Nov. 10, 1942. W. M. EMERY 2,301,264

PORTABLE POWER DRIVEN TOOL

Filed Feb. 13, 1942 3 Sheets-Sheet 1

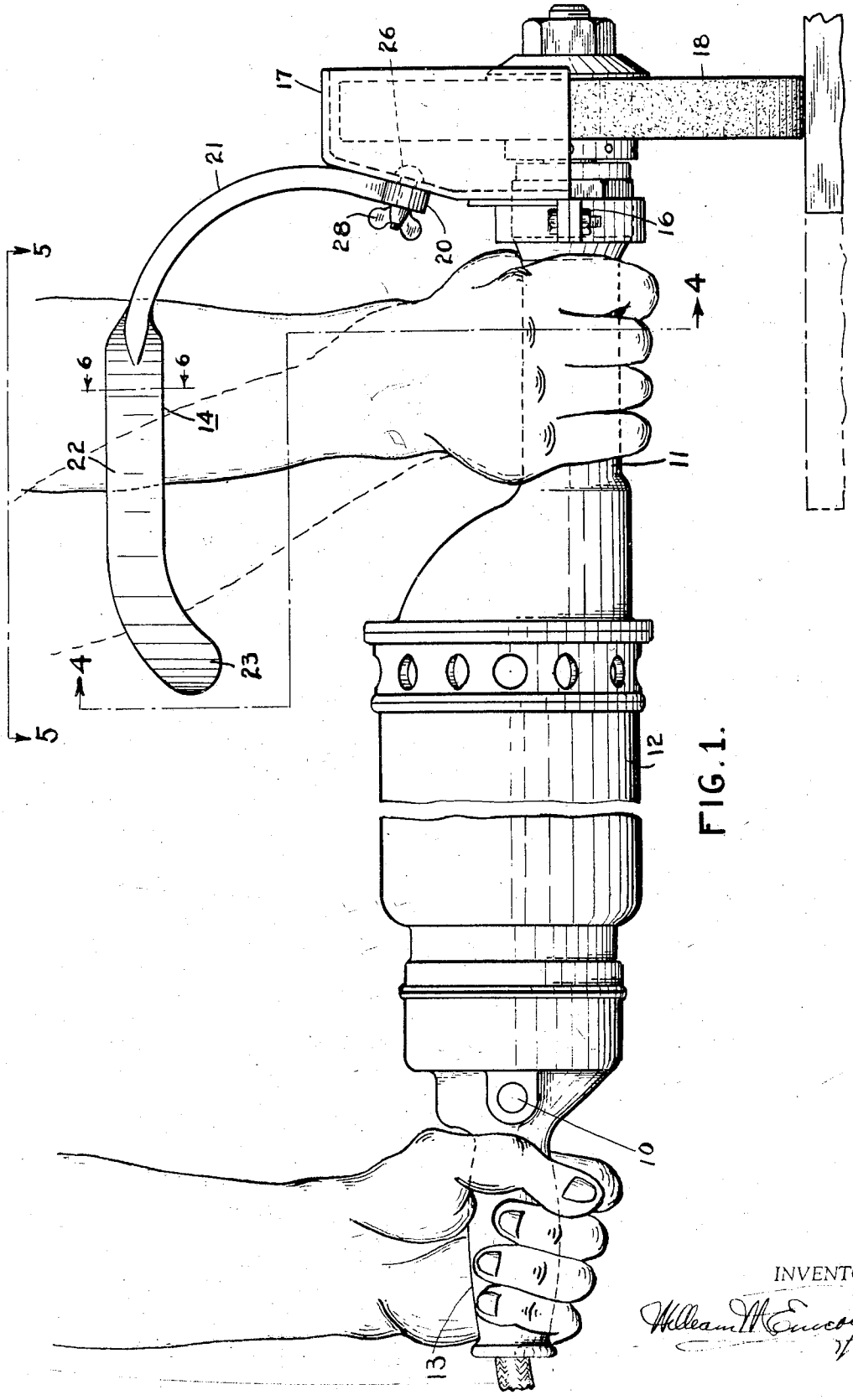


FIG. 1.

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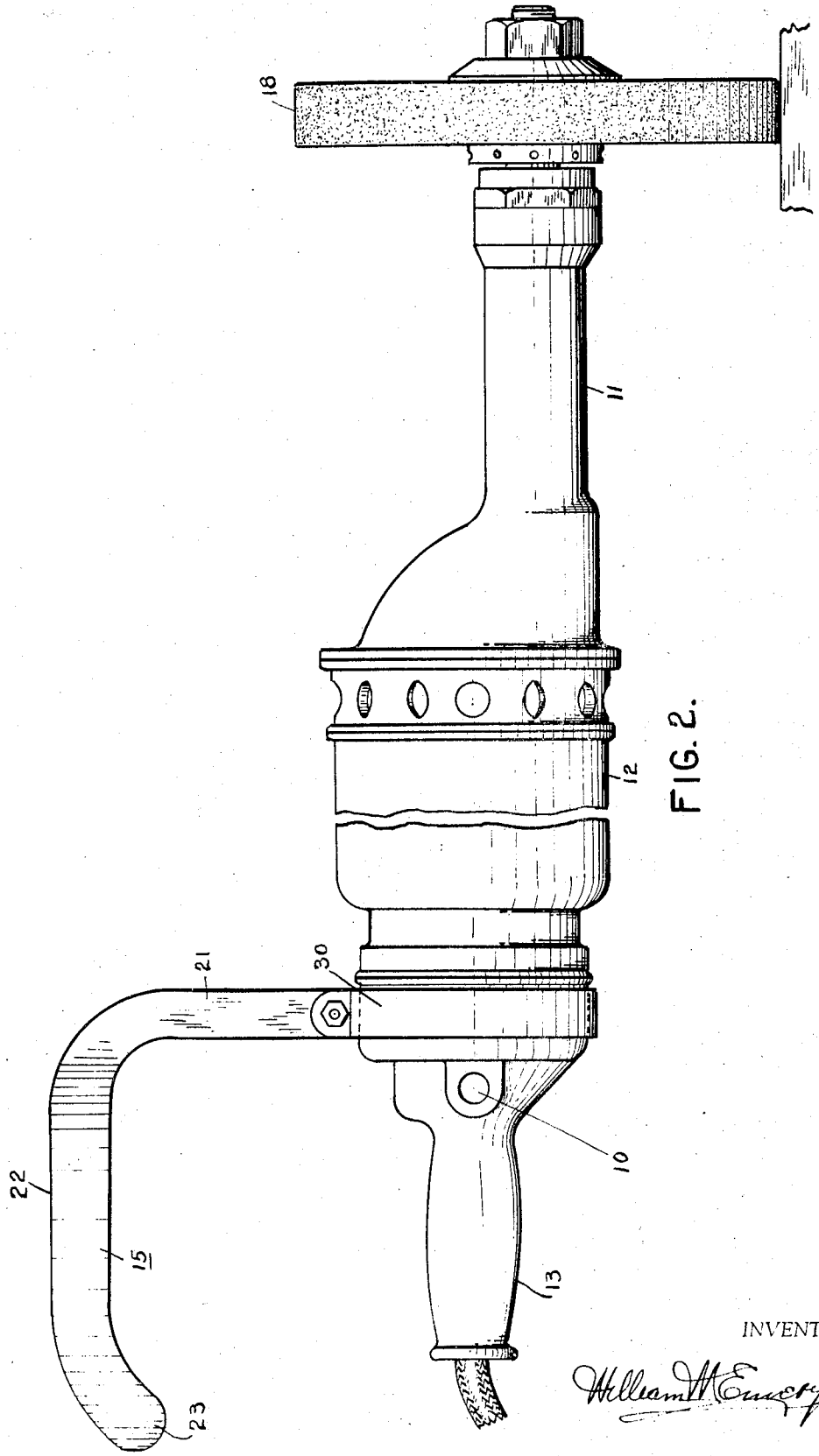


FIG. 2.

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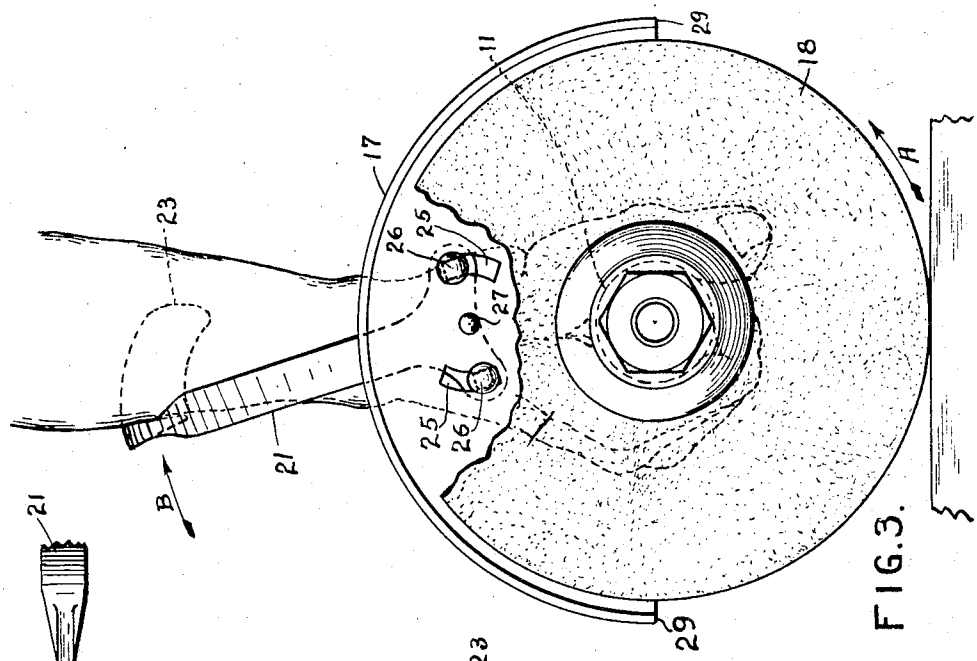


FIG. 3.

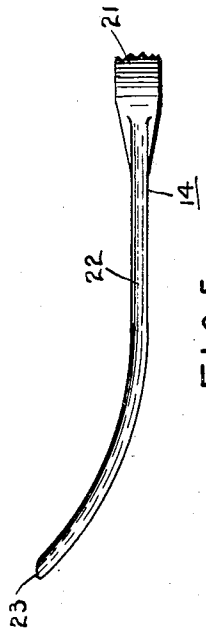


FIG. 5.

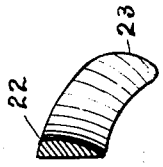


FIG. 6.

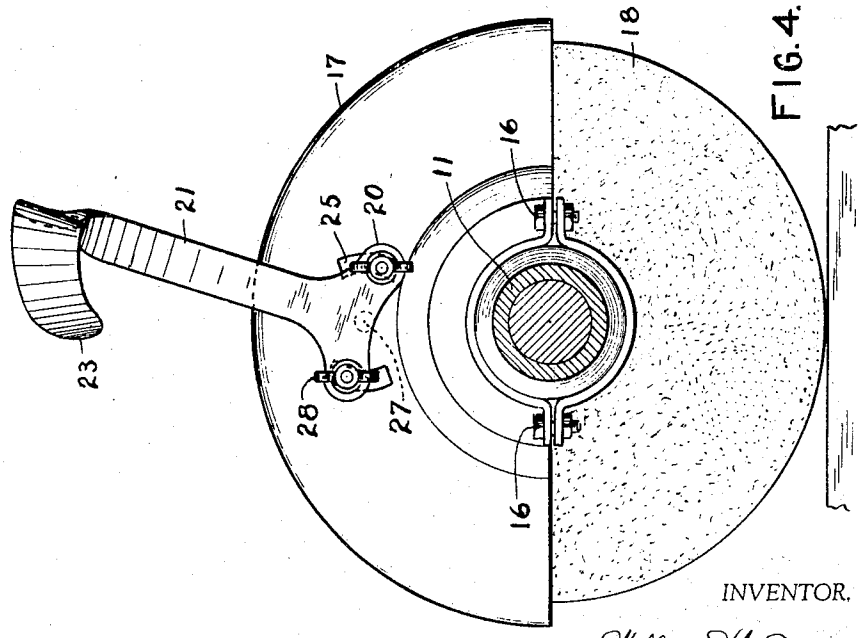


FIG. 4.

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Patented Nov. 10, 1942

2,301,264

# UNITED STATES PATENT OFFICE

2,301,264

## PORTABLE POWER DRIVEN TOOL

William M. Emery, Shaker Heights, Ohio, assignor to The Rotor Tool Company, a corporation of Ohio

Application February 13, 1942, Serial No. 430,787

11 Claims. (Cl. 51—170)

My invention refers to improvements in power driven portable hand tools with special attention to grinders, nut setters, drills and the like where the tools are of such horsepower that they develop substantial reactive torque. This includes such tools that for efficient or convenient operation the handle is positioned substantially axially.

With grinders, for example, a limit has been found above which in the past it has been inefficient to increase the horsepower and the torque because of the inability of the operator to resist the reactive torque by gripping the straight or axial handles without excessive fatigue. In fact, the majority of the fatigue in the use of such tools is directly traceable to finger, hand and wrist fatigue, so much so that in continuous operations the operator seldom presses sufficiently upon the work to utilize the full horsepower capacity of the tool or to secure maximum metal removal from the work being ground. The work accomplished is further reduced by necessary rest periods. Furthermore, if the wheel grabs while grinding the inside diameter of a cast hole the operator is unable to hold the tool and frequently suffers injury.

Some years ago spade handles were used on such tools. A spade handle consists of a handle like that on a spade. It has a hand contacting portion substantially about the width of the hand disposed substantially perpendicular to and across the axis of the tool and connected to the tool by rigid bails integral to each end of the handle. They have been largely abandoned because many hands, especially thumbs, were injured when the wheel grabbed. The spade handle provided insufficient leverage to resist the stalling load of the motor and the operator was often unable to disengage his hand before injury.

The so-called straight or axial handles shown in my drawings are the standard conventional handles used today and their axial position is more convenient for most grinding but in the last five years during which such handles have been used with large tools, no inventor has successfully overcome the fatigue problem that so limits the production and horsepower-torque capacity of this type tool.

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 increase in torque. So serious is this problem that the wheel and tool manufacturers and large users formed, several years ago, a safety committee to standardize on certain proven wheel guard designs and to educate users and manufacturers to always use them when grinding, especially where the wheel is not guarded by the work. They say one of their biggest problems is the very workmen who they are trying to protect. Especially the piece-worker who finds that the guard reduces in some cases his production but never increases it. If some part could be added which could not be attached except to the guard which would increase the production of the piece-worker and reduce his fatigue, then he would not carelessly remove the guard to the jeopardy of himself and his fellow workmen because such an act would increase his labor and reduce his wages by cutting his production.

Accordingly, I have as an object of my invention to provide as an attachment for the wheel guard, practical means to relieve the fingers, hand and wrist of the operator from fatigue incident to resisting the torque reaction of the motor and thereby to encourage the operator not to detach the wheel guard to the endangerment of himself and his companion workmen.

Another object is to increase the hourly production of the operator by reducing his fatigue and also by the utilization of the maximum horsepower capacity of the tool and by the increase in the horsepower capacity.

Another object is to provide for the use of more powerful motorized portable grinders and tools at full horsepower capacity without increasing the operator fatigue and in some cases without increasing the peripheral speed of the wheel.

Another object is to prevent the tool from twisting in and away from the hands of the operator, thereby saving the operator from personal injury, if and when a stalling load is applied such as by the work grabbing the grinding wheel or cutting tool.

Another object is to provide for the operator a comfortable torque resisting arm rest.

Also to provide a "torque arrestor," as I have called my device, that will in no case hamper the release of the tool by the operator in case of emergency.

Another object is to increase the productivity and metal removing capacity of portable tools without increasing the operator labor. Another object is to reduce the labor of handling portable tools.

Further objects and novel features of my construction will be apparent from the following specification and claims when considered to-

gether with the accompanying drawings in which:

Fig. 1 is an elevational side view of an embodiment of my invention adapted for use in connection with a wheel guard.

Fig. 2 is an elevational side view of another embodiment of my invention adapted for use in connection with the rear or live end of the tool for use especially where the wheel is inserted into tubular work and any attachment on the wheel end might interfere.

Fig. 3 is an end view of Fig. 1 with the grind wheel partially broken away.

Fig. 4 is a view from line 4—4 of Fig. 1.

Fig. 5 is an elevational view indicated by line 5—5 of Fig. 1.

Fig. 6 is a sectional view from line 6—6 of Fig. 1.

Fig. 1 shows the wheel end handle 11 of a portable grinder powered by a high cycle electric motor mounted in a frame or housing 12 of approximately 2 horsepower under average working conditions but having a stalling torque equivalent to double the working torque. The speed of the wheel spindle is geared down to 4000 R. P. M. which at a 2 horsepower load results in a torque of approximately 31.5 inch pounds to be resisted by the operator by gripping two handles such as wheel end handle 11 and live end handle 13 which have a diameter of approximately 1½" in diameter.

This means that while working, the operator must constantly resist 42 pounds torque at the surface of the gripping handles. In an effort to prevent the tool from turning in his hand, he must grip it so tightly that the circulation of blood to the fingers is so restricted as to further exaggerate his fatigue.

Under stalling conditions, because the motor is a substantially constant speed induction motor, the stalling reactive torque in the example set forth would be about 63 inch pounds or 84 pounds to be restricted by the fingers of the operator. If the wheel grabs, the tool is usually wrenched from the operator's hands suddenly and without warning and he cannot contact the push button switch 10 while the tool is revolving to stop the motor. Fear that the stalling power, which without my invention is practically irresistible, might suddenly occur, keeps the operator tense and his arm muscles stressed. The fatigue to the operator's fingers, hands and wrists in resisting such a force in such a manner is obvious.

When my torque arrester 14 or 15 is used, this situation is radically altered. In the embodiment shown the torque arrester provides a leverage of 8 inches which means that under full working load the force mentioned of 42 pounds would be reduced to 4 pounds and force of 84 pounds would be reduced to 8 pounds, thus making the resistance of the reactive forces almost effortless.

Clamped to wheel end handle 11 by bolted clamps 16 is a conventional wheel guard 17, about a grinding wheel 18. Pivotally attached to the guard is my torque arrester 14 which has sufficient lever length or radial distance from the axis of the wheel end handle 11 to contact with the forearm of the operator. See Figs. 1 and 3.

The torque arrester may be L shaped and includes in this embodiment of my invention an anchorage or shifting means 20, a lever arm 21 and a torque resistor portion 22. So long as the direction of rotation of wheel 18 shown by arrow A in Fig. 3 is unchanged, and grinders are usually non-reversible, only one side of the torque resistor portion 22 ever contacts the forearm of the operator. The reactive torque force is indicated by arrow B in Fig. 3. This contacting surface is curved for comfortable contact in various operating positions. See Fig. 6. The operator often swings the tool from side to side across and away from his body. The hand and arm shown in full lines in Fig. 1 indicates the arm position of the operator when the tool is held in front of the operator's body and in broken lines is an arm indicating the position when the tool is held to one side away from the body of the operator.

It is substantially the same whether handle 11 is grasped with the left or right hand, except for the indexing of the torque arrester 14 relative to the guard 17 hereafter explained. It will be noted that the arrester 14 is sufficiently extended to continue arm contact in extreme conditions and has its extremity 23 curved toward the tool axis and also as shown in Figs. 3 and 5 toward the operator's arm, thus preventing the torque resister portion 22 or 23 from accidently slipping off the arm. The extremity 23 is well behind any line projectable at right angles from the gripping surface of handle 11.

An important safety advantage of my invention is found in the fact that it encourages the operator to use the safety wheel guard 17 by attaching to it an additional function, that of anchoring the torque arrester 14.

This anchorage 20 consists of adjustable means which includes two circularly elongated holes 25 cut in the guard 17 in which two carriage bolts 26 are slidably mounted to allow turning movement on pivot 27 until wing nuts 28 are tightened. Since half of the periphery of the grind wheel is covered by the guard 17, especially when the wheel has worn smaller, there is a tendency for the peripheral edges 29 of the guard 17 to contact certain types of work as the tool is rocked back and forth in the grinding operation unless it is held in about the right position. This position is determined to a considerable extent by the indexing of torque arrester 14 relative to guard 17. This will further depend on whether the wheel end handle is held in the right or left hand of the operator. To meet these varying conditions I have devised the adjustable anchorage 20 already described. When the wheel end handle is held in the other hand, than is shown, it is better to set the carriage bolts in the opposite end of slots 25 than shown in Figs. 3 and 4.

As previously mentioned, for some types of work a torque arrester on the wheel end handle or even a wheel guard may be in the way. Under these conditions, a torque rest may be attached as shown in Fig. 2 by a peripheral strap clamp 30. Otherwise, the rest 15 shown in Fig. 2 is substantially like 14 shown in Fig. 1 and previously described and is accordingly similarly numbered.

It will be noted that an opening between the tool and the extremity 23 is always disposed with sufficient space between the extremity 23 and the motor frame 12 to pass the forearm of the average operator, so that should the motor frame 12 become electrically charged or for any other reason the tool must be quickly released, the operator will not be caught by the rest 14 but may throw the tool from him. Also the distance from the rest 14 and 15 and the handles 11 and 13 respectively is sufficient not to grip or entangle the wrist or

fingers should the operator desire to release the machine while it is under torque. For this reason the distance from the handle 11 or 13 should be sufficient for the torque arrester 14 or 15 to rest above the wrist on the forearm. It is rests on the wrist or the back of the hand it would not only lose much of its effective leverage but would entangle the hand and/or break the wrist or hand. This contrasts with the former experience of the industry with spade handles which led to their practical abandonment for grinders by large industrial plants.

When my invention is used, the operator no longer need grip the handles 11 and 13 tightly. A very loose hold is sufficient so that the blood will circulate freely thru the hand, thus eliminating strain and fatigue in the fingers, hand and wrist.

I do not limit my invention to the applications or to embodiments of the dimensions shown or for use with motors of the horsepower or type indicated. The use of my invention will permit the efficient use of more powerful motors than those described and applications other than grinders.

I claim:

1. In a portable grinding tool, the combination with a motor, a substantially axially positioned wheel end handle, and a wheel guard, of, a curved torque arrester lever movably mounted thereon to contact with the forearm of the operator when the handle is gripped by the operator, to thereby resist the reactive torque of the motor.

2. In a portable grinding tool, the combination with a motor, a substantially axially positioned handle, a wheel guard, of, a lever movably attached to the guard and adapted for contact with the forearm of the operator when the handle is grasped by the operator to provide an additional leverage to resist the reactive torque of the motor.

3. In a portable grinding tool the combination with a revolving grinding wheel, a motor to revolve the wheel, and a frame having handle portions and motor housing portions, of, a detachable wheel guard attached to the frame and positioned about said wheel to protect the operator should the wheel burst, a torque arrester attached to the guard and positioned to contact the forearm of the operator when handle portions of the frame is grasped thereby easing the operator's labor in resisting the reactive torque of the motor and thereby providing an incentive for operator not to remove the safety wheel guard.

4. In a portable tool, the combination with a rapidly revolving grinding wheel, a guard covering a segment of the periphery of said wheel, of, a torque arrester lever attached to said wheel guard and shifting means to change the angular relationship between the torque arrester lever and the wheel guard.

5. In a portable grinding tool, the combination with a motor and a substantially axially positioned live-end handle, of, a curved L shaped torque arrester lever adjacent to said handle, a portion of said lever being substantially parallel to said handle and positioned sufficiently away from said live-end handle to contact with the forearm of the operator when the handle is grasped by the operator, to provide a greater moment of leverage to resist the reactive torque of the motor, thereby relieving fatigue in the fingers, hand and wrist of the operator.

6. In a portable tool, the combination with a motor and a frame therefor including two substantially axially disposed handles, of a torque arrester lever having a substantially L-shaped portion attached to said frame adjacent to one of said handles and positioned to contact, and cross the forearm of the operator when one of said handles is grasped by the operator to provide a greater moment of leverage to resist the reactive forces incident to the motor, thereby relieving strain and fatigue on the fingers, hand and wrist of the operator.

7. In a portable tool, the combination with a motor, a frame, and a substantially axially positioned handle, of a torque arrester lever attached to the frame, adjacent to said handle, a section of said lever being shaped to contact with the forearm of the operator when the handle is grasped by the operator to provide a greater moment of leverage to resist the reactive forces incident to the motor, thereby relieving strain and fatigue on the fingers, hand and wrist of the operator.

8. In a portable tool, the combination with a motor, a frame, and a substantially axially positioned handle, of, a torque arrester lever pivotly attached to said frame adjacent to the handle, means to lock said handle in a selected position, a section of said lever being shaped to contact with the forearm of the operator when the handle is grasped by the operator to provide a greater moment of leverage to resist the reactive forces incident to the motor, thereby relieving strain and fatigue on the fingers, hand and wrist of the operator.

9. In a portable tool in combination with a cutting tool, a frame, and at least one substantially axially disposed handle, of, a torque arrester attached adjacent to the handle, said torque arrester having a portion disposed away from said handle to provide spaced relationship therebetween and one end thereof extending to a point spaced away from said frame sufficiently to pass the forearm of the operator between the frame and said end.

10. In a portable grinding tool in combination with a grind wheel, a frame including at least one handle disposed substantially parallel to the axis of the tool, of, a torque arrester attached to said frame and projecting therefrom in spaced relationship to the axis of the tool to contact the forearm of the operator when said handle is grasped by the operator.

11. In a portable power driven tool in combination with a work tool, a motor to revolve the work tool and a frame including a handle disposed between the motor and the work tool, of a torque arrestor attached to said frame and projecting therefrom in spaced relationship to the handle to contact the forearm of the operator when said handle is grasped by the operator, thereby easing the operator's labor in resisting the reactive torque of the motor.

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