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Sheet Feed Control Apparatus

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3 Sheets-Sheet 1

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The present invention relates to controlling mechanism for sheet feeding machines. In that type of apparatus in which paper sheets are fed successively to ruling, folding or printing machines or the like, it sometimes happens that two or more sheets are simultaneously delivered by reason of the fact that static electricity or other conditions will cause the sheets to stick together, and usually one is slightly behind the other, causing an elongation that creates serious difficulty in the apparatus, to which these sheets are delivered.

The object of the present invention is to provide means that will effectively stop the sheets before their final delivery, and incidentally also stop the further feed of the sheets until the apparatus has been cleared.

An embodiment of the invention that is present considered the preferable one, is illustrated in the accompanying drawings, wherein:

Figure 1 is a view partly in side elevation and partly in vertical section of the feeding means showing the improved control mechanism thereon;

Figure 2 is a plan view of the same;

Figure 3 is a horizontal sectional view through the controlling valve and its operating mechanism;

Figure 4 is a detail perspective view of the thickness-detecting device;

Figure 5 is a longitudinal sectional view of the suction feeder taken substantially on the line 5—5 of Figure 1;

Figure 6 is a detail sectional view taken on the line 6—6 of Figure 5;

Figure 7 is a detail sectional view taken on the line 7—7 of Figure 6;

Figure 8 is a detail view showing the adjustable mounting for the thickness detector.

In the embodiment disclosed a supporting table 9 is provided for a pile of sheets 10, the table being automatically elevated as the sheets are fed therefrom in any manner well understood to those skilled in the art. A conveyor is provided at the delivery end of the pile, said conveyor, in the present instance, including a series of rollers 11, and said rollers delivering to the folding machine or other apparatus that operates on the sheets.

For the purpose of feeding the sheets from the pile 10, a suction device is employed, consisting of a roller 12 mounted on a swinging arm 13, and adapted to elevate the topmost sheet of the pile and move it toward the conveyor. This device may be of the type disclosed in my Patent No. 1,494,303, issued May 13, 1924. The roller 12 as therein disclosed comprises rows of intake ports 14 opening into longitudinal bores 15 that have communication through ports 16 with other longitudinal bores 17, the bores 15 and 17 opening through a head 19 or end of the said roller. The roller is mounted on a driving shaft 18 and has at the end through which the ports 15 and 17 open, a hub 19 that is journaled in a head 20. This head 20 is provided with an inlet port 21 in line with the path of movement of the open ends of the bores 17, so that as the head rotates, the bores successively come into communication with said port 21 at which time the open end of the corresponding bore 15 is closed, as shown in Figure 5, so that communication through the port 21 is established with the outside air through the line of ports 14.

The port 21 opens into a valve chamber 22, at one side of which is a passageway 23 and this passageway in turn is coupled to a conduit 24 leading to an exhaust pump 25. Directly opposite the port 21 is another port 26. A reciprocatory valve 27 has a transverse port 28 therethrough and this valve is movable to a position to afford communication between the ports 21 and 26, as shown in Figures 3 and 5, and to another position where such communication is cut off.

One or more pneumatic stops is provided between certain of the rollers 11 of the conveyor. These stops consist of heads 29 having their upper surfaces substantially on a level with the upper faces of the rollers, and each head having one or more inlet ports 30. Extending from said heads and communicating with the ports 30 are branch pipes 31 leading to a conduit 32 that extends to an upstanding nipple 33 mounted on the rear portion of the head 20 and in communication with a port 34 opening into the top of the valve chamber 22, as shown in Figure 7. Another port 35 affords communication between the valve chamber 22 and the passageway 23, the ports 34 and 35 being in rear of the ports 21 and 26, as will
be evident by reference to Figure 3. The reciprocatory valve 27 has an angular port 36, which as shown in Figure 7, is movable to a position to afford communication between the ports 34 and 35, and as will be evident by reference to Figure 3, is so situated with respect to the port 28 that when said port 28 establishes communication with the ports 21 and 26, the ports 34 and 35 will be out of communication. Vice versa, when the ports 34 and 35 are in communication through the port 26, then the ports 21 and 26 will be out of communication.

Pivotedly mounted on the arm 13 at 37 is a lever 38, one arm 39 of which is interposed between a spring 40 and an adjusting screw 41. The other arm of this lever has journaled therein a rock shaft 42 to which is fixed an arm 43 connected by a link 44 with the valve 27. The arm 43 which extends on the opposite side of the said connection is formed into a handle 45. The rock shaft 42 has journaled thereon a roller 46, and alongside said roller there is fixed to said rock shaft a thickness detector in the form of a curved segment 47. This segment is located directly over a roller 49 over which the sheets pass, as will be clear by reference to Figure 4, and sheets thus moving between said roller 48 and the thickness detector 47.

With this construction the thickness detector 47 is adjusted a sufficient distance away from the roller 48, so that a single sheet will pass between the two without engaging or moving the segment 47, but if two sheets happen to simultaneously pass between said roller and segment sufficient friction will be caused by the upper sheet against the segment 47 to swing said segment. As a consequence the rock shaft 42 will be turned, and the arm 43 will be swung and through the link 44 the valve 27 will be moved. Now the normal position of the ports is such that the valve 27 is in the position illustrated in Figure 3, in which case the suction of the pump 25 will be through the ports 26, 28 and 21. Consequently as the suction feed device rotates, air will be drawn into the lowermost set of ports 14 and the sheets thus picked up from the pile 10 and moved over the roller 42 on to the conveyor. As already explained when the said ports 26, 28, and 21 are in register, the ports 34, 35 and 36 are out of communication. The feeding roller 12 will thus operate normally until after it has picked up simultaneously two or more sheets and delivered them between the roller 48 and the thickness detector 47. When this takes place the thickness detector swings, causing the valve 27 to be shifted from the position shown in Figure 3 to the position illustrated in Figure 7, at which time the suction through the feed roller will be cut off, but said suction will be shifted to the conduit 33, 32, 31, and thus indrafts of air will take place through the ports 30 of the heads 29. Consequently if the multiple sheets have gotten to a point where they will be moved by the conveyor rollers 11, said sheets will pass over the heads 29 and immediately caused to adhere thereto by the suction. The sheets will thus be stopped and will not pass on into the apparatus that would otherwise operate on them. Obviously these sheets can be easily removed from the conveyor, whereupon the operator has only to swing the handle 45 back to its initial position as shown in Figure 1, whereupon the apparatus again begins to operate normally and will continue said operation until a plurality of sheets are again picked up and fed by the rollers 12.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim is:

1. In sheet feeding apparatus, the combination with a conveyor for receiving sheets at one end, transporting the sheets and delivering them from the opposite end, of a suction head located between said ends and traversed by the sheets carried by the conveyor, and means for creating suction through the head to cause the sheets to adhere thereto and be held from movement by the conveyor.

2. In sheet feeding apparatus, the combination with a conveyor, of pneumatic sheet holding device associated therewith for stopping sheets carried by the conveyor, and a sheet thickness determining device controlling the operation of the holding device.

3. In sheet feeding apparatus, the combination with a conveyor, of a pneumatic sheet holding device associated therewith for stopping sheets carried by the conveyor, and a sheet thickness determining device mounted at the receiving end of the conveyor and operated by an excessive number of sheets simultaneously passing thereto, said thickness determining device constituting means for controlling the operation of the holding device.

4. In sheet feeding apparatus, the combination with a conveyor for receiving sheets at one end, transporting the sheets and delivering them from the opposite end, of a suction head located between the said ends and traversed by the sheets carried by the conveyor, means for creating suction through the head to cause the sheets to adhere thereto and be held from movement by the conveyor, a valve controlling the suction, and a thick-
ness determining device at the receiving end of the conveyor connected to the valve for actuating it and operated by an excessive number of sheets passing simultaneously to the conveyor.

5. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, a source of power, mechanism that separately delivers such power to the feeding device to cause it to operate on the sheets and to the stop for holding the sheets against movement by the conveyor, and means for shifting such power from the means that delivers it to the feeding device to the means that delivers it to the stop to make the feeding device inactive and to cause the stop to operate on and stop the sheets fed by the feeding device.

10. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, meaning for causing the feeding device to become inactive and the stop to become active.

15. In sheet feeding apparatus, the combination with a sheet conveyor, of a pneumatic device for feeding sheets to the conveyor, a pneumatic stop for the sheets carried by the conveyor, and means for causing the feeding device to normally operate and the stop to become inactive and for causing the feeding device to become inactive and the stop to become active.

20. In sheet feeding apparatus, the combination with a sheet conveyor, of a pneumatic device for feeding sheets to the conveyor, a pneumatic stop for the sheets carried by the conveyor, and means controlled by an excessive number of sheets fed by the feeding device for causing the feeding device to become inactive and the stop to become active.

25. In sheet feeding apparatus, the combination with a sheet conveyor, of a pneumatically actuated device for feeding sheets to the conveyor, a pneumatically operated stop for the sheets already fed to and being carried by the conveyor, an air pump having communication both with the feeding device and stop device, and a valve that controls such communication.

30. In sheet feeding apparatus, the combination with a sheet conveyor, of a pneumatically operated device for feeding sheets to the conveyor, a pneumatically operated stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, and a valve movable to one position to afford communication between the pump and feeding device and cut off communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device and cut off communication between the pump and feeding device.

35. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pumps and feeding device.

40. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

45. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

50. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

55. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and feeding device.

60. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

65. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

70. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

75. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

80. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

85. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

90. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

95. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

100. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

105. In sheet feeding apparatus, the combination with a sheet conveyor, of a device for feeding sheets to the conveyor, a stop for the sheets carried by the conveyor, an air pump having communication both with the feeding device and stop device, a valve movable to one position to afford communication between the pump and stop device, said valve being movable to another position to afford communication between the pump and stop device.

In testimony whereof, I affix my signature.

ALBERT BROADMEYER.