This invention relates to grinding and polishing machines and particularly to a machine of this type employing an endless abrasive belt as the abrading element.

The present invention concerns improvements in the belt grinding machine described in my United States Patent No. 2,578,662 and provides several advantageous features thereover. In accordance with the present invention, as distinguished from the invention described in my prior patent aforesaid, the three rollers which support and drive the endless abrasive belt are mounted so that they may be adjusted simultaneously. Thus, the three rollers are all mounted on a member which is adjustable about two perpendicular axes so that the roller which supports the portion of the belt which contacts the work may be raised or lowered without requiring readjustment of the spacing of the remaining two rollers and so that the contact roller may be aligned with the remaining two rollers, the three rollers having substantially the same plane of rotation when the machine is in operation. In addition, the remaining two rollers may be raised or lowered with respect to the contact roller to permit changing the arc of contact between the abrasive belt and the contact roller without raising or lowering the contact roller itself. Means are also provided for adjusting the remaining two rollers with respect to each other to permit the use of contact rollers of different diameters and to permit the tensioning of the belt in the event that it stretches during operation or in the event the belts differ slightly in length when replaced. The means for adjusting the remaining two rollers with respect to each other includes a spring tensioning device which eliminates the necessity of readjusting the rollers when the belt length changes by only small amounts.

The machine of the invention has the advantage that it is unnecessary to adjust two different supports during initial installation of the machine in order to align the contact roller with the remaining two rollers. Also, the three rollers and the mounting member may be supported from a single stand and, if desired, the mounting member and three rollers may be removed as a unit from a stand and installed in other places where a polishing or grinding machine is desired, for example, at a lathe, at the end of a rolling mill, etc., the mounting member with the three rollers being mounted directly on the apparatus with which it is associated or being suspended from some auxiliary device such as a chain hoist.

Thus, with the belt grinding and polishing machine of the present invention, the space required is reduced as compared to that required with the previously known machines of this type, the installation is simplified and the adjustments required during the operation of the machine are reduced to a minimum. In addition, the machine is versatile in that it may be used by itself or in association with other apparatus, it being possible to mount the machine of the invention closely adjacent the work piece.

The invention may be better understood by referring to the following detailed description of the invention which sets forth the manner in which I now prefer to practice the invention and by referring to the accompanying drawings, in which:

Fig. 1 is a side elevation view of a polishing and grinding machine incorporating the invention;

Fig. 2 is a fragmentary side elevation view of the machine shown in Fig. 1 and is taken from the opposite side from the view of Fig. 1;

Fig. 3 is a plan view, partly in cross section, of the machine shown in Figs. 1 and 2;

Fig. 4 is a fragmentary enlarged view of a portion of the roller adjusting apparatus employed to maintain a constant tension on the abrasive belt; and

Fig. 5 is a side elevation view indicating the manner in which the machine of the invention may be suspended from a chain hoist.

Referring to Figs. 1 and 2, the machine is provided with a contact roller 10 which has a relatively soft, cushioned outside surface 11 which may be formed as described in my patent aforesaid from materials such as cloth, rubber, felt, sheepskin, hair, etc. 12. As shown in Fig. 4, there rotate about a shaft 13 which is received in U-shaped recesses 14 at the end of the portion 14 of the mounting member indicated generally by reference numeral 15.

The mounting member 15 also has a portion 16 which extends rearwardly from a stand 17, the portion 16 being pivotally mounted on the stand 17 and being held thereon by a bolt 18 which permits the member 15 to rotate about a horizontal pivot axis extending parallel to the axis of rotation of the roller 10. After the member 15 has been adjusted to the desired position, it is held in its adjusted position by means of a clamping bolt 19.

A further mounting member comprises two rods or shafts 20 and 21 which extend through holes in the portion 16 is provided for the purpose of suspending the remaining two rollers 22 and 23, the roller 23 being mounted on and driven by the motor 24. The motor 24 is held on a base plate 25 which is supported from the ends of the two rods 20 and 24 and the motor 24 is supplied with electrical energy through the electrical conductor 26 which connects to a control box 27, electrical energy being supplied from a power source (not shown) through the box 28 and the conductor 29.

The roller 22 is mounted on a plate or member 30 which at its sides at least partially and preferably completely encircles the rods 20 and 21 but which is slidable along the length of the rods 20 and 21. The roller 22 rotates on a shaft 31 which is secured to the member 30 and the axis of rotation of the roller 22 is not only substantially parallel to the axis of rotation of the roller 10 and the pivot axis of the member 15, but also to the axis of rotation of the roller 23.

A screw 32 which is rotatable by a hand wheel 33 is provided for the purpose of adjusting the roller 22 toward and away from the roller 23. The screw 32 is rotatably supported at one end by the cross member 34 and at the opposite end by the portion 16 which has a hole 35 therein for receiving the end of the screw 32. As shown in Fig. 4, the screw 32 engages the internal threads of a bushing 36 which is threaded into a slide 37 which is slidable on the rods 20 and 21. The bushing 36 is prevented from rotating by a set screw 38 which fits into a tapped hole in the slide 37 and which jams against the side of the bushing 36. The screw 32 passes freely through a hole in the member 30 and, as the screw 32 is rotated, the slide 37 moves in a direction determined by the direction of rotation of the screw 32 and the direction of the threads on the screw 32 and the bushing 36.

A spring 39 is provided intermediate the bushing 36 and the member 30 so that when the slide 37 moves upwardly it applies a force to the member 30, and hence to the roller 22, in a direction away from the roller 23. Conversely, when the slide 37 moves downwardly, the
upward pressure on the member 30 is reduced permitting the roller 22 to move toward the roller 23. An endless abrasive belt 40 extends around the three rollers 10, 22 and 23 and, after the belt 40 has been positioned on these rollers, it may be made tight by rotation of the hand wheel 33 which causes the slide 37 to move upwardly. The slide 37 is moved in an upward direction until the desired tension on the belt 40 is obtained and the spring 39 maintains substantially a constant tension on the belt 40 even though the length of the belt 40 may vary slightly during use. Accordingly, it is unnecessary to raise the slide 37 after the initial adjustment of the slide 37 unless there is a relatively great change in the length of the belt 40.

Although a work piece to be ground or polished may be held against the belt at the surfaces of the rollers or in between the rollers, the piece is preferably held so that the belt passes between it and the surface 11 of the roller 10, the surface 11 supporting the belt as it passes therebetween. The rods 20 and 21 are slidable with respect to the portion 16 so as to permit the arc of contact between the belt 40 and the surface 11 to be changed without changing the position of the roller 10 and without requiring readjustment of the roller 22 with respect to the other rollers. For example, it may be desirable to make the arc of contact extend mainly above the axis of the roller 10 so that the work may be pressed downwardly against the belt 40. In this case, the rods 20 and 21 would be moved downwardly from the position shown in Fig. 1 so as to cause the arc of contact between the belt 40 and the surface 11 to extend around the upper portion of the roller 10. On the other hand, if the work is to be pressed against the portion of the belt extending across the front of the roller 10 as shown in Fig. 1, then the rods 20 and 21 are adjusted to the position shown in Figs. 1 and 2. Adjustment of the rods 20 and 21 is accomplished by loosening the wing bolts 41 and 42 which fit into tapped holes in the portion 16 and which engage the rods 20 and 21 in the tightened positions of the bolts 41 and 42. When the bolts 41 and 42 are loosened, it is possible to slide the rods 20 and 21 with respect to the portion 16. After the desired adjusted position is reached, the bolts 41 and 42 are tightened holding the rods 20 and 21 in the desired position.

If it is desired to adjust the position of the roller 10 with respect to a work piece or for the convenience of an operator, the roller 10 is loosened permitting rotation of the member 15 around the bolt 18. Thus, the roller 10 may be raised or lowered along the belt 40 and such raising or lowering may be accomplished without requiring readjustment of the roller 22 with respect to the other rollers and without changing the tension on the belt 40. As mentioned above, the member 15 is held in its adjusted position by the bolt 19 which is tightened after the member 15 has been adjusted.

Referring to Fig. 3, it will be seen that the portion 14 comprises a pair of spaced arms 43 and 44 which support the ends of the shaft 12. When the tension on the belt 40 is reduced, it is a simple matter to remove the shaft 12 from the recesses in the arms 43 and 44 and to substitute the shaft 10 having either of the base 15 having different dimensions. A different surface 11 or different dimensions for the roller 10 may be desired for different types of work being ground or polished.

The portion 14 is swivelly mounted on the portion 15 by means of a bolt or pin 45 which is tight enough to prevent rotation of the portion 14 about the bolt 45, the axis of the bolt 45 being the swivel axis of the portion 14. As pointed out in my aforementioned patent, it is important that the mounting for the roller 10 be adjustable about an axis extending parallel to the plane of rotation of the roller 10 so that the roller 10 may be aligned with the rollers 22 and 23 and so that proper tracking of the belt 40 is obtained. In addition, it has been found that the swivel axis should be disposed with respect to the axis of rotation of the roller 10 so that the desired tracking of the belt 40 may be obtained and adjustment of the portion 14 may be carried out without causing the belt 40 to jump off one of the rollers. It has been found with the arrangement shown and with the means for adjusting the roller 10 of the type shown, it is possible to provide tracking of the belt 40 and to apply heavy pressures to the belt 40 without causing the belt 40 to slip or to jump from one of the rollers. This is true even though the roller 10 is provided with a cushioned surface 11 and even though the width of the surface 11 may be more or less than that of the belt 40.

The portion 14 is also provided with a slot 46 through which extends a bolt 47 which fits into a threaded hole in the portion 16. When the bolt 47 is loosened, the portion 14 may be swivelled about the bolt 45 to an extent determined by the length of the slot 46. When the portion 14 has been adjusted to a position which provides proper tracking of the belt 40, the bolt 47 may be tightened holding the portion 14 in the adjusted position or it may be left loose as the portion 14 will be held in its adjusted position by means hereinafter described.

To aid in the adjustment of the portion 14 with respect to the portion 16, the roller 10 is provided with a collar 53 which prevents axial movement of the sleeve 50. With the bolt 47 loosened, it is thus possible by rotating the knob 51 to cause the screw 48 to be drawn into the sleeve 50 or moved outwardly therefrom and at the same time to rotate the portion 14 about the bolt 45. As mentioned above, it is possible to remove the mounting member 15 and the parts mounted thereon as a unit from the stand 17 and to associate this portion of the machine with some other apparatus, such as a lathe, rolling mill, etc. In this manner it is possible to grind or polish a work piece while it is in the lathe or as it issues from a rolling mill. In addition, it may also be desirable to move the machine with respect to the work rather than to move the work with respect to the machine.

When the machine of the invention is mounted other than on the stand 17, it may be mounted by means of the bolts 18 and 19 but, if desired, it may be mounted by means of other means of raising or lowering the machine as illustrated in Fig. 5. As shown in Fig. 5, the member 15 is suspended from a yoke 56 secured thereto by the bolt 18, the yoke 56 in turn being supported by the hook 57 of the chain hoist 55. Preferably, a strap 58 is connected between the yoke 56 and the member 15 so as to maintain the member 15 in a horizontal position as illustrated in Fig. 5 but which position may be altered by an operator. The strap 58 may be secured to the member 15 by a bolt or pin 59 extending through one of the holes 54. With this arrangement an operator may swing the machine so as to traverse the work piece with the belt 40, the portion of the belt which contacts the work piece at any given time being the portion thereof in contact with the contact roller 10.

Having thus described my invention with particular
2,788,103

reference to the preferred form thereof and having shown and described certain modifications, it will be obvious to those skilled in the art to which the invention pertains, after understanding my invention, that various changes and other modifications may be made therein without departing from the spirit and scope of my invention, as defined by the claims appended hereto.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. An endless abrasive belt polishing and grinding machine comprising a mounting member having two portions one of which is swivelly connected to the other and supports the other; a pair of rollers mounted in spaced relation on and supported by one of said portions of said member with their axes of rotation substantially perpendicular to a common plane which intersects said axes substantially at the mid-points thereof and which is substantially parallel to the swivel axis of said portions, a contact roller having a relatively soft, cushioned outside surface to support an endless abrasive belt against the counterforce of an engaging work piece; means rotatably mounting and supporting said contact roller on the other of said portions of said mounting member with the axis thereof spaced from the swivel axis, said contact roller being mounted with its axis of rotation substantially parallel with the axes of rotation of said pair of rollers and being mounted with the mid-point of its axis substantially in said plane so that an endless abrasive belt may be mounted on all of said rollers for lengthwise movement thereon.

2. An endless abrasive belt polishing and grinding machine comprising a mounting member having two portions one of which is swivelly connected to the other and supports the other; a pair of rollers mounted in spaced relation on and supported by one of said portions of said member with their axes of rotation substantially perpendicular to a common plane which intersects said axes substantially at the mid-points thereof and which is substantially parallel to the swivel axis of said portions; a contact roller having a relatively soft, cushioned outside surface to support an endless abrasive belt against the counterforce of an engaging work piece; means rotatably mounting and supporting said contact roller on the other of said portions of said mounting member with the axis thereof spaced from the swivel axis and on the opposite side of said swivel axis from said pair of rollers, said contact roller being mounted with its axis of rotation substantially parallel with the axes of rotation of said pair of rollers and being mounted with the mid-point of its axis substantially in said plane so that an endless abrasive belt may be mounted on all of said rollers for lengthwise movement thereon.

3. An endless abrasive belt polishing and grinding machine comprising a mounting member having two portions one of which is swivelly connected to the other and supports the other; a pair of rollers mounted in spaced relation on and supported by one of said portions of said member with their axes of rotation substantially perpendicular to a common plane which intersects said axes substantially at the mid-points thereof and which is substantially parallel to the swivel axis of said portions, a contact roller having a relatively soft, cushioned outside surface to support an endless abrasive belt against the counterforce of an engaging work piece; means rotatably mounting and supporting said contact roller on the other of said portions of said mounting member with the axis thereof spaced from the swivel axis and on the opposite side of said swivel axis from said pair of rollers, said contact roller being mounted with its axis of rotation substantially parallel with the axes of rotation of said pair of rollers and being mounted with the mid-point of its axis substantially in said plane so that an endless abrasive belt may be mounted on all of said rollers for lengthwise movement thereon.

4. An endless abrasive belt polishing and grinding machine comprising a mounting member having two portions one of which is swivelly connected to the other and supports the other; a first roller; means rotatably mounting and supporting said roller on one of said portions of said member; a second roller; means adjustably and rotatably mounting and supporting said second roller on said one portion of said member with its axis of rotation substantially parallel with that of said first roller, said first and second rollers being mounted with their axes substantially perpendicular to a common plane which intersects said axes substantially at the mid-point thereof and which is substantially parallel to the swivel axis of said portions; said portions mounting means being adjustable toward and away from said first roller; a contact roller having a relatively soft, cushioned outside surface to support an endless abrasive belt against the counterforce of an engaging work piece; means rotatably mounting and supporting said contact roller on the other of said portions of said mounting member with the axis thereof spaced from the swivel axis and on the opposite side of said swivel axis from said first and second rollers, said contact roller being mounted with its axis of rotation substantially parallel with the axes of rotation of said first and second rollers and being mounted with the mid-point of its axis substantially in said plane so that an endless abrasive belt may be mounted on all of said rollers for lengthwise movement thereon.

5. An endless abrasive belt polishing and grinding machine comprising a mounting member having two portions one of which is swivelly connected to the other and supports the other; a motor having a roller driven thereby; means mounting and supporting said motor on one of said portions of said member; a second roller; means adjustably and rotatably mounting and supporting said second roller on said one portion of said member, said rollers being mounted with their axes of rotation substantially perpendicular to a common plane which intersects said axes substantially at the mid-points thereof and said mounting means being adjustable toward and away from said motor roller; means spring-connected to said mounting means and urging said mounting means away from said motor roller; a contact roller having a relatively soft, cushioned outside surface to support an endless abrasive belt against the counterforce of an engaging work piece; means rotatably mounting and supporting said contact roller on the other of said portions of said mounting member with the axis thereof spaced from the swivel axis and on the opposite side of said swivel axis from said motor roller and said second roller, said contact roller being mounted with its axis of rotation substantially perpendicular to said plane, said plane intersecting said axis substantially at the mid-point thereof so that an endless abrasive belt may be mounted on all of said rollers for lengthwise movement thereon.

6. An endless abrasive belt polishing and grinding machine comprising a mounting member having two portions one of which is swivelly connected to the other and supports the other; means pivotally mounting one of said portions, the pivot axis extending perpendicularly to the length of said member and to the swivel axis; a second mounting member mounted on and supported by said one portion with an upper portion extending upwardly from said one portion and a lower portion extending downwardly from said one portion, the length of said second member extending parallel to a plane which is perpendicular to said pivot axis and said second member being adjustable in the direction of its length with respect to said one portion; a motor having a roller driven thereby, said motor being mounted on and supported by said lower portion with the axis of said roller parallel to said pivot axis; a second roller; means adjustably and rotatably mounting and supporting said second roller on said upper portion with its axis of rotation substantially parallel with the axis of said motor roller, the mid-points of the axes of said motor roller and said second roller lying in a plane which
is substantially perpendicular to said axes and said mounting means being adjustable lengthwise of said second member; an adjusting member adjustable mounted on said second member; spring means interconnecting said adjusting member and said mounting means for positioning said mounting means being adjustable lengthwise of said second member; a contact roller having a relatively soft, cushioned outside surface to support an endless abrasive belt against the counterforce of an engaging work piece; means rotatably mounting and supporting said contact roller on the other of said portions of said second member with the axis thereof spaced from said swivel axis, said contact roller being mounted with its axis of rotation substantially parallel with the axes of rotation of said second member; and said second roller and being mounted with the mid-point of its axis substantially in said plane so that an endless abrasive belt may be mounted on all of said rollers for lengthwise movement thereon.

7. An endless abrasive belt polishing and grinding machine comprising a supporting stand; a mounting member having two portions one of which is swivelly connected to the other, manually adjustable means connected between said portions for adjusting the position of said one portion with respect to said other portion about the swivel axis, said other portion being pivotally mounted on said stand with said other portion extending rearwardly of said stand and with said one portion extending forwardly of said stand, the pivot axis extending perpendicularly to the length of said member and to the swivel axis; a further mounting member mounted on said other portion rearwardly of said stand with an upper portion extending upwardly from said other portion and a lower portion extending downwardly from said other portion, the length of said further member extending parallel to a plane which is perpendicular to said pivot axis and said further member being adjustable in the direction of its length with respect to said other portion; a motor having a roller driven thereby, said motor being mounted on said lower portion with the axis thereof extending vertically, the pivot axis extending horizontally and perpendicularly to the length of said member; a further mounting member mounted on said other portion rearwardly of said stand with an upper portion extending upwardly from said other portion and a lower portion extending downwardly from said other portion, the length of said further member extending parallel to a plane which is perpendicular to said pivot axis and said further member being adjustable in the direction of its length with respect to said other portion; a motor having a roller driven thereby, said motor being mounted on said lower portion with the axis thereof extending vertically, the pivot axis extending horizontally and perpendicularly to the length of said member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; a further portion interconnecting said adjusting member and said mounting means for positioning said mounting means; a contact roller having a relatively soft, cushioned outside surface to support an endless abrasive belt against the counterforce of an engaging work piece; means rotatably mounting said contact roller on said one portion with the axis thereof spaced from said swivel axis and on the opposite side of said pivot axis from said motor roller and said second roller, said contact roller being mounted with its axis of rotation substantially parallel with the axes of rotation of said motor and said second rollers and being mounted with the mid-point of its axis substantially in said plane so that an endless abrasive belt may be mounted on all of said rollers for lengthwise movement thereon.

8. An endless abrasive belt polishing and grinding machine comprising a supporting stand; a mounting member having two portions one of which is swivelly connected to the other, manually adjustable means connected between said portions for adjusting the position of said one portion with respect to said other portion about the swivel axis, said other portion being pivotally mounted on said stand with said other portion extending rearwardly of said stand and with said one portion extending forwardly of said stand and said other portion being mounted with said swivel axis extending vertically, the pivot axis extending horizontally and perpendicularly to the length of said member; a further mounting member mounted on said other portion rearwardly of said stand with an upper portion extending upwardly from said other portion and a lower portion extending downwardly from said other portion, the length of said further member extending parallel to a plane which is perpendicular to said pivot axis and said further member being adjustable in the direction of its length with respect to said other portion; a motor having a roller driven thereby, said motor being mounted on said lower portion with the axis thereof extending vertically, the pivot axis extending horizontally and perpendicularly to the length of said member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; an adjusting member adjustable mounted on said further member; a further portion interconnecting said adjusting member and said mounting means for positioning said mounting means; a contact roller having a relatively soft, cushioned outside surface to support an endless abrasive belt against the counterforce of an engaging work piece; means rotatably mounting said contact roller on said one portion with the axis thereof spaced from said swivel axis and on the opposite side of said pivot axis from said motor roller and said second roller, said contact roller being mounted with its axis of rotation substantially parallel with the axes of rotation of said pair of rollers and being mounted with the mid-point of its axis substantially in said plane, and an endless abrasive belt mounted on all of said rollers for lengthwise movement thereon.

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