

[54] COLLATOR AND WEB FEED CONTROL MEANS FOR THE SAME

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[57] ABSTRACT

A collator comprising a plurality of rotatably supported paper rolls the paper webs of which are gathered in superimposed layers to form a unitary business form or the like. Provision is made for discharging the webs to one or the other end of the collator to permit the webs of all rolls to be discharged in one direction, all rolls to be discharged in the opposite direction or one or more rolls to be discharged in different directions so as to permit employment of the collator on two different manifolds at the same time. Unique tensioning means is provided for controlling the feed of the web.

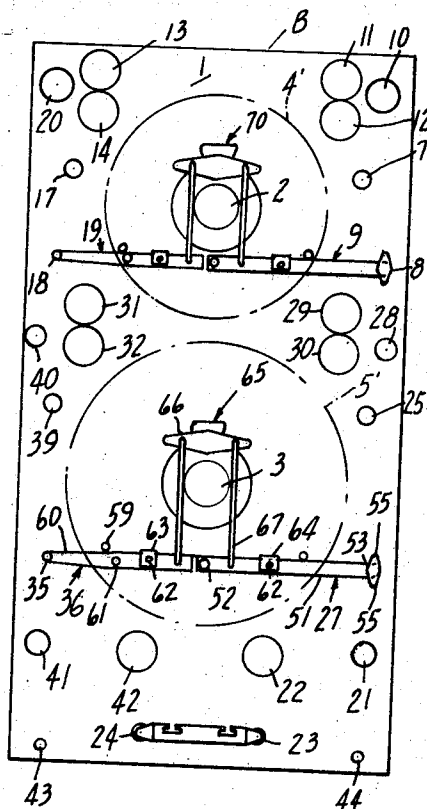
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[58] Field of Search 226/110, 109, 91, 50, 199, 226/196; 242/76

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8 Claims, 9 Drawing Figures



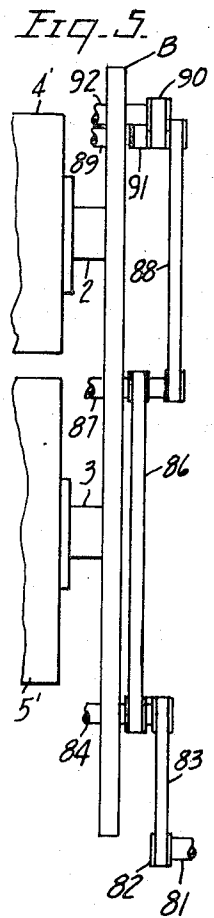
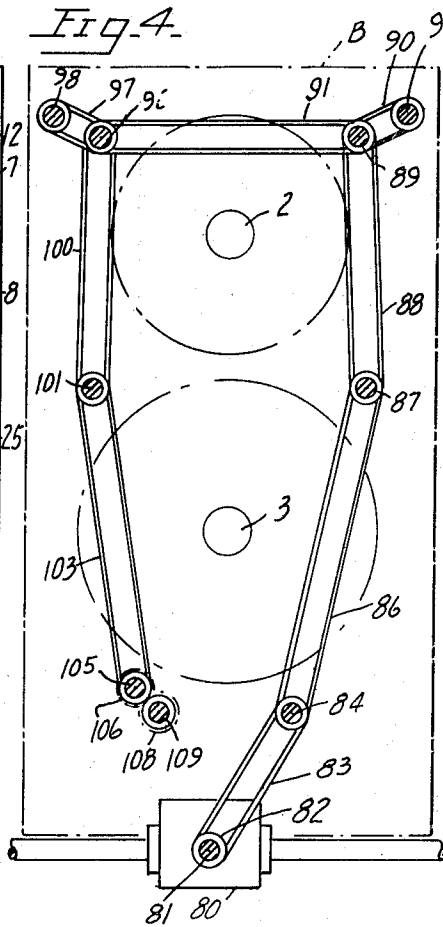
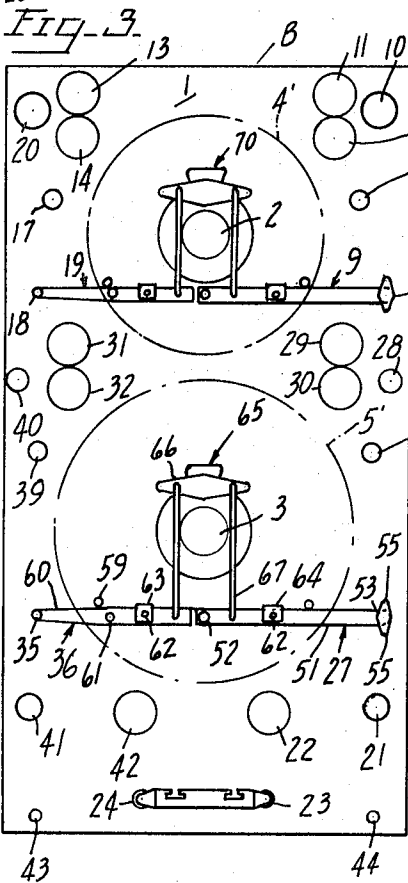
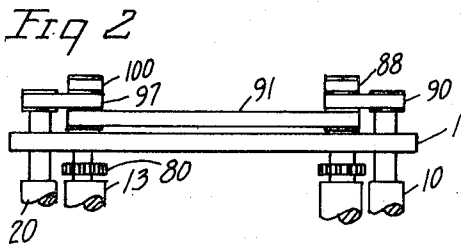
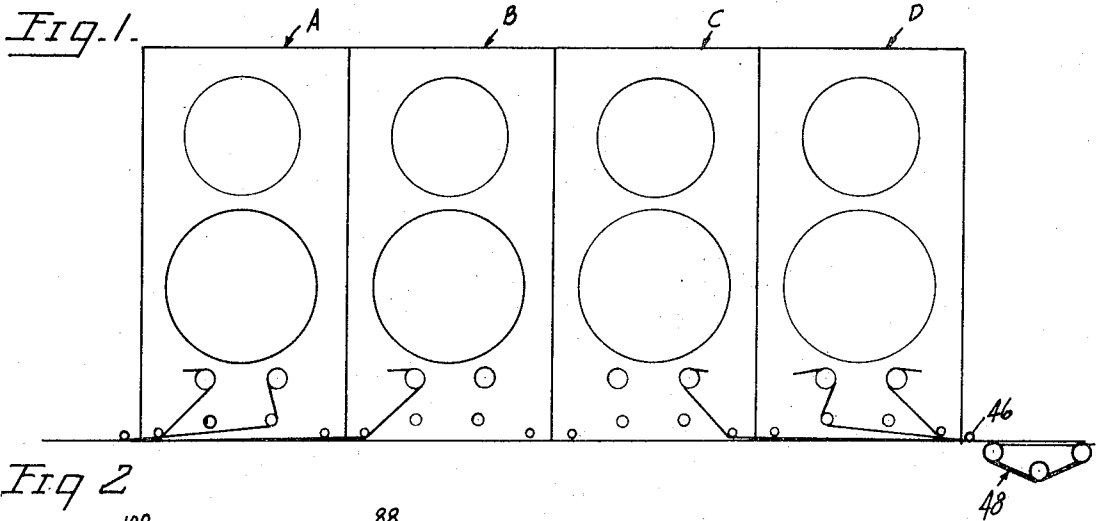


Fig. 6.

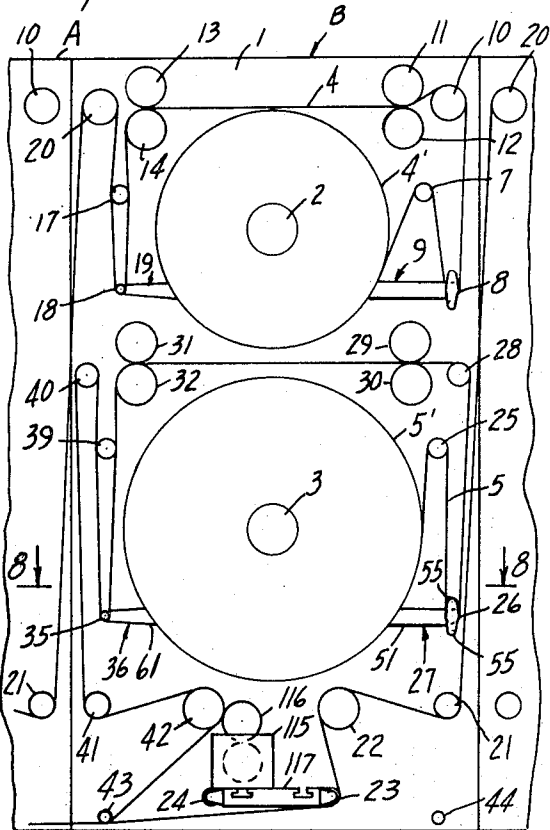


Fig. 7.

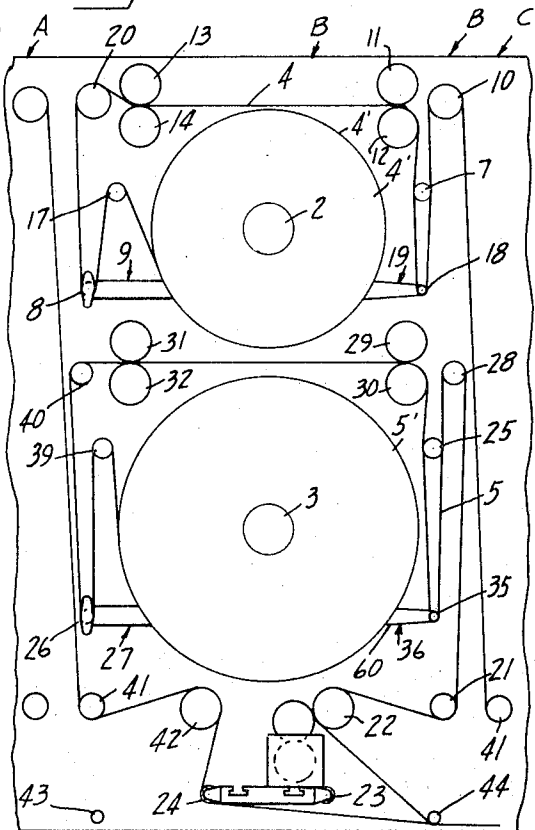


Fig. 8.

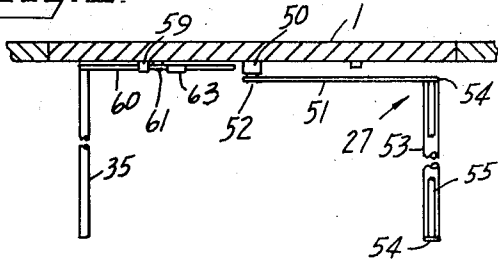
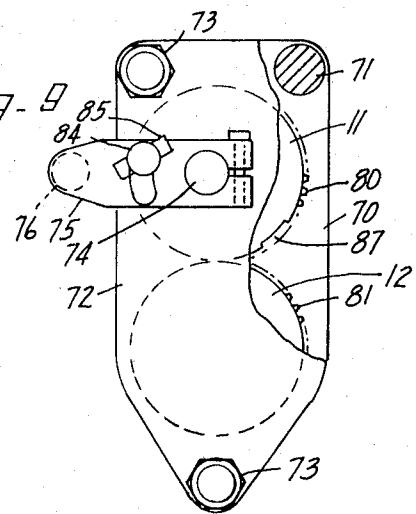


Fig. 9.



COLLATOR AND WEB FEED CONTROL MEANS FOR THE SAME

This invention relates to a collator of the type employed to assemble a multilayered business form or the like in which a plurality of sheets of paper are secured together usually with carbon interposed between each pair of paper sheets. The main object of the present invention is to generally improve collators of this character by permitting greater flexibility in the use of the same.

Heretofore collators of the subject type have usually comprised a horizontally extending row of paper rolls and a horizontally extending parallel row of carbon rolls with web directing means permitting the feeding of the webs from the various rolls in one direction so as to form a multilayered assemblage usually with a carbon between each adjacent pair of paper sheets. For example, in order to provide for the many numbers of copies that are often required in business forms it is necessary to have a row of perhaps ten rolls of paper from which the paper webs thereon are fed. Usually the row of carbon paper rolls is above the paper rolls and means is provided for feeding the carbon web between each pair of adjacent paper webs. In all cases it has been customary to feed the webs in one direction from the group of rolls by means of chains or the like provided with pins received within corresponding holes in the margins of the paper webs. After the webs are all superimposed certain other operations such as numbering, transverse perforating and the like may be performed on the assemblage.

In cases wherein the user has, for example, a ten-part collator so as to provide ten layers of paper for the business form when it is desired to make only a five-part form then one-half of the machine is wasted or in cases where the job is a smaller one even more than one-half of the machine may be wasted.

By the present invention the collator is arranged and feeding mechanism is provided to permit the feeding of the paper webs to one or the other end of the row of paper rolls so that a plurality of rolls may be employed to form a business form discharged from one end of the collator assemblage and another plurality of rolls may be arranged with their webs discharging to the opposite end of the collator thereby making more efficient use of the expensive equipment involved.

Another object of the invention is the provision of improved tensioning means for the paper web and which tensioning means is entirely mechanical, simple to construct, and extremely efficient and accurate in maintaining the feed of the paper at exactly the right rate without any problem of accumulation of slack occurring.

Other objects and advantages will be apparent from the following specification and from the drawings.

FIG. 1 is a greatly reduced semischematic side elevational view of one form of collator showing a plurality of paper and carbon rolls but with the guide means omitted for clarity and schematically indicating the direction of discharge of the paper and carbon webs.

FIG. 2 is a fragmentary top plan view of one collator station showing a portion of the drive means.

FIG. 3 is a side elevation of the support plate showing the various elements supported thereon.

FIG. 4 is a view similar to FIG. 3 but with the support plate and elements forwardly thereof removed to show the driving means.

FIG. 5 is a fragmentary side elevation of the collator station showing the driving means.

FIG. 6 is a view similar to FIG. 4 showing the carbon and paper webs being fed in one direction.

FIG. 7 is a view similar to FIG. 6 but showing the carbon and paper being fed in the opposite direction.

FIG. 8 is a horizontal cross sectional view through the backing plate taken in a plane indicated by lines 8-8 of FIG. 6 and showing the tension control means.

FIG. 9 is a typical side elevation, partly in section, of a pair of feed rolls showing the means for intermittently feeding the web.

Referring first to FIG. 1 the collator comprises a plurality of stations four of which are indicated in FIG. 1 and referred to as A, B, C, and D. Although only four such stations are indicated in FIG. 1 it will be understood that a greater number may be employed and, in fact, it is not unusual for a ten-part collator to be employed. In the case of a ten-part collator for example there are ten stations each rotatably supporting a row of paper so that ten webs in superimposed relationship are fed from the collator with nine carbons interposed between the paper webs. Since the principles employed by the present invention and the structure to be disclosed herein are applicable regardless of the number of parts involved only four stations are indicated in FIG. 1 for simplicity. Aside from an exception to be noted later on all of said stations A, B, C, D may be identical in structure and in FIGS. 2-7 only station B is shown in detail.

Each station comprises a vertically disposed back plate 1 to which are secured the corresponding ends of a pair of shafts 2, 3, for respectively receiving rolls of carbon and paper thereon; said rolls being indicated at 4' and 5' respectively in FIGS. 6, 7.

Referring to FIG. 6 in which station B is arranged so as to feed the manifolded form to the left-hand end of the collator it is seen that the carbon web 4 is fed from the roll around a guide 7 then downwardly around the roller 8 of a tensioning device generally designated 9 then upwardly around a power driven roller 10, then between a pair of power driven feed rolls 11, 12 which in the particular case of FIG. 6 are inactive with the upper roller 11 being withdrawn from feeding engagement with the web (see FIG. 9). The web then passes between another pair of feed rolls 13, 14 identical to feed rolls 11, 12 and which, in this case, are in feeding engagement with the web 4 which is then directed downwardly past the inner side of fixed guide 17 similar to guide 7 and then around a fixed guide rod 18 of another tensioning device generally designated 19. The web 4 then proceeds upwardly past the outer side of fixed guide 17 and around a power driven roller 20 which is similar to roller 10. The web 4 is then directed downwardly and around a guide 21 that is on the adjacent station A. A similar guide 21 is at station B as indicated.

As seen in FIG. 6 the carbon 4 is directed around a power driven roller 22 then around a rotatably supported guide roller 23 and is then brought into superimposed relationship relative to the paper web 5 in the conventional manner and is advanced along the path of travel of the completed form by the usual guide means such as a pinned conveyor chain 48 (FIG. 1).

In the arrangement shown in FIG. 6 the paper web 5 from the paper roll 5' is passed around a fixed guide 25 similar in function to guide 7 and then downwardly around a roller 26 of a tensioning device generally designated 27. The paper web then passes upwardly around a power driven guide roller 28 and between a pair of power driven feed rolls 29, 30 which, as in the case of feed rolls 11, 12, are out of feeding relation with the web, the upper roll 29 having been moved away from web gripping relationship. The web then proceeds between power driven feed rollers 31, 32 then downwardly past fixed guide 39 and around a guide 35 of a tensioning device generally designated 36. The web then passes upwardly alongside guide 39 and around an idler roller 40 then downwardly and around a roller guide 41 then inwardly and around a powered roller 42 and then downwardly around a fixed guide 43 which leads the paper into superimposed relationship with a carbon coming from station C if the collator is set up to receive such a carbon from station C.

In FIG. 7 the same structure is shown as in FIG. 6 except that the carbon and paper is reeved so as to be discharged from the right-hand end of the collator instead of from the left-hand end as indicated in FIG. 6. In this case the tensioning devices 9, 19 and 27, 36 are reversed in a manner which will be subsequently described, and web 5 is reeved around fixed guide 39 and then downwardly around the roller 26 of tensioning device 27 and then upwardly and around idler roller 40 and between the driven rollers 31, 32 which, in this case, are shifted out of feeding relation with the web. The web then proceeds between driven feed rollers 29, 30 which have been shifted into web feeding relationship. The web then comes downwardly past the fixed guide 25 and around guide 35 of tensioning device 36 and then upwardly past the opposite side of fixed guide 25 and around idler roller 28 thence downwardly around guide 21, around roller 22 and then is deflected downwardly onto the discharging manifold by guide 44.

In the right-hand discharge arrangement shown in FIG. 7 the carbon 4 from the roll 4' is reeved around the fixed guide 17 then downwardly around the roller 8 of the tensioning device 9 (which has been reversed from the position of FIG. 6) then upwardly and around driven roller 20, between inactive power driven rollers 13, 14 and then between active power driven feed rollers 11, 12 the downwardly and around the roller 18 of tensioning device 19 (which has also been reversed from the position of FIG. 6) then upwardly around driven roller 10. The carbon is then transferred to the next station by being run downwardly and around guide 41, around driven roller 42, around idler roller 24, and then under the paper web coming from the adjacent station with which paper web the layers are held down by roller 46 (in the case of the last station, FIG. 1) and then brought into engagement with the pinned feed chains on the manifold driving unit generally designated 48. The method by which the tensioning devices 9, 19 and 27, 36 are reversed from the positions of FIG. 6 to the positions of FIG. 7 will now be described.

Fixedly secured to the inner side of support plate 1 is a boss 50 to which the inner end of an arm 51 is pivotally supported by means of pivot 52 (FIG. 8). At the free end of arm 51 the same is provided with a rotatably supported roller 53. In order to provide adequate support for the roller 53 a pair of inner and outer support

plates 54 are interconnected by rods 55 above and below said roller 53. As best seen in FIGS. 6 and 7 the paper web is reeved between the roller 53 and the adjacent reinforcing rod 55. When it is desired to reverse the feed of the web from the left-hand discharge shown in FIG. 6 to the right-hand discharge shown in FIG. 7 the arm 51 is swung about pivot 52 through 180° to the position shown in FIG. 7. The tensioning device generally designated 36 is adapted to be reversed in a similar manner from the position of FIG. 6 to the position of FIG. 7. In this case the tensioning device 36 comprises an elongated arm 60 which is pivotally supported intermediate its ends on a pin 61 secured to plate 1. At one end of arm 60 there is provided the fixed guide 35 herebefore referred to and on the opposite end of arm 60 there may be provided a weight 63 which may be adjustably secured to the arm 60 by means of set screw 62 (FIG. 3) in the particular position described to maintain the required tension in the web.

The tensioning device generally designated 27 is adapted to coact with a brake 65 of the type having a plate 66 which may be rotated in either direction to apply the braking force (FIG. 3). Arm 51 is connected by upwardly extending rod 67 with said plate 66 of brake 65 so that upon excessive downward movement of said arm in a clockwise direction as seen in FIG. 3 the brake 65 is energized to apply resistance to the rotation of roll 5' thereby imparting additional tension to the paper web. In like manner, tensioning device 9 imparts a braking action to a similar brake 70 on shaft 2 when the downward movement of the arm of tension member 9 is excessive. It will be understood that the tension members 9, 19 are interchanged in like manner as tension members 27, 36 when the direction of discharge of the webs is reversed from the position of FIG. 6 to the position of FIG. 7. The arm 51 of tensioning device 27 may also be provided with an adjustable weight 64 so that the downward load on both tensioning devices may be adjusted to suit the weight of the paper and the particular circumstances existing.

In FIG. 9 the mounting means for feed rolls 11, 12 is disclosed and it will be understood that feed rolls 13, 14 and the feed rolls for the paper web are similar and are mounted in a similar manner. It will further be understood that most of the rollers shown in FIG. 3 are mounted in a manner similar to that disclosed in FIG. 9 and that the particular mounting means for the rollers shown in FIG. 3 are omitted for clarity.

Secured to the back plate 1 is a mounting plate 70 which is connected by rods 71 with an outer mounting plate 72. The rods 71 are reduced in diameter at their outer ends and threaded for receiving thereon nuts 93 so that the rollers 11, 12 may be rotatably supported at their ends in bearings adjacent plates 70, 72. The bearings for the upper roller 11 are provided with eccentrics 74 which in turn are swingably supported in the plates 70, 72. Secured to the eccentrics 74 are a pair of yokes 75 which are connected together by rods 76 so that the bearings of roller 11 may be swung as a unit about the center of eccentric 74 and in this manner swing the rollers 11 toward and away from roller 12 which rotates about a fixed axis. Said rollers 11, 12 are connected for rotation together by gears 80, 81 the teeth of which remain in mesh with roller 11 is moved away from roller 12 since the necessary amount of movement is extremely small. When the desired position of roller 11 is achieved it may be locked in such

position by lock nut 84 provided with a manually manipulatable handle 85. As noted before when the carbon is being fed in a direction shown in FIG. 6 the feed roller 13 is in feeding relation to the roller 14 but the feed roller 11 is out of feeding relation with the roller 12. On the other hand when the carbon is being fed in the direction of FIG. 7 feed roller 13 is out of engagement with roller 14 while feed roller 11 has been moved into engagement with roller 12.

From the above described structure it will be apparent that the symmetrical arrangement of the various elements shown in FIG. 3 permits reversibility of the collator so that all of the webs may be fed in one direction or in the opposite direction or, if desired, some of the webs may be fed in one direction and some in the opposite direction. It will be apparent that the structure greatly enhances the flexibility and efficiency of the collator and obviates nonuse of a portion of this expensive equipment when smaller than maximum jobs are to be run.

As seen in FIG. 9 the upper feed roll 11 has an interrupted periphery at the point designated 87. The purpose of this structure will now be described.

Referring to FIG. 6 wherein there are shown two webs of carbon and one web of paper being fed to the left-hand end of the collator and specifically with reference to the feed rollers 31, 32 which are identical to the feed rollers 11, 12 shown in FIG. 9 it will be seen that since said feed rollers are geared together that the gripping action of the rolls on the paper is lost when the interruption 87 in the periphery of roll 11 moves downwardly to the tangent point with roll 12. When this occurs the relatively heavy tensioning device 27 including the adjustable weight 64 (FIG. 3) thereon tends to reverse the direction of the web since there is no resistance on the latter (the feed rolls 29, 30 being out of engagement with the web). If a material amount of tension thus develops in the web 5 then the tensioning device 36 tends to swing upwardly. However such upward swinging is prevented by a stop 59 on plate 1 so that, in effect, only slight downward movement of the arm 60 of tensioning device 36 is permitted. By this structure the intermittent feeding of the web due to the presence of the interruption 87 on the roll 11 in combination with the action of tensioning devices 27, 36, and further in combination with suitable adjustments made by moving weights 63, 64 along the length of arms 51, 60 the actual feeding of the paper may be closely adjusted depending on the weight thereof so that no great amount of slack takes place represented by downward movement of arm 60.

In the event the downward movement of arm 27 is greater than a predetermined amount caused by over-running of the paper roll 5' then, as noted above, the brake 65 is actuated by rod 67 to reduce such over-running and to increase the tension to again bring the arm 51 of tensioning device 27 upwardly.

It will be noted that another stop 59 may be placed on the opposite side of the center of the mechanism to engage arm 60 and still be clear of interference with arm 51 when the mechanism is reversed for running in the opposite direction. Similarly another rod 67 may be connected to brake plate 66 but unconnected with arm 60 so that when the position of tensioning device 27 is reversed it is merely necessary to disconnect one rod 67 and connect the other.

The above described operation of tensioning devices 27, 36 is identical to the operation of tensioning devices 9, 19 on the carbon.

It will be understood that various means for driving the collator may be employed. One such means is shown in FIG. 4 wherein a gear box 80 may be driven by a reversible motor (not shown) and provided with a shaft 81 having a pulley 82 driving a timing belt 83 which in turn rotates a shaft 84 in the same direction and which shaft 84 is connected with roller 22. From shaft 84 timing belt 86 drives shaft 87 carrying roller 30 and from shaft 87 a timing belt 88 drives shaft 89 carrying roller 12. Shaft 89 drives two timing belts 90, 91, the former driving the shaft 92 of roller 10 and the latter driving shaft 96 of roller 14. A timing belt 97 from shaft 96 drives the shaft 98 of roller 20 while a second belt 100 drives shaft 101 of roller 32. From shaft 101 a timing belt 103 drives a shaft 105 carrying a gear 106 which is in mesh with a gear 108 on shaft 109 of roller 42. This pair of gears reverses the direction of roller 42 relative to all of the other rollers driven by the timing belts.

If it is desired to apply glue along one or both margins of the paper webs a glue pot 115 having a dispensing gear 116 may be provided on a support 117 which may also serve to support guides 23, 24. Support 117 is preferably provided with a pair of ways 120 for alternatively receiving the glue pot 115 therein. Suitable means (not shown) may be provided for fixedly but removably securing the glue pot 115 to the support 117. Thus the gluing operation, if any, is also made reversible to suit the direction of discharge of the manifold.

If one of the two manifolds to be formed by the collator is always discharged in one direction it is possible to omit one of the carbon rolls. In other words, if a manifold is always discharged to the left regardless of whether one or two manifolds are being formed then the carbon roll at station A may be omitted since the number of carbon rolls is, in most cases, one less than the number of paper rolls.

Although it is possible to run all stations from one motor and employ reversing gears and disconnect clutches where required it is more practical to have one motor for one half the number of stations and one motor for the other half. In this manner greater flexibility is available in connecting and disconnecting stations and in reversing the direction of a particular station. Shafts from gear box 80 may be employed to drive adjacent stations as indicated in FIG. 4.

I claim:

1. A paper web feeding device for feeding a web of paper along a horizontal path of travel,
a roll of paper disposed with its axis horizontal,
means mounting said roll for rotation about its axis,

first guide means for directing said web horizontally in a direction perpendicular to said axis and away from one side of said roll,

second guide means for alternatively directing said web in the opposite horizontal direction, away from the opposite side of said roll,

a pair of drive rollers in driving engagement with said web interposed between said roll and the horizontally directed portion of said web,

and power means for driving said drive rollers.

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2. A device according to claim 1 wherein two pairs of drive rollers are provided for said web, means for disengaging one pair from said web when the latter is directed in one horizontal direction, and means for disengaging the other pair when the web is directed in the opposite direction.

3. A device according to claim 1 wherein a tensioning device is interposed between said roll and said drive rollers for maintaining the tension in the web within a predetermined range.

4. A device according to claim 1 wherein a plurality of rolls of paper are provided in a horizontally extending row with their axes parallel and wherein the webs are directed horizontally in superposed relation.

5. A paper web feeding device for feeding a plurality of webs of paper in superposed relation along a horizontal path of travel,

a plurality of rolls of paper arranged in a horizontally extending row with their axes parallel and horizontal,

means mounting said rolls for rotation about their respective axes,

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guide means for directing the webs of said rolls horizontally and in superposed relation in one horizontal direction parallel to said row, and

guide means for alternatively directing the webs of said rolls in the opposite horizontal direction in superposed relation.

6. A device according to claim 5 wherein a pair of drive rollers in driving engagement with each web are interposed between each roll and the horizontally directed portion of its web.

7. A device according to claim 6 wherein two pairs of drive rollers are provided for each roll, means for disengaging one pair from its corresponding web when the latter is directed in one horizontal direction, and means for disengaging the other pair when the web is directed in the opposite direction.

8. A device according to claim 6 wherein a tensioning device is interposed between each roll and its corresponding drive rollers for maintaining the tension in the web within a predetermined range.

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