METHOD AND DEVICE FOR AUTOMATIC FEEDING OF SINGLE SHEETS OF PAPER OR THE LIKE

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Fig. 1

Fig. 2

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METHOD AND DEVICE FOR AUTOMATIC FEEDING OF SINGLE SHEETS OF PAPER OR THE LIKE

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6 Claims. (Cl. 271—53)

This invention relates to a method for determining the position in which one edge of a sheet of paper or similar flexible sheet material rests against a stop determining the position of the sheet in a feeding direction.

An object of the invention is to provide a method and a device for automatically feeding each sheet with its front edge in an exactly predetermined position. The operation of the device can also be incorporated in an operating station located after the sheet feeding device. Such an operating station can, for example, be incorporated in a packaging machine where the sheet fed has to be advanced onward, for example, to a folding station into an exactly determined position. The operating station can also be incorporated in a rotary duplicator whereby each sheet is automatically fed by the sheet feeding device to the printing cylinder of the duplicator with the front edge of the sheet in exactly predetermined position relative to the printing mold fixed to the printing cylinder, whereby each text line on the printing mold will be transmitted to the sheet, which can consist of a pre-printed blank, in precisely correct position. This invention can be applied wherever it is necessary that a sheet be fed into an exactly predetermined position.

The method according to the invention is characterized in that an edge of the sheet is advanced against the stop in such a way that a bulge or wave is formed in the sheet, which is sensed by a sensing device giving a signal which indicates that the edge positively lies against the stop.

The apparatus according to the invention is provided with a sheet feeding mechanism which catches the sheet and automatically feeds it when the front edge of the sheet has been advanced to lie close against a stop, and includes a sensing device which is operated by a bulge formed in the sheet when the front edge of the sheet has come to lie against the stop and the rest of the sheet has been fed further toward the stop, which sensing device controls driving means for the sheet feeding device so that the sheet feeding device catches and feeds the sheet when the bulge has been formed and its existence sensed.

In this apparatus the sheet feeding means will only operate and feed the sheet to the operating station when the sheet with its front edge has been effectively advanced against the stop.

The invention will be described principally with reference to a preferred embodiment in connection with the accompanying drawing on which FIGURE 1 shows, diagrammatically, a perspective view of the essential parts of the apparatus according to the invention and,

FIGURE 2 is a diagrammatic elevation of a slightly modified embodiment illustrating how a beam of light is positioned relative to a sheet which has been advanced so far on the table that a bulge has been formed in the sheet and intercepted by the light beam.

In FIGURE 1 reference numeral 1 designates a first sheet feeding roller and numeral 2 a second sheet feeding roller in contact with roller 1. The rollers 1 and 2 are assumed to represent sheet feeding rollers of a rotary duplicator, and a sheet 4, fed over the table 3 of the duplicator, is fed by said rollers, after having been advanced sufficiently manually against the stop formed by the contact line between the rollers 1 and 2, towards a printing station of the duplicator, not shown, where the text on a printing mold foil entirely or partly is applied to the sheet 4 in an exactly predetermined position.

In FIGURE 1 only the roller 1 is shown to be driven by a continuously operating motor 5 and the shaft 6 of the roller 1 is connected with the motor 5 by an electromagnetically controlled clutch 8 which is controlled from an electric photocell 9 through a cable 15. A source of light 10 cooperates with the photocell 9. The source of light 10 emits a light beam 11 over the table 3 and as long as the sheet remains flat or only slightly bulged on the table the light beam 11 will impinge on the photocell 9 indicating that the sheet 4 has not been pressed sufficiently against the stop formed by the contact line between the two rollers 1 and 2. When the sheet 4 which is assumed to be introduced by hand against the stop, but which is to an exact predetermined position after having been advanced sufficiently manually against the stop, it bulges upwardly on the table as shown in the drawing, the sheet has been advanced sufficiently and can be fed to the printing station, not shown here. The formed bulge 12 will interrupt the light beam 11, as best seen in FIGURE 2, and the photocell 9 will no longer be activated. When the light beam is cut by the bulge 12 on the sheet 4 the photocell 9 emits a signal through cable 15 to the electromagnetically controlled clutch and causes operation of the coupling 8 and the roller 1 starts to rotate and, in cooperation with the roller 2, feeds the sheet 4 with the leading edge to the exact position necessary for transferring the print in the correct position on the sheet 4 from the printing mold, not shown.

A check that the sheet 4 is laterally in the right position, that is, close to the guide rail 13 or otherwise only moved from same within admitted tolerances can also be obtained with the aid of the photocell shown and the light source 10. For this purpose the angle between the plane of the table 3 and the light beam 11 is made as large as possible whereby even a relatively slight lateral displacement will prevent the bulge 12 from interrupting the light beam 11. Preferably the distance of the bulge 12 from the plane of the table 3 is then restricted by transmitting plate 14 or the like placed above the table which is indicated by dashed lines in FIGURE 2 whereby the maximum height of the bulge and thus the maximum admitted lateral displacement of the sheet can be very exactly determined.

It is evident that the invention is not restricted to the embodiment shown where the stop for the leading edge of the sheet is formed by two feeding rollers and the feeding of the sheets is brought about by means of a clutch. The stop can, of course, for example, consist of an arresting means which in known manner is arranged between two spaced rollers which when the leading edge of the sheet has advanced to proper position and the bulge 12 has been moved against each other and catch and feed the sheet at the same time as the arresting device is withdrawn. In this case the photocell will control a mechanism for moving the rollers into sheet gripping position. It is also possible to use a single feeding roller which cooperates with a smooth surface which may be the table 3 shown. Other means, known per se, for feeding or pulling the sheet may also be utilized. It is to be noted that the statement that the light beam 11 is directed across the feeding direction of the sheet 4 does not mean that the projection of the light beam on the flat sheet is perpendicular to the feeding direction, but that the angle between the feeding direction and said projection can vary within wide limits.

The shown sensing device 9, 10, can in some cases be replaced by a considerably simpler, but not so sensitive sensing device which consists of a switch, not shown,
with a bulge contacting arm or by another mechanical feeler. The contact arm is placed above the table and at such a distance from the table that the arm, when proper height of the bulge has been attained, is moved upwards and operates an electric circuit to the shown clutch or another driving device.

1 claim:

1. Method of predetermining the position in which one edge of a sheet of paper or similar flexible material will lie against a stop to determine the position of the whole sheet in one direction, comprising advancing said sheet until the leading edge thereof engages a stop, continuing the advance of the rest of said sheet to cause it to form a bulge, sensing the existence of said bulge at a predetermined degree of bulge, generating a signal in response to the sensing of said bulge indicating that the said edge of said sheet has positively engaged the stop.

2. Apparatus for predetermining the position of a sheet of flexible material to be fed to an exact position by a feeding mechanism comprising means forming a path in which said sheet moves, a stop for engagement by the leading edge of a sheet of said material being fed in said path to retain said leading edge, whereby said sheet bulges upon the remainder thereof being fed further, a sensing device for sensing the existence of said bulge, a sheet feeding apparatus having a driving means, control means for said driving means, said sensing means having means for controlling said drive control means to operate said feeding means when the bulge of the sheet has been sensed by said sensing means.

3. Apparatus according to claim 2, and in which said sensing device comprises a photodetector and a light source, said photodetector being positioned to sense a light beam emitted by said light source and sent above said sheet when flat, laterally across the direction of feed of the sheet obliquely to the sheet plane.

4. Apparatus according to claim 3, and in which said stop is comprised by the contact line between two cooperating sheet feeding rollers.

5. Apparatus according to claim 2 in which said sheet feeding apparatus comprises a pair of parallel rollers in contact with each other, a source of drive, said control means for said driving means comprising a magnetic clutch, connected for operation under the control of said sensing means.

6. Apparatus according to claim 2 and in which a light transmitting plate is positioned above and substantially parallel with said path to restrict the height of the bulge of said sheet.

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