Jan. 23, 1951 W. R. WRIGHT 2,539,379

ROTARY CUTTER MACHINE

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Fig. 1

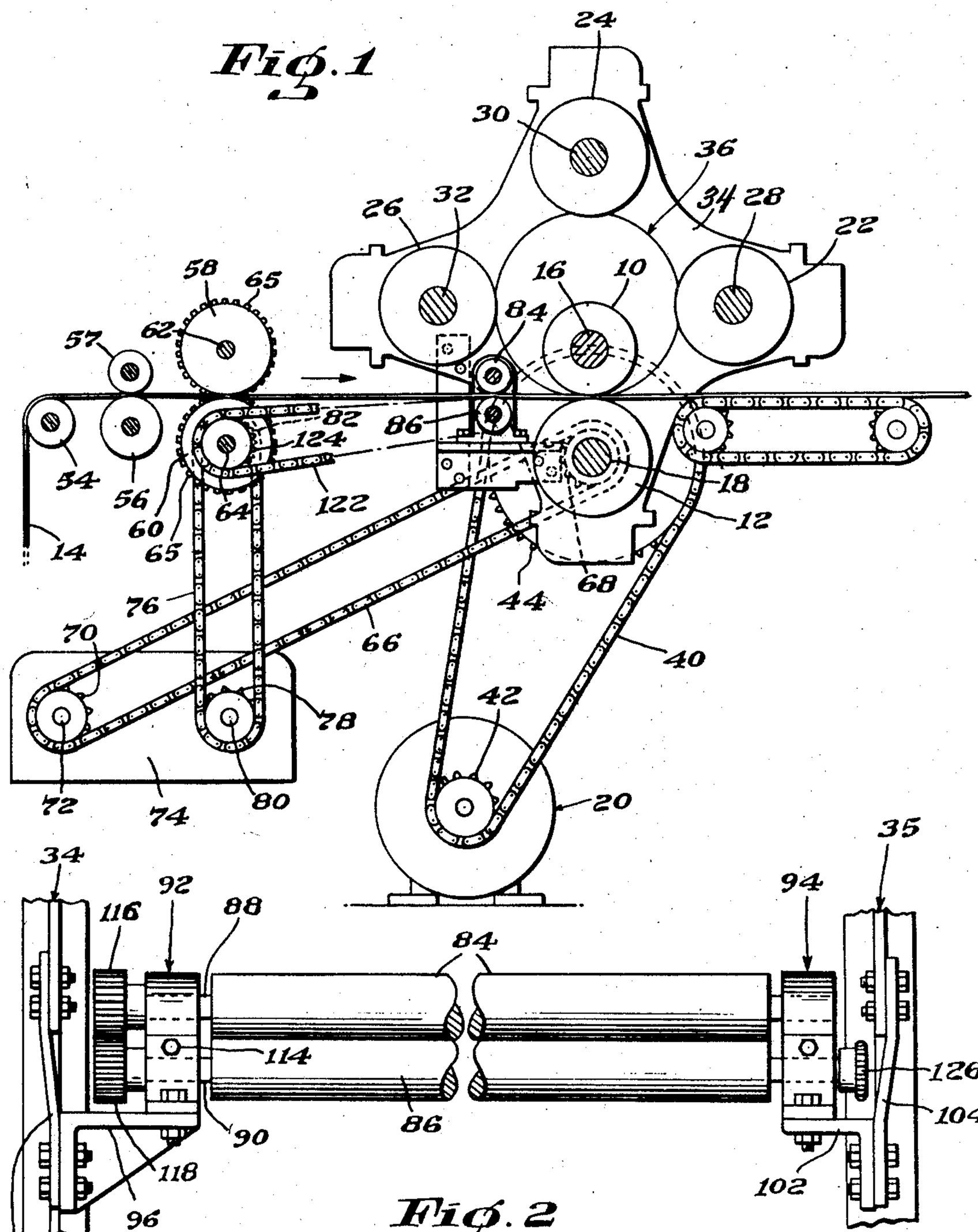

Fig. 2

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Fig. 3

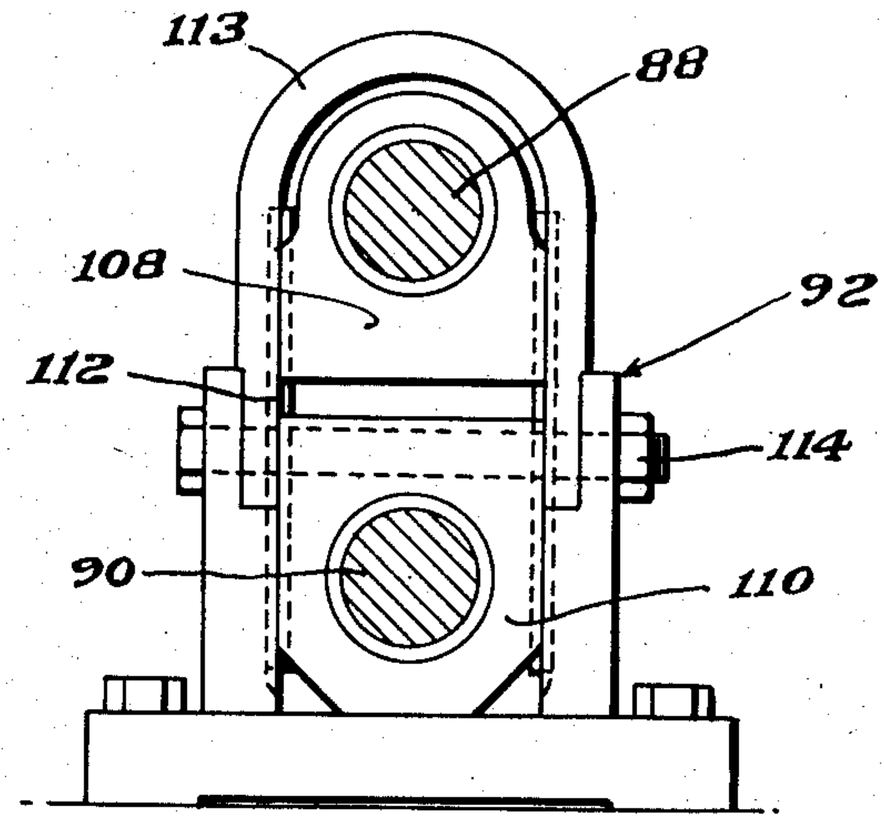

Fig. 4

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ROTARY CUTTING MACHINE

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6 Claims. (Cl. 164—68)

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The present invention relates to improvements in a rotary cutting machine, and more particularly to an improved mechanism for continuously feeding a sheet of flexible material between the anvil and cutting rollers of the machine.

In the manufacture of shingles and similar products from sheet material as, for example, in the manufacture of shingles from a sheet of asphalt roofing material, the web is conventionally drawn toward the machine and directed between the anvil and cutting rollers by means of a pair of nip feed rollers located in close proximity to the cutting machine. These rollers are positively driven and are required to be of substantial diameter in the order of 18 inches or more in order to exert in efficient manner the necessary pull upon the web. Under present conditions the web is required to travel unsupported from the feed rollers to the cutting plane of the anvil and cutting rollers of the machine a distance which it has been found impractical to reduce beyond a minimum of about three feet.

The arrangement described has been found to be defective in that the control of the feeding web at the point where the web crosses the cutting plane of the cutter is not sufficient to maintain a smooth even feed of the web across the cutting plane. It has been noted that there is a tendency for that portion of the web extending from the feed rollers to the operating plane of the cutters to buckle and weave, and this is accompanied by serious irregularities in the dimensions of the shingles produced including variations in length and width and in the position and dimensions of the cutouts therein. Efforts have been made to correct this condition as, for example, by the use of rubber gripping surfaces respectively on the anvil and cutter rolls of the cutter, so that a tighter grip may be maintained on that portion of the sheet passing between the anvil and cutter rollers at the operating plane of the cutter. These surfaces, however, have been found susceptible to wear, and as applied to the cutter and anvil rollers, have been found not well adapted to maintain the desired degree of tension and position of the material at the cutting plane of the rollers.

It is a principal object of the present invention to provide a novel and at the same time simple arrangement of the mechanism for feeding the sheet material between the anvil and cutting rolls of the machine, which is well adapted to maintain the sheet material at all times in a fully controlled taut condition up to the moment when it passes through the cutting plane of the anvil and

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cutter rollers, and thus to eliminate irregularities in the measurements of the severed parts.

In accordance with this object, there is provided in the illustrated construction in addition to the usual large diameter feed rollers, an additional pair of feed rollers of relatively small diameter in the order of about four inches, which are placed in as close proximity as possible to the cutting plane of the cutter and anvil rollers, and act to draw the sheet material under tension from the feed rollers, and to accurately control the position of the material as it passes across the cutting plane of the cutters and anvil rollers. It will be understood that the rate of drive of the main feed rollers is adjusted to the rate of drive of the anvil and cutter rollers in the usual manner to cause the material to be presented to the cutter at the correct linear speed. In the illustrated form of the invention shown, the auxiliary feed rollers yieldingly engage the sheet material to maintain a frictional driving contact between the rollers and the material, and the rollers are driven at a slightly faster linear feed rate than the main rollers, so that the material extending from the main feed rollers is maintained in the fully controlled taut condition desired, to insure that it is passed evenly and continuously across the cutting plane of the anvil and cutter rollers. The action of the auxiliary rollers disposed and driven as above described, has been found unexpectedly effective in maintaining a highly accurate and dependable control of the feeding sheet material beyond the plane of contact of the main feed rollers, up to and across the cutting plane of the anvil and cutter rollers. The improved control of the feeding web thus obtained has been found entirely adequate to overcome any tendency of the cutters to interfere with the feed of the material thereto.

The several features of the invention will be fully understood from the following detailed description taken in connection with the drawings, of which Fig. 1 is a sectional view in side elevation illustrating particularly the cutter and anvil rollers of the turret cutter, and the sheet material feed devices associated therewith including driving and change speed connections to the respective cutter and feed mechanisms; Fig. 2 is a fragmentary detail view on an enlarged scale looking from the left of the auxiliary feed rollers as shown in Fig. 1, together with certain of the supporting and actuating connections therefor which form more specifically the subject matter of the present invention; Fig. 3 is an enlarged detail view of one of the housings and bearing

blocks mounted therein for supporting the auxiliary feed rollers; and Fig. 4 is a detail sectional view in a vertical plane looking from the left of Fig. 1, illustrating the driving connections for the cutter and anvil rollers of the cutting machine.

Only so much of the turret cutter and the sheet material conveyer system associated therewith are shown as is believed necessary to illustrate the connection of the present invention therewith. A turret cutting machine of the general type described is shown, for example, in the patent to McFarland No. 2,008,028, dated July 16, 1935, for Planetary Cutting Machines, to which reference may be had for a more complete disclosure of this machine.

The cooperating anvil roller and cutter roller elements of a turret cutting machine are shown in Fig. 1 of the drawings in relation to associated feed and conveyer elements which are employed to feed sheet material as, for example, asphalt roofing material in sheet form continuously to the anvil and cutting rollers of the cutter, and thereafter to remove the severed roofing shingle units from the machine. The parts shown in Fig. 1 include specifically an anvil roller 10 and a cutter roller 12 between which the sheet material 14 is fed in order to be severed into individual roofing shingle units. The anvil roller 10 is supported on a shaft 16, and cutter roller 12 is similarly supported on a shaft 18. In accordance with the disclosure of the patent above referred to, the anvil and cutter rollers are geared together and are positively driven through driving connections of conventional form from a motor 20. As further indicated in Fig. 1, the cutting machine is of the so-called turret planetary type with four alternatively available cutting rollers including roller 12 and the additional rollers 22, 24 and 26 mounted respectively on shafts 28, 30 and 32 carried on a rotatable frame or turret of which one end supporting element for the cutter roller shafts is shown at 34, the other being indicated at 35 in Fig. 2. The turret including end piece 34 is rotatable about bearings eccentric to the supporting shaft 16 for anvil roller 10, one of said bearings being generally indicated at 36 in Fig. 1.

The driving connections through which the anvil roller 10 and active cutter roller 12 are driven as best shown in Figs. 1 and 4, include a stub shaft 38 which is arranged to be continuously driven from motor 20 by means of a sprocket chain 40 which passes over a sprocket 42 on the armature shaft of the motor 20, and over a sprocket 44 on the jack shaft 38. The anvil roller shaft 16 is driven from the jack shaft 38 by meshing gears 46 and 48 mounted respectively on the two shafts. A pinion 50 on the anvil roller shaft 16 meshes with a pinion 52 on the cutter roller shaft 18, so that the two rollers are driven in unison.

The feed mechanism of the machine may include the usual guide rollers such as those indicated at 54, 56 and 57, and a pair of positively driven feed rollers 58 and 60 by means of which the sheet material is drawn toward and is fed at a predetermined feed rate to the cutting machine. The rollers 58 and 60 which may be regarded as standard equipment, are the conventional large rollers, eighteen inches or more in diameter, ordinarily employed to engage and feed the material to the cutter with the required degree of certainty and efficiency. The rollers 58 and 60 are mounted respectively on supporting shafts 62, 64, and are geared together by gears 65 to rotate in unison.

The feed rollers 58, 60 are driven at a rate which is synchronized with the rate of drive of the cutter through connections which comprise a sprocket chain 66 which passes around a sprocket 68 on jack shaft 38 and around a sprocket 70 carried on an input shaft 72 of a change speed gear box 74. A sprocket chain 76 passes around sprockets 78 on an output shaft 80 of the gear box 74 and around a sprocket 82 on the feed roller supporting shaft 64 to drive the feed rollers at a rate determined in accordance with the setting of the gears in the box 74.

In accordance with the invention, an auxiliary feed mechanism is here employed which acts in cooperation with the positively driven feed rollers 58, 60 to present the continuously travelling sheet material at the cutting plane of the anvil roller 10 and cutter roller 12 in a flat, properly controlled condition to insure a desired degree of precision in the operation of the cutting machine to produce shingle units of uniform dimensions. To this end applicant provides a pair of auxiliary feed rollers 84, 86 which as best shown in Fig. 1, are disposed with relation to the cutting machine to engage a portion of the travelling sheet 14 which is closely adjacent the cutting plane of the anvil roller 10 and cutter roller 12. The rollers 84, 86 are carried respectively on supporting shafts 88, 90 which are in turn mounted in bearing blocks slidably disposed in housings 92, 94 fixed to the end frames 34, 35 of the cutting machine turret. As shown in Fig. 2, the housing 92 is carried on an L-shaped bracket 96 which is in turn mounted on a supporting plate 98 bolted to the end frame 34 of the cutting machine turret. The housing 94 is similarly mounted on an L-shaped bracket 102 secured to a supporting plate 104 on the opposite end frame 35 of the cutting machine turret. Fig. 3 discloses in detail the manner of supporting the shafts 88, 90 in the housing 92. As shown in this figure, the shaft 88 is supported adjacent its end in a bearing block 108 and shaft 90 is similarly supported in a bearing block 110, said blocks being freely movable relatively to one another on a guideway 112. A cover piece 113 secured to the base of the housing 92 by bolts 114 completes the assembly. The shafts 88, 90 are similarly supported at their opposite ends in bearing blocks slidably supported in the housing 94, so that auxiliary feed rollers 84, 86 are arranged to maintain a yieldable friction driving contact with the sheet material passing therebetween. Meshing pinions 116 and 118 carried respectively on supporting shafts 88, 90 connect the auxiliary feed rollers 84, 86 to turn in unison.

In accordance with the invention, the auxiliary feed rollers 84, 86 are arranged to be driven in timed relation to the main feed rollers 58, 60, but at slightly faster linear rate, in order to maintain a desired degree of tautness in control of the material passing from the main feed rollers across the cutting plane of the anvil roller 10 and cutter roller 12 of the machine. The drive for the auxiliary feed rollers comprises a sprocket chain 122 which passes around a sprocket 124 on the main feed roller supporting shaft 64 and around a sprocket 126 on one end of the supporting shaft 90 for auxiliary feed roller 86. While a differential advance in linear speed of the auxiliary feed rollers approximating 4% over the driving rate of the main feed rollers 58, 60 has been found sufficient to maintain the required control of the feeding material as it is

presented to the cutter, it is preferred to maintain a differential increase in linear speed which is in the neighborhood of 10% in order to allow for wear of the mechanism.

From the illustrated construction, it will be noted that the auxiliary feed rollers **84**, **86** are supported from the end frames **34**, **35** of the turret. In the event that the turret is rotated to place one of the alternatively available cutter rollers **22**, **24** or **26** in operation, it will be evident that the auxiliary feed rollers **84**, **86** and their supporting connections must be dis-assembled and again re-assembled on the turret in operative relation to the particular cutter roller substituted for the cutter roller **12**. Alternatively, the supporting brackets and housings **92**, **94** may be duplicated on each quadrant of the turret end frames **34**, **35**, so that is is necessary only to reposition rollers **84** and **86** on supporting brackets in a different quadrant to effect the required adjustment. It will be understood that the invention is not limited to the structure specifically illustrated for supporting the auxiliary feed rollers **84**, **86** closely adjacent the cutting plane of the anvil and the cutter rollers of the machine, and that these rollers may be removably supported in the position shown with the use of alternately available structures as, for example, a travelling carriage on which the rollers may be moved into and out of the operating position shown.

The invention having been described, what is claimed is:

1. For supplying strip roofing material in a fully controlled taut condition at the cutting plane of the rotary cutter, the combination with a rotary cutter having cooperating anvil and cutter rollers, of a strip material feed mechanism which comprises a pair of feed rollers arranged for feeding the strip material to the rotary cutter, a pair of auxiliary slip feed rollers of a diameter substantially less than the diameter of said feed, anvil and cutter rollers and thereby adapted to engage the feeding strip material in close proximity to the cutting plane of the rotary cutter, means for supporting the auxiliary feed rollers between the feed rollers and rotary cutter in close proximity to the cutting plane of the rotary cutter, power driving connections for driving the rotary cutter and feed rollers at related linear rates, and connections for driving the auxiliary feed rollers at a faster rate than the feed rollers.

2. For supplying strip roofing material in a fully controlled taut condition at the cutting plane of a turret-type rotary cutter, the combination of a rotary cutter having an anvil roller and a turret with end frames providing support for a plurality of alternatively available cutter rollers, of a strip material feed mechanism which comprises a pair of feed rollers for drawing sheet material toward the cutter, power means for driving the rotary cutter and feed rollers at related linear rates, a pair of auxiliary feed rollers of a small diameter adapted to be located between the feed rollers and anvil and cutter rollers closely adjacent the cutting plane of the rotary cutter, supporting means for the auxiliary feed rollers providing a frictional slip contact of the auxiliary rollers with the feeding sheet material, and means for driving the auxiliary feed rollers with the feed rollers but at a faster linear rate.

3. For supplying strip roofing material in a fully controlled taut condition at the cutting plane of the rotary cutter, the combination with a rotary cutter having an anvil roller and a turret support including end frames with alternatively available cutter rollers mounted thereon, of a strip material feed mechanism which comprises a pair of feed rollers for supplying strip material to the rotary cutter, a pair of auxiliary feed rollers of a diameter substantially smaller than the diameters of the feed rollers and anvil and cutter rollers and thereby adapted to engage the feeding strip material in close proximity to the cutting plane of the rotary cutter, supports on said turret end frames for mounting the auxiliary feed rollers in close proximity to the cutting plane of the rotary cutter, power driving connections for driving the rotary cutter and feed rollers at related linear rates, and driving connections for driving the auxiliary feed rollers at a faster rate than said feed rollers at the cutting plane of the rotary cutter.

4. For supplying strip roofing material in a fully controlled taut condition at the cutting plane of the rotary cutter, the combination with a rotary cutter having cooperating anvil and cutter rollers, of a strip material feed mechanism, which comprises a pair of feed rollers of a substantial diameter upwards of eighteen inches arranged for feeding the strip material to the rotary cutter, a pair of auxiliary slip feed rollers, each having a diameter in the order of four inches, means for supporting the auxiliary rollers between the feed rollers and rotary cutter in close proximity to the cutting plane of the rotary cutter, power driving connections for driving the rotary cutter and feed rollers at related linear rates, and means for driving said auxiliary feed rollers at a linear feed rate between four and ten percent in excess of the linear feed rate of said feed rollers.

5. For supplying strip roofing material in a fully controlled taut condition at the cutting plane of the rotary cutter, the combination with a rotary cutter having an anvil roller and a turret support including end frames with alternatively available cutter rollers mounted thereon, of a strip material feed mechanism which comprises a pair of feed rollers each having a diameter upwards of eighteen inches for supplying strip material to the rotary cutter, a pair of auxiliary feed rollers each having a diameter in the order of four inches, and thereby adapted to engage the feeding strip material in close proximity to the cutting plane of the rotary cutter, supports on said turret end frames for mounting the auxiliary feed rollers in close proximity to the cutting plane of the rotary cutter, power driving connections for driving the rotary cutter and feed rollers at related linear rates, and means for driving the auxiliary feed rollers at a linear feed rate between four and ten percent in excess of the linear feed rate of said feed rollers.

6. For supplying strip roofing material in a fully controlled taut condition at the cutting plane of the rotary cutter, the combination with a rotary cutter having cooperating anvil and cutter rollers, of a strip material feed mechanism, which comprises a pair of feed rollers arranged for feeding the strip material to the rotary cutter, a pair of auxiliary slip feed rollers of a diameter substantially less than the diameters of said feed, anvil and cutter rollers, and thereby adapted to engage the feeding strip material in close proximity to the cutting plane of the ro-

tary cutter, means for supporting the auxiliary feed rollers between the feed rollers and rotary cutter in close proximity to the cutting plane of the rotary cutter comprising a pair of vertically disposed guideways and bearing blocks for said auxiliary feed rollers relatively movable on said guideways, a meshing gear connection between said auxiliary feed rollers, power driving connections for driving the rotary cutter and feed rollers at related linear rates, and connections for driving the auxiliary feed rollers at a faster rate than the feed rollers.

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