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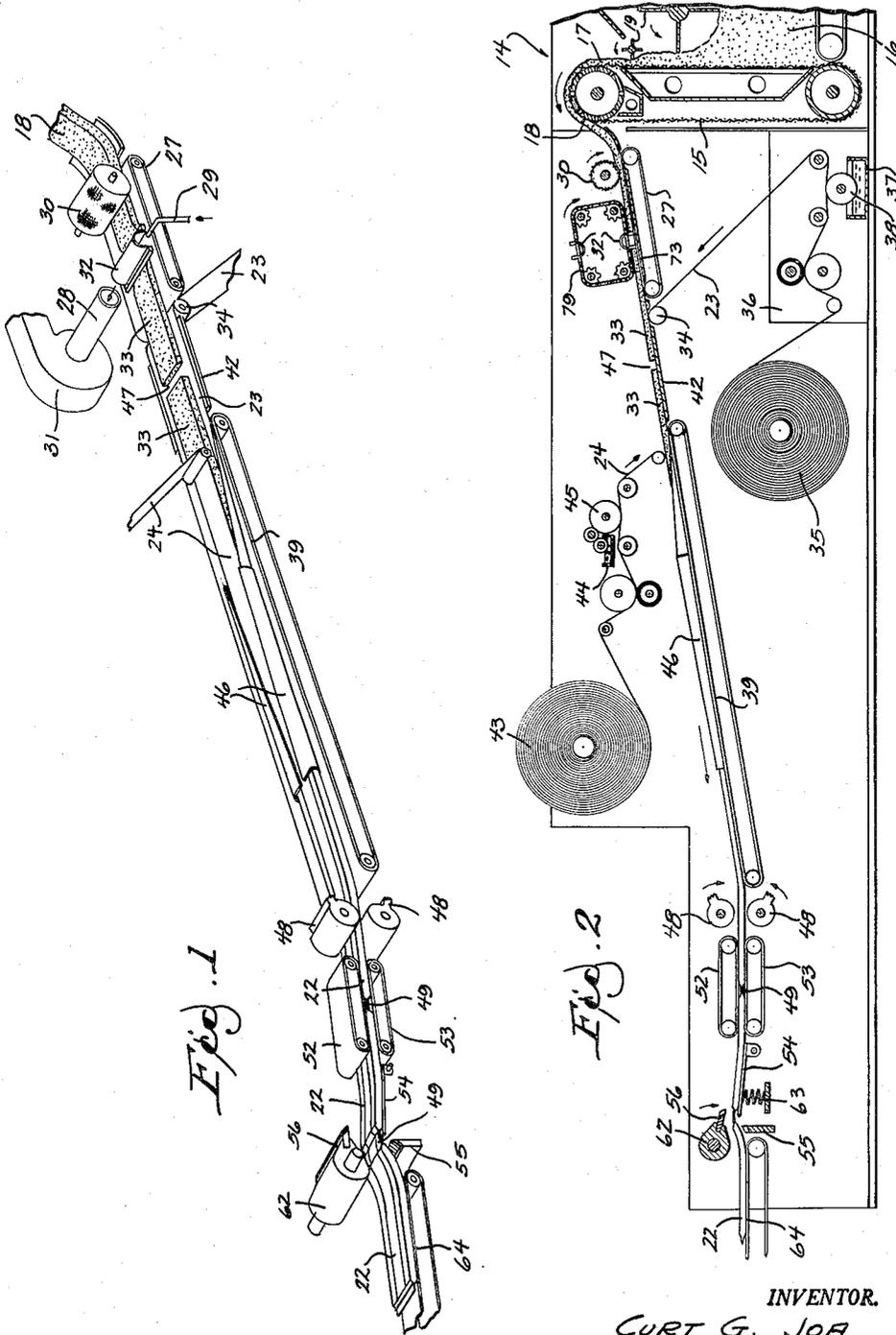
C. G. JOA

3,017,795

METHOD AND APPARATUS FOR FORMING INDIVIDUAL WRAPPED PADS
FROM OTHERWISE CONTINUOUS BATT STRIPS

Filed June 6, 1957

3 Sheets-Sheet 1



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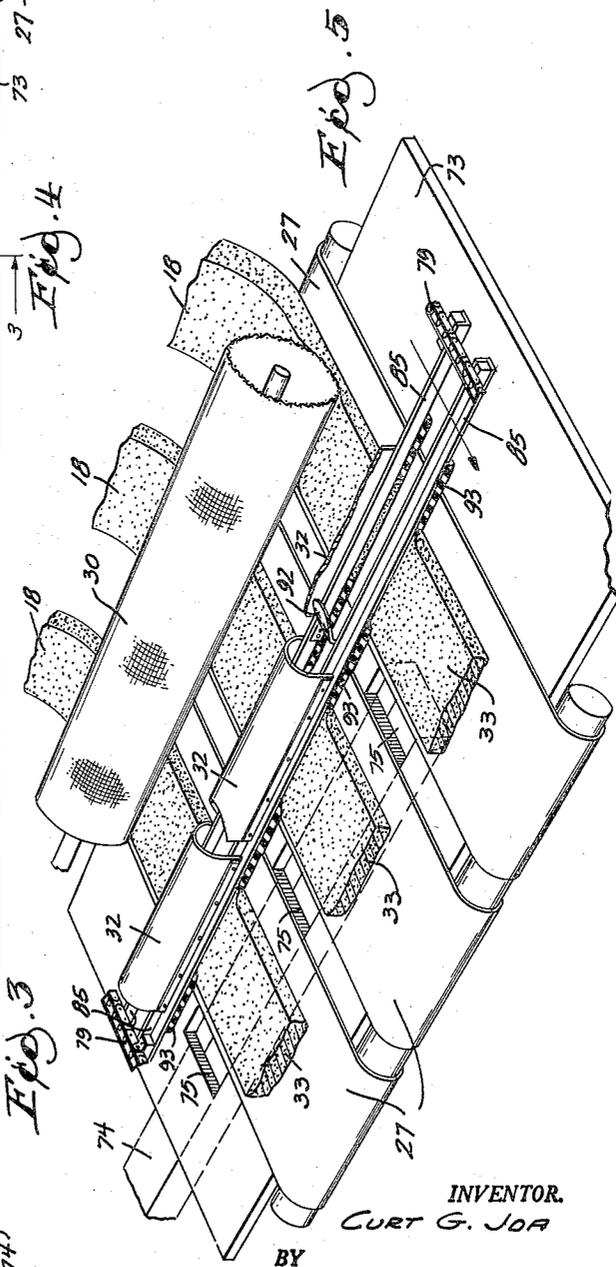
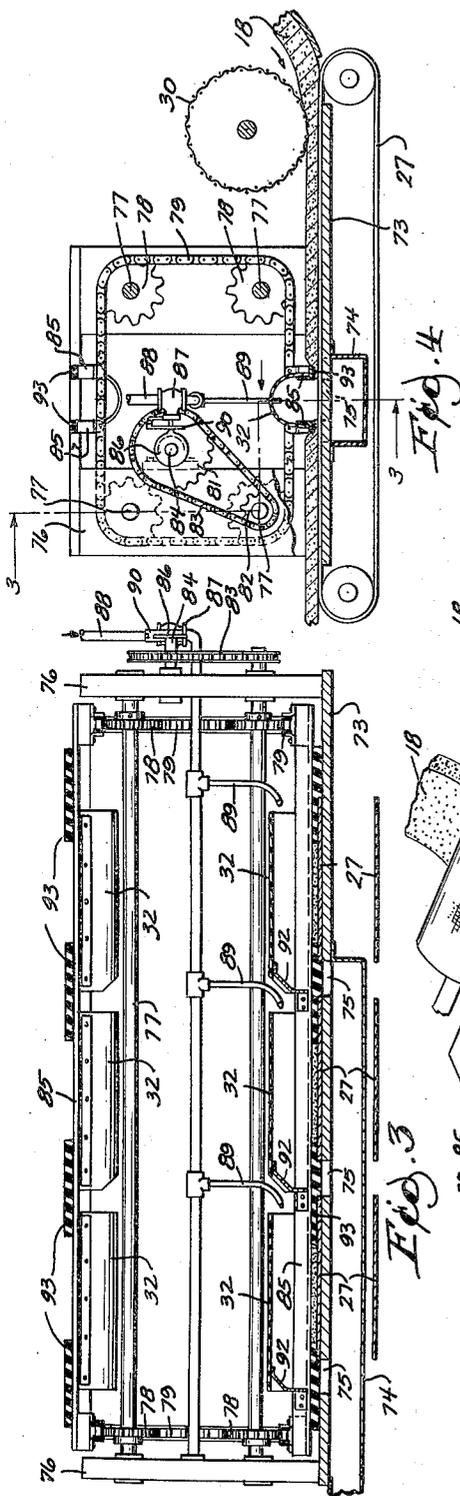
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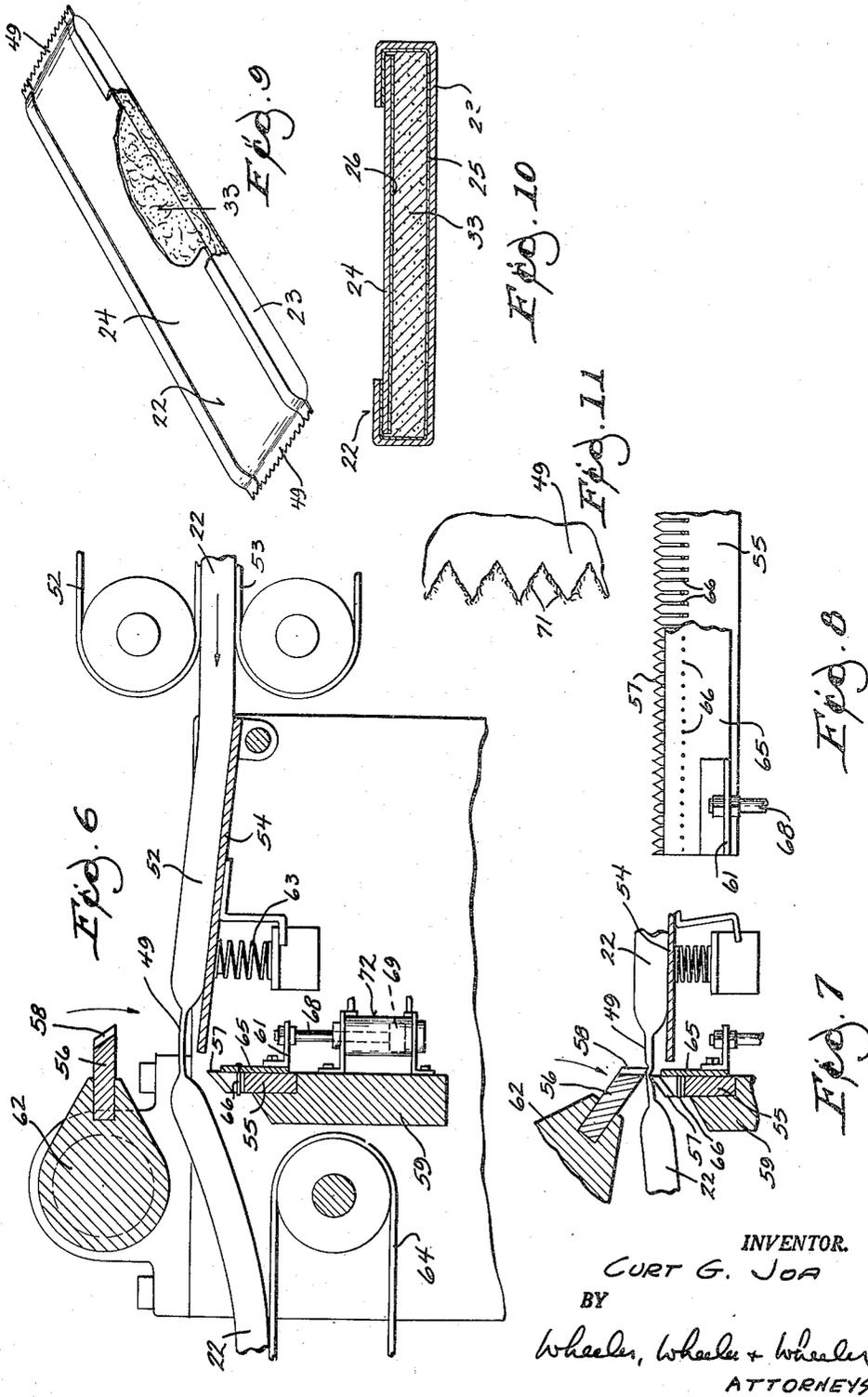
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METHOD AND APPARATUS FOR FORMING INDIVIDUAL WRAPPED PADS FROM OTHERWISE CONTINUOUS BATT STRIPS

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2 Claims. (Cl. 83-129)

This invention relates to a method and apparatus for forming individual wrapped pads from otherwise continuous batt strips.

Cross reference is made to my co-pending applications, Serial No. 550,653, filed December 2, 1955, now abandoned, and Serial No. 646,696, filed March 18, 1957, which disclose devices for forming continuous batt strips as a procedure preliminary to procedures of the present invention.

Of course, it is immaterial to the present invention how the batt strip is initially formed, the cross referenced patent applications being cited merely as illustrative of batt forming devices and exemplifying devices which I have actually commercially used for this purpose.

In the method and apparatus of the present invention, one or more elongated strips of batt material discharged from the forming machine is divided at longitudinally spaced points into discrete portions spaced longitudinally by dividing gaps, such portions being then ensleeved in wrapping paper which is continuous across the discrete portions of batt material, as well as across the spacing gaps intervening therebetween. In the continued advance of the ensleeved strip, the opposed plies of wrapping paper in the area of the gaps are pressed together and sealed.

Knife means subsequently severs, preferably with a tearing stroke, the wrapping paper across the seals aforesaid to subdivide the wrapped strip into discrete wrapped pads consisting of batt material confined in sealed wrapping paper. While the pads made according to the present invention may be used for any pad purposes, they are specifically intended for use as cushion pads in packaging furniture. The pads must be sturdy to withstand shipping and handling stresses and yet provide a soft cushion to protect the furniture. Moreover, the pads may not have any abrasive or rough surfaces which might otherwise scratch the furniture finish.

A unique feature of the method and apparatus of the present invention is my procedure for severing the elongated strip of batt material into discrete portions with subdividing gaps intervening therebetween. I do this by removing entirely batt material segments of substantial width from the strip. These segments are removed by a convection current induced by establishing a pressure differential across the batt segment to be removed.

The resultant convection current of air or like fluid picks up the batt segment, removes it from the strip and returns it to the batt forming machine for redeposit. I have found that such pressure differential can most conveniently be established by subjecting the batt segment to vacuum. In some instances, the pressure differential is advantageously increased by impinging a stream of air or like fluid against the side of the segment opposite that subject to the vacuum.

The foregoing procedure presents a problem in that the strip of batt material is ordinarily in motion on a conveyor belt. The method and apparatus of the present invention accommodates for such motion.

According to the present invention, a vacuum box is disposed in fixed relation to the strip conveyor. It may be continuously at subatmospheric pressure, or at such pressure only periodically as the strip passes the vacuum

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box inlet. The convection current which flows into the vacuum box is localized or channelled to confine it to effect only the batt segment to be removed by at least partially enclosing the segment with an air confining hood. I may optionally blow air, etc. into the end of the hood opposite the vacuum box inlet.

The air blower, and if desired the vacuum pump as well, is desirably actuated only for that period of time during which the batt segment is opposite the vacuum box inlet. At all other times the air blower is disabled to permit the strip to pass without change of form.

Continuous strips of pre-glued wrapping paper are then applied to the longitudinally separated batt portions and the wrapping paper strips ensleeved thereabout. Thereafter, the paper is sealed in the area of the spacing gaps and severed as aforesaid.

To avoid formation of abrasive material on the outer surface of the pad, such as might be formed by extrusion of conventional glue from between the plies of wrapping paper as they are squeezed together, I use a special form of adhesive which is very pliable even after it has set. Accordingly, such glue as is extruded will be very pliable, even after setting, and will not scratch finished furniture surfaces. Moreover, the wrapping paper is desirably severed by tearing it to fray out the fibers of the paper and entrapped glue. This avoids a sharp or clean cut edge which might otherwise abrade or scratch furniture finish.

Other objects and advantages of the invention will be more apparent from an examination of the following disclosure in which:

FIGURE 1 is a diagrammatic perspective view showing a simplified form of apparatus for practicing the present invention.

FIGURE 2 is a side elevation, partly in cross section, showing in more detail the apparatus diagrammatically illustrated in FIGURE 1.

FIGURE 3 is a cross sectional view taken along the line 3-3 of FIGURE 4 and is a vertical cross section taken through the vacuum box and associated apparatus.

FIGURE 4 is an end view, partly in cross section and partly in elevation, of the device shown in FIGURE 3.

FIGURE 5 is an enlarged fragmentary perspective view showing the vacuum box and associated apparatus.

FIGURE 6 is a greatly enlarged fragmentary view, partly in cross section, of the cut-off apparatus for severing the ensleeved strip into individual wrapped pads.

FIGURE 7 is a fragmentary view similar to FIGURE 6, but showing the position of the parts during severing co-action of the knife blades.

FIGURE 8 is a fragmentary side view of the stationary knife blade and its push-off blade.

FIGURE 9 is a perspective view on a reduced scale showing a cushioning pad as produced by the method and apparatus of the present invention.

FIGURE 10 is an enlarged cross section taken through the completed pad of FIGURE 9.

FIGURE 11 is an enlarged fragmentary plan view of the severed margin of a pad.

The batt forming apparatus more fully described in my prior applications aforesaid is illustrated diagrammatically at 14 at the right in FIGURE 2 and includes a screen 15 on which fibrous material 16 is deposited in the form of a batt 17 which is discharged from the screen in the form of a batt strip 18. As in the devices of my co-pending applications aforesaid, a leveling device 19 functions to provide for substantially uniform thickness and density of the batt material.

The end product of the method and apparatus of the present invention is illustrated in FIGURE 9 as a cushion pad 22 which may be used for packing. A particular use for pad 22 is as a filler pad in furniture shipping car-

tons. The loosely compacted section 33 of batt material is not self-sustaining and is ensleeved in a wrapping paper cover consisting of a base strip 23 having its side margins formed in channels to receive therein the batt 33 and to marginally overlap a cover wrapping strip 24.

To keep the batt section 33 secure against dislocating movement within the wrapping paper, the inner surfaces of the wrapping strips 23, 24 are coated with glue layers 25, 26. Accordingly, the batt section 33 will be anchored against shifting movement within its wrapper.

FIGURE 1 diagrammatically illustrates my novel method and apparatus for forming the pads 22. The continuous strip 18 of batt material discharged from the forming machine 14 is received on belt conveyor 27 on which it is conveyed past appropriate means for creating a convection current of air. As illustrated in FIGURE 1, the inlet or nozzle 28 of a vacuum pump or blower 31 may be disposed at one side of the belt 27 and a source 29 of air under pressure may be disposed at the other side of the conveyor 27.

Accordingly, a stream of air can be blown across the conveyor 27 to remove by convection a segment of batt material intervening between the nozzles 28, 29.

To localize and channel the convection current, I find it desirable to temporarily position on the strip 18 an air hood 32 which desirably presses down on spaced portions of the batt strip 18 to define the batt segment removed by the convection current. This procedure subdivides the strip 18 into discrete batt portions 33 longitudinally spaced by gaps 47.

It is broadly immaterial if all of the apparatus 28, 29, 32 moves as a unit with the conveyor 27 in the course of removing the batt segment by convection. In the preferred form herein illustrated the vacuum tube 28 and air nozzle 29 are relatively stationary and intermittently operated in time with the advance of conveyor 27 to remove batt segments at points appropriately spaced in the strip.

In any event, the strip 18 is sub-divided into discrete spaced batt sections 33 which are discharged from conveyor 27 onto the strip 23 of wrapping paper which is drawn over the roll 34 and onto apron 42. The strip 23 is unwound from a supply roll 35 and passes through gluing apparatus 36 including a glue tank 37 and transfer roll 38 which coats the surface of the strip 23 which is uppermost on apron 42.

The upper strip 24 of wrapping paper is applied to the upper surface of the batt after having been unwound from a supply roll 43 and having received a coating of glue from glue tank 44 and transfer roller 45. Strip 24 is substantially the same width as the batt strip 18 but strip 23 is somewhat wider. Accordingly, the edge margins of strip 23 may be folded by conventional folding plows 46 to form the channels aforesaid and overlap the wrapping strip 24. As illustrated in FIGURE 2, the plows 46 may gradually taper toward their outlet ends to press the wrapping paper against the ensleeved batt sections 33 while the adhesive at least partially sets.

In the foregoing operation, the wrapping paper ensleeves the spaced discrete batt sections 33 and the gaps 47 therebetween.

As the ensleeved longitudinally spaced batt sections 33 are discharged from conveyor 39, the sealing dies 48, timed to co-act only when the gaps 47 are therebetween, press together portions of the wrapping strips 23, 24 which are at opposite sides of the gaps 47 between the batt sections 33. Accordingly, the glue coated on the facing surfaces of the strips seal the strips together under pressure of the dies 48 to constitute connective links 49 between the respective pads 22.

After sealing, the pads 22 are further compressed between the co-acting belt conveyors 52, 53 during continued advance thereof. Meanwhile the glue coatings 25, 26 have time to set and the spaced discrete uncut pads

22 are in due course discharged from the conveyors 52, 53 onto a spring biased apron 54 preceding the pad severing apparatus shown diagrammatically in FIGURE 2 and in greater detail in FIGURES 6-8.

The apparatus for severing the wrapped batt strip through the flattened and sealed connective links 49 intervening between the pads 22 consists of co-acting knife blades 55, 56 respectively having teeth serrations 57, 58 which intermesh in the co-action of the blades. Stationary knife 55 is mounted on a fixed support 59. Movable knife 56 is mounted on a rotary shaft 62 having an axis of rotation offset rearwardly from knife 55.

Accordingly, knife 56 sweeps past knife 55 in a downward direction.

Apron 54 is normally biased by spring 63 to its position shown in FIGURE 6 in which the discharge end of the apron 54 is above the level of the teeth 57 of knife 55. Accordingly, except during the time of knife co-action, the conveyors 52, 53 will simply feed the linked pads 22 through the gap between the knives 55, 56 and onto the take-away conveyor belt 64. However, when rotary knife 56 reaches its position shown in FIGURE 7 in which its teeth 58 cooperate with the teeth 57 of the knife 55, the downward component of thrust of knife 56 will compress spring 63 and depress apron 54 to lower the connective links 49 onto teeth 57 of blades 55. After severance of the links 49, spring 63 will bias the apron 54 to its elevated position shown in FIGURE 6 in which the pad 22 will clear the stationary knife 55 in its continued advance through the machine.

To insure disengagement of the teeth 57 of stationary knife 55 from the severed edges of the connective links 49, knife blade 55 is provided with a push-off plate or bar 65 mounted for reciprocation on the knife 55 by reason of the engagement of its pins 66 with slots 67 formed in the blade 55. The push-off bar or plate 65 is provided with a bracket 61 connecting it to rod 68 of the piston 69 of a fluid operated motor 72. Conventional means (not shown) is provided for co-ordinating the motor 72 with the rotation of shaft 62 for actuating the fluid operated motor 72 immediately after the link 49 is severed. Accordingly, push-off plate 65 assists the spring 63 in clearing the fibers 71 of the link 49 from entanglement with the teeth 57 of the blade 55.

The serrated co-acting teeth 57, 58 are regarded as of considerable significance in the present invention in that a sharp or clean cut severed edge in the link 49 is avoided. By reason of the meshing teeth 57, 58 the connective link 49 is torn in the course of knife co-action therewith. Accordingly, the fibers 71 of the link 49 are frayed out as illustrated in FIGURE 11. The fraying or tearing action aforesaid is attributed to the difference in peripheral speed of radially offset portions of the serrated knife teeth.

The frayed out fibers 71 are softer and more pliant and less damaging to furniture finish than would be a clean-cut edge, particularly if such edge contains hardened glue. The tearing action aforesaid not only frays out the fibers of the paper but frays out such glue as is extruded from between the plies of wrapping paper.

To further reduce the possibility of abrading furniture finish, I use for an adhesive a product which desirably sets in pliable form. Asphalt has been used successfully as well as a rubber base adhesive sold by the 3-M Company under its mark "E-1025."

The detailed construction of the preferred apparatus for dividing the batt strip 18 into discrete spaced portions is shown in FIGURES 3, 4, and 5. In practice, there may be more than one strip 18 discharged from the batt forming machine 14. In FIGURES 3 through 5, three such strips are illustrated. These may first be compacted slightly against conveyor belt 27 and its underlying apron 73 by the compacting roll 30. The apron 73 is provided with ports 75 intervening between the laterally spaced belt runs 27 and communicating with a vacuum

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duct 74 suspended from the apron 73. Accordingly, the ports 75 are laterally offset from the path of travel of the respective batt strips 18.

As shown in FIGURES 3 and 4, the edge margins of the apron 73 support side plates 76 which are provided with bearings for the four cross shafts 77 to which end sprockets 78 are applied. The sprockets 78 mesh with interconnecting chains 79. One shaft 77 has an additional sprocket 82 meshing with the driving chain 83. Chain 83 meshes with drive sprocket 81 mounted on shaft 84. Shaft 84 desirably receives through conventional mechanism (not shown) power from the same source as drives the conveyor belts 27. Accordingly, the chains 79 move in timed co-ordination with the belts 27.

Laterally aligned spaced air hoods 32 are mounted on the chains 79 as best shown in FIGURE 5. At spaced intervals along the chain 79, are provided paired cross-bars 85 on which the hoods 32 are screwed or otherwise secured. In the specific apparatus illustrated, chains 79 are provided with two sets of paired bars 85 and hoods 32. The longitudinal spacing between the sets of hoods determines the spacing between the gaps 47 formed in the batt strips 18. The lowermost shafts 77 for chains 79 are relatively widely separated so that a set of hoods 32 will be positioned against the advancing batt strips 18 before the portions of the batt covered by the hoods reaches the vacuum duct 74. Even if the duct 74 is continuously at sub-atmospheric pressure, batt material will not be removed from the strip until the hoods 32 are laterally aligned with the inlets 75, thus to direct the stream of air entering the inlets 75 through the hoods and against the batt segments. Of course, I may optionally provide conventional apparatus to evacuate duct 74 only periodically, when the hoods 32 in their position substantially as shown in FIGURE 4.

At a timing of the parts shown in FIGURE 4, a timing cam 86 mounted on shaft 84 engages the actuator 90 of valve 87 in the compressed air supply pipe 88.

Pipe 88 supplies air under pressure to the nozzles 89. Note that the nozzles 89 are directed laterally into the hoods 32 which have their respective end walls 92 at an appropriate angle to direct the convection current of air induced by the vacuum duct 74 and pressure of nozzles 89 into the ports 75 which are then directly below the inclined ends 92 of the hoods 32. The stream of air picks up by convection the loosely compacted fibers of the segments of batt material localized beneath the hoods 32 and carries such fibers through the vacuum duct 74 to a point of deposit which may conveniently be the mass of batt material in the batt forming machine 14.

In some cases, vacuum alone is sufficient to remove

the segment of batt material from beneath the hoods 32. In other cases, the addition of pressurized air from the nozzle 89 is beneficial. In any event, gaps 47 intervening between spaced batt portions 33 are formed by removing by convection segments of batt material beneath the hoods 32. To prevent loss of vacuum, the bars 85 may be provided with sealing pads 93 of rubber or the like which bridge across the conveyor belts 27 between the laterally spaced batt strips 18.

The removal of batt material segments occurs concurrently with continued forward movement of the conveyor belts 27. Substantially immediately after the batt material segment has been removed from beneath the hoods 32, cam 86 will have rotated to the point where actuator 90 for valve 87 is released to shut off the supply of air to nozzles 89 and de-energize blower 31. Accordingly, the batt strips 18 between the spaced sets of hoods 32 are not displaced by any convection current until the next set of hoods 32 is positioned upon the batt strips and reach FIGURE 4 position when cam 86 again actuates valve 87 and blower 31.

I claim:

1. In a device of the character described a pad severing knife comprising co-acting serrated knife blades, one of said blades having a clearing bar mounted for reciproca-tion thereon.

2. The device of claim 1 in which one of said blades is provided with means mounting it for rotation, the other said blade being stationary, a motor for said clearing bar and means for energizing said motor to clear said blade after co-action of said blades.

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