June 17, 1969

T. J. LEVEQUE

SANDING MACHINE

3,449,868

Filed Sept. 16, 1966

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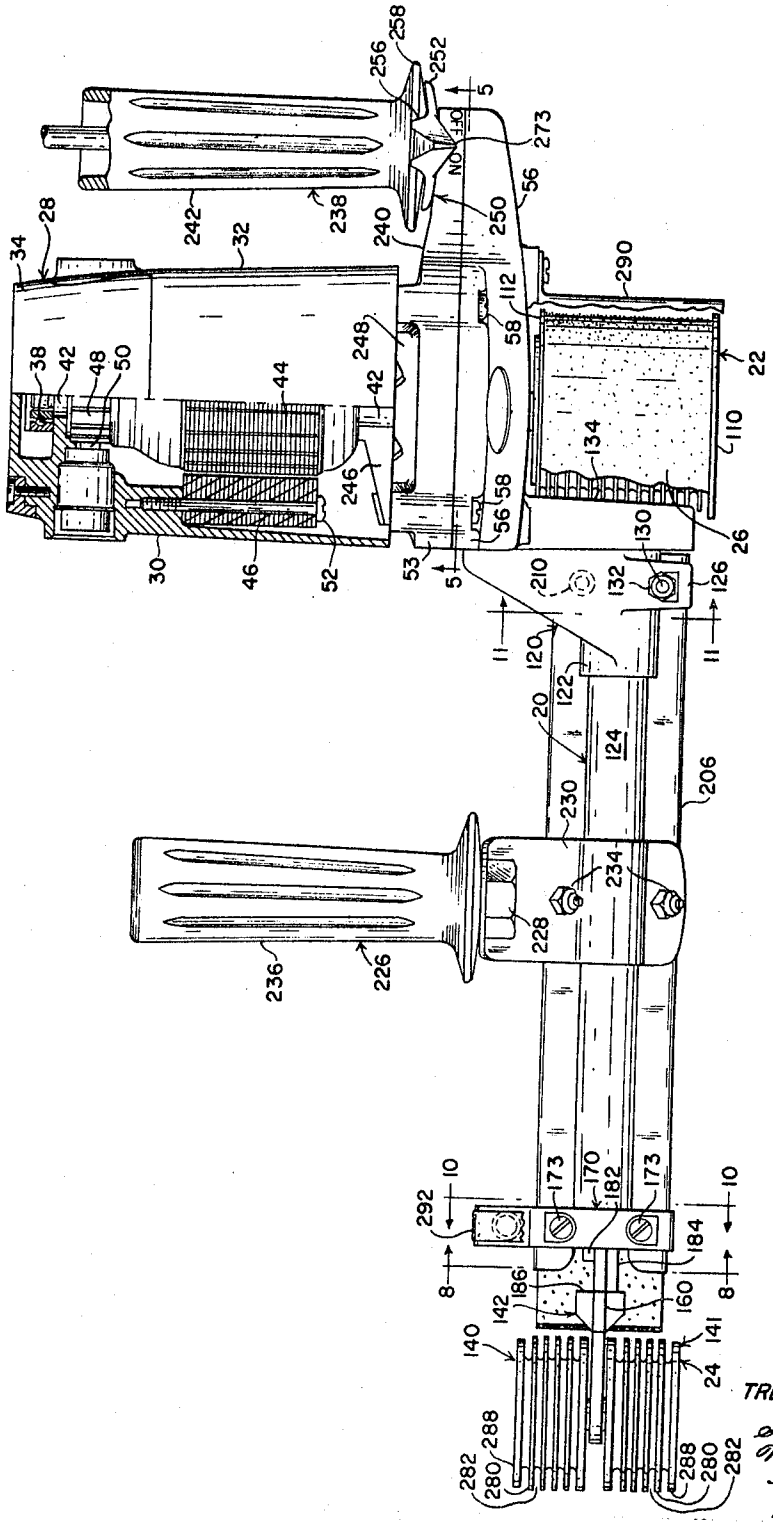


FIG. 1

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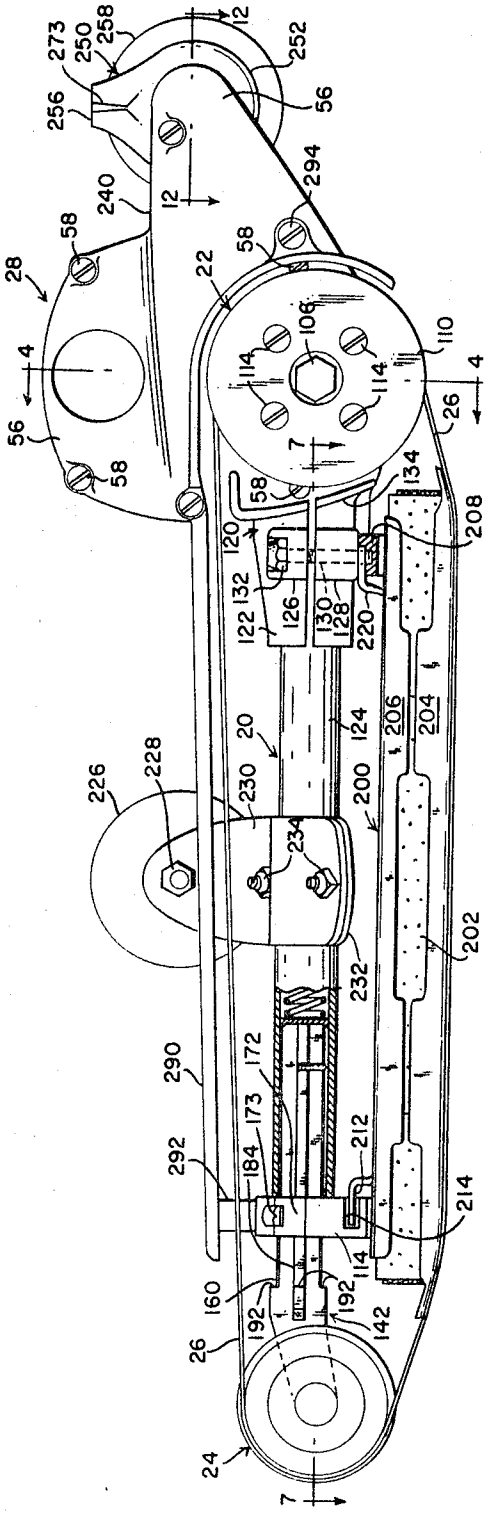


FIG. 2

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SANDING MACHINE

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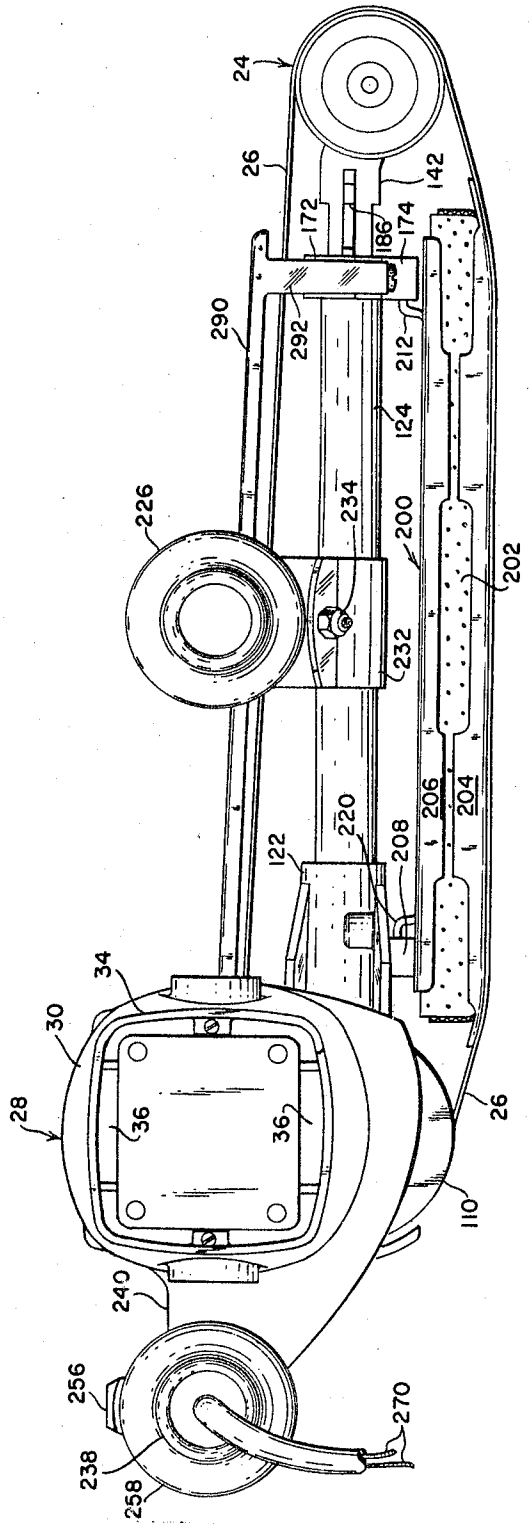


FIG. 3

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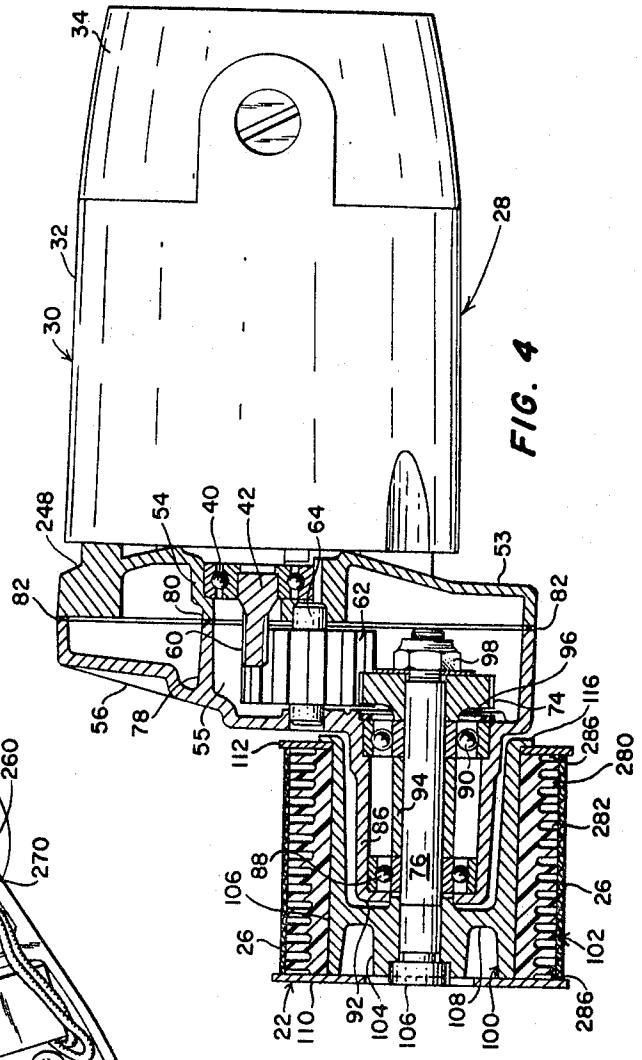


FIG. 4

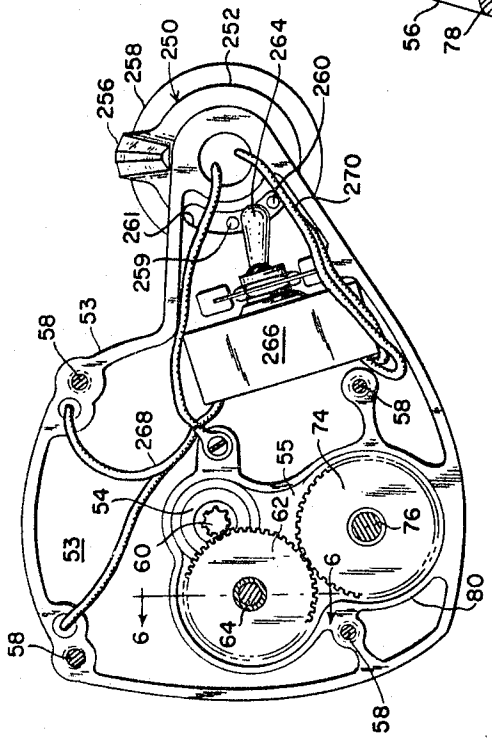


FIG. 5

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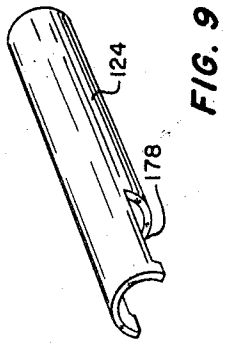


FIG. 9

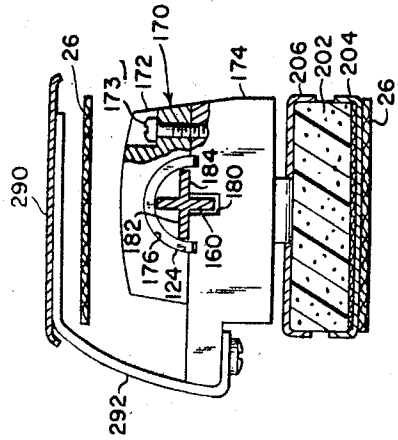


FIG. 8

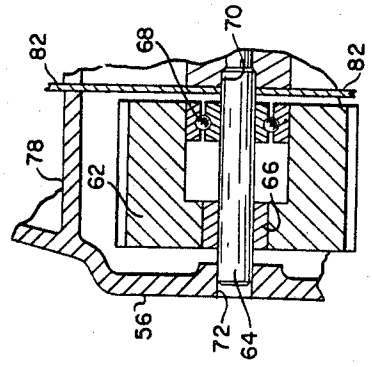


FIG. 6

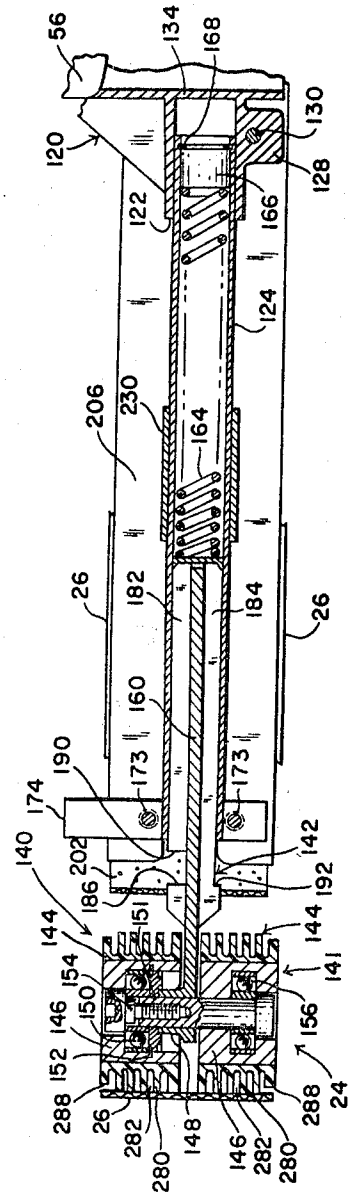


FIG. 7

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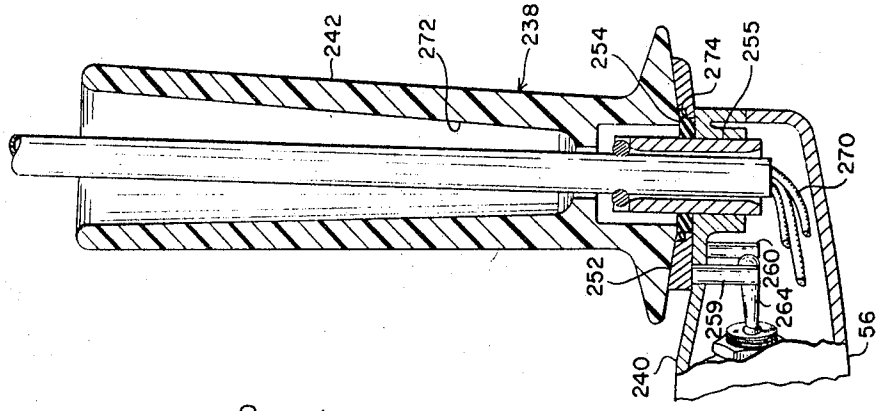


FIG. 12

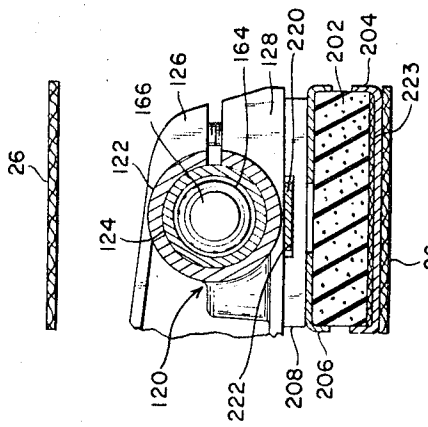


FIG. 11

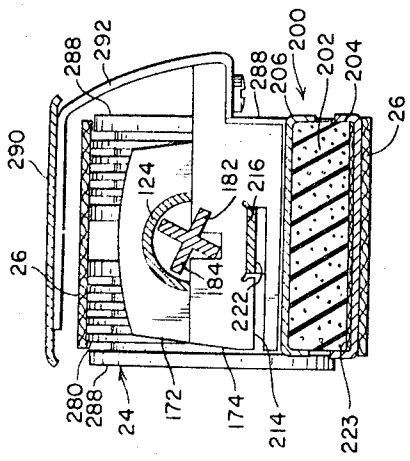


FIG. 10

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3,449,868

SANDING MACHINE

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Filed Sept. 16, 1966, Ser. No. 580,025
Int. Cl. B24b 21/00, 23/00
U.S. Cl. 51—141 7 Claims

ABSTRACT OF THE DISCLOSURE

A portable, bodily manipulatable, power, surface finishing machine having an endless surface-finishing belt trained around parallel spaced apart rollers and a motor mounted on a roller support frame and extending laterally from one side thereof in parallel relation with the rollers in the region of one roller to which it is drive connected. The motor is disposed in parallel spaced apart relation between two tool-manipulating handles which also extend laterally from the aforesaid side of the frame, with the axis of one handle being disposed rearwardly of the drive roller and the axis of the other handle extending between the two rollers to provide a balanced relationship with the motor.

This invention relates to power tools and particularly to improvements in portable surface-finishing machines of the traveling band type. The present invention is especially concerned with portable sanders and the like wherein a surface-finishing belt is trained around spaced apart motor driven and idler pulleys.

A major object of this invention is to provide an improved portable, power driven surface-finishing machine having a novel compact, balanced arrangement of parts which renders the machine easily manipulatable and especially adaptable for contour surface finishing work.

The arrangement of parts according to this invention provides a comfortable balance, easy manipulation of the machine, and an unblocked view of the workpiece surface. It also allows the operator to stand comfortably to one side of the machine and to hold his elbows close to his body for firmly guiding the machine. In addition, no part protrudes appreciably beyond the outboard edge of the belt to thus allow the belt to be guided into confined regions and corners. The machine of this invention thus is particularly suitable for finishing automobile body surfaces and the like.

A further object of this invention is to provide a belt-type surface-finishing machine with a novel back-up shoe or pressure platen assembly for supportingly engaging the inner surface of the workpiece engaging belt flight and thereby applying a uniform pressure to the effective working area of the belt. As more specific objects, this invention provides for a novel back-up shoe or platen which is quickly and easily removable and mountable in place, which allows increased flexibility of the working run of the belt to accommodate uneven workpiece contours, and which is compactly located together with a quick change mounting structure between opposed flights of the surface-finishing belt.

Yet another object of this invention is to provide a belt-type surface-finishing machine with a novel drive and idler pulley structure to insure proper tracking of the surface-finishing belt around the drive and idler pulleys and to minimize the belt wear occasioned by engagement of the belt edges with pulley flanges.

Further objects of this invention will appear as the description proceeds in connection with the appended claims and annexed drawings wherein:

FIGURE 1 is a partially sectioned top plan view of a portable belt sanding machine incorporating the principles of this invention;

FIGURES 2 and 3 respectively are front and rear elevations of the sanding machine shown in FIGURE 1;

FIGURE 4 is a section taken substantially along lines 4—4 of FIGURE 2;

FIGURE 5 is a section taken substantially along lines 5—5 of FIGURE 1;

FIGURE 6 is a section taken substantially along lines 6—6 of FIGURE 5;

FIGURE 7 is a section taken substantially along lines 7—7 of FIGURE 2;

FIGURE 8 is a section taken substantially along lines 8—8 of FIGURE 1;

FIGURE 9 is a perspective view of the pulley support tube shown in FIGURES 1 and 2;

FIGURE 10 is a section taken substantially along lines 10—10 of FIGURE 1;

FIGURE 11 is a section taken substantially along lines 11—11 of FIGURE 1; and

FIGURE 12 is a section taken substantially along lines 12—12 of FIGURE 2.

Referring now to the drawings and more particularly to FIGURES 1 and 2, the portable, power-operated sanding machine embodying the principles of this invention is shown to comprise a frame **20** which rotatably supports a power-driven pulley assembly **22** and an idler pulley assembly **24** spaced laterally forwardly from pulley assembly **22**. An endless, sanding belt **26** of suitable conventional form is trained around pulley assemblies **22** and **24** and has a lower, substantially straight flight for engaging workpieces to be surface-finished. An electric motor **28** is carried by frame **20** for driving pulley assembly **22** in a counterclockwise direction to advance the lower workpiece-engaging belt flight from left to right as viewed from FIGURE 2.

As shown in FIGURES 1–4, motor **28** comprises a housing **30** having a hollow, open-ended cylindrical section **32**. An end plate **34** mounted at the rearward end of section **32** defines a series of axially extending air inlet ports **36** as best shown in FIGURE 3.

As best shown in FIGURES 1 and 4, housing **30** mounts a pair of axially aligned, spaced apart anti-friction roller bearing assemblies **38** and **40** which journal a rotor shaft **42** extending coaxially through housing section **32**. A rotor **44** mounted on rotor shaft **42** between bearing assemblies **38** and **40** is circumferentially surrounded by a stator **46** and has a commutator section **48** engaged by carbon brushes **50** (one shown in FIGURE 1). Stator **46** is securely fixed to housing **32** by cap screws indicated at **52**.

As best shown in FIGURES 2 and 4, the forward end of housing section **32** is closed by an end plate **53** having a bored boss **54** which receives bearing **40**. The forward end of shaft **42** extends coaxially through boss **54** and into a gear compartment **55**.

Gear compartment **55**, as shown in FIGURES 4 and 5, is delimited by end plate **53** and a gear housing **56**. End plate **53** and housing section **32** are rigidly fixed to gear housing **56** by machine screws **58**.

Referring to FIGURES 4–6, the forward end of shaft **42** is axially splined at **60** to provide teeth which constantly mesh with a large diametered gear **62** in compartment **55**. Gear **62** is journalled on a shaft **64** by axially spaced apart bearings **66** and **68** (see FIGURE 6). The rearward end of shaft **64** is press-fitted into a bore **70** formed in end plate **53**. The opposite end of shaft **64** is slidably received in an aligning hole **72** bored through gear housing **56**.

With continuing reference to FIGURES 4 and 5, gear **62** constantly meshes with a gear **74** which is non-rotatably mounted on a pulley drive shaft **76**. The axis of shafts **42**, **64**, and **76** are parallel. Shaft **64** extends below

and to one side of shaft **42**, and shaft **76** is vertically below shaft **42**.

Gears **74** and **62**, as shown in FIGURES 4–6, are received in compartment **55** which is delimited by internal, axially extending, aligned skirt sections **78** and **80** respectively formed integral with gear housing **56** and end plate **53**. A gasket **82** clamped between opposed end faces of skirt sections **78** and **80** prevent leakages of gear lubricant from compartment **55**. Gear compartment **55** is completely enclosed by skirt sections **78** and **80** and the opposed end wall portions of gear housing **56** and end plate **53**. Gears **62** and **74** are sized to provide for a suitable speed reduction and form the gear train drivingly connecting shaft **42** to shaft **76**.

As best shown in FIGURE 4, gear housing **56** is formed with a forwardly extending pulley support hub **86** through which shaft **76** coaxially and freely extends. Shaft **76** is journalled in axially spaced apart ball bearing assemblies **88** and **90** which are coaxially received in hub **86**. Bearing assembly **88** is axially confined between an annular radially extending hub lip **92** and an annular spacer **94** through which shaft **76** rotatably extends. Bearing assembly **90** is axially confined between spacer **94** and a groove and a grove-seated retainer ring **96** carried by gear housing **56**. The hub of gear **74** is axially confined between bearing assembly **90** and a lock nut **98** threaded onto the rearward end of shaft **76**.

Pulley assembly **22** is shown in FIGURE 4 to comprise a rigid, metallic hub **100** and a resilient, belt-engaging tire or annulus **102** which is made from a suitable elastomeric material and which will be described in detail later on. The forward end of shaft **76** protruding beyond hub **86** non-rotatably extends with a press fit through a bored boss section **104** of hub **100**. A locking screw **106** is threaded into the outboard end of shaft **76**.

Still referring to FIGURE 4, hub **100** is formed with an axially extending sleeve section **106** which is integrally joined to boss section **104** by a radial web portion **108**. Sleeve section **106** is formed with a smooth, uniformly diametered periphery and extends axially rearwardly to circumferentially surround hub **86**. Annulus **102** is press-fitted onto sleeve section **106** axially between pulley flanges **110** and **112**. Flange **110** is mounted on the outboard end of hub **100** by machine screws **114** (see FIGURE 2). Flange **112** peripherally surrounds sleeve section **106** at the inboard end of hub **100** and is axially confined between the inboard end face of annulus **102** and a radially outwardly turned, annular lip **116** formed integral with sleeve section **106**. This construction of pulley assembly **22** provides for easy assembly and disassembly of hub **100**, annulus **102**, and flanges **110** and **112**.

From the pulley, motor, and gear housing construction thus far described, it will be appreciated that pulley assembly **22** is mounted forwardly of gear housing **56** and motor **30** is mounted rearwardly of housing **56**. The rotor axis of motor **30** is parallel to and vertically above the rotational axis of pulley assembly **22** when the sanding machine is held in a horizontal position. Assembly **22** and gear **74** may be disassembled as a unit from the unitary sub-assembly of motor **30**, end plate **56**, gear **62** and shaft **64** by removing screws **58**.

As best shown in FIGURES 1 and 2, a frame-mounted bracket **120** preferably formed integral with gear housing **56** extends forwardly from the front face of housing **56** and between pulley assemblies **22** and **24**. Bracket **120** is integrally formed with a split collar section **122** along an axis normally intersecting the rotational axis of shaft **76** substantially midway between flanges **110** and **112**. The rearward end of an idler pulley support tube **124** forming a part of frame **20** is coaxially received in collar section **122**. The split portions of collar section **122** are integrally provided with lateral ears **126** and **128**. A machine screw **130** extending through aligned bores in ears **126** and **128** is threaded into a nut **132** to tightly clamp the rearward end of tube **124** in collar section **122**.

Still referring to FIGURES 1 and 2, bracket **120** is integrally formed with a fender plate section **134** extending and between pulley assembly **22** and collar **122**. Fender section **134** comprises a skirt extending the length of pulley assembly **22** and in close proximity to the belt-engaging periphery of annulus **102** between opposed flights of belt **26** to deflect particles downwardly and rearwardly.

As shown in FIGURES 1, 2, and 7, tube **124** extends forwardly between opopsed flights of belt **26** and supports idler assembly **24** at its forward end. Idler assembly **24** comprises a pair of aligned, axially spaced apart roller units **140** and **141** and a biasing plunger **142**.

Roller unit **140**, as best shown in FIGURE 7, comprises a resilient tire or annulus **144** which is made of suitable elastomeric material such as rubber and which is coaxially mounted on a rigid hub **146**. Plunger **142** extends between roller units **140** and **141** and has an axially extending arm portion **148** received in hub **146**. An anti-friction roller bearing assembly **150** is mounted on a member **151** extending through arm portion **148**. Bearing assembly **150** supports hub **146** for rotation about an axis normally intersecting the longitudinal axis of support tube **124** and axially aligning with the rotational axis of roller unit **141**. Hub **146** is press-fitted on the outer race of bearing assembly **150**. Bearing assembly **150** is axially retained between a retainer ring **152** and the head of a machine screw **154** coaxially threaded into the end of member **151**.

Roller unit **141** is of the same construction as roller unit **140**. Accordingly, like reference numerals have been used to identify like parts. A bearing assembly **156** mounted on member **151** journals roller unit **141** for rotation about an axis aligning with roller unit **140**. Roller units **140** and **141** are axially confined between the head of screw **154** and the enlarged head of member **151**.

From this description, it is clear that roller units **140** and **141** are independently mounted for rotation on plunger **142**. This construction enables all of the idler frame support parts to be located laterally inwardly of a plane containing the outboard edge of belt **26**. From FIGURE 1 it is apparent that no parts except flange **110** project beyond a plane containing the end faces of roller unit **141** and the sub-assembly of annulus **102** and hub **100**. This feature enables the sanding machine of the present invention to be used effectively in performing contour sanding or other surface-finishing operations as on automobile bodies since belt **26** can readily be positioned in confined corners without interference from parts forming the sanding machine assembly.

With continued reference to FIGURE 7, plunger **142** slidably and rotatably extends into support tube **124** and is formed with a flat-sided plate section **160**. The width of plate section **160** extending into support tube **124** is made sufficiently small to provide a sliding fit that enables plunger **142** to be rotated about the axis of tube **124** for a purpose to be explained shortly.

A helically coiled spring **164** received in support tube **124** is compressed between the rearward end of plunger **142** and a cylindrical plug **166**. Spring **164** reacts against plug **166** to bias plunger **142** and idler assembly **24** forwardly along the axis of tube **124** to tighten belt **26**. Plug **166** is urged axially rearwardly by spring **164** into abutment with a split, groove-seated retainer ring **168** in the rearward end of tube **124**.

As shown in FIGURES 1, 2, and 8, a bracket assembly **170** is mounted on the forward end of support tube **124** for retaining the rotational axis of idler assembly **24** parallel with the rotational axis of drive pulley assembly **22** when plunger **142** is urged forwardly by spring **164** to its belt tightening position. Bracket assembly **170**, as best shown in FIGURE 8, comprises a clamping block **172** fixed by machine screws **173** to a support bracket **174**.

Clamping block **172** is formed with a smooth-walled, arcuate groove which cooperates with the planar top face of bracket **174** to form a semi-circular channel **176**. The forward end of support tube **124** is notched at **178** (see FIGURE 9) and extends coaxially through channel **176**. The downwardly facing, forward edges of notch **178** are received in parallel, longitudinally extending, upwardly facing grooves formed in the top surface of bracket **174**. This forward, notched end of support tube **124** is clamped tightly between block **172** and bracket **174** by tightening screws **173**.

With continued reference to FIGURE 8, bracket **174** is formed with a flat-sided, flat-bottomed groove **180** which opens upwardly into channel **176**. The lower portion of plate section **160** freely extends through groove **180** with sufficient clearance on both sides to allow plunger **142** to be turned in both directions through limited angular distances about the longitudinal axis of support tube **124**.

As shown in FIGURES 7 and 8, plunger **142** is integrally formed with flat-sided, parallel arm portions **182** and **184** extending at right angles from the opposite sides of plate section **160** about midway between the upper and lower edges thereof. When plunger **142** is in its forwardly biased, belt tightening position shown in FIGURES 7 and 8, the undersides of arm portions **182** and **184** seat against the planar top face of bracket **174** to prevent angular displacement of plunger **142** in either direction. Abutment of arm portions **182** and **184** against bracket **174** retains plate section **160** in a plane normally intersecting the rotational axis of pulley assembly **22** to thus maintain the rotational axis of idler assembly **24** parallel to that of assembly **22**.

In accordance with this invention, arm portion **182** is formed with a flat-sided, laterally outwardly opening notch **186** which cooperates with bracket **174** to provide a twist latch for releasably retaining plunger **142** in a retracted, belt-slackening position. Notch **186** is located forwardly of bracket **174** when plunger **142** is in its forwardly biased, belt-tightening position where the undersides of arm portions **182** and **184** butt against the top face of bracket **174** to prevent rotation of plunger **142**. Notch **186** is formed with a uniform width that is slightly greater than the longitudinal length of bracket **174** in the region of groove **180**. When notch **186** is aligned with bracket **174**, therefore, plunger **142** may be turned in a clockwise direction (as viewed from FIGURE 10) such that the upper edge region of bracket **174** passes through notch **186**. This displacement of plunger **142** is limited by abutment of the lower edge of plate section **160** against the edge of groove **180**. With plunger **142** in its angularly displaced position shown in FIGURE 10, the forwardly facing edge **190** (see FIGURE 7) of notch **186** faces and is urged by spring **164** into abutment with the rearwardly facing end face of bracket **174** adjacent groove **180** to axially lock plunger **142** in a retracted, belt-slackening position.

When it is desired to latch plunger **142** in its retracted position, idler assembly **24** and plunger **142** are unitarily pushed rearwardly against the bias of spring **164** by gripping idler assembler **24** and applying pressure with the palm of the hand along the portion of belt **26** trained around roller units **140** and **141**. When plunger **142** is rearwardly displaced by a sufficient distance to align notch **286** with bracket **174**, the sub-assembly of idler assembly **24** and plunger **142** is then turned slightly in a counterclockwise direction (as seen from FIGURE 8) to position edge **190** axially opposite the rearwardly facing surface of bracket **174**. The sub-assembly of idler assembly **22** and plunger **142** is now released, allowing the bias exerted by spring **164** to shoulder edge **190** against the rearward end face of bracket **174**. In this locked position, plunger **142** and idler assembly **24** are axially retracted from their forwardly biased positions by a sufficient distance to slacken and thereby enable the removal of belt **26**. Rearwardly facing positioning shoulders **192** are provided on plate section **160** and arm portions **182** and **184** to butt against the forward face of bracket assembly **170** when notch **186** aligns with bracket **174** in its retracted position.

When it is desired to release plunger **142** from latching engagement with bracket **174**, belt **26** is positioned around pulley assemblies **22** and **24** and the sub-assembly of idler assembly **24** and plunger **142** is turned until edge **190** clears the top face of bracket **174**. Plunger **142** is then released, allowing arm portions **182** and **184** to pass over the top face of bracket **174** as plunger **142** and idler assembly **24** are urged by spring **164** to their forward, belt-tightening positions. It thus will be appreciated that the simplified twist latch of this invention provides for the ready removal and mounting of belt **26**.

In further accordance with this invention, a back-up shoe assembly **200** is removably mounted on frame **20** for supporting the lower workpiece engaging run of belt **26**. Assembly **200**, as shown in FIGURE 2, extends between pulley assemblies **22** and **24** and comprises a resilient pad **202** seated between a rigid pressure or facing plate **204** and a rigid backing plate **206**. Facing plate **204** has a flat, smooth surface which engages the inwardly facing surface of the lower belt flight. The ends of plate **204** are smoothly curved and upwardly turned to provide rounded corners which do not gouge into the belt. The side edges of plate **204** are bent upwardly to form a longitudinal channel receiving the lower portion of pad **202**. Pad **202** may be formed from one or more layers of suitable resilient material such as polyurethane and spaces backing plate **206** vertically above plate **204**. The side edges of plate **206** are bent to provide a downwardly facing channel in which pad **202** is seated.

Plate **204** is separable from pad **202** and is snugly held against the bottom face of the pad by the tension in the lower belt flight. This belt tension urges backing plate **206** into abutment with the bottom face of bracket **174** and the bottom face of a back-up shoe mounting plate **208**. Plate **208** is fixed to collar section **122** by screw **130** and by a further screw **210** (FIGURE 1).

As shown in FIGURES 2 and 10, backing plate **206** is integrally formed with a raised forwardly extending tonbue **212** which slidably extends into a rearwardly and sidewardly opening, fiat-sided groove **214**. Tongue **212** is straight and extends essentially in parallel relation with the longitudinal axis of tube **124**. Groove **214** is formed in bracket **174** and extends horizontally from a region vertically below tube **124** to the side of bracket **174**.

At its inner end, groove **214** is formed with a downwardly opening recess **216** located below tube **124** and substantially medially intersected by a plane containing the longitudinally axis of tube **124**. Tongue **212** is urbed upwardly to seat in recess **216** by the tension in the lower belt flight. The flights of belt **26**, as previously mentioned, are tensioned as a result of the bias exerted by spring **164**.

As shown in FIGURES 2 and 11, backing plate **206** is integrally formed with a second rigid tongue **220** which is parallel to, but extends in the opposite direction from tongue **212**. Tongue **220** extends into a forwardly and upwardly opening groove **222** formed in plate **208**. When belt **26** is advanced, the frictional engagement between the lower belt flight and bacg-up shoe assembly **200** urbes tongue **220** to a position of maximum projection into groove **222**. Engagement of tongues **212** and **220** with the side edges of recess **216** and groove **222** respectively prevents lateral displacement of back-up shoe assembly **200** relative to belt **26**.

Back-up shoe assembly **200** is quicgly and easily removed simply by pressing the forward end downwardly to a position where tongue **212** clears recess **216** and then by swinging the forward end of the assembly in a direction to move tongue **212** out through the side opening of groove **214**. Assembly **200** readily pivots about an axis passing throubh tongue **200** at right angles to the axis of tube **124**, thereby enabling tongue **212** to easily be slid out

of groove 214. After tongue 212 is removed from groove 214, assembly 200 is shifted forwardly to remove tongue 220 from groove 222. When assembly 200 is mounted on frame 20 tongue 220 is first inserted into groove 222 and tongue 212 is then inserted sidewardly into groove 214. The tension in the lower belt flight snaps tongue 214 into recess 216.

Removal and insertion of assembly 200 is more easily facilitated by first latching the sub-assembly of idler 24 and plunger 142 in its retracted position to loosen belt 26. This quicg-change feature provides for the quick and ready replacement of back-up shoes of varying shapes to obtain access to surfaces of different contours.

In accordance with this invention, pad 202 is compressible to allow limited rocking movement of facing plate 204 about an axis extending parallel to and vertically below the axis of tube 124. This rocking motion provides the lower belt flight with sufficient flexibility to allow it to follow and engage uneven workpiece contours. Plate 204 thus effectively floats on the cushion provided by pad 202 to assure a more uniformly finished surface.

Advantageously, a covering 223 (see FIGURES 10 and 11) is adhered to the bottom face of par 202. Covering 223 may be made from any suitable material which preferably is similar to the surface-finishing belt material. With this construction, facing ylate 204 may optionally be removed to allow covering 223 to seat against the inside surface of the lower belt flight. This provides the lower belt flight with greater flexibility.

As shown in FIGURES 1 and 2, a forward, tool manipulating handle 226 is fixed by a machine screw 228 to an upstanding ear of a mounting bracket 230. Bracket 230 is removably fixed to tube 124 by a clamping plate 232 and two bolt and nut assemblies 234.

Handle 226 has a cylindrically elongated gripping section 236 extending along an axis that is substantially at right angles to a plane containing the inboard side edge of belt 26. Gripping section 236 is laterally offset from belt 26 on the same side as motor 28 and is essentially parallel with the rotational axis of motor shaft 42. Handle 226 is disposed forwardly of motor 28 and extends along an axis that passes above the top flight of belt 26. The axis of gripping section 236 is contained in a plane normally intersecting the axis of tube 124 about midway between pulley assemblies 22 and 24.

Still referring to FIGURES 1 and 2, a second tool manipulating handle 238 is mounted on an extension 240 forming a part of end plate 53 and extending laterally from motor 30 to a region that is hearwardly of pulley assembly 22. Handle 238 has a cylindrically elongated gripping section 242 which is substantially coextensive and parallel with gripping section 236. Gripping section 242 thus extends parallel with motor 28 and is disposed rearwardly of pulley assembly 22. Motor 28 is thus positioned between handles 226 and 238. The longitudinal axes of gripping sections 236 and 242 are contained in a plane which is substantially parallel with the opposed runs of belt 26.

With the foregoing arrangement of handles 226 and 238 relative to motor 28 and the other parts of the sanding machine, the operator is able to stand to one side of the machine, gripying handles 226 and 238 in the palms of his hands. Handles 226 and 238 are spaced sufficiently close to enable the operator to position his elbows close to his body when holding the sanding machine about waist high in front of him.

By locating motor 28 laterally to one side of belt 26, the overall center of gravity of the sanding machine is located between handles 226 and 238 since motor 30 represents the heaviest component of the machine. Handles 226 and 238 are so spaced on opposite sides of motor 28 as to balance the weight to be carried at each handle. This unique arrangement of parts thus provides for a well-balanced portable tool that is easily and comfortably manipulatable.

In further accordance with this invention, a fan 246 (see FIGURE 1) is non-rotatably mounted on the forward end of rotor shaft 42 in close radial alignment with circumferentially spaced apart air discharge ports 248. Ports 248 are defined by rearward opening recesses in end plate 53 and the opposing, forward end of motor housing section 32.

When motor 28 is energized, fan 246 draws air into housing 30 through ports 36 at the rearward end of motor 28. This air is drawn axially over the rotor and stator surfaces and the rotor shaft bearings and is discharged by fan 246 radially through ports 248 to form a protective air screen when it is essentially parallel to the plane containing the inboard side edge of belt 26 and which normally intersects the forward ends of handles 226 and 238.

Owing to the arrangement of handles 226 and 238 with the other parts of the sanding machine, the air screen provided by fan 246 extends between the operator's face and belt 26. This air screen thus makes use of the exhausted motor ventilating air to deflect dust and chips away from the operator's face.

In further accordance with this invention a switch actuator 250 for controlling the operation of motor 28 is shown in FIGURES 1 and 12 to be mounted at the inner end of handle 238 so that the operator can conveniently shift it between on and off positions with his thumb while grasping handle 238 in the palm of his hand. Actuator 250 comprises a collar 252 which is rotatably mounted on a short sleeve 254. Sleeve 254 is coaxially threaded onto a nipple 255 which is threaded into a tapped bore formed through extension 240. The outer end of nipple 255 is threaded into the inner end of handle 238 to thus fix handle 238 to extension 240.

A thumb engaging projection 256 (see FIGURES 1 and 2) formed integral with collar 254 extends radially beyond the inner end of handle 238 which is flanged at 258. Also formed integral with collar 254 are a pair of parallel, spaced apart, axial fingers 259 and 260 which, as shown in FIGURE 5, extend through an arcuate slot 261 in extension 240.

With continued reference to FIGURE 5, fingers 259 and 260 extend on opposite sides of a switch operating stem 264 which forms a part of a conventional toggle switch 266. Switch 266 is received in gear housing 56 and is fixed between opposed faces of extension 240 and gear housing 56. The output terminals of switch 266 are connected by leads 268 to stator 46. The input terminals of switch 266 are connected to sheath covered electrical conductors 270 which extend through nipple 255 and through handle 238, the interior of which is hollowed out as indicated at 272 in FIGURE 12.

By engaging projection 256 with his thumb, the operator can rotate actuator 250 in opposite directions to alternatively engage fingers 259 and 260 with stem 264, thereby tripping stem 264 between its on and off positions. Projection 256 advantageously terminates in a pointer 273 (FIGURE 1) which cooperates with markings on extension 240 to indicate whether switch 266 is in its on position or its off position. A groove-seated, O-ring 274 (FIGURE 12) carried by collar 252 is axially compressed against the inner flanged end of handle 238 to provide an annular seal for preventing dirt and other foreign particles from entering the housing space in which switch 266 is mounted.

In the manufacture of the sanding machine of this invention, pulley assemblies 22 and 24 are accurately assembled on frame 20 by using a suitable jig to assure that the drive and idler pulley rotational axes are closely parallel. Close parallelism of the pulley axes improves the tracking of belt 26 around the pulley assemblies to minimize sideward belt movement and consequential, objectionable, wear producing engagement of the belt edges with pulley flanges 110 and 112.

Despite accurate assembly of the sanding machine parts, however, the pulley rotational axes usually are not

perfectly parallel owing to unavoidable manufacturing tolerances. This non-parallelism, which would normally result in some sideward movement of belt **26**, is compensated for by the special construction of tires **102** and **144** which will now be described.

As best shown in FIGURE 4, tire **102** is integrally formed with a series of radially outwardly extending, parallel spaced apart, flexible ribs **280** of uniform diameter. Ribs **280** are disposed in side-by-side relation circumferentially around the pulley body.

With continuing reference to FIGURE 4, ribs **280** define a series of circumferential, radially outwardly opening, flat-sided grooves **282** of uniform depth and width. The depth of grooves **282** is shown to be greater than the tickness of ribs **280**, and the axial spacing between adjacent ribs is made sufficiently large such that one rib does not objectionably interfere with the other if it is flexed.

When motor **28** is energized to advance belt **26**, flanges **110** and **112** limit sideward movement of belt **26**. This sideward movement may be the result of a side thrust applied by the operator in moving the belt laterally over the workpiece surface. It also may be the result of an inherent non-parallelism between the rotational axes of pulley assemblies **22** and **24**, manufacturing imperfections in the surface-finishing belt, or belt distortion.

The construction of ribs **280** is such that they will be flexed laterally by a very small distance from planes normally intersecting the pulley rotational axis when belt **26** is moved laterally towards either of the pulley flanges. Ribs **280** provide no more than a negligible reaction surface against which a side thrust can act to drive belt **26** into engagement with either flange **110** or flange **112**. As a result, the action force tending to drive belt **26** into engagement with either of the pulley flanges will also be negligible since it cannot exceed the magnitude of the reaction force. Without a solid reaction surface, belt **26** effectively floats on ribs **280**.

By minimizing the magnitude of the belt side thrust in this manner, wear of the belt edges by engagement with flanges **110** and **112** is minimized. It thus will be appreciated that instead of utilizing an opposing force to keep belt **26** centered, this invention substantially eliminates the action force or side thrust by reducing the reaction force at ribs **280** to a negligible magnitude. In this manner, the inherent manufacturing imperfections of the sanding machine are compensated for to insure correct tracking of the belt around the pulley assemblies.

The idler tires **144**, as shown in FIGURES 1 and 7, are provided with a rib and groove construction which is the same as that just described for tire **102**. Accordingly, like reference numerals have been used to designate the ribs and grooves. The function of the rib and groove construction of tires **144** is the same as that explained for tire **102**.

Referring back to FIGURE 4, it will be noted that circumferential, radially outwardly opening grooves **286** are formed between the endmost ones of the drive pulley ribs **280** and the opposed faces of flanges **110** and **112**. Grooves **286** provide spaces to allow the endmost ribs **280** to flex toward flanges **110** and **112**. Grooves **286** also prevent the edges of belt **26** from becoming wedged between the endmost pulley tire ribs and the opposed faces of flanges **110** and **112**.

The diameters of flanges **110** and **112** are sufficiently large to prevent belt **26** from climbing over the flanges. These flange diameters, however, are not made so large that they are likely to engage and mark the workpiece surface.

As shown in FIGURES 1 and 7, pulley assembly **24** is flangeless, and the two outermost tire ribs **288** of assembly **24** are smaller in diameter than the remaining tire ribs which are uniformly diametered. This novel construction keeps belt **26** from becoming lodged between the adjacent outermost pair of ribs and from jumping ribs **288** when a side thrust is exerted. It was found that when ribs **288** were formed with the same diameter as the remaining tire ribs, belt **26** would tend to become lodged behind either of the outermost ribs and then jump the outermost rib as though it were a flange when sideward pressure was exerted on the belt. When the side pressure ceased, the belt would jump back, thus moving in an erratic path. In addition to eliminating this objectionable condition, the reduced diameter of ribs **288** effectively provides pulley assembly **24** with a crowned configuration owing to the tendency of the tire ribs to deform. The crown in idler assembly **24** further minimizes sideward movement of belt **26**.

Advantageously, a belt guard **290** may be removably mounted on frame assembly **20**. Guard **290** is disposed above and parallel with the upper belt flight. The rearward end of guard **290** is curved to extend partially around pulley assembly **22**. The forward end of guard **290** is detachably fixed to frame **20** by a bracket and machine screw assembly **292**. The rearward end of guard **290** is secured to gear housing **56** by a machine screw **294**.

Referring back to FIGURE 2, back-up shoe assembly **200** may be reversibly mounted on frame **20** since tongues **212** and **220** are substantially of the same configuration, each being insertable into either groove **214** or groove **222**. Thus, assembly **200** may be turned 180 degrees and mounted in place by inserting tongues **212** and **220** respectively into grooves **222** and **214**. The advantage of this reversible back-up shoe construction is that the forward and rearward ends of plate **204** may be provided with different configurations for alternate use simply by reversing the position of assembly **200**. In the position of assembly **200** shown in FIGURE 2, the forward upturned end of plate **204** adjacent to pulley assembly **24** is provided with a more gradual and more elongated curvature than the rearward end thereof. Thus, a more gradually inclined workpiece surface may be finished uniformly. If the workpiece surface is so contoured that a shorter, upwardly curved pressure plate end is needed to obtain a uniform finish, the operator simply reverses back-up shoe assembly **200** to place the presently shown rearward end adjacent to pulley assembly **24**.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by Letters Patent is:

1. A portable, bodily manipulatable power tool for surface-finishing workpieces comprising:

(a) a pair of spaced apart rollers,

(b) a surface-finishing belt trained around said rollers.

(c) a rigid, elongated support structure extending longitudinally between opposed runs of said belt and rotatably mounting said rollers,

(d) a pair of tool-manipulating handles mounted on said support structure along longitudinal, essentially parallel axes transversely intersecting a plane containing one side edge of said belt, the axes of said handles being essentially parallel with the rotational axes of said rollers,

(e) a motor having a housing and a drive shaft rotatably supported in said housing about an axis extending essentially parallel to the longitudinal handle axes and laterally from said plane at the region of one of said rollers,

(f) means drive connecting said shaft to said one roller, and

(g) means on said support structure for supporting said motor laterally between said handles in spaced apart relation thereto,

(h) said handles being disposed rearwardly and forwardly of said one roller in balancing arrangement with said motor and having gripping sections laterally offset from the side of said plane facing away from said belt.

2. The portable, bodily manipulatable power tool defined in claim 1 wherein the longitudinal axis of the forward one of said handles extends between said rollers.

3. The portable, bodily manipulatable power tool defined in claim 1 wherein the other of said rollers comprises a pair of axially adjacent, separately formed roller sections, and wherein said support structure comprises a part extending between said roller sections, and means on said part for journalling said roller sections axially inwardly of the opposite side faces of said other roller.

4. The portable, bodily manipulatable power tool defined in claim 1 comprising a driven shaft mounting said one roller, means journalling said driven shaft on said support structure, and a gear train forming a part of said drive connecting means and connecting said drive shaft to said driven shaft, said means supporting said motor comprising a gear housing mounting said gear train at the end of said motor adjacent said belt, means fixing said motor housing on said gear housing, and means mounting said gear housing on said support structure.

5. A power driven tool for surface-finishing workpieces comprising:

(a) a frame,

(b) a pair of spaced apart roller assemblies carried by said frame,

(c) an endless surface-finishing belt trained around said roller assemblies and having opposed runs extending between said assemblies,

(d) a back-up shoe disposed between said runs and supporting the workpiece engaging run of said belt, and

(e) means reversibly, removably mounting said back-up shoe on said frame,

(f) said back-up shoe comprising a rigid pressure plate seated against the inwardly facing surface of said workpiece-engaging run and having belt engaging ends which are forwardly and rearwardly disposed relative to the movement of said workpiece engaging run and which are bent toward the other run of said belt at different curvatures to provide for the alteration of belt contour in the region where the belt engages the forwardly disposed one of said ends upon reversing the position of said shoe, whereby alternate belt contours conforming to differently contoured workpiece surfaces are provided in the region of said forwardly disposed end by reversing the position of said shoe.

6. The portable, bodily manipulatable power tool defined in claim 1 wherein a plane containing the longitudinal axes of said handles pass transversely through said housing.

7. The portable, bodily manipulatable power tool defined in claim 1 wherein axially directed projections of the end surfaces of said one roller and said motor facing toward each other are in overlapping relation.

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