May 26, 1964 D. J. OLTON ETAL 3,134,206

COATED ABRASIVE BELT MACHINE

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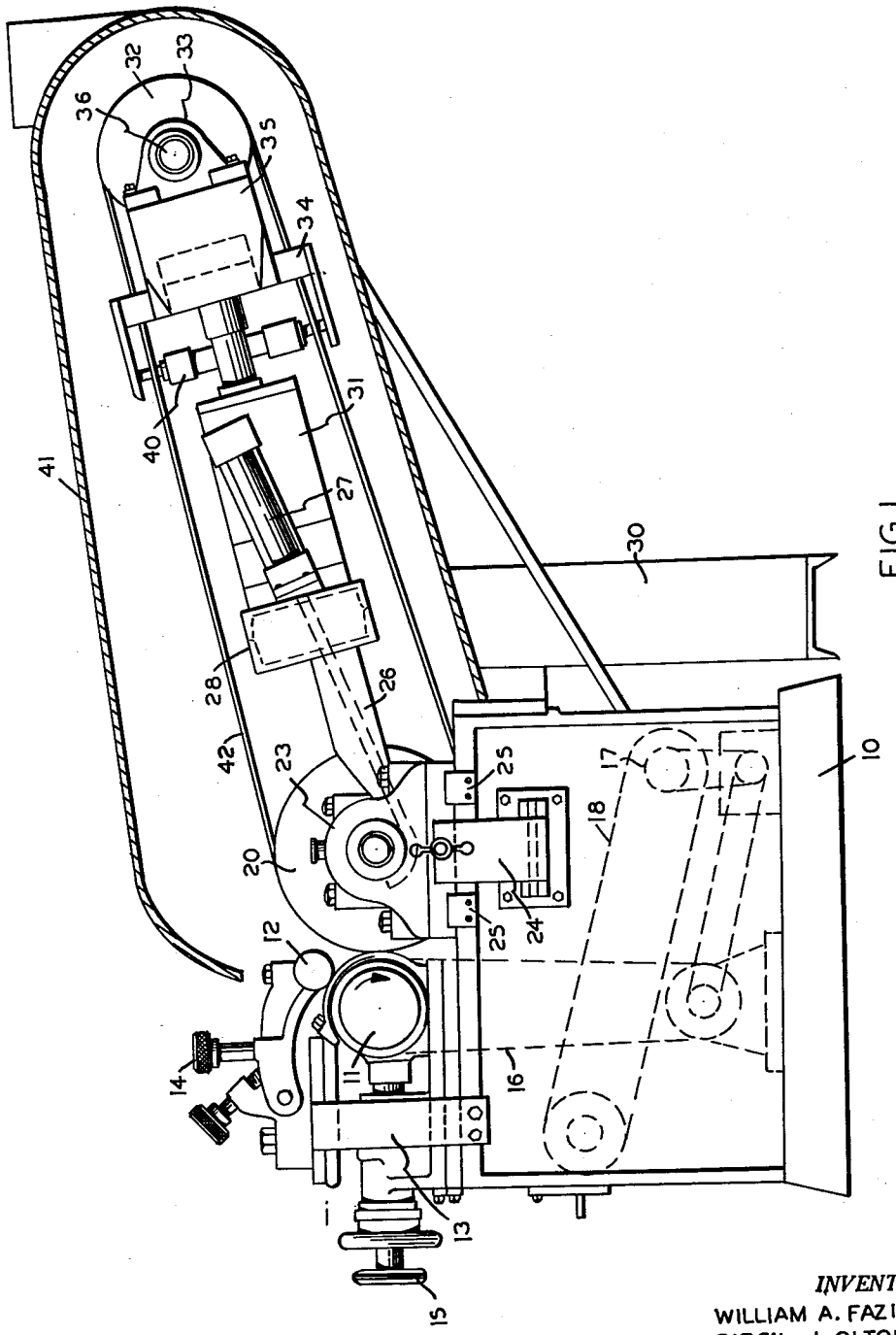


FIG. 1

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COATED ABRASIVE BELT MACHINE

Filed Nov. 10, 1960 8 Sheets-Sheet 2

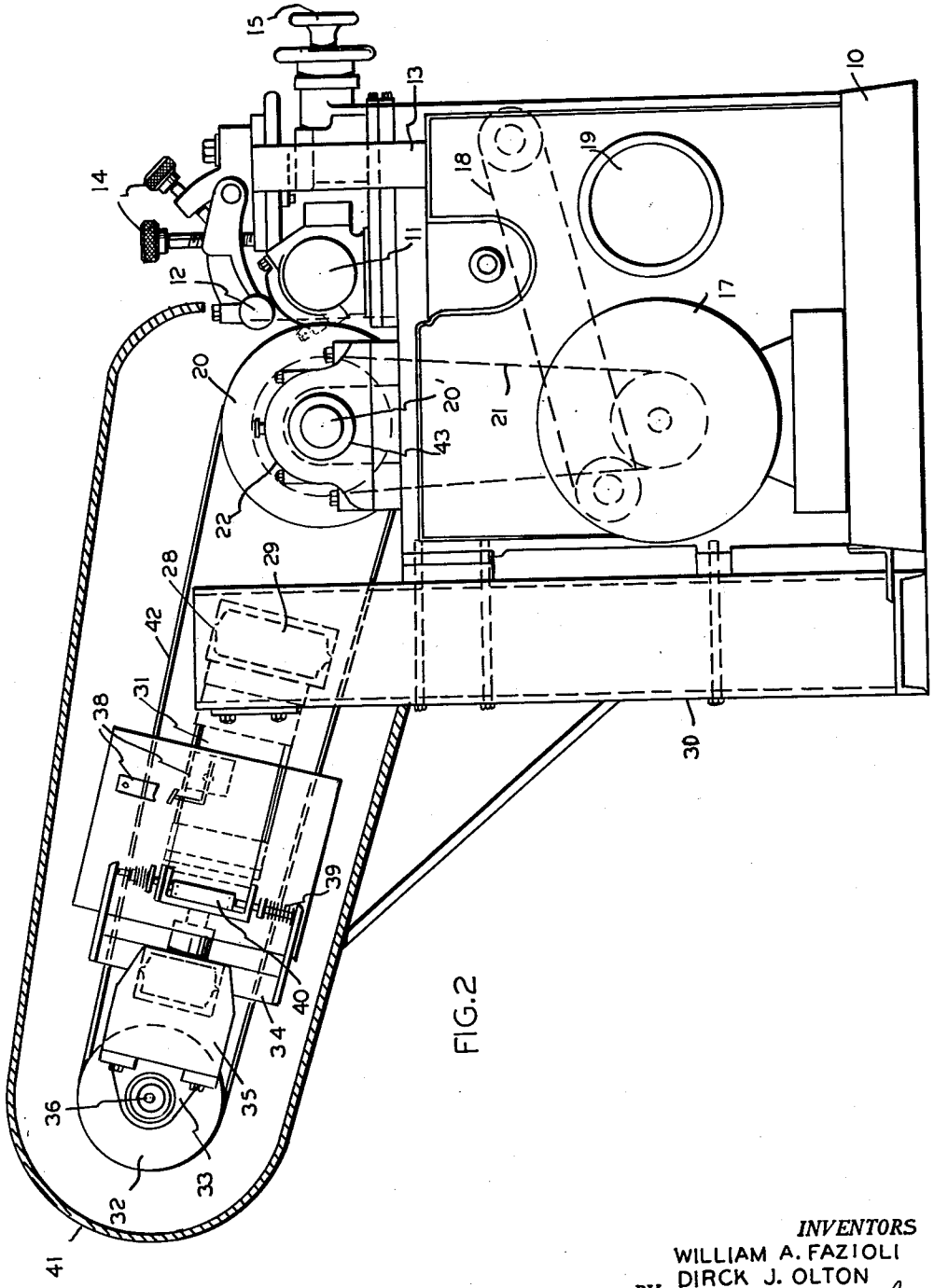


FIG.2

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COATED ABRASIVE BELT MACHINE

Filed Nov. 10, 1960 8 Sheets-Sheet 3

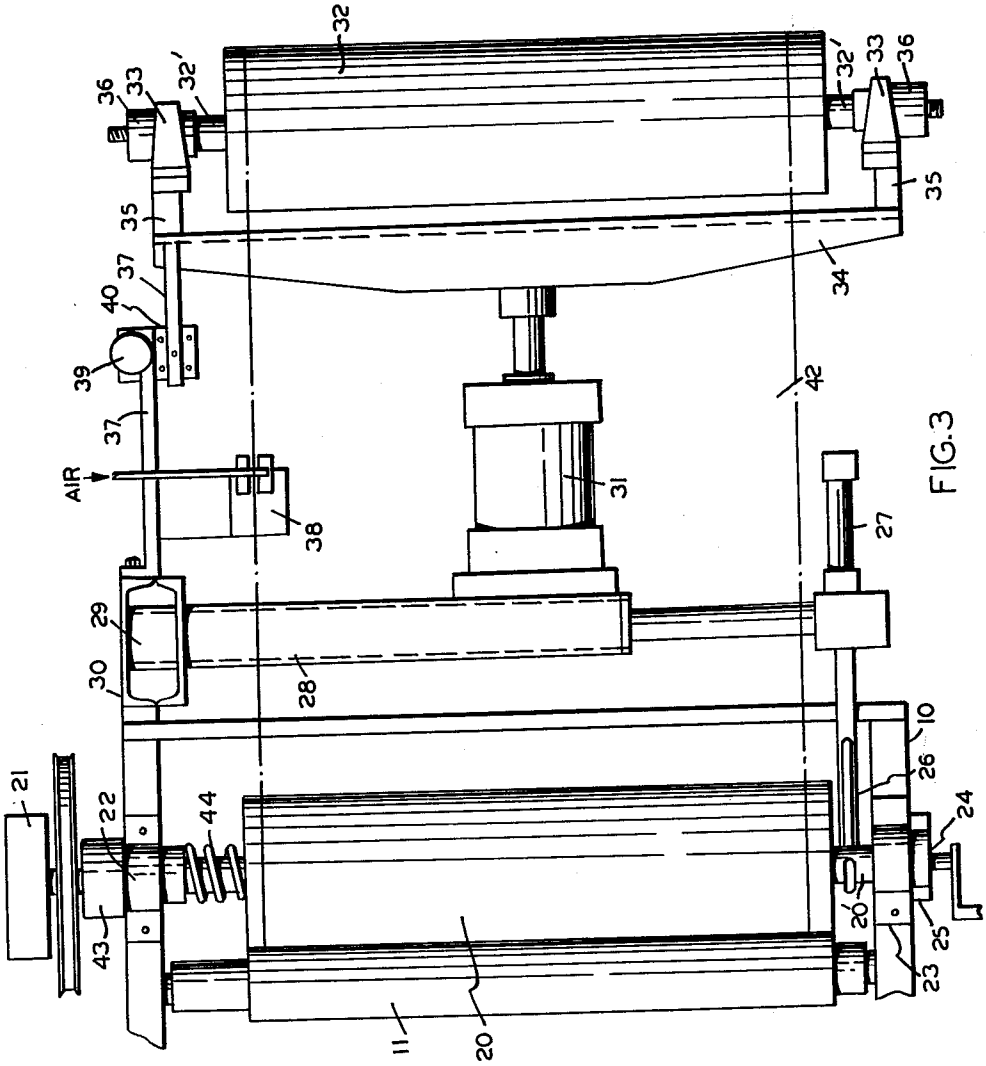


FIG. 3

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COATED ABRASIVE BELT MACHINE

Filed Nov. 10, 1960 8 Sheets-Sheet 4

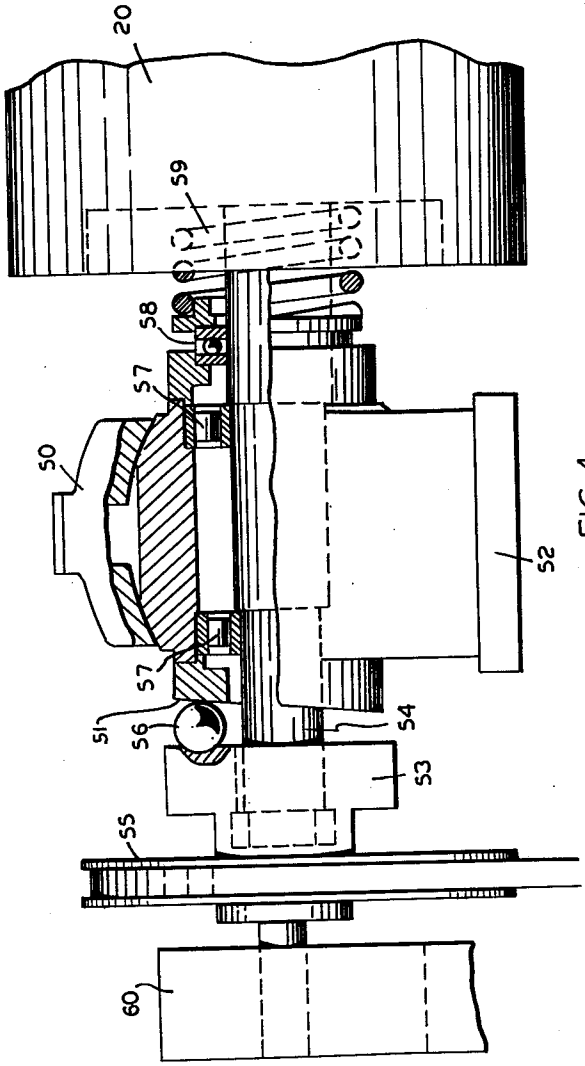


FIG.4

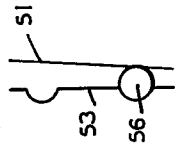


FIG.6

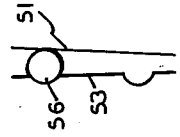


FIG.5

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COATED ABRASIVE BELT MACHINE

Filed Nov. 10, 1960 8 Sheets-Sheet 5

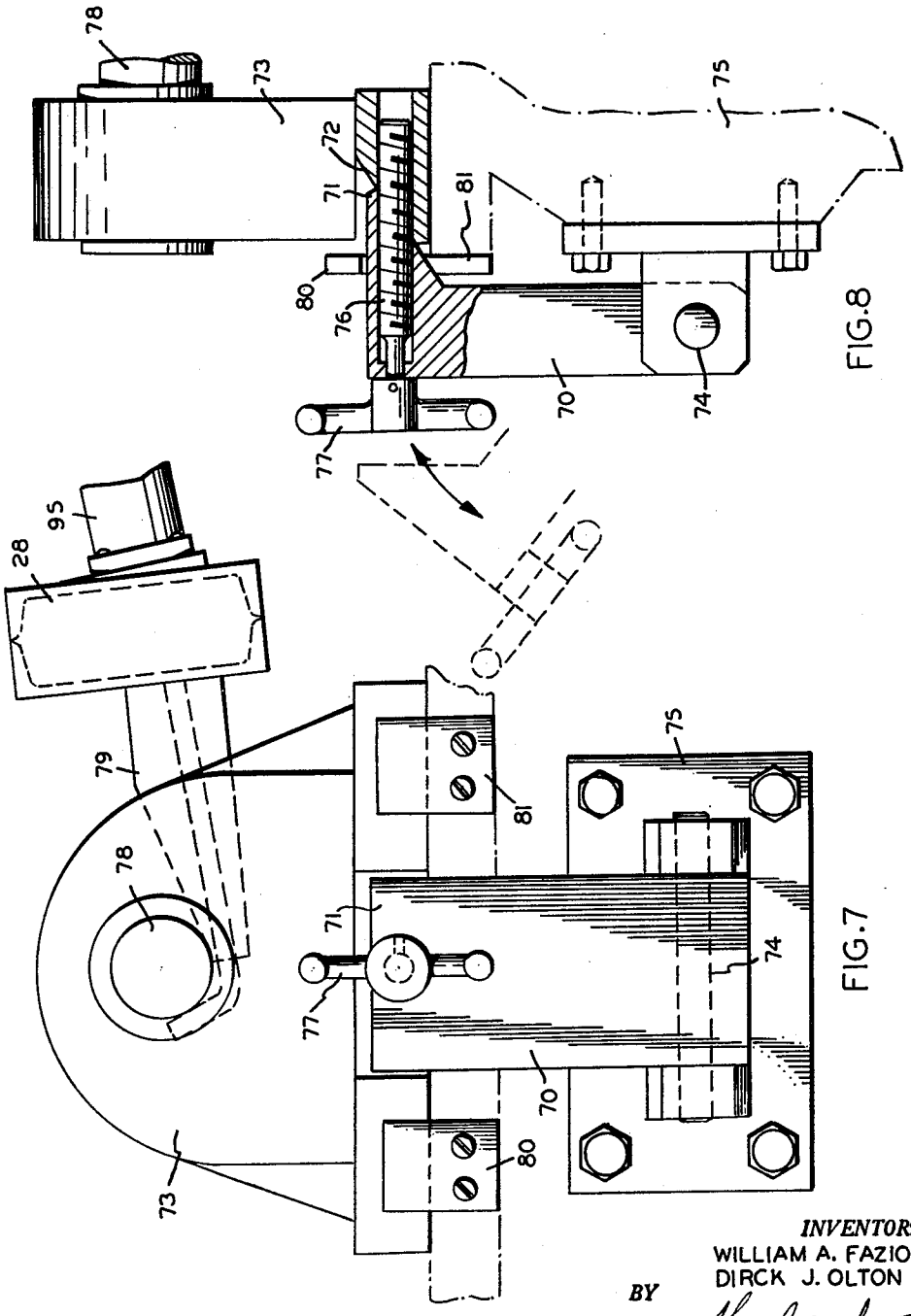


FIG.8

FIG.7

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COATED ABRASIVE BELT MACHINE

Filed Nov. 10, 1960 8 Sheets-Sheet 6

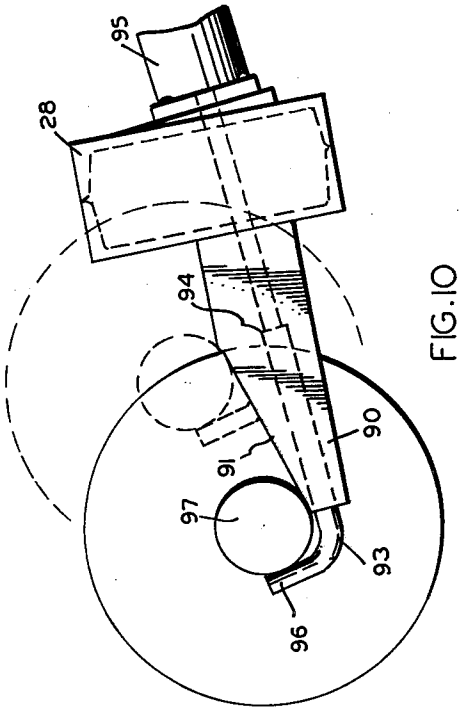


FIG. 10

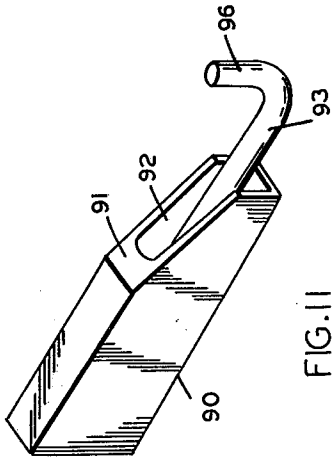


FIG. 11

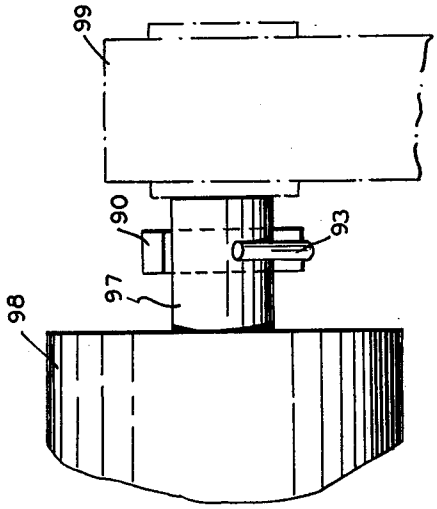


FIG. 9

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COATED ABRASIVE BELT MACHINE

Filed Nov. 10, 1960 8 Sheets-Sheet 7

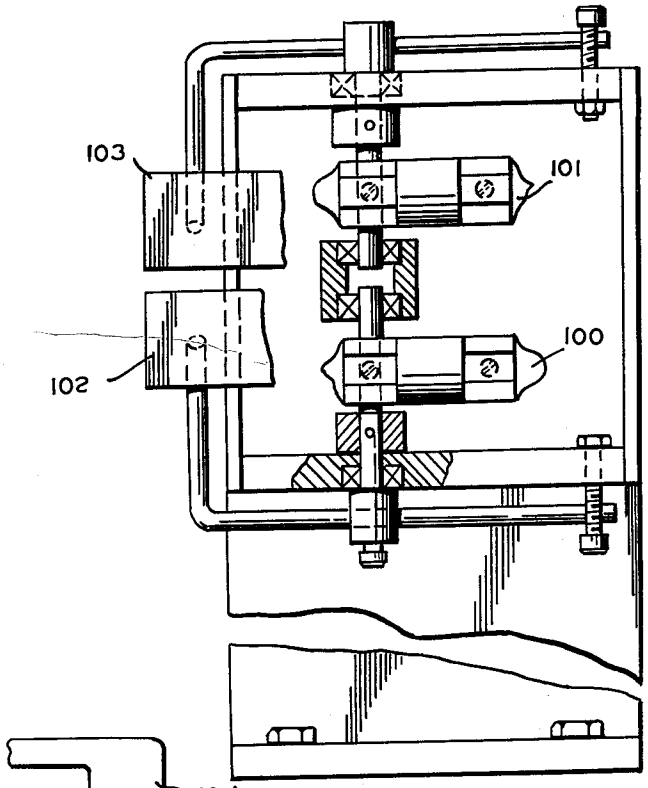


FIG.12

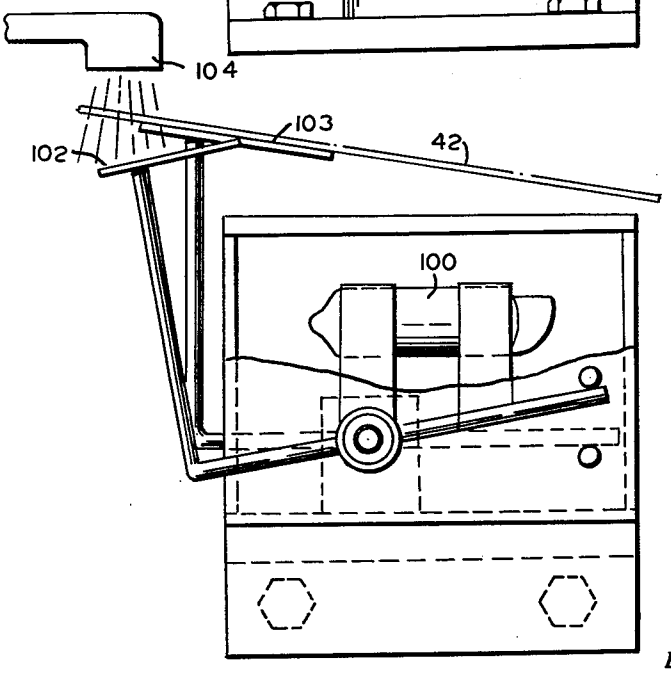


FIG.13

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COATED ABRASIVE BELT MACHINE

Filed Nov. 10, 1960 8 Sheets-Sheet 8

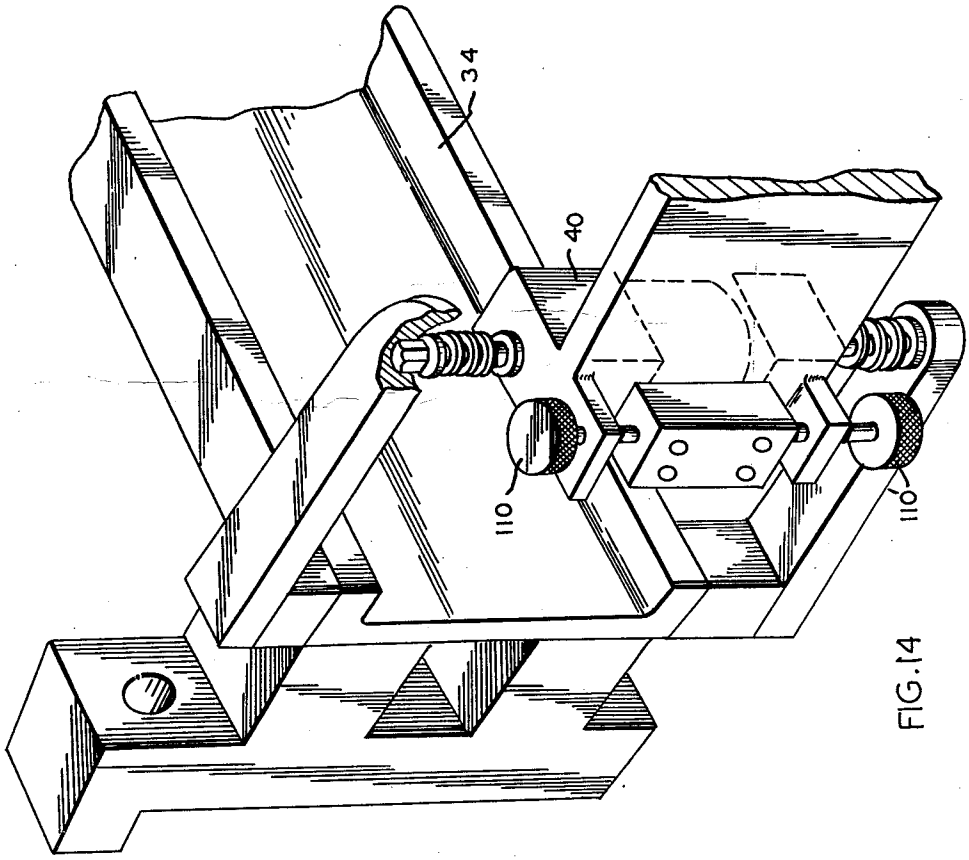


FIG. 14

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United States Patent Office 3,134,206 Patented May 26, 1964

3,134,206

COATED ABRASIVE BELT MACHINE

Dirck J. Olton, Loudonville, and William A. Fazioli, Troy, N.Y., assignors, by direct and mesne assignments, of one-half to Norton Company, Troy, N.Y., a corporation of Massachusetts, and one-half to Curtin-Hebert Company, Inc., Gloversville, N.Y., a corporation of New York

Filed Nov. 10, 1960, Ser. No. 68,477
8 Claims. (Cl. 51—142)

The present invention relates generally to the field of coated abrasives and more specifically to improved coated abrasive belt machinery.

The term "coated abrasives" has become the accepted generic name for the abrasive tools formerly referred to as "sandpaper." Coated abrasives today are one of the foremost tools of industry and are made in a variety of shapes and sizes, utilizing many different adhesives, abrasive grains and backings, and are used on many different types of equipment. One of the most desirable forms of coated abrasives from the standpoint of industry is the endless coated abrasive belt. It is to this latter form of coated abrasives and to the use thereof that the present invention is primarily directed.

The present invention is capable of use not only on machines designed specifically for coated abrasive belt use but also can be used in converting machinery designed for drum buffing to coated abrasive belt machines. It is herein illustrated as, but obviously the use thereof is not limited to, such conversion only.

Accordingly, it is an objected of the present invention to provide a new and improved coated abrasive belt machine.

Another object of the invention is to provide a means for converting abrasive drum machines to coated abrasive belt machines.

Additional objects, if not specifically set forth herein, will be readily apparent to one skilled in the art from the following detailed description of the invention.

In the drawings:

FIGURE 1 is a right side view of the present invention installed on a drum buffing unit to convert the same to abrasive belt usage.

FIGURE 2 is a left side view of the machine of FIGURE 1.

FIGURE 3 is a top plan view of the machine of FIGURES 1 and 2 with the hood and pressure roll removed for clarity of illustration.

FIGURE 4 is a cross-sectional view of the oscillating assembly used to oscillate the contact roll of the machine of FIGURES 1–3.

FIGURES 5 and 6 are diagrammatic illustrations of the principle of oscillation contained in the assembly illustrated in FIGURE 4.

FIGURES 7 and 8 are detail drawings, partly in cross-section, of the outboard latch assembly of the machine of FIGURES 1–3.

FIGURES 9, 10 and 11 are detailed drawings of the contact roll air-lift device illustrated in connection with the machine of FIGURES 1–3.

FIGURES 12 and 13 are top and side detail views respectively of the automatic belt tracking device of the present invention.

FIGURE 14 is a perspective view of the manual adjustment of the belt tracking device shown on the machine of FIGURES 1–3.

Generally, the present invention resides in an improved coated abrasive belt machine wherein improved means are provided for oscillating the contact roll and for tracking the coated abrasive belt running thereover; and wherein the contact roll is so mounted as to permit quick and easy change of coated abrasive belts to be used thereon.

More specifically, and referring now to the drawings, the present invention is illustrated as applied to converting a drum buffing machine into a wide coated abrasive belt machine. Abrasive drum machines have been heretofore used in many industries and especially in the leather industry for the buffing of tanned hides. Such machines have not been able to satisfactorily handle hides which showed considerable variation in thickness and, due to the inherent problems in the use of a coated abrasive strip wrapped on the cast iron drum of the machine have resulted in chatter or marring of the hides. Also, due to the heat generated, such machines have brought the natural oils to the surface of the hides being treated, resulting in random glazing or clouding of the hides, and a decrease in value of the finished hide. The use of a coated abrasive belt, on the other hand, produces cooler temperatures and when converted as described herein, the former drum buffer now using a coated abrasive belt runs cooler, without chatter and can handle wide variations in hide thickness without difficulty. Also, the belt can be changed when worn-out in about two minutes as contrasted to the 30 to 40 minute down time of a machine to rewrap the drum.

General Description

Referring now to FIGURES 1, 2 and 3 of the drawings, 10 represents the frame of the conventional drum buffer which has been modified in accordance with the present invention. The conventional components mounted on frame 10 include the feed roll 11, pressure roll 12, pressure roll mounting bracket 13, pressure roll adjustments 14 and feed roll adjustment 15. The feed roll 11 is driven by a belt drive 16 from main motor 17 and a conveyor belt system 18, also driven by main motor 17, is provided to remove dust and debris from the abrading operation and convey the same to the exhaust duct 19 where such material is picked up by a suction dust removal system (not shown).

In place of the conventional drum of the buffing machine is provided a contact roll 20 driven from main motor 17 by belt drive 21. Roll 20 is mounted on shaft 20' in a pair of self-aligning bearings 22 and 23, the bearing 22 on the driven side of roll 20 being permanently mounted to frame 10 and the bearing 23 on the floating end of roll 20 being held in position by a quick release outboard latch mechanism 24 and stops 25 as more fully illustrated and described in connection with FIGURES 7 and 8 hereof. An oscillating mechanism 43 and return spring 44 are provided on the driven end of shaft 20' as is described in detail in connection with FIGURES 4, 5 and 6 hereof. Bearing 23 is movable, once latch mechanism 24 is released, by the contact roll air lift device 26 (described in detail in connection with FIGURES 9, 10 and 11 hereof) actuated by air cylinder 27 mounted on cantilever beam 28. Beam 28 is attached at one end 29 as shown to a frame extension column 30 permanently affixed to frame 10. Also positioned on beam 28 is the tension air cylinder 31 which provides lateral motion between contact roll 20 and idler roll 32 mounted on shaft 32' in bearings 33 positioned on frame 34 which is affixed to the opposite end of tension air cylinder 31. Yokes 35 support the bearings 33 on frame 34 as best shown in FIGURE 3. Idler roll 32 is capable of oscillation due to assembly 36 at each end thereof. Mounted between idler roll 32 and contact roll 20 and connected by suitable linkage 37 to frames 30 and 34 are the automatic belt tracking assembly 38 (shown in detail in FIGURES 12 and 13) and the manual tracking adjustment 39 (shown in detail in FIGURE 14) which actuate tracking air cylinder 40. Covering the upper portion of contact roll 20 and surrounding the idler roll

and intermediate mechanisms is a hood 41. Extending around idler roll 32 and contact roll 20 (which are shown in their operating positions in these views) is a tensioned coated abrasive belt 42.

Contact Roll Oscillating Assembly

Referring now to FIGUURES 4, 5 and 6 of the drawings, the mechanism utilized to effect oscillation of the contact roll 20 of FIGURES 1–3 is shown in detail. Mounted adjacent of and exterior to the main shaft bearing 50 is a fixed cam plate 51. This plate 51 as well as bearing 50 is fastened to the frame 52 of the machine. The cam plate 51 is fastened to the frame 52 of the machine. The cam plate 51 is slanted as shown in the drawing of FIGURE 4 and forms one wall of a bearing race, the other wall of which is formed by a thrust bearing 53 mounted around shaft 54 of contact roll 20, with the plane of the bearing substantially normal to the axis of shaft 54, and driven by a separate pulley 55 from the main drive motor (shown on FIGURES 1–3). The angle of the cam plate to the plane of the thrust bearing is slight, e.g. 3°. Mounted within the bearing race so formed is a single ball bearing 56 preferably of 1/4" diameter. Bearing 50, since the contact roll 20 and shaft 54 must be pivoted in order to replace coated abrasive belts driven thereby, is a self-aligning bearing. In order to insure operation of the bearing 50 during oscillation, roller bearings 57 are incorporated in this unit. Mounted around shaft 54 inboard of the main bearing 50 are a thrust bearing 58 and a tension spring 59. The main drive pulley 60 is shown on the outboard end of shaft 54. In operation, the thrust bearing 53 is driven by pulley 55 at about 400 r.p.m. At the same time, shaft 54 is rotating under the drive of pulley 60 at about 1100 r.p.m. One revolution of thrust bearing 53 causes ball bearing 56 to travel 180° about the shaft from the position shown in FIGURE 5 to that shown in FIGURE 6, moving the shaft 54 and contact roll 20 outwardly to form one-half of an oscillation. On the second revolution of the thrust bearing 53, ball bearing 56 returns to the position shown in FIGURE 5 and spring 59 returns shaft 54 and contact roll 20 to their original position completing one oscillation. It should be noted that the cam plate 51, thrust bearing 53 and ball bearing 56 are enclosed in a housing which has been omitted from the drawing of FIGURE 4 for clarity of illustration. Bearings 57 are spaced apart within the self-aligning housing of bearing 50 to insure alignment against the torque force produced by the action of ball bearing 56 against cam plate 51.

In the preferred embodiment illustrated, the oscillating mechanism directly oscillates the contact roll and indirectly, through the medium of the tensioned coated abrasive belt, oscillates the floating idler roll described in detail and claimed in the copending application of Louis J. Hine, Serial No. 58,829, filed September 27, 1960. However, it is possible to further modify the equipment to provide direct oscillation independent of the rotational driving means for both the contact roll and the idler roll. This may take the form of direct-acting hydraulic cylinders or the like which simultaneously actuate both the idler roll and the contact roll. The two rolls must oscillate in unison and accordingly the preferred embodiment is as shown herein since the synchronization of the oscillation of the two rolls is automatic with the illustrated structure. The direct oscillation of the two rolls requires more expensive installation and must be critically controlled to insure that the two rolls oscillate as one.

Outboard Latch Assembly

Referring now to FIGURES 7 and 8 of the drawings, the means to permit easy and quick freeing of one end of the contact roll so as to change abrasive belts is illustrated. This unit consists of a hinged latch 70 having the free end 71 thereof mating in a tapered fit with a tapered block 72 affixed to the base of the outboard bearing 73. Latch 70 is secured at its pivoted end 74 to frame 75 and is held in closed position by means of a locking screw 76 operated by a suitable handle member 77. In operation, the latch 70 is opened to permit the outboard bearing 73 and contact roll shaft 78 to be lifted by the contact roll air-lift device shown generally at 79 and described in detail in connection with FIGURES 9, 10 and 11 hereof. A pair of stops 80 and 81 are provided to assist in re-positioning bearing 73 when the contact roll is allowed to drop back into place.

Contact Roll Air-Lift Assembly

Referring now to FIGURES 9, 10 and 11 of the drawings, the mechanism whereby the outboard end of the contact roll is lifted to permit changing coated abrasive belts is illustrated. The assembly consists of a support member 90 having a tapering wedge-shaped upper surface 91. This support member is affixed to the central beam 23 as is more clearly shown in FIGURES 1–3 described above. A slot 92 extends through support member 90 to permit passage of a hook member 93. Hook member 93 is affixed at its straight end 94 to the piston of a double-acting air cylinder 95. The curved end 96 of hook member 93 engages the shaft 97 of contact roll 98 between the end of roll 98 and the outboard bearing 99. In operation, once the latch mechanism described above in connection with FIGURES 7 and 8 of the drawings is released, the cylinder 95 is actuated by air pressure and the shaft 97 and roll 98 supported thereby is drawn by hook member 93 up the inclined surface 91 of support member 90. This provides an uninterrupted passage around the outboard end of contact roll 98 and idler roll 32 (shown in FIGURES 1-3 hereof) to permit easy removal and replacement of a coated abrasive belt extending over these rolls. When the air is reversed, the hook 93 is extended permitting the shaft 97 and roll 98 to slide back in place. Outboard bearing 99 likewise moves with shaft 97 and is returned to its place in the same manner. Obviously, other fluid-actuated devices as a hydraulic cylinder or the like could be substituted for air cylinder 95.

Automatic Belt Tracking Assembly

Referring now to FIGURES 12 and 13 of the drawings, the assembly utilized to automatically keep the coated abrasive belt centered on the idler and contact rolls of the machine is illustrated. This consists of a pair of independent mercury switches 100 and 101 actuated by a pair of external air paddles 102 and 103. The entire unit is mounted on the frame extension 30 of FIGURES 1–3 between the idler and contact rolls. In operation, the outboard paddle 102 is normally depressed by a jet of air from air jet 104. The inner paddle 103 is in the raised position since the air jet (not shown in FIGURES 12 and 13) immediately above paddle 103 is normally interrupted by the edge of the coated abrasive belt 42 as is best shown in FIGURE 3 of the drawings. If the coated abrasive belt shifts towards the outside edge of the idler and contact rolls (the side on which the tracking unit is mounted) the belt interrupts the air jet impinging against paddle 102 and this paddle will rise, actuating mercury switch 100 which in turn through suitable electrical connections (not shown) actuates a solenoid operated air valve 40 (shown in FIGURES 1–3) causing the end of idler roll 32 (FIGURES 1–3) to lift and cause the belt to track back towards the proper running position. If the belt moves too far towards the center of the roll, paddle 103 will be depressed by its cooperating air jet, actuating switch 101 and in turn air valve 40 to depress the end of idler roll 32 causing the belt to move across the roll in the opposite direction.

Manual Belt Tracking Adjustment Assembly

FIGURE 14 illustrates the manual adjustment associated with the means described above in connection with

FIGURES 12 and 13. By means of adjusting knobs **110** and **110'**, the idler roll **32** operatively mounted in frame **34** (as best shown in FIGURES 1–3) may be raised or lowered to make the belt track normally correct, thus reducing the shifting action induced by the automatic tracking device shown and described in connection with FIGURES 12 and 13 above. Movement of knobs **110** and **110'** will raise or lower air cylinder **40** thus raising or lowering the end of frame **34** attached thereto.

Operation

The complete unit illustrated in the drawings is, as stated above, particularly adapted for use in the buffing of tanned hides. In its commercial form a machine such as that illustrated utilizes coated abrasive belts of from about 40" to about 50" in width and the entire machine is about 10 feet wide, 6 feet deep and 5 feet high. The belt is driven with a 15 H.P. motor at approximately 3700 surface feet per minute. The contact roll is preferably surfaced with rubber of about 35 Durometer hardness.

In operation, the outboard latch mechanism is released with the idler roll in non-tensioned position. The air value controlling the lift of the contact roll is actuated and the outboard end of the roll is lifted. A coated abrasive belt—usually of grit 80 to grit 400—and having a length of 126 inches is then slid over the contact roll and idler roll. The contact roll air lift device is then actuated to drop the contact roll back in place where it is securely positioned by the latch mechanism; the idler roll is tensioned through the air cylinder mounted centrally of the frame; and the unit is ready for operation. The various controls are preferably interlocked electrically so that the belt must be tracking and under tension before driving power can be applied. The machine is then started and the hides to be buffed are fed to the belt between the steel pressure roll and the feed roll which is preferably coated with a rubber of about 15 Durometer hardness. The oscilation of the contact and idler rolls at about 200 cycles per minute, with travel of about 7/16", produces an oscillation of the coated abrasive belt which effectively bars streaking or the development of grain lines in the finished hides. The use of the soft rubber contact roll permits the machine to automatically buff thin sections of hide without removing excessive amounts from the thicker areas. As mentioned above, the abrasive belt is cool cutting and the unit produces finishes of complete consistency at sharply reduced production costs.

While illustrated in connection with the conversion of a drum buffing unit to a belt unit, it is obvious that a belt unit may be built directly, incorporating the features of the present invention, and that such belt unit may be utilized for any of the operations to which coated abrasive belt units are applied.

Obviously, many variations and modifications may be made without departing from the spirit and scope of the invention disclosed herein and therefore, only such limitations should apply as are imposed by the appended claims.

We claim:

1. In a coated abrasive belt machine having a frame and a pair of rolls mounted on shafts journaled in bearings within said frame and adapted to support and drive a coated abrasive belt repleaceably trained over said rolls, an oscillating means associated with at least one of said rolls comprising: a thrust bearing so mounted on the shaft on which said roll is mounted as to be axially movable therewith and independently rotatable thereof; a cam plate spaced from said thrust bearing, said cam plate being mounted around said shaft and independent of both axial and rotational movement thereof; means positioned between and in contact with said thrust bearing and said cam plate and adapted, upon rotation of said thrust bearing independently of said shaft to act against said cam plate to axially move said shaft and thrust bearing with respect to said cam plate; and means acting upon said shaft to periodically return said shaft to its original position with respect to said cam plate.

2. In a coated abrasive belt machine having a frame and a pair of rolls mounted on shafts journaled in bearings within said frame and adapted to support and drive a coated abrasive belt replaceably trained over said rolls, an oscillating means associated with at least one of said rolls comprising: a fixed cam plate and a rotatable thrust bearing forming opposed sides of a ball bearing race positioned around the shaft on which said roll is mounted, said thrust bearing being so mounted on said shaft in a position normal to the axis of said shaft as to be axially movable with said shaft and independently rotatable thereon, and said cam plate being so mounted around said shaft at an angle with respect to the plane of said thrust bearing as to be independent of both axial and rotational movement of said shaft; a ball bearing disposed within said race and adapted to rotate therearound as said thrust bearing is rotated independently of said shaft, said ball bearing during part of its rotation acting against said fixed cam plate to axially move said thrust bearing and the shaft associated therewith outwardly with respect to said fixed cam plate; and means acting upon said shaft during the balance of the rotation of said ball bearing about its race to return the shaft and thrust bearing to its initial position.

3. In a coated abrasive belt machine having a frame and an idler roll and a contact roll mounted for rotation within said frame and adapted to support and drive a coated abrasive belt replaceably trained over said rolls, means for mounting said rolls comprising: means to support said idler roll with at least one end thereof free of contact with said frame whereby a coated abrasive belt may be passed thereover; a pair of self-aligning bearings having journaled therein a shaft supporting said contact roll, one of said bearings being fixedly secured to said frame and the other of said bearings being releaseably held to said frame in alignment with said first bearing; means adjacent said fixed bearing to drive said contact roll; means to displace said other bearing from contact with said frame to permit the passage of a coated abrasive belt thereover; and latch means to releaseably secure said other bearing to said frame in alignment with said fixed bearing.

4. A machine as in claim 3 wherein said means to displace said other bearing is a fluid-actuated cylinder and piston with an extension of the piston thereof adapted to engage the shaft of said contact roll.

5. A belt grinder comprising a contact roll, a bearing-supported shaft carrying the same, means to tilt one end of said shaft and contact roll, an idler roll spaced a substantial distance in back of the contact roll, a shaft carrying the idler roll, bearings for said shaft, a yoke carrying said bearings and located in front of the idler roll between the top and bottom spans of the abrasive belt, means urging said yoke rearward to tension the belt, an overhung beam carrying said means at the side of the machine having the fixed bearing, tracking means at the latter side of the machine for detecting excessive lateral movement of the belt, means automatically moved in response to said tracking means for tilting the adjacent end of the yoke upward or downward to restore proper belt position, the overhung mounting of the bearing yoke facilitating changing the abrasive belt, driving means for the contact roll, and means for oscillating the contact roll for a short distance in axial direction.

6. A coated abrasive belt machine comprising: a frame, an idler roll and a contact roll mounted for rotation within said frame and adapted to support and drive a coated abrasive belt replaceably trained over said rolls; means to support said idler roll with at least one end thereof free of contact with said frame whereby a coated abrasive belt may be passed thereover; a pair of self-aligning bearings having journaled therein a shaft supporting said contact roll, one of said bearings being fixedly secured to said frame and the other of said bearings being releaseably held to said frame in alignment with

said first bearing; means to drive said contact roll; and actuator means associated with said other bearing to displace said other bearing from contact with said frame to permit the passage thereover of a coated abrasive belt.

7. A belt grinder for accurately grinding wide sheet material to a desired thickness, said grinder comprising a contact roll, a tiltable bearing fixedly mounted at one end of said roll, a shaft received in said bearing for carrying the contact roll, a pressure roll disposed immediately adjacent the contact roll, precision means for precisely adjusting the spacing between the pressure roll and the contact roll, an idler roll spaced a substantial distance from the contact roll for tensioning the abrasive belt, said idler roll being overhung on bearing means supported from the same side of the grinder as the tiltable bearing, and a power operated actuator so related to the shaft that the actuator serves to tilt the free end of the contact roll away from the pressure roll and toward the idler roll, thereby facilitating changing the abrasive belt.

8. A belt grinder for accurately grinding wide sheet material to a desired thickness, said grinder comprising a contact roll, a tiltable bearing fixedly mounted at one end of said roll, a quickly releaseable bearing at the other end of the roll, means to lock or release the latter bearing, said bearing being supported in a fixed predetermined position when locked for use, a shaft received in said bearings for carrying the contact roll, a pressure roll disposed immediately adjacent the contact roll, precision means for precisely adjusting the spacing between the pressure roll and the contact roll, an idler roll spaced a substantial distance from the contact roll for tensioning the abrasive belt, said idler roll being overhung on bearing means supported from the same side of the grinder as the tiltable bearing, and a power operated actuator so related to said shaft that on releasing the releaseable bearing the actuator serves to tilt the free end of the contact roll away from the pressure roll and toward the idler roll, thereby facilitating changing the abrasive belt.

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