April 1, 1930. C. B. MAXSON 1,752,681

FEEDING AND STACKING METHOD AND MACHINE

Filed Aug. 28, 1928

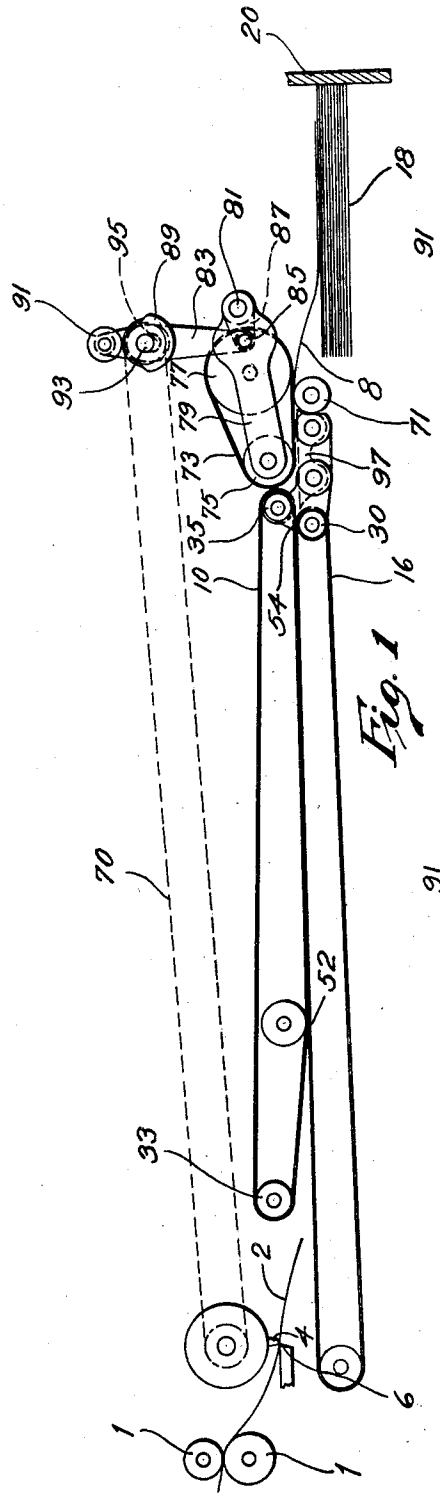


Fig. 1

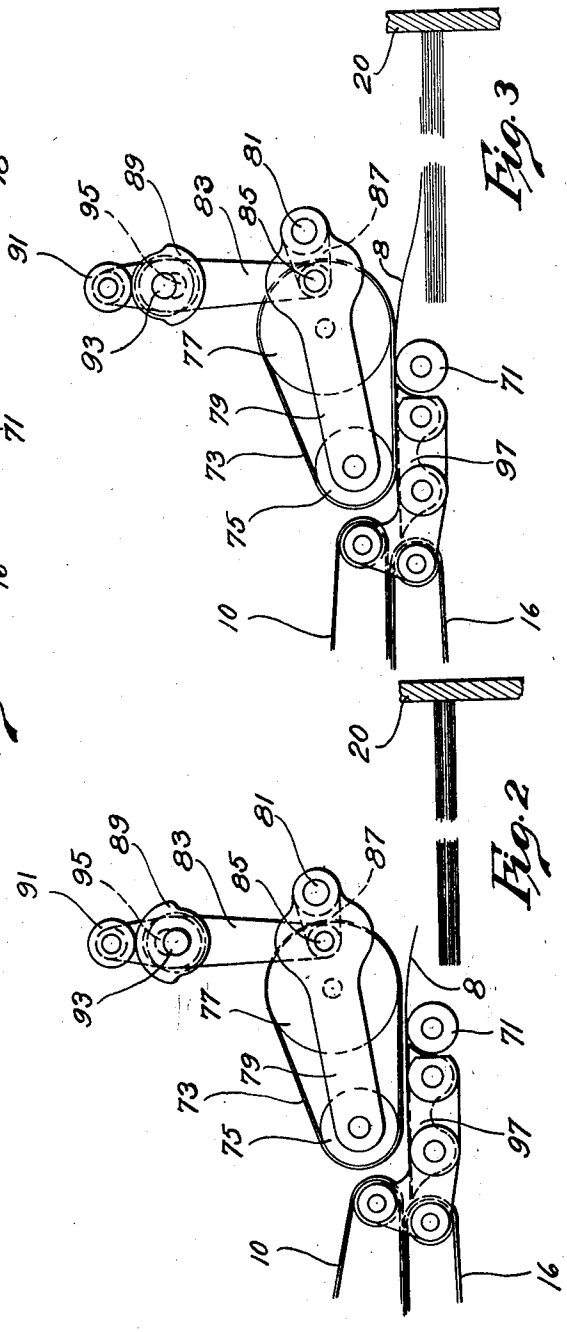


Fig. 3

Fig. 2

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Patented Apr. 1, 1930 1,752,681

UNITED STATES PATENT OFFICE

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FEEDING AND STACKING METHOD AND MACHINE

Application filed August 28, 1928. Serial No. 302,566.

The present invention relates to feeding and stacking methods and machines, and more particularly to methods of and machines for feeding and stacking sheet material, like paper.

After a roll of paper has been made in the paper mill, it is usually necessary to cut it up into sheets. This is effected by leading the web to a cutter, which severs it into the desired lengths and feeds the sheets thus produced into a lay-boy, where they become stacked. The speed of operation of the machine is limited by the fact that, if the sheets are fed at too high a speed, they have a tendency to buckle and fly about in the lay-boy, preventing proper stacking. The overlapping delivery that is illustrated and described in Letters Patent Nos. 1,541,910 to 1,541,915, granted July 14, 1925, has very effectively solved this problem. There are, however, cases when an overlapping delivery is not desirable.

A chief object of the present invention, accordingly, is to provide a novel method and machine for speeding up the operation even when the sheets are fed into the lay-boy singly, or in unit bundles of sheets.

With the above and other objects in view, the invention consists of the improved method and machine a preferred embodiment of which is hereinafter described, illustrated in the accompanying drawings, and defined in the appended claims.

In the accompanying drawings, Fig. 1 is a diagrammatic view of a machine constructed according to a preferred embodiment of the present invention; and Figs. 2 and 3 are fragmentary views, upon a larger scale, of a portion of the machine, showing successive steps in the process of delivering the sheets into the lay-boy.

The invention is illustrated in its preferred form in Fig. 1. Any suitable feed mechanism 1 may be employed to advance a web 2 of material, like paper, to a rotating cutter 4 which cooperates with a cutter block 6 to sever the paper into sheets 8 of predetermined length. A plurality of layers of material may be led to the feed mechanism in superposed relation from a plurality of rolls, or the roll or rolls and the cutters may be dispensed with, and previously cut sheets operated upon directly, as described below. The forward ends or heads of the sheets are successively gripped by and fed between tapes 10 on one side and 16 on the other. It will be understood that the term "tape" is employed herein in a generic sense, and includes within its scope other feeding mechanisms, like belts, cylinders, aprons and the like.

The tapes are driven at a speed somewhat higher than that of the feed mechanism 1 and, therefore, at a speed higher than that at which the sheets are delivered to the tapes. The head of each sheet is consequently gripped by the tapes 10 and 16 and the sheet is pulled taut and away from the next-succeeding sheet, leaving a gap (not shown) between each two successive sheets. In this spaced-apart relation, the sheets are received at 52 between the tapes 10 and 16. To facilitate such reception, the tapes 10 are caused to overlap the tapes 16, as shown. The tapes 10 and 16 feed the sheets singly and in spaced-apart relation into a magazine or lay-boy 18 at a speed so high that they have a tendency to buckle and fly about therein in a manner that would make stacking impossible. The tapes 10 on one side of the sheets and the tapes 16 on the other side restrain the sheets from buckling while traveling at the high speed, but in the lay-boy, there is no such restraining influence.

According to the present invention, the heads of the sheets are permitted to enter the lay-boy singly (or in small unit bundles) by their own inertia, at high speed, and unrestrained. In order to prevent the sheets from buckling and flying about in the lay-boy, however, the tail of each sheet, after its head has entered the lay-boy, is engaged to slow down the speed of travel of the sheet. Each sheet is thus fed forward further in the lay-boy, but at reduced speed, and its tail is caused to enter the lay-boy at the reduced speed, and to become deposited therein, before the head of the next-following sheet enters the lay-boy. There, a stop 20 acts upon the forward ends or heads of the sheets to limit their further

forward movement, so that the sheets become stacked or piled in the lay-boy evenly.

In this manner, the sheets may be advanced to, and stacked evenly in, the lay-boy, without curling or other defects incident to high speed, though the sheets are, in reality, advanced singly by the tapes 10 and 16 at quite a high speed.

A very simple machine is, therefore, provided for feeding sheets of material successively past a predetermined point, feeding the sheets away from the point at an increased speed to separate each sheet from the next-following sheet, the increased speed being so high as to make it impracticable to feed the sheets at the said speed directly into the lay-boy, and then engaging the tail of each sheet after its head has passed a second predetermined point, to cause the sheet to travel at slower speed in the lay-boy. The first predetermined point may, for example, be the point where the cutters are located, and the second predetermined point the point 54 at which the tapes 10 and 16 separate.

According to the preferred embodiment of the invention, the tail of each sheet, after its head has entered the lay-boy, is engaged by two cooperating, combined gripping and feeding means, one acting on each side of the tail of the sheet. The two means are normally separated from each other to permit the head of the sheet to enter the lay-boy, but they become actuated towards each other immediately thereafter to engage the tail of the sheet, on opposite sides thereof, and move forward together, at slower speed, to slow down further travel of the sheet in the lay-boy. One of the two means comprises tapes 73, mounted over rolls 75 and 77, carried upon a frame 79. The frame 79 is pivoted at 81 and is movable up and down about the pivot 81 by a lever 83 that is pivoted at 85 to a crank arm 87 that is fixed to the pivot 81. The lever 83 is movable up and down by a rotary cam 89 that engages a roll 91 on the free end of the lever 83. The lever 83 is thus raised once to each rotation of the cam 89, a pin 93 being mounted in an elongated opening 95 of the lever 83 to permit this relative motion between the lever 83 and the cam 89. The cam 89 is driven in any well-known manner in timed relation to the feed of the machine, preferably by a sprocket-chain connection 70 to the knife 4. The other means is one or more idler rolls 71, disposed between the forward roll 30 of the tapes 16 and the lay-boy 18. When the lever 83 and, therefore, the tapes 73, are raised, the head of the sheet will be delivered by the tapes 10 and 16, over guides 97 and between the tapes 73 and the roll or rolls 71, and into the lay-boy. The lever 83 will thereupon become automatically lowered to clamp the tail end of the sheet between the tapes 73 and the roll or rolls 71. The parts are so timed as to cause engagement of the tail of each sheet against the roll 71. The tapes 73 are driven at a reduced speed, to cause the sheet to become deposited at reduced speed in the lay-boy.

The tapes 10 are mounted over rolls 33 and 35. The roll 35 is loosely mounted over the spindle 69, the other roll 33 being positively driven to drive the tapes 10.

The same difficulties that are met with in present-day methods and machines when it is attempted to feed and stack single sheets at high speed are encountered when it is attempted to operate upon small bundles of sheets, particularly if the sheets be constituted of very light or thin paper, or paper that is not stiff from other causes. The present invention, obviously, is as applicable to the feeding and stacking of bundles of sheets as to single sheets. Although, for concreteness, therefore, the term "sheet" is employed in the claims, it is to be understood that the term is intended to embrace within its scope not only a single sheet, but a unit which may be constituted of a single sheet or of a bundle of sheets. It is desired that the claims be broadly construed, except insofar as it may be necessary to impose limitations in view of the state of the prior art.

What is claimed is:

1. A method of feeding sheet material into a lay-boy and stacking the sheets therein comprising feeding the head of each sheet into the lay-boy unrestrained at a speed so high that if the whole sheet were delivered unrestrained into the lay-boy at the said speed the sheet would have a tendency to buckle and fly about therein, and engaging the tail of each sheet after its head has entered the lay-boy unrestrained to slow down the speed of travel of the sheet in the lay-boy.

2. A method of feeding sheet material into a lay-boy and stacking the sheets therein that comprises feeding the material past a predetermined point, feeding the sheets away from the point at increased speed to separate each sheet from the next-following sheet, feeding the head of each sheet singly and unrestrained into the lay-boy at a speed so high that if the whole sheet were delivered unrestrained into the lay-boy at the said speed the sheet would have a tendency to buckle and fly about therein, and slowing down the speed of travel of each sheet in the lay-boy after its head has entered the lay-boy unrestrained and feeding the tail of the sheet into the lay-boy before the head of the next-following sheet has entered the lay-boy.

3. A method of cutting sheets of material from a web and stacking them in a lay-boy that comprises feeding the web to a cutter, cutting the web with the cutter into sheets, feeding the sheets away from the cutter at increased speed to separate each sheet from the next-following sheet, and feeding the

head of each sheet singly and unrestrained into the lay-boy at a speed so high that if the whole sheet were delivered unrestrained into the lay-boy at the said speed the sheet would have a tendency to buckle and fly about therein, engaging the tail of each sheet after its head has entered the lay-boy unrestrained to slow down the speed of travel of the sheet in the lay-boy, and feeding the tail of the sheet into the lay-boy before the head of the next-following sheet has entered the lay-boy.

4. A sheet-feeding machine having, in combination, means for feeding sheet material past a predetermined point, means for feeding the sheets away from the point at increased speed to separate each sheet from the next-following sheet, means for causing the head of each sheet to travel unrestrained past a second predetermined point, and means for engaging the tail of each sheet after its head has passed the second predetermined point to cause the sheet to travel at slower speed.

5. A machine for feeding sheet material into a lay-boy and stacking the sheets therein having, in combination, means for feeding the material past a predetermined point, means for feeding the sheets away from the point and into the lay-boy at increased speed to separate each sheet from the next-following sheet, means for causing the head of each sheet to travel unrestrained into the lay-boy, and means for engaging the tail of each sheet after its head has entered the lay-boy unrestrained to slow down the speed of travel of each sheet in the lay-boy.

6. A machine for feeding sheet material into a lay-boy and stacking the sheets therein having, in combination, means for feeding the material past a predetermined point, means for pulling upon the head of each sheet after it has passed the point to feed the sheet away from the point at increased speed, means whereby the head of each sheet is caused to travel by its inertia into the lay-boy, and means for engaging the tail of each sheet after its head has entered the lay-boy to slow down the speed of travel of each sheet in the lay-boy.

7. A machine for cutting sheets of material from a web and stacking them in a lay-boy having, in combination, means for feeding the web, a cutter for cutting the web into sheets, means for feeding the sheets away from the cutter and into the lay-boy at increased speed to separate each sheet from the next following sheet, means for causing the head of each sheet to travel unrestrained into the lay-boy, and means for slowing down the speed of travel of each sheet in the lay-boy after the head of the sheet has entered the lay-boy.

8. A machine for cutting sheets of material from a web and stacking them in a lay-boy having, in combination, means for feeding the web, a cutter for cutting the web into sheets, means for engaging the head of each sheet after it has been cut and pulling upon it to feed the sheet away from the cutter and into the lay-boy at increased speed, means for releasing the head of the sheet to cause the head of the sheet to travel unrestrained into the lay-boy, and means for engaging the tail of each sheet after its head has entered the lay-boy unrestrained to slow down the speed of travel of each sheet in the lay-boy

9. A machine for feeding sheet material into a lay-boy and stacking the sheets therein having, in combination, means for feeding each sheet into the lay-boy at a speed so high that the sheet has a tendency to buckle and fly about therein, means for causing the head of each sheet to travel unrestrained into the lay-boy, two cooperating means for engaging the tail of each sheet after its head has entered the lay-boy unrestrained, and means for first relatively separating the two engaging means so as to render them ineffective to engage the material to feed it at the time that the head of the sheet is entering the lay-boy and then relatively actuating them towards each other so as to render them effective to engage the tail of the sheet and feed it, whereby the first-named means is enabled to feed the material into the lay-boy unrestrained between the two engaging means when they are separated.

10. A sheet-feeding machine as defined in claim 9 in which one of the two engaging means comprises a tape operable at a speed slower than the speed of travel of the head of the sheet into the lay-boy and movable into engagement with the tail of the sheet after the head of the sheet has entered the lay-boy.

11. A sheet-feeding machine as defined in claim 9 in which one of the two engaging means comprises a sheet-engaging surface operable at a speed slower than the speed of travel of the head of the sheet into the lay-boy and movable into engagement with the tail of the sheet after the head of the sheet has entered the lay-boy.

12. A method of cutting sheets of material from a web and stacking them in a lay-boy that comprises feeding the web to a cutter, cutting the web with the cutter into sheets, engaging each sheet on both sides of the sheet and feeding it away from the cutter at increased speed to separate each sheet from the next-following sheet, the increased speed being so high that, if the sheets where delivered at the said high speed singly and unrestrained into the lay-boy, they would have a tendency to buckle and fly about therein, restraining the tendency of the shets to buckle and fly about before the sheets enter the lay-boy, delivering the head of each sheet singly and unrestrained into the lay-boy, and engaging the

tail of each sheet after its head has entered the lay-boy unrestrained to slow down the speed of travel of the sheet in the lay-boy, the separation of the successive sheets permitting the tail of each sheet to become deposited in the lay-boy before the head of the next-following sheet has entered the lay-boy.

13. A machine for cutting sheets of material from a web and stacking them in a lay-boy having, in combination, means for feeding the web, a cutter for cutting the web into sheets, means for engaging each sheet on both sides of the sheet, means for driving the engaging means at high speed to cause it to pull each sheet rapidly away from the cutter at increased speed to separate each sheet from the next-following sheet, the high speed being so high that, if the sheets were delivered at the said high speed singly and unrestrained into the lay-boy, they would have a tendency to buckle and fly about therein, the engaging means restraining the sheets from buckling and flying about before the sheets enter the lay-boy, but delivering the head of each sheet singly and unrestrained into the lay-boy, and means for engaging the tail of each sheet, after its head has entered the lay-boy unrestrained, to slow down the speed of travel of the sheet in the lay-boy, the separation of the successive sheets permitting the tail of each sheet to become deposited in the lay-boy before the head of the next-following sheet has entered the lay-boy.

14. A machine for feeding sheets of material and stacking them in a lay-boy having, in combination, feed means for engaging each sheet on both sides of the sheet, means for driving the feed means at a speed so high that, if the whole sheet were delivered by the feed means at the said high speed singly and unrestrained into the lay-boy, it would have a tendency to buckle and fly about therein, the feed means restraining the sheets from buckling and flying about before the sheets enter the lay-boy, but delivering the head of each sheet singly and unrestrained into the lay-boy, and means for engaging the tail of each sheet, after its head has entered the lay-boy unrestrained, to slow down the speed of travel of the sheet in the lay-boy.

15. A machine for feeding sheets of material and stacking them in a lay-boy having, in combination, two tapes for engaging each sheet on both sides of the sheet, means for driving the tapes at a speed so high that, if the whole sheet were delivered by the tapes at the said high speed singly and unrestrained into the lay-boy, it would have a tendency to buckle and fly about therein, the tapes restraining the sheets from buckling and flying about before the sheets enter the lay-boy, but delivering the head of each sheet singly and unrestrained into the lay-boy, two cooperating surfaces being disposed between the tapes and the lay-boy, the said surfaces being normally separated to permit the head of the sheet to enter freely therebetween during its passage from the tapes into the lay-boy, and means for relatively actuating the cooperating surfaces towards each other to engage opposite sides of the tail of each sheet, after its head has entered the lay-boy unrestrained, to slow down the speed of travel of the sheet in the lay-boy.

In testimony whereof, I have hereunto subscribed my name.

CHARLES B. MAXSON.