Oct. 12, 1954 G. C. PUNTON 2,691,252

KNIFE SHARPENER

Filed May 28, 1951 3 Sheets-Sheet 1

FIG. 1

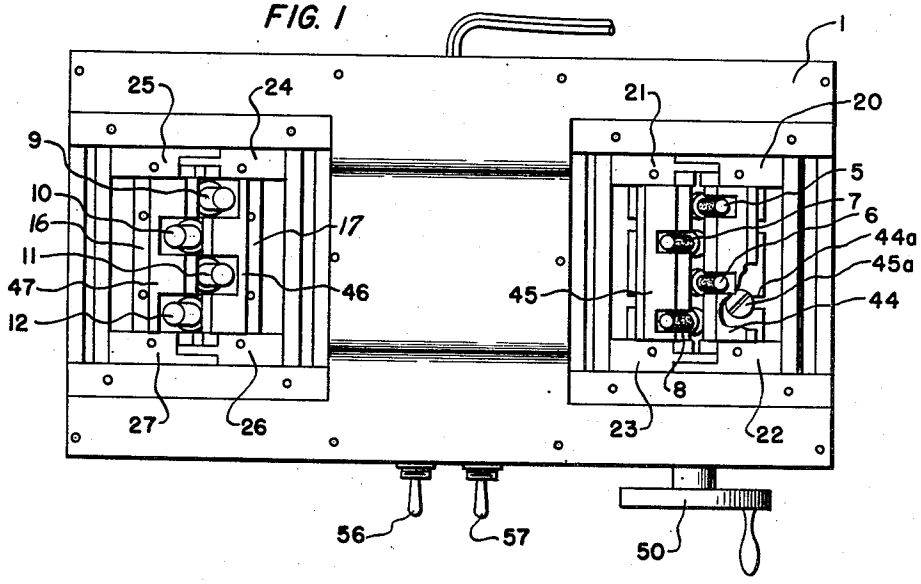
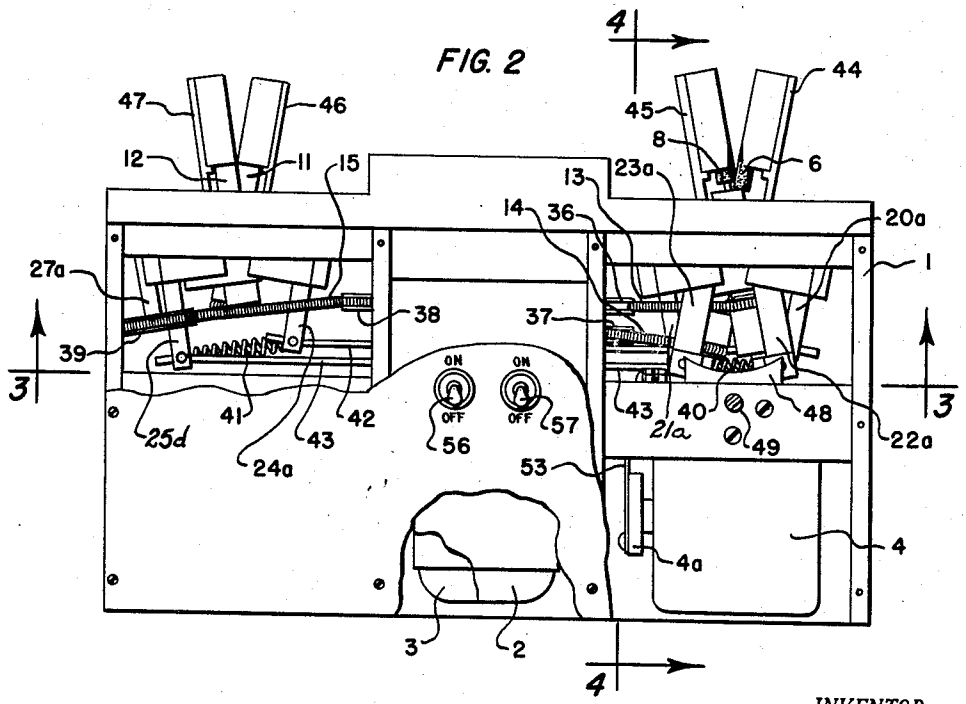


FIG. 2



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FIG. 3

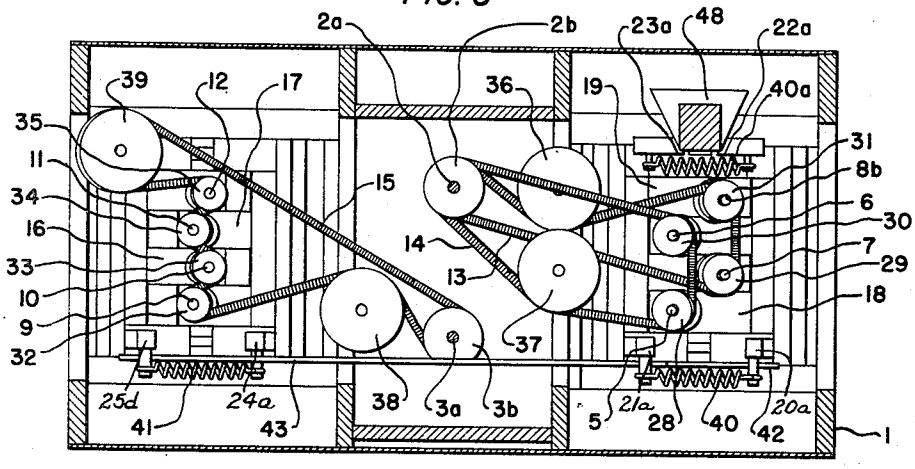
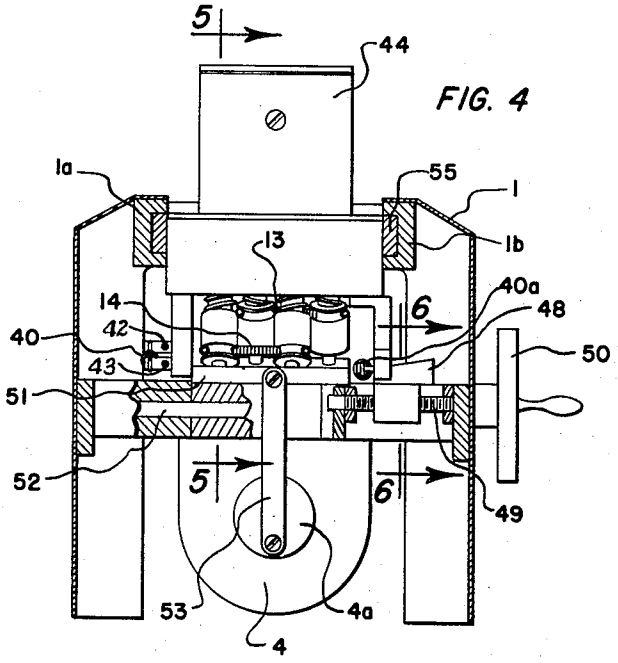


FIG. 4



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KNIFE SHARPENER

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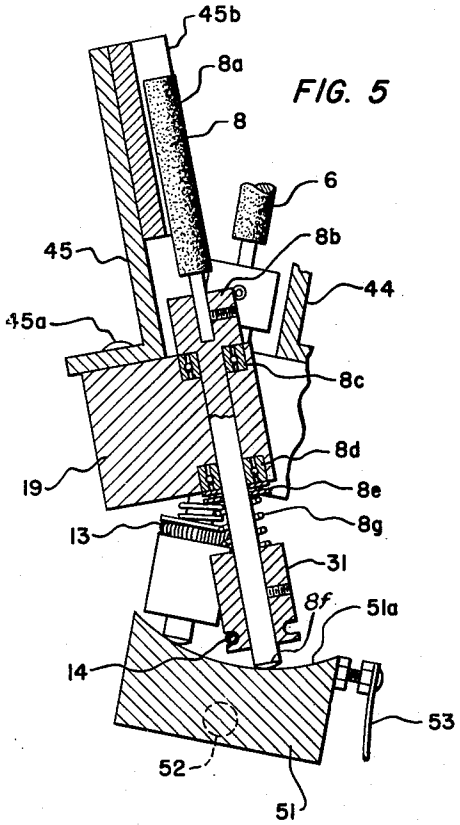
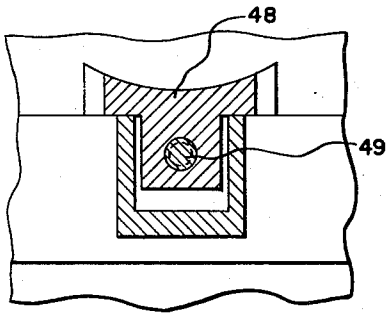


FIG. 5

FIG. 6



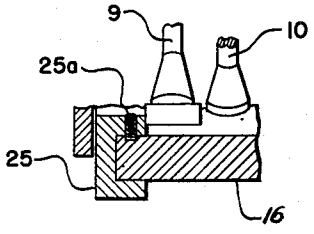


FIG. 8

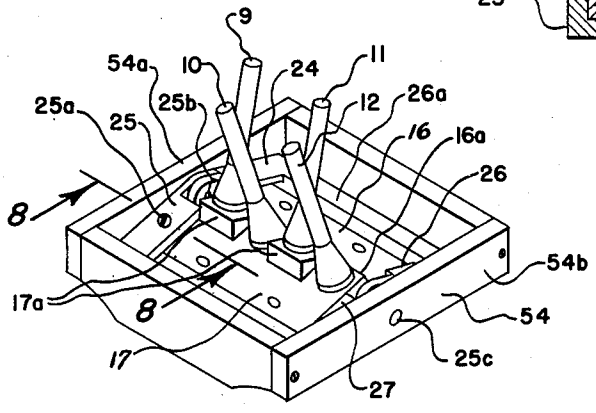


FIG. 7

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2,691,252

UNITED STATES PATENT OFFICE

2,691,252

KNIFE SHARPENER

George C. Punton, Chula Vista, Calif.

Application May 28, 1951, Serial No. 228,610

12 Claims. (Cl. 51—40)

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My invention relates to a knife sharpener, more particularly to a knife sharpener adapted for use in precision filing and grinding of knife blade edges used in butcher shops or other production wherein knives are used, and the objects of my invention are:

First, to provide a knife sharpener of this class which is capable of very quickly providing a precise sharp edge on a knife by removing a minimum amount of material therefrom;

Second, to provide a knife sharpener of this class having means for adjusting the cutting or grinding spindles to the desired angle for concurrently machining opposite sides of a knife blade edge without particular attention of the operator thereto;

Third, to provide a knife sharpener of this class having a plurality of opposed axially diverging files and a plurality of axially diverging grinding spindles, which are synchronized in their diverging angle so that adjustment thereof causes correspondence of the angle of the diverging files with the angle of the diverging grinding spindles, permitting a knife to be filed and subsequently ground to a high degree of finish without changing the machining angle dictated by the desired cutting edge angle of the blade;

Fourth, to provide a knife sharpener of this class which may be used for sharpening various cutting instruments, such as knives, cleavers, or other tool, by adjusting the file and grinding spindles accordingly;

Fifth, to provide a knife sharpener of this class having a particular arrangement of grinding spindles, wherein the axes of the spindles are staggered and in opposed relationship to each other, permitting opposed surfaces of these spindles, axially of a knife blade, to be adjusted as desired without peripheral interference of the grinding spindles;

Sixth, to provide a knife sharpener of this class having a plurality of opposed diverging grinding spindles, and means for concurrently rotating and reciprocating said grinding spindles longitudinally of their axes, whereby the grinding operation performed upon knife blade edges does not tend to form grooves in said grinding spindles or wear the same unevenly;

Seventh, to provide a knife sharpener of this class having a plurality of opposed diverging knife edge machining spindles, provided with guards therearound exposing only the peripheral portion of said spindles, whereby the machining of a knife blade may be precisely controlled by

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said guides, which prevents undue machining of the knife blade edge during sharpening thereof;

Eighth, to provide novel means for angularly adjusting a plurality of opposed diverging knife edge machining spindles;

Ninth, to provide a knife sharpener of this class which is particularly adapted to save considerable time in sharpening knives, and to provide a very fine, precise, keen edge thereon with a minimum amount of attention on the part of the operator sharpening the knives; and

Tenth, to provide a knife sharpener of this class which is very simple and economical of construction, efficient in operation, and which will not readily deteriorate or get out of order.

With these and other objects in view, as will appear hereinafter, my invention consists of certain novel features of construction, combination and arrangement of parts and portions, as will be hereinafter described in detail and particularly set forth in the appended claims, reference being had to the accompanying drawings and to the characters of reference thereon, forming a part of this application, in which:

Fig. 1 is a top or plan view of my knife sharpener; Fig. 2 is a side elevational view thereof, showing portions broken away to amplify the illustration; Fig. 3 is a bottom plan sectional view, taken from the line 3—3 of Fig. 2; Fig. 4 is a transverse sectional view, taken from the line 4—4 of Fig. 2; Fig. 5 is a fragmentary sectional view, taken from the line 5—5 of Fig. 4, showing the structure on enlarged scale; Fig. 6 is an enlarged fragmentary sectional view, taken from the line 6—6 of Fig. 4; Fig. 7 is a perspective view of the assembly of the file spindles of my knife sharpener; and Fig. 8 is a fragmentary sectional view, taken from the line 8—8 of Fig. 7.

Similar characters of reference refer to similar parts and portions throughout the several views of the drawings.

The motors 2 and 3, supported in the frame 1, provide for the operation of the grinder spindles 5, 6, 7 and 8, and the file spindles 9, 10, 11 and 12, by means of the belts 13, 14 and 15. It will be noted that the motor 2 is provided with a shaft 2a, on which the pulley 2b is fixed. This pulley 2b is a double grooved pulley with which the belts 13 and 14 are engaged. The motor 3 is provided with a shaft 3a having a pulley 3b fixed thereon, and engaging this pulley 3b is the belt 15. The idler pulleys 36 and 37, 38 and 39, are stationary pulleys engaging the belts 13, 14 and 15 for directing the same rela-

tive to the pulleys of the grinder spindles 5, 6, 7 and 8, and the file spindles 9, 10, 11 and 12. The idler pulleys 36, 37 and 38 are stationarily fixed to the frame 1, while the idler pulley 39 is supported on the track frame 27 by means of the depending bracket 27a, all as shown best in Fig. 2 of the drawings.

The grinder spindles 5, 6, 7 and 8 are provided with pulleys 28, 30, 29 and 31, respectively, secured to the lower ends thereof, and the pulleys are engageable with the belts 13 and 14, as shown best in Fig. 3 of the drawings. It will be noted that the belt 14 passes over the idler 37 and the pulleys 28 and 30, while the belt 13 passes over the idler 36 and over the pulleys 29 and 31. The belt 15, engaging the idlers 38 and 39, passes over the pulleys 32, 33, 34 and 35, on the lower ends of the file spindles 9, 10, 11 and 12, respectively. The spindle bearing supports 16 and 17 are provided with intermeshing finger portions 16a and 17a, in which the file spindles 9, 10, 11 and 12 are rotatably mounted. It will be noted that the file spindles 10 and 12 are rotatably mounted in the finger portions 16a of the spindle bearing support 16, while the file spindles 9 and 11 are rotatably mounted in the finger portions 17a of the spindle bearing support 17.

The opposite ends of the spindle bearing support 17, as shown in Fig. 7 of the drawings, are fixed in the channel-shaped track frames 25 and 27 by means of the set screws 25a. Likewise, the spindle bearing support 16 is mounted at its opposite ends in the channel-shaped in cross-section track frames 24 and 26, which are rigidly interconnected by the bar 26a. Thus parallel alignment of the track frames 24 and 26 is maintained. The track frames 25 and 27, 20 and 22 and 21 and 23 are interconnected in a similar manner.

The ends of the track frames 24 and 25 are pivotally interconnected by means of the pin 25b, and the ends of the track frames 26 and 27 are pivotally connected by means of the pin 25c. The track frames 20 and 21 are pivotally interconnected by a pin similar to the pin 25b, while the track frames 22 and 23 are also pivotally connected by means of a pin similar to the pin 25b hereinbefore described.

All of the spindle frame supports 16, 17, 18 and 19 are maintained in fixed relationship with their respective track frames by means of set screws similar to the set screw 25a hereinbefore described and illustrated in Figs. 7 and 8 of the drawings.

The spindle assembly frame 54 provides a support for the track frames 24, 25, 26 and 27, and the pin 25b extends through the side 54a of said spindle assembly frame 54, and a similar pin 25c on which the spindle frames 26 and 27 are pivoted, extends through the side 54b of the spindle assembly frame 54. As shown in Fig. 4, the spindle assembly frame 55 is mounted in channel tracks 1a and 1b of the frame 1, and similar tracks at the opposite end of the frame 1 support the spindle assembly frame 54, hereinbefore described.

The spindle assembly frames 54 and 55 are slidably mounted in the tracks of the frame 1, so that the spindle assemblies may be readily removed from the frame 1, as desired.

It will be noted that the springs 40 and 40a are secured to downwardly depending arms connected with the track frames 20, 21, 22 and 23, tending to pivot the same on the pins similar to the pins 25b and 25c illustrated in Fig. 7 of the drawings. Thus, these springs 40 and 40a tend to angularly diverge the grinding spindles 5, 6, 7 and 8, and cause the cam portions 22a and 23a connected with the spindle frames 22 and 23, to engage the wedge 48, which is mounted on the screw 49, in screw-threaded relationship therewith. The screw 49 is maintained against endwise movement in the frame 1, and is rotatably mounted, so that the wedge 48 is caused to longitudinally traverse the screw 49 when it is rotated by the hand wheel 50.

The wobble plate 51 is provided with an upper concave surface 51a, and is pivotally mounted in the frame 1 on the axle 52, as shown best in Fig. 4 of the drawings. The link 53 pivotally connects the wobble plate 51 with the crank disc 4a on the shaft of the motor 4, which is adapted to cause the wobble plate 51 to pivot back and forth over the axis of the axle 52, which is stationarily mounted in the frame 1.

The link 42 interconnects the track frames 24 and 26 and the track frames 20 and 22, inasmuch as the link 42 is pivotally connected at one end to the arm 24a and at the other end to the arm 20a. The link 43 interconnects the track frames 25 and 27 and track frames 21 and 23 by its pivotal connection at one end to arm 25d and at the other end to arm 21a. Thus it will be seen that the movement of track frames 24 and 26 are synchronized with the movement of track frames 20 and 22 and similarly the movement of track frames 25 and 27 are synchronized with the movement of track frames 21 and 23. The operation of the wedge 48 therefore causes pivotal divergence or convergence of the file spindles 9, 10, 11 and 12 identical to that of the grinding spindles 5, 6, 7 and 8.

The spindle guards 44 and 45 are substantially L-shaped, as shown in Fig. 5 of the drawings, and are secured at their base portions to the spindle bearing supports 18 and 19 by means of the screws 45a passing through slots 44a, which provide for adjustment of these spindle guards 44 and 45 relative to the axis of the grinding spindles 5, 6, 7 and 8. It will be noted that the spindle guard 45 is adjacent to the grinding spindles 7 and 8, while the spindle guard 44 is adjacent the grinding spindles 5 and 6. It will be noted that each of these spindle guards 44 and 45 is provided with notch portions therein, which substantially receive and surround the grinding spindles 5, 6, 7 and 8.

The grinding spindles 5 and 6 axially diverge relative to the grinding spindles 7 and 8, and the peripheral portions of these grinding spindles 5, 6, 7 and 8 project very slightly beyond the face portions of the spindle guards 44 and 45. The spindle guard 45, as shown in Fig. 5 of the drawings, is provided with a face 45b, which may be spaced a small fraction of an inch from the peripheral surface 8a of the grinding spindle 8. The same relationship applies to the grinding spindle 6 and the spindle guard 44, so that a knife inserted between the spindle guards 44 and 45 may be ground to a predetermined depth without damaging the knife edge and removing an undue amount of material therefrom.

The construction of the spindle guards 46 and 47, adjacent to the file spindles 9, 10, 11 and 12, is substantially similar to the spindle guards 44 and 45, hereinbefore described.

Each of the grinding spindles 5, 6, 7 and 8 is provided with a supporting shaft and bearings all similar in construction. The grinding spindle 6, as shown in Fig. 5, is provided with a shaft

8b, having a pair of bearing races 8c and 8d, which are mounted in the spindle bearing support 19. Secured to the shaft 8b is the pulley 31, and surrounding the shaft 8b is the spring 8g, which engages a thrust bearing 8e, all of which tends to force the shaft 8b downwardly into engagement at its lower end 8f with the upper surface 51a of the wobble plate 51.

It will be noted that the shaft 8b is slidably mounted in the inner races of the bearings 8c and 8d, in order to provide axial reciprocal movement of the grinding spindle 8 caused by action of the wobble plate 51.

The operation of my knife sharpener is substantially as follows:

When it is desired to sharpen a knife, in using my knife sharpener, the motors 2, 3 and 4 are operated by closing the switches 56 and 57, shown best in Fig. 1 of the drawings. When the motors 2, 3 and 4 are operating, the pulleys 2b and 3b drive the belts 13, 14 and 15, causing rotation of the file spindles 9, 10, 11 and 12, and the grinder spindles 5, 6, 7 and 8. Assuming that a knife blade is very rough, it is placed between the file spindles 11 and 12, as shown in Fig. 2 of the drawings, in engagement with the spindle guards 46 and 47, and is drawn therethrough. The slight peripheral projection of the file spindles 11 and 12 beyond the guards 46 and 47 causes the knife blade to be filed at opposite converging edges. The knife blade may then be drawn between the pair of grinding spindles 7 and 8 and the pair of grinding spindles 5 and 6, adjacent to the spindle guards 44 and 45, which finishes the edge on the knife blade. During rotation of the grinding spindles 6 and 8, together with the spindles 5 and 7, the motor 4, by means of the crank disc 4a, link 53 and wobble plate 51, causes the grinding spindles 5, 6, 7 and 8 to reciprocate axially, which prevents peripheral grooves being worn in said grinding spindles during their engagement with the knife blade supported intermediate the spindle guards 44 and 45.

The upper curved surface 51a of the wobble plate 51, during pivotal movement on the axle 52, alternately forces the shafts of the grinding spindles 5, 6, 7 and 8 upwardly through the spindle bearing supports 18 and 19. The springs 8g return the shafts 8b downwardly with each reciprocal movement, while the thrust bearings 8e prevent twisting of the springs 8g.

When it is desired to adjust the angular relationship of the diverging grinder and file spindles, the hand wheel 50 is rotated, causing rotation of the screw 49, which axially adjusts the wedge 48, acting on the arms 22a and 23a fixed to the spindle bearing supports 18 and 19. The links 42 and 43, as hereinbefore described, cause synchronized adjustment of the spindle bearing supports 16 and 17 over the axes of the pins 25b and 25c, so that the diverging angle to which a knife blade is subjected is the same intermediate the file spindles and the grinding spindles, for preliminary cutting and finish grinding.

The springs 40 and 41 tend to hold the axes of the grinding spindles and the file spindles in accordance with the engagement of the wedge 48 by the arms 22a and 23a, hereinbefore described. The set screws 25a, as shown in Fig. 8 of the drawings, permit the spindle bearing supports 16 and 17 to be adjusted relative to each other for spacing or crossing the axes of the file spindles, while similar set screws permit the

relative adjustment of the spindle bearing supports 18 and 19 in the track frames 20, 21, 22 and 23, for similarly adjusting the axes of the grinding spindles. The spindle guards 44 and 45, as shown in Fig. 1 of the drawings, at their lowermost L-shaped portions, are provided with slots 44a which are longitudinally adjustable over the screws 45a, in order to promote the setting of the spaces of the spindle guards in slight spaced relation to the peripheral portions of the grinding spindles, in order to predetermine the depth of cut on a blade inserted between said spindle guards 44 and 45, when sharpening the same.

Though I have shown and described a particular construction, combination and arrangement of parts and portions, I do not wish to be limited to this particular construction, combination and arrangement, but desire to include in the scope of my invention the construction, combination and arrangement substantially as set forth in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a knife sharpener, a plurality of blade surfacing cylindrical spindles arranged in axially diverging relationship to each other, said spindles being mounted for rotation about their axes, guards for said spindles exposing only a slight portion of the peripheral surfaces of said spindles for controlling the depth of machining on a blade inserted between said guards and said spindles during rotation of said spindles, and means for rotating and axially reciprocating said spindles.

2. In a knife sharpener, a plurality of blade surfacing cylindrical spindles arranged in axially diverging relationship to each other, said spindles being mounted for rotation about their axes, guards for said spindles exposing only a slight portion of the peripheral surfaces of said spindles for controlling the depth of machining on a blade inserted between said guards and said spindles during rotation of said spindles, means for rotating and axially reciprocating said spindles, bearings for said spindles, and spindle bearing supports for holding said bearings, individually pivotal relative to each other, for changing the diverging angle of said spindles relative to each other.

3. In a knife sharpener, a plurality of blade surfacing cylindrical spindles arranged in axially diverging relationship to each other, said spindles being mounted for rotation about their axes, guards for said spindles exposing only a slight portion of the peripheral surfaces of said spindles for controlling the depth of machining on a blade inserted between said guards and said spindles during rotation of said spindles, means for rotating and axially reciprocating said spindles, bearings for said spindles, spindle bearing supports for holding said bearings individually pivotal relative to each other, for changing the diverging angle of said spindles relative to each other, and means for moving said spindle bearing supports toward or away from each other, comprising overlapping fingers in which said bearings are supported, whereby the axes of said spindles may be moved toward or away from each other for accommodating various blades and thicknesses thereof.

4. In a knife sharpener, a plurality of blade surfacing cylindrical spindles arranged in axially diverging relationship to each other, said spindles

being mounted for rotation about their axes, guards for said spindles exposing only a slight portion of the peripheral surfaces of said spindles for controlling the depth of machine on a blade inserted between said guards and said spindles during rotation of said spindles, means for rotating and axially reciprocating said spindles, bearings for said spindles, spindle bearing supports for holding said bearings individually pivotal relative to each other, for changing the diverging angle of said spindles relative to each other, means for moving said spindle bearing supports toward or away from each other, comprising overlapping fingers in which said bearings are supported, whereby the axes of said spindles may be moved toward or away from each other for accommodating various blades and thicknesses thereof, and means for pivoting said spindle bearing supports for adjusting the diverging angle of said spindles.

5. In a knife sharpener, a plurality of blade surfacing cylindrical spindles arranged an axially diverging relationship to each other, said spindles being mounted for rotation about their axes, guards for said spindles exposing only a slight portion of the peripheral surfaces of said spindles for controlling the depth of machining on a blade inserted between said guards and said spindles during rotation of said spindles, means for rotating and axially reciprocating said spindles, bearings for said spindles, spindle bearing supports for holding said bearings individually pivotal relative to each other, for changing the diverging angle of said spindles relative to each other, means for moving said spindle bearing supports toward or away from each other, comprising overlapping fingers in which said bearings are supported, whereby the axes of said spindles may be moved toward or away from each other for accommodating various blades and thicknesses thereof, means for pivoting said spindle bearing supports for adjusting the diverging angle of said spindles, and secondary spindle bearing supports having secondary blade machining spindles in connection therewith, and link means interconnecting said first-mentioned spindle bearing supports and said second-mentioned spindle bearing supports for synchronizing the adjustment of the diverging angle of said first-mentioned spindles and said second-mentioned spindles.

6. In a knife sharpener, a plurality of blade surfacing cylindrical spindles arranged in axially diverging relationship to each other, said spindles being mounted for rotation about their axes, guards for said spindles exposing only a slight portion of the peripheral surfaces of said spindles for controlling the depth of machining on a blade inserted between said guards and said spindles during rotation of said spindles, means for rotating and axially reciprocating said spindles, bearings for said spindles, spindle bearing supports for holding said bearings individually pivotal relative to each other, for changing the diverging angle of said spindles relative to each other, means for moving said spindle bearing supports toward or away from each other, comprising overlapping fingers in which said bearings are supported, whereby the axes of said spindles may be moved toward or away from each other for accommodating various blades and thicknesses thereof, means for pivoting said spindle bearing supports for adjusting the diverging angle of said spindles, secondary spindle bearing supports having secondary blade machining spindles in connection therewith, and link means interconnecting said first-mentioned spindle bearing supports and said second-mentioned spindle bearing supports for synchronizing the adjustment of the diverging angle of said first-mentioned spindles and said second-mentioned spindles, all of said spindles having pulleys in connection therewith, and flexible belts engaging said pulleys for rotating all of said spindles.

7. In a knife sharpener, a plurality of blade surfacing cylindrical spindles arranged in axially diverging relationship to each other, said spindles being mounted for rotation about their axes, guards for said spindles exposing only a slight portion of the peripheral surfaces of said spindles for controlling the depth of machining on a blade inserted between said guards and said spindles during rotation of said spindles, means for rotating and axially reciprocating said spindles, bearings for said spindles, spindle bearing supports for holding said bearings individually pivotal relative to each other, for changing the diverging angle of said spindles relative to each other, means for moving said spindle bearing supports toward or away from each other, comprising overlapping fingers in which said bearings are supported, whereby the axes of said spindles may be moved toward or away from each other for accommodating various blades and thicknesses thereof, means for pivoting said spindle bearing supports for adjusting the diverging angle of said spindles, secondary spindle bearing supports having secondary blade machining spindles in connection therewith, and link means interconnecting said first-mentioned spindle bearing supports and said second-mentioned spindle bearing supports for synchronizing the adjustment of the diverging angle of said first-mentioned spindles and said second-mentioned spindles, all of said spindles having pulleys in connection therewith, and flexible belts engaging said pulleys for rotating all of said spindles, said spindle bearing supports having tracks in which said bearings are adjustable, spindle assembly frames for said tracks, and a main frame in which said spindle assembly frames are slidably mounted.

8. In a knife sharpener, a pair of pivoted spindle bearing supports having intermeshing fingers, spindle bearings mounted in said fingers, grinder spindles rotatably mounted in said spindle bearings, tracks for said spindle bearing supports pivoted on an axis aligned with said overlapping finger portions, and means for adjusting the angular divering relationship of the axes of said grinder spindles by pivoting said tracks.

9. In a knife sharpener, a pair of pivoted spindle bearing supports having intermeshing fingers, spindle bearings mounted in said fingers, grinder spindles in said spindle bearings, tracks for said spindle bearing supports pivoted on an axis aligned with said overlapping finger portions, and means for adjusting the angular diverging relationship of the axes of said grinder spindles by pivoting said tracks, guard means adjustable laterally of the axes of said grinder spindles, adapted to substantially surround the same and expose only a small portion of the surface of said grinding spindles, said guards being opposed to each other and adapted to support a knife blade therebetween, which may be sharpened by the exposed portions of said grinder spindles.

10. In a knife sharpener, a pair of pivoted spindle bearing supports having intermeshing fingers, spindle bearings mounted in said fingers,

grinder spindles in said spindle bearings, tracks for said spindle bearing supports pivoted on an axis aligned with said overlapping finger portions, and means for adjusting the angular diverging relationship of the axes of said grinder spindles by pivoting said tracks, guard means adjustable laterally of the axes of said grinder spindles, adapted to substantially surround the same and expose only a small portion of the surface of said grinding spindles, said guards being opposed to each other and adapted to support a knife blade therebetween, which may be sharpened by the exposed portions of said grinder spindles, and means for axially reciprocating and simultaneously rotating said grinder spindles.

11. In a knife sharpener, a pair of pivoted spindle bearing supports having intermeshing fingers, spindle bearings mounted in said fingers, grinder spindles in said spindle bearings, tracks for said spindle bearing supports pivoted on an axis aligned with said overlapping finger portions, and means for adjusting the angular diverging relationship of the axes of said grinder spindles by pivoting said tracks, guard means adjustable laterally of the axes of said grinder spindles, adapted to substantially surround the same and expose only a small portion of the surface of said grinding spindles, said guards being opposed to each other and adapted to support a knife blade therebetween, which may be sharpened by the exposed portions of said grinder spindles, and means for axially reciprocating and simultaneously rotating said grinder spindles, said means comprising a wobble plate having an upper concave surface engageable with the lower ends of said spindles.

12. In a knife sharpener, a pair of pivoted spindle bearing supports having intermeshing fingers, spindle bearings mounted in said fingers,

grinder spindles in said spindle bearings, tracks for said spindle bearing supports pivoted on an axis aligned with said overlapping finger portions, and means for adjusting the angular diverging relationship of the axes of said grinder spindles by pivoting said tracks, guard means adjustable laterally of the axes of said grinder spindles, adapted to substantially surround the same and expose only a small portion of the surface of said grinding spindles, said guards being opposed to each other and adapted to support a knife blade therebetween, which may be sharpened by the exposed portions of said grinder spindles, and means for axially reciprocating and simultaneously rotating said grinder spindles, said means comprising a wobble plate having an upper concave surface engageable with the lower ends of said spindles, said spindles having pulleys near their lower ends and flexible belts engaging said pulleys.

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