United States Patent

Stoll

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[54] PORTABLE GRINDER APPARATUS

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[51] **Int. Cl.** **B24b 23/00**

[58] **Field of Search** ..... 51/170 MT, 170 R, 273, 177, 51/170 T, 170 TL

[56] **References Cited**

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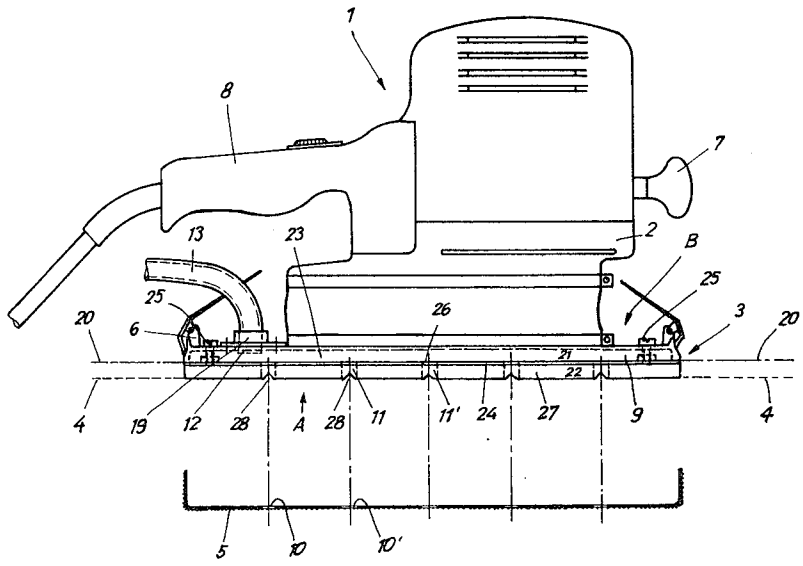
[57] **ABSTRACT**

A portable grinding apparatus has a working plate movably mounted on a casing and oscillatable by a motor carried by the casing. The plate includes a top member having downwardly directed flanges and a bottom member adapted to carry on its lower surface on abrasive material and closing the open bottom of the top member. A pipe for connection to a suction device extends through the top member into the interior of the space between the top and bottom members. The bottom member and the grinding material have aligned holes to allow the flow of air and entained chips through the space to the outlet pipe.

9 Claims, 3 Drawing Figures



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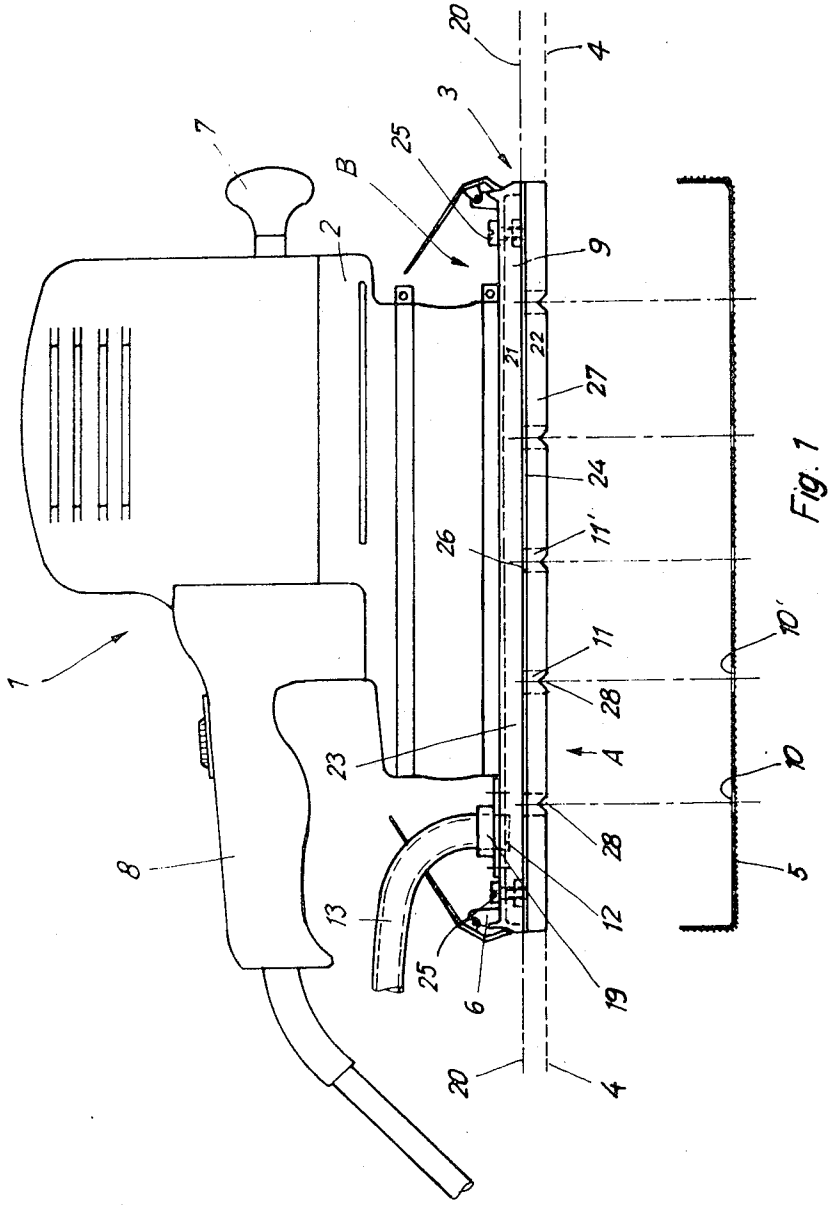

Fig. 1

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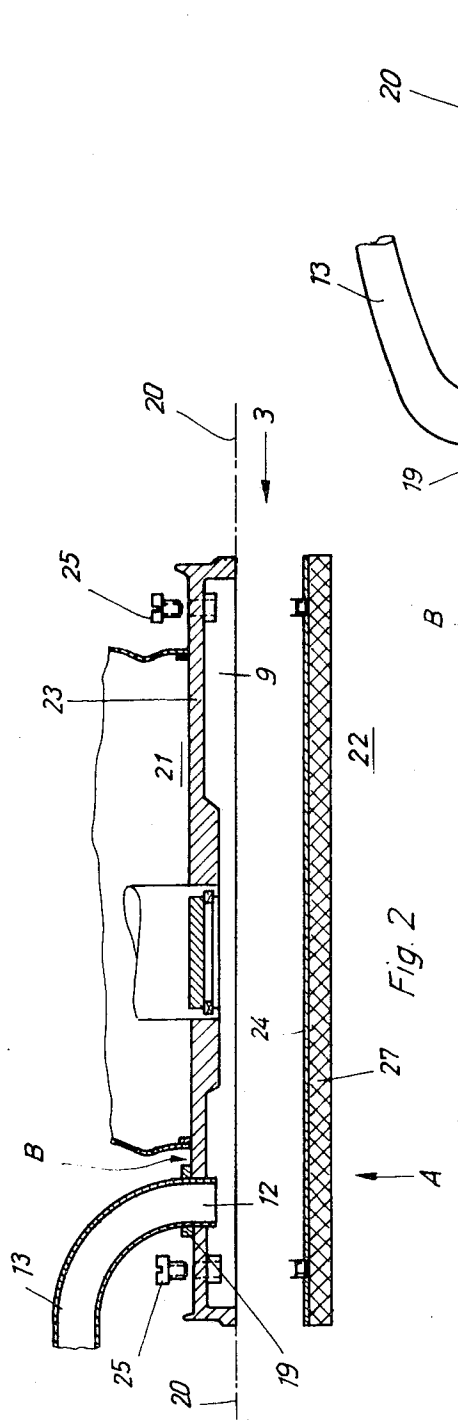

Fig. 2

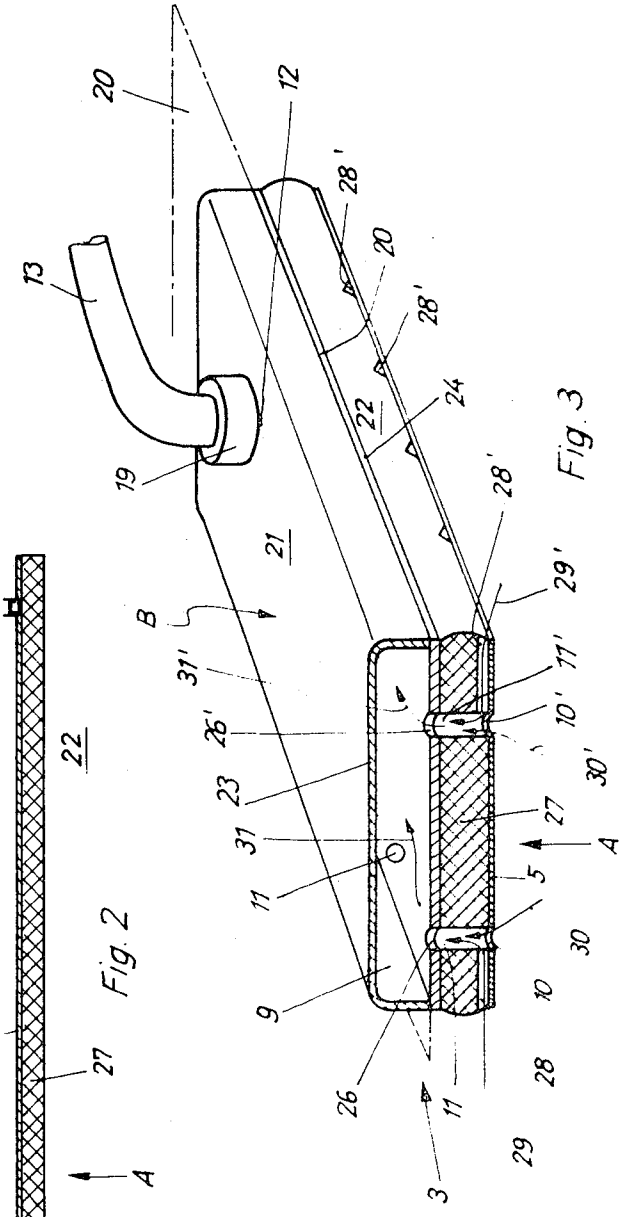

Fig. 3

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BY

PORTABLE GRINDER APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a portable grinding apparatus with a suction arrangement for the removal of chips.

SUMMARY OF THE INVENTION

The present invention relates to a portable grinder apparatus and more particularly to an apparatus in which a housing encases a drive motor which sets into oscillating movement a working plate which is movably suspended on said housing and which carries on its lower surface an easily exchangeable grinding medium, such as abrasive paper or a web of grinding cloth, the said oscillating movement being contained in a single plane, and in which the produced chips are removed by a suction device.

The primary object of the present invention is to provide a grinding apparatus of the kind with only small space requirements and with the aid of which also small angles and corners can be worked wherein the outer edge of abrasive paper is allowed to reach right into angles, corners or the like.

Another object of the invention is to provide a portable grinder apparatus of the type described above in which the working plate comprises a hollow space within itself, the latter being interconnected on the one hand with passage openings projecting downwardly through the bottom of the working plate and also through the abrasive paper and, on the other hand, with a suction opening connecting it with the above mentioned suction device.

Yet another object of the invention is to provide a device of the kind in question in which all components of the suction device are extremely simple and obtainable at low cost.

A still further object of the invention is to provide a device of the character described with which the suction effect is also considerably improved due to the shorter suction paths, which are of importance flat when working even surfaces but still more when working curved surfaces, in which case the suction paths of the device of the invention are even shorter, which again considerably increases the suction power.

Another object of the invention is to provide a device of the above-mentioned character with which the arrangement can be used with portable grinders of any type, wherein the suction device may be part of the portable grinder and driven by the latter's own drive motor, or else a separate, independently driven suction device which is connected to the suction opening of the working plate through an essentially flexible suction line. In the latter case, the suction devices may take any form, from domestic vacuum cleaners to industrial vacuum cleaners, the selection of the device and, thus, the suction power depending on the material to be ground in each individual case.

Other objects and advantages will appear hereinafter and while I show herewith and will describe a preferred form of construction, I desire it to be understood that I do not limit myself to such preferred form but that various changes and adaptations may be made therein without departing from the spirit of my invention as hereinafter claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

Further details and advantages of the invention will become apparent from the following drawings, in which:

FIG. 1 is a side elevation of a portable grinder according to the invention with a detached sheet of abrasive paper;

FIG. 2 is a partial vertical cross section along the longitudinal axis of the grinder shown in FIG. 1 and

FIG. 3 is a diagrammatic representation of and a vertical cross section through part of the grinder shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings, a portable grinder 1 comprises a drive motor enclosed in a housing 2, the said drive motor setting a working plate 3 which is movably suspended on the said housing 2 into an essentially straight-lined or slightly curved oscillating movement within plane 4, in which a grinding agent, such as a sheet of abrasive paper or grinding cloth 5 is located which rests on the lower surface A of the working plate 3 when the device 1 is in operating condition and which is held against the working plate by clamping means 6 which provide for easy exchangeability. A knob 7 is mounted on the housing 2 at the front end of the device 1, while the rear side of the housing carries a rigid shank or handle 8 which serves to hold the device, as is the case also with knob 7.

In the device of the invention, the working plate 3 comprises a cavity 9 opening on the one hand on the bottom surface A of the working plate 3 through passage openings. 11, 11' or bores extending essentially perpendicularly to the plane of the abrasive paper 5 and penetrating through the latter at 10, 10', and being connected on the other hand through a suction opening 12 with a suction device not shown in the drawing. The said suction device may either be part of the grinder 1 and driven by the latter's own drive motor, or else consist of a separate unit which has its own drive and is, therefore, driven independently of the grinder 1 and which is connected to the suction opening 12 of the working plate 3. The connection between the suction device and the grinder may consist, for instance, of a flexible suction line 13. As is apparent from the drawings, the cavity 9 extends essentially over the whole face of the working plate 3. In the essentially square-shaped working plate 3, the passage openings 10, 10', 11, 11', are equally spaced along two lines arranged symmetrically in relation to the longitudinal middle axis of the working plate 3 and in parallel relation to the longitudinal edges of the working plate 3, the suction opening 12 of the cavity 9 in the working plate 3, which is connected to the suction device, extending conveniently through the longitudinal middle plane of the working plate 3 rectangular to the plane 4 of the abrasive paper 5, and being arranged within the rear portion of the working plate 3 beneath the handle 8 mounted on the housing 2 and being contained within the upper surface B turned away from the abrasive paper 5 of the working plate 3. Depending on the space available, the suction opening 12 may be provided either at a right angle to the plane 4 or at an angle different from a right angle in relation to the rear portion of the working plate 3 extending underneath the handle 8. As is apparent in particular from FIGS. 1 and 2, a tubular connection socket 19 is provided on the working plate 3, which forms an extension of the suction opening 12 in the direction towards the upper surface B of the working plate 3 and which serves to connect with the suction line 13.

The working plate 3 is subdivided along a plane 20 essentially parallel to the plane 4 and comprises on the one hand an upper portion 21 which is suspended and mounted on the housing 2 of the grinder 1 and which consists of an essentially box-shaped frame 23 which is open towards the plane of division 20 and which contains on its upper surface the suction opening 12, and comprises, on the other hand, a bottom portion 22 which is detachably connected to the upper portion 21 along the plane of division 20 and which comprises a flat plate 24 consisting, for instance, of metal such as steel or aluminum which rests on the frame edges 23 facing the plane of division 20, the said plate bearing against the frame along the frame edges, whereby the cavity 9 comprised between the frame 23 and the plate 24, is sealed, the said plate being further detachably connected, for instance, by means of screws 25 inserted from the upper frame surface B. The plate 24 comprised in the bottom portion 22 is provided with passage bores 26, 26' which also extend through the abrasive paper 5 at 10, 10' (FIG. 3) and which interconnect the cavity 9 existing between the frame 23 and the plate 24 with the bottom surface A of the working plate 3 and, thus, with the area in which chips are encountered during the grinding of workpieces. The plate 24 forming the bottom portion 22 has on its surface opposite the cavity 9 a rigidly connected, for instance, glued-on plate 27 of resilient material, such as rubber or plastic, which

carries on its surface opposite the cavity **9** a web of abrasive paper **5** (FIG. 3) which is made easily exchangeable by means of the clamping members **6** provided on the frame **23**, the stiff, for instance, metallic plate **24**, the resilient plate **27** and the abrasive paper **5** being provided with flush passage bores **26, 26', 11, 11'** and **10, 10'**, which interconnect the cavity **9** existing between the upper portion **21** and the bottom portion **22** with the bottom surface A of the abrasive paper **5** carrying the abrasive grain and which thereby serve to open the cavity **9** to the exterior on the side of the surface A.

At least part of the flush passage bores **10, 11, 26** which are provided essentially perpendicularly relative to the plane **4** of the abrasive paper, is provided with shunt openings **28, 28'** extending from one side (edges **15, 16**) of the bottom portion **22** into the passage bore **10, 11, 26**, which shunt openings serve to direct air drawn off the zones adjacent the sides of the working plate **3** (arrows **29, 29'** in FIG. 3) into the associated passage bores. As is, furthermore, apparent from FIG. **3**, air containing grinding chips is drawn off from the bottom surface A through the passage bores **10, 11, 26** or **10', 11', 26'** (arrows **30, 30'**). The two indrafts **29, 30** or **29', 30'** mix within the passage bore and proceed in accordance with the suction effect in the direction of the arrows **31, 31'** towards the suction opening **12**. In the embodiment shown in the drawings, each passage opening **10, 11, 26** or **10', 11', 26'** is provided with such a shunt opening **28, 28'**. As is apparent from FIG. **3**, the shunt opening **28, 28'** are provided between the resilient plate **27** and the abrasive paper on that surface of the said resilient plate which faces the abrasive paper **5**. The said shunt openings take thereby essentially the form of a groove which extends essentially within the plane **4** formed by the abrasive paper **5** and whose sides diverge towards the abrasive paper. The said shunt openings **28, 28'** serve the purpose to draw off any chips that may be encountered at the sides of the working plate **3** and, at the same time, to prevent any excessive adhesion between the abrasive paper **5** and the workpiece surfaces caused by the vacuum existing in the passage bores **10, 11, 26** or **10', 11', 26'**.

Having thus fully described my invention, what I claim as new and wish to secure by Letters Patent is:

1. A portable grinding apparatus comprising, in combination, a casing, a driving motor within said casing having a drive shaft, a working plate movably mounted and supported on said casing so as to be movable within a single plane, s driving connection between said drive shaft of said driving motor and said working plate, said driving motor causing said working plate to perform an oscillating movement within a plane rectangular to the axis of said drive shaft, a grinding element, said grinding element being mounted on the underside of said working plate turned away from said driving motor, said grinding element being releasably attached to said working plate, a suction device for sucking up the chips produced during grinding operation, means connecting said suction device with at least a portion of the space adjacent the said working plate, wall means cooperating with said working plate and forming therewith a hollow space, through bores in said working plate, said through bores extending from said hollow space to the underside of said working plate turned away from said drive motor, thereby enabling said hollow space to communicate with the outer atmosphere and the space adjacent the underside of said working plate, a suction opening in said wall means, said suction opening serving to connect said hollow space with a suction device.

2. The portable grinder apparatus set forth in claim **1** in which the said grinding element is a flexible abrasive material and in which the said through bores project downwardly through the bottom surface of the said working plate and through the flexible abrasive material.

3. The portable grinder apparatus set forth in claim **2**, wherein the said suction device forms part of the said grinder apparatus and is driven by the latter's drive motor.

4. The portable grinder apparatus set forth in claim **2**, wherein the said suction device is a separate, independently driven device, said apparatus including, connected to the said suction opening, a flexible suction line.

5. The portable grinder apparatus set forth in claim **1**, wherein the working plate is substantially rectangular and the through bores extend at right angles in relation to the plane of the abrasive element and are equally spaced along at least two lines arranged symmetrically in relation to the longitudinal middle axis of the said working plate and in parallel relation to the longitudinal edges of the said working plate.

6. The portable grinder apparatus set forth in claim **1**, wherein the suction opening is located within the rear portion of the working plate and on the upper surface opposite the grinding elements and extends through the longitudinal middle plane of the working plate which forms a right angle with the plane of the grinding element, the longitudinal middle plane forming the plane of symmetry of the suction opening.

7. The portable grinder apparatus set forth in claim **1**, wherein the said working plate is divided along a plane extending essentially in parallel to the plane of the grinding element, and wherein said working plate comprises on the one hand an upper portion suspended on the housing of the grinder apparatus, and, on the other hand, a bottom portion which is detachably connected with the upper portion along the plane of division, the upper portion comprising an essentially box-shaped frame which is open towards the plane of division facing the plane of division, with the suction openings extending upwardly through such frame, while the bottom portion comprises a flat plate which rests on the free edges of the frame which face the plane of division and whose rectangular dimensions correspond essentially to the rectangular dimensions of the frame and which is in contact with the edges of the frame, thus closing the cavity existing between the frame and the plate, and which is detachably connected with such edges and which is formed of a material which resists bending and torsion.

8. The portable grinder apparatus set forth in claim **7**, wherein the plate forming the bottom portion comprises, on its surface opposite the cavity, a rigidly mounted plate of resilient material, which carries on its surface opposite the cavity the grinding element which comprises a web of abrasive paper, clamping members mounted on the frame releasably engaging said web, and in that the flat plate as well as the resilient plate and the abrasive paper are provided with aligned passage bores, which connect the cavity existing between the upper portion and the bottom portion with the bottom surface of the abrasive paper.

9. The portable grinder set forth in claim **8**, wherein at least part of the passage bores which extend essentially vertically in relation to the plane formed by the abrasive paper are provided with a shunt opening extending from one side of the bottom portion into the passage bore and serving to direct air drawn off from the zones adjacent the sides of the working plate into the associated passage bore.

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