United States Patent [19]

Kirtz

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[54] **GRINDING MACHINE**

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[52] **U.S. Cl.** .... **51/80 BS**

[51] **Int. Cl.** **B24b 3/52**

[58] **Field of Search** .... 51/80 R, 80 A, 80 BS, 51/23, 83, 40, 111; 76/50

[56] **References Cited**

UNITED STATES PATENTS

2,228,385	1/1941	Burns	51/80 R
3,258,878	7/1966	Clark	51/80 R
1,065,593	6/1913	Davis	51/23
2,432,535	12/1947	McBride	51/80 R
2,865,141	12/1958	Madl et al.	51/80 R
3,484,997	12/1969	Allen	51/80 R

FOREIGN PATENTS OR APPLICATIONS

284,010	10/1928	Great Britain	51/80 R
264,692	10/1949	Switzerland	51/80 R

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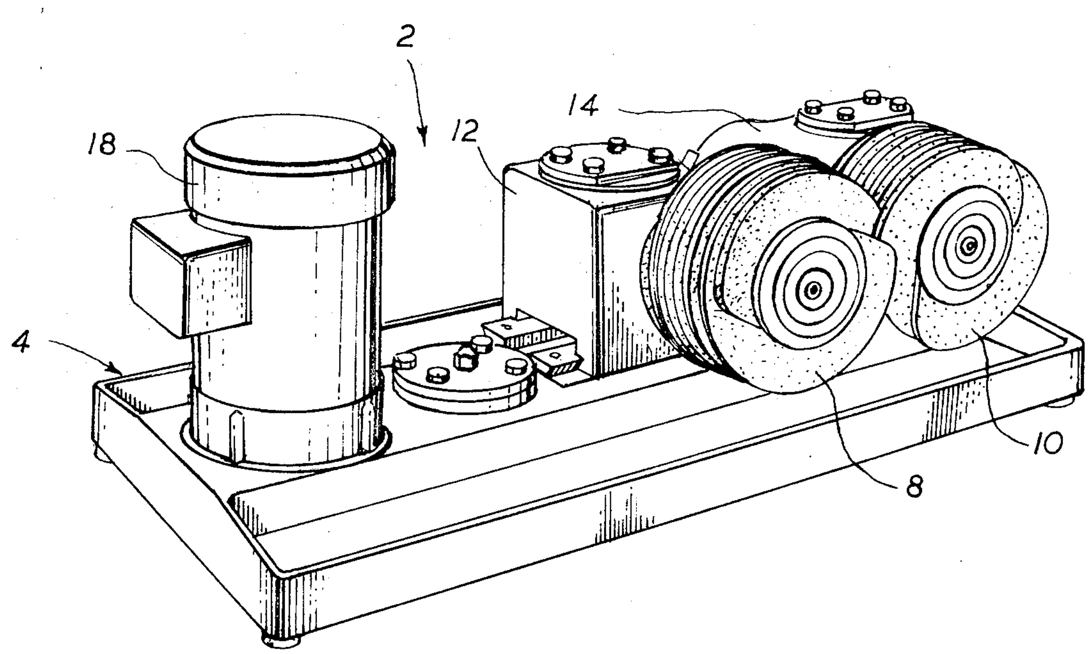
[57] **ABSTRACT**

A grinding machine for honing the cutting edge of a cutting implement including a support member having a grinding assembly mounted on one side including a pair of interdigitated grinding wheels, and a drive mechanism supported on the opposite side being enclosed by the support member. Power means mounted in laterally spaced relation from the grinding assembly rotating the grinding wheels. At least one of the grinding wheels is mounted for adjustment with respect to the other grinding wheel. The drive mechanism includes an endless drive element for operating the grinding wheels in timed relation, and a speed-reducing mechanism connects the drive mechanism and grinding wheels for reducing the timing error resulting from adjustment thereof. Each grinding wheel includes a drive shaft journaled for rotation in the support member being arranged for driving connection with one side of the drive element for maximum power utilization and compactness.

11 Claims, 10 Drawing Figures



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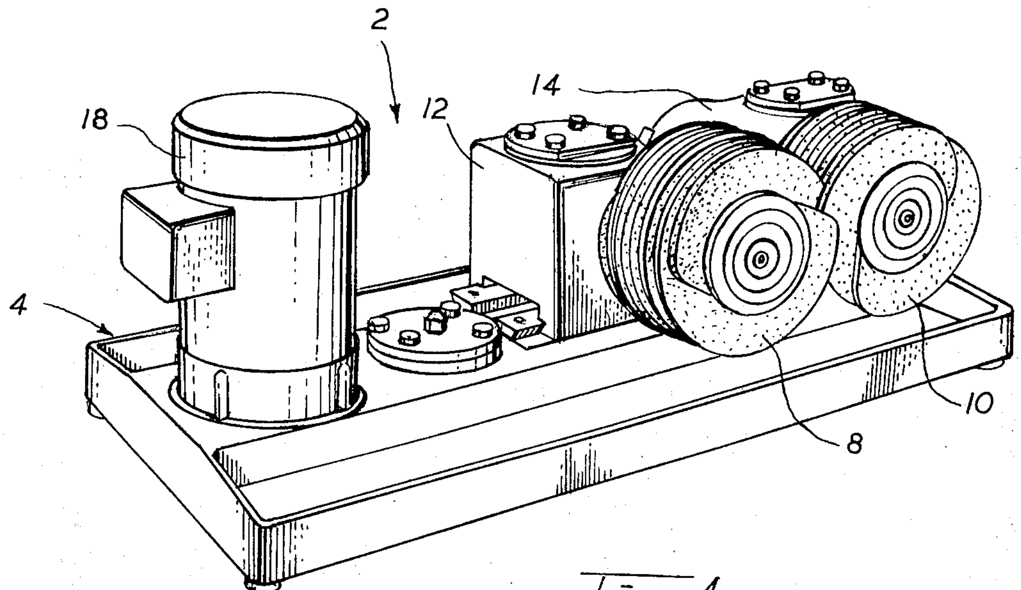


Fig. 1

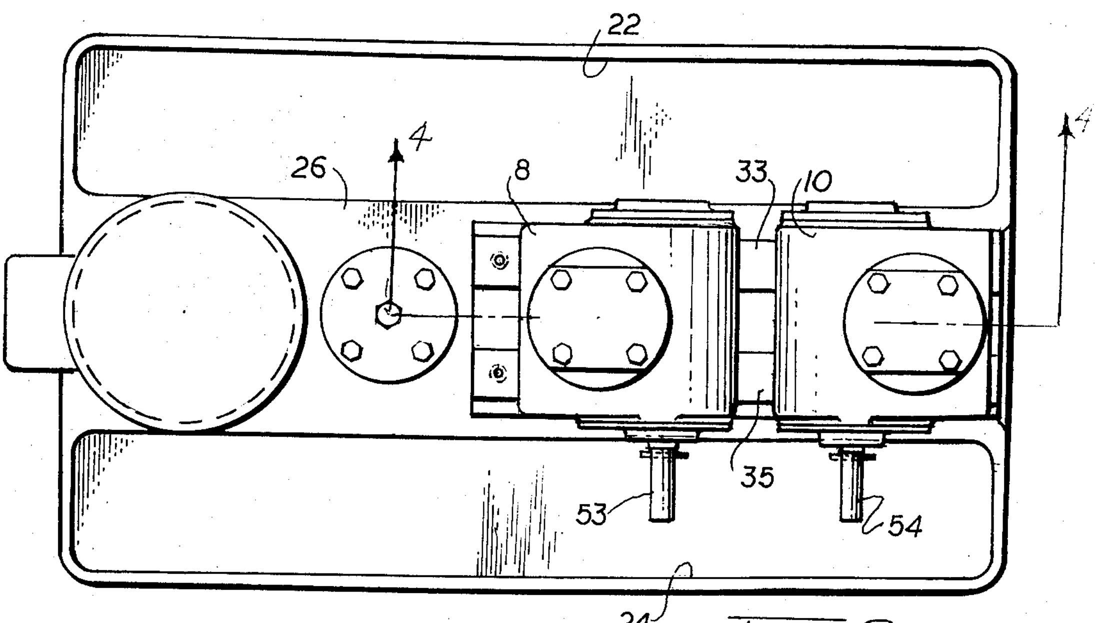
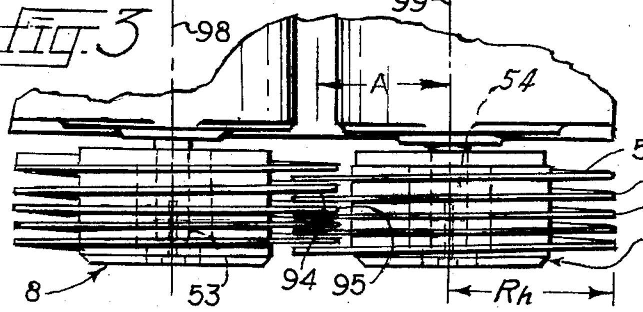


Fig. 2

Fig. 3



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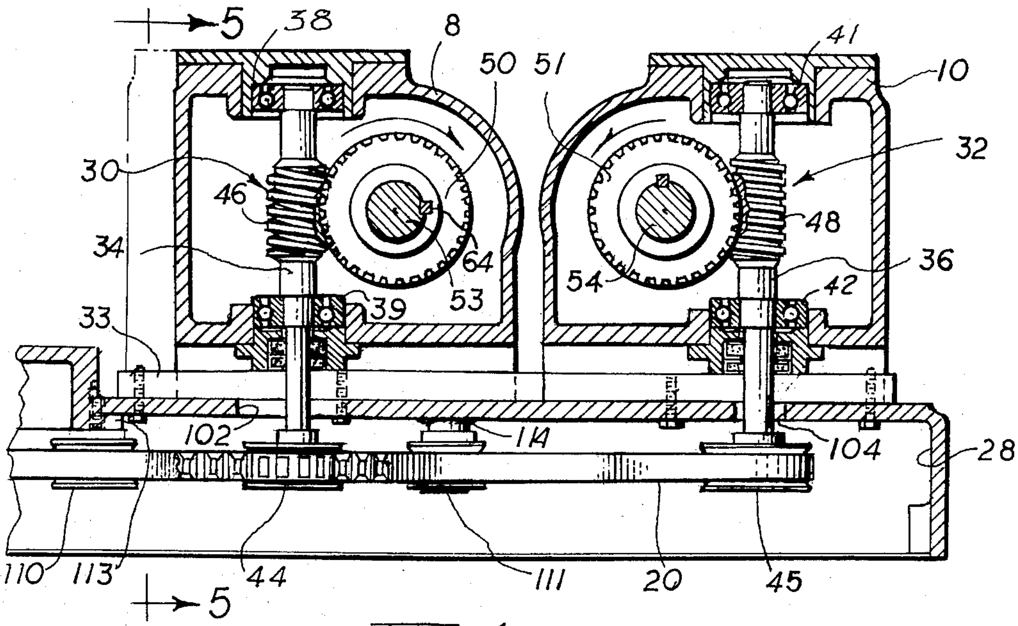

Fig 4

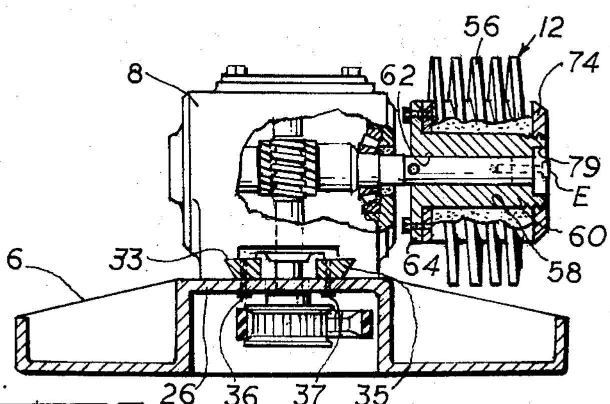

Fig 5

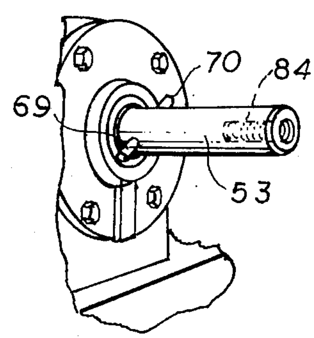

Fig 6

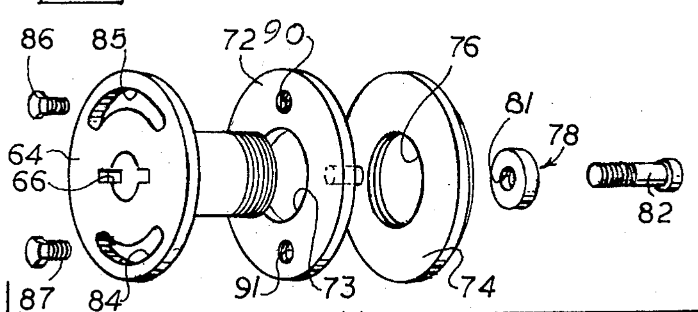

Fig 7

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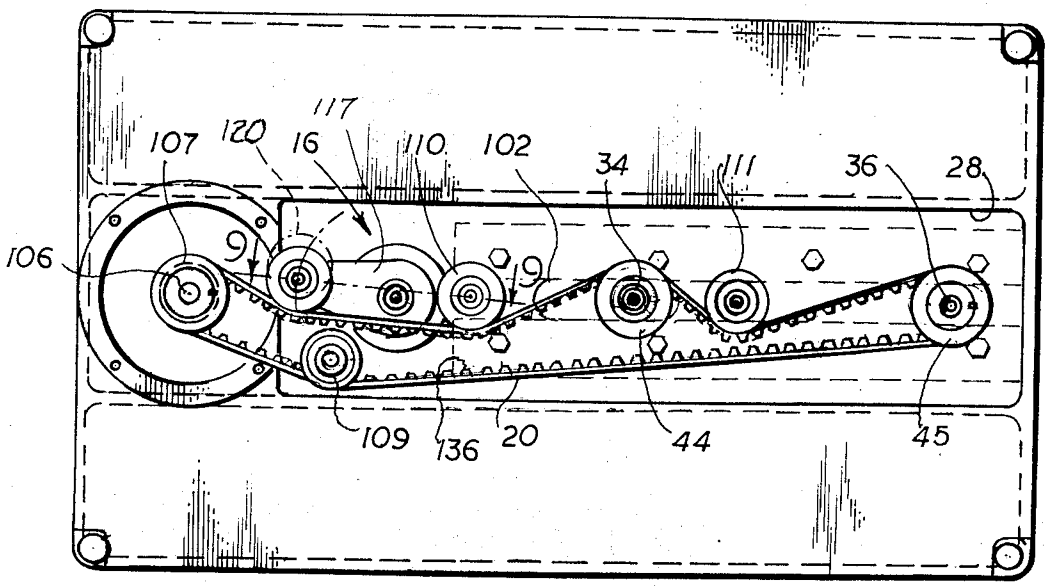

Fig. 8

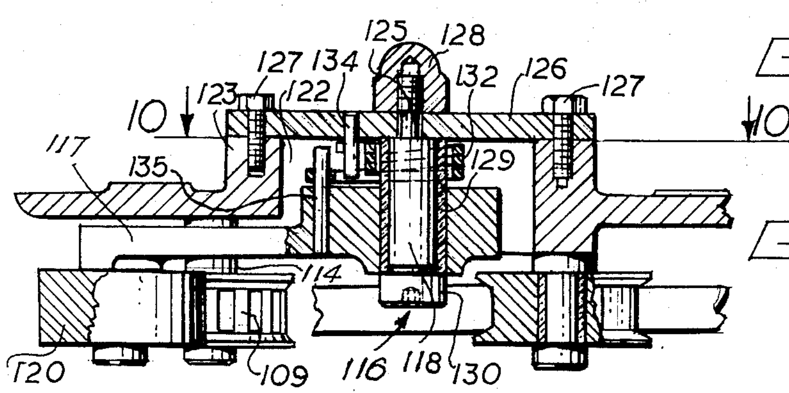

Fig. 9

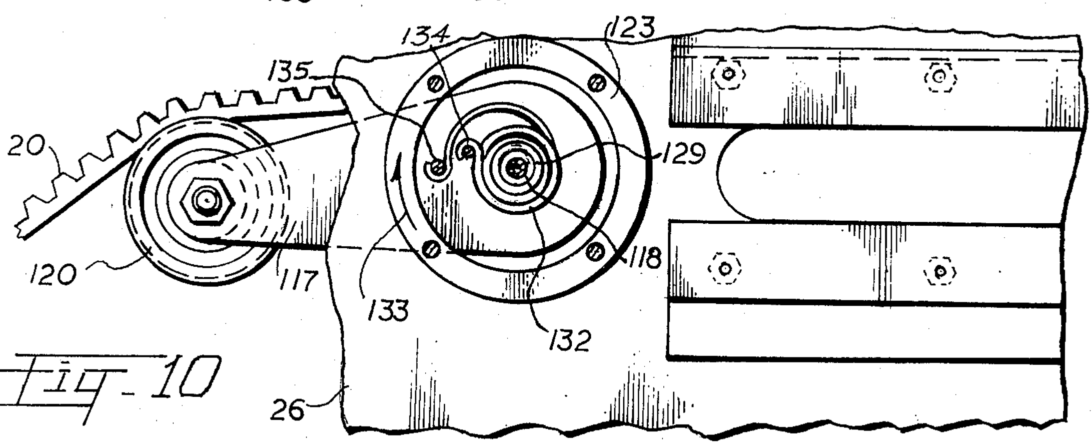

Fig. 10

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GRINDING MACHINE

BACKGROUND OF THE INVENTION

The present invention is related to grinding machines, and more particularly to machines for honing the cutting edges of cutting implements, such as knives or the like.

Heretofore, grinding machines for honing cutting edges of cutting implements have been available to manufacturers for mass production of cutting implements, such as knives or the like. Recently, it has been found that a definite need for such grinding machines prevailed in smaller commercial enterprises which utilize cutting implements in the course of their businesses, such as restaurants, meat processors, or the like. In the past, the machinery available to the manufacturers of cutting implements were either greatly oversized or extremely inefficient for use by the smaller commercial user. On the other hand, honing devices have been available for use in the household, but such devices are not capable of meeting the production demands of the small commercial user, such as a restaurant or a meat processing establishment.

SUMMARY OF THE INVENTION

The present invention contemplates providing a grinding machine for honing the cutting edges of cutting implements of the type for use by small commercial users, such as meat processors, restaurants, or the like. More particularly, the grinding machine of the present invention comprises a support member having a grinding assembly supported for rotation adjacent one side and a drive mechanism supported adjacent the opposite side thereof. The drive mechanism is enclosed by the support member and is operably connected to the grinding assembly. A power means is mounted on the support member in laterally spaced relationship from the grinding assembly and is operably connected to the drive mechanism for operating the grinding assembly. The support member includes a top side and a bottom side having the grinding assembly supported adjacent the bottom side. The support member is of elongated construction with the power means mounted adjacent one end and the grinding assembly mounted adjacent the opposite end. More specifically, the support member includes a hollow cavity adjacent the bottom side, and the drive mechanism is mounted within the cavity. The grinding assembly includes a plurality of grinding units including a speed-reducing means operably connected to the drive mechanism. The grinding units each include a rotatable grinding member. The grinding members are mounted in interdigitated grinding relation with respect to one another, having at least one of the grinding units mounted for movement relative to the support member for adjusting the grinding relation of the grinding members. The grinding units and the power means each include a drive shaft having their axes of rotation lying in substantially the same common plain. More specifically, the drive shaft of one of the driving units is positioned between the drive shaft of another of the grinding units being moveable in the plane defined by the drive shaft of the power means and the drive shafts of the grinding units. The drive mechanism includes an endless drive element for operating the grinding assembly. A tensioning means maintains substantially constant tension on the drive element and comprises guide means including rotatable members having their axes of rotation lying in substantially the same common plane defined by said drive shafts.

As can be seen, the above arrangement provides for an extremely compact structure; further, the specific structural arrangement provides maximum power utilization, as well as, smoother grinding action and longer grinding wheel life.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a perspective view of the grinding machine of the present invention;

FIG. **2** is a top plan view of the grinding machine shown in FIG. **1**;

FIG. **3** is a fragmentary, top plan view showing the grinding members of the grinding machines of the present inventions;

FIG. **4** is a fragmentary, cross-sectional view taken along the lines **4—4** of FIG. **2**;

FIG. **5** is a fragmentary, cross-sectional view taken along the lines **5—5** of FIG. **4**;

FIG. **6** is a fragmentary, perspective view of the grinding unit of the present invention showing the mounting shaft for the grinding wheels;

FIG. **7** is an assembly view of the timing hub for mounting the grinding members of the present invention.

FIG. **8** is a bottom plan view of the grinding machine shown in FIG. **1**;

FIG. **9** is a fragmentary, partially-in-section view taken along the line **9—9** of FIG. **8**;

FIG. **10** is a fragmentary, top plan view taken along the line **10—10** of FIG. **9**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring again to FIG. **1**, there is illustrated, generally at **2**, the grinding machine of the present invention shown as including a base **4** having a pair of grinding wheels **8** and **10** mounted thereon. The grinding wheels **8** and **10** are journaled for rotation in casings **12** and **14**, respectively, each being adapted for rotation about a generally horizontal axis. As shown in FIG. **8**, assembly **16** is supported by the base **4** and includes drive unit **18**, such as an electric motor or the like. The drive assembly **16** includes an endless drive element **20**, such as a flexible belt or the like, which may be operably connected to the motor **18** and the grinding wheels **8** and **10** for rotating the grinding wheels **8** and **10** in timed relation as will be described more fully hereinafter. At least one of the casings, such as **12**, is movably mounted on the base **4** for movement toward and away from the other casing, such as **14** for adjusting the position of the grinding wheels **8** and **10** with respect to one another.

Referring now to FIGS. **2** and **8**, the base **4** may be made of any suitable rigid material, such as steel, plastic or the like, and is shown as being formed with upwardly openings **22** and **24** adjacent the top side thereof. The cavities **22** and **24** are spaced apart from one another and extend lengthwise along the opposite sides of the base **4** and together define a raised platform **26**. The platform **26** forms the upper wall of a downwardly opening cavity **28**, which extends lengthwise of the base **4** between the cavities **22** and **24** being adapted to provide an enclosure for the drive assembly in a manner to be described more fully hereinafter.

Referring now to FIGS. 2 and 4, the casings 12 and 14 are of a generally hollow construction being adapted to house gear assemblies 30 and 32 which are arranged for driving the grinding wheels 8 and 10, respectively, in opposite directions. As shown in FIG. 5, at least one of the casings, such as 12, is slidably mounted on the base 4 by dovetail-shaped guide blocks 33 and 35 which are shown as being secured to the platform 26 by fasteners 36 and 37, such as screws or the like. By this arrangement, the casing 12 may move lengthwise along the base toward and away from the casing 14.

As shown in FIG. 4, the gear assemblies 30 and 32 include vertically-oriented drive shafts 34 and 36, respectively. The shaft 34 is journaled for rotation in bearings 38 and 39 which are mounted on the casing 12. Likewise, the shaft 36 is journaled in bearings 41 and 42 which are supported by the casing 14. Sheaves 44 and 45 are shown as being keyed to the lower end of the shafts 34 and 36, respectively, being adapted for driving engagement with the belt 20. As shown, each of the shafts 34 and 36 are provided with a worm gear, as at 46 and 48, being adapted for intermeshing engagement with associated radial gears 50 and 51 which are disposed within the casing 12 and 14, respectively. The gear 50 is connected in driving relation to a generally horizontally-oriented shaft 53 which supports the grinding wheel 8 while the gear 51 is keyed to a generally horizontally-oriented shaft 54 on which the grinding wheel 10 is mounted. The worm gears 46 and 48 drivingly engage diametrically opposite sides of the radial gears 50 and 51, respectively, being arranged to rotate the shafts 53 in a clockwise direction as indicated by the arrow 55, and the shaft 54 in a counter-clockwise or opposite direction, as indicated by the arrow 57. By this arrangement, movement of the belt 20 will cause rotation of the shafts 34 and 36, and thus, will rotate the grinding wheels 8 and 10 in opposite directions as aforesaid. It is understood that other forms of gearing, such as spur gears, can be utilized to achieve a similar result depending upon the desired operating speed of the grinding wheels for a particular use.

Further, such gearing arrangement enables the drive assembly 16 to be mounted in enclosed relation within the base 4, as well as, establish the rotational speed of the grinding wheels in a safe operating range.

As the grinding wheels 8 and 10 are similar in construction, only one, such as 8, will be described in detail with like parts of the remaining grinding wheel 10 being described by like numerals including the suffix "*a*," when necessary. As shown in FIG. 5, the grinding wheel 8 includes a generally helically shaped abrasive member 56 which may be made of any suitable grinding material as well known in the art. The abrasive member 56 includes a central bore 58 adapted to receive a hub member 60 therethrough. The hub member 60 in turn includes a central bore 62 adapted to receive the shaft 53. The shaft 53 includes radially extending pins 69 and 70 adapted for interlocking engagement with the hub 60 to prevent slipping of the hub with respect to the shaft. As shown in FIGS. 6 and 7, the hub 60 includes an inner flange 64 which is provided with slots 66 and 67 which extend generally radially outwardly from the bore 62. The pins 69 and 70 are mounted adjacent the inner end of the shaft 53 being adapted to be disposed within the slots 66 and 67 in the installed position of the hub 60. Referring also again to FIG. 7, a disc plate 72 is provided including a central circular opening 73 for receiving the hub 60 therethrough. The plate 72 is disposed in flush seated engagement with the flange 64 being adapted to engage the inner side of the abrasive member 56. An outer disc plate 74 is provided including a circular central opening 76 adapted to abuttingly engage the outer side of the abrasive member 56. As shown, the outer end of the hub 60 and inner surface of the opening 76 may be complementary threaded to threadably attach the plate 74 to the outer end of the hub 60. The hub 60 is secured in position on the shaft by means of a plug-like member 78 which seats in a recess 79 (FIG. 5) in the outer end of the hub 60. In the form shown, the plug-like member 78 includes a cylindircal bore 81 adapted to receive a fastener 82 therethrough for threaded engagement within axially extending bore 84 provided adjacent the outer end of the shaft 53 to hold the plug-like member 78 in abutting engagement with the back wall 80 of the recess, and thus hold the entire assembly on the shaft 53. By the arrangement, the pins 69 and 70 are maintained within the slots 66 and 77. The flange 64 is provided with a pair of diametrically opposed arcuate slots 84 and 85 through which threaded fasteners 86 and 87 may be inserted for threaded engagement within openings 90 and 91 provided in the disc plate 72. By this arrangement, the abrasive member 56 may be rotatably adjusted on the hub 60 for a reason which will become more fully understood hereinafter. It can be understood that only one arcuate slot, such as 85 or 84, need be provided in order to accomplish rotational adjustment of the abrasive member 56 on the hub 60. Further, only one of the grinding members need be equipped with such a rotational adjustment arrangement.

Referring now to FIG. 3, the grinding wheels 8 and 10 are shown in the mounted position on the shafts 53 and 54, respectively. As shown, the abrasive members 56 and 56*a* are provided in the form of a generally circular helix having a plurality of flights, as at 95 and 95*a*, respectively. The helix of the abrasive member 56 is formed the reverse of the helix of the abrasive member 56*a* for a reason which will become apparent hereinafter. In the form shown, the radius r_h of the helix is greater than the distance A which is equal to one-half of the distance between the axis of rotation 98 of the shaft 53 in the axis of rotation 99 of the shaft 54. By this arrangement, the adjacent flights of the abrasive members 56 and 56*a*, such as 95 and 95*a*, respectively, will overlap one another in generally interdigitated relation between the shafts 53 and 54. As previously stated, one of the abrasive members, such as 56, is rotatably adjusted so that an individual flight, such as 95 may be positioned generally centrally between flights 94*a* and 95*a*, of the abrasive member 56*a*, and vice versa.

Referring now to FIG. 4, the extent of the overlap of the flights may be adjusted by moving the casing 12 lengthwise along the base, as aforesaid. In this regard, the shaft 34 extends downwardly from the casing 12 between the guide blocks 33 and 35, and through an elongated slot 102 provided in the central web portion 26. The slot 102 extends lengthwise of the base having a width greater than the corresponding diameter of the shaft 34 to enable the shaft 34 to rotate freely, as well as, shift back and forth in the lengthwise direction of the base 4. As shown, the shaft 36 also extends downwardly through an opening 104 in the central web portion 26 so that the lower end of both the shafts 34 and 36 extend into the cavity 28.

Referring now to FIG. 8, the drive mechanism 16 is housed within the cavity 28 providing a protective enclosure therefor, as well as, enabling access thereto from the underside of the base 4. As shown, the drive motor 18 is mounted on the top side of the base 4 having its drive shaft 106 extending downwardly through the central web portion 26 into the cavity 28. The drive shaft 106 is provided with a drive sheave 107. The sheaves 107, 44 and 45 are aligned so as to rotate in substantially the same plane having the belt 20 entrained thereabout in driving relation. In the form shown, the drive shaft 106, and shafts 34 and 36 are aligned so as to define a plane P which extends generally angularly, such as perpendicularly, and lengthwise with respect to the base 4.

Guide sheaves 109, 110, and 111 are mounted within the cavity 28 so as to rotate in the same general plane as the plane of rotation of the sheaves 106, 44, and 45 for directing the travel of the belt 20. As shown in FIG. 4, the sheaves 110 and 111 are journaled for rotation on downwardly depending stub shafts 113 and 114 which may be secured to the underside of the central web portion 26, such as by welding or the like. In the form shown, the rotational axis of the sheaves 110 and 111 are positioned in the same general plane defined by the axis of rotation of the shafts 106, 34, and 36, as shown in FIG. 8. The guide sheave 109 is similarly supported adjacent the underside of the central web portion by a stub shaft 114 having its axis of rotation offset with respect to the axis of rotation of the guide sheaves 110 and 111 for a reason which will be more fully described hereinafter.

Referring again to FIG. 9, a belt tensioning mechanism 116 is mounted within the cavity 128 adjacent the underside of the central web portion 26. As shown, the tensioning mechanism 116 includes an elongated lever arm 117 which is supported for angular pivotal movement on the base 4 about a generally vertical axis. The lever 117 is shown as being connected adjacent the lower end of a (as indicated by the phantom lines at 117) generally vertically extending shaft 118. A pressure applying sheave 120 is supported for rotation on a downwardly depending shaft 121 which is affixed to the other or outer end of the lever arm 117. In the form shown, the pin 118 extends upwardly from the lever arm 117 through the opening 122 in central web portion 26. The opening 122 is defined by an endless side wall 123 adjacent the top side of the central web portion 26 having a cover member 126 detachably mounted thereon, such as by screws 127. The upper end of the pin 118 is shown as being threaded and of a reduced diameter and extends upwardly through an opening 125 being attached to cover, such as by a lock nut 128. In the form shown, the lever arm 117 is mounted on a sleeve type bearing 129, such as by press fit or the like, which is adapted for pivotal movement about the pin 118. As shown, the pin 118 is flanged adjacent the lower end, such as at 130, being adapted to support the lever arm 117 and bearing 129 in seated engagement thereon. A resilient member 132, such as a coil spring or the like, is disposed in encircling relation about the pin 118 being adapted to resist rotation of the lever arm 117 about the pin 118.

Referring now to FIGS. 9 and 10, one end of the spring 132 is shown as being attached to a vertically extending pin 134 which depends downwardly from the cover member 126 and is secured thereto, such as by threading or the like. Likewise, the opposite end of the spring 132 is shown as being in engaged relation with another vertically extending pin 135 which projects upwardly from the lever 117 being secured thereto, such as by threading or the like. By this arrangement, the spring 132 will urge the lever arm in a clockwise direction, as indicated by the arrow 133 in FIG. 10, causing the sheave 120 to be maintained in contact wth the belt 20, and thus, maintain tension thereon.

Referring now to FIG. 8, the belt 20 is shown as being of the cog-type having a plurality of cogs 136 disposed in uniformly spaced relationship throughout the length thereof. As reverse rotation of the grinding wheels 8 and 10 is achieved by the gear assembles 30 and 32, the belt 20 need include cogs along only one side, such as the innerside, for driving engagement with the sheaves 107, 44 and 45, and thus, minimize the power requirements of electric motor 18. Accordingly, the sheaves 107, 45 and 44 are each provided with recesses (not shown) uniformly spaced about the periphery thereof to accommodate the cogs 136 to prevent any slipping or lost motion between the sheaves 44 and 45, and thus, if the sheaves 44 and 45 are of the same size, the grinding wheels 8 and 10 will be rotated at the same speed.

Referring now to FIG. 3, it can be seen that as the grinding wheels 56 and 56*a* become worn, it is necessary to adjust the spacing between the support shafts 53 and 54 to compensate for such wear. To achieve such, the casing 8 is arranged, as previously described, to be shifted along the guide blocks 33 and 34 to move shaft 53 closer to the shaft 54, and thus, move the sheave 44 in a direction toward the sheave 45. As the guide sheave 111 is disposed between the sheaves 44 and 45 and has its axis of rotation disposed in the general plane defined by the axis of rotation of the shafts 34 and 36, the belt 20 is directed inwardly as it leaves the sheave 45, and then is directed ouwardly around the sheave 44 so that the innerside thereof engages both the sheave 44 and the sheave 45 regardless of the position of the shaft 34 with respect to the shaft 36. Such as arrangement enables the use of the one-sided cog-belt 20 and enables utilization of the full driving capacity thereof, as well as, providing for an extremely compact structure for the machine. Any center-to-center adjustment of the grinding wheels 8 and 10 may also change the timing relation therebetween. In the form shown, the cog belt 20 is connected in driving relation before the gear reduction minimizing the change in timing and enabling the flights of the grinding wheels to be positioned in closely spaced relation to achieve smooth grinding while reducing the possibility of damage to the grinding wheels as a result of contact therebetween.

As can be seen, the tensioning mechanism 16 compensates for any decrease or increase in the length of travel of the belt between the guide sheaves 110 and 111 as the sheave 44 is shifted therebetween. As indicated previously, the sheave 109 is offset with respect to the general plane P defined by the axis of rotation of the shaft 106 and 36 so as to direct the belt 20 outwardly in a direction away from the plane P along the outgoing run as it leaves the sheave 107, and thus provides clearance for the belt 20 as it traverses back and forth on the return run. More particularly, as the belt 20 leaves the sheave 45, the sheave 111 directs the belt inwardly across the plane P. The sheave 44 then directs the belt outwardly from the sheave 111 back across the plane P. As the belt leaves the sheave **44**, it is directed inwardly again across the plane P by the sheave **110.** Upon leaving the sheave **110,** the drive sheave **107** directs the belt **20** back across the plane P. The pressure sheave or pulley **120** acts on the belt **20** as it leaves the guide sheave **110** tending to maintain the belt **20** on the same side of the plane P as it passes between the sheave **110** and the sheave **107.** As can be seen by this arrangement, although the belt travels a devious path, the displacement of the driving run, which is shown as the return run, is approximately equal to or less than half of the diameter of the largest one of the sheaves which engages the belt as it moves along the drive or return run, thus providing for an extremely compact structure for the machine.

I claim:

1. A grinding machine for honing the cutting edge of a cutting implement comprising,
a support base,
said support base including a top side and a bottom side, said bottom side being arranged for supporting said machine on a support member,
a grinding assembly supported for rotation adjacent said top side of said support base,
power means mounted on said support base adjacent said top side for rotating said grinding assembly,
a drive mechanism supported adjacent said bottom side of said support base,
said support base including a hollow cavity opening outwardly in a direction away from said top side to define a readily accessible enclosure for said drive mechanism when the machine is supported on said support member,
said grinding assembly and said power means being operably connected to one another by said drive mechanism within said cavity for operating said grinding assembly,
said power means including a drive shaft,
said grinding assembly including a pair of laterally spaced grinding units,
each of said grinding units including a drive shaft,
said drive shafts of said grinding units and drive shaft of said power means having their axes of rotation lying in substantially the same common plane, and
said drive shaft of one of said grinding units being positioned between the drive shaft of the other of said grinding units and the drive shaft of said power means and being movable in said common plane between said drive shaft of said power means and said drive shaft of said other grinding units.

2. A grinding machine for honing the cutting edge of a cutting implement comprising,
a support base,
said support base including a top side and a bottom side,
said bottom side being arranged for supporting said machine on a support member,
a grinding assembly supported for rotation adjacent said top side of said support base,
power means mounted on said support base adjacent said top side for rotating said grinding assembly,
a drive mechanism supported adjacent said bottom side of said support base,
said support base including a hollow cavity opening outwardly in a direction away from said top side to define a readily accessible enclosure for said drive mechanism when the machine is supported on said support member,
said grinding assembly and said power means being operably connected to one another by said drive mechanism within said cavity for operating said grinding assembly,
said power means including a drive shaft,
said grinding assembly including laterally spaced grinding units,
each of said grinding units including a drive shaft, and
said drive shafts of said grinding units and drive shaft of said power means having their axes of rotation lying in substantially the same common plane.

3. A grinding machine in accordance with claim 2 wherein,
said drive mechanism includes an endless drive element engageable with said drive shafts of said grinding units, and said drive shaft of said power means within said cavity, and
said endless drive element being movable through said cavity in the general direction of said common plane and having one side thereof drivingly engaging said shafts for minimizing the power of requirements of said power means.

4. A grinding machine for honing the cutting edge of a cutting implement comprising,
a support base,
said support base including a top side and a bottom side,
said bottom side being arranged for supporting said machine on a support member,
a grinding assembly supported for rotation adjacent said top side of said support base,
power means mounted on said support base adjacent said top side for rotating said grinding assembly,
a drive mechanism supported adjacent said bottom side of said support base,
said support base including a hollow cavity opening outwardly in a direction away from said top side to define a readily accessible enclosure for said drive mechanism when the machine is supported on said support member,
said grinding assembly and said power means being operably connected to one another by said drive mechanism within said cavity for operating said grinding assembly,
said grinding assembly including a plurality of grinding units each having a speed reducing means operably connected thereto,
said speed reducing means extending through said support base into said cavity for connection to said drive mechanism for operating said grinding units,
each of said grinding units including a rotatable grinding member,
each of said grinding members being mounted on a support shaft in interdigitated grinding relation with respect to one another,
said support shafts being disposed in a generally horizontally oriented position when said machine is supported on said supporting member,
each of said grinding units including a speed reducing means operably connected thereto,
each of said speed reducing means including a drive shaft,
each of said drive shafts extending in a generally vertically oriented position and being operably con-

nected at one end to a respective one of said support shafts and being connected at its opposite end to said drive mechanism within said cavity,

said support base being of an elongated construction,

said cavity extending in the lengthwise direction of said support base and having said power means mounted adjacent one end thereof and having the grinding assembly mounted adjacent the other end thereof, and

said drive mechanism including an endless drive element disposed within said cavity and running in the lengthwise direction thereof such that said grinding members rotate about a generally horizontal axis and said drive element moves in a generally horizontally extending plane when said machine is supported on its bottom side on said support member.

5. A grinding machine for honing the cutting edge of a cutting implement comprising,

a support base,

a grinding assembly mounted on said support base,

said grinding assembly including laterally spaced rotatable grinding units disposed in interdigitated relation on said support base,

power means mounted on said support base for rotating said grinding units,

a drive mechanism supported by said support base and operably connecting said power means with said grinding assembly for rotating said grinding units,

each of said grinding units including a drive shaft and said power means including a drive shaft,

said drive shaft of said grinding units and said drive shaft of said power means having their axes of rotation extending in generally parallel relation to one another,

said drive mechanism including an endless drive element having one side thereof operably engageable with said drive shafts of said power means and said grinding units,

each of said grinding units including speed reducing means, and

said speed reducing means of one of said grinding units being operably engageable with said drive mechanism for rotating said one grinding unit in one direction and a speed reducing means of another of said grinding units being operably connected to said drive mechanism for operating said other of said grinding units in another direction.

6. A grinding machine for honing the cutting edge of a cutting implement comprising,

a support base,

a grinding assembly mounted on said support base,

said grinding assembly including laterally spaced rotatable grinding units disposed in interdigitated relation on said support base,

power means mounted on said support base for rotating said grinding units,

a drive mechanism supported by said support base and operably connecting said power means with said grinding assembly for rotating said grinding units,

each of said grinding units including a drive shaft and said power means including a drive shaft,

said drive shaft of said grinding units and said drive shaft of said power means having their axes of rotation extending in generally parallel relation to one another,

said drive mechanism including an endless drive element having one side thereof operably engageable with said drive shafts of said power means and said grinding units,

each of said grinding units including a rotatable grinding member for honing said cutting edge, and

each of said grinding units including speed reducing means connected between said drive mechanism and a respective one of said grinding members to achieve a reduction in any timing errors between said grinding members and minimize the power transmitted from said power means.

7. A grinding machine in accordance with claim **6**, wherein

said drive mechanism includes an endless drive element engageable along one side thereof with said power means and said grinding assembly, and

said grinding assembly including speed-reducing means operably connecting said grinding units to said drive mechanism,

said speed-reducing means including laterally-spaced gear assembly each associated with a respective one of said grinding units,

each of said gear assemblies including a first gear rotatable about one axis and a second gear rotatable about another axis,

one of said second gears engageable with one of said first gears in diametrically-opposed relation to the other first gear and second gear,

each of said second gears mounted on a drive shaft, and

said drive element is engageable with said drive shaft for rotating said drive shaft in one direction to rotate said first gears in opposite directions.

8. A grinding machine in accordance with claim **7**, wherein

said first gears are rotatable about generally horizontally oriented axes,

said second gears and their drive shafts are rotatable about generally vertically-oriented axes,

said power means includes a drive shaft rotatable about a generally vertically-oriented axis, and

said axes are disposed in substantially the same common plane.

9. A grinding machine in accordance with claim **8**, wherein

said support base includes a downwardly opening cavity therein,

said drive shafts extend through said support base and into said cavity, and

said drive element operably engages said drive shafts within said cavity being movable generally in the direction of said common plane.

10. A grinding machine in accordance with claim **9**, including

tensioning means for maintaining substantially constant tension on said drive element.

11. A grinding machine in accordance with claim **9**, wherein

said drive element comprises a cog-type belt including a plurality of cogs disposed in laterally spaced relation along one side of said belt,

each of said drive shafts including a sheave disposed within said cavity for engagement with said belts,

and each of said sheaves including laterally spaced recesses about the periphery thereof for receiving the cogs on said belt to provide precise timing between the rotation of said grinding units.

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