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UNITED STATES PATENTS
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[54] **ALIGNING MECHANISM FOR ENVELOPE**
BLANKS

24 Claims, 4 Drawing Figs.

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 59, 58, 1, 2, 12, 13; 93/36 (SQ), 62; 53/(Inquired)

ABSTRACT: Irregularly shaped blanks or sheets are transported along a conveyor system having conveyor belts for biasing the blanks against a wall located along the conveying structure. The blanks are irregular (for example, T-shaped) and contact the wall at several points. An aligning pin is provided with a photocell operated means for selectively moving it into the path of the blank so that the pin makes sliding contact with the side edge of a trailing portion of each blank. In this regard, the aligning pin is moved into a position relative to the wall so that continued motion along the conveyor causes each blank to pivot into its desired alignment.

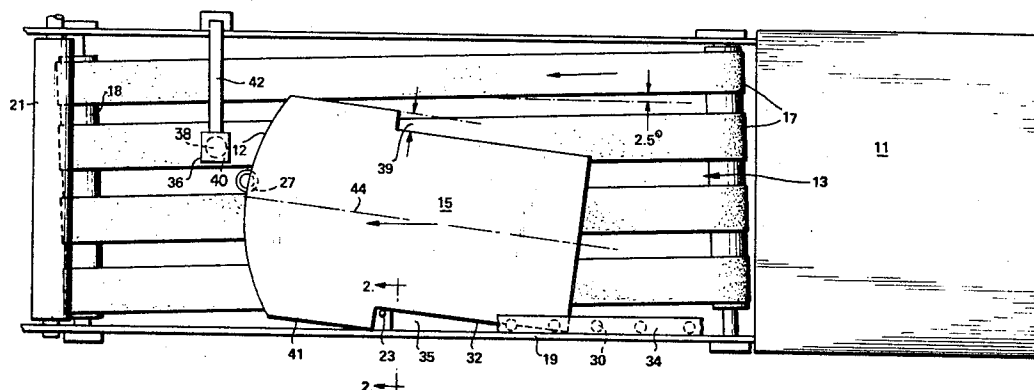


FIG. 1

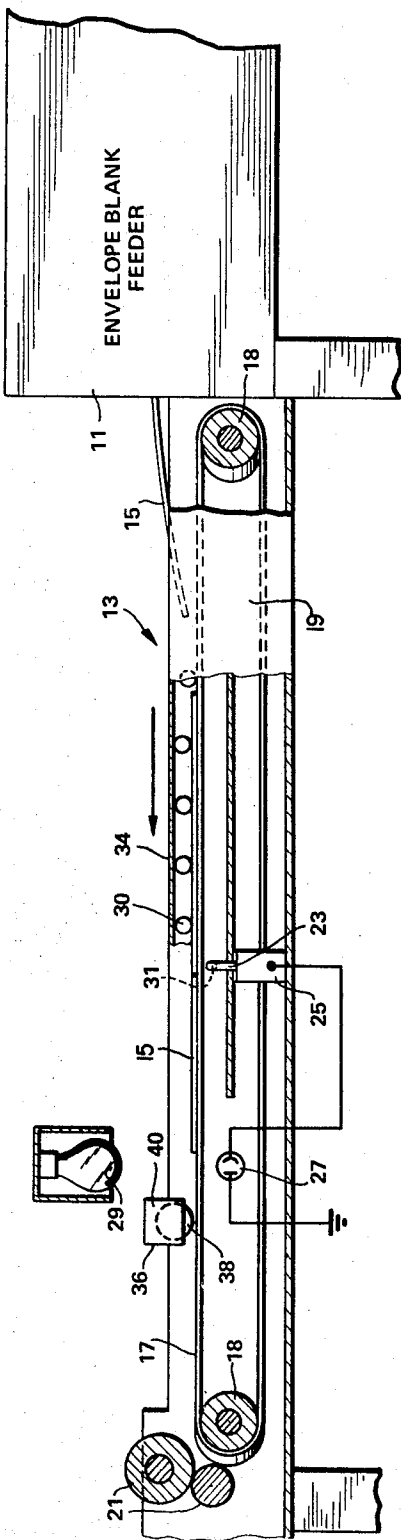
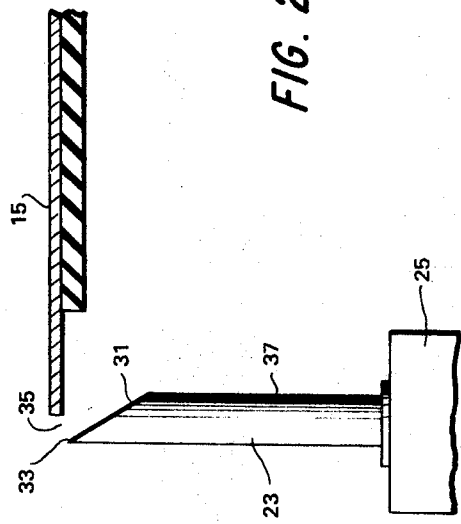


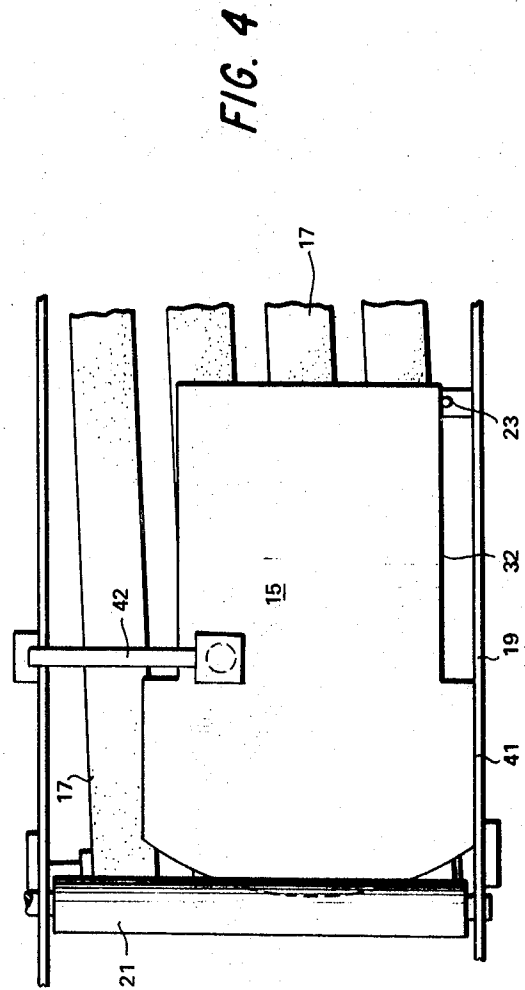
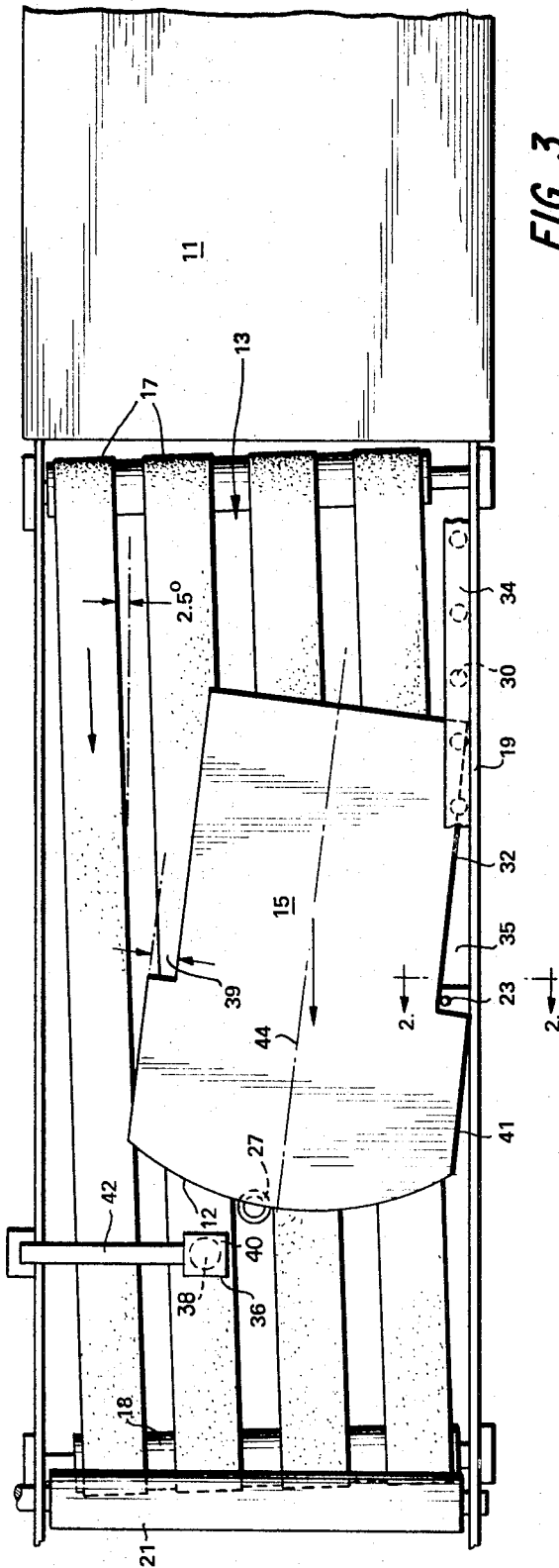
FIG. 2



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ALIGNING MECHANISM FOR ENVELOPE BLANKS

BACKGROUND

This invention relates generally to the art of devices used to control articles on conveyors. More particularly, it relates to the art of aligning blanks or sheets on a conveyor system before they are inserted into a folding mechanism.

There are many conveyor systems in use for feeding rectangularly shaped sheets or blanks into folding machines. Such systems simply use drive rollers or belts which are positioned at a bias with respect to the desired direction of blank motion so that a straight side edge of each blank or sheet is brought in sliding engagement with a straight registration wall located along the conveyor's path. But these bias-registration systems are not suitable for aligning irregularly shaped blanks or sheets which do not have a long enough straight side edge to register with the straight wall. Hence, more complex systems have been required to align irregularly shaped blanks or sheets.

One type of structure for aligning irregular sheets or blanks on a conveyor system includes sets of pins which converge or push on each blank. One example of such an aligning system is described in U.S. Pat. No. 3,153,533 to Novick. Another such prior art aligning device is described in U.S. Pat. No. 434,630 to Hart wherein the leading edges of the blanks to be aligned come into contact with stationary pins which are aligned with one another. Hart's blanks continue to be biased against the pins by the conveyor system until the leading edge is in contact with both pins so that the blank is aligned. At this point, either the pins recede or the blank is raised so that it can continue to be transported along the conveyor system. Other systems for aligning irregularly shaped blanks comprise jaws which actually close on each blank to be aligned and move the blank into an aligned position. An example of this type of device is described in U.S. Pat. No. 1,941,248 to Cottrell.

All of the above-mentioned devices for aligning irregularly shaped sheets or blanks require costly and complicated machinery. Also, it is difficult to match such aligning devices with conveyor systems that were not particularly constructed to be used in conjunction with them. For example, the converging pin and the closing jaw devices are not compatible with "straight-wall" conveyor systems; and "blocking pin" aligners do not work with biasing belt or roller systems because irregularly shaped blanks assume a skewed position again as soon as they pass the blocking pins. Consequently, it is an object of this invention to provide a structure for aligning irregularly shaped blanks or sheets wherein such structure is both simple and fully compatible with otherwise conventional conveyors having bias belts or rollers for driving the blanks against a straight registration wall.

SUMMARY OF THE INVENTION

In accordance with principles of the present invention, a trailing side edge aligning member is positioned relative to a side guide wall so that an irregularly shaped blank or sheet is in its desired alignment when the forward portion of its side edge abuts the guide wall and the trailing portion of its side edge abuts the aligning means. In this manner, the irregularly shaped blanks or sheets are brought into alignment by merely being brought into simultaneous sliding contact with both the side guide at its forward position and the side edge aligning member at its trailing portion.

According to a preferred embodiment of the invention, as an irregularly shaped blank or sheet is transported along the conveyor system it is held against the side guide wall by the biasing belts or rollers until the leading portion of the blank passes adjacent a movable aligning pin. This event is detected by a photocell which delivers an output signal to a means for moving the aligning pin upwardly into the path of a side edge of the blank's trailing portion. Further motion of the blank along the conveyor path then straightens the blank's side edge which, in turn, brings the entire blank into its desired alignment so that it can be suitably inserted into a folding machine, for example.

BRIEF DESCRIPTION OF THE INVENTION

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings in which reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention in a clear manner.

FIG. 1 is a schematic illustration of one embodiment of the sheet blank aligning system of this invention;

FIG. 2 is a closeup schematic of an aligning pin taken along the line 2-2 of FIG. 3 with certain elements removed;

FIG. 3 is a plan view of a T-shaped blank as seen before it is aligned by the aligning device of this invention; and,

FIG. 4 is a plan view of a T-shaped sheet blank after it is aligned.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and more particularly to FIG. 1; the invention will be described as applied to the alignment of envelope blanks. But its application is not limited to envelope blanks. The invention could be applied to boxes, cartons, folders, wrapping paper, bottles, or other types of blanks which must be aligned on a conveyor system. In the illustrated embodiment, however, an envelope feeder 11 contains a pile of envelope blanks, not shown, which it ejects one at a time onto a conveyor 13. Envelope blank 15, for example, is shown being ejected from the envelope blank feeder 11 onto the conveyor 13. Blank 15 has a trailing flap side edge 32 and a side flap side edge 41 (FIGS. 3 and 4). The conveyor 13 has bias belts 17 for biasing the blank 15 against a side guide wall 19. Belts 17 are driven by rollers 18 and can be more clearly seen in FIG. 3. The conveyor transports the envelope blank 15 to a folding machine which is schematically illustrated by rollers 21 for folding the blanks into a desired configuration in a conventional manner.

Located under the conveyor 13 is an aligning pin 23 which is actuated by a pin actuator 25 to move up through the conveyor 13 into the path of the blank 15. The actuator 25 is connected to a photocell 27 which is located forward of the aligning pin 23. The photocell is also below both the conveyor 13 and a light source 29 which is positioned on the opposite side of the conveyor 13 from the photocell 27. The end of the pin 23 has a beveled surface 31 (FIG. 2) the purpose of which will be explained below.

Marble rollers 30 are loosely held in fixed positions by bar 34 (FIGS. 1 and 3). Bar 34 actually extends the full length of wall 19 but is cut away in the drawing so as not to complicate the aligning pin area. As can be seen in FIG. 3, the blank 15 slides under the bar 34 and the marbles roll along the top of the blank as it is transported along conveyor 13. Thus, the side edge of blank 15 is held flat against the conveyor by the marbles. The use of such pressure marbles is old in the art.

As shown in FIG. 3, the biasing belts 17 both transport the envelope blanks 15 and bias them against the side guide wall 19. In the preferred embodiment, biasing is accomplished by positioning the conveyor belts 17 at a 2.5° angle with the wall 19 as shown in FIG. 3. Other methods of biasing the blanks can also be employed. For example, gravity biasing techniques can be used if the conveyor system is built on an incline.

In operation, after each envelope blank 15 is ejected from the feeder 11, it is moved toward the folding machine 21 and urged against the sidewall 19 by the biasing belts 17 so as to assume the orientation shown in FIG. 3. The marbles 30 hold the side flap side edge 41 and the trailing flap side edge 32 flat against the conveyor 3. The blank 15 then passes between the light source 29 and the photocell sensor 27, thus changing the signal of the photocell sensor 27 to the pin actuator 25. The actuator is operative in response to this signal change to push the aligning pin 23 up through the conveyor 13 into the path of the blank's trailing flap side edge 32.

The relative positions of the sensor 27 and the aligning pin 23 are such that, upon rising, the pin's tip 33 will not push against the side of the blank 15, but rather come up in an open area such as 35 in FIG. 2; and the edge 37 of the pin is located one T-arm-length 39 (FIG. 3) away from the side guide wall 19. If the timing is slightly off, the beveled surface 31 may act as a cam with respect to blank 15 in that it slides the blank out of the path of the pin.

After the pin 23 is moved upwardly, the conveyor's bias belts 17 continue to transport the blank 15 toward the folding machine 21 and the side edge 32 of the trailing flap of the blank 15 is moved away from the side guide wall 19 by the pin 23. At the same time, the straight edge 41 of the blank 15 continues to slide along the sidewall 19. In this manner, the blank 15 is straightened and aligned by the simultaneous cooperation of the biasing belts 17, the aligning pin 23, and the side guide wall 19. Hence, the blank 15 is fully aligned as it enters the folding machine 21, as shown in FIG. 4.

In some cases the biasing means does not hold the trailing flap edge 32 tightly against the pin 23. A marble drag 36 (FIGS. 1 and 3) is employed to overcome this difficulty. The marble drag comprises a marble 38 loosely held in box 40 and resting on a belt 17. The marble drag box 40 is supported above the conveyor 13 by a suitable means 42 (FIG. 3). The marble drag 36 applies a drag force to the blank 15 on the side of centerline 44 away from the straight wall 19. This force causes a moment of torque tending to rotate the blank 13 in a clockwise direction, thus the trailing flap side edge 32 is held firmly against pin 23. Means other than a box can be used to hold the marble, for example, a piece of sheet metal having an aperture can be positioned parallel to the belts with the marble in the aperture. Also, it is not essential that a marble be used. For example, a brush, a felt arm or any other suitable means can be positioned to slide over the top of the blank.

Once the trailing edge of the blank 15 has passed over the photocell sensor 27, it again receives light from the light source 29 and furnishes the actuator 25 with a control signal for pulling the pin 23 downwardly and out of the path of the next blank. The cycle is then repeated when the next blank passes between the light source and the photocell. Where higher speeds are desired, it has been found convenient to use a second photocell (not shown) to provide a control signal for lowering the pin 23. If a second photocell is used, the pin is lowered before the blank clears the first photocell. Still another modification is to use a timer (not shown) in conjunction with the pin actuator 25. The actuator raises the pin in response to a signal from photocell 27 and lowers it at the end of a preset time period as measured by the timer.

It will be appreciated by those skilled in the art that the invention described above functions equally well if the pin 23 is moved in the plane of the blank rather than perpendicular to the blank; and instead of the pin 23, other aligning means can also be used in the practice of this invention. For example, a block can be moved into position to contact the blank's trailing edge. Also, a portion of the side guide wall can be pushed out toward the blank 15 upon receipt of a signal from the sensor; and it is not critical to this invention that a photocell sensor be used because other sensors can also perform the function of designating that the blank has reached the point of its travel where the aligning means should be actuated.

This specification describes one embodiment wherein an aligning means is brought into sliding contact with a trailing edge of a sheet blank. But, while the invention has been particularly shown and described with reference to that preferred embodiment, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention. For example, as noted above, the aligning means can be something other than a pin. Also, a wire-actuated microswitch, proximity switch, or the like could be used to detect the blanks rather than a photocell. In the above described embodiment, the blanks can either be randomly fed or fed in a timed sequence to the conveyor. If the blanks are time fed and

the movements of the pin are synchronized with the timer, it is not necessary to use a sensor. A timer similar to that disclosed in U.S. Pat. No. 2,171,362 to Gulliksen could be used in this respect.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

We claim:

1. Apparatus for aligning irregularly shaped blanks of the type having at least two distinct edge portions located on the same side thereof, said machine comprising:

conveyor means for transporting said blanks along a predetermined path;

side guide means located adjacent said path, said conveyor means being operative to urge one of said distinct edge portions into sliding engagement with said side guide means; and,

trailing side guide means laterally positioned with respect to said side guide means and having an aligning surface simultaneously slidably engaging the other of said distinct edge portions so that said blank is brought into desired alignment with respect to said predetermined path as said blank is moved therealong.

2. Apparatus according to claim 1 including trailing side guide actuating means operative in response to the presence of said blank at a predetermined point along said path for selectively engaging said trailing side guide means with said other distinct edge portion.

3. Apparatus according to claim 2 including a photocell sensor operative in response to motion of said blank past said predetermined point to deliver an output signal to said trailing side actuating means for initiating said selective engagement of said trailing side guide means with said other distinct edge portion.

4. Apparatus according to claim 1 wherein said trailing side guide means is selectively vertically movable into engagement with said other distinct edge portion.

5. Apparatus according to claim 4 including trailing side guide actuating means operative in response to the presence of said blank at a predetermined point along said path for selectively engaging said trailing side guide means with said other distinct edge portion.

6. Apparatus according to claim 5 including a photocell sensor operative in response to motion of said blank past said predetermined point to deliver an output signal to said trailing side-actuating means for initiating said selective engagement of said trailing side guide means with said other distinct edge portion.

7. Apparatus according to claim 1 wherein said trailing side guide means is a pin.

8. Apparatus according to claim 7 including a trailing side guide actuating means and a photocell sensor:

said photocell sensor being operative in response to motion of said blank past a predetermined point along said path for delivering an output signal to said actuating means; and,

said actuator being operative in response to receipt of said output signal for selectively moving said pin into engagement with said other distinct edge portion.

9. Apparatus according to claim 8 wherein said pin is vertically movable into engagement with said other distinct edge portion, said pin having a beveled edge along the leading end so as to act as a cam with respect to said blank by sliding it out of the path of the pin.

10. Apparatus according to claim 1 further comprising: drag means applying a slowing force at a point on said blank away from said side guide means and thereby creating a rotating moment which holds said blank tightly against said trailing side guide means.

11. Apparatus according to claim 10 wherein said drag means is a marble held loosely by a support above said conveyor and in rolling contact with said conveyor so that said blank can pass between said marble and said conveyor.

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12. Apparatus according to claim 10 including trailing side guide actuating means operative in response to the presence of said blank at a predetermined point along said path for selectively engaging said trailing side guide means with said other distinct edge portion.

13. Apparatus according to claim 12 wherein said trailing side guide means is selectively vertically movable into engagement with said other distinct edge portion.

14. Apparatus according to claim 13 wherein said trailing side guide is a pin.

15. Apparatus according to claim 1 wherein said two distinct edge portions are parallel, and wherein:

said trailing side guide means is laterally spaced from said side guide means by a distance corresponding to the lateral distance across said blank between said parallel edge portions.

16. Apparatus according to claim 15 wherein said trailing side guide means is selectively vertically movable into engagement with said other parallel edge portion.

17. Apparatus according to claim 16 including trailing side guide actuating means operative in response to the presence of said blank at a predetermined point along said path for selectively engaging said trailing side guide means with said other parallel edge portion.

18. Apparatus according to claim 17 including a photocell sensor operative in response to motion of said blank past said predetermined point to deliver an output signal to said trailing side-actuating means for initiating said selective engagement of said trailing side guide means with said other parallel edge portion.

19. Apparatus according to claim 15 wherein said trailing

side guide means is a pin.

20. Apparatus according to claim 19 including a trailing side guide actuating means and a photocell sensor:

said photocell sensor being operative in response to motion of said blank past a predetermined point along said path for delivering an output signal to said actuating means; and,

said actuator being operative in response to receipt of said output signal for selectively moving said pin into engagement with said other parallel edge portion.

21. Apparatus according to claim 20 wherein said pin is vertically movable into engagement with said other parallel edge portion, said pin having a beveled edge along the leading end so as to act as a cam with respect to said blank by sliding it out of the path of said pin.

22. Apparatus according to claim 15 further comprising:

drag means applying a slowing force at a point on said blank away from said side guide means and thereby creating a rotating moment which holds said blank tightly against said trailing side guide means.

23. Apparatus according to claim 22 wherein said drag means is a marble held loosely by a support above said conveyor and in rolling contact with said conveyor so that said blank can pass between said marble and said conveyor.

24. Apparatus according to claim 22 including trailing side guide actuating means operative in response to the presence of said blank at a predetermined point along said path for selectively engaging said trailing side guide means with said other distinct edge portion.

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