March 27, 1951 H. C. WHEELER 2,546,914

GRINDING MACHINE FOR SHEAR BLADES OR THE LIKE

Filed March 5, 1949 4 Sheets-Sheet 1

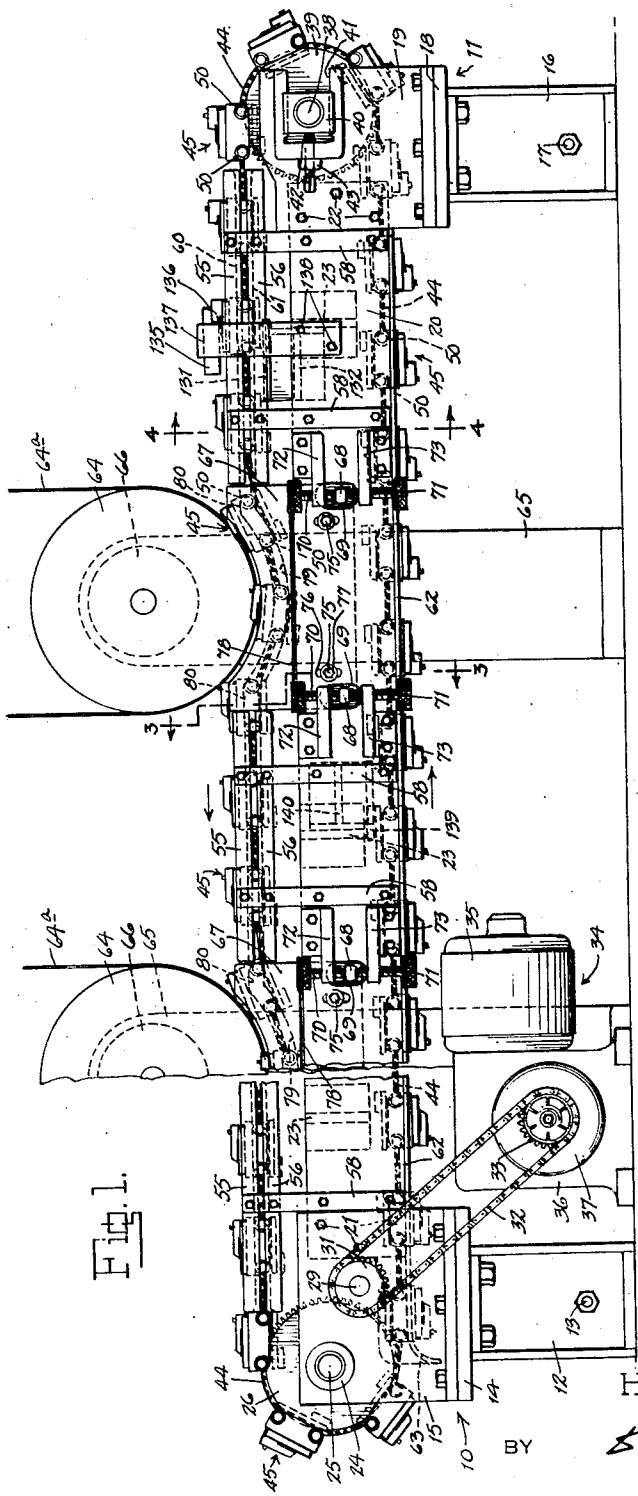

Fig. 1.

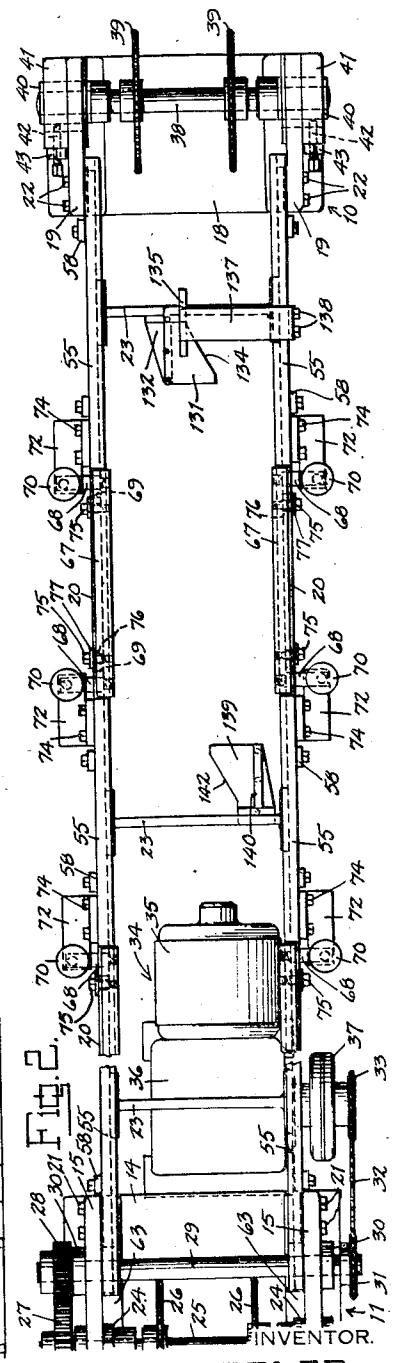

Fig. 2.

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March 27, 1951 H. C. WHEELER 2,546,914

GRINDING MACHINE FOR SHEAR BLADES OR THE LIKE

Filed March 5, 1949 4 Sheets-Sheet 2

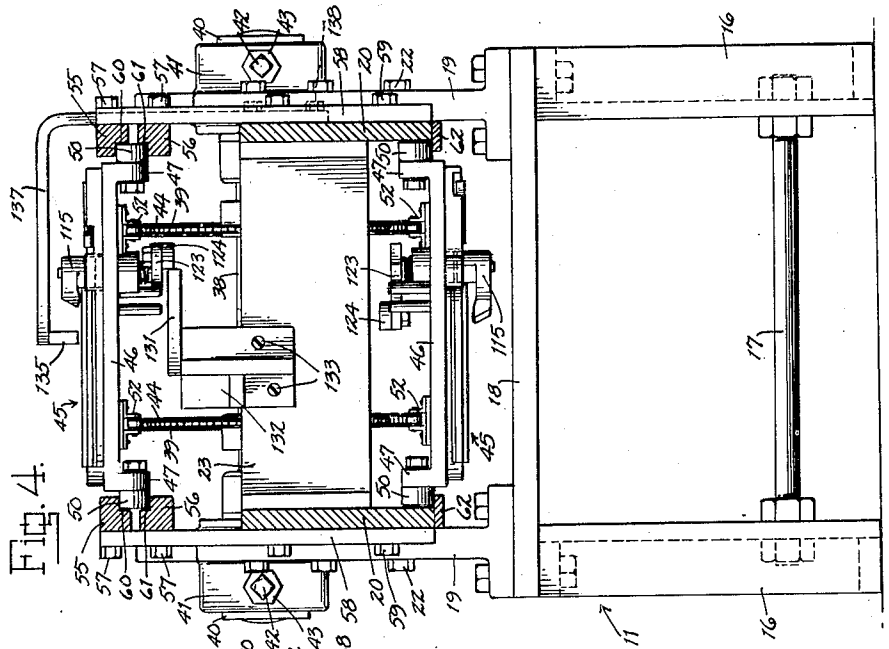

Fig. 4.

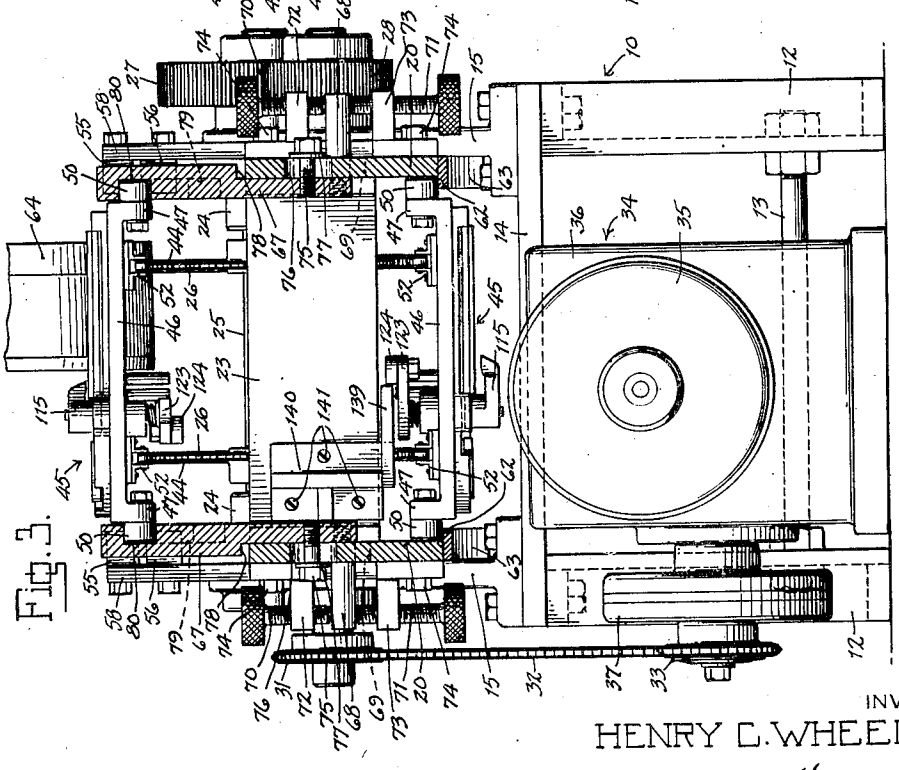

Fig. 3.

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March 27, 1951 H. C. WHEELER 2,546,914

GRINDING MACHINE FOR SHEAR BLADES OR THE LIKE

Filed March 5, 1949 4 Sheets-Sheet 3

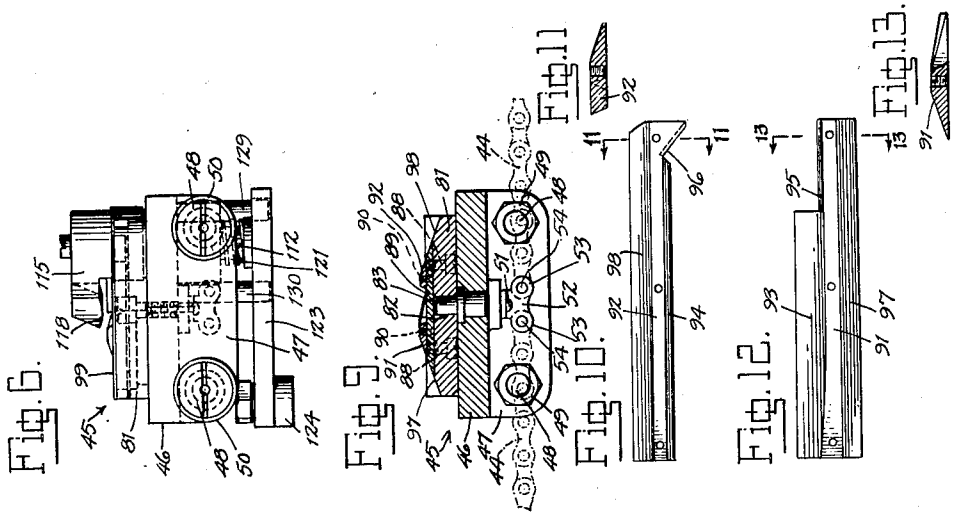

Fig. 6.

Fig. 9.

Fig. 10.

Fig. 12.

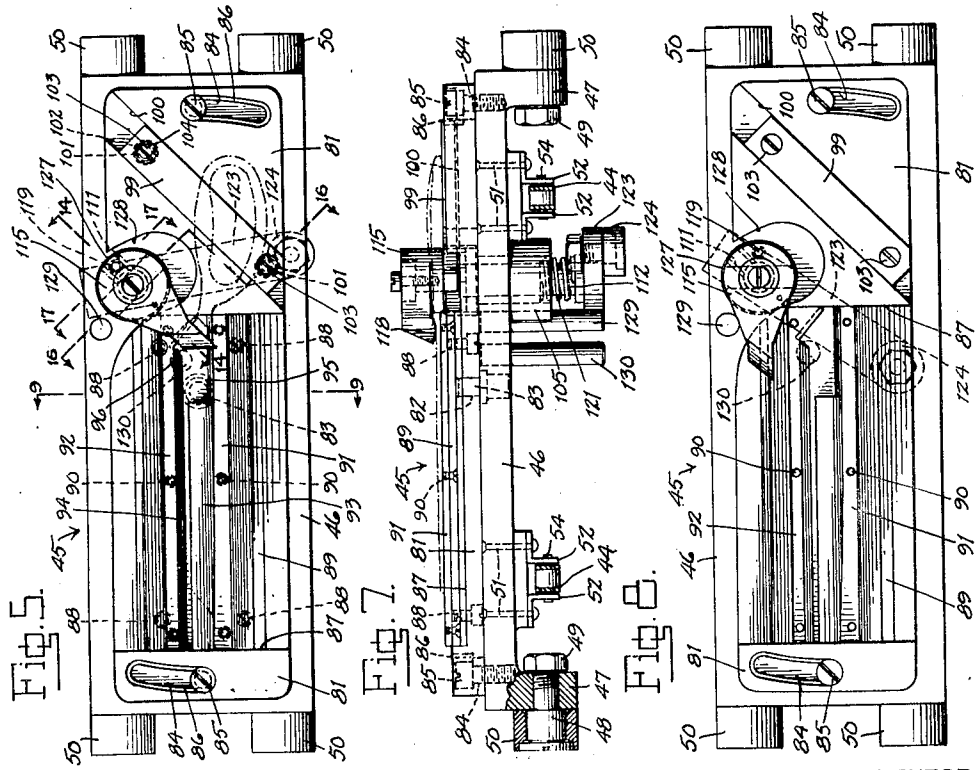

Fig. 5.

Fig. 7.

Fig. 8.

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March 27, 1951 H. C. WHEELER 2,546,914

GRINDING MACHINE FOR SHEAR BLADES OR THE LIKE

Filed March 5, 1949 4 Sheets-Sheet 4

Fig. 17.

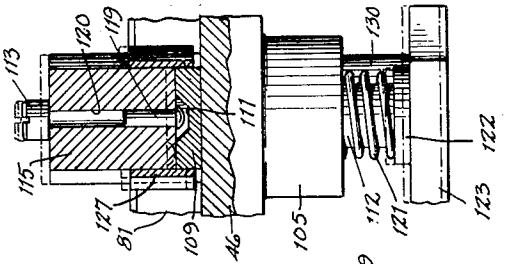


Fig. 16.

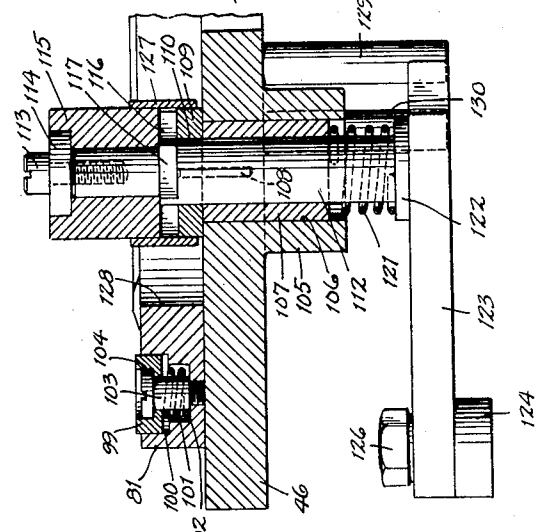


Fig. 14.

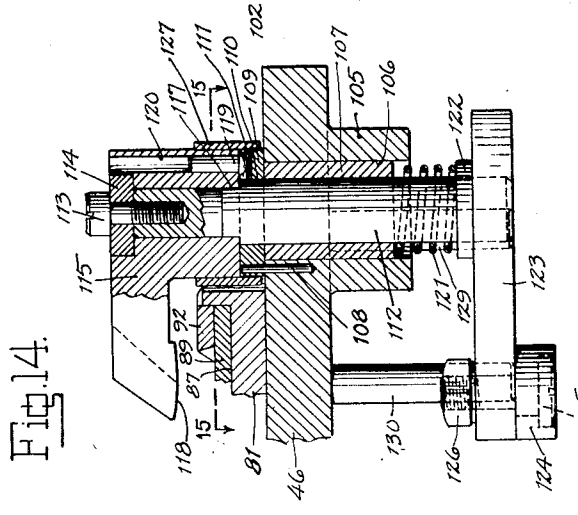
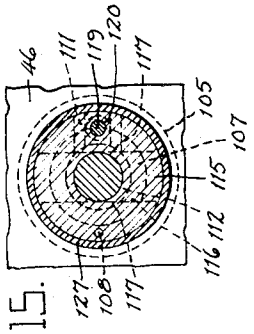


Fig. 15.



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Patented Mar. 27, 1951 2,546,914

UNITED STATES PATENT OFFICE

2,546,914

GRINDING MACHINE FOR SHEAR BLADES OR THE LIKE

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Application March 5, 1949, Serial No. 79,843

13 Claims. (Cl. 51—76)

1

The present invention relates to a grinding machine for shear blades or the like, and has for its object to provide an automatic machine of this character in which a continuous succession of shear blades or the like, placed in successively arranged carriers, are carried by an endless conveyer into grinding relation with one or a succession of grinding wheels, or other suitable grinding means, and whereby the grinding operation is carried out rapidly, uniformly and with a precision that is usually only obtained by slow hand grinding methods requiring highly skilled operators. Shear blades are ground with a helical surface, and it is particularly proposed to provide carrier means for the blades adapted to hold them in a precisely predetermined angular relation as they move in relation to the grinding wheels, to produce such helical surface. It is further proposed to provide guide means for feeding the blade carriers into and out of relation to the grinding wheels, and for maintaining them, between the points of engagement and disengagement of the blades with respect to the grinding wheels, in a given arcuate path of travel about the grinding wheel peripheries.

Another object is to provide guide means for the carriers adapted to swing into and out of relation with the grinding wheel surfaces so that the entire area of each blade surface to be ground is at once brought into and out of engagement with the grinding wheel surface, thus preventing the partial or edge grinding of such blade surface.

A further object is to provide carriers for the blade into which they may be loosely placed by the operator of the machine, and having clamping means adapted to be brought automatically into retaining relation to the blades to hold them during the grinding operation, and to be disengaged automatically from the blades to release them at the completion of the grinding operation.

With the above and other objects in view, an embodiment of the invention is shown in the accompanying drawings, and this embodiment will be hereinafter more fully described with reference thereto, and the invention will be finally pointed out in the claims.

In the drawings:

Fig. 1 is a side elevation of the grinding machine, according to the illustrated exemplary embodiment of the invention, the same being shown partially broken away.

Fig. 2 is a top plan view of the main frame of the machine, partially broken away, the grinding wheels and the conveyer for the blade carriers being removed.

2

Fig. 3 is a vertical sectional view, on an enlarged scale, taken along the line 3—3 of Fig. 1.

Fig. 4 is a vertical sectional view, on an enlarged scale, taken along the line 4—4 of Fig. 1.

Fig. 5 is a plan view on a further enlarged scale of one of the blade carriers, the position of a blade being indicated by the dot-and-dash lines, and the blade retaining means being shown in blade gripping position.

Fig. 6 is an end view of the blade carrier.

Fig. 7 is a side elevation, partially in vertical section.

Fig. 8 is a plan view showing the blade retaining means in blade releasing position.

Fig. 9 is a vertical transverse sectional view, taken along the line 9—9 of Fig. 5, the dot-and-dash lines indicating the conveyer chain connected thereto.

Fig. 10 is a plan view of one of the nest strips employed for positioning the blade in the carrier.

Fig. 11 is a transverse sectional view, taken along the line 11—11 of Fig. 10.

Fig. 12 is a plan view of another of the nest strips for positioning the blade in the carrier.

Fig. 13 is a sectional view taken along the line 13—13 of Fig. 12.

Fig. 14 is a detail vertical sectional view, on a further enlarged scale, taken along the line 14—14 of Fig. 5.

Fig. 15 is a horizontal sectional view, taken along the line 15—15 of Fig. 14.

Fig. 16 is a vertical sectional view, taken along the line 16—16 of Fig. 5.

Fig. 17 is a vertical sectional view taken along the line 17—17 of Fig. 5, the dot-and-dash lines indicating one of the operative positions of the part illustrated therein.

Similar reference characters indicate corresponding parts throughout the several figures of the drawings.

Referring to the drawings, the grinding machine, according to the illustrated exemplary embodiment of the invention, comprises a main frame consisting of a pair of end table supports, indicated generally as 10 and 11, the table support 10 comprising a pair of leg members 12—12 having a bracing shaft 13 bolted between them, and having a horizontal table bed 14 bolted to their upper ends, a pair of vertical bearing plates 15—15 being bolted to the table bed 14. The table support 11 is substantially similar to the table support 10, and comprises leg members 16—16 having a bracing shaft 17 bolted between them and having a horizontal table bed 18 bolted to their upper ends, a pair of vertical bearing

plates 19—19 being bolted to the table bed. A pair of longitudinal side plates 20—20 extend between the end table supports 10 and 11 and have their end portions rigidly secured to the inner sides of the bearing plates 15—15 and 19—19 by bolts 21 and 22, a series of transverse T-braces 23 being disposed between the side plates 20 and rigidly secured at their ends to the inner sides of the side plates, preferably by welding.

The machine of the invention contemplates the automatic feed of a succession of shear blades into relation with one or more grinding wheels, or other suitable grinding means. The general term "grinding" is employed and intended to describe such specific operations as grinding, polishing, buffing and the like. For the present illustration there is shown a machine having two longitudinally spaced grinding wheels, one of the grinding wheels and its associated parts being fully shown and the other grinding wheel and its associated parts being partially shown. It will be understood that in the case of a single grinding wheel being employed the overall length of the machine will be materially shortened, and in the case of a succession of two or more grinding wheels the overall length will be increased as required to accommodate the additional units and provide the necessary space between them. It is further pointed out that in providing a succession of grinding wheels the first grinding wheel will usually be of a type to perform a preliminary or rough grinding operation upon the blades, and the successive grinding wheels will be such as to produce intermediate and finishing grinding operations, the complete grinding of the shear blades being thus carried out in the one machine.

In the bearing plates 15 of the table support 10 there is journaled in suitable bearings 24 a conveyer mounting shaft 25 upon which are secured a pair of sprocket wheels 26—26, the shaft being provided upon one of its ends with a spur gear 27 engaged by a pinion gear 28 mounted upon one end of a counter shaft 29 journaled in suitable bearings 30—30 in the bearing plates 15, this counter shaft being provided upon its other end with a sprocket gear 31 driven through a sprocket chain 32 from a sprocket wheel 33 of a power unit, indicated generally as 34, this power unit including an electric motor 35, suitable reduction gearing provided in a reduction gearing housing 36 and a friction clutch drive 37 between the reduction gearing and the sprocket wheel 33.

In the bearing plates 19 of the table support 11 there is mounted for longitudinal adjustment a shaft 38 provided with a pair of sprocket wheels 39—39 in longitudinal line with the sprocket wheels 26—26, this shaft being rotatably supported at its ends in bearing blocks 40—40, slideably mounted for longitudinal adjustment in slideways 41—41 provided in the respective bearing plates 19—19, these blocks being engaged at their inner sides by adjustment screws 42—42 set in the ends of the slideways 41—41 and being fixed in their positions of adjustment by lock nuts 43—43, turning of the adjustment screws moving the bearing blocks longitudinally in the slideways. Two parallel endless conveyer sprocket chains 44—44, in which a series of equally spaced blade carriers are set, as will presently more fully appear, are carried about the sprocket wheels 26—26 and 39—39, and through the drive of the shaft 25 from the power unit the conveyer chains are caused to travel in the direction indicated by the arrow in Fig. 1.

The blade carrier units, indicated generally as 45, each comprise a rectangular body member 46, best illustrated in Figs. 5 to 9, provided at each of its ends with a downwardly extending flange 47 in which a pair of roller studs 48—48 are secured by nuts 49—49, and upon which are mounted cylindrical rollers 50—50, one roller being provided in projecting relation at each of the four corners of the body member 46. At the underside of the body member substantially adjacent each of the flanges 47 there are secured by rivets 51 a pair of angular brackets 52—52, each having apertured ears 53—53 in which are engaged the end pins 54—54 of the two sections of the sprocket chain 44 connected to the blade carrier, the spacing of the end pins 54—54 corresponding to the spacing of the other pins connecting the links of the sprocket chain, so that the brackets 52 in effect constitute a link of the sprocket chain adapted to be engaged by the teeth of the sprocket wheels as the blade carrier moves about the sprocket wheels.

The upper traverse of the conveyer constitutes the working path of the blade carriers during which they move into relation with the grinding wheels, as will presently more fully appear, and the lower traverse of the conveyer constitutes the return path. In the movement of the carrier along the upper working path the carriers are guided along the intervals between the sprocket wheels and the grinding wheels and between the successive grinding wheels by a series of horizontal trackways at each side of the machine, these trackways each consisting of a pair of parallel rails 55 and 56 secured by screws 57 to the inner sides of the upper end portions of a series of vertical supporting bars 58 secured by screws 59 to the outer sides of the longitudinal side plates 20. The rails 55 and 56 are respectively provided at their opposed faces with right angular channel recesses 60 and 61 in which the rollers 50 of the blade carriers are guided and having rolling engagement with the lower recesses 61, the horizontal path of movement of the blade carriers in the trackways being tangential to the sprocket wheels 26 and 39. In the movement of the blade carriers along the lower return path they are supported in inverted position on inwardly projecting ledge bars 62—62 secured upon the lower sides of the side plates 20, the rollers 50 having rolling contact with these ledges. At the ends of the ledge bars adjacent the sprocket wheels 26—26 there are secured to the inner sides of the bearing plates 15 downwardly flared ledge members 63—63 arranged in continuation of the ledge bars for the purpose of providing a flared entrance for engagement of the rollers with the ledge bars.

The grinding wheels 64 are mounted above the upper traverse of the conveyer in suitable supports 65, and each grinding wheel is preferably provided with an individual driving motor, indicated as 66. The grinding wheel may if desired be constructed of suitable grinding, polishing, buffing or similar material, but preferably such material is carried on an endless band 64a engaged over the wheel as a support, this band also being engaged over a suitable wheel or pulley, not shown, spaced above the wheel 64. The peripheral surface of the grinding wheel may be suitably contoured, as shown, for example, in Fig. 3, in the case of grinding operations requiring such contoured periphery, the flexible band 64a readily conforming to this contour. The grinding wheels may rotate in either direction depending upon the

particular placement of the blades in the blade carriers. In moving in relation to each of the grinding wheels the blade carriers are guided through an arcuate path about the periphery of the grinding wheel, and for this purpose there are mounted upon the side plates 20—20, between the spaced ends of the horizontal trackways at each side of the grinding wheels, a pair of channel guide plates 67—67.

These channel guide plates are mounted for vertical adjustment upon the inner sides of the side plates 20—20, each being provided for this purpose with a pair of longitudinally spaced lugs 68—68 projecting through slot openings 69—69 in the side plates, these lugs each having flattened upper and lower surfaces respectively engaged by vertically disposed upper and lower adjustment screws 70 and 71 mounted in angular brackets 72 and 73 secured by screws 74 to the outer side of the respective side plate. Thus by adjustment of the screws the channel guide plates may be vertically adjusted, and also angularly adjusted, to bring about proper alignment with the horizontal trackways as well as the proper relation to the grinding wheel. The adjusted position of each of the channel guide plates is fixed by flat head screws 75—75 screwed therein and engaged in vertical slots 76—76 in the respective side plate 20, a washer 77 being disposed beneath each screw head for binding engagement with the side plate upon tightening of the screw.

The channel guide plates each project substantially above the upper edges of the side plates 20, and their upper projecting portions are relatively thicker than the lower portions engaged with the side plates, an outwardly disposed shoulder ledge 78 being provided at the lower edge of the upper thickened portions directly above the upper edge of the side plate and which is adapted to limit the downward adjustment of the channel guide plate. At the inner side of each of the channel guide plates near its upper edge there is provided an arcuate channel groove 79 having horizontal channel grooves 80—80 at its ends in longitudinal alignment with the horizontal guide ways 55 and 56, the upper edge of the channel guide plate being concavely recessed in parallel relation to the channel groove 79. These channel grooves are thus continuous with the horizontal trackways and provide arcuate trackways for the rollers of the blade carriers, so that the shear blades are successively moved in a path about the periphery of the grinding wheel, being tilted into and out of engagement with the grinding wheel surface as the rollers move from the horizontal to the arcuate channels. To this end the spacing of the rollers at each side of the blade carrier is such that the entire surface of the shear blade to be ground is at once brought into contact with the grinding wheel as the forward and rearward spaced rollers both become engaged with the arcuate channel grooves and the ground surface is at once disengaged from the grinding wheel through tilting the blade carrier as the forward rollers move from the arcuate channel groove to the horizontal channel groove. While the arcuate channel groove appears to be substantially concentric to the grinding wheel periphery, it is in fact slightly eccentric, so that the space between them is slightly convergent to thus maintain a constantly engaged relation of the blade with the wheel as its surface is ground and dimensionally changed.

The blade carrier 45, as best shown in Figs. 5 to 17 is adapted to permit angular adjustment of the blade, for the purpose of predetermining the angle at which the blade is held as it moves in relation to the grinding wheel, and for this purpose there is mounted upon the flat upper side of the body member 46 a rectangular swivel plate 81, provided with a centrally disposed hole 82 engaged by a pivot plug 83 secured in the body member 46. At each end of the swivel plate 81 there is provided an arcuate slot 84 concentric to the pivot plug 83 and engaged by a set screw 85, the head of which is seated against a countersunk shoulder 86 of the slot. Upon loosening of the screws 85 the swivel plate may be swung about the pivot stud 83 to any desired angular position, within the limit of adjustment determined by the lengths of the slots 84, the adjusted position being secured by tightening the set screws 85.

Within a rectangular recess 87 in the upper side of the swivel plate there is secured by means of screws 88 extending upwardly from the underside of the plate 81, a nest plate 89 for supporting the shear blade, this nest plate having secured upon its upper side, by means of screws 90 extending upwardly from its under side, a pair of side nest strips 91 and 92, suitably beveled as at 93 and 94, to conform to the beveled outer side surfaces of the shear blade, and being suitably notched as at 95 and 96, to conform to the shouldered base of the shear blade adjacent its handle portion. As clearly shown in Figs. 5 and 6, the surface of the blade to be ground is slightly raised from the upper surfaces of the side nest strips. The outer sides of the side nest strips, as well as the outer edges of the nest plate 89, and the upper surface of the base of the recess 87, are beveled, as at 97 and 98, so that clearance spaces are provided at each side of the blade surface to be ground, to thus enable the blade carrier to swing into relation with the grinding wheel to engage the surface of the blade to be ground therewith, without contact of any part of the blade carrier with the grinding wheel.

The handle portion of the shear blade is adapted to be resiliently supported, and for this purpose a support plate 99 is engaged in a diagonally disposed slot 100, provided in the upper side of the swivel plate 81 at its portion to the right of the recess 87, as seen in Fig. 5, being resiliently mounted upon a pair of coil springs 101—101, disposed in sockets 102—102 about shoulder screws 103—103 screwed into the base of the sockets, the screw heads being seated in pockets 104—104 in the support plate. The support plate normally projects slightly above the swivel plate, as shown in Fig. 16, and is adapted to be depressed through downward pressure applied to the handle of the shear blade. The shear blade is adapted to be firmly held by clamping means, presently to be more fully described, and the resilient support of the handle provided by the support plate 99 prevents any possibility of the handle being strained to the point where it will fracture or bend. It also compensates for any irregularity in the handle portion which might otherwise prevent proper seating of the blade in the nest plate.

The body member 46 of the blade carrier is provided at one side of the center and adjacent one longitudinal edge with a downwardly projecting bearing hub portion 105, having a cylindrical bore 106 in which is secured by a force fit a cylindrical bearing bushing 107 having its upper end flush with the upper side of the body member and its lower end upwardly offset from the lower side. Upon the upper side of the body member

there is secured, by means of a pin 108, a cam ring 109 having a cylindrical bore 110 in register with the bore of the bearing bushing 107, and having a radially disposed cam recess 111 in its upper surface, this recess having a flat base surface and upwardly and outwardly beveled end surfaces. Rotatably engaged in the bearing bushing 107 is a vertical shaft 112 upon the upper reduced diameter end of which there is secured, by means of a screw 113, and a countersunk washer 114, the hub portion of a clamp member 115, this clamp member being fixed against rotation upon the shaft by a diametric slot 116 in its lower side engaged by flats 117—117 provided on the shaft. The clamp member 115 includes a projecting arm portion having a convex clamp surface 118 at its underside adapted in one position of the clamp member to engage the base of the shear blade, as shown in Fig. 5, and in another position to be disengaged from the shear blade, as shown in Fig. 8.

In moving into and out of engaging relation with the shear blade the clamp member is adapted to be lowered and raised substantially vertically, so that there is no appreciable wiping engagement with the shear blade. For this purpose the clamp member is provided at its underside with a round headed clamp raiser pin 119, set in a hole 120, this pin being normally disposed in the cam recess 111 of the cam ring 109 with the under surface of the clamping member in engagement with the upper surface of the cam ring, being yieldably held in this position by a spring 121 engaged about the lower end of the shaft 112 between the upwardly offset end of the bearing bushing 112 and the hub portion 122 of a clamp operating lever arm 123 secured upon the lower end of the shaft. Swinging of this lever arm, as will hereinafter more fully appear, is adapted to impart swinging movement to the clamp.

As the clamp is swung from its closed or clamping position, as seen in Figs. 5 and 14, the pin 119 rides up upon one of the beveled end surfaces of the cam recess 111 and on to the upper surface of the cam ring, thus raising the clamp member, as shown in Fig. 8, this being the open or releasing position of the clamp member. As the clamp member moves into clamping position it remains raised from the surface of the shear blade until it is directly above it, whereupon it is lowered into engagement with the shear blade as the pin 119 reengages the cam recess 111. Upon the end of the lever arm 123 there is provided a roller 124, rotatably supported upon a headed screw stud 125, secured to the lever arm by a nut 126, this roller adapted to engage cam means provided in the machine, for the purpose of automatically operating the clamp member into clamping and unclamping positions, as will presently more fully appear.

A cylindrical collar 127 is engaged about the cam ring 109, and projects above it to provide a dirt shield for the cam recess 111 and the space between the clamp member and the cam ring, this collar being engaged with a force fit upon the cam ring and being slideably engaged by the hub portion of the clamp member. The swivel plate 81 is provided with a cut-out 128 concentric to the pivot stud for clearing the clamping mechanism as the swivel plate is moved between its positions of adjustment. A pair of stop posts 129 and 130 are secured upon the underside of the body member 46, and are positioned to respectively abut the lever 123 in its limit positions, as indicated respectively in Figs. 5 and 8.

At a point in the upper traverse of the conveyer in advance of the first grinding wheel there is provided a clamp closing cam 131 mounted upon a bracket 132 secured by screws 133 to one of the T-braces 23, the inclined surface 134 of this cam being disposed in the path of travel of the clamp operating rollers 125 of the successive blade carriers, the clamp members of which are in open position at this point in their travel. This cam causes the lever arm 123 and the clamp member 115 connected thereto to swing into clamping engagement with the shear blade disposed in the carrier, as shown in Fig. 5.

It is pointed out that an operator of the machine feeds the shear blades into the carriers at a point to the right of the closing cam, as seen in Fig. 1. A shoe 135 having a rounded nose 136 is mounted upon a bracket arm 137 secured by bolts 138 to one of the side plates 20, this shoe being situated so that it engages the shear blade in the carrier as it moves into relation with the closing cam, to insure that it is properly seated in the nest plates of the carrier between the side nest strips. The shear blades are thus firmly held in the carriers as they travel into grinding relation with the grinding wheels.

At a suitable point along the lower traverse of the conveyer there is provided a clamp opening cam 139, mounted upon a bracket 140 secured to one of the T-braces 23 by screws 141, the inclined surface 142 of this cam being disposed in the path of travel of the rollers 124 of the clamp operating lever arms 123 of the blade carriers in the closed position of the clamp members, and is adapted to swing the clamp members into open position to release the ground shear blades. As the blade carriers are in inverted position as they move along the lower traverse of the conveyer, the released blades drop by gravity into a suitable receptacle or conveyer means for moving them away from the machine.

I have illustrated and described a preferred and satisfactory embodiment of the invention, but it will be understood that changes may be made therein, within the spirit and scope thereof, as defined in the appended claims.

What is claimed is:

1. In a grinding machine for shear blades or the like, a grinding means having a circumferential peripheral grinding surface, a conveyer suitably supported and driven beneath said grinding means and including a series of successively arranged blade carriers, horizontal guide means longitudinally at each side of said grinding means for guiding said blade carriers into and out of relation therewith, and arcuate guide means in spaced relation to the grinding surface of said grinding means for guiding said blade carriers in an arcuate path about said grinding surface, said blade carriers each having longitudinally spaced front and rear guide engaging means whereby said blade carriers are tilted as said front and rear guide engaging means are simultaneously in engagement with said horizontal and arcuate guide means.

2. In a grinding machine for shear blades or the like, a grinding means having a circumferential peripheral grinding surface, a conveyer suitably supported and driven beneath said grinding means and including a series of successively arranged blade carriers, horizontal guide means longitudinally at each side of said grinding means for guiding said blade carriers into and out of relation therewith, and arcuate guide means in spaced relation to the grinding surface of said

grinding means for guiding said blade carriers in an arcuate path about said grinding means, said blade carriers each having longitudinally spaced front and rear guide engaging rollers whereby said blade carriers are tilted as said front and rear guide engaging rollers are simultaneously in engagement with said horizontal and arcuate guide means.

3. In a grinding machine for shear blades or the like, a grinding means having a circumferential peripheral grinding surface, a conveyer suitably supported and driven beneath said grinding means and including a series of successively arranged blade carriers, said blade carriers each having blade supporting means in its upper side, transversely spaced horizontal guide means at each side of said conveyer and longitudinally at each side of said grinding means for guiding said blade carriers into and out of relation therewith, and transversely spaced arcuate guide means at each side of said conveyer in spaced relation to the grinding surface of said grinding means for guiding said blade carriers in an arcuate path about said grinding surface, said blade carriers each having longitudinally spaced front and rear spaced guide engaging means at each side whereby said blade carriers are tilted as said front and rear guide engaging means are simultaneously in engagement with said horizontal and arcuate guide means.

4. In a grinding machine for shear blades or the like, a grinding means having a circumferential peripheral grinding surface, a frame including a pair of transversely spaced longitudinally extending side plates, conveyer carrying wheels mounted at the ends of said frame, drive means having driving connection with at least one of said wheels, an endless conveyer carried by said wheels and driven beneath said grinding means and including a series of successively arranged blade carriers, guide means supported on said side plates at each side of said conveyer for supporting and guiding the upper longitudinal traverse of said conveyer and including arcuate guide means in spaced relation to the grinding surface of said grinding means for guiding said blade carriers in an arcuate path about said grinding surface, and guide means supported on said side plates at each side of said conveyer for supporting and guiding the lower traverse of said conveyer.

5. In a grinding machine for shear blades or the like, a grinding means having a circumferential peripheral grinding surface, a frame including a pair of transversely spaced longitudinally extending side plates, conveyer carrying wheels mounted at the ends of said frame, drive means having driving connection with at least one of said wheels, an endless conveyer carried by said wheels and driven beneath said grinding means and including a series of successively arranged blade carriers, guide means supported on said side plates at each side of said conveyer for supporting and guiding the upper longitudinal traverse of said conveyer and including vertically and angularly adjustable arcuate guide means in spaced relation to the grinding surface of said grinding means for guiding said blade carriers in an arcuate path about said grinding surface, and guide means supported on said side plates at each side of said conveyer for supporting and guiding the lower traverse of said conveyer.

6. In a grinding machine for shear blades or the like, a grinding means having a peripheral grinding surface, a conveyer suitably supported and driven beneath said grinding means and including a series of successively arranged blade carriers, each comprising a horizontal body member and a horizontal blade supporting member mounted for angular adjustment on said body member about a vertical axis.

7. In a grinding machine for shear blades or the like, a grinding means having a peripheral grinding surface, a conveyer suitably supported and driven beneath said grinding means and including a series of successively arranged blade carriers, each comprising a body member, and blade positioning means having a recessed blade nesting rigid portion and a blade handle supporting resilient portion.

8. In a grinding machine for shear blades or the like, a grinding means having a peripheral grinding surface, a conveyer suitably supported and driven beneath said grinding means and including a series of successively arranged blade carriers, each comprising a body member, and blade positioning means having a recessed blade nesting portion and a resilient blade handle supporting portion, and a clamp member mounted in said body member for movement into and out of clamping engagement with the upper side of said blade.

9. In a grinding machine for shear blades or the like, a grinding means having a peripheral grinding surface, a conveyer suitably supported and driven beneath said grinding means and including a series of successively arranged blade carriers, each comprising a body member, and blade positioning means having a recessed blade nesting portion and a resilient blade handle supporting portion, and a vertically yieldable clamp member mounted in said body member for movement into and out of clamping engagement with the upper side of said blade.

10. In a grinding machine for shear blades or the like, a grinding means having a peripheral grinding surface, a conveyer suitably supported and driven beneath said grinding means and including a series of successively arranged blade carriers, each comprising a body member having blade supporting means in its upper side, a clamp member pivotally mounted in said body member for swinging movement into and out of clamping relation with said blade and having limited axial movement, spring means arranged to impart downward axial movement to said clamp member, and cam means operative through the swinging movement of said clamp member to impart upward axial movement thereto.

11. In a grinding machine for shear blades or the like, a grinding means having a peripheral grinding surface movable in a circumferential grinding path of a predetermined radius, a conveyer suitably supported and driven in relation to said grinding means including a series of successively arranged blade carriers, guide means longitudinally at each side of said grinding means for guiding said blade carriers into and out of relation therewith, and arcuate guide means in spaced relation to said peripheral grinding surface constructed and arranged to guide the movement of said blade carriers in an arcuate path about said circumferential grinding path to engage the blade surfaces to be ground with said peripheral grinding surface and to move said surfaces in the same circumferential grinding path therewith, and whereby the ground surfaces of said blades are concavely ground in one direction upon a radius corre-

sponding to the predetermined radius of said circumferential grinding path.

12. The invention as defined in claim 11, further characterized by adjustable mounting means for said arcuate guide means constructed and arranged to place said guide means in eccentric relation to said peripheral grinding surface whereby the path of movement of said blade carriers converges toward said peripheral grinding surface from one end to the other of said guide means.

13. In a grinding machine for shear blades or the like, a grinding means having a peripheral grinding surface movable in a circumferential grinding path of a predetermined radius and said grinding surface having a predetermined transverse grinding contour, a conveyer suitably supported and driven in relation to said grinding means including a series of successively arranged blade carriers, guide means longitudinally at each side of said grinding means for guiding said blade carriers into and out of relation therewith, and arcuate guide means in spaced relation to said peripheral grinding surface constructed and arranged to guide the movement of said blade carriers in an arcuate path about said circumferential grinding path to engage the blade surfaces to be ground with said peripheral grinding surface and to move said surfaces in the same circumferential grinding path therewith, and whereby the ground surfaces of said blades are concavely ground in one direction upon a radius corresponding to the predetermined radius of said circumferential grinding path and are ground in the other direction to conform to the predetermined transverse grinding contour of said grinding surface.

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