Jan. 11, 1944. W. M. EMERY 2,338,807

PORTABLE POWER DRIVEN TOOL

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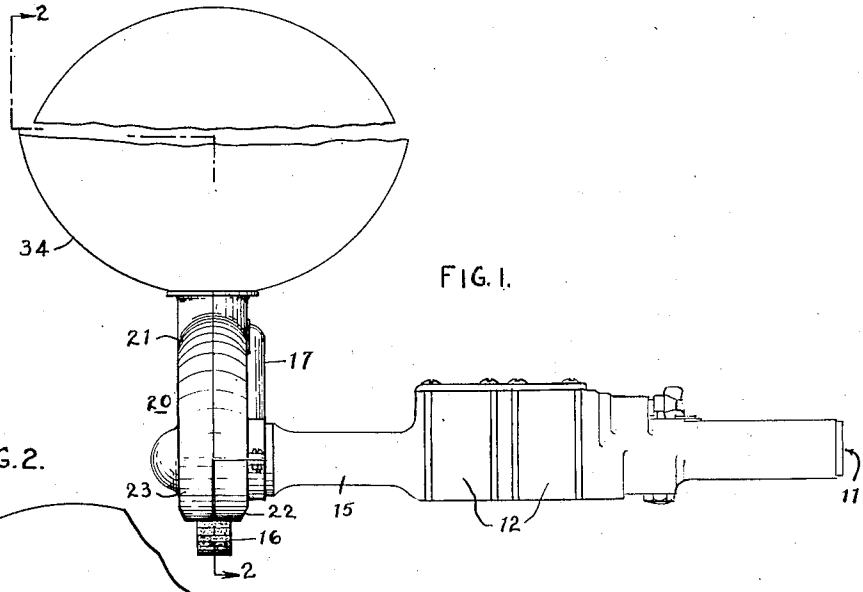



FIG. 1.

FIG. 2.

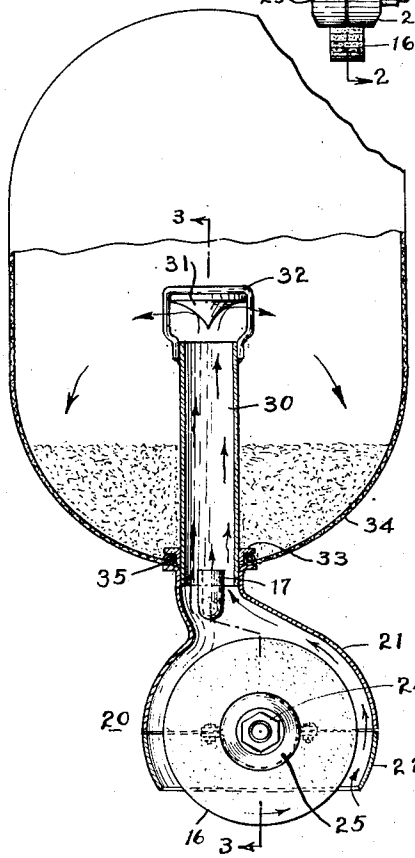
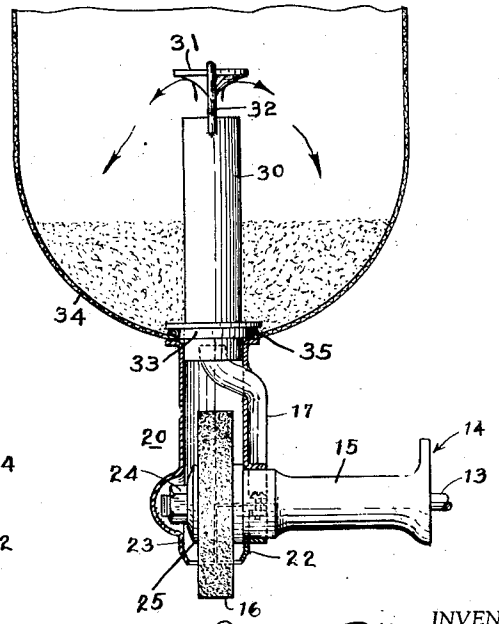



FIG. 3.




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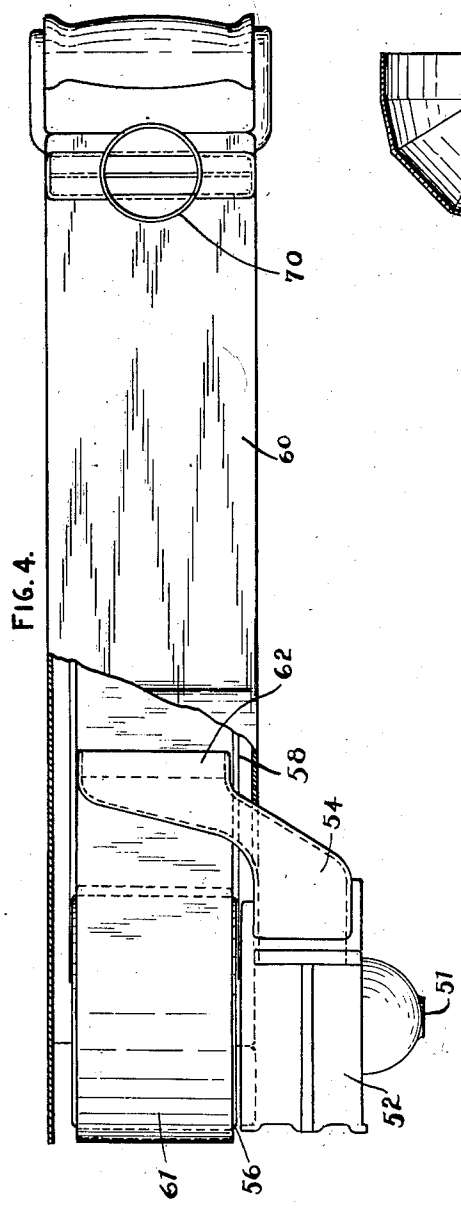



FIG. 4.

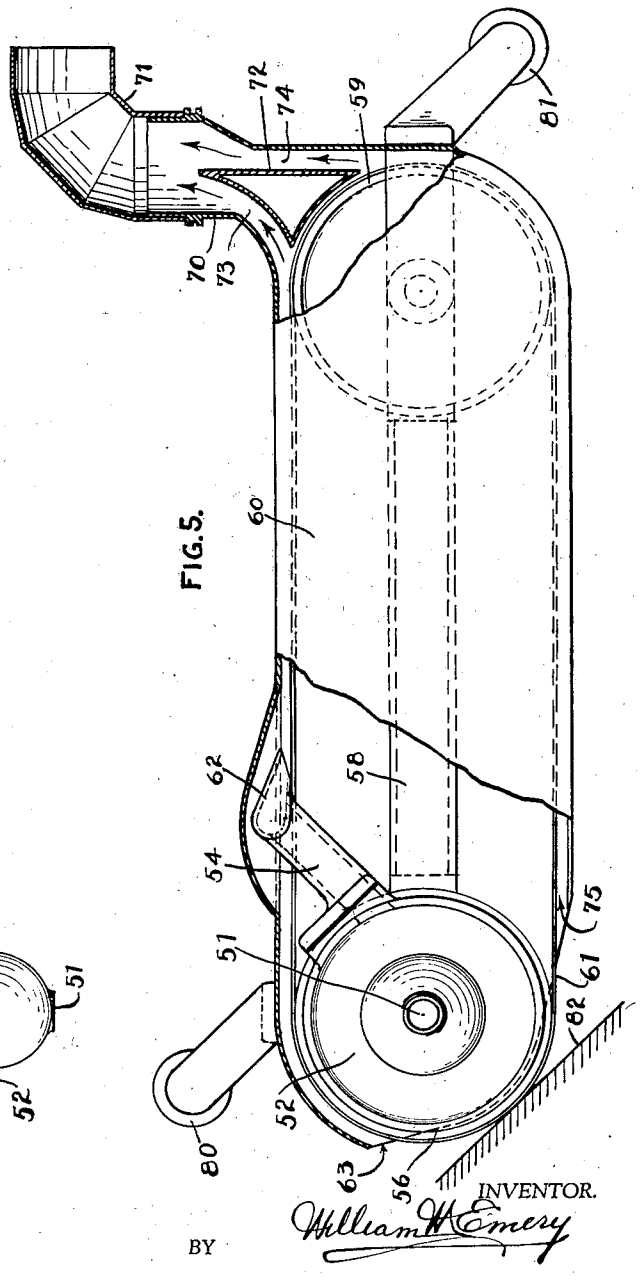



FIG. 5.

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# UNITED STATES PATENT OFFICE

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## PORTABLE POWER DRIVEN TOOL

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Application November 30, 1942, Serial No. 467,304

3 Claims. (Cl. 51—273)

My present invention refers to improvements in portable pneumatic driven tools with special attention to abrasive and polishing tools which have many uses, some of which are grinding, polishing and sanding.

Grinding and polishing work has always been known as a dirty, hazardous and unhealthy job. Many workmen have refused such work and women in particular have been seldom employed for it. These conditions have been greatly improved by ventilating and dust removing systems where the polishing and grinding machines are stationary but no practical solution has been offered where the nature of the work requires portable tools. Some attempts have been made to attach small electric motor driven exhaust fans to other types of tools but this adds complication and weight that are unnecessary as I will hereafter point out, if used with pneumatic tools.

Some of the objects of my invention are to improve the working conditions for the operators of such tools, making such work more attractive to women war workers as well as men not accustomed to this type of employment. More specific objects are to provide means that encourage the operators to use the protective wheel guard at all times, to improve hygienic conditions by collecting much of the dust incident to the work and removing it from the air inhaled by the operators thereby reducing pulmonary diseases and keeping the dust out of the face, eyes and hair of the operator.

Other objects are to provide means to prolong the life of the abrasive and frictional media; to improve the quality of the work where the finer finishes are desired, to increase the operators' endurance and their daily production; and to prevent the spread of abrasive dust to other parts of the plant thereby protecting adjacent machinery and finished products.

In my Patent #2,301,264 issued for other means to encourage the operator not to discard the wheel guard I point out that one ever-present hazard to the operator of a grinder is wheel breakage due to centrifugal forces and other causes. This has increased as the R. P. M.'s of the wheels have been increased to secure faster metal removal without increased torque. So serious is this problem that the wheel and tool manufacturers and large users several years ago formed a safety committee to standardize on certain proven wheel guard designs, and to educate users and manufacturers to always use them while grinding, especially where the wheel is not guarded by the nature of the work. Members of this safety committee reported that one of their biggest problems was the laxity of the very workman whom they are trying to protect. Especially the piece-worker who finds that the guard reduces in some cases his production but never increases it. Inducements other than "safety" from a rare or less occasional hazard must be offered to encourage the use of the guard. Therefore, in my present invention the guard not only functions to protect the operator and his neighbors from the relatively rare but frequently fatal bursting wheels but also from the constant unpleasant throwing of dust and sparks. Where several men are grinding in one room, the objection of the other men to the constant dust will force the recalcitrant operators to use the guard whereas they will not so vociferously object in the case of a potential hazard that seldom occurs, regardless of the fact that when it does occur it often is fatal.

Further objects and novel features of my invention will be apparent from the following specifications and claims, when considered together with the drawings wherein only a few of the embodiments of my invention have been selected for illustration. I do not limit my invention to these selected embodiments nor the proportions shown in the accompanying drawings in which:

Fig. 1 is a side view of an embodiment of my invention in elevation as applied to a pneumatic grinder of conventional design.

Fig. 2 is a sectional view cut approximately on line 2—2 of Fig. 1.

Fig. 3 is a sectional view cut on approximately line 3—3 of Fig. 2.

Fig. 4 is a top view partly broken away of another embodiment of my invention.

Fig. 5 is a side view partly broken away of the embodiment shown in Fig. 4 except for the addition of a dust deflector.

Fig. 1 shows a pneumatic grinder of a conventional design. All such tools, of course, have an inlet 11 for the compressed air, a rotary motor 12, a shaft 13 (Fig. 3). The exhaust from the motor in my invention is not immediately discharged to the atmosphere but is conducted through the hollow tool end handle 15 which forms a passage or conduit therefor and the arrow 14 in Fig. 3 represents the exhaust leaving the pneumatic motor prior to entering the tool end handle 15. The details of construction between inlet 11 and exhaust 14 are old and not pertinent to my present invention so I will not

describe them and their showing should be considered as conventional.

Air coming from the exhaust 14 has a somewhat pulsating pressure but it can be assumed for the present exposition that this exhaust has about 20 pounds pressure per square inch and a volume of about 40 cubic feet at atmospheric pressure. This in practice varies somewhat with the speed, size and design of the tool.

The exhaust air from the motor passes through the wheel end handle 15 in the space surrounding the shaft 13 and passes out of the handle 15 near to the wheel 16 into tube 17.

A steel wheel guard 20 is clamped to the wheel end handle 15. As shown here, it includes a top section 21, bottom section 22 and an outside section 23 which are detachably attached to one another by the illustrated bolts. The wheel guard 20 partially surrounds a grind wheel 16 which is attached to the shaft 13 by the conventional nut 24 and wheel collars 25.

The wheel guard 20 is proportioned to fit as close as practical to the sides of the wheel and to expose such of the wheel as is necessary for grinding.

In the upper part of the top section 21 is formed a tube 30 which is capped by a conical baffle 31 held in place by a wire yoke 32 welded to the tube 30. The purpose of this is to distribute the dust as shown by the arrows and to encourage gravity separation to take place as well as air filtration.

About the lower part of the tube is a ring 33 which represents conventionally any variety of means well known in the vacuum cleaner industry for attaching of a dust collecting bag such as 34. In the present case the bag is held to the ring by a draw string 35.

In operation the exhaust air rushes from the motor 12 with considerable velocity through the wheel end handle 15, through the tube 17 which enters the tube 30 in the guard with an offset bend which directs the exhaust air up the tube thus forming an ejector or jet pump means to entrain air in tube 30, causing a suction about the wheel 16 drawing a substantial amount of air between the wheel 16 and the guard 20. It is not unusual for a jet pump to entrain 10 to 20 times as much air as is used to actuate it. Accordingly an inrush of air between the guard and the wheel could be provided by my invention up to 400 to 800 cubic feet per minute to suck up the sparks and dust dependent upon the proportioning of the parts and the back pressure incident to the filtration of the air.

In this way, my invention uses the hitherto wasted power of the exhaust to create a powerful draft about the grind wheel to pick up the dust and sparks from the wheel and deposit them in a receptacle and filtering this air before it is returned to the atmosphere. This is done without adding any material weight or power lines or mechanical complications as would be the case if an additional motor and fan were used to create this draft. Thus the operator has cleaner air to breathe. The grinding room is cleaner and all working conditions are materially more healthy and attractive. To gain these advantages the operator must use the wheel guard, a fact which makes for greater safety.

Figs. 4 and 5 show another embodiment of my invention wherein 51 is an inlet into a pneumatic rotary motor 52 and 62 is an exhaust nozzle from the motor 52. The motor can be any one of the conventional designs well known and old in the art, so I will not describe its construction.

A pressure or working roll 56 which frequently has a resilient structure or surface is attached to the revolving motor 52.

The motor 52 and roll 56 are mounted on a frame 58. The frame 58 also mounts and spaces an idler roll 59 parallel to the pressure roll. A sanding belt 61 passes over both rolls. A housing or guard 60 is mounted on the frame 58 to surround the belt 61 except such opening as is necessary to contact the pressure roll with the work. The frame 58 separates the space in the housing above the frame from the space in the housing below the frame. The housing 60 contacts with the sides of the frame 58.

Obvious means not shown is provided to easily detach or open one side of the housing to allow for the easy change of worn abrasive belts. Conventional means, not shown, or claimed here, are frequently provided to move the idler pulley to vary the belt tension and to align it with the pressure roll.

A hitherto unsolved problem of great importance in belt sanders is cooling and cleaning the belt which prolongs its life without making the necessity of extending the belt length. While increasing the length of the belt has the desired effect, it tends to make the tool too clumsy and too heavy for many applications and uses. As I will presently explain, my invention provides for the very rapid cooling, indeed almost refrigerating of the belt, so that a shorter belt may be efficiently used.

The importance of cooling belts or glue or emery coated wheels and the like is more readily appreciated when it is recalled that many of the binders used, such as glue, have a softening or melting point, and when the temperature continues to exceed this point, the life of the abrasive belt or wheel is materially reduced.

While I do not exclude large applications of my invention from the sphere of this patent application, one of the purpose of this invention is to provide light, compact and efficient tools which have features hitherto unknown on such machines.

Another undesirable factor in the use of abrasives is their tendency to clog or fill up between the abrasive grains. This not only galls and mars the work but lessens the life of the abrasive means. A feature of my invention, which will be obvious from the following explanation, is that it blows out the spaces between the abrasive granules as they revolve, as well as sucking off particles which at first cling lightly to the abrasive and then carry over only to be rubbed deeper into the abrasive at subsequent passes.

The exhaust 54 terminates in a nozzle 62 which directs with considerable velocity the still somewhat compressed exhaust air against the abrasive surface of the belt as it is revolved toward the exhaust nozzle in this embodiment, although I do not limit my invention to this direction of rotation. This tends to clean the abrasive belt. As the still compressed exhaust air rushes at considerable velocity against the oncoming belt it expands within the housing or guard creating quite a low temperature therein, thus cooling the abrasive by the velocity as well as the expansion of the exhaust air. Some air is entrained by the airstream from the nozzle 62 which is drawn in about the opening indicated by the numeral 63. This air cannot pass direct-

ly to the underhalf of the tool because the frame 58 acts as a partition but tends to pass between the belt and the housing.

Over the idler pulley 59 is the housing exhaust which in Fig. 4 is indicated as a tube section 70 to which may be attached a filtering bag such as 34 somewhat as shown in Figs. 1 to 3. In Fig. 5 a flexible elbow 71 is shown added to the tube which may be adjusted to throw the dust away from the operator towards possibly a suction fan or other stationary means for collecting the dust elsewhere in the room.

At the foot of the tube section 71 is a jet pump or ejector formed by a triangular piece 72 and the housing 60 and the tube 70. The main air stream from the exhaust passes through passage 73 and entrains a volume of air from passage 74 in the tube 70 or elbow 71. This air is drawn primarily from the atmsophere as indicated by 75 where the majority of sparks and debris are collected by the inrush of air when the belt is revolved counterclockwise as shown in Fig. 5. This debris and dust is ejected by the air stream through the tube 70 or elbow 71 into a bag or other suitable receptacle or filtering or exhausting device.

Handles 80 and 81 may be disposed to hold the machine manually at any convenient angle to the work 82 for sanding, grinding and polishing.

I claim:

1. In a portable grinding tool having a pneumatic motor, an air inlet therefor, an exhaust outlet therefor, a shaft revolved by the motor, an abrasive wheel attached to the shaft, a handle housing said shaft and located between the motor and the wheel and a guard partially confining the wheel and attached to the handle, the combination of, jet pump means adjacent to the guard to entrain air therein to draw atmospheric air from about the periphery of the wheel, means to transmit the air stream from the exhaust of the motor to the jet pump means, a tubular mixing chamber for said jet pump, a baffle to distribute the air stream, a bag to separate the dust from the air, and means to attach the bag to the tool.

2. A manually portable tool unit, including the combination of a compressed air motor, having an inlet and an exhaust, a shaft revolved by the motor, an abrasive work device attached to the shaft, a hood about said device, a handle disposed between the motor and the work device and of a perimeter adapted to be grasped and encircled by at least the thumb and first finger of a normal human hand, a conduit for air still under some compression from the exhaust of the motor, said conduit being disposed to be part of said handle, a mixing chamber adjacent to the hood and having an exhaust opening, a jet connected with said conduit to direct said air from the motor into said mixing chamber toward said exhaust opening, and another conduit interconnecting said hood with said mixing chamber and opening into said mixing chamber spaced from said jet and said exhaust opening to withdraw air and dust from said hood when air is exhausted from the motor into the mixing chamber toward the exhaust thereof.

3. A manually portable tool unit, the combination of a combressed air motor, a shaft revolved thereby, an abrasive device attached to the shaft, a hood over said device, a mixing chamber having an exhaust opening, a first conduit to carry substantially atmospheric air from the hood and opening into the mixing chamber at a point spaced from the exhaust opening and a second conduit to carry air still under some compression from the air motor to the mixing chamber to direct a stream of said compressed air toward said exhaust, from a point between said exhaust and said opening of the first conduit, said mixing chamber being substantially closed except for the openings mentioned and the exhaust opening being larger than either of the other openings, thereby entraining air from said hood by the air stream from the motor to extract dust from about the abrasive work device.

WILLIAM M. EMERY.