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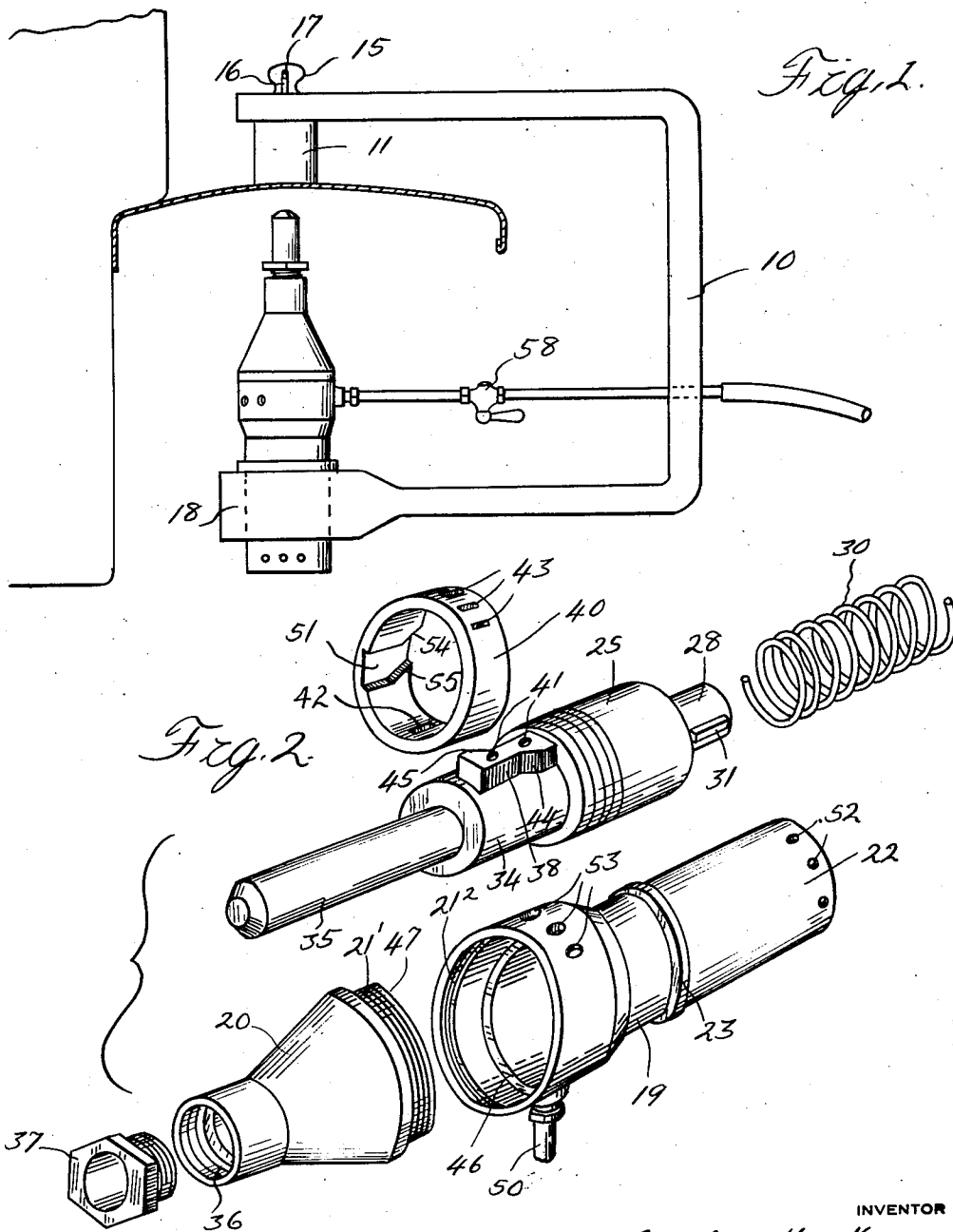
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1,934,979

POWER OPERATED BUMPING TOOL FOR SHEET METAL

Filed July '26, 1930

2 Sheets-Sheet 1



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POWER OPERATED BUMPING TOOL FOR SHEET METAL

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2 Sheets-Sheet 2

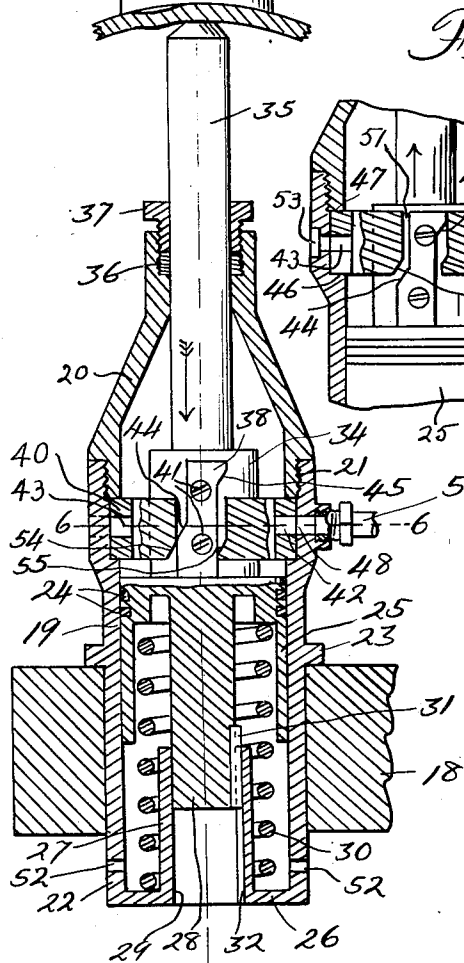
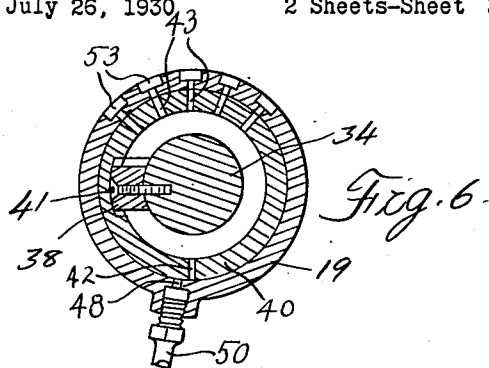
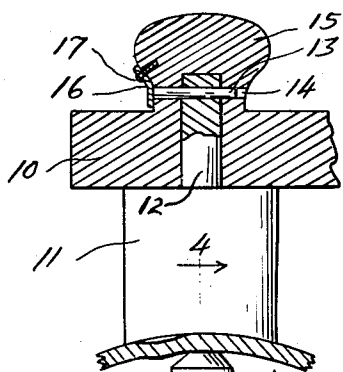


Fig. 3.

Fig. 5.

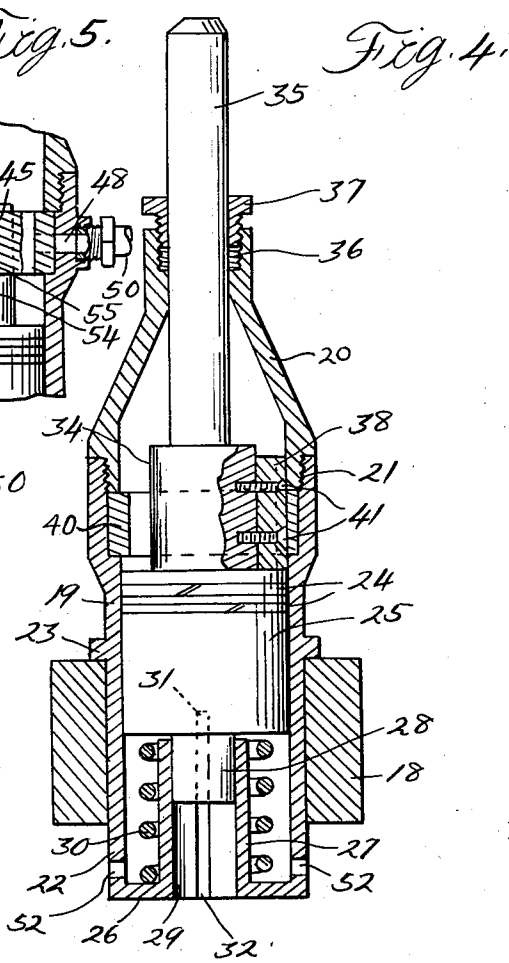


Fig. 4.

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POWER OPERATED BUMPING TOOL FOR
SHEET METAL

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4 Claims. (Cl. 121—30)

This invention relates to pneumatic hammering or bumping tools, and more particularly to a tool of this nature which is adapted to hammering or bumping out irregularities in sheet metal, such as automobile fenders, etc.

An important object of this invention is the incorporation of a pneumatic hammer therein which will operate with equal efficiency, and deliver blows of equal predetermined force, despite wide differences in the air pressure supplied thereto.

Another object of my invention is the provision of such an automatic bumping tool enabling quick and easy smoothing out of irregularities in automobile fenders, and in which the dolly or anvil is automatically held in correct position against the opposite side of the metal being bumped, from the hammer.

Another object of this invention is to provide such a tool in which a dolly is supported on the opposite side of the work by the tool itself, in a new and highly efficient manner in which it could not be done by hand, and whereby coordinate movement of hammer and dolly, and firm engagement of the latter with the work as each blow is struck, is insured.

It is further an object of my invention to produce such a bumping tool which will be of unusually simple and inexpensive, but rugged construction.

A still further object of this invention is the production of a portable power tool which will be of relatively light weight.

Other objects and advantages will be apparent from the following description, wherein reference is made to the accompanying drawings illustrating a preferred embodiment of my invention and wherein similar reference numerals designate similar parts throughout the several views.

In the drawings:

Figure 1 is a side elevational view of my improved pneumatic bumping tool, also showing an important use thereof, namely the straightening of an automobile fender, which is fragmentarily and sectionally shown.

Figure 2 is a disassembled perspective view of my device, showing all of the principal parts thereof.

Figure 3 is a vertical sectional view taken diametrically through my device, part of the clamp being broken away, and looking in the same direction as in Figure 1; a piece of sheet metal being also fragmentarily shown in the process of being hammered by the tool.

Figure 4 is a vertical sectional view similar to Figure 3, but taken on the line 4—4 of that view and looking in the direction of the arrows there shown, being right angularly thereto, or from the end of the clamp.

Figure 5 is a detail fragmentary sectional view of the valve and valve operating mechanism.

Figure 6 is a horizontal section taken substantially on the line 6—6 of Figure 3.

Referring now to the drawings:

Reference character 10 designates a C clamp, which supports my improved pneumatic hammer, and one of a series of interchangeable dollies or anvils 11, which serves to reinforce the other side of the metal being worked upon, and to govern the deformation thereof by the hammer.

The dolly, which may be of any desired shape, depending upon the contour desired to be imparted to the material being worked upon, is firmly but detachably affixed to the upper leg of the clamp in any desired manner and position, as by forming the dolly with a projecting rod or post 12, which is diametrically apertured near its outer end, as at 14, for the reception of a tapering pin 13. To support the pin, the apertured knob 15 may be suitably carried by the clamp on that side, being here shown as integral. For additional security in holding the pin in place, a retaining clip 16 may cover the larger end of the aperture, being affixed to the knob by means of the pin 17, about which it may be swung to the protecting position, as shown in Figure 3.

The pneumatic hammer is supported upon the other leg of the clamp in axial alignment with the dolly, that extremity of the clamp being suitably enlarged as at 18, for reenforcement, and to more firmly secure the hammer. The lower portion of the housing of the hammer, which is substantially cylindrical, is fitted into an aperture in the enlarged portion of the clamp, as shown in Figures 1, 3, and 4. The relative width of the clamp is clearly shown in Figure 4, although this is of course not important to the invention itself. The lower portion 19 and upper portion 20 of the housing are separate, and secured together, as by screwing into each other, as shown in Figures 3 and 4, at 21. The smooth lower portion which fits into the clamp is designated 22, and its engagement with the clamp may be a slip fit, enabling removal of the hammer for other uses. A flange 23 limits the downward movement of the housing in the clamp.

The interior of the lower portion 19 of the housing is formed as a smoothly finished cylinder, within which the reciprocable piston 25 slid-

ably fits. Suitable packing rings 24, of conventional form and carried by the piston, seal the latter within the cylinder. The cylinder is closed at its lower end by means of the annular bottom wall 26, which is turned upwardly at the center, (being formed when the cylinder is cast) to form the upstanding axially apertured post 27, the bore 29 of which is smoothly finished to form a journal for the slidable rod 28, which is connected to, and supports and guides the piston, being preferably cast integral therewith. (Figure 3). The rod 28, which is freely slidable in the journal 29, is also prevented from turning therein, as by means of the spline 31, which may project integrally therefrom, and the cooperating slot 32 formed in the journal 29, as by broaching. It will thus be seen that not only is the piston prevented from rotating in the cylinder, but all parts carried by the piston are also prevented thereby from turning in the housing.

The piston and its associated parts are constantly urged upwardly by the relatively heavy compression spring 30, in the manner shown in Figures 3 and 4.

The hammer is also carried by the piston, and may, with the enlarged intermediate portion 34, be cast integral therewith, if a sufficiently hard material is used. If, however, it is desired to use a harder material for the hammer than for the piston, the former may be secured thereto in any suitable manner, as by threading thereinto, or over a threaded projection carried by the piston; which latter is my preferred method. The elongated cylindrical hammer head 35 projects upwardly and out of the housing through a suitable stuffing box 36, which is closed by a packing nut 37, and through which the hammer slides. As shown in Figures 3 and 4, the stuffing box and packing nut seal the top of the frusto-conical upper portion 20 of the housing.

The enlarged base 34 of the hammer, which is secured to the piston, carries a valve-actuating cam 38, which may be secured thereto by screws 41. The valve itself is a short sleeve or annulus, 40, having an inlet port 42 therethrough in one portion of its periphery, and a plurality of outlet ports 43, in another. As shown in Figures 2, 3, and 4, the cam is a short block, having, upon opposite ends and sides the projecting slanting surfaces 44 and 45, which are the cam faces.

The upper extremity of the lower portion 19 of the housing is enlarged and internally threaded, as best shown in Figure 2 at 21'. The counterbored portion carrying these threads is of appreciably greater diameter than the cylinder immediately below it which houses the piston, and the counterbore extends downwardly below the threads, which occupy only the upper portion of it, the circumferential ridge 46 being thus formed, which, cooperating with the smooth lower surface 47 of the reduced and externally threaded portion 21' of the upper part, 20, of the housing, forms an annular groove when the two portions of the housing are screwed together. The groove thereby formed is of the proper dimensions to receive the sleeve valve 40 therein without binding, in a slip fit, holding the sleeve against movement longitudinally of the housing while enabling the sleeve to be turned freely in the groove when the parts 19 and 20 of the housing are tightly secured together. An inlet port 48 is drilled through the housing in the grooved portion forming the valve seat, and in opposing

position are drilled a number of outlet ports 53, which thereby present a much greater cross sectional area than the inlet. The outlet ports in the sleeve valve and in the groove in the housing are correspondingly placed circumferentially and longitudinally of the cylinder, so that when the sleeve is in place, all of the outlet apertures in both the sleeve valve and the cylinder may be aligned, enabling their simultaneous opening or closing by rotating the sleeve valve in the groove. The inlet apertures in the sleeve valve and cylinder are somewhat offset with respect to each other circumferentially, so that when they are aligned, and the inlet passage consequently open, all of the outlet ports will be in disalignment or closed; while when the outlet ports are opened the inlet port will be blanked, by reason of the disalignment of the ports in the sleeve and the groove in the cylinder.

An air hose 50 may be coupled to the inlet port to furnish the motivating fluid supply. It will be seen that an appreciable annular space separates the inner surface of the sleeve valve and the cylindrical base 34 of the hammer, which supports the valve-actuating cam; permitting free circulation of the air or other motivating fluid within that entire part of the housing above the piston, both upper and lower portions. Thus when the inlet port 42 in the sleeve valve is aligned with the inlet port 48 in the housing, as shown in Figure 3, the outlet ports are closed, and incoming air having sufficient force to overcome the pressure of the spring 30 will force the piston downwardly. It is of course desired to turn the valve, when the piston has completed the downward stroke, to the position wherein the inlet is closed and the outlet ports are opened. When this occurs, the spring forces the piston, and consequently the hammer, upwardly, for the working stroke. The air in the space above the piston is of course simultaneously forced out through the relatively unrestricted outlet ports 43—53, which are then aligned, as shown in Figure 5. When the upward stroke is completed it is desired to shift the sleeve valve back to its first position, in which only the inlet is open, to again retract the hammer.

To accomplish this shifting of the sleeve valve by rotating it within the groove, a substantially vertical groove or slot 51 with substantially parallel sides, is cut in the inner surface of the sleeve valve; having, however, a bend, or slanting sides 54 and 55, at one extremity, here shown as near the bottom. These constitute the cam followers, and the cam block 38 projects far enough from the enlarged hammer base 34 to engage in the slot, in the manner shown in Figures 3 and 5, and side view in Figure 4. The vertical distance between the upper and lower slanting surfaces of the cam, 45 and 44, is governed by the length of the piston stroke in which the valve-shifting action must occur. When no air is applied to the piston, it is normally held in raised position by the spring 30. When the piston is raised, the inlet port is always open, as will be apparent. If then air is forced through the inlet port into the space above the piston, the latter will be forced downwardly. As the piston approaches the bottom of its stroke, the upper surface 45 of the cam engages the slanting surface 55 of the sleeve valve, and turns the sleeve sufficiently to close the inlet port and open the outlet ports. The spring 30 then forces the piston upwardly; the air being discharged through the outlet ports. As the piston, carrying the cam, approaches the

top of its stroke, the lower slanting cam surface 44 engages the other sloping face 54 of the slot, and turns the sleeve valve sufficiently to close the outlet ports and open the inlet ports. Thus automatically, air is intermittently fed to the space above the piston during the proper phase of each cycle, alternately forcing the piston and hammer downwardly, at which time it is cut off while the spring forces them upwardly—during which time only, the outlet ports are open. The reliability of this action is insured by the fact that the spline and slot 31—32 prevent the piston and cam from turning about their axis, and force perfect rectilinear movement of the cam; while the sleeve is free to rotate.

Breather ports 52 are drilled in the cylindrical lower portion 22 of the housing, below the piston, to prevent cushioning of the piston by trapped air.

If desired, provision may be made for rendering adjustable the pressure of the spring 30, or springs of different strengths may be substituted, although I have not found this to be necessary, since no matter at what pressure air may be supplied, as long as the pressure is sufficient to overcome the upward pressure exerted by the spring, and to force the piston downwardly sufficiently to shift the valve, the hammer will operate, and the pressure may vary from that which is barely sufficient to force down the piston, to all that the housing will withstand, and the force of the blow struck by the hammer will nevertheless remain constant at all times; because the blow is delivered under the influence of the spring and not the air.

A valve 58 may be inserted in the air line to control the supply, and the speed of operation of the hammer may also be controlled thereby if desired, although ordinarily it is desired to have it strike as rapidly as possible. By means of this valve also, the hammer may be retracted from the dolly sufficiently to produce a needed space between them, and the hammer will hold such position, as long as it has not been retracted sufficiently to shift the valve. Thus if it becomes necessary to use the device upon material which is thicker at the edge than the part wished to be worked, as automobile fenders, which usually have a bead at the edge, the hammer head may be retracted sufficiently to allow slipping the bead between the hammer and the dolly by merely opening the valve 58 slightly, or until the piston has been forced downwardly a short distance.

While it will be apparent that the illustrated embodiment of my invention herein disclosed is well calculated to adequately fulfill the objects and advantages primarily stated, it is to be

understood that the invention is susceptible to variation, modification and change within the spirit and scope of the subjoined claims.

What I claim is:

1. In a hammering machine having a cylinder and a truck type piston reciprocable therein, means comprising a guide member projecting into the space encompassed by the skirt of the piston for preventing relative rotative movement of the piston and cylinder, and a spring partially housed within the piston, surrounding the guide member and urging the piston in one direction.

2. In a fluid-driven hammering machine, a housing, a reciprocable trunk type piston within the housing, valvular controlling means within the housing for the motivating fluid, comprising a circumferentially shiftable sleeve valve surrounding the piston, actuating means for the valve comprising a shifting member carried by the piston, means engaging the piston for preventing relative rotation thereof, and a spring urging the piston in one direction and partially housed therewithin.

3. In a fluid-driven hammer, a housing, a cylinder therein, a trunk type piston reciprocable within the cylinder, a reciprocable hammer carried by the piston, means for preventing rotation of the piston, an annular shifting controlling valve carried by the housing and encircling the reciprocating parts for controlling the inlet and exhaust of the motivating fluid, a valve actuating member carried by the reciprocable parts for shifting the valve, and a spring arranged partly within the skirt of the piston for urging the same in one direction.

4. In a fluid-driven hammer, a housing, a cylinder therein, a trunk type piston reciprocable within the cylinder, a reciprocable hammer connected to the piston and projecting through and from the housing, a source of fluid supply deliverable under pressure to the housing and injectable thereinto upon the hammer side of the piston, a shiftable valve carried by the housing for controlling the inlet thereto and exhaustion therefrom of the motivating fluid, valve actuating means carried by the reciprocable parts for shifting the controlling valve, a spring arranged within the skirt of the piston and normally urging the same toward the fluid inlet, thus forcing the hammer outwardly, whereby injection of fluid into the housing causes movement of the piston away from the inlet to retract the hammer, and release of the fluid pressure permits movement of the piston toward the inlet, causing outward movement of the hammer, under the influence of said spring.

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