May 7, 1963 J. J. STRZODA 3,088,248

SICKLE BAR GRINDER

Filed March 13, 1961 2 Sheets-Sheet 1

Fig. 1

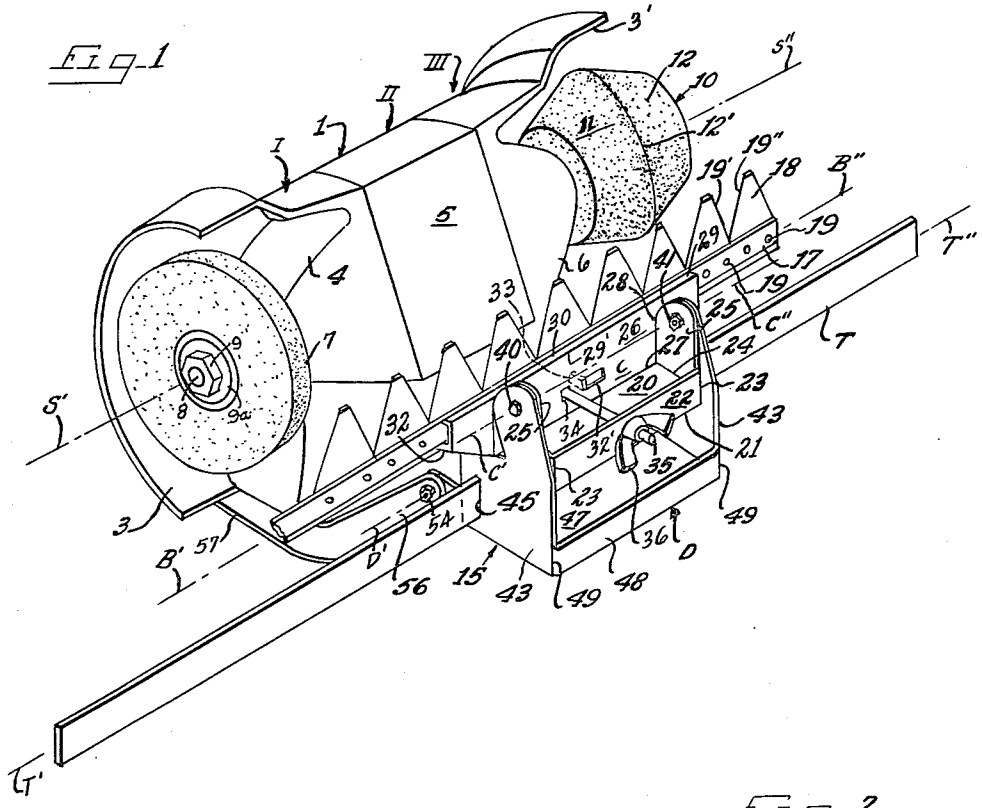
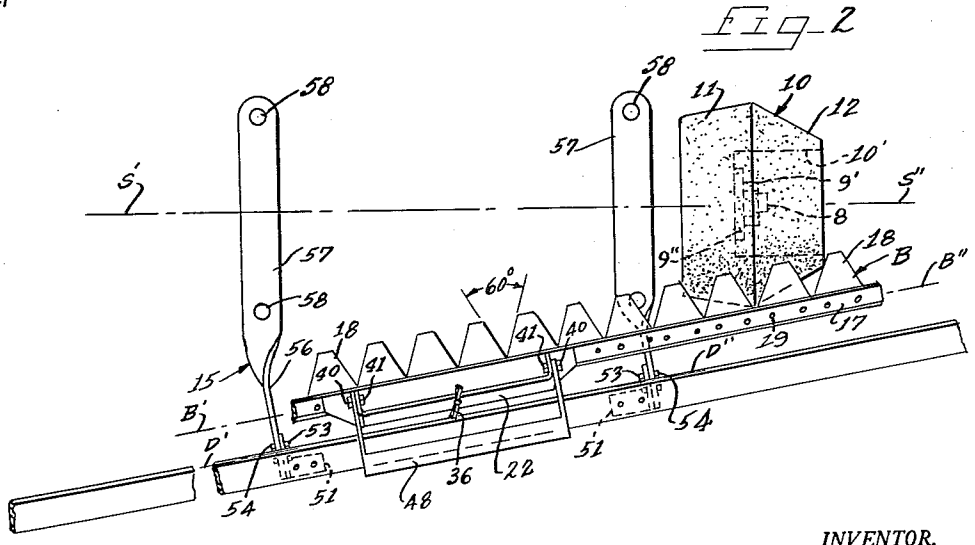


Fig. 2



INVENTOR.
Joseph J. Strzoda
BY

Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

May 7, 1963 J. J. STRZODA 3,088,248

SICKLE BAR GRINDER

Filed March 13, 1961 2 Sheets-Sheet 2

Fig. 3

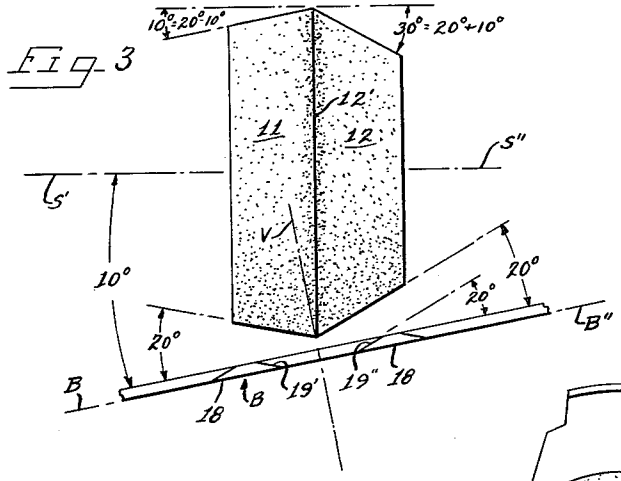


Fig. 4

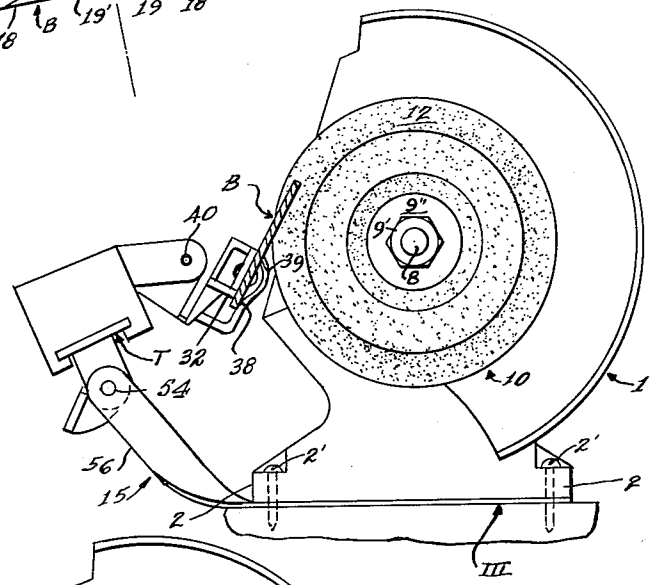
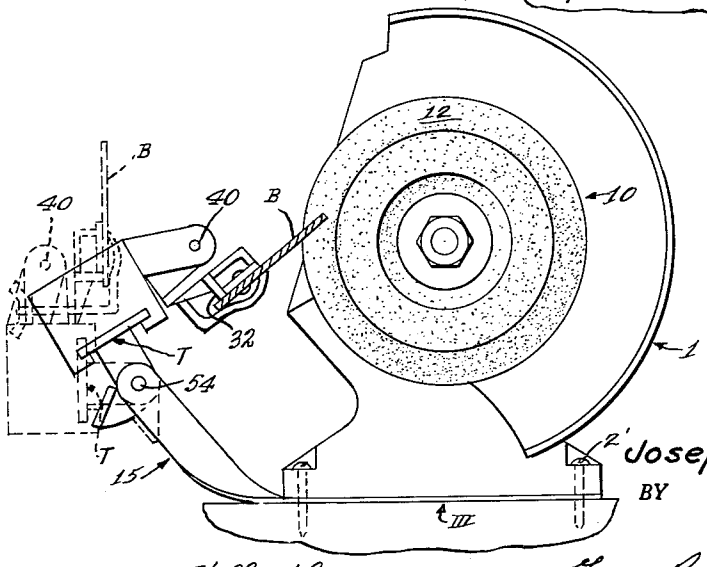


Fig. 5



INVENTOR.
Joseph J. Strzoda
BY

Hill, Sherman, Meroni, Gross & Simpson ATTORNEYS

United States Patent Office

3,088,248

Patented May 7, 1963

3,088,248
SICKLE BAR GRINDER

Joseph J. Strzoda, Chicago, Ill., assignor to Ram Tool Corporation, Chicago, Ill., a corporation of Illinois

Filed Mar. 13, 1961, Ser. No. 95,199
3 Claims. (Cl. 51—98)

This invention relates to sharpening or grinding apparatus for planar, V-serrated cutting edges, such as sickle bars or the like, and more particularly to a sickle bar sharpening apparatus to permit the use of a normally interfering, direct connected, motor and grinder wheel, especially a conventional bench grinder.

Previously used sharpening or grinding apparatus for such planar serrated edges, and particularly for sickle bars, have had the length axis of the sickle bar or the like, as well as its swing or tilt axes for its feed adjustment, parallel to the axis of rotation of symmetrical or equal angle, conical faces of a grindstone or wheel and necessarily have had an indirect or special drive to prevent interference with the sickle bar teeth (such as by a belt pulley or center pulley of smaller diameter than that of the two faced grindstone, this pulley being located on the shaft close to the two-faced stone) to thus prevent interference with the sides of a close and direct connected motor or with other parts of the grinder unit or apparatus. Thus, it has not been feasible to use the readily available, conventional bench grinder for sharpening sickle bars or the like because of such interferences.

According to this invention, an otherwise interfering, direct connected motor and grinder wheel, and particularly a conventional bench grinder, may be employed for the simultaneous sharpening or grinding of adjacent pairs of V edges of a planar V-toothed or serrated elongated blade (hereinafter sometimes referred to as a sickle bar or the like) by the use of special and non-symmetrical stone or grinding wheel having unequal conical angles for its peripheral faces to replace one of the wheels of such a bench grinder for the grinding of such pairs of V edges and by the use of jig-clamp and slide guide means according to this invention to hold the bar so that it always has its length axis inclined at a small acute angle to the grinder's axis of rotation and is slidably adjustable along its own length (or along this same inclination angle) by a suitable slide guide track means or the like to move new edge pairs into operative or grinding position. This acute inclination angle is fixed so that the bar is always held at this acute angle during all of its different movements and particularly whenever it is in operative or grinding position against the unsymmetrical grinding wheel. This fixed acute angle or inclination angle is equal, or substantially equal, to one-half of the difference between the conical angles of the two different faces of the non-symmetrical grinding wheel so that the bisectors of the dihedral angle between these two different faces always bisect the spaces between adjacent teeth of the sickle bar and so that the sickle bar teeth are thereby ground or sharpened to equal edge angles by each of these two different and substantially, conical grinding faces, which may, if desired, be slightly crowned or curved for the hollow grinding of such teeth.

This invention also provides cooperating means for properly guided, feed motions of the sickle bar and its teeth into, or against, the two different faces of the grinding wheel to thereby sharpen along the lengths of said pair of edges, with the two edges being ground to equal angles. The apparatus of this invention provides feed motion guide means (preferably of the linkage or swinging type) whereby the cutter bar is guided during its feed motion so that it moves only perpendicular to its own length (which is inclined to the axis of rotation of the grinder wheel as noted above). Preferably, this feed

motion guide means comprises a linkage having at least two different, offset, and parallel pivot means which are also inclined to the axis of rotation of the grinder wheel by the same acute angle as that for the inclination of the sickle bar, to thus always maintain the feed motions in a direction perpendicular to the length of the sickle bar. The apparatus according to this invention is readily installed on a conventional bench grinder or the like and its sickle bar holding clamp means can be readily swung out of the way to permit other uses of this bench grinder while the apparatus of this invention is installed thereon. This apparatus is more fully described below.

It is an object of this invention to provide sharpening apparatus for a cutting edge blade or the like having planar, V teeth or serrations, such as and particularly for a sickle bar or the like, which permits the use of a sharpening grinding wheel drive unit having a normally interfering width or radius which is as large or larger than the smallest effective or operative width or radius of the V tooth sharpening, grinding wheel.

Other and more specific objects hereof are to provide apparatus for the sharpening of sickle bars or the like on a conventional bench grinder and to provide simple, low cost and reliable attachment means for this purpose which can be readily applied to conventional bench grinders.

Further objects hereof reside in a provision of a non-symmetrical or unequal angle sharpening stone or grinder wheel having two different conical faces for adjacent teeth of an angularly disposed sickle bar or the like and the provision of improved slide guide means, track means, and feed means for such sharpening, said feed means being preferably of the swingable linkage type having at least two pivot axes parallel to the length of said inclined sickle bar.

Other objects, features and advantages of this invention will be apparent from the following description of an exemplary embodiment, which is illustrated in the drawings wherein:

FIGURE 1 is a perspective view showing a conventional bench grinder with a special sickle grinding wheel and a sickle bar held in jig-clamp apparatus according to an exemplary embodiment of this invention;

FIGURE 2 is a broken away or incomplete plan view of the apparatus of FIGURE 1 showing the sickle bar and other parts near the end of the sharpening of a pair of the edges;

FIGURE 3 is a schematic and partially broken away plan view looking down on the sickle bar and its grinding wheel of FIGURE 1 and showing the angular relationships;

FIGURE 4 is an end view looking from the far end of FIGURE 1 showing the sickle bar and other parts at the beginning of the sharpening of a pair of V edges; and

FIGURE 5 is an end view similar to FIGURE 4 but showing the sickle bar and other parts with the pair of V edges being sharpened to a greater depth than that shown in FIGURE 4 and with the dotted line position of the sickle bar and associated parts corresponding approximately to the position shown in FIGURE 1.

Referring now to the drawings, they show an exemplary form of this invention in use with, or applied to, a conventional bench grinder unit, which is designated as a whole by 1. This unit 1 has the usual parts which, in the illustrated form, include the three main casting or housing portions, I, II, and III which are suitably secured together and may be considered as the one unit 1. The unit 1 (or these three housing portions) includes the laterally extended base portions 2 which is of generally rectangular form and has, at its four corners, suitable openings for the hold down screws 2'. Housing portion I has the integral grinding wheel guard portion 3 extending

out from the tapered-down end portion 4 which extends into the flat and nameplate carrying portion 5 of the central housing portion II which encloses the central portion of the usual motor, not shown here. The housing portion III has the tapered down portion 6 extending from portion 5 as shown. The flat face and larger diameter grinding wheel 7 (which is not used during sickle bar grinding and which may cause interference except for this invention) is mounted on the left or near end of the motor shaft 8 (as seen in FIGURE 1) by suitable means such as the self tightening nut 9 and washer 9*a*.

At the outer end of unit 1, the wheel guard portion 3' is integral with casting portion III and surrounds one side of the special grinding wheel designated as a whole by 10. This grinding wheel 10 has the different angle or unsymmetrical and substantially conical faces 11 and 12 which are hereinafter described in greater detail.

As shown in FIGURE 2, this grinding wheel 10 is mounted on the other end of the double ended motor shaft 8 by means such as the self tightening nut 9' engaging the washer like member 9'' in the flat bottom of the tapered side, cup like depression 10' in the outer end of this grinding wheel 10.

The sickle bar holding and adjusting unit or attachment of this invention is designated as a whole by 15 and the sickle bar is designated as a whole by B. The longitudinal axis of the sickle bar is shown by the line B'B''. The sickle bar clamp unit is designated as a whole by C. It is constructed to releasably and tightly secure the sickle bar B at and along its back and on to the side in any desired axial position along the length or axis of the sickle bar B.

As shown in FIGURE 1, the sickle bar B has teeth or planar serrations 18 having pairs of adjacent or opposed edges, such as 19' and 19'', which are to be simultaneously ground or sharpened, usually but not necessarily, only on one side, as indicated in FIGURE 3. The rivets 19 secure the toothed portion of B to a back reinforcement.

The clamp unit C may be of various, suitable types of construction, but is here illustrated as comprising the one piece, sheet steel stamping, as shown, and which is elongated along, and engages the length of, sickle bar B on one side thereof as described in more detail below.

The stamping C includes the flat or bottom portion 20 and the integral front wall portion 22 bent along line 21. The unit C also includes the integral end walls or pivot carrying portions 25 at each end. These portions 25 are bent up along bend lines 24 and are secured, as by welding at 23, to front wall 22. The inner bent-up portion of the unit C is formed by the integral rear wall 26 which is bent up along the bend line 27. The upper edge of the rear wall 26 is bent over at 29' into the inwardly or rearwardly directed and horizontal wall 29 which has a straight inner edge 30 to clampingly engage along the length of sickle bar B.

The unit C also includes four axially spaced and lower level engaging or clamping points for the same side of sickle bar B. These points are provided by suitable means such as the inner ends of the bent in tangs or lugs 32 at each end and by the two intermediate tangs 33 bent in from the rectangular openings 32' which are equally spaced on either side of the central hole 34 for the clamp screw 35.

As shown in FIGURE 1, clamp screw 35 has a wing nut 36 on its suitably threaded outer end to engage against wall 22. The integral inner end of the clamp screw 35 is bent up as shown at 38 and 39 of FIGURE 4 to form two vertically spaced, engaging or clamping areas on the inner side of sickle bar B to tightly clamp bar B in any selected position along the length of its axis B'B'' against the clamp-guide tracks provided by edge 30 and by tangs 32 and the intermediate tangs 33.

Clamp unit C is swingable about axis C'C'' by the two aligned pivots or bolts 40 secured by the inner nuts 41 and through corresponding holes in the end portions 25.

These end portions 25 are engaged between similar up-turned end walls or pivot carrying portions 43 of the box-like and one piece stamping unit designated as a whole by D. The slider unit D is mounted for slidable adjustment on and along the guide or track member designated as a whole by T which is here shown as a flat steel bar and which is inserted (as from one end) into the aligned and suitably-formed guide slots 45 in the walls 43 at each axial end of the slider unit D. These slots 45 provide adequate friction to retain slider D in any selected position along track T.

As shown in FIGURE 1 and also in FIGURES 4 and 5, the slider unit D is also a one-piece end box-like stamping somewhat similar to unit C. Thus, in the exemplary embodiment illustrated, the slider unit D includes the flat bottom wall 47 integral with end walls 43 and also integral with the bent up and stiffening front wall 48 secured to walls 43 as by welds 49. In this form, the lower rear edge or wall 47 is flat and not stiffened by another wall, which may be supplied if desired.

The slide guide or track T has suitably secured brackets 51 (as shown in FIGURE 2) through which extend the aligned and pivot forming bolts 53 secured by the outer nuts 54 through corresponding holes in the bent over and vertical, flat ends 56 of the support brackets or arms 57, which may be formed of suitable steel strips and which have holes 58 to receive screws 2' to hold arms 57 clamped in place under the secured bench grinder unit 1.

As shown in the several figures, axes B'B'', T'T'', C'C'', and D'D'' are all parallel. Each of them is inclined at a small acute angle (such, for example, as the 10° shown in FIGURE 3) to the axis of rotation S'S''.

As shown best in FIGURES 2 and 3, this inclination or small acute angle prevents any interference between the sickle bar (and its securing and adjusting apparatus) and the relatively wide middle portion of thickness of the bench grinder unit 1, or with the grinding wheel 7 or its tool rest. This interference would otherwise occur if bar B were parallel to axis S'S'' since the central width or radius of the bench grinder unit 1 is about equal to, or greater than, the effective radius of wheel 10. The radius of wheel 10 is approximately fixed by the desired surface or peripheral speed for wheel 10 when rotating at the constant speed of the motor of the conventional bench grinder 1.

As noted above, a parallel mounted sickle bar may also have an interference with the larger diameter grinder wheel 7 or with its outwardly extending tool rest which is normally mounted at its front side. Any such interference with grinder wheel 7, its tool rest or with the width or radius of the motor casing, such as 5, is avoided by this invention during sharpening of a sickle bar or the like.

FIGURE 1 shows the bar and unit C swung up about C'C'' and out of engagement with grinder wheel 10 with the teeth 18 in an upright or non-sharpening position.

FIGURE 2 shows, in plan, the teeth of bar B being sharpened in the position of the same general nature as that shown in FIGURE 4 wherein the bar B is in position for the start of the sharpening or grinding of the outer tips of a pair of opposed edges, such as 19' and 19''.

In FIGURE 5, the sharpening has proceeded further into the V between the teeth so that bar B is tilted and swung further in along the grinder wheel 10 by tilting about its tilt axes (at 40 and at 54).

It will be apparent to those skilled in this art that the bar teeth may be positioned in any needed sharpening position by suitable tilting motions about axes C'C'' and D'D'' and that this linkage provides a guide means for the feed motions of the teeth a long their edges, these guide motions being always exactly perpendicular to the length of the bar B or to the axis B'B''.

It will also be apparent that a suitable number of

teeth may be sharpened for one clamp-up of bar B in unit C by sliding slider unit D along track T. In the apparatus shown, six or seven tooth pairs may be so sharpened for one such clamp-up. It will also be understood that bar B may be unclamped and axially repositioned and reclamped in unit C so that any desired length of such bar may be sharpened by the apparatus of this invention.

The important relationships between the inclination angle (here 10°) between bar B, or its axes B'B", and the axis of rotation S'S" and the interrelated different face angles of the unsymmetrical grinder wheel **10** are best shown by the values and relationships of schematic FIGURE 3. As shown in this FIGURE 3 and in the other figures, the particular bar B illustrated has equal included angles of 60° between the tooth edges and for the teeth. Also, the edges are ground, preferably on one side alone, to angles of 20°, as best shown in FIGURE 3.

Accordingly, the substantially conical faces **11** and **12** of grinder wheel **10** have their conical angles made unequal so that they are bisected at V which is normal to the axis B'B" of the sickle bar. To put it another way, the bisectors of the dihedral angle between the faces **11** and **12** are inclined to the perpendicular to the axis of rotation S'S" by an angle of 10° which is the same as the inclination angle between bar B or its axis B'B" and the axis of rotation S'S". Thus, the inclination angle for bar B (here 10°) is subtracted from a normally required 20° conical angle for face **11** (as it would have been for a parallel bar B) and this same 10° angle is added to the 20° face angle for face **12** (as it would have been for a parallel bar B). From the foregoing, it will be apparent that the faces **11** and **12** are properly disposed for the sharpening of the edges of the inclined bar B. As noted hereinabove, the faces **11** and **12** need not be true or exact conical surfaces within the purview of the invention and need only be substantially conical. As one example, these two faces **11** and **12** may be suitably crowned or convexly curved for the hollow grinding of the edges **19"** of teeth **18** as will be readily understood by those skilled in this art. This curvature is too small to be readily illustrated herein.

It is believed that those skilled in this art will readily perceive the desirable angular relationships for other forms or embodiments of this invention from this FIGURE 3 and from the foregoing description and will fully understand the operation and uses of this invention and its features and advantages.

It will, of course, be understood that various other angles may be used, that the guides, pivots, and the like may be provided in numerous other ways and that this invention, within its broad purview, may be used for various other purposes or applications, particularly where there are similar problems.

While I have specifically described and illustrated only one exemplary embodiment, yet it is to be understood that various other known or desired arrangements or constructions may be used and that features of this invention may, also be used to advantage in other applications or other types of apparatus, all within the teachings and spirit of this invention.

I claim as my invention:

1. Apparatus for attachment to a conventional bench grinder unit including a base and a driving electric motor with a shaft for the simultaneous one sided knife edge type sharpening of adjacent pairs of the edges of the sickle bar, said attachment apparatus comprising

(*a*) a grinding wheel having an axis of rotation and of materially smaller diameter than said motor to be mounted on one shaft end of said motor and

(*b*) cooperating sickle bar locating and holding means to be secured to the base of said grinder unit,

(*c*) said grinding wheel having two substantially intersecting and unequal angles, substantially conical faces,

(*d*) said locating and holding means including bracket arms having means at one end to be secured on the ends of the base of said bench grinder unit and aligned pivot means at their other ends forming a first tilt axis which is inclined to said axis of rotation by a small acute angle which is substantially one-half of the difference between the different conical angles of said two faces to prevent interference between said sickle bar and said electric motor.

(*e*) a long slide guide track means swingably mounted on said aligned pivot means of said bracket arms with said long track means being always parallel to but offset from said first tilt axis,

(*f*) a box-like, slider, stamping member elongated along, and engaging along a short length of the length of, said long track means for adjustment along substantially its entire length to move all of the different pairs of the edges of such a sickle bar within the length of said long track means into approximate position to be self-centered by engagement with said conical faces of said grinding wheel to position them for sharpening and

(*g*) a box-like stamping member having means to clamp only the rear edge portion of the sickle bar to avoid interference with the grinding of any of its said pairs of edges, said clamping member being elongated along, and pivoted in, said slider member adjacent its ends on a second tilt axis parallel to said first tilt axis,

(*h*) said two tilt axes providing a tilting feed linkage to always guide said sickle bar clamping member for feed motions substantially perpendicular to said tilt axes for knife edge type sharpening along the lengths of all of said pairs of V edges of a sickle bar within the length of said long track means to thus avoid reclamping of said sickle bar to reposition it.

2. Apparatus for attachment to a bench grinder unit including a base, a driving electric motor and an adjacent coaxial direct connected grinding wheel which is of materially smaller diameter than said motor and which has two substantially intersecting conical faces of unequal conical angles to sharpen along adjacent pairs of edges of a sickle bar positioned at an angle to the axis of rotation of the grinder unit to avoid interference with the larger diameter of its electric motor, said attachment apparatus comprising

(*a*) two bracket arms spaced apart along the axis of rotation of said grinder unit and having inner ends with means to be secured to the base of said grinder unit and aligned pivot means at their outer ends to form a first tilt axis offset from and at an acute angle to the axis of rotation of the grinder unit,

(*b*) a long track member mounted offset from and to swing about said aligned pivots of said first tilt axis,

(*c*) a slider member slidably adjustable along substantially the entire length of long track member to sharpen all of the sickle bar edges within its length without reclamping and repositioning of said sickle bar and having aligned pivot means to form a second tilt axis offset from and parallel to said first tilt axis,

(*d*) and a clamping member to clampingly engage only the rear edge portion of said sickle bar to avoid interference with its teeth, said clamping member being swingably mounted by said pivot means of said slider member to tilt about said second tilt axis.

3. Apparatus for attachment to a bench grinder unit including a base, a driving electric motor and an adjacent coaxial direct connected grinding wheel which is of materially smaller diameter than said motor and which has two substantially intersecting conical faces of unequal conical angles for sharpening along adjacent pairs of edges of a sickle bar inclined at an angle to the axis of rotation of said grinder unit to avoid interference

with its larger diameter electric motor, said attachment apparatus comprising

(*a*) a pair of bracket members axially spaced along the axis of rotation of said grinder unit, each having means to be secured under the base of said grinder unit and each having pivot means adjacent its outer end, said pivot means being aligned to form a first tilt axis offset from and at an acute angle to the axis of rotation of said grinding unit,

(*b*) an elongated track member outwardly offset from and swingably mounted to said pivot means of said bracket members,

(*c*) a box-like sheet metal stamping forming a slider member mounted to slide along substantially the entire length of said elongated track member, said slider member having a pair of spaced apart pivots forming a second tilt axis offset from and parallel to said first tilt axis

(*d*) and a second box-like sheet metal stamping forming a sickle bar clamping member mounted in said box-like slider member and connected to its said pivots to swing about said tilt second tilt axis.

References Cited in the file of this patent

UNITED STATES PATENTS

80,571	Snow et al.	Aug. 4, 1868
371,870	Williams	Oct. 18, 1887
623,683	Neuens et al.	Apr. 25, 1899
1,107,033	Clark	Aug. 11, 1914
1,162,304	Neuens	Nov. 30, 1915
2,153,502	Ocenasek	Apr. 4, 1939

FOREIGN PATENTS

185,483	Switzerland	July 31, 1936
188,379	Switzerland	Dec. 31, 1936