

March 18, 1958

C. W. GEISLER
SHEET FEEDING DEVICE

2,827,288

Filed Nov. 23, 1954

2 Sheets-Sheet 1

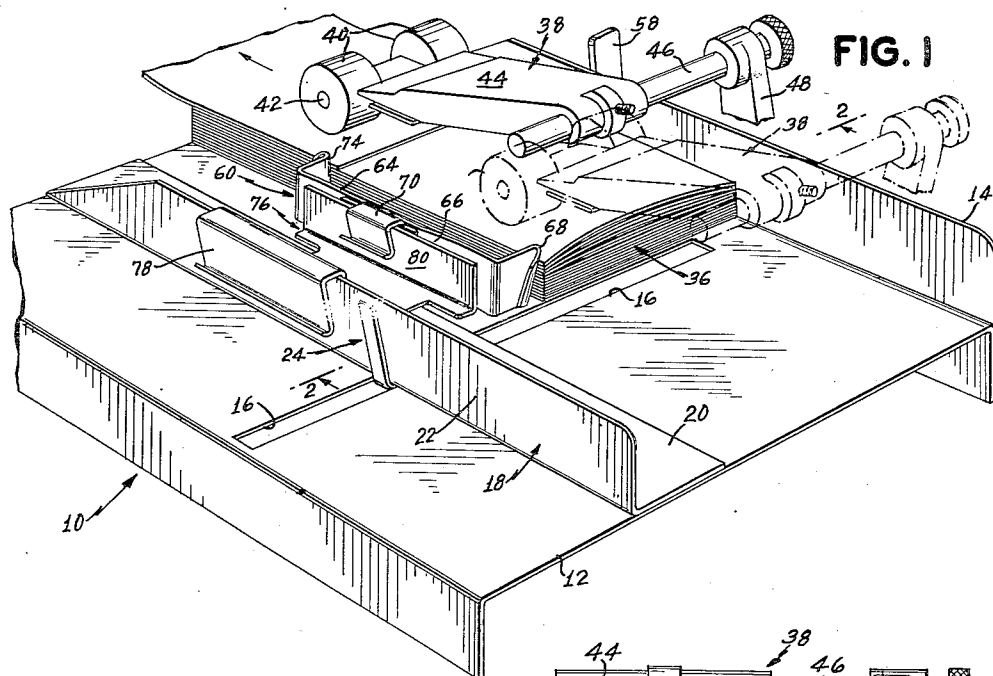


FIG. 2

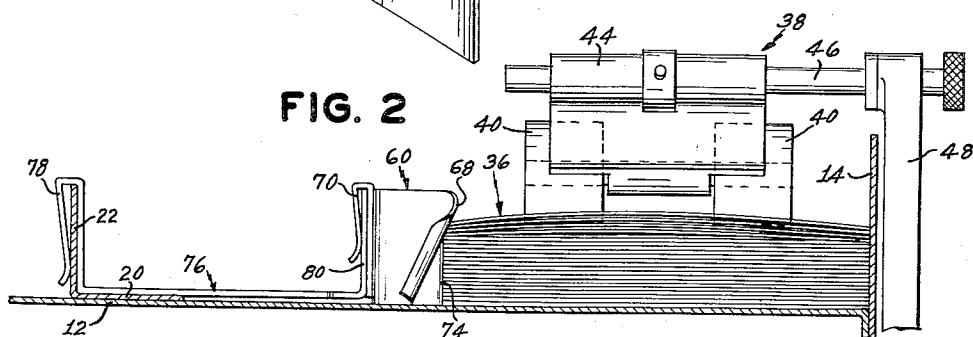


FIG. 3

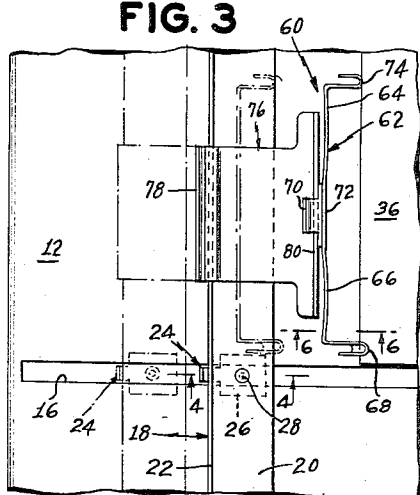
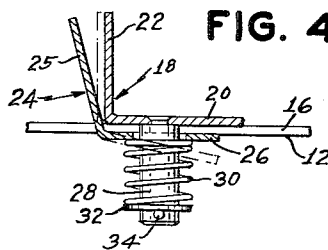


FIG. 4



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2 Sheets-Sheet 2

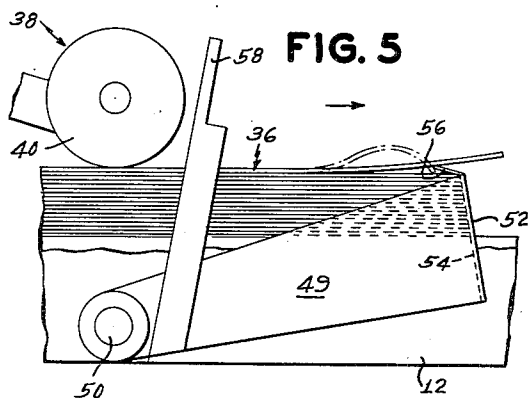


FIG. 5

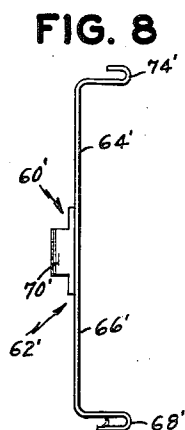


FIG. 8

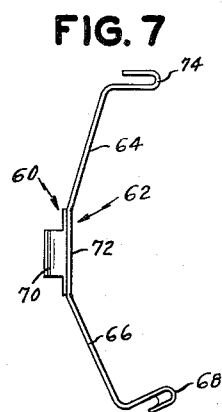


FIG. 7

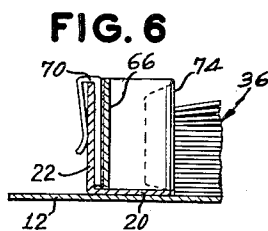


FIG. 6

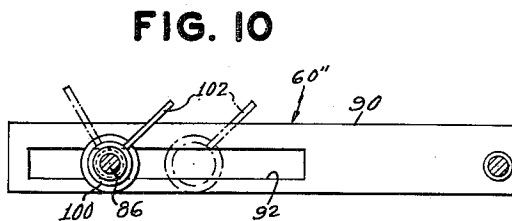


FIG. 10

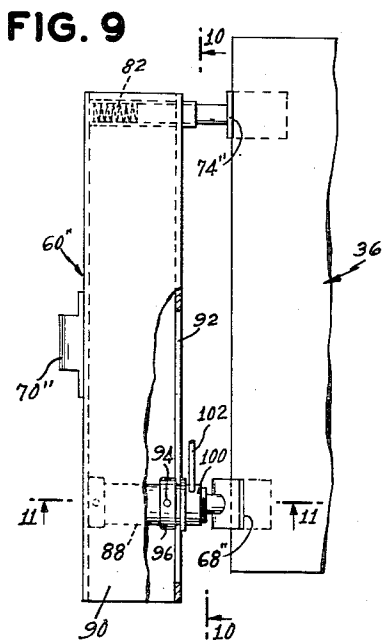


FIG. 9

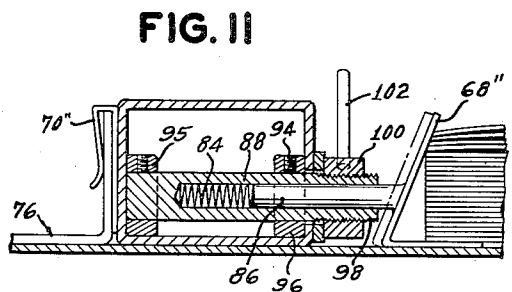


FIG. 11

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2,827,288

SHEET FEEDING DEVICE

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Application November 23, 1954, Serial No. 470,613

9 Claims. (Cl. 271—24)

This invention relates to sheet feeding devices and more particularly to sheet feeding devices for duplicating machines.

It is well recognized in the duplicating and printing arts that the feeding of a single sheet from a supply stack presents a problem due to the inherent characteristics of the sheets themselves; for example, the thickness, stiffness, surface finish and the tendency of the sheets to adhere to one another.

The primary object of the present invention is the provision of reliably operable means to facilitate the feeding of cards and sheets of certain characteristics to a duplicating or printing machine and for that purpose to provide a device which is operable to buckle the top sheet or top few sheets upwardly in such manner that the feed pusher is reliably operable to feed one sheet at a time from the supply stack.

Another object of this invention is to provide a sheet separating device which buckles the top few sheets of a stack of sheets upwardly in an arc extending transversely of the direction of feed so that the feed pusher is reliably operable to move one sheet at a time off the stack to the duplicating machine.

A further object of this invention is to provide a sheet separating device which functions satisfactorily to separate the top sheet from a stack of sheets which vary somewhat in width although normally considered approximately of the same width.

A yet further object of this invention is to provide a sheet feeding device which may be used advantageously for different sizes and weights of stock.

Other objects and features of this invention will become clear as the characteristic features of construction and mode of operation of this invention are described in detail.

In the accompanying drawings:

Fig. 1 is a perspective view of a sheet feeding device employing a sheet separating device embodying the presently preferred form of the present invention;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a plan view of a sheet separating device embodying this invention;

Fig. 4 is an enlarged sectional view taken along the line 4—4 of Fig. 3;

Fig. 5 is a side elevational view of a sheet separating device which may be used in cooperation with a sheet separating device embodying the present invention;

Fig. 6 is a sectional view on the line 6—6 of Fig. 3 with the extension omitted;

Fig. 7 is a plan view of the sheet separating device illustrated in Fig. 3, showing said device in its non-tensioned condition when retracted from engagement with the stack of sheets;

Fig. 8 is a plan view similar to Fig. 7 of a sheet separating device according to another form of the invention;

Fig. 9 is a plan view of a sheet separating device illus-

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trating another form of this invention, parts being cut away for clearness of illustration;

Fig. 10 is a sectional view taken along the line 10—10 of Fig. 9; and

Fig. 11 is a sectional view taken along the line 11—11 of Fig. 9.

The sheet feeding means of the present invention is intended primarily for feeding cards or sheets one at a time to a duplicating or printing machine, for example but without limitation a machine of the type shown by United States Patent No. 2,569,387, issued to Grant R. Robinson and assigned to the assignee of the present application. Said machine is provided with a sheet separating device described and claimed in said patent and more particularly hereinafter referred to and generally described in the present specification. In accordance with the present invention, a separating device is provided which may be readily attached to said machine and operated in lieu of the separating device of said patent without however removing the latter from the machine. The separating device described in said patent is operable advantageously in connection with various sheets ordinarily used for obtaining copies, while on the other hand, the separating device of the present invention is preferred for use in connection with cards or sheets which are stiffer or thicker than the sheets more frequently used for copies. Thus, the present invention provides the user of the machine with alternative sheet separating devices for use alternatively according to the character of the copy sheets or cards. It will be understood however that while the sheet separating device described in said patent will ordinarily be used in most instances, the sheet separating device of the present invention may be substituted to advantage for other sheet separating devices, and for cards or sheets of the character referred to previously the sheet separating device of this invention has been found to be especially advantageous for use in lieu of the device of said patent.

Referring now to the drawings in detail and first to Figs. 1 to 7, the sheet feeding device 10 includes a base or support 12 and a normally stationary side wall or guide 14 extending longitudinally of the base. The base 12 is provided with a slot 16 extending transversely thereof from the edge opposite the fixed guide 14 to a point intermediate the two edges of the base. A sliding or adjustable guide 18 extends parallel to the fixed guide 14 and is adapted to be moved toward and away from the fixed guide in a manner which will now be described. The sliding guide 18 is L-shaped and has one portion 20 bearing against the base 12 and another portion 22 extending perpendicular to the base. As best illustrated in Figs. 1, 3 and 4, a releasable clamping device 24 for guide 18 has an upwardly extending arm 25 which extends upwardly from the base at a slight angle to portion 22 of said guide. Part 25 extends through slot 16 and under base 12 at which point it is integral with a wider clamping part 26. A stud 28 which is fixedly secured to the portion 20 of sliding guide 18 in any suitable manner extends downwardly through the slot 16. A helical spring 30 is disposed around stud 28 and is held by a washer 32 in position in which it bears against clamp part 26, said washer being retained on stud 28 by a cotter pin 34. Clamp 24 holds guide 18 in adjusted position laterally of the companion guide 14. When it is desired to change the position of guide 18, clamp arm 24 is pivoted downwardly to move clamp part 26 against the pressure of spring 30 to release guide 18 for adjusting movement.

A feeding device including a pusher 38 is provided for moving the top sheet of a stack of sheets 36 to a duplicating machine (not shown). This pusher includes a pair of rubber covered rollers 40 which are rotatably

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mounted on axle 42 which in turn is carried by an arm 44. Arm 44 is mounted on a rod 46 and the rod in turn is carried by an actuating lever 48, which is pivotally rocked between the positions illustrated by the solid and dotted lines shown in Fig. 1 and the pusher mechanism is adapted to move the top sheet in a forward direction but not in a backward direction, as described in the above mentioned patent.

In the past it has been the practice, as described in said patent, to place a stack of sheets 36 in position between the fixed and sliding guides with both guides lightly bearing against the longitudinally extending edges of the stack. Then a suitable sheet separating mechanism such as that illustrated in Fig. 5 was employed. Such a sheet separating mechanism comprises an arm 49 pivoted on base or support 12 at pivot 50. The front end of the arm is provided with transversely or laterally extending narrow strip 52 so that when the arm 49 is in its normal position as shown in Fig. 5, it is disposed at an angle to the plane of the base 12 and constitutes a stop for the advanced edge in the stack of sheets 36. The inner stack engaging face 54 is provided at its upper edge with a V-shaped projection or lip 56 that is peripherally disposed at an angle somewhat greater than a right angle to stop face 54 and this lip 56 is located over a forward corner area of the stack 36. In operation, the arm 49 may be rocked upwardly from its inoperative position in which lip 56 is on base 12 to its operative position by finger tap 58 projecting upwardly therefrom and the stack of sheets 36 placed on the base 12. The stack may then be feathered against the stop face 54 and the stop accurately positioned with its projecting lip in engagement with the uppermost sheet of the stack. As the pusher 38 is moved forward in the direction of the arrow in Fig. 5 the top sheet will buckle against the inner stop engaging face 54 and will ride along the edge of the lip 56 until it becomes disengaged from the stop and lip whereupon its edge passes over the stop and moves towards the additional processing mechanism. When desired, this separating mechanism may be moved to a non-operating position in which the stack will not engage the face 54 or lip 56.

The present invention relates to a novel sheet separating device 60 functioning according to a different principle from the aforementioned Robinson device and which may be employed independently of the Robinson device. However, it has been found that if both devices are employed with the same sheet feeding mechanism, each for a different type of stock, the feeding mechanism is more versatile than any sheet feeding mechanism heretofore known in that with both devices available on the machine, paper stock ranging from ordinary light sheets of stationary to relatively stiff card stock may be processed by the same sheet feeding mechanism. Of course, it will be understood that if both devices are employed, only one is employed at a time, the other being moved to its inoperative position or being entirely disconnected from the feeding device. However, it is to further be understood that the present invention may be employed in machines other than those which are provided with the device of said patent and is suitable for all commonly used types of sheet paper employed in the devices disclosed herein.

The sheet separating device embodying this invention is shown in its presently preferred form in Figs. 1 to 3 and 6 and 7. This device indicated generally as 60 includes a spring steel member 62 which has a central portion 72 and two arms 64 and 66 extending outwardly therefrom and disposed at angles to the central portion so that the device has substantially a C shape in its untensioned condition. One of these arms, preferably the forward arm 64, is shaped at its outer edge so that it presents a vertical edge 74 to the stack of paper as may best be seen in Fig. 6. The other arm 66 has an edge 68 which is disposed at an acute angle to the vertical edge of the stack of paper and is so positioned that it engages only the

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edges of the top few sheets. Said edges 68 and 74 are rounded as shown more clearly in Figs. 3 and 6. Due to the inherent resiliency of the member 62 the rounded edge 68 is held in engagement with the edge of the top sheets with some force and this force, together with the fact that the angular edge 68 breaks the contour of the edge of the stack thus decreasing the lateral space for the top few sheets, is effective for causing the top few sheets to buckle upwardly of the stack to thereby separate each sheet from the other and cause air to flow therebetween. This buckling action is best shown in Fig. 2, and the result of such action is to reduce the friction and adherence of one sheet to the other. Accordingly, when the pusher wheels 40 engage the top sheet of the stack 36 and move forward as shown in Fig. 1, the top sheet will be free to move relative to the remaining sheets into any desired type of sheet processing machine, such as a duplicating machine. It will be noted that the rounded edge 74 need not apply a force against the side of the stack but merely be in close proximity thereto to act as a guide and prevent lateral movement of the cards as they move forward due to the action of the pusher mechanism.

In order to removably secure the separating device 60 in proper position a clip 70 is connected to the central portion 72 of the member 62 as by rivets, bolts, or preferably as by spot welding. This clip is adapted to fit over the sliding guide 18 and thereby hold the buckling device in a fixed position relative to the sliding guide. The sliding guide may then be adjusted to the proper position relative to the stack of sheets or cards so that the proper transverse force will be applied to the cards. With such an arrangement, if the present device is employed in conjunction with the aforementioned Robinson device, when it is desired to employ the Robinson device, clip 70 may be disconnected from sliding guide 18 and the sliding guide can be moved against the side of the stack. Thereafter, the Robinson device can be moved to its operative position and the feeding mechanism can be employed.

In the event that the sliding guide cannot be moved close enough to the fixed guide 14 so that the sheet separating device 60 can properly engage the edge of the stack 36 to buckle the top sheets thereof, an extension 76 having a clip 78 on one end and a vertically extending portion 80 on the other may be employed. In using extension 76 the clip 78 is placed over the upward extending portion 22 of sliding guide 13 so that the vertically extending portion 80 will be relatively close to the stack edge. The clip 70 of the sheet separating device 60 may then be clipped to the vertically extending portion 80 of the extension 76 and the sliding guide may then be positioned so that the rounded edge 68, that is the angularly disposed edge will engage the edge of the top few sheets with the desired force to cause the top sheets to buckle.

As may be best seen in Fig. 7, in the preferred embodiment of this invention the arm 64 carrying the vertical rounded edge 74 which functions as a guide member is disposed at an angle to the central portion of the sheet separating device which is preferably slightly larger than the angle at which the arm 66 is disposed relative thereof. This particular design is desired so that the buckling member or angularly disposed edge 68 will engage the stack prior to the edge 74 engaging the stack and, accordingly, the buckling edge 68 will apply a force considerably greater than any force which the vertical edge 74 applies to the stack. To further enhance this effect, arm 64 is slightly longer than arm 66 so that arm 64 is slightly less stiff and will not exert as much force against the side of the stack as will arm 66. It has been found that this is particularly desirable since if the edge 74 applies a considerable force to the stack it tends to jam the mechanism which, of course, is undesirable. However when the edge 74 is lightly engaging or merely in close proximity to the side it serves excellently as a guide to prevent movement of the sheets laterally of the

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direction of feed and the force applied to the sheets is insufficient to cause any malfunctioning of the mechanism. Although not shown it is to be noted that the edge 74 may be disposed at an angle to the side of the stack similar to the angle which the edge 68 is disposed relative thereto and with such disposition the feeding means will function adequately.

The arms of the sheet separating device 60 are disposed at an angle to the central portion 72 so that the device 60 may be positioned by means of clip 70 directly on the sliding guide 18 and when the proper force is being applied against the side of the stack by the buckling member 68 the arms will still have sufficient clearance so as not to engage the portion 22 of the sliding guide. However, the arms may be disposed in line with the central portion as is shown in Fig. 8 of the drawings. With regard to Fig. 8 it is to be noted that except for the difference in the angular displacement of the arms the structure is substantially the same as the structure shown in Fig. 7. Preferably, as in the case of the preferred embodiment, the arm 64' carrying the guide member or vertical edge 74' is slightly longer than the arm 66' carrying the buckling member or angular edge 68'. This particular configuration is desired so that the force exerted on the side of the stack by the guide member or edge 74' is less than the force exerted by the buckling member or angular edge 68'.

Referring now to Figs. 9 through 11 another modification of the present invention is illustrated. In this modification, instead of utilizing the resilient member 60 or 60' as in the embodiments shown in Figs. 7 and 8, separate spring biasing members here shown as helical springs 82 and 84 are employed. The buckling member or angular face 68'' is secured to a rod 86 which rod fits into a tube 88 and has a relatively close fit therewith. The helical spring 84 is positioned inside the hollow portion of the tube and the rod abuts against the spring so that the spring will urge the rod and the angular member 68'' outwardly. The guide member 74'' is urged in a similar manner into engagement with the stack but preferably the spring 82 is weaker than the spring 84 so that guide member 74'' will not exert as great a force against the side of the stack as buckling member 68''. Both of these tubes enclosing the springs and portions of the rods are enclosed in a housing 90 which housing is provided with a clip 70'' which is adapted to be secured either to the sliding guide 18 or to extension 76 as may be desired. Furthermore, preferably one of the members 68'' or 74'' is adjustably positionable within the housing; as here shown member 68'' is so positionable. The positioning means comprises a slot 92 extending longitudinally along the face of housing 90 which confronts the edge of the stack. The tube 88 is secured thereto by any suitable means such as a collar 96 which abuts against the inner face of the housing and is held there by a set screw 94. A second collar 95 is connected to tube 88 to maintain it in its horizontal alignment. Tube 88 also has a threaded portion 98 extending outwardly of said housing and threadedly mounted on the tube is another collar 100 having an internally threaded portion which is adapted to cooperate with threaded portion 98. The outside collar 100 is also provided with a rod 102 which may be grasped so that the collar may be turned thereby tightening and loosening the grip of the two collars on the face of the housing. When loosened, the tube 88 and hence the rod 86 and the buckling member 68'' may be moved along the slot 92 in order to adjust its position relative to the guide member 74''. With such an adjustable feature provided, the separating device 60'' may be satisfactorily employed for stacks having a wide range of lengths.

In employing any of the above described embodiments of this invention, it has been found that the best results are achieved if the buckling or angular edge or face is disposed to the rear of the point at which the wheels 49

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of the pusher mechanism 38 engage the stack to commence the forward movement of the top sheet. With the buckling face so disposed, any force exerted by the buckling face which resists the movement of the sheets tends to stress the sheets whereas if the buckling face were in front of the point at which the pusher member commences moving the sheets forwardly the resisting force would tend to compress the sheets. Such a compressional force might cause the sheets to buckle and crease which, of course, would be undesirable. However, it will be understood that my invention is not limited to such a disposition of the various elements.

It is to be noted that in using any of the above described forms of this invention, because of the angular displacement of the buckling member and the relatively strong spring bias, the widths of the individual sheets in stack 36 may vary over a limited range without impairing the function of the sheet separating device since the spring bias will move the buckling member into engagement with the top sheet regardless of its width to thereby cause it to buckle provided, of course, that the variation is not too great.

Although, as previously stated, this invention may be satisfactorily employed for various types of sheet stock it has been found that it is particularly desirable for heavy or card stock and, accordingly, it is preferred to employ on the same machine the sheet separator shown in Fig. 5 and described heretofore for normal lightweight stock such as writing paper or the like. By providing both types of sheet separating devices on the same sheet feeding mechanism for alternative use it has been found that the versatility of the mechanism is greatly enhanced.

Although I have shown and described several forms of this invention and have suggested several modifications thereof, other changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of this invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. As an article of manufacture, a device for separating the top sheet from the remaining sheets of a stack of sheets, said device comprising a resilient member having a central portion and two arms extending outwardly therefrom, one of said arms being provided with a buckling edge which is disposed at an acute angle to the vertical and which is adapted to engage the side edge of the top sheet of said stack, the other of said arms being provided with a guide edge which is adapted to prevent lateral movement of said top sheet.

2. As an article of manufacture, a device for separating the top sheet from the remaining sheets of a stack of sheets, said device comprising a resilient member having a central portion and two arms extending outwardly therefrom, one of said arms being provided with a buckling edge which is disposed at an acute angle to the vertical and which is adapted to engage a side edge of the top sheet of said stack, the other of said arms being provided with a guide edge which is adapted to prevent lateral movement of said top sheet, said guide edge being vertically disposed.

3. As an article of manufacture, a device for separating the top sheet from the remaining sheets of a stack of sheets, said device comprising a resilient member having a central portion and two arms extending outwardly therefrom, one of said arms being provided with a buckling edge which is disposed at an acute angle to the vertical and which is adapted to engage a side edge of the top sheet of said stack, the other of said arms being provided with a guide edge which is adapted to prevent lateral movement of said top sheet, said arms being angularly disposed relative to said central portion so that said resilient member has substantially a C-shape.

4. A device as defined in claim 3 and further charac-

terized by said first arm being disposed at a greater angle from said central portion than said second arm whereby the force exerted against said top sheet by said first arm will be greater than the force exerted against said top sheet by said second arm.

5. As an article of manufacture, a device for separating the top sheet from the remaining sheets of a stack of sheets, said device comprising a resilient member having a central portion and two arms extending outwardly therefrom, one of said arms being provided with a buckling edge which is disposed at an acute angle to the vertical and which is adapted to engage a side edge of the top sheet of said stack, the other of said arms being provided with a guide edge which is adapted to prevent lateral movement of said top sheet, fastening means operatively secured to said central portion, said arms being substantially in alignment with said central portion, said one arm being slightly shorter than said other arm whereby said one arm will be slightly stiffer than said other arm.

6. As an article of manufacture, a device for separating the top sheet from the remaining sheets of a stack of sheets, said device comprising a buckling member having a face disposed at an acute angle to the vertical and adapted to engage a side edge of the top sheet of said stack, a tube, a spring disposed within said tube, and a rod operatively connected to said buckling member at one end and disposed within said tube at the other end for operatively engaging said spring, whereby said spring will exert a force on said buckling member when said buckling member is in engagement with said side edge of the top sheet.

7. As an article of manufacture, a device for separating the top sheet from the remaining sheets of a stack of sheets, said device comprising a housing, first and second tubes mounted in said housing, first and second springs disposed in said first and second tubes, respectively, first and second rods associated with said first and second tubes, respectively, each of said rods having one end disposed within its associated tube and operatively engaging its associated spring, a buckling member having a face disposed at an acute angle to the vertical, said face being adapted to engage a side edge of the top sheet of said stack to thereby buckle it upwardly of said stack, said buckling member being operatively connected to said first rod so that said first spring will exert a force against said buckling member when said angular face is engaging said side edge of the top sheet, and a guide member having a vertically disposed face adapted to engage said side edge of said top sheet for limiting lateral

movement thereof, said guide member being operatively connected to said second rod so that said second spring will exert a force against said guide member when said vertical face is engaging said side of said sheet, and means associated with said housing for adjusting the relative position of said buckling and guide members.

8. In a sheet feeding device having pusher means for moving the top sheet off a stack of sheets, a guide member extending in the direction of feed of said stack, another member extending in the direction of said feed of said sheet, and means for adjusting the spacing between said last mentioned member and said guide member, a sheet separating device comprising a buckling member disposed at an acute angle relative to the other side of said stack and adapted to engage a side edge of the top sheet of said stack, and spring biasing means for urging said buckling member against said edge of said top sheet to thereby cause said top sheet to buckle upwardly from its adjacent sheet in an arc extending transverse the intended path of movement of said sheet, an extension member having at one end connecting means adapted to be connected to one of said aforementioned members extending in the direction of feed, and connecting means operatively connected to said buckling member and adapted to be connected to the other end of said extension member.

9. In a sheet feeding device for advancing the top sheet of a supply stack, means for buckling said top sheet upwardly in relation to the underlying sheets of the stack, said means comprising a movably mounted sheet engaging element engageable with the upper side edge portion of the supply stack, and spring means for resiliently pressing said sheet-engaging element into operative engagement with the upper side edge portion of the supply stack, said spring means acting to urge said sheet-engaging member in a direction transversely of the direction of feed of said stack and substantially parallel to the plane of the top sheet.

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