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2,350,631

PORTABLE HAND HELD ELECTRIC TOOL

Filed Feb. 10, 1943

2 Sheets-Sheet 1

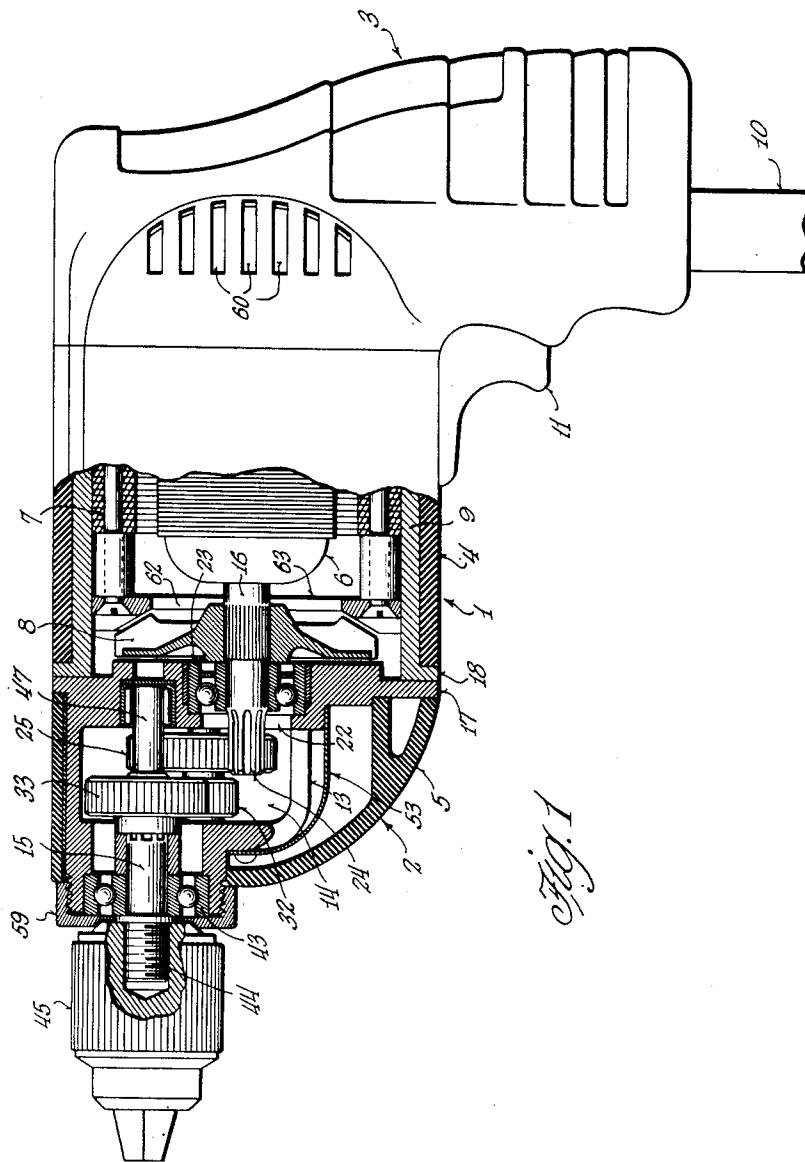


Fig. 1

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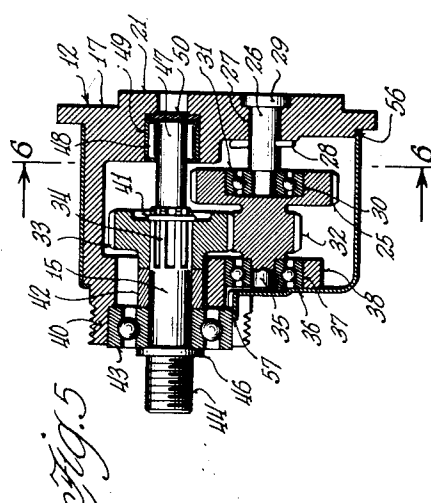
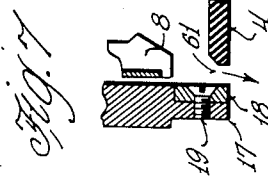
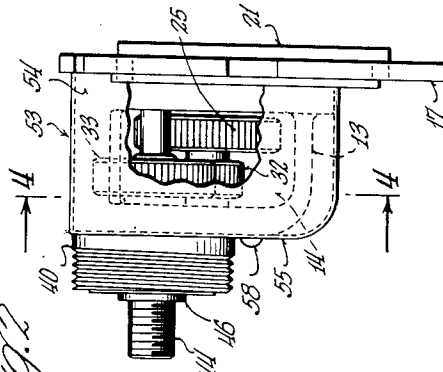
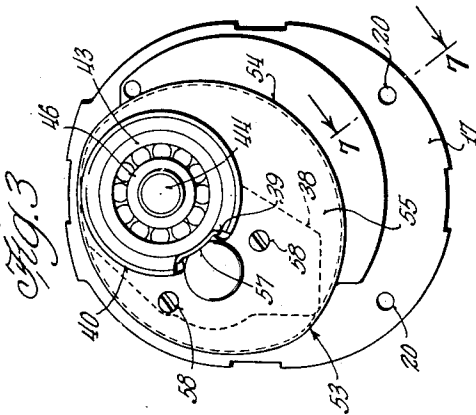
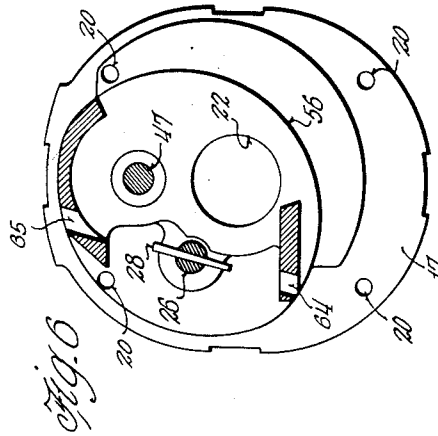
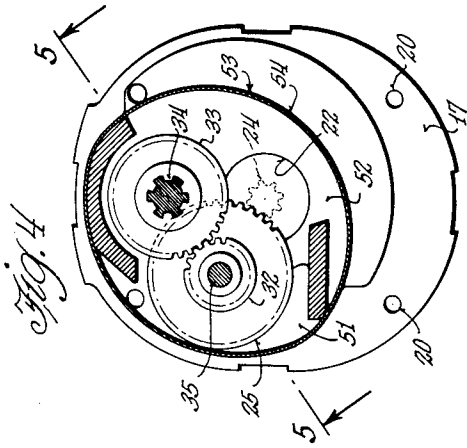
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PORTABLE HAND HELD ELECTRIC TOOL

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2 Sheets-Sheet 2



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PORTABLE HAND-HELD ELECTRIC TOOL

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Application February 10, 1943, Serial No. 475,367

8 Claims. (Cl. 172—36)

This invention relates to portable hand held, self-contained, electrically motor driven drills and similar tools of the character disclosed and claimed in my co-pending applications filed October 16, 1942, Serial Nos. 462,244 and 462,245.

The present invention concerns the reducing gear section of such tools and has for among its principal objects the following:

To provide a one-piece gear frame for the reducing gear section of the tool, preferably in the form of a die-casting, to eliminate the need for a separate end plate between the motor and the reducing gear sections of the tool as heretofore, and to enable the bearing supports for the axis elements of the gear train to be made in perfect alignment in the integrally connected wall portions of said gear frame;

To provide the gear frame with a gear housing having side openings through which the gear elements of the gear train may be readily and easily passed in assembling and disassembling the gear train with respect to the gear frame;

To provide releasable mountings for the gear and axis elements of the gear train for assembling and disassembling purposes;

To provide a shield member fitting over the gear housing of the gear frame in closing relation to the side openings therein to retain a lubricant within the housing for the gear train; and

To provide the improved features of construction and arrangement of parts as hereinafter described and claimed.

In the accompanying drawings showing a preferred embodiment of my invention—

Fig. 1 is a side elevational view of a portable hand held electrically motor driven drill provided with a reducing gear section constructed in accordance with my invention, the tool casing being broken away to show the parts;

Fig. 2 is a similar elevational view of the one-piece gear frame and shield member assembly removed from the tool to indicate the unitary nature of this unit;

Fig. 3 is a front elevational view of said unit;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 4;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 5; and

Fig. 7 is a sectional view of a detail of construction to be hereinafter described.

In the drawings, I have shown a portable hand held electrically motor driven tool of the pistol grip type having a motor section 1, a reducing gear section 2 and a handle section 3. These sections are secured together in the order shown and contain the operative parts of the machine. In the tool shown, the handle section 3 and the

cover elements 4, 5 for the motor and the reducing gear sections 1 and 2, respectively, are each in molded form of a relatively light and inexpensive plastic material as disclosed in my co-pending application, Serial No. 462,244 aforesaid.

The electric motor unit for the tool comprises generally an armature or rotor 6, a stator 7, an air circulating fan 8 and a substantially U-shaped metal supporting frame 9 as employed in my co-pending applications. The brushes (not shown) for the motor are carried by the frame 9 at the handle end of the tool and the handle section 3 contains a switch device, also not shown, by which the electric current to the motor is turned on and off in the operation of the tool. The supply cable 10 for the motor is clamped to and extends into the handle section 3 through its lower or butt end, as in tools of this character, and is connected into the motor circuit through the switch device.

The tool has a trigger block 11 slidably mounted in the handle section 3 just below the motor section 1 for closing the switch when the trigger is pushed and held inwardly. The trigger block 11 is normally spring urged outwardly to open the switch when released. A suitable locking arrangement for holding the trigger block depressed to keep the switch closed may be employed as disclosed in my co-pending applications.

The reducing gear section 2 of the tool comprises the plastic cover 5 above mentioned and a gear frame and a shield member unit depicted in Figs. 2 to 6.

The gear frame 12, according to my invention, is made in the form of a one-piece casting, preferably a die-casting, and has a hollow body portion 13 providing a chamber 14 to house the gear train which drives the tool spindle 15 from the motor shaft 16 at the reduced speed required. The rear or base wall 17 of the gear frame 12 fits against the front flat face of a ring element 18 at the front end of the motor supporting frame 9 as an integral part thereof. This ring element 18 is at the front end of the motor section 1 and also provides a seat for the front edge of the motor cover section 4 as shown in Fig. 1. The cover 4 is clamped against the ring 18 by the handle section 3 which abuts it as shown. The handle section 3 fits over the rear end portion of the frame 9 and is secured thereto by screws in the manner shown in my co-pending application Serial No. 462,244.

The base wall 17 provides an end plate for closing the front end of the motor section 1 when the gear frame is placed thereagainst. The parts are secured together by a number of screws, one of which is shown at 19 in Fig. 7. The wall 17 is provided with tapped openings 20 for these screws. The wall 17 conforms to the size and

shape of the ring element 18 and has a rearwardly extending boss portion 21 to fit within and engage the center opening in the ring 18 to interfit and align the parts when assembled as shown in Fig. 1. This construction conforms to that disclosed in my co-pending applications.

The wall member 17 at its boss portion 21 has an opening 22 extending therethrough into the chamber 14 to mount a ball bearing unit 23 to support and journal the front end of the motor shaft 16. The rear end of this shaft is supported in a similar manner at the rear end of the frame 9. The shaft 16 is provided at its front end within the chamber 14 with gear teeth providing a gear pinion 24 which meshes with a gear wheel 25 mounted on a stub-shaft 26.

The stub-shaft 26 is fitted in a bore 27 in the base wall 17 and is held in place by a wedge-pin 28 inserted through an opening in the shaft 26 within the chamber 14 as detailed in Figs. 5 and 6. The shaft 26 has a headed portion 29 at its outer end to seat it in the frame wall 17 as shown. Gear wheel 25 has a central recess 30 to seat a ball bearing unit 31 which provides a journal for the gear wheel 25 on the inner end of the shaft 26. Gear wheel 25 carries an integrally joined pinion 32 on its side opposite to the shaft 26 and meshing with a gear wheel 33 mounted on a splined portion 34 of the tool spindle 15. The gear pinion 32 has a shaft extension 35 in axial alignment with the shaft 26 to support and journal the pinion in a ball bearing unit 36 mounted within an opening 37 in the outer wall portion 38 of the gear housing 13. The opening 37 intersects an arcuate groove 39 of the same radius in one side of a forwardly projecting tubular extension 40 on the frame wall 38 as shown in Figs. 3 and 5. The purpose of this groove will presently appear.

The gear wheel 33 is retained on the splined portion 34 of the spindle 15 by a split spring retainer ring 41. The latter holds the gear wheel 33 against a sleeve 42 on the spindle 15 between the gear wheel 33 and a ball bearing unit 43 which journals the spindle 15 within the tubular extension 40 at the front end of the tool. The front end of the spindle 15 has a screw threaded portion 44 to mount a chuck 45 and there is a collar 46 at the base end of said threaded portion 44 to seat the chuck and to hold the ball bearing unit 43 within the tubular extension 40. The latter is provided with an internal shoulder to seat said bearing unit. The portion of the spindle 15 inwardly of the gear wheel 33 is reduced in diameter as at 47 so that the gear wheel 33 when released by the retainer ring 41 may be slid onto this reduced portion of the spindle for removal of the parts as will presently appear. The spindle portion 47 extends to the wall portion 17 and is supported and journaled therein in alignment with the tubular portion 40 by a roller bearing unit 48 fitted within a recess 49 in said frame wall 17. A plate 50 closes the inner end of said recess, the latter being bored through the wall 17 as shown.

The gear housing 13 has side openings 51, 52, which as shown in Fig. 4, are diametrically disposed and are large enough to pass the gear wheels 25 and 33, respectively.

In disassembling the parts just above described, the tool spindle 15 is withdrawn from the tubular extension 40 through its front end, the retainer ring 41 first being removed from the splined portion 34 of the spindle. As the spindle 15 is withdrawn, the gear wheel 33 remains within the

chamber 14 for removal through the side opening 52.

Next, the cluster gear 25—32 is forced off of the inner end of the shaft 26 towards the opening 37, the pinion 32 entering said opening 37 and carrying the bearing unit 36 therewith. This is permitted because the groove 39 forms a forward continuation of the opening 37. This releases the cluster gear from the inner end of the shaft 26, whereupon the pin 28 is forced out of the shaft and the latter pressed out of the bore 27. Now the cluster gear 25—32 is dropped back into the chamber 14 and can be passed out of the side opening 51.

To reassemble the parts, the operations as above described are reversed. The cluster gear 25—32 is first placed in the chamber 14 and inserted in the opening 37. Then the shaft 26 is put in place and the pin 28 reset. The cluster gear is then applied over the inner end of the shaft 26. Next, the gear wheel 33 is placed in the chamber 14 at the tubular extension 40 and the spindle 15 is applied through the gear into the roller bearing unit 48. The ring retainer 41 is now applied and the assembly is complete for securing as a unit to the front end of the motor supporting frame 9. With the axis elements 15 and 26 and 35, respectively, for the gear train, journaled in the wall sections 17 and 38 which are integrally connected through the interposed gear housing 13, the openings for the axis elements in said wall portions may be made in alignment in single drilling operations.

The shield member above referred to comprises a cup-shaped sheet metal stamping 53 having a surrounding marginal wall 54 and an outer wall 55 as shown in Figs. 2 and 3, respectively. The marginal wall 54 extends from the outer wall 38 of the gear housing 13 to the base wall 17 and seats against said base wall about a centering rib or shoulder 56. The outer wall 55 of the shield member 53 rests on the outer wall 38 of the gear housing and has an opening therein to pass the tubular extension 40 as shown in Figs. 3 and 5. The outer wall 55 of the shield member has a tongue or key 57 to enter the groove 39 to hold the shield from turning on the gear frame. The shield member 53 is secured to the gear frame over the gear housing 13 by a number of screws 58. The shield member 55 extends over the side openings 51, 52 as shown in Fig. 4 and serves to retain lubricant within the chamber 14 for the gear train and its axis elements. In this connection, it will be noted that the outer wall 55 of the shield member closes the opening 37 in the housing wall 38 and that the plate 50 closes the entry into the chamber 14 at the inner end of the spindle 15.

A ring nut 59 is screwed on the tubular extension 40 to hold the ball bearing unit 43 in place and to clamp the cover 5 against the front side of the gear frame wall 17 as shown in Fig. 1.

The air intake openings 60 for the fan 8 are in the handle section 3 at the rear end of the tool. The air discharge openings 61 (Fig. 7) for the fan are in the motor section 1 about the periphery of the fan on the rear side of the ring element 18 in the same manner as in my co-pending application Serial No. 462,244. The fan draws air into its center at the opening 62 in the fan chamber wall 63.

The gear housing 13 may have aligned openings 64, 65 in its body wall opposite to the wedge-pin 28 so that said pin may be engaged by a suitable tool for removing and inserting the pin.

The structure shown and described is simple

and effective in construction and facilitates the assembly and disassembly of the reducing gear section of the tool. Perfect alignment for the axis elements of the gear train is made possible by having the bearings and supports therefor in the integrally connected front and rear wall portions of the one-piece gear frame.

The details of construction and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of my invention, except as pointed out in the annexed claims.

I claim as my invention:

1. A portable hand held power operated tool having a driving motor and a support therefor, a one-piece gear frame having an integrally connected base wall secured to the front end of the motor support and a gear housing on the front side of said base wall, a rotatable spindle journaled in said gear frame within said housing, said motor having a driving shaft extending into the gear housing through said base wall, and a gear train journaled in the gear frame within said housing and providing a drive from the motor shaft to the spindle, said spindle and said gear train being releasably mounted within the gear frame, and said housing having side openings to pass the gears of the gear train in assembling and disassembling the parts.

2. A portable hand held power operated tool having a driving motor and a support therefor, a one-piece gear frame having an integrally connected base wall secured to the front end of the motor support and a gear housing on the front side of said base wall, a rotatable spindle journaled in the gear frame within said housing, said motor having a driving shaft extending into said gear housing through said base wall, a gear train journaled in said gear frame and providing a drive from the motor shaft to the spindle, said spindle and said gear train being releasably mounted within the gear frame, said housing having side openings to pass the gears of the gear train in assembling and disassembling the parts, and a shield member fitting over the gear housing in closing relation to its side openings.

3. A portable hand held power operated tool having a driving motor and a support therefor, a one-piece gear frame having a base wall secured to the front end of the motor support and having a gear housing with a tubular extension on the front side thereof, a rotatable spindle journaled within said extension on a bearing unit therein, said motor having a driving shaft extending into said gear housing, a gear train journaled in the gear housing and providing a drive from the motor shaft to the spindle, a cover section fitting over the gear housing, and a nut element having screw threaded connection with the tubular extension for clamping the bearing unit therein and the cover section over the gear housing.

4. A portable hand held power operated tool having a driving motor and a support therefor, a one-piece gear frame secured to the front end of said motor support and having a gear housing on the front side thereof, a rotatable spindle journaled within said gear housing, said motor having a driving shaft extending into said housing, a gear train journaled within the gear housing and providing a drive from the motor shaft to the spindle, said spindle and said gear train being releasably mounted within the gear frame, said gear housing having side openings for pass-

ing the gears of the gear train in assembling and disassembling the parts, a shield member fitting over the gear housing in closing relation to said side openings, and a tongue on the shield member engaging the gear frame for holding the parts against relative rotation.

5. A portable hand held power operated tool having a driving motor and a support therefor, a one-piece gear frame secured to the front end of the motor support and having a gear housing with a tubular extension on the front side thereof, a rotatable spindle journaled in the gear housing within said tubular extension, said motor having a driving shaft extending into the gear housing, a gear train journaled in the gear frame and providing a drive from the motor shaft to the spindle, a shield element fitting over the gear housing and having a tongue engaging a groove in the side portion of the tubular extension.

6. A reducing gear unit for portable power operated tools of the character described comprising a one-piece gear frame have a base wall and an integrally connected gear housing on one side thereof, a rotatable spindle and a stub-shaft releasably mounted in the gear frame and extending into the gear housing in substantially parallel relation, a gear wheel splined on the spindle within the gear housing, a cluster gear within the housing and having one end journaled on the stub-shaft and the other end journaled in the gear frame, said cluster gear having a pinion in mesh with the gear wheel on the spindle, and side openings in the housing to pass the gears in assembling and disassembling the same with respect to the spindle and the stub-shaft.

7. A reducing gear unit for portable power operated tools of the character described comprising a one-piece gear frame having a base wall and an integrally connected gear housing with a tubular extension on one side thereof, a rotatable spindle extending into said gear housing through said tubular extension and journaled in bearing units, one mounted on said base wall and the other in said tubular extension, a stub-shaft releasably mounted in said base wall and extending into said gear housing in substantially parallel relation to said spindle, a gear wheel splined on the spindle within the gear housing, a cluster gear located within the housing and journaled at one end on the stub-shaft and at the other end in the gear frame, said cluster gear having a pinion in mesh with said gear wheel, side openings in the gear housing to pass the gears in the assembling and disassembling of the same, and a nut element screwed on the tubular extension for holding the spindle bearing therein.

8. A reducing gear unit for portable power operated tools of the character described comprising a one-piece gear frame having front and rear walls and an integrally connected gear housing therebetween, a gear train and off-set axis elements therefor located within the gear housing and journaled in the gear frame in the front and rear walls thereof, the bearing supports in the gear frame walls for the axis elements being in alignment and formed in single drilling operations, said gear train and the axis elements being releasably mounted in the frame for assembling and disassembling with respect to the gear frame, and openings in the gear housing to pass the gears of the gear train.

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