Oct. 24, 1950 A. W. SMITH 2,526,976

POWER-OPERATED HAND TOOL

Filed July 12, 1946

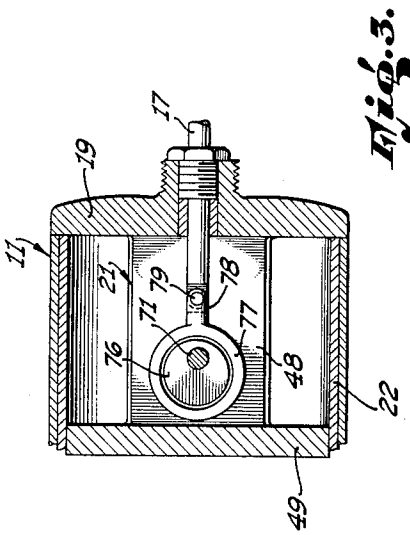


Fig. 3.

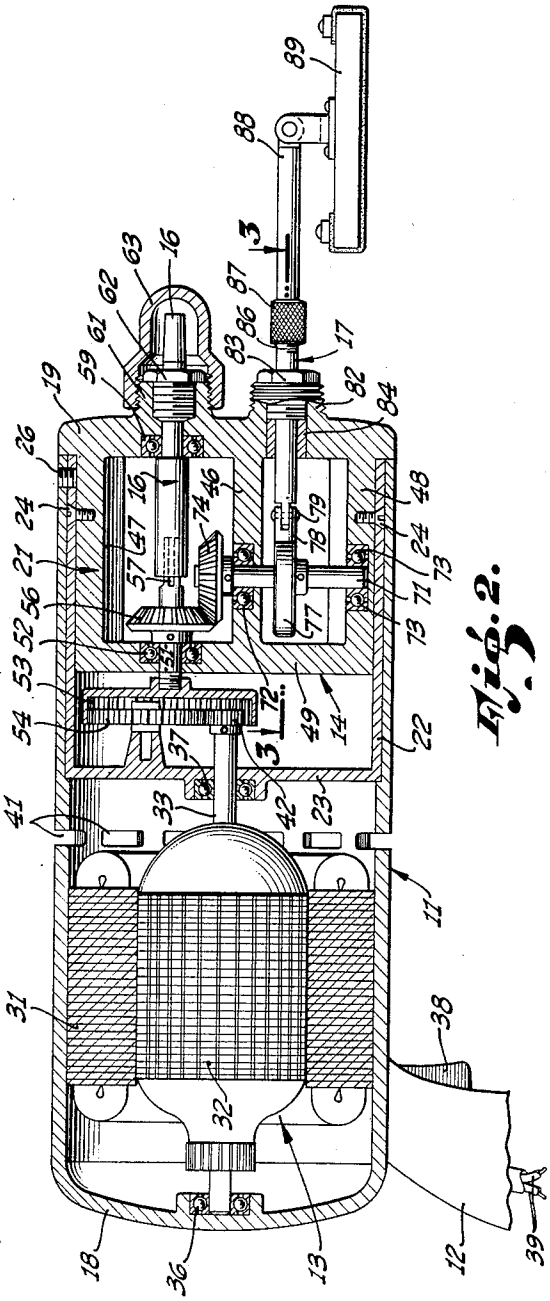


Fig. 2.

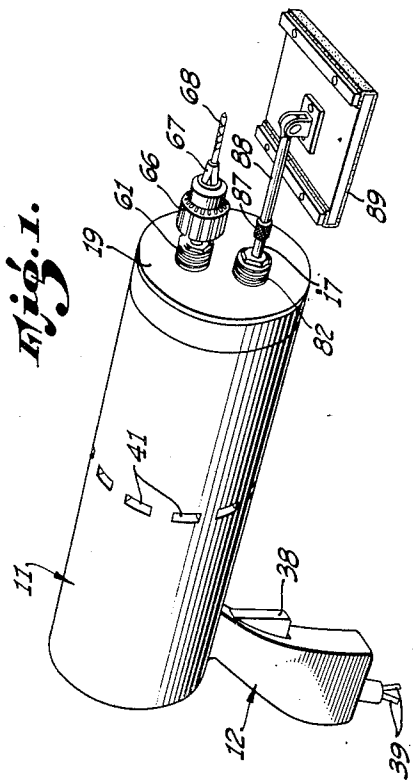


Fig. 1.

ARTHUR W. SMITH,
INVENTOR

BY Albert M. Tolwinska

ATTORNEY.

Patented Oct. 24, 1950

2,526,976

UNITED STATES PATENT OFFICE

2,526,976

POWER-OPERATED HAND TOOL

Arthur W. Smith, Los Angeles, Calif., assignor of one-half to M. Duke Lanfre, Los Angeles, Calif.

Application July 12, 1946, Serial No. 683,291

3 Claims. (Cl. 74—44)

1

The present invention relates to power tools in general and particularly to a hand-carried motor-driven power tool. More specifically the invention comprises a power-operated hand tool provided with driving means for rotary and for reciprocatory working elements.

Power-operated hand tools are of great value in many types of work. Their weight enables them to be moved readily from place to place and being relatively small they can be used in surroundings preventing the use of more cumbersome tools. Additionally they are desirable in that they are capable of performing many operations in a time period only a fraction of that required to perform the same operation by hand.

Certain operations require a rotary work-contacting element while others make better use of a reciprocating element. Power-operated hand tools in the past have been adapted to drive one or the other type but none has satisfactorily provided a power source for both rotary and reciprocatory elements. The advantage of having one tool capable of providing both motions is clear and results not only in an investment saving but also in a time saving in that a simple exchange of work-contacting elements upon the same power tool is all that is required.

With the foregoing disadvantages of the prior art in mind, it is an object of the present invention to provide a new and improved power-operated hand tool adapted to actuate both rotary and reciprocatory work-contacting elements.

It is a further object of the invention to provide a motor-driven power tool adapted to be carried in the hand in which reciprocatory or rotary working elements can be selectively attached and actuated.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

Referring now to the drawings in which a preferred embodiment of the invention is illustrated:

Figure 1 is a view in perspective of a tool constructed in accordance with the present invention, both rotary and reciprocatory working elements being attached for purposes of illustration only;

Figure 2 is a longitudinal section through the tool constructed in accordance with the present invention, a reciprocatory working element being operatively connected; and

Figure 3 is a partial section upon the line 3—3 of Figure 2 showing the cam-actuating means forming a part of the reciprocatory drive.

2

The power-operated hand tool constructed in accordance with the present invention comprises several principal parts including an enclosing casing 11, a handle 12 attached at one end of casing 11, a driving motor 13 positioned in the casing, speed reducing power transmitting means 14 connected to motor 13, and the rotary and reciprocatory actuating elements 16 and 17 which extend from the casing at its end spaced from handle 12.

The tool casing, indicated generally by the reference character 11, is preferably cylindrical and closed at one end by an integral convex wall 18. Its opposite end is closed by a removable plate 19 formed integrally with a frame 21 seated in a gear box or housing 22, the rear wall 23 of which divides the casing 11 into a motor compartment and a power transmission compartment. Frame 21 is secured within the gear housing 22 by means of set screws 24 and both are removably secured in casing 11 by means of one or more set screws 26.

The driving motor for the unit is positioned within the motor compartment formed between the walls 18 and 23. Its stator 31 is carried by casing 11 while its rotor 32 is mounted upon shaft 33 rotatable in bearings 36 and 37 in walls 18 and 23, respectively. A switch 38 is carried by handle 12 and the leads 39 to the motor extend therethrough, the flow of current to the motor being controlled by the switch. To insure adequate motor cooling casing 11 is provided with circumferentially spaced openings 41 for the circulation of ventilating air.

The speed reducing and power transmitting means are positioned within the gear box 22 into which the motor shaft 33 extends, a pinion 42 being carried in its end. Frame 21, which supports those means, includes a central supporting wall 46 midway between curved side walls 47 and 48, the latter lying against the side wall of gear box 23, and an end wall 49. The spaces between the aforementioned walls, and in fact the entire space within gear box 22, is preferably filled with sufficient lubricant or grease to insure quiet running and long life of the moving parts positioned therein.

A longitudinally extending driven shaft 51 is rotatably mounted in frame wall 49 by a bearing 52 and carries, rearwardly of wall 49, an internal ring gear 53. Upon the inner side of gear 53 and meshing therewith, is an eccentrically mounted intermediate gear 54 which also meshes with the pinion 42 on the motor shaft 33. Rotation of shaft 33 and pinion 42 effects rotation of inter-

mediate gear 54 which in turn drives ring gear 53 fixed upon shaft 51, to cause the latter to rotate at a reduced speed determined by the ratio of the gears. Upon the opposite side of wall 49 shaft 51 carries a bevel gear 56 and at its end forwardly thereof is reduced in size and given an irregular section as at 57 in order to seat fixedly in the recessed end of the tool-actuating shaft 16 rotatably mounted in a bearing 59 in front wall 19. Shaft 16 extends forwardly through wall 19 which is formed therearound on its outer face with a surrounding boss 61 threaded internally and externally. A hexagonal headed gland 62 is threaded into boss 61 to provide a seal around the shaft and, as clearly shown in Figure 2, a protecting cap 63 is adapted to be screwed onto the threaded exterior of the boss when a working tool element is not connected. When a rotary tool is to be actuated the cap 63 is removed and a Jacob's chuck 66 is forced onto the end of tool-actuating shaft 16, its jaws 67 seating a work contacting element such as a drill 68 shown in Figure 1.

Within the gear case 22 a transverse driven shaft 71 is rotatably mounted in bearings 72 and 73 positioned in walls 46 and 48, respectively. To connect it to longitudinal driven shaft 51 it carries on its inner end a bevel gear 74 meshing with gear 56. Centrally and between longitudinally extending walls 46 and 48 shaft 71 carries an eccentric cam 76 rotatable therewith and enclosed by a ring follower, 77. The latter is extended upon one side in the form of a bifurcated extension 78 connected by a pivot pin 79 to the reciprocatory tool actuating plunger or rod 17. The latter extends parallel to the rotary tool actuating shaft 16 and passes outwardly through the front plate 19 in which it is slidably supported by a sleeve bushing 84. As in case of shaft 16, forward plate 19 is formed with an encircling boss 82 around rod 17, a boss which is threaded internally and externally and which is, in the manner of boss 61, sealed internally by means of the gland 83. The outer end of rod 17 is preferably threaded as at 86 and so adapted to seat an internally threaded sleeve 87 comprising the attaching end of an arm 88 pivotally connected to a reciprocatory tool 89 which, as illustrated, is a sander. The latter is readily disconnected by rotating sleeve 87 and thereafter, if desired, a protective cup like the cup 63 may be screwed upon the boss 82.

In operation the current-conducting leads 39 are connected to a suitable source of electrical current. Depending upon the type of work to be performed, the operator removes the protective cup which encloses the ends of element 16 or 17 to expose it. Element 16 is selected if a rotary work contacting element is to be driven, a Jacob's chuck is forced onto the end thereof, and the operative tool element secured in place by closing the chuck jaws. If however a reciprocatory element is to be driven, the protective cup or thimble is removed from the threaded boss 82 to expose the end of reciprocatory rod 17 and the working element connected thereto. The closing of the manually operable switch 38 then effects the energization of the driving motor 13 whereupon the armature 32 and shaft 33 rotate and with them the pinion gear 42. Concomitantly the planetary drive rotates the ring gear 53 at reduced speed and as the rotary shaft 51 is fixed relatively thereto, it, and with it shaft 16, also rotates. Transversely extending driven shaft 71, being connected through bevelled gears 54 and 56 to the longitudinally extending shaft 51, is also rotated. Its rotation effects the reciprocation of the reciprocatory rod 17 which moves inwardly and outwardly relative to the casing. If a rotary working tool has been connected to shaft 16 it is rotated. If a reciprocating tool has been connected to rod 17, then it is reciprocated. The tool is easily stopped and started for the change of working tools by the manual operation of the control switch 38 and a change from rotary to reciprocatory tools, or vice versa, is readily accomplished in the manner described.

While the particular apparatus herein shown and described in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. A power-operated hand tool comprising: an elongated casing open at the forward end and having a handle on the rearward end; a driving motor in the rearward portion of said casing having a shaft substantially coaxial therewith; a journal bearing mounted in the rearward end of said casing to rotatably support the rearward end of said motor shaft; a gear housing having an open forward end flush with the forward end of said casing, said housing being positioned within said casing and having a rearward wall extending entirely across the interior of said casing, said housing wall having a journal bearing therein to support the forward end of said motor shaft with said motor shaft extending through said wall; a removable frame secured in the forward portion of said gear housing, said frame having a rearward wall extending entirely across the interior of said gear housing and being forwardly spaced from said rear wall of said housing wall whereby to form therewith a first sealed transmission chamber adapted to receive a body of lubricant, and said frame having a forward closure plate positioned and adapted to close the forward ends of said casing and gear housing and to form a second transmission chamber ahead of said frame wall; a first longitudinal shaft rotatably mounted in said second chamber, said rotatable shaft extending rearwardly through said frame wall into said first chamber and forwardly through said plate to project from the front of said casing; a second longitudinal shaft reciprocally mounted in said second chamber and extending forwardly through said plate to project from the front of said casing; a gear transmission positioned in said first chamber and operatively connected between said motor and rotatable shafts to effect reduced speed rotation of said rotatable shaft; and reciprocating means in said second chamber including a transverse shaft journaled in said frame and geared to said rotatable shaft and an eccentric on said transverse shaft to effect reciprocal motion of said second longitudinal shaft as a result of rotation of said first shaft.

2. The construction of claim 1 further characterized in that each of said first and second shafts is formed with detachable means for connecting tools to the forward ends thereof.

3. The construction of claim 2 further characterized by having a pair of identical threaded bosses formed on the front of said closure plate, one surrounding each of said first and second

shafts and an interiorly threaded protecting cap secured to one of said bosses whereby to enclose said shaft therein.

ARTHUR W. SMITH.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,412,430	Verneuil	Apr. 11, 1922
1,464,570	Hage	Aug. 14, 1923
1,634,623	Miller	July 5, 1927
1,898,956	Harvie	Feb. 21, 1933
2,138,862	Johnston	Dec. 6, 1938
2,201,190	Mastrud	May 21, 1940
2,220,871	Toop	Nov. 5, 1940
2,268,292	Lovelace	Dec. 30, 1941