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KNIFE SHARPENING DEVICE WITH ADJUSTABLE CUTTERS

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This invention relates to a knife sharpening device with adjustable cutters.

This knife sharpening device is provided with linearly adjustable cutters whose angular relationship remains constant irrespective of their relative heights. It is accordingly the principal object of this invention to provide a knife sharpening device of the character described, wherein the cutters are linearly adjustable toward and away from each other while remaining fixed in their angular relationship.

Another object of this invention is the provision of a knife sharpening device of the character described, which is adjustable to expose different portions of the cutters to the knives or other articles of cutlery or the like which are undergoing conditioning thereon. When one portion of the cutters becomes worn and dull, another portion may be brought into action and this process may continue until the cutters are completely worn, in which case they may either be re-ground or replaced. The adjustment is micrometric and extremely small portions of the cutters are exposed and employed at any given time. The adjustment from one point of exposure to another is so small that a given cutter or set of cutters may be adjusted relative to each other to expose successively different portions innumerable times.

An important object of this invention is the provision of a knife sharpening device of the character described in which the cutters consist of removably secured bars or blocks which are made of tungsten carbide, tantalum carbide, titanium carbide or combinations thereof or any similar material of extreme hardness. Carbolyt of Carboloy Co., Inc. is illustrated of the various metals which may be employed for the purposes of this invention. These carbide bars or blocks are diamond ground to provide extremely efficient and durable sharpening edges. This fact, coupled with the adjustment feature last above mentioned, provides a sharpening device which will remain sharp and fully efficient for an almost infinitely long period of time.

An object of this invention is the provision of a knife sharpening device of the character described whose cutters are securely but removably held in place in varying angular relationship toward each other. Each cutter or set of cutters is held in place by means of a single screw. When the screw is loosened, the cutters are completely free for removal from their respective supports. When the screw is tightened, the cutters are securely and rigidly held in place in precisely the right angular position relative to the other cutter or cutters.

Preferred forms of this invention are shown in the accompanying drawing in which:

Fig. 1 is a plan view of a knife sharpening device made in accordance with a first form of this invention.

Fig. 2 is a side view thereof.

Fig. 3 is a longitudinal section on the line 3—3 of Fig. 1.

Fig. 4 is an end view of said device.

Fig. 5 is a cross-sectional view on the line 5—5 of Fig. 2.

Fig. 6 is a plan view of a knife sharpening device made in accordance with a second form of this invention.

Fig. 7 is a side view thereof.

Fig. 8 is a cross-sectional view on the line 8—8 of Fig. 6.

Fig. 9 is an end view thereof.

Fig. 10 is a longitudinal section on the line 10—10 of Fig. 6.

Fig. 11 is a fragmentary sectional view of a modified form of the sharpening device shown in Figs. 6 to 10 inclusive, this modified form having a positive locking member to lock its adjustable parts in fixed relationship to each other.

Knife sharpening device 10 shown in the figures of the drawing includes a base 12 which is substantially rectangular in plan view and which is provided with holes 14 through which screws or other fastening means may be inserted to secure said base to a suitable support, such as a table, counter or working bench. Two blocks 16 and 18 are opposed on said base 12. Block 16 is fixedly secured to the base by means of screw 20. Block 16 rests flat against the base but is movable thereon. Guide rails or a channel may be provided to limit the direction of movement of block 16 so that it may move only along a straight line or path toward or away from fixed block 18. It may be found, however, that such guide rails or such channel are not required for the purpose indicated since other means are provided which have the effect of limiting the direction of movement of block 16 in the manner indicated.

A horizontally extending hole 22 is formed in block 16 and an aligned hole 24 is formed in block 18. A rod 26 projects at one end into hole 22 and at its other end by means of set screw 28. The same rod also projects through hole 24 with which hole 22 is aligned. There is a very close but nonetheless sliding fit between rod 26 and hole 24 and there is a snug fit between said rod and hole 22. Consequently, the rod is adapted to hold the two blocks 16 and 18 in true alignment with each other. Thus far, block 16 and rod 26 are free to move toward and away from block 18 along a path of movement which coincides with the central axis of holes 22 and 24 androd 26. The bottom 30 of block 16 is flat against base plate 12 and said block is therefore unable to turn about the axis of said rod 26.

The end of rod 26 which projects through hole 24 in block 18 is provided with screw threads 32. A nut 34 is threaded to said screw-threaded end of rod 26. One end of nut 34 abuts wall 36 of block 18. The opposite end of the nut is provided with a hexagonally-shaped portion 38 which may be gripped between the fingers to turn the nut relative to said rod 26. When the nut is turned in one direction, it will thrust or pull the rod rightwardly as viewed in Fig. 3. Since block 16 is secured to said rod, such rightward movement of the rod will effect a corresponding and integral movement of said block 16. When the nut is turned in the opposite direction, rod 26 will to that extent be free to move leftwardly, and with it, said block 16.

Tension means is provided to thrust or urge block 16 leftwardly, also as viewed in Fig. 3, when nut 34 is turned in the opposite direction last above mentioned. Compression spring 40 is the tension means which accomplishes this result. This spring is coiled about rod 26 and it bears at one end against block 18 and at its opposite end against block 16. Thus, its action is to thrust or urge the two blocks apart to the extent permitted by nut 34. More specifically, one end of the spring projects into an annular recess 42 formed in block 16 concentrically with hole 22. It bears against annular wall 44 in said recess. A second recess 46 is formed in block 18 concentrically with hole 24. The opposite end of spring 40 bears against annular wall 48 of said recess 46. It is clear, therefore, that the two ends of the spring are nested within recesses in the two blocks and they bear against the end walls in said recesses to urge the two blocks apart as above indicated.

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There is a flat horizontal surface 50 at the top of block 16 and a corresponding flat horizontal surface 52 at the top of block 18. To the left of horizontal surface 50, as viewed in Fig. 3, is a vertical shoulder 54 and to the right of horizontal surface 52 is a vertical shoulder 56. The same shoulders project upwardly from said horizontal surfaces and they serve as stops for plates 58 and 60 as will hereinafter be seen. Plate 58 is disposed upon flat surface 50 and against shoulder 54. A screw 62 secures said plate 58 to block 16. Similarly, plate 60 is disposed upon flat surface 52 and against shoulder 56. A screw 64 secures said plate 60 to block 18. Plates 58 and 60 serve as locking plates for cutters 66 and 68 and cutter 70. It will be seen in the drawing that block 16 is provided with a pair of spaced, parallel projections 72 and 74 respectively which support the two cutters 66 and 68. These projections are provided with diagonally extending surfaces 76 and in the preferred form of this invention these surfaces are disposed at an angle of 45 degrees to the horizontal. This angle may vary in accordance with individual preferences and requirements, as will hereinafter be seen. At the lower end of each of these diagonal surfaces is a shoulder 78. It will be noted that cutters 66 and 68 rest against these diagonal surfaces 76 and against shoulders 78. The upper ends of cutters 66 and 68 are engaged by a beveled portion 80 of plate 58.

Plate 58 will now be seen to constitute a locking or clamping plate with respect to cutters 66 and 68. When screw 62 is tightened upon locking plate 58, said locking plate bears tightly against cutters 66 and 68 and locks them against shoulders 78. These cutters will remain in their locked positions until screw 62 is loosened and they may then be removed and replaced. Side walls 82 and 84 may be provided on projecting portions 72 and 74 to support the sides of the two cutters 66 and 68. This construction is similarly supported. It rests against a diagonal surface 86 and against a shoulder 88 at the lower end of said diagonal surface. Diagonal surface 86 and shoulder 88 are formed on a projection 90 of block 18. It will be noted that projection 90 projects into the space between projections 72 and 74 of block 16 and the three projections may thereby be described as being intermeshed with each other. This intermeshing relationship helps to maintain the two blocks 16 and 18 in longitudinal alignment with each other. It also allows the three cutters 66, 68 and 70 to intermesh with each other as Fig. 3 clearly shows. Plate 58 has a beveled portion 92 which engages the upper end of cutter 70 and holds it firmly against shoulder 88 when screw 64 is tightened on said plate. It will be understood that diagonal surface 86 is disposed at an angle of 45 degrees to the horizontal and at an angle of 90 degrees to the plane on which diagonal surfaces 76 are disposed.

It will thus appear that cutters 66 and 68 on the one hand and cutter 70 on the other hand are securely maintained in meshed relationship at right angles to each other. This angular relationship will be retained and maintained irrespective of whether the two blocks 16 and 18 are moved toward or away from each other either by means of a drive or under the influence of spring 40.

A knife or other article of cuttery or other device or tool which it is desired to sharpen, may be drawn across the cutters along a horizontal line on which the cutting edges of all three cutters meet. A 90 degree angle edge is thereby formed in the knife or other article being sharpened and this edge will be precision true and keen. Should it be desired to apply a more acute edge to the knife, surfaces 76 and 86 would have to be formed at different angles, depending upon the precise angle which is to be cut into the knife edge.

It will be noted that the cutting edges of the three cutters are beveled, those of cutters 66 and 68 being beveled in one direction and that of cutter 70 being beveled in the opposite direction. Consequently, sharp edges of the cutters are brought to bear against the knife so as to provide an ideal sharpening action. These cutters may be beveled in the directions shown in the drawing for right-handed operation of the device and they may be beveled in opposite directions for left-handed operation of the device.

Three cutters are shown in the drawing. This is an illustrative number. The smallest number would be two, in which case the single cutter would be opposed simply by a guide bar having no cutting edges. Another possibility is to have two cutters, one on each side, and overlapping each other in the sense that cutter 70 overlaps either of the two cutters 66 and 68. A third possibility is the use of three cutters as shown in the drawing and other possibilities would involve a greater number of cutters than three, all the same intermeshed relationship as is shown to obtain between cutter 70 on the one hand and cutters 66 and 68 on the other hand.

Turning now to Figs. 6 to 10 inclusive, a sharpening device 100 is shown which is basically similar to sharpening device 10 first above described. It has, however, some constructional differences. It has a narrow base 102 with a hole 104 through which a fastening member such as a screw may be inserted to secure the base to a suitable horizontal support. If desired, this device may be used without fastening it down to a support but simply by holding it manually in place during the sharpening operation. In such case, hole 104 may be used to hang the device from a suitable support such as a nail or hook on a wall or other vertical support.

Base plate 102 has two side walls 106 and 108 respectively which extend upwardly therefrom and which converge toward each other as is clearly shown in Fig. 8. At the end opposite hole 104 is an upwardly turned end piece 110 which serves a function which will hereinafter be described. A hole 112 is formed in said end piece 110.

A block 114 is secured by means of screw 116 to base plate 102. Block 114 has a dove-tail shape as Fig. 8 clearly shows to dove-tail between converging walls 106 and 108 of the base plate. This relationship locks block 114 securely in place with but the single screw 116 and it is prevented from moving relative to the base in any direction whatsoever.

A second block 118 is also provided with a dove-tail portion similar to that shown in Fig. 8 and it similarly engages the side walls 106 and 108 of the base plate. There is, however, no screw corresponding to screw 116 in block 118 and consequently said block is free to move longitudinally of the base. Converging side walls 106 and 108 will prevent block 118 from twisting or turning on said base and also from becoming dislodged therefrom. Furthermore, these two converging side walls function to hold block 118 in alignment with block 114 and any movement of said block 118 will thereby be limited to a longitudinal or axial movement in alignment with said block 114.

Block 118 is provided with a longitudinally extending threaded hole 120 and engaging in said hole is a threaded rod 122 having a fluted head 124 which serves as a finger piece for turning said threaded rod. Head 124 is disposed against the outside of vertical end piece 110 (the right side as viewed in Fig. 10). A compression spring 126 is coiled about the threaded rod and it bears at one end against the inner side of end piece 110 (left side as viewed in Fig. 10) and its opposite end bears against block 118. The action of said spring is to urge the block 118 leftwardly and in the direction of block 114. When threaded rod 122 is turned in one direction, it pulls block 118 away from block 114 and against the action of said spring. When said threaded rod is screwed in the opposite direction, it yields block 118 and the spring is thereby enabled to push said block in the direction of block 114 to the extent permitted by said threaded rod.

Fig. 11 shows a slight variation in the construction shown in Fig. 10. In place of spring 126, there is a lock-
ing nut 128 which bears against the inner side of vertical end piece 110. When block 118 is properly adjusted or set, 128 may be tightened upon threaded rod 122 and against end piece 110. This nut 128 will lock this threaded rod against movement toward the right as viewed in Fig. 11 and head 124 will lock said threaded rod against leftward movement as viewed in Fig. 11.

Block 114 has a sloping surface 130 facing block 118 and block 118 has a pair of sloping surfaces 132 facing block 114. These sloping surfaces will bear at an angle of approximately 45 degrees to the horizontal and sloping surfaces 132 bear at an angle of approximately 90 degrees with respect to sloping surface 130. At the lower end of sloping surface 130 is a shoulder 134 and at the lower end of sloping surfaces 132 are shoulders 136.

Cutters 138 and 140 each are mounted on sloping surfaces 132 and against shoulders 136. Cutter 142 is mounted on sloping surface 139 and against shoulder 134. These several cutters are made, preferably, of carbide metal, as has above been indicated in connection with the general statement at the beginning of the specification, and they are formed in the shape of a rectangular bar or block having a beveled cutting edge.

Block 114 has a horizontal surface 144 at its top and a vertically extending shoulder 146 behind said horizontal surface (to the left of said horizontal surface as viewed in Fig. 10). Similarly, a horizontal surface 148 is provided at the top of block 118 and a vertically extending shoulder 150 is provided to the right of said horizontal surface as viewed in Fig. 10. A locking plate 152 having a beveled edge 154 is disposed upon horizontal surface 144 and against shoulder 146. Its beveled edge engages the upper end of cutter 142 and a locking screw 156 secures said locking plate 152 to block 114 and locks cutter 142 in place against shoulder 134. Similarly, a locking plate 158 having a beveled edge 160 is mounted on horizontal surface 148 and against shoulder 150. Its beveled edge bears against the upper ends of cutters 134 and 140 and a locking screw 162 secures said locking plate 158 to block 118 and holds the two cutters 138 and 140 securely against shoulders 136.

Side walls 164 and 166 may extend along the outer edges of sloping surfaces 132. These side walls are, of course, integral with block 118 and they serve as retaining walls with respect to cutters 138 and 140 to prevent any possible dislodgment of them and to maintain them in parallel relation to each other. It will be noted that cutters 138 and 140 are spaced from each other to accommodate cutter 142 between them. Similarly, portions 165 of block 118 are spaced to receive portion 170 of block 114 between them. Consequently, the adjacent ends of blocks 114 and 118 are in overlapping or meshed relationship toward each other and similarly, cutters 138 and 140 are in overlapping or meshed relationship to cutter 142.

The cutters normally rest against sloping surfaces 130 and 132 and since the cutters are generally rectangular in shape, their cutting angle will correspond to the angle at which said sloping surfaces intersect. Should it be desired to change the cutting angle, the cutters may be mounted with a cutting edge which is not parallel to the back edge that rests against the sloping surfaces. In such case, the cutting angle will permanently be set at an angle other than 90 degrees, irrespective of whether block 118 is moved toward or away from block 114.

Another method of changing the cutting angle, if this should be desired, is to tilt one or all of the cutters relative to the sloping surfaces which support them in the manner shown in Fig. 7. It will there be seen that cutter 142 is tilted to a position which is indicated by interrupted lines 172. The cutter will still be locked in place by means of locking plate 152 against shoulder 134 and the only difference would be in the reduced or narrowed cutting angle between cutters 138 and 140 on the one hand and cutter 142 on the other hand.

The foregoing illustrates two forms of this invention. These two forms may be modified and other forms may be provided and had within the broad spirit of the invention and the broad scope of the claims.

I claim:

1. A sharpening device for knives and the like, comprising a flat horizontal base having upwardly and inwardly turned side flanges and one end flanges projecting upwardly at right angles to said base, a block secured to the opposite end of said base, said block having recessed sides to receive the side flanges of the base in dovetail relationship, a sloping wall formed on said block, a shoulder at the lower end of said sloping wall, at least one cutter mounted on said sloping wall with its outer end abutting said shoulder, a clamp member secured to said block and engaging the upper end of said cutter to lock cutter in place against said sloping wall and against said shoulder, a second block slidably mounted on said base between the end of said base and the first block, said second block being also recessed along its sides to receive the side flanges of the base in dovetail relationship, thereby being locked against lateral and vertical movement but being free to move horizontally longitudinally of the base between the end flange of the base and the first block, a sloping wall formed on the second block in facing relation to the sloping wall on the first block, a shoulder formed at the lower end of the sloping wall on the second block, at least one cutter mounted on said sloping wall of the second block and against the shoulder of said second block in offset relation to the cutter on the first block, a clamping member secured to the second block and engaging the upper end of the cutter on the second block, locking it against the sloping wall and shoulder of said second block, a threaded hole formed in said second block longitudinally of the base, a registering hole formed in the end flange of the base, a screw projecting through the hole in the end flange and engaging the threaded hole in the second block, said screw having a knob-shaped head on its outer end and abutting the outer side of the end flange of the base, and a coiled compression spring mounted on said screw and bearing at one end against the second block and at its opposite end against the end flange of the base, thereby urging said second block in the direction of the first block and against the holding action of the screw.

2. A sharpening device in accordance with claim 1, wherein the cutters on the two blocks are substantially rectangular in shape, their respective cutting edges being directly opposite the edges which rest against the sloping walls of said blocks, whereby their cutting edges are maintained at substantially the same angles relative to the base as said sloping walls, said cutters being thereby adapted to define a V-shaped space between them to receive a knife when the screw is turned to yield the second block to the action of the spring, thereby causing the second block to move under the influence of said spring toward the first block and to bring the cutters into partly overlapping positions.

3. A sharpening device in accordance with claim 1, wherein the cutters are removably and replaceably locked in place against their respective sloping walls and shoulders by the clamping members which respectively engage them.

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