

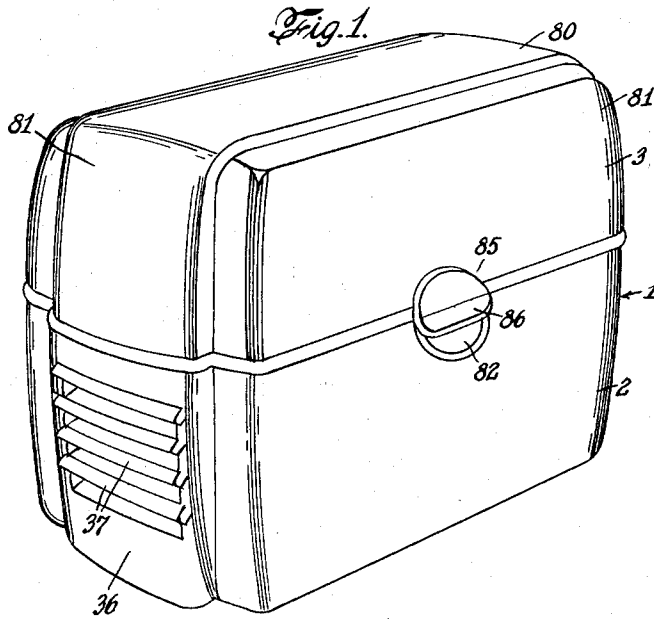
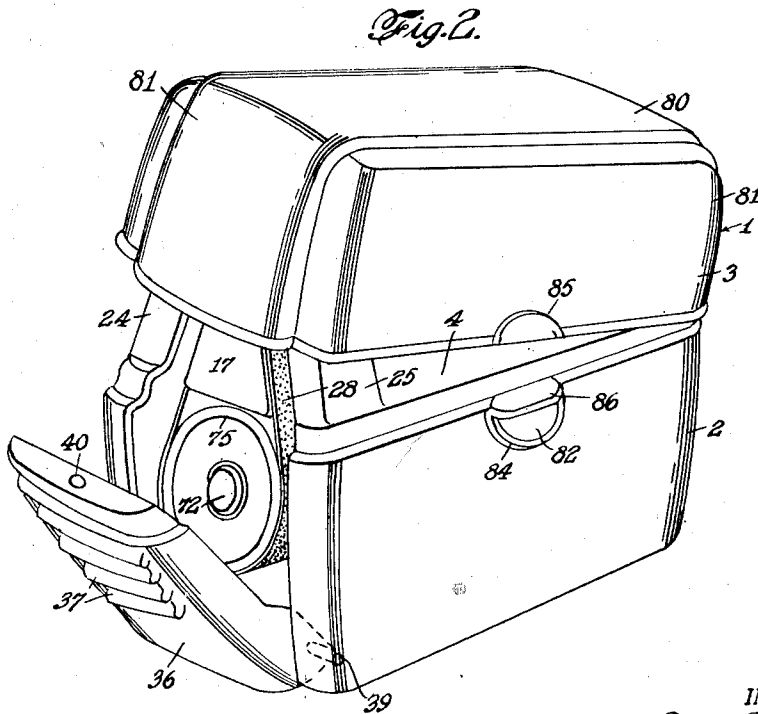
Sept. 4, 1951

R. E. RISLEY ET AL
KNIFE SHARPENER

2,566,809

Filed Oct. 31, 1947

3 Sheets-Sheet 1



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Fig. 3.

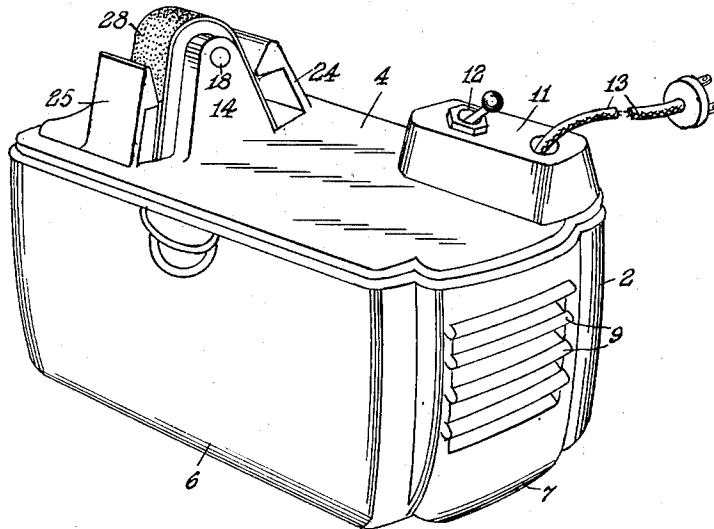
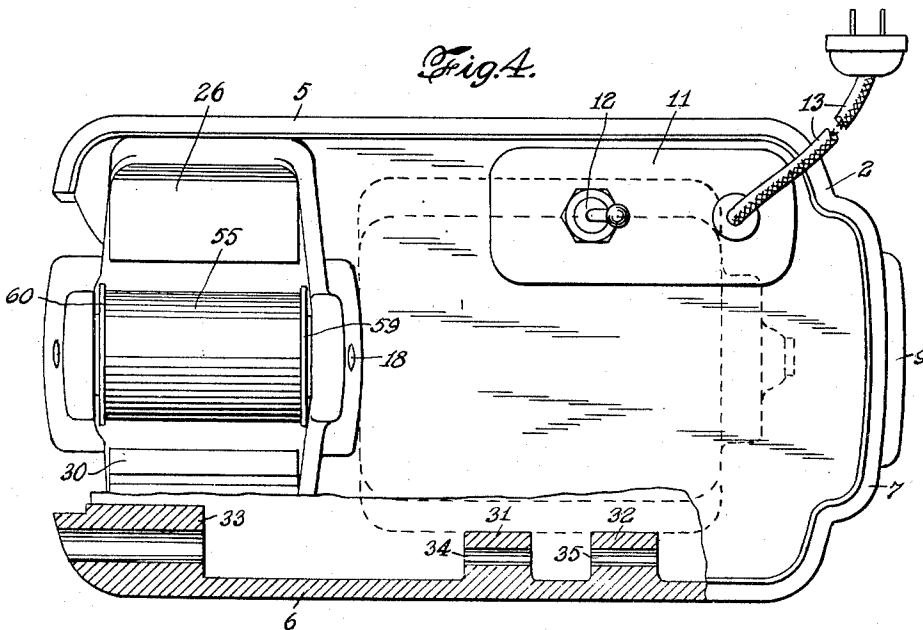


Fig. 4.



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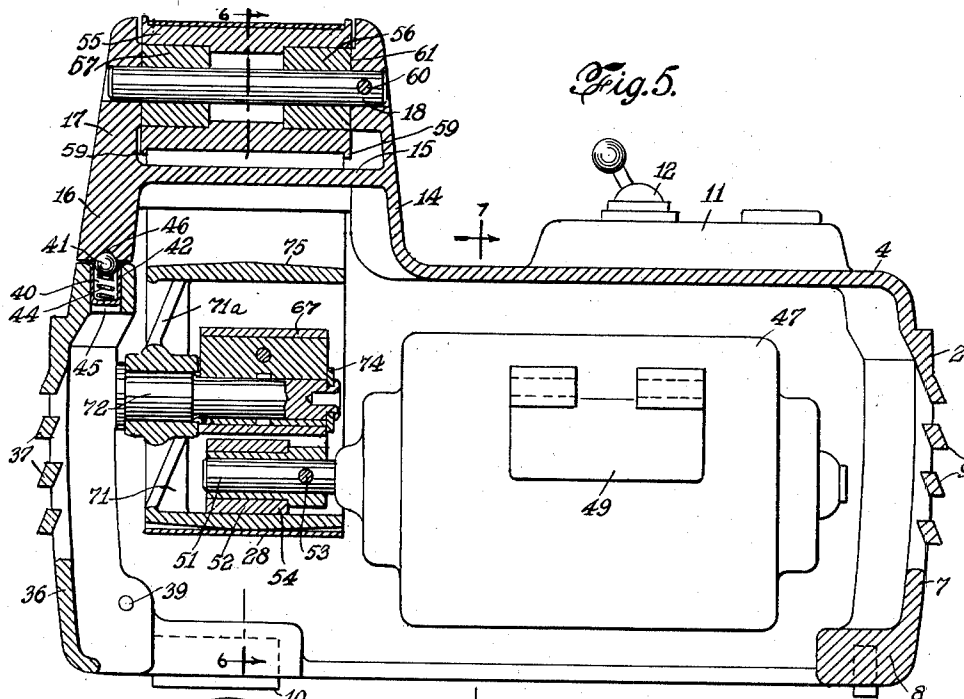
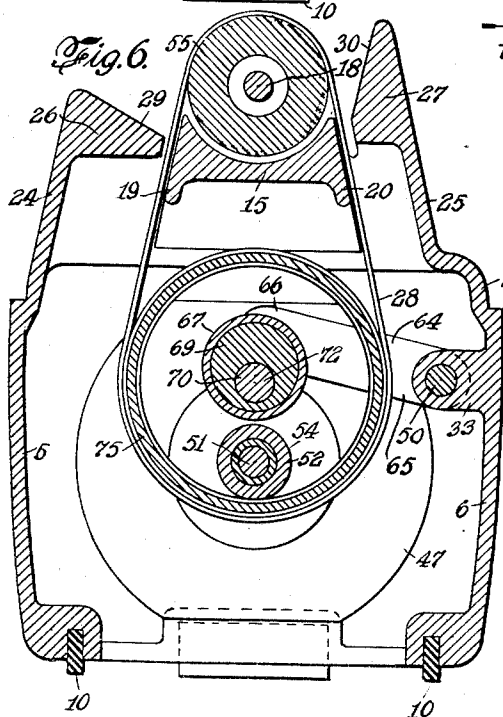
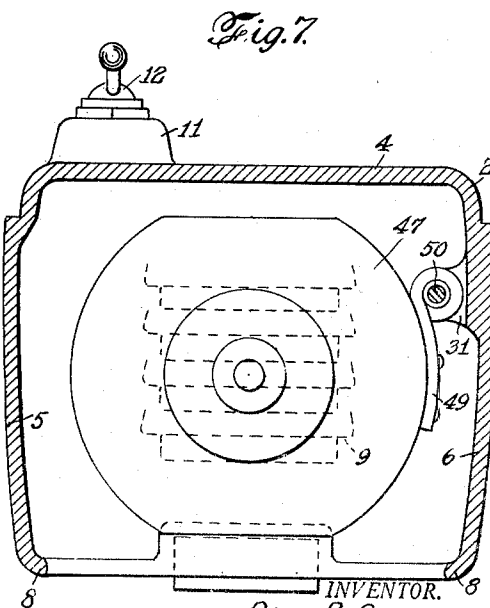
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UNITED STATES PATENT OFFICE

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KNIFE SHARPENER

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This invention relates to grinding machines of the abrasive belt type.

An object of the invention is to provide an improved grinding machine particularly suitable for sharpening knives, scissors or the like.

Another object of the invention is to provide a grinding machine in which the grinding mechanism is enclosed excepting for the end of the abrasive belt and excepting the portions of the belt which may be engaged by the tool during the grinding thereof.

Another object of the invention is to provide an abrasive belt grinding machine in which the belt is automatically maintained at the proper tension.

Another object of the invention is to provide an abrasive belt grinding machine in which the belt runs in the vertical direction making both sides of the outer surface of the belt available for use in the sharpening of a tool.

Another object of the invention is to provide an abrasive belt grinding machine adaptable to grinding either knives or scissors without adjustment of the machine.

Another object of the invention is to provide an abrasive belt grinding machine which utilizes a high speed light weight motor without excessive belt speed and which utilizes the weight of the motor for maintaining tension of the belt.

Another object of the invention is to provide an abrasive belt grinding machine in which a continuous supporting surface is furnished for the tool being ground.

Another object of the invention is to provide an abrasive belt grinding machine in which the abrasive belt may be easily replaced or interchanged with another belt having a different surface.

Another object of the invention is to provide an improved grinding machine which is economical to manufacture, efficient in operation, and durable in use.

In accordance with the invention, these objects are accomplished by providing a knife sharpener in which a housing encases and supports a motor, speed reduction means, and an abrasive belt, and also furnishes guiding means so that various tools may be sharpened without adjustment of the machine. The abrasive belt is mounted on a pair of driving and driven pulleys. The driven pulley is rotatably supported about a fixed axis by the housing while the driving pulley is rotatably supported about a movable axis and mounted so that the belt may be tightened by movement thereof. The driving pulley, in the preferred

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form, is cup-shaped and is of a larger size than a motor drive wheel which is received within the cup-shaped opening of the driving pulley to drive it by frictional contact therewith. This construction provides clutch means and speed reduction means in the one unit. The motor is mounted within the housing so that its weight provides the desired tension on the abrasive belt which is tightened by movement of the motor through the contact of its drive wheel and the driving pulley. The housing is formed to provide a backing to support the abrasive belt and to furnish guiding means to support the tool being sharpened while it is held against the belt.

A grinding machine constructed in accordance with the invention is advantageous in that all of the parts may be enclosed in a housing, thus reducing the amount of dust particles which can escape to the room in which the machine is used. The construction of the housing is such that inexpensive die casting may be used in its formation. The motor used as the driving power may be of the high speed light weight type while still avoiding undesirably high speed of the abrasive belt and providing a belt driving pulley of relatively large diameter to provide a more positive drive. The weight of the motor cooperates with that of the driving pulley to maintain adequate tension on the belt. The machine is neat in appearance and compact in form and may be easily stored. The machine is continuously in adjustment and so is readily useable even by unskilled workmen.

Other objects and advantages of the invention will be apparent from the following description and from the accompanying drawings which show, by way of example, an embodiment of the invention.

In the drawings:

Fig. 1 is a perspective view of a grinding machine in accordance with the invention with the case closed.

Fig. 2 is a view corresponding to Fig. 1 with the cover partially raised and with an end wall partially opened showing a portion of the abrasive belt and driving pulley.

Fig. 3 is a perspective view of the grinding machine with the cover removed.

Fig. 4 is a partially broken away plan view of the grinding machine with the cover removed.

Fig. 5 is a partial vertical longitudinal sectional view of the grinding machine with the motor shown in elevation.

Fig. 6 is a vertical cross-sectional view of the

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grinding machine taken along the line 6—6 of Fig. 5.

Fig. 7 is a vertical cross sectional view of the grinding machine taken along the line 7—7 of Fig. 5.

Referring to the drawings there is shown a grinding machine 1 in accordance with the invention. As may be seen in Figs. 1 and 2, the machine is encased in a lower housing 2 covered by a top member 3.

The lower housing or base member 2 acts as the frame for the support of the operating parts of the machine, to supply an enclosure to protect the mechanism and to provide a neat appearance. The housing 2 may be die-cast in a one-piece unit and is formed of any suitable material such as metal or plastic and comprises a top portion 4 with downwardly depending side walls 5 and 6, and an end wall 7. The bottom edges 8 of the side walls 5 and 6 are inwardly turned to provide a surface contacting area and to enhance the appearance of the housing 2 which may also be ribbed to add to the appearance thereof. The side walls 5 and 6 are also sloped inwardly slightly to further improve the appearance. The end wall 7 of the housing 2 is formed with horizontally extending louvers 9 to permit ventilation of the housing, and its bottom edge 8 is thickened and turned inwardly. Recesses are provided on the bottom edge of the housing to receive surface contacting members 10 formed of rubber or other resilient material. The top 4 of the housing 2 is generally flat in contour with a raised portion 11 at one end adjacent the rear side 6 of the housing for the mounting of an electric switch 12 and to provide a terminal for an electric cord 13.

In order to provide a mounting for a top pulley to carry an abrasive belt, the top 4 of the housing 2 is formed with an upwardly extending frame portion 14. A longitudinally extending horizontal portion 15 is branched off from the extension 14 and formed with a downwardly turned end 16 and an upwardly turned end 17, the end 17 coacting with the upper end of the extension 14 to provide shaft mounting ends which are perforated to form a support for a pulley shaft 18. A backing or support for an abrasive belt 28 is made by forming the horizontal portion 15 of the housing 2 with edges somewhat wider than the main body thereof and tapering the edges outwardly and downwardly as indicated at 19 and 20 (Fig. 6).

The housing 2 is also formed with tool guiding means in the top 4 thereof comprising a pair of upwardly extending guideways 24 and 25, each of these members having thickened longitudinally extending upper portions 26 and 27. The guideways 24 and 25 are positioned on opposite sides of the pulley mounting assembly formed of the extensions 14 and 15 and extend parallel to the length of the shaft 18, the length of the guideways being approximately equal to or slightly greater than the width of an abrasive belt 28 to be carried by a pulley mounted on the shaft 18. Inclined surfaces 29 and 30 are formed on the inner sides of the thickened portions 26 and 27 with an angle with respect to the abrasive belt 28 so that the tool to be sharpened is always, when placed on the surfaces, properly positioned with respect to the belt.

Mounting means for a motor in the housing 2 is provided by lugs 31 and 32 formed on the inside of the front side wall 6 above the center thereof. The lugs are perforated as indicated at 34 and 35 to receive a bearing shaft. A third perforated

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lug 33 is also provided adjacent the edge of the end wall 6 to provide means for mounting a driving pulley. A door 36 is provided at one end of the housing 2 to close the open end of the housing and to provide easy access for replacement of the abrasive belt.

The door 36 is formed with louvers 37 to permit through ventilation of the housing and is pivotally mounted by means of studs or screws 39 inserted through perforations in the lower edges of the front ends of the side walls 5 and 6. The door is held closed by a spring-pressed ball assembly 40 including a ball 41 retained in a holder 42 and urged outwardly by a spiral spring 44. The ball assembly is adapted to be retained in a recess or bore 45 in the top edge of the door 14. The ball 41 is adapted to be received in a recess 46 in the lower edge of the downwardly turned portion 16 to hold the door closed.

A motor 47 is fitted with a hinge-like bracket 49 adapted to be pivotally supported by a pivot shaft 50 engaging in the perforations 34 and 35 of the lugs 31 and 32. The drive shaft 51 of the motor is fitted with a wheel 52 secured thereon by a pin 53 and having a friction drive surface 54.

A top or driven pulley 55 with bearing surfaces 56 and 57 is mounted on the shaft 18. The outer surface of the pulley 55 is formed with flanged edges 59 and 60 to guide the belt in centered position thereon. The shaft 18 is secured against longitudinal movement by a pin 60 which is threaded or secured by a friction fit in an aperture in the frame portion 14.

A driving pulley assembly is pivoted carried by the mounting lug 33. The pulley assembly comprises a bracket arm 64 having one end 65 pivotally mounted by the shaft 50, the other end 66 of the bracket arm being enlarged to form a bearing housing 67 for a bearing 69 having an eccentrically positioned bearing surface 70. The weight of the bracket arm 64 may be varied as desired, as will hereinafter appear. A cup-shaped driving pulley wheel 71, the weight of which may be varied as desired, is supported by a shaft 72 rotatably supported in the bearing 69 by a lock washer 74 or other suitable means. The outer surface 75 of the cup-shaped driving pulley wheel 71 is crowned to cause the abrasive belt 28 to be centered thereon. Air circulation for the cooling of the motor 47 is provided by making spokes 71a on the pulley wheel 71 fan-bladed in shape. By reason of the mounting of the bracket arm 64 and the motor bracket 49 on the shaft 50 the pivot axes of the motor and the cup-shaped wheel 71 are maintained in alignment.

The endless abrasive belt 28 is preferably made of woven material surfaced with an abrasive substance of the desired grinding quality and it is adapted to be placed over the pulleys 55 and 71 and held stretched by the weight of the driving pulley and the motor 47.

The top member or cover 3 may be die cast in a one piece unit of any suitable material such as metal or plastic and is preferably formed with a flat top portion 80 having downwardly depending side walls 81 adapted to abut against the upper ends of the side walls of the lower housing 2. In order that the top member 3 may be secured in position over the lower housing 2, catches or fastening members 82 are provided. The fastening members 82 are semi-circular in shape and may be rotatably fastened to the side walls 5 and 6 of the lower housing 2 in any usual manner such as by screws inserted into the rear of the fastening members from the inside of the housing

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member through perforations in the side walls thereof (not shown). The fastening members are formed with inwardly facing grooves 84 on the periphery of the semi-circular edges thereof, the grooves 84 being adapted to engage with correspondingly-shaped raised projections 85 on the side walls 81 of the top member 3. To secure the top member 3 to the lower housing 2, the fastening members 82 are rotated so that the inwardly facing grooves 84 are engaged with the projections 85 thus locking the top member in position. A raised portion 86 is provided on each of the fastening members to facilitate the turning thereof.

In the operation of the grinding machine 1, the cord 13 is connected to a source of electric current and the switch 12 is turned on. The rotation of the motor 47 causes the rotation of the wheel 52 secured to the drive shaft 51 and positioned within the cup-shaped opening of the pulley 71, a clutch contact with the inside of the pulley being made by the friction surface 54 of the wheel 52. By reason of the differences in the diameters of the motor wheel 52 and of the pulley 71 a speed reduction is obtained permitting the use of a relatively high speed motor yet providing a comparatively low belt speed. The abrasive belt 28 is centered on the pulley 71 by the tapered outside surface of the pulley and is centered on the top pulley 55 by the flanged edges 59 and 60 of the pulley.

The required tension is applied to the abrasive belt 28 by the weight of the pivotally mounted bracket 64, which rotatably supports the lower pulley. The tension is also applied by the weight of the motor 47 gravitational forces tending to cause the motor to rotate downwardly about its pivotal support on the shaft 50 and thereby tending to cause the driving pulley 71 to rotate downwardly about its pivotal support on the same shaft thus providing a force tending to separate the pulleys 55 and 71 and tensioning the belt. By reason of the sidewise positioning of the supports for the motor and the driving pulley, a limited movement of both parts may take place practically in a vertical direction and thus the abrasive belt 28 is tightened while maintained properly positioned on the upper pulley 55.

In sharpening a knife or other tool with a long tapered cutting edge, the tool is positioned on the surface 30 of the guideway 25 and is held at the proper angle for the sharpening of the edge thereof. The tools may be inserted either from the left or the right so that both sides thereof are ground at the same angle and the continuous support provided to the belt by the backings 19 and 20 permits the proper grinding of the curved or pointed end portions of a tool such as a knife. As the belt 28 extends to the edges of the supporting surfaces 29 and 30, a knife may be ground close to its shank, while the blades of a pair of scissors may be ground close to the pivot.

From the preceding description, it will be seen that the present invention provides a novel grinding machine of the abrasive belt type in which tools having cutting edges of various angles may be sharpened without the necessity of adjusting the grinding machine. The grinding mechanism is practically completely enclosed and protected against damage. The abrasive belt 28 may be easily replaced or changed by opening the door 36 of the machine and lifting the driving pulley 71 to relieve the tension of the belt. The belt will be held to the desired tension even though it stretches because of continued use, the tensioning

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means being provided by the weight of the motor. The belt will be properly positioned at all times as the alignment of the motor and pulleys will be maintained through a considerable range of take-up on the belt. A construction is provided in which both sides of the belt are available for the sharpening of tools. A continuous supporting surface is provided so that the tool may be properly positioned while its entire cutting edge is ground. A positive drive is assured as the speed reduction construction permits the use of a larger driving pulley.

While the invention has been described and illustrated with reference to a specific embodiment thereof, it will be understood that other embodiments may be resorted to without departing from the invention. For example, the motor 47 has been described as being pivotally mounted in the housing. Other embodiments might include constructions in which the motor is slidably mounted. Further, the cup-shaped driving wheel 71 might also be slidably mounted. In still other embodiments the speed reduction feature utilizing the cup-shaped wheel 71 might be eliminated to permit the direct driving of the abrasive belt 28 by the wheel 52 of the motor 47. Therefore, the form of the invention set out above should be considered as illustrative and not as limiting the scope of the following claims.

We claim:

1. A grinding machine comprising a housing, an idler pulley rotatably supported by said housing for rotation about a fixed axis, a floating pulley having a peripheral rim portion, means for rotatably mounting the floating pulley including a shaft parallel to the axis of the idler pulley and a support for said shaft pivotally mounted on said housing to swing about an axis which is parallel to said shaft and is displaced laterally from a line connecting the shaft and the axis of the idler pulley, whereby the rotatable floating pulley is swingable bodily about said pivotal axis to move toward and away from the idler pulley, an abrasive belt running over said pulleys, a driving motor having a casing and a rotating shaft disposed parallel to and offset from the axis of the floating pulley, a friction driving surface carried by said motor shaft and in frictional driving engagement with the inner surface of the peripheral rim of the floating pulley, and means for pivotally supporting the motor casing on the housing to swing about an axis which is parallel to the axis of the motor and is offset laterally from a vertical line passing through the center of gravity of the motor, whereby the motor under the action of gravity tends to swing in a direction away from the idler pulley to press the driving surface of the motor shaft into frictional driving engagement with the peripheral rim of the floating pulley and to exert on said pulley a component force tending to move the floating pulley away from the idler pulley.

2. A grinding machine according to claim 1, in which the pivotal axes of the motor support and the support for the floating pulley shaft are substantially coincident.

3. A grinding machine comprising a housing having side, end and top walls, an idler pulley rotatably supported above the top wall of the housing for rotation about a stationary horizontal axis, a cup-shaped pulley disposed below the idler pulley and having a peripheral rim portion, means for rotatably mounting the cup-shaped pulley including a shaft parallel to the

axis of the idler pulley and a support for said shaft pivotally mounted on a side wall of the housing to swing about an axis which is parallel to said shaft whereby the rotatable cup-shaped pulley is swingable bodily about said pivotal axis to move toward and away from the idler pulley, an abrasive belt running over said pulleys, a driving motor having a casing and a rotatable shaft disposed parallel to and offset from the axis of the cup-shaped pulley, a friction driving surface carried by the motor shaft and engaging the peripheral rim of the cup-shaped pulley, and means for pivotally mounting the motor casing on a side wall of the housing to swing about an axis which is parallel to the axis of the motor and is offset laterally from a vertical line passing through the center of gravity of the motor, whereby the weight of the motor tends to swing the motor downward to press the driving surface of the motor shaft into frictional driving engagement with the inner surface of the peripheral rim of the cup-shaped pulley and to exert on said pulley a component force tending to swing it downwardly away from the idler pulley.

4. A grinding machine according to claim 3, in which the idler pulley is cylindrical and the cup-shaped pulley is crowned.

5. A grinding machine comprising a frame, an idler pulley rotatably supported on said frame, a driving pulley having a peripheral rim portion, means for rotatably supporting the driving pulley for rotation about an axis which is parallel to the axis of the idler pulley and is movable laterally toward and away from the idler pulley while maintaining said parallel relationship, an abrasive belt running over said pulleys, a motor having a rotating shaft parallel to and offset from the axis of the driving pulley, a friction driving surface carried by the motor shaft and engaging the inner surface of the peripheral rim of the driving pulley, the diameter of the driving surface being materially less than that of the peripheral rim of the driving pulley to provide a speed reduction and means for movably mounting the motor on the frame to maintain said parallel relationship of the motor and pulley axes while permitting bodily movement of the motor in a direction having a vertical component, whereby the weight of the motor acts through the motor shaft to press the driving surface into frictional driving engagement with the peripheral rim of the driving pulley and to exert on said pulley a radially directed component force tending to move the driving pulley away from the idler pulley.

6. A grinding machine comprising a housing having side, end and top walls, a pulley support projecting upwardly from the top wall, an idler pulley rotatably mounted on said support with its axis horizontal and extending lengthwise of the housing, a driving pulley disposed below the idler pulley and inside the housing with its axis parallel to that of the idler pulley, a movable pulley support for the driving pulley providing for bodily movement of the driving pulley toward and away from the idler pulley while maintaining said parallel relationship, an abrasive belt

running over said pulleys, said housing being provided with spaced parallel openings through which said belt extends, and having raised integral portions adjacent said openings and outside the belt, with inclined plane surfaces sloping toward, and disposed at a predetermined angle to, said belt; said inclined surfaces serving as guides, a motor enclosed in said housing and having a rotating shaft parallel to and offset from the axis of the driving pulley and a frictional driving surface carried by said shaft and engaging the inner surface of a peripheral portion of the driving pulley and means for movably mounting the motor on a wall of the housing to maintain said parallel relationship of the motor shaft and pulley axis while providing for bodily movement of the motor in a downward direction, whereby downward movement of the motor by gravity presses the driving surface of the motor shaft into frictional engagement with the driving pulleys and tends to move the driving pulley downwards away from the idler pulley.

7. In a grinding machine the combination of a housing having side and top walls; an idler pulley rotatably supported on said housing, a floating pulley disposed below the idler pulley and inside the housing, means for rotatably supporting the floating pulley for rotation about an axis which is parallel to the axis of the idler pulley and is movable laterally toward and away from the idler pulley while maintaining said parallel relationship, said floating pulley having a peripheral rim portion, an abrasive belt running over the said pulleys, a motor having a rotating shaft parallel to and offset from the axis of the floating pulley, a driving wheel on said motor shaft and engaging the inner surface of the peripheral rim of the floating pulley, and means for movably mounting the motor in the housing, said mounting means providing for bodily movement of the motor in a direction having a component that is radial of the floating pulley, said motor being biased to tend to move in a direction to press the driving wheel against the peripheral rim portion of the floating pulley and thereby exert a force on said pulley tending to move it away from the idler pulley.

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