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SHEET FEEDING MECHANISM

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Fig. 1.

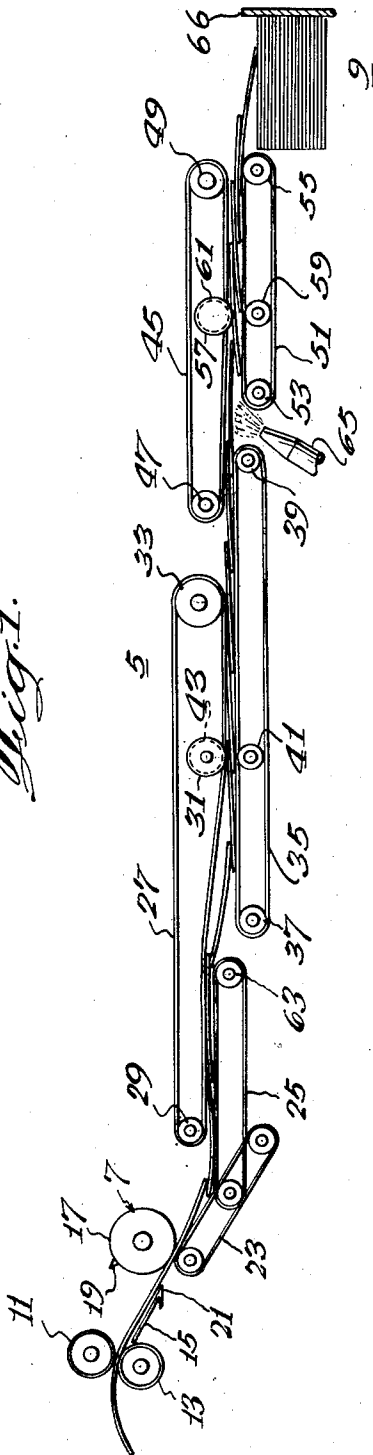
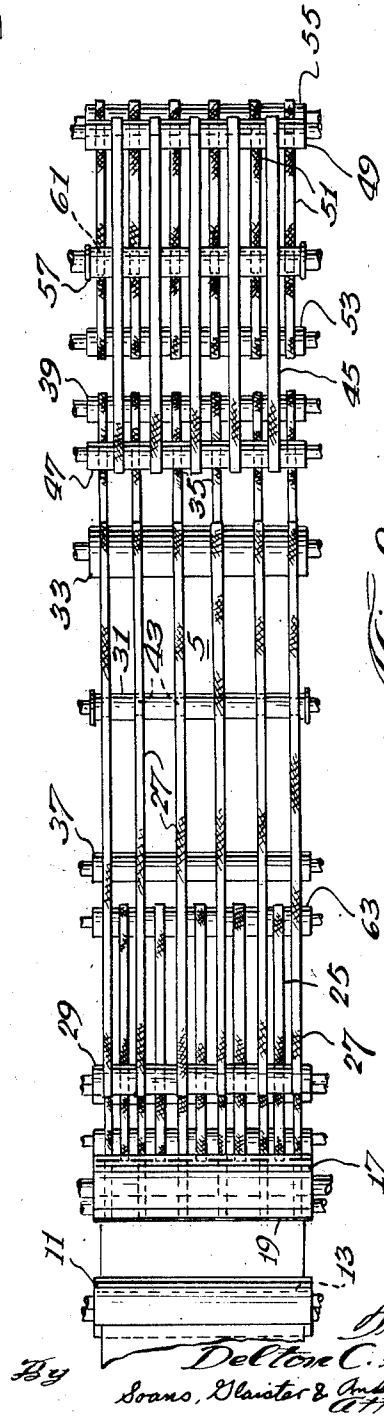


Fig. 2.



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SHEET FEEDING MECHANISM

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5 Claims. (Cl. 271-76)

The present invention relates generally to machines for feeding sheet material, and is particularly directed to an improved form of apparatus for feeding paper sheets into a layboy or the like.

In the production of stacks of paper sheets from one or more rolls of paper, it has been the practice to feed the continuous length paper to a rotary cutter or the like, where it is cut into sheets of predetermined length. These sheets are then fed, either singly or in "cuts" of two or more sheets, on to a system of conveyor tapes for movement to a stack forming means such as a layboy. Since the cutter operates at high speeds and forms sheets or "cuts" at a rapid rate, it is desirable to slow down the sheets before they enter the layboy, in order that the edges might not be damaged as the sheets strike the backstop in the layboy which defines the rear edge of the stack being formed. This has previously been accomplished by slowing down the sheets intermediate the cutter and the layboy, so that they overlap one another and enter the layboy at a slower speed.

However, it is recognized that there is a practical limit to the extent to which sheets can be retarded as they are expelled from the cutter. If the sudden decrease in the speed of sheets is excessive, they will buckle and jam up in the conveyor belts. This problem has become particularly apparent with the improvements made in rotary cutters which afford operation at much faster speeds than was previously possible. And with this great increase in cutter speed, it has been found that the known types of overlapping devices are incapable of performing satisfactorily at the upper limits of the cutter operation.

It is, therefore, the primary object of the present invention to provide an overlapping device for use with a cutter-layboy machine, which is capable of providing sufficient retardation of the cut sheets and overlapping thereof to prevent damage to the sheets as they enter the layboy, while affording an increase in the number of sheets fed to the layboy during a given period of time.

Other objects and advantages of the invention will become apparent as the disclosure progresses with respect to the accompanying drawings, wherein:

Fig. 1 is a diagrammatic illustration of apparatus embodying the principles of the present invention.

Fig. 2 is a top plan view of the structure in Fig. 1, with portions broken away in order to more clearly show other details of the apparatus.

With reference to the drawings, it is seen that the selected embodiment of the invention comprises a sheet-feeding machine 5 disposed between a rotary cutter 7 and a layboy 9 in position to receive sheets from the cutter and place them in the layboy. The latter is operable in the usual manner to gradually lower the pile of sheets as it is being built up.

A pair of draw rolls 11 and 13 are disposed in advance of the cutter 7 to pull one or more continuous length sheets from supply rolls (not shown) and feed the paper over a bed plate 15 to the cutter. The cutter 7 may be

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any continuously operable type of paper cutter, and is illustrated generally as comprising a cylinder 17 having a transverse blade 19 mounted thereon. The cutter operates in the usual manner with the draw rolls 11 and 13 determining the speed of the paper feed, and the cutter knife 19 bearing against a bed knife 21 on the leading edge of the bed plate 15 to cut the sheets in the desired lengths. In this latter respect, it should be understood that the cutter is operable with either a single roll or a plurality of rolls. In the latter case a plurality of sheets, called a "cut," will be cut with a single action of the cutter blade 19.

A system of high speed take-off tapes 23 and 25 is mounted adjacent the forward edge of the cutter in position to advance the severed sheets or "cuts." The take-off tapes are preferably driven at a speed which is sufficient to avoid having the knife edge strike the trailing edge of the cut sheet as the knife moves in a counterclockwise direction to make the next cut. In the selected embodiment the initial take-off tapes 23 are disposed in a downwardly inclined position with the upper run of the tapes being generally coplanar with the bed plate 15. The take-off tape section 25 is generally horizontal and intersects the inclined tapes 23 at an intermediate portion thereof. This particular arrangement facilitates the clearance of the cutting cylinder 17 by the sheets.

Overlying the forward take-off tapes 25 and extending forwardly therefrom in the direction of the layboy 9 is a system of tapes 27, which preferably operate at cutter speed and, therefore, are driven through means (not shown) affording adjustment to conform with the selected speed of the cutter 7. The rear portions of the tapes 27 are disposed around a roller 29 in close relation to the upper run of the take-off tapes 25 in order to firmly grip the sheets or cuts therebetween. The intermediate and forward portions of the tapes 27 are positioned about an idler roller 31 and a forward roller 33, respectively, which are disposed to place the associated sections of the lower run of the tapes 27 below the level of the upper run of take-off tapes 25.

A system of relatively slow speed conveyor tapes 35 is disposed forwardly of the take-off tapes 25 in closely underlying relation to the forward section of the tapes 27. The conveyor tapes 35 are suitably trained at opposite ends of their run around a pair of rollers 37 and 39 and, also, around an intermediate idler roll 41 which is disposed in close relation to the roller 31 so as to firmly grip the sheets therebetween. In this latter respect, it is preferred that the idler roller 31 be formed with reduced diameter portions 43 to permit the tapes 27 to be elevated somewhat with respect to the tapes 35, while affording a close spacing between the main enlarged portions of the roller 31 and the underlying idler roll 41. The roller 31 may then be driven at the same speed as the tapes 35 and roll 41 through frictional engagement with the latter.

The forward portion of the conveyor tapes 35 extend beyond the ends of the tapes 27 and is overlapped by another system of tapes 45 which are disposed around a pair of rolls 47 and 49. The tapes 45 are preferably driven at the same rate of speed as the conveyor tapes 35 and the forward ends of the latter are disposed in closely underlying relation to the rear portions of the tapes 45 so as to press the sheets therebetween. The intermediate and forward sections of the tapes 45 are disposed with the lower run of the tapes below the level of the tapes 35, in a manner similar to the disposition of the preceding tape 27.

A second system of conveyor tapes 51 is disposed forwardly of the first conveyor tapes 35 around a pair of rollers 53 and 55 and in underlying relation to the tapes

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45. A pair of closely spaced idler rolls 57 and 59 are positioned at intermediate sections of the tapes 45 and 51, respectively, to again provide means for gripping the sheets or cuts as they move toward the layboy. As in the roll 31, the idler roll 57 includes reduced diameter portions 61 which afford greater spacing between the tapes 45 and 51 than between the rolls 57 and 59 at the position of the latter. Furthermore, the tapes 51 are driven at a speed which is slower than that of the preceding tapes 35.

As will be more apparent later on in the description, the spacing between the roller 63 at the forward end of the take-off tapes 25 and the rolls 31—41, as well as the spacing between the roller 39 and the idler rolls 57—59, must be greater than the length of the sheets being handled. Furthermore, it is believed desirable in most operations to provide a source of air at the drop between the tapes 35 and the tapes 51, such as the illustrated air nozzle 65, in order to assist the overlapping of the sheets. A similar means may also be employed between the rollers 63 and 37, if desired.

Having in mind the foregoing description of the illustrated structure, an explanation of the operation of the sheet feeding mechanism will be given. A continuous length of paper from one or more supply rolls is moved into the cutter-layboy by the action of the draw rolls 11 and 13 and cut into sheets of predetermined uniform lengths by the cutter 7. As each sheet or cut leaves the cutter it is picked off by the take-off tapes 23 and 25, which operate at a speed faster than the cutter cylinder 17 in order that the cut sheets might properly clear the knife 19 before it makes another cut.

As each sheet reaches the roller 29, which together with the tapes 27 is traveling at cutter speed, there is an initial reduction in the speed of the sheet as it is gripped between the roller 29 and the tapes 25. This action produces an initial overlap as the succeeding sheet, which is being propelled at a faster rate by the tapes 23, moves across the trailing edge of the first sheet.

As the sheet is moved along it drops down on to the first system of relatively slow tapes 35 and is again retarded as its leading edge is grasped between the rolls 31 and 41. This permits the succeeding sheet to move forwardly, relative to the sheets being retarded by the rolls 31 and 41, as it leaves the tapes 25 and drops on to the tapes 35. Thus the sheets are overlapped to a greater degree and the rate of travel of the overlapped sheets is decreased as they are carried along by the slow tapes 35. It will be recognized, however, that the amount of retardation of the speed of travel of the sheet, by virtue of the differential in speed between the take-off tapes 25 and the tapes 35, has a practical limit depending somewhat on the weight and grade of the sheets being handled. If the tapes 35, and the associated rolls 31 and 41, are run too slowly there will be a choking up of the sheets at the roll 31 with a resulting loss of paper and a shut down period for the machine. Consequently, with a high speed cutter the sheets cannot be slowed down sufficiently with a single overlapping device to prevent buckling of the sheets and damage to the leading edges as the sheets strike the backstop 66 in the layboy 9.

To overcome the above difficulty there is provided a further sheet retarding and overlapping means. As the sheets progress along the tapes 35 they are grasped between the rearward portion of the tapes 45 and the underlying forward portion of the tapes 35. Each sheet or cut is then dropped downwardly on to the tapes 51 and in so doing moves forwardly relative to the trailing edge of the preceding sheet which has been retarded by the rolls 57—59. The air jets 65 may be employed to further facilitate this relative movement of the sheets which produces an additional amount of overlap of the sheets.

Each sheet is retarded as it is engaged by the rolls 57 and 59 and the overlap between such sheet and the succeeding sheet is therefore increased, as above described.

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The overlapped sheets are then carried into the layboy at the slow rate of travel of the tapes 51, which are preferably operating slower than the tapes 35.

It is seen, therefore, that the present invention provides an improved form of sheet delivery means, wherein the use of a pair of conveyor systems arranged in tandem and operating at progressively slower speeds, with each system including an overlapping device, produces a greater and more effective reduction in the speed of travel of the sheets and a greater amount of overlap for the sheets. Consequently, a greater volume of sheets can be handled by the delivery means per unit of time, and the apparatus is, therefore, adaptable to greater cutter speeds than are the previously known devices.

I claim:

1. In combination with a cutter-layboy adapted to form vertical stacks of uniform size sheets from a continuous length of paper, a sheet feeding means for delivering the sheets from the cutter to the layboy comprising a high speed tape conveyor extending downwardly and forwardly from said cutter, a first relatively low speed horizontal tape extending from a position below and adjacent to the forward lower end of said high speed tape to receive sheets from the latter, a first overlapping tape disposed above a portion of said high speed tape conveyor in closely overlying relation thereto and lapping said first low speed tape, said first overlapping tape operating at a speed greater than said first low speed tape, a pair of rolls disposed at a position along said first low speed tape and adapted to press the leading edge of each sheet as it reaches such position, thereby causing the succeeding sheet to overlap the trailing edge of said sheet, a second low speed horizontal tape disposed at a position spaced forwardly of and below said first low speed tape in position to receive sheets from said first low speed tape and to convey said sheets to said layboy, a second overlapping tape lapping the forward end of said first low speed tape and said second low speed tape in closely overlying relation thereto and operating at the speed of the former, said second low speed tape operating at a speed less than said first low speed tape and said second overlapping tape, and an additional pair of rolls disposed at a position along said second low speed tape and adapted to press the leading edge of each sheet to thereby increase the amount of overlap of the sheets.

2. In combination with a cutter-layboy adapted to form vertical stacks of uniform size sheets from a continuous length of paper, a sheet feeding means for delivering sheets from the cutter to the layboy at a reduced speed and in overlapped relation to one another, said sheet feeding means comprising a relatively high speed tape conveyor extending forwardly from the cutter for removing the sheets therefrom, a first overlapping device in position for receiving sheets from said high speed conveyor and comprising a first relatively low speed horizontal tape extending toward the layboy from a position below and adjacent to the forward end of said high speed conveyor, an overlying tape having a portion thereof lapping the forward end of said high speed conveyor and extending in closely overlying relation to said first low speed tape to engage sheets therebetween, said overlying tape being operated at a speed greater than the underlying low speed tape, and a pair of rolls disposed along said first low speed tape and adapted to press against the leading edge of each sheet, thereby permitting the succeeding sheet to move forwardly into overlapping relation to said sheet, and a second overlapping device in position for receiving sheets from said first overlapping device, said second overlapping device comprising a second relatively low speed horizontal tape operating at a speed less than that of said first low speed tape and positioned below the level of the latter and in forwardly spaced relation to the end of said first low speed tape, means for introducing air between the overlapped sheets as they pass from said first low speed tape to said second

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low speed tape, a second overlying belt disposed in lapping relation to said first and second low speed tapes, said second overlying belt operating at a speed substantially the same as said first low speed tape and being closely disposed with respect to the latter to move sheets on to said second low speed belt, and an additional pair of rolls disposed along said second low speed tape and adapted to press against the leading edge of each sheet to thereby further increase the amount of overlap of said sheets.

3. In combination with a cutter-layboy adapted to form vertical stacks of uniform size sheets from a continuous length of paper, a sheet feeding means particularly adapted to deliver lightweight sheets from the cutter to the layboy comprising a high speed tape conveyor extending forwardly from said cutter, a first relatively low speed horizontal tape extending from a position adjacent the forward end of said high speed tape to receive sheets from the latter, a first overlapping tape disposed above a substantial portion of said high speed tape conveyor in closely overlying relation thereto and lapping a substantial portion of said first low speed tape, said first overlapping tape operating at a speed greater than said first low speed tape, a pair of rolls disposed at a position of overlap between said first low speed tape and said first overlapping tape and adapted to press the leading edge of each sheet as it reaches such position, thereby causing the succeeding sheet to overlap the trailing edge of said sheet, a second low speed horizontal tape disposed at a position spaced forwardly of and below said first low speed tape in position to receive sheets from said first low speed tape and to convey said sheets to said layboy, a second overlapping tape lapping a substantial portion of said first low speed tape and substantially all of said second low speed tape in closely overlying relation thereto, said second overlapping tape operating at the same speed as said first low speed tape, said second low speed tape operating at a speed less than said first low speed tape, means for delivering a stream of air between the adjacent ends of said first low speed tape and said second low speed tape in a generally upwardly and forwardly inclined direction with respect to the path of said sheets, and an additional pair of rolls disposed at a position along said second low speed tape and adapted to press the leading edge of each sheet to thereby further increase the amount of overlap of the sheets.

4. In combination with a cutter-layboy adapted to form vertical stacks of uniform size sheets from a continuous length of paper, a sheet feeding means particularly adapted to deliver lightweight sheets from the cutter to the layboy comprising a high speed tape conveyor extending forwardly from said cutter, a first relatively low speed horizontal tape extending from a position adjacent the forward end of said high speed tape to receive sheets from the latter, a first overlapping tape disposed above a substantial portion of said high speed tape conveyor in closely overlying relation thereto and lapping a substantial portion of said first low speed tape, said first overlapping tape operating at a speed greater than said first low speed tape, a pair of rolls disposed at a position of overlap between said first low speed tape and said first overlapping tape, which position is spaced from the forward end of said high speed tape conveyor a distance greater than the length of the sheets being handled, said pair of rolls being adapted to press the leading edge of each sheet as it reaches said position to thereby cause

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the succeeding sheet to overlap the trailing edge of said sheet, a second low speed horizontal tape disposed at a position spaced forwardly of and below said first low speed tape in position to receive sheets from said first low speed tape and to convey said sheets to said layboy, a second overlapping tape lapping a substantial portion of said first low speed tape and substantially all of said second low speed tape in closely overlying relation thereto, said second overlapping tape operating at the same speed as said first low speed tape, said second low speed tape operating at a speed less than said first low speed tape, an additional pair of rolls disposed at a position along said second low speed tape and adapted to press the leading edge of each sheet to further increase the amount of overlap of the sheets, said additional pair of rolls being positioned a distance from the forward end of said first low speed tape greater than the length of the sheets being handled, and means underlying the gap between said first and second low speed tapes for delivering a stream of air in a generally upwardly and forwardly inclined direction with respect to the path of the sheets.

5. In combination with a cutter-layboy adapted to form vertical stacks of uniform size sheets from a continuous length of paper, a sheet feeding means for delivering the sheets from the cutter to the layboy comprising a high-speed tape conveyor including a high-speed tape which extends downwardly and forwardly from said cutter and a second high-speed tape which intersects said downwardly and forwardly extending tape at an intermediate region thereof and which extends forwardly and horizontally therefrom, a first relatively low speed horizontal tape extending from a position below and adjacent to the forward lower end of said second high-speed tape to receive sheets from the latter, a first overlapping tape disposed above a portion of said second high speed tape in closely overlying relation thereto and lapping said first low speed tape, said first overlapping tape operating at a speed greater than said first low speed tape, a pair of rolls disposed at a position along said first low speed tape and adapted to press the leading edge of each sheet as it reaches such position to thereby cause the succeeding sheet to overlap the trailing edge of said sheet, a second low speed horizontal tape disposed at a position spaced forwardly of and below said first low speed tape in position to receive sheets from said first low speed tape and to convey said sheets to said layboy, a second overlapping tape lapping the forward end of said first low speed tape and said second low speed tape in closely overlying relation thereto and operating at the speed of the former, said second low speed tape operating at a speed less than said first low speed tape and said second overlapping tape, and an additional pair of rolls disposed at a position along said second low speed tape and adapted to press the leading edge of each sheet to thereby increase the amount of overlap of the sheets.

References Cited in the file of this patent

UNITED STATES PATENTS

1,545,910	Maxson	July 14, 1925
1,545,915	Maxson	July 14, 1925
1,752,681	Maxson	Apr. 1, 1930
2,261,972	Matthews	Nov. 11, 1941
2,670,955	Strecker	Mar. 2, 1954

FOREIGN PATENTS

583,115	Germany	Aug. 29, 1933
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