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METHOD AND APPARATUS FOR SEPARATING ADHESIVELY JOINED SHEETS

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3 Sheets-Sheet 1

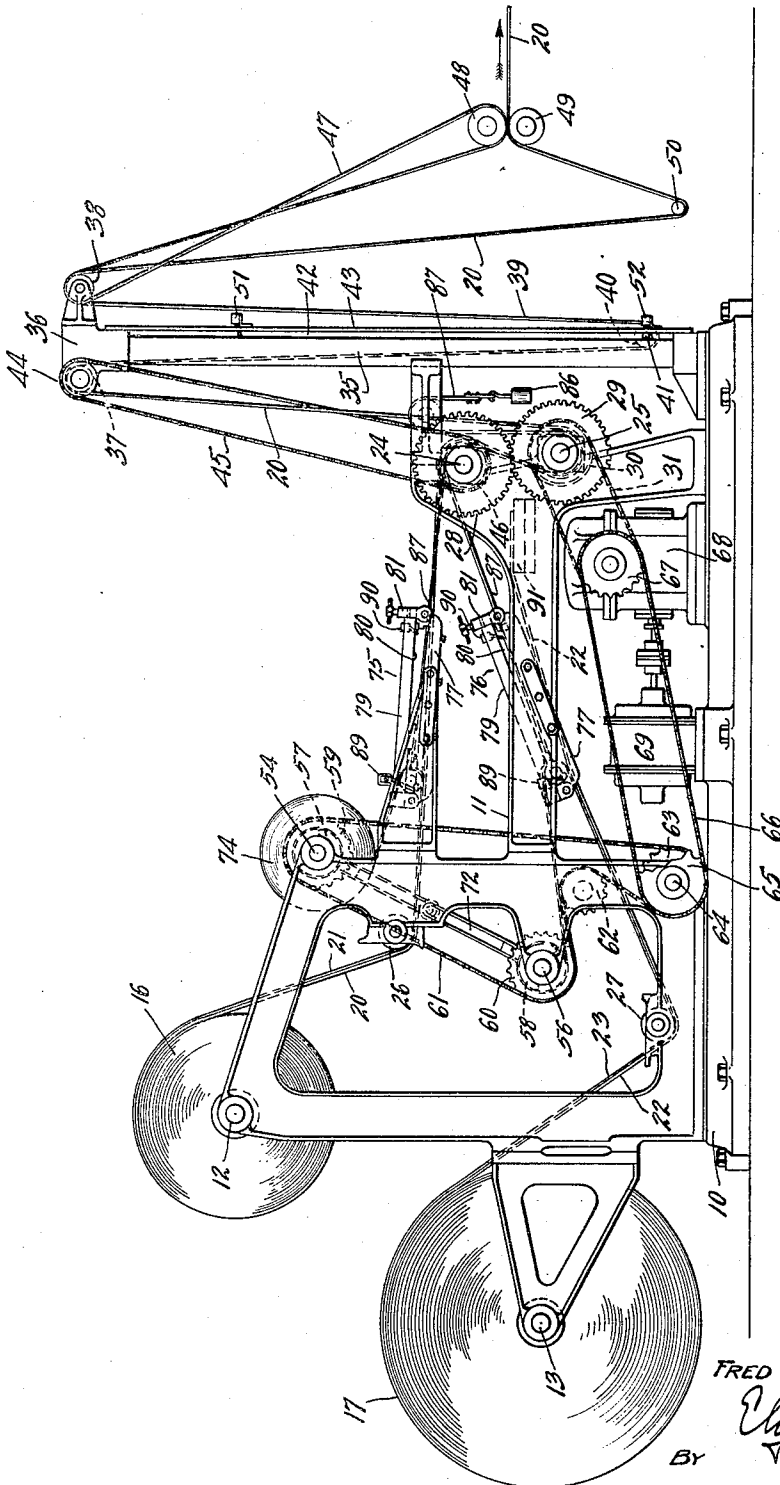


Fig. 1

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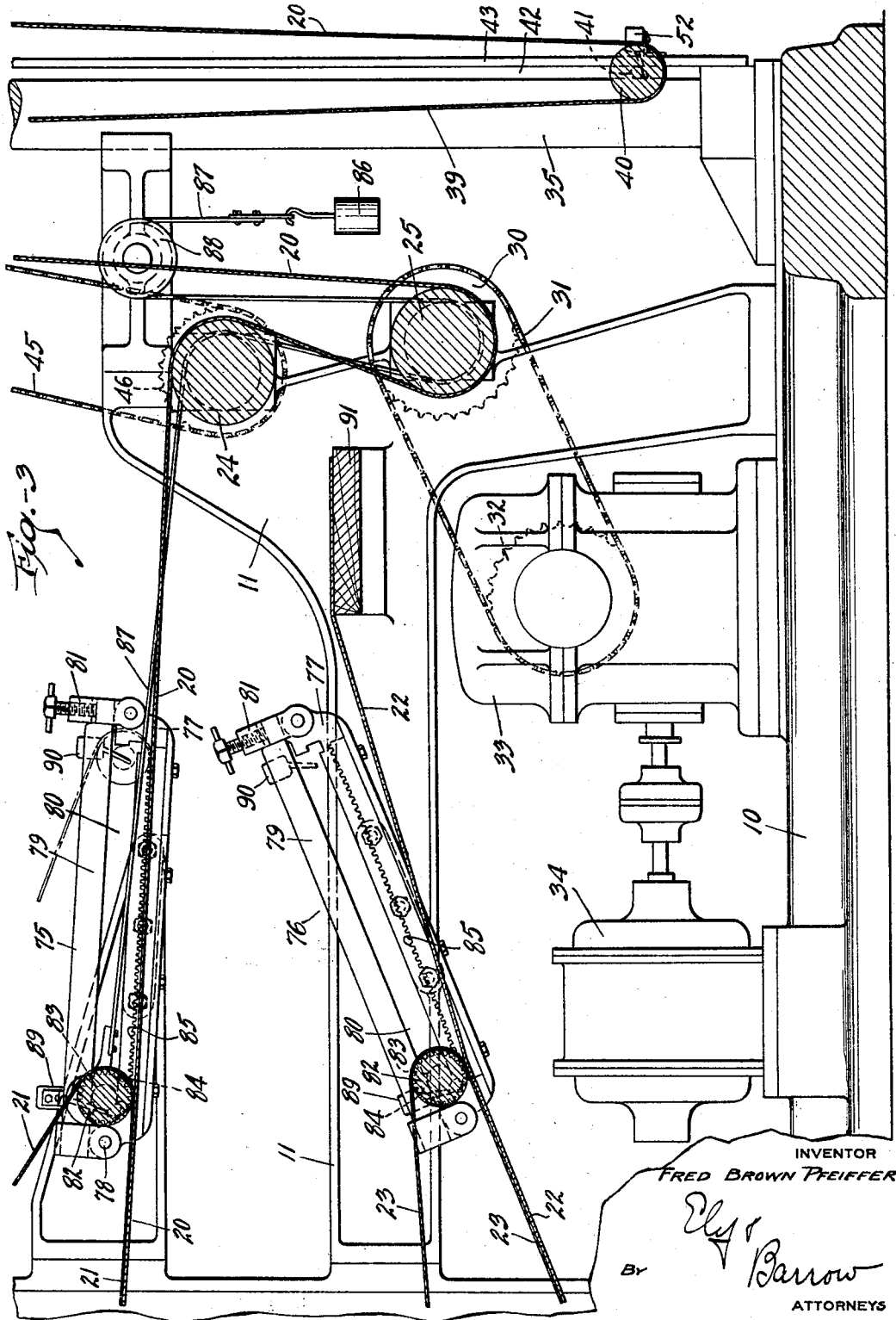
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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR SEPARATING ADHESIVELY JOINED SHEETS

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This invention relates to methods and apparatus for separating adhesively joined sheets, such as, for example, rubberized fabric and liner, and more especially it relates to procedure and apparatus for feeding rubberized sheet material from a roll of liner and sheet material, and concurrently rewinding the liner.

The chief objects of the invention are to effect separation of adhesively joined sheets without causing folds or wrinkles in either sheet; to provide for rewinding the liner smoothly and tightly; and to provide improved procedure and apparatus for carrying out the foregoing objects. Other objects will be manifest.

Of the accompanying drawings:

Figure 1 is a side elevation of apparatus embodying and adapted to carry out the invention in its preferred form and the work therein;

Figure 2 is a plan view, on a larger scale, of part of the apparatus shown in Figure 1, parts thereof being broken away; and

Figure 3 is a section on line 3—3 of Figure 2.

As will be seen with reference to Figure 1, the apparatus comprises means for mounting two supply rolls of liner and rubberized fabric, and two liner-rewinding mechanisms, the arrangement being such that the latter may be operated alternatively, so that the machine is not idle while a filled roll of liner is being removed and another supply roll of liner and fabric is being mounted in the machine. At the delivery end of the machine is provided a variable supply loop of the fabric which permits the latter to be withdrawn intermittently or constantly.

Referring to Figure 1 of the drawings, 10 is a base-casting and 11, 11 are side frames rising from opposite sides thereof. At the work receiving end of the machine (the left end as viewed in the drawings), the respective frames 11 are provided with rotatable journals 12, 13 in which are removably mounted axial shafts 14, 15 of two supply rolls 16, 17 of rubberized fabric interwound with liner. The journals 12, 13 are provided with respective brake drums 18, 18 en-

gaged by brake bands 19, 19 (Figure 2) for resisting the rotation of the journals whereby suitable tension is imparted to the fabric and liner as it is withdrawn from the supply rolls 16, 17. The fabric and liner of the supply roll 16 are designated 20, 21 respectively, and the fabric and liner of the roll 17 are designated 22, 23 respectively.

For withdrawing the fabric and liner from either supply roll 16, 17, there is provided, at the delivery end of the apparatus, a pair of driven feed rolls 24, 25 which are in spaced apart relation, one above the other. Said rolls are adapted to withdraw the liner and fabric from the supply roll by frictional engagement with the fabric strip only, the latter being trained about both rolls so as to have ample frictional contact therewith. Idler guide rollers 26, 27 for the strips of fabric and liner are removably journaled in the side frames 11 adjacent the supply rolls 16 and 17 respectively.

The feed rolls 24, 25 are formed with the usual end journals which are mounted in suitable bearings in the side frames 11. The near ends of the journals of the rolls 24, 25 are operatively connected by intermeshed gears 28, 29, respectively, of equal size, and the journal of the roll 25 at the far side of the machine is provided with a sprocket which is connected by a sprocket chain 31 to a sprocket 32 of a reduction gear device 33, the latter being directly connected to suitable driving means, such as the motor 34.

The feed rolls 24, 25 are adapted to withdraw from the supply rolls 16 or 17, an adhesively joined strip of liner and strip of fabric, and feed the strip of fabric into an adjacent storage loop or festooning rack, the liner being progressively removed from the fabric at a point between the guide rolls 26 or 27 and the feed roll 24 as presently will be described.

The festooning rack is positioned at the delivery end of the machine and comprises a pair of standards or posts 35, 35 rising from the base casting 10 at opposite sides thereof. The upper ends of the posts 35 are provided with respective caps or brackets 36 in which are journaled the respective ends

of a pair of parallel, spaced-apart, driven feed rollers 37, 38. Fabric coming from the feed roll 25 passes over the rollers 37, 38, falling in a storage loop 39 of variable length between them, and a floating weight roll 40 is suspended in said loop. Each end of the roll 40 is provided with an axial extension 41 of small diameter which rides in a vertical slot 42 defined by a post 35 and a strip or plate 43 secured to and extending along, but spaced from one side thereof. The arrangement provides stability of the storage loop and weight roller, while permitting the latter freely to rise and fall with the variations of the amount of material in the storage loop.

For driving the feed roller 37 to feed material into storage loop 39, the far end of the roll 37 is provided with a sprocket 44 connected by a sprocket chain 45 to a sprocket 46 mounted upon the end journal of the driven feed roll 24. For driving the feed roller 38 to withdraw material from the storage loop 39, a cross-belt 47 is trained around an end portion of said roller and around one feed roller 48 of a pair of feed rollers 48, 49 associated with apparatus, such as a slitter or bias cutter, which utilizes or further operates upon the material. An idler guide roll 50 is so positioned between the feed rollers 38, 49 as to cause the material to pass over the latter roller.

Mounted upon one of the strips 43 adjacent the top and bottom thereof are respective electrical switches 51, 52 which are in the electrical circuit supplying current to the motor 34. Each switch has an operating lever extending across the slot 42 so as to be engaged and operated by the extension 41 of the weight roller 40 as the latter approaches the limits of its upward or downward movement. The switch 51 is normally open and the switch 52 is normally closed. The arrangement is such that when the storage loop 39 is full, the member 41 of the weight roller 40 opens the normally closed switch 52 and shuts off the current to the motor 34, thereby stopping the latter so that no more material is fed into the storage loop. As material is withdrawn from the storage loop, its length shortens and causes the weight roller 40 to rise until it engages and closes the normally open switch 51, whereby power again is supplied to the motor to cause the same to resume the feeding of material into the storage loop.

The stripping of the liner from the fabric is effected in the region between the guide rollers 26 or 27 and the feed roll 24 according to which supply roll 16 or 17 is furnishing the stock. The liner rewinding mechanism is power operated entirely independently of the fabric feeding mechanism hereinbefore described. The liner 21 from the supply roll 16 of fabric and liner is rewound

upon a stock-shell 53 (Figure 2) which is provided with the usual axial shaft, the end portions of which are removably mounted in rotatable journals 54, 54 in the respective side frames 11 near the top thereof. In like manner for rewinding the liner 23 from the supply roll 17, a stock-shell 55 is provided, the same being positioned somewhat below the stock-shell 53 and provided with the usual axial shaft which has its respective end portions removably mounted in rotatable journals 56, 56 in the opposite side frames 11.

At the far side of the machine as viewed in Figures 1 and 2, the journals 54, 56 extend beyond the side frame 11 and have respective clutch members 57, 58 journaled upon said extensions. The clutch members 57, 58 are provided or formed with respective sprockets 59, 60 which are connected by a sprocket chain 61, the latter also passing around an idler sprocket 62 and a sprocket 63 mounted upon the adjacent end of a countershaft 64 which extends transversely of the machine and has a sprocket 65 mounted upon the near end thereof. The sprocket 65 is connected by a sprocket chain 66 with a sprocket 67 of a reduction gear device 68, the latter being driven by a motor 69. Slidably keyed upon the journals 54, 56 are clutch members 70, 71 (Figure 2) which are complementary to the clutch members 57, 58 on the same journals, and the clutch members 70, 71 are engaged by a common shipper lever 72 which is pivotally mounted at its middle upon a bracket 73 projecting from the side frame 11. The arrangement is such that either liner shell 53 or 55 may be operatively connected to the driving means selectively, depending upon whether the stock is being withdrawn from the supply roll 16 or supply roll 17. A roll of rewound liner 74 is shown upon the stock shell 53. Preferably the speed of the liner wind-up is faster than the forward feed of the fabric.

It has been discovered that the wrinkling of fabric and liner, which heretofore has occurred when the same were separated after being adhesively joined, was primarily due to non-uniformity of the adhesion which caused the initial separation to occur along an irregular line. This defect in the prior practice is overcome in this invention by providing a rigid backing for at least one of the sheets at the point of separation, and by assuring that both sheets are taut. For separating the liner 21 from the fabric 20, mechanism generally designated 75 has been provided, and similar mechanism 76 is provided for separating the liner 23 from the fabric 22. The mechanisms 75, 76 are identical in construction so that a description of mechanism 75 will suffice for both.

The device 75 comprises a pair of parallel frame or bracket members 77, 77 secured to the opposite side frames 11 and hinged to the

end of each frame member at 78 is a plate or cover 79. Each frame member is formed with an elongate recess in its upper face, and the plate 79 covers the same to produce a closed-end slot or way 80 in the frame member. A suitable locking device 81 is provided for securing the free end of the plate 79 to the frame member. The device 75 is so positioned angularly of the side frames 11 that the slot 80 is parallel to the sheet 20 when the latter is stretched taut between the rolls 24, 26. A roller 82 of rigid material provided with axial end trunnions 83, 83 has the latter mounted in the respective slots 80 of the device, and each end trunnion is provided with a pinion 84 which is meshed with a rack 85 secured to a side face of a frame member 77. The arrangement is such that the roller 82 always maintains the proper angular position transversely of the fabric sheet 20 and its diameter is such that it always bears against the composite strip of fabric and liner. The roller 82 is normally urged toward one end of the device 75, (the right end as viewed in the drawings), by a counterweight 86 which is suspended from one end of a cable 87, the other end thereof being hooked to one of the end trunnions 83. The intermediate portion of the cable 87 is trained around the end journals of the feed rollers 24, 25 and over an idler sheave 88 journaled upon a side frame 11. The counterweight for the mechanism 76 is positioned at the opposite side of the apparatus from the one just described.

Mounted upon one of the cover plate 79 adjacent the ends thereof are respective electrical switches 89, 90 which are in the electrical circuit supplying power to the motor 69. Each of said switches is provided with an operating lever which extends across the slot 80 in position to be engaged and operated by an end trunnion 83 when the latter is at either end of the slot 80. The switch 89 is normally closed and the switch 90 is normally open. The arrangement is such that when the roller 82 moves to the right end of the slot 80, it closes the normally open switch 90 and causes power to flow to the motor 69 to drive the same and thereby to rotate the liner rewinding shell 53. When the roller 82 moves to the left end of the slot 80, it opens the normally closed switch 89 and shuts off the power to the motor 69, thereby stopping the liner rewinding drive.

A splicing board 91 supported by the side frames 11 extends transversely of the apparatus at a convenient position between the mechanism 75, 76 and the feed rollers 24, 25. The splicing board provides a rigid support upon which the leading end of a length of fabric may be spliced to the trailing end of the preceding length of fabric.

In the operation of the apparatus, a supply roll 16 of rubberized fabric 20 and liner 21 is mounted in the journals 12 and the liner

21 and fabric 20 threaded through the machine, the fabric successively passing around the rolls 26, 24, 25, 37, 40, 38 and 50 and thence to the machine (not shown) at the delivery end of the apparatus. The liner 21 after passing under the idler roll 26 is looped around the stripper roller 82 and drawn taut to pull the roller back, against the pull of the counterweight 86, to the position at the left of its course as shown in full lines in Figure 3. The loose end of the liner is wrapped tightly about the rewinding shell 53. The clutch members 57, 70 are put into engagement after which the motor 34 is set in motion to drive the fabric feeding rolls and thus to withdraw the fabric and liner from the stock roll 16, the brake 19 on the journal of the latter assuring substantial tension in the fabric between the rolls 26, 24. Since the leading end of the liner 21 is anchored about the rewinding shell 53, it will be seen that the fabric and liner will be pulled apart along a line which advances half as fast as the fabric. The roller 82, being normally urged toward the right by the counterweight 86, follows up the stripping and thus stays within the reverse loop of the liner, with the result that the liner is kept taut and the stripping is effected along a straight line constituting the line of tangency of the fabric sheet 20 and the liner 21 on the roller 82.

The forward movement of the roller 82 carries it to the broken line position shown in Figure 3 where its trunnion 83 engages the operating lever of the switch 90 and closes said switch, whereupon power is delivered to the motor 69 to drive the same. This produces rotation of the rewinding shell 53 which winds the liner thereupon and since such rewinding is faster than the forward speed of the fabric, the roller 82 is drawn rearwardly, to the left as viewed in the drawings, and thus effects further stripping of the liner from the fabric. The resistance of the counterweight to the rearward movement of the roller 82 provides sufficient tension in the liner to assure smoothness and tightness of the roll of rewound liner 74. As the roller 82 reaches the limit of its rearward movement, its trunnion engages the operating lever of the normally closed switch 89 and opens the same to disconnect the power from the motor 69 and thus to discontinue the rewinding of the liner.

The stripping and rewinding of the liner is entirely automatic in its operation, and continues as described as long as fabric is withdrawn from the apparatus, whether such withdrawal is continuous or intermittent.

The supply roll 17 is mounted in the machine and the liner 23 and fabric 22 therefrom threaded through the liner stripping mechanism 76 as shown while the material is being withdrawn from the supply roll 16.

The leading end of the fabric sheet 22 may be anchored to the splicing board 91 as shown so that the splicing of the sheet 22 to the trailing end of the sheet 20 may be easily and quickly effected.

The arrangement by which the roller 82 always is positioned back of the liner 21 at the point of separation of the liner and fabric, and the taut condition of the latter, assures that the separation will occur along a straight line transversely of the material, with the result that wrinkles in either sheet of material are avoided. The arrangement by which the liner is rewound under tension provides tightness and smoothness of the liner in the rewound roll 74.

The invention is susceptible of modification within the scope of the appended claims which are not limited to the specific construction shown or exact procedure described.

What is claimed is:

1. The method of separating adhesively joined sheets which comprises feeding the sheets forward while holding the leading end of one sheet stationary to strip it from the other sheet, and then winding up the sheet thus stripped.

2. A method as defined in claim 1 in which the stripped sheet is rewound intermittently as determinate lengths of it are stripped from the other sheet.

3. The method of separating adhesively joined sheets which comprises feeding the sheets forward while holding the leading end of one sheet stationary to strip it from the first sheet, and maintaining both sheets taut as the separation of the sheets progresses.

4. In apparatus for separating adhered sheets, the combination of means for feeding one of the sheets forward, means for holding the leading end of the other sheet stationary to effect a stripping of the second sheet from the first, a roller mounted in a loop in the second sheet, and yielding means normally urging the roller into the loop so as to hold the second sheet taut.

5. In apparatus for separating adhesively joined sheets, the combination of means for feeding one of the sheets in one direction, means for feeding the other sheet in the other direction to strip it from the first sheet, and a roller over which the second sheet passes as it is pulled from the first sheet, said roller being movable in a course parallel to said first sheet.

6. Apparatus as defined in claim 5 including yielding means normally urging the roller toward one end of its course.

7. In apparatus for separating adhesively joined sheets, the combination of means for continuously feeding one of the sheets in one direction, means for feeding the other sheet intermittently in another direction to strip it from the first sheet, and means positioned at

the point of separation of the sheets controlling the feed of said second sheet.

8. In apparatus for separating adhesively joined sheets, the combination of means for feeding one of the sheets in one direction, means for feeding the other sheet in another direction to strip it from the first sheet, and means responsive to the differential speed of feed of said sheets controlling the feed of the second sheet.

9. In apparatus for separating adhesively joined sheets, the combination of means for feeding both sheets forward, and means engaging the leading end of one sheet and feeding said end rearwardly faster than the forward speed of the sheets to effect separation thereof.

10. A combination as defined in claim 9 including means for intermittently operating the means that feed the sheet rearwardly.

11. In apparatus for separating adhesively joined sheets, the combination of means for feeding both sheets forward, means engaging the leading end of one sheet for feeding said sheet rearwardly to effect separation of the sheets, and means controlling said last mentioned means for causing it to separate the sheets alternately slower and faster than the forward feed of the sheets.

12. In apparatus for separating adhesively joined sheets, the combination of means for continuously feeding both sheets in one direction, means engaging the leading end of one of the sheets for feeding it intermittently in an other direction, at greater speed than the feed of the joined sheets, to effect separation of the sheets, and means positioned at the point of separation of the sheets controlling the intermittent feeding means.

13. In apparatus for separating adhesively joined sheets, the combination of means for continuously feeding both sheets in the same direction, a rewinding roll to which the leading end of one sheet is attached for feeding said sheet in another direction to effect separation of the sheets, a traveling roller at the point of separation of the sheets, and means actuated by the traveling roller controlling the operation of the rewinding roll.

14. A combination as defined in claim 13 including means for driving the rewinding roll at greater surface speed than the forward feed of the joined sheets.

15. The method of separating adhesively joined sheets which comprises continuously feeding both sheets, and continuously effecting separation of the sheets by feeding one of them in another direction alternately slower and faster than the feed of the joined sheets.

16. The method of separating adhesively joined sheets which comprises continuously feeding both sheets in one direction, and alternately holding the leading end of one

sheet stationary and then feeding it in the opposite direction to the feed of the sheets to effect separation thereof.

5 17. A method as defined in claim 16 in which the feeding of the sheet in the opposite direction is faster than the feed of the joined sheets.

10 18. The method of separating adhesively joined sheets which comprises continuously feeding both sheets in one direction, and intermittently feeding the leading end of one sheet in another direction, to effect separation of the sheets along a line transversely of the sheets, which line constantly moves, within
15 determinate limits, longitudinally of the sheets.

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