Jan. 26, 1937. P. H. ROOT 2,069,097

KNIFE GRINDER

Filed March 23, 1935

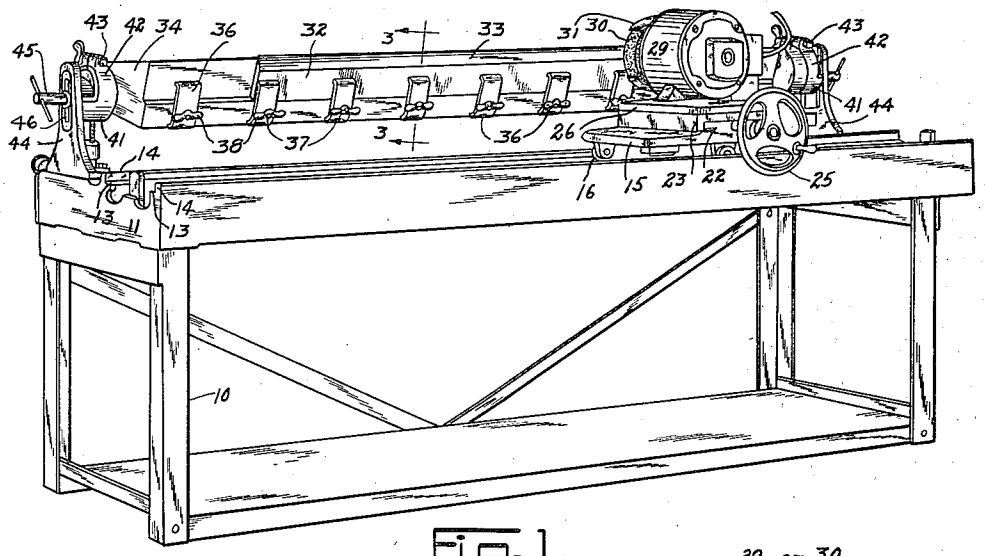

Fig. 1.

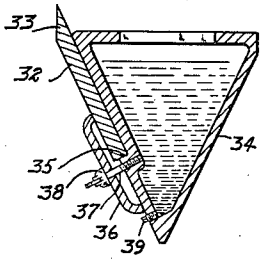

Fig. 3.

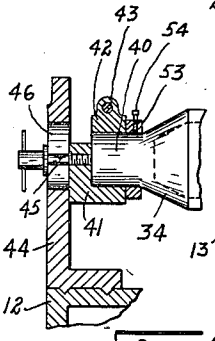

Fig. 4.

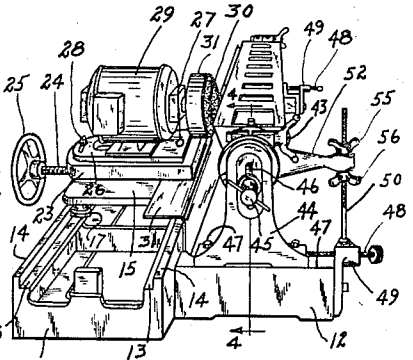

Fig. 2.

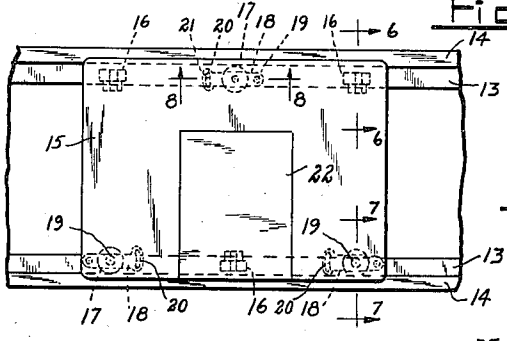

Fig. 5.

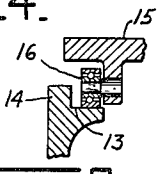

Fig. 6.

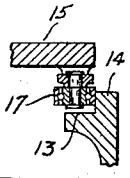

Fig. 7.

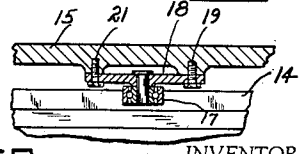

Fig. 8.

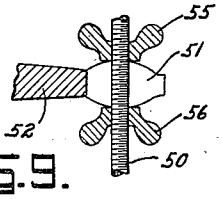

Fig. 9.

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KNIFE GRINDER

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Application March 23, 1935, Serial No. 12,654

4 Claims. (Cl. 51—266)

This invention relates to improvements in knife grinders.

One of the objects of the invention is the provision of a knife bar or work holder which is hollow and thereby adapted to receive and hold cooling water, the heat resulting from the grinding operation being transmitted from the knife to the knife bar through the tightly engaging plane surfaces of the knife and bar, and being absorbed by the water.

Another object is the provision of a novel and inexpensive means for insuring accurate travel of the grinding wheel along the surface of the knife to be ground.

A further object is the provision of means for preventing the deposit of dust upon the track.

Still another object is the provision of means for adjusting the angularity of the knife bar, which means remains operative in spite of vertical or transverse adjustments of the bar.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which

Fig. 1 is a perspective view of a knife grinder embodying my invention.

Fig. 2 is a perspective view of the same from the opposite end of the machine.

Fig. 3 is a transverse sectional detail view on a larger scale of the knife bar with a knife in place thereon, this view being taken substantially on the line 3—3 of Fig. 1.

Fig. 4 is a vertical detail sectional view, also on a larger scale, the view being taken substantially on the line 4—4 of Fig. 2.

Fig. 5 is a plan view of the carriage with the grinding wheel and its supporting elements removed in order to more clearly illustrate the carriage mounting.

Figs. 6 and 7 are vertical detail sectional views taken substantially on the line 6—6 and 7—7 of Fig. 5.

Fig. 8 is a vertical detail sectional view taken substantially on the line 8—8 of Fig. 5, and

Fig. 9 is a detail vertical sectional view through a means for angularly adjusting the knife bar.

In the drawing I have shown at 10 the frame of the machine, which may be built up in any desired manner of structural steel elements, or otherwise. On this frame there is supported the machine bed, which consists primarily of a track member 11 and lateral extensions 12, upon the latter of which supports for the knife bar are carried. The track member 11 comprises a track bottom wall, which for the sake of light weight may consist of rails 13 only. The track also comprises side wall members 14, the inner surfaces of which are machined so as to be parallel.

In this machine, as will be observed from the drawing, the knife is fixed and the grinding wheel travels along the track member 11. For this purpose I employ a carriage 15, which is supported upon ball bearing wheels 16 that are vertically disposed and run upon rails 13. Preferably there are three of these wheels, two on one side near the ends of the carriage and one on the other side midway between the ends of the carriage. Supported upon the bottom of the carriage there are also a plurality of horizontal ball bearing wheels 17 which bear upon the side wall members 14 of the track. They are shown bearing upon the inner surfaces of the side wall members 14, although it will be appreciated that they could be caused to bear upon the outer walls if desired. In the drawing I have shown three such horizontal wheels 17, which are arranged in staggered relation with the vertical wheels 16. I have shown all three of these horizontal wheels adjustable, which is the preferred arrangement, although an adjustment of any one of them alone would answer the purpose reasonably well. The adjustment is effected by mounting each of these wheels on a horizontal lever 18 pivotally connected by a stud 19 with a depending boss on the carriage 15. At its opposite end the lever is provided with an arcuate slot 20, through which extends a stud 21 threaded into another depending boss on the carriage. After the stud 21 is loosened the lever 18 may be swung on its pivot to cause the wheel 17 to bear firmly against the track wall 14, after which the stud 21 is again tightened to lock the wheel in adjusted position.

The carriage 15 on its upper surface has a transverse guide 22, upon which is mounted a slide 23 that may be moved in and out by screw 24 with a hand wheel 25 for convenient operation. On the top of this slide there is a motor supporting plate 26 which is connected with the slide by a pivot 27 and a bolt and slot connection 28. The motor 29 is secured upon the plate 26, and has a grinding wheel 30 mounted directly on its shaft. The grinding operation is performed by the forward face of the wheel. By moving the plate 26 to a slightly angular position, one side only of the wheel engages the knife and the bevel is ground slightly concave.

The degree of concavity may of course be varied by the adjustment mentioned.

In order to prevent steel particles and dust from the grinding wheel from being deposited on that one of the rails 13 which is nearer the grinding wheel, I attach an angular sheet metal guard 31 to the carriage 15, which guard extends over the track and down the side thereof, as illustrated in Fig. 2.

The knife blade to be sharpened, which may be the blade of a paper cutting machine or any other blade of similar size and shape, is illustrated in the drawing at 32. It is beveled on one side, as shown at 33. The holder for the blade, herein generally termed the knife bar, is shown at 34. It is approximately triangular in cross section, as illustrated in Fig. 3, is hollow, and is open at the top except for occasional transverse bracing elements, illustrated in Fig. 2. Upon one side it is provided with a shoulder 35 against which rests the lower edge of the knife 32. The surface of the hollow bar above the shoulder 35 is plane and smooth, and the knife is clamped tightly against it by means of a series of clamping plates 36, through which extend studs 37 that are anchored in the bar. Wing nuts 38 threaded on the studs 37 and bearing on the outer surfaces of the clamping plates 36, serve to draw the latter tightly against the knife 32, thereby securing the knife firmly in position and holding its smooth surface in close contact with the adjacent plane surface of the knife bar. Hence the knife is not only rigidly mounted in the knife bar, but the ready transmission of heat from the knife to the knife bar is assured. The hollow knife bar is filled with water, as indicated in Fig. 3, and hence heat transmitted to the bar from the knife blade is quickly dissipated. A small threaded plug 39 is provided at the bottom of the bar, by means of which the cavity or water pocket in the bar may be drained when desired.

At its ends the knife bar 34 is provided with trunnions 40, which are rotatably mounted in bearing blocks 41. Each of these bearings comprises a split ring clamp 42 which may be integral with the main part of the bearing and may be drawn up to clamp the trunnion against turning movement by means of a bolt or screw 43. The bearing blocks 41 are carried by brackets 44, and are adjustable vertically in the brackets by means of studs 45 which extend through vertical slots 46 in the brackets, and are threaded into the bearing blocks 41. When a desired adjustment is made, the parts are locked in position by the rotation of the stud clockwise, as will be readily understood. When the locking bolts 43 are loosened the knife bar may be turned to any desired position of angular adjustment, after which the bolts 43 are again tightened. The brackets 44 slide transversely upon the bed extensions 12, suitable guiding means being provided, as indicated in Fig. 4, and locking studs 47 being used to hold the brackets firmly in any desired position of adjustment. I provide means for effecting accurate adjustment of each of the brackets, consisting of a screw 48 threaded through a detachable support 49 secured to the extension 12, the screw having a swivel connection with the bracket 44.

Extending upwardly from the support 49 at one end of the machine there is a post 50, the upper portion of which is threaded. This post extends through a vertical slot 51 in the extremity of a radial arm 52, the inner end of which is provided with a ring 53 surrounding the trunnion 40 of the knife bar and locked thereto by means of a set screw 54. Thumb nuts 55 and 56 on opposite sides of the arm 52 engage the latter and may be used, when the two clamping bolts 43 are loosened for swinging the arm 52 up or down to provide a fine adjustment of the knife bar angularly. This adjustment, it will be observed, may be used regardless of the vertical adjustment of the bearings 41 or the horizontal adjustment of the bracket 44. When vertical adjustment of the bearings 41 is to be effected, however, it is advisable to loosen one or both of the thumb nuts 55 and 56.

The operation of the sharpener will be readily understood from the foregoing description. The blade to be sharpened is placed against the knife bar 34 with its rear edge abutting against the shoulder 35. The clamping plates 36 being properly arranged with their upper edges bearing against the blade 32, nuts 38 are tightened down, locking the blade in position and in close engagement with the adjoining plane surface of the knife bar. The various adjustments of the knife bar mounting are then actuated to bring the knife to the desired elevation and angle, and the slide 23 is moved inwardly until the grinding wheel 30 comes into grinding relation with the blade. The motor supporting plate 26 may also be swung about its pivot to provide the desired concavity in the bevel. The motor then being started, the operator moves the carriage 15 along the track from one end to the other, taking a light cut. This trial pass may show that a further slight adjustment is necessary in order to bring the cut to precisely the correct position and angle. When the accurate adjustment is secured however, it is only necessary to reciprocate the carriage manually, and after each reciprocation to turn the hand wheel 25 sufficiently to feed the grinding wheel inwardly to a slight extent.

During the grinding operation the hollow knife bar 34 keeps the blade 32 cool, because the heat engendered in the blade by the friction set up by the rotating grinding wheel passes readily from the blade to the knife bar through the plane, closely contacting surfaces of those elements, and thence to the water filling the hollow knife bar. In this manner I avoid the trouble and annoyance of cooling the blade by running a stream of water over it, as has been commonly done in prior machines for the purpose.

In the foregoing description I have necessarily gone somewhat into detail in order to explain fully the particular embodiments of the invention herein illustrated, but I desire it to be understood that such detailed disclosures are not to be construed as amounting to limitations except as they may be included in the appended claims.

Having thus described my invention, I claim:

1. In a machine of the class described, a knife bar provided with end trunnions, whereby the bar may be tilted to different angular positions, the major portion of said bar being open at the top and having an elongated pocket adapted to receive and hold cooling water, and means for clamping a knife to the bar exteriorly of said pocket.

2. In a machine of the class described, a knife bar provided with end trunnions, said bar being hollow and substantially triangular in cross section, the upper side of the bar having an opening

therethrough by means of which cooling water may be introduced into the hollow interior of the bar, and means for clamping a knife exteriorly to one of the two remaining sides of the bar.

3. In a machine of the class described, a hollow knife bar provided with end trunnions, said knife bar having an opening in its upper portion to receive cooling water, and having on one side wall means for clamping a knife thereto exteriorly of the pocket.

4. In a machine of the class described, a hollow knife bar having a pocket adapted to receive and hold cooling water, means for mounting the knife bar adjustably, said knife bar having a plane external surface on one side thereof exteriorly of said pocket and extending lengthwise of the bar, and means for clamping a knife to the bar in engagement with said plane surface.

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