United States Patent [19]

Shimmin

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[54] **WEB GUIDING AND CORNER FOLDING APPARATUS**

[75] Inventor: **Lawrence E. Shimmin**, San Diego, Calif.

[73] Assignee: **Copley Press, Inc.**, La Jolla, Calif.

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[21] Appl. No.: **206,334**

[52] **U.S. Cl.** .....**226/11**, 226/49, 226/91, 270/68 R, 270/86

[51] **Int. Cl.** **B65h 17/20**

[58] **Field of Search**.....226/90, 91, 196, 11, 49; 271/19, 21, 22; 270/68 R, 68 A, 86

[56] **References Cited**

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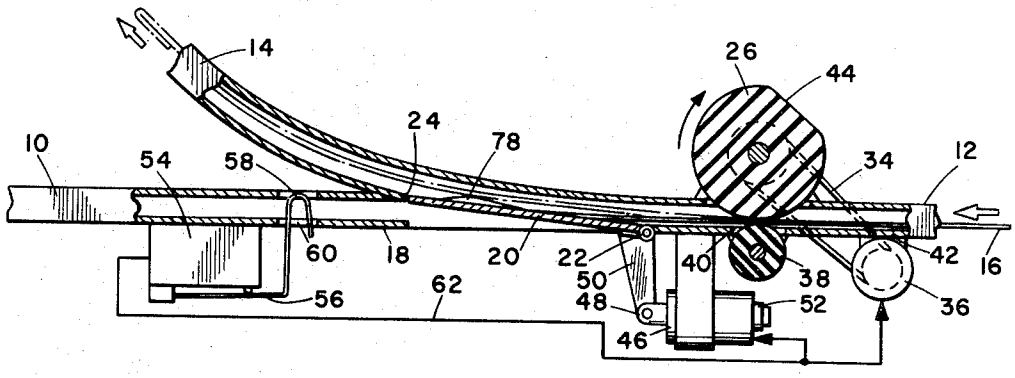
Primary Examiner—Richard A. Schacher

Attorney—Carl R. Brown et al.

[57] **ABSTRACT**

Apparatus for guiding a moving web of material, such as paper, film, or the like, and folding the corners of the leading edge of the moving web to stiffen the leading portion and facilitate automatic feeding through processing means. Folding is accomplished by a guide plate having shaped apertures into which the leading corners of the web are guided as the web advances. With the corners retarded in the apertures, continued motion of the web causes the corners to be folded back. The folding action is assisted by deflection of the web by moving the guide plate.

10 Claims, 9 Drawing Figures



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SHEET 1 OF 2

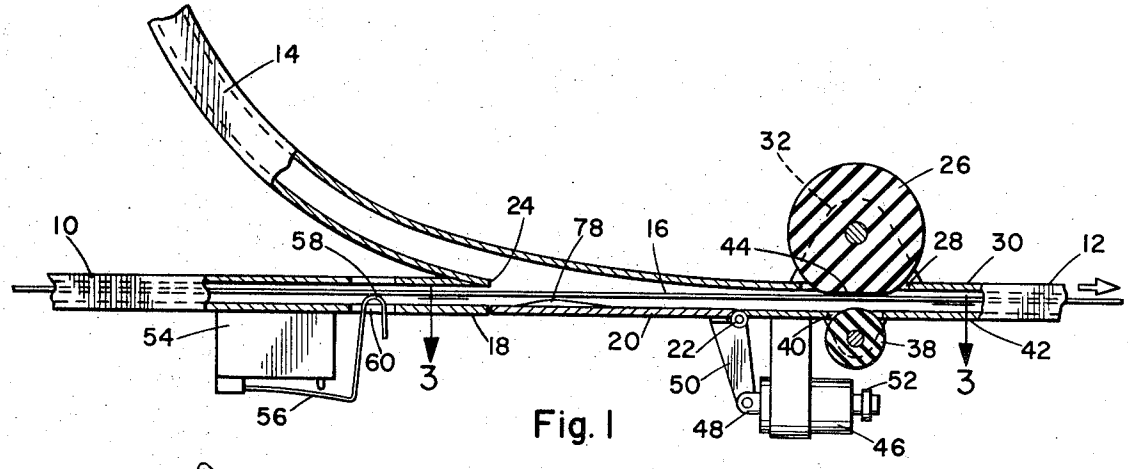


Fig. 1

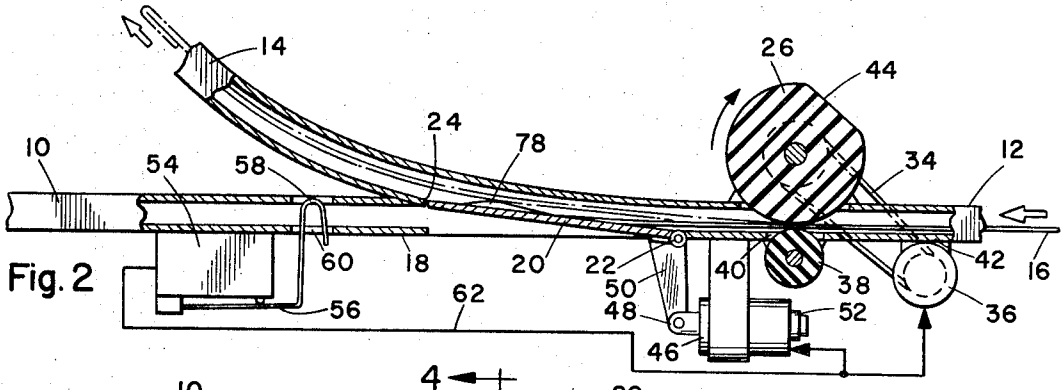


Fig. 2

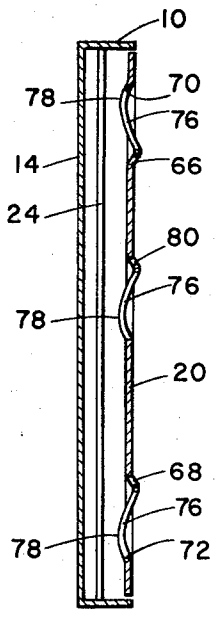


Fig. 4

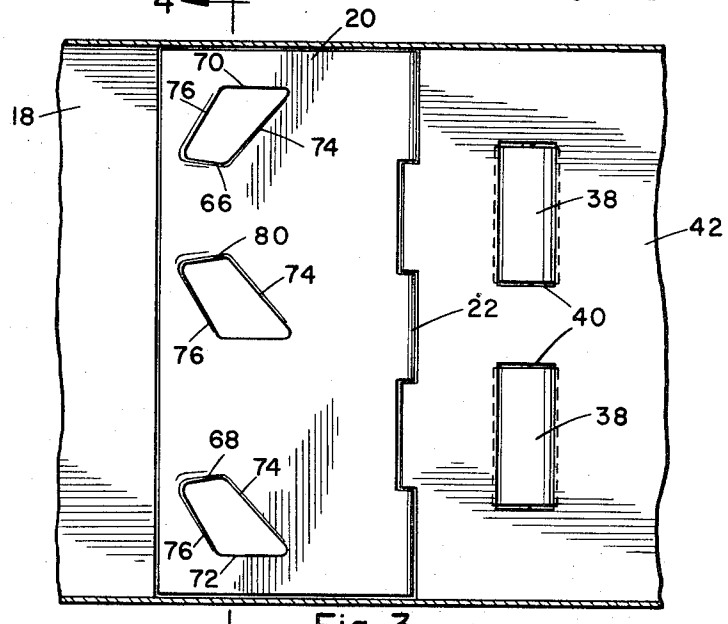


Fig. 3

INVENTOR.
LAWRENCE E. SHIMMIN

BY

Brown & Martin

ATTORNEYS

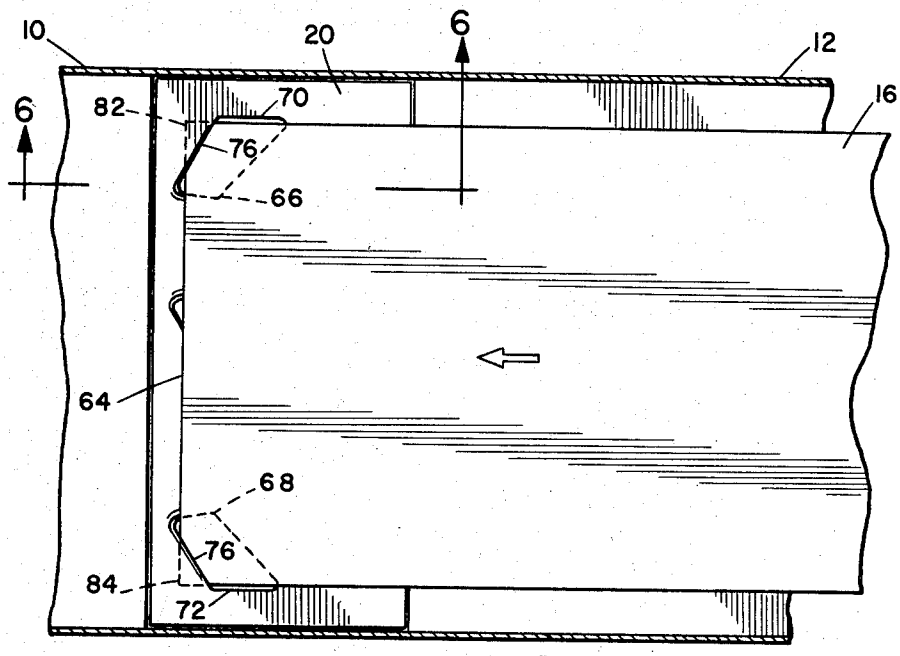


Fig. 5

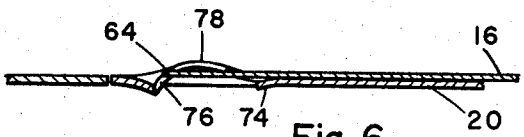


Fig. 6

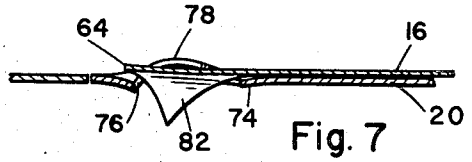


Fig. 7

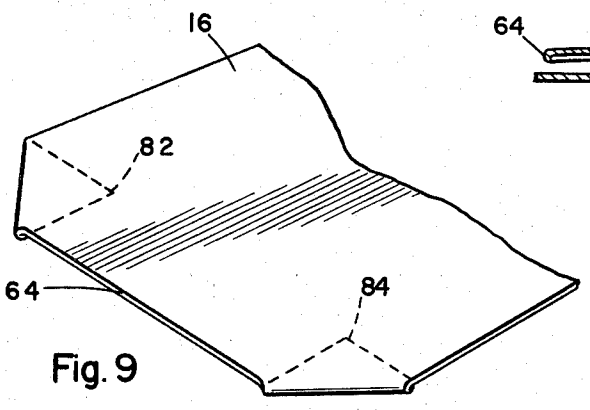


Fig. 9

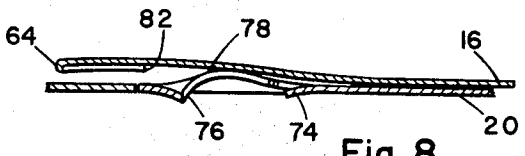


Fig. 8

INVENTOR.
LAWRENCE E. SHIMMIN

BY Brown & Martin

ATTORNEYS

WEB GUIDING AND CORNER FOLDING APPARATUS

BACKGROUND OF THE INVENTION

In apparatus for handling a strip or web of material, such as paper, film, or the like, various arrangements of rollers, guides and other such means are used to carry the web through the different stages. When the mechanism is accessible, threading the web is a simple matter. In some instances it is desirable to have automatic threading of the web through at least part of the mechanism. A particular example of this is an automatic photo-processing unit for developing paper or film, in which the sensitized material must be threaded in the dark. For continuous processing of a long length of web material, a prepared leader may be used to ensure proper threading. However, when strips of material are cut from a supply roll contained in the apparatus and fed through as needed, it is impractical to attach a leader to each end. Thin web material, particularly paper, tends to cling and wrap around developer rollers, and may not feed through reliably in the correct path, so some means is necessary to prepare the web and automatically to ensure proper threading and processing.

SUMMARY OF THE INVENTION

The apparatus described herein accepts a length of web material from a supply source, directs the web to a subsequent destination and, in doing so, folds the corners of the leading edge of the web to stiffen the material and ensure proper threading. Web material is passed through a closely confining track, in one portion of which is a guide plate that performs the directing and corner folding action. The guide plate has apertures which are spaced at the width of the web to intercept the corners of the web end as it passes over the plate. The apertures are shaped so that the corners of the web material are trapped and retarded as the web moves, causing the corners to be folded back diagonally. By positioning the guide plate so that the web is deflected from its normal plane of travel into a take-off track leading to a processing unit, the web is forced to bear against the guide plate, ensuring that the corners enter the apertures properly.

The diagonally folded corners stiffen the leading edge of the web in a flattened wedge-like configuration, which resists wrapping around rollers and facilitates accurate guiding of the web through a predetermined path.

The primary object of this invention, therefore, is to provide a new and improved web guiding and corner folding apparatus.

It is another object of the invention to provide a new and improved apparatus which folds back the leading corners of a moving web.

It is another object of the invention to provide a new and improved apparatus which directs a web along a specific path while simultaneously folding the corners.

It is another object of the invention to provide a new and improved web guiding and corner folding apparatus which is adaptable to a variety of web handling and processing devices.

Other objects and many attendant advantages of this invention will become more apparent upon a reading of the following detailed description together with an examination of the drawings wherein like reference numerals refer to like parts throughout and in which:

FIG. **1** is a side elevation view, with portions cut away, of the corner folding and guiding mechanism incorporated in a web handling structure.

FIG. **2** is a similar view, but with the guide plate actuated to direct the web and fold the corners.

FIG. **3** is a sectional view taken on line **3**—**3** of FIG. **1**.

FIG. **4** is a sectional view taken on line **4**—**4** of FIG. **3**.

FIG. **5** is a view similar to FIG. **3**, showing initial engagement of the web for folding.

FIG. **6** is an enlarged sectional view taken on line **6**—**6** of FIG. **5**.

FIG. **7** is a similar sectional view showing the corner folding action.

FIG. **8** is a similar sectional view showing the corner folding completed.

FIG. **9** is a perspective view of the end of a web with the corners folded.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The web handling structure illustrated in FIGS. **1** and **2** includes a supply track **10** leading into a storage track **12**, with a branching delivery track **14** curving upwardly in the general direction of the supply track. Each portion of the track has a thin flat cross section for enclosing a web **16** in a closely controlled path. The structure is typical of a web reversing junction in a machine such as a photographic paper or film processor, the arrangement and operation of which are well known. In such a machine, sensitized web material is drawn from a supply roll, exposed to the required image material and cut off beyond the end of the exposed portion. The cut length of web is temporarily stored in a suitable light tight container, then is extracted and fed through a chemical processing unit for development. In some instances the web is fed incrementally through the processor, so that individual frames can be cut off.

Inset in the lower portion or floor **18** of supply track **10** is a guide plate **20**, pivotally mounted on a hinge **22** extending across the width of the track. Guide plate **20** can swing through a short distance from a position coplanar with floor **18** to a raised position in alignment with the exit lip **24** of delivery track **14**, as in FIG. **2**. When passing from the supply track **10** to storage track **12**, the web **16** slides over guide plate **20**. In the reverse direction the web is deflected by the raised guide plate into the delivery track **14**. The existing drive means in the machine, not shown, is used to drive the web into the storage track. To propel the web in the opposite direction into the delivery track, a drive roller **26** is mounted above storage track **12** and protrudes downwardly into the track through an opening **28** in the top panel **30**. Drive roller **26** is rotatably mounted on a support **32** and is driven by a belt **34** from a motor **36**. Any suitable drive means may be used, that shown being an example. Below the drive roller are freely rotatable back-up rollers **38**, which protrude upwardly through openings **40** in floor **42**. Drive roller **26** has a flat face **44** which, when the web is moving into storage track **12**, is disposed parallel to the web with the drive

roller stationary, as in FIG. 1. This leaves clearance for the web to pass freely.

Guide plate is actuated by means such as the solenoid 46, having a plunger 48, which is connnected to an arm 50 depending from the guide plate. A stop 52 on the plunger 48 limits the motion so that the guide plate is properly aligned with exit lip 24.

The web reversing and deflecting action is controlled by a microswitch mounted below floor 18, the switch having a resilient actuating arm 56 with a feeler 58 which protrudes through an opening 60 in the floor. Web 16 normally holds the feeler 58 down, keeping switch 54 open. A suitable power supply, not shown is connected through switch 54 to the solenoid 46 and motor 36, as indicated by wiring 62 in FIG. 2. When the cut end of web 16 passes opening 60, the feeler 58 is free to rise and actuating arm 56 closes the switch 54. This causes solenoid 46 to be energized, lifting the guide plate 20, and motor 36 is started to rotate the drive roller 26, as indicated by the directional arrow in FIG. 2. The web is gripped between back-up rollers 38 and the cylindrical portion of drive roller 26 and driven back over the guide plate 20, which deflects the web into delivery track 14. Spacing of feeler 58 from the guide plate and the timing of the solenoid and drive motor will depend on the speed of motion of the web. The reverse drive must start before the cut end of the web passes beyond the drive roller. With the flat face 44 on the roller, drive will be incremental and by making the roller 26 with a suitable circumference, each increment can be equal to one image frame length on the exposed web.

To prepare the web for entry into the processing unit, the guide plate 20 is provided with means for folding the corners of the cut end, which becomes the leading edge 64 of the web 16. At opposite sides of guide plate 20 are trap slots 66 and 68, which are similar in configuration but oppositely handed. The outside edges 70 and 72 of the trap slots are spaced apart slightly greater than the width of the web 16. Each trap slot has an entry edge 74 on the side adjacent hinge 22, the entry edges being inclined and converging away from the hinge. The trap slots also have stop edges 76 opposite the entry edges, also converging away from hinge 22, in the direction of motion of the web. Entry edges 74 are curved downward slightly to allow the corners of the web to enter the trap slots. Stop edges 76 are bowed upward, as indicated at 78 in FIG. 4, so that the web corners slide underneath. Since the web is deflected upwardly by the guide plate, the web leading edge 64 will be presses against the guide plate and will tend to slide into the trap slots. A further trap slot 80, comparable to slot 68, is shown as being spaced closer to trap slot 66, to accommodate a narrower web. Other arrangements of trap slots may be used for standard web sizes.

Referring now to FIGS. 5 and 6, the web leading edge 64 is illustrated as being caught in trap slots 66 and 68, with the corners 82 and 84 under the stop edges 76. Further motion of the web against the inclined stop edges 76 will cause the corners to be rolled downwardly and inwardly, as in FIG. 7. Continued motion of the web will drive the leading edge 64 beyond the trap slots, causing the corners to be folded diagonally inwardly, as in FIG. 8. Confinement of the web within the enclosing track will prevent the folded corners from re-opening, and friction from motion along the track will tend to keep the corners folded under.

The resultant leading edge configuration is illustrated in FIG. 9. Sharp corners have been eliminated and the leading edge portion has been stiffened. In the processing unit, an untreated web of thin material will tend to wrap around certain of the rollers, particularly those wet with chemical solutions. The stiffened leading edge, however, will pass through the various stages of rollers and other guide means without curling or jamming. In use the entire structure will be enclosed in a light tight housing, so the various slots and openings in the track do not require sealing.

The structure as illustrated is adaptable to a particular type of machine, in which the motion of the web material is reversed. It will be obvious that the trap slot arrangement in the guide plate can be incorporated in a web guiding track in which web motion is unidirectional. The leading corners of each length of web material will thus be intercepted and folded as the web passes over the trap slot position.

Having described my invention, I now claim.

1. Web guiding and corner folding apparatus, comprising,

a web guiding track having enclosing walls including a web supporting wall,

drive means for moving a strip of web material along said track,

a guide plate inset in the web supporting wall of said track,

said guide plate having trap slots therein spaced to receive the web strip therebetween,

and said trap slots having stop edges for intercepting the leading edge corners of a web strip and folding the corners inwardly as the web strip moves past the slots.

2. Apparatus according to claim 1, wherein said stop edges are inclined and converge in the direction of motion of the web.

3. Apparatus according to claim 2, wherein said stop edges are raised above the web supporting surface of said track.

4. Apparatus according to claim 3, wherein said trap slots have downwardly turned entry edges opposite the respective stop edges.

5. Apparatus according to claim 1, wherein said track has a branching portion diverging from the side opposite said web supporting wall and having an exit lip at the junction thereof,

said guide plate being pivotally mounted in said track to swing between a position coplanar with said web supporting wall and a position in planar alignment with said exit lip,

and actuating means for moving said guide plate between the two positions.

6. Apparatus according to claim 5, and including a sensing means for sensing the passage of the end of a web strip adjacent said guide plate, said sensing means being connected to operate said actuating means for moving the guide plate and diverting the web into said branching portion of the tack.

7. Apparatus according to claim 6, and including driven roller means mounted on said track for engage-

ment with the web strip, said roller means being connected to said sensing means to drive the web into said branching portion when said guide plate is deflected.

8. Apparatus according to claim 5, wherein the stop edges of said trap slots are inclined and converge in the direction of motion of the web.

9. Apparatus according to claim 8, wherein said stop edges are bowed upwardly above the web supporting surface of said guide plate.

10. Apparatus according to claim 9, wherein said trap slots have downwardly turned entry edges opposite the respective stop edges.

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