ABSTRACT: A mechanism for registering sheets of paper and feeding them individually to a machine which operates on single sheets comprises a hook which contacts the leading edge of a sheet advancing over a table, slows down and stops at a registering position to stop and register the sheet and then advances to clear the sheet in combination with feed rollers which grip the sheet after registration and feed it to the machine.
SHEET REGISTERING AND FEEDING MECHANISMS

The invention relates to a sheet registering and feeding mechanism for use in delivering a succession of sheets of paper, card or other flexible material to a machine such as a cutting and creasing machine or a printing machine operating on a succession of individual sheets.

The invention provides a mechanism for the above purpose having a feed table or equivalent support surface for receiving the sheets (e.g. from a sheet feeder such as is described in U.S. Pat. application Ser. No. 738,500 for separating sheets from a pile or stack and forwarding the sheets as a continuous stream of partially overlapping sheets over the nip rollers below the table for engaging the underside of each leading sheet in turn, means for driving the feed roller intermittently, a nip roller (or rollers) operable from above to press the sheets against the feed roller, means for separating the feed and nip rollers, a combined slowdown abutment and front lay arranged to be engaged by the leading edge of each sheet in turn and means for moving the abutment in a path in which it travels in the sheet-feeding direction to a lay position beyond the feed roller at which position it stops and serves as a register for the leading sheet edge, then moves further in the same direction to clear the sheet, returns at a lower level beneath the sheet and rises to receive the next sheet, the mechanism being timed to operate in a manner in which each sheet in turn is engaged by the slowdown abutment. To effect the approach to the lay position, the abutment moving in the sheet-feeding direction and the rollers being separated to allow the sheet to pass between, the abutment comes to rest to register the sheet, the rollers are brought together to grip the sheet, the rollers then being stationary, (i.e. nonrotating) the abutment moves forward to clear the sheet and the feed roller then rotates to feed the sheet to the machine.

Preferably the abutment is of hooklike form to receive the edge portion of the sheet within the hook thereby to hold the portion from riding over the lay face of the abutment.

The mechanism preferably includes other devices for controlling the sheets such as side lays, (e.g. as disclosed in U.S. Pat. No. 2,712,936 or as later described), vortices as described in U.S. Pat. No. 3,173,683 for holding the sheets down and detectors for two or more sheets fed together. Such devices are embodied in the specific example of the invention now to be described with reference to the accompanying drawings, in which:

FIG. 1 is a plan view of the feed table and associated parts but omitting the drop rollers and other members,

FIG. 2 is a section on the line A—A in FIG. 1,

FIG. 3 is a section on the line B—B in FIG. 1,

FIG. 4 is a section on the line C—C in FIG. 1,

FIG. 5 is a view in the direction of arrow E in FIG. 2,

FIG. 6 is a view in the direction of arrow D in FIG. 4,

FIG. 7 shows the path of the slowdown hook, and

FIGS. 8 and 9 are views, from opposite sides, of the side lay mechanism.

The mechanism forming the subject of this example is intended to receive sheets from a sheet feeder and to deliver them, one at a time, to a two-drum cutter and creaser, the drums being indicated by arcs 10, 11 in FIG. 2.

The mechanism comprises a feed table 12 onto which the sheets (travelling from right to left in FIG. 3) are delivered in a continuous stream by the feeder. The mechanism is driven by the feeder in synchronism therewith. Beneath the feed table and exposed through a transverse slot 14 therein, is a feed roller 15 which is divided into segments with gaps therebetween as later described. An intermittent drive mechanism, not shown, is provided for driving the roller also as later described. Nip rollers 16 carried on a shaft 17 are provided for pressing the sheets (one is indicated in part at 18) onto the feed roller, there being two or more such nip rollers spaced apart along the feed roller. A part-rotatable, by means of a cam (not shown) on shaft 21 (see below) to lift and lower the nip rollers to release and grip the sheets.

The mechanism is supported on two transverse rails 20 and is adjustable thereon towards and away from the machine either bodily or by one end more than the other, to skew the mechanism in relation to the machine.

Beneath the feed table there is a camshaft 21 carrying near its opposite ends cams 22 and 23. The cam 22 operates via a lever 25 and follower 26 to rock a transverse shaft 27. The cam 23 operates via a lever 28, follower 29, link 30 and lever 31 to rock a transverse shaft 32. Loose on the shaft 27 there are four upright levers 34 which can be coupled in either of two positions, by bolts at 35, to arms 36 fixed to the shaft 27. Fast on the shaft 32 there are four arms 38 to which are pivotally connected four upright links 39. The upper ends of the levers 34 and links 39 are interconnected by links 40 which are extended to form slowdown hooks 41, the extensions passing through gaps 42 in the feed roller. The whole arrangement, including the configurations of cams 22,23 is such that on rotation of the camshaft 21 the hooks 41 follow a path as shown in FIG. 7, the hooks stopping for a period at the front lay position 44. The purpose of the two-position coupling between levers 34 and arms 36 is to enable selected hooks to be moved out of their operative positions when not required.

The mechanism comprises a pusher lay 60 sliding between a plate 61 on the feed table and a smoother plate 62, to push against the side edge of the sheet to push the front-register sheet to its side register position before the sheet is gripped by the nip and feed rollers. To effect the movement of the lay 60 there is a cam 63 with a follower 64 on a lever 65 with a fulcrum 66. Towards its upper end, the lever 65 has a roller 67 engaging in a slot in a lever 68 depending from a fixed pivot 69. At its lower end the lever 68 is forked to engage a pin 70 in a bracket carrying the lay. The bracket has a guide rod 71 slidable in a guidance 72. The lay position is adjustable by means of screw rings 73 which move the mechanism as a whole.

The lever 65 also carries, at its upper end, a two-sheet detector or caliper which comprises a plunger 55 which, when the lever is in the position seen in FIG. 8 rests on, or nearly rests on, a single sheet lying on the feed table. If there be two sheets, the plunger is raised by its engagement therewith and operates a microswitch 56 on the lever 65.

Vortices 58 as described in Ser. No. 944,666 are provided for holding the sheets down on the table.

In the operation of the mechanism, as each leading sheet passes over the feed table, its leading edge meets the hooks 41 (or a selected pair of them), the hooks travelling with the sheet at reduced speed and coming to rest at the front lay position 44. During this time the nip rollers are raised and the feed roller stationary. While the sheet is held by the front lays it is side laid. The nip rollers descend to grip the sheet. The hooks then continue their forward movement and move downwardly (FIG. 7) to clear the sheet. The feed roller then rotates to feed the sheet to the machine while at the same time, the hooks return beneath the sheet and rise to receive the next sheet claim:

1. A sheet registering and feeding mechanism comprising:

   a feed table for receiving a succession of sheets over the table,

   at least one feed roller below the table for engaging the underside of each leading sheet in the succession in turn, means for driving the feed roller intermittently,

   at least one nip roller mounted above the feed roller and movable between a disengaged position, in which it is spaced from the feed roller, and an engaged position, in which it presses the sheets against the feed roller,

   at least one combined slowdown and front lay means comprising a member arranged to be engaged by the leading edge of each sheet in turn as the sheet is fed over the table,

   means for moving said member in a path in which it is caused to travel in a sheet-feeding direction to a lay position beyond said member at one edge of each sheet, at which position it is caused to stop so as to serve as a register for the leading edge sheet, from where it is caused to move further
the sheet-feeding direction to clear the sheet, after which it is returned at a lower level and then raised to receive the next sheet, and means for timing said sheet registering and feeding mechanism in a cycle of operation in which (a) each sheet in turn is engaged by said member as it approaches the front lay position, with the member moving in a sheet-feeding direction and with said nip and feed rollers being separated to allow the sheet to pass between, (b) said member is stopped to register the sheet, (c) said nip and feed rollers are brought together to grip the sheet while the rollers are held stationary, (d) said member is moved forwardly to clear the sheet and (e) the feed roller is rotated to feed the sheet.

2. Mechanism as claimed in claim 1 in combination with the sheet feeder for separating sheets from a pile or stack and forwarding the sheets as a continuous stream of partly overlapping sheets over the table.

3. Mechanism as claimed in claim 1 in combination with a machine operating on a succession of individual sheets and to which the sheets are fed by the feed roller.

4. Mechanism as claimed in claim 9 and embodying a side lay mechanism operable to effect side registration of the sheets before they are gripped by the nip and feed rollers.

5. Mechanism as claimed in claim 9 and embodying at least one vortex suction device on the feed table for holding the sheets down.

6. Mechanism as claimed in claim 9 and embodying a two-sheet caliper or detector.

7. The mechanism of claim 1 in which the combined slow-down abutment and front lay means comprises a hooklike member to receive the edge portion of a sheet within the hook.

8. Mechanism for registering each sheet in turn of a succession of advancing sheets and for feeding the registered sheet characterized by at least one combined slow-down abutment and front lay comprising a member arranged (a) to be engaged by the leading edge of the sheet, (b) to move in the sheet-advancing direction while slowing down the sheet to a lay position at which it stops and serves as the register for a leading sheet edge and thereafter (c) to move out of the path of the sheet, in combination with means for gripping and forwarding the registered sheet.

9. Mechanism as claimed in claim 8 in which the gripping and forwarding means comprises feed rollers.