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[21] Appl. No. **874,450**
[22] Filed **Nov. 6, 1969**
[45] Patented **June 8, 1971**
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[50] Field of Search..... 271/18, 19,
42; 294/61; 112/203; 221/213-216

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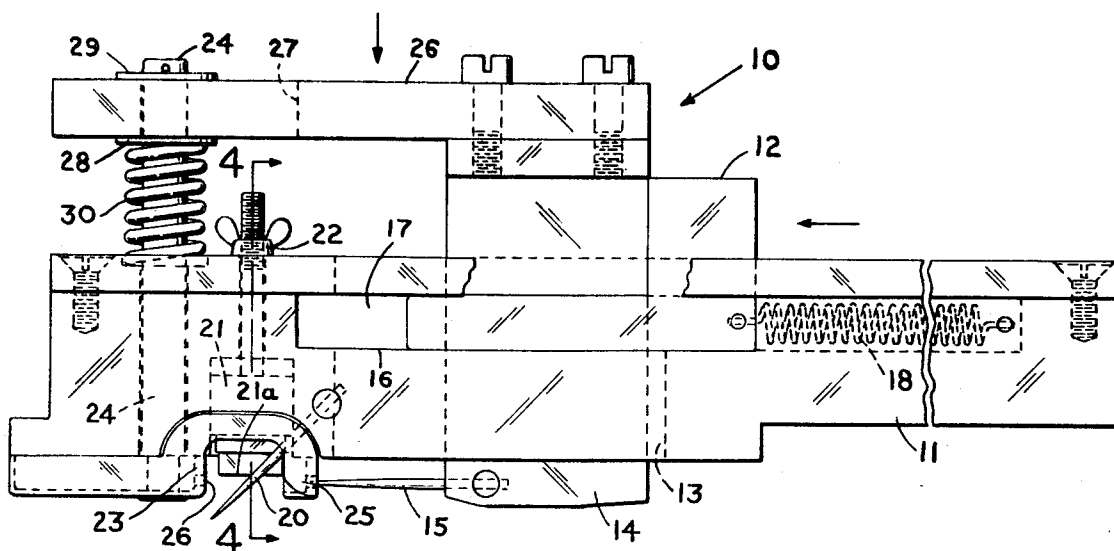
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[54] **PLY SEPARATING MODULE**
6 Claims, 7 Drawing Figs.

[52] U.S. Cl..... 271/19,
221/216, 294/61

[51] Int. Cl..... B65h 3/22,
B65h 3/30

ABSTRACT: A device and method of lifting one cloth sheet from a stack of many sheets, using two angular needles on which the fabric is caused to ride as the two needles are pushed into the cloth, and a skiving needle which pierces one ply and holds that ply while the device is backed away from the stack and moved to another location.



PLY SEPARATING MODULE

BACKGROUND OF THE INVENTION

The field of the present invention is ply separation and feeding, and more particularly, separation of one or a selected number of plies of cloth from a stack. The invention is particularly useful in separating and feeding a single piece of cloth from a stack of many pieces. Vacuum systems have been used in the past to separate sheets of paper and other materials from a stack but are somewhat unreliable for separating pieces of cloth because of the porosity of the cloth. At any rate, a vacuum system tends to be fairly complicated.

In lieu of vacuum system lifting pins have been used to pick up cloth. The pin-lifting apparatus known to the inventor have a drawback in that they tend to pick up or deliver more than one ply (or the selected number of plies) from the stack. This is due to the fact that the pins go through the first layer and snag on a lower ply which is not to be lifted. Another difficulty is that the stacked pieces tend to stick together and cling to each other because of such things as static electricity, bits of the cut edge being intertwined due to the cutting, or actual fusing at the edges (if thermoplastic threads are used).

SUMMARY OF THE INVENTION

The present invention overcomes the various disadvantages found in the prior art devices by utilizing two sets of needles. There is provided a module with two angled lifting needles which work in cooperation with a skiving needle and an adjustable ceiling.

Pressure from the lifting needles is brought to bear against the top sheet of the material so that the lifting needles penetrate several layers of cloth. The picking module (containing the needles) is moved generally parallel to the surface of the stack so that the cloth pieces which have been pierced by the lifting needles will ride up the needles and be urged against the ceiling which is located between and generally above the lifting needles. The skiving needle is then moved between the two lifting needles and parallel to the ceiling so as to pierce the cloth which is bunched up against the ceiling. The number of plies pierced by the skiving needle will be determined by the distance of the skiving needle from the ceiling. For a single piece, the distance would be slightly less than the thickness of one ply. Once the skiving needle has securely engaged the cloth the skiving needle is dragged downward and simultaneously the module is backed-off from the stack thereby stripping the plies not pierced by the skiving needles from the lifting needles. The end result is that the ply or plies to be lifted and separated from the stack are securely held on the skiving needle so that the picking module may be moved to a new location in order to deliver the separated ply or plies to that location.

A principal feature of the invention is that it will separate one or a selected number of plies effectively and efficiently and with the required reliability.

THE DRAWINGS

The invention will be more easily understood with reference to the drawings wherein:

FIG. 1 is a side elevational view of a pickup module constructed according to the principles of the present invention;

FIG. 2 is a top view of the module of FIG. 1;

FIG. 3 is a bottom view of the module of FIG. 1;

FIG. 4 is a sectional view taken through 4-4 of FIG. 1; and
FIG. 5a, 5b and 5c are operational views showing the module in various modes.

The drawings should be understood to be more or less of a schematic representation. Like numerals identify like elements in the several views.

DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. 1 shows a ply separating module designated generally as 10. The module includes a housing 11 which carries the various working parts. An actuator 12 rides in a through slot 13 cut in the housing. A tongue 14 rides in turn within a slot in the actuator. The tongue carries at its bottom end a skiving needle 15 disposed parallel to the bottom surface of the housing. The actuator slides on bearing surface 16 formed by cutaway portion 17. Tension spring 18 is attached to the actuator and serves to automatically return the actuator to a rest position after the actuator has traveled toward the working end of the module.

In the working end of the module are located two angled lifting needles 20; an adjustable ceiling 21 is located between the two needles and is movable up and down. A locking nut 22 may be provided to assist in maintaining the position of the ceiling. A receiver 23 is attached to spindle 24 which is slideably movable in the housing. The receiver forms a generally U-shaped portion about the lifting needles. Holes 25 and 26 are provided in the receiver plate. The skiving needle in its rest position is located so that its point just engages hole 25. As the tongue 14 is moved by the actuator toward the working end of the module, the skiving needle crosses the gap formed by the receiver and enters hole 26. It can be seen that the adjustment in the ceiling moves the ceiling toward and away from the skiving needle and thereby adjusts the clearance between the ceiling and the needle.

The ceiling configuration preferably comprises a slightly rounded face 21a; however, the ceiling could also be a flat portion. Typically the face is only slightly wider than the skiving needle although within limits this does not appear to be a critical aspect of the design.

A plate 26 is securely attached to the tongue at one end. Referring now to FIG. 2, the spindle 24 protrudes through a slot 27 cut in the plate. The slot allows for relative motion between the spindle 24 and the plate 26 as the tongue is moved back and forth. The plate would be typically attached to some suitable actuating means (not shown in the FIGURE) 24.

Referring again to FIG. 1 collars 28 and 29 allow the plate to move in relation to the spindle backwards and forwards but cause the spindle to move up and down with the plate. The plate rigidly connects the receiver and the tongue and allows both the receiver and the skiving needle to be moved downward together for casting off the fabric from the lifting needles. A spring 30 may be utilized to return the receiver and the needle to their original position.

FIG. 3 shows the location of both lifting needles 20 in relation to the adjustable ceiling 21 and the skiving needle 15. The lifting needles are typically disposed at an angle of about 45° with respect to the ceiling. As the module comes down generally parallel to the stack for the lifting operation, the needles can be considered to be at an angle of approximately 45° with respect to the top of the stack of cloth.

FIG. 4 illustrates in sectional representation the placement of the ceiling and the three needles. The adjustable ceiling 21 is movable up and down in the space between the two lifting needles. The ceiling is movable toward or away from the skiving needle depending on cloth thickness and/or number of plies to be picked in a single operation. It is apparent that the adjustment between ceiling and skiving needle could alternatively be achieved by providing for up and down movement of the needle while holding the ceiling in a fixed position.

FIGS. 5a, 5b, and 5c illustrate typical operation of the module and show respectively locking the cloth in the module, castoff of unwanted plies and release of the picked ply.

In typical operation the module is moved down so that the lifting needles just engage the top ply of fabric. The motion is then down and along the top of the stack so that several pieces of cloth will be forced up the needles and against the ceiling 21. The forward motion of the module holds the plies against the ceiling as a wrinkle in the cloth. The horizontally disposed,

sliding skiving needle then moves between the lifting needles and through the top ply of cloth in the wrinkle or through any number of plies depending on the clearance between the ceiling and the skiving needle. Concurrently with the movement of the skiving needle or immediately thereafter, the skiving needle is moved downward forcing all the unwanted plies off the lifting needles (FIG. 5b). This action is assisted by the receiver piece which slides down along with the skiving needle. The skiving needle and the receiver may thereafter be returned to their original position. In such a case only the plies pierced by the skiving needle return. The other plies, due to the resistance of the lifting needles, tend not to return even though there are forces acting to return them such as static forces or intertwining of the threads or fibers. The entire module is then moved up and away from the stack and to a new position such as a sewing station. Once the module is at the new station, the actuator is returned to its rest position, thereby withdrawing the skiving needle from the fabric. Preferably the skiving needle is in the down position at this stage so that the cloth no longer engages the lifting needles and may fall away from the module without interference from the lifting needles when the skiving needle is withdrawn. (FIG. 5c). The module is then returned to the stack to lift further pieces from the stack.

In a typical operation several of the above described modules may be used. For example, a module may be used at each corner of the fabric to be lifted.

It will be appreciated by one skilled in the art that a wide

variety of changes may be made without departing from the scope of the invention. For example, certain features of the apparatus may be used independently of others and equivalents may be substituted for the various elements and steps all within the spirit and scope of the invention.

I claim:

1. Apparatus for separating a single ply from a stack comprising: a ceiling; two lifting needles disposed on the ceiling and angled with respect to the ceiling; a skiving needle disposed generally horizontally with respect to the ceiling; and means for moving the skiving needle between the lifting needles and generally horizontally with respect to the ceiling.

2. The apparatus of claim 1 wherein the ceiling is adjustable toward and away from the skiving needle.

3. The apparatus of claim 1 including means for moving the skiving needle down and away from the ceiling and generally toward the points of the lifting needles.

4. The apparatus of claim 3 including a generally U-shaped receiver, having a through hole adapted to receive the sliding skiving needle and located on one leg of the U.

5. The apparatus of claim 1 wherein the ceiling comprises a rounded surface approximately the same width as the skiving needle.

6. The apparatus of claim 4 including means for moving the receiver, simultaneously with the movement of the skiving needle, away from the ceiling and toward the points of the lifting needles.

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