



(22) Date de dépôt/Filing Date: 1995/07/07

(41) Mise à la disp. pub./Open to Public Insp.: 1996/01/27

(45) Date de délivrance/Issue Date: 2005/09/06

(30) Priorité/Priority: 1994/07/26 (9415011.7) GB

(51) Cl.Int.⁶/Int.Cl.⁶ B24B 23/00

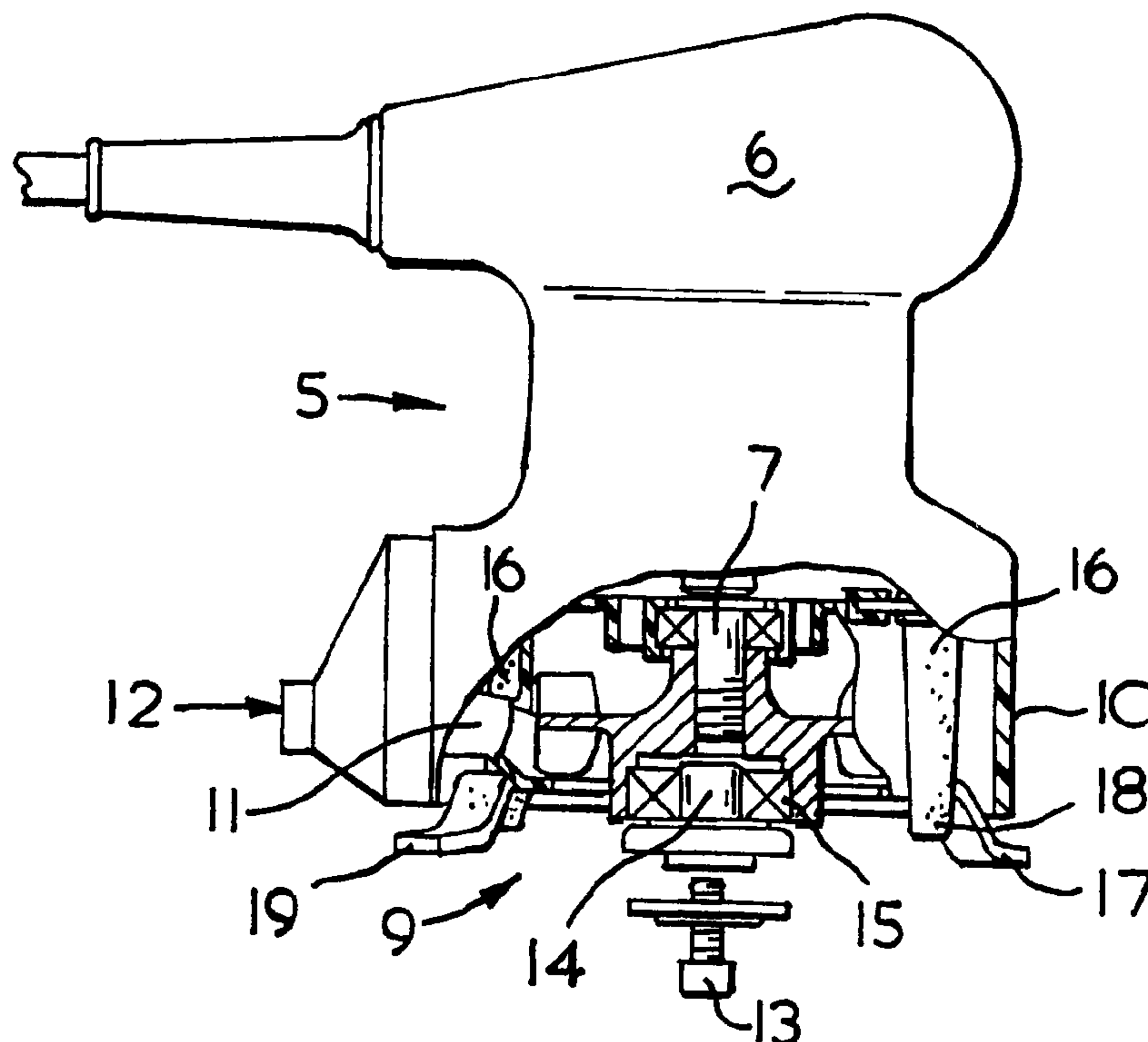
(72) Inventeur/Inventor:
MARTIN, MICHAEL, GB

(73) Propriétaire/Owner:
BLACK & DECKER INC., US

(74) Agent: SIM & MCBURNEY

(54) Titre : OUTIL MANUEL OSCILLANT

(54) Title: OSCILLATING HAND TOOL



(57) Abrégé/Abstract:

A dual function powered oscillating hand tool comprises (i) a drive unit having an electric motor and a drive shaft; (ii) a bearing mounted on said drive shaft and located radially eccentrically relative to said drive shaft; (iii) a second drive shaft mounted on said eccentric bearing and (iv) means for mounting a sanding head on said second drive shaft. The sanding head may comprise a sanding platen for random orbit sanding or a sanding shoe for orbital sanding and said tool further comprises means selectively engageable to restrict said random orbit of the sanding shoe to a regular orbit.



ABSTRACT OF THE DISCLOSURE

Improved Oscillating Hand Tool

A dual function powered oscillating hand tool comprises

5 (i) a drive unit having an electric motor and a drive shaft;

(ii) a bearing mounted on said drive shaft and located radially eccentrically relative to said drive shaft;

(iii) a second drive shaft mounted on said eccentric bearing and

10 (iv) means for mounting a sanding head on said second drive shaft. The sanding head may comprise a sanding platen for random orbit sanding or a sanding shoe for orbital sanding and said tool further comprises means selectively engageable to restrict said random orbit of the sanding shoe to a regular orbit.

15

20

25

TITLE OF THE INVENTION
IMPROVED OSCILLATING HAND TOOL

BACKGROUND TO THE INVENTION

5 The present invention relates to a powered oscillating hand tool comprising a drive unit having an electric motor with a drive shaft to which a sander head can be attached. In general, known sanders can be described as either random orbit sanders or orbital sanders.

10 In random orbit sanders, a circular platen is driven by a drive system which comprises an eccentric bearing so that the platen can spin independently of the motor, and the platen describes a random orbit. Such sanders are in general used for the removal of relatively large quantities of material. Alternatively, the sander may be of the orbital type, with a shaped shoe, the drive system of which comprises an eccentric which is restrained so that the
15 sander shoe cannot spin independently of the motor and it therefore describes a regular orbit. The shoes of such sanders are available in a range of shapes and such sanders are in general used for the removal of relatively small quantities of material, for example for detailed work or for finishing. By choice of a suitably shaped shoe, it is
20 possible to access areas which are inaccessible with a random orbit sander. The fixed eccentric drive system of the orbital sander is cheaper and simpler to manufacture than the eccentric bearing of the random orbit sander.

 Known sanders have been either of the random orbit type or the orbital type, which has meant that when the user
25 wished to have the ability to perform both coarse and detailed sanding operations, it has been necessary for him

to purchase two separate units, one of each type, or to purchase only one unit and suffer the disadvantages thereof..

5 It is an object of the present invention to provide a sander in which the above disadvantages are reduced or substantially obviated.

BRIEF SUMMARY OF THE INVENTION

10 The present invention therefore provides a dual function powered oscillating hand tool comprising

(i) a drive unit having an electric motor and a drive shaft;

15 (ii) a bearing mounted on the drive shaft and located radially eccentrically relative to the drive shaft;

(iii) a second drive shaft mounted in the eccentric bearing and

20 (iv) means for mounting a sanding platen or shoe on the second drive shaft wherein the sanding head may comprise a sanding platen for random orbit sanding or a sanding shoe for orbital sanding and in that the tool further comprises means selectively engageable to restrict the random orbit of the sanding shoe to a
25 regular orbit.

According to one aspect of the invention, there is provided a dual-function powered oscillating hand tool comprising:

30 a drive unit having a housing and a first drive shaft;

 a bearing mounted on the first drive shaft and located radially eccentrically relative thereto;

2a

a second drive shaft mounted on the eccentric bearing and rotatable about the axis thereof, wherein the housing has an opening for the first and second drive shafts,

5 first and second platens interchangeably mountable on the second drive shaft, one of which first and second platens co-operates with coupling means for coupling with the drive unit to prevent free rotation of the one platen about the bearing axis, the other of the first and
10 second platens being arranged, when mounted on the second drive shaft, with free rotation with respect to the bearing axis, and wherein the coupling means consist of a plurality of rigid components and a plurality of flexible columns, each column of the plurality co-operable with a
15 rigid component, one of which flexible columns or rigid components being fixed on the one platen and the other of which flexible columns or rigid components being fixed on the housing and that the flexible columns are arranged about the opening; wherein only when the one platen
20 prevented from free rotation is mounted, the flexible columns and the rigid components are in engagement whereas the other platen lacks any such coupling means
and wherein fitting of one of said platens to the drive unit requires no adaptation to the drive unit other
25 than direct substitution of the first platen for the second platen, or vice versa.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The invention will now be further described with
30 reference to the accompanying drawings in which

Figure 1 is a side view, partially in section, of the drive unit of a first embodiment of a hand tool according to the present invention, shown without an

operating head;

Figure 2 is a side view of the lower part of the drive unit of Figure 1 when fitted with an orbital sander shoe;

- 5 Figure 3 is a side view of the lower part of the drive unit of Figure 1 when fitted with a random orbit sander platen;

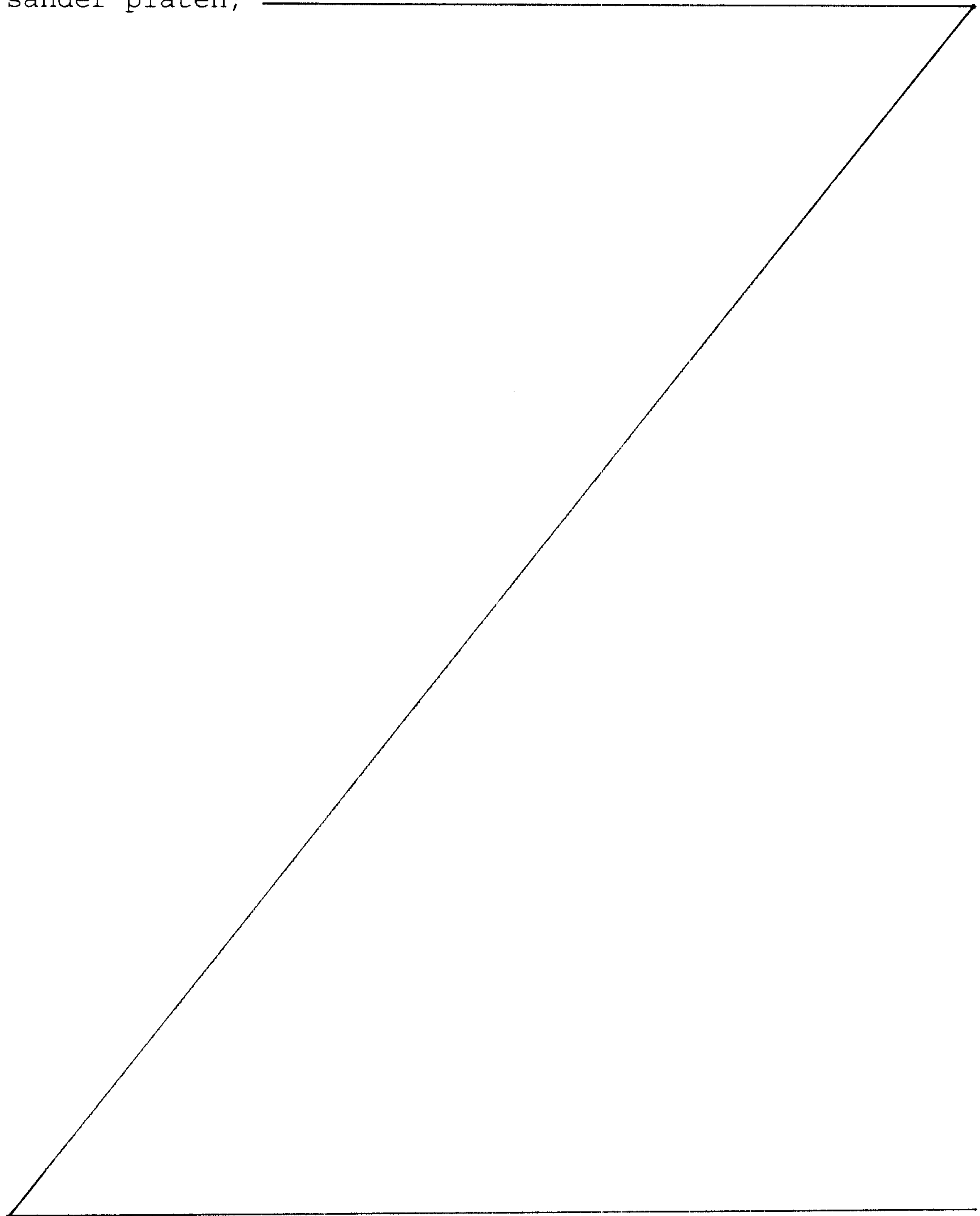


Figure 4 is a side view, partially in section of the drive unit of a second embodiment of a hand tool according to the present invention, shown without an operating head;

Figure 5 is a side view of the lower part of the drive unit of Figure 4 when fitted with an orbital sander shoe;

5 Figure 6 is a side view of the lower part of the drive unit of Figure 4 when fitted with a random orbit sander platen;

Figure 7 is a side view, partially in section, of the drive unit of a third embodiment of a hand tool according to the present invention, shown without an operating head;

10 Figure 8 is a side view of the lower part of the drive unit of Figure 7 when fitted with an orbital sander shoe, and

Figure 9 is a side view of the lower part of the drive unit of Figure 7 when fitted with a random orbit sander platen.

DETAILED DESCRIPTION

15 Figure 1 shows a drive unit (5) including an electric motor (not shown) located in upper housing (6) and driving shaft (7). A fan (8) mounted on shaft (7) is arranged to draw air in from mouth (9) of lower housing (10) and direct it through extractor duct (11) to exhaust outlet (12). A nut (13) is used to secure operating heads (see Figures 2 and 3) to shaft (14) which is housed in the fan (8) by
20 bearing (15) which is eccentrically located radially in respect to shaft (7).

Two pairs of hollow, tapering, flexible columns (16) made of rubber are arranged around the mouth (9) of the lower housing (10). Each flexible column (16) has a more
25 flexible cranked leg (17) projecting from the column (16) a short distance from the tip (18) so that in the unstressed

position the end (19) of the leg (17) projects beyond the tip (18) of the column (16).

Drive unit (5) can alternatively be fitted with an (oscillating) orbital sander shoe (20), (Figure 2) or with a random orbit sander platen (21) (Figure 3).

As seen in Figure 2, shoe (20) which is supported by tips (18) of the flexible columns (16), is driven by the electric motor through shafts (7,14). The cranked legs (17) in this case are deflected from the flexible columns (16) to lie level with the upper surface of the shoe (20). A perforated sandpaper sheet (not shown) may be attached to the outer face (22) of the shoe (20), for example by the use of hook-and-loop fabric such as that sold as VELCRO (RTM) glued to face (22). Holes (23) passing through the shoe (20) facilitate the removal of dust etc, from the sanding face through the shoe (20) to exhaust outlet (12) via the duct (11). An extractor hose (not shown) may be attached to the exhaust outlet (12).

As seen in Figure 3, platen (21) is driven by the electric motor by means of shafts (7,14).

Again, a perforated sandpaper sheet (not shown) may be attached to the outer face (24) of the platen (21), for example by the use of hook-and-loop fabric glued to the face (24). Holes (25) passing through the platen (21) again facilitate removal of dust etc, through the platen (21) to exhaust outlet (12). In this case, tips (18) of the flexible columns (16) are held away from the platen (21) so that the ends (19) of the cranked legs (17) contact the platen (21). In operation, ends (19) of legs (17) drag against the rotating platen (21) to exert a braking effect.

The invention thus provides a powered oscillating power tool which can easily be fitted with an orbital sander head or with an efficiently braked random orbit sander head without requiring adjustment to the drive.

5 In a second embodiment shown in Figures 4 to 6 of the accompanying drawings, like components are similarly numbered as in Figures 1 to 3.

As can be seen from Figure 4, the drive unit (5), upper housing (6), drive shaft (7), fan (8), mouth (9), lower housing (10), duct (11), outlet (12), screw (13), shaft (14) and bearing (15) are as described with reference to Figures 1 to 4.

A shroud (42) surrounds the fan (8), within the lower housing (10) and a flange (44) is provided at the lower end of a wall (46) of the shroud (42). A plurality of location slot (48) are formed in the flange (44) and are adapted to
15 receive corresponding location pegs (50) of an annular brake ring (52). This brake ring (52) is formed of a flexible material, for example rubber, and when attached to the shroud (42) depends from that shroud and projects beyond the lower housing (10).

20 Drive (5) can alternatively be fitted with an orbital sander shoe (54), (Figure 5) or a random orbit sander platen (56), (Figure 6).

As can be seen in Figure 5, the shoe (54) is driven by the electric motor through shafts (7,14). A slotted groove (58), suitably made from a thermoplastic material, is
25 provided on the upper surface (60) of the shoe (54), and is preferably moulded integrally with the shoe backing plate

(62). As the shoe (54) is mounted on the shaft (14), the brake ring (52) engages in the groove (58).

As can be seen from Figure 6, the shoe (54) may be removed and replaced by a random orbit platen (56). A raised ring (64), suitably made from a thermoplastic material and moulded integrally with the platen backing plate (66), is provided in the upper surface (68) of the platen (56). As the platen (56) is mounted on the shaft (14), the raised ring (64) engages in the brake ring (52).

In operation, in the orbital mode the brake ring (52) engages in the groove (58) and restricts the motion of the shoe (54) to a conventional orbital motion. In the random orbit mode, the platen ring (64) engages with, and rolls around the internal circumference of the brake ring (52), thus limiting the rotational speed of the platen (56) and significantly reducing the stop time when the power supply to the unit is interrupted.

15

In a third embodiment shown in Figures 7 to 9 of the accompanying drawings, like components are again numbered as in Figures 1 to 6.

In this embodiment, as can be seen from Figure 7, four upstanding spigots (72) are provided on the underside of the floor (74) of the motor housing. These spigots (72) are suitably made of a thermoplastic material and are preferably integrally moulded with the floor (74) of the motor housing.

Drive unit (5) can alternatively be fitted with an orbital sander shoe (76), (Figure 8) or with a random orbit sander platen (78), (Figure 9).

25

As can be seen from Figure 8, four legs (80) are provided on the backing plate of the shoe (76). As the shoe (76) is mounted on the shaft (14), each of the legs (80) engages a corresponding spigot (72). The legs (80) are shaped for engagement with the spigots (72) and may be made of any flexible material, eg rubber or a synthetic plastics material, and may be welded, screwed, bonded, integrally moulded with or fastened by any appropriate means to the shoe (76).

As can be seen from Figure 9, the shoe (76) may be removed and replaced by a random orbit sander platen (78). If it is wished to provide braking for the sander in the random orbit mode, then a separate brake must be provided in a manner known per se.

In operation, in the orbital mode, each of the legs (80) engages in a corresponding spigot (72) and the motion of the shoe is restricted to a conventional regular orbit. In the random orbit mode, the platen is free to rotate in a random orbit.

In the embodiment shown in Figures 7 to 9, the legs are attached to the shoe, and engage in spigots in the drive unit. It is, however, within the scope of the invention for the legs to be attached to the drive unit and engage with spigots on the backing plate of the shoe. With this variation, it is possible for the legs to provide a braking effect in random orbit mode, thus obviating the need for a separate brake component.

While the powered oscillating hand tool according to the invention is particularly adapted for use with sanding heads such as random orbit sanding platens and orbital sanding shoes, it is of course within the scope of the

invention to provide a tool to which further alternative oscillating heads can be attached.

5

10

15

20

25

WHAT IS CLAIMED IS:

1. A dual-function powered oscillating hand tool comprising:

a drive unit having a housing and a first drive shaft;

a bearing mounted on the first drive shaft and located radially eccentrically relative thereto;

a second drive shaft mounted on the eccentric bearing and rotatable about the axis thereof, wherein the housing has an opening for the first and second drive shafts,

first and second platens interchangeably mountable on the second drive shaft, one of which first and second platens co-operates with coupling means for coupling with the drive unit to prevent free rotation of said one platen about the bearing axis, the other of said first and second platens being arranged, when mounted on the second drive shaft, with free rotation with respect to the bearing axis, and wherein the coupling means consist of a plurality of rigid components and a plurality of flexible columns, each column of the plurality co-operable with a rigid component, one of which flexible columns or rigid components being fixed on said one platen and the other of which flexible columns or rigid components being fixed on the housing and that the flexible columns are arranged about the opening; wherein only when said one platen prevented from free rotation is mounted, the flexible columns and the rigid components are in engagement whereas said other platen lacks any such coupling means

and wherein fitting of one of said platens to the

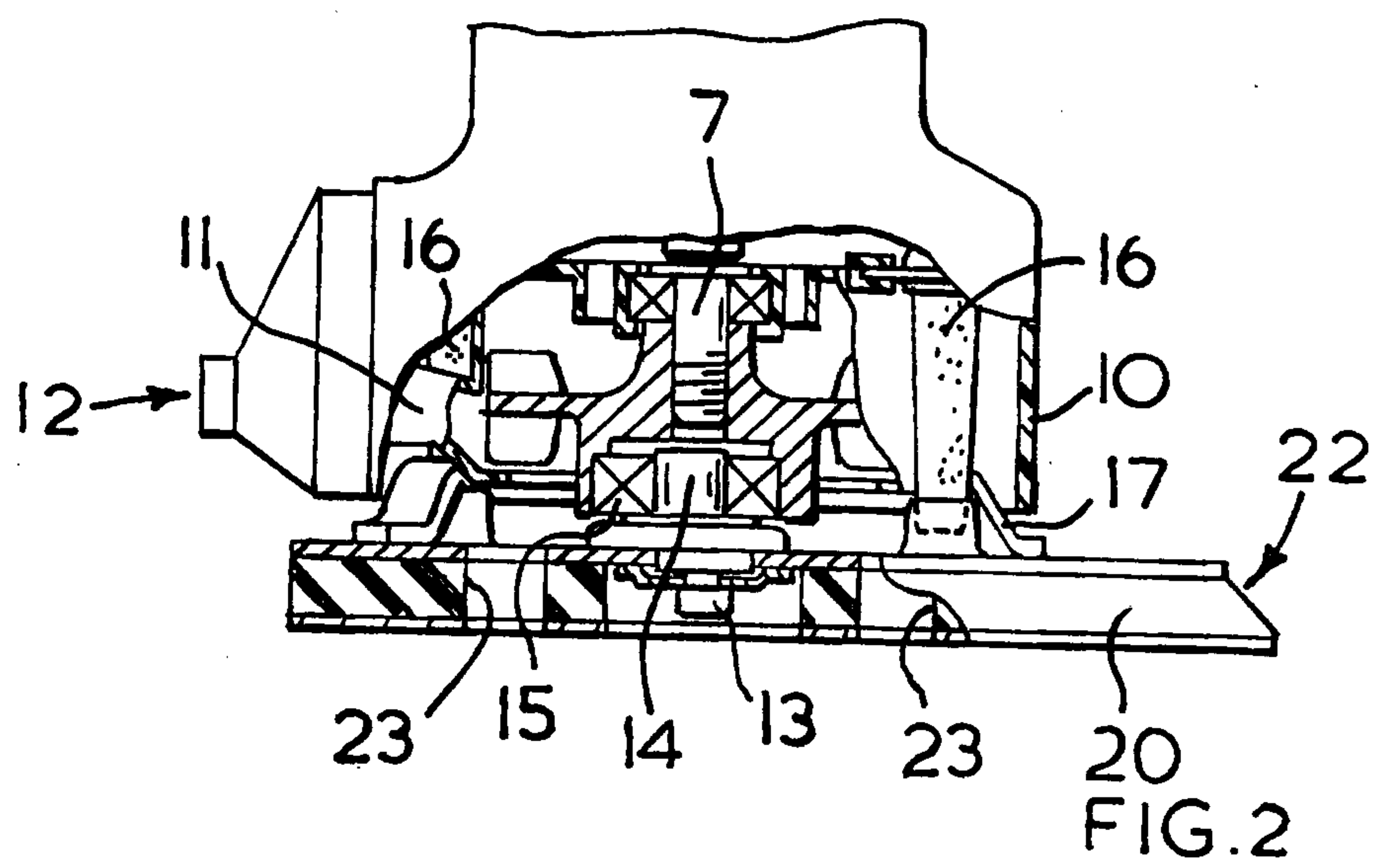
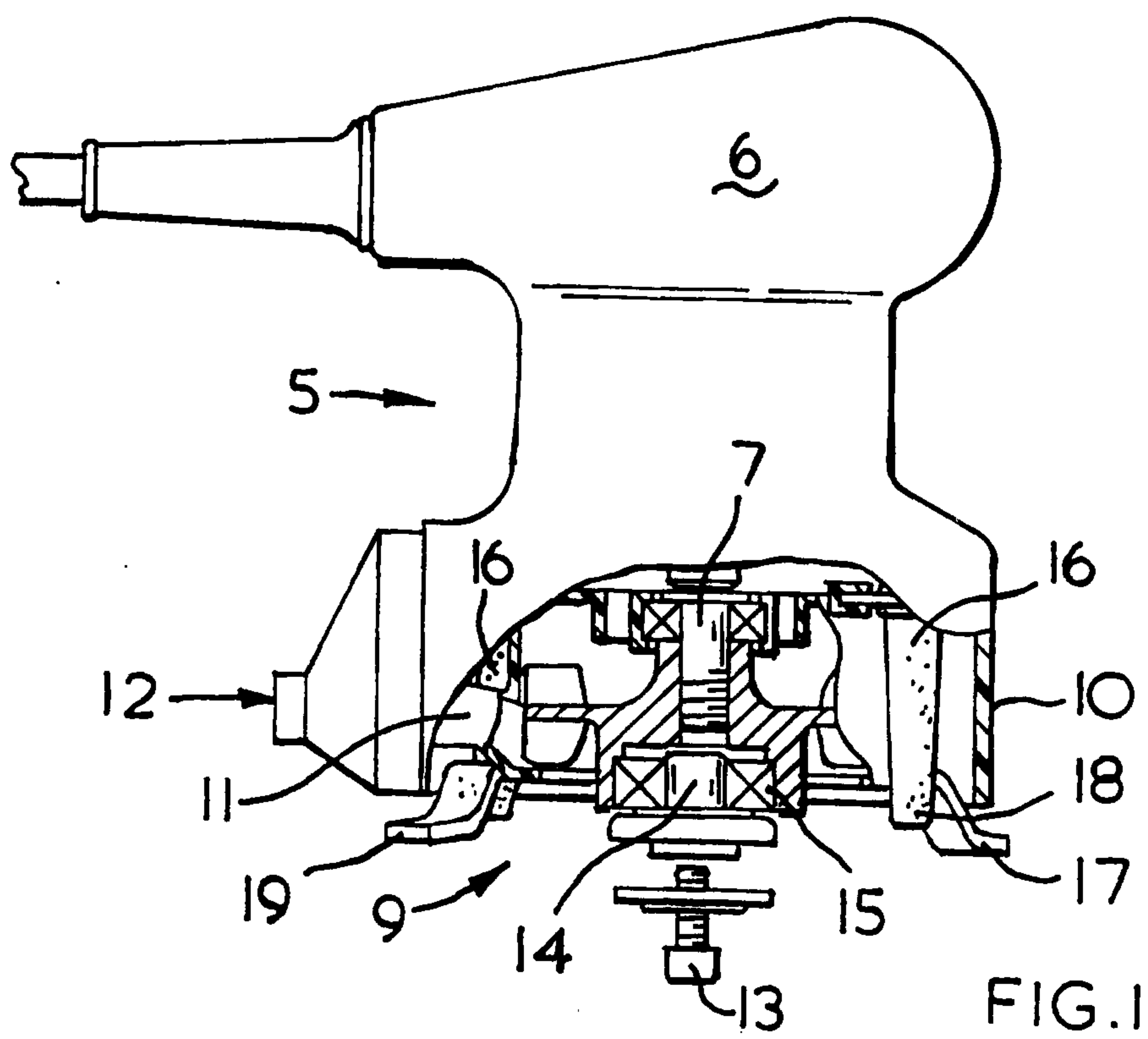
drive unit requires no adaptation to the drive unit other than direct substitution of the first platen for the second platen, or vice versa.

2. A dual-function powered oscillating hand tool according to claim 1 wherein each flexible column of the plurality co-operates with the corresponding rigid component by insertion of said each column into a rigid location point defined by each rigid component.

3. A dual-function oscillating hand-tool according to claim 1 wherein each flexible column of the plurality is hollow and the corresponding rigid component includes a boss which engages the hollow column.

4. A dual-function powered oscillating hand-tool according to one of claims 1-3 wherein said hand-tool further including a brake which is operative when one of said first and second platens is arranged for free rotation with respect to the bearing axis.

5. A dual-function powered oscillating hand-tool according to claim 4 wherein the columns of the plurality are located on the drive unit and are a component of the brake.



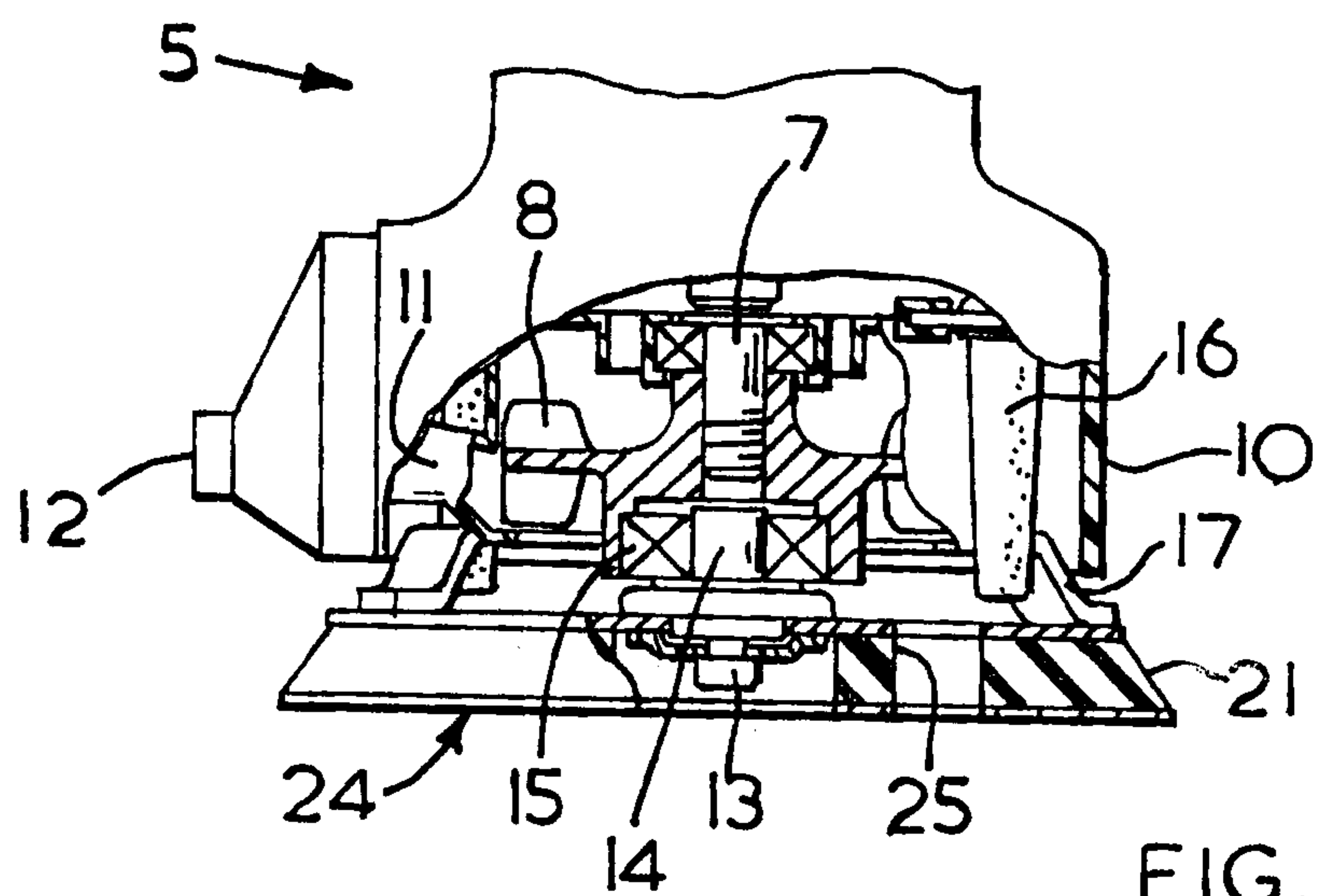


FIG. 3

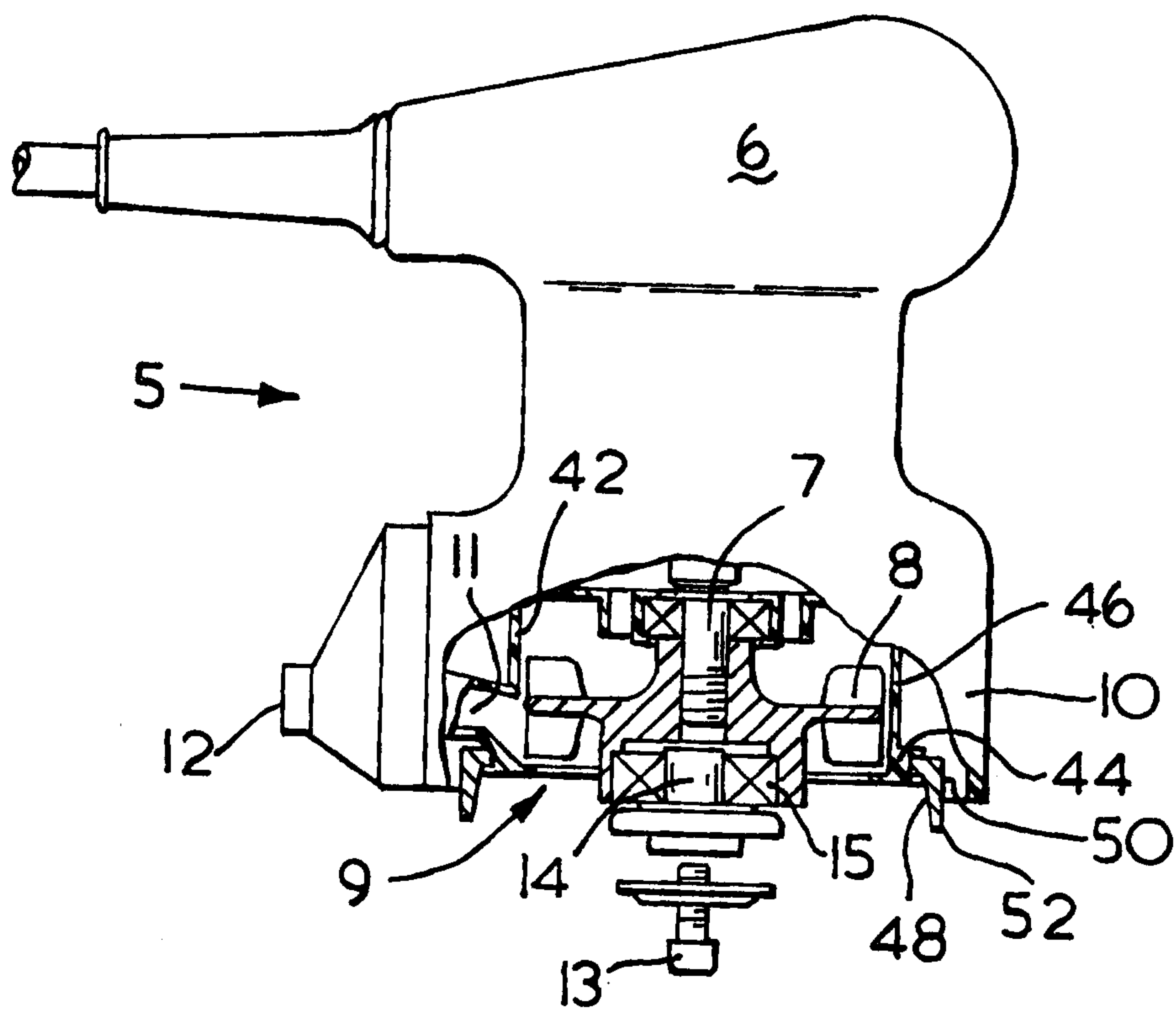


FIG. 4

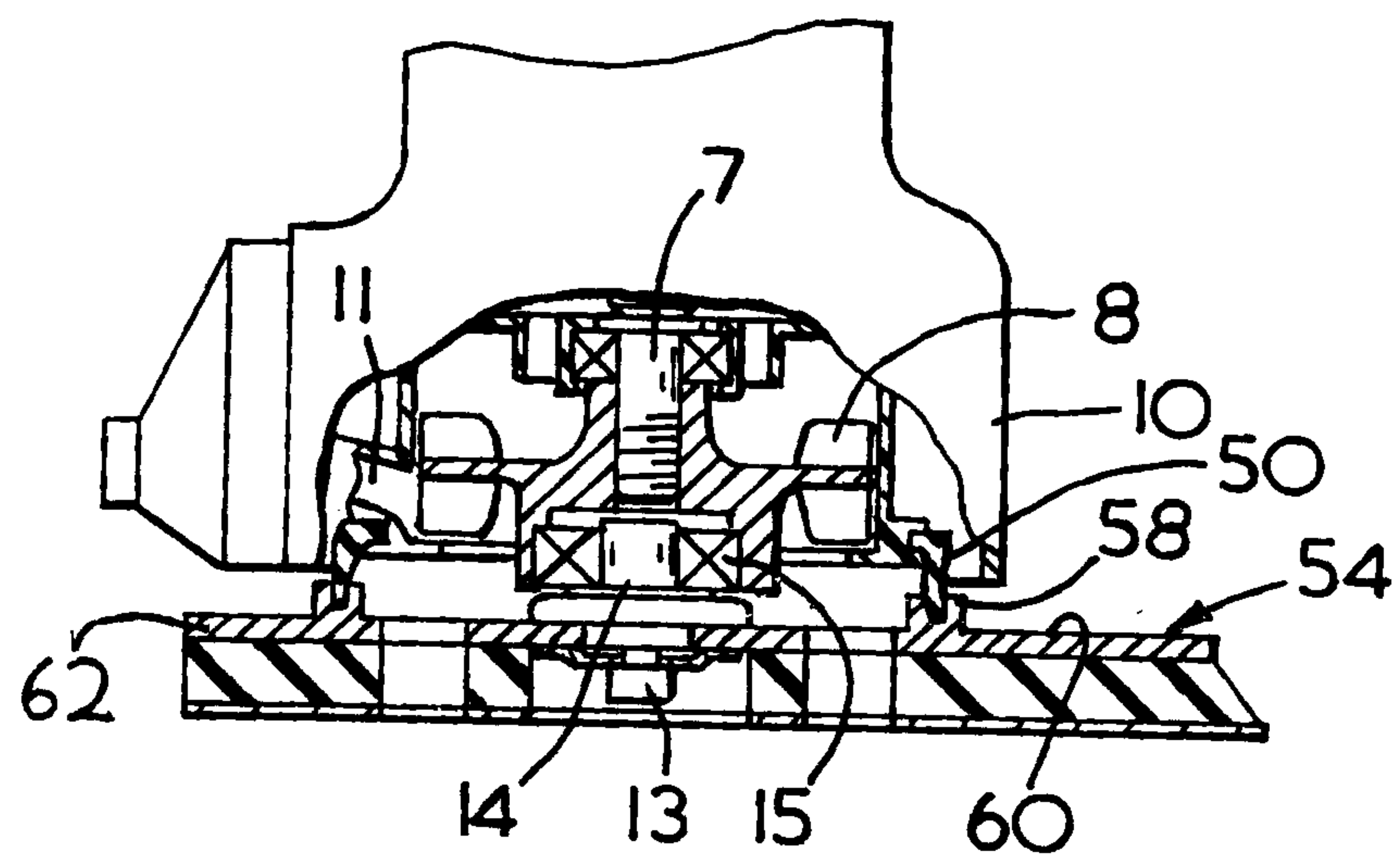


FIG. 5

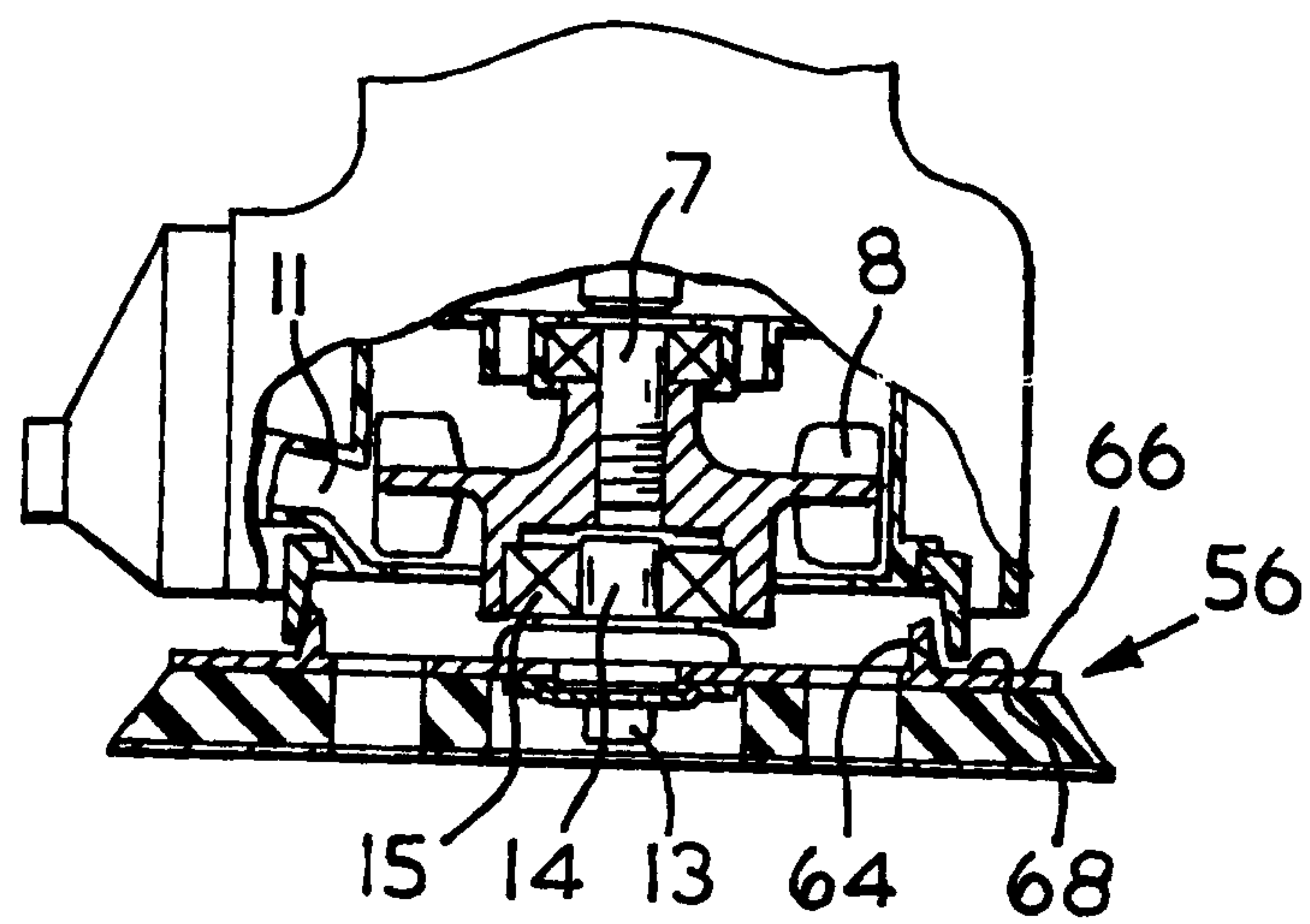


FIG. 6

