July 16, 1968 H. K. LEACH ET AL 3,393,309

POWER-OPERATED TOOL

Filed Oct. 20, 1965 2 Sheets-Sheet 1

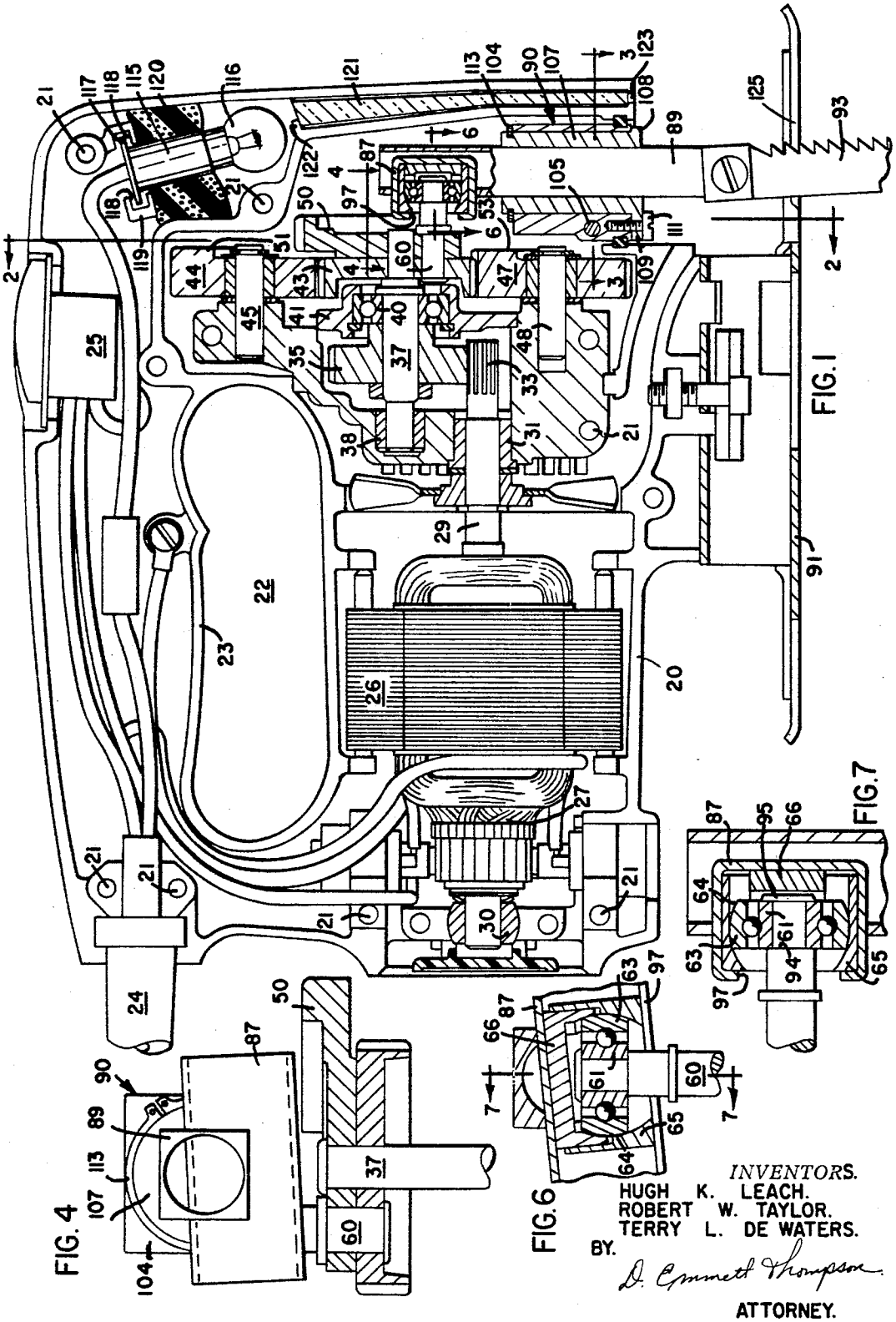


FIG. 1

FIG. 4

FIG. 6

FIG. 7

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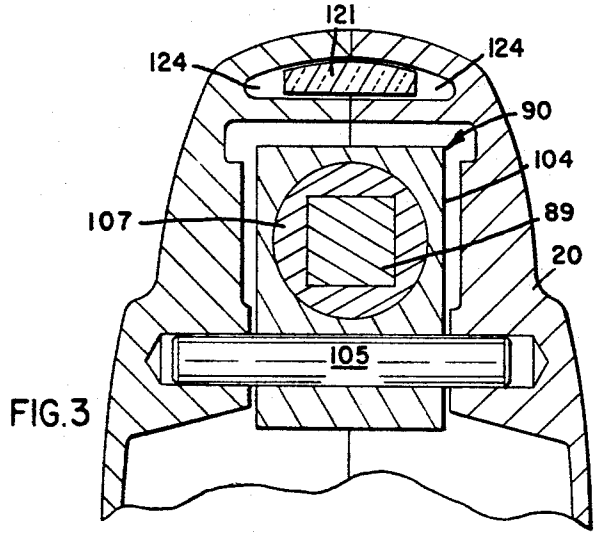


FIG.3

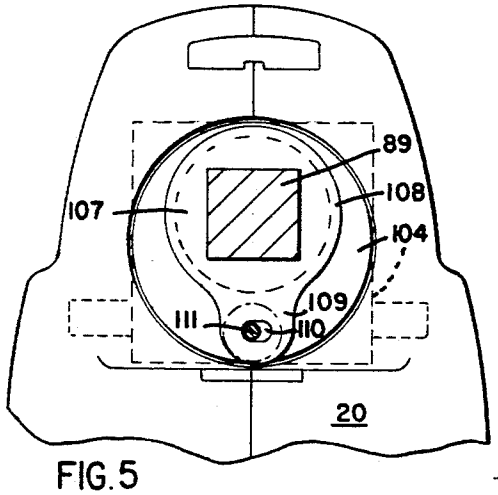


FIG.5

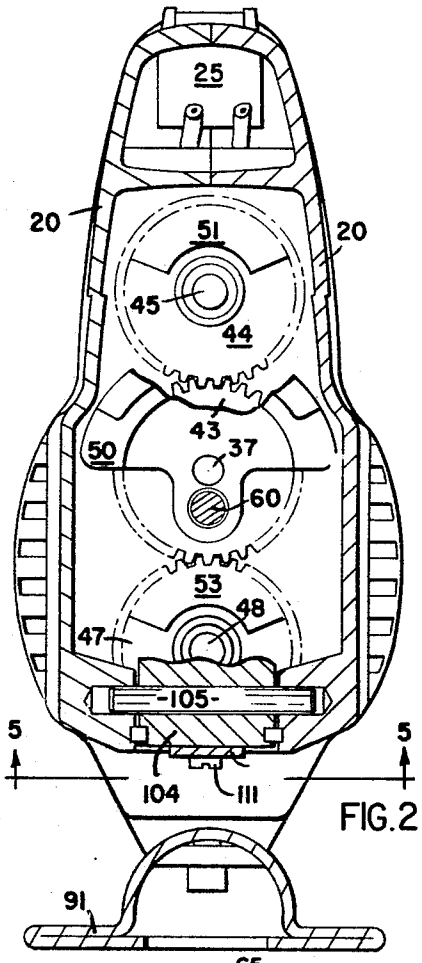


FIG.2

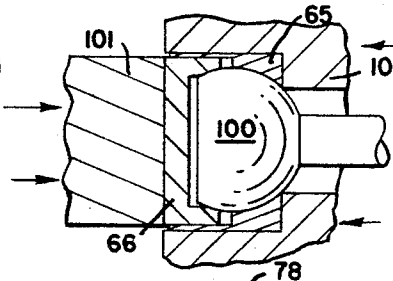


FIG.13

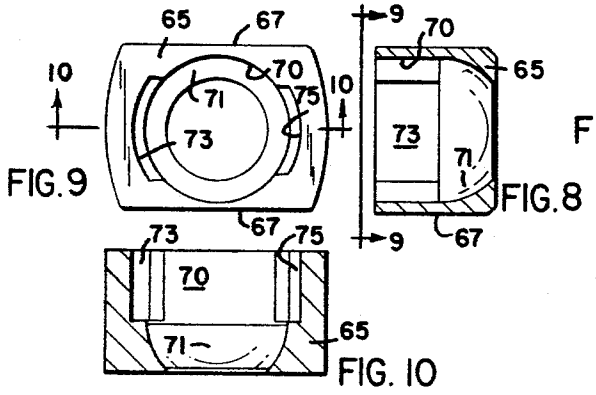


FIG.9 FIG.8 FIG. 10

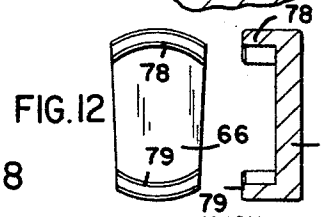


FIG.12 FIG. 11

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3,393,309

POWER-OPERATED TOOL

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Filed Oct. 20, 1965, Ser. No. 498,215
3 Claims. (Cl. 240—2)

ABSTRACT OF THE DISCLOSURE

A lamp is mounted in the tool casing in an area remote from the area of the casing through which the cutter extends. A light transmitting member is mounted in a chamber extending from the lamp to the exterior of the casing and functions to direct a beam on the work at the area thereof engaged by the cutter. The arrangement permits the lamp to be mounted in an available space, such as the handle of the tool.

This invention relates to a power-operated tool having a reciprocating cutter.

The invention has as an object a novel structural arrangement for imparting either obital or straight line reciprocation to the cutter.

The invention has as a further object a portable hand manipulated power-operated tool embodying a light transmitting arrangement for directing a beam of light on the workpiece in proximity to the cutter.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is made to the accompanying drawings in which like characters designate corresponding parts in all the views.

In the drawings:

FIGURE 1 is a lengthwise sectional view of a power-operated tool embodying our invention.

FIGURE 2 is a view taken on line 2—2, FIGURE 1.

FIGURE 3 is a view taken on line 3—3, FIGURE 1.

FIGURE 4 is a view taken on line 4—4, FIGURE 1, with the crank pin moved to horizontal position, and the crank disk shown in section.

FIGURE 5 is a view indicated by line 5—5, FIGURE 2.

FIGURE 6 is a view taken on line 6—6, FIGURE 1.

FIGURE 7 is a view taken on a line corresponding to line 7—7, FIGURE 6.

FIGURE 8 is a vertical sectional view taken through the main section of the bearing follower.

FIGURE 9 is a view looking to the right, FIGURE 8.

FIGURE 10 is a view taken on line 10—10, FIGURE 9.

FIGURE 11 is a vertical sectional view through the inner or thrust portion of the bearing follower.

FIGURE 12 is a view looking to the right, FIGURE 11.

FIGURE 13 is a sectional view of the parts forming the bearing follower shown in vertical section, the view including the forming tools for forming the follower sections.

The invention is shown and described in the form of a hand manipulated saber saw having a frame casing, or housing, 20, which consists of a pair of compelemental mating sections secured together by fasteners extending through apertures 21, each section being formed with a complemental concavity in various areas to accommodate the operating structure of the tool. Each casing section is formed with an aperture, which in the assembled casing, provides an elongated opening 22 under a handle portion 23.

The concavities in the handle portion 23 receive the power supply cord 24, and motor operating switch 25.

A motor field 26 is fixedly mounted in the casing. An armature 27 is mounted for rotation in the field 26, and its armature shaft 29 is journalled in bearings 30, 31, mounted in the casing. The forward end of the armature shaft is formed with a pinion 33 arranged in mesh with a spur gear 35 fixedly mounted on a shaft 37. The shaft 37 is journalled in a bearing 38 mounted in the casing, and an antifriction bearing 40 mounted in a cap 41 fixed to the casing.

The shaft 37 extends forwardly from the bearing 40 to fixedly receive a gear 43 arranged in mesh with a gear 44 journalled on a stud 45 fixed in the casing. The gear 43 also meshes with a gear 47 journalled on the stud 48 fixed in the casing. There is affixed to the gear 43, a counterweight 50, see FIGURE 2. A counterweight 51 is affixed to the gear 44, and a counterweight 53 is affixed to the gear 47. The counterweights 50, 51, 53, are fixed to the respective gears in the order shown in FIGURE 2, and serve to dampen the vibration resulting from the reciprocation of the tool carrier.

The gear 43 serves as a crank and has a crank pin 60, on which is mounted a bearing structure. On the forward reduced end portion of the crank pin 60, there is affixed the inner race 61 of an antifriction bearing. The outer race 63 of this bearing is formed, on its periphery, with a spherical surface 64 which is embraced by a crank follower, here shown as of two-part construction.

The crank follower consists of a main section 65, and a section 66, see FIGURES 8, 9 and 10. The section 65 is formed with flat outer surfaces 67 extending in parallel relation. The central portion of the follower is formed with a cylindrical bore 70 extending inwardly for approximately one-half the thickness of the piece. The bottom 71 of the bore 70 is of spherical formation complemental to the spherical surface 64 of the outer bearing race 63. There is an arcuate counterbore 73 in one end portion of the member 65, and a similar counterbore 75 in the opposite end portion of the member. Both of the counterbores 73, 75, communicate with the bore 70. The counterbore 73 is of greater arcuate length than the counterbore 75.

The second section 66 is initially formed as shown in FIGURES 11 and 12. The section 66 is formed at its ends with projections 78, 79, of arcuate formation. The peripheral surfaces of the projections 78, 79, are dimensioned, both as to radius and respective length, comparable to the counterbores 73, 75, whereby the section 66 can be inserted in the section 65.

The assembled follower, consisting of the sections 65, 66, is slidably retained in a guideway formed in a crosshead 87 fixedly secured to the upper end of a cutter carrier 89. The carrier 89 is slidably mounted in a guide bearing 90 for vertical reciprocation toward and from the base plate 91 attached to the casing 20. The base plate is formed with a slot through which the cutter, such as saw blade 93, attached to the lower end of the carrier, extends.

The inner race 61 of the antifriction crank pin bearing is trapped between a shoulder 94 and a headed portion 95 of the crank pin, see FIGURES 6 and 7. The outer race 63 of the antifriction bearing is trapped in the follower assembly as described. The follower assembly has slidable interlocking engagement with a guideway formed in the crosshead 87, and which extends in a direction perpendicular to the lengthwise axis of the tool carrier, and at an acute angle to the plane in which the crank pin 60 rotates. Inasmuch as the bearing structure is fixed against axial movement on the crank pin 60, and is slidably retained in the guideway, upon rotation of the crank shaft 37, reciprocation is imparted to the tool carrier, and

simultaneously fore-and-aft lateral movement is imparted to the crosshead and tool carrier.

In the arrangement shown, the crosshead **87** consists of a tubular member, rectangular in cross section, and formed with a slot **97** in its side confronting the crank disk **43** for reception of the crank pin **60**.

As previously stated, the follower section **66** is also formed with an internal spherical surface embracing the outer race **63** of the crank pin bearing. Preferably, the thickness of the follower, consisting of the assembled sections **65**, **66**, should be comparable to the width of the guideway in the crosshead **87**, to avoid undue play between the crosshead and the follower during the lateral fore-and-aft movement of the crosshead. In order to obtain these desired results, a spherical forming member **100** is positioned in the section **65**, and the section **66** then positioned in the section **65**. The latter is then pressed against the spherical member **100**, see FIGURE 13, by a ram **101**. During this operation, the section **65** is backed up by a die **102**. The ram **101** is moved towards the die **102** a distance to effect the proper thickness of the follower assembly and, at the same time, the projections **78**, **79**, of the section **66** are coined to provide for the internal spherical surface which, by means of the member **100** form an exact spherical continuation of the surface **71** on member **65**. The result is that when the bearing structure, including the follower sections **65**, **66**, are assembled in the completed tool, there is no undue play between the crank pin bearing and the crosshead.

To accommodate the fore-and-aft lateral movement of the carrier **89**, the guide bearing **90** is mounted in the casing for oscillation about an axis extending perpendicular to the bore of the bearing, and to the axis of rotation of the crank shaft **37**. The carrier **89** and the guide bearing **90** have slidably interengaging surfaces to prevent relative rotation between these parts, see FIGURE 3.

In some instances, it is preferred to have the saw blade reciprocate in a straight line. This is accomplished by rotating the blade carrier **89** about its lengthwise axis to bring the guideway in the crosshead **87** into parallel relation with the crank disk **43**, that is the plane in which the crank pin **60** rotates. Inasmuch as the blade carrier is restrained from rotation in the guide bearing **90**, this means that if the guide bearing **90** is rotated about the axis of the carrier, the carrier, crosshead, and guideway are rotated.

In the form disclosed, the guide bearing **90** is of two-piece construction consisting of a rectangular block **104** mounted for oscillating movement on a shaft **105**, see FIGURES 2 and 3. The shaft **105** extends in a direction perpendicular to the lengthwise axis of the tool carrier and to the axis of the crank shaft **37**. The block **104** is formed with a cylindrical bore to receive a cylindrical bushing **107** formed at its lower end with a radial flange **108** positioned against the lower end of the block **104** and being formed with a radially extending portion **109** formed with an elongated slot **110** to receive a clamping screw **111** threading into the block **104**. The bushing **107** extends beyond the upper end of the block **104** and is provided with a circumferentially extending groove to receive a snap ring **113**, which serves in conjunction with the flange **108** to rotatably retain the bushing in the block **104**. The screw **111** is accessible through the slot in the base plate **91** and, when loosened, the bushing may be rotated in the block **104** to move the guideway in the crosshead **87** into and out of parallel relation to the plane in which the crank pin **60** rotates. It will be apparent that when the guideway in the crosshead **87** extends in parallel relation to the crank disk, straight line reciprocation is imparted to the tool carrier **89**. This arrangement provides for the convenient adjustment of the parts exteriorly of the casing **20** to provide for straight line reciprocation of the tool carrier or any degree of orbital movement imparted thereto up to the maximum desired.

The tool of our invention further includes a novel arrangement for directing a light beam on the work piece in the area engaged by the cutter. The casing sections **20** are formed with confronting concavities in an area remote from the cutter carrier and the area of the casing through which the carrier extends. There is an electric lamp receptacle **115** mounted in the concavities for the reception of a lamp **116**, see FIGURE 1. The receptacle **115** is provided at its base with a plate **117**, opposite sides of which extend into confronting slots **118** formed in ribs **119** integral with the casing sections. The slots **118** are greater in width than the thickness of the plate **117** to provide for free movement of the lamp receptacle **115**. The lamp receptacle is embraced and supported by yieldable material **120**, such as plastic foam.

The casing sections are also formed with elongated confronting slots **124** forming a compartment which extends from the area in which the lamp **116** is positioned to the general area through which the cutter carrier **89** extends. A bar **121** of light-teransmitting material is positioned in this compartment, and is retained therein by shoulders **122–123** formed at the ends of the compartment, these shoulders partially overlying the ends of the bar **121**. The bar **121** is effective to transmit a light beam from the lamp **116** downwardly through the slot **125** in the base plate **91** to the guide line on the work piece being sawed. That is, the light beam is directed on the work piece immediately in front of the cutter **93**.

The material **120** serves to absorb any vibration in the tool during the operation thereof, and to prevent such vibration being transmitted to the receptacle **115** and lamp **116**. The lamp is supplied with power during operation of the tool.

It will be apparent that this arrangement permits mounting the lamp in an area remote from the area of the casing through which the cutter carrier extends, and in fact remote from the actuating mechanism for the carrier, and yet effectively directs the beam on to the work piece in the area of the cutter. This arrangement is particularly advantageous in the saber saw type of tool described, in that it does not add any appreciable extension in the front of the casing. In tools of this type, it is desirable to maintain the spacing of the front of the casing from the cutter to a minimum, in order that the operator can more readily follow the guide line on the work piece. With our arrangement, the construction adds only a fraction of an inch to the fore and aft length of the tool, and yet provides for convenient mounting of the lamp.

We claim:

1. A portable power operated tool comprising a casing, a cutter extending from said casing, power operated cutter actuating mechanism mounted in said casing and operable to impart cutting motion to said cutter, an electric lamp receptable mounted in said casing in an area remote from said cutter, a lamp mounted in said receptacle, said casing including a pair of complemental mating sections, said casing sections being formed with elongated confronting slots, said slots forming an elongated compartment extending from the area in which said lamp is mounted and opening through the casing, said compartment having an inwardly extending shoulder at each end thereof, a light transmitting member positioned in said compartment between said shoulders and serving to transmit a light beam from said lamp and direct said beam on a work piece in the area engaged by said cutter.

2. A portable power operated tool comprising a casing, power operated actuating mechanism mounted in said casing and including a cutter carrier extending through the casing, a cutter mounted on said carrier, said power operated actuating means being operable to impart cutting motion to said cutter, an electric lamp receptacle mounted in said casing in an area remote from the area through which said carrier extends, said casing being formed with an elongated chamber exending from said remote area to the exterior of said casing, an elongated light transmitting member mounted in said chamber with one end

of said member terminating in proximity to said lamp, and the opposite end of said member being exposed through said casing, said light transmitting member serving to transmit a light beam from said lamp and direct said beam on a work piece in the area thereof engaged by said cutter.

3. A portable power operated tool as claimed in claim 2, wherein said casing is formed with a hollow handle and said area, in which said lamp receptacle is mounted, is located in said hollow handle.

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