ABSTRACT OF THE DISCLOSURE

A slitting and creasing machine for either sheets or continuous web with at least two sets of tools in separate frame supports. Each one of the frames can be lowered so that the tools in it can be adjusted for a following production while the other set is in operating position on the running product. A pair of cutting rollers at the infeed end of the machine for transversely cutting sheets off while the shifting of the two sets of tools takes place and movable guides for deflecting these waste sheets into a container.

The present invention relates to improvements concerning slitting and creasing machines for strip or sheet products, particularly to those used in the corrugated board industry.

Such machines serve to slit or notch and/or to crease the strip or sheet product along lines which are parallel to the travel of the product through the machine. When the requirements of the product necessitate a modification of the position of these lines, the feeding of the product into the machine has to be stopped during an appreciable lapse of time, corresponding to the change of the tools. Such stopping does not permit to have the benefit of the advantages which might result from a practically continuous feeding. In the particular case of corrugated board, such stopping causes an overheating of the product in the drying plant preceding the machine, such overheating resulting in a deterioration of the qualities of the corrugated board.

My present invention is directed at remediying this condition by eliminating the necessity of this stopping in the feeding.

My invention mainly consists in providing the slitting and creasing machine with at least two sets of rotary tools, which can be differently adjusted, and with a mechanism, comprising a fluid power motor or the like, which places one of the sets of tools in an operative position and the other set in an inoperative position, the tools being put into rotation at the required speed before being placed in an operative position.

My invention consists in some further arrangements hereinafter mentioned and preferably used together with the above mentioned main arrangement.

My invention particularly covers certain modes of application and embodiment of the said arrangements, and also the slitting and creasing machines provided with such improvements.

By way of example and to provide a better understanding of my invention, a specification of particular modes of carrying out the invention is given hereinafter, the same being illustrated in a schematic and non restrictive manner in the accompanying drawing. In said drawing:

FIGURE 1 represents a section, through a vertical longitudinal plane, of a slitting and creasing machine, according to the invention, one first set of tools being in an operative position;

FIGURE 2, similar to FIGURE 1, represents this machine at the time of the passing into an operative position of the second set of tools;

FIGURE 3 shows, in transverse elevation, a modification, according to the invention, of a slitting and creasing machine in an operative position;

FIGURE 4 shows the machine of the FIGURE 3 during the disengaging from its operative position;

FIGURE 5 represents, in plane view, the installation of this modification of the machine; and

FIGURE 6 shows a section, through a vertical longitudinal plane, of another modification of the machine according to the invention;

FIGURE 7 shows a hydraulic device adaptable to these machines; and

FIGURE 8 is a box diagram showing the control of the operation of the machine.

For realizing a slitting and creasing machine for strip or sheet products according to my invention, one proceeds as follows.

The slitting or creasing machine, by way of an example, is intended to slit and/or to crease a strip of corrugated board 1 which is continuously fed into the machine. At the start, the strip 1 enters into a shear between two cutting rollers 2, 3. This shear is ordinarily inoperative; its purpose will be further specified.

The machine comprises sets of rotary tools for slitting and creasing, such as 4, 5, 6, 7, which are known per se and which are actuated by means of a drive, not shown in the drawing. The set of tools 4, 5, 6, 7 is integral with a movable support 8 which can be vertically lifted into a frame 9 by means of the fluid power motor 10. Another set of tools is integral with a support 11 which is vertically movable in the frame 12 by means of the fluid power motor 13. Obviously, the machine may comprise other sets of tools, arranged in the same manner in frames, placed one after another according to the direction of movement of the strip 1.

When the set of the support 8 is in operation, as shown in FIG. 1, the strip 1 is fed into a guide 14, articulated in 15 and horizontally maintained, thereafter between the tools 4 and 5, 6 and 7; it is further fed into a fixed guide 16, placed between the frames 9 and 12, thereafter into a guide 17 fixed to the upper part of the support 11 and then it is delivered out of the machine at 18.

During this work phase, the tools of the support 11 are in a lower position and are silenced; it is possible to adjust them; to that effect pins 19, 20 are provided.

In order to change from the work performed by the set of tools of the support 8 to that provided for by the tools of the support 11, the tools of the said support 11 are put into rotation and the cutting rollers 2, 3 are actuated in order to cut one or several sheets 21 off the strip with a short length. At the same time, the fluid power motor 22 raises the guide 14, as shown in FIG. 2, power motor 10 lower support 8 and the jack 13 raises the support 11 and put into the tools of said support into operative position. Flippers 23, placed under the guide 14, directs the cut sheets 21 downward which falls into 24.

When the cutting rollers 2, 3 become again inoperative, power motor 22 adjusts guide 14 horizontally. The strip 1 following its course engages said guide, is fed into guide 25 fixed at the upper part of the support 8, and into guide 16; thereafter strip 1 enters between the tools of the support 11.

Obviously the reverse operations will start again the tools of the support 8 after a new adjustment of said tools.

Some of the above-mentioned guides may be resiliently mounted or comprise elastic parts in order to enable the supports of the tools to begin shifting when the strip is still engaged in these guides.

As a modification, the slitting and creasing tools may be held in a frame 26 open at 27. By rollers 28 rolling on
the rails 29 and actuated by a motor the frame 26 can be shifted perpendicularly to the running of the strip 1 through the machine.

The tools of the frame 26 are fixed, on the one hand, to upper shafts, such as 30, the bearings of which are fixed in the frame, and, on the other hand, to lower shafts, such as 31, rotating in bearings integral with movable supports which can be raised or lowered by means of one or several fluid power motors. Advantageously, the upper shafts which are arranged for receiving cutters, are axially urged to an operative position by an elastic means so that the cutters of these shafts may be pressed against the corresponding cutters of the lower shafts.

In an operative position, corresponding to FIG. 3, the frame 26 runs over a sliding coupling 40 with splices, driven by a shaft 41 rotating in the frame 42, fixed in relation to the rails 29; further, the movable supports 43 of the shaft 31 are in an upper position.

In order that the tools may follow the small transverse displacements of the strip 1, the part 36 can be displaced parallel to the rails 29, manually or by a motor 44 servo-controlled in a known manner by the said displacements. Due to the fork hook 37, the part 36 causes the frame 26 to roll on the rails 29 in the desired direction.

In order to bring the above-described device into the inoperative position of the tools, it is sufficient to lower the supports 43 holding the shafts such as 31. Then the strip 1 passes freely between the tools. The motion of the shaft 41 is stopped and by raising the hook 37 the frame 26 is disengaged from the part 36. The frame 26 can then be laterally displaced by rolling on the rails 29, whereby the opening 27 and the slidable coupling 40 permits this displacement.

Before the setting of the tools of the frame 26 into an inoperative position, another frame 45 fitted in a similar manner is brought over the strip 1. The tools of this frame 45 are put into rotation by means of a slidable coupling as described above and can be set into an operative position when those of the frame 26 are brought to an inoperative position so that there is no interruption of the production.

This modification of the invention offers an advantage, that is the strip 1 does not need to be transversely cut when one set of tools, held by a frame, is replaced by another. It is equally possible to go on with producing at a certain width of the strip by keeping a set of tools and its frame in its plan and to perform various production processes on the rest of the strip in putting the appropriate tools to work.

The adjustment of the tools is made when the frames are laterally disengaged from the strip. Obviously, the machine may comprise more than two frames of this kind.

As another modification, the machine can have two sets of tools 46, 47 held by a frame 48 which can rock around a pivot 49 in order to put one of the sets into an operative position. A double-acting fluid motor 50 controls the rocking of the frame 48. Such system as well as the first one that has been described requires a shear 51 to cut one or several sheets in the strip 1 when the frame 48 is rocked. A shutter 52 directs the cut sheets downwards when the shear works. The guides 53, 54 are integral with the frame 48; the guides 55 and 56 remain fixed in relation to this frame. Such modification may be extended to the cases in which the frame holds more than two sets of tools and turns around above a pivot for putting any one of these sets into an operative position.

The slitting and creasing machine according to the invention may be provided with a programming device controlling the automatic changing from one (not shown in the drawing) set of tools to another after a predetermined length of strip has been fed into the machine. Without any need to go back to the particulars of the operations such devices according to the various embodiments of the machine will put the adjusted tools into rotation, will control the fluid power motors 10, 13 or 50, actuate the motors of the rollers 28 of the frames 26 and 45 and the fluid power motors of the supports 43. These automatically controlled various operations, can be however dangerous for the persons in charge of the adjusting the tools which are temporarily at rest; they can also be prejudicial to the machine when, for instance, the setting of the supports 8 or 11 into position is effected too slowly or in an incomplete manner.

According to the invention a safety device is provided; this device prevents the putting of the tools into rotation and the shifting of the supports of these tools during the adjustment of the said tools. To that effect, a guard-member 57, hinged in 58, prevents the access to the tools when a raised position and must be lowered for their adjustment, this lowering having the effect of controlling the above-mentioned safety device. Besides, when the machine is provided with a shear at the start thereof, this shear is actuated as long as the tools are not in the provided position due to well-known means as limit switches.

At last, in the case of operation of the described mechanisms by two hydraulic cylinders 59, 60 acting simultaneously in order to shift a member 61, such as a tool support, parallel to itself, it is advantageous to balance the motion of the pistons 62, 63 of the fluid power motors 59, 60 in providing a hydraulic compensation device, comprising double-acting pistons 64 and 65, respectively integral with the rods of the pistons 62 and 63. The pistons 64, 65 move in the cylinders 66, 67 in delimiting variable volumes 68, 69, 70, 71 filled with liquid. Pipes 72 and 73, respectively connecting the spaces 68 and 74 and the spaces 69 and 70, ensure the required balancing of the movements of the pistons 62, 63. Gauges 74 and 75 connected with the pipes 72 and 73 permit to check the working of the fluid power motors.

The invention is obviously not restricted to the methods of application and embodiment specifically described; it also embodies all variations thereof.

What I claim is:

1. A slitting and creasing machine for strip or sheet products comprising at least two sets of rotary tools, said sets being arranged in movable supports said tools being differently adjustable, and a mechanism, comprising at least two fluid power motors, one of said motors putting one of said two sets into an operative position relative to the path of said products the other putting said other set into an inoperative position out of the path of said products for being adjusted for another product while the first product is running, said tools being put into rotation at the required speed before being placed into said operative position.

2. A slitting and creasing machine according to claim 1, wherein the sets of tools are integral with movable supports which can be vertically shifted into frames by means of jacks.

3. A slitting and creasing machine according to claim 2, and a movable guide directing downwards the sheets cut by said cutting rollers.

4. A slitting and creasing machine according to claim 3, and a further guide, the said guide being integral with the said frame.
1, and a programming device controlling the automatic shifting from one of said sets of said tools to the other after a predetermined quantity of product having passed through the feed end of said machine.

6. A slitting and creasing machine according to claim 5, and a safety device preventing the putting of said tools into rotation and the shifting of said supports of said tools, said safety device comprising a hinged guard member preventing the access to said tools while being in a raised position, said guard member operated by being lowered.

References Cited

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent No.</th>
<th>Date</th>
<th>Inventor</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>823,250</td>
<td>6/1906</td>
<td>Aldrich</td>
<td>83—479</td>
</tr>
<tr>
<td>1,642,081</td>
<td>9/1927</td>
<td>Munroe</td>
<td>83—433 X</td>
</tr>
<tr>
<td>1,959,424</td>
<td>5/1934</td>
<td>Hawkins</td>
<td>83—479 X</td>
</tr>
<tr>
<td>2,418,066</td>
<td>3/1947</td>
<td>Bruker</td>
<td>83—9</td>
</tr>
<tr>
<td>2,509,047</td>
<td>5/1950</td>
<td>Stempel</td>
<td>83—157 X</td>
</tr>
</tbody>
</table>

ANDREW R. JUHASZ, Primary Examiner.