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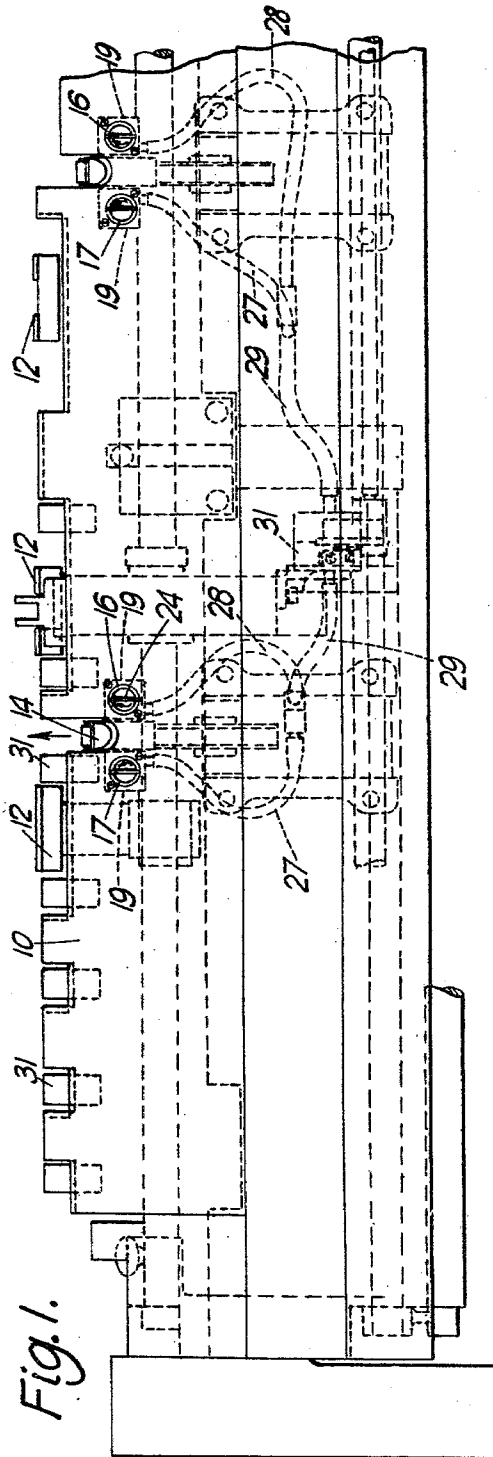
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SHEET FEEDING MACHINES

Filed Sept. 27, 1962

2 Sheets-Sheet 1



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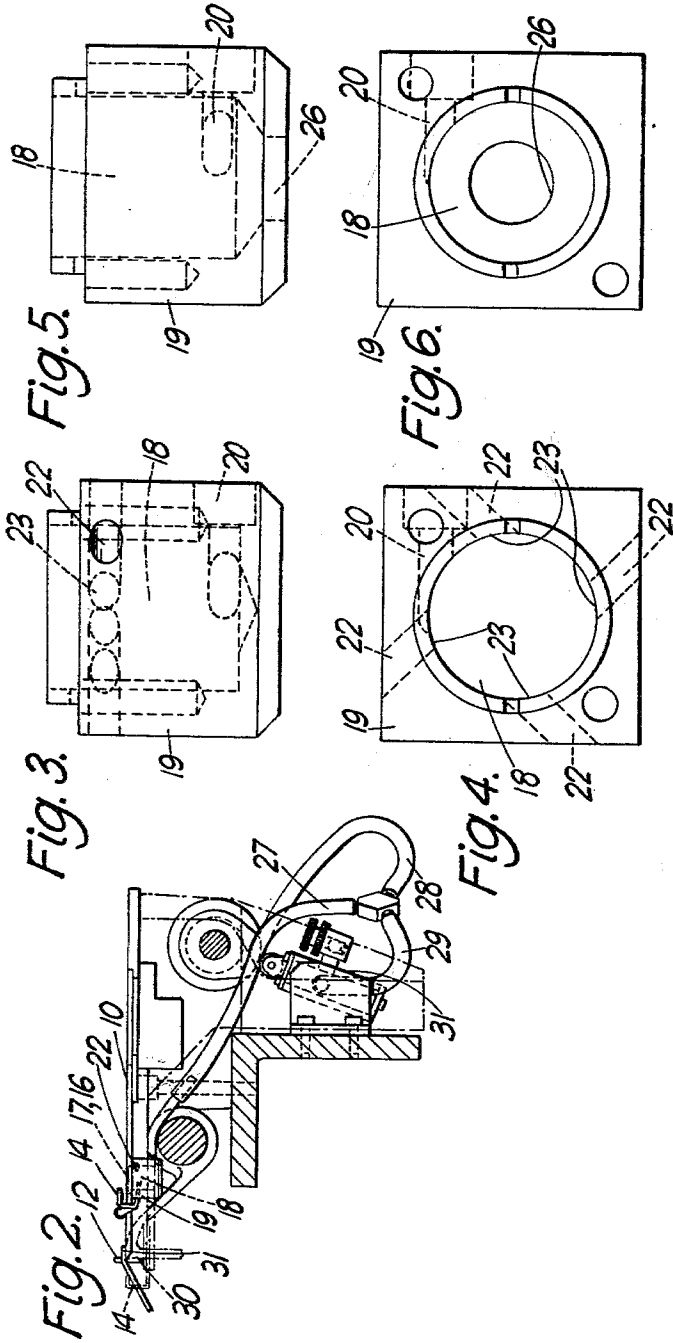
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SHEET FEEDING MACHINES

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5 Claims. (Cl. 271—46)

The invention relates to sheet feeding machines of the kind (herein called the kind described) in which sheets are conveyed (e.g. by a tape conveyor) either as a succession of single sheets or as a continuous stream of partly overlapping sheets, over a table on which each leading sheet in turn is slowed down and, usually, stopped and its leading edge registered in position against one or more front lays.

A practical difficulty which sometimes arises in such machines is that the leading edge of a sheet may be curled or raised from the table and so ride over the front lays. This applies whether or not the front lays are of the known hook-like form.

It is known to provide in machines of the above kind a sheet slow down device which engages the leading edge of each sheet before it reaches the front lays and moves towards the front lays at a speed less than that of the conveyor and so slows down the sheet before it reaches the lays. Such a device also may be of hook-like form. Here again there is a risk that a sheet may ride over the slow down device and so continue to advance without being slowed down. It has been proposed to incorporate a suction gripper with such a slow down device but as such a gripper positively grips the sheet it must travel with the sheet and moreover adjusting movement of the sheet relative to the gripper is precluded.

The present invention provides a sheet feeding machine of the kind described, characterised by a chamber with a mouth open to the underside of the sheets or stream and an air nozzle which enters the chamber tangentially or at a suitable angle to the tangent, to create a vortex within the chamber and therefore an area of reduced pressure at the mouth aforesaid tending to suck the sheets down onto the table.

Preferably the chamber has one or more outlets for air in its side or bottom walls (i.e. additional to the mouth) and the arrangement may be that a proportion of the air spills out through the mouth and over the table providing a cushion of air between the sheets and the table on which the sheets may float and the remainder passes out through the outlet or outlets. With such an arrangement the mouth may be in the surface of the table.

It is further preferred that the outlet or outlets are between the nozzle and the mouth.

The chamber may be of substantially cylindrical form or at least of generally circular cross-section.

There may be sheet supporting or guiding means (e.g. one or more bars) over the mouth.

In one form of the invention there are two chambers with mouths and nozzles as aforesaid at positions spaced a short distance apart across the table and there is a slow down hook or other slow down device which enters between or nearly enters between the two mouths to engage each sheet in succession and then travels with a sheet towards the front lays. With this arrangement the direction of rotation of the two vortices may be such that at adjacent sides of the chambers, the movement of air in both is in the direction of sheet movement.

A specific embodiment of a machine according to the invention will now be described, by way of example, and with reference to the accompanying drawings, in which:

FIGURE 1 is a plan view of a part of the machine,

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FIGURE 2 is a side view of the machine,

FIGURE 3 is a side view of one form of vortex block used in the machine,

FIGURE 4 is a plan view of the block shown in FIGURE 3, and

FIGURES 5 and 6 are views, corresponding to FIGURES 3 and 4 of another form of vortex block.

The machine comprises a conveyor (not shown) of the endless tape type, the tapes travelling over a table and carrying a stream of sheets delivered from a pile by a separating and stream feeding machine. The sheets are held down on the tapes by rollers and, at the delivery end, by balls in place of the rollers (see British specification No. 709,516). The tapes stop short of the delivery end of the table which is shown at 10. At this end there are front lays 12. There are also, before the lays, slow down devices 14 in the form of hooks which are raised above the table, ahead of the lays, to receive the front edge of a sheet and then travel towards the lays with the sheet and then beyond the lays. The return movement may be effected below the table (see the position indicated in chain lines in FIGURE 2). After registration the sheets are taken by grippers 30, 31 and removed from the table.

Immediately before the position at which the slow down devices receive the sheet (as shown in full lines) there are for each device, two circular openings 16, 17 in the table, these being the mouths of cylindrical vortex chambers 18 provided in blocks 19 beneath the table 10. The axes of the chambers 18 are perpendicular to the table. There is one vortex block on each side of the path of the slow down device. At the bottom of each chamber 18 there is an air inlet nozzle 20 which enters tangentially, and just below the table each device has four equally spaced outlets 22 for air, the outlets leaving tangentially in the sense that their inlet openings 23 face against the direction of flow around the chamber from the nozzle, that is air flowing around the chamber can leave without reversal of direction.

In use the air, entering tangentially through inlet 20, forms a vortex within each chamber which produces an area of low pressure at the mouth 16, 17 on the axis of the chamber which tends to pull an overlying sheet down to the table 10. Most of the air leaves through the outlets but some spills over the mouth and forms an air cushion between the sheet and the table on which the sheet may float and so be free to continue its movement to the lays.

The direction of flow of the air from the nozzles into the two chambers is so arranged that, at the adjacent sides of the chambers, the flow, in each, is in the direction of sheet movement. The direction of rotation of the air is indicated by the arrows in FIGURE 1.

Across the mouth of each chamber there is a narrow support bar 24 which extends in the direction of sheet movement and guides the sheets over the mouth and prevents the leading edges being drawn into the chamber. Each chamber has a diameter of about $\frac{3}{4}$ inch.

Air is supplied to the inlets 20 of the vortex chambers through pipes 27, 28, 29 and is controlled by a cam-operated valve 31. This valve is arranged to open just before each sheet reaches the slow down hooks 14 and to close just after the sheet reaches the front lays 12.

FIGURES 5 and 6 show an alternative form of vortex block which may be used in place of the blocks 19 described above. In this alternative there is an outlet opening 26 in the bottom of the chamber, the outlets 22 being omitted.

In a further alternative, not shown, the air inlet 20 is near the top of the chamber and, in the case where tangential outlets are used, between the table and those outlets.

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Although it is preferred that the air rotates in the direction indicated in FIGURE 1 it is within the invention to transpose the two chambers so that the air at the adjacent sides of the block moves in the opposite directions to those shown

I claim:

1. In a sheet feeding machine of the kind comprising a feed table over which a succession of sheets may be fed and at least one front lay engageable by the leading edge of each sheet in turn, a sheet hold-down device comprising a chamber which is internally of circular cross-section, which has at one end a mouth open at the surface of the table to the underside of the sheets and which has, in addition to the mouth, at least one outlet opening in a wall of the chamber and an air nozzle which enters the chamber in a tangential direction at a position which is remote from the mouth, and means for introducing a supply of air under positive pressure through the nozzle to create a vortex within the chamber and therefore an area of reduced pressure within the mouth aforesaid tending to suck the sheets down onto the table.

2. A sheet feeding machine as claimed in claim 1 having sheet supporting means over the mouth of the chamber.

3. A sheet feeding machine as claimed in claim 1 in which the said outlet opening is located in the side wall of the chamber between the nozzle and the mouth.

4. In a sheet feeding machine of the kind comprising a feed table, over which a succession of sheets may be fed, at least one front lay engageable by the leading edge of each sheet in turn, and a sheet slow-down device which engages the leading edge of each sheet in turn at a position before the sheet reaches the lay and then travels with the sheet towards the lay, two sheet hold-down devices spaced apart across the table a short distance on either side of the position of engagement of the sheets by the slow-down device, said hold-down devices each

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comprising a chamber which is internally of circular cross-section, which has at one end a mouth open at the surface of the table to the underside of the sheets and which has, in addition to the mouth, at least one outlet opening in a wall of the chamber and an air nozzle which enters the chamber in a tangential direction at a position which is remote from the mouth, and means for introducing a supply of air under positive pressure through the nozzle to create a vortex within the chamber and therefore an area of reduced pressure within the mouth aforesaid tending to suck the sheets down onto the table.

5. A sheet feeding machine as claimed in claim 4 in which the nozzles are so positioned that the direction of rotation of the two vortices is such that at adjacent sides of the chambers the movement of air in both is in the direction of sheet movement.

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