

[54] **PRESS FOR WEB PRINTING HAVING
INTERMITTENT PAPER FEEDING
MEANS**

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[52] U.S. Cl. **226/156, 226/195**

[51] Int. Cl. **B65h 17/22**

[58] Field of Search **226/156, 148, 195**

[56]

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[57]

ABSTRACT

An improved press for intermittent paper web feeding including means for synchronously driving each end of the web through identical and simultaneous motion. Means is provided for improved clutching action, and the maintenance of a variable loop in the web existing between a continuously rotating paper feed supply and the incremental web feeding means.

1 Claim, 14 Drawing Figures

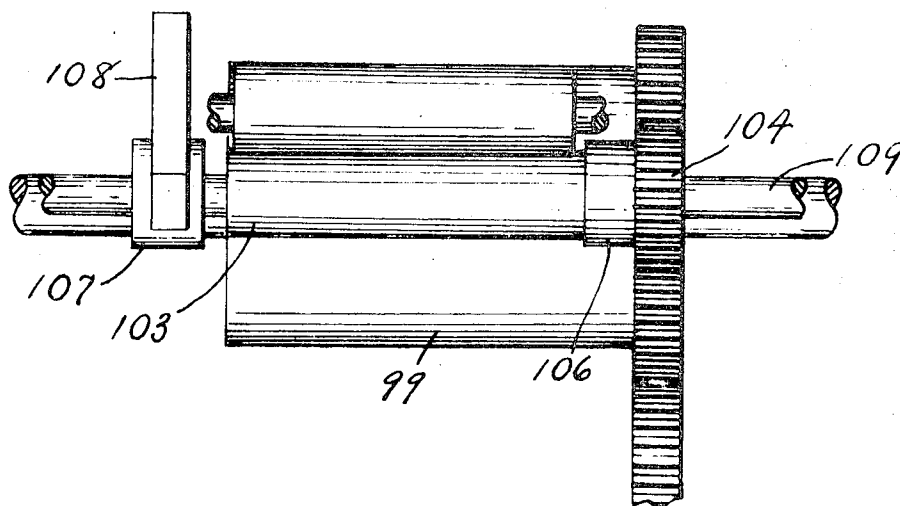


Fig. 1

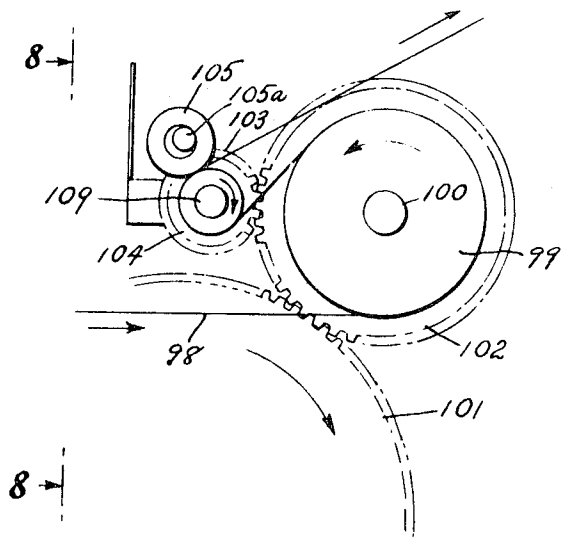
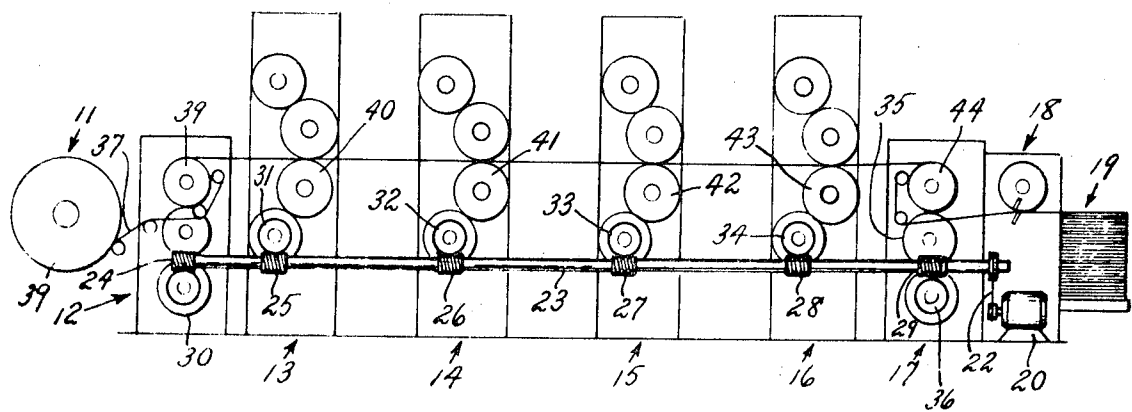
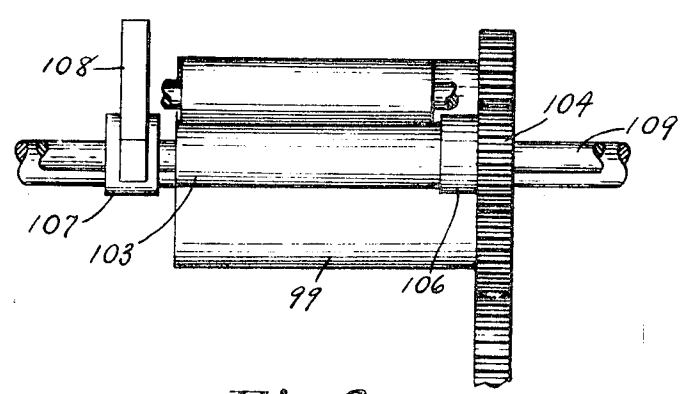


Fig. 7



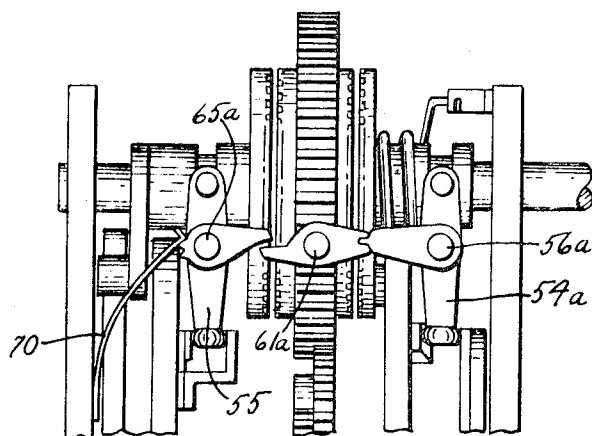
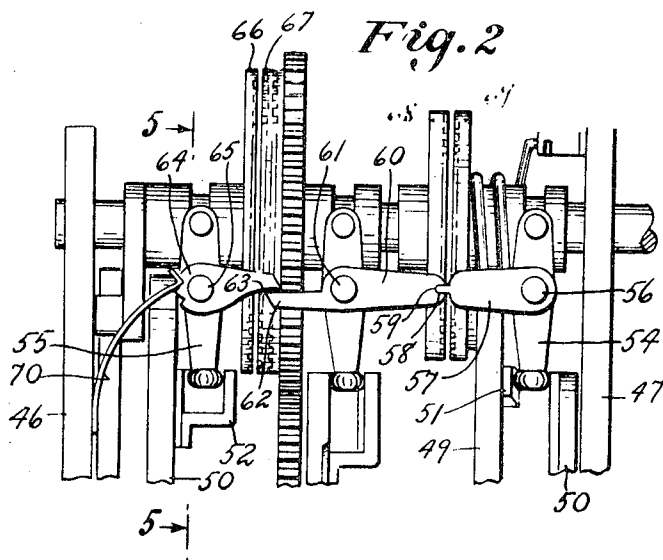
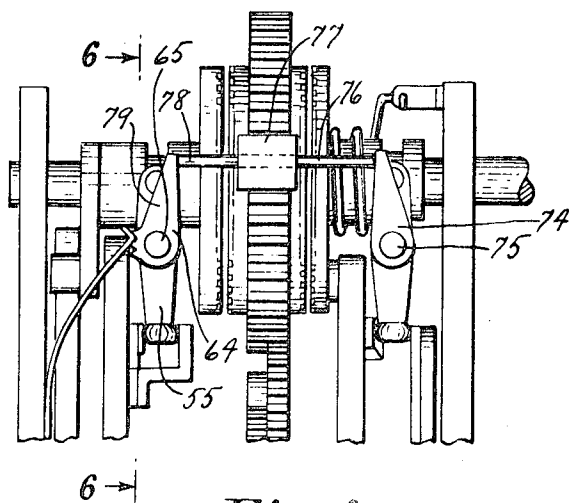


Fig. 3



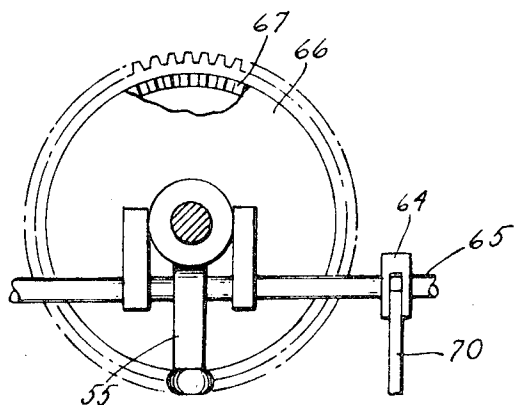


Fig. 5

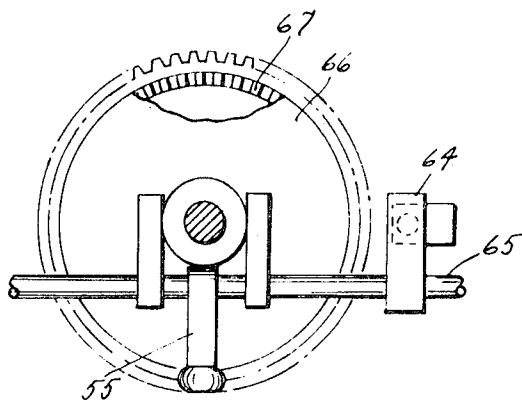


Fig. 6

Fig. 9

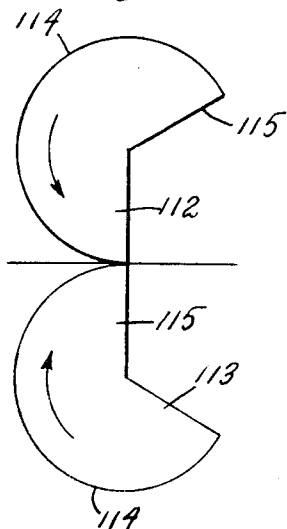


Fig. 10

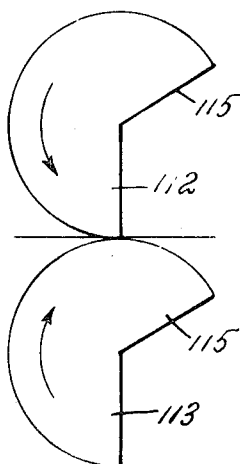


Fig. 11

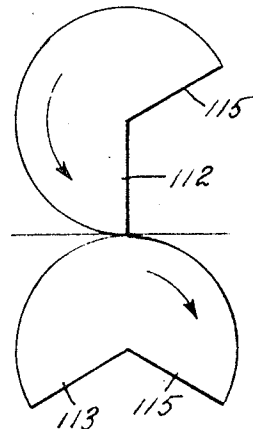


Fig. 12

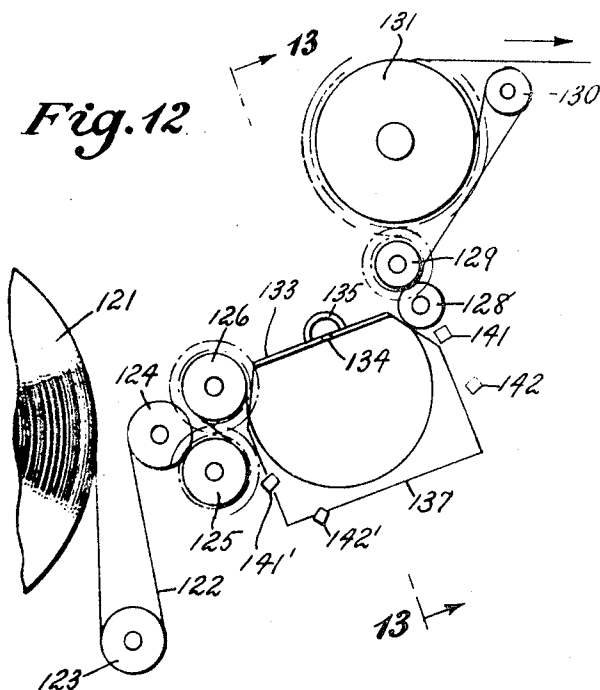


Fig. 13

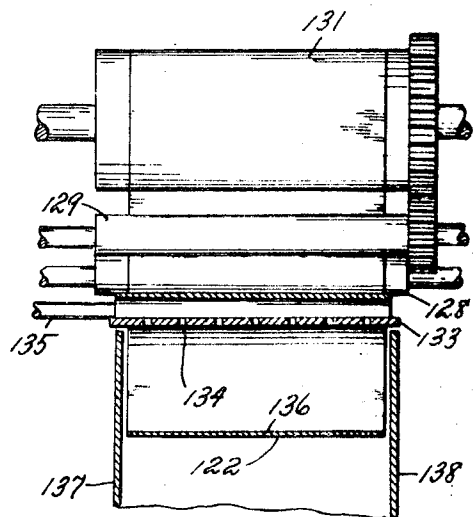
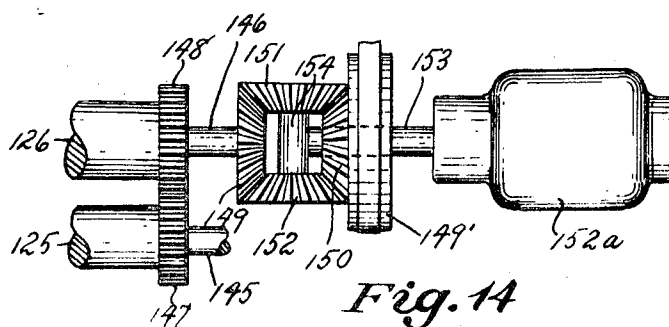


Fig. 14



PRESS FOR WEB PRINTING HAVING INTERMITTENT PAPER FEEDING MEANS

This application is a division of my co-pending application Ser. 863,188; filed Oct. 2, 1969 under the same title.

This invention relates generally to the field of printing presses, and more particularly to web feeding presses having intermittent paper feeding means of the type disclosed in my prior U.S. Pat. No. 3,204,556, dated Sept. 7, 1965.

Presses of this type incorporate means for conserving paper where images to be printed are dimensions less than the developed length of the printing cylinders.

In the web type of printing press, paper is continuously fed from a roll past a number of printing stations, each of which includes one or more printing cylinders which print a single color of multicolor image in superimposed relation. In conventional presses, the printing cylinder is of fixed diameter, and consequently the total printing area is correspondingly fixed. Where the particular image to be printed is of substantially less area, if the web of paper upon which printing is performed is continuously fed, a substantial waste of paper will result. This is particularly serious in web type presses where only long runs are usually made, and where the printed sheets are subsequently severed from the web and cut down to the desired size.

As disclosed in the above mentioned prior U.S. Pat. No. 3,204,556, it is known in the art to feed the paper web independently of the movement of the printing cylinders, and to accelerate the paper web in conformance with the printing areas of the printing cylinders to obtain a smear-free impression.

It is among the principal objects of the present invention to provide improved structure wherein the web of paper passing through a plurality of printing stations is synchronously driven from a single continuously rotating shaft at both ends thereof through simultaneous intermittent motion.

Another object of the invention lies in the provision of means for locking the main control gear in place during the non-printing part of an operative cycle, so that vibration, web tension, or other forces cannot cause the gear to turn during this period.

Still another object of the invention lies in the provision of improved means for maintaining tension about large web driving rollers, employing a smaller roller geared to rotate with the large roller in such manner that the small roller has a surface speed in excess of that of a large roller, acting to maintain contact of the web with the surface of the larger roller, the smaller roller including overrun or other clutch means, so as to be turned in conjunction with the larger roller only in the direction of rotation in which paper is pulled from the larger roller.

A further object of the invention lies in the provision of improved means for varying the developed length existing between two coating cylinders, the means including the provision of a gap in the circumference of each cylinder, and means for changing the angular relationship between the cylinders.

Yet another object of the invention lies in the provision of improved means for maintaining a variable loop existing between a continuously moving portion of the paper web emanating from a paper supply means, and the intermittent motion by which the paper web is advanced during printing cycles.

These objects, as well as other incidental ends and advantages, will more fully appear in the progress of the following disclosure, and be pointed out in the appended claims.

In the drawings, to which reference will be made in the specification, similar reference characters have been employed to designate corresponding parts through the several views.

FIG. 1 is a schematic wide elevational view of an embodiment of the invention.

FIG. 2 is a fragmentary view in elevation showing improved means for maintaining a main gear immobilized during a non-printing portion of an individual cycle.

FIG. 3 is a similar fragmentary elevational view, showing an alternate form of the means illustrated in FIG. 2.

FIG. 4 is a fragmentary elevational view showing an alternate form of construction.

FIG. 5 is a fragmentary sectional view as seen from the plane 5-5 in FIG. 2.

FIG. 6 is a fragmentary sectional view as seen from the plane 6-6 in FIG. 4.

FIG. 7 is an enlarged fragmentary view in elevation, showing a means for maintaining tension during both forward and reverse motion of the paper web.

FIG. 8 is a fragmentary and elevational view as seen from the plane 8-8 in FIG. 7.

FIG. 9 is a schematic view showing a pair of cooperating impression rollers in a first position of relative adjustment.

FIG. 10 is a similar schematic view showing a second position of relative adjustment.

FIG. 11 is a similar schematic view showing a third position of relative adjustment.

FIG. 12 is a fragmentary schematic view showing improved variable loop paper web maintenance means.

FIG. 13 is a fragmentary sectional view as seen from plane 13-13 in FIG. 12.

FIG. 14 is a fragmentary view in elevation showing automatic loop adjustment means forming a part of the structure illustrated in FIGS. 12 and 13.

Referring to FIG. 1 in the drawing, the device, generally indicated by reference character 10, is of a type disclosed in my prior U.S. Pat. No. 3,204,556, and comprises broadly: a paper web supply means 11, first web advancement means 12, first, second, third and fourth printing stations 13, 14 15, and 16, respectively, second web advancement means 17, web severing means 18 and sheet stacking means 19, all of the above means 1-11 inclusive, being driven from a prime mover 20 through a sprocket chain 22 and longitudinally oriented main shaft 23 supported in bearings (not shown) for rotation. Worm gears 24, 25, 26, 27, 28 and 29 mesh with corresponding gears 30, 31, 32, 33, 34 and 35. A paper web 37 emanates from a roll 39 or other source, and is moved through means 12-17, inclusive, by driving rollers 39 and 44 connected to gears 30-36, inclusive, which incorporate the mechanism described in my above mentioned U.S. Pat. No. 3,204,556. Since the mechanism of the two stations is identical, and each station is driven from the common shaft 23, it will be apparent that the rotary motion imparted to the rollers 39 and 44 at each end is identical, without the necessity of a rotating shaft or belt connecting the same, thus feeding the paper accurately to maintain register at high speed.

Referring to FIG. 2, there is illustrated the means of preventing undesired movement of a disengaged main driving gear during the period in which no motion is being transmitted through the accelerating and decelerating clutches. As more fully explained in my above mentioned U.S. Pat. No. 3,204,556, a pair of plates 46 and 47 support between them a drive shaft (not shown) which drives cams 49 and 50 operating through cam blocks 51 and 52 to shift the position of levers 54 and 55 which serve as cam followers.

Mounted on shaft 56 which also mounts followers 54, is an arm 57 having a tooth 58 on the free end thereof engaging a recess 59 in a lever 60 freely turning on a pivot shaft 61. The opposite end 62 of the lever 60 engages the bottom surface 63 of an arm 64 fixed to a corresponding shaft 65.

During operation, clutchplates 66 and 67 are engaged, and remain so until acceleration commences. At this point, cam block 51 acts upon arm 54 to engage accelerator clutch plate 68 with plate 69. At the same time, angular motion of the arms 57 and 60, transmitted to arm 64, swings it upwardly or counterclockwise as seen in FIG. 2, disengaging clutch plate 66 from plate 67. Spring actuated detent means 70 holds the arm 63 and its attached parts until member 55 is subsequently acted upon by cam 52.

FIG. 3 shows the same installation on a modification of the structure corresponding to FIG. 12 of my U.S. Pat. No. 3,204,556. Corresponding parts are designated by similar reference characters with the additional suffix "a."

Turning to FIG. 4, there is illustrated an alternate form of the above described means wherein an arm 74 is mounted upon the shaft 75, and operates upon a rod 76 arranged for sliding motion within a supporting block 77, the opposite end 78 of the rod 76 bearing against a similar arm 79.

Referring now to FIGS. 7 and 8, there is illustrated a means for improving the accuracy of transmission of rapid intermittent motion of a roller to a web of paper wrapped partially around it. For such movement, it has been found desirable to use a pair of small rollers mounted close to the large roller, and geared to the large roller, so that the small rollers pull the paper web tightly around the larger roller, which in turn controls the movement of the paper through the device. In order to maintain tension of the web around the large roller by the small rollers which are geared to it, it is necessary that the diameter of the small roller be such that it has a slightly higher surface speed than that of the large roller. In the case where the web not only stops, but reverses for a portion of its cycle, as is necessary in devices of this type, the higher surface speed of the small roller would normally act to loosen the paper on the large roller during the reverse period of the cycle, and this would result in slippage and loss of accuracy in the printed image. Referring to FIG. 7, the web of paper 98 passes about the large roller 99 mounted on shaft 100. Motion is transmitted through a gear 101 to a driven gear 102. The web passes around a first small roller 103 driven by a pinion 104 meshing with gear 102. A second small roller 105 is free turning, and is adjusted on an eccentric shaft 105a which permits it to be brought into contact and out of contact with the small roller 104.

Referring to FIG. 8, a first overrunning clutch 106 transmits motion from the pinion 104 to the shaft sup-

porting the roller 103. When the large roller is rotated in the direction indicated by the arrow in FIG. 7, the clutch 106 is engaged, but when the large roller 99 rotates in an opposite direction, the small roller 103 is not driven by it. Also mounted on the shaft 109 is a second overrunning clutch 107 having brake means 108 associated therewith, so that the clutch 107 and brake 108 tend to retard rotation of roller 103 when it turns in a direction opposite from that indicated by the arrow.

During operation, the web of paper is led around the rolls as indicated, and the rolls turn in the direction of the arrow. Roller 105 is maintained tightly against roller 103, and the web is frictionally driven between them. When rotation reverses, roller 103 is not driven because of the presence of the overrunning clutch, and is turned by tension of the web working against the brake 108 and clutch 107, thereby maintaining tension around the large roller 99.

Referring to FIGS. 9, 10 and 11, there is illustrated a means for releasing the pressure between the blanket and impression cylinders during the non-printing portion of a cycle, so that paper may stop and be repositioned while the cylinders continue to turn. In the case of a press having an adjustable printing length, the portion of the cycle during which pressure is released must also be adjustable. FIGS. 9, 10 and 11 illustrate schematically a pair of printing cylinders, including a first or blanket cylinder 112 and a second or impression cylinder 113, each including paper or web engaging surfaces 114, and cutaway portions 115. In the position shown in FIG. 9, the cylinders are mutually adjusted to give maximum printing length, in FIG. 10 one of the cylinders has been rotated and locked relative to the other, so that the printing length would be equal only to the area over which mutual engagement occurs.

In FIG. 11, this area has been still further reduced to a minimum.

Another improvement in the disclosed embodiment is the provision of means for the maintenance of a variable loop which must be provided to take up any variation occurring between a steadily moving roll of paper which feeds a mechanism which advances the paper in intermittent fashion. It is desirable to maintain a tension on the loop, but mechanical means such as a movable roller, referred to in the art as a dancer roller, introduces problems of inertia at high speeds. The present structure contemplates maintaining the tension pneumatically.

Referring to FIG. 12, a paper web supply roll 121 dispenses a web 122 which is incrementally advanced within the device 10. The web passes about a lower fixed roller 123, and thence around first, second and third rollers 124, 125 and 126, respectively, which are driven at a constant speed.

The web then enters a loop-forming and maintenance mechanism, generally indicated by reference character 127, and exits to engage small driven rollers 128, 129 and 130, as well as a large roller 131 which are incrementally driven.

The mechanism 127 comprises an upper wall 133 having perforations 134 through which air from a compressed air supply 135 passes. This air is directed against the upper surface 136 of the web which passes between a pair of loosely fitting side walls 137 and 138 on either side of the web (see FIG. 15) which maintain the required amount of air pressure on the loop. Referring to FIG. 12, first and second photo cell units 141

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and 142 coacting with lights 141' and 142', respectively, are provided to sense the effective size of the loop, each unit including a source of illumination and a light sensitive cell, as is well known in the art.

The small driven rollers 125 and 126 are mounted for rotation on shafts 145 and 146, respectively (FIG. 14), which are provided with interconnecting gears 147 and 148. A continuously driven pulley 149' supplies motive power to a differential mechanism including a first bevel gear 150 pinned to the pulley 149', and connecting gears 151 and 152. An adjustment motor 152a transmits motion to an output shaft 153 supporting a differential shaft 154 upon which the gears 151 and 152 are mounted.

During normal operation, the motor 152a is not in operation. During such operation, the size of the loop within the mechanism 127 will be such as to permit light to pass between the second photo cell unit 142, but block passage of light from the first photo cell unit 141. Where the loop becomes so short that light passes between both photo cell units 141-142, the motor 152a rotates in a first direction, and when light is blocked from both photo cell units 141-142, the motor 152a is rotated in an opposite direction. Rotation in either direction serves to introduce differential motion in the transmission of the motion from the continuously

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driven gear 149 to the shaft 145, tending to either speed up or slow down the angular velocity of the continuously turning rollers 124-126, thereby tending to enlarge or reduce the size of the loop.

I wish it to be understood that I do not consider the invention limited to the precise details of structure shown and set forth in this specification, for obvious modifications will occur to those skilled in the art to which the invention pertains.

I claim:

1. In an intermittent feed web transport mechanism, a primary roller engaging a surface of a web, a secondary roller geared to and driven by said primary roller, a first overrunning clutch means interconnecting said primary And secondary rollers, such that motion is transmitted from said primary roller to said secondary roller in a single direction in which said web is transferred from said primary roller to said secondary roller, a second overrunning clutch connected to said secondary roller, and brake means interconnected to said secondary roller through said second overrunning clutch to be operative when said secondary roller is rotating in a direction in which said first overrunning clutch is in free wheeling condition.

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