This invention relates mainly to roofing apparatus, although in some of its aspects it can be used on any apparatus in which it is necessary to keep two separate rotary devices in registry as to their operations on material being worked upon under variable conditions. The invention has been illustrated as embodied in a machine for slotting a continuous sheet of roofing, cutting said sheet transversely into strips, the cuts registering with said slots, and conveying said strips while separating therefrom the strips cut out from them.

In previous machines of this character there have been two main difficulties. First it was quite difficult to keep the transverse cuts in exact registry with the slots. The exact reason for this is not fully understood and need not be explained, since it is a well known condition in the art. It may be said, however, that the thickness of the roofing sheet seems to have something to do with it. This difficulty has been overcome by providing a chain drive which may be adjusted during the continuous operation of the machine. Formally in commercial devices it has been considered necessary to stop the machine to make the adjustment. The other difficulty has been found in the fact that the slugs or cut-outs which formed the slots are sometimes carried along with the strips, causing trouble when the strips are stacked or bound into a bundle. This difficulty has been avoided by the simple expedient of twisting the conveyor belts so that the slugs are automatically dropped off. By twisting the conveyor belts on one side in one direction (outwardly) and by twisting the remainder of the conveyor belts on the other side in the other direction (also outwardly) the additional advantage is attained of separating the two strips when two strips are formed end to end by longitudinal slitting of the continuous sheet.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawing and claims appended hereto.

In the drawing, which illustrates an embodiment of the invention, and wherein like reference characters are used to designate like parts,

Figure 1 is a somewhat diagrammatic and fragmentary view of a roofing machine illustrating one feature of the invention and showing the parts of the machine to which the other feature might be applied.

Figure 2 is a fragmentary side elevation showing in detail the adjustable chain drive feature; and

Figure 3 is a vertical section substantially along the line 3—3 of Figure 2, showing only the details of the chain drive adjustment feature.

Although this invention may take many forms, and as to some of its aspects may be used in many arts, only one has been chosen for illustration. When the invention is used in the manufacture of roofing much of the apparatus would be the same as has ordinarily been used. A continuous sheet 2 of saturated, coated and surfaced roofing will be passed over suitable guideways 4, 5 and 6, which in effect form a cutting line 7 between the guideways 4 and 5 the first step in the cutting may be performed, which in the illustrated instance would be a slotting and setting of the sheet, the slotting being performed by slotting rolls 8, which are provided with slotted knives 10 which act against the anvil rolls 12. The slotting rolls 8 would be mounted on and keyed to a shaft 14, and the anvil rolls 12 would be mounted on a shaft 16. The shafts 14 and 16 would be pressed toward each other in any suitable manner, as in the prior art, and if desired may be geared together. One of the slotting rolls 8 may also be provided with a circumferential slitting knife 20 which would form a longitudinal slit 22 in the sheet from one slot to the next. Of course other slitting means may be substituted if preferred. Between the guideways 5 and 6 may fit rolls 24 and 25 mounted on shafts 26 and 27 which may be pressed toward each other and geared together as in the prior art. Other devices may also be mounted along the cutting table if desired.

At the end of the guide strips 6 is a cutting edge 30 which extends the width of the table. Mounted adjacent this cutting edge is a rotating knife 32 having two blades 34 which cooperate with a table edge 30 in shearing relationship. It may also be provided with lugs between the blades for knocking out the slugs, though this has not been shown. The knife 32 is so geared to the remainder of the apparatus in the manner described below, that it severs the sheet in registry with the forward edges of the slots. When thus severed, the sheet forms the left-hand strips 36 and the identically shaped right-hand strips 38 which are dropped on the conveyor belts 40 and 42, which are rotated faster than the motion of the continuous sheet to separate the strips, as in the prior art.
According to the usual practice, the slotting knives 10 are so shaped that they do not completely cut the slot but leave in the slot a tongue joined at its forward end to the sheet. The rotating knife 32 therefore not only cuts the strips apart, but also completes the severing of the tongue. When these tongues have thus been severed, they form slugs which usually drop through the conveyor belts 40 or 42. Quite often, however, a slug will drop onto a conveyor belt and rest there, almost invariably being either between two strips or under one of them, the reason for this being that the slugs pass off the cutting table after the strip ahead and before the strip from which they were cut. According to the old practice such slugs as came to rest on the belts were carried along and dumped into the stacking apparatus. This is avoided in the present instance by twisting the belts as shown clearly at the right hand end of Figure 1, so that the slugs are dumped off as shown at 35. It is preferred that the belts 40 under the strip 36 be all twisted in one direction outwardly, as shown, and that the belts 42 under the strips 38 be twisted in the opposite direction outwardly as shown. Regardless of the direction in which they are twisted, the slugs will be dropped as they near the portion of the belt which is vertical. When the belts are twisted in the directions shown, they perform the further function of slightly spreading the strips 36 from the strips 38, thereby facilitating their handling in stacking.

As previously stated, it is for some reason quite difficult to make the blades 34 exactly register with the forward edges of the slots. In former practice this has been done by occasionally stopping the machine and making necessary adjustments. The adjustments usually being to change the position of the slotting shaft 14 with respect to the gear turning it. Such practice was quite expensive at best, but with the advent of the process of continuously forming felt and passing the felt directly into the roofing machine, it became necessary to either provide special means for keeping a reserve of the felt in between two parts of the machine, or to provide means for making adjustment without stopping the machine. Applicant has filled this need in a very simple manner, which is capable of use where two rotating parts of the machine must be occasionally adjusted as to their relative angular positions, and where the possible maximum adjustment necessary would not be too great.

In order to describe this invention, one possible driving arrangement may first be described. Power may be supplied to the machine through a shaft 44 from any outside source. The shaft 44 may carry a gear 46 which through an idler 48 may drive the gear 50 keyed to a shaft 52 on which may be mounted the rotating knife 32. The conveyor belts 40 may be driven by separate gearing not shown. The feed roll shaft 27 may be driven through a gear 54 mounted thereon and by the idler gears 56. For driving the slotting rolls a sprocket 58 is keyed to the shaft 27 and is therefore driven by the gear 54. Mounted on the sprocket 58 is a chain 60 which also passes around a sprocket 62 keyed to the shaft 14. With the structure thus far described the apparatus would be driven in synchronism without any adjustment. The adjustment is provided by shifting the upper and lower runs of the chain 60. Considering the sprocket 58 as being at rest, it should be obvious that if the lower run of chain 60 is indented or gathered in at the middle it will turn the sprocket 62 counter-clockwise, thus drawing tight the upper run of the chain 60. This invention contemplates means for performing these steps precisely and under control. Located above the upper run, and engaging the same, is an idler sprocket 64 mounted to rotate in frame 66. Located below the lower run of chain 60 and engaging the same is a second idler sprocket 68 mounted to rotate in the U-shaped bracket 70. In order to adjust the tension on the chain 60 the bracket 70 is slidably mounted in the frame 66 being held in its position by engaging the slotted roll 72 and guided by guide flanges 74. Any convenient means of adjusting the bracket 70 may be provided, such as the screw 76 screwed into the frame 66 and bearing against the bottom of the U-shaped bracket 70 as shown. The frame 66 as a whole may be shifted vertically by means of a screw 78 screwed into said frame, and rotatably supported in fixed position in a standard 80 as by collars 82. The screw 78 may be turned by a suitable handle 84 or by any other means desired, usually some remote control gearing.

As the screw 78 is turned in one direction it will raise the frame 66 thereby further indenting the lower run of chain 60 and letting the upper run be turned out a substantially equivalent amount. This will rotate the slotting rolls 8 counter-clockwise with respect to the feed rolls 26 and rotating knife 32. If the screw 78 is turned in the other direction frame 66 may be lowered, the upper run of the chain 60 will be indented, and the lower run of chain 60 will be allowed to be drawn out an equivalent amount. This will rotate the slotting rolls 8 clockwise with respect to the feed rolls 26 and cutting rolls rotating knife 32. These relative movements will take place whether the apparatus is stationary or moving and do not in the least interfere with the continuous operation of the machine. Of course the adjustment could also be made by other and usually more expensive means, such as by gearing, including a planetary gear adjustable as to its planetary position.

From the foregoing it is seen that the need of stopping the machine for registry has been avoided in a practical and inexpensive manner. Likewise the twisting of the strips 40 and 42 has avoided prior difficulties due to the slugs not being separated from the strips so that the apparatus may now be operated for many hours without interruption.

It is to be understood that many other embodiments of the invention, including some in improved form, will be apparent, and in the course of time more will be devised by those skilled in the art. It is not desired that this invention be limited to the details described, for its scope includes all such forms or improvements as come within the spirit of the following claims, construed as broadly as the prior art will permit.

What is claimed is:
1. Apparatus for the manufacture of roofing sheets, including: a slotting roll, a transverse severing blade, means for driving said slotting roll and severing blade in synchronism, and means for rotating one with respect to the other during operation in order to secure accurate registry of the transverse cuts with the slots.
2. Apparatus for the manufacture of roofing sheets including: a slotting roll, a transverse severing blade, means for driving said slotting roll and severing blade in synchronism, said means in-
including two rotary driving members and an intermediate driving member, and means for adjusting said intermediate driving member and causing it to change the relative angular position of said rotary driving members.

3. Apparatus for the manufacture of roofing including: a slotting roll, a transverse severing blade, means for driving said slotting roll and severing blade in synchronism, and means for rotating one with respect to the other during operation in order to secure accurate registry of the transverse cuts with the slots; said means for driving including a pair of sprockets and a chain, and said means for adjusting including means for indented one of the runs of said chain at will.

4. Apparatus for the manufacture of roofing including: a slotting roll, a transverse severing blade, means for driving said slotting roll and severing blade in synchronism, and means for rotating one with respect to the other during operation in order to secure accurate registry of the transverse cuts with the slots; said means for driving including a pair of sprockets and a chain, and said means for adjusting including means for indented one of the runs of said chain at will and for letting out and taking up the slack in the other run to compensate for said indentation.

5. Apparatus for causing two separated implements to exactly register as to their effects on a common article being worked upon, which comprises means for driving one of said implements from the other through a flexible endless band, and means for varying at will the indentation of one run of said band between said implements.

6. Apparatus for causing two separated implements to exactly register as to their effects on a common article being worked upon, which comprises means for driving one of said implements from the other through a flexible endless band, means for varying at will the indentation of one run of said band between said implements, and means for correspondingly letting out and taking up slack in the other run of said band.

7. Apparatus for causing two separated implements to exactly register as to their effects on a common article being worked upon, which comprises means for driving one of said implements from the other through a chain, means for varying at will the indentation of one run of said chain between said implements, and means for correspondingly letting out and taking up slack in the other run of said chain.

8. Apparatus for the manufacture of roofing including: means for feeding a continuous sheet of roofing material to a cutter, means for cutting strips from said roofing material and for cutting waste slugs from said roofing material, and conveyor belts for carrying the severed strips to a stacking device, such conveyor belts being twisted in order to dump therefrom any of said slugs which fall thereon.

9. Apparatus for the manufacture of roofing including: means for feeding a continuous sheet of roofing material to a cutter, means for cutting strips from said roofing material and for cutting waste slugs from said roofing material, and conveyor belts for carrying the severed strips to a stacking device, such conveyor belts being twisted in order to dump therefrom any of said slugs which fall thereon; the belts on one side being twisted in one direction, outwardly at their tops, and the belts on the other side being twisted in the other direction, outwardly at their tops, so that if separate strips are dropped on the two sides they will be separated by the twist of the belts.

10. A conveyor for use in conjunction with apparatus for cutting strips from roofing material and cutting waste slugs from said roofing material, which comprises: a plurality of conveyor belts in spaced side by side relation, and means for supporting and driving said belts, said conveyor belts being twisted in order to dump therefrom any of said slugs which fall thereon but being arranged to carry the strips beyond the point where the slugs are dumped.

11. A conveyor for use in conjunction with apparatus for cutting strips from roofing material and cutting waste slugs from said roofing material, which comprises: a plurality of conveyor belts in spaced side by side relation, and means for supporting and driving said belts, said conveyor belts being twisted in order to dump therefrom any of said slugs which fall thereon; the belts on one side being twisted in one direction, outwardly at their tops, and the belts on the other side being twisted in the other direction, outwardly at their tops, so that if separate strips are dropped on the two sides they will be separated by the twist of the belts.

12. A conveyor for use in conjunction with apparatus for cutting strips from roofing material and cutting waste slugs from said roofing material, which comprises: a plurality of conveyor belts in spaced side by side relation, and means for supporting and driving said belts, said conveyor belts being twisted in order to dump therefrom any of said slugs which fall thereon, but the forward run of each of said conveyor belts being uppermost throughout its length.

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