May 10, 1949. W. F. THOMPSON 2,469,797

KNIFE SHARPENER

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Fig. 1.

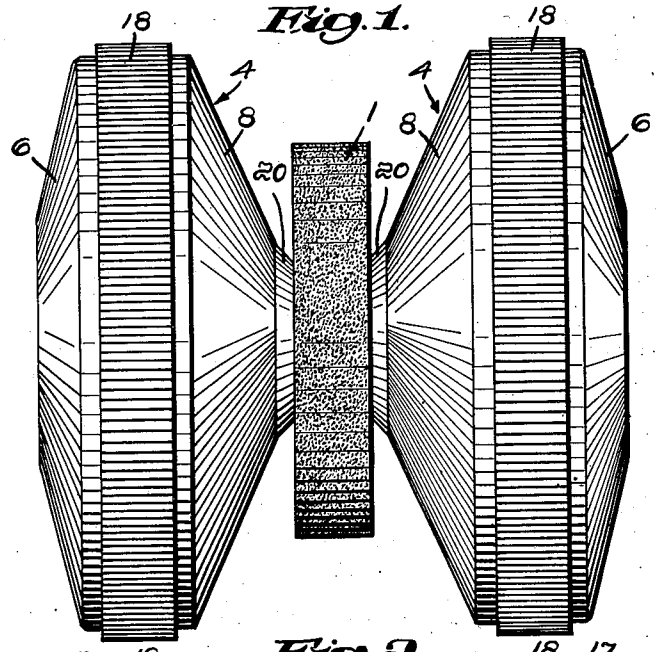


Fig. 2.

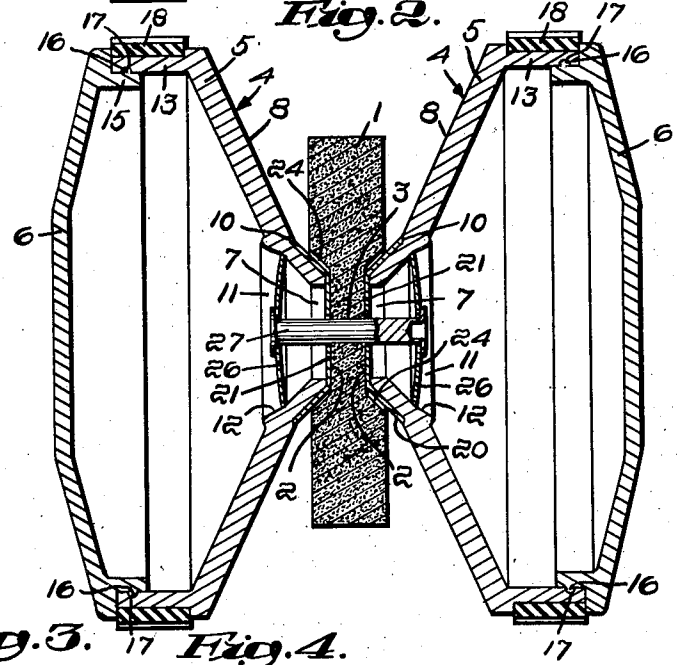


Fig. 3.

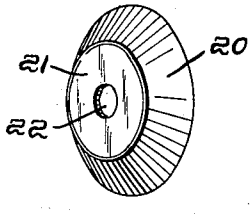
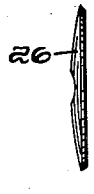


Fig. 4.



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Fig. 5.

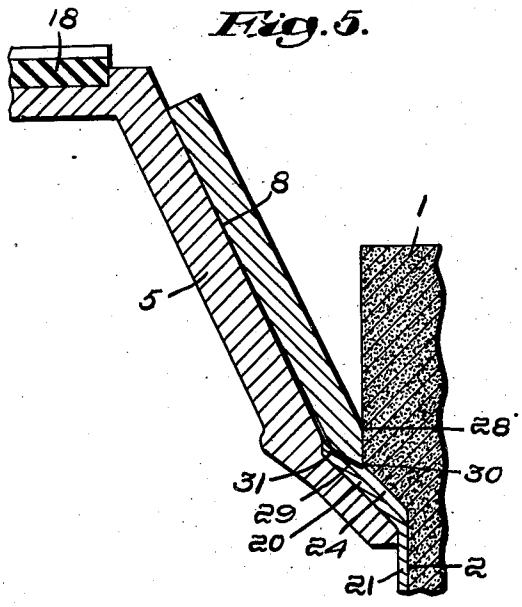


Fig. 6.

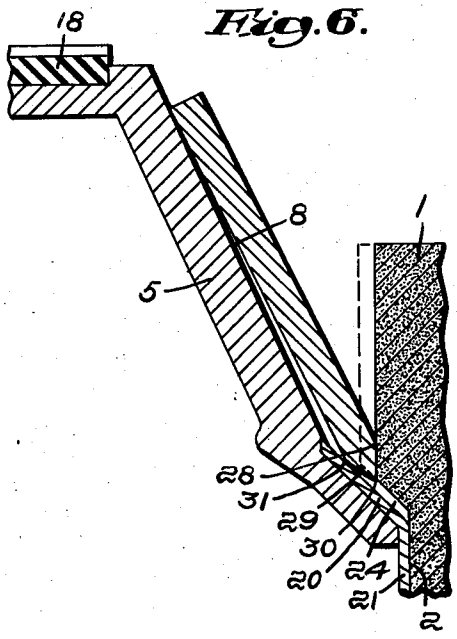


Fig. 7.

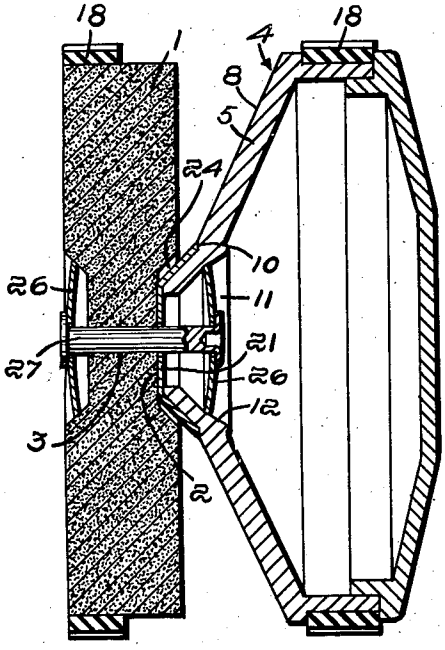
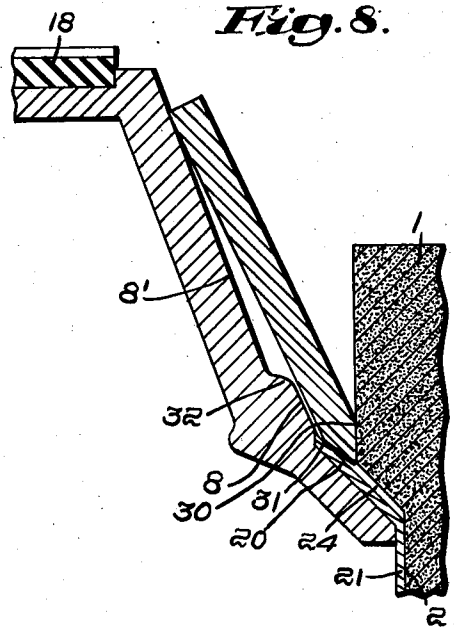


Fig. 8.



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UNITED STATES PATENT OFFICE

2,469,797

KNIFE SHARPENER

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Application May 2, 1947, Serial No. 745,610

6 Claims. (Cl. 51—210)

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The invention relates to a knife sharpener.

This application is a continuation in part of my co-pending application Serial No. 672,795, filed May 28, 1946, now abandoned, for an improvement in knife sharpeners.

The knife sharpener which forms the subject of my present invention is, as in my former pending application, essentially characterized by the idea of one operable, when resting on a flat surface, by free rolling contact back and forth over this surface by movement of the knife blade alone as the blade is reciprocated during its sharpening, and which result is physically attained by means that prevents wedging of the blade during the sharpening operation, which, if not obviated, would prevent free rolling of the knife sharpener.

In any successful knife sharpener the grinding operation should be such that the bevelled surfaces obtained by the grinding leading to the cutting edge of the blade should not form with each other a too obtuse angle for though such bevelled surfaces might then lead to a cutting edge yet their very obtuseness would prevent easy cutting. In practice ordinarily the bevelled surfaces of a knife blade leading to its cutting edge have an angularity to each other of about 45°, sometimes less and sometimes more, but if the angularity is more it should not be more than 60° if easy cutting by the blade is to be obtained. The proper grinding of the bevelled surfaces of a knife blade leading to its cutting edge can only be obtained by maintaining the blade in a proper inclined position with relation to the abrasive element against the side of which one bevelled surface of the blade is being held. In connection with this maintained inclination of the blade two factors must be considered, one that the blade must be held in such inclined position that a proper bevelling of surfaces will be obtained, and the other the avoidance of wedging of the blade as it is reciprocated. The blade might be held in such inclined position as one substantially equal to the angle formed by its bevelled surfaces and wedging might be prevented but its bevelled surfaces might then be ground at too obtuse an angle with relation to each other. On the other hand, if the blade be held with a lesser angular inclination during the grinding then proper bevelled surfaces might be obtained but these is the danger of wedging. This is not especially harmful in cases where the rollers are not free rolling but mounted in bearings, or in case, also, where the knife sharpener is equipped with a handle which may be gripped in one hand as the blade

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is being reciprocated by the other hand of the operator. In a free rolling sharpener, however, all wedging of the blade is prohibitive as it would prevent the function of free rolling.

The present knife sharpener comprises a set of rollers, a hub section, or sections, and a rotary abrasive element or wheel, all bound together so that the abrasive element will be turned as the rollers are turned by rolling contact with the surface over which they are moved.

In order for the present type of knife sharpener to properly function, with obtainance of properly bevelled surfaces, and wedging avoided, it is necessary that the blade during its sharpening be held to have a 3-point bearing. The abrasive element or wheel provides one bearing against which bears one bevelled surface of the blade leading to its cutting edge, this bevelled surface being the one being ground. The roller, or rollers, provide another bearing for the blade held in an inclined position during its sharpening. The third bearing is that presented by the surface of the hub against which the blade bears for assisting in its positioning and for holding the bevelled surface of the blade being ground against the side of the abrasive element or wheel.

The blade might be held in a properly inclined position, to obtain not only a proper grinding of the bevelled surface leading to its cutting edge and with avoidance of wedging, by the bearing of the blade against the side of the adjacent roller for determining the inclined position of the body of the blade and its bearing against the hub only at a point immediately adjacent its cutting edge. Though this bearing of the blade against the hub enables the blade to be maintained in a proper angular position for grinding of its bevelled surfaces, and will also prevent wedging, yet there is a tendency for the hub during its rotation to dull the saw teeth along the cutting edge of the blade effected by the grinding operation, as this is done by a cross cut, so lessening the effectiveness of the grinding operation and consequent sharpening.

It is accordingly the object of the present invention not only to provide a free rolling knife sharpener in which the blade is maintained in proper inclined position to effect the proper grinding of its bevelled surface leading to its cutting edge, and with avoidance of all wedging, but also the obtainance of a construction in which the blade will be so maintained that there will be no tendency for the hub to lessen the sharpness of its cutting edge during the sharpening, and this by providing that during the sharpen-

ing the bevelled surface of the blade not being ground, together with the cutting edge of the blade, will be lifted away from the hub and the blade bear against the hub only at the apex of the angle from which leads the bevelled surface of the blade not being ground.

Another object of the invention is to prevent scratching of the sides of the blade of the larger knives as the blades are reciprocated during their sharpening.

The invention can best be seen and understood by reference to the drawings, in which—

Fig. 1 is a front elevation of the knife sharpener.

Fig. 2 is an end or side elevation.

Fig. 3 is a view of the hub later to be referred to.

Fig. 4 is a view of one of the washers later to be referred to.

Fig. 5 is a plan in enlarged detail showing the set position of the knife blade during its sharpening.

Fig. 6 is the same as Fig. 5 excepting that the knife blade has a slightly changed position due to the wearing away of the abrasive wheel.

Fig. 7 is a front elevation of a modified construction of the knife sharpener; and

Fig. 8 is a plan in enlarged detail showing a slightly modified construction of the roller against which the blade bears, when positioned for sharpening, to avoid scratching the side of the blade during the sharpening operation.

Referring to the drawings: 1 represents the abrasive element against the side or sides of which the cutting edge of the blade is held for sharpening as the abrasive element is rotated. This element is preferably a wheel consisting of an abrasive stone, or composition of, or including, an abrasive material, in order that the element may continue to operate as its sides are worn away. The abrasive element or wheel has dished or recessed sides, each side being provided with a cavity 2 preferably frusto-conical in shape. The element has an axial opening 3 through it.

Arranged on opposite sides of the abrasive element or wheel are rollers 4, 4, respectively. It is by means of these rollers that the abrasive element is rotated as the rollers, forming a carriage, are rolled forward and back over a supporting surface, as that of a table, by the operation of the knife blade as it is reciprocated during its sharpening.

The rollers are preferably hollow made of hard plastic material in two parts 5 and 6 which snap together to form the complete roller when the parts are assembled. Of these parts the part 5 on the inner side of the roller is a dished part having a central opening 7 through it. On its side facing the abrasive wheel this part presents a frusto-conical surface 8 forming a guide for the knife blade as will later be explained, and at the lower end of this surface an annular recess 10 which lies all around equidistant from its central opening 7 and receives, socketed within it, the outer edge of a hub, later to be referred to. On its interior the part 5 is provided with a shallow socket 11 having an annular edge 12 which lies all around equidistant from the opening 7. The socket is adapted to receive and centrally maintain against lateral displacement a washer, later to be referred to. The part 5 also presents a turned edge portion 13 which forms the peripheral edge of the roller. The part 6 on the outer side of the roller comprises a dished part having an inturned flange 15 adjacent its

outer edge which fits within the turned edge portion 13 of the part 5. The flange 15 is provided with an out-turned bead 16 which fits within an annular slot 17 formed within the turned edge portion 13 of the part 5 when the parts 5 and 6 are combined thus locking them together to form the complete roller but enabling the parts to be separated upon the application of finger pressure for releasing one part from the other. The rollers are each rimmed with a tread 18 which fits on the turned edge portion 13 of the part 5 which forms the outer peripheral edge of the roller as aforesaid. The treads are made of rubber or composition.

Interposed to lie between the rollers and the abrasive wheel with extension, respectively, into the cavities 2 in the sides of the abrasive wheel are hubs 20 made of some hard metal. Each hub is a dished element generally frusto-conical in shape with web 21 closing its inner end excepting for an opening 22 through this end corresponding in size with the opening 3 through the wheel. The outer free edge of the hub fits within the annular recess 10 formed within the outer side of the part 5 of the roller, and by which the hub becomes centrally located in socketed position. The hub has the same general frusto-conical shape as the cavity within the wheel into which it fits with the end 21 of the hub bearing against the bottom of the cavity, the axial openings 3 in the wheel and the openings 22 in the ends of the respective hubs then being in alignment. That portion of each hub extending into the adjacent cavity in the wheel is preferably made somewhat smaller than the frusto-conical sides of the cavity in the wheel so as to leave a slight annular clearance 24 between the inserted portion of the hub and the frusto-conical side of the cavity. Each hub presents an outer inclined surface 25 and this surface meets the inclined side surface 8 of the roller adjacent to it.

In assembling the parts the combined rollers and hubs are brought into conjunction with the abrasive wheel with the hubs socketed within the side cavities of the abrasive wheel and with the outer edges of the hubs socketed within the annular recesses 10 on the outer sides of the parts 5 of the respective rollers, as previously explained.

U spring washers 26 are placed in the sockets 11 in the interior of the respective rollers. The whole is then connected and bound together by a rivet 27 passed through the washers through the openings 22 in the ends of the respective hubs and through the opening 3 in the abrasive wheel with the head of the rivet bearing against one washer, and after compression of the parts and flattening of the U washers, clinched against the side of the other washer.

In order to understand the functional adaptability of the rollers and hubs in the support and positioning of the knife blade during its sharpening consideration must be taken of the structural form of the blade especially in respect to the bevelled surfaces leading to its cutting edge and of which the surface 28 is the inner bevelled surface, the surface 29 the outer bevelled surface, and 30 the cutting edge. It is these surfaces 28 and 29 that are ground for effecting the sharpening of the cutting edge. Ordinarily the bevelled surfaces leading to and meeting in the cutting edge of a knife blade lie at an angle to each other of approximately 45° to 60°.

Consideration must also be taken of the posi-

tion occupied by the knife blade during the sharpening operation. As previously explained, in order for a knife sharpener of the present type to function properly the blade during its sharpening should have a 3-point bearing. The abrasive wheel provides one bearing and performs the grinding operation. The roller provides another bearing for maintaining the knife blade in a proper inclined angular position for obtaining the grinding operation. The hub provides a third bearing also assisting in holding the knife blade in a proper inclined position for effecting the grinding operation and for holding the blade surface to be ground against the side of the abrasive wheel during the grinding.

In order that these bearings may function properly in a knife sharpener of the free rolling type and wedging be avoided, the held inclination of the blade should in the first instance be such that the one bevelled surface of the blade being ground will lie in engagement with the side of the abrasive element in proper position for grinding. The inclination of the blade having thus been determined by its bearing against the side of the roller the blade will also engage the inclined peripheral surface of the hub. The side surface presented by the roller and the inclined peripheral surface of the hub, against both of which surfaces the blade has bearing, are so co-ordinated as regards their respective angularities to the side of the abrasive element that the bearing of the bevelled surface of the blade against the abrasive element will be maintained by the bearing of the blade against the hub. Accordingly if there is to be any wedging it must be between the abrasive element and the hub, and if wedging is to be avoided a proper co-ordination between the surface of the roller and hub against which the blade has bearing must be obtained.

Generally speaking such determined angularity will depend upon the bevel to be given the knife blade. Such bevel having been determined upon, the angularity presented by the side of the roller with respect to the abrasive element will be such that the blade bearing against the roller will be held in such inclined position that the bevelled surface of the blade to be ground will be held against the side of the abrasive element so as to give the desired bevel to the blade and its cutting edge sharpened. The inclination of the blade having thus been obtained by its bearing against the roller its proper bearing against the hub to prevent wedging is obtained by a proper co-ordination between the angle at which the blade is supported by its bearing against the side of the roller and the angle of the hub surface. To prevent wedging the angle of the hub at the point where the blade has engagement with it must be more than the angle of the supported blade to the abrasive element.

The co-ordination between the angle of the supported blade by its bearing against the abrasive element and that of the hub surface where the blade has bearing should also be such that the cutting edge of the blade will not be brought into contact with the hub during the sharpening operation as this tends to eliminate the saw teeth obtained by the grinding on the cutting edge of the blade which should be retained for securing the best type of cutting edge. Accordingly not only should the angle of the hub be more than that of the supported blade, but should not be more than twice the angle of the supported blade if the cutting edge of the blade is to be prevented from engaging the hub. The preferred arrangement

is one in which the blade will engage the hub at the point of the angle 31 on the blade from which leads its bevelled surface not being ground to the cutting edge of the blade when the cutting edge of the blade will be lifted away from the surface of the hub during the sharpening operation.

In practice the angle of the side of the roller is such that it will support the blade to maintain an angularity of between 22½° to 30° to the adjacent side of the abrasive element while the hub surface at the point where the blade has contact has an angularity of from 40° to 45°.

The same conditions will prevail as the side of the abrasive element is worn away excepting that the bevelled surface of the blade then not being ground together with the cutting edge of the blade will be lifted farther away from the surface 25 of the hub commensurate with the increase in the wear of the abrasive element, substantially as shown diagrammatically in enlarged detail in Fig. 6.

In the operation of the knife sharpener as described the blade of the knife will be held first against one side of the abrasive element or wheel and then against its other side, there being no change in the position of the sharpener with respect to the surface over which it is rolling. In Fig. 7 a modification is shown in that only one side of the abrasive element is used for the sharpening and after one bevelled surface of the blade has been ground then the sharpener is turned so that the other bevelled surface of the blade may be ground. In such a construction while it is necessary to have two rollers between which the grinding opeartion is performed yet one of these rollers may be the abrasive element itself where, as shown, it is of substantially the same size diametrically as its single accompanying roller and is rimmed with a tread 18' which occupies substantially one-half part of the peripheral surface of the abrasive element or wheel so that it may continue to properly function as the wheel wears.

As appears in the preceding figures the knife blade as it is reciprocated during its sharpening will bear along its side against the surface 8 of each of the rollers. This bearing is apt to scratch or mar the side of the blade as the rollers are rotated and is not especially objectionable with blades of small width, or those up to one-half inch, but becomes objectionable with a wider width of blades, as those above one-half inch in width. The difficulty is overcome by providing the roller with a surface 8' so inset that the blade when occupying its proper inclined position with relation to the hub and to the abrasive element will bear against the side of the roller only along the top edge of the blade. In this connection it is preferred that there be employed the modified construction shown in Fig. 8 where a portion of the surface 8 adjacent the hub is retained and offset to provide the surface 8' against which only the top edge of the wider blades will bear when in proper inclined position to engage the hub and abrasive element as aforesaid during the sharpening. In practice this offset is about 1/32 of an inch in width and the inclination of the offset surface 8 to the vertical side of the abrasive element is about 25° and that of the surface 8' about 20°. With such a construction blades of a width one-half inch or less may be positioned by their lateral bearing against the surface 8 and those above one-half inch against the surface 8'.

I claim:

1. A knife sharpener comprising a set of roll-

ers one having a frusto-conical guide surface, an abrasive element rotated by the free rolling of the rollers back and forth over a supporting surface when actuated by the blade of the knife as it is reciprocated during its sharpening, said one of the rollers being so spaced from said abrasive element that its frusto-conical guide surface will have such angularity to the adjacent side surface of the abrasive element that the blade bearing against said surface of the abrasive element will occupy such determinate inclined position that one or the other of the bevelled surfaces of the blade leading to its cutting edge will engage the side surface of the abrasive element, a hub to said one of the rollers presenting an inclined peripheral surface adjacent to the frusto-conical guide surface and against which hub surface the blade when positioned as aforesaid has bearing and by which the engagement of the one bevelled surface of the blade with the abrasive element as aforesaid will be maintaind, the angle to the abrasive element at which the blade is supported by its bearing against the side of the roller being so co-ordinated with the inclined surface of the hub with respect to the abrasive surface that the angle of the hub at the point where the blade has bearing against the hub surface is greater than the angle of the supported blade with respect to the abrasive surface to prevent wedging and not greater than twice that of the supported blade to prevent the cutting edge of the blade contacting with the hub, and means for connecting said rollers, hub and abrasive element to rotate in unison.

2. A knife sharpener comprising a set of rollers one having a frusto-conical guide surface, an abrasive element rotated by the free rolling of the rollers back and forth over a supporting surface when actuated by the blade of the knife as it is reciprocated during its sharpening, said one of the rollers being so spaced from said abrasive element that its frusto-conical guide surface will have such angularity to the adjacent side surface of the abrasive element that the blade bearing against said surface of the abrasive element will occupy such determinate inclined position that one or the other of the bevelled surfaces of the blade leading to its cutting edge will engage the side surface of the abrasive element, a hub to said one of the rollers presenting an inclined peripheral surface adjacent to the frusto-conical guide surface and against which hub surface the blade when positioned as aforesaid has bearing and by which the engagement of the one bevelled surface of the blade with the abrasive element as aforesaid will be maintained, the angle to the abrasive element at which the blade is supported by its bearing against the side of the roller being so co-ordinated with the inclined surface of the hub with respect to the abrasive surface that the angle of the hub at the point where the blade has bearing against the hub surface is greater than the angle of the supported blade with respect to the abrasive surface to prevent wedging and such that the blade will engage the hub surface at the point of the angle from which the bevelled surface of the blade not being ground leads to its cutting edge whereby the bevelled surface of the blade not being ground together with the cutting edge of the blade will be lifted away from the surface of the hub during the sharpening of the blade, and means for connecting said rollers, hub and abrasive element to rotate in unison.

3. A knife sharpener comprising a set of rollers one having a frusto-conical guide surface, an

abrasive element rotated by the free rolling of the rollers back and forth over a supporting surface when actuated by the blade of the knife as it is reciprocated during its sharpening, said one of the rollers being so spaced from said abrasive element that its frusto-conical guide surface will form a bearing for the knife blade during its sharpening whereby the blade will occupy such determinate inclined position that one or the other of the bevelled surfaces of the blade leading to its cutting edge will have engagement with the adjacent side surface of the abrasive element, the frusto-conical side surface of said one of the rollers presenting a bearing as aforesaid being inset in part whereby blades of a determinate width will engage said side surface of the roller only along the top edge of the blade, a hub to said one of the rollers presenting an inclined peripheral surface adjacent to the frusto-conical guide surface and against which hub surface the blade when positioned as aforesaid has bearing and by which the engagement of the one bevelled surface of the blade with the side surface of the abrasive element as aforesaid will be maintained, the inclination of the frusto-conical side surface of said one of the rollers and the inclination of said hub surface being so co-ordinated that the blade during its reciprocation will be supported in an inclined position by its bearing against the frusto-conical guide surface of said one of the rollers and ride upon the surface of the hub, and means for connecting said rollers, hub and abrasive element to rotate in unison.

4. In a knife sharpener the combination comprising a rotatable abrasive element, a rotatable element spaced from said abrasive element and presenting a frusto-conical guide surface arranged to have such angularity to the adjacent side surface of the abrasive element that the blade bearing against said frusto-conical guide surface will occupy such determinate inclined position to the adjacent side surface of the abrasive element that one or the other of the bevelled surfaces of the blade leading to its cutting edge will engage the side surface of the abrasive element, a hub to said rotatable element presenting an inclined peripheral surface adjacent to said frusto-conical guide surface and against which hub surface the blade when positioned as aforesaid has bearing and by which the engagement of the one bevelled surface of the blade with the abrasive element as aforesaid will be maintained, the angle to the abrasive element at which the blade is supported by its bearing against the frusto-conical guide surface of the rotatable element being so co-ordinated with the inclined surface of the hub with respect to the abrasive surface that the angle of the hub at the point where the blade has bearing against the hub surface is greater than the angle of the supported blade with respect to the abrasive element to prevent wedging and not greater than twice that of the supported blade to prevent the cutting edge of the blade contacting with the hub, and means for connecting said rotatable element, hub and abrasive element to rotate in unison.

5. In a knife sharpener the combination comprising a rotatable abrasive element, a rotatable element spaced from said abrasive element and presenting a frusto-conical guide surface arranged to have such angularity to the adjacent side surface of the abrasive element that the blade bearing against said frusto-conical guide surface will occupy such determinate inclined position to the adjacent side surface of the abrasive ele-

ment that one or the other of the bevelled surfaces of the blade leading to its cutting edge will engage the side surface of the abrasive element, a hub to said rotatable element presenting an inclined peripheral surface adjacent to said frusto-conical guide surface and against which hub surface the blade when positioned as aforesaid has bearing and by which the engagement of the one bevelled surface of the blade with the abrasive element as aforesaid will be maintained, the angle to the abrasive element at which the blade is supported by its bearing against the frusto-conical guide surface of the rotatable element being so co-ordinated with the inclined surface of the hub with respect to the abrasive surface that the angle of the hub at the point where the blade has bearing against the hub surface is greater than the angle of the supported blade with respect to the abrasive element to prevent wedging and such that the blade will engage the hub surface at the point of the angle from which the bevelled surface of the blade not being ground leads to its cutting edge whereby the bevelled surface of the blade not being ground together with the cutting edge of the blade will be lifted away from the surface of the hub during the sharpening of the blade, and means for connecting said rotatable element, hub and abrasive element to rotate in unison.

6. In a knife sharpener the combination comprising a rotatable abrasive element, a rotatable element spaced from said abrasive element and presenting a frusto-conical guide surface arranged to have such angularity to the adjacent side surface of the abrasive element that the blade bearing against said frusto-conical guide surface will occupy such determinate inclined position to the adjacent side surface of the abrasive element that one or the other of the bevelled surfaces of the blade leading to its cutting edge will engage the side surface of the abrasive element, the frusto-conical surface of said rotatable element presenting a bearing as aforesaid being inset in part whereby blades of a determinate width will engage said surface of the rotatable element only along the top edge of the blade, a hub to said rotatable element presenting an inclined peripheral surface adjacent to said frusto-conical surface and against which hub surface the blade when positioned as aforesaid has bearing and by which the engagement of the one bevelled surface of the blade with the abrasive element as aforesaid will be maintained, the inclination of the frusto-conical side of said rotatable element and the inclination of said hub being so co-ordinated that the blade during its sharpening will be supported in an inclined position by the frusto-conical guide surface of the rotatable element and ride upon the surface of the hub, and means for connecting said rotatable element, hub and abrasive element to rotate in unison.

WILLIS F. THOMPSON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
948,362	Wilkinson	Feb. 8, 1910
1,092,877	Wallace	Apr. 14, 1914
1,388,882	Paul	Aug. 30, 1921
1,398,741	Rose	Nov. 29, 1921
2,232,402	Norton	Feb. 18, 1941