Jan. 16, 1962 L. J. STUCKENS 3,017,179

SHEET SEPARATOR DEVICE

Filed Sept. 9, 1958 3 Sheets-Sheet 1

Fig. 1

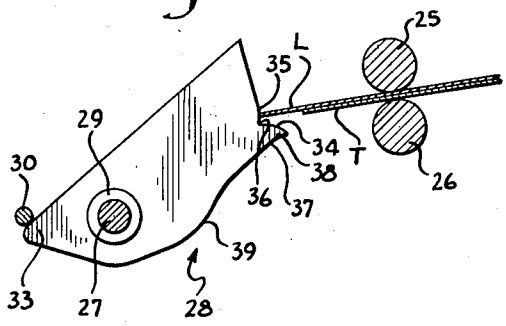


Fig. 2

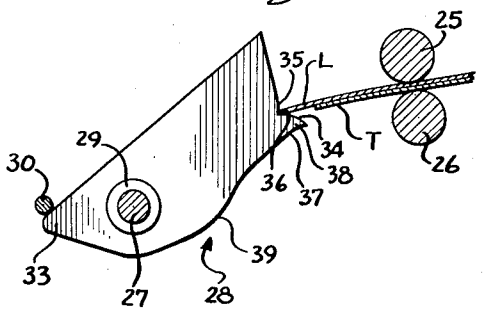


Fig. 3

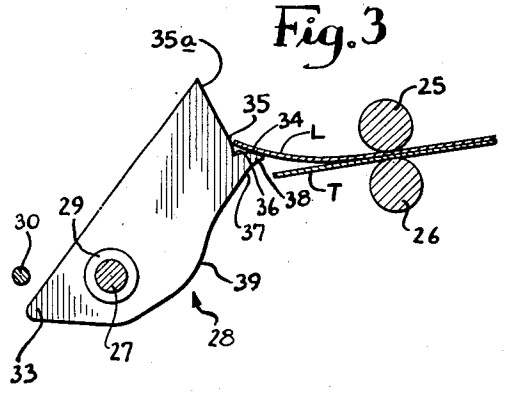


Fig. 4

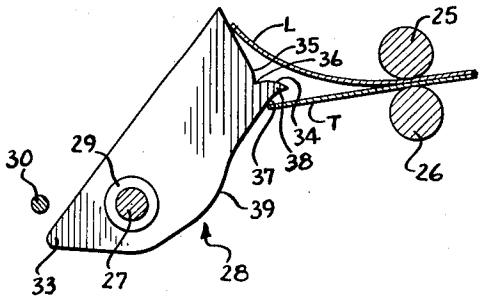


Fig. 5

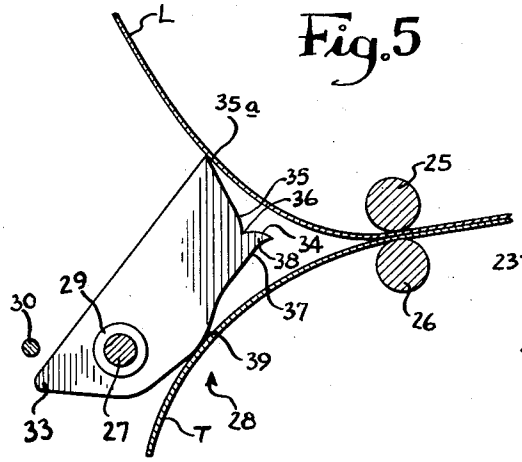
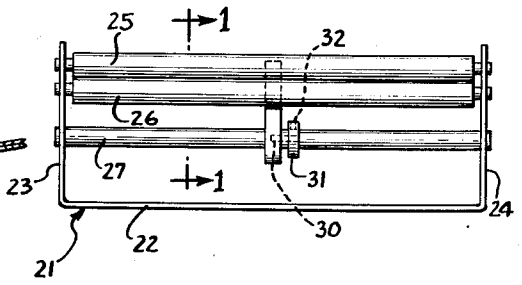


Fig. 6



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SHEET SEPARATOR DEVICE

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Fig. 7

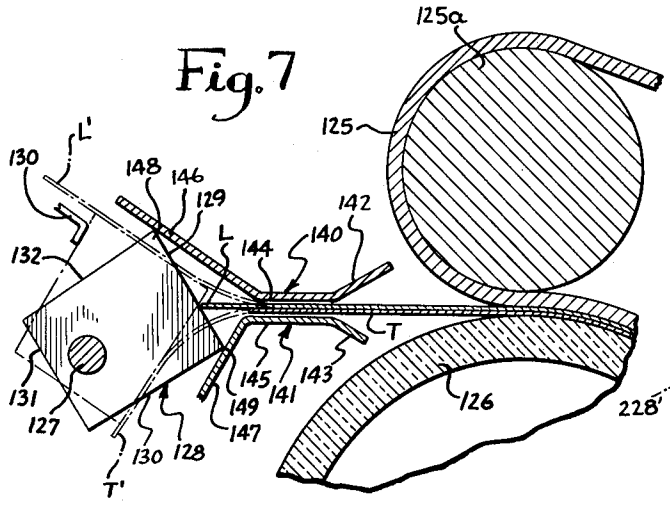


Fig. 8

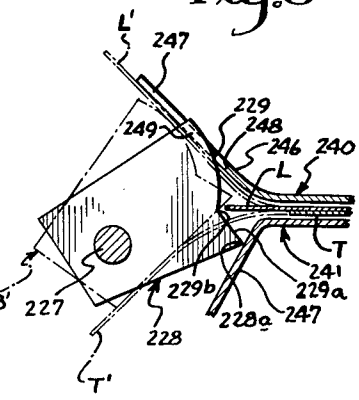


Fig. 9

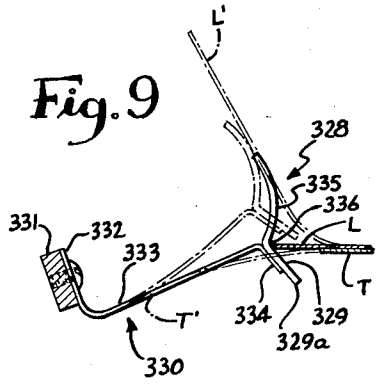


Fig. 10

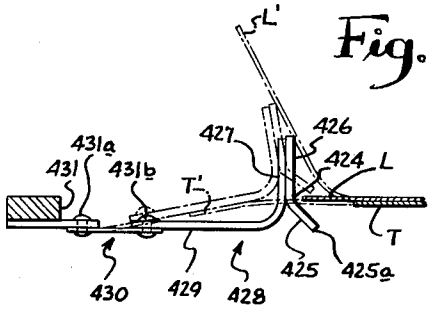
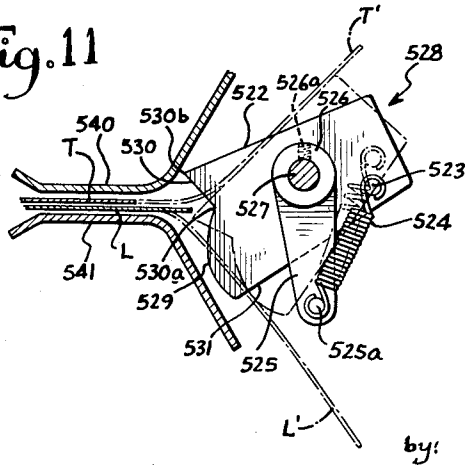


Fig. 11



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Jan. 16, 1962 L. J. STUCKENS 3,017,179

SHEET SEPARATOR DEVICE

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Fig. 12

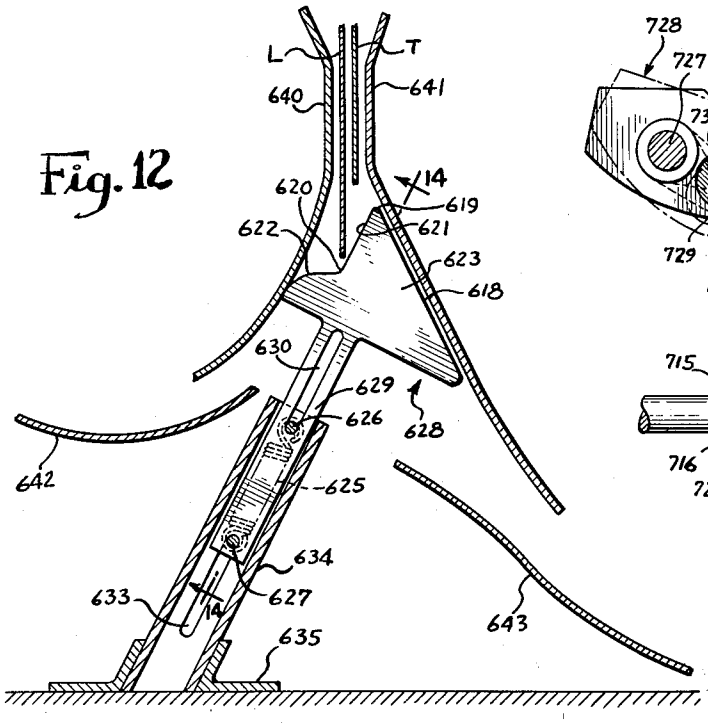


Fig. 15

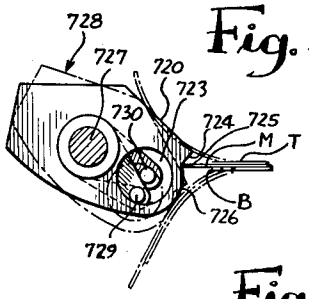


Fig. 16

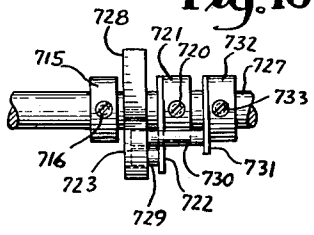


Fig. 13

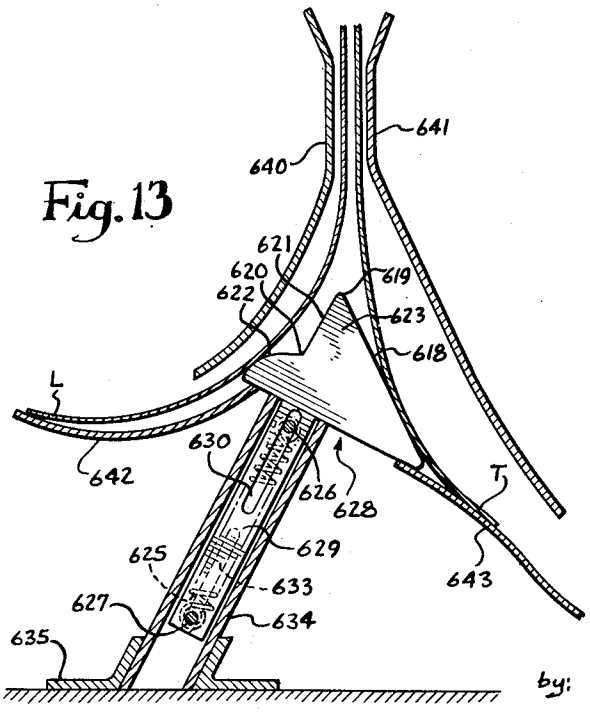
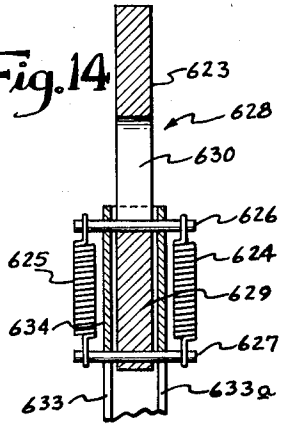


Fig. 14



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United States Patent Office 3,017,179 Patented Jan. 16, 1962

3,017,179

SHEET SEPARATOR DEVICE

Leo J. Stuckens, Evanston, Ill., assignor to American Photocopy Equipment Company, Chicago, Ill., a corporation of Illinois

Filed Sept. 9, 1958, Ser. No. 759,898
17 Claims. (Cl. 271—64)

This invention relates to a device for separating superimposed sheets from each other as the sheets are advancing, and more particularly, to a novel separator device which is actuated solely by the thrust of one of the sheets to be separated.

In sheet handling apparatuses such as photocopy machines, reproducing equipment, printing presses, processing machinery and the like, it is frequently necessary to separate one or more sheets from a group of superimposed sheets while the group is moving in a direction parallel to the planes of the sheets. For example, in a photocopy device it would be extremely advantageous to provide an automatic means for separating the document sheet from the negative sheet after the exposure step, or for separating the positive sheet from the document and negative sheets before the exposure step.

In the sheet handling apparatuses heretofore known in the prior art, separation of superimposed sheets is usually obtained by pneumatic or suction devices which may be actuated to cause one of the sheets to adhere thereto and thereby effect the desired separation. Another expedient heretofore employed in the prior art has been the use of a movable deflector element which is moved to alternate positions by a cam mechanism or by electrical solenoids. These prior art separator devices have proven to be complicated, expensive and unreliable in operation.

As opposed to the expensive and complicated sheet separator arrangements heretofore employed, the sheet separator device in accordance with the present invention is relatively simple and inexpensive as to its construction. Furthermore, its mode of operation is extremely reliable in that the present device is actuated solely by the thrust of one of the sheets to be separated. This simple positive mode of operation eliminates the possibility of any failure or maladjustment of an auxiliary actuating mechanism or pneumatic means which has heretofore been necessary in devices which utilized a movable deflector element or a suction arrangement.

This application is a continuation in part of my prior co-pending applications Serial No. 705,520 filed December 27, 1957, and Serial No. 741,372 filed June 11, 1958. These prior applications disclose two forms of sheet separator device in accordance with the present invention and disclose the manner in which the invention may be utilized in a photocopy machine of the compact desk-type variety. The present application discloses additional modifications or forms of sheet separator devices in accordance with the general principle and mode of operation disclosed in said prior applications.

In the drawings:

FIG. 1 is a vertical sectional view taken substantially on line 1—1 of FIG. 6 and shows one form of the invention wherein the kicker or separator member is pivotally mounted, and shows a pair of superimposed sheets advancing toward the kicker member with the leading edge of one of the sheets making initial contact with the latter;

FIG. 2 is a view similar to FIG. 1 but shows a successive stage wherein the leading edge of the sheet has moved into a recess formed in the kicker member;

FIG. 3 shows the same embodiment in a latter stage wherein the kicker member has been pivoted upwardly in response to the thrust exerted by the leading edge of the leading sheet;

FIG. 4 is a view similar to FIGS. 1 to 3 and shows the manner in which the two sheets are separated when the kicker member is in its uppermost position;

FIG. 5 is a view similar to FIG. 4 and shows the sheets being separated as they travel around the kicker member;

FIG. 6 is a front elevational view of the embodiment shown in FIGS. 1 to 5 and shows one of the many possible arrangements for mounting the kicker member;

FIG. 7 is a side elevational view, partly in section, showing another embodiment of the invention wherein the kicker member is pivotally mounted;

FIG. 8 is a sectional view, showing still another embodiment having a pivotal mounting for the kicker member;

FIG. 9 shows an embodiment wherein the kicker member is movably mounted by means of a resiliently yieldable element;

FIG. 10 shows another embodiment of the invention having a resiliently yieldable element for movably mounting the kicker member;

FIG. 11 shows another embodiment wherein the kicker member is pivotally mounted, and having spring means for biasing the kicker member instead of the gravity biasing arrangement shown in the embodiment of FIGS. 1 to 8 inclusive;

FIG. 12 is a sectional view showing another embodiment wherein the kicker member is slidably mounted for reciprocal movement;

FIG. 13 shows the embodiment of FIG. 12 with the kicker member in its actuated position;

FIG. 14 is a sectional view taken substantially on line 14—14 of FIG. 12;

FIG. 15 is a side elevational view showing still another embodiment wherein the kicker member is pivotally mounted; and

FIG. 16 is an end elevational view of the embodiment shown in FIG. 15.

Referring first to FIGS. 1 to 6 inclusive, the reference numeral 21 indicates generally a support bracket or frame comprising a horizontal element 22 having at its opposite ends integral upstanding flange portions 23, 24. A pair of rollers 25, 26 have their opposite ends rotatably mounted in support flanges 23, 24. Extending between the latter and fixedly secured thereto at its opposite ends is a fixed shaft 27.

The movable kicker member or separator element is designated generally by the reference numeral 28 and is provided with a bearing sleeve 29 receiving shaft 27 whereby kicker 28 is freely rotatably mounted for pivotal movement about the axis of shaft 27. It will be seen from the shape of kicker 28 and the relative location of bearing sleeve 29 that the center of gravity of kicker 28 is located to the right of shaft 27 as viewed in FIGS. 1 to 5 inclusive. This causes kicker 28 to be normally biased by gravity in a clockwise direction as viewed in these figures.

A stop member 30, or other suitable means, may be employed to limit the pivotal movement of kicker member 28 to the initial position shown in FIGS. 1 and 2. As shown in FIG. 6, stop member 30 is secured to a collar 31 rotatably mounted on shaft 27 and secured in any adjusted position on the latter by means of a set screw 32 which may be tightened to engage shaft 27. The position of stop member 30 and therefore the initial rest position of kicker member 28 may be selectively adjusted by loosening screw 32, rotating collar 31 to any desired position of angular orientation, and then retightening screw 32. Stop member 30 is adapted to abut against the upper surface of the tail portion 33 of kicker 28.

The outer end of kicker 28 comprises an arcuate sur-

face or edge 34 intersecting with another surface or edge 35 angularly inclined with respect thereto to form a recess or notch 36 therebetween. The outer end of edge 34 intersects with the lower edge 37 to form a lip 38. The lower edge 37 extends downwardly and rearwardly to a convex edge 39.

The group of superimposed sheets to be separated pass between rollers 25, 26 and advance toward kicker 28. Although for purposes of simplicity and clarity in illustration the drawings disclose only a pair of superimposed sheets, it will be understood that the group may include many more than two sheets and, in this event, the invention is operative and effective to separate one or any desired number of sheets from the other sheets in the group.

In order to assure proper operation of the device, the sheets must be so oriented with respect to each other that the leading edge of one of the sheets is in advance of the other sheet or sheets to be separated therefrom by a small lead of approximately one-quarter of an inch. In FIGS. 1 to 6 the leading sheet is the uppermost one and is designated by the reference letter L, and the lowermost trailing sheet is designated by the reference letter T.

As the sheets L, T pass between rollers 25, 26 toward kicker member 28, the leading edge of the leading sheet L eventually contacts the right-hand end of kicker member 28. The latter is so positioned with respect to rollers 25, 26 and the direction of feed of sheets L, T that the leading edge of sheet L will frequently enter directly into recess 36. If the leading edge of sheet L droops slightly so as to first make contact with the arcuate edge 34, or is slightly higher than normal so as to first strike edge 35, these edges 34, 35 will guide the leading edge of sheet L toward and finally into the recess 36. Due to the lead of sheet L with respect to sheet T, the latter does not make contact with kicker member 28 until after the following operation has occurred.

That is, continued movement of sheet L will cause its leading edge to exert a thrust upon kicker member 28. The line of this thrust extends to the left as viewed in FIGS. 1 to 5 in a direction extending above shaft 27 so as to exert a torque on kicker 28, thereby causing the latter to rotate upwardly in a counterclockwise direction about shaft 27.

As kicker 28 rotates upwardly in response to the thrust exerted by sheet L, the arcuate contour of edge 34 engages the lower surface of sheet L to cause its leading edge to be raised outwardly of recess 36. The leading edge of sheet L then rides upwardly along edge 35 as shown in FIGS. 3 and 4. Kicker 28 will have been rotated to its upward position before the leading edge of trailing sheet T advances sufficiently to contact kicker 28. The leading edge of sheet T then contacts kicker 28 along the edge 37 thereof as shown in FIG. 4, and the leading edge of sheet T then slides downwardly along edge 37 and then along the convex edge 39 until a condition is reached, as shown in FIG. 5, wherein the two sheets are advancing around kicker 28 which serves to separate them and compel their movement in different directions.

The upper portion 35*a* of edge 35 of kicker 28 remains in contact with sheet L and the latter thus holds kicker 28 in its uppermost position until the trailing edge of sheet L has passed the upper extremity of edge 35, whereupon kicker 28 is then free to pivot in a clockwise direction down to its original normal position determined by the abutment of tail portion 33 against stop member 30.

Referring now to FIG. 7, there is shown another embodiment of the invention comprising a kicker 128 freely rotatably mounted on a horizontal shaft 127 located to the left of the center of gravity of kicker 128 so as to cause the latter to be normally biased by gravity in a clockwise direction as viewed in the drawing. Except for its shape, kicker 128 is substantially similar to kicker 28 described above in connection with FIGS. 1 to 6 inclusive.

Instead of rollers as disclosed above, the sheets L, T may pass between a continuous belt 125 and a large rotatable cylinder or roller 126. Belt 125 is entrained around and in contact with a segment of the exterior surface of cylinder 126 and is also entrained around roller 125*a* as well as other rollers (not shown).

As sheets L, T advance to the left from between belt 125 and cylinder 126 toward kicker 128, they may be guided by a pair of guide elements indicated generally by the reference numerals 140, 141 and each comprising an inclined forward section 142, 143, a horizontal section 144, 145, and an inclined rear section 146, 147.

Kicker 128 comprises a flat planar front edge or surface 129, and its lower, rear and upper edges 130, 131, 132 respectively are also disclosed as flat and rectilinear. The initial or lowermost position of kicker 128 is shown in solid lines in FIG. 7, and its actuated or upper position is shown by the dash-dot lines. Kicker 128 is prevented from being moved by gravity in a clockwise direction beyond its initial position by abutment of corner 148 with the inclined section 146 of the upper guide member 140, or by abutment of the lower corner 149 with the inclined section 147 of lower guide member 141. The uppermost or actuated position of kicker 128 is determined by the abutment of the top edge 132 with a stop member 130.

As described above in connection with the embodiments of FIGS. 1 to 6, the leading edge of sheet L must be provided with a lead with respect to the leading edge of trailing sheet T. As the sheets L, T pass between guide member 140, 141 toward kicker 128, the leading edge of sheet L will eventually strike the front edge 129 of kicker 128. The thrust exerted on kicker 128 by sheet L will be in direction having a line of action above shaft 127, whereby the thrust exerted by sheet L will cause kicker 128 to pivot in a counterclockwise direction toward the position shown in dash-dot lines. Sheet L then continues to ride upwardly along the front edge 129 as shown by dash-dot lines at L'.

By the time that the leading edge of trailing sheet T strikes kicker 128, the latter has already been pivoted to its uppermost position by sheet L, so that the leading edge of sheet T will strike the lower edge 130 of kicker 128 and will ride along the latter as shown by the dash-dot lines at T'. It will thus be seen that the sheets L, T are separated by kicker 128 so as to move in different directions at approximately 90 degrees with respect to each other. Kicker 128 is maintained in its uppermost position by sheet L until the trailing edge of the latter passes above and out of engagement with the upper corner 148, after which gravity urges kicker 128 in a clockwise direction back to its initial position shown in solid lines.

Referring now to FIG. 8, kicker 228 is a modified version of kicker 128 described above with respect to FIG. 7. The front face of kicker 228 is provided with an arcuate portion 229 intersecting with the lower rectilinear portion 229*a* so as to form a notch or recess 229*b* therebetween. Kicker 228 is otherwise shaped similarly to kicker 128 and is freely pivotally mounted on shaft 227.

The lower guide member 241 may be identical to guide member 141 previously described in connection with FIG. 7. The upper guide member 240 is similar to the previously described guide member 140 except that the inclined rear section 246 thereof is provided with a narrow slot 247 extending rearwardly and upwardly from the point designated by the reference numeral 248 to the extreme upper end of section 246. The upper forward corner portion 249 of kicker 228 rides within slot 247 which provides clearance for corner 249 when kicker 228 is in its initial lowermost position shown in solid lines. This initial position is determined by the abutment of the forward lower corner 228*a* of kicker 228 against downwardly inclined section 247 of guide member 241. Kicker 228 tends to rotate to this position because the center of gravity of kicker 228 is to the right of shaft 227 when kicker 228 is mounted as shown in FIG. 8.

When kicker 228 is moved by the thrust of the leading sheet L to its uppermost position shown in dash-dot lines

as designated by the reference numeral 228', the lower surface of sheet L bears against the arcuate edge 229 to maintain kicker 228 in its uppermost position until the trailing edge of sheet L has passed out of contact with edge 229. When this occurs, gravity biases kicker 228 in a clockwise direction, as viewed in FIG. 8, back toward its initial position.

The slotted portion of section 246 of upper guide member 240 serves as a backing support for leading sheet L and reinforces the latter as sheet L bears against arcuate edge 229 to maintain kicker 228 in its actuated upper position. That is, section 246 prevents sheet L from being pushed away by kicker 228 as the latter tends to be pivoted by gravity in a clockwise direction, so that kicker 228 may not pivot downwardly until the trailing edge of sheet L has passed out of contact with arcuate edge 229.

Referring now to FIG. 9, kicker 328 is mounted on a resiliently yieldable member 330 comprising an upwardly extending flange 332 affixed to a support element 331, a forwardly extending portion 333 perpendicular to flange 332, and a downwardly extending flange 334. Member 330 is made of a resilient material such as spring steel. Attached to flange 334 is the rear surface of a lower straight portion 329 of kicker 328. Integral with said portion 329 is an arcuate upper portion 335 which curves convexly in an upward direction. A notch or recess 336 may be formed at the intersection of kicker portions 329, 335.

Member 330 and kicker 328 are normally in the position shown by solid lines in FIG. 9. As the group of superimposed sheets advances to be separated, initially, the leading edge of sheet L strikes kicker 328. If sheet L should strike kicker 328 above notch 336, the curvature of portion 335 initially tends to guide it down into notch 336. Similarly, if the leading edge of sheet L should strike portion 329, it is guided upwardly into notch 336.

The continuing advance of the superimposed sheets causes the leading edge of sheet L to exert a thrust against kicker 328, thereby causing yieldable element 330 to bend upwardly to the position shown by the dash-dot lines in FIG. 11. The leading edge of sheet L then rides up along the convexly curved surface of portion 335. At the same time, trailing sheet T, advancing toward kicker 328 with its leading edge slightly behind that of sheet L, passes below the lower edge 329*a* of portion 329 and slides along the bottom surface of portion 333 of member 330. Trailing sheet T is able to clear edge 329*a* by virtue of kicker 328 having been moved to the upper position shown by the dash-dot lines due to the thrust exerted by sheet L.

Resiliently yieldable member 330 mounting kicker 328 is held in the position shown by the dash-dot lines for so long as the lower surface of leading sheet L remains in contact with portion 335 of kicker 328. When sheet L passes out of contact with portion 335, yieldable member 330 is free to resume its normal straight position and kicker 328 returns to its normal position shown by the solid lines in FIG. 11. By this time, sheet L has gone along an upward path indicated at L', while sheet T has proceeded along a lower path indicated at T', thus effectively separating the two sheets.

FIG. 10 shows another embodiment of the invention also utilizing a resiliently yieldable member for movably mounting the kicker. Resiliently yieldable member 430 is secured at one end to a support 431 by conventional means such as rivet 431*a*. Attached by rivet 431*b* to the upper surface of yieldable member 430 at its other end is a horizontal portion 429 of kicker 428. Integral with portion 429 is a vertically extending portion 427. Attached to the outer surface of portion 427 is a vertical portion 426. Integral with the latter and extending angularly downwardly therefrom is an inclined portion 425 forming a recess 424 at its junction with portion 426.

As the superimposed sheets L and T advance toward kicker 428 the forward edge of leading sheet L will strike the outer surface of either portion 426 or portion 425. If it should strike portion 426, the effect is to push against portion 426 in such a manner as to cause resiliently yieldable member 430 to bend upwardly. If the forward edge of sheet L should strike portion 425 it is thereby guided upwardly into recess 424 where it will again exert a force causing resiliently yieldable member 430 to bend upwardly. The effect of the bending of yieldable member 430 is to cause kicker 428, which is attached to member 430, to be moved to the upper position shown by the dash-dot lines in FIG. 10. As it continues to advance, sheet L follows a path shown by the dash-dot lines at L'. At the same time, sheet T clears the lowermost edge 425*a* of portion 425 and, passing under kicker 428, follows a path indicated by the dash-dot lines at T'.

Referring to FIG. 11, there is shown a kicker 528 rotatably mounted on a shaft 527 and having a convex surface or edge 529 located below the flat surface or edge 530. Also mounted on shaft 527 is a collar 526 rigidly fastened thereto by set screw 526*a*. Extending downwardly from collar 526 and fixed thereto is an arm 525 to which is secured a pin 525*a* extending therethrough and having opposite ends projecting laterally outwardly from the respective opposite surfaces of arm 525. The inner end of pin 525*a* is in the path of counterclockwise rotation of kicker 528 and serves as a limit thereto. The outer end of pin 525*a* engages one end of a coil spring 524. The other end of spring 524 is attached to a pin 523 secured to the lower rear portion of kicker 528. Since the center of gravity of kicker 528, as pictured in FIG. 11, is to the left of the axis of shaft 527, kicker 528 tends to rotate in a counterclockwise direction. Kicker 528 is restrained from so rotating by spring 524 which normally maintains it in the initial position shown by the solid lines. This position can be selectably varied by loosening set screw 526*a* and rotating collar 526 to a desired angular orientation on shaft 527. Such a rotation will produce the same angular displacement for kicker 523 as for collar 527.

The superimposed sheets L, T are advanced to the right, as viewed in FIG. 11, toward kicker 528 through guides 540, 541. The forward edge of sheet L strikes the surfaces 529 or 530 of kicker 528 whereupon sheet L acts in a manner similar to that described above with respect to the embodiment shown in FIG. 1. That is, if sheet L initially strikes upper surface 530, it is guided downward into notch 530*a*. If it strikes the lower convex surface first, it is guided upward into notch 530*a*. As sheet L is projected forward against kicker 528 the sheet pivots kicker 528 on shaft 527 in a counterclockwise direction. Kicker 528 rotates in a counterclockwise direction due to the fact that, as mounted in the embodiment illustrated in FIG. 11, the line of action of the thrust exerted by sheet L is below the axis of shaft 527. The limit of this rotation is determined by the position of pin 525*a* of arm 525, against the inner end of which the lower edge 531 of kicker 528 will eventually abut if it continues to rotate. This position can also be selectably varied by adjusting collar 526.

As kicker 528 rotates counterclockwise, leading sheet L slides along convexly curved surface 529, following the path indicated by the dash-dot lines at L'. At the same time, trailing sheet T advances into a position where it will clear the forwardmost edge 530*b* of surface 530 and contact upper surface 522 of kicker 528. Trailing sheet T will then ride along upper surface 522 as indicated by the dash-dot lines at T'. Kicker 528 is held in the position shown by the dash-dot lines for so long as the sheet L remains in contact with edge 529. When sheet L is no longer in contact with edge 529, spring 524, which has been placed under tension by the counterclockwise rotation of kicker 528, will bias kicker 528 back to its normal position shown by the solid lines.

FIGS. 12, 13 and 14 illustrate a separating device utilizing a kicker 628 slidably mounted for reciprocal movement. Projecting angularly upward from a mounting base 635 is a hollow tube 634 with longitudinal slots 633, 633*a* formed in the wall thereof. Slidably mounted in tube 634 is a portion 629 of kicker 628. Kicker portion 629 has a longitudinal slot 630 extending from the upper end thereof to a point approximately half-way down its length. As seen in FIG. 14, extending through the bottom of portion 629 and fixed therein is a pin 627, the opposite ends of which extend through slots 633, 633*a* of tube 634. Extending through slot 630 is a pin 626 which is fixedly secured to tube 634. To pin 626 is attached the respective upper ends of springs 625 and 624. The lower ends of springs 625 and 624 are attached to pin 627. Pin 627 is free to move in slots 633, 633*a* of tube 634, and portion 629 is free to slide with respect to fixed pin 626 and tube 634.

As seen in FIG. 12, the head portion 623 of kicker 628 has a sheet contacting surface composed of two surfaces or edges 622 and 621. Surface 622 is convex and is angularly inclined to surface 621 to form a recess 620 at the intersection thereof. Sheets L and T are advanced downwardly between guides 640 and 641 so that the forward edge of sheet L will strike kicker 623 at a point within or near recess 620 and will be guided into the latter in the manner described above with respect to several of the other embodiments. The pushing force exerted by advancing sheet L on kicker 628 causes the latter to slide downwardly within tube 634. As a result, springs 625 and 624 are tensioned in extended positions shown in FIG. 13.

As a result of the downward sliding movement of kicker 628, when trailing sheet T advances to contact kicker 628 the sheet clears the uppermost point 619 of kicker head 623 and is guided by edge 618 in a path extending downwardly and to the right as viewed in the drawings. Eventually, trailing sheet T contacts guide member 643 and follows the path dictated thereby. Meanwhile, the leading sheet L has been guided by surface 622, now retracted to the position shown in FIG. 13, so that it eventually contacts guide member 642 and follows a path governed by the latter. Kicker 628 is held in the retracted position shown in FIG. 13 for so long as the sheets remain in contact therewith. Thereafter kicker member 628 is returned to the upper position shown in FIG. 12 by the force exerted by springs 625 and 624.

FIGS. 15 and 16 disclose another embodiment wherein the kicker 728 is pivotally mounted on a shaft 727. Kicker 728 is of a configuration similar to those kickers disclosed in FIGS. 8 and 11. In the mounting arrangement shown in FIG. 15, however, the convex surface 726 is below notch 725 and the flat surface 724 is above notch 725. Near the forward end of kicker 728 is a large round opening 723. The center of gravity of kicker 728 is to the left of the axis of shaft 727 so that kicker 728 normally tends to pivot on shaft 727 in a counterclockwise direction.

Kicker 728 is restrained in its counterclockwise rotation by a pin 729 which extends through opening 723 and abuts against the bottom edge thereof. As seen in FIG. 16, pin 729 is secured to an arm 722 which in turn is mounted on a collar 721 adjustably secured to shaft 727 by set screw 720. As the three superimposed sheets advance toward kicker 728 the leading edge of middle sheet M, the most advanced of the three, is guided into notch 725 of kicker 728 by surfaces 724, 726. As it continues to advance, middle sheet M exerts a thrust against kicker 728, causing it to pivot on shaft 727 in a clockwise direction until it is stopped by a pin 730, which extends through opening 723 and abuts against the upper edge of opening 723 as kicker 728 rotates in a clockwise direction. As seen in FIG. 16 pin 730 is secured to an arm 731 attached to a collar 732 adjustably secured to

shaft 727 by set screw 733. By loosening set screw 720 on collar 721 and set screw 733 on collar 732, and rotating the collars to other angular positions on shaft 727, the relative positions of pins 729 and 730 can be changed so as to vary the degree and the limits of rotation of kicker 728. Mounted on shaft 727 is another collar 715, secured thereto by set screw 716 so as to limit the lateral movement of kicker 728 on shaft 727.

Kicker 728 is stopped in its clockwise pivotal movement at the position shown by the dash-pot lines in FIG. 15. In this position the upper trailing sheet T clears the uppermost portion of surface 724 and follows a path along the top side 720 of kicker 728. Middle sheet M and lower sheet B, of course, have been kicked downward by the clockwise rotation of kicker 728 so that they follow a path along surface 726. After the sheets have passed beyond kicker 728, the latter is urged by gravity back toward its initial rest position determined by the abutment of pin 729 with the lower edge of opening 723.

It is to be understood that the specific embodiments of the invention shown in the drawings and described above are merely illustrative of several of the many forms which the invention may take in practice and are not to be construed as limiting the scope of the invention as defined in the appended claims which are to be interpreted as broadly as possible in view of the prior art.

I claim:

1. A device for separating superimposed sheets, the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets said device comprising a member, means mounting said member for free movement to either one of two alternate positions, means on said member responsive to engagement by the leading edge of the first of said sheets to move said member from a first of said positions to the second position thereof, means on said member for guiding said one sheet in a first direction, and means on said member responsive to movement of the latter to said second position to guide another of said sheets in a second direction different from said first direction so as to separate said sheets.

2. A device for separating superimposed sheets, the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets said device comprising a member, means pivotally mounting said member for free oscillatory movement between two alternate angular positions, means on said member responsive to engagement by the leading edge of the first of said sheets to pivot said member from a first of said positions to the second position thereof, means on said member for guiding said one sheet in a first direction, and means on said member responsive to movement of the latter to its second position to guide another of said sheets in a second direction different from said first direction so as to separate said sheets.

3. A device for separating superimposed sheets, said device comprising a kicker member, means slidably mounting said kicker member for free reciprocal movement between two alternate positions, means on said kicker member responsive to engagement by the leading edge of one of said sheets to move said kicker member from a first of said positions to the second position thereof, means on said kicker member for guiding said one sheet in a first direction, and means on said kicker member responsive to movement of the latter to its second position to guide another of said sheets in a second direction different from said first direction so as to separate said sheets.

4. A device for separating superimposed sheets, the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets said device comprising a kicker member, means mounting said kicker member for free movement to either one of two alternate positions, said means comprising a fixed element and a yieldable element secured to said fixed element, said kicker member being fixed to said yieldable element, means on said kicker member responsive to engagement by the lead-

ing edge of the first of said sheets to move said kicker member from a first of said positions to the second position thereof, means on said kicker member for guiding said one sheet in a first direction, means on said kicker member responsive to movement of the latter to its second position to guide another of said sheets in a second direction different from said first direction so as to separate said sheets.

5. A device for separating superimposed sheets, the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets said device comprising a kicker member, means mounting said kicker member for movement to either one of two alternate positions and arranged so that said kicker member is gravity-biased by its own weight toward a first of said positions, means on said kicker member responsive to engagement by the leading edge of the first of said sheets to move said kicker member from said first position to the second position thereof, means on said kicker member for guiding said one sheet in a first direction, and means on said kicker member responsive to movement of the latter to its second position to guide another of said sheets in a second direction different from said first direction so as to separate said sheets.

6. A device for separating sheets, said device comprising a kicker member, means mounting said kicker member for movement to either one of two alternate positions, spring means urging said kicker member toward a first of said positions, means on said kicker member responsive to engagement by one of said sheets to move said kicker member from said first position to the second position thereof, means on said kicker member for guiding said one sheet in a first direction, and means on said kicker member responsive to movement of the latter to its second position to guide another of said sheets in a second direction different from said first direction so as to separate said sheets.

7. A device for separating superimposed sheets, said device comprising a kicker member, means mounting said kicker member for movement between two alternate positions, said kicker member having means constituting an integral portion thereof positioned to engage the leading edge of a first of said sheets during advancing movement of the latter and while the kicker member is in a first of said positions and for receiving the thrust of said first sheet to cause the kicker member to move from said first position to said second position thereof in response to said thrust of said first sheet, means on said kicker member for guiding said first sheet in a first direction, and means on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet in a second direction so as to separate said sheets from each other.

8. A device for separating sheets from each other during movement thereof, said device comprising a kicker member, means mounting said kicker member for movement between two alternate positions, means normally biasing said kicker member toward a first of said positions, said kicker member having recess means for engageably receiving the leading edge of a first of said sheets during advancing movement of the latter and while the kicker member is in said first position to cause the kicker member to move from said first position to said second position thereof in response to the thrust of said first sheet, means on said kicker member for guiding said leading edge of said first sheet into said recess means, means on said kicker member for guiding said first sheet in a first direction, means on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet in a second direction so as to separate said sheets from each other, and means on said kicker member engageable with said first sheet for maintaining said kicker member in said second position until the trailing edge of said first sheet has passed out of engagement with said last-recited means.

9. A device for separating superimposed sheets from each other during advancing movement thereof, the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets said device comprising a kicker member, means rotatably mounting said kicker member for oscillatory movement between two alternate angular positions, means normally maintaining said kicker member in a first of said positions, said kicker member having means for engaging the leading edge of the first of said sheets during advancing movement of the latter and while the kicker member is in said first position to cause the kicker member to pivot from said first position to said second position thereof in response to the thrust exerted by said first sheet on said kicker member, a first guide means on said kicker member for guiding said first sheet in a first direction, and a second guide means on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet in a second direction so as to separate said sheets from each other.

10. A device for separating superimposed sheets from each other during advancing movement thereof, the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets said device comprising a kicker member, means rotatably mounting said kicker member for oscillatory movement between two alternate angular positions and normally biasing said kicker member to the first of said positions, said kicker member having means for engaging the leading edge of a first of said sheets during advancing movement of the latter and while the kicker member is in said first position to cause the kicker member to pivot from said first position to said second position thereof in response to the thrust exerted by said first sheet on said kicker member, a first guide surface on said kicker member for guiding said first sheet in a first direction, a second guide surface on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet in a second direction so as to separate said sheets from each other, and means on said kicker member engageable with one of said sheets for maintaining said kicker member in said second position until the trailing edge of said one sheet has passed out of engagement with said last-recited means.

11. A device for separating superimposed moving sheets, said device comprising a kicker member, means mounting said kicker member for movement to either one of two alternate positions, means on said kicker member for engaging one of said sheets to cause said kicker member to move from a first of said positions to the second position thereof in response to the thrust exerted by said one sheet, a first guide surface on said kicker member for guiding said one sheet in a first direction, and a second guide surface on said kicker member responsive to movement of the latter to its second position to guide the second sheet in a second direction different from said first direction so as to separate said two sheets, and means normally biasing said kicker member toward said first position thereof.

12. A device for separating sheets, said device comprising means for simultaneously advancing a plurality of sheets in superimposed relation with the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets, a kicker member, means mounting said kicker member for movement between two alternate positions, said kicker member having surface means thereon for engaging said leading edge of said first sheet during advancing movement of the latter and while the kicker member is in a first of said positions to cause the kicker member to move from said first position to the second position thereof in response to the thrust of said first sheet, a first guide means on said kicker member for guiding said first sheet in a first direction, and a second guide means on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet in a second direction so as to separate said sheets from each other.

13. A device for separating sheets, said device comprising means for simultaneously advancing a plurality of sheets in superimposed relation with the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets, a kicker member, means mounting said kicker member for movement between two alternate positions and normally biasing said kicker member toward a first of said positions, said kicker member having a recess for engageable receiving said leading edge of said first sheet during advancing movement of the latter while the kicker member is in said first position to cause the kicker member to move from said first position to the second position thereof in response to the thrust of said first sheet, means on said kicker member for guiding said leading edge of said first sheet into said recess, a first guide surface on said kicker member for guiding said first sheet around said kicker member in a first direction, and a second guide surface on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet around said kicker member in a second direction so as to separate said sheets from each other.

14. A device for separating sheets, said device comprising means for simultaneously advancing a plurality of sheets in superimposed relation with the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets, a kicker member, means pivotally mounting said kicker member for oscillatory movement between two alternate positions and normally biasing said kicker member toward a first of said positions, said kicker member having a recess for engageably receiving said leading edge of said first sheet during advancing movement of the latter and while the kicker member is in said first position to cause the kicker member to pivot from said first position to the second position thereof in response to the thrust of said first sheet, means on said kicker member for guiding said leading edge of said first sheet into said recess, a first guide surface on said kicker member for guiding said first sheet around said kicker member in a first direction, and a second guide surface on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet around said kicker member in a second direction so as to separate said sheets from each other.

15. A device for separating sheets, said device comprising means for simultaneously advancing a plurality of sheets in superimposed relation with the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets, a kicker member, means slidably mounting said kicker member for reciprocal movement between two alternate positions and normally biasing said kicker member toward a first of said positions, said kicker member having a recess for engageably receiving said leading edge of said first sheet during advancing movement of the latter and while the kicker member is in said first position to cause the kicker member to move from said first position to the second position thereof in response to the thrust of said first sheet, means on said kicker member for guiding said leading edge of said first sheet into said recess, a first guide surface on said kicker member for guiding said first sheet around said kicker member in a first direction, and a second guide surface on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet around said kicker member in a second direction so as to separate said sheets from each other.

16. A device for separating sheets, said device comprising means for simultaneously advancing a plurality of sheets in superimposed relation with the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets, a kicker member, means freely mounting said kicker member for movement between two alternate positions and normally biasing said kicker member toward a first of said positions, said kicker member having a portion thereof positioned to engage said leading edge of said first sheet during advancing movement of the sheets and while the kicker member is in said first position to cause the kicker member to move from said first position to the second position thereof in response to the thrust of said first sheet, a first guide surface on said kicker member for guiding said first sheet around said kicker member in a first direction, a second guide surface on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet around said kicker member in a second direction so as to separate said sheets from each other, and means on said kicker member engageable with one of said sheets for maintaining said kicker member in said second position until the trailing edge of said one sheet has passed out of engagement with said last-recited means.

17. A device for separating sheets, said device comprising means for simultaneously advancing a plurality of sheets in superimposed relation with the leading edge of a first of said sheets projecting forwardly of the leading edge of a second of said sheets, a kicker member, means freely rotatably mounting said kicker member for pivotal movement between two alternate positions and normally biasing said kicker member toward a first of said positions, said kicker member having a portion thereof positioned to engage said leading edge of said first sheet during advancing movement of the sheets and while the kicker member is in said first position to cause the kicker member to pivot from said first position to the second position thereof in response to the thrust of said first sheet, a first guide surface on said kicker member for guiding said first sheet around said kicker member in a first direction, a second guide surface on said kicker member responsive to movement of said kicker member to said second position to guide the second sheet around said kicker member in a second direction so as to separate said sheets from each other, and means on said kicker member engageable with one of said sheets for maintaining said kicker member in said second position until the trailing edge of said one sheet has passed out of engagement with said last-recited means.

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