardly from said one plug, means releasably connecting said arm to said one plug, a tap pin movably mounted in said arm at the other end thereof, means extending through said tubular arm from said tap pin to said piston for transmitting movement of said piston to said tap pin, a frame secured at one end to said arm at a location adjacent said cylinder and having its other end disposed adjacent said tap pin and its intermediate portion spaced from the intermediate portion of said arm, said frame including two members pivotally connected together with their adjacent ends overlapping to provide a leverage for manually forcing said outer end of said frame toward said tap pin, said transverse partition having a valve seat on the side thereof adjacent said valve plunger and a fluid passage leading from said valve seat to the other side thereof, said other end plug having a guide means thereon maintaining said valve plunger in alignment with said valve seat and a fluid passage therethrough, spring means acting between said other end plug and said valve plunger resiliently urging said plunger into valve closing engagement with said valve seat, a valve operating lever mounted on said cylinder, means extending through said transverse partition connecting said lever to said valve plunger for manually opening said valve to admit fluid to said transverse partition and to the space between said transverse partition and said piston, said cylinder having a vent opening connected to said space for venting pressure fluid therefrom, spring means acting between said piston and said one end plug resiliently urging said piston toward said transverse partition, and a fitting secured to said other end plug in registry with the fluid passage therethrough for connecting a pressure fluid conduit to the hammer.

2. A pneumatic tap hammer comprising a cylinder, means providing a transverse partition in said cylinder intermediate the length thereof, end plugs secured one in each end of said cylinder, a piston slidably mounted in said cylinder between said transverse partition and one of said end plugs, a valve plunger in said cylinder between said transverse partition and the other end plug, said one end plug having a bore extending therethrough, a tubular arm having one end received in the bore of said one plug and extending outwardly from said one plug, means releasably connecting said arm to said one plug, a tap pin movably mounted in said arm at the other end thereof, means extending through said tubular arm from said tap pin to said piston for transmitting movement of said piston to said tap pin, a frame secured at one end to said arm at a location adjacent said cylinder and having its other end disposed adjacent said tap pin and its intermediate portion spaced from the intermediate portion of said arm, said frame including two members pivotally connected together with their adjacent ends overlapping to provide a leverage for manually forcing said outer end of said frame toward said tap pin, said transverse partition having a valve seat on the side thereof adjacent said valve plunger and a fluid passage leading from said valve seat to the other side thereof, said other end plug having a guide means thereon maintaining said valve plunger in alignment with said valve seat and a fluid

passage therethrough, spring means acting between said other end plug and said valve plunger resiliently urging said plunger into valve closing engagement with said valve seat, a valve operating lever mounted on said cylinder, means extending through said transverse partition connecting said lever to said valve plunger for manually opening said valve to admit fluid to said transverse partition and to the space between said transverse partition and said piston, said cylinder having a vent opening connected to said space for venting pressure fluid therefrom, spring means acting between said piston and said one end plug resiliently urging said piston toward said transverse partition, and a fitting secured to said other end plug in registry with the fluid passage therethrough for connecting a pressure fluid conduit to the hammer, said tubular arm having an elbow bend therein at its end remote from said cylinder and said means extending through said tubular arm comprising an elongated rod extending from a location adjacent the corresponding end of said piston to a location adjacent said tubular bend, and ball elements disposed in said arm between said tap pin and the adjacent end of said rod.

3. A pneumatic tap hammer comprising a cylinder, means providing a transverse partition in said cylinder intermediate the length thereof, end plugs secured one in each end of said cylinder, a piston slidably mounted in said cylinder between said transverse partition and one of said end plugs, a valve plunger in said cylinder between said transverse partition and the other end plug, said one end plug having a bore extending therethrough, a tubular arm having one end received in the bore of said one plug and extending outwardly from said one plug, means releasably connecting said arm to said one plug, a tap pin movably mounted in said arm at the other end thereof, means extending through said tubular arm from said tap pin to said piston for transmitting movement of said piston to said tap pin, a frame secured at one end to said arm at a location adjacent said cylinder and having its other end disposed adjacent said tap pin and its intermediate portion spaced from the intermediate portion of said arm, said frame including two members pivotally connected together with their adjacent ends overlapping to provide a leverage for manually forcing said outer end of said frame toward said tap pin, said transverse partition having a valve seat on the side thereof adjacent said valve plunger and a fluid passage leading from said valve seat to the other side thereof, said other end plug having a guide means thereon maintaining said valve plunger in alignment with said valve seat and a fluid passage therethrough, spring means acting between said other end plug and said valve plunger resiliently urging said plunger into valve closing engagement with said valve seat, a valve operating lever mounted on said cylinder, means extending through said transverse partition connecting said lever to said valve plunger for manually opening said valve to admit fluid to said transverse partition and to the space between said transverse partition and said piston, said cylinder having a vent opening connected to said space for venting pressure fluid therefrom, spring means acting between said piston and said one end plug resiliently urging said piston toward said transverse partition, and a fitting secured to said other end plug in registry with the fluid passage therethrough for connecting a pressure fluid conduit to the hammer, said arm being substantially straight, said frame extending substantially around three sides of a rectangle, and an abutment plate carried by said frame at the end thereof remote from said cylinder in opposition to the adjacent end of said arm.

4. A pneumatic tap hammer comprising a cylinder, means providing a transverse partition in said cylinder intermediate the length thereof, end plugs secured one in each end of said cylinder, a piston slidably mounted in said cylinder between said transverse partition and one of said end plugs, a valve plunger in said cylinder between said transverse partition and the other end plug, said one end plug having a bore extending therethrough, a tubular arm having one end received in the bore of said one plug and extending outwardly from said one plug, means releasably connecting said arm to said one plug, a tap pin movably mounted in said arm at the other end thereof, means extending through said tubular arm from said tap pin to said piston for transmitting movement of said piston to said tap pin, a frame secured at one end to said arm at a location adjacent said cylinder and having its other end disposed adjacent said tap pin and its intermediate portion spaced from the intermediate portion of said arm, said frame including two members pivotally connected together with their adjacent ends overlapping to provide a leverage for manually forcing said outer end of said frame toward said tap pin, said transverse partition having a valve seat on the side thereof adjacent said valve plunger and a fluid passage leading from said valve seat to the other side thereof, said other end plug having a guide means thereon maintaining said valve plunger in alignment with said valve seat and a fluid passage therethrough, spring means acting between said other end plug and said valve plunger resiliently urging said plunger into valve closing engagement with said valve seat, a valve operating lever mounted on said cylinder, means extending through said transverse partition connecting said lever to said valve plunger for manually opening said valve to admit fluid to said transverse partition and to the space between said transverse partition and said piston, said cylinder having a vent opening connected to said space for venting pressure fluid therefrom, spring means acting between said piston and said one end plug resiliently urging said piston toward said transverse partition, a fitting secured to said other end plug in registry with the fluid passage therethrough for connecting a pressure fluid conduit to the hammer, an abutment plate carried by said frame at the end of the latter remote from said cylinder, and means providing a universal connection between said frame and said abutment plate.

5. A pneumatic tap hammer comprising a cylinder, end plugs secured one at each end of said cylinder, one of said end plugs having a bore extending coaxially therethrough, an elongated tubular arm having one end received in the bore of said one end plug, means detachably connecting said arm to said one end plug, a piston reciprocable in said cylinder adjacent said one end plug, a tap pin movably mounted in said arm at the other end of the latter, means extending through said arm from said tap pin to said piston for transmitting movements of said piston to said tap pin, a two-part frame secured at one end to said arm adjacent said cylinder and having its other end adjacent said tap pin and its

intermediate portion spaced from said arm, a pressure plate on said other end of said frame and opposed to said tap pin, the two parts of said frame being pivotally interconnected intermediate the length of the frame and having overlapping end portions providing leverage for manually forcing said pressure plate toward said tap pin, a fitting secured to the other end plug for connecting a pressure fluid conduit thereto, said other end plug having a fluid passage extending from said fitting to the interior of said cylinder adjacent said other end plug, valve means in said cylinder between said other end plug and said piston for controlling the application of fluid under pressure to said piston, said cylinder being provided with a vent for releasing fluid under pressure therefrom, and manually actuated lever means mounted on said cylinder and connected to said valve means for operating the latter.

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