June 10, 1958 H. W. RINGMAN 2,838,248

RECHIPPER

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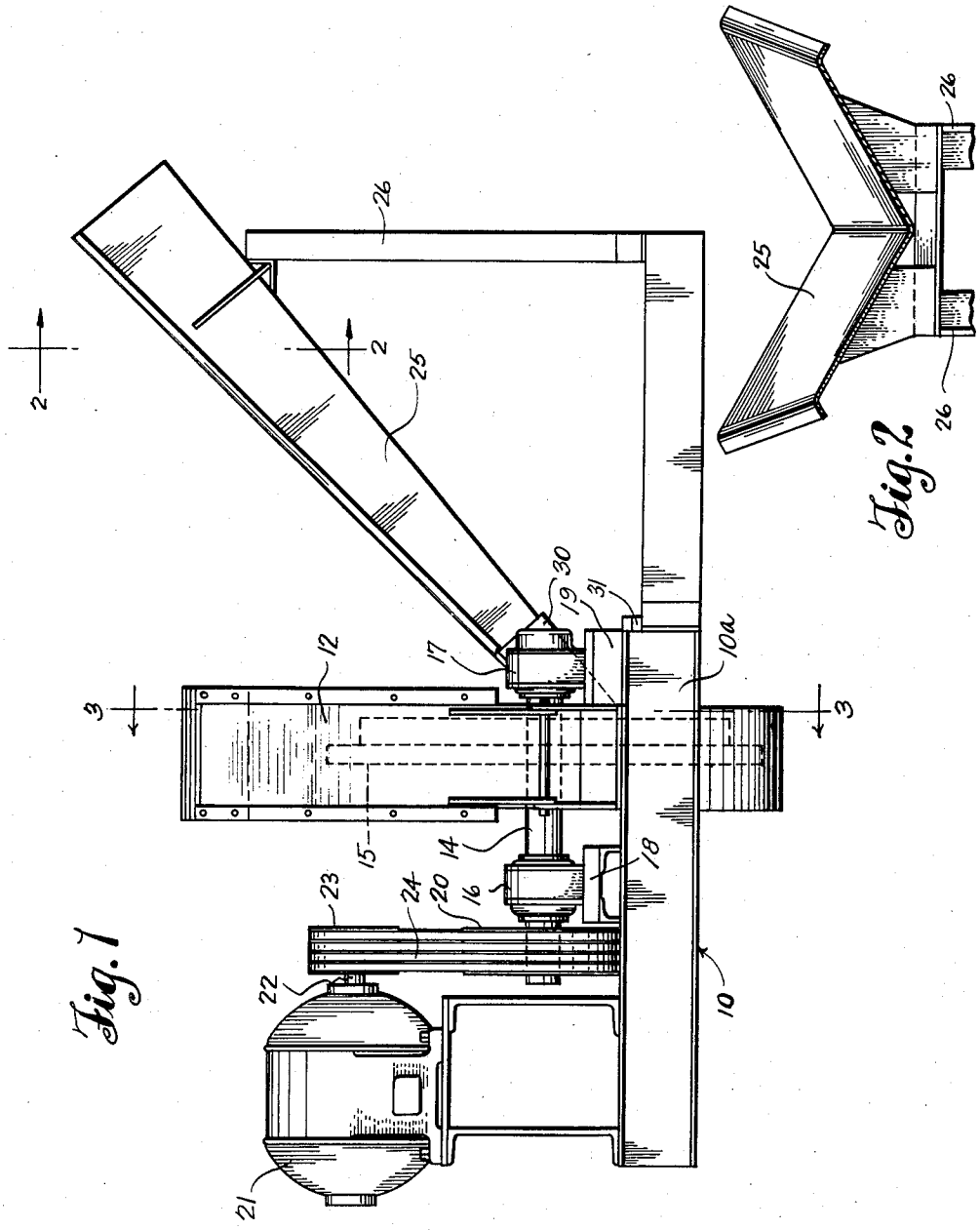


Fig. 2

Fig. 1

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Fig. 3

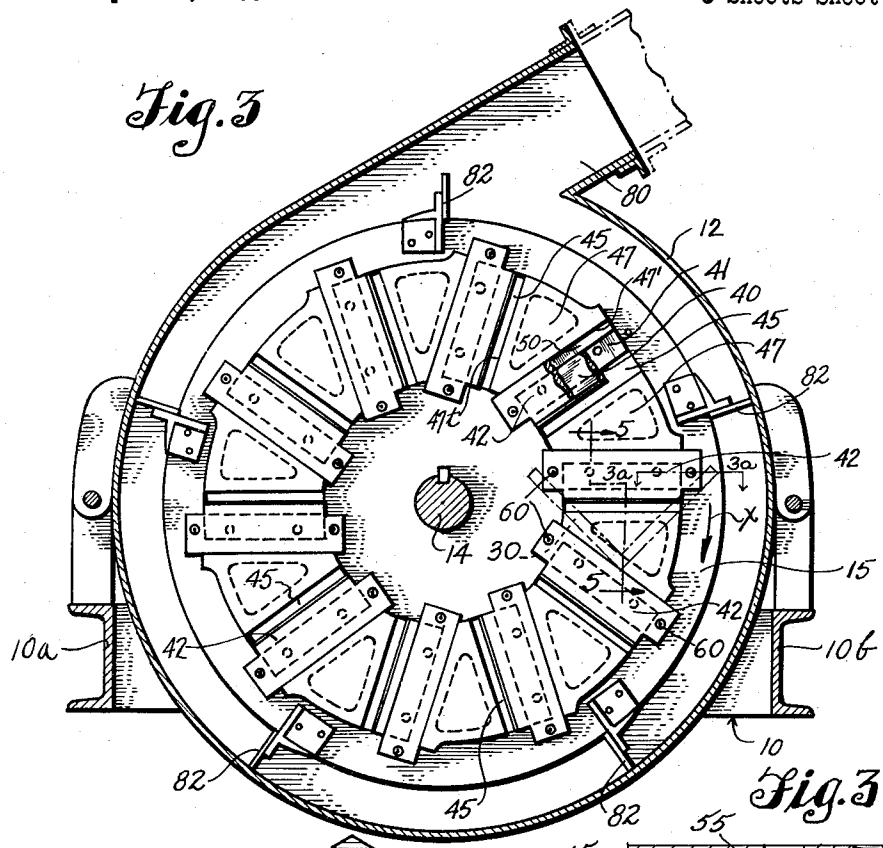


Fig. 3a

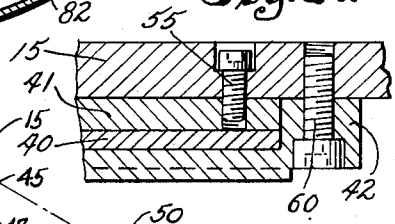


Fig. 4

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Fig. 5

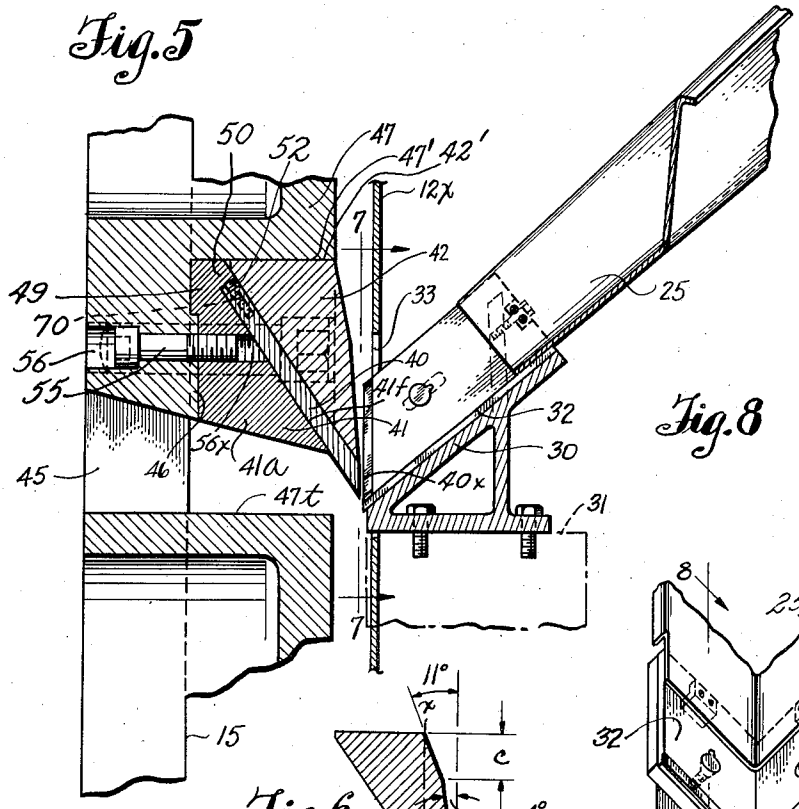


Fig. 8

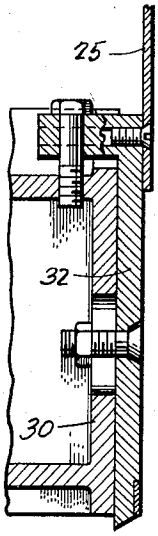


Fig. 7

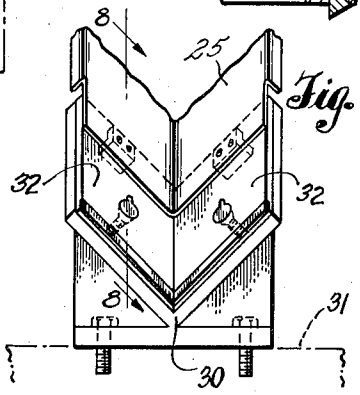


Fig. 6

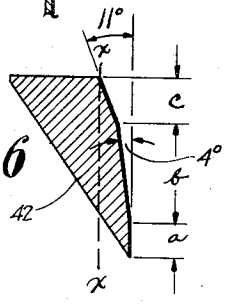
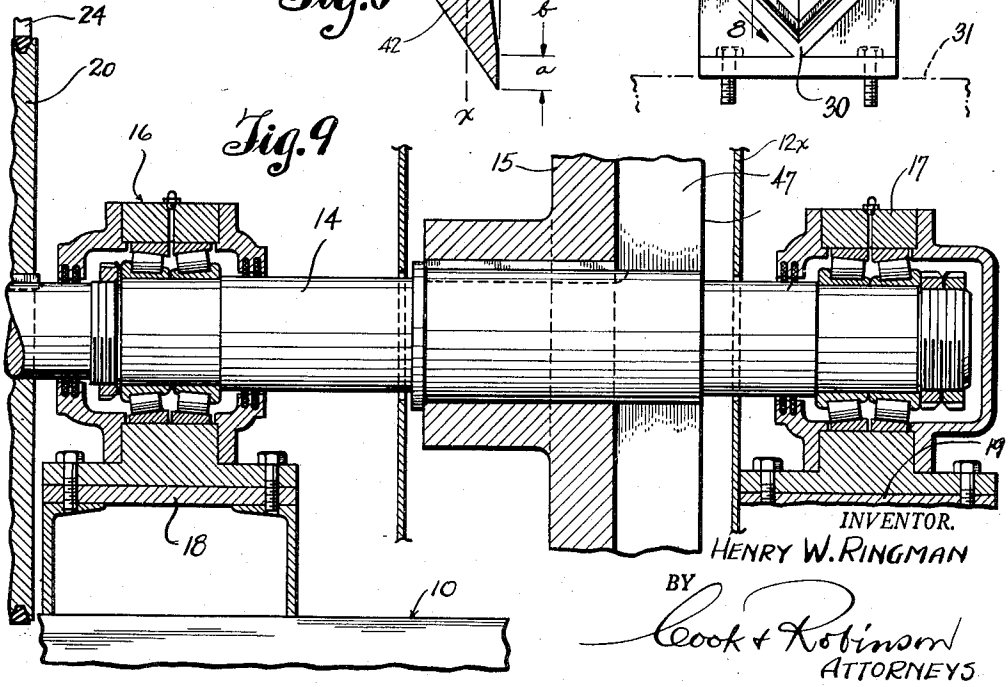


Fig. 9



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RECHIPPER

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Application September 25, 1956, Serial No. 611,835

3 Claims. (Cl. 241—92)

This invention relates to improvements in rechippers which are of the general character of that described and illustrated in United States Patent No. 2,582,537, issued on January 15, 1952. More particularly, the present invention relates to improvements in the knives, knife carriers, knife holders and revolubly driven chipper disk on which these parts are functionally mounted.

It is the primary object of this invention to provide certain improvements in these above mentioned parts whereby the pieces of wood, including slivers, strips, chunks and the like, which are to be rechipped by the knives, will not be flipped over or out of the feed spout when contacted by the knives as carried on the revolubly driven rechipper disk.

To better explain the operation of rechipping and the objects of the present improvements, reference is here made to the specification of the above mentioned patent wherein it is explained that in the chipping of wood bolts as practiced in the paper pulp industry by present day high speed chippers, the operation results in the formation, along with the desired chips, of a certain quantity of slivers, strips, chunks and other pieces that are "off size" and "off shape". This unsatisfactory material comprises an appreciable percentage of the wood that goes through the chipper. Therefore, it has become a common practice to "rechip" this reject material, utilizing various feeding means for properly lining up the slivers, strips and pieces to cause them to be advanced to the cutters or knives of the chipper disk in an endwise direction in so far as is possible.

One means of aligning the chips and slivers for rechipping comprises a downwardly inclined feed chute or hopper of shallow V-shape in cross-section, into which the material is received at the higher end, and to which vibratory movement is imparted thus to cause the strips, slivers and pieces to be automatically brought into alignment and compacted as fed in the downwardly inclined direction from the chute across the anvil plates of the feed spout with which the chipper knives coact for the rechipping operation.

Regardless of the aligning and slight compacting of the slivers and strips in this way, rechipping difficulty has been experienced due to the fact that as the knife edges cut through the material as fed across the anvil plates, some of the pieces are flipped upwardly and the compacted mass of material is disrupted and thrown into disorder to more or less extent resulting in unsatisfactory rechipping.

In view of the foregoing rechipping difficulties, certain ways and means have been employed to overcome them; one means being by providing traveling feed belts for carrying the material to the delivery spout and with which belts material hold down fingers extending to the cutting line are associated. However, this means has not, for various reasons, proven entirely satisfactory.

Recent tests and experiments have shown that knife design as well as surface shapes immediately following the heel of the knife edge at the material receiving side of

the chipper disk can be of material importance in overcoming the previously mentioned disturbing action on the material by the knife edges cutting therethrough. Therefore, it has been the principal object of this invention to provide novel features in design of the chipper knives, and knife holders that present novel surfaces at the material receiving side of the disk that are so related to the cutting edges of the knives as to substantially reduce the "flipping" action imparted to the pieces of material when the knife edges cut therethrough.

It is also an object of the present invention to provide improved features in the chipper disk face and parts assembled on the disk face whereby an interlock between the disk and each knife carrier, and a positive "backing" abutment for the knife carriers and holders are provided.

Further objects and advantages reside in the details of construction and combination of the various parts, and in their mode of use as will hereinafter be fully described.

In accomplishing the above mentioned and other objects and advantages of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a side view of a rechipper embodying the improvements of the present invention therein.

Fig. 2 is a cross-section of the material feed chute, taken on line 2—2 in Fig. 1.

Fig. 3 is a vertical cross-section, taken on line 3—3 in Fig. 1, through the chipper disk housing, showing the chipper disk and arrangement of knives as secured thereon by the improved knife carriers and holders of this invention.

Fig. 3*a* is a sectional detail on lines 3*a*—3*a* in Fig. 3.

Fig. 4 is a perspective view of a portion of the knife mounting disk showing the chip passages therethrough, and also showing a knife carrier, a knife, and a knife holder separated from each other for explanatory purposes.

Fig. 5 is an enlarged cross-section through that portion of the chipper disk at the location of a chip passage or opening therethrough, and showing also the interlocking feature of the disk and knife carrier, and manner in which the knife is secured on the carrier by the knife holder. Furthermore, showing the novel surface formation of the knife holder and relationship of the cutting edge of the knife thereto.

Fig. 6 is a cross-sectional detail of a knife holder.

Fig. 7 is a vertical section on the line 7—7 in Fig. 5 showing the feed spout supporting the discharge end of the V-shaped feed chute and the anvils applied thereto which coact for the rechipping operation with the rechipping knives as carried by the chipper disk.

Fig. 8 is an enlarged section, taken on the line 8—8 in Fig. 7 in a plane perpendicular to the sidewall of the spout.

Fig. 9 is a sectional view in the axial line of the chipper disk mounting arbor, showing the manner of mounting the chipper disk.

Referring more in detail to the drawings:

The present improvements have been applied to a common type of wood chipper shown in side elevation in Fig. 1. This chipper comprises a horizontal base structure 10, embodying opposite side, longitudinal channel members, 10*a* and 10*b*, as shown in cross-section in Fig. 3, between and by which a cylindrically shaped housing or casing 12 is transversely supported. Extended horizontally through the casing, coaxial thereof and longitudinally of the base frame 10, is the driving arbor 14 on which a chipper disk 15 is fixedly mounted. The disk 15 is contained in the casing as indicated by its dotted line showing in Figs. 1 and as seen in Fig. 3. The arbor shaft 14 is rotatably mounted at the outside of the oppo-

site end walls of the casing in bearings 16 and 17 carried on transverse members 18 and 19 of the base frame 10, and at one end it is equipped with a driving belt wheel 20. The chipper disk is driven by an electric motor 21 mounted on the base frame. The motor has a drive shaft 22 equipped with a belt wheel 23. Belts 24 operate about the wheels 23 and 20 to drive the disk 15 at the required speed and in the direction indicated by the arrow X applied thereon in Fig. 3.

The material that is to be acted on is fed to the chipper disk within a downwardly inclined V-shaped feed chute 25, as shown in Figs. 1 and 2; the chute being supported at its outer end from the base frame structure 10 by uprights 26. At its lower end it rests in a V-shaped spout 30 which is of the form shown best in Fig. 7 and which is mounted on a transverse frame support 31 as shown in Figs. 5 and 7.

The inside surfaces of the spout 30 are faced with anvils 32—32, of plate form as shown in Figs. 6 and 7, and at their lower ends the anvils project just slightly through an opening 33 in the adjacent end wall 12*x* of the casing 12 for the delivery of the material to the chipper knives. The relationship of the feed chute, spout, anvils and chipper disk is as shown in vertical section in Fig. 5; this section being taken in the vertical longitudinal plane of the spout and through the casing wall, and it shows the means for and manner of mounting the knives on the chipper disk so that they will coact with the anvils 32—32 of the spout for the material chipping operation. It has been indicated in Fig. 3 that the disk 15 is equipped with ten knives, equally angularly spaced from each other and from the axis of rotation of the disk 15.

All knives are alike in shape and size and are designated by reference numeral 40. Each is a flat plate of rectangular form. Associated with each knife is a knife carrier 41 and a knife holder 42; these parts being shown in Fig. 4 in separated relationship for better understanding of their specific details of construction, and in Fig. 5 they are shown in their assembled relationship on the chipper disk.

In order to carry these parts in secure and proper manner for coaction with the anvil plates, the chipper disk 15 is formed with abutments and interlocks, the character of which will be best understood by reference to Fig. 4. It is to be understood that the chipper disk is formed at regularly spaced intervals with rectangular slots or passages 45 opening through the disk; these slots being radial of the disk and equally spaced from its axial center. Projecting slightly from the forward face of the disk, along what will be referred to as the top edge of each slot, considering each slot as being in the position relative to the anvils as seen in Fig. 5, is a pad 46. Also, projecting from the front face of the disk immediately below each slot 45 is an abutment forming portion 47. The top surface 47*t*, of each abutment forming portion, considering them in the position seen in Fig. 4, is flat and also flush with the bottom surface of the corresponding disk slot 45. The lower surface 47′ of each abutment also is flat, and lies in a plane that is perpendicular to the plane of the face of the chipper disk but directly parallel with the direction of the slot 45 that is immediately below it. These abutments project substantially from the face of the disk 15, as will be understood by reference to Fig. 5, to back up the knife carrier and knife holder for the blade which corresponds thereto.

In further describing the knife carriers 41 and knife holder 42 as associated with the disk 15, they will be considered in reference to the showing of these parts in Fig. 5, so as to avoid confusion in respect to use of such terms as "top," "bottom," "back" etc. in describing the various parts.

Each knife carrier 41 comprises a solid metal block equal in length to the corresponding disk slot 45, and formed with a flat back wall surface engaged flatly against the front face of the pad 46 that extends along the top of the slot. Along the top edge portion of this back surface, the block 41 is formed with a projecting rib 49 that fits in the channel that is formed between the top edge of the disk pad and under surface 47′ of abutment 47. In cros-section the knife carrier block 41 is substantially triangular, and its forward surface 41*f* slopes upwardly and toward the disk face at about an angle of 45°. Along the top of the front face of the block is a forwardly projecting rib 50, forming an abutment shoulder 52 across the block, and facing toward its lower edge. The under surface 41*a* of the carrier block slopes slightly downwardly and forwardly, and as noted in Fig. 5 coacting with the top surface of the next lower abutment 47 to provide a passage which is a continuation of the disk passage 45; the top of the disk slot being flush with and sloped upward according to the slope of the under surface 41*a* of the corresponding knife carrier 41.

Each knife 40 comprises a flat rectangular plate equal in length to the knife carrier 41 and disk slot 45. It is disposed flatly against the front surface of the knife carrier 41 with its square cut top edge abutted against the shoulder 52 of the carrier. The lower longitudinal edge of the knife is beveled to a sharpened cutting edge 40*x*, the beveled surface being so formed as to lie in a vertical plane when the parts are assembled. In operation, this sharpened edge passes in shearing contact with the coacting edges of the anvils to cut through the material that is fed down the chute 25 to the knives.

The means for securing the knife carrier blocks 41 to the disk 15 comprises for each block, a pair of cap screws 55 that are passed forwardly through shouldered bores 56 in the disk and threaded into tapped holes 56*x* in the opposite end portions of the block, as well shown in Fig. 5. These bolts terminate short of the knife as applied flatly against the front face of the carrier block.

The means for securing the knives in place on the knife carrier blocks comprise for each knife, a knife holder 42. Each holder comprises a bar of metal that overlies the knife, lengthwise thereof and extends somewhat beyond its ends. The bar has a flat top surface 42′ that engages flatly against the under surface 47′ of the corresponding abutment 47. Also, the bar is recessed across its back and under surface, in such manner as to allow its opposite end portions to engage flatly against the forward surface of the disk beyond opposite ends of the knife, and to allow the surface of the recess to bear flatly against the forward surface of the knife as seen in Fig. 5. Bolts 60 are applied inwardly through holes 61 in the opposite end portions of the bar and are threaded into holes 62 in the chipper disk, thus to clamp the holder in its knife securing position, as has been shown in Fig. 3*a*.

It is to be observed by reference to Fig. 5 that the lower edge portion of the knife extends somewhat beyond the lower edge of the carrier block 41 and equally beyond the front faces of the opposite ends or shoulder forming portions of the knife holder. This projecting lower edge portion of the knife is backed across its top surface, that is, across the heel portion of the sharpened edge, by a forward swell or bulge that is represented by that part at the right hand side of the dash line *x*—*x* in Fig. 6. The lower edge of this bulge is flush with the beveled face of the knife blade. It is further to be noted by reference to the showing of the holder in Fig. 6, that the forward surface of the bulge of the holder immediately adjacent the beveled edge of the knife, identified in Fig. 6 by the dimension *a*, extends in the plane of travel of the blade edge. Above this vertical portion, through the portion identified by the dimension *b* the surface slopes rearwardly at an angle of about 4° relative to the plane of the travel of the blade edge, and above this, through the portion identified by dimension *c* it slopes inwardly at about an angle of 11°. It is by reason of this surface contour that the forward and upward "flip-

ping" of the material is prevented with the passing of the cutting edge of the knife through the material.

In the final assembly of the parts **40**, **41** and **42** on the forward face of the chipper disk, the knife carrier **41** seats the knife firmly thereon. If desired, the knife may have adjusting screws **70—70** threaded into its base edge, as in Fig. 4, to engage the shoulder **52**, and which screws may be extended as may be required to adjust the blade forwardly to compensate for wear thereon and grinding.

With the knife holder bar applied as described, the knife will be firmly clamped in place. The opposite end or shoulder portions of the holder provide abutments for opposite ends of the knife which prevent any endwise movement thereof. The interlocking feature of the knife carrier with the pad **46** of the disk and the interlocking of the knife holder with the secured knife carrier insures the firm seating of the knife against any possible slippage. This results not only from the firm seating and clamping action of the knife holder against the knife but also because the opposite end portions of the holder provide abutment shoulders for the opposite end surfaces of the knife.

Aside from the interlocking and securing features, the invention is characterized by the bulging or forwardly set portion of the blade holder which is immediately above the beveled surface of the knife edge at the right hand side of line *x—x* in Fig. 6 and which, in effect, is a continuation of that beveled surface. This particular portion of the holder presents a forward surface that is parallel with the vertical plane of the beveled edge, and when the blade cuts through a mass of slivers, sticks or strips being fed down the trough across the anvils it serves as a stop that prevents the pieces being flipped forwardly or from the chute. This detail of construction has proven to be quite advantageous over previous chippers where there was substantial clearance between the forward face of the chipper disk and plane of travel of the blade edge.

Features of construction shown but not claimed in the present invention include the discharge spout **80** that leads tangentially from the casing **12** as seen in Fig. 3 and from which the rechipped material is discharged under the impelling force imparted thereto by fins **82** that are fixed to the periphery of the disk **15** to sweep along the cylindrical surface of the housing.

The arrangement of anvil plates in the feed trough preferably is like that shown in the patent previously noted.

The present design of chipper disk **15** with raised face exemplified by the projecting abutments **47** makes possible the application of the interlocking knife carriers **41** and positive backings for the knife holders **42**. The knife holders are designed to give adequate clamping without any danger of knife tipping, and also to so cover the ends of the knives that they cannot get out. The extended working surface of each knife holder backs up the knife up to the heel of its cutting edge and immediately back of the blade is made parallel to the blade path for some distance before angling away from the path. This particular surfacing of the knife holder is one of the important features of the present invention.

What I claim is:

1. In a rechipper; a vertically disposed and axially revoluble knife carrier disk with a chip discharge slot formed therethrough outwardly from the disk axis and substantially radially of the disk, a material feed spout directed downwardly toward and terminating in a shearing edge disposed in a plane that is slightly spaced from and parallel to the disk face and at such location that the discharge slot passes it with each rotation of the disk, a knife mounted on the forward face of the disk across the top edge of said slot in a position inclined away from the disk face and formed along its forward edge with a beveled cutting surface lying in a plane parallel to the disk face, to pass the shearing edge of the spout with coacting shearing action for the chipping of material advanced thereto in said spout, and a knife holding bar overlying the knife and securing it to the disk formed with a forward surface that continues from and in the plane of the beveled cutting surface of the knife for a substantial distance.

2. In a rechipper; a vertically disposed and axially revoluble knife carrier disk, with chip discharge slots formed therethrough substantially radially of the disk and outwardly spaced from its axis of rotation, a material feed spout directed downwardly toward and terminating slightly from the forward face of the disk in a shearing edge lying in a plane parallel to the disk face, knife holding means on the forward face of the disk, along the trailing edges of the chip discharge slots, a knife corresponding to each slot, functionally mounted by the corresponding knife holding means, each knife comprising a flat plate, mounted in a position inclined away from the disk in the direction of its rotation and having a forward beveled cutting edge surface overhanging the entrance to the slot in a plane that is parallel to the plane of rotation of the disk, to pass the shearing edge of the feed spout with coacting shearing action for the chipping of material advanced thereto in said spout, and a knife holding bar overlying each knife and having a forward surface that continues from, and in the same plane as the beveled cutting edge surface of the knife for an appreciable distance and then slopes rearwardly to the forward face of the disk.

3. The combination recited in claim 2 wherein the knife carrier disk is formed along and spaced from the trailing edge of each chip discharge slot with an overhanging planar abutment surface, and wherein each knife holding means comprises a knife carrier block disposed against and secured to the disk face above the slot and formed with a flat top surface that is seated against said planar abutment surface, and with a forwardly and downwardly inclined rear surface against which the corresponding knife forming plate is flatly disposed, and wherein said knife holder comprises a bar that flatly overlies the knife forming plate and is secured to the disk in clamping contact with the knife, and is formed with a flat top surface that is seated against said planar abutment surface.

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