Jan. 21, 1941. W. W. NASH 2,229,598

PORTABLE POWER DRIVEN GRINDING TOOL

Filed Jan. 2, 1940 2 Sheets-Sheet 1

Fig. 1

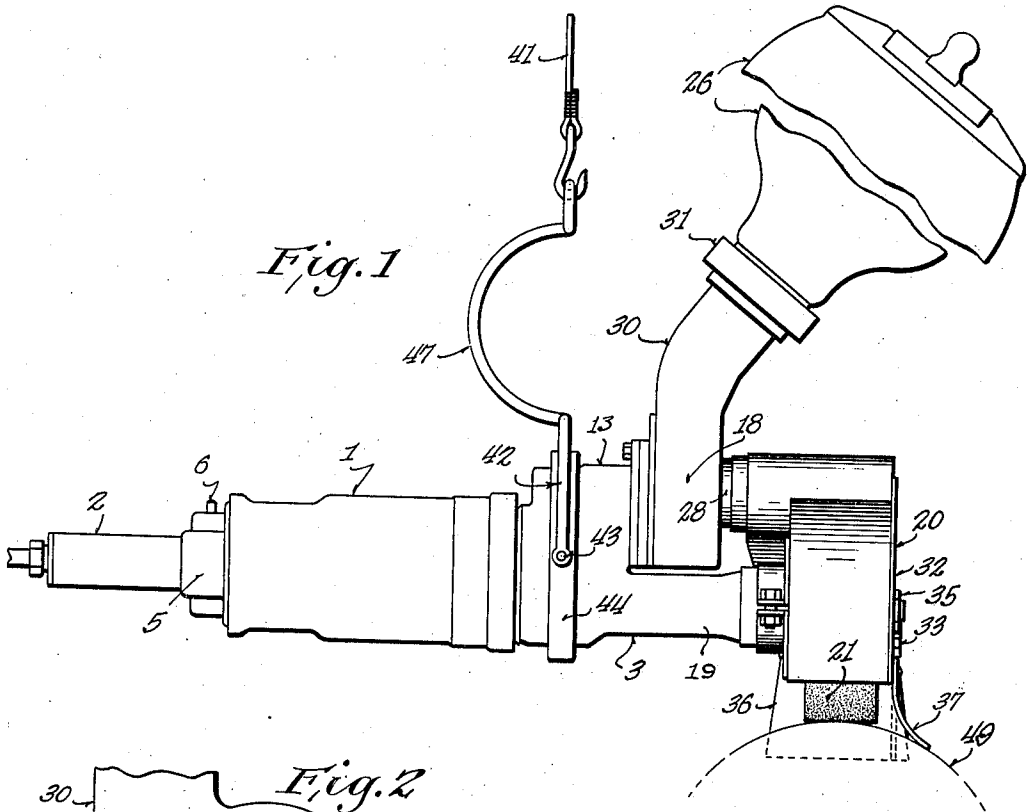


Fig. 2

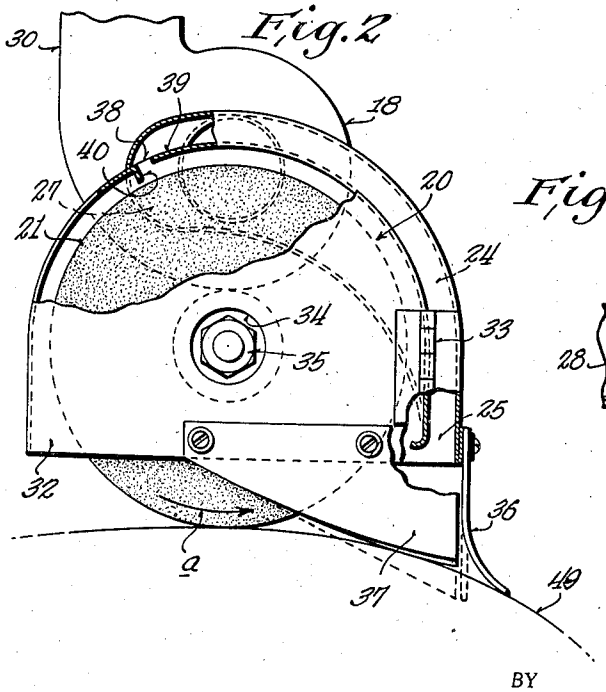
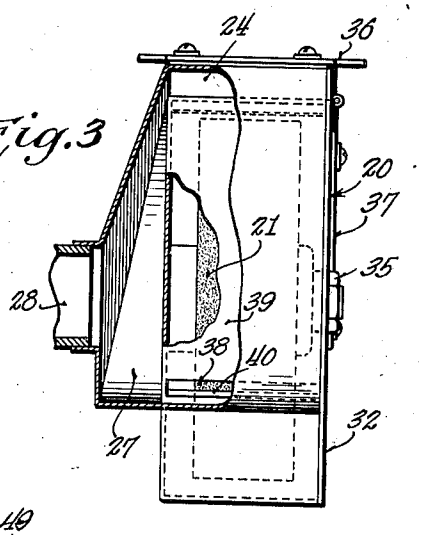


Fig. 3



INVENTOR.
WILLIAM W. NASH

BY

ATTORNEY.

Jan. 21, 1941. W. W. NASH 2,229,598

PORTABLE POWER DRIVEN GRINDING TOOL

Filed Jan. 2, 1940 2 Sheets-Sheet 2

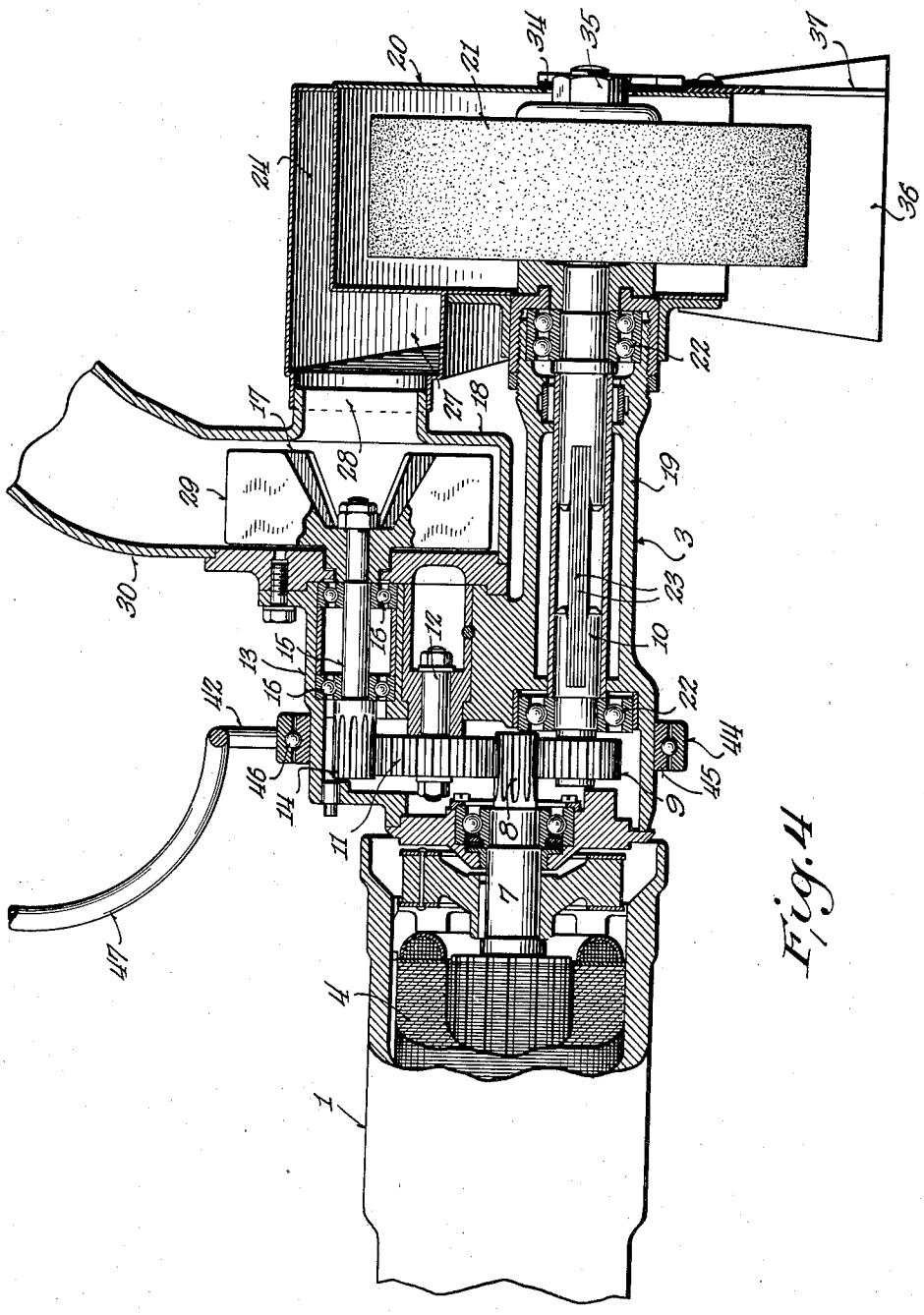


Fig. 4

INVENTOR.
WILLIAM W. NASH

BY

ATTORNEY.

Patented Jan. 21, 1941 2,229,598

UNITED STATES PATENT OFFICE

2,229,598

PORTABLE POWER DRIVEN GRINDING TOOL

William W. Nash, Aurora, Ill., assignor to Independent Pneumatic Tool Co., Chicago, Ill., a corporation of Delaware

Application January 2, 1940, Serial No. 312,039

8 Claims. (Cl. 51—99)

This invention relates to portable power driven grinding and like tools.

The main purpose and object of my invention is to provide such tools with suction producing means for removing and collecting the abrasive dust generated in the use of the tools so that each tool will be equipped with its own dust remover and collector as a complete and integral part thereof.

A further object of my invention is to drive the suction producing means by the same motor with which the tool is provided to drive the grinding wheel and thus simplify and compact the tool structure for ease in handling and manipulation.

In furtherance of the foregoing object, a shaft is provided in the tool structure for driving the suction producing means and said shaft is driven by the tool spindle on which the grinding wheel is mounted for direct drive, the spindle and the shaft being preferably arranged in substantially parallel relation to locate the suction fan and the grinding wheel at the front end of the tool.

The invention consists further in the features hereinafter described and claimed.

In the accompanying drawings—

Fig. 1 is a side elevational view of a portable power driven grinding tool provided with an abrasive dust remover and collector in accordance with my invention;

Fig. 2 is a front view of the tool with parts broken away and in section, respectively, to show some of the details of the construction at the hood end of the tool;

Fig. 3 is a top plan view of the assembly shown in Fig. 2, parts being broken away and in section, respectively, for illustrative purposes; and

Fig. 4 is a longitudinal sectional view of the tool on a larger scale to show the driving connection from tool spindle to the fan shaft.

As shown in the drawings, the tool has a body section composed of a motor section 1 and handle and gear case sections 2, 3 secured together in end to end relation with the handle section at the rear end of the tool and the gear case section at the front end of the tool. The motor case 1 contains an electric motor 4, as shown in Fig. 4, while the handle 2 extends rearwardly from a switch casing 5 at the rear end of the motor case 1 and containing a switch mechanism for turning on and off the electric current to the tool motor in the use of the tool. The switch device has an actuator 6 accessible from the tool handle as shown in Fig. 1.

The armature shaft 7 of the motor extends into the gear case section 3 and is there provided with gear teeth 8 which are in constant mesh with a gear pinion 9 fixed on the tool spindle 10 and an idler gear 11 mounted on a countershaft 12 supported in an upwardly extending portion 13 of the gear case section 3 as shown in Fig. 4. The idler gear 11 meshes with a gear pinion 14 on a fan shaft 15 journaled in said extension 13 in ball bearings 16, 16 as shown. The shaft 15 mounts a suction fan 17 on its forward end, said fan being directly driven by said shaft and located within a fan housing 18 secured by screws or the like to the forward side of the extension 13 as disclosed herein.

The gear case 3 has a lower portion 19 extending forwardly of the upper portion 13 to the front end of the tool and there supporting a hood 20 over a grinding wheel 21 mounted for direct drive on the front end of the spindle 10 in the hood as shown. The spindle 10 is journaled in said extension 19 on ball bearings 22, 22, one in the extension and the other in the gear case section next to the pinion 9. The spindle 10 is located within a sleeve in the extension 19 and includes torque responsive blades 23 as in the prior patent to F. P. Forss, No. 2,112,695, granted March 29, 1938.

The hood 20 encloses the greater portion of the grinding wheel 21 and is open on its underside so that the grinding wheel may extend below the hood for contact with work in the use of the tool.

The hood 20 is provided with a suction passage 24 having an intake opening 25 at its lower end at the lower edge of the hood on the side thereof towards which the grinding wheel rotates as indicated by the arrow *a* in Fig. 2. This locates the opening 25 in the direction in which the material loosened by the grinding wheel 21 is projected tangentially therefrom during a grinding action. Hence, the intake opening 25 crosses the path of the abrasive dust so that the suction effort of the fan 17 will draw the dust into the passage 24 for removal to a collection receptacle 26 with which the tool is equipped on the discharge side of the fan. The receptacle 26 is carried by the tool and is preferably in the form of a bag of a non-inflammable material as will presently appear.

The passage 24 widens axially of the tool as it reaches the top of the hood 20 and there provides an enlarged chamber 27 extending beyond the rear side of the hood for connection with an intake opening 28 in the front wall of the fan housing 18 as shown. The opening 28 is in line

with the axis of the fan, the latter being of the center intake centrifugal suction type having blades 29 which discharge peripherally into an outlet conduit 30 connected to the fan housing and extending upwardly therefrom. The upper end of this conduit mounts the bag 26, a coupling 31 serving as a releasable connection between them. This enables the bag to be removed for emptying and cleaning.

Inasmuch as particles taken into the suction passage 24 are likely to be aglow from the heat of friction from the abrading action, the bag 26 is preferably made of woven glass fibers to prevent injury by the heated particles. The bag is flexible and is sufficiently porous to be distended by the air stream discharged into the same by the fan and hence assumes a more or less upright position while the tool is in operation. The bag may be equipped with a bracing structure to hold it from collapsing when the tool is not in use.

The front wall 32 of the hood may be hinged to the hood body as at 33 as shown in Fig. 2. This enables the hood to be readily opened when it is desired to change or replace the grinding wheel 21. The wall 32 is provided with an opening 34 to pass a nut 35 which clamps the wheel on the front end of the spindle 10.

The hood 20 is equipped with flexible deflectors 36, 37 along and at the outer end of the intake opening 25, respectively, to prevent the abrasive dust escaping from the suction effort of the fan 17. The deflector 36 parallels the opening 25, while the deflector 37 is transverse thereto on the front side of the hood. Both deflectors may be made of resilient rubber material and extending below the lower edge of the hood contact with the work when the grinding wheel is pressed against the same. This is depicted in Fig. 2, the deflectors being shown engaging the work and serving to keep the dust particles within the suction effort of the fan. The deflectors may be secured to the hood as shown.

As illustrated in Fig. 2, the hood has a slot 38 in its top wall 39 at the rear end of the suction passage 24. This slot has a downwardly extending flange 40 to deflect into the suction passage any particles which may be carried around with the wheel beyond the influence of the intake opening 25.

Having the suction means driven by the same motor which drives the grinding wheel as herein disclosed, eliminates the need for a separate motor to drive the suction fan. This simplifies the tool structure and moreover makes for compactness which promotes portability and ease in manipulation. Grinding tools of the character depicted are usually equipped with high frequency motors. This gives the tool increased speed and power. In practice these motors operate on a continuous load at about 2 H. P. On momentary loads they operate at about 4 H. P. Taking the drive for the suction fan from the tool motor provides ample power for operating both the fan and the grinding wheel as the fan requires less than ½ H. P. to drive it. Hence, with my novel driving arrangement the tool motor may effectively drive both the fan and the grinding wheel without diminishing the power factor for the grinding wheel.

While the tool referred to herein is portable and may be so used, yet in practice along production lines as in automotive fender grinding and body work, the tool is usually suspended from an overhead support by a spring biased counter-balancing device. Part of this equipment is shown in Fig. 1 wherein the cable 41 has a yoke 42 for attaching the cable to the tool for suspending it above the place of use. The arms of the yoke straddle the tool case from above and have trunnion connections 43 at their lower ends with the outer ring 44 of a swivel fixture which encircles the tool case and is fixed thereto at a balancing point between its ends. The inner ring 45 of this fixture is fixed to the tool case and the bearing balls 46 of the fixture are between the rings as shown. The pivots 43 and the bearing balls 46 provide a universal mounting for the tool, that is, the pivots allow for tilting of the tool vertically, while the balls allow for a bodily rotation about the tool axis. This gives the tool while suspended the flexibility necessary for the grinding wheel to reach all portions of the work.

The yoke 42 is provided above the tool case with a curved section 47 which extends towards the rear end of the tool to provide a space for the outlet conduit 30 when the tool is swung about its pivots 43 towards the yoke. In Fig. 2, the work indicated at 48 represents a motor vehicle fender, the outer surface of which is smoothed by grinding to take a coating of paint.

The gearing which drives the fan shaft 15 is geared up for speed and in the embodiment shown herein produces a vacuum of between 4 and 5 inches at the suction intake 25. It will be noted that the intake 25 is within the width of the hood 20, while the passage 24 widens out from this width. This increases the velocity of the air as it is drawn into the intake 25 by the fan to create the suction effort required for removing the abrasive dust. The deflectors 36, 37 also house the loosened particles and keep them from escaping into the surrounding atmosphere. With my invention, each tool is equipped with its own abrasive dust remover and collector, and thus the operator and the other workmen in the region of the grinding operation are protected from breathing in the fine particles of this abrasive dust. In the drawings, the hood 20 is shown as having a split collar on its rear side for clamping the hood to the extension 19.

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. In a portable power driven grinding tool having a body section, a spindle and a fan shaft journaled in said body section in substantially parallel relation, a motor connected to the body section and having a power shaft extending into the body section between the fan shaft and the spindle, means operatively connecting said power shaft to the spindle and the fan shaft for driving the same, a grinding wheel mounted for direct drive on the spindle, a hood carried by the body section for the grinding wheel and providing a chamber to partially house the same, means providing a suction passage at the hood independently of and opening into said chamber adjacent to the grinding wheel at the lower edge of the hood for removing the abrasive dust produced by the grinding wheel in the operation thereof, a suction fan in said passage and driven by said fan shaft, and a dust collecting receptacle connected to said passage on the discharge side of the fan.

2. In a portable power driven grinding tool

having a body section, a spindle and a fan shaft journaled in said body section in substantially parallel relation, a motor secured to the body section and having a power shaft extending into the body section between the spindle and the fan shaft, said power shaft having gear teeth at its end within the body section, gear pinions fixed to the ends of the spindle and the fan shaft adjacent to the power shaft, one of said gear pinions being in mesh with the teeth on the power shaft for direct rotation thereby, gear wheel means journaled in the body section and in mesh with the other gear pinion and the teeth on the power shaft to be driven thereby, a grinding wheel mounted for direct drive on the front end of the spindle, a hood carried by the body section for said grinding wheel and providing a chamber to partially house the same, means providing a suction passage at the hood independently of and opening into said chamber adjacent to the grinding wheel at the lower edge of the hood for removing the abrasive dust produced by the grinding wheel in the operation thereof, a suction fan in said passage and driven by the fan shaft, and a dust collecting receptacle connected to said passage on the discharge side of the fan.

3. In a portable power driven grinding tool having a body section provided with upper and lower portions, the lower portion extending beyond the front end of the upper portion and providing therebetween a recess on the outer side of the tool, a spindle and a fan shaft journaled in said lower and upper portions, respectively, in substantially parallel relation, a motor secured to the rear end of the body section and having a power shaft extending into the body section between the spindle and the fan shaft, means operatively connecting the power shaft to the spindle and the fan shaft for driving the same, a grinding wheel mounted for direct drive on the front end of the spindle, a hood carried by the lower portion of the body section for the grinding wheel and providing a chamber to house the same within the hood, said chamber being open on its under side for the grinding wheel to extend partially below the hood, a fan housing carried by the body section in said recess and containing a suction fan driven by the fan shaft, said housing having an inlet opening on the intake side of the fan and a discharge opening on the discharge side of the fan, means providing a suction passage at the hood independently of said chamber for removing the abrasive dust produced by the grinding wheel in the operation thereof, said passage having a suction intake opening into said chamber at the lower edge of the hood adjacent to the grinding wheel and an outlet at the recess and connected with the intake of the fan housing, and a dust collecting receptacle connected to the discharge opening of said housing.

4. In a portable power driven grinding tool having a body section, a spindle and a fan shaft journaled in said body section in substantially parallel relation, a motor connected to the rear end of the body section and having a power shaft extending into the body section between the fan shaft and the spindle, means operatively connecting the power shaft to the spindle and the fan shaft for driving the same, a grinding wheel mounted for direct drive on the front end of the spindle, a hood carried by the body section for the grinding wheel and providing a chamber to house the same within the hood, said chamber being open on its under side for the grinding wheel to extend partially below the hood, a suction passage carried by the hood independently of said chamber and having a suction intake opening into said chamber at the lower end of the hood adjacent to the grinding wheel for removing the abrasive dust produced by the grinding wheel in the operation thereof, a suction fan in said passage and driven by said fan shaft, a dust collecting receptacle carried by the tool and connected to said passage on the discharge side of the fan, and flexible dust deflectors carried by the hood and extending below the hood at said suction intake.

5. In a portable power driven grinding tool having a body section, a spindle and a fan shaft journaled in said body section in substantially parallel relation, a motor secured to the body section and having a power shaft extending into the same, means operatively connecting the power shaft to the spindle and the fan shaft for driving the same, a grinding wheel mounted for direct drive on the spindle, a hood carried by the body section for said grinding wheel and providing a chamber to partially house the same within the hood, said chamber being open on its under side for the grinding wheel to extend below the hood, a suction passage carried by the hood independently of said chamber and having a suction intake opening into said chamber at the lower edge of the hood adjacent to said grinding wheel for removing the abrasive dust produced by the grinding wheel in the operation thereof, a fan in said passage and driven by said fan shaft, said passage increasing in width from its inlet to its outlet end at the intake side of the fan, and a dust collecting receptacle carried by the tool and connected to said passage on the discharge side of the fan.

6. In a portable power driven grinding tool having a body section, a spindle and a fan shaft journaled in said body section in substantially parallel relation, a motor connected to the body section and having a power shaft extending into the body section between the fan shaft and the spindle, means operatively connecting the power shaft to the spindle and the fan shaft for driving the same, a grinding wheel mounted for direct drive on the spindle, a hood carried by the body section over the grinding wheel, a suction passage carried by the hood on the outer side thereof and having an intake opening at its lower end adjacent to the grinding wheel for removing the abrasive dust produced by the grinding wheel in the operation thereof, a suction fan in said passage and driven by said fan shaft, said hood having a slot therein at the end of the passage adjacent to the fan, a flange at said slot in the space between the hood and the grinding wheel for deflecting dust carried around with the grinding wheel into the suction passage for removal by the fan, and a dust collecting receptacle connected to the passage on the discharge side of the fan.

7. In a portable power driven grinding tool having motor, gear case, and handle sections connected together in end to end relation with the motor section intermediate the gear case and the handle sections, a spindle and a fan shaft journaled in the gear case section in substantially parallel relation, an electric motor within said motor section and having an armature shaft extending into the gear case section between the spindle and the fan shaft, gearing in the gear case section operatively connecting the arma-

ture shaft to the spindle and the fan shaft for driving the same, a grinding wheel and a suction fan mounted for direct drive on the spindle and the fan shaft, respectively, adjacent to the front end of the tool, a housing secured to the gear case section for the fan, a hood carried by the gear case section for the grinding wheel and providing a chamber to partially house the same, a suction passage at the hood independently of said chamber for removing the abrasive dust produced by the grinding wheel in the operation thereof, said passage having an intake opening into said chamber adjacent to the grinding wheel at the lower edge of the hood and an outlet opening connected to the fan housing on the inlet side of the fan, and a dust collecting receptacle carried by the tool and connected to the fan housing on the discharge side of the fan.

8. In a portable power driven grinding tool having a body section, a spindle and a fan shaft journalled in said body section, a motor secured to said body section and having an operative connection with the spindle and the fan shaft for driving the same, a grinding wheel mounted for direct drive on the spindle exteriorly of the body section, a hood carried by the body section for the grinding wheel and providing a chamber to partially house the same with the grinding wheel extending out of the hood at the lower edge thereof, said hood being provided with a suction passage independently of said chamber and following along the same at the periphery of the wheel from the lower edge of the hood to the upper portion thereof above the grinding wheel, said passage having its outlet opening adjacent the upper end of the hood, a suction fan connected to said outlet opening and driven by the fan shaft, and a dust collecting receptacle connected to said passage on the discharge side of the fan.

WILLIAM W. NASH.