C. E. MARKS METHOD OF AFFIXING CONDENSER TAP STRAPS TO MOUNTING STRIP MATERIAL Original Filed Sept. 1, 1948

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2 SHEETS-SHEET 1



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METHOD OF AFFIXING CONDENSER TAP STRAPS TO MOUNTING STRIP MATE-RIAL

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2 Claims. (Cl. 154-118)

The present invention relates to a method for attaching a plurality of strips of material, at spaced and equal intervals, to another strip of material. More particularly, my invention relates to an improvement over the method and appara-5 tus for transversely affixing a plurality of conducting tap straps to a wider strip of insulating mounting material disclosed in the copending applications of Raney, Serial No. 41,804 filed July 31, 1948, Serial No. 116,346 filed September 17, 10 a method for affixing such tap straps while the 1949, and the copending application of Hogue and Hamilton, Serial No. 46,206, filed August 26, 1948, each assigned to the same assignee as the instant application. The broad aspects of any features disclosed in these copending applications and 15 plied to only such surfaces of the tap strap or common to the instant application are to be regarded as prior art with respect to this present application which is directed to a particular method not disclosed in these prior art applications. This application is a division of my copending application entitled "Method and Apparatus for Fixing Condenser Tap Straps to a Paper Web, Serial No. 47,246, filed September 1, 1948, and assigned to the same assignee as the instant application, now Patent No. 2,597,844.

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It was indicated in the aforementioned application, Serial No. 46,206, that in order to employ the combination of a plurality of conducting tap straps affixed to a longitudinal strip of insulating mounting material in the manner disclosed in copending application Serial No. 18,104, filed March 31, 1948, now Patent No. 2,547,644, the longitudinal strip of insulating paper must have the conducting tap straps affixed thereto not only at spaced and equal intervals but a portion of $_{35}$ each tap strap must extend a predetermined distance, laterally beyond a longitudinal edge of the mounting strip, approximately equal to the distance it is desired to have the tap strap project out of the finished condenser roll. The desirabil-40 ity and reasons for having the projecting portion of each tap strap free of any contamination, such as adhesive material employed to adhere the strap to the mounting strip, was also pointed out.

In addition to the fulfillment of these require- 45ments, however, it is also desirable to carry out the operation of affixing tap straps and completing a great number of finished rolls in a minimum of time. Reduction in the time required to assemble a finished roll obviously would be realized if the 50 strip 14 transversely toward the mounting strip necessity of momentarily stopping the movement of the mounting strip could be eliminated while each tap strap is being affixed thereto. However, aside from the problem involved in the realization of this objective, an additional problem is pre- 55 tively. Shaft 17 is driven clockwise, as viewed,

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sented in that it would be difficult, practically, if not impossible, to apply adhesive material to a mounting strip while in motion.

It is, therefore, an object of my invention to provide an improved method for affixing, at spaced and equal intervals, a plurality of conducting tap straps to a mounting strip of insulating material.

It is also an object of my invention to provide mounting strip is in motion.

It is a further object of my invention to provide a method of affixing conducting tap straps to a mounting strip whereby adhesive material is apmounting strip as will be in engagement after affixing to each other.

My invention will be better understood from the following description when taken in connec-20 tion with the accompanying drawings and the scope of my invention will be pointed out in the appended claims.

In the drawings, Fig. 1 is a perspective and diagrammatic representation of an apparatus embodying my invention; Fig. 1a is an enlarged edge 25 view of an adhesive applicator element incorporated in the Fig. 1 apparatus; and Fig. 2 is a perspective and diagrammatic illustration of a similar apparatus incorporating a modification of $_{30}$ my invention and Fig. 2*a* is an enlarged edge view of the adhesive applicator element incorporated in the Fig. 2 apparatus.

Referring now to Fig. 1 of the drawings, 10 represents a supply roll of insulating mounting material rotatably mounted on spindle or shaft [] which in turn is supported by a stationary frame work not illustrated in the interest of simplicity. As supply roll 10 is unwound, by drive means to be described hereinafter, the longitudinal strip of mounting material 12 therefrom is directed toward the left in the direction of the arrow and during this leftward passage passes over and is temporarily supported on support platform 13 also rigidly supported by the stationary frame work.

A supply strip of conducting material 14 is fed from a supply roll or reel, not shown, in the direction of the arrow toward and transversely over the platform 13 and the longitudinal supply strip of mounting material 12. To feed the conducting I employ feed means comprising a pair of cooperating feed rolls 15 and 16 fixedly mounted on shafts 17 and 18 respectively which are positively interconnected by spur gears 19 and 20 respecby bevel gear set 21, shaft 22, bevel gear set 23 and shaft 24 from a pulley or chain sprocket mounted thereon but not shown which in turn may be driven by a belt or chain from a motor neither of which are illustrated. Notches 15' and 15' have been respectively cut across the contacting periphery of rolls 15 and 16 which are so mounted on their respective shafts that during each revolution thereof notches 15' and 16' are bisected by a line interconnecting the centers of 10 the rolls or are adjacently disposed on opposite sides of the conducting strip 14 therebetween. Since the periphery of the rolls are out of engagement with the strip at this time the feed thereof is obviously terminated for a momentary period 15 and flange 51 of channel shaped backing memduring each revolution of the feed rolls. A pair of cooperating rotatable discs 25 and 26 between which conducting strip 14 is directed while being fed by the feed rolls toward platform 13 is positioned between feed rolls 15 and 16 and the plat- 20 form. Discs 25 and 26 are fixedly mounted on the positively driven shafts 27 and 29 respectively through spur gears 29 and 30 by idler gear 31 which meshes with gear 19 fixed to feed roll shaft 17. These discs are so positioned on their 25 respective shafts with respect to each other and strip 14 is so directed therebetween that the longitudinal axis thereof is aligned with the central plane of rotation of each disc. Although disc 25 is a complete circular disc, disc 26 comprises sub- 30 stantially the sector of a circle with sufficient additional material to give strength to the hub portion thereof. Because of this particular configuration and the fixed spacing between shafts 27 and 28 only the circular periphery portion of 35 disc 26 engages the under surface of conducting strip 14 so that for a short period during each revolution of the discs, disc 26 is completely out of engagement with the conducting strip 14 as it is fed between the discs. It should be observed at 40this point that disc sector 26, as better illustrated in Fig. 1a, has a thickness less than the width of conducting strip 14 and the circular periphery portion thereof rotates in a bath of adhesive material 32 in supply reservoir 33 which is provided 45 with any suitable heating means to maintain the adhesive material therein in a liquid state.

Between feed rolls 15 and 16 and discs 25 and 26 at a predetermined distance from platform 13 and the adjacent longitudinal edge of mounting $_{50}$ strip 12 is supported a conducting strip severing means or knife substantially the same as the severing means disclosed in the above mentioned copending application of Hogue and Hamilton, Serial No. 46,206. This severing means 55 comprises a die and strip support 34 rigidly fixed to the apparatus frame work and punch or knife housing 35 slidably mounted for vertical movement at the rear, but not shown, on the frame work. The forward lower end 35' of housing 35 69 is formed or machined to a knife edge, the purpose of which will be apparent as the description proceeds. Conducting strip holding element 36 is mounted for vertical movement within housing 35, biased downward by a spring therein 65 and aligned for engagement with die slot 37 which has a width and is so aligned as to slidably accommodate conducting strip 14 as it is fed toward mounting strip 12. The downward travel of holding element 36 under its spring bias is 70 limited by the engagement of a pin 38 affixed thereto with the lower edge of a slot 39 in the side wall of knife housing 35. Normally, holding element 36 is biased out of engagement with die slot 37 by springs 40 interposed between top 75 with moving mounting strip 12.

plate 41, fixed to housing 35, and the slotted flange 42 of a substantially channel shaped backing member 43 fixedly mounted on the frame work. Upward thrust of springs 40 is resisted by engagement of a bolt 44, passing through plate 41 into housing 35, with the rounded end of an adjustment screw 45 threadably mounted in a beam or lever 46 rotatively pivoted on pivot pin 47 fixedly mounted on the apparatus frame work. Cam wheel 48 is rotatively mounted at one end of lever 46 and is biased into engagement with cam 49 mounted on an extension of drive shaft 24 by spring 50 interposed between lever 46, at the other end thereof opposite the pivot pin 47, ber 43. An extension 52 is provided at this end of lever 46 to which one arm 53 of a toggle is pivotedly mounted at pivot pin 54. A toggle tamper 55 having a length approximately equal to the width of the mounting strip 12 and a rounded tamping surface is pivotedly mounted transversely with respect to the mounting strip to the lower end of arm 53 by means of pivot pin 56. This combination comprising a toggle is biased in a counterclockwise direction by spring 51, attached to arm 53 and a downwardly projecting portion of lever extension 52. However, stop 58, part of the downwardly projecting portion, normally prevents counterclockwise movement of the toggle tamper beyond the position indicated which is such that the longitudinal center line of the tamping surface on tamper 55 is aligned with the longitudinal axis of the conducting strip 14 fed over the mounting strip 12. Moreover, arm 53 is so mounted with respect to platform 13 and mounting strip 12 that its movement about pivot 54 is in a plane normal to the platform surface and coincident with a horizontal center line thereof and the longitudinal axis of the mounting strip.

So as to prevent back-lash of conducting strip 14. a pair of friction blocks 59 are provided between which the strip is pulled by feed rolls 15 and 16. The lower friction block is supported on the stationary frame work while the upper block is movable but biased downwardly by spring 60 interposed therebetween and a part of the frame work 61.

A friction drive roll 62 is fixedly mounted on shaft 63 which is positively connected by spur gear 64 fixed thereto and spur gear 65 to drive shaft 24. 66 represents a partially wound reel of mounting material with tap straps affixed thereto in substantial rolling engagement with friction roll 62 and wound on a split mandrel mounted on reel up shaft 67 which is supported on a radius arm, not shown, which in turn is pivotedly mounted on the apparatus frame work, as illustrated in the above mentioned copending application of Hogue and Hamilton. It is by means of friction roll 62 that the mounting strip 12 is unwound from supply roll 10 and directed over platform 13 by idler guide rolls 68 and 69 around friction roll 62 and eventually rewound into a reel such as 66. The mounting of shaft 67 on a pivoted radius arm results in constant rolling engagement of the reel being rewound with friction drive roll 62 regardless of the amount of mounting material that has been rewound into a finished reel. 70 represents an ironer roll rotatably and also slidably mounted for vertical movement on the apparatus frame work but biased downwardly toward the upper surface of platform 13 for rolling engagement

To operate the apparatus hereinbefore described, an end of mounting strip 12 is first manually pulled over support platform 13, directed around guide rolls 68 and 69 and friction drive roll 62 as shown and attached to the split man-5 drel on shaft 67 and an end of conducting strip 14 is manually directed between friction blocks 59 into frictional engagement with the circular peripheries of feed rolls 15 and 16. Then the drive motor, not shown, which turns drive shaft 10 24, gear 65 and cam 49 in a clockwise direction is started. Thereafter all the steps of my invention are executed automatically. Drive feed roll 62 unwinds the longitudinal mounting strip 12 from supply roll 10 continuously across support 15 platform 13 around the guide rolls and rewinds it into the reel 66. Feed rolls 15 and 16 feed the conducting supply strip through the die slot 37 toward and transversely over continuously moving mounting strip 12 for a lineal distance equal 20 to the circumferential dimension of the contacting periphery of a feed roll.

Simultaneously during the feed, the circular periphery portion of disc 26 which has previously rotated in the liquid adhesive material 32 engages 25 the bottom surface of conducting strip 14 to apply a strip of adhesive thereto having a lineal dimension equal to the circumferential dimension of the engaging periphery of the disc. Because of the location of disc 26 with respect to 30 the adjacent longitudinal edge of moving mounting strip 12, the angle subtending the circular periphery of disc 26 and the synchronization thereof with the feed rolls, this strip of adhesive is applied only to that portion of strip 14 which 35 is adjacent to and fed over mounting strip 12. Moreover, since disc 26 has a thickness less than the width of strip 14 and because the longitudinal axis thereof is aligned with the central plane of rotation of disc 26, the adhesive material which 40is applied is confined to a very narrow strip about the longitudinal center line of the bottom surface of the conducting strip.

Thereafter, notches 15' and 16' of feed rolls 15 and 16 respectively become adjacently disposed at 45 which time the feed of strip 14 is momentarily stopped. The various elements of the apparatus are interconnected as hereinbefore described and so synchronized that during this momentary period the detented or depressed portion 71 in the 50contacting surface of rotating cam 49 begins to roll into engagement with cam wheel 48 permitting biasing spring 50 to turn lever or beam 46 clockwise about its fulcrum or pivot 47 thereby depressing housing 35 downwardly, against the 55biasing action of springs 40, and the lower end of holding element 36 into engagement with conducting strip 14 in die slot 37. Additional rotation of cam 49 results in further downward and slidable motion of housing 35 this time relative $_{60}$ to holding element 36, which having engaged stationary die slot 37 and strip 14 remains stationary, whereupon the knife edge 35' of housing 35 passes through and severs conducting strip 14. As pointed out in the above indicated copending ap- $_{65}$ plication, by virtue of the resulting compression of the spring within the housing, this additional downward movement of housing 35 imposes considerable holding pressure on strip 14 during the actual severing thereof. This clockwise motion of $_{70}$ the beam 46 also and simultaneously lowers toggle tamper 55 into rolling and pressure engagement with that portion of the conducting strip which has previously been fed over the mounting strip 12 whereby the adhesive coated undersur- 75 The upper end of shaft 109 is mounted for rota-

face of the conducting strip now severed is pressed into engagement with the mounting strip. The severed conducting strip thus adhesively affixed to the continuously moving mounting strip will promptly move therewith to the left and because of the friction between the conducting tap strap and the curved lower surface of the tamper 55 and the pivoted mounting thereof the toggle tamper elements will move a short distance therewith clockwise about pivot pins 56 and 54 against the biasing action of spring 57 after which disengagement of the detented portion 71 of rotating cam 49 will result in counterclockwise movement of beam 46 about pivot 47 to raise tamper 55 for free counterclockwise movement of arm 53 about pivot 54 under the biasing action of spring 57 into engagement with stop 58. This movement of lever 46 simultaneously permits upward vertical movement of punch or knife 36 under the biasing action of springs 40. Spring biased roller 70 serves to apply pressure for an additional short period to the affixed conducting tap strap as it passes therebetween and the surface of support platform 13.

Thus, a new and improved method has been provided whereby a conducting tap strap 72 having a predetermined portion projecting beyond or exterior a longitudinal edge of a strip of mounting material is automatically affixed thereto at spaced and equal intervals while the mounting strip is in continuous motion. Moreover, in accordance with this new method both surfaces of the projecting portion of each tap strap are entirely free of any insulating material such as the adhesive employed to bond the tap to the mounting strip.

In Fig. 2, I have illustrated an apparatus somewhat similar to the Fig. 1 apparatus except that a modification of my invention is embodied therein and other features have been incorporated which render this machine more flexible than the apparatus illustrated in the Fig. 1 embodiment. As in the embodiment of Fig. 1, a supply roll 80 of insulating mounting material is rotatably mounted on a spindle or shaft 81. A longitudinal strip of material 82 is unwound therefrom and pulled under idler rolls 83 and 84 across stationary platform 85 and rewound into a finished roll 86, after tap straps have been affixed thereto, by friction roll 87. Friction roll 87 is fixedly mounted on shaft 88 which is continuously rotated clockwise through bevel gear set 89, shaft 90, bevel gear set 91, drive shaft 92, and drive pulley 93 keyed thereto by a motor through a belt, neither one of which are shown.

A supply strip of conducting material 94 is fed from a supply reel 95 through a guide slot 96 toward and transversely over the mounting strip 82 and the platform 85 by a pair of cooperative feed rolls 97 and 98. Feed rolls 97 and 98 are keyed respectively to rotatable shafts 99 and 100 which are positively interconnected by spur gears [0] and 102 respectively. The feed rolls are driven by a bevel gear 103 keyed to feed roll shaft 99. bevel gear 104 meshing therewith and shaft 105 through a variable speed drive comprising a metallic driving disc 106 keyed to a shaft 107 and a leather edged driven disc 108 engageable with the face of disc 106 and mounted on shaft 109. A portion of shaft 109 at the lower end thereof is hollow to slidably receive shaft 105 which is rotationally driven by shaft 109 through the engagement of a pin fixed on shaft 105 with longitudinal slots in the hollow portion of shaft 109.

tion within an adjustment device 110 having a threaded portion III engageable with the threads of a nut 112 welded or otherwise fixed to the stationary framework 113 of the apparatus. Since shafts 105 and 109 are axially movable with re-5 spect to each other, disc 108 may therefore be moved radially toward or away from the periphery or center of drive disc 106 by turning threaded portion 111 within nut 112 whereby the rotational speed of feed rolls 97 and 98 may be 10 varied. The purpose of such a variable speed drive is to change the tap strap length when employing different widths of paper. Driving disc 106, keyed to shaft 107, is rotated constantly by drive shaft 92 through spur gears 114 and 115 15 keyed respectively to shafts 92 and 107. A conducting strip severing means comprising a shear blade 116, positioned between the feed rolls and platform 85 and vertically movable within stationary blade guides 117 suitably fixed to the ap- 20 paratus framework, is provided to carry out the conducting strip severing function as in the main embodiment.

A tamper 118 pivotally mounted at 119 on block 120 for counterclockwise movement against 25 the biasing action of spring 121 is also provided. Block 120 is removably mounted on a projection 122 integral with or otherwise suitably fixed to shear blade 116. By means of wing nut 123, block 120, and the tamper may be quickly re- 30 moved and reversibly remounted on projection 122 so that tamper 118 may swing clockwise against its spring bias, the purpose of which will be explained hereinafter.

The cutting edge of shear blade 116 is nor-35 mally biased away from conducting strip 94 and tamper 118 is biased away from platform 85 by springs 124 interposed between stationary blade guides 117 and a yoke or extension 125 fixed to shear blade 116. Springs 124 also bias 40 a cam roller 126 mounted on cross head 127, which is in turn fixed to yoke 125, into constant rolling engagement with cam 128 mounted on shaft 107.

In contrast to the Fig. 1 embodiment feed $_{45}$ rolls 97 and 98 are completely circular and one end of shaft 100, to which feed roll 98 is keyed, is rotatably mounted on a pair of radius arms 129 fixed to shaft 130 which in turn is pivotally mounted on the apparatus frame work. Spring 50 131 interposed between one of the radius arms and a portion of the stationary framework 132 normally biases feed roll 98 toward the conducting strip 94 and into cooperation with feed roll 97. However, a feed roll push rod 133 is $_{55}$ mounted at one end to yoke 125 and the opposite or lower end is engageable with one of the radius arms 129 so that when shear blade 116 is moved downwardly by cam 128, feed roll 98 is moved out of engagement with strip 94 and $_{\rm GO}$ away from feed roll 97 against the bias of spring 131. Although feed roll 98 is positively and constantly driven, this movement is, nevertheless, permitted by the pin and slot coupling 134 and universal joint 135 in shaft 100.

As was the case in the Fig. 1 embodiment, an adhesive reservoir 136 containing liquid adhesive therein is positioned between the shearing means and platform 85. An adhesive applicator disc 137 is also provided and mounted for 70 rotation of at least a portion thereof in the liquid adhesive as better illustrated in Fig. 2a. Unlike the Fig. 1 embodiment, however, disc 137 is completely circular and is keyed to a shaft 139 which is rotatably mounted on a pair of 75

radius arms 140 fixed to a shaft 141 pivotally mounted on the apparatus framework. A cam roller 142 is mounted on the upper end of a push rod 143, the opposite or lower end of which is fixedly connected to one of the radius arms 140. A coil spring 144 mounted around push rod 143 and interposed between cam roller 142 and push rod guide 145, fixed to the stationary framework, biases adhesive applicator disc 137 into engagement with conducting strip 94 and roller 142 into engagement with a cam 146 keyed to shaft 107. To allow for a slight movement of adhesive applicator disc on arms 140 away from conducting strip 94, shaft 139 is driven through a flexible shaft 147 which is in turn driven through gears 148, 149, and 150 by gear 102 keyed to shaft 100.

As to the operation of the apparatus hereinbefore described, energization of the motor which drives shaft 92 will initiate movement of mounting strip 82 in the direction of the arrow across platform 85 and feed of an end of conducting strip 94 toward and transversely over the mounting strip as in the main embodiment. Adhesive applicator disc 137, during a portion of this feed will be in engagement with the underside of the conducting strip whereby a narrow strip of adhesive material will be applied thereto. While conducting strip 94 is still in motion, cam 146 will become effective to depress push rod 143 downwardly against the bias of spring 144 and disc 137 out of engagement with the conducting strip. The portion of the conducting strip thereafter fed toward the mounting strip represents that portion of the eventual tap strap which will project beyond the edge thereof. Shortly thereafter, cam 128 will become effective to start downward movement of shear blade 116 and yoke 125, whereupon further feed of conducting 94 will be momentarily stopped since pushrod 133 connected to the yoke will thereby depress radius arms 129 and feed roll 98 mounted thereon out of engagement with conducting strip 94. Upon further downward movement of shear blade 116, the cutting edge thereof will pass through, thereby severing conducting strip 94. Simultaneously, tamper [18 will be lowered into rolling and pressure engagement with the severed portion, whereupon the tamper will travel a short distance therewith counterclockwise about its pivot 119 as was the case in the main embodiment. Then cam 128 will become effective to permit rise of shear blade 116 under the biasing action of springs 124 and simultaneous rise of tamper 118 out of engagement with the moving tap strap, now firmly affixed to the mounting strip, whereupon the tamper is free to swing clockwise under the bias of spring 121 to its initial position. At this point, cam 146 will become effective to permit upward movement of pushrod 143 under the biasing action of spring 144, thereby moving adhesive applicator disc 137 into a position to apply adhesive to the $_{65}$ next increment of conducting strip 94 as it is fed toward the moving mounting strip. As the shear blade and yoke 125 approach the uppermost position of their travel, the raising of pushrod 133 will allow spring 131 to move rotating feed roll 98 into pressure engagement with conducting strip 94, whereupon the previously severed end thereof will be moved into engagement with the applicator disc 137 and then over the moving mounting strip.

This apparatus, thus embodying a modification

of my invention, is somewhat more flexible than the apparatus shown in the Fig. 1 embodiment in that both rolls for use on the right-hand side as well as rolls for use on the left-hand side of the tap strap inserter machine disclosed in the 5 above mentioned copending application, Serial No. 18,104 may be made on the same machine. The operation hereinbefore described involved the assembly of a left-hand roll. To assemble tap straps on a right-hand roll, a supply roll or 10 reel corresponding to supply roll 80 is mounted on spindle 160 corresponding to spindle 81 after which the mounting strip is pulled to the left instead of to the right across the platform 85 roll 87 for re-winding into a finished roll on radius arm 162 corresponding to radius arm 163. Before starting the actual assembly of such a right-hand roll, tamper support block 120 is removed from support arm 122 and reversibly mounted thereon 20 thereto will be adjacent to said other strip, stopso that the tamper will be free to move clockwise with and in the direction of movement of the mounting strip against the biasing action of spring 121.

statutes, described particular methods of operation for carrying out my invention, other changes will be obvious to those skilled in the art; and I, therefore, aim in the appended claims to cover all such changes as fall within the true spirit and 30 severed strip through a predetermined distance. scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. The method of affixing a narrow strip of material transversely to a continuously moving 35 supply strip of relatively wider mounting material at spaced and equal intervals thereon which comprises the steps of feeding the end of a supply strip of narrow material toward and transversely over said wider mounting material, simultane- 40 ously applying to only the surface of said narrow strip fed over and adjacent to said mounting strip a relatively narrow strip of adhesive material centered on the longitudinal axis of said narrow

strip and having a width less than the width thereof, stopping the feed of said narrow strip of material, then severing said narrow strip so that a portion adjacent the severed end thereof will extend beyond a longitudinal edge of said mounting strip and pressing said surface of said narrow strip having adhesive applied thereto against the adjacent surface of said continuously moving wider strip of mounting material.

2. The method of affixing a narrow strip of material transversely to a continuously moving supply strip of relatively wider mounting material at spaced and equal intervals thereon from a supply of narrow material, one of said strips around friction roll 161, corresponding to friction 15 having adhesive material applied to a surface thereof, which comprises the steps of feeding the end of said narrow supply strip toward and transversely over said mounting strip so that the surface of one of said strips having adhesive applied ping the feed of said narrow strip, then transversely severing said narrow strip so that a portion adjacent the severed end thereof will extend beyond a longitudinal edge of said wider mount-While I have, in accordance with the patent 25 ing strip, pressing said severed narrow strip against said continuously moving strip of mounting material and continuing application of said pressure for a predetermined time thereafter during movement of said mounting strip and said

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