

April 13, 1965

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3,178,172

HANDLING APPARATUS FOR FOLDED MATERIAL

Filed Oct. 22, 1962

3 Sheets-Sheet 1

Fig. 1

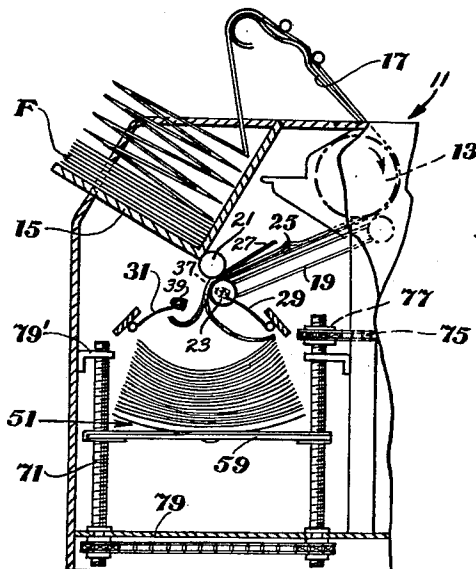
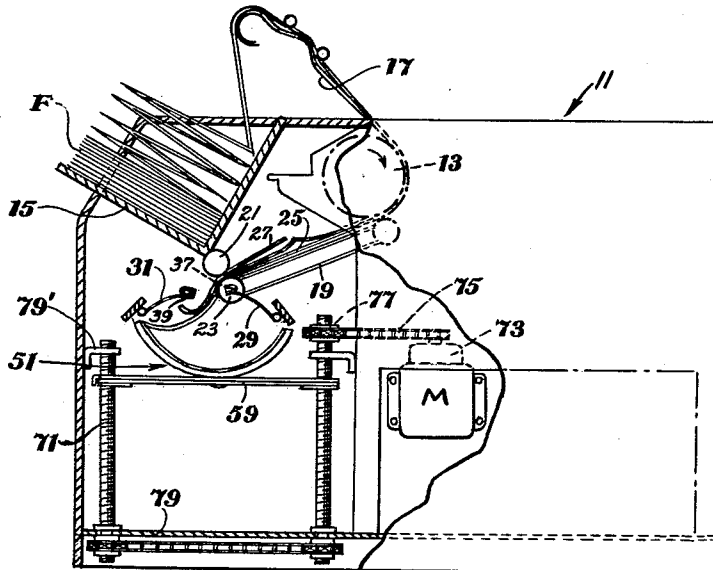


Fig. 2

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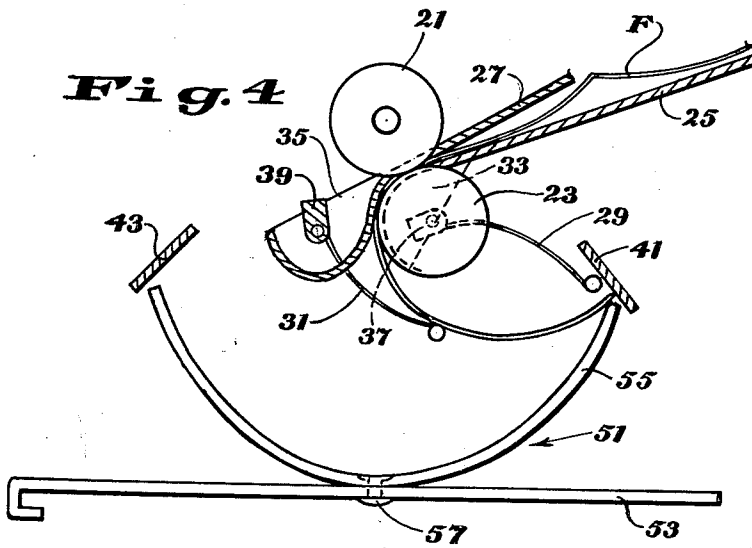
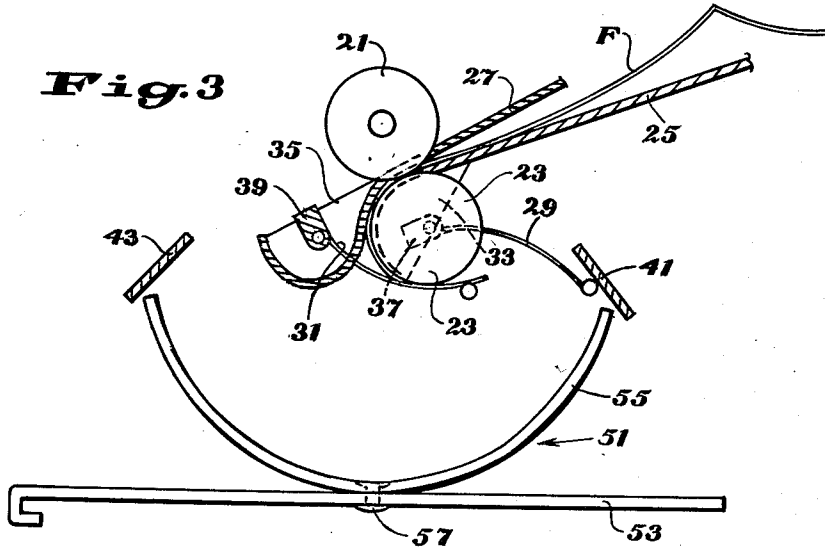
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3 Sheets-Sheet 2



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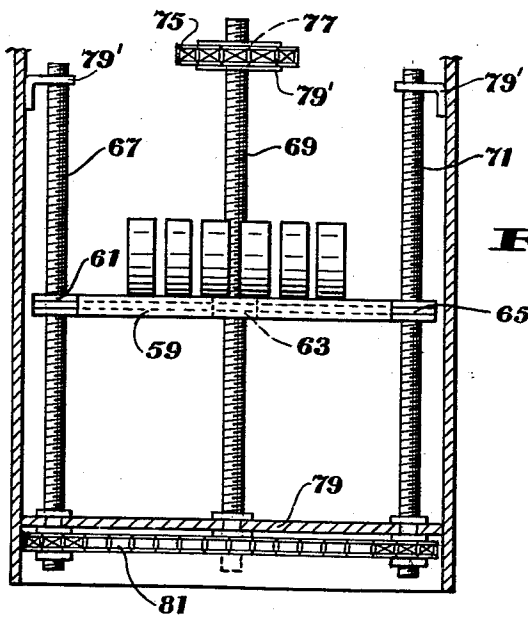
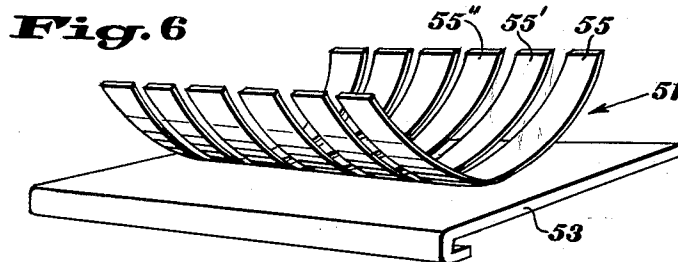
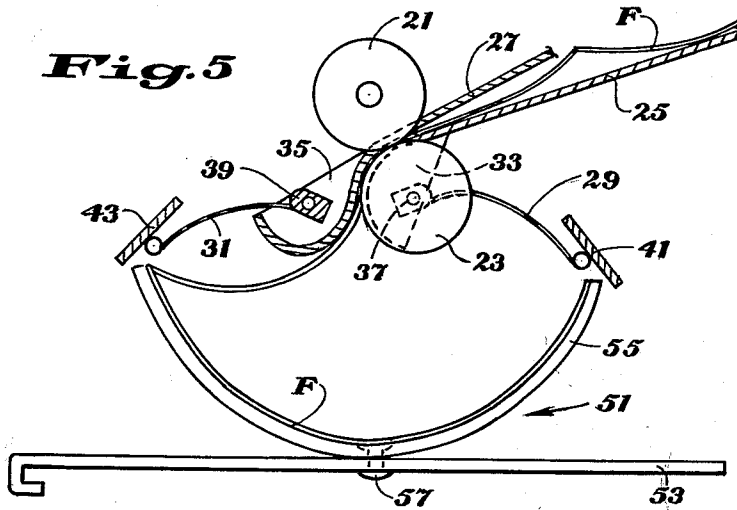
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HANDLING APPARATUS FOR FOLDED MATERIAL

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3 Sheets-Sheet 3



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3,178,172 HANDLING APPARATUS FOR FOLDED MATERIAL

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8 Claims. (Cl. 270-79)

This invention relates to apparatus for handling continuous paper strip material of the type that folds upon itself by means of multiple folds, successive ones of which face in opposite directions. One such material is sold by Moore Business Forms, Inc., under the name Fanfold continuous forms.

The use of such folded strip material, particularly for print-out of computer machinery, is wide spread. In view of the continuous nature of the strip material and in view of the volume of material which is recorded on them, there has developed a need for a high speed handling device which will direct the material after leaving a piece of associated equipment into a hopper or receiver where the material is stacked or folded in the same order as it entered the associated equipment. The apparatus of the present invention is directed to such a handling apparatus.

In order to facilitate the understanding of the present invention, it will be described herein as it might be utilized in combination with a continuous microfilmer, although it will be recognized that the invention is not limited to such use as it can be used, for example, with any apparatus where such folded material is unfolded and moved from one stack to another. Also it is useful in conjunction with a computer output. As known in the art, a continuous microfilmer is a photographic recording apparatus in which the document being photographed and the photographic recording media are moved simultaneously and in synchronism across the photographic exposure.

In general, the continuous strip material handling apparatus of the present invention comprises a novel receiver for receiving the zigzag-folded forms that I refer to as strip material having a plurality of successive reverse folds, as shown in the drawings appended hereto, and novel means for directing the material into the receiver. The apparatus also comprises mechanism whereby a predetermined spacial relation is maintained between the uppermost material in the receiver and the throat through which the material is discharged, regardless of the amount of material received in the hopper.

One object of the present invention is, therefore, to provide an improved handling apparatus for folded continuous strip material.

Another object of the present invention is to provide a receiver for receiving such material, which maintains substantially a constant concave configuration of the uppermost material in the receiver with respect to the discharge throat.

Yet another object of the present invention is to provide folded strip material handling apparatus in which the receiver is moved relative to a discharge throat through which the material passes in its movement to the receiver, so as to maintain the predetermined spacial relation referred to above.

Another object of the present invention is to provide in combination with a document copying apparatus an improved apparatus for receiving the folded strip material as they are discharged from the copying apparatus after photographing.

Another object of the present invention is to provide in combination with a document copying apparatus a

receiver which is movable to maintain the predetermined spacial relation mentioned above.

Still other objects and advantages of the present invention will become readily apparent to those skilled in the art from the following description with reference to the accompanying drawings in which like characters denote like parts, and wherein:

FIG. 1 and FIG. 2 are somewhat at schematic end elevational views showing the strip material handling apparatus in accordance with the present invention as it is utilized in combination with a document copying apparatus;

FIGS. 3, 4 and 5 are enlarged detail views showing the discharge throat and receiver with the material directing guides in various positions;

FIG. 6 is a detail perspective view of the concave receiver members and base or carrier therefor; and

FIG. 7 is a front elevational view showing the receiver in position and operatively associated with means for moving the hopper relative to the discharge throat of the apparatus.

In FIG. 1 the numeral 11 designates a document copying apparatus and more specifically a continuous microfilmer of a type which is well known in the art. For example, the Recordak Commercial Microfilmer, Model RE-1, is well adapted for photographically copying continuous folded strip material and will operate advantageously with the handling apparatus which is herein described. A complete description of the copying apparatus and its operation will not be set forth herein since this apparatus is well known in the art and does not form, as far as its specific structure is concerned, a part of the present invention. Suffice it to say that the copying apparatus 11 has a drum 13 which is driven by a motor not shown so that the document being copied is advanced through a photographing station where it is illuminated and the image of the illuminated document is recorded on film in another part of the apparatus. Such film moves in synchronism with the movement of the document through the photographing station and in a direction opposite the document movement.

The numeral 15 designates a supply hopper in which a stack of folded strip material F is positioned prior to the feeding of the material through the copying apparatus for photographing. As is apparent from the drawing, the material F is led over a guide 17 and into the copying apparatus 11 where the leading edge of the material is engaged by the drum 13 and advanced through the copying apparatus.

The numeral 19 designates a belt which is driven from the motor (not shown) within the copying apparatus 11 and which in turn drives the discharge rollers 21 and 23 so that the material F is discharged into a receiver in the manner which will be hereinafter set forth. Belt 19 and rollers 21 and 23, together with lower guide plate 25 and upper guide plate 27, form the ejection conveyor for the forms from the copying apparatus. A pair of guides 29 and 31 (shown in some detail in FIGS. 3 to 5) are pivotally mounted on brackets 33 and 35 (FIG. 5) formed on guide plates 25 and 27, respectively for pivotal movement about fixed axes. The guides 29 and 31 are formed preferably of a light weight spring wire or rod material which has a curved configuration and is rounded at the outer end of the guides so as to present a smooth surface to the material F. The respective guides include counterweights 37 and 39. The counterweights as a result of gravity hold the guides in their respective upper positions in contact with stop members 41 and 43, respectively, or on the opposite side of their respective pivot axes when moved to such position. Such upper positions for the guides are shown in FIGS. 1, 2, and 5 of the draw-

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ings, while guide 31 is shown in the other position in FIGS. 3 and 4.

The receiver, which is generally designated by the numeral 51, comprises a base plate or carrier 53 and a plurality of resilient flexible concave members 55, 55', 55'', etc., which are affixed to the plate 53 by means of screws or rivets 57, see FIGS. 3 to 5. Plate 53 rests on a movable support 59 which is a triangularly shaped plate having bushings 61, 63, and 65 mounted in its three corners. The bushings are threaded for engagement with the power screws 67, 69, and 71, respectively. Screw 69 is driven by an auxiliary motor M through a gear reducer 73, drive chain 75 and a sprocket 77 mounted on the screw. Of course, as an alternative to the use of motor M, one could drive screw 67 by the motor, not shown, within the copying apparatus. Screw 69 like screws 67 and 71 is vertically supported for rotary movement by a base member 79 and each of the screws has a sprocket attached to the lower end thereof and engaged by a chain 81 so that each of the screws is driven simultaneously and in synchronism and at the same speed. This insures that support 59 and therefore hopper 51 will move uniformly as a result of the driving movement imparted to the three screws. The screws are also suitably journaled at their upper portions as at 79'. Alternatively, counter-balanced springs (not shown) instead of motor M, may be used in cooperation with the weight of material F to control vertical positioning of the carrier 53.

Guides 29 and 31 can be selectively positioned in either of two positions. For example, guide 31 can be positioned in the extreme positions of FIGS. 3 and 5, respectively, and guide 29 has two similar extreme positions. One of these positions for each guide member is defined by its contact with the adjacent stop member 41 or 43. The counterweights 37 and 39 hold the guides to which they are attached, in these extreme positions. In the guide positions of FIG. 3 the guides have been manually positioned to direct the leading edge of the folded material transversely toward stop 41. This direction has been selected because the first fold in material F faces as shown in the drawings. If the first fold faced in the opposite direction, the guides would be manually positioned to guide the leading edge of material F transversely toward stop 43. In such positions, guide 31 is positioned in contact with stop 43 and guide 29 will lie in a position corresponding to that of guide 31 in FIG. 3. When so initially and manually positioned, the leading end section of the material F would be guided by the guide 29 towards stop 43 and after hitting stop 43 guide 29 would be pivoted by the movement of the material back to its upper position in contact with stop 41. Guide 29 is held in contact with stop 41 by virtue of the counterweight 37. This counterweight also acts to hold guide 29 in contact with stop 41 because of the overcenter pivot for the guide 29. It is to be understood that the function of guides 29 and 31 is only to initially direct the leading edge of the material toward the selected stop 41 or 43 and that thereafter the guide that occupies the position of guide 31 in FIG. 3 is moved out of the way by the moving material form and the guides are not utilized during the rest of the feeding of that particular continuous strip of folded material.

The operation of the apparatus of the present invention will now be described. Let us assume that a supply of folded material F has been placed in supply hopper 15 and that the leading edge of the material has been guided through the guide 17 into frictional engagement with the drum 13 and the associated transport mechanism of the copying apparatus 11. As soon as the copying apparatus is turned on, the material F is conveyed through the photographing station in the copying apparatus where it is photographed and is discharged by the ejection conveyor through discharge rollers 21 and 23 towards the receiver 51. For proper operation of the guides 29 and 31, they must be positioned, prior to the movement of the

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material F through rollers 21 and 23, so as to direct the movement of the leading edge in the proper direction. Thus assuming that guide 31 has been initially moved to its lower position in which it is shown in FIG. 3, the leading edge of the material will be directed by the guide 31 to contact stop 41 and the weight and movement of the material will begin to pivot guide 31 about its axis as illustrated in FIG. 4. As more and more of the material F passes through rollers 21 and 23, guide 31 is moved by the material until guide 31 eventually goes beyond its center position so that the counterweight causes it to flip to its uppermost position in contact with stop 43 as illustrated in FIG. 5. Eventually the first fold in the fanfold forms is disposed in contact with and in a curved configuration on resilient members 55 and because of the fold the material starts back on itself in contact with the first layer of material in the receiver.

At the same time motor 73 drives the screws 67, 69, and 71 to move the hopper away from the discharge throat formed by rollers 21 and 23. This movement is synchronized with the feeding movement of the material F so that the uppermost layer of material in the hopper 51 remains at a constant distance from the discharge rollers 21 and 23, as the material piles up in the receiver. As a result, the distance of travel of the material from the discharge throat to the pile in the receiver remains constant and orderly folding is insured. The members 55, 55', 55'', etc., are made of a resilient material preferably a light weight spring steel and are sufficiently flexible that the weight of the material F piling up on them tends to flatten them, that is, to increase the radius of curvature of the members 55, etc. Thus as indicated in FIG. 2, the members 55, 55', 55'', etc., have a much greater radius of curvature than they do in FIG. 1 because of the weight of material F. It has been found that the stack of fold lines along each lateral edge of the folded material is thicker when loosely fed into a receptacle, tending to cause continual reduction in the radius of curvature of the upper layer of material as the stack increases in height. Such change is likely to interfere with orderly folding and stacking. By utilizing members 55, 55', 55'', etc., which thus flatten with the weight of the material, the curve of the upper layer in the receiver is maintained and the material is received at high speed and stacked in a uniform manner.

It will now be appreciated by those skilled in the art that the apparatus of the present invention facilitates the rapid handling of folded forms permitting the same to be uniformly stacked and conveniently retrieved for use in further associated equipment.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

Having now particularly described my invention, what I desire to secure by Letters Patent of the United States and what I claim is:

1. In combination:

- (a) a receiver for continuous strip material having a plurality of successive reverse folds,
- (b) means cooperating with said receiver and forming a discharge throat for strip material fed to said receiver, and
- (c) means for guiding the leading end of the continuous strip material from said discharge throat to said receiver, said guiding means comprising pivotally mounted means located between said throat and said receiver on at least one side of the path of feeding movement of the material from said throat and being selectively movable between a first position in which the leading end of said strip material is thereby directed transversely of said feeding movement to initiate proper folding of the material in the re-

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ceiver and a second position remote from said path in which further feeding movement of the material from said throat is unaffected by said pivotally mounted means, said pivotally mounted means being moved from said first to said second position by movement thereagainst of a portion of the strip material following said leading end during said further feeding movement and as said leading end engages said receiver.

2. The combination in accordance with claim 1 wherein said pivotally mounted means are located on both sides of said path of movement of said material from said throat to said receiver.

3. The combination in accordance with claim 2 and stop means on the side of said path opposite said means movable to an inoperative position, said stop means being positioned for engagement by the edge of said leading end of said strip material to initially position said material in the receiver.

4. The combination in accordance with claim 3, said pivotally mounted means being manually movable to direct said leading edge of said strip material selectively to either side of the said path of movement.

5. The combination in accordance with claim 1 and wherein said receiver comprises resilient flexible concave means presenting a concave surface for receiving said material, the flexibility of said means being such that the material received on said surface progressively flattens said means as the weight of the folded material thereon increases.

6. Apparatus according to claim 1 in combination with and receiving said material from a microfilming machine.

7. A device for linearly discharging continuous strip material having a plurality of successive reverse lines of fold through a discharge throat at a predetermined linear speed, and a strip material receiver positioned below said discharge throat and centrally aligned therewith com-

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prising resilient flexible concave means spaced from an axis and presenting a concave surface facing said throat and having a predetermined radius of curvature with respect to said axis for first receiving said continuous strip material in folded, stacked condition thereon, and means for moving downwardly said receiver, relative to said throat, while maintaining its central alignment with said throat, simultaneously with the discharge of said continuous strip material from said throat and at a speed proportional to the rate of discharge to maintain a predetermined spatial relation between said throat and the uppermost portion of the strip material in said receiver, the flexibility of said concave means being such that the increasing weight of the strip material received on said means progressively flattens said means thereby increasing the radius of curvature thereof so as to compensate for the tendency of said uppermost portion of received strip material to take a radius of curvature which is less than that of said predetermined increased radius of curvature of said concave means, because of added thickness of said material at said lines of fold.

8. A receiver in accordance with claim 7 wherein said concave means comprises a plurality of spaced spring members, and a carrier therefor to which said members are attached.

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