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3,052,469

AUTOMATIC DROP-LEAF STACKER

Filed April 26, 1961

2 Sheets-Sheet 1

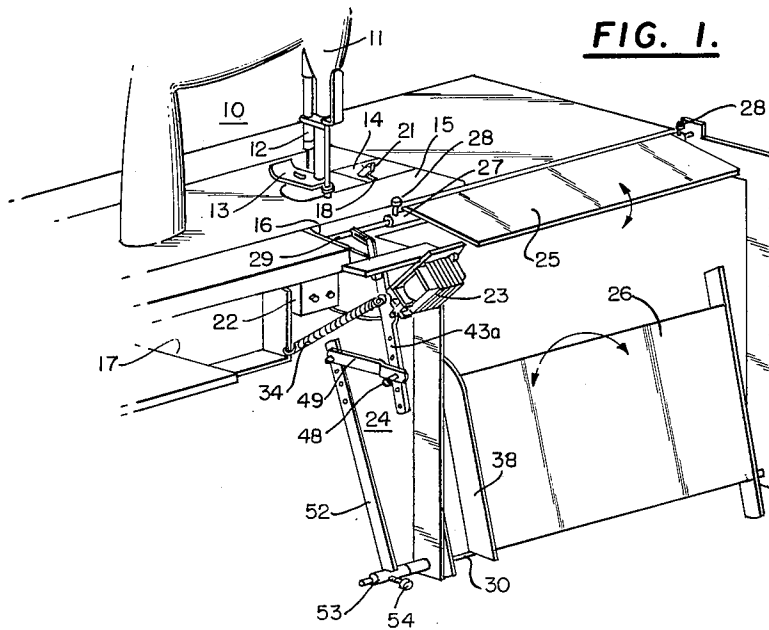


FIG. 1.

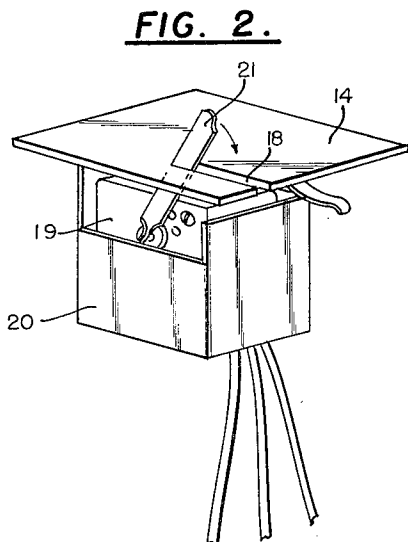
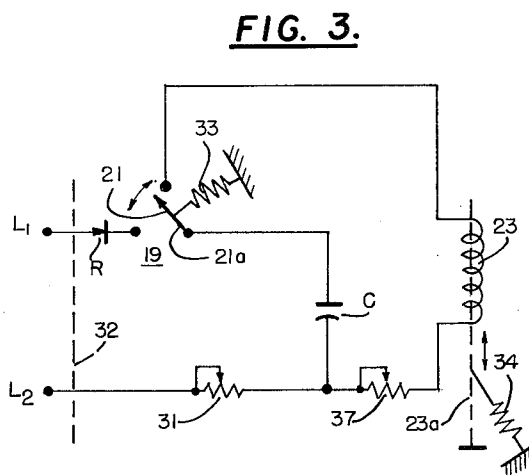


FIG. 2.



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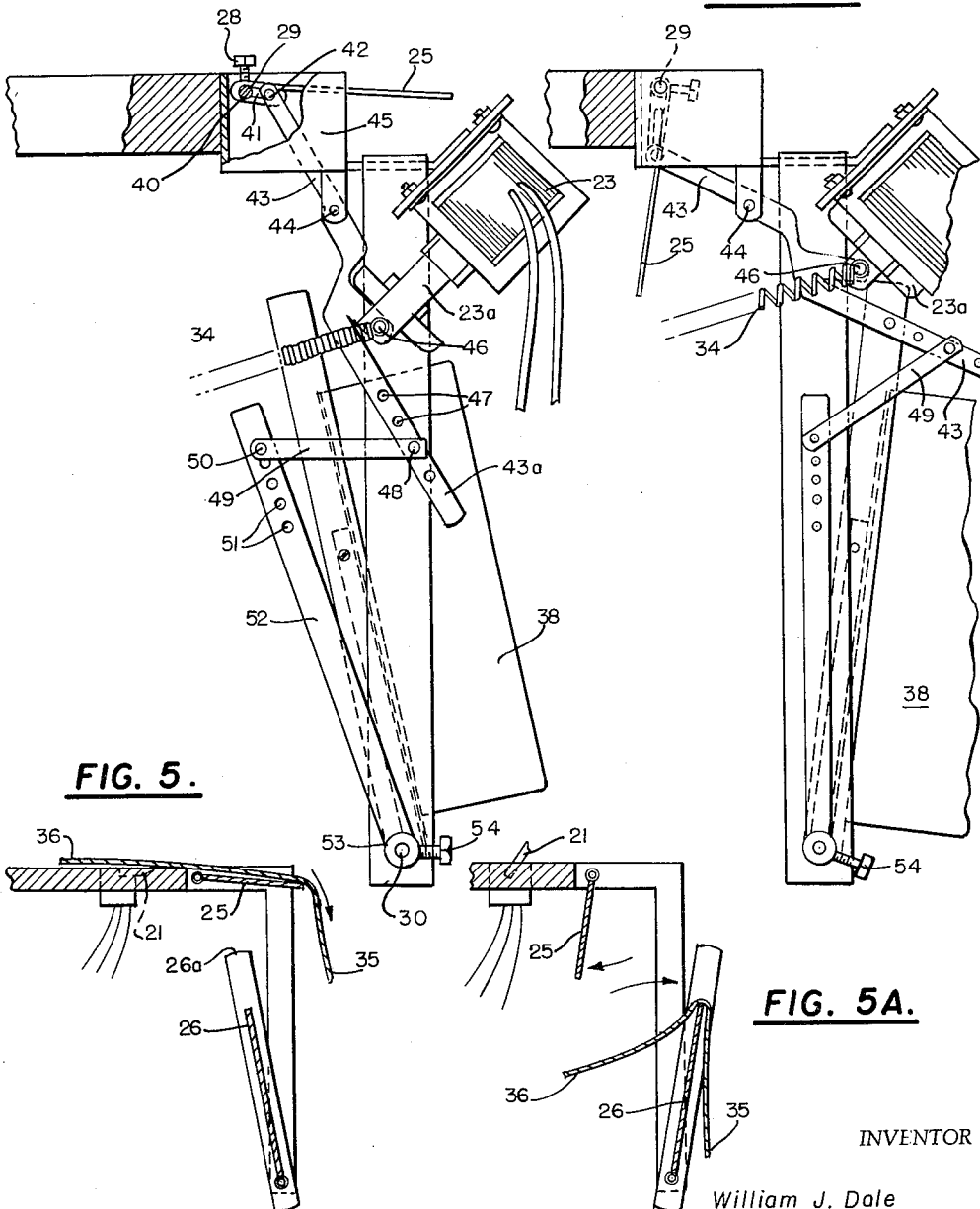
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2 Sheets-Sheet 2

FIG. 4A.



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AUTOMATIC DROP-LEAF STACKER

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8 Claims. (Cl. 271—86)

The present invention relates to automatically controlled devices usable in garment manufacture; and is more especially concerned with a device adapted to be used in conjunction with sewing machines for the automatic handling of sewn garment components. In this respect, as will appear, the control device of the present invention is particularly adapted for use in effecting an automatic stacking of sewn garment components, etc., although, as will also appear, the control concepts of the present invention may be readily employed for the activation of slide knives, cutters, and similar devices, used in conjunction with sewing machines.

In garment manufacture, step operations are normally conducted by one or more sewing machine operators who, upon receiving a bundle of garment components, e.g. a bundle of shirt sleeves or the like, perform a stitching operation on each such component preparatory to further processing of the component, in conjunction with other components, by other operators in the factory. It has been conventional practice at the present time for sewing machine operators to stitch a number of such garment components, permitting said stitched components to progress in sequence off of the sewing machine table top into a bin or like collection receptacle. Upon completing the sewing of a bundle of such components, the sewing operator then interrupts the sewing of components, and individually folds, stacks and bundles the sewn components, from the bin, for transfer to the next processing operation.

This normal sequence of operation has long been recognized to be most inefficient. In particular, the manual stacking and bundling of components, by the sewing machine operator, necessarily requires that the sewing machine operation be interrupted. It is moreover tedious and time-consuming. As a result, it has been suggested that some form of machine stacker be utilized to reduce sewing operation interruptions. However, the stackers suggested heretofore have ordinarily been large, cumbersome and expensive pieces of equipment, often entailing such major installation and maintenance expenses as to render them economically unfeasible; and notwithstanding these disadvantages, stackers suggested heretofore have still required some manual operation, by the sewing machine operator, e.g. activation of the machine or close supervision thereof during the stacking operation, whereby undesired interruptions of the sewing operation still occur. As a result, notwithstanding the undesirable delays which have necessarily occurred when sewing machine operators effect the manual stacking and bundling of garment components, this type of operation has persisted in the industry for lack of a feasible alternative or commercially practical, solution to the problem.

The present invention, recognizing these problems, is concerned with an automatic stacker adapted to be readily installed on existing sewing machines with minor if any modifications thereof. The stackers of the present invention are particularly simple, inexpensive and compact pieces of equipment taking up only a small space; are easy to install and maintain; and are completely automatic in operation thereby freeing the sewing machine operator from the necessity of stacking and bundling garment components, thus permitting the operator to continue stitching without interruption.

In providing for the foregoing operation and advan-

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tages, the present invention contemplates the provision of an automatic control device installed on the machine, e.g. the sewing machine, and responsive to the presence or absence of a garment component being sewed. This control device is in turn associated with a stacker mechanism operable to direct the leading edge of the garment being sewed to a first location (e.g. toward one surface of a stacker plate) and further automatically responsive to completion of a sewing step for directing the trailing edge of the garment component to a second location (e.g. the other surface of a stacker plate). Successive garment components being sewed are thus caused to stack, one upon the other, on a collecting mechanism (e.g. a stacker plate of the type mentioned) whereafter the stacked components can be immediately taken as a group to the next processing location. The automatic control features of the invention may moreover be used to operate mechanisms other than stacker devices, e.g. knives for automatically cutting chain stitches between successive garment components, etc., and this will be apparent as the description proceeds.

It is accordingly an object of the present invention to provide improved automatically operable mechanisms for use in conjunction with commercial sewing machines and adapted to expedite sewing operations.

A further object of the present invention resides in the provision of a simple, inexpensive, and easily installed and maintained stacker structure adapted to be used in conjunction with sewing machines.

Another object of the present invention resides in the provision of an automatically operable activating device associated with a garment processing apparatus, e.g. a commercial sewing machine, for controlling the operation of further devices such as a stacker associated with said processing apparatus.

Still another object of the present invention resides in the provision of an automatic control device capable of activating slide knives, stackers, cutters, and similar devices used in conjunction with sewing machines, for the automatic handling of sewn garment components and other applications in the garment industry.

A still further object of the present invention resides in the provision of an automatic stacker capable of freeing sewing machine operators from the necessity of manually stacking and bundling garment components, thereby permitting such operators to continue stitching without appreciable interruption.

A still further object of the present invention resides in the provision of an automatically operable mechanism adapted to expedite the processing of garment components and thereby functioning to reduce the cost of garments attributable to labor.

The foregoing objects, advantages, construction and operation of the present invention will become more readily apparent from the following description and accompanying drawings, in which:

FIGURE 1 is a perspective view of an automatic garment component stacker constructed in accordance with the present invention and attached to a commercial sewing machine.

FIGURE 2 is a detail view of a microswitch sensing mechanism employed in the arrangement of FIGURE 1.

FIGURE 3 is a schematic diagram of a control circuit of the type employed in the arrangement of FIGURE 1.

FIGURE 4 is a detail side view of a linkage and components comprising the automatic stacker of the present invention, in one position of operation.

FIGURE 4A is a view similar to FIGURE 4 showing the operation of the linkage and components comprising the stacker of the present invention; and

FIGURES 5 and 5A are illustrative operational representations of the cooperating drop leaf and stacker plate

comprising components of the improved stacker of the present invention.

Referring now to FIGURE 1, it will be seen that the stacker of the present invention may be attached to a commercial sewing machine 10 comprising a sewing machine head 11 provided with a needle carrier 12, presser foot 13 (having, if desired, a chain stitch cutter associated therewith), and cloth plate 14, all mounted on a sewing machine table top 15 as is well known in commercial sewing machines.

The stacker of the present invention may be attached to the front, side, or rear of an existing table top 15, requiring only minor modification of said table top. In particular, a portion of the table top may be removed by sawing or the like, to provide recesses such as 16 and 17 for reception of various mounting components comprising unitary portions of the stacker mechanism. In addition, a slot 18 is cut into the cloth plate 14 of the machine; and a microswitch 19, housed in a bracket 20 (see FIGURE 2) can then be mounted under said cloth plate 14, said microswitch having a spring-biased actuating finger 21 extending through slot 18 to a position above cloth plate 14, adjacent the sewing machine head.

The microswitch itself, as will appear, cooperates with a control device 22 ultimately to vary the energization of a solenoid 23 associated with a linkage, generally indicated at 24 (and more specifically shown in FIGURES 4 and 4A). Linkage 24 in turn operates to effect movement of a drop leaf 25 and a stacker plate 26 (although, as will appear, the stacker plate may be stationary) comprising the main components of the improved automatic stacker of the present invention.

Drop leaf 25 is, as illustrated in FIGURE 1, attached, e.g. by welding, to a tube or sleeve 27, which is in turn held by set screws 28 on a shaft 29 pivotally mounted in the recess section 16 of the sewing machine table top. Drop leaf 25 is, under the control of linkage 24 (as will be described), adapted to reciprocate from the position shown in FIGURE 1, i.e. substantially parallel to and extending outwardly from table top 15, to a position extending downwardly and transverse to table top 15 (compare FIGURES 5 and 5A). Stacker plate 26 in turn is positioned so that the upper edge of said stacker plate underlies drop leaf 25 when said drop leaf is in its upper position (FIGURE 5), said top edge of plate 26 being exposed to falling material when said drop leaf 25 moves to its downward position (see FIGURE 5A). The stacker plate 26 may be mounted on a shaft 30 for swinging movement; or, in the alternative, it may be held stationary for reception of certain lengths of material. In this respect, and as will appear hereinafter, the stacker plate 26 may be maintained in stationary position when the garment components being sewed are relatively long whereas it may be cause to reciprocate for the stacking of shorter length components, with the actual degree of reciprocation being adjustably controllable depending upon the length of component being stacked.

The general operation of the device can possibly best be appreciated by reference to FIGURES 3, 5 and 5A. Microswitch 19, and particularly finger 21 thereof, responds to the presence or absence of cloth to effect distinct control functions. In the circuit shown in FIGURE 1, power line L1—L2 may be coupled via a rectifier R, as well as via one contact of microswitch 19, to a capacitor C; and a rheostat 31 may be provided to vary the charging time of capacitor C. Power line L1—L2 may comprise the conventional 220 volt supply normally utilized in conjunction with commercial sewing machines, being coupled via rectifier R, as indicated, to effect charging of capacitor C when the switch blade 21a (actuated by microswitch finger 21) is in its downward position as shown in FIGURE 3. In the event that it is desired to use a capacitor C and a solenoid 23 not compatible with a 220-volt supply, a transformer may be interposed in the circuit at the position generally indicated

as 32 to reduce the voltage being coupled to capacitor C to any lesser quantity consistent with the actual component selected.

Blade 21a and/or finger 21 of microswitch 19 is normally biased to its upward position by a spring, e.g. a light leaf spring, symbolically represented at 33. The armature 23a of solenoid 23 is moreover normally biased to a downward position by a further spring 34 attached, e.g. as indicated in FIGURE 1, to a stationary portion of the sewing machine. When blade 21a of microswitch 19 is in its upper position capacitor C is disconnected from the line source L1—L2; and for this condition of operation, capacitor C initially has no charge thereon, and armature 23a of solenoid 23 is held in its downward position by spring 34. The overall structure at this time, and particularly the linkage 24, serves to hold the drop leaf 25 in its upper position, and stacker plate 26 in a rearwardly inclined position with the upper edge 26a of said stacker plate underlying drop leaf 25. The relationship of the parts 25 and 26, for this initial condition of operation, thus corresponds to the relative positioning of parts shown in FIGURE 5.

As the operator commences sewing a garment component, the weight of the cloth passing across the cloth plate 14 depresses finger 21 into slot 18. This causes switch blade 21a (see FIGURE 3) to move downward against the restraint of spring 33 thereby completing a circuit via rectifier R and via adjustable resistor 31 between the line source L1—L2 and capacitor C. As the component is sewed and travels along the cloth plate, finger 21 remains in its depressed position; and capacitor C accumulates a charge. At this time moreover the component being sewed is directed by the outwardly extending drop leaf 25 to such position that the leading edge of said garment component, indicated at 35 in FIGURE 5, drapes from the forward edge of drop leaf 25 over the exterior surface of stacker plate 26. During this continued operation, solenoid 23 remains in a de-energized condition.

When the trailing edge 36 passes the position of microswitch finger 21, spring 33 operates to rapidly snap said finger 21a to its upper position (see FIGURES 3 and 5A). This movement of blade 21a then completes a circuit from capacitor C across the coil of solenoid 23 via, if desired, a further control rheostat 37. Capacitor C thereupon discharges through the coil of solenoid 23, pulling the armature 23a of the solenoid to an upper position against the restraint of spring 34. This upward movement of armature 23a, as will appear, operates linkage 24 to cause drop leaf 25 to swing to its downward position, and stacker plate 26 to swing to a forward position (see FIGURE 5A) wherefore, the trailing edge of the article will be caused to drop across the anterior surface of stacker plate 26. A guide plate 38 may, as illustrated in the various figures, be disposed along one side of stacker plate 26 to assist in the draping of material across the top edge of stacker plate 26.

Each passage of a single article across the microswitch causes a single control operation of the type described. In particular, the impinging of a single article on the finger 21 causes a control cycle to commence in which the capacitor is charged; and passage of the trailing edge of the garment component past finger 21 causes the capacitor to discharge in a single surge through solenoid 23 thereby to effect a single reciprocation of armature 23a. Once the capacitor has discharged, spring 34 operates to return armature 23a to its original position, wherein the various parts are associated generally in the way shown in FIGURE 5; and impingement of a next article being sewed will not alter this relative position of parts until after the trailing edge of said next component part has actually passed finger 21.

In general operation therefore, as each successive garment component is sewed, it is first directed toward the forward surface of stacker plate 26 until, upon completion of the sewing operation, the system operates to di-

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rect the trailing edge of the garment to the anterior surface of stacker plate 26; and successive articles being sewed are thus caused to be draped and piled one upon the other across the upper edge of stacker plate 26. The draped and stacked articles can thereafter be quickly removed as a bundle for transfer to a next operating location. Actual stacking is effected, as will be appreciated, primarily by the drop leaf operation; and the stacker plate 26 is actually provided as a means of disposing of the work.

The electrical circuit shown in FIGURE 3 may take various alternative forms. It has already been suggested that a transformer could be interposed at location 32. In addition, it has been found that, in many installations, the use of a rectifier R is not mandatory. By appropriate choice of components C and solenoid 23 and due to the rapidity with which successive sewing operations occur (e.g. an operator may sew in the order of fifteen sleeves per minute, taking a time of substantially four seconds per sleeve) the capacitance C can acquire a sufficient charge to operate the solenoid, albeit not the maximum charge, when the switch blade 21 breaks the circuit. In addition, the adjustable rheostats 31 and 37 represent refinements which may not be mandatory in practice, depending again upon the choice of components C and solenoid 23. Indeed, the solenoid 23 can be replaced by other forms of actuators, e.g. hydraulic or other fluid pressure responsive actuators. Moreover, armature 23a of the solenoid 23, or whatever other actuator is selected, need not directly operate the linkage 24, but can be employed to close another switch, e.g. another microswitch serving to control energization of a separate source of motive power serving to operate the drop leaf and/or stacker plate.

The actual operation of various preferred mechanical components forming the stacking mechanism of the present invention may best be appreciated by reference to FIGURES 4 and 4A. Shaft 29, upon which the drop leaf 25 is mounted, has a link 40 welded thereto provided with an elongated internal slot 41. A pin 42 is slidably disposed in said slot 41 and is attached to the uppermost end of a link 43. Link 43 in turn includes a first pivot 44 engaging for example a portion of angle iron 45 in which the shaft 29 is mounted; and said link 43 further includes a second pivot 46 attached to the armature 23a of solenoid 23. A prolongation 43a of link 43 extends generally downward below the position of armature 23a; and said prolongation 43 is provided with a plurality of adjustment apertures 47, any one of which may receive a set screw 48 (see e.g. FIGURE 1). Set screw 48 acts as the pivot point at the forward end of a transverse link 49, the anterior end of which link is pivoted as at 50 in any one of a further plurality of adjustment apertures 51 provided at the upper end of link 52. The lower end of link 52 is in turn attached to a sleeve 53 slidably mounted upon a prolongation of shaft 30 (associated with stacker plate 26), being held in place thereon by a still further set screw 54.

Solenoid 23 is initially de-energized, either as a result of the capacitor C having already discharged through the coil thereof, or as the result of the capacitor being in process of acquiring a charge during a sewing operation. The spring 34 accordingly holds armature 23a in its outermost or downward position (see FIGURE 4); and link 43, having been pivoted in a clockwise direction about pivot 44, has pin 42 thereof moved to the forward end of slot 41 in link 40 thereby to hold drop leaf 25 in its uppermost position. At this same time, the prolongation 43a of link 43 acts via transverse link 49 to move stacker plate 26 to its rearwardmost position.

When the solenoid 23 becomes energized, due to discharge of capacitor C through the coil thereof, armature 23a thereof quickly moves to a retracted position against the restraint of spring 34, i.e. to the position shown in FIGURE 4A. The movement of armature 23a relative

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to pivotal connection 46 causes link 43 to pivot in a counter clockwise direction about pivot 44. Pin 42, sliding initially rearward in slot 41, then acts through link 40 to move drop leaf 25 rapidly to a downward position. At this same time prolongation 43a of link 43 swings forwardly and, through transverse link 49, pulls the stacker plate 26 to a forward position. Upon completion of capacitor discharge, and the resultant de-energization of solenoid 23, spring 34 quickly operates to return the parts to their original position preparatory to a next control operation.

The adjustable set screws 48 and 50 are provided to variably locate link 49 with respect to link prolongation 43a and link 52. By varying the relative position of this link, the actual forward and rearward stroke of stacker plate 26 can be altered as desired. It has been found that stacking is accomplished with more reliability, for relatively short articles being sewed, when the stacker plate describes a relatively large arc of travel. As the length of article being sewed increases, the arc of travel necessary in stacker plate 26 decreases; and for relatively long articles no movement of stacker plate 26 at all is required, the draping of the trailing edge of the article being regularly accomplished through the action of drop leaf 25 alone. By suitable design of the various linkages, and by suitable spacing of the adjustment apertures 47 and 51, it is possible so to locate transverse link 49 that stacker plate 26 remains in a neutral substantially vertical position notwithstanding reciprocations of link 43a. It is also possible, when it is desired to hold stacker plate 26 in a stationary position, to merely disconnect link 49 at one or its other end and then to hold stacker plate 26 in any desired position by a separate lock or latch element.

It should further be noted that the embodiment of the invention shown in the drawings is what might be termed a "single drop leaf" structure, in that only one drop leaf 25 is employed. The width of such a drop leaf is, of course, limited by the spacing above the upper edge of stacker plate 26 inasmuch as drop leaf 25, in normal operation, must swing across the top of said stacker plate. This provides a limitation on the width of drop leaf 25 which, in some circumstances, may be undesirable. In particular, when extremely long articles are being sewed, it is possible that the article may drape across the forward edge of a single drop leaf 25 and extend all the way to the floor, with the possibility of soilage, before the system senses that the trailing edge of the article should be draped across the rear side of the stacker plate. In such instances, it is desirable to provide multiple drop plates acting in concert to provide a more extended drop leaf surface and operating jointly to drop to a lower position when draping of the article is desired across the stacker plate.

Moreover, while the present invention finds particular utility in conjunction with the stacking of garment components, other flexible and/or pliable articles may be similarly stacked, not only in conjunction with sewing machines but also in conjunction with other processing apparatuses and techniques which are facilitated by such stacking. The term "fabric" used in the preceding description, and in the claims, is accordingly intended to cover not only cloth, but also such alternative materials as are capable of being draped during stacking, as described.

Other variations and modifications will be suggested to those skilled in the art; and it must therefore be understood that the foregoing description is meant to be illustrative only and should not be considered limitative of my invention. All such variations and modifications as are in accord with the principles described, are meant to fall within the scope of the appended claims.

Having thus described my invention, I claim:

1. An automatic stacker for use in sewing machines comprising a movable leaf disposed in the path of travel of an article being sewed, a stacker plate mounted for reciprocating movement adjacent said leaf, and means re-

sponsive to the presence and absence of an article being sewed for variably positioning said movable leaf relative to an edge of said stacker plate, said last-named means including means for holding said leaf in a first position directing the leading edge of an article being sewed toward one side of said stacker plate, and for moving said leaf to a second position, in response to completion of a sewing operation, directing the trailing edge of said article toward the other side of said stacker plate, whereby successively sewed articles are stacked in draped superposed position across said stacker plate edge, said last-named means further including linkage means for pivoting said stacker plate through a preselected arc of travel substantially in synchronism with movement of said leaf between said first and second positions.

2. The structure of claim 1 wherein said linkage means includes means for adjusting the arc through which said stacker plate pivots for a given movement of said leaf.

3. The structure of claim 1 wherein said article responsive means comprises switch means positioned adjacent said path of travel of said article being sewed to sense both the sewing of said article and completion of said sewing, an electrical control circuit adapted to assume a conditioned state when said switch means senses occurrence of a sewing operation, and actuator means electrically responsive to the previous conditioning of said control circuit and mechanically coupled to both said stacker plate and leaf for moving both said stacker plate and leaf when said switch means senses completion of said sewing.

4. The structure of claim 3 including wherein said control circuit includes capacitor means, circuit means including said switch means for charging said capacitor means when said switch senses that a sewing operation is in progress, and for discharging said capacitor means when said switch means senses that said sewing operation has been completed, said linkage means coupling said actuator means to said leaf and said stacker plate, said actuator means being responsive to discharge of said capacitor means for moving said leaf and stacker plate in synchronism with one another via said linking means.

5. An automatic stacker for use in fabric processing machines, comprising an elongated movable drop leaf pivotally mounted along one of its elongated edges and disposed in the path of travel of a moving fabric article being processed, means for normally holding said drop leaf in a generally horizontal first position, a stacker plate disposed in generally vertical position below said horizontally disposed drop leaf, said stacker plate being mounted for pivotal movement about a lower generally horizontal edge thereof, said drop leaf overlying the upper edge of said stacker plate when said drop leaf is horizontally disposed, and article sensing means responsive to the presence and absence of said moving fabric article being processed for pivoting said drop leaf and said stacker plate in opposite rotary directions to one another from a first relative position, wherein the unpivoted elongated edge of said drop leaf is disposed adjacent one side of said generally vertical stacker plate, to a second relative position wherein the unpivoted elongated edge of said drop leaf is disposed

adjacent the other side of said stacker plate, whereby a moving fabric article being processed has portions thereof successively directed by said drop leaf toward opposing sides of said stacker plate by the combined opposing pivotal actions of said drop leaf and stacker plate thereby to drape said article across said upper edge of said stacker plate.

6. The structure of claim 5 including capacitor means arranged to be charged when said article sensing means senses occurrence of a fabric processing operation, and to be discharged when said sensing means senses completion of said processing operation, and actuator means comprising a solenoid for initiating said opposing rotary movements of said stacker plate and drop leaf, said solenoid being coupled to said capacitor means for energization upon discharge of said capacitor means.

7. An automatic stacker for use in fabric processing machines, comprising a stacker plate disposed in a generally vertical direction and mounted for pivotal movement in a generally vertical plane, an elongated movable drop leaf pivotally mounted along one of its elongated edges and disposed in the path of travel of a moving fabric article being processed at a position above said stacker plate, said drop leaf being normally positioned in a generally horizontal plane overlying the uppermost edge of said stacker plate, elongated linkage means, said stacker plate and said drop leaf pivotally engaging said linkage means respectively adjacent the opposing ends of said linkage means, actuator means engaging said linkage means at a point between the points of engagement of said stacker plate and drop leaf, article sensing means responsive to the presence and absence of said moving fabric article being processed for selectively energizing said actuator means thereby to move said linkage means so as to pivot said drop leaf and said stacker plate in opposing rotary directions to one another, thereby to alter the relative positions of said stacker plate and drop leaf from a first position wherein the unpivoted elongated edge of said drop leaf is disposed adjacent one side of said stacker plate to a second relative position wherein the unpivoted elongated edge of said drop leaf is disposed adjacent the other side of said stacker plate, whereby a moving fabric article being processed has portions thereof successively directed toward opposing sides of said stacker plate thereby to drape said article across said stacker plate, at least one of said linkage means points of engagement including an adjustable connection to permit adjustment of the arc through which at least said stacker plate moves thereby to properly drape articles of different lengths across said stacker plate.

8. The structure of claim 7 wherein said adjustable connection is so arranged that, in at least one adjustment position of said adjustable connection, said stacker plate is substantially fixedly held in a predetermined generally vertical plane during the movement of said drop leaf.

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