

[54] **ELECTRIC HAMMER** 3,828,863 8/1974 Bleicher et al..... 173/109

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[57] **ABSTRACT**

The casing of a portable electric percussion tool includes a one-piece casting which carries (a) a cylinder for supporting a reciprocating driver and striker (b) a drive shaft for rotating a tool holder to which blows are transmitted by the striker (c) a bearing for the motor shaft of an electric motor (d) the end portion of the stator enclosure of the motor nearer the said bearing for the motor shaft, and (e) a crankshaft which is driven by the motor shaft through gearing and which drives the drive shaft and reciprocates the driver. The lengthwise axis of the cylinder and the rotational axes of the drive shaft and motor shaft are parallel to each other, and at right angles to the axis of rotation of the crankshaft.

[30] **Foreign Application Priority Data**

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[51] Int. Cl.²..... E21C 3/04

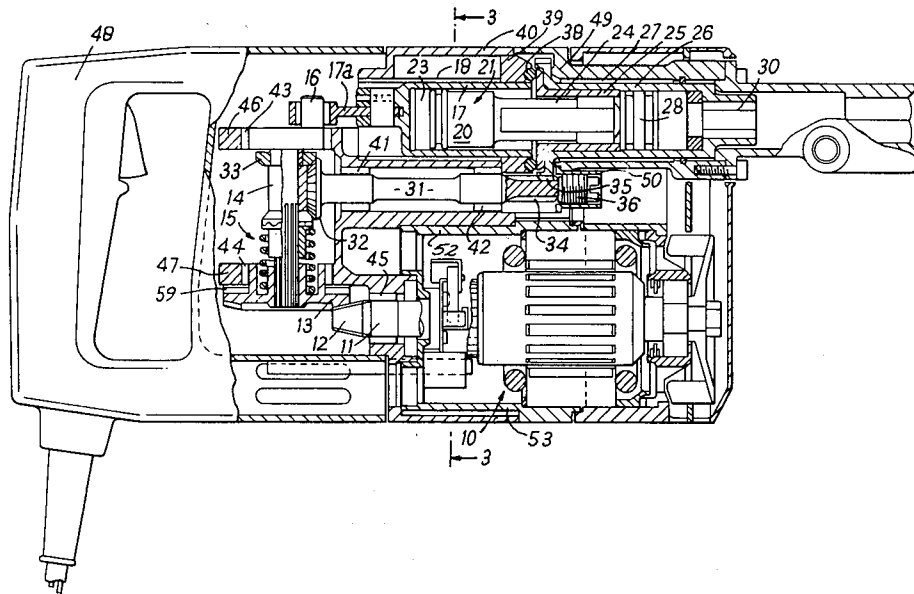
[58] Field of Search 173/109, 117, 118, 122

[56] **References Cited**

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2 Claims, 3 Drawing Figures



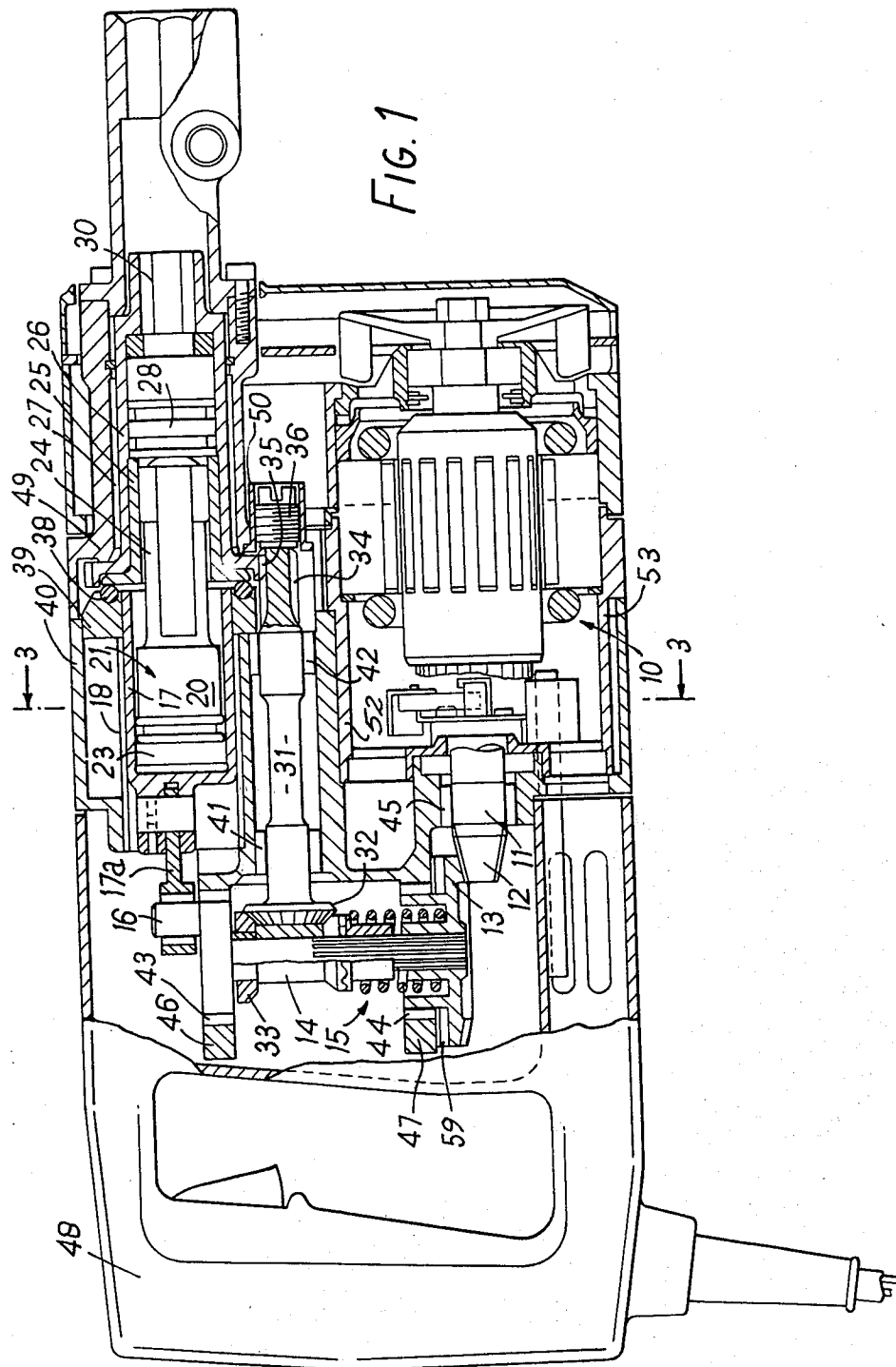


FIG. 2

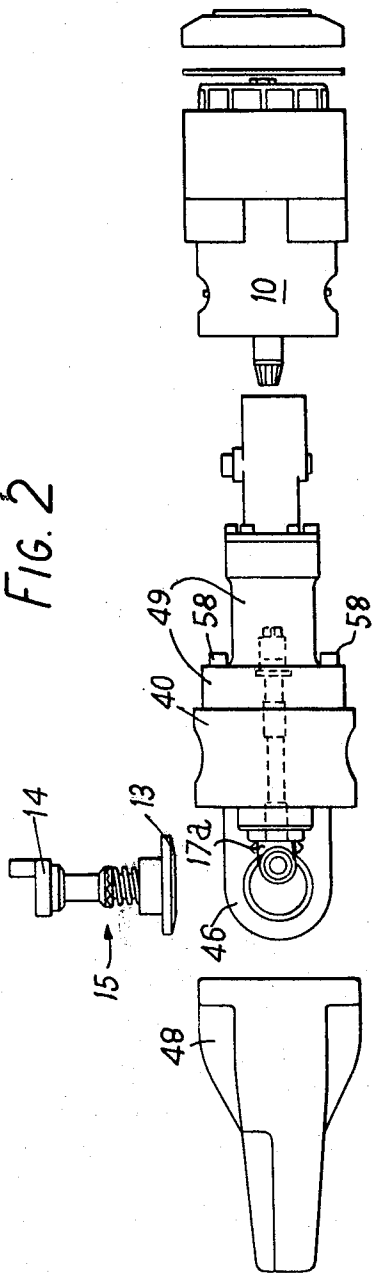
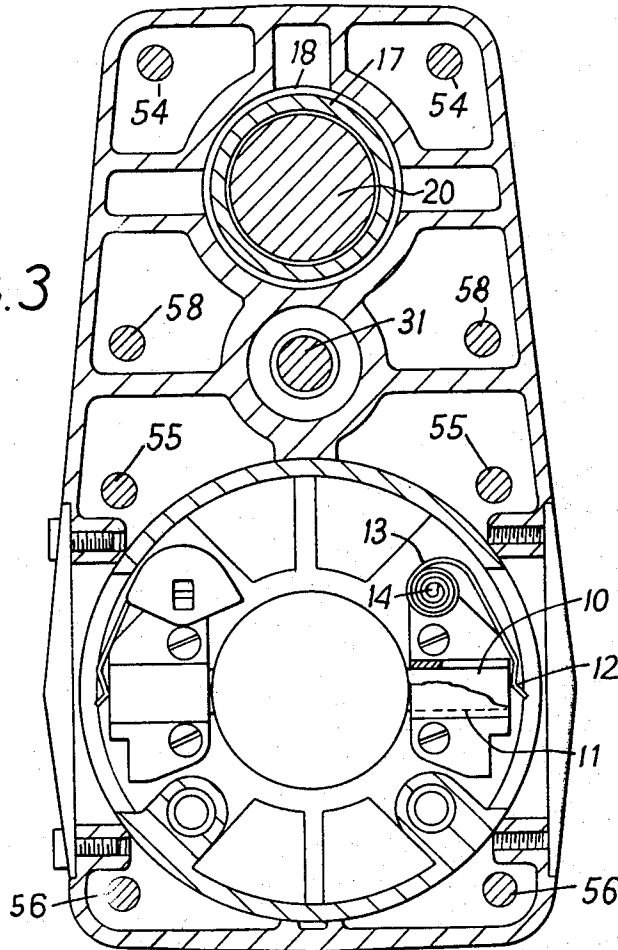


FIG. 3



ELECTRIC HAMMER

SUMMARY OF THE INVENTION

This invention relates to portable percussion tools.

According to this invention there is provided a portable percussion tool comprising a casing incorporating a cylinder in which a driver and a striker are disposed for reciprocating motion, an air chamber being formed axially between the driver and striker in which chamber a quantity of air is trapped, a rotary tool holder mounted for rotary movement in alignment with the striker, an anvil carried in said holder arranged to be struck directly or indirectly by the striker, an electric motor whereof the motor shaft is parallel to the axis of the cylinder, a driving shaft disposed parallel to the motor shaft and the cylinder and arranged to rotate the tool holder, and a crankshaft which is disposed at right angles to the motor shaft, said driving shaft and the axis of the cylinder and which is driven by the motor shaft through gearing and drives the driving shaft, said crankshaft having a crankpin connected to reciprocate the driver through a connecting rod, and said casing including a one-piece casting or moulding which carries the cylinder, the drive shaft and the crankshaft and provides a bearing support for the end of the motor shaft nearer the crankshaft and which encloses and locates the portion of the motor which carries the motor brush gear.

BRIEF DESCRIPTION OF THE DRAWINGS

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a side elevation, partly in section, of a tool according to the invention,

FIG. 2 is a plan view which corresponds to FIG. 1 but in which the motor and the rear part of the casing are shown separated from the central body of the tool, the crankshaft being shown in side elevation, and

FIG. 3 is an end elevation on the plane 3—3 of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings, the portable percussion tool shown is powered by an electric motor 10 of double-insulated construction and having on its output shaft 11 a bevel pinion 12 which meshes with a bevel gear 13 located on one end of a crankshaft 14. The crankshaft is disposed at right angles to the motor shaft and includes in its length a pre-set overload clutch 15. The other end of the crankshaft carries a crankpin 16 which transmits a reciprocating movement to a driver 17 through a connecting rod 17a. Driver 17 is slidably mounted in a fixed cylinder sleeve 18 and provides within itself a cylinder in which a piston portion 20 of a striker 21 is mounted for reciprocating movement. The driver and the piston portion of the striker form between them a closed air chamber 23. The striker comprises also an extension 24 which projects axially from the cylinder in the driver and from the cylinder sleeve into a recoil sleeve 25 encircled by a tool holder 26 which is mounted in a fixed sleeve 27 in front casing part 49 of the tool for rotation about an axis aligned with that of the cylinder sleeve 18. An anvil 28 provided with sealing rings is mounted for axial sliding movement in the tool holder between the end of the recoil sleeve 25 and the inner end of the shank of a tool

bit (not shown). The shank of the bit is of hexagonal section and is slidable lengthwise of itself between two end positions in a correspondingly shaped socket 30 in the tool holder.

A drive shaft 31 disposed between the cylinder sleeve 18 and the motor 10, and extending parallel to the axes of sleeve 18 and the motor, has a bevel gear 32 at one end meshing with a bevel gear 33 driven through clutch 15 on the crankshaft and at its other end is formed with gear teeth 34 which mesh with teeth 35 on the tool holder. The depth of mesh between the teeth of gears 32, 33 is adjustable by means of a screw 36 engaging the end of the drive shaft 31.

Rotation of the crankshaft by the motor reciprocates the driver 17 which causes reciprocation of the striker by virtue of the air trapped between them in the air chamber. The striker 21 strikes the end of the shank of the bit through the anvil 28. Recoil movement of the anvil is checked by recoil sleeve 25 which rests against a rubber or other elastic ring 38 carried by a block 39.

A one-piece moulding 40 in the form of a pressure die casting houses the cylinder sleeve 18 and provides support for bearings 41, 42 for the drive shaft, for bearings 43, 44 for the crankshaft and for a bearing 45 for the motor shaft. Bearings 43, 44 are supported in lugs 46, 47 on the casting projecting into a space enclosed by relatively massive handle moulding 48. In addition, the moulding 40 provides a recess 52 in which the adjacent end portion 53 of the stator enclosure of the motor is located against radial movement; the bearing 45 of the motor shaft is not supported by the stator enclosure and the arrangement thus ensures accurate centering of the motor shaft with respect to the moulding without imposing any loading on the motor shaft due to eccentricity of the shaft with respect to the stator enclosure. The stator enclosure in the illustrated construction carries the brush gear of the motor.

The method of assembling the principal components of the central body of the tool is as follows. Fixed sleeve 27 and threaded insert 50 carrying screw 36 are secured in front casing 49. The tool holder 26 carrying anvil 28, recoil sleeve 25 and associated parts is inserted into fixed sleeve 27. Fixed sleeve 18 and block 39 are secured in moulding 40. Driver 17 carrying connecting rod 17a and striker 21 are inserted in fixed sleeve 18, ring 38 is located in the groove provided in block 39. Front casing 49 and associated parts are assembled to moulding 40 and associated parts and secured by lower screws 58. The drive shaft 31 is then inserted and screw 36 is backed off so that the outer face of gear 32 lies below the lowest point of bearing 43 to permit the free passage of crankshaft assembly 14 into the bore of bearing 43. Crankshaft assembly 14 is then inserted into its bearing lugs from beneath, the crankpin 16 being engaged in the eye of the connecting rod 17a.

Shims are inserted between a thrust bearing 59 of the crankshaft and the adjacent surface of the lug 47 to provide the correct mesh between the bevel gears 12, 13 and for purposes of determining the required thickness of the shims, shims having a gap in their periphery being employed. When the required thickness of the shims has been determined, the motor is moved outwards until the tip of bevel pinion 12 will allow bevel gear 13 to pass freely over it and the crankshaft is then removed, provided with the appropriate permanent shims and replaced. The motor is then replaced and secured

with screws 54, 55 and 56 which also anchor handle 48 and screw 36 is adjusted to move the bevel gear on the drive shaft into correct engagement with the bevel gear on the crankshaft.

Thus, by arranging the components in the manner described, including the provision of means for adjusting the positions of certain of the components, it is made possible to use the single casting 40 to support and locate a substantial number of the principal components, and so to build accuracy into the construction instead of relying on the accurate machining and reliable fastening together of a number of component casing parts, and to reduce assembly time.

I claim:

1. A portable percussion tool comprising a casing incorporating a cylinder, a driver and a striker disposed for reciprocating motion in the cylinder, an air chamber being formed axially between the driver and striker in which chamber a quantity of air is trapped, a rotary tool holder mounted for rotary movement in alignment with the striker, an anvil carried in said holder arranged to be struck directly or indirectly by the striker, an electric motor including a stator and stator enclosure and a motor shaft extending therethrough and disposed parallel to the axis of the cylinder, a driving shaft disposed parallel to the motor shaft and the cylinder and arranged to rotate the tool holder, and a crankshaft

which is disposed at right angles to the motor shaft and which has a crankpin connected to reciprocate the driver, first meshing bevel gears mounted on the crankshaft and the motor shaft respectively, second meshing bevel gears mounted on the crankshaft and the drive shaft respectively, means for locating the drive shaft against movement axially of itself in a direction away from the crankshaft, said means being adjustable to permit the drive shaft to be moved axially of itself to move the bevel gear thereon radially clear of the associated second bevel gear on the crankshaft during assembly and dismantling of the tool, and said casing including a member moulded in one piece and which carries an end portion of the cylinder, said member providing bearing supports for the crankshaft and drive shaft and a bearing support adjacent the crankshaft for the motor shaft, and said member having a bore in which is received and radially located an end portion of the stator enclosure of the motor adjacent the crankshaft.

2. A percussion tool as claimed in claim 1, wherein the crankshaft incorporates an overload clutch through which the first bevel gear on the crankshaft is connected to drive the second bevel gear on the crankshaft and the crankpin.

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