Dec. 12, 1967 J. G. ATTWOOD 3,357,699

DEVICE FOR SEPARATING STACKED SHEETS

Filed Aug. 3, 1965 2 Sheets-Sheet 1

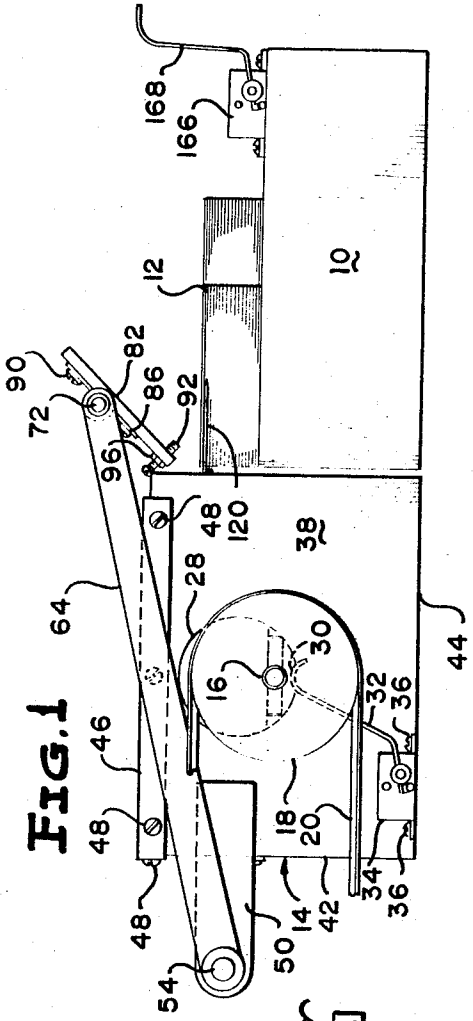


FIG. 1

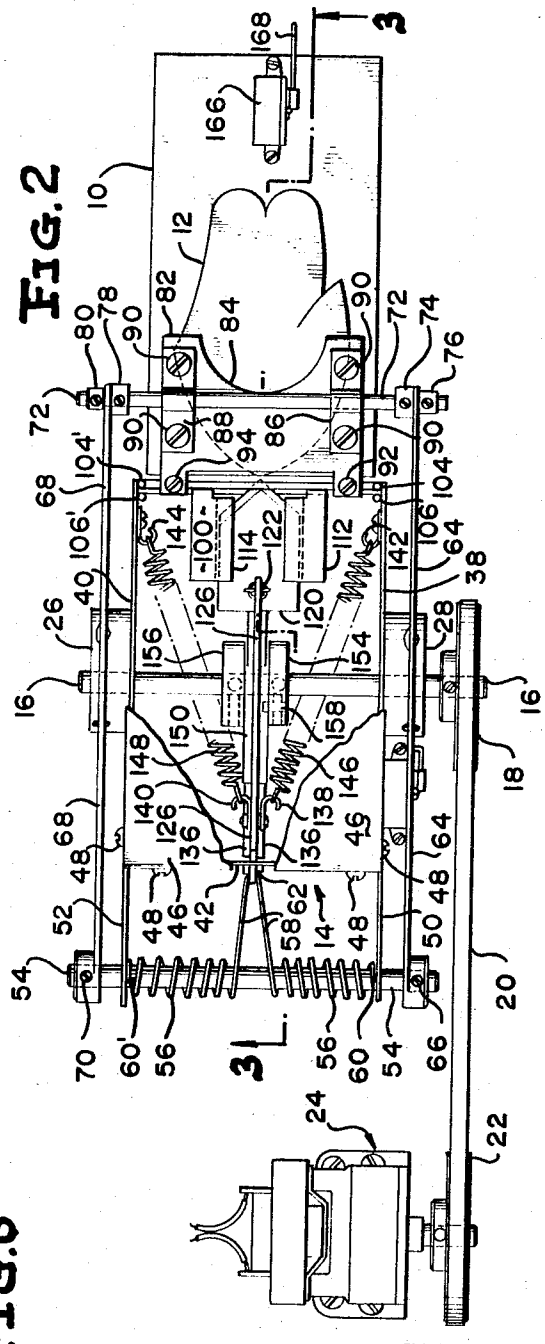


FIG. 2

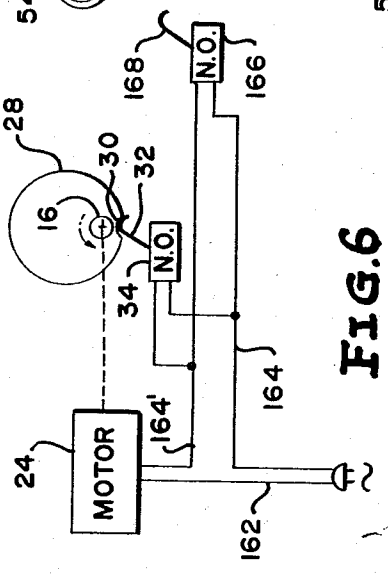


FIG. 6

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DEVICE FOR SEPARATING STACKED SHEETS

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FIG. 3

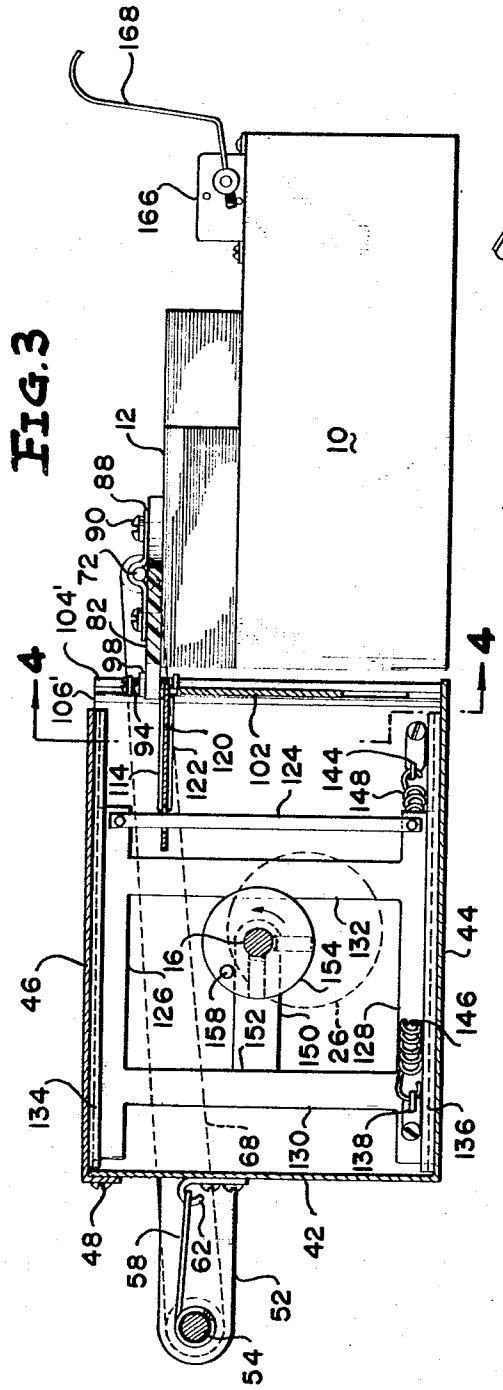


FIG. 5

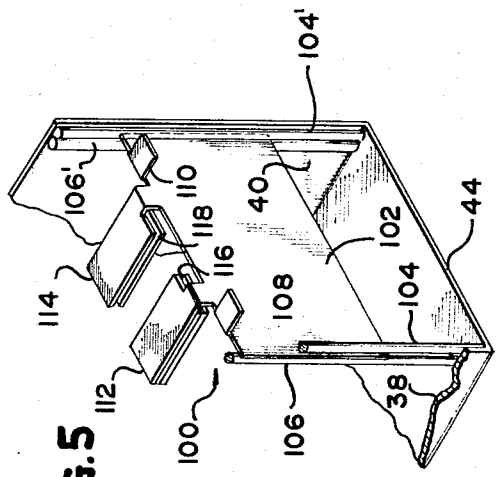
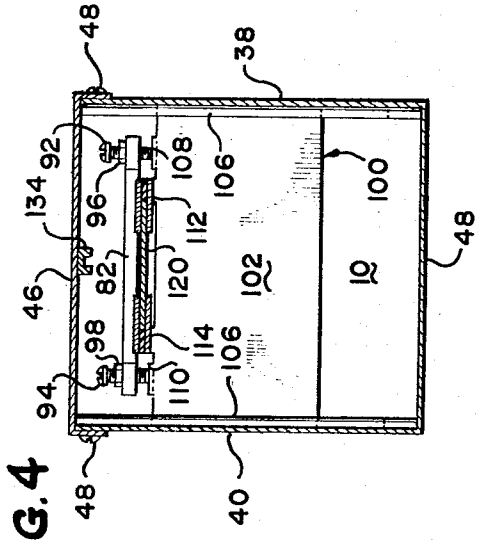


FIG. 4



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DEVICE FOR SEPARATING STACKED SHEETS

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Filed Aug. 3, 1965, Ser. No. 476,964
30 Claims. (Cl. 271—18)

ABSTRACT OF THE DISCLOSURE

A device for separating sheets of material is provided wherein the sheets are placed in a stack on a supporting member and a blade is moved between an uppermost sheet and an adjacent sheet, or beneath a plurality of sheets, the blade being carried by a vertically adjustable frictionally retained guide, the guide position being determined by an adjustable guide actuating means. The guide actuating means is carried by a member disposable onto a top sheet in the stack, and is movable therefrom, carrying the adjustment means out of contact with the guide after the blade has been inserted between adjacent sheets, whereby the uppermost sheet of sheets in the stack can be removed.

This invention relates to a separator mechanism and method and more specifically to a device for inserting a plunger or blade between selected sheets of a stack of sheets so as to facilitate the subsequent removal of the sheet or sheets from the stack by an operator. In the preferred embodiment, a reciprocal blade is inserted below the top sheet of the stack so as to permit an operator, through the cooperation of the blade now positioned of the sheets to remain in the stack, to remove the top sheet without disturbing other sheets.

The present invention is particularly suited for use in an operation involving the manufacture of stitched articles. In operations of this type, single plies of flexible sheet material must be removed from a stack. Accordingly, the use of the term "sheet" will be construed to means any sheet or ply of material whether it be of paper, paperboard, metal, textile fabrics of cotton, wool, plastic or leather, etc.

As a general procedure, the preparations going into the manufacture of stitched articles begin at the cutting table with the cutting out of material sections according to a predetermined pattern from a multi-layer stack of the material. Thereafter, the severed stacks of material are forwarded to initial work stations for subsequent operations thereon. At the work station, the individual sheets or plies must be removed from the stack in a piece-by-piece sequence. The removal of the sheets or plies from the stack will usually be performed by the operator who is to perform the initial operation on the separated workpiece. Experience has shown that the operation of removing the plies singly from a stack is not always an easy task but requires a considerable amount of concentration and finger dexterity on the part of the operator, especially in the case of certain materials which tend to adhere to each other whenever the operator attempts to remove the plies from the stack one-by-one.

For example, fabrics containing artificial fibers or thermoplastic threads have the tendency to be fused together at their severed edges during the cutting process. In other fabrics, the threads at their severed ends may interlock, whereas still other materials may stick together by static electricity, reduced pressure, or for other reasons. Also, many fabrics are of such smooth texture that an operator has a difficult time in gripping them in order to remove the plies from the stack. Under such circumstances, it is conceivable that the effectiveness of a skilled operator may suffer considerably if he has to perform

any extra effort to accomplish a mere work handling operation such as the separation of the plies of material set forth.

Accordingly, if stitching operations are to be truly successful and efficient, then means must be available to the operator for quickly and efficiently removing the sheet of material from the stack prior to performing an operation on the material. The present invention envisions, in its preferred embodiment, the insertion of a plunger or blade between the first and second sheets of material so that the operator may now readily remove the top sheet due to its "free-separation" by the insertion of the blade therebetween.

Accordingly, it is the principal object of the present invention to improve sheet separator methods and apparatus.

It is a further object of the present invention to reduce the time necessary for an operator to remove a sheet from a stack of sheets.

It is a further object of the present invention to increase the efficiency of sheet separating methods and apparatus.

It is a further object of the present invention to provide a device which is adapted to automatically separate respective single plies of material from a stack of work sections or plies of any type of flexible material regardless of the size and thickness of the material.

It is a further object of the present invention to provide a lightweight sheet separating mechanism that is simple in construction which may be placed anywhere without special mounting facilities and which requires no extra skill for operating it.

It is a still further object of the present invention to provide a mechanism that is actuable at the will of the operator without requiring the operator of perform any wasted effort.

These and other objects of the present invention are accomplished by positioning a plate-like plunger or blade adjacent a stack of sheets of material and upon command, driving the plunger at high speed between the top and second sheet of the stack. In the present embodiment, the plunger is propelled by spring means which are alternately tensioned and released by a motor driven mechanism. The motor may be actuated at will be the operator but stops automatically after the plunger has inserted itself between the top two sheets, so that the operator may remove the separated top sheet at his convenience from the plunger surface. In doing so, the operator will actuate the switch means for restarting the motor. Cooperating with the plunger are means for automatically resetting the plunger in relation to the stack, or, rather in relation to the next sheet to be separated. This may be known as an indexing operation. This operation is performed by lowering the plunger guide means by a distance substantially equal to the thickness of one sheet. According to the teaching of the invention, the resetting means may be adjusted to suit the thickness of practically any regular work material and can be performed repetitively without further adjustment. A salient feature of the invention is that the plunger or blade is indexed with relation to the top sheet of the stack and not by other means which may cause an accumulation of errors.

The invention both as to its organization and method of operation together with further objects and advantages thereof will best be understood by reference to the following specification taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a front elevational view of the invention showing the driven pulley and a portion of the drive belt and illustrating the blade in its position between the first and second sheets of material in the stack;

FIGURE 2 is a plan view of the invention with portions of the top cover removed and showing the blade in its retracted position;

FIGURE 3 is a sectional view taken along the line 3—3 of the FIGURE 2 and showing the propelling mechanism for the blade;

FIGURE 4 is a fragmentary sectional view taken along the line 4—4 of the FIGURE 3 and illustrating the positional relationship of the plate which engages the top of the stack and the blade;

FIGURE 5 is a fragmentary perspective view of a portion of the invention and showing in detail the blade guide bracket and the method of supporting the bracket in the housing; and

FIGURE 6 is a schematic diagram of the electrical control circuitry employed in the preferred embodiment of the invention.

With reference to the FIGURE 1, a platform **10** is illustrated supporting a stack of sheets **12** which may be a plurality of plies of material having the desired configuration. A housing **14** supports a shaft **16** which is journaled in suitable bearings (not shown) affixed to a side of the housing **14**. A driven pulley **18** is rigidly connected to the the shaft **16** by any suitable means and adapted to receive a driving belt **20**. As shown in the FIGURE 2, the driving belt **20** engages a drive pulley **22** which is coupled to the shaft of a motor **24**. The motor **24** may be of the electrical reduction gear type.

As shown in the FIGURES 1 and 2, a cam **26** is secured to one end of the shaft **16** while a cam **28** is secured to the shaft **16** between the pulley **18** and one side of the housing **14**. The cams **26** and **28** are substantially identical except for a notch **30** which is formed in the periphery of the cam **28** for receiving the end of an operating arm **32** of a normally open switch **34**. The switch **34** is secured to the lower base of the housing **14** by any suitable means such as the bolts **36** and **36'**. In the position shown, the switch contacts associated with the operating arm **32** are open and are closed upon rotation of the cam **28**, to be hereinafter described.

The housing **14** is open at its end adjacent the sheets **12** and includes a pair of vertical side walls **38** and **40**, a vertical end wall **42**, a bottom horizontal member **44**, and a detachable top cover **46** which is maintained in position by a plurality of screws **48**. The vertical side walls **38** and **40** cooperate with the respective cams **28** and **26** for restraining the shaft **16** from axial movement. A pair of brackets **50** and **52** extend from the side walls **38** and **40**, respectively, and are secured thereto by any suitable means. The brackets **50** and **52** have aligned apertures formed in their extending ends so as to receive and support a shaft **54**. A spiral torsion spring **56** having a tangentially projecting central lever portion **58** is arranged on the shaft **54** between the brackets **50** and **52**. The outer ends of the spring **56** are straightened so as to engage suitable bores provided in the shaft **54** at **60** and **60'** while the central lever portion **58** engages a hook **62** secured to the left vertical end wall **42** of the housing **14**. The spring **56** is so positioned upon the shaft **54**, and through its anchoring to the shaft at **60** and **60'** and its engagement with the hook **62**, biases the shaft **54** in a clockwise position as viewed in the FIGURE 3.

With continued reference to the FIGURES 1 and 2, a lever arm **64** is adapted to be fitted about the shaft **54** and secured thereto by a screw means **66** and a similar substantially parallel lever arm **68** is adapted to fit about the opposite end of the shaft **54** and secured thereto by screw means **70**. The right hand end of the lever arms **64** and **68** are interconnected by a shaft **72**. The lever arm **64** is secured to one end of the shaft **72** by a pair of shaft surrounding collars **74** and **76**, one on each side of the lever arm **64**. Similarly, a pair of collars **78** and **80** are positioned upon the opposite end of the shaft **72** so as to maintain the lever arm **68** in the position shown. A plate **82** having a cut out portion **84** is mounted for pivotal movement upon the shaft **72** by a pair of hinges **86** and **88**. The hinges **86** and **88** are formed so as to provide a slot for the shaft **72** and are secured to the plate **82** by any suitable means, such as the screws **90**.

The hinges **86** and **88** are secured to the top surface of the plate **82** and cooperate with the shaft **72** so that the plate **82** is free to pivot thereon.

The plate **82** serves as an adjustment and weight means relative to the separating plunger or blade (to be hereinafter described) and the stacks of sheets **12**. At the extreme left ends of the plate **82** there is provided a pair of spaced threaded bores through which extend a pair of threaded bolts **92** and **94** with their threaded portions protruding beyond the lower surface of the plate **82**. The bolts **92** and **94** carry a pair of locking nuts **96** and **98**, respectively, in engagement with the upper surface of the plate **82**. The locking nuts **96** and **98** serve to maintain the bolts **92** and **94** in the desired position.

The function of the bolts **92** and **94** is to engage portions (to be hereinafter described) of a plunger guide bracket **100** which is best shown in the FIGURE 5 and to force the guide bracket **100** downwardly a predetermined distance so as to index or reset the operating level of the separating blade to conform with the level of its desired entry into the stacks of sheets **12**.

The ends of the lever arms **64** and **68** supporting the plate **82** are urged downwardly by the spring **56** and in engagement with the cams **28** and **26**, respectively. As the cams **26** and **28** rotate, the arms **64** and **68** pivot about the axis of the shaft **54** so as to permit the plate **82** to come into engagement with the top of the stack **12**, the plate **82** pivoting from its inclined position shown in the FIGURE 1 to a position in a horizontal plane. The height of the stack **12** will determine at what point on the cams **28** and **26** that the lever arms **64** and **68** disengage the peripheral surface of the cams. If the stack is relatively high, then the cams will disengage the lever arms **64** and **68** at a point earlier that if the stack **12** is lower.

A plan view of the guide bracket **100** is illustrated in the FIGURE 2 and a perspective view of the bracket **100** is shown in the FIGURE 5. The function of the guide bracket **100** is to support the blade, to be hereinafter described, which is inserted between selected sheets and also to be repositioned or indexed into successive positions so as to accurately position the insertable blade.

With reference to the FIGURE 5, the guide bracket **100** is comprised of a flat vertically disposed portion **102** having a plurality of horizontally extending projections supported at its upper edge. More specifically, the vertical portion **102** extends transversely from the vertical side wall **38** to the vertical side wall **40** and is supported in guides which are formed by a first pair of vertical bars **104** and **106** adjacent the side wall **38** and a second pair of vertically disposed bars **104'** and **106'** adjacent the side wall **40**. The side edges of the vertical portion **102** engage the grooves formed between the bars **104**, **106** and **104'**, **106'** with a snug fit so that the vertical portion **102** is not free to slide loosely therein; however, when sufficient force is applied to the projections, to be described, from the portion **102**, the vertical portion **102** may be readily moved to its new position. The snug fit serves to provide sufficient friction to maintain the guide bracket **100** at a predetermined level without being repositioned by gravitational force but permits displacement of the guide bracket **100** by means to be described.

A pair of lobes **108** and **110** project outwardly from the upper edge of the vertical portion **102** and in a direction toward the stack of sheets **12**. During a certain portion of the machine cycle, the lobes **108** and **110** are engaged, respectively, by the bolts **92** and **94** and by this engagement, serve to index or reposition the guide bracket **100** with respect to the top of the stack of sheets **12**. Also, extending from the same upper edge of the vertical portion **102** and in a direction opposite to the lobes **108** and **110**, are a pair of guide members **112** and **114** which are fabricated in such a manner so as to present a pair of inwardly directed slots **116** and **118** therein. As best shown in the FIGURES 4 and 5, each

of the guide members 112 and 114 are formed of three flat sections, the middle section being narrower than the outer sections so as to form the slots 116 and 118. A plunger or blade 120 is positioned for sliding engagement in the slots 116 and 118. At predetermined periods in the machine cycle, the blade 120 is reciprocated in the slots 116 and 118 and withdrawn from its position over the uppermost sheet of the stack 12 and then inserted to a position between selected sheets, such as between the top and second sheet. The end of the blade 120 adapted for insertion between the sheets may have any convenient configuration such as tapered (as shown), rounded, beveled, etc.

While the plate 82 serves to position the guide bracket 100, and therefore the blade 120, a separate means, to be hereinafter described, is employed to produce the intermittent reciprocating motion to the blade 120. The blade 120 is provided with an aperture 122 which is somewhat larger in diameter than that of a rod 124 so that the blade 120 may slide freely thereon. The aperture 122 cooperates with the vertically disposed rod 124 so as to provide the desired reciprocating motion of the blade 120. The rod 124 is a portion of the blade actuating mechanism which is adapted to propel the blade in a horizontal direction toward the stack of sheets 12 and thereafter be removed, for indexing and reinsertion to a new position.

As shown in the FIGURE 3, the rod 124 is supported at its upper end by a horizontal member 126 and at its lower end by a similar horizontal member 128. The horizontal members 126 and 128 are retained in their spatial relationship by a pair of vertical members 130 and 132. Thus, the horizontal members 126 and 128 and the vertical members 130 and 132 form a frame for supporting the rod 124. The vertical members 130 and 132 are spaced somewhat inwardly from the ends of the horizontal members 126 and 128. The horizontal member 126 is positioned for sliding engagement in a guide 134 while the lower horizontal member 128 is positioned for sliding engagement in a guide 136. The guide 134 is affixed to the top cover 46 in any suitable manner while the guide 136 is secured to the bottom member 44 of the housing 14. The horizontal members 126 and 128 reciprocate rightwardly (as viewed in the FIGURE 3) within the guides 134 and 136, respectively, and then leftwardly after actuation by an operator.

As shown in FIGURES 2 and 3, a hook 138 is secured to the horizontal member 128 at approximately its junction with the vertical member 130 while a hook 140 is similarly positioned on the other side of the horizontal member 128. A hook 142 is secured to the vertical side wall 38 near the vertical bar 106 while a similar hook 144 is secured to the side wall 40 near the vertical bar 106'. The hooks 138, 140, 142 and 144 may be secured to their respective members by any suitable means. A first spring 146 is connected between the hooks 138 and 142 while a second spring 148 is connected between the hooks 140 and 144. The springs 146 and 148 are under tension and due to this force being exerted rightwardly, as viewed in the FIGURES 2 and 3, the horizontal members 126 and 128, the vertical members 130 and 132, the vertical rod 124 and the blade 120 are urged rightwardly but are temporarily restrained in position by a movable lever arm 150 which is journaled on the shaft 16 for free rotation and so arranged that its plane of rotation about the shaft 16 coincides with the vertical plane of the vertical member 130. That is to say, the vertical member 130 abuts the lever arm 150 at the point indicated at 152. If the lever 150 is removed from the position shown in the FIGURE 3, then the blade 120, driven by its vertical rod 122 and associated members, will be urged rightwardly under the influence of the springs 146 and 148. Thereafter, the lever arm 150 will momentarily restore the mechanism to the position shown in the FIGURES 2 and 3.

The lever arm 150 is considerably wider than the vertical member 130 which it engages and is retained in

position upon the shaft 16 by a pair of collars 154 and 156 which are secured to the shaft 16 by any suitable means but are not tightly wedged against the lever arm 150 so as to restrain it in its rotation about the shaft 16. The collar 154 carries an eccentrically disposed pin 158 which extends into the path of rotation of the lever arm 150. Thus, if the shaft 16 is rotated, the pin 158 will act upon the lever arm 150 so as to urge it about the axis of the shaft 16 in the direction of the rotation of the shaft 16. The shaft 16 is rotated counterclockwise as viewed in the FIGURE 3 so that the pin 158 would force the lever arm 150 downwardly thus permitting the vertical and horizontal members 130, 132, 126 and 128 to drive the vertical rod 124 rightwardly and carry the blade 120 to a position between selected sheets of the stack 12. Continued rotation of the shaft 16 to a predetermined position, will return the lever arm 150 to the position shown in the FIGURE 3.

The FIGURE 4 is a fragmentary sectional view taken along the line 4—4 of the FIGURE 3 and illustrating the position of the blade 120 with respect to the plate 82 while the plate 82 is in its position on top of the stack of sheets 12. The blade 120 is positioned within the slots 116 and 118 formed, respectively, in the guide members 112 and 114 and would be projected into the plane of the paper as viewed in the FIGURE 4. The bolts 92 and 94 are shown positioned upon the lobes 108 and 110 and as the lever arms 64 and 68 (see the FIGURES 1 and 2) ride downwardly on their respective cams 28 and 26, the plate 82 will be lowered thus permitting the bolts 92 and 94 to engage the lobes 108 and 110 and drive the guide bracket 100 downwardly to a new position and thus index the guide bracket 100 and the blade 120 carried thereby. It will be recalled that the vertical portion 102 of the guide bracket 100 will engage the vertical bars 104, 104', 106 and 106' and is frictionally maintained in the grooves formed thereby so that gravity will not act to displace the guide bracket 100. The bracket 100 must be positively driven by a small amount of force to its new position. If the blade 120 were to be positioned between successive sheets of the stack 12, then each time the guide bracket 100 is indexed, it would be indexed a distance equal to the thickness of one sheet 12.

The electrical circuitry of the FIGURE 6 includes a motor 24 which is supplied suitable electric power by a first conductor 162 and by a second conductor 164 and 164' in which a normally open switch 34 is inserted in series with the conductors 164 and 164' while a second normally open switch 166 is in parallel with the switch 34. The switch 166 includes an operator actuating arm 168, the switch 166 and its actuating arm 168 being shown in the FIGURES 1, 2 and 3. The switch 166 is secured to the platform 10 by any suitable means. When the actuating arms 32 and 168 of the switches 34 and 166, respectively, are in the position shown in the FIGURE 6, the motor circuit is open and the motor 24 would be inoperative. When the actuating arm 32 of the switch 34 is resting in the notch 30 of the cam 28, the switch 34 is open and the switch 34 is closed whenever the actuating arm 32 is engaging the remainder of the cam surface of the cam 28. Whenever an operator depresses the actuating arm 168 of the switch 166, current would be supplied to the motor 24 through the internal contacts of the switch 166. The motor 24 would then rotate the shaft 16 so that the actuating arm 32 of the switch 34 would be moved out of the notch 30 and the switch 34 would now complete the circuit to the motor 24 as soon as the operator releases the actuating arm 168 of the switch 166. Thus, the operator only momentarily depresses the actuating arm 168 to actuate the switch 166 to supply current to the motor 24 since the motor 24 would subsequently receive its current through the contacts of the switch 34 which would be closed upon a few degrees rotation of the cam 28. As soon as the notch 30 of the cam 28 returns to the position shown in the FIGURE 6, the actuating arm 32 would be

lifted back into the notch **30** thus opening the circuit and stopping the motor **24**.

The operation

For the purposes of explanation, we will assume that a stack of sheets **12** has been positioned upon the platform **10** in the manner illustrated. With reference to the FIGURE 1, the machine cycle is shown as being completed although the operator must now remove the top sheet **12** a portion of which rests above the blade **120**. Further, we will assume that the adjusting bolts **92** and **94** have been positioned so that upon engagement with the lobes **108** and **110** of the guide bracket **100**, the guide bracket **100** and the blade **120** will be indexed to a position equal to the number of sheets to be sequentially selected from the stack **12**. For the purposes of explanation, we will assume that the blade **120** is to be successively inserted between the first and second sheets of the stack **12**.

After the top sheet of the stack **12** in the FIGURE 1 has been removed, the operator would subsequently depress the actuating arm **168** of the switch **160** thereby supplying current to the motor **24** and rotational motion to the shaft **16**. As soon as the operator releases the actuating arm **168**, the arm **32** of the switch **34** would have moved from the notch **30** of the cam **28** and the switch **34** would now supply a current path to the motor **24**.

The pin **158** (best shown in the FIGURE 3) would engage the lever arm **150** and rotate it counterclockwise so that the lever arm **150** would engage the vertical member **130** and assume the position shown in the FIGURE 3. In this manner, the blade **120** through the cooperation of the vertical rod **124** and horizontal members **126** and **128** would have removed the blade **120** to a position shown in the FIGURE 3.

Thereafter, the lever arms **64** and **68**, engaging the cam surfaces of the cams **28** and **26**, respectively, would lower the plate **82** from the position shown in the FIGURE 1 to the position shown in the FIGURE 3. As the plate **82** nears the top of the stack **12**, the bolts **92** and **94** would engage the lobes **108** and **110**, respectively, so that the guide bracket **100** and blade **120** are now indexed to a position so that the blade **120**, when released, would be inserted between surface portions of the first and second sheets in the stack **12**. As soon as the plate **82** engages the top of the stack **12**, the lever arms **64** and **68** would ride away from their respective cam surfaces, the point at which the lever arms leave the cam surfaces being dependent upon the height of the stack **12**.

Next, the shaft **16** continuing a cycle of rotation would cause the pin **158** to engage the lever arm **150** and drive the lever **150** downwardly so that the vertical member **130** and the members connected thereto, would be driven rightwardly as viewed in the FIGURE 3, thus carrying the blade **120** between the first and second sheet of the stack **12**.

Lastly, the cams **28** and **26** would again engage the lever ams **64** and **68**, respectively, and urge the lever arms **64** and **68** upwardly to the position shown in the FIGURE 1 and the plate **82** would pivot to the inclined position shown in the FIGURE 1. Since the plate **82** has the cut out portion **84**, removal of the top sheet of the stack **12** by an operator is easily accomplished. When the mechanism reaches the position shown in the FIGURE 1, the actuating arm **32** of the switch **34** is again resting in the notch **30** so that current to the motor **24** has been inhibited, thus ceasing the rotation of the shaft **16** and the elements driven thereby.

It will be noted that a special feature of the invention is the provision of substantially instant acceleration of the blade **120** so that it is possible to separate such plies or sheets of material as are fused together or interlocked or otherwise difficult to separate. This is accomplished by the flat surface **152** of the free end of the lever arm **150** which serves to retain the vertical member **130** (and the blade **120** through the members associated therewith) at the utmost biased position against the pull of the springs **146** and **148** up to the moment when the lever arm **150** drops away.

Thus, the present invention may be embodied in other specific forms without departing from the spirit and the essential characteristics of the invention. The present embodiment is, therefore, to be considered in all respects as illustrative and the scope of the invention being indicated by the appended claims rather than the foregoing description, and all changes which come within the meaning and range of the equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, means adapted for insertion between selected ones of sheets in a stack, means engageable with a terminal sheet of a stack for indexing said means adapted for insertion and means for displacing said means engageable after indexing said means adapted for insertion.

2. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, means adapted for insertion between selected ones of sheets in a stack, means engageable with a terminal sheet of a stack for indexing said means adapted for insertion during intermittent activation of said means adapted for insertion by said means engageable, and means for advancing said means adapted for insertion to a position between selected ones of the sheets as determined by said means engageable said means adapted for insertion being separately carried relative to said means engageable.

3. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, means adapted for insertion between selected ones of sheets in a stack, means engageable with a terminal sheet of a stack for indexing said means adapted for insertion, means for advancing said means adapted for insertion to a position between selected ones of the sheets as determined by said means engageable, and means for displacing said means engageable after indexing said means adapted for insertion to expose the selected sheets to facilitate subsequent removal of sheets.

4. The sheet separator of claim **3** wherein said means for advancing comprises means for reciprocating said means adapted for insertion to assume a first position under the first sheet and a second position removed from the sheets.

5. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a blade positioned adjacent the stack of sheets and adapted for insertion between selected ones of the sheets, and means engageable with a terminal sheet of the stack for indexing said blade to a position aligned between sheets to be selected during intermittent activation of said blade by said means engageable, said blade being separately carried relative to said means engageable.

6. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a blade positioned adjacent the stack of sheets and adapted for insertion between selected ones of the sheets, means engageable with a terminal sheet of the stack for indexing said blade to a position aligned between sheets to be selected during intermittent activation of said blade by said means engageable, said blade being separately carried relative to said means engageable, and means for advancing said blade to a position between selected ones of the sheets as determined by said means engageable.

7. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a blade positioned adjacent the stack of sheets and adapted for insertion under the first sheet of the stack, means engageable with the top sheets of the stack for indexing said blade to a position aligned under the selected sheet, means for advancing said blade to a position under the first sheet, and means for displacing said means engageable to expose the top sheet to facilitate its subsequent removal.

8. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, means supported by said guide and adapted for insertion between selected ones of sheets in a stack, and means engageable with said guide and a terminal sheet of a stack for intermittently contacting and indexing said guide than thereby positioning said means adapted for insertion said means engageable being movable to a position free of contact with said guide.

9. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, means supported by said guide and adapted for insertion between selected ones of sheets in a stack, means engageable with said guide and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, and means supported by said means engageable for varying the indexing of said guide to thereby select the position of said means adapted for insertion relative to a stack.

10. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, means supported by said guide and adapted for insertion between selected ones of sheets in a stack, means engageable with said guide and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, means engageable with said means adapted for insertion for propelling said means adapted for insertion between selected sheets of a stack, and means coupled to said means for indexing for displacing said means for indexing to facilitate the subsequent removal of selected sheets.

11. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, a pair of projections extending from said guide and forming an inwardly directed channel, means supported within said channel adapted for insertion between selected ones of sheets in a stack, means engageable with said guide and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, means engageable with said means adapted for insertion for propelling said means for insertion between selected sheets of a stack, and means coupled to said means for indexing for displacing said means for indexing to facilitate the subsequent removal of selected sheets.

12. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, a pair of projections extending from said guide and forming an inwardly directed channel, a pair of lobes extending from said guide, means supported within said channel and adapted for insertion between selected ones of sheets in a stack, means engageable with said pair of lobes and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, means engageable with said means adapted for insertion between selected sheets of a stack, and means coupled to said means for indexing for displacing said means for indexing to facilitate the subsequent removal of selected sheets.

13. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, a pair of projections extending from said guide and forming an inwardly directed channel, a blade supported within said channel and adapted for insertion between selected ones of sheets in a stack, means engageable with said guide and a terminal sheet of a stack for indexing said guide and thereby positioning said blade, means engageable with said blade for propelling said blade between selected sheets of a stack, and means coupled to said means for indexing for displacing said means for indexing to facilitate the removal of selected sheets.

14. The combination as defined in claim 13 wherein said blade has a tapered end for facilitating the insertion of said blade between selected sheets.

15. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, means supported by said guide and adapted for insertion between selected ones of sheets in a stack, plate means engageable with said guide and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, means engageable with said means adapted for insertion for propelling said means adapted for insertion between selected sheets of a stack, and means coupled to said plate means for displacing said plate means to facilitate the subsequent removal of selected sheets.

16. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, a pair of lobes extending from said guide, means supported by said guide and adapted for insertion between selected ones of sheets in a stack, plate means including means supported by said plate means and engageable with said pair of lobes and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, means engageable with said means adapted for insertion for propelling said means adapted for insertion between selected sheets of a stack, and means coupled to said plate means for displacing said plate means to thereby facilitate the subsequent removal of selected sheets.

17. The combination as defined in claim 16 wherein said means supported by said plate and engageable with said guide for indexing are adjustable threaded members the rotation of which will alter the position of said means adapted for insertion with respect to said plate means.

18. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, means supported by said guide and adapted for insertion between selected ones of sheets in a stack, an aperture formed in said means for insertion at an end opposite to the end adapted for insertion, means engageable with said guide and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, a frame including a rod positioned within said aperture of said means adapted for insertion for reciprocating said means adapted for insertion to a first position between selected sheets and to a second retracted position, and means coupled to said means for indexing for displacing said means for indexing to facilitate the subsequent removal of selected sheets.

19. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, means supported by said guide and adapted for insertion between selected ones of sheets in a stack, means engageable with said guide and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, means engageable with said means adapted for insertion for propelling said means adapted for insertion between selected sheets of a stack, a pair of arms, means for pivotally mounting said means for indexing to said pair of arms, and means for actuating said arms and thereby displacing said means for indexing to a position so as to facilitate the subsequent removal of selected sheets.

20. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, a pair of projections extending from said guide and forming an inwardly directed channel, a blade positioned within said channel and aadpted for insertion between selected ones of sheets in a stack, a plate means including means supported by said plate means and engageable with said guide and a terminal sheet of a stack for indexing said

guide and thereby positioning said blade, a frame means coupled to said blade for reciprocating said blade to a position between selected sheets and to a retracted position, and a pair of arms coupled to said plate means for displacing said plate means so as to facilitate the subsequent removal of selected sheets.

21. The combination as defined in claim **20** including means coupled to said frame means and said pair of arms for producing a single cycle of operation.

22. The combination as defined in claim **20** including means supported by said plate means and engageable with said guide for altering the position of said blade with respect to said plate means so as to accommodate sheets of different thicknesses.

23. The combination as defined in claim **22** wherein said means supported by said plate means and engageable with said guide for indexing includes a pair of lobes extending from said guide, said lobes being periodically engageable by said means supported by said plate means.

24. A method for separating a selected number of sheets from the remaining sheets of a stack comprising the steps of positioning a movable guide adjacent a stack, supporting a blade upon said guide for insertion between selected sheets of the stack, placing a guide indexing means in contact with an uppermost sheet in a stack and indexing said guide to successive positions along the edge of the stack alternately with inserting the blade between sheets in the stack and displacing the guide indexing means from contact with the uppermost sheet.

25. A method for separating a selected number of sheets from the remaining sheets of a stack comprising the steps of positioning a movable guide adjacent a stack, supporting a blade upon said guide for insertion between selected sheets of the stack, placing a guide indexing means in contact with an uppermost sheet in a stack for detecting the position of a terminal sheet of the stack, and intermittently contacting and indexing said guide by the indexing means to successive positions in accordance with the detected position of the terminal sheet alternately with inserting the blade between the sheets in the stack.

26. A method for separating a selected number of sheets from the remaining sheets of a stack comprising the steps of positioning a movable guide adjacent a stack, supporting a blade upon said guide for insertion between selected sheets of the stack, placing a guide indexing means in contact with an uppermost sheet in a stack and intermittently contacting and indexing said guide to successive positions along the edge of the stack, and inserting the blade between selected sheets as determined by the position to which the guide was indexed.

27. The method as defined in claim **26** including the steps of withdrawing the blade preparatory to repeating each indexing step.

28. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, guide means, means for frictionally supporting said guide means adjacent a stack of sheets, means supported by said guide means and adapted for insertion between selected ones of sheets in a stack, means engageable with said guide means and a terminal sheet of a stack for indexing said guide means in said means for frictionally supporting said guide means so as to thereby position said means adapted for insertion, said means engageable being alternately movable into and out of engagement with a terminal sheet and said guide members, and other means engageable with said means adapted for insertion for propelling said means adapted for insertion between selected sheets of a stack.

29. A sheet separator comprising means for supporting a plurality of sheets in stacked relation, a movable guide supported adjacent a stack of sheets, means supported by said guide and adapted for insertion between selected ones of sheets in a stack, plate means engageable with said guide and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, means engageable with said means adapted for insertion for propelling said means adapted for insersertion between selected sheets of a stack, and means coupled to said plate means in an off-center relationship for lifting said plate means and to permit the tilting thereof so as to facilitate the subsequent removal of selected sheets.

30. A sheet separator comprising means for supporting a plurality of sheets in stacking relation, a movable guide supported adjacent a stack of sheets, means supported by said guide and adapted for insertion between selected ones of sheets in a stack, plate means engageable with said guide and a terminal sheet of a stack for indexing said guide and thereby positioning said means adapted for insertion, means engageable with said means adapted for insertion for propelling said means adapted for insertion between selected sheets of a stack, and means coupled to said plate means for displacing said plate means to facilitate the subsequent removal of selected sheets, said plate means including a pair of hinges supported by said means and engageable by said means coupled so as to permit said plate means to pivot with respect to said means coupled when displaced.

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