April 9, 1957 A. Y. NOOJIN, JR., ET AL 2,788,069

METHOD AND MEANS OF SUBDIVIDING SHEET MATERIAL INTO PIECES

Filed Nov. 30, 1954 3 Sheets-Sheet 1

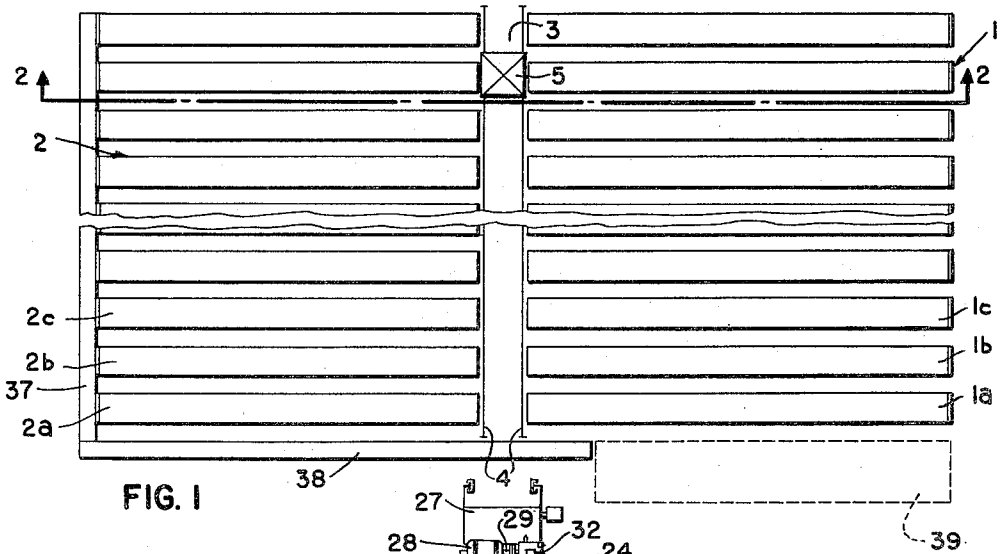


FIG. 1

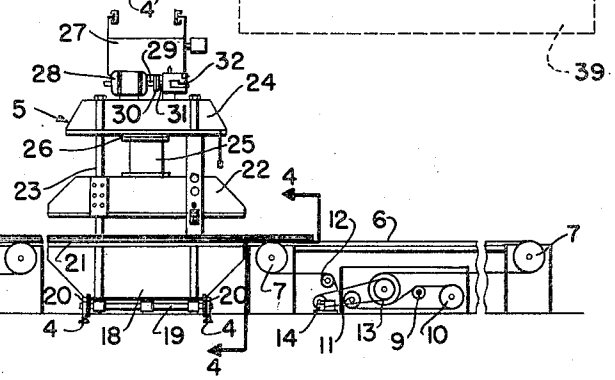


FIG. 2

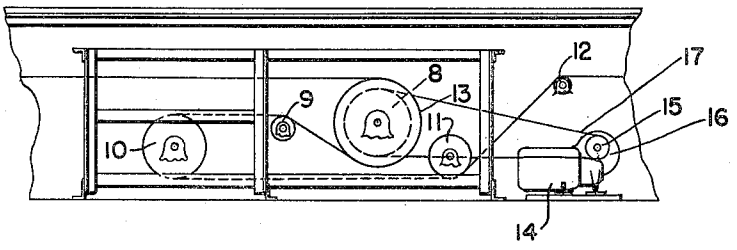
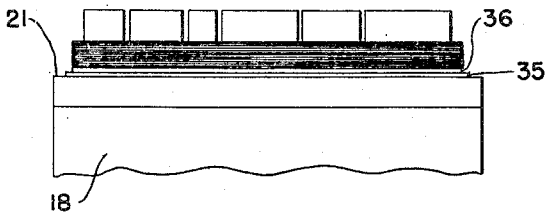


FIG. 3



FIG. 4



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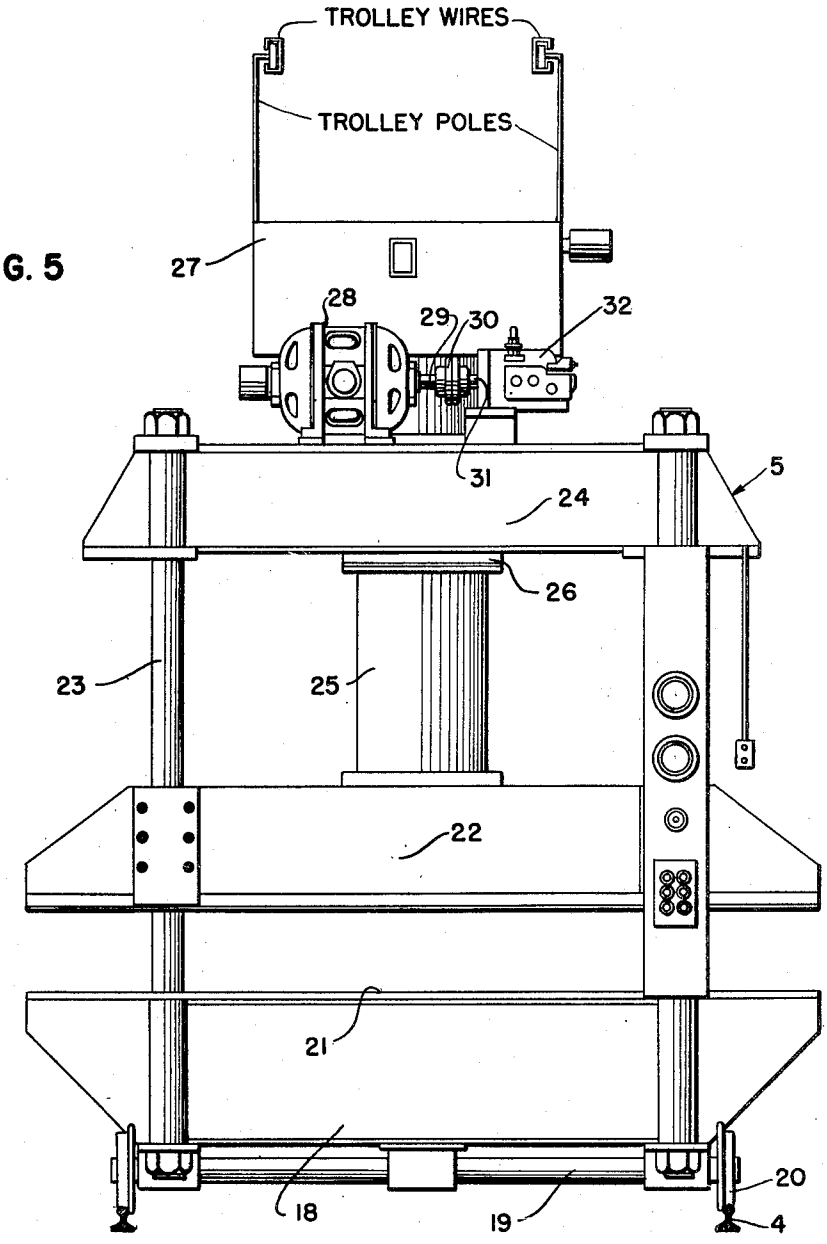
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April 9, 1957 A. Y. NOOJIN, JR., ET AL 2,788,069

METHOD AND MEANS OF SUBDIVIDING SHEET MATERIAL INTO PIECES

Filed Nov. 30, 1954 3 Sheets-Sheet 2

FIG. 5



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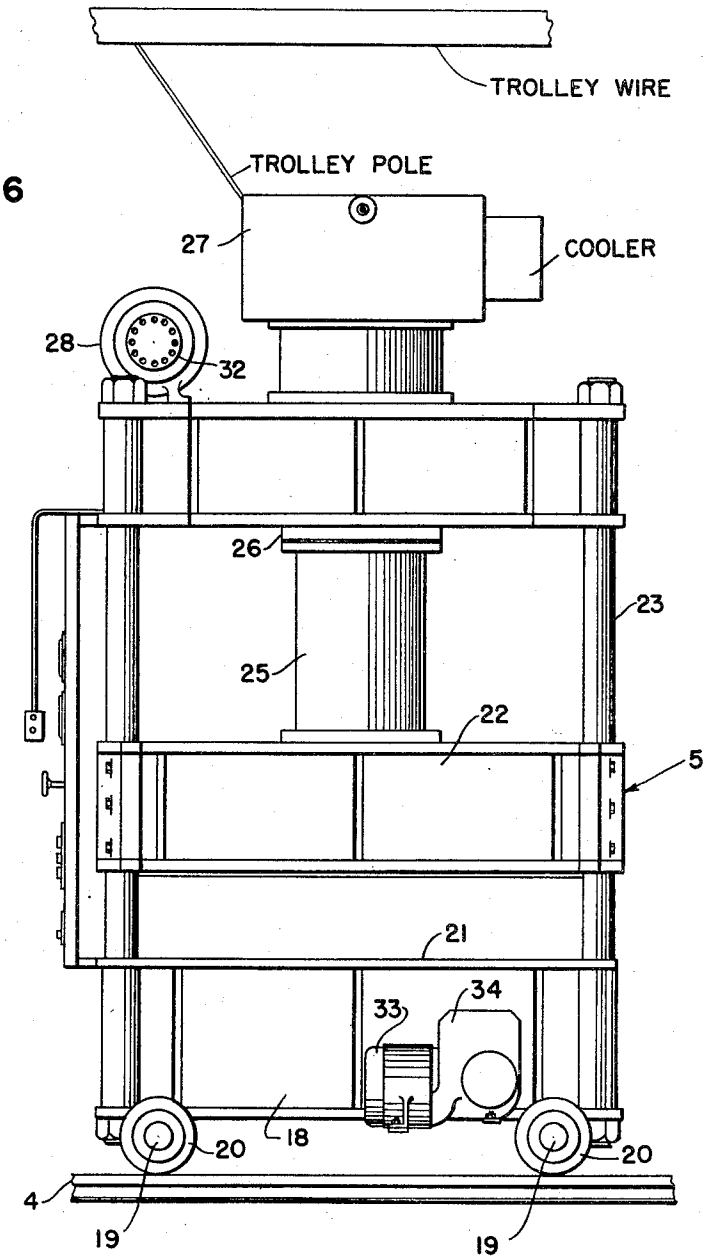
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April 9, 1957 A. Y. NOOJIN, JR., ET AL 2,788,069

METHOD AND MEANS OF SUBDIVIDING SHEET MATERIAL INTO PIECES

Filed Nov. 30, 1954 3 Sheets-Sheet 3

FIG. 6



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2,788,069

METHOD AND MEANS OF SUBDIVIDING SHEET MATERIAL INTO PIECES

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Application November 30, 1954, Serial No. 472,096

5 Claims. (Cl. 164—17)

This invention relates to a method and apparatus for sub-dividing sheet material, such as fabric, into pieces of selected sizes and shapes.

Heretofore in the industry of garment making, for example, fabric webs have been cut into garment parts of the desired sizes and shapes largely by hand cutters employing patterns and a hand-manipulated knife or cutter. Hand cutting is a highly skilled craft which requires years of training, with resultant high labor costs, and a low volume of production. Recognizing this, manufacturers attempted on numerous occasions to mechanize the cutting operations. To some extent, this was accomplished by a clicker die press by means of which small parts of simple design, such as collar parts and cuff linings, were die cut. Attempts to die cut all parts of a garment resulted in increased material costs and inability to efficiently die-cut patterns, designs and stripes without substantial waste of fabric.

An object of this invention is to provide an improved apparatus and method of cutting sheet material, such as fabric sheets or webs, into predetermined selectable sizes and shapes, such as all garment or article parts, which will provide maximum economy in consumption of material per garment or article, which will be faster than the antiquated hand-cutting heretofore used, which will have the accuracy of hand cutting or better, and which will permit the die-cutting of patterns, designs and stripes that heretofore were incapable of being cut in quantity by dies.

Another object of the invention is to provide an improved method and means for producing garment parts that are to be assembled into a garment, which are uniform in contour, one lot with another, thereby eliminating the high cost of repair in garments caused by the inability of production sewing machine operators to create a proper seam due to the garment parts being undercut or overcut in size which at times occurs with hand cutting of the parts.

Another object of the invention is to provide an improved method and means for producing garment parts of such uniformity that gauges and stops may be employed on production sewing machines to aid in the sewing operation, thereby lessening the need for highly skilled sewing machine operators.

Other objects and advantages will be apparent from the following description of one embodiment of the invention, and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawings:

Fig. 1 is a schematic top view of two banks of aligned cutting tables with the cutting machine positioned between said banks of tables;

Fig. 2 is a side elevation of the cutting machine, cutting board and conveyorized cutting tables constructed in accordance with this invention, and viewed from the line 2—2 of Fig. 1;

Fig. 3 is an elevation of a part of a table and the belt operating means on a larger scale than in Fig. 2;

Fig. 4 is an elevation on a larger scale than in Fig. 2 of certain details of the press, and showing the work and dies in cutting position relatively thereto, as viewed approximately along the line 4—4 of Fig. 2, but with dies in operative position;

Fig. 5 is an end elevation of a cutting machine constructed in accordance with this invention, but on a larger scale than in Fig. 2; and

Fig. 6 is a side elevation of the same.

In the illustrated embodiment of the invention, and referring particularly to Fig. 1, a plurality of spreading tables 1 are arranged in a row or group and along side of this group of spreading tables, a plurality of similar bundling tables 2 are arranged. The tables of both groups are relatively long, approximately 70 to 80 ft. long. The bundling tables are arranged in end to end alignment with corresponding tables of group 1, but with an aisle 3 between them. For convenience of reference, the tables of group 1 will be identified in order as tables 1*a*, 1*b*, 1*c*, etc., and the tables of group 2 will be similarly identified as tables 2*a*, 2*b*, 2*c*, etc., with table 2*a* being disposed in end to end alignment with the table 1*a*, and with the table 2*b* in end to end alignment with the table 1*b* and so on throughout the group. In the aisle between the groups of tables, rails 4 are provided which run lengthwise of the aisle. A suitable mechanical press 5 is mounted to run on the rails and be selectively placed in alignment with any of the aligned tables 1 and 2. The sheet material, such as fabric, is moved progressively through the press and there cut into pieces conforming to selected shapes and sizes. The material, as cut, is conveyed on to the bundling table which is aligned therewith. After the fabric on one of the operating tables has been moved through the press and subdivided into the desired shapes and sizes, the press is then moved alongside another pair of aligned tables and the operation is then repeated upon the sheet material or fabric that is carried on such other spreading table. Thus the press is moved from one pair of aligned tables to another and the same operations repeated for that pair of tables. After the press has been moved to another pair of tables, the spreading tables previously used are provided with fresh material to be cut into the desired shapes and sizes.

Referring next to Figs. 2, 3 and 4, each of the tables is provided with a conveyor belt 6, of the endless type, which has an upper stretch running on top of the table from end to end. At each end of each of these tables, the endless belt passes around a guide drum 7 which is rotatably mounted in the frame of the table and from the drum 7, which is at the end farthest from the aisle 3, the belt 6 passes to and around a drum 8 which is rotatably mounted in the frame below the top surface thereof and then the belt passes over an idler drum 9, thence around an idler takeup drum 10 which is shiftable lengthwise of the table and held in different shifted positions so as to apply the necessary tension on the belt conveyor and take up any slack therein. From the drum 10, the belt passes around an idler drum 11 which is also rotatably mounted in the table frame, thence over an idler drum 12 to and around the other drum 7 which is at the opposite end of the table from the drum 7. The belt conveyor is moved endwise and given linear travel by driving forces applied thereto by the drum 8 which may, for convenience, be called the driving drum. Coupled to, or fixed on this drum, is a pulley 13. An electric motor 14 mounted on the frame of the table, operates a driving pulley 15 through a speed reduction mechanism 16. A driving belt 17 passes around the pulleys 13 and 15 and thus the operation of the

motor will transmit linear motion to the endless belt conveyor. The motor is a reversible motor so that it may be operated selectively in either direction and under suitable controls disposed convenient to the aisle.

Each of the tables **2** also has a similar endless belt conveyor **6** which is operated in a similar manner and selectively in either direction. Similar parts have similar reference numerals in the tables **2**.

The press **5** may be any suitable high pressure press, such as a mechanically operated press, or preferably a hydraulic press. This press has a base **18** which is provided with a pair of spaced apart, parallel axles **19** extending across the press in a direction crosswise of the aisle, and carrying flanged, railroad-type wheels **20** that ride on the rails **4**. By means of the wheels **20** and the axle **19**, the press operates as a railway car which may be rolled along the track and aisle so as to place the press in a position to bridge the gap across the aisle between any pair of the spreading and bundling tables. The press has a pressure abutment **21**, the upper surface of which is disposed at approximately the same level as the level of the upper stretch of the endless belt conveyors **6** of the aligned tables. The ends of the abutment **21** are disposed in close proximity to the ends of the tables **1** and **2** so that there will be but a small gap between the press and the tables in alignment therewith. The press also has a platen **22** which is guided vertically on posts or strain rods **23** that connect the abutment **21** with a head **24**. Attached to the upper face of the platen is a ram or piston **25** which extends upwardly into a downwardly opening cylinder **26** that is carried by the head **24** (see Fig. 5). Mounted on the top of the press head **24** is the usual surge tank **27**.

An electric motor **28**, having its shaft **29** coupled through a coupling **30** to the shaft **31** of a pump **32**, serves to provide the operating fluid under high pressure for the operation of the press. The pump is connected at its intake side to the surge tank and at its output side alternately to the ends of cylinder **26**. The pump is preferably of the variable delivery type and may be of the reversible type, or it may employ a reversing valve in order to selectively divert the operating fluid under pressure to one end or the other of the cylinder **26**, in order to cause descent or elevation of the piston **25** and platen **22**. Hydraulic presses of this type are well known in the art and therefore a detailed description of the same and of the controls and hydraulic circuits employed have been omitted in the interest of clarity. Such hydraulic presses are commonly equipped with control mechanism which, when initiated, will cause a descent of the ram or piston **25** to a desired and selected position in its advance, which is of course adjustable, and then will automatically return to its elevated position and stop. This type of press may be purchased in the open market from any of a number of manufacturers, and therefore the press has been illustrated only schematically.

An electric cooler, if desired, is provided along one side of the surge tank through which oil from the surge tank may be circulated to be cooled, and returned to the tank, in order to prevent overheating of the oil. A double trolley wire is provided above the press along the aisle, and trolleys on the press running to such trolley wires or rails supply current to the electric motor **38** and to the cooler which keeps the oil cool. Also mounted on the carriage of the press is an electric motor **33** (Fig. 6) which operates through a speed reduction mechanism **34** to drive one of the axles mounting flanged wheels **20**. Thus by operation of the motor **33**, the press may be operated along the rails to any desired position along the aisle, and thus be placed in alignment with any desired pair of aligned spreading and bundling tables **1** and **2**.

Before placing the material to be cut upon the spreading table, a traverse board **35** of Fig. 4 which may, for convenience, be of linoleum or other similar material which is somewhat flexible, is placed upon the upper stretch of the conveyor belt of a spreading table. This traverse board extends approximately the length and width of the table. A cutting or fiber board is then placed upon the traverse board, and is approximately the same size in face area and aligned therewith. The sheet material to be cut is then spread in successive layers upon the cutting board **36**, so as to form a stack of layers thereon of the desired thickness. This spreading may be performed in the usual manner in which fabric is spread on cutting tables of garment factories at the present time, i. e. by passing a carrier with a supply of fabric back and forth along the table and shifting the sheet material progressively to the table as it moves to define a spread. The fabric layers so spread upon the cutting board, extend for nearly the full length of the cutting board. After the layers have been spread to the desired stack thickness, the cutting dies representing the different parts of an object or garments are then placed upon the stack of layers, first at the end nearest the aisle, and are so arranged closely and compactly on the stack of layers of fabric or sheet material that there will be a minimum of waste of the fabric between the various dies. To help an unskilled or semi-skilled worker arrange the individual dies for minimum wastage, a layout template may be employed. Such a template may be a paper or fabric sheet having the correct die layout marked or printed on the upper face thereof. The template is placed over the upper face of the stack of layers and the dies are arranged upon the template according to the delineated die arrangement thereon.

When the dies are so arranged, the conveyor belt on that spreading table is operated, by operation of its motor **14**, to move the belt in a direction to carry its upper stretch which forms the top of the table toward the aisle. The traverse board and the cutting board with the stack of layers thereon, and the dies move over and across the abutment **21** of the press until the dies are disposed beneath the platen **22**. The operator then initiates an operation of the press, and when this happens the platen **22** descends and forces the dies which are resting on the stack of layers, downwardly through the layers and against the cutting board **36**. The press is set to stop the movement of the platen just when the cutting edges of the dies reach and engage the cutting board, and then the platen is returned to its elevated position, usually and preferably automatically, and then stopped. The operator then removes the dies from beneath the platen and rearranges them on more of the fabric stack that is next ready to move beneath the platen in a similar, compact and close arrangement to one another, after which the conveyor of the spreading table is further operated in the same direction to carry the traverse board and its fiber board further to the left in Fig. 1, and thus carry the portion of the stack of layers having the dies thereon beneath the platen **22** and over the abutment **21**. This carries the cutting from the first operation over upon the belt **6** of the bundling table to the left of the press in Figs. 1 and 2. The traverse board **35** and cutting board **36** serve to continue the conveyance of the cut parts over upon the aligned bundling table **2** where they are tied in bundles and marked. They are then sent to a central storage place, by conveyor.

The conveyor **6** on table **2** is usually operated at the same time that the conveyor **6** on table **1** is operated, and of course both operate in the same direction and thus aid in feeding of the superposed boards **35** and **36** and the fabric layers thereon through the press and over upon the bundling table. When the second group of dies are under the platen **22**, the operator then initiates another cycle of descent, elevation and stop as explained above.

When the platen rises and stops, the operator can then remove the dies and place them on still another uncut part of the stack of layers which is nearest to the press and then the operation of moving the superposed boards and fabric layers through the press is continued. If it should be inconvenient to remove the dies from beneath the platen, the operator could reverse the direction of travel of the endless belt **6** of the two aligned tables between which the press is placed and thus move the dies and cuttings from beneath the platen over on the table **1** where they could be more easily reached.

In accordance with the present invention, all the parts of a shirt, for example, except possibly loop strips, may be die-cut in this manner. The loop strips may also be die cut, but it may be desirable to cut them separately from scrap fabric that would otherwise be wasted. For pinned work, the fronts, collars and pockets will be blocked out on the spread with a cutting machine, or with block-out dies, and the dies for those parts placed on the fabric after it has been aligned as to patterns. After all parts have been cut from a stack, the parts will be ply-numbered and bundled and sent to an assembly room. The die cut shirt parts receive ply numbers in an effort to keep material of the same shading together otherwise a shirt may be assembled whose parts may vary in shade. After all of the bundles have been removed, the operator of the press then operates the endless conveyor **6** of both aligned tables to carry the traverse and cutting boards together over upon the original spreading table **1** where they are ready for a new supply of sheet material to be spread thereon. The press then moves into position between two other aligned tables **1** and **2** where the die cutting operations are repeated. The traverse board and cutting board may, if desired, be moved back to the original table after the press has been moved along the aisle into a position between other aligned tables, by keeping the board or boards temporarily from sagging when crossing the aisle. A temporary support can be placed in the aisle to support the boards while they are conveyed empty back to the spreading table **1**.

In the cloth spreading operation on the conveyor table, prior to die cutting, fewer plys may be spread and shading may be employed thereby eliminating the necessity of ply numbering after the plys have been cut and bundled.

In the illustrated embodiment, separate but superposed traverse and cutting boards are provided because the use of both has certain advantages, but one of these boards can, if desired, be eliminated, in which event the retained board serves the function of both cutting and traverse board.

Referring particularly to Fig. 1, endless conveyors **37** may be arranged to run along the ends of the bundle tables **2** which are remote from the aisle, and to deposit any bundles placed thereon upon another conveyor **38** which runs parallel to the bundling table **2***a* and delivers the tied bundles into a storage bin **39**. The dies are preferably tapered on the inside, so that outside walls of the dies may be placed close together and thus reduce to a minimum, the waste cuttings between adjacent dies.

It will be understood that various changes in the details, materials and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

We claim:

1. Apparatus for die cutting sheet material into pieces having selected shapes and sizes, which comprises a plurality of tables arranged side by side and spaced apart, in two groups, with a space between the groups, and with the tables of each group in end to end alignment with those of the other group, a track extending lengthwise along said space between the groups, a car running on said track so as to move into positions between any aligned pair of tables, each table having as its upper surface the upper stretch of an endless conveyor, a cutting board on each table conveyor of one group and approximately coextensive in length with that table, means for causing movement of each conveyor selectively in either direction, said car having an open ended, horizontal abutment at approximately the same level as the upper stretches of the conveyors, and also having a platen and power means for causing it to descend until it reaches a selected measured distance from its said abutment, and then return, whereby while said platen is elevated, the operation of said endless conveyors on two endwise aligned tables between which the car is located, may move said cutting board with any sheet material layers thereon from the table at one side of the car, across the car, and deposit them upon the other table at the opposite side of the car, and when cutting dies are arranged upon a stack of layers on said cutting board on one table, they may be moved first beneath the platen with the layers and cutting board, and there forced by descent of said platen through the stack of layers to subdivide the layers into sub-stacks of layers of desired shapes and sizes, and the sub-stacks thereafter conveyed with the superposed board over upon the other endwise aligned table, and the car then moved into the space between another pair of endwise aligned tables and the operation repeated.

2. The method of die cutting fabric into pieces having selected shapes and sizes, which comprises arranging tables in rows of pairs, with the tables of each pair in end to end alignment but spaced apart, moving a power press selectively into positions between the ends of any pair of tables, placing on a table of said any pair a cutting board, then arranging the fabric in a stack of superposed layers upon said board, placing a plurality of separate, individual cutting dies on one face area of the upper surface of said stack in a selected close relationship to each other, moving said board with superposed stack and dies towards the other table of the pair until said one face area is over the space between the adjacent ends of that pair of tables, then forcing the dies through the stack and against the cutting board to subdivide the stack into sub-stacks of superposed pieces, removing the dies and placing them on an uncut area of the stack, moving the board and stack further across the space between the adjacent ends of the tables of that pair to bring the dies again over the space between the ends of those tables, and the sub-stacks and portions of the board supporting them over upon the other table of that pair, and repeating this cycle until all of the stack has been cut into sub-stacks.

3. Apparatus for die cutting sheet material of natural and synthetic fibers and combinations thereof into pieces having selected shapes and sizes, which comprises a plurality of endless conveyors arranged parallel one to another in two groups, with a space between the groups and with the conveyors of each group in end to end alignment with those of the other group, means for imparting movement to each conveyor in the same direction, a cutting board on each conveyor of one group and approximately co-extensive in length with that conveyor, upon which stacks of symmetrically aligned layers of material to be die cut may rest, a track extending lengthwise along said space between the groups, a motorized conveyance operating on said track so as to move into selected positions between any aligned pair of conveyors, said conveyance having an open ended platform in approximately the same horizontal plane as the upper stretches of the conveyors, and also having a platen and power means for causing said platen to descend to a predetermined distance from its said platform, and then return, whereby while said platen is elevated, the operation of two endwise aligned conveyors between which the conveyance is located will cause one conveyor to move said cutting board with any material layers thereon, from the location at one side of the conveyance platform across said platform, and transfer them to the conveyor

on the opposite side of the conveyance, and when cutting dies are arranged upon a stack of material layers on said cutting board on one conveyor, they may be moved first beneath the platen with the stack and cutting board, and there forced by descent of said platen, through the stack of material layers to sub-divide the stack into sub-stacks of layers of desired shapes and sizes, and the sub-stacks thereafter conveyed with the cutting board over upon the other endwise aligned conveyor, and the conveyance then moved between another pair of endwise aligned conveyors and the operation repeated.

4. In the manufacture of wearing apparel, the method of die cutting stacks of superposed layers of fabric into pieces of selected shape and size, which method includes arranging stationary tables end to end in pairs defining a spreading and a bundling table in each such pair and with a space between the ends of each spreading table and the companion bundling table, spreading a stack of elongated superposed layers of fabric upon one of said spreading tables, arranging a plurality of cutting dies side by side upon said stack, moving said stack and dies into the space between the ends of the spreading table and the companion bundling table and, with cutting means, forcing said dies through said stack to divide the stack into cut pieces, thereinafter simultaneously moving an uncut portion of said stack with dies thereon into said space while moving the cut portion onto the companion bundling table, repeating the cutting and moving steps until said elongated stack has been substantially entirely divided into cut pieces which have been moved onto the companion bundling table, and finally moving said cutting means between another companion pair of spreading and bundling tables, the spreading table of which previously has been prepared for cutting by spreading a stack of fabric and arranging cutting dies thereon.

5. Apparatus for die cutting textile fabrics into pieces of selected size and shape, comprising a plurality of companion pairs of spreading and bundling tables arranged with the tables in each pair end to end but with a space between such ends and with the spaces defining an aisle, each said table having as its upper surface the upper stretch of an endless conveyor means for moving textile fabrics along the corresponding table, and die cutting means movable along said aisle between the ends of successive companion pairs of said tables for cutting textile fabrics fed thereto from a spreading table and carried therefrom to a companion bundling table.

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