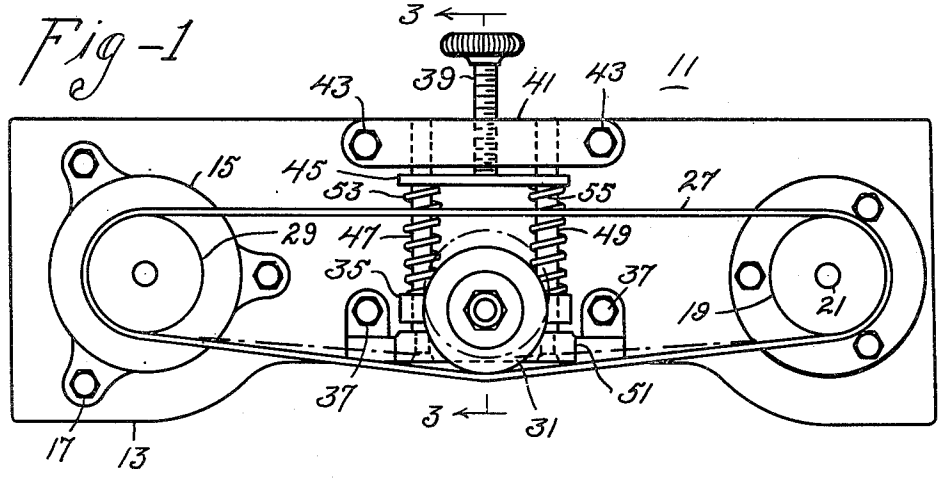
April 29, 1952 F. E. HENDRICKSON 2,594,646

POLISHING MACHINE

Filed Nov. 30, 1946 2 SHEETS—SHEET 1

Fig-1



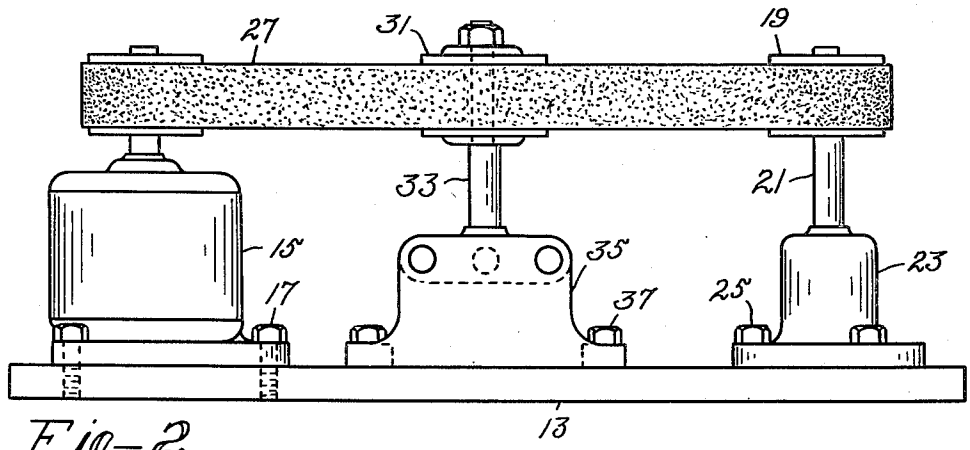


Fig-2

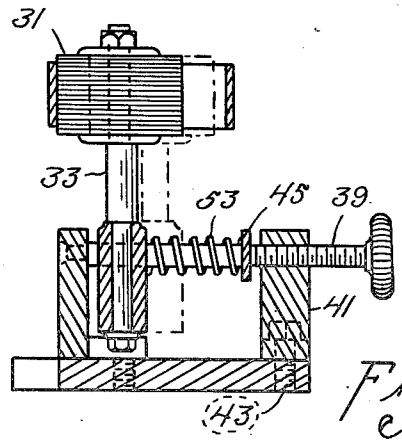


Fig-3

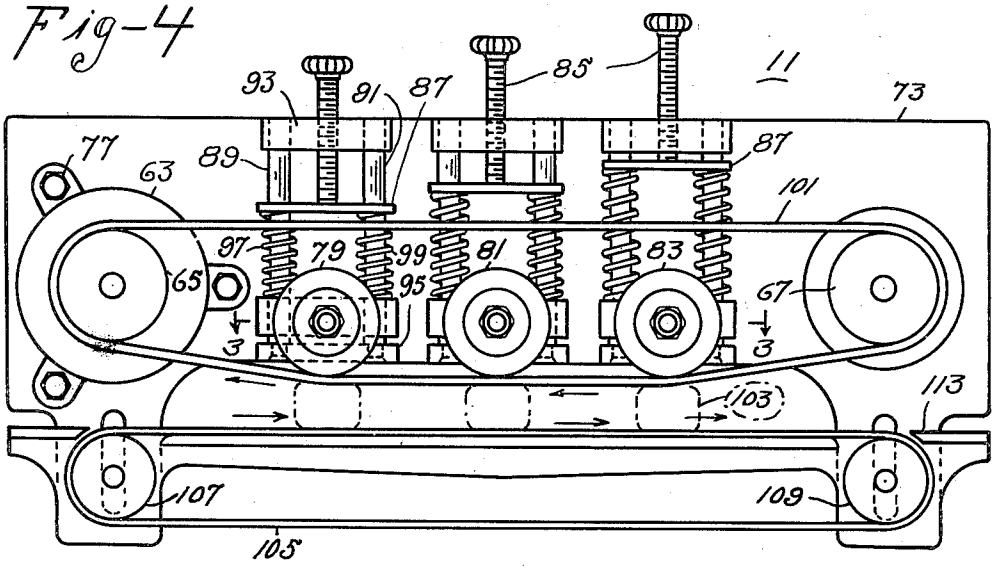
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POLISHING MACHINE

Filed Nov. 30, 1946 2 SHEETS—SHEET 2

Fig-4



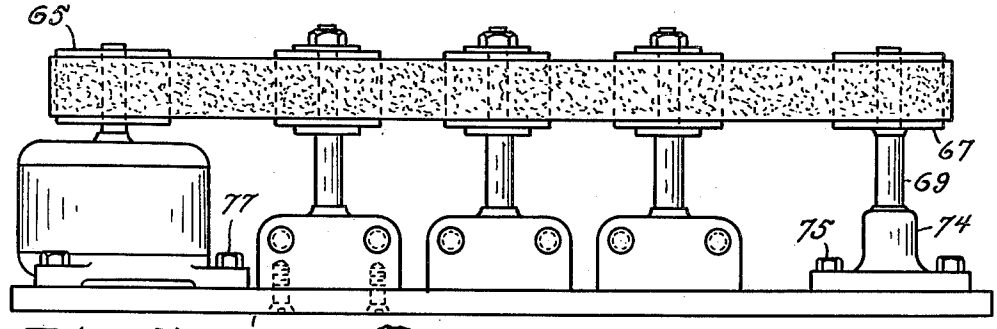


Fig-5

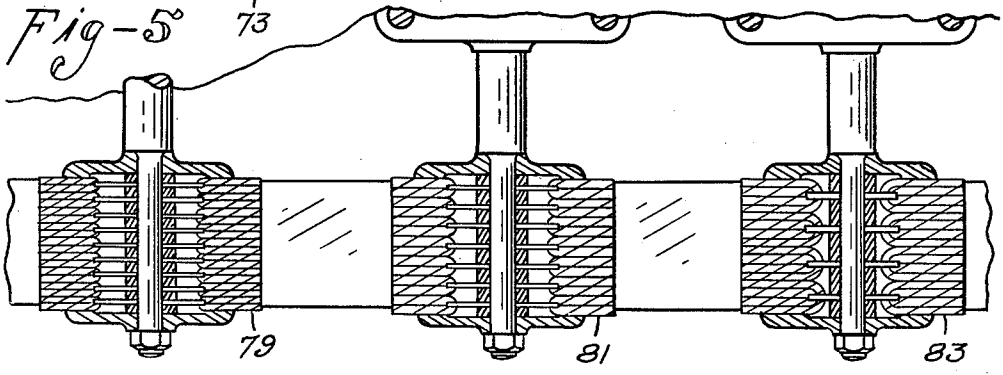


Fig-6

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Patented Apr. 29, 1952

2,594,646

UNITED STATES PATENT OFFICE

2,594,646

POLISHING MACHINE

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Application November 30, 1946, Serial No. 713,277

2 Claims. (Cl. 51—141)

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My invention relates to buffing and polishing machines and particularly to automatic polishing machines.

An object of my invention is to provide a polishing machine having a work wheel which is pressed against the inside surface of a polishing belt by a spring biased slide.

Another object of my invention is to provide a polishing machine comprising a work wheel which is pressed against the inside surface of a polishing belt with a constant working pressure.

Another object of my invention is to provide a polishing machine embodying a plurality of work wheels of different hardness and of different pressures against the belt.

Other objects of my invention will either be apparent from a description of one form of a device embodying my invention or will be set out in the course of such description and be set forth in the appended claims.

In the drawings,

Figure 1 is a top plan view of a manual polishing machine comprising a single work wheel,

Fig. 2 is a front elevation of the parts shown in Fig. 1,

Fig. 3 is a fragmentary vertical sectional view taken on the line 3—3 of Fig. 1,

Fig. 4 is a view in side elevation of a polishing machine comprising three work wheels and an endless motor-driven belt for moving the work,

Fig. 5 is a bottom plan view of the parts shown in Fig. 4, and,

Fig. 6 is a fragmentary sectional view through the three work wheels.

Referring first of all to Figs. 1 to 3 inclusive, I have there shown a polishing machine 11 which comprises a base plate 13, which plate is substantially horizontal and which has secured thereto at one end thereof a vertical shaft electric motor 15, a plurality of securing bolts 17 being provided for this purpose.

At the other end of the supporting plate 13 I provide an idling pulley 19 which is mounted on a vertical rotatable shaft 21, this rotatable shaft being supported by a bearing member 23 which bearing is secured against base plate 13 by a plurality of bolts 25.

A polishing or abrasive belt 27 is adapted to operate over the motor pulley 29 and over pulley 19. The degree of coarseness of the belt 27 may be any desired value or it may be of a kind adapted to the work to be done and to the material which is to be polished.

A single work wheel 31 which may be of the kind hereinbefore disclosed and claimed in my

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co-pending application #657,804 filed March 28, 1946, now abandoned, is mounted on a rotatable shaft 33, this rotatable shaft extended substantially parallel to the motor shaft and to shaft 21, and is supported by a movable bearing member 35, which bearing member may be moved in a substantially horizontal plane. Bearing member 35 is supported on base plate 13 as by a pair of bolts 37.

The bearing member 35 is moved as by a manually actuable screw-threaded shaft 39 which extends through a member 41, which member may be secured to the base plate 13 by a pair of bolts 43. Shaft 39 has its inner end abutting against a plate 45 which plate 45 is provided with two openings so that it may move on two guide shafts 47 and 49, these shafts being rigidly supported by a bracket member 51 and by member 41. Springs 53 and 55 surround the guide shafts 47 and 49 respectively and extend from member 45 to bearing member 35 so as to permit of varying the pressure exerted by work wheel 31 against the inner surface of belt 27.

I have shown by broken lines in Fig. 1 of the drawings the position of work wheel 31, when the tension of the springs 53 and 55 has been reduced, thereby permitting the work wheel 31 to move rearwardly while subject to pressure from the endless belt enveloping said work wheel. The pressure between the work wheel 31 and belt 27 is relatively small when located as indicated by the broken line position and it is of course obvious that the turning movement of shaft 39 in a direction to compress springs 53 and 55 will move wheel 31 forwardly (as seen in Fig. 1 of the drawings) so as to vary or rather increase the pressure of the work wheel on the belt and therefore to also correspondingly increase the pressure of the belt against a piece of work.

Referring now to Figs. 4 to 6 inclusive, I have there shown a polishing machine 61 comprising a motor 63 having a pulley 65, a pulley 67 mounted on a rotatable shaft 69, which rotatable shaft is supported in a bearing 71, which bearing is supported on a plate 73 by a plurality of bolts 75. The motor 63 may be secured in proper operative position on plate 73 by a plurality of bolts 77.

I show three work wheels 79, 81 and 83, placed side by side and embodying manually actuable externally screw-threaded adjusting shafts 85 abutting against plates 87. Each of these plates is adapted to slide on two guide shafts 89 and 91 which extend from a member 93 to a member 95 and are rigidly held in their proper operative

positions. Springs 97 and 99 encircle the guide shafts 89 and 91 respectively. The manipulation of the adjustment for work wheels 79, 81 and 83, in relation to the polishing belt, is similar to that for work wheel 31 of Fig. 1.

An endless polishing or abrasive belt 101 is adapted to run over pulleys 67 and 65 and the three work wheels 79, 81 and 83 are adapted to engage the inner surface of the belt 101. As shown in Fig. 4, the left hand work wheel 79 is subjected to greater spring pressure than work wheel 81, and work wheel 81 is subjected to greater spring pressure than work wheel 83.

The direction of movement of a piece of work 103 is from left to right as seen in Fig. 4 so that the degree of polishing will be such as to tend to remove the deeper scratches or marks first, as explained below. The work wheel 81, with its reduced pressure against the belt 101, will then remove the relatively coarse surface finish produced by work wheel 79, and work wheel 83 will produce a still finer finish on the surface of a piece of work.

The successful operation of a machine embodying my invention in producing fine surface finish may be explained as follows: When a raw metal surface having deep scratches, pipes or pinholes is to be polished, it is necessary to first remove a sufficient amount of surface metal to reach the bottom of such scratches and blemishes. This is generally done by the use of a coarse abrasive belt or wheel, which, however, produces another set of marks because of the coarseness of the abrasive and the amount of mechanical pressure applied. To remove the new grit marks produced by the first operation, the piece of work is then polished on or by another abrasive wheel or belt having a finer grit and sometimes several subsequent operations on wheels or belts of successively finer grits are employed until a satisfactory finish is obtained. The theory back of this method of operation is that each successive wheel or belt will remove an amount of metal equal to the depth of the scratches produced by the prior operation and in so doing produces new and finer scratches which in turn are to be removed by further subsequent operations. For most metal polishing, three abrasive operations are satisfactory, although some parts may require six or seven operations with successively finer grits of abrasion.

During experimental work with my improved polishing machine I have found that different degrees of surface finish can be obtained by varying the amount of mechanical contact pressure between the piece of work and the abrasive belt. For instance, when using a certain type of abrasive belt, if a high pressure was exerted between the belt and the piece of work to be polished, a relatively coarse type of surface finish was obtained and if a medium pressure was used a finer surface finish was obtained, and if a very light pressure was used a still finer type of surface finish was obtained. That this should be so may be clear when it is considered that the type or kind of finish obtained depends on the depth of scratches produced by the abrasive belt and that the depth of the scratches depends not only on the grade or fineness of the grit employed, but also upon the amount of mechanical pressure with which such grits are forced into contact with the piece of work being polished. By controlling the amount of pressure backing up the floating work wheel, the degree of polishing finish can thus be regulated.

I have shown in Fig. 4 an endless work conveyor belt 105, the upper reach or span of which travels from left to right over two pulleys 107 and 109. Platforms 111 and 113 are provided, one at the left hand end of base 73 and the other at the right hand end of base 73, for reception and discharge respectively of the individual pieces of work to be polished.

Referring now to Fig. 6 of the drawings, I have there shown the three work wheels 79, 81 and 83 as being so constructed that they will inherently have different degrees of hardness. Thus work wheel 79 may be so designed and constructed that it will be relatively hard. Work wheel 81 may be so constructed that it will be of medium hardness, and work wheel 83 may be so constructed that it will be of minimum hardness, or soft.

The use of a spring-biased floating mounting for a work wheel, particularly on a manual type of polishing machine, insures that the mechanical pressure between the part or work to be polished and an abrasive or polishing belt is approximately constant and when employed in a non-automatic machine is independent of manipulation of a piece of work by the operator. The use of work wheels having relatively soft and resilient composition permits of yielding of the work wheel to the pressure of the work, permitting curved or irregular shaped surfaces of the work piece to sink into the body of the work wheel causing a pliable abrasive belt to envelope the surface of the work and closely hug the contour of the piece being polished.

This permits of obtaining a more uniform finish even when employing unskilled operators, than has hitherto been obtained by skilled operators when using conventional sanding or polishing wheels. Thus, for instance, when flat surfaces are polished on a conventional sanding wheel the amount of pressure exerted by the operator on the work is extremely critical, too much pressure causing the abrasive grits to dig into the surface of the work and produce deep scratches. In my improved polishing machine the chance of exerting too much pressure has been entirely eliminated by the method of mounting the work wheel on a spring-biased floating slide so that the mechanical pressure between the work and the abrasive belt will remain substantially constant regardless of the manipulations and inadvertent movements of the operator.

Thus, referring to Figs. 1 to 3 of the drawings, the operator need only start in with light tension or pressure of the abrasive belt and try out the pressure, increasing it in case it is not enough. He can do no damage to the work with too little pressure but will only have to repeat, with slightly increased pressure, his polishing of the work. After he has once determined the proper amount of pressure to be exerted by the kind of work wheel he has in his machine he can then continue and will obtain substantially the same results until wearing out of the abrasive belt occurs.

The work wheel thus floats under substantially constant pressure against the abrasive belt and to obtain the same kind of finish during successive operations it is necessary only for the operator to exert sufficient pressure on the work piece to make the work wheel float. Slight inadvertent movements of the polisher's arms and hands during the actual polishing operation are thus unimportant as the chances of exerting too

much pressure with the resulting deep scratches are entirely eliminated.

Referring to Figs. 4 to 6 inclusive, the piece of work 103 is first brought into pressure contact with the abrading surface of the belt just ahead of and below work wheel 79 and since work wheel 79 engages belt 101 with the greatest mechanical pressure the deeper die marks or surface scratches are removed first. After that it again makes contact with the abrasive belt at the second work wheel 81 where a slightly finer polishing finish is obtained because of the smaller pressure exerted by the work wheel on the part being polished. A still finer and final polishing is imparted to the work by work wheel 83 because of the fact that the spring tension on work wheel 83 is much less than that on the preceding work wheels.

To obtain various finishes the individual work wheels may also be made of different degrees of hardness, the first one being hard, the second being medium hard, and the third may be extremely soft. A combination of wheels of various hardnesses and different spring pressures also results in different types of finishes.

While I have shown three work wheels I do not desire to be limited thereto, the number of work wheels being made adjustable particularly when an endless conveying belt 105 is used to cause movement of the pieces of work past the different work wheels.

Depending on the type of finish desired, different grades of abrasive belts may be used. Thus, for instance, a first abrasive may be very coarse, or a belt having a finer grade of abrasive may be used, or a still finer grade of abrasive may be used.

Various modifications may be made in the device embodying my invention without departing from the spirit and scope thereof, and all such modifications coming within the appended claims are to be considered a part of my invention.

I claim as my invention:

1. An automatic polishing machine comprising

in combination, an endless polishing belt, a plurality of belt-backing work wheels supported in contact with the inside surface of said belt, each said wheel being separately movable toward and away from the belt, means for moving a piece of work along said belt past each of said work wheels in succession, and biasing means for pressing said work wheels against said inside surface of said belt, said means being adjusted to urge each said work wheel against said belt with a greater force than the work wheel succeeding it in the direction of travel of a work piece.

2. The combination of claim 1 wherein each said work wheel is harder than the one succeeding it in said direction of travel of a work piece.

FRITZ E. HENDRICKSON.

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