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[31] **42/48054**

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226/3, 17, 21—23, 180, 181, 186, 187, 88, 189

[56] **References Cited**
UNITED STATES PATENTS
2,071,682 2/1937 Buccicone..... 226/180
2,461,376 2/1949 Feldmeier 226/180

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[54] **METHOD AND APPARATUS FOR FEEDING WEBS**
1 Claim, 7 Drawing Figs.

[52] U.S. Cl..... **226/180,**
226/187, 226/189

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

ABSTRACT: Inclining the axis of rotatable rollers which sandwich the edges of a web being fed therebetween to exert tension on the web as it moves between the rollers such that the center line of the inclined rollers extends outwardly of the web edge in a direction of the web feed.

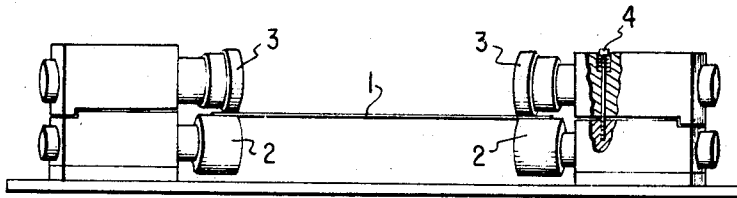


FIG. 1

(PRIOR ART)

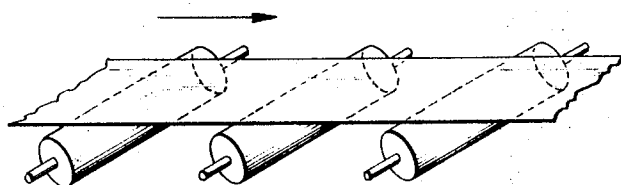


FIG. 2

(PRIOR ART)

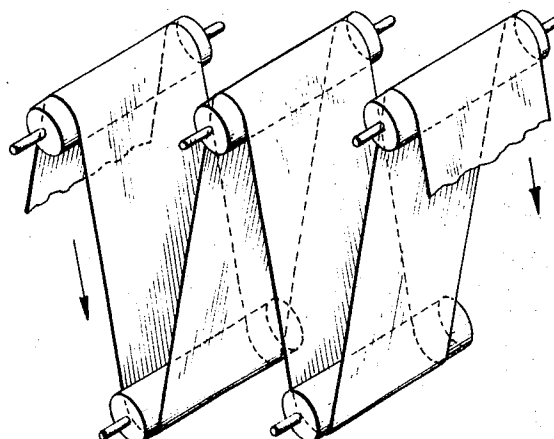
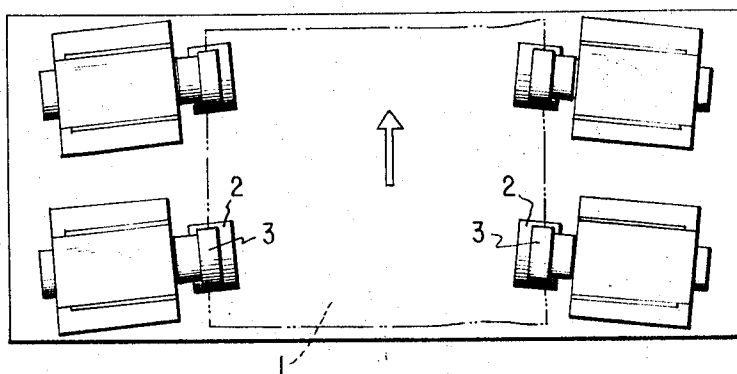


FIG. 3



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FIG. 4

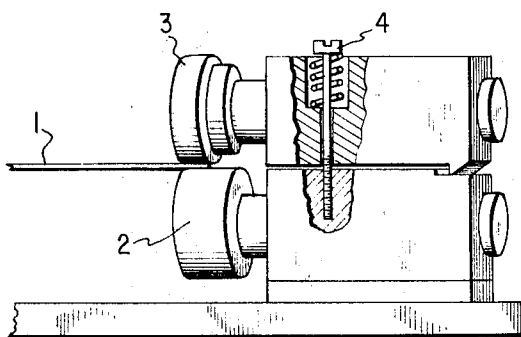
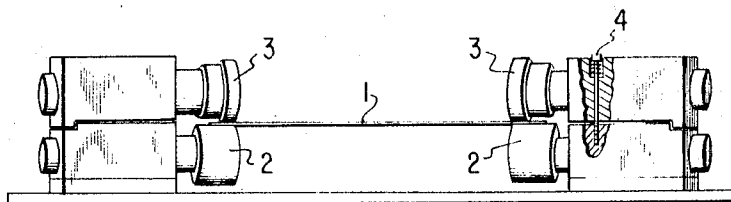


FIG. 5

FIG. 6

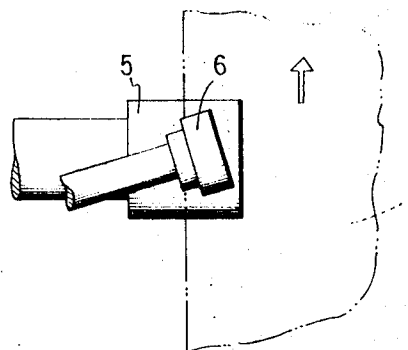
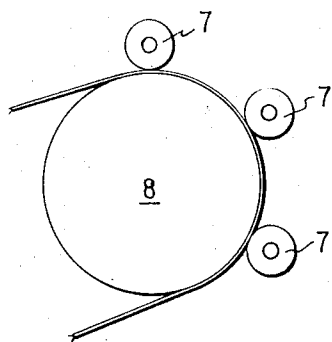


FIG. 7



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METHOD AND APPARATUS FOR FEEDING WEBS

The present invention relates to a method and apparatus for feeding flexible strip material generally designated "webs," the strip material being in the form of plastic film, thin metal film, paper and the like, and more particularly to the feeding of webs by rollers or the like without the necessity of contact between the roller and the process surface of the web during such processes as printing, coating and the like.

Generally, the web may be fed in either a horizontal position or along a zigzag up and down path, but when the shape of the supporting roller is cylindrical, the surface of the roller is brought into contact with the surface of the web. Therefore, where the web is fed just subsequent to processing of the web surface, the web is fed in a zigzag path using spool-shaped rollers which contact only the opposite edges of the web, as for instance in U.S. Pat. No. 2,226,187. Such prior art web feeding methods are shown in FIGS. 1 and 2. In this method of web feeding, there are disadvantages since the web is capable of being folded by the mere weight thereof and/or by the tension in the advancing direction of the web. Further, the web due to its weight has a tendency to fall from the spool rollers. Further, the tension in the feeding direction of the web is limited and the feed velocity of the web is unstable.

A principal object of the present invention is to provide a method and apparatus for feeding webs immediately after processing the same in a safe manner, without instability in feed speed, and without the necessity for the rollers to contact the process surface of the web.

Other objects and advantages will be better understood from the following description in detail taken in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic perspective view of a prior art method for horizontally feeding the web;

FIG. 2 is a schematic perspective view of a prior art apparatus for feeding webs in a somewhat vertical and zigzag manner;

FIG. 3 is a plan view of one embodiment of the apparatus used in the method of the present invention;

FIG. 4 is a side elevation view of the apparatus shown in FIG. 3;

FIG. 5 is an enlarged view of a portion of the apparatus shown in FIG. 4;

FIG. 6 is a plan view of a portion of a modified apparatus operating in accordance with the method of the present invention; and

FIG. 7 is a schematic, side view of a modified apparatus in accordance with another embodiment of the present invention.

Referring to the drawings, FIGS. 3 through 5 show one form of the apparatus employing the method of the present invention in which a web 1 after processing is fed in the direction of the arrow and is provided continuously with laterally exerted tension at the opposite edges of the web at spaced intervals. It is noted that the major portion of the web, especially near the center, is not involved in the present tensioning operation, but only the opposed edges of the web are contacted by the tensioning means which provide an outward pulling force through sets of rollers which are disposed at the edges and at spaced longitudinal intervals. Since the pulling force exerted at opposite edges of the web is continuous, the web is fed at a stable speed without any wrinkles, or twists caused by tension and without noticeable scratches, or slack in the web, etc.

Various types of apparatus have been designed employing the feeding method of the present invention. The apparatus of FIGS. 3 through 7 inclusive involve embodiments of the present invention and employ in general the method described above. Each embodiment will now be described in detail.

Referring to FIGS. 3, 4 and 5, along each edge the paired rollers involve bottom or lower supporting rollers 2 which are positioned below and adjacent the opposed edges of the web 1 for supporting the web while it is fed in a horizontal direction. Each edge paired roller includes upper press rollers 3 which

are disposed above the supporting rollers 2 for pressing and holding the edges of the web 1, in which case, the web is fed by the rotation of rollers 2 and 3 as it is sandwiched therebetween.

In this embodiment, the axis of rotation of both the supporting rollers 2 and the press rollers 3 are parallel with each other and are slightly inclined or rotated in a clockwise direction at the right side edge of the web 1 and in a counterclockwise direction at the left side edge when seen from above and facing the advancing direction of the web. By this method, web 1 is tensioned in a lateral direction since the force is exerted outwardly by the rollers as the web is being continuously fed between the rollers.

The supporting rollers 2 and/or the press rollers 3 may be driven by a motor associated with each roller or a single drive motor may be coupled in a conventional manner to all rollers through conventional gear means. Alternatively, the rollers may not be driven but the web 1 may be pulled in the direction of arrow by other web feeding means. In this case, the rollers merely exert lateral tension at the edges of the web during feeding. Suitable material may form the surface of the rollers 2 and 3 and it is desired that such material be metal, or metal covered with plastic or hard rubber or the like. Referring to FIG. 4, a screw 4, which surrounds a compression spring couples the upper and lower roller support such that by adjustment of the screw, the pressure exerted by press roller 3 onto the supporting roller 2 in the sandwiched web 1 may be properly selected depending upon the elasticity of the spring surrounding the screw.

In an alternate embodiment shown in FIG. 6, the supporting roller 5 of the paired rollers rotates about an axis perpendicular to the direction of movement of web 1 while the press roller 6 has its axis slightly rotated or inclined and is disposed such that a lateral tension is exerted on web 1. Like pairs of rollers 5 and 6 are employed on the opposite edge of the web 1. In this case, the centerline of roller 6 extends outwardly past the edge of the web 1 in the direction of movement of web 1 to provide the necessary lateral tension. Thus, the web 1 is being continuously provided with lateral tension by the offset relationship of press roller 6 with respect to supporting roller 5.

Referring to FIG. 7, a single rather large diameter supporting roller 8 having an axis which is perpendicular to the direction of movement of the web is provided with a plurality of press rollers 7 which again have their axes offset with respect to that of the supporting roller 8 to produce tension in the same manner as the previous embodiments.

According to the method and apparatus as described above and in accordance with the present invention, the paired rollers are brought into contact only with the opposed edges of the web and therefore the web which is being processed on both surfaces, can be fed in a horizontal or zigzag path without impairment. The velocity of web feed may be increased and the tension exerted on the web in the feed direction can likewise be increased. Since the speed is stabilized, the web may be fed safely at the increased velocity. By experiment, a web is fed in accordance with the present invention by an apparatus shown in FIG. 1 with the web being fed successfully even with a tension of 20 kg. perimeter width in the feeding direction in a stable and reliable manner under conditions in which:

The web comprises a polyester film of 50 μ thickness coated with a photographic emulsion on the opposite surfaces thereof;

The supporter roller comprises an axial length of 60 mm., a diameter of 90 mm., and has a chrome plated finish;

The press roller likewise has a diameter of 90 mm., is chrome plated and has an axial length of 15 mm.

The axis of both rollers are inclined 1° and a plurality of sets of rollers are employed with a spaced interval of 250 mm. The web feed velocity is 25 m./mm.

The present invention has been described in detail with particular reference to a number of embodiments thereof, but it will be understood that variations and modifications of the in-

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vention may be effected within the scope and spirit of the invention as described herein above and as defined in the appended claims.

What we claim is:

1. An apparatus for feeding a thin, pliant web along a section of determinate length comprising plural sets of paired rollers arranged at spaced intervals along both edges of said web, said sets of paired rollers sandwiching the edges of said web

between the pairs of rollers and providing the sole support of said web along said section and means inclining the axis of one roller of each pair with respect to the other of said pair, outwardly from the edge of said web in the direction of feed to urge the edges of the web outwardly and thus provide lateral tension to the web during feeding.

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