The present invention relates to a right-angle sander, and more particularly, to an improved bearing means for a portable electric right-angle tool suitable for use in sanding, polishing, or general ablating operations.

It is an object of the present invention to provide a high-quality reliable tool which may be manufactured easily and conveniently at a relatively low cost.

It is another object of the present invention to provide a "clam shell" right-angle sander having a pair of complementary mating halves, including a top half and a bottom half detachably secured together along a common horizontal midplane, consonant with a simplified and improved bearing means for the armature shaft and for the right-angle spindle of the tool, thereby obviating the prior art requirements for expensive machining of the castings.

It is a specific object of the present invention to provide a spindle journaled in a double-row ball bearing retained within a bore formed in a depending boss on the lower housing half, thereby eliminating the necessity for a bearing boss within the interior of the top half of the "clam shell" housing.

In accordance with the teachings of the present invention, a portable power-operated tool is herein illustrated and described, which has an elongated housing comprising a pair of complementary mating halves (including a top housing half and a bottom housing half) secured together along a common horizontal midplane. A motor is provided, and the motor has an armature shaft journaled in spaced-apart bearings retained between the complementary mating halves of the elongated housing. The axis of the armature shaft is substantially within the common horizontal midplane and has a driving pinion on its forward end. A depending boss is formed on the lower housing half, and this boss extends transversely away from the common horizontal midplane, preferably at right-angles, and has a through bore formed therein. A double-row ball bearing is retained within the bore formed in the depending boss, and a spindle is journaled in the bearing. Preferably, the bearing and spindle are provided in the form of a subassembly. A gear is carried by the spindle of the subassembly, and preferably, this gear is a face gear which is disposed substantially below the common horizontal midplane between the complementary mating halves of the elongated housing. The face gear has teeth engaging the driving pinion for direct transmission of power from the armature shaft to the spindle, and a pad or other work-engaging element is mounted on the other end of the spindle.

These and other objects of the present invention will become apparent from a reading of the following specification, taken in conjunction with the enclosed drawings, in which:

FIGURE 1 is a perspective of the improved tool of the present invention;

FIGURE 2 is a longitudinal section, taken substantially along the lines 2—2 of FIGURE 1, and enlarged over the scale of FIGURE 1; and

FIGURE 3 is an exploded perspective of the tool shown in FIGURE 1.

With reference to FIGURE 1, there is illustrated a right-angle sander 10 which is indicative of the class of tools to which the teachings of the present invention may be applied. Generally, the sander 10 comprises an elongated housing 11 having a radially-enlarged central portion providing a motor casing 12, the motor casing having resilient bumpers 12a and 12b secured thereto; a somewhat flattened portion providing a gear case 13 forwardly of the motor casing; and an elongated switch handle portion 14 rearwardly of the motor casing. The switch handle 14 has the usual electric switch 15 for energizing the armature of the unit from the line cord 16. An auxiliary handle 17 is provided to facilitate convenient usage and control of the tool. The tool further includes a pad assembly 18 (or other work engaging element) for sanding or polishing operations.

With reference to FIGURES 2 and 3, the elongated housing 11 is of the "clam shell" design and is split about a common horizontal plane, the latter being designated by the line X-Y in FIGURE 2. The housing 11 thus comprises a pair of complementary mating halves, including a top housing half 11a and a bottom housing half 11b, which are detachably secured together (by a plurality of screws 11c) along the common horizontal midplane X-Y, the latter sometimes being referred to as the parting line between the castings. Each of the mating halves 11a and 11b is provided with a first transverse wall 19 between the motor casing and the gear case, and a second transverse wall 20 between the motor casing and the rearward switch handle. These transverse walls are in the nature of integrally-cast ribs and have bearing seats 21 formed therein. Preferably, these bearing seats 21 are formed as portions of a sphere, see FIGURE 2, and are adapted to match with one another to provide a pair of spaced-apart aligned spherical bearing seats 22 for the armature shaft 24. Bearings 22 and 23 are received within the bearing seats 21 and are trapped therein between the complementary mating halves 11a and 11b of the split housing. The front bearing 22 has a resilient O-ring 22a in its respective bearing seat. The ring 22a has a twofold purpose: first, it prevents the bearing 22 from rotating within its seat; and secondly, it provides a convenient grease seal between the gear case and the motor casing. The rear bearing 23 is suitably keyed to its respective seat by means of a key 23a. Each of the bearings has an outer spherically-formed surface, complementary to its respective bearing seat, and an armature shaft 24 is journaled in the bearings. In this manner, the armature shaft is self-aligning with respect to the housing 11. Any suitable bearings may be used; preferably, however, the front bearing 22 is a ball bearing, whereas the rear bearing 23 is a roller or needle bearing. The armature shaft 24 carries a fan 25 mounted on a hub 26, an armature 27, and a commutator 28, all of which are of conventional design. The armature 27 cooperates with a suitable field subassembly 29 for required performance.

As shown in FIGURE 2, the longitudinal axis of the armature shaft 24 is substantially within the common horizontal plane X-Y, and the forward end of the armature shaft extends beyond the bearing 22 in the wall 19, into the gear case 13, and has a suitable pinion 30 formed thereon.

A depending boss 31 is formed integrally with the lower housing half 11b and extends transversely away from the common horizontal midplane X-Y, partially at right angles thereto. This depending boss 31 has a through bore 32 formed therein. A subassembly 33 comprising a double-row ball bearing 34 and a spindle 35 is retained within the bore 32 by means of a retaining washer 36 and screws 37. Preferably, but not necessarily, the bearing 34 and spindle 35 is formed as an integral subassembly for reasons of manufacturing economy.

A gear 38, preferably comprising a face gear, is carried by the spindle 35 of the subassembly. As shown more
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3. Clearly in FIGURE 2, this gear 38 is preferably disposed substantially below the common horizontal midplane X–Y between the mating halves of the split housing. The gear 38 has teeth engaging the pinion 30, thereby providing for right-angular transmission of power directly from the armature shaft 24 to the spindle 35, thence to the pad assembly 18.

The improved construction of the present invention thus obviates time-consuming machining heretofore required in the prior art; eliminates the necessity for a spindle bearing within the top portion of the gear case of the “clam shell” housing; and facilitates the manufacture and sale of a right-angle sander which is durable and has relatively high performance, yet is more economical to manufacture.

Obviously, many modifications may be made without departing from the basic spirit of the present invention; and accordingly, within the scope of the appended claims, the invention may be practiced other than as has been specifically described herein.

I claim:

1. In a portable power-operated tool, the combination of:

(A) An elongated housing comprising a pair of complementary mating halves including a top housing half and a bottom housing half secured together along a common horizontal midplane;

(B) A motor including an armature shaft journaled in spaced-apart bearings retained between the complementary mating halves of the housing, the axis of the armature shaft being substantially within the common horizontal midplane;

(C) A driving pinion on the forward end of the armature shaft;

(D) A depending boss formed on the lower housing half, the boss extending transversely away from the common horizontal midplane and having a through bore formed therein;

(E) A double-row ball bearing retained within the bore formed in the depending boss;

(F) A spindle journaled solely in the double-row bearing; and

(G) A gear carried by the spindle and having teeth engaging the drive pinion, thereby providing for the transmission of power directly from the armature shaft to the spindle.

2. The combination of claim 1, wherein:

(A) The bearings for the armature shaft are provided with outer spherical surfaces and are received in respective spherically-formed seats in the housing, whereby the armature shaft is self-aligning with respect to the housing.

3. The combination of claim 2, wherein:

(A) A resilient ring is disposed between the housing halves and the bearing for the forward portion of the armature shaft adjacent to the pinion, thereby providing a grease seal between the motor, on the one hand, and the pinion and gear on the other.

4. The combination of claim 1, wherein:

(A) A bore formed in the depending boss extends substantially at right angles to the common horizontal midplane.

5. The combination of claim 1, wherein:

(A) The double-row ball bearing and spindle are formed as an integral subassembly.

6. The combination of claim 1, wherein:

(A) The gear comprises a face gear and is disposed substantially below the common horizontal plane between the complementary mating halves of the split housing.

7. A right-angle sander, comprising:

(A) An elongated housing including:

(1) A radically enlarged central portion providing a casing for a motor;

(2) A gear case portion forwardly of the motor casing; and

(3) A switch handle portion rearwardly of the motor casing;

(B) Said housing being split along a horizontal plane and including a top mating housing half and a bottom mating housing half detachably secured together;

(C) Said housing further having a pair of transverse walls, one between the gear case and the motor casing, and the other between the motor casing and the switch handle;

(D) Each of said walls having complementary recesses formed therein, providing respective bearing seats;

(E) A motor in the motor casing, the motor including an armature shaft journaled in self-aligning bearings in the respective bearing seats, and the bearings being trapped between the mating halves of the split housing;

(F) The armature shaft having its longitudinal axis substantially within the horizontal plane, and further having a forward portion extending beyond the transverse wall between the motor casing and the gear case;

(G) A boss formed in the bottom mating half of the split housing, the boss depending from the gear case portion of the housing, substantially at right angles to the horizontal plane, and having a bore formed therein;

(H) A spindle journaled in bearing means retained in the bore of the depending boss; and

(I) Right-angle gearing directly interconnecting the spindle and the armature shaft, the gearing including a pinion on the forward portion of the armature shaft and a cooperating gear mounted on the spindle, and the gear being disposed substantially below the horizontal plane of the split housing.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,411,024

George E. Maffey, Jr.

November 12, 1968

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 54, after "quired" insert -- motor --.

Column 3, line 44, "drive" should read -- driving --.
Column 4, line 11, "radically" should read -- radially --.

Signed and sealed this 21st day of April 1970.

(SEAL)

Attest:

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Commissioner of Patents