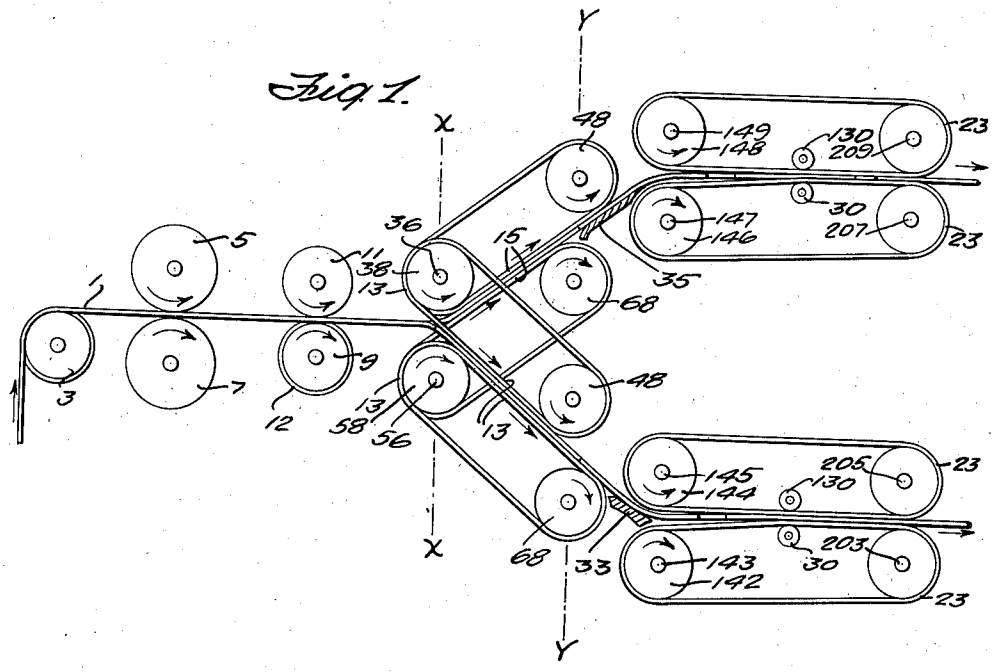
Oct. 7, 1941. L. R. STALDER 2,258,428

PROCESS OF AND APPARATUS FOR DIVIDING A WEB

Filed July 18, 1940 3 Sheets-Sheet 1

Fig. 1.



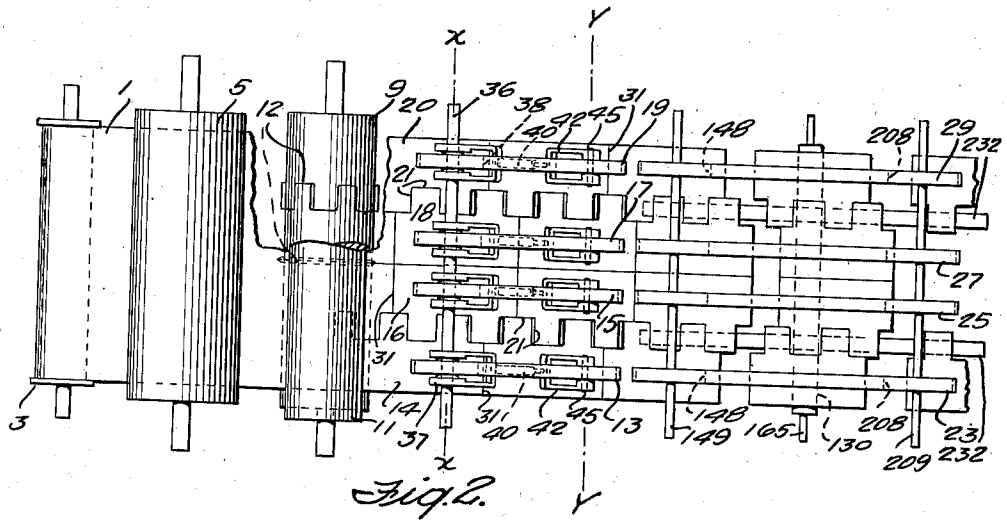


Fig. 2.

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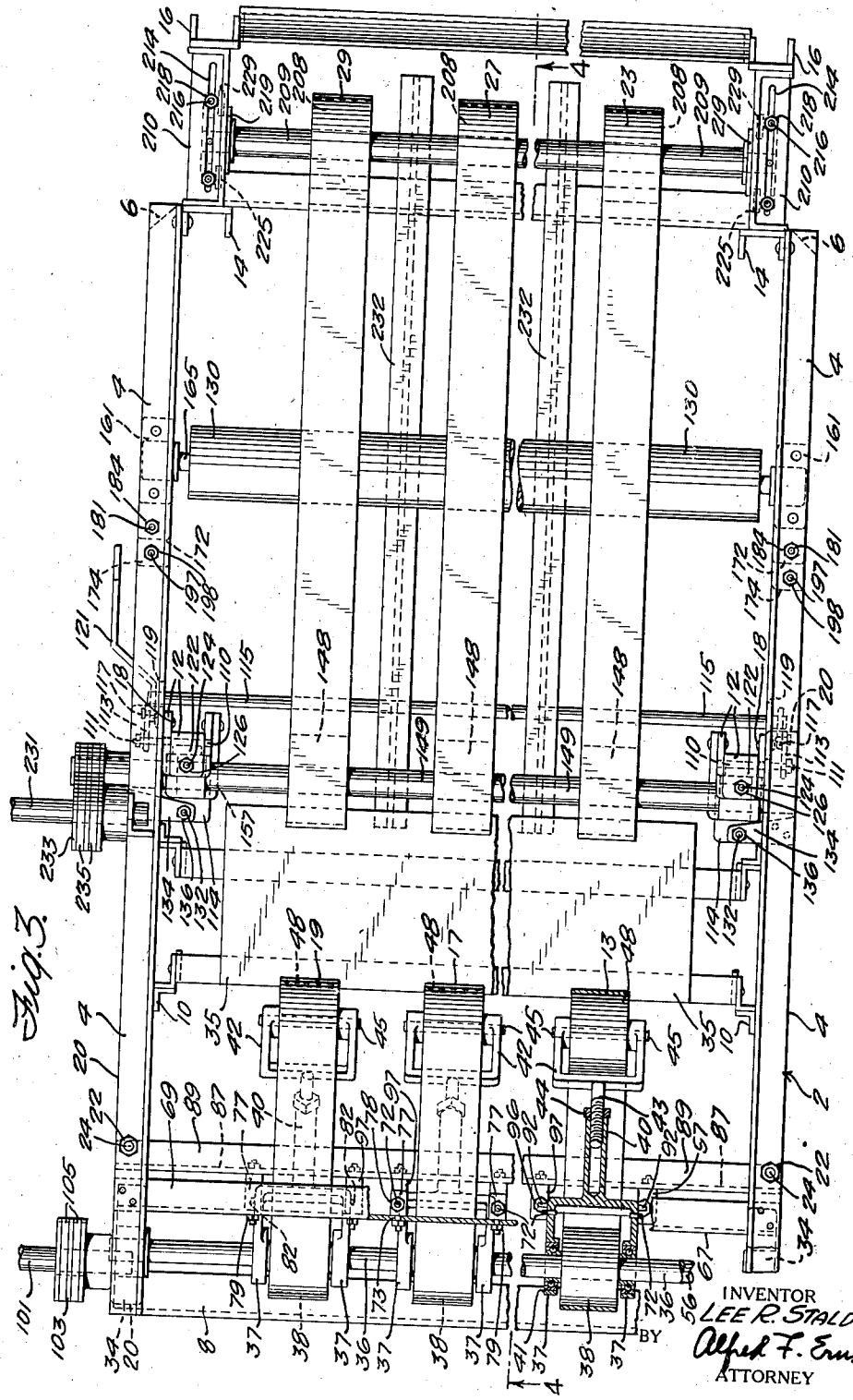

Fig. 3.

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Filed July 18, 1940 3 Sheets-Sheet 3

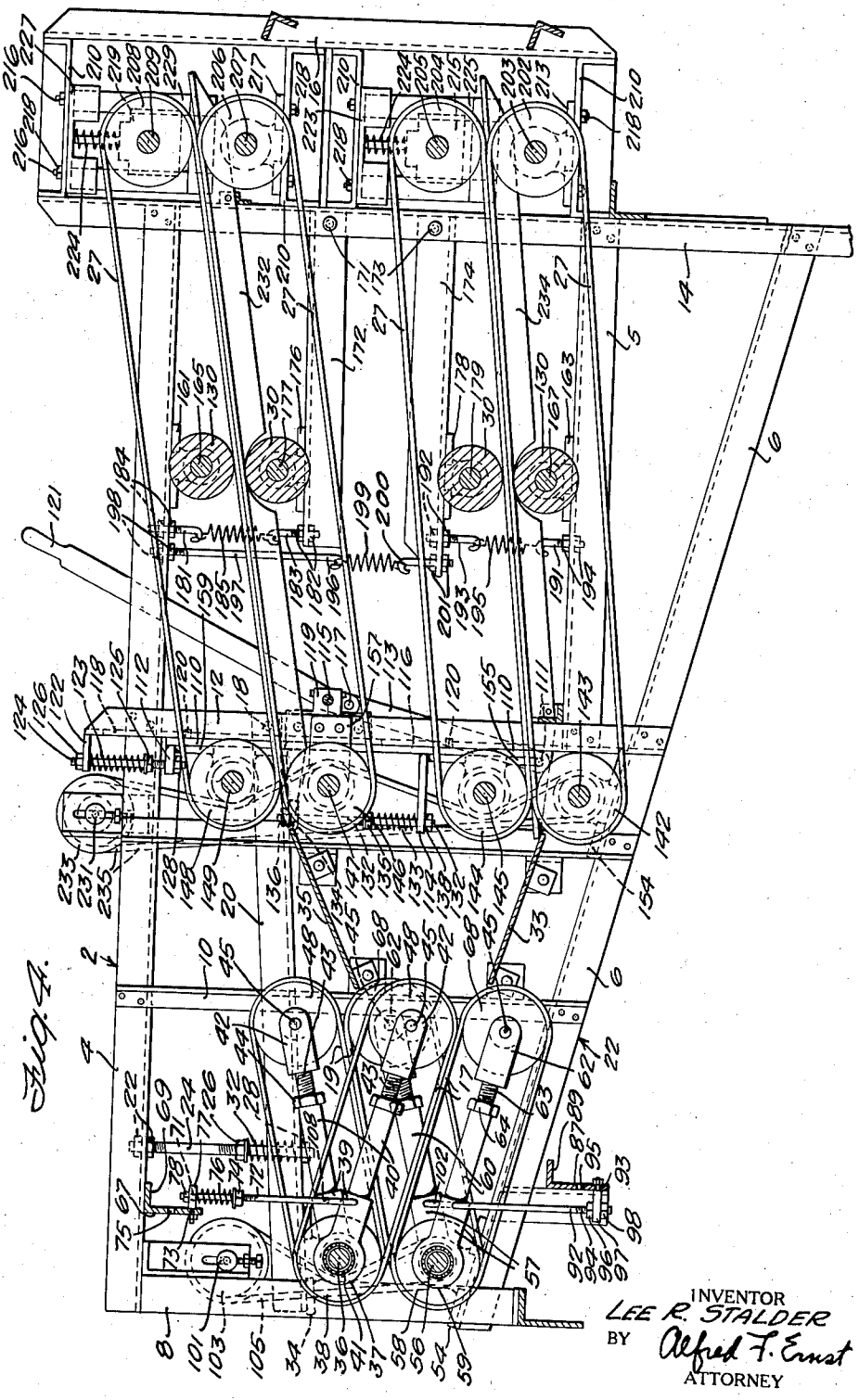

Fig. 4.

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UNITED STATES PATENT OFFICE

2,258,428

PROCESS OF AND APPARATUS FOR DIVIDING A WEB

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Application July 18, 1940, Serial No. 346,128

11 Claims. (Cl. 164—28)

This invention relates to web severing machines and more particularly to an improved process and apparatus for continuously separating a web of sheet material into individual strips. These strips may be of predetermined length and width. The apparatus of the invention is adapted to cooperate with a continuous rotary cylinder cutting machine of the type commonly used for cutting strip shingles or roofing lengthwise from a moving web of prepared roofing fabric.

In the production of cut shingles from a web of asphalt impregnated felt, usually coated with asphalt and surfaced on a face thereof with slate granules, it is usually the practice to cut only part way through the web in order to minimize rapid dulling and wear of the cutting knives. The web must thereafter be separated along these weakened or partially cut through lines in order to form the finished strips.

With the usual apparatus for effecting longitudinal and transverse separation of a roofing web along the cuts produced by the knives it is common to provide a number of pairs of superposed endless belts with the face of a stretch of one belt adjacent but spaced apart from the face of a stretch of the other belt of the pair, the pairs being arranged in a row across the web and with the stretches therof extending in the direction of web movement. Adjacent pairs of belts extend at angles oppositely divergent to the plane of web travel through the cutting machine. For each of said pairs of belts a "pinch roll" is provided which is positioned in proximity to the adjacent stretches of the pair and which by contact with one of the belts functions to bring the faces of said stretches into gripping contact with the strip passing therebetween.

In cutting from a sheet shingle strips with a predetermined tab configuration in which the tab on one strip is cut out of the recess between tabs on the strip adjacent in the sheet it is usual to stagger the transverse cuts which determine the ends of the shingles in each of the adjacent longitudinal strips in order to cut like shingles from the roofing web with a minimum of waste. Because these cuts are staggered, it is especially necessary to effect complete separation of the strips along the longitudinal cuts before final end separation of the strips along the staggered transverse cuts may be effected in order to avoid tearing of the strips at places between these ends.

The prior art machine described above accomplishes the longitudinal separation of the strips by directing adjacent longitudinal strips which have been demarked in the web into divergent planes between the spaced apart stretches of adjacent pairs of superposed belts. These belts, because of the spacing between the faces of the pairs, initially do not grip the strips during the longitudinal separation but act merely to guide them into different planes. It is intended that this guiding shall effect the longitudinal separation of the strips from the web and thereafter that the strips be gripped between the belts at the "pinch rolls" and become accelerated to effect end separation.

In separating longitudinal strips from a moving web of sheet material by use of the prior art machine above described, a compromise is adopted in determining the depth to which the thickness of the web is scored or cut through in the outlines of the shingle strip. Complete cutting through of the web by the cutter knives which would insure easy separation of the strips along the cuts would result in rapid wear and dulling of the cutter knives. On the other hand when the thickness of the web is only partially cut through, although wear of the knives is reduced, it becomes more difficult without tearing of the strips to separate the strips upon the lines along which the sheet is only partially cut through.

When the strips are only partially cut through in this manner there is a tendency for the strips to remain bound together at adjacent edges as the body portions of adjacent longitudinal strips are directed to travel in different planes away from the web at opposite angles thereto. In said prior art machine there is a decided tendency for the strips to be pulled from their proper line of travel between the belts and to become skewed with respect to the line of motion of the belts. When the accelerating force is exerted on a strip due to the pinch at the "pinch roll" location, the strips must separate endwise and the line of separation frequently does not coincide with the weakened transverse lines because on the longitudinal lines on the web complete separation has not been effected. The strips, therefore, may become torn across because of their skewed position. This produces waste due to the useless torn product.

A further objectionable feature of the prior art machine is the scuffing of the slated surface of the strip as it is being delivered in between belts which are moving at a relatively higher speed than the strip speed before the strips are separated endwise.

It is a primary object of this invention to effect

the separation of a roofing web into roofing strips along the weakened lines produced by the cutter cylinder knives by an improved process which substantially prevents damage to the product during the separating operation.

It is a further object of this invention to provide apparatus which will carry out my new process and eliminate the difficulties encountered in the prior art practice as above outlined.

A feature of my process is the gripping of the longitudinally extending strips formed on the web as they are being separated along the weakened longitudinal lines substantially at the line of intersection of the diverging planes of the belts and the plane of web travel. This gripping before the longitudinal strips to be separated have moved substantially from the plane of the web prevents any substantial transverse motion of the strip into a skewed position as the strip is being separated from the web and insures complete separation of the strips along the longitudinal lines produced by the cutter knives.

A further feature of my process is the separation of the strips along the longitudinal lines produced by the cutter, in the manner just described, while the web and the strips diverging therefrom are moving at equal speeds. This eliminates the scuffing referred to above.

End or transverse separation of the strips is accomplished by an accelerating force applied to the strip in the direction of strip movement. This accelerating force is caused to act upon the strip only after complete longitudinal separation has been effected with the result that each strip is maintained in its proper line of travel and clean cut separation of the shingles or shingle strips from the web is effected.

My apparatus provides an auxiliary separating means positioned between the cutter cylinder and the usual accelerating belts of the prior art. This auxiliary means is effective to guide the strips in the divergent planes away from the plane of web travel but in such a manner that line intersection of the planes of the strips and the plane of the web is maintained constantly at a given place relative to the cutters and separating devices.

It is a further feature of my apparatus that means are provided to grip the strips being separated substantially at this line of intersection of the divergent planes with the unseparated web to prevent substantial transverse movement of the strip out of the planes of the strips as separation along the longitudinal lines produced by the cutter knives is being effected.

Another feature of my invention is that an auxiliary set of separating belts is arranged with pairs of superposed belts in a row transversely across the web with the stretches of adjacent pairs of belts extending at oppositely divergent angles to the plane of the web but so that the stretches of the belts of each pair which are adjacent each other and in contact with a divergent strip effect this contact and continue it substantially from the line of intersection of the divergent planes of the adjacent belt stretches with the web to the point at which the adjacent longitudinal strips are completely separated. This auxiliary primary set of belts is positioned between the conventional "pinch roll" type of combined separating and accelerating belts and the cutter cylinder or the hold-back rolls, if the latter are used. The "pinch roll" set of belts then functions only as a secondary set for endwise separation of the shingle strips.

A further feature of my invention is the mounting of at least one belt of said pairs of superposed belts in such a manner as to allow for movement of the belts into and out of face to face engagement with each other or with a web or strip passing therebetween.

Another feature of my invention is the bias means which directs the movement of at least one belt of said pairs of superposed belts toward the face of the other belt. In the primary set of belts this movement is especially provided adjacent the line of intersection of the planes of the belts and the web in order that gripping of the web substantially at the point of initiation of the separation of adjacent strips along the longitudinal lines produced by the cutter may be insured and motion of the strips into skewed positions out of the plane of the separated strip may be prevented.

A feature of my apparatus is the floating support provided to bias the superposed belts of a pair into face to face relation with each other and still provide a cushion against which the strips may enter and be gripped between the faces of said pair of belts.

Other objects and advantageous features of my invention will be described in connection with the drawings in which:

Fig. 1 is a diagrammatic elevation of a shingle cutting machine embodying the features of my invention.

Fig. 2 is a plan view of the machine of Fig. 1.

Fig. 3 is a detail plan view of the primary belt support mechanism.

Fig. 4 is a detailed elevation of one embodiment of the apparatus of my invention taken on line 4—4 of Fig. 3.

Referring to Figs. 1 and 2, a web of roofing material 1 is shown passing continuously through the cutting mechanism. The web 1 may comprise asphalt saturated felt which is coated on one or both faces with asphalt coating material and may carry on the upper face a surfacing of comminuted material such as crushed slate and on the lower face an anti-stick substance such as fine mica or talc.

The web 1 is drawn from a looper or other cooling device on the roofing machine (not shown) and passes over the flanged guide roll 3 and between pull rolls 5 and 7 to the cutter cylinder mechanism. The cutter mechanism comprises a cutter cylinder 9 and a backing roll 11 between which the roofing web 1 is fed, preferably with the slated face thereof toward the backing roll. The cutter cylinder 9 is provided with upstanding knives 12 on the peripheral surface thereof which are held in predetermined positions on the surface of the cutting cylinder 9, according to the configuration to be produced on the shingles to be cut from the web.

The knives 12 on the cutter cylinder 9 cooperate with the backing roll 11 partially to cut through or to weaken the web 1 passing between the cutting rolls along predetermined lines 21 and 31.

Following the cutter mechanism is the primary separating mechanism of the present invention which comprises, in the particular embodiment illustrated, four pairs of superposed belts 13, 15, 17 and 19 arranged across the web and with the stretches thereof extending in the direction of the length of the web. In order to accomplish the separation of the web along the longitudinal

weakened lines 21, alternate pairs of belts 13 and 17 are directed to extend downwardly from the plane of the web and alternate belt pairs 15 and 19 are directed to extend upwardly from the plane of the web to form between the stretches of adjacent pairs of belts mutually divergent planes which intersect the plane of the web substantially at the line X—X. As will be described in greater detail below in connection with Figs. 3 and 4 the superposed belts of each pair of belts are biased into face to face relation with each other to grip the longitudinal strips 14, 16, 18 and 20 from the line X—X along the stretches of the belts.

The flanged guide rolls 3, pull rolls 5 and 7, cutter and backing rolls 9 and 11 and the pairs of primary separating belts 13, 15, 17 and 19 are all driven with a surface speed substantially equal to the surface speed of the web in the direction of its length as it passes through the machine. The speed of belts 13, 15, 17 and 19, however, may be slightly greater than the cutter speed in order to keep the web taut.

Arranged in position to receive the strips from the primary longitudinal strip separating pairs of belts 13, 15, 17 and 19 are the end or transverse separating pairs of superposed belts 23, 25, 27 and 29 which, in the particular arrangement illustrated, have their stretches extending in generally parallel relation to the plane of the web. These secondary pairs of belts 23, 25, 27 and 29 are driven at substantially higher surface speed. This higher speed may be from one and one half to three times the speed of the web. Each pair of secondary belts is provided with a "pinch roll" 30 and a backing roll 130 which bring the adjacent stretches of the belts of a pair into face to face relation to grip the strips at a point intermediate the two ends of the stretches of the belts and, with relatively long shingle strips, spaced from the zone through which the strips initially enter between said stretches.

The "pinch rolls" 30 and 130 are positioned from the line Y—Y a distance along the web greater than the spacing between successive transverse cuts 31 on any one strip but less than the distance between alternate cuts 31 on the same strip. Thus only one transverse cut across any one as yet transversely unseparated longitudinal strip can lie between the line Y—Y and the location of the "pinch rolls" 30 and 130. Guide plates 33 and 35 are provided to direct the ends of the unseparated strips between the pairs of superposed secondary belts to provide for the continuous delivery to the end separating or accelerating mechanism.

As will be described in greater detail in connection with Figs. 3 and 4 I provide mechanism which is effective to bias the front rolls of the secondary belt pairs into contacting relation so that the bight of these pairs of belts may be moved forward from the "pinch rolls" 30 and 130 to a position nearer the line Y—Y to suit different lengths of shingle strips being separated.

The operation of the machine shown in Figs. 1 and 2 is as follows:

The prepared roofing web 1 is drawn over flanged guide roll 3 and between pull rolls 5 and 7 and is fed between the cutter cylinder 9 and its backing roll 11. While passing between the cutter rolls 9 and 11 the web is weakened or has the thickness reduced along a series of longitudinal lines or weakened portions 21 which are spaced apart transversely of the length of the web 1 to form longitudinal strips 14, 16, 18 and 20. When strip shingles several tabs long are to be produced, transverse lines or cuts are formed, by transversely extending parts of the knives 12 of the cutter cylinder 9, which intersect the zig-zag longitudinal lines 21 and form the end transverse cuts 31 of the strip shingle. The outline produced by weakening of the web along intersecting zig-zag longitudinal lines 21 and transverse lines 31 may be seen by referring to Fig. 2.

As shown, the longitudinal strips 14, 16, 18 and 20 outlined by the lines or cuts 21 and 31 are drawn between respective pairs of primary separating belts 13, 15, 17 and 19 and are gripped between the superposed belts of the pairs substantially at the bight or initial line of separation of the strips from the web at the line X—X. When, as in the particular embodiment shown in Fig. 2, it is desired to separate strips having the tab of one strip cut out of the recess between tabs on the adjacent strip, it is especially necessary that the strips be held from movement out of the line of motion of the belts until complete separation of the strips along lines 21 is effected. Means are provided for adjusting the primary separating belts of my invention so as to grip the longitudinal strips between belts 13, 15, 17 and 19 for the full stretch of the belts between the lines X—X and Y—Y in Figs. 1 and 2.

Adjacent strips, for example, 14 and 16, are directed in the divergent planes between belts 13 and 15 and separation of the strips proceeds from the line of initial grip of the belt pairs, namely, at the line X—X, and continues until the strips are completely separated along the longitudinal weakened lines or cuts. It is to be noted that the pairs of superposed primary belts 13, 15, 17 and 19 grip the strips held therebetween for a sufficient stretch and diverge at an angle great enough to effect the complete edge separation of the strips along the lines 21 before the strips pass beyond the line Y—Y where they are no longer gripped or held from transverse movement. The divergent angle shown in Fig. 1 is somewhat exaggerated in order to make clear the arrangement of belts. In the detailed embodiment of the invention (Fig. 4) I have shown approximately a practical divergent angle.

The strips are then guided by the plates 33 and 35 between the secondary pairs of high speed belts arranged across the machine. As illustrated in Fig. 1, the pairs of belts 23, 25, 27 and 29 do not grip the strips until the ends of the strips reach the line of action of the "pinch rolls" 30 and 130. The rolls 30 and 130 bring the superposed faces of the pairs of secondary belts into contact with the ends of the strips to accelerate the strips because of the higher speed of the secondary pairs of belts. As there is provided a weakened transverse cut 31 on each strip between the line Y—Y and the "pinch rolls" 30 and 130 separation along this weakened end cut is effected by the accelerating force and the completely severed shingle strip is delivered to chutes for stacking and subsequent packaging.

When it is desired to separate shorter shingles than those shown in Fig. 2, I may bring the front pairs of rolls of the secondary belt pairs into spring biased contacting relation and thus apply the accelerating force provided by the secondary belt pairs before the longitudinal strips reach the "pinch rolls" 30 and 130. This arrangement is effective for separating so-called "individual shingles" which are of shorter length than the so-called "strip shingles."

In Figs. 3 and 4 I have illustrated a particular embodiment of the bias means utilized in the

primary separating belts of my invention. Fig. 4 shows a section of the machine as if taken on the line 4—4 of Fig. 3.

The frame 2 is made up of angle section members 4, 6, 8 and 10 and channel members 12, 14 and 16 rigidly assembled together by riveting or welding.

Pivoted at pin 18 to the channel members 12 at each side of the machine is an angle member 20 which is free for vertical movement at the opposite end thereof. Intermediate the angle members 8 and 10 and rigidly secured to the angle member 4 by nuts 22 is a rod or bar 24 which is threaded at the ends thereof as shown. An opening providing clearance for the rod 24 is formed in the angle member 20 aligned with said rod 24 so that the rod may be passed therethrough and the angle member 20 may slide thereon by pivoting in the vertical plane about the pin 18.

Intermediate the ends of the rod 24 is a nut 26. Bearing on the underface of the angle member 20 is a nut 28 which is secured to the end of rod 24 to prevent passage of the end of the rod through the opening of the angle member 20. A compression spring 32 is provided on the rod 24 bearing on the upper face of the angle member 20 and the underface of the nut 26 which is effective to bias the angle member 20 away from the member 4 and toward the underlying belts of each pair.

Attached adjacent the end of members 20 is a pillow block 34 which carries shaft 36. The shaft 36 extends across the full width of the machine to a similar pillow block on the opposite side of the machine carried by a second angle member 20 at said opposite side of the machine.

The shaft 36 has keyed thereto and spaced apart along the shaft in positions approximately as indicated in Fig. 3 a number of rolls 38 for frontal support of the upper belts of each of the superposed pairs of primary belts 19, 17, 15 and 13.

Spacer members 40 (see Fig. 4) are provided for support of the outer roll 48 of each of the uppermost endless belts. The spacer members 40 are mounted for free movement in the vertical plane about the shaft 36 as center and are supported on said shaft 36 by means of yokes 39. The arms 37 of each of the yokes 39 are positioned on opposite sides of the rolls 38 with which they are associated and are provided with bearings 41 through which the shaft 36 is passed.

At their outer ends each of the spacer members 40 is provided with yoke 42 having a threaded support 43 and associated lock nuts 44. Yoke 40 carries stub shaft 45 for revoluble support of the rolls 48 about the axis of the stub shaft 45. Endless belts are stretched over the surfaces of the rolls 38 and 48 to form the upper belt of each of the primary pairs of belts above described in connection with Figs. 1 and 2.

Each of the angle members 6 forming the lower part of the rigid frame 2 has attached thereto a pillow block 54 which carries a supporting shaft 56. The shaft 56 extends across the full width of the machine and carries rolls 58 similar to the rolls 38 carried by shaft 36 mounted in pillow block 34.

For support of the outer rolls 68 the shaft 56 carries spacer members 60 which are mounted by yokes 59 and 62 similarly to the mounting of the spacer members 40 and their associated rolls 48, yokes 39 and yokes 42 of the upper belt set described above. Endless belts similar to the belts on the rolls 38 and 48 are provided on the lower rolls 58 and 68 to complete the pairs of superposed belts.

The principal difference in the mounting of the upper and lower belts of the primary pairs of belts is the floating support of the upper belt set by pivoted members 20 in contrast with the rigid support of the lower belt set by the frame members 6.

Auxiliary support rods 72, 82, 92 and 102 are provided to fix the angular relation to the divergent belt stretches of adjacent pairs of superposed belts. Attached to each of the side members 4 is an L shaped member 69 providing a vertical bearing plate 67 which extends across the width of the machine. The bearing plate 67 is provided with holes 73 and 75 for attachment of positioning block 77 thereto. The positioning block 77 is provided with a threaded outer stud portion which may pass through the plate 67 and be secured thereto by nuts 79. The positioning block 77 is provided with a hole 71 providing clearance for passage of the rod 72 therethrough. A rod 72 is pivotally attached to each arm 37 of the yokes 39 of the downwardly directed belt pairs 13 and 17 and extends in line with the bearing plate 67 and through the hole 71 in the positioning block 77 providing clearance for the rod 72, for free movement of the rod therethrough. The unattached end portion of the rod 72 is threaded and is provided with a nut 78 on the end thereof and a nut 74 thereon positioned between the positioning block 77 and the pivotally attached end of said rod 72 for receiving the bearing of a compression spring 76 which is positioned between the nut 74 and the underface of the positioning block 77. Similar support is provided by the rods 82 passing through positioning blocks 77 positioned in the upper holes 75 of the plate 67 and which is pivotally connected to the yoke 39 of the upwardly directed pair of belts 19.

Pivotally attached at one end thereof to each arm 57 of the front yoke 59 of the lower of the downwardly directed pairs of belts is a rod 92 provided with a threaded length 94 at the lower portion thereof. The threaded portion 94 passes through a positioning block 97 having a hole therein which provides clearance for the rod 92. The positioning block 97 is held to bearing plate 87 of the L shaped member 89 by passage through holes 93 similarly to the mounting of the block 77 of the upper belt set above described. Nuts 96 and 98 are provided on the threaded portion of the rod 92 which may be tightened to grip the positioning block 97 attached to bearing plate 87 and provide rigid support for the rod 92 and consequently for the lower belt spacer member 60.

It is to be understood that the pairs of individual positioning means of the type shown and just described for the upper belts of pairs 17 passing through the positioning blocks 77 also are provided for the remaining upper belts of the pairs passing through similar positioning blocks positioned in the holes of the bearing plate 67 over the respective belt pairs 13, 15 and 19.

Likewise for the lower belts of each of the primary pairs of belts, a pair of positioning rods, such as rods 92 shown and described attached to positioning blocks 93, are provided individually for each of said lower belts. These positioning rods 92 and 102 are pivotally attached to the yoke arms 57 of the lower belts of each pair of primary belts. By means of nuts 96 and 98 these rods

are attached to positioning blocks held in the holes 93 or 95 of the bearing plate 87.

The primary pairs of superposed belts may be driven by driving the shaft 101 and attached sprocket 103 from a power source. This drive is transmitted to sprockets mounted on shafts 36 and 56 by means of drive chain 105, as shown in Fig. 4.

The secondary or high speed pairs of belts 23, 25, 27 and 29 for effecting separation of the shingle strips along the transverse cut are yieldingly mounted in the frame and are provided with means for changing the line of bight of the high speed belt sets.

Referring particularly to Figs. 3 and 4, each of the channel members 12 has slidably mounted on the web thereof a flat plate 110 which is provided with ears or brackets 112 and 114. The web of each channel is provided with slots 116 and 118 into which the studs 120 attached to plate 110 may enter to guide the plate 110 for sliding movement along the channel 12.

The channel 12 is provided at the upper end portion thereof with an ear or lug 122. A hole is formed in the lug 122 which provides clearance for passage of rod 124 therethrough. The rod 124 is threaded and is provided on the end thereof which is passed through the hole in lug 122 with a nut 126. The opposite end of the rod 124 is threaded into a tapped out hole in the ear 112 and a locknut 128 bearing on said ear 112 is secured to this end of the rod 124. A compression spring 123 is provided between the lug 122 and the adjusting nut 125 mounted on the threaded portion of the rod 124.

Similarly the lower ear 114 has threaded therein the rod 132 which at its upper end passes slidably through a hole in lug 134 mounted on angle member 20. Rod 132 is provided with nuts 135, 136 and 138 which are arranged as are the nuts 125, 126 and 128 on the rod 122. A compression spring 133 is provided between the ear 114 and adjusting nut 135.

The front rolls 142, 144, 146 and 148 are mounted on shafts 143, 145, 147 and 149 which extend across the full width of the machine.

The shaft 143 is mounted in pillow blocks 154 which are in turn rigidly secured to the frame members 6.

The shaft 145 is mounted in pillow blocks 155 which are in turn secured to the movable plates 110 at each side of the machine for movement therewith.

Shaft 147 is mounted in pillow blocks 157 which are secured to the channel members 12.

Shaft 149 is mounted in pillow blocks 159 which are mounted similarly to the pillow blocks 155 to the plates 110 for movement with the plate 110.

Attached to the lower end portion of each of the plate members 110 by means of studs 111 is a connecting rod 113 which is connected to the crank 117 the shaft 115 of which is mounted in split bearings 119 fastened to the sides of the channel members 12. Suitably attached to one end of the shaft 115 is a handle 121 which may be used to operate said crank.

Secured to the frame members 4 and 5 at each side of the machine are pillow blocks 161 and 163 which carry the shafts 165 and 167 on which the pinch rolls 130 are revolubly mounted.

Pivotally mounted at each side of the machine to upright channels 14 by means of pivots 171 and 173 are angle members 172 and 174. These angle members 172 and 174 have mounted on the outer portions thereof pillow blocks 176 and 178 through which pass the shafts 177 and 179 for revoluble support of the pinch rolls 30.

Secured to the angle members 4 and 172 at each side of the machine by means of nuts 184 and 182 are hooks 181 and 183 which have the shanks thereof threaded to receive the nuts 184 and 182. Stretched between the hooks 181 and 183 are tension springs 185 which are effective to bias the angle members 172 and pinch roll 30 mounted thereon toward the pinch roll 130 mounted on the member 4.

In a similar manner hooks 191 and 193 are secured to the angle members 5 and 174 at each side of the machine by means of nuts 194 and 192 and have mounted thereon the tension springs 195. A hook 196 at each side of the machine having a long shank 197 secured to the angle member 4 by means of clamp nuts 198 is connected by tension spring 199 to hook 200 attached to the outermost end portion of the pivoted members 174 by means of clamp nuts 201. The springs 199 serve to offset the weight of the angle members 174 and the associated parts mounted thereon so that the means for effecting bias of the members 174 and associated pinch roll 30 toward the pinch roll 130 is provided solely by the springs 195.

The outer rolls 202, 204, 206 and 208 of the secondary pairs of belts have the shafts 203, 205, 207 and 209 thereof mounted for adjustment of belt tension. The pillow blocks 213, 215, 217 and 219 on each side of the machine for mounting the shafts 203, 205, 207 and 209 are supported on slotted frame member 210 secured to the channel members 14 and 16. Slots 214 (Fig. 3) are provided in each of the frame members 210 through which the studs 216 of the shaft bearing supports may pass. Nuts 218 are provided on the studs to clamp the pillow blocks in the desired positions.

In Fig. 4 the outer rolls 204 and 208 are resiliently mounted in the pillow blocks 215 and 219. On each side of the machine the pillow blocks 215 and 219 are slidably mounted on rails 225 and 229 which are secured to the base plates 223 and 227. Compression springs 224 and 226 bias the pillow blocks 215 and 219 and the associated shafts and rolls 204 and 208 into resilient contact with the lower rolls 202 and 207 of the pairs.

The pairs of secondary belts 23, 25, 27 and 29 are stretched over the secondary rolls as shown in Figs. 3 and 4 to receive the longitudinally separated shingles or shingle strips and to effect end separation of the shingle upon the transverse cuts.

Power drive may be provided on shaft 231 and through sprocket 233 and chain 235 to effect drive of the secondary or accelerating pairs of belts as shown in Fig. 4. This drive may be arranged to move the secondary belts at from 1.5 to 3 times the speed of the web through the cutting machine but it is desirable that the speed be maintained constant in order to assure proper delivery of the separated shingles to the chutes or catch boxes. It is preferable, therefore, that a separate constant speed motor be connected to drive shaft 231.

Guide plates 232 and 234 are provided in the spaces between the secondary pairs of belts as may be seen in Figs. 2, 3, and 4 in order to support the tabs of the shingles which have been completely separated from the web as they travel from through the high speed separating belts.

The operation of the primary separating

means shown in Figs. 3 and 4 is essentially the same as that shown in Fig. 1 described above. The operation of the bias means provided in Figs. 3 and 4 will now be described.

It can be seen that the upper belts of the pairs 13, 15, 17 and 19 are mounted on the angle members 20 which are pivoted at 18 for rotation about this pin 18. The angle members 20 and upper belts mounted thereon are biased under the force provided by compression springs 32 on each side of the machine toward the lower belts of the pairs which are not resiliently mounted. When no roofing strips are being passed between the upper and lower belts of any of the pairs of superposed belts the upper belt of each pair is biased into face to face contact with the lower belt of the pair. When roofing strips are being passed between the pairs of belts the upper belts lift slightly, compressing springs 32, and the strips 14, 16, 18 and 20 may enter between and be gripped by the otherwise contacting belt surfaces during the separation of the strips along the longitudinal weakened lines.

The handle 121 in Fig. 4 is illustrated in correct position for effecting end separation of short or individual shingles with the bight of the high speed belts substantially at the forward rolls 142, 144, 146 and 148. If shingle strips of greater length than the distance between line Y—Y and the bight of rolls 142, 144 and 146, 148 are being cut, such as are shown in Fig. 2, the handle 121 is swung downwardly to the right. Thus crank 117 and conecting rods 113 are moved upwardly and studs 111 and sliding plates 110 to which they are fastened are moved upwardly against the bias of springs 123 and 133. The rolls 144 and 148 and the belts thereon are moved out of contact with the lower belt of each pair so that a longitudinal strip may enter between the pairs of high speed belts 23, 25, 27 and 29 and not be gripped or accelerated until the end of the shingle strip is "pinched" between resiliently mounted "pinch rolls" 30 and rigidly mounted "pinch rolls" 130 to effect end or transverse separation across the weakened portions of the strips.

It is to be noted from Figs. 3 and 4 that each of the upper belts in the machine and the supports therefor are resiliently or spring mounted. This is a safety feature which is incorporated in the machine so that if a doubled thickness of web enters between any of the superposed rolls and belts, the danger of bent shafts or strained parts is eliminated because the upper belt sets merely lift and allow the greater thickness of web to pass. Doubled web thickness may occur from splices of the raw felt before saturation in the roofing machine or may occur from splices necessitated by breaks in the saturated or coated web, in which case the ends of the web are lapped and coating asphalt is placed between the sheets to bind them together. The resilient mounting, therefore, not only insures uniform and adequate grip of the belts upon the shingles but affords a means of relief in case an obstruction or abnormal thickness of the web passes through the separating apparatus of the mechanism.

The following adjustments are provided in the particular embodiment of the invention shown in Figs. 3 and 4.

1. Individual adjustment of tension for the endless belts of the primary belt pairs by means of the threaded supports 43 and 63 on yokes 42 and 62 and their associated locknuts 44 and 64.

2. Individual adjustment of direction of delivery of adjacent pairs of superposed primary belts by locating the positioning blocks 77 and 87 of the upper belt support rods 72 and 82 in the upper or lower holes 75 and 73 of the bearing plate 67, and likewise by adjustment of the pairs of lower belt support rods 92 and 102 and their positioning blocks 97 in the upper or lower holes 95 and 93 of the bearing plate 87.

3. Adjustment of the bias means providing the contact pressure between the upper and lower belts of each pair of primary separating belts by the nuts 26 on the threaded rods 24 at each side of the machine which permits the compression pressure of springs 32 to be regulated at will.

4. Adjustment of the tension of the individual belts of each of the secondary pairs of belts by means of nuts 218 and studs 216 attached to the pillow blocks. The pillow block supporting studs 216 may slide in slots 214 of frame members 210 and may be secured in place by tightening the nuts 218.

5. Adjustment of the bearing pressure of springs 123 and 133 which bias the rolls 144 and 148 in the position shown in Fig. 4 by means of nuts 125 and 135 on the rods 124 and 134.

6. Adjustment of the "pinch" between stationary pinch rolls 130 and pinch rolls 30 mounted on pivoted angles 172 and 174, which rolls are biased into contact by springs 185, 195 and 199. This adjustment is provided by means of nuts 182, or 184, 192 or 194 and 198 or 201 on the hook members attached to the outer portions of said angle members.

The above described examples of my invention may be modified as to form, construction and arrangement of parts without departing from the spirit of the invention. While I have provided mounting and bias means for effecting bias of the upper belts of the superposed pairs of belts, constituting the primary and secondary web separating mechanism, toward the lower belts of the pairs, it is to be understood that the invention is not limited to this particular arrangement. By providing suitable mountings and bias means, the lower belts of the primary separating pairs may be biased toward the upper belts, which in turn may be rigidly mounted on the frame. If desired, means may be provided for effecting bias of both belts of each pair into face to face contacting relation.

It is also to be understood that my invention is not limited to the separation, longitudinally of a suitable web, of wide spaced rectangular tab strips as shown. Shingles with hexagonal or other shape wide spaced tabs, as well as individual shingles or shingles having tabs separated by narrow slots may be produced by suitable arrangement of knives on the cutter rolls and by adjustment of the spacing between the separating belts of the primary and secondary belt sets.

I do not wish to limit my invention to the above described example in which separation of four strips from a roofing web is effected but I intend that any number of longitudinal strips, two or greater, may be cut and separated from the web by the provision of the proper number of separating belts across the web.

I claim:

1. Web severing mechanism comprising means for feeding an elongated web in the direction of its longitudinal extent, means for weakening said web along longitudinal lines spaced transversely of the longitudinal extent of the web to demark a plurality of longitudinal strips in said

web, means effective to move concomitantly with the movement of the weakened but unseparated web adjacent longitudinal strips in mutually divergent planes having a line of intersection substantially in said weakened but unseparated web, and means acting to secure said strips from substantial movement out of said divergent planes to effect separation of said web along said weakened longitudinal lines.

2. Web severing mechanism comprising means for feeding an elongated web in the direction of its longitudinal extent, means for weakening said web along longitudinal lines spaced transversely of the longitudinal extent of the web to demark a plurality of longitudinal strips in said web, means bearing on opposite faces of said strips effective to move adjacent strips in mutually divergent planes having a line of intersection substantially in the plane of the unseparated web, and yieldingly mounted means connected to the part of said last mentioned means which bears on one face of said strip effective to bias said part toward the other part of said means bearing on the opposite face of said strip to cause said strip to be gripped between said opposed parts and to prevent substantial movement of said strips out of the line of movement in said divergent planes in order to effect separation of said web along said weakened longitudinal lines.

3. Web severing mechanism comprising means for feeding an elongated web in the direction of its longitudinal extent, means for weakening said web along longitudinal lines spaced transversely of the longitudinal extent of the web to demark a plurality of longitudinal strips in the web, a plurality of conveyor belts each like-extending with the direction of web movement and arranged across the web in superposed pairs, adjacent pairs of conveyor belts being arranged with the superposed belts thereof in mutually divergent planes having a line of intersection substantially in the plane of web movement, and means to drive said conveyor belts in the direction of web movement at substantially the speed of the web movement, each of said pairs of conveyor belts being constructed and arranged individually to grip one of said longitudinal strips initially substantially at said line of intersection and to secure said strips from substantial movement out of said divergent planes of the belts while said strips are being moved in said planes to effect separation of said web along said weakened longitudinal lines.

4. Web severing mechanism comprising means for feeding an elongated web in the direction of its longitudinal extent, means for weakening said web along longitudinal lines spaced transversely of the longitudinal extent of the web to demark a plurality of longitudinal strips in said web, a plurality of conveyor belts each like-extending with the direction of web movement and arranged across the web in superposed pairs of conveyor belts, adjacent pairs of conveyor belts being arranged with the superposed belts thereof in mutually divergent planes having a line of intersection substantially in the plane of web movement, means to drive said conveyor belts in the direction of web movement, at least one belt of each of said superposed pairs being mounted for movement substantially transverse to the stretch of said belt, and bias means associated with said belt of each pair mounted for said transverse movement to bias said belts into gripping contact with the faces of the web fed therebetween substantially at said line of intersection.

5. Web severing mechanism comprising means for feeding an elongated web in the direction of its longitudinal extent, means for weakening said web along longitudinal lines spaced apart transversely of the longitudinal extent of the web to demark a plurality of longitudinal strips in said web, a plurality of conveyor belts each having the stretches thereof generally like extending with the direction of web movement and arranged in superposed pairs in a row across the web, means for positioning adjacent pairs of conveyor belts with the superposed belts thereof in either of two planes having a line of intersection substantially in the plane of the unseparated web, and means connected to said positioning means to individually adjust the position of each belt of said superposed pair of conveyor belts in either of the two mutually diverging planes.

6. In a web severing mechanism means for moving an elongated web in the direction of its longitudinal extent, a pair of conveyor belts with their stretches adjacent and generally like-extending in the direction of web movement, means for guiding the web between the faces of said adjacent stretches of said belts, driving means for said conveyor belts arranged to move the adjacent stretches thereof in the direction of web movement, means effective to bring said adjacent stretches of said pair of conveyor belts into gripping contact with the face of the web being fed therebetween at a point intermediate the ends of said adjacent stretches, and means operable at will to effect gripping contact of said adjacent belt stretches with said web adjacent the line where the faces of said superposed belts are initially adjacent.

7. In a web severing mechanism according to claim 6 pinch rolls bearing upon opposite faces of said belts in said adjacent stretches to bring said stretches into gripping contact with the faces of the web being fed therebetween, one of said pinch rolls being mounted on a fixed support, the opposed pinch roll being yieldingly mounted on a support and biased toward said other pinch roll to effect contact thereof with the face of a belt passing between said pinch rolls.

8. In a web severing mechanism according to claim 6 rolls between which one of said conveyor belts is stretched, one of said rolls being yieldingly mounted on a support and biased toward the plane of said adjacent belt stretches, and means connected to said support and operable at will to move said support and said roll mounted thereon to effect gripping contact of said adjacent belt stretches with said web adjacent said yieldingly mounted roll.

9. In a web severing mechanism means for moving an elongated web in the direction of its longitudinal extent, a plurality of rolls arranged in superposed pairs to turn upon axes like-extending across the web, the axes of one pair of superposed rolls being spaced apart from the axes of the other pair of said rolls in the direction of web movement, conveyor belts carried between said pairs of rolls and respectively upon similarly positioned rolls of said superposed pairs of rolls, said rolls being positioned so that the superposed stretches of the conveyor belts have their outer faces adjacent each other, means for guiding the web between said adjacent faces of said superposed belts, means for driving said belts to move the superposed stretches thereof in the direction of web movement, at least one of said superposed

rolls being mounted for movement transversely toward and away from the plane of said adjacent belt stretches, means effective to bring the adjacent faces of said superposed belt stretches into gripping contact with the faces of the web passing therebetween at a point spaced from said roll mounted for transverse movement, and means operable at will connected to said roll mounted for transverse movement to effect movement thereof and of the conveyor belt supported thereby toward the plane of said adjacent belt stretch thus to effect said gripping contact of the faces of the belts with the web passing therebetween adjacent said roll mounted for transverse movement.

10. Process of severing an elongated web of sheet material which comprises weakening said web along longitudinal lines spaced transversely of the longitudinal extent of the web to demark a plurality of longitudinal strips, providing paths of movement of the adjacent longitudinal strips in mutually divergent planes having their line of intersection substantially in the plane of the weakened but unseparated web, moving said web in the direction of its longitudinal extent while substantially preventing separation of said strips from said web prior to said web reaching said line of intersection, gripping said strips individually substantially at said line of intersection so as to cause said strips initially to separate substantially at said line of intersection and so as to secure each of said strips from substantial movement out of the line of movement in its divergent plane after said initial separation.

11. Process of severing an elongated web of sheet material which comprises reducing the cross-sectional thickness of said web along intersecting longitudinal and transverse lines to demark a plurality of longitudinal strips having transverse lines on a face thereof, providing paths of movement of the adjacent longitudinal strips in mutually divergent planes having their line of intersection substantially in the plane of the demarked but unseparated web, moving said web in the direction of its longitudinal extent while substantially preventing separation of said strips from said web prior to said web reaching said line of intersection, gripping said strips individually substantially at said line of intersection while separating said strips along said longitudinal lines and so as to secure each of said strips from substantial movement out of the line of movement in its divergent plane after said initial separation, and thereafter exerting force on said strips in the direction of strip movement to separate said strips along said transverse lines.

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