

[54] PORTABLE POWER TOOL WITH ORBITAL WORK-ENGAGING MEANS

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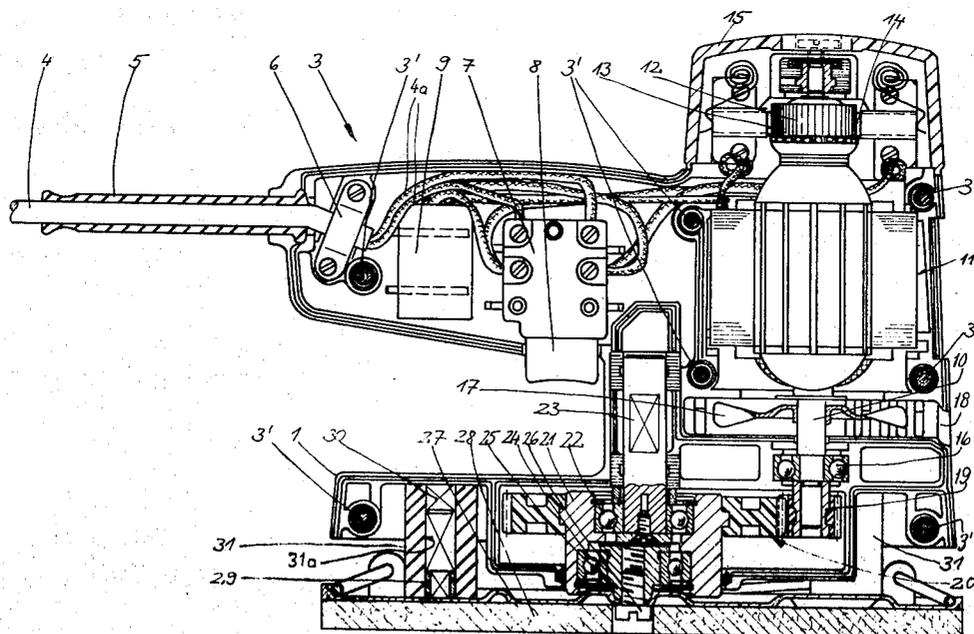
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[57] ABSTRACT

A portable power-operated grinding or polishing machine wherein a plate-like work-engaging tool orbits in its own plane in response to rotation of the output member of a transmission receiving torque from a universal motor in the housing of the machine. The tool is directly connected to the housing by several elastic columns whose end portions are fitted into sockets of or receive projections provided on the tool and on the housing. The tool is connected with an eccentric ring on the output member of the transmission by means of a single fastener so that it can be detached from the housing as soon as the fastener is removed.

8 Claims, 3 Drawing Figures



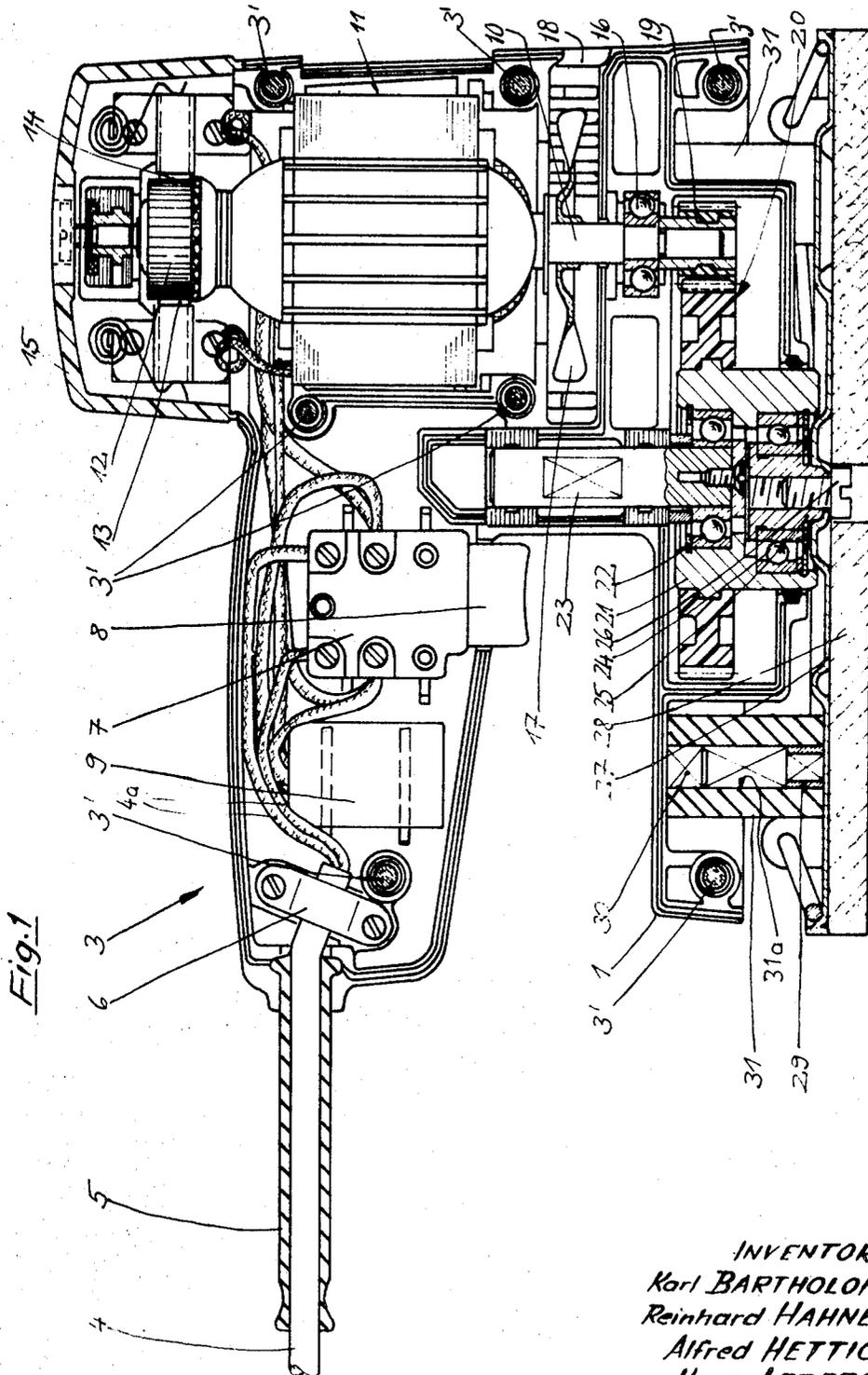


Fig. 1

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Fig. 2

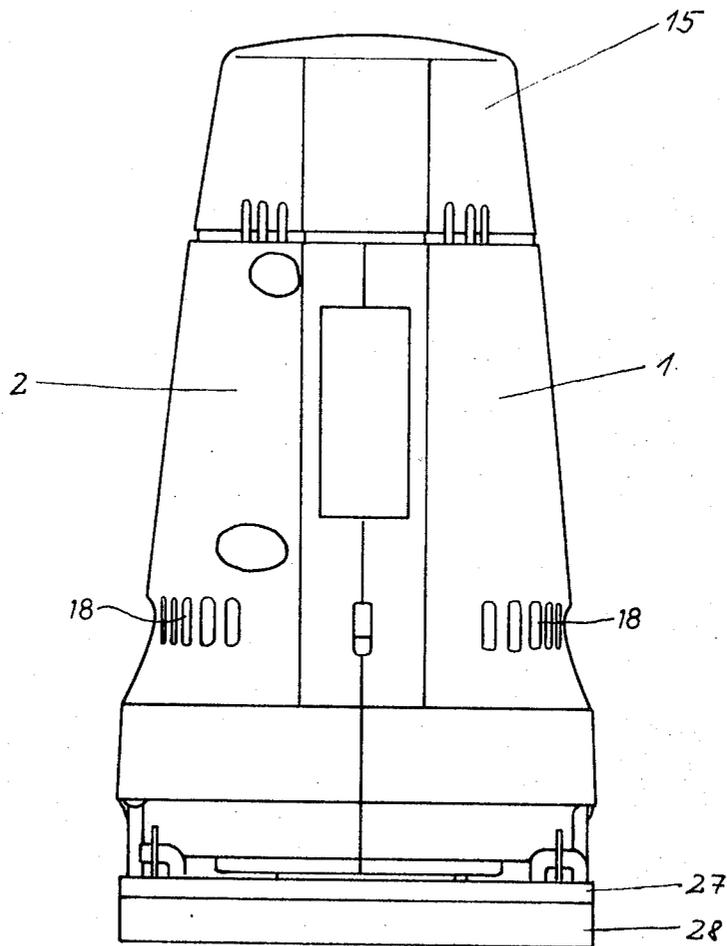
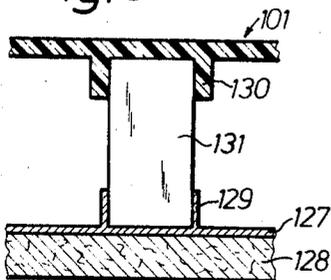


Fig. 3



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PORTABLE POWER TOOL WITH ORBITAL WORK-ENGAGING MEANS

BACKGROUND OF THE INVENTION

The present invention relates to power operated machines in general, and more particularly to improvements in portable power tools. Still more particularly, the invention relates to improvements in portable power operated machines of the type wherein a grinding, sanding, polishing, buffing or like work-engaging member (hereinafter called pad) is caused to oscillate in a predetermined plane with reference to the housing which accommodates the motor.

It is already known to couple a plate-like orbital or swingable sanding or grinding pad to the housing of a portable power-operated grinding machine by elastic coupling members in the form of columns having ends which are vulcanized, glued, welded or otherwise permanently bonded to metallic parts. Such metallic parts can constitute screws, bolts, pins or trunnions and are fixedly secured to the pad as well as to the housing of the machine.

A drawback of the just described coupling members is that the bonding of their ends to metallic parts consumes much time and must be carried out by skilled persons and by resorting to complicated machinery. Furthermore, the metallic parts reduce the effective length of elastic coupling members so that, in order to insure a certain freedom of movement of the pad with reference to the housing, the machine must employ relatively long coupling members with attendant increase in bulk and weight. Also, the useful life of the bonds between elastic coupling members and the metallic parts is relatively short because the bonds are subjected to extremely high stresses when the machine is in operation and are likely to break after relatively short periods of use. This holds true regardless of whether the metallic parts are inserted into or surround the end portions of elastic coupling members.

A further drawback of the just described coupling members is that, in order to detach the pad from the housing of the machine, an operator must disconnect each and every metallic part from the housing or from the pad. The connections between such metallic parts and the housing and pad are normally established by means of screws so that each detachment and each reattachment of the pad takes up a substantial amount of time.

SUMMARY OF THE INVENTION

An object of the invention is to provide a novel and improved connection between the housing of a portable power operated machine, such as a grinding or sanding machine, and a pad which is arranged to orbit with reference to the housing.

Another object of the invention is to provide between the housing of the machine and the pad a connection which can be established or terminated without resorting to any tools and which can stand much longer periods of use than the connections in presently known power operated machines of such character.

A further object of the invention is to provide novel and improved separable connections between elastic coupling members and a plate-like orbital pad on the one hand and the housing of a portable grinding, sanding, polishing or like machine on the other hand.

An additional object of the invention is to provide a portable power operated grinding, sanding, polishing or like machine which can be assembled and taken apart with little loss in time and wherein the elastomeric coupling members between the pad and the housing need not be provided with any bonded metallic parts.

The invention is embodied in a power operated machine, particularly in a portable grinding or polishing machine, which comprises a housing, a motor mounted in the housing, a pad which is movable with reference to the housing, motion transmitting means connecting the motor with the pad so as to impart to the pad an orbital movement with reference to the housing, and a plurality of elongated elastic coupling members each directly connecting the pad with the housing so as to undergo deformation in response to movement of the pad with reference to the housing.

The coupling members are preferably columns consisting of rubber or elastomeric synthetic plastic material and having end portions which are directly but preferably readily separably connected to suitable male or female portions of the housing and pad. The connection between the motion transmitting means and the pad preferably comprises a single fastener so that the pad can be detached in immediate response to removal of such single fastener. This is due to the fact that the coupling members need not be connected to the housing and/or to the pad by screws or the like but are merely slipped onto suitable projections or inserted into suitable sockets provided on the housing and on the pad. Thus, the coupling members can be held in mere frictional engagement with the housing as well as with the pad.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved power operated machine itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a central longitudinal vertical sectional view of a portable power operated sanding, grinding or polishing machine which embodies the invention;

FIG. 2 is a rear end elevational view of the machine as seen from the right-hand side of FIG. 1; and

FIG. 3 is a fragmentary sectional view of a modified machine.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. 1 and 2, there is shown a portable power-operated sanding, grinding or polishing machine (hereinafter called grinding machine) which comprises a housing having two mirror symmetrical sections or shells 1, 2 made of a metallic or synthetic plastic material. The housing further comprises a hollow handle 3 which preferably consists of two sections each forming part of one of the shells 1, 2. The sections 1, 2 of the housing and those portions of the sections 1, 2 which define the handle 3 are separably connected to each other by several screws or bolts 3'. The rear end portion of the handle 3 has an opening for a protecting sheath 5 surrounding an electric cable or cord

4 having at its free end a plug (not shown) which is insertable into a customary wall outlet. The cable 4 is secured to the handle 3 by a clamp 6.

The conductors 4a of the cable are connected with the contacts of an electric switch 7 which is mounted in the handle 3 and has a readily accessible actuating member 8. The connection between a universal electric motor 11 and the switch 7 comprises an anti-interference capacitor 9. The motor 11 is mounted in the main portion of the housing 1, 2 and has a downwardly extending shaft 10. The collector 12 and the carbon brushes 13, 14 of the motor 11 are accessible upon removal of a brush holder cover 15 which separately is secured to the housing.

The lower part of the motor shaft 10 is mounted in an antifriction bearing 16 located below a cooling fan 17 which is secured to the shaft 10 and causes currents of air to circulate in the housing and through ventilating openings 18.

The lower end portion of the motor shaft 10 carries a pinion 19 which forms part of a motion transmitting connection or transmission between the motor 11 and a plate-like work-engaging member or tool 27 which is adjacent to the lower end portion of the housing. The pinion 19 preferably comprises a metallic hub and a ring-shaped portion provided with teeth and consisting of a textile material permeated with a resinous substance. The transmission further comprises a gear 20 which meshes with the pinion 19 on the shaft 10 and has a metallic hub 21 surrounded by a ring provided with teeth and preferably made in the same way as the ring of the pinion 19. The hub 21 is rotatably mounted on an antifriction bearing 22 which surrounds a post 23 fixedly mounted in the housing of the machine.

The hub 21 constitutes a rotary motion transmitting member of the transmission and has an eccentric circular recess located at a level below the antifriction bearing 22 and receiving a further antifriction bearing 24 surrounding an eccentric cylinder 25 which is secured to a plate like pad 27 by a single screw 26 or an analogous fastener so that the axis of the hub 21 is normal to the plane of the pad. The latter carries a work-engaging sheet 28 which consists of leather, felt or other suitable sanding, grinding or polishing material. The pad 27 preferably consists of sheet steel and its upper side is provided with four projections 29 registering with similar projections 30 at the undersides of the housing sections 1, 2. The projections 29 are preferably welded to the upper side of the pad 27 and the projections 30 can constitute integral parts of the respective sections 1, 2.

In accordance with a feature of the invention, the means for connecting the pad 27 with the housing sections 1, 2 comprises four elongated coupling members or columns 31 consisting of rubber or elastomeric synthetic plastic material and having in their end portions recesses which receive the adjacent projections 29 and 30 so that each coupling member 31 is directly connected with the housing as well as with the pad 27 in such a way that the connections can be terminated as soon as the fastener 26 is removed to permit the pad 27 to move away from the housing. In the embodiment of FIGS. 1 and 2, the projections 29, 30 are of other than circular outline, preferably of polygonal and most preferably of rectangular or square cross-sectional outline. The recesses at the ends of the coupling members 31 have a similar cross-sectional outline so that the cou-

pling members 31 cannot rotate with reference to the respective projections 29 and 30 when the pad 27 orbits in its own plane in response to rotation of the hub 21 with reference to the eccentric cylinder 25. The coupling members 31 are preferably provided with cylindrical external surfaces. As shown in FIG. 1, the recesses in the coupling members 31 can form the end portions of through holes 31a. Owing to such configuration of the members 31, they can be obtained by severing at regular intervals a continuously extruded tube of elastomeric material. Since the end portions of the members 31 need not be welded, vulcanized, glued or otherwise bonded to metallic parts, the cost of the members 31 is but a fraction of the cost of connections which are used in presently known sanding, grinding or polishing machines with orbiting plate-like pads. Also, the useful life of the members 31 is longer because they need not be positively secured to the projections 29 and 30 so that they are less likely to undergo excessive stresses in response to oscillation of the pad 27 with reference to the housing. Thus, each member 31 can undergo deformation along its full length which contributes to compactness of the machine because the pad 27 can be placed rather close to the adjacent portion of the housing.

The detachment of the pad 27 from the housing for the purposes of inspection or replacement takes up very little time because the elastic coupling members 31 are not positively connected to the projections 29 and 30. Thus, the pad 27 can be detached upon removal of the fastener 26 and a fresh pad can be attached to the eccentric cylinder 25 with little loss in time. Such convenient removability of the pad 27 enables the user or operator to frequently inspect the condition of coupling members 31 with little loss in time and to rapidly replace a defective coupling member when necessary. Since the projections 29, 30 are of other than circular cross-sectional outline and extend into similarly configured portions of holes 31a in the members 31, the coupling members cannot rotate on the respective projections when the pad 27 is caused to orbit with reference to the housing. This reduces the likelihood of wear upon the coupling members 31.

FIG. 3 illustrates a portion of a modified grinding or sanding machine having elastomeric coupling members or columns 131 (only one shown) which include end portions extending into sockets 129, 130 respectively provided on the plate-like pad 127 and on the housing sections (only the section 101 shown). The sockets 129, 130 have polygonal (preferably square or rectangular) recesses and the end portions of the coupling members 131 have a similar cross-sectional outline so that the coupling members cannot turn when the pad 127 and its sheet 128 are caused to orbit with reference to the housing. If desired, the median portions of the coupling members 131 can be provided with cylindrical peripheral surfaces. The illustrated coupling member 131 can form a section of a continuously extruded elastomeric body which is severed at regular intervals to yield coupling members of desired length.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art and, therefore, such adaptations should and are intended to

be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In a power operated machine, particularly in an orbital sander or the like, a combination comprising, a housing; a motor mounted in said housing; a pad spaced from and movable with reference to said housing; motion transmitting means connecting said motor with said pad so as to impart to said pad an orbital movement; a plurality of elastic columns extending between said housing and said pad; a first plurality of coupling portions, having each an outline other than a circular outline, respectively provided on opposite ends of each of said elastic columns; and a second plurality of coupling portions, having each an outline matching that of a corresponding one of said first coupling portions, on said housing and said pad and respectively engaged with said first coupling portions, one of said plurality of coupling portions being female coupling portions and the other of said plurality of coupling portions being male coupling portions respectively engaged in said female coupling portions.

2. A combination as defined in claim 1, wherein said female coupling portions are sockets provided on said pad and in said housing.

3. A combination as defined in claim 1, wherein said female coupling portions are recessed end portions on

opposite ends of each column and wherein said male coupling portions are projections on said housing and said pad and extending into the recessed end portions of said columns.

4. A combination as defined in claim 1, wherein said motion transmitting means comprises a member rotatably and axially immovably mounted in said housing, and including fastener means removably securing said pad to said member, said first and second coupling portions being merely in frictional engagement with each other to thus facilitate replacement of said columns after removal of said pad.

5. A combination as defined in claim 1, wherein each of said coupling portions has a polygonal outline.

6. A combination as defined in claim 3, wherein said recesses form part of through holes in the respective column.

7. A combination as defined in claim 3, wherein each of said recesses and each of said projections has a polygonal cross-sectional outline.

8. A combination defined in claim 1, wherein said motion transmitting means comprises a rotary member, an eccentric rotatably mounted on said rotary member and fastener means securing said pad to said eccentric so that said pad orbits in a plane which is normal to the axis of said rotary member when the latter is rotated by said motor.

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