

April 30, 1940.

B. F. FOWLER

2,199,069

SANDING MACHINE

Filed April 28, 1937

4 Sheets-Sheet 1

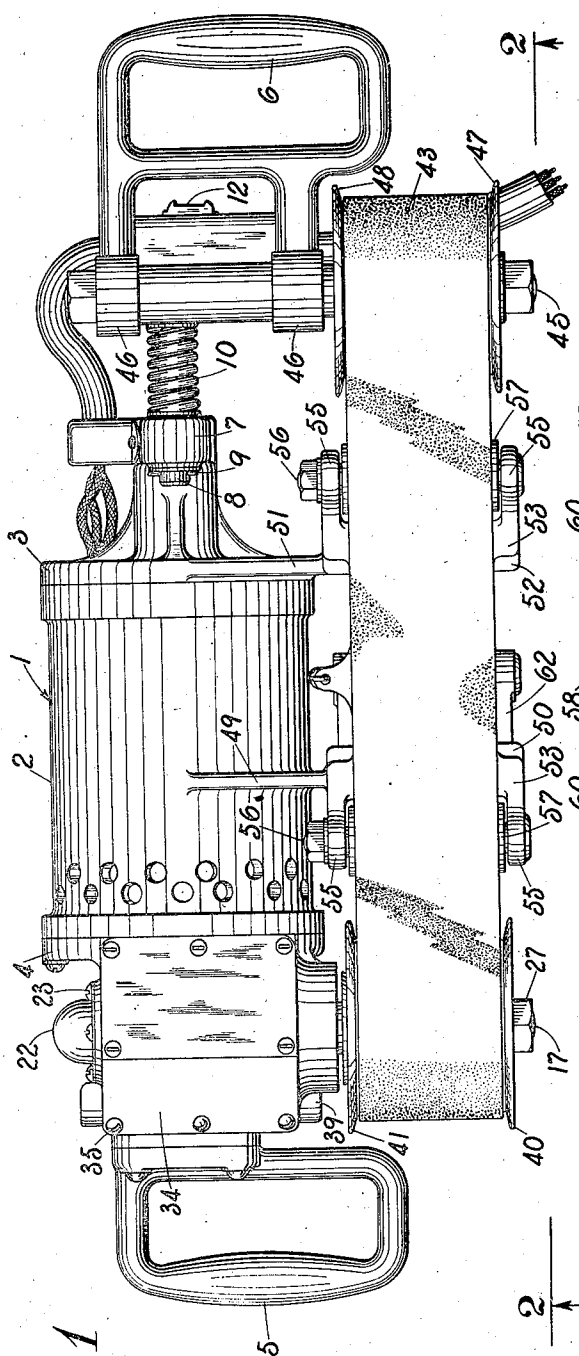


Fig. 1

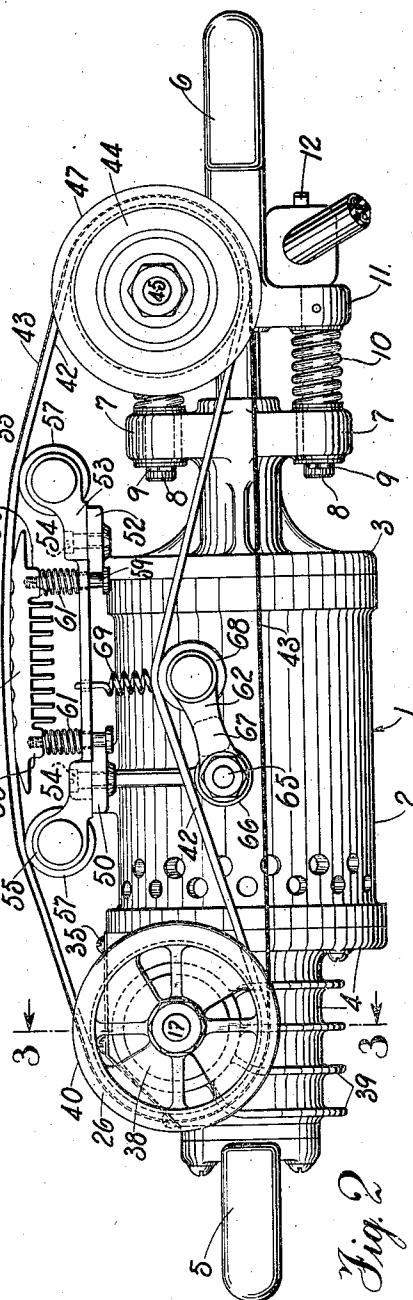


Fig. 2

INVENTOR.
Bert F. Fowler
BY
P. W. Ramsey
ATTORNEYS.

April 30, 1940.

B. F. FOWLER

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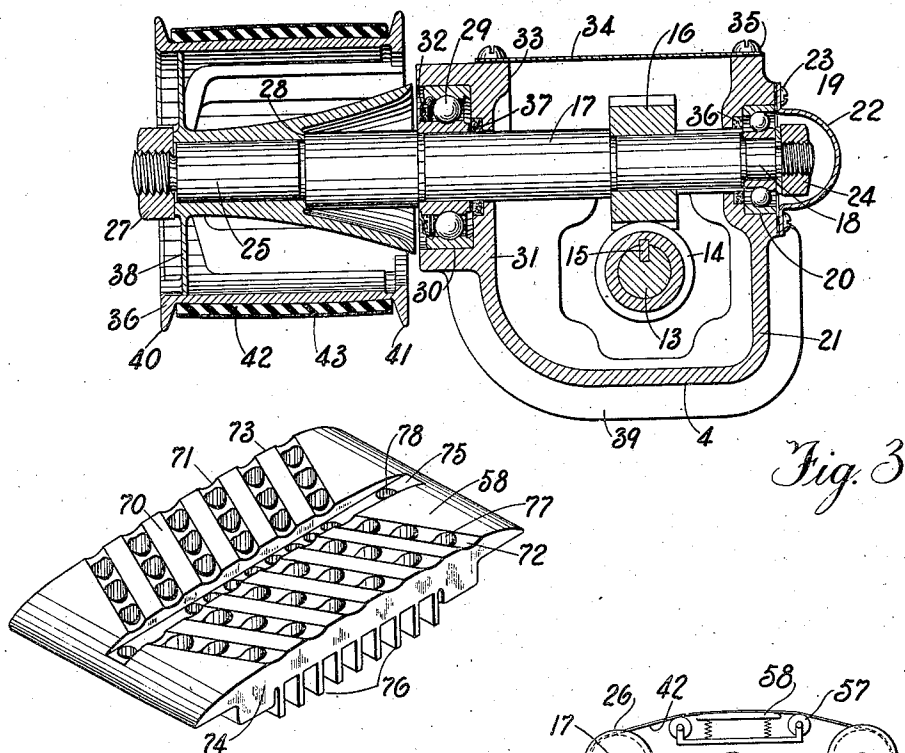


Fig. 3

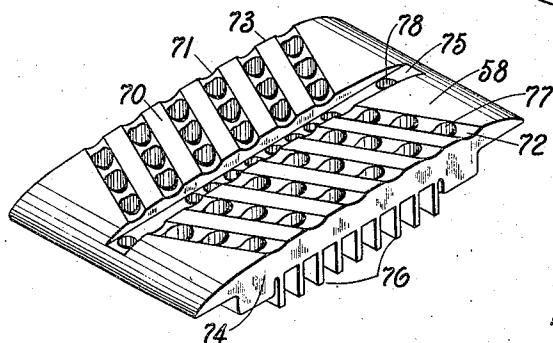


Fig. 8

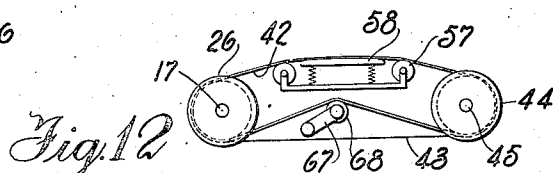


Fig. 12

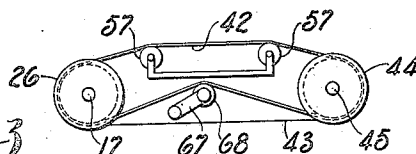


Fig. 13

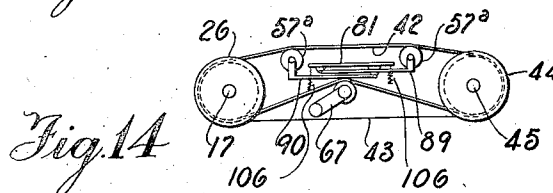


Fig. 14

INVENTOR.
Bert F. Fowler
BY
P. W. Ramsey
ATTORNEYS.

April 30, 1940.

B. F. FOWLER

2,199,069

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Fig. 4

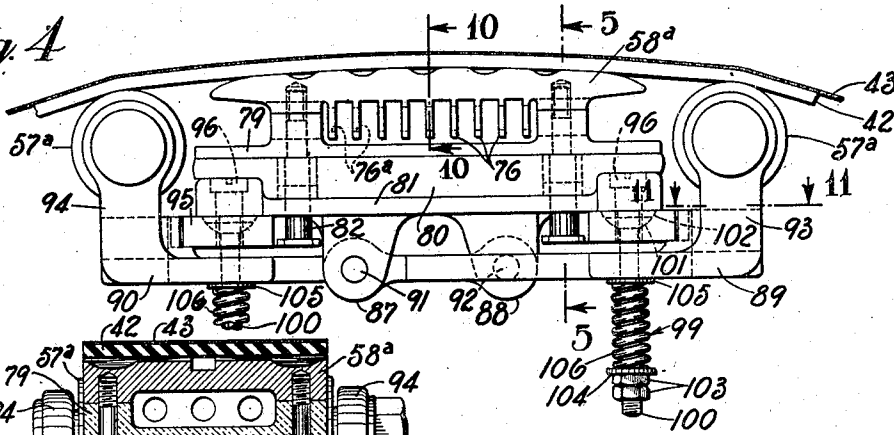


Fig. 5

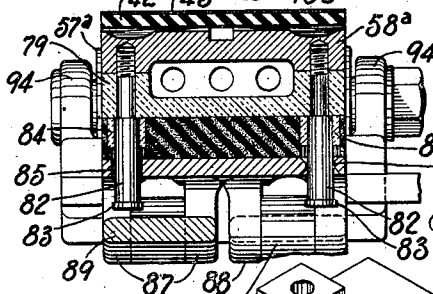


Fig. 9

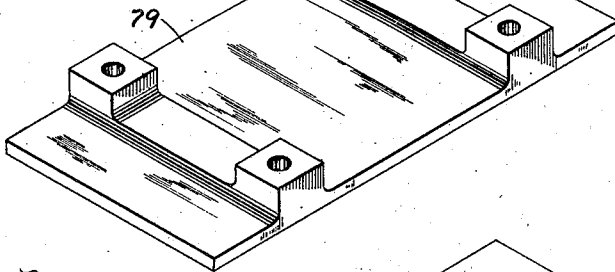


Fig. 6

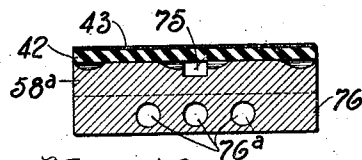


Fig. 10

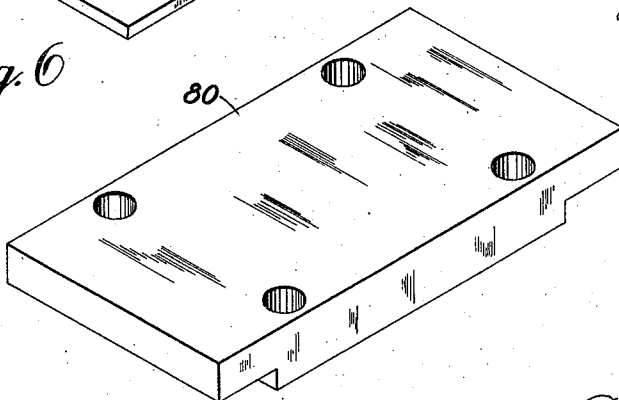


Fig. 7

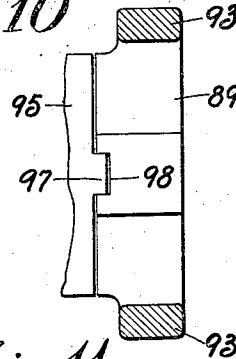


Fig. 11

INVENTOR.
Bert F. Fowler
BY P. M. Ramsey
ATTORNEYS.

April 30, 1940.

B. F. FOWLER

2,199,069

SANDING MACHINE

Filed April 28, 1937

4 Sheets-Sheet 4



INVENTOR.

Bert F. Fowler
BY *P. W. Ramsey*
ATTORNEYS.

BY

ATTORNEYS.

UNITED STATES PATENT OFFICE

2,199,069

SANDING MACHINE

Bert F. Fowler, South Bend, Ind.

Application April 28, 1937, Serial No. 139,406

14 Claims. (Cl. 51—170)

This invention relates to sanding machines and more particularly to portable sanding machines.

Briefly, and in general terms, the invention relates to a portable sanding machine including a body or supporting structure, driving means, a driving belt, a sanding belt, driving and driven pulleys, an improved shoe or pressure plate for engagement with the inner surface of the driving belt, novel means for yieldingly and universally supporting said shoe, and a novel use and arrangement of auxiliary rollers adapted to guide and support said driving and sanding belts.

The present invention is susceptible of a great many uses, but is particularly well adapted for use in economically finishing curved or convex surfaces such as are found, for example, on the metal bodies of automobiles.

Portable sanding machines have been used heretofore for finishing automobile bodies to supplant the comparatively crude method of finishing by hand-filling, a method which essentially increases production costs. However, prior sanding machines have been found to be inefficient because they are constructed with a shoe that is rigidly mounted with respect to the body or supporting structure and the number of practical uses to which such sanding machines might be put is thereby inherently limited.

One disadvantage of the use of the prior sanding machines having a rigid shoe is that it is difficult to apply a uniform pressure to the effective working area of the sanding belt and, therefore, the quality of finish obtainable is dependent upon the skill with which the operator applies the machine. Obviously, the degree of skill required increases with the softness of the surface worked upon. Thus, any uneven application of pressure upon the driving and the sanding belts by means of the rigid shoe results in more rapid removal of material from the surface worked upon at the high pressure points of contact and, hence, a uniformly smooth surface is not easily attainable.

Another disadvantage of the prior rigid-shoe type of sanding machines is that they are not adapted for expeditiously finishing curved or convex surfaces and, therefore, require still greater skill upon the part of the operator to make a neat job of such surfaces.

Still another disadvantage of the rigid-shoe sanding machines is that, even in the hands of a skillful operator, the care required to produce satisfactory finishes consumes considerable time and such consummation of time increases production costs.

The present invention is designed to overcome

the above defects and disadvantages of prior sanding machines by providing a machine which requires a minimum of skill to operate and which is adapted to quickly and expeditiously finish flat and curved or convex surfaces with equal facility and at low cost. The above desirable results are primarily obtained by constructing a sanding machine with a shoe or pressure plate that is capable of automatically adjusting itself into alignment with the surface being finished. The finishing of convex surfaces is greatly facilitated by the provision of yieldable mounting means for the shoe. Such shoe-mounting means may be used in combination with relatively rigid, or relatively yieldable, auxiliary rollers. Satisfactory finishes on convex surfaces, and particularly convex surfaces of relatively small radius, can be obtained by removing, or omitting, the pressure shoe and the means which yieldably supports the same. With the pressure plate removed, it will be clear that the auxiliary rollers engage and support the driving belt and its associated sanding belt and permit inward flexing of said belts to conform to the curvature of the surface being finished.

The invention contemplates numerous ways for mounting the above shoe or pressure plate so that it may universally tilt and align itself relative to the surface being finished, and for the purposes of illustration I have shown three ways for mounting said plate, employing resilient or yieldable springs, a resilient or yieldable pad, and fluid or hydraulic means, respectively. Other and equivalent means may obviously be employed to accomplish the same results and it will, therefore, be understood that the shoe-mounting means disclosed herein are to be considered as illustrative only. It will also be understood that yieldably supported rollers may be used in the forms of the invention in which I have shown fixed rollers, and vice versa.

The principal object of the present invention is to provide a portable sanding machine which is small in size, light in weight, easy to operate or manipulate and capable of doing a greater number of operations in the art of surface finishing than has been possible with previous devices of the same general class.

Another object of the invention is to provide a sanding machine which can be used to expeditiously and economically finish flat and curved or convex surfaces.

Another object of the invention is to provide a sanding machine construction in which the shoe or pressure plate is supported so as to be

capable of urging a sanding belt into engagement with a surface to be finished with a substantially uniform pressure throughout the effective working area of said belt.

8 Still another object of the invention is to provide a sanding machine construction in which the sanding belt can flex to conform itself to the contour of the surface being sanded.

10 A further object of the invention is to provide a sanding machine construction in which the shoe or pressure plate is substantially universally supported and adapted to automatically align itself with the surface being sanded.

15 A still further object of the invention is to provide a shoe or pressure plate for use in portable sanding machines adapted to quickly dissipate the heat generated by the frictional engagement thereof with the driving belt.

20 Other and still further objects of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which:

25 Fig. 1 is a plan view of a portable sanding machine made in accordance with this invention and disclosing one form of means for mounting the shoe or pressure plate upon the supporting frame or body of said machine;

30 Fig. 2 is an elevational view of the sanding machine of Fig. 1 viewed in a plane indicated by the line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 2;

35 Fig. 4 is an elevational view showing another form of means for mounting the shoe or pressure plate upon the supporting frame or body of a portable sanding machine;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4;

40 Fig. 6 is an isometric view showing a heat insulating pad for use with the mounting means shown in Fig. 4;

Fig. 7 is an isometric view showing a resilient pad for use with the mounting means shown in Fig. 4;

45 Fig. 8 is an isometric view of a shoe or pressure plate which may be used in the embodiments of the invention disclosed in Figs. 1 and 4;

50 Fig. 9 is an isometric view of a heat insulating spacer designed for use with the shoe-mounting means shown in Fig. 4;

Fig. 10 is a transverse sectional view through the shoe or pressure plate taken on the line 10—10 of Fig. 4;

55 Fig. 11 is a detail view of the means provided on the supporting frame for preventing the auxiliary rollers from getting out of alignment with the driving and sanding belts;

Fig. 12 is a diagrammatic view of the form of invention disclosed in Figs. 1, 2 and 3;

60 Fig. 13 is a diagrammatic view of the form of invention shown in Figs. 1, 2 and 3 but with the shoe or pressure plate omitted to facilitate finishing of convex surfaces of small radius;

65 Fig. 14 is a diagrammatic view of the form of the invention shown in Fig. 4 but with the shoe or pressure plate omitted to facilitate finishing of convex surfaces of relatively large radius;

70 Fig. 15 illustrates a third form of mounting for the shoe which includes fluid means for universally supporting said shoe;

Fig. 16 is a horizontal sectional view taken upon the line 16—16 of Fig. 15; and

Fig. 17 is a vertical sectional view taken upon the line 17—17 of Fig. 15.

75 Referring now more particularly to Figs. 1, 2

and 3 of the drawings, the main body or the supporting structure for the various elements comprising the sanding machine constituting the present invention is generally indicated by the numeral 1. Said body comprises a motor casing 2 containing a motor, a combined closure plate and bracket 3 secured to one end of said motor casing, and a reduction gear housing 4 secured to the opposite end of said casing. A handle 5 is secured to the reduction gear housing 4 and is adapted to be gripped by one hand of the operator when the machine is in use. A second handle 6, adapted to be gripped by the other hand of the operator, is carried by lateral extensions 7 of the bracket 3. The handle 6 is supported relatively to the extensions 7 by means of a pair of substantially parallel pins 8 passing through said extensions. Cotter pins 9 extend through the ends of the pins 8 adjacent the extensions 7 and a coil compression spring 10 surrounds each of said pins, said springs being interposed between the extensions 7 and lugs 11 projecting laterally from the handle 6. With the above in mind, it will be clear from Fig. 2 that the handle 6 may be moved axially with respect to the motor casing 2 by compressing the springs 10 to facilitate removal of the sanding belt as will be described hereinafter.

A switch 12 is conveniently located adjacent the handle 6 and is adapted to control the operation of the motor in the casing 2.

Referring now particularly to Fig. 3, the reduction gear housing 4 encloses one end of a motor drive shaft 13. Said drive shaft has a worm 14 secured thereto and a key 15 for driving said worm 14. The worm 14 meshes with a gear 16 which is secured to and driven by a key (not shown) on the drive shaft 17 extending transversely of the housing 4. One end of the driven shaft 17 has a reduced extension 18 adapted to extend through a ball bearing 19. Said ball bearing is disposed in a recess 20 formed in a side wall 21 of the reduction gear housing 4, and is retained in said recess by a cover or dust cap 22 secured to the wall 21 by screws 23. The reduced end 18 of the shaft 17 is prevented from moving longitudinally with respect to said ball bearing by means of a nut 24 threaded upon said end of said shaft.

The opposite end of the shaft 17 is also provided with a reduced extension 25 adapted to receive a driving pulley 26. Said driving pulley is maintained in assembled relation with the shaft 17 by means of a nut 27 which clamps said driving pulley against a shoulder 28 on said shaft.

The shaft 17 is supported intermediate its reduced ends by a ball bearing 29 seated in a recess 30 formed in a wall 31 of the reduction gear housing 4. The outer portion of said ball bearing is provided with a sealing means 32 to prevent foreign matter from gaining access to said ball bearing and oil from escaping from the housing through said bearing.

The housing 4 has an opening 33 covered by a closure plate 34 secured to said housing by screws 35. The ball bearings 19 and 29 have packing means 36 and 37, respectively, disposed at the inner sides thereof and in engagement with the shaft 17. Thus, the reduction gears 14 and 16 are disposed in a completely closed housing, and preferably run in oil.

The driving pulley 26 is provided with vanes 38 adapted to blow air against the reduction gear housing 4 to thereby cool the same. In order to facilitate cooling, said housing is provided with a

plurality of cooling fins 39. These fins are designed to conduct heat from the oil contained in the housing 4 to the exterior of said housing and to thereby dissipate the same by convection to the air and especially such air as is blown against said fins by the vanes 38 of said pulley.

The driving pulley 26 is further provided with radially extending flanges 40 and 41 adapted to receive between them a driving belt 42, which is preferably made of some elastic material such as rubber, and a sanding belt 43 lying in superposed relationship to said driving belt.

A driven pulley 44 is rotatably supported upon a shaft 45 journaled in lugs 46 formed integral with the handle 6. The driven pulley 44 is also provided with radially extending flanges 47 and 48 adapted to receive between them the driving belt 42 and the sanding belt 43.

The motor casing 2 is provided with a transversely extending rib 49 which terminates in a plate 50. The bracket 3 carries a rib 51 disposed substantially parallel to the rib 49 and terminating in a plate 52 disposed in substantially the same plane as the plate 50. The rib 49 and plate 50, and the rib 51 and the plate 52, each constitute a bracket adapted to support a base member for a pressure plate and/or auxiliary rollers. As shown in Fig. 2, a base member 53 is secured to the plates 50 and 52 by screws 54. The base member 53 carries a pair of ears 55 at opposite ends thereof adapted to receive shafts 56 carrying rollers 57. A depressible shoe or pressure plate 58 is disposed above the base member 53 and normally engages and supports the inner side of the driving belt 42. The rollers 57 are arranged at opposite ends of the shoe 58 and serve as auxiliary supports for the driving belt 42 and the sanding belt 43.

Four pins 59 are threaded at one end into said shoe 58; two in a lug 60 formed at each end of said shoe. A resilient compression spring 61 surrounds each of said pins 59 and is disposed between the lugs 60 and the base member 53. There is sufficient clearance between the pins 59 and the apertures in the base member 53 through which they pass to permit lateral and longitudinal, or universal tilting and movement of the shoe 58 relatively to the base member 53. Thus, it will be seen, that the shoe 58 may readily tilt and align itself with any surface against which the sanding belt is applied, and further, that said shoe 58 may yield relatively to said surface and move toward the base member 53 upon application of pressure sufficient to compress the springs 61.

In order to take up the excess slack in the driving belt 42, means 62 is provided to maintain said driving belt taut at all times. Said means comprises a stud 65 secured to a boss 66 of the motor casing 2, and a link 67 adapted to be pivotally mounted upon said stud. The link 67 carries an idler pulley 68 which engages an outer face of the driving belt 42. The link 67 has one end of a tension spring 69 connected thereto, and the other end of said spring is connected to the base member 53. It will be clear from an inspection of Fig. 2, that the tension spring 69 tends to draw the link 67 and the idler pulley 68 toward the base member 53 and thus applies pressure to the belt 42 to maintain the same taut to prevent slipping thereof. The driving belt 42 and the sanding belt 43 are maintained relatively taut by the action of the springs 10 upon the driven pulley 44.

The sanding belt 43 may be readily removed

from the pulleys 26 and 44 for replacement or any other purpose by moving the handle 6 toward the casing 2 thereby compressing the springs 10 and providing sufficient slack in said sanding belt to permit the same to be passed over the flanges of said pulleys.

The shoe or pressure plate 58 shown in Fig. 2 is illustrated in more detail in Fig. 8. Here, the means devised for cooling the shoe 58 by dissipation of the heat resulting from the friction of the driving belt thereagainst is more clearly shown. It will be seen that the outer face 70 of said shoe, which intimately or frictionally engages the under side of the driving belt 42, is provided with a series of angularly disposed grooves 71 and 72 extending inwardly from side faces 73 and 74 thereof to a longitudinally extending groove 75 disposed intermediate said side faces. The inner or under side of said shoe is provided with a plurality of substantially parallel cooling fins 76 adapted to increase the radiating surface of said shoe. The radiating surface is increased by the provision of vertical recesses 77 extending through said shoe between the fins 76 and into the grooves 71 and 72. Said radiating surface is further increased by the surface of recesses 78 extending through said shoe and into the longitudinal groove 75. The fins 76 may also be provided with apertures 76^a, as shown in Figs. 4, 5 and 6. Thus, it will be seen that the shoe 58 is so made as to present a maximum area of radiating surface which is conducive to cooler operation of the shoe and driving belt, and to a longer useful life of said belt.

Heat transfer from the shoe 58 to the remainder of the machine is materially reduced by spacing the body of the shoe away from the base member 53 by means of the compression springs 61. While some heat will be conducted to the base members 53 by the pins 59 and the springs 61, the quantity of heat so conducted is practically negligible.

While I have shown four pins 59 for substantially universally supporting the shoe 58, it will be understood that this number is not essential and that any other number of pins, more or less, which will support the shoe in the manner specified, is contemplated by this invention.

The sanding machine illustrated in Fig. 2 is particularly well adapted for finishing flat surfaces, and convex surfaces of a relatively large curvature. In order to adapt said sanding machine to finish convex surfaces of a smaller radius, it is only necessary to remove the pins 59 so that the shoe 58 may be disassembled to permit greater flexing of the belt inwardly intermediate the auxiliary rollers 57. For the purpose of convenience I have diagrammatically illustrated in Figs. 12 and 13, respectively, the two forms which the machine of Fig. 2 may take. Fig. 12 shows the shoe 58 in position, and Fig. 13 illustrates the same machine with the shoe and its resilient support removed. It will be obvious from the latter figure that the driving and sanding belts may readily flex inwardly relatively to the auxiliary rollers 57 to conform to the curvature of the surface being finished thereby.

Referring now to the form of the invention disclosed in Figs. 4, 5, 6, 7, 9, 10 and 11, a rigid shoe or belt surface engaging member 58^a is shown mounted upon a body of heat insulating material 79. Said body of heat insulating material is mounted directly above a slab 80 of yieldable or resilient material, such as rubber. Said slab of resilient material is in turn mounted

upon a base member 81 adapted to be secured to the body of a sanding machine by means of webs such as the plates 50 and 52 shown in Fig. 1.

The rigid, preferably metallic, shoe 58^a, the body of insulating material 79, the slab of resilient material 80, and the base member 81 are maintained in assembled relation by four pins 82 which have one end thereof threaded into the shoe 58^a and the opposite end provided with a head 83 which projects below the base member 81. Since the studs 82 will conduct a slight amount of heat from the shoe 58^a, it is desirable to protect the slab of resilient material 80 from said heat and this is accomplished by placing an insulating spacer 84 in the surrounding relationship with said studs at the points where they would otherwise contact said resilient material. Such spacer is specially illustrated in Fig. 9.

As shown in Fig. 5, the pins 82 may be fitted with considerable clearance in the apertures 85 in the base member 81 through which they pass. Such clearance will obviously permit depression and universal tilting of the shoe 58^a relative to the base member 81. However, in order to permit a greater degree of relative tilting than could be obtained with plain circular apertures of uniform diameter, the apertures may be beveled at opposite ends thereof as indicated at 86.

The auxiliary rollers 57^a shown in Fig. 4, instead of being mounted in fixed relation to the base member as in Fig. 2, are so mounted that they can move relatively to the body of the machine and also relatively to the shoe 58^a. In order to permit such movement, the base member 81 is provided with two pairs of projecting lugs 87 and 88, respectively, adapted to receive and pivotally support one end of arms 89 and 90, respectively. The arm 89 is pivotally mounted in the lugs 87 by means of a pin 91, and the arm 90 is pivotally mounted with respect to the lugs 88 by means of a pin 92. The opposite end of the arm 89 carries projections 93 adapted to rotatably support one of the auxiliary rollers 57^a, and the opposite end of the arm 90 is provided with similar means 94 for supporting the other auxiliary roller.

Plates 95 are secured to each end of the base member 81 by means of screws 96. Each plate 95, as best illustrated in Fig. 11, is provided with a projection 97 adapted to be received in a recess 98 formed in the arm 89. It will be understood that the arm 90 is also provided with a recess 98 adapted to receive a projection 97. The purpose of said projections and recesses is to prevent transverse movement of the arms 89 and 90 relatively to the plates 95 and the base member 81. By reason of the above arrangement, the auxiliary rollers 57^a will at all times be maintained in alignment with the driving belt 42 and the sanding belt 43.

In order to maintain the auxiliary rollers 57^a in contact with the driving belt 42, and at the same time to permit yielding of said rollers relatively to the shoe 58^a, supporting means generally designated 99 is provided. Said means comprises four bolts 100, a pair of said bolts being adapted to pass through each of said plates 95 and through one of the arms 89 and 90. One end of said bolts is provided with a head 101 adapted to seat in a substantially semi-spherical recess 102 formed in the plates 95. The purpose of a recess of such shape is to permit swiveling of the bolts 100 relatively to the plates 95. The

opposite ends of said bolts 100 are threaded and each bolt is adapted to receive adjusting nuts 103 and washers 104 and 105. The washer 105 is adapted to engage the under side of the arms and a compression spring 106 is adapted to be mounted upon each of said bolts between the washers 104 and 105.

It will be clear from the above described construction that in finishing a surface, pressural application of the driving and sanding belts against said surface at the zone directly in line with one of the auxiliary rollers 57^a, will cause said roller to move inwardly by reason of the fact that the arm carrying the same is pivotally mounted and can move inwardly as is obvious from Fig. 4. Upon such movement of either of the arms 89 or 90, the bolts 100 will swivel slightly in their sockets 102 and the compression springs 106 will be compressed in accordance with the pressure applied to, or the amount of yield of, said auxiliary rollers. When the machine is withdrawn from the work, the pressure on the belts is relieved and the arm 89 and/or 90 and the associated roller or rollers will be automatically returned to their initial position by the action of the springs 106.

In order to increase the utility of the form of the invention shown in Fig. 4, the bolts 82, the shoe 58^a, the insulating body 79 and the slab of resilient material 80 may be removed from the base member 81 to permit the driving and driven belts to flex inwardly to a comparatively greater degree between the auxiliary rollers 57^a. Upon removal of the above specified parts, it will be clear that the driving and sanding belts can flex and conform themselves to a convex surface of a relatively large radius, and that upon inward yielding of the auxiliary rollers 57^a still larger convex surface can be accommodated.

The embodiment of the invention shown in Fig. 4, but with the shoe 58^a and the resilient supporting means therefor removed is diagrammatically illustrated in Fig. 14.

Referring now to Figs. 15, 16 and 17, which disclose a third means for universally mounting a shoe or pressure plate 58^b, it will be noted a base member 81^b is shown adapted to be secured to the body of a sanding machine by means of plates such as the plates 50 and 52, illustrated in Fig. 1. The base member 81^b carries relatively rigid arms 107 designed to rotatably support auxiliary rollers 57^b.

The base member 81^b is provided with a laterally extending boss 108 providing a horizontal bore 109 open at one end 110 and reduced and closed at the opposite end thereof as indicated at 111. The reduced end 111 communicates with angularly disposed passageways 112, each of which passageways opens into a vertical bore 113. As best illustrated in Fig. 16, there are four passageways 112 and four cylindrical bores 113. Each of the bores 113 is adapted to receive a slidable plunger 114.

The angular passageways 112 are preferably formed by drilling through the base member 81^b at a point adjacent the lower end of the vertical bores 113. The inner ends of the passageways 112, as has already been stated, open into the reduced bore 111, and the outer ends of said passageways are each closed by a plug in the form of a screw 115.

The plungers 114 are of such length that they extend beyond the open ends of the vertical bores 113, and preferably terminate in a ball end 116.

The periphery of said plungers is packed by means of a packing element 117 secured in place by a packing retaining ring 118. The ball ends 116 of the plungers 114 are adapted to be received in substantially semi-spherical sockets 119 formed in lugs 120 depending from the shoe 58^b. Dust and other foreign material is prevented from settling upon the plungers 114 by collapsible diaphragms 121 surrounding each of said plungers. One end of said diaphragms is secured to the packing retaining rings 118 and the opposite end thereof is secured to the lugs 120. Said diaphragms, in addition to keeping the plungers clean, also serve to prevent inadvertent expulsion of the plungers 114 from the bores 113, as when the pressure on the shoe 58^b from the tension of the driving belt is relieved, or said belt is removed from the driving and driven pulleys.

It will be clear from the foregoing that with proper clearances, the ball and socket supports for the shoe 58^b provide means whereby the shoe 58^b can tilt universally, or in other words either longitudinally or transversely or in both directions simultaneously, with respect to the base member 31^b.

The horizontal bore 109 contains a piston 122 having a cup packing 123 secured to one face thereof by a screw 124. The opposite face of said piston is preferably cut away to form a recess 125 adapted to receive one end of a compression spring 126.

The open end 110 of the cylindrical bore 109 is closed by a hexagonal-shaped cap 127. Said cap is provided with a threaded aperture 128 adapted to receive an adjusting screw 129. One end of said adjusting screw terminates in a cone-shaped cap 127. Said cap is provided with a threaded aperture 128 adapted to receive an adjusting screw 129. One end of said adjusting screw terminates in a cone-shaped portion 130 which projects into one end of the compression spring 126; the other end of said spring being seated in the recess 125 of the piston 122. The opposite end of said adjusting screw, as best shown in Fig. 16, is provided with a slot 131 adapted to receive a screw driver (not shown) for adjusting the same. A lock nut 132 is threaded upon the adjusting screw 129 and is adapted to lock said screw in any desired position of adjustment by jamming against the cap 127.

The horizontal bore 109, the reduced extension 111 thereof, the passageways 112 and the vertical bores 113 contain a fluid, not shown in the drawings, which is adapted to hydraulically support the plungers 114; the fluid in the bore 109 being intended to be disposed upon that side of the piston 122 which carries the packing 123. Hence, it will be apparent that the plungers 114 may be adjusted to a desired vertical height in the vertical bores 113 by adjusting the position of the piston 122 in the horizontal bore 109, and that said piston may be adjusted in said horizontal bore by turning the adjusting screw 129. It will also be apparent that such adjustment is not permanent or inflexible and that the plungers 114 may move either up or down in the bores 113 independently of each other and in a more or less resilient manner by reason of the fact that the piston 122 is not fixedly adjusted but is backed by a resilient spring 126, the adjusted compression of which may be increased by any fluid forced back and out of the vertical bores 113 and into the bore 109, as by downward movement of said plunger; or the compression of said

spring may be relieved as by an outward movement of said plungers.

By providing spaced pulleys, one of which is resiliently supported by means which tend to exert a force moving the pulleys apart, and passing an endless driving belt 42 around these pulleys, which belt is held out of its normal path between the pulleys by an idler roll 68, and a sanding belt 43 which takes the direct path between the pulleys, certain very desirable results are achieved. In sanding machines of the type described which are used in modern high speed production a serious problem is encountered in the dissipation of heat generated by friction of the sanding belt upon the surface being worked upon and upon the supporting members of the machine. In some cases the heat may be so high that the adhesive used to adhere the abrasive to the belt is softened and the abrasive comes off the backing. By providing means for spacing the relatively thin abrasive carrying belt 43 from the driving belt 42 on one side of a common center line of the supporting pulleys, the sanding belt 43 is cooled because of the free circulation of air on all sides thereof. In like manner the driving belt is also subjected to substantial cooling of the portion thereof which is engaged by the idler roll 68. Furthermore, in my apparatus the driving belt 42 is longer than the sanding or abrasive belt 43 and, due to the action of the idler roll 68, the driving belt engages the driving and driven pulleys 26 and 44 over a greater part of their circumference than does the sanding belt 43. Thus, the possibility of slipping of the driving pulley 26 may be reduced.

By providing a resilient connection between the handle 6 and the members which support the driven roller 44 the spring 10 tends to maintain the sanding belt 43 under the proper tension while the idler roll 68 with its spring support maintains the driving belt 42 under the desired tension. As is clearly seen in Figure 2 the sanding belt 43 is spaced entirely away from the driving belt 42 for substantially the center to center distance between the pulleys 26 and 44 on one side of a common center line drawn between these pulleys. By causing the driving and sanding belts to be moved outwardly away from the common center line of the pulleys on the opposite side thereof by the universally movable shoe and roller arrangements, the use of the device in finishing curved or difficultly accessible surfaces is greatly facilitated.

While I have shown my invention embodied in several forms, it will be understood that numerous changes may be made therein without departing from the spirit of the invention or from the scope of the annexed claims.

What I claim is:

1. In a surface finishing machine, a body, a belt, pulley means operatively supporting said belt relative to said body, means for driving said pulley means, a supporting shoe adapted to contact said belt and mounted so that it can tilt transversely with respect to the normal plane of said belt, auxiliary belt supporting rollers and means for supporting said rollers for independent movement toward and away from said body.

2. In a surface finishing machine, a body, driving and driven pulleys operatively arranged relatively to said body, a belt in engagement with said pulleys, a supporting shoe adapted to contact said belt and arranged for universal tilting movement relative to said belt, an auxiliary belt supporting roller adjacent said tilting belt con-

tacting means, and a pivoted support for said roller permitting movement of said roller toward and away from said body.

3. A surface finishing machine of the type described including a body, a belt, pulley means operatively supporting said belt relatively to said body, pressure shoe means yieldably supporting said belt intermediate said pulley means, and auxiliary yieldingly mounted means engaging and supporting said belt adjacent said yieldable pressure shoe.

4. A surface finishing machine of the type described including a body, a belt, pulley means operatively supporting said belt relatively to said body, and a plurality of elements supporting said belt intermediate said pulley means, said elements including spaced apart rollers and a universally movable rigid surfaced pressure shoe between said rollers, the belt engaging portion of said rollers being below at least a portion of the belt engaging surface of said pressure shoe.

5. A surface finishing machine of the type described including a body, driving and driven pulleys operatively arranged relatively to said body, a belt in engagement with said pulleys, a shoe adapted to be in frictional engagement with said belt, means supporting said shoe, independently movable brackets supported by said body, and a pair of rollers mounted on said brackets and arranged adjacent the opposite ends of said shoe and constituting auxiliary supporting means for said belt.

6. In a sanding machine having an endless belt, a pair of spaced pulleys for supporting said belt and a pressure member adapted to engage the inner surface of said belt, said pressure member being adapted to permit universal movement of the portion of the belt engaged thereby and comprising a rubber or the like body and a rigid face or surface member adapted to contact the belt.

7. In a sanding machine having an endless belt, a pair of spaced pulleys for supporting said belt and a pressure member adapted to engage the inner surface of said belt, said pressure member being adapted to permit universal movement of the portion of the belt engaged thereby and comprising a rubber or the like body, a rigid face or surface member adapted to contact the belt and a heat insulating material member between said rubber body and rigid contact face.

8. In a sanding machine, a body, a belt, driving and driven pulleys engaging said belt and operatively supporting same relative to said body, a pair of spaced arms each pivotally mounted on said body, rollers carried by said arms, resilient means tending to move said rollers into engagement with the inner surface of said belt and means for limiting the movement of each of said rollers toward said belt independently of the other roller.

9. In a sanding machine, a body, a belt, pulleys engaging said belt and operatively supporting same relative to said body, spaced arms pivotally mounted on said body, rollers carried by said

arms, resilient means tending to move said rollers into engagement with the inner surface of said belt, means for limiting the movement of said rollers toward said belt and a resiliently supported pressure shoe member between said rollers.

10. In a sanding machine, a body, a belt, pulleys engaging said belt and operatively supporting same, spaced arms pivotally mounted on said body, rollers carried by said arms, resilient means tending to move said rollers into engagement with the inner surface of said belt, means for limiting the movement of said rollers toward said belt and a pressure shoe member between said rollers, said pressure shoe having a rigid belt engaging surface supported to permit substantially universal movement of the portion of the belt engaged thereby.

11. A surface finishing machine of the type described including a body, a driving belt, a surface finishing belt overlying said driving belt, pulley means operatively supporting said driving belt relative to said body, means for driving said pulley means, belt backing-up means adapted to contact said driving belt and mounted so that it can tilt transversely to the normal plane of said belt, auxiliary belt supporting rollers, and means for supporting said rollers for independent movement toward and away from said body.

12. A surface finishing machine of the type described including a body, driving and driven pulleys operatively arranged relative to said body, a driving belt in engagement with said pulleys, a surface finishing belt, a belt supporting shoe adapted to contact said driving belt and arranged for substantially universal tilting movement relative to said driving belt, an auxiliary belt supporting roller adjacent said tilting belt contacting shoe, and a pivoted support for said roller permitting movement of said roller toward and away from said body.

13. In a surface finishing machine of the type described, a body, spaced pulleys supported by said body, means for driving one of said pulleys, a driving belt in engagement with said pulleys, a surface finishing belt overlying said driving belt, a shoe adapted to be in engagement with said driving belt, means supporting said shoe, independently movable brackets supported by said body, and belt engaging means mounted on said brackets and arranged adjacent the opposite ends of said shoe and constituting auxiliary supporting means for said belts.

14. In a surface finishing machine, a body, a belt, pulleys carried by said body engaging said belt and operatively supporting same relative to said body, spaced arms pivotally mounted on said body, belt engaging members carried by said arms, resilient means tending to move said belt engaging means into engagement with the inner surface of said belt, and a resiliently supported pressure shoe member between said belt engaging means.

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