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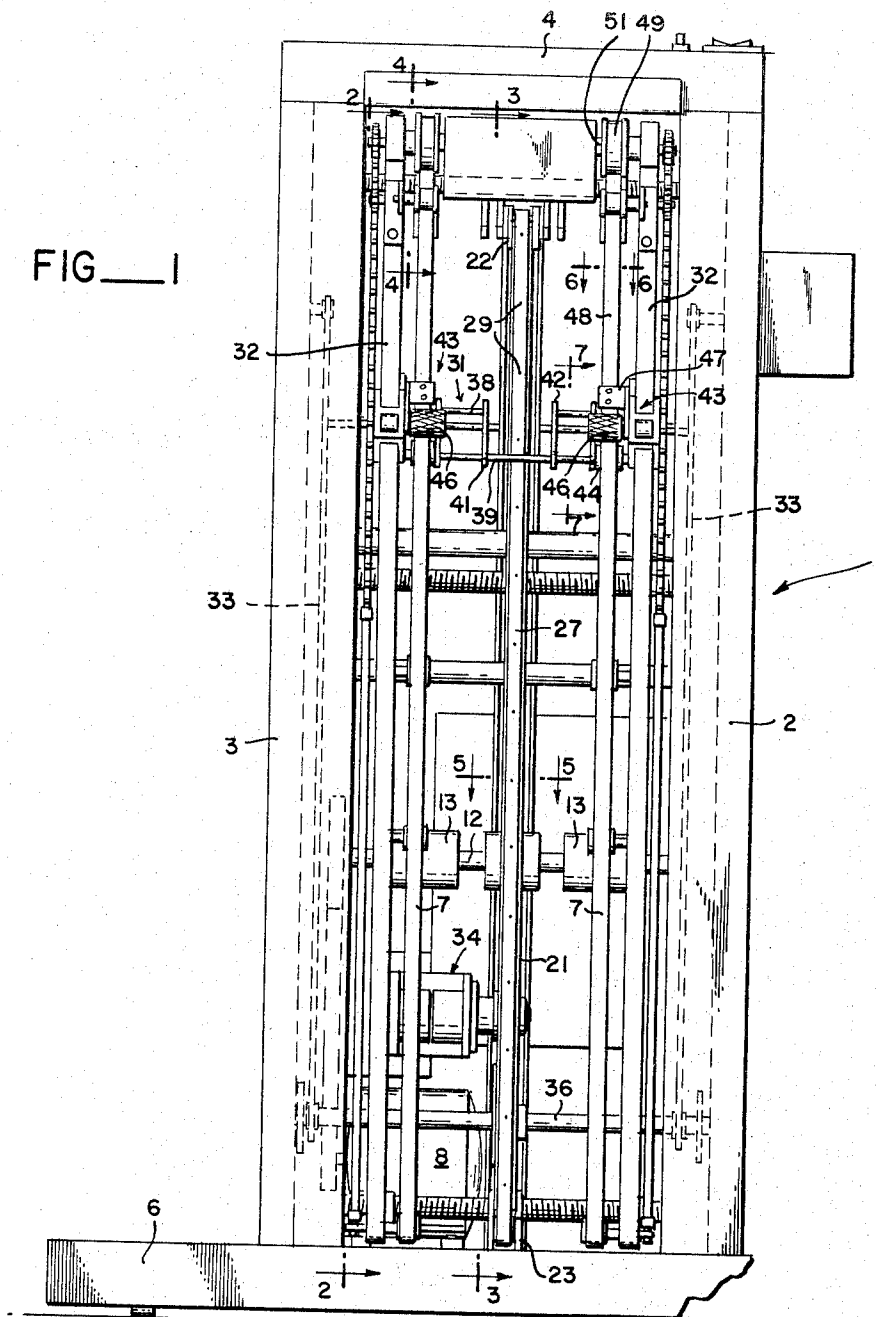
3,372,922

SHEET CONVEYOR MECHANISM

Filed Sept. 29, 1966

2 Sheets-Sheet 1

FIG. 1



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2 Sheets-Sheet 2

FIG__2

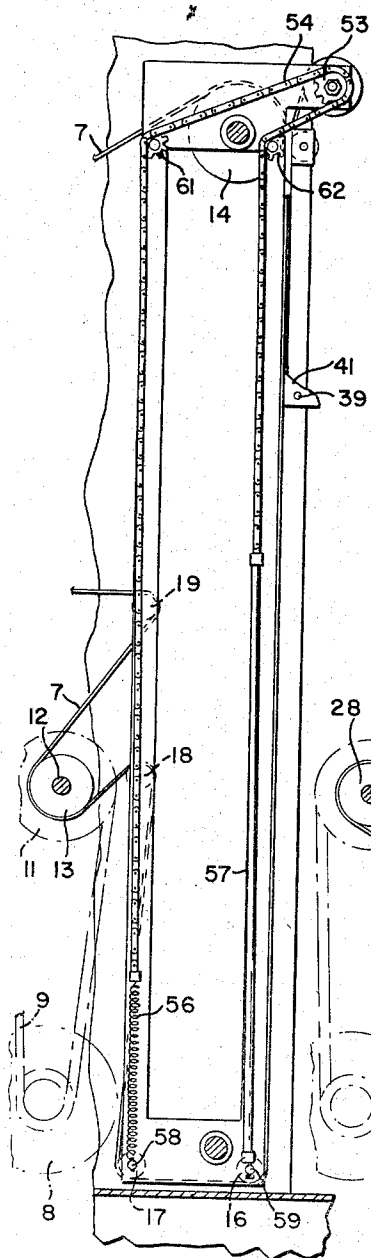


FIG__3

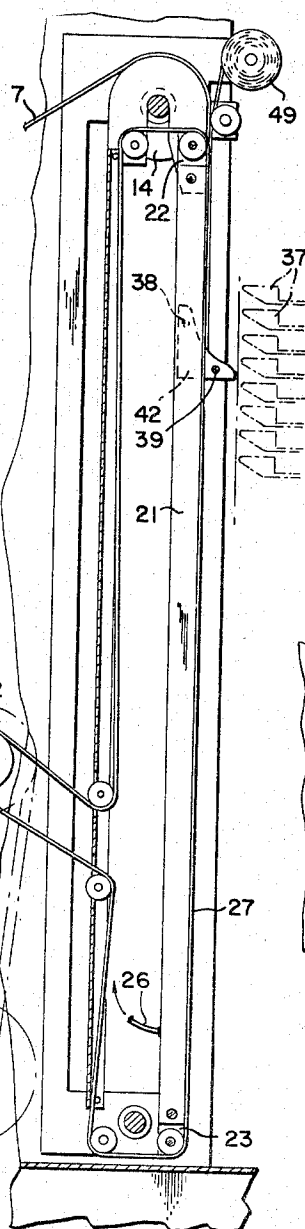


FIG__4

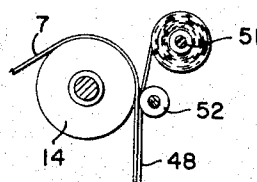


FIG__5

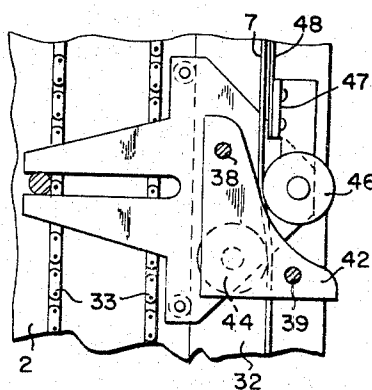
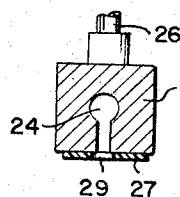


FIG__7



FIG__6

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SHEET CONVEYOR MECHANISM

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No. 583,012

12 Claims. (Cl. 270—58)

ABSTRACT OF THE DISCLOSURE

A collator distributor having a set of conveyor belts disposed vertically in front of a plurality of shelves. Non-moving, retractable, metallic tapes are disposed contiguous to each of the conveyor belts to hold sheets against the belts as the sheets are fed downwardly. Moving, vacuum tape means are mounted between the conveyor belts to hold the sheets flat as they are conveyed.

This is a continuation-in-part of application Ser. No. 521,077, filed Jan. 17, 1966.

The present invention relates to an improved sheet conveyor mechanism for use in high speed conveyor systems and more especially in the vertical or substantially vertical conveyor sections of systems such as used in collator distributors and the like.

In sheet collating systems and the like having substantially vertical conveyor sections and vertically movable deflector means associated therewith for deflecting individual sheets from the conveyor, it has been found advantageous to use a combination of laterally spaced moving conveyor tapes and retractable tapes associated therewith to hold the sheets thereagainst. In this type of arrangement, the retractable tapes have one end connected to a winding reel and the other end connected to the movable deflector mechanism so that the retractable tapes are always located in face-to-face proximity with the moving conveyor tapes downwardly along the course of the tapes to the point at which the sheets are deflected. The sheets, of course, lie between the retractable tapes and the moving conveyor tapes. The succeeding sheets may, however, tend to override one another because of the friction between the sheets and the retractable tapes when moving at high speed and because of the vertical or substantially vertical disposition of the conveyor section. Another problem which arises is that of the tendency of the mid portion of the sheets to bow outwardly between the conveyor tapes because of air currents generated at high speeds.

According to the present invention, a structural arrangement is provided wherein the retractable tapes are arcuate in cross section so as to present substantially a line contact between the retractable tapes and the surface of the sheets to lessen the friction and, in addition, a third tape is placed between the two spaced conveyor tapes and moves along the vertical section of the conveyor system at the same speed as the spaced conveyor tapes. The intermediate tape is provided with closely spaced perforations or hole and moves along the vertical course over the surface of a backing member which includes a vacuum chamber so that the mid portion of the sheet is caused to adhere to the perforated tape to prevent ballooning and bowing of the center portion of the sheet. In this manner, the individual sheets remain at their original spacing as they move along the vertical course of the conveyor system and arrive at the deflector mechanism in a flat condition so as to avoid any possibility of hangup as they are deflected from the conveyor system on to bins, shelves or the like.

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Accordingly, the object of the present invention is to provide an improved sheet conveyor mechanism for high speed conveying and deflecting of individual sheets.

Another object of the present invention is to provide a sheet conveyor mechanism of the character described wherein the center portion of the sheet is held by vacuum against an intermediate perforated moving tape.

Another object of the present invention is to provide a sheet conveyor mechanism of the character described which includes arcuate cross sectioned retractable tape means for holding the conveyed sheet against spaced conveyor tapes along a vertical course of the system.

Other objects and advantages will appear and be understood from the following description and claims, the invention consisting in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the accompanying drawings:

FIG. 1 is an elevational view of the vertical conveyor and deflector section of a collating device;

FIG. 2 is a cross sectional view taken along lines 2—2 of FIG. 1;

FIG. 3 is a cross sectional view taken along lines 3—3 of FIG. 1;

FIG. 4 is a cross sectional detail taken along lines 4—4 of FIG. 1;

FIG. 5 is a cross sectional detail taken along lines 5—5 of FIG. 1;

FIG. 6 is a cross sectional detail taken along lines 6—6 of FIG. 1; and

FIG. 7 is a cross sectional detail taken along lines 7—7 of FIG. 1.

Referring now to the drawings wherein like reference numerals indicate identical parts in the various views, it will be noted that only the vertical conveyor section of the system is illustrated in the drawings since the present invention deals only with this section of the particular system. The vertical frame portion of the machine is indicated generally at 1 and will include the vertical housing members 2 and 3, the top housing structure 4 and the base 6.

The conveyor system includes the two laterally spaced tapes 7 which may be driven by means such as an electrical motor 8, belt drive 9 and pulley 11 which rotate the drive shaft 12 and drive rollers 13 over which the belts are trained. FIGS. 2 and 3 are dead sections with certain of the parts removed in order to more clearly illustrate the course of the conveyor tapes and other structures directly concerned with the present invention. As will be seen most clearly in FIGS. 1 and 2, the belts 7 approach the vertical course over guide rollers 14, continue on the vertical downward course then horizontally about rollers 16 and 17, upwardly over rollers 18, about the drive rollers 13 and then away from the vertical section over the rollers 19.

A hollow bar or pipe 21 is fixed in position between the conveyor belts 7 by means of brackets or the like 22 and 23. The bar 21 is provided with a slot or channel 24 which is key shaped in cross section as seen in FIG. 5 and which opens into one face of the bar. As shown in FIGS. 3 and 5, the channel 24 comprises a vacuum chamber which is connected via a tube or pipe 26 to a source of vacuum (not shown) which may be any suitable source such as a conventional pump driven by the motor 8 or even an external source of vacuum. A third tape 27, shown most clearly in FIG. 3 is trained about a drive roller 28 on the shaft 12 so as to be driven at the same speed as the conveyor tape 7 and is passed about a system of guide rollers as illustrated so as to be directed downwardly over the surface of the bar 21 overlying the vacuum chamber 24. As seen in FIGS. 1 and 6, the tape 27 is provided with

closely spaced perforations or holes 29 positioned to communicate with the channel 24.

A vertically movable deflector assembly indicated generally at 31 is mounted to reciprocate on the vertical guide bars 32 located on the outboard side of each of the conveyor tapes. The assembly is driven for reciprocation by means of the drive chain 33 which may in turn be powered by the motor 8 through a brake and clutch assembly 34 drivingly connected to the shaft 36. The exact details of the deflector assembly and its operation form no part of the present invention and it will be sufficient to understand that the assembly 31 is controlled to move vertically upwardly or downwardly from station to station so as to deflect sheets to the shelves or bins 37 as seen in FIG. 3.

As seen in FIG. 1, the deflector assembly 31 includes the cross rods 38 and 39 mounting the deflector plates 41 and 42 and which are connected to identical slide assemblies 43 which move on the bars 32 by means of their connection with the chain 33. As seen most clearly in FIG. 7, the slide assemblies 43 also include the guide rollers 44 which contact the back sides of the tapes 7 and the knurled rollers 46 which contact the front face of each tape.

Each of the slide assemblies 43 has a bracket 47 connected to one end of a retractable tape 48 which overlies the associated conveyor tape 7. The tapes 48 may be light gauge metal tapes or may be made from non metallic material. These tapes are preferably arcuate in cross section as illustrated in FIG. 6 so as to provide substantially a line contact with a sheet of paper conveyor along the tapes 7 thereby minimizing the effect of friction. The upper end of each tape is connected to a reel 49 carried on cross shaft 51 which is journaled for rotation by extended portions of the vertical bars 32. The tapes 48 may be trained over suitable guide rollers 52 so as to be held in close face-to-face proximity to the surface of the tapes 7 down to the position of the deflector assembly 31. Thus a sheet being conveyed by the tapes 7 as it enters the vertical courses passes under the retractable tapes 48 so as to be held against the tapes 7 until the sheet is deflected from the conveyor by the assembly 31. The sheet is deflected by being directed away from the conveyor tapes by the deflector plates 41 and 42 which causes the sheet to pass between the rollers 44 and 46 and into a selected one of the bins or shelves 37.

In order to provide means for automatically winding the retractable tapes 48 on to the reels 49 as the deflector assembly 31 moves upwardly and to allow the tapes to be removed from the reels when the assembly is moved downwardly, the shaft 51 is provided with means for spring loading as the assembly moves downwardly. As illustrated in FIGS. 1 and 2, each end of the shaft 51 is provided with a drive sprocket 53 over which is trained a link chain 54 the opposite ends of which are connected respectively to a spring member 56 and a bungee or spring 57 respectively. The lower end of the spring 56 may be fixed to the cross shaft 58 which mounts the rollers 17 and the lower end of the bungee or spring 57 is connected to the cross shaft 59 which mounts the rollers 16. The spring 56 acts merely to take up the slack in the portion of the chain 54 which passes downwardly over the idler sprocket 61 and the bungee 57 acts as a tensioning means for the other end of the chain which passes downwardly over the idler sprocket 62. Thus, when the deflector assembly 31 moves downwardly, the tapes 48 are unreel from the reel 49 so as to rotate the shaft 51 in the counter clockwise direction as viewed in 52 and, as a result, the bungee 57 is stretched or tensioned as the chain 54 is moved. When the deflector assembly 31 is returned upwardly, the bungee is allowed to contact and rotate the shaft 51 in the clockwise direction as viewed in FIG. 2 to rewind the tapes on the reels 49 through action of the chain 54.

The present invention provides improvements in the sheet conveyor mechanism of the collator and, through action of retractable tapes 48 and conveyor tapes 57, the

leading corners and edges of the paper are held flat with a minimum of friction between the moving sheets and the non-moving tapes 48 due to the curvature of the tapes. At the same time, the perforated tape 27 prevents ballooning of the central portion of the sheets which is held flat against the tape due to the action of vacuum pressure applied through the perforations 29. Thus the sheets may be delivered in rapid succession to the deflector assembly 31 in a flat condition for deflecting and with no opportunity for hang up or overlapping on the vertical course of the conveyor.

It is believed that the invention will have been clearly understood from the foregoing detailed description of the illustrated now-preferred embodiment. Minor changes in the details of construction will suggest themselves and may be resorted to without departing from the spirit of the invention. Accordingly, it is intended that no limitations be implied and that the hereto annexed claims be given a scope fully commensurate with the broadest interpretation to which the employed language fairly admits.

Having thus described the invention, what is new and desired to be secured by Letters Patent is:

1. In combination with a sheet conveyor system having laterally spaced conveyor tapes; nonmoving tape means mounted in face-to-face proximity with the respective conveyor tapes for holding a moving sheet in contact with the conveyor tapes, and moving vacuum tape means mounted between said conveyor tapes for holding the sheet flat as it is conveyed.

2. The combination according to claim 1 wherein; said nonmoving tapes are arcuate in cross section so as to present substantially a line contact with the moving sheet.

3. The combination according to claim 1 wherein said vacuum tape means comprises; means forming a vacuum chamber positioned between said conveyor tapes, an endless perforated tape, and means mounting said endless tape for movement over said chamber at the same speed as the conveyor tapes, whereby the mid portion of the traveling sheet is held against the perforated tape.

4. The combination according to claim 3 wherein; said nonmoving tapes are arcuate in cross section so as to present substantially a line contact with the moving sheet.

5. The combination according to claim 1 wherein; said nonmoving tapes and said vacuum tape means extend over a substantially vertical course of said conveyor tapes so as to prevent overrunning of spaced sheets carried by the conveyor tapes.

6. The combination according to claim 3 wherein; said nonmoving tapes and said vacuum tape means extend over a substantially vertical course of said conveyor tapes so as to prevent overrunning of spaced sheets carried by the conveyor tapes.

7. The combination according to claim 4 wherein; said nonmoving tapes and said vacuum tape means extend over a substantially vertical course of said conveyor tapes so as to prevent overrunning of spaced sheets carried by the conveyor tapes.

8. The combination according to claim 1 including; sheet deflector means operatively associated with said conveyor tapes, means mounting said deflector means for reciprocation along said conveyor tapes for deflecting moving sheets therefrom, said nonmoving tapes being connected at one end to said deflector means, and winding means connected to the other ends of said nonmoving tapes, said winding means permitting unwinding of the tapes when the deflector means is moved in a direction away from the winding means and serving to rewind the tapes when the deflector means is returned.

9. The combination according to claim 8 wherein said winding means comprises; first and second spools mounted on a shaft extending transverse to the conveyor tapes, sprocket means on the end of said shaft, a chain extending over said sprocket means, one end of said chain including an elastic member having the end thereof fixed relative to said shaft in a manner that movement of the

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deflector means away from the spools moves said chain to tension said elastic member, said elastic member serving to exert a winding force on said spools when the deflector member is returned so as to rewind said nonmoving tapes.

10. The combination according to claim 4 including; sheet deflector means operatively associated with said conveyor tapes, means mounting said deflector means for reciprocation along said conveyor tapes for deflecting moving sheets therefrom, said nonmoving tapes being connected at one end to said deflector means, and winding means connected to the other ends of said nonmoving tapes, said winding means permitting unwinding of the tapes when the deflector means is moved in a direction away from the winding means and serving to rewind the tapes when the deflector means is returned.

11. The combination according to claim 5 including; sheet deflector means operatively associated with said conveyor tapes, means mounting said deflector means for reciprocation along said conveyor tapes for deflecting moving sheets therefrom, said nonmoving tapes being connected at one end to said deflector means, and winding means connected to the other ends of said nonmoving tapes, said winding means permitting unwinding of the

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tapes when the deflector means is moved in a direction away from the winding means and serving to rewind the tapes when the deflector means is returned.

12. The combination according to claim 11 wherein said winding means comprises; first and second spools mounted on a shaft extending transverse to the conveyor tapes, sprocket means on the end of said shaft, a chain extending over said sprocket means, one end of said chain including an elastic member having the end thereof fixed relative to said shaft in a manner that movement of the deflector means away from the spools moves said chain to tension said elastic member, said elastic member serving to exert a winding force on said spools when the deflector member is returned so as to rewind said nonmoving tapes.

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