Nov. 14, 1944. J. J. KILIAN 2,362,699

KNIFE SHARPENER

Filed Feb. 10, 1942

Fig. 1

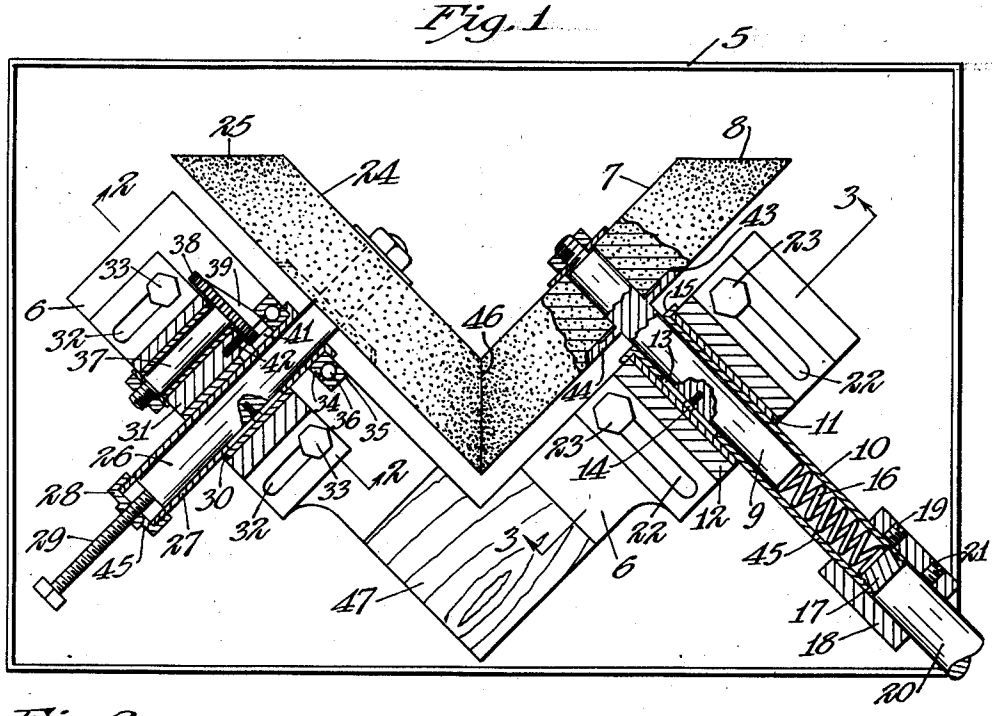


Fig. 2

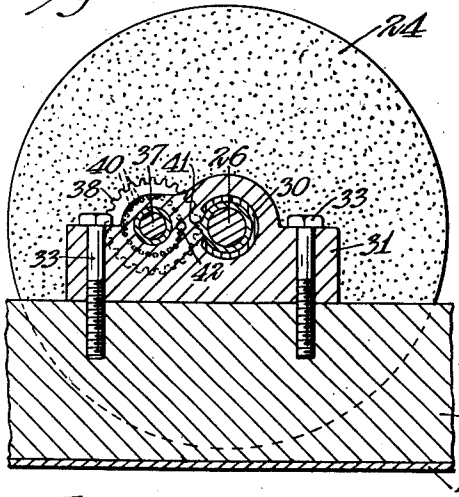


Fig. 3

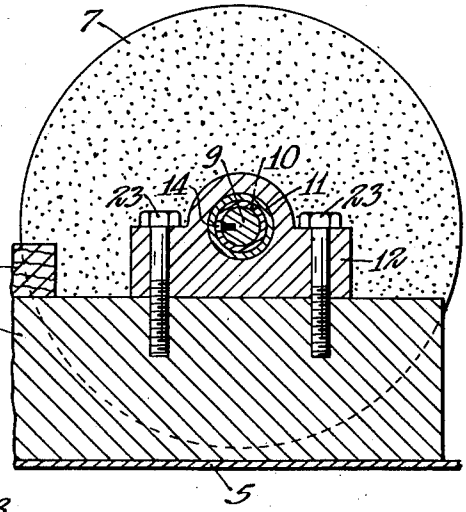
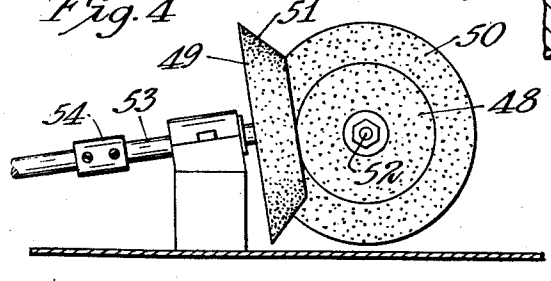


Fig. 4



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Patented Nov. 14, 1944

2,362,699

UNITED STATES PATENT OFFICE

2,362,699

KNIFE SHARPENER

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Application February 10, 1942, Serial No. 430,178

4 Claims. (Cl. 51—40)

This invention relates to sharpening apparatus and more particularly to mechanism for sharpening knives and similar edged implements. Knife sharpeners have been devised heretofore which include a pair of abrasive wheels running in contact and providing a bight in which the blade is placed and where it is acted upon by the working surfaces of both rotary elements, rotation at the bight being toward the edge of the blade. In devices of this type, however, there is a tendency of the working surfaces to form grooves and said surfaces require periodical grinding or dressing to make them smooth again.

It is a general object of my invention to provide sharpening apparatus of this general type which includes a pair of rotary abrasive elements whose working surfaces are in frictional contact and means for positioning said abrasive elements relative to each other in such a way that the objectional grooving of the working surfaces will not take place and said surfaces will remain transversely flat and in proper condition at all times.

A more specific object of the invention is to provide such apparatus with a pair of rotary abrasive elements whose rotational axes are disposed at an angle to each other and to provide means for shifting said rotary abrasive elements axially to produce a generally lateral wiping action of one working surface on the other to eliminate grooving of said working surfaces.

A further object of the invention is to provide sharpening apparatus wherein the action of the preceding paragraph is produced by disposing the rotary axes of the rotary abrasive elements on non-intersecting lines.

These and other objects and advantages of the invention will more fully appear from the following description made in connection with the accompanying drawing, wherein like reference characters refer to the same parts throughout the views, and, in which:

Fig. 1 is a plan view of an embodiment of my invention with portions broken away and in section;

Fig. 2 is a section taken approximately on the line 2—2 of Fig. 1;

Fig. 3 is a section taken approximately on the line 3—3 of Fig. 1; and

Fig. 4 is a more or less diagrammatic showing of a simplified embodiment of my invention.

In Fig. 1 there is shown a pan 5 within which is positioned an angular bracket or base 6. On the right-hand end of the bracket as viewed in Fig. 1 is a rotary wheel or other suitable abrasive element 7 having a diagonally disposed working surface 8. The abrasive wheel 7 is mounted upon a shaft 9 which extends rearwardly into a sleeve 10, said sleeve being rotatable in a bearing 11 which is fixed in a bearing block 12. The sleeve 10 is provided with a slot 13 and a key 14 in the shaft 9 is adapted to ride in the slot 13 to permit axial movement of said shaft 9 relative to the sleeve 10. A flange 15 on the end of sleeve 10 nearest the abrasive wheel 7 prevents said sleeve 10 from moving away from said abrasive wheel. A compression spring 16 is positioned in the sleeve 10 between an end of the shaft 9 and a suitable plug 17 in the right-hand or outer end of said sleeve 10. A collar 18 is secured to the sleeve 10 by means of a set screw 19 and said collar is also connected to a drive member such as a flexible shaft 20 secured in said collar by a set screw 21.

The bearing block 12 is provided with slots 22 on either side thereof and studs 23 which extend through said slots 22 and into the base 6 permit the entire assembly to be shifted axially of the shaft 9.

At the left-hand side of Fig. 1 there is shown an abrasive wheel 24 having a slanting working face 25 adapted to engage the working face 8 on the wheel 7, as shown in Fig. 1. The abrasive wheel 24 is mounted suitably upon a shaft 26 which is positioned in a sleeve 27 and keyed thereto as is the case of the shaft 9 and sleeve 10 previously described. Sleeve 27 is provided with a cap 28 into which is threaded a screw 29 which bears against an end of the shaft 26 so that it can be adjustably moved within said sleeve 27.

The sleeve 27 is adapted to rotate in a bearing 30 in a bearing block 31. Said bearing block 31 is provided with slots 32 to receive studs 33 so that said bearing block can be adjustably positioned on the base 6 in the same manner as the bearing block 7 previously described.

Mounted on the inner end of the sleeve 27 adjacent the abrasive element or wheel 24 is a bearing race portion 34 which cooperates with an outer race portion 35 to retain a series of ball bearings 36. Mounted for rotation in a portion of the bearing block 31 is a stub shaft 37 and on one end of said stub shaft is a sprocket 38 and cam 39, said cam bearing against the outer bearing race portion 35. On the side of the sprocket 38 facing the bearing block 31 a series of depressions 40 are formed, and as the sprocket 38 is rotated by a tooth 41 on the sleeve 27 with a step-by-step motion said sprocket 38 and cam 39 are releasably secured by a spring pressed pin 42 which is positioned in the bearing block 31

and successively engages the depressions 40 on the adjacent face of said sprocket 38.

When the abrasive element or wheel 7 is rotated by its connection with the flexible drive 20 or other suitable means this rotational movement is transmitted to the rotary abrasive wheel 24 since the abrasive surfaces 8 and 25 of the wheels 7 and 24 respectively are in frictional contact. Rotation of the shaft 26 and sleeve 27 with the abrasive wheel 24 brings the tooth 34 on sleeve 27 into engagement with successive teeth on the sprocket 28 causing the cam 39 to rotate in engagement with the outer bearing race portion 35. Pressure against this bearing unit forces the sleeve 27 and shaft 26 axially toward the axis of the shaft 9 and abrasive wheel 7. This motion is transmitted from the sleeve 27 to the shaft 26 by reason of the fact that the adjusting screw 29 at the outer or left-hand end of the sleeve 27 is in engagement with the outer or left-hand end of the shaft 26. As this movement takes place pressure of the abrasive wheel 24 with its working surface 25 against the working surface 8 on the wheel 7 will push said abrasive wheel 7 and its shaft 9 against the tension spring 16 so that there is a relative lateral shifting motion of one abrasive wheel to the other. Then as the low side of the cam 39 comes into engagement with the bearing race portion 35, pressure of the cam 39 against said bearing race portion 35 is relieved. Then the pressure of spring 16 against the end of shaft 9 will cause said shaft 9 and abrasive wheel 7 to move axially toward the axis of shaft 26 and abrasive wheel 24, and said wheel 24 and its shaft 26 will move toward the bearing block 31 which supports the shaft 26 thus completing the cycle of relative reciprocation of the two contacting wheels. This relative lateral movement of the two contacting abrasive wheels produces a frictional driving force which is diagonal to transverse lines across the working surface of said abrasive elements and the result is that the working surfaces of the wheels do not have grooves formed therein nor does one wheel acquire an overlapping edge which would otherwise result in unequal wearing of the two abrasive elements.

This apparatus is adapted to be run in an oil bath which is contained in the pan 5. One problem encountered is that of oil from the pan accumulating on the wheels, and when the apparatus is stopped the oil will run down the rear faces of the wheels onto the shafts 9 and 26. In order to relieve this condition I provide a drain channel 43 between the rear portion of each of the wheels 7 and 24 and the rear wheel clamping plate 44 on each of said wheels. This to a great extent prevents oil from flowing onto either shaft 9 or 26. However, should any oil leak in between shafts 9 and 26 and their sleeves 10 and 27 I provide vent holes 45 in each of said sleeves rearwardly of said shafts 9 and 27 so that oil will not back up behind said shafts and prevent their proper movement.

In sharpening a knife or similar implement the apparatus is set in motion from any suitable power source through the flexible drive 20 with the abrasive elements 7 and 24 rotating, as viewed in Fig. 1, in clockwise and counterclockwise directions respectively. This results in the wheels at their bight, as seen in Fig. 1, producing a movement toward the edge of a knife held horizontally with its blade vertically disposed and its edge positioned in the bight which is indicated at 46. The knife is then moved longitudinally as it lies in the bight and the wheels rotate and it is possible to form a sharp even edge on the knife in a short time. If desired, a wood or other relatively soft block 37 can be placed adjacent the point where the abrasive wheels meet so that if the knife is pulled too far out of the bight 46 it will fall upon the cushioning block 47 and the edge will not be harmed.

In the embodiment shown in Fig. 4 the even and smooth wearing of the abrasive wheels is accomplished in a somewhat different manner. As shown there are two wheels 48 and 49 which have slanting working surfaces 50 and 51. The wheel 48 is on a horizontally disposed axis 52 whereas the wheel 49 is mounted on a shaft 53, the longitudinal axis of which does not intersect with the shaft 52 forming the axial support of the abrasive element 48. The shaft 53 supporting wheel 49 is shown to have a drive connection indicated generally at 54 but it is contemplated that either shaft 52 or 53 may constitute the drive shaft wtih power supplied through its respective abrasive wheel to the other wheel by contact between the working surfaces 50 and 51 on the two wheels 48 and 49. With an arrangement such as that shown there is a frictional driving contact between the two wheels with a direction diagonal to transverse lines across one or both of said working surfaces 50 and 51. Thus the edges of the working surfaces 50 and 51 on the wheels 48 and 40 do not run in alignment but diagonally turn across each other producing a wiping action between said working surfaces to maintain said surfaces transversely flat so that no grooves or ridges will be formed.

From the foregoing description it will be seen that I have provided mechanism for sharpening devices such as knives wherein a pair of abrasive wheels are utilized with the working surfaces of the wheels in frictional driving contact and wherein the wheels are so positioned that grooves or ridges will not be formed on such working surfaces thus eliminating any necessity for periodical honing or dressing of said working surfaces, and it has been shown and described that the results can be produced either by mechanically moving the abrasive wheels relative to each other to produce a sidewise wiping action, or the axes of the two wheels can be located on non-intersecting lines with the working surfaces of the wheels together.

While I have shown the abrasive wheels disposed at an angle of approximately 90 degrees it is, of course, contemplated that any other angle might be used, and as matter of fact wheels having peripheral working surfaces whose transverse lines are parallel to the axes of the wheels can also be utilized in either embodiment of the invention.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of my invention.

What is claimed is:

1. Sharpening apparatus comprising, a pair of rotary abrasive elements having working faces in frictional contact, one of said abrasive elements having a drive connection, and means for reciprocating said abrasive elements oppositely to each other while in contact to produce relative lateral movement between said abrasive elements.

2. Sharpening apparatus comprising, a pair of rotary abrasive elements having working surfaces in frictional contact, the axes of said elements

lying at angles to each other, means for yieldably urging one of said elements along its axis toward the axis of the other of said elements, and means connected to said other of said elements for positively moving it intermittently along its axis toward the axis of said yieldably urged element.

3. Sharpening apparatus comprising, a pair of rotary abrasive elements having working surfaces in frictional contact, the axes of said elements lying at angles to each other, one of said elements including means for yieldably urging it along its axis toward the axis of the other of said elements, and said other of said elements having means connected thereto for reciprocating it axially toward and away from the axis of said first mentioned element, and one of said elements including means for adjustably positioning it axially independent of said yielding or reciprocating means to provide an adjustable takeup to compensate for wear.

4. Sharpening apparatus comprising, first and second rotary abrasive elements having working surfaces in frictional contact, the first of said elements having an axial shaft connected thereto, a bearing for said shaft permitting axial movement of the shaft therein, yielding means for urging said shaft and first abrasive element toward the rotational axis of said second abrasive element, said second rotary element having an axial shaft connected thereto, a bearing for said shaft permitting axial movement of said shaft therein, a cam follower on said second shaft, a cam supported for rotation adjacent said second shaft and contacting said follower, and means on said second shaft for imparting rotational movement to said cam.

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