Aug. 25, 1964 W. E. JOHNSON ETAL 3,145,449

POWER OPERATED RECIPROCATING TOOL

Filed April 18, 1962 3 Sheets-Sheet 1

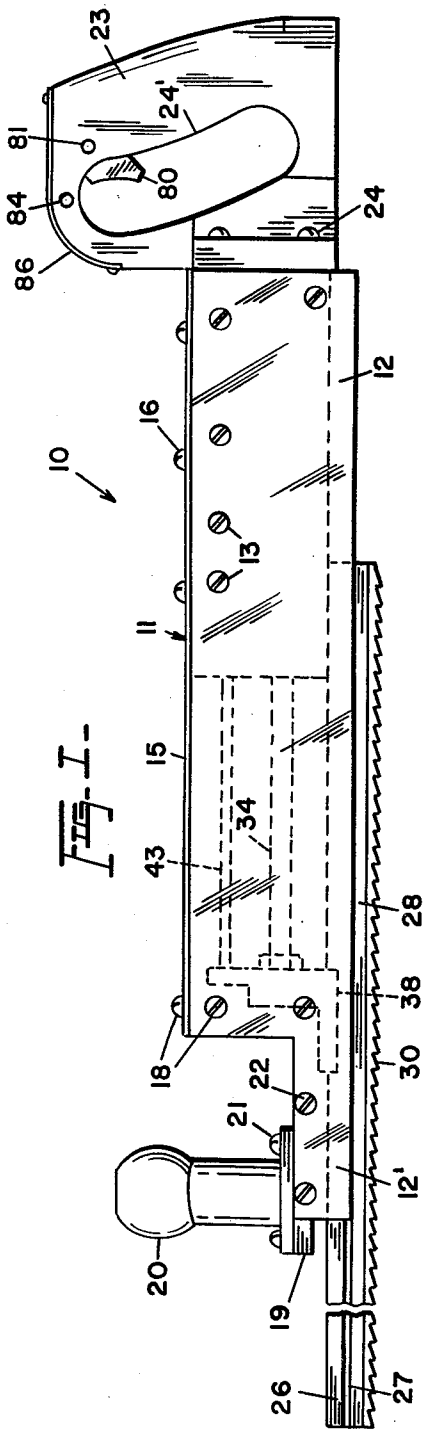


FIG. 1

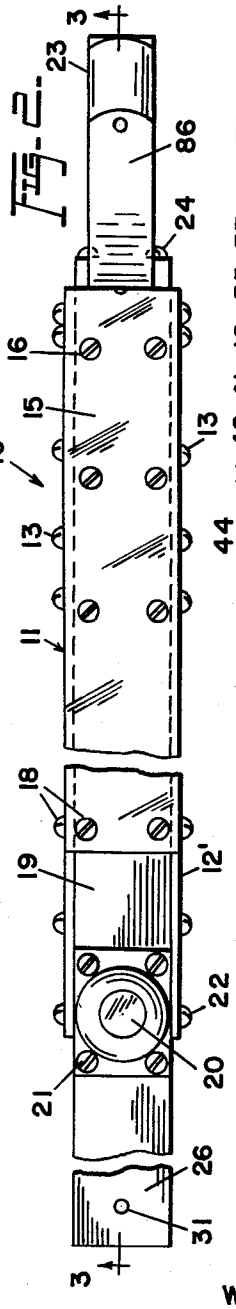


FIG. 2

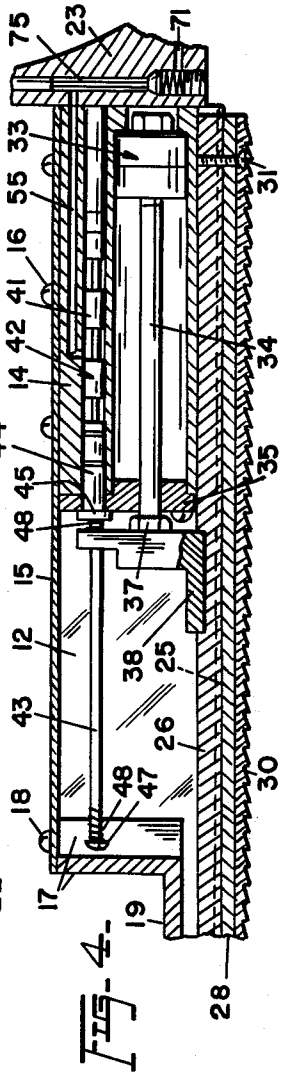


FIG. 4

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Filed April 18, 1962 3 Sheets-Sheet 2

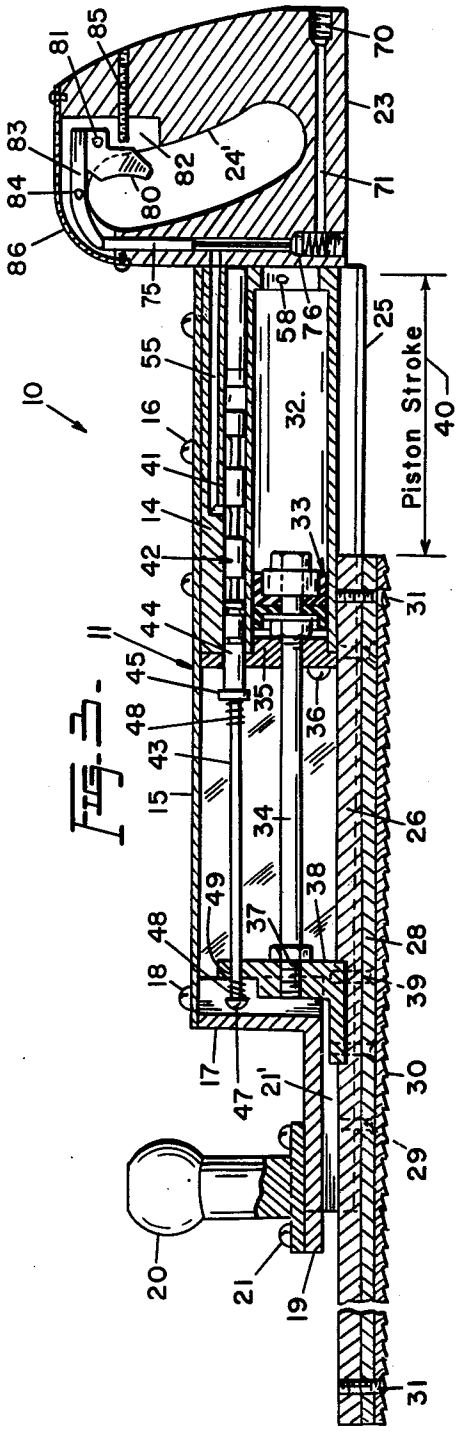


Fig. 3.

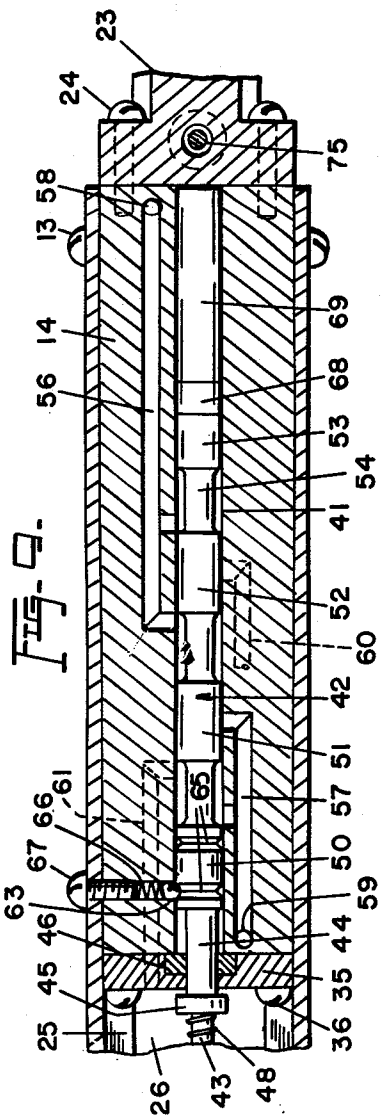


Fig. 4.

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POWER OPERATED RECIPROCATING TOOL

Filed April 18, 1962 3 Sheets-Sheet 3

FIG. 5.

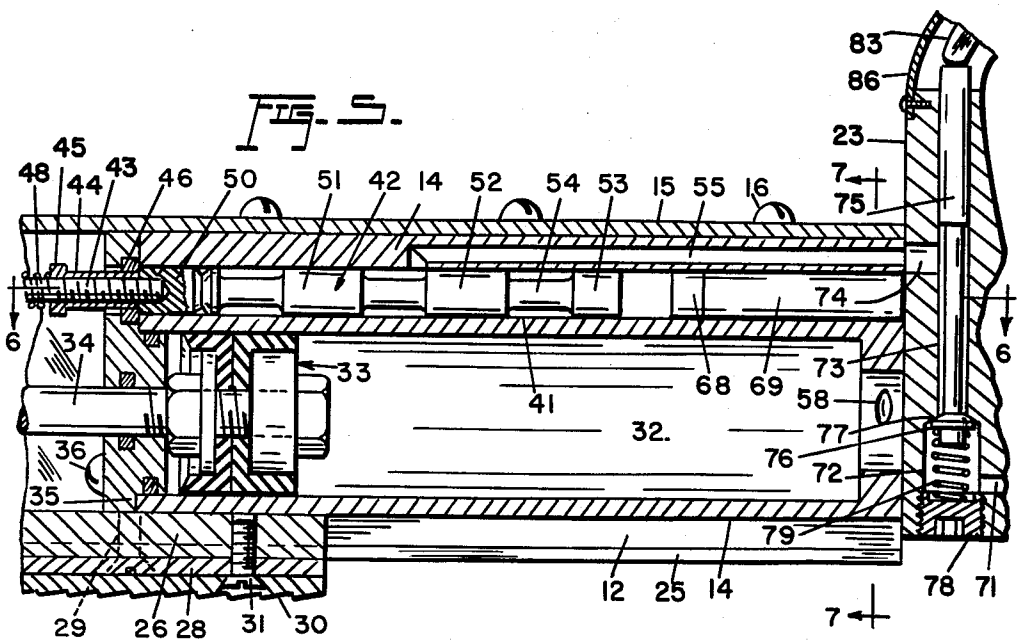
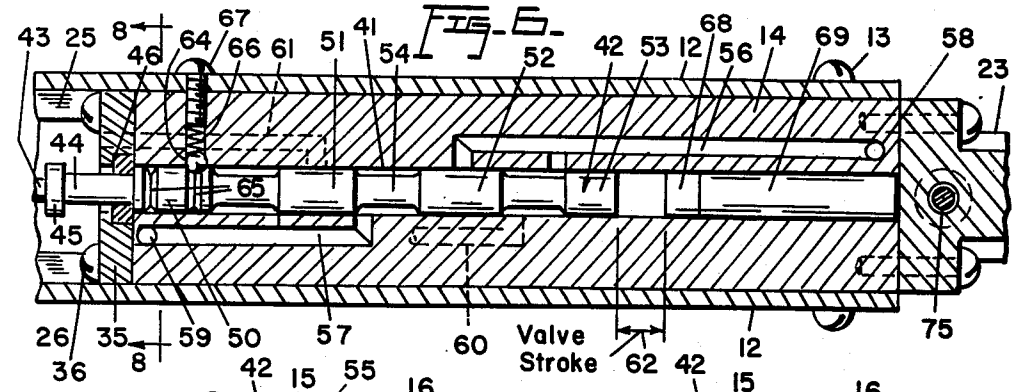


FIG. 6.



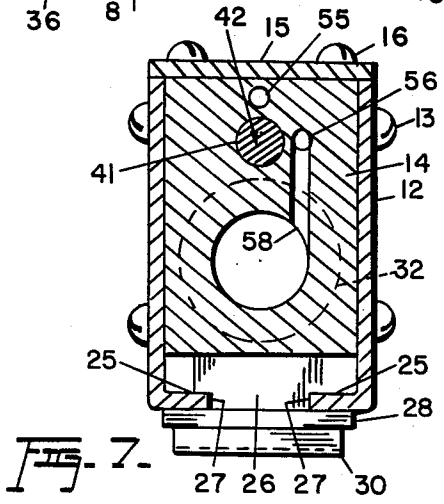


FIG. 7.

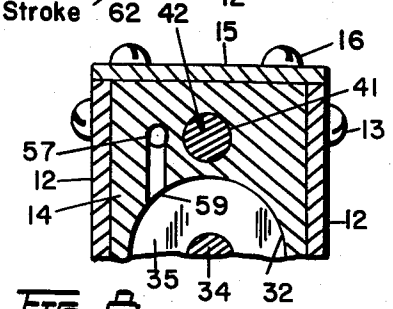


FIG. 8.

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United States Patent Office 3,145,449 Patented Aug. 25, 1964

3,145,449

POWER OPERATED RECIPROCATING TOOL

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Filed Apr. 18, 1962, Ser. No. 188,310
2 Claims. (Cl. 29—76)

This invention relates to new and useful improvements in power operated tools, and the principal object of the invention is to provide a reciprocating type tool which is actuated by a fluid pressure operator.

As such, the invention is primarily adapted to serve as a reciprocating file for use in automobile body work, wherein hand manipulated files are customarily employed for smoothing dented surfaces which have been filled in with lead, fiberglass, or the like. The use of a conventional hand file is a tedious procedure which demands the expenditure of considerable energy and, even at best, does not produce evenly smooth results. The invention overcomes this difficulty by providing a fluid pressure operated file wherein reciprocation of the file is effected with ease, convenience and with marked efficiency in obtaining the desired surface finish.

Although as already noted, the invention is primarily intended for use as a file, it may also be used as a sander, or as a saw, or as any other tool of the reciprocating type. Moreover, while the invention as disclosed herein is adapted for actuation by compressed air, hydraulic fluid may be utilized if conventional means are employed for returning the fluid from the tool to its pressurized source.

Some of the advantages of the invention reside in its simplicity of construction, efficient and dependable operation, and in its adaptability to convenient and economical manufacture.

With the foregoing more important object and features in view and such other objects and features as may become apparent as this specification proceeds, the invention will be understood from the following description taken in conjunction with the accompanying drawings, wherein like characters of reference are used to designate like parts, and wherein:

FIGURE 1 is a side elevational view of the power operated file in accordance with the invention;

FIGURE 2 is a top plan view thereof;

FIGURE 3 is a vertical sectional view, taken substantially in the plane of the line 3—3 in FIGURE 2;

FIGURE 4 is a fragmentary sectional view, similar to that shown in FIGURE 3 but with the fluid operator at the other end of its stroke;

FIGURE 5 is an enlarged, fragmentary sectional view of the fluid operator portion of FIGURE 3;

FIGURE 6 is a fragmentary sectional view, taken substantially in the plane of the line 6—6 in FIGURE 5;

FIGURE 7 is a sectional view, taken substantially in the plane of the line 7—7 in FIGURE 5;

FIGURE 8 is a fragmentary sectional view, taken substantially in the plane of the line 8—8 in FIGURE 6; and

FIGURE 9 is a fragmentary sectional view, similar to that shown in FIGURE 6 but with the fluid operator valve at the other end of its stroke.

Referring now to the accompanying drawings in detail, the invention is embodied in a fluid pressure operated reciprocating tool, specifically, a compressed air operated reciprocating file, which is designated generally by the reference numeral 10. The same comprises an elongated housing 11 which is composed of a pair of side plates 12, secured by suitable screws 13 to opposite sides of a cylinder block 14. The housing 11 also includes a top plate 15 secured to the top of the block 14 by suitable screws 16. Both the top plate 15 and the side plates 12 project longitudinally beyond one end of the block 14 and have secured thereto an end plate 17 by suitable screws 18. The end plate 17 is provided with an extension 19 on which is mounted a hand grip 20 by screws 21, and the side plates 12 are also equipped with extensions 12' which are secured to the extension 19 by the screws 22. The end of the housing 11 adjacent the block 14 is provided with a handle 23 which is fastened to the block by suitable screws 24, the handle having a hand opening 24' formed therein as shown, so that the tool may be conveniently held and manipulated with one hand on the handle 23 and the other hand on the hand grip 20, as will be clearly apparent.

The housing side plates 12 and their extensions 12' project below the bottom of the cylinder clock 14 and, as is best shown in FIGURE 7, have inturned lower edge portions or flanges 25. These flanges constitute guides for a reciprocable member 26 which is grooved as at 27 to slidably receive the flanges 25. The member 26 is elongated and has a keeper strap 28 secured to the underside thereof by suitable screws 29. Thus, the member 26 and the strap 28 are retained in position and are reciprocable on the guide flanges 25 and together, the elements 26 and 28 constitute a support or carrier for the actual tool element which, in the instance shown, is in the form of an elongated file 30, which is removably attached to the support means 26, 28 by suitable screws 31. It will be observed that the elements 26, 28 and 30 project outwardly beyond the adjacent end of the housing 11 to a sufficient extent that the file 30 may have a conventional length of approximately fourteen inches. The file 30 itself is a conventional entity, of the type commonly used in automobile body work.

The cylinder block 14 is formed with a cylindrical bore or cylinder 32 which has its axis parallel to the guide flanges 25 and slidably receives a reciprocable piston 33. The piston 33 is of a suitable conventional construction and is secured to a reciprocable piston rod 34 which projects outwardly through an end plate 35 of the cylinder block 14 into the portion of the housing 11 adjacent the housing end plate 17. The block end plate 35 is secured to the block 14 by suitable screws 36. The outer end of the piston rod 34 is secured as at 37 to an actuating member 38 which is in the form of a substantially L-shaped bracket and is fastened by suitable screws 39 to the tool support means 26, 28 so that when the piston 33 is reciprocated in the cylinder 32, the support means 26, 28 together with the file 30 are concurrently reciprocated along the guide flanges 25, the stroke of this reciprocation being indicated at 40 in FIGURE 3.

The cylinder block 14 is also provided with a cylindrical valve chamber or bore 41 which has an axis parallel to the axis of the cylinder 32 and to the guide flanges 25. The bore 41 slidably accommodates a reciprocable, spool-type valve member 42, one end of which has screw-threadedly connected thereto an extension rod 43 which is disposed in the housing 11 in spaced parallel relation to the piston rod 34. The portion of the extension rod 43 which is threadedly connected to the valve member 42 has threaded thereon a bushing 44 having an enlarged head 45, and the bushing 44 is slidable in a "Teflon" bearing 46 provided in the block end plate 35. The free or outer end of the extension rod 43 is provided with a head 47 and a pair of compression springs 48 are positioned on the rod 43 adjacent the head 47 and the head 45 for engagement by the aforementioned actuating member 38 which is apertured as at 49 to be slidable along the extension rod 43, as will be hereinafter explained.

As is best shown in FIGURES 5, 6 and 9, the valve member 42, being of the spool-type as aforesaid, includes a set of longitudinally spaced lands 50, 51, 52, 53 which are

spaced apart from one another by diametrically reduced necks 54. Compressed air is delivered into the chamber 41 through a passage 55 in a manner hereinafter described, while air passages 56, 57 extend from the chamber 41 to the relatively opposite end portions of the cylinder 32, into which they open as ports 58, 59, respectively, shown in FIGURES 7 and 8. In addition, passages 60, 61 communicate the chamber 41 with the atmosphere, these passages opening through the end plate 35 of the block 14. The positional relationship of the valve member lands 50, 51, 52, 53 to the passages 55, 56, 57, 60 and 61 is such that when the valve member 42 is in the position shown in FIGURES 3 and 5, compressed air entering the chamber 41 through the passage 55 may flow, (as it best apparent from FIGURE 6) through the passage 57 and port 59 into the end of the cylinder 32 adjacent the end plate 17, thus causing the piston 33 to slide inwardly in the cylinder. In this same position of the valve member, air is exhausted from the inner end of the cylinder through the port 58 and passages 56 and 60 to the atmosphere. Conversely, when the valve member 42 is in the position shown in FIGURES 4 and 9, compressed air in the chamber 41 is delivered through the passage 57 and port 59 to the inner end of the cylinder, thus causing the piston to slide outwardly while air is exhausted from the outer end of the cylinder through the port 58 and passages 57 and 61 to the atmosphere.

The stroke of the reciprocable valve member 42 is indicated at 62 and means are provided for releasably locking the valve member at the ends of its stroke, that is, in the two alternative positions shown in FIGURES 6 and 9. These means comprise a locking ball 63 which is positioned in a bore 64 provided in the block 14 and is lockingly receivable in a pair of spaced annular grooves 65 formed in the land 50 of the valve member 42. The ball 63 is urged into the grooves by a compression spring 66 in the bore 64, and a screw 67 is provided in the bore to retain the ball and the spring in place. When the valve member 42 is at the outer end of its stroke, further outward movement thereof is prevented by contact of the land 50 with the aforementioned bearing 46. When the valve member is at the inner end of its stroke, its further inward movement is prevented by a "Teflon" stop plug 68 which is engaged by the land 53. The plug 68 is inserted in the chamber 41 at an appropriate point and may be prevented from sliding inwardly by a cylindrical spacer 69 interposed between the plug and the handle 23, as illustrated.

Compressed air is supplied to the tool through a flexible hose (not shown) having a fitting threaded into a socket 70 formed in the handle 23. An air passage 71 extends from the socket 70 to a diametrically enlarged chamber 72 at the lower end of a vertical bore 73, also provided in the handle. The bore 73 communicates with the passage 55 through a lateral opening 74 and a stem 75 is slidable in the bore 73. The lower end of the stem 75 is provided with a valve member 76 which is engageable with a valve seat 77 at the junction of the bore 73 with the chamber 72. The lower end of the chamber 72 is closed by a plug 78 and a compression spring 79 is interposed between this plug and the member 76 to urge the latter against the seat 77. Thus, the valve means 76, 77 are normally closed, but may be opened to admit compressed air into the chamber 41 by actuation of a trigger-like control 80 which is mounted on a pivot pin 81 in a recess 82 in the handle 23 and projects into the hand opening 24'. The control 80 operatively engages a rocker arm 83 which is pivoted in the recess 82 on a pin 84 and the rocker arm 83 engages the upper end of the stem 75 to slide the latter downwardly and open the valve means 76, 77 when the control 80 is depressed. The extent of opening of the valve means 76, 77 may be limited by a stop screw 85 which is provided in the handle 23 and projects into the recess 82 to abut the control 80 in its depressed position. The recess 82 is closed by a removable cover plate 86, whereby access to the elements, 80, 81, 83, 84 and 75 may be had when the cover plate is removed.

Referring now to FIGURE 3, when the control 80 is depressed to open the valve means 76, 77, the position of the valve member 42 is such that air will be admitted into the outer end of the cylinder, causing the piston 33 to slide inwardly along with the piston rod 34 and the file 30. During this action, the member 38 will also slide inwardly along the extension rod 43, but the extension rod and the valve member 42 will remain stationary until the member 38 comes in contact with the spring 48 adjacent the head 45. As the piston 33 reaches the inner end of its travel, the pressure of the member 38 exerted through the spring 48 on the head 45 will become sufficient to release the locking means 63, 65, so that the valve member 42 will slide with a snap action from the position shown in FIGURE 3 to that shown in FIGURE 4 and as this occurs, compressed air will be delivered to the inner end of the cylinder to cause outward sliding of the piston. Again, the valve member 42 will remain stationary, until it is shifted with a snap action from the position in FIGURE 4 to that in FIGURE 3, when the piston rod approaches the outer end of its travel and the member 38 engages the spring 48 at the head 47. It will be apparent from the foregoing that the valve 42 is actuated automatically in response to reciprocation of the piston rod 34 and that the file 30 will continue to be reciprocated as long as the control 80 is held depressed. Moreover, the snap acting movement of the valve 42, as above described, will assure smooth reciprocating movement of the file, without jerking or erratic tendencies, such as would exist if the valve member 42 were slid in a continuous reciprocating movement.

While in the foregoing there has been described and shown the preferred embodiment of the invention, various modifications may become apparent to those skilled in the art to which the invention relates. Accordingly, it is not desired to limit the invention to this disclosure and various modifications and equivalents may be resorted to, falling within the spirit and scope of the invention as claimed.

What is claimed as new is:

1. In a fluid pressure operated reciprocating tool, the combination of a horizantally elongated housing having an open bottom and inner and outer ends, a cylinder block disposed horizontally in the inner end portion of said housing, said housing comprising a pair of side plates and a top plate secured respectively to the opposite sides and the top of said cylinder block and projecting longitudinally outwardly beyond the same, an end plate secured to the outer ends of said side plates and top plate, a handle secured to said cylinder block at the inner end of the housing, said side plates also projecting downwardly below the bottom of said cylinder block, a pair of opposing inturned flanges provided at the lower edges of said side plates, a horizontally elongated reciprocable tool holder disposed in the open bottom of the housing and provided in opposite sides thereof with a pair of grooves slidably receiving said flanges, said cylinder block being formed with a horizontal cylinder, a piston reciprocable in said cylinder, a piston rod connected to said piston and projecting outwardly from the cylinder into the outer end portion of said housing, a bracket rigidly secured to the top of said tool holder and disposed in the outer end portion of the housing, said bracket having the outer end of the said piston rod rigidly connected thereto whereby reciprocation of said piston in said cylinder may reciprocate said tool holder along said flanges, said cylinder block being provided above said cylinder with a horizontal valve chamber having a compressed air inlet, a set of ports communicating with op-

posite ends of said cylinder and a set of ports vented to the atmosphere, a reciprocable spool type valve member slidable in said valve chamber between an inwardly slid position wherein compressed air may be delivered to the inner end of said cylinder while the outer end of the cylinder is vented to the atmosphere and an outwardly slid position wherein compressed air may be delivered to the outer end of the cylinder while the inner end of the cylinder is vented, a reciprocable valve actuating rod rigidly connected to said valve member and extending horizontally in the outer end portion of said housing above said piston rod, said bracket being formed with an aperture slidably receiving said valve actuating rod, resilient abutment means provided on said rod in longitudinally spaced relation from each other and at opposite sides of said bracket, said abutment means being engageable by said bracket at the opposite ends of the reciprocating movement of said piston rod whereby to alternately slide said valve actuating rod between its inwardly and outwardly slid positions, passage means for

delivering compressed air to the inlet of said valve chamber, and manually operated valve means in said handle for controlling the flow of air through said passage means.

2. The device as defined in claim 1 together with a horizontal extension provided on said end plate substantially below the level of said top plate and projecting longitudinally outwardly therefrom beyond the outer end of said housing, and a hand grip provided on said extension.

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