Jan. 25, 1938. H. J. PATTISON ET AL 2,106,535

PORTABLE POLISHING MACHINE

Filed Feb. 19, 1936 2 Sheets-Sheet 1

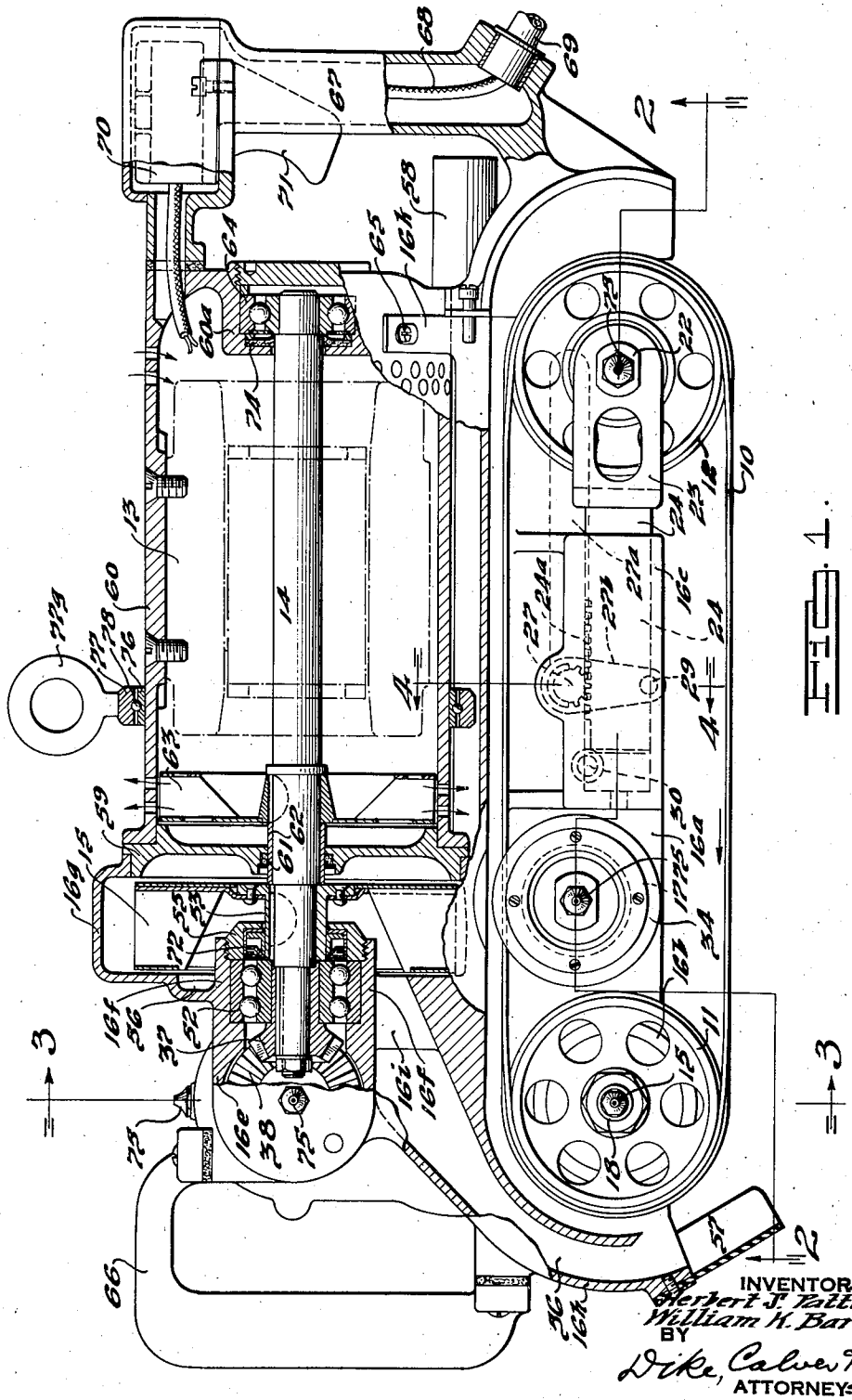

FIG. 1.

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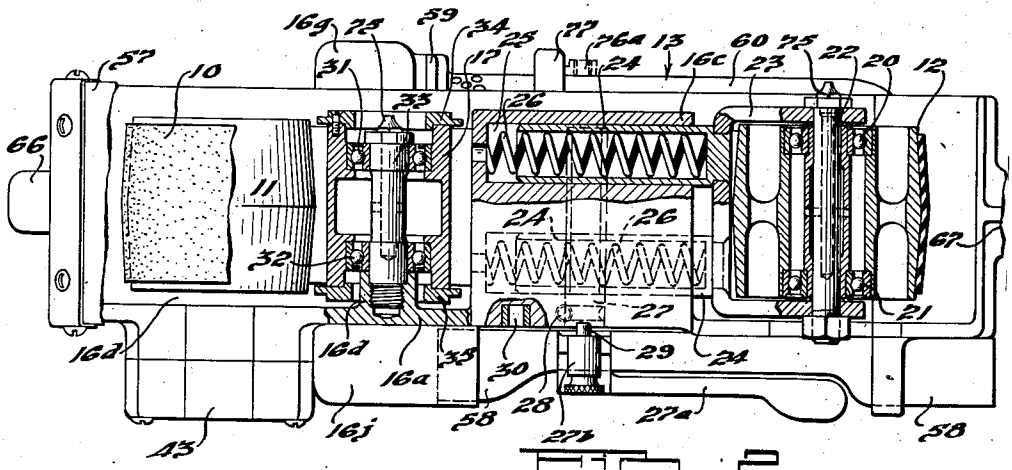

FIG. 2.

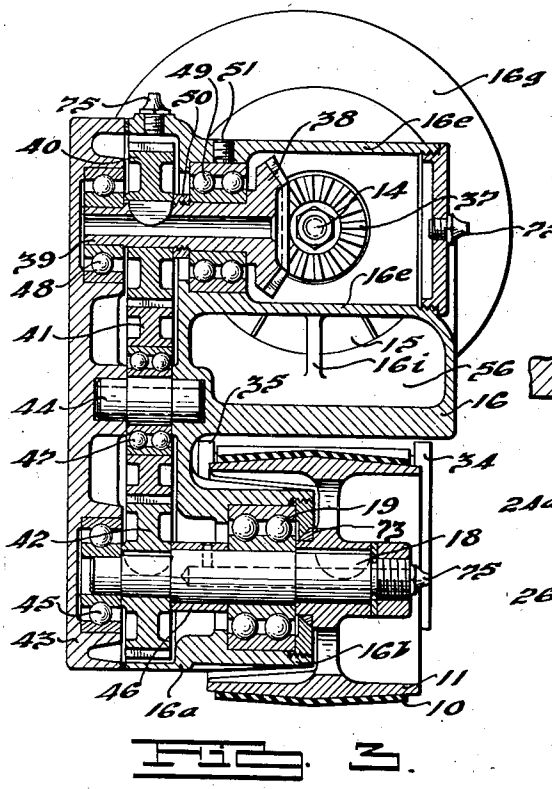

FIG. 3.

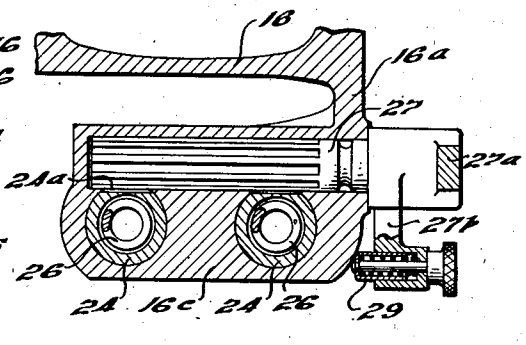

FIG. 4.

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2,106,535

PORTABLE POLISHING MACHINE

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Application February 19, 1936, Serial No. 64,608

7 Claims. (Cl. 51—170)

The present invention relates generally to machines having a moving belt preferably used to polish flat or curved surfaces and, more particularly, to portable polishing machines for polishing the enamel, lacquer, or other finish of automobile bodies.

The portable polishing machines which have hitherto been commercially available have been either of the reciprocating pad type, the rotating disc type, or the rotating cylinder type. The first of these three types is slow because of the starting and stopping of the pads at the end of each stroke, the second type is slow because only a small sector of the disc pad can be effectively held against the surface to be polished and because only a shall zone on the disc is moving at the optimum speed, and the third type is slow because only a narrow element of the cylinder is in contact with the surface to be polished. One of the principal objects of this invention is to provide a commercially practical machine which is free from the above objections, which will polish a comparatively large area at once and in which all parts of the polishing member move at the same optimum speed.

Another object of this invention is to provide a portable polisher with means to collect and dispose of the dust created by the polishing operation.

Another object of this invention is to provide a portable polisher of the belt type with means to keep the belt under constant tension and permitting its easy removal and replacement.

Another object of this invention is to provide a portable polisher of the belt type with simple means to keep the belt in position.

Other objects and advantages of the invention will appear from the following description and appended claims when considered in connection with the accompanying drawings forming a part of this specification.

Fig. 1 is a side elevation of one of the preferred embodiments of the invention with many of the parts broken away to the central vertical plane and shown in section.

Fig. 2 is a sectional view on the line 2—2 of Fig. 1, taken in the direction of the arrows.

Fig. 3 is a sectional view on the line 3—3 of Fig. 1, taken in the direction of the arrows.

Fig. 4 is a sectional view on the line 4—4 of Fig. 1, taken in the direction of the arrows.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention claimed herein beyond the requirements of the prior art.

The particular embodiment of the invention shown in the drawings comprises a polishing belt 10 stretched over two pulleys 11, 12, an electric motor 13 above the belt 10 with its shaft 14 parallel to the run of the belt, a fan 15 mounted on the motor shaft 14 and arranged to draw in the dust created by the polisher, and gearing extending from the end of the motor shaft around the edge of the belt and driving one of the pulleys. These and the other parts which form the polisher are mounted in or upon a frame or body 16 which extends lengthwise of the polisher between the motor 13 and the belt 10 and down at one side of the belt 10 and which has a forward portion extending up in front of the motor 13 and down in front of and at the side of the belt 10.

The portion 16a of the frame 16 at the side of the belt 10 carries the pulleys 11, 12, 17 which support and guide the belt. The drive pulley 11 at the front end is mounted on a shaft 18 carried by a ball bearing 19 in a boss 16b projecting in between the two sides of the belt 10 from the side 16a of the frame. The other end of the belt 10 is carried by an idler pulley 12 running on a pair of ball bearings 20 and 21 on a shaft 22 carried by a yoke 23 which lies within the belt 10. The yoke 23 is carried by a pair of cylinders 24 riveted to it and slidably mounted in a pair of parallel holes 25 in a guide block 16c. The guide block 16c projects in between the two sides of the belt 10, being made integral with the frame 16 and being carried by the part 16a which extends down along at one side of the belt 10. The cylinders 24 which carry the yoke 23 are hollow and contain helical springs 26 which tend to force them out of the guide block 16c, pushing the idler pulley 12 away from the drive pulley 11 and keeping the belt 10 tight. The upper surfaces of the cylinders 24 are formed into racks 24a which are engaged by a gear-like splined shaft 27 rotatably mounted in a transverse hole in the guide block and retained by a pin 28 fitting into a circumferential groove on the shaft. The splined shaft 27 is provided with a lever 27a, by which it may be rotated, and an arm 27b, which carries a small spring pressed plunger 29 adapted to snap into a bushed hole 30 in the side of the guide block 16c

when the lever 27a is swung down into vertical position. The teeth on the shaft 27 and on the cylinder 24 are engaged so that when the cylinders 24 and the yoke 23 and idler 12 carried by them are in their normal position with the belt 10 tight, the handle 27a on the shaft lies horizontally out of the way along the side of the machine. Then when the handle 27a is swung down and the plunger 29 snaps into the hole 30 in the guide block 16c, the idler 12 will be retracted enough to allow easy removal and replacement of the belt 10.

The belt 10 is kept centered upon the pulleys 11 and 12 by the guide pulley 17 which lies between the drive pulley 11 and the guide block 16c for the idler pulley yoke cylinders 24. The guide pulley 17 turns on a pair of ball bearings 31 and 32 mounted upon a stud 33 screwed into a boss 16d on the side 16a of the frame or body 16 alongside of the belt 10, and it engages the bottom of the upper run of the belt 10. A pair of end plates 34 and 35 screwed onto the sides of the guide pulley 17, form flanges engaging the edges of the belt 10 and do the actual guiding. Removal of the belt over the edge of the flange 34 is facilitated by a hollow 36 in the frame just above the pulley flange 34 on the open side of the machine.

It is important to note that the lower or working portion of the belt 10 may be pressed upward for a certain distance and, therefore, the belt 10 may be conveniently applied to surfaces curved longitudinally or transversely of the belt, such for instance, as a rounded corner of an automobile body, and to engage such surface by the major portion of its working area. It should be also noted, that such inward pressure applied to the belt 10 draws the pulleys 11 and 12 against the spring 26, thus increasing the tension forces acting on said belt 10, thereby also increasing the total normal pressure exerted by said belt on the polished surface. Considering the fact that being so pressed, the belt 10 follows the curvature of the surface and that the area of contact of the belt and the polished surface is usually increased when the belt is pressed up, it will be appreciated that employment in our device of mechanical means whose resistance increases proportionally to distortion makes it possible to maintain a substantially uniform normal pressure of the belt on the polished surface.

Pulleys 11 and 12 are made outwardly tapering, said feature serving two important purposes: first, to relieve excessive pressure usually exerted on the polished surface by the sides of the belt when the curvature of said surface changes transversely of the belt, and thereby to equalize the normal pressure of the belt on the polished surface at different points of contact; and, second, to resist with a greater force the transversely directed reaction of the polished surface, tending to throw the belt off the pulleys 11 and 12, when the axes of the pulleys are not parallel to the line tangent to such curved surface.

The drive of the belt 10 is from the motor shaft 14 through a pair of bevel gears 37 and 38, a cross shaft 39 and down the side of the frame or body 16 through a train of spur gears 40, 41 and 42 to the shaft 18 which carries the drive pulley 11. The gears 40, 41 and 42 are enclosed in a housing formed by a recess in the side of the forward part of the body 16 and by a gear cover 43 fitting over the recess and supporting the outer ends of the shafts 39, 44 and 18 upon which the gears 40, 41 and 42 are mounted.

The lower gear 42 is keyed to the drive pulley shaft 18, the center of the shaft being supported by the ball bearing 19 in the boss 16b projecting into the end of the pulley 11 and the outer or gear end of the shaft 18 being supported by a ball bearing 45 mounted in the gear cover 43. The drive pulley shaft 18 is located endwise by the ball bearing 19 supporting the center of the shaft, the inner race of the bearing 19 being clamped between the hub of the drive pulley 11 and a spacer 46 pressed on to the shaft 18 and the outer race being clamped in the supporting boss 16b.

The central or idler gear 41 is freely rotatable on a ball bearing 47 carried by a short shaft 44, whose ends fit into recesses in the side of the frame or body 16 and in the gear cover 43.

The upper gear 40 is keyed onto the hollow transverse shaft 39 which is carried by an outer ball bearing 48 mounted in the gear cover 43 and in a central ball bearing 49 mounted in the frame. The inner end of the upper shaft 39 is integral with the bevel gear 38, whose back is provided with a shoulder against which a nut 50 clamps the inner race of the central bearing 49. The outer race of the central bearing 49 fits up against a shoulder in the body 16 facing towards the bevel gear 38 so as to take the thrust and, in addition, is held in place by a set screw 51.

The bevel gear 38 formed integrally with the upper transverse shaft 39 is engaged by a second bevel gear 37 keyed onto the front end of the motor shaft 14, the two gears 37 and 38 being enclosed in a chamber 16e extending across the upper part of the body. The hub of the bevel gear 37 on the motor shaft 14 is carried by a ball bearing 52 mounted in a hollow boss 16f on the body projecting a short distance along the motor shaft 14. The inner race of the bearing 52 is clamped between a shoulder on the bevel gear 37 and the hub 53 of the fan 15 on the motor shaft, the fan hub 53 bearing against a shoulder on the shaft 14 and projecting into the bearing boss 16f. The outer race of the bearing 52 is clamped between a shoulder in the bearing boss 16f and nut 55. The motor shaft 14 and bevel gear 37 are thus accurately positioned axially.

The fan 15 which serves to collect the dust created by the machine is of the centrifugal type and rotates in an involute housing 16g formed integral with the frame or body 16 of the machine. The front 16h of the frame which extends down in front of the belt drive pulley 11 is hollow and forms an air duct 56 whose opening or nozzle is just in front of and above the lower run of the belt 10. A rubber apron or shield 57, fastened to the nozzle 16h, extends down in front and at the sides of the nozzle to intercept the dust thrown off by the belt and to prevent clean air from in front of the machine from being uselessly drawn by the fan. From the nozzle, the air duct 56 extends up and back under the bevel gear housing 16e to the center of the fan 15, the end of the duct extending up and encircling the front motor shaft bearing boss 16f which projects back from the bevel gear housing 16e. A short vertical strut 16i extends across the duct 56 from the part of the frame 16 just above the belt 10 to the bearing boss 16f but, being in line with the flow of air, does not obstruct its passage.

The discharge conduit from the fan lies behind the housing for the vertical gear train and is formed into a rearwardly directed elbow 16j. A sheet metal discharge tube 58 whose forward end fits into the end of the elbow 16j extends along the side 16a of the frame to the end of the ma-

chine where a flexible hose for carrying away the dust laden air can be connected to it. The central part of the discharge tube 58 is flattened on one side to allow the handle 27a, which retracts the belt idler pulley 12, to swing up past it, as the belt stretches in service and lets the yoke 23 carrying the idler 12 move out beyond its normal position.

The rear of the fan chamber is closed by a partition or diaphragm 59 whose rim is bolted between the front end of the motor housing 60 and the back of the fan housing 16g. The center of the partition 59 is provided with a seal 61 which bears against a spacer 62 on the motor shaft between the dust removal fan hub 53 on one side of the partition 59 and a motor cooling fan 63 on the other.

The rear end of the motor shaft 14 is carried by a ball bearing 64 in a hollow boss 60a at the rear end of the motor housing 60. The rear end of the housing 60 in turn is secured in a saddle 16k at the rear end of the frame or body 16 by means of screws 65. The actual motor 13 is a high speed heavy duty universal motor of the type used in electric drills, and, being conventional, is not illustrated in detail.

Each end of the machine is provided with a handle, the front handle 66 being screwed onto the front end of the frame 16 and the rear handle 67 being screwed onto the rear ends of the frame 16 and the motor housing 60. The wire 68 through which power is supplied to the machine enters the lower part of the rear handle 67 through a conventional tapered rubber sleeve 69 and is connected to a standard switch 70 located in the upper part of the handle 67 and operated by a trigger 71.

All of the bearings 19, 20, 21, 31, 32, 45, 47, 48, 49, 52 and 64 in the machine and the train of gears 37, 38, 40, 41 and 42 are packed in grease. The grease for the gear train and its bearings is prevented from escaping by a seal 72 within the front motor bearing retainer 55 bearing on the dust fan hub 53 and by a leather washer 73 bearing upon the hub of the drive pulley 11. The bearings 20, 21, 31 and 32 of the idler pulley 12 and the guide pulley 17 and the rear motor bearing 64 are of the type known commercially as "Greaseal" and are equipped with built in grease retainers, and the rear motor bearing 64 is provided in addition with a leather seal 74. Standard pressure grease gun fittings 75 are provided for greasing all the bearings and gears, the fitting of the rear motor bearing 64 being on the side of the motor housing 60 and the others being as shown.

The machine is provided with a ball bearing supporting ring comprising an inner race 76 encircling the motor housing 60 and secured to it by set screws through lugs 76a on the side of the race and an outer race 77 rotatable around the inner one 76 on steel balls 78 and provided with a ring or eye 77a. When the machine is in use, the eye 77a is fastened to a hook or shackle on the end of a line depending from a pneumatic balancer exerting a constant upward pull on the line and carrying the entire weight of the machine.

While the machine has been described above as a polishing machine, it can obviously be used for other purposes. For instance, if a fleece or other suitable belt is provided, waxing can be done with it. If a sandpaper or other abrasive belt is employed, smoothening of rough surfaces can be done. With the proper grade of abrasive and a belt provided with a felt or other suitable surface, the machine lends itself to rubbing down lacquer, enamel, varnish, paint, etc.

We claim:

1. A portable polishing machine comprising a frame, a pulley carried by the frame, a guide block carried by the frame and provided with a pair of parallel holes directed away from the pulley and a transverse hole offset from but intersecting the parallel holes, a pair of cylinders slidable in the parallel holes and having gear teeth spaced along their length, a gear-like cylinder rotatable in the transverse hole with its teeth engaging the teeth on the slidable cylinders, manually operable means for rotating the rotatable cylinder, an idler pulley carried by the slidable cylinders, a polishing belt around the pulleys, and resilient means urging the slidable cylinders and the idler pulley away from the other pulley.

2. A portable polishing machine as described in in the preceding claim 1, in which the slidable cylinders are hollow and in which the resilient means comprise helical springs extending within the hollow cylinders.

3. A portable polishing machine comprising a longitudinally extending movable polishing element, a motor extending longitudinally above the polishing element, means for driving the polishing element from the motor, a ring freely rotatable about the motor, and means secured to the ring for supporting the machine.

4. In a portable motor driven tool, a motor having an elongated housing, a bearing member encircling the motor housing and movable longitudinally thereof, means for securing the bearing member to the housing at selected points along the length of the housing, a member carried by the bearing member and rotatable around the housing, and means on the last mentioned member for attaching a means for supporting the weight of the tool.

5. In a portable polishing machine, a stationary rotatable pulley, a movable rotatable pulley, means for rotating said stationary pulley, an endless belt travelling over said pulleys, a stationary guiding block between said pulleys having a bore, a plunger having one end thereof slidable in said bore and its opposite end carrying the movable pulley, a spring arranged in said bore and urging the movable pulley away from the stationary pulley, a gear and rack means for moving the movable pulley through a predetermined distance, and means positively locking said plunger at the extreme points of said distance.

6. In a portable polishing machine, a stationary rotatable pulley, a movable rotatable pulley, means for rotating said stationary pulley, an endless belt over said pulleys, a stationary guiding block between said pulleys having a bore, a plunger having one end thereof slidable in said bore and its opposite end carrying the movable pulley, a spring arranged in said bore and urging the movable pulley away from the stationary pulley, a gear and rack means for moving the movable pulley through a predetermined distance, a lever for operating said gear and rack means, and an automatic catch positively locking the lever at the extreme points of said distance.

7. In a portable polishing machine, a stationary rotatable pulley, a movable rotatable pulley, means for rotating said stationary pulley, a stationary guiding block between said pulleys having a bore, a plunger having one end thereof slidable in said bore and its opposite end carrying the

movable pulley, a spring arranged in said bore to act on said plunger and to urge the movable pulley away from the stationary pulley, an endless belt over said pulleys adapted to be depressed when applied to convex surfaces toward the line connecting the centers of said pulleys, a flanged belt retaining pulley arranged between said stationary and movable pulleys and engaging the idling portion of the belt for preventing throwing of the belt off the pulleys by the side thrust of curved surfaces, a rack formed on said plunger and an axially stationary rotatable gear cooperating with said rack for moving the movable pulley through a predetermined distance, a lever for operating said gear, and an automatic catch positively locking the lever at the extreme points of said distance, thereby permitting removal of the belt as well as preventing the working portion of the belt from coming in contact with the belt retaining pulley.

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