Sept. 18, 1956 S. BADER 2,763,103

BELT GRINDING AND POLISHING MACHINE

Filed March 12, 1954 2 Sheets-Sheet 1

Fig. 4.

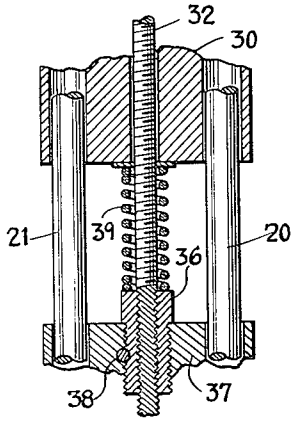


Fig. 1.

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Fig. 2.

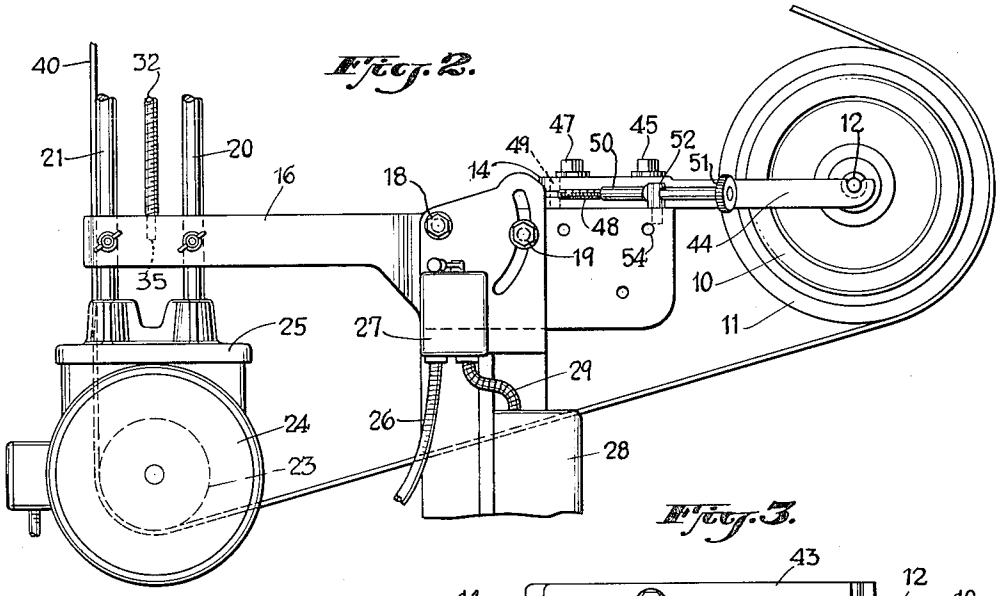


Fig. 3.

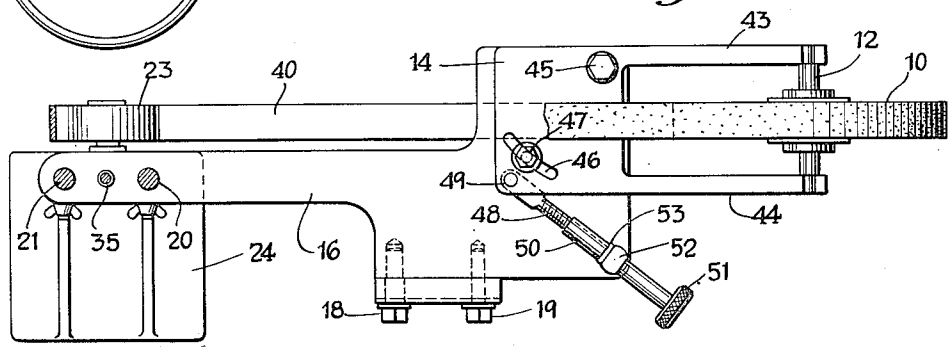
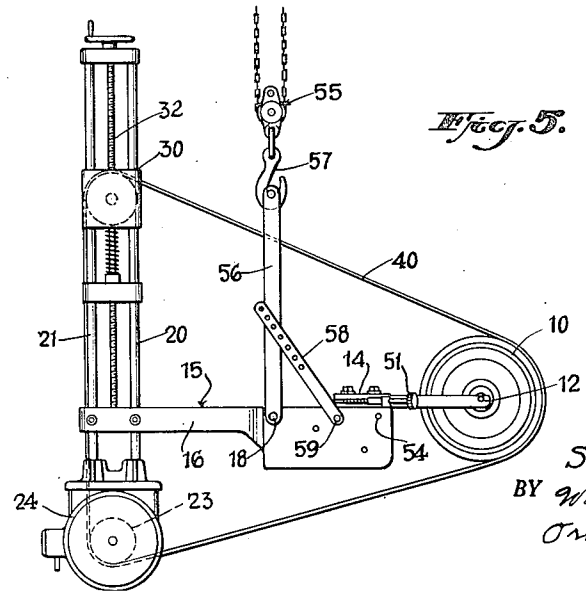


Fig. 5.



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United States Patent Office

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BELT GRINDING AND POLISHING MACHINE

Stephen Bader, Rockville Centre, N. Y.

Application March 12, 1954, Serial No. 415,791

9 Claims. (Cl. 51—135)

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 advantages 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 an endless abrasive belt are mounted so that they may all 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 this 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, wire, etc. The roller **11** rotates about a shaft **12** which is received in U-shaped recesses **13** 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 comprising 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 **21** 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 readjust 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 inbetween 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 bolt **19** is loosened permitting rotation of the member **15** around the bolt **18**. Thus, the roller **10** may be raised or lowered 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 a roller **10** having either a different surface **11** or 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 **16** by means of a bolt or pin **45** which is tight enough to prevent looseness of the portion **14** but which permits 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 displaced 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 of the rollers 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**, an adjusting screw **48** pivotally secured to the portion **14** by the pin **49** is provided. This screw **48** is engaged by an internally threaded sleeve **50** which is provided with a knob **51** by which the sleeve **50** may be rotated. The sleeve **50** extends through an eye bolt **52** which is pivotally secured to the portion **16** and the sleeve **50** 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 a 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 suitable bolts or pins extending through the holes **54** in the portion **16** or it may be mounted by any combination of these. Also, although I have shown the rollers **10**, **22** and **23** in Figs. 1–3 mounted with the roller **23** below the roller **10** and the roller **22** above the roller **10**, and hence with the member **15** extending in a horizontal direction, it will be apparent that the member **15** may be mounted in other positions, for example, vertically or at an angle with respect to the horizontal.

If the work is of such a size that it is desirable to move the machine with respect to the work, the portion of the machine mounted on the member **15** may be suspended from a chain hoist **55** 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 when the machine is not being guided 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

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 an 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 one 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 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 one 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; spring means 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 first mounting member having two portions one of which is swivelly connected to the other and supports the other; means for 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 adjustably mounted on said second member; spring means 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 and supporting said contact roller on the other of said portions of said first 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 motor roller 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.

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 of said roller parallel to said pivot axis; a second roller, means adjustably and rotatably mounting said second roller on said upper portion with the axis of rotation of said second roller substantially parallel with that 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 further member; an adjusting member adjustably mounted on said further member; spring means 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 of said roller parallel to said pivot axis; a second roller; means adjustably and rotatably mounting said second roller on said upper portion with the axis of rotation of said second roller substantially parallel with that 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 further member; an adjusting member adjustably mounted on said further member; screw means mounted on said further member and engaged with said adjusting member for moving said adjusting member lengthwise of said further member; spring means 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 roller 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.

9. 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, and an endless abrasive belt mounted on all of said rollers for lengthwise movement thereon.

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