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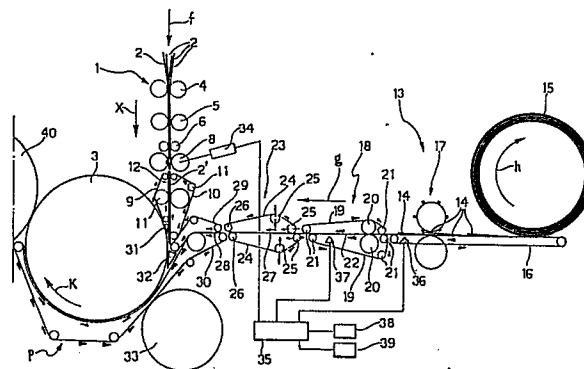
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(54) **In-register combination method and device for the folding machines of rotary printing presses, particularly for the production of magazines with covers.**

(57) A method and device for the in-register combination of printed strips (2), particularly intended to form magazines, with their separately printed covers, in the folding machine (P) of a rotary printing press. The covers are arranged in the form of separate sheets (14) wound with partial superpositioning onto a known unwinding drum (15), and are supplied sequentially to the accumulator cylinder (3) of the folding machine (P) in a controlled manner and in synchronism with the advance of the printed strips (2). This control provides for interventions on the speed of advance of the covers and the distance of their advance (13) in response to reference signals, so that the covers (14) arrive at the accumulator cylinder (3) in phase with the signatures (21) of the printed strips (2).



Description

In-register combination method and device for the folding machines of rotary printing presses, particularly for the production of magazines with covers.

The present invention relates generally to in-register combination systems for the folding machines of rotary printing presses, particularly for the production of magazines with covers.

In the production of periodicals with a degree of quality, the covers normally have a greater gram weight than the paper used for the signatures of the magazine. In order to combine these different materials, it used to be necessary to place the signatures of lighter paper and the cover or covers of heavier paper, which were printed separately beforehand, onto suitable collectors, and then to proceed with stapling, trimming and packing for despatch. In other words, it was not possible to produce the periodical with an uninterrupted production cycle directly at the end of the rotary printing press.

More recently a combination system has been suggested which involves two separate continuous lines of supply to the accumulator cylinder of the folding machine, one supply being a set of printed strips intended to constitute the signatures of the magazine and the other being a separate printed band bearing the covers, respectively. With this solution, the signatures making up the periodical are supplied to the accumulator cylinder until the accumulation stage is completed, after which the covers are supplied by the second line from a second rotary press.

This solution has several disadvantages due, in the first place, to the difficulties connected with the phasing of the two printing presses. In the second place, in the event of a breakdown or malfunction of one of the supply lines, it is necessary to stop both the rotary presses. Finally, any errors in the phasing or positioning of the covers inevitably involve rejection of the whole magazine at the output of the folding machine.

The object of the present invention is to avoid these problems, and this object is achieved by means of a method for the in-register combination, in an accumulator-cylinder-type folding machine for rotary printing presses, of printed strips, particularly intended to form magazines, with their covers which are printed separately from the printed strips, characterised in that it consists of arranging the covers in the form of separate sheets wound with partial superpositioning onto a known unwinding drum, and of supplying the separate sheets successively to the accumulator cylinder of the folding machine in a controlled manner and in synchronism with the advance of the printed strips.

By virtue of this concept, the combination of the covers in register is considerably simplified since the need for two coupled rotary presses, with their phasing difficulties, is avoided. Furthermore, the covers wound on the unwinding drum can easily be subjected to preliminary controls, so as to avoid any rejection of complete magazines downstream of the folding machine.

According to the invention, the controlled and synchronised supply of the separate sheets usually comprises the steps of:

- unwinding the separate sheets from the unwinding drum and transferring them to a linear path of advance towards the accumulator cylinder downstream of the arrival point of the signatures of the printed strips,

- separating the separate sheets along the path of advance, arranging them in positions in which they are spaced apart and not superposed, and obtaining signals corresponding to their positions along the path of advance,

- obtaining reference signals for the signatures of the printed strips upstream of the accumulator cylinder, and

- comparing the position signals with the reference signals and, on the basis of this comparison, intervening on the speed of advance of the separate sheets and/or the distance of their advance, so that the separate sheets arrive at the accumulator cylinder in phase with the signatures.

A further subject of the invention is a device for carrying out the aforesaid method, characterised in that it comprises:

- an unwinding drum of known type, onto which the covers are wound in the form of partly superposed, separate sheets,

- a conveyor line from the unwinding drum to the accumulator cylinder of the folding machine, downstream of the arrival point of the signatures of the printed strips, the line including unwinding means for transferring the covers from the drum to the conveyor line, accelerator means for arranging the sheets in positions in which they are spaced apart and not superposed, and means for varying the distance travelled by the covers along the conveyor line,

- means for detecting the position of the covers along the conveyor line upstream of the accelerator means and upstream of the distance-varying means, respectively, and adapted to provide corresponding detection signals,

- sensor means adapted to provide reference signals for the signatures of the printed strips arriving at the accumulator cylinder, and

- control means which are supplied with the detection signals and with the reference signals, and are arranged to compare these signals and to pilot the accelerator means and/or the means for varying the distance travelled in dependence on this comparison.

The invention will now be described in detail with reference to the appended drawing, provided purely by way of non-limiting example, which shows, in diagrammatic form an in-register combination device according to the invention fitted to the folding machine of a rotary printing press.

With reference to the drawing, a supply line, indicated 1, conveys a plurality of superposed

printed strips 2 from a rotary printing press (not illustrated) to the accumulator cylinder 3 of a conventional folding machine, generally indicated P in the direction indicated by the arrow f. The conveyor line 1 comprises pairs of conveyor rollers 4, 5 and 6, downstream of which there is provided a pair of cutting cylinders 8 having, in known manner, blades and counter-blades whose function is to cut the strips 2 to size, so as to produce the signatures (or, better, the sheets intended to constitute the signatures) according to the size required for the magazine. After cutting, the signatures 2' pass between two belts 9 and 10 supported by drive and return rollers, generally indicated 11. The belts 9 and 10 are spaced apart so as to form a conveyor channel 12 in correspondence with their facing sides, for transporting the signatures 2'.

This channel 12 ends in the immediate vicinity of the circumference of the accumulator cylinder 3 which, in known manner, has means for gripping the signatures 2'. The accumulator cylinder 3 may collect a single signature 2' or, in the case of larger magazines, the signatures are accumulated on this cylinder 3 to be stapled only when the magazine is complete.

The accumulator cylinder 3 has a slave stapling cylinder of known type, indicated 33, which, together with the cylinder 3, cooperates with a clamp-carrying folding cylinder 40.

A second supply line for supplying covers of heavier paper, indicated 14, in the direction of the arrow g is indicated 13 and meets the periphery of the accumulating cylinder 3 downstream of the arrival point of the line 1.

According to the invention, the covers 14 are wound as partly superposed, separate sheets onto an unwinding drum 15 of known type. The unwinding drum 15 is rotatable in the sense of the arrow h and its lower part is in entrainment contact with a continuous motor-driven belt conveyor 16, by means of which the covers 14 are unwound successively and transferred to the conveyor line 13. The covers 14 lie on the conveyor pass of the belt 16 in positions in which they are still partly superposed, and reach a check-roller device, schematically indicated 17. This device 17 operates so as to enable passage of one cover 14 at a time, temporarily slowing down the next cover superposed thereon.

An acceleration station, generally indicated 18, is situated at the output of the conveyor 16 and includes two endless belts 19 wound around respective drive and return rollers 20 and 21. The drive rollers 20 can be operated by means of respective motors, not illustrated, provided with a tachometric control of a type usual in the branch of the art.

The belts 19 are spaced apart so as to form a conveyor channel 22 in correspondence with their respective conveyor passes, for conveying the covers 14. This channel 22 supplies a travel control station, generally indicated 23, which includes two endless belts 24 wound around respective return rollers 25, 26 of which the first are displaceable vertically and horizontally by means of motor-driven systems, not illustrated but within the capabilities of

an expert in the art. The facing conveyor passes of the two belts 24 define a channel 27, the length of which can obviously vary according to the position assumed by the return rollers 25 for conveying the covers 14.

The conveyor channel 27 in its turn supplies a channel 28 defined between a pair of belts 29, 30 which supply the covers 14 to the periphery of the accumulator cylinder 3, immediately downstream of the channel 12 supplying the signatures 2' with respect to the sense of rotation of this cylinder 3, indicated k. In order to determine precisely and in an adjustable manner the output of the belts 9, 10 and 29, 30 relative to the circumference of the accumulator cylinder 3, wedge-shaped guides 31, 32 are provided adjacent the periphery of the accumulator cylinder 3. To advantage, the belt 30 may be extended so as to surround approximately half the lower circumference of the cylinder 3.

A sensor device operatively associated with the rotary cutting cylinders 8 is indicated 34 and is adapted to provide electrical reference signals for the signatures 2' supplied to the accumulator cylinder 3 by the conveyor line 1. These signals are supplied to an electronic control unit 35 which also receives electrical detection signals from a pair of sensors 36, 37 for sensing the positions of the covers 14 along the supply line 13. The sensors 36 and 37 are arranged at the output end of the conveyor 16 and in correspondence with the channel 22 of the acceleration device 18, respectively.

The electronic control unit 35 is arranged to compare the detection signals from the sensors 36 and 37 with the reference signals from the sensor 34, and to control the tachometric devices for controlling the driving rollers 20 of the belts 19 of the acceleration device 18 and the devices for moving the return rollers 25 of the belts 24 of the travel control device 23, in dependence on this comparison and through respective piloting circuits 38 and 39.

In operation, after the strips 2 have been cut by the cylinders 8, they are supplied in the form of signatures 2' to the accumulator cylinder 3 which collects a series of one or more superposed signatures 2'. The sheets 14 constituting the covers are supplied by the line 13 in a controlled manner according to the size and composition of the periodical, and in synchronism with the advance of the signatures 2'. Clearly, if the frequency of arrival of the signatures 2' at the input of the accumulator cylinder 3 corresponds to a quantity X, in the case of non-accumulated production, the frequency F of supply of the sheets 14 constituting the covers must be identical, and thus

$$F = X.$$

In the case of accumulated production with two cuts, this frequency will be

$$F' = X/2.$$

In the case of accumulated production with three cuts, the frequency will be

$$F' = X/3$$

This is essential, since it must always be ensured that the covers 14 arrive at the accumulator cylinder 3 exactly at the moment when all the inside

pages 2' of the magazine are already present on the cylinder and ready for stapling.

As stated, the supply of the covers 14 must be synchronised and in phase with the arrival of the signatures 2' in order to achieve perfect superpositioning on the cylinder 3. The control unit 35 ensures this phasing and, as a result of the comparison between the detection signals from the sensors 36 and 37 and the reference signals from the sensor 34, controls the piloting devices 38 and 39. The motor-driven rollers 20 and thus the belts 19 are accelerated or decelerated by means of the device 38 so as to vary the speed of the covers 14 through the device 18. The positions of the return rollers 25, and hence the length of the path of the covers 14 through the device 23, are modified by means of the device 39. Perfect phasing between the signatures 2' and the covers 14 arriving at the accumulator 3 is achieved by the combination of the two adjustments.

Once all the pages 2' and the covers 14 are present on the accumulator cylinder 3, the stapler 33 is activated to apply metal staples, and the stapled magazine is then transferred to the cylinder 40 which carries out folding and transfer of the magazines to the output belt for onward transmission to the packing and despatch stations.

It will be clear from the above that the device according to the invention enables magazines to be made up continuously and directly at the output of the printing press, with considerable simplification in terms of the phasing of the covers and with a drastic reduction in the risk of errors and consequent rejections.

Claims

1. A method for the in-register combination, in an accumulator-cylinder-type folding machine for rotary printing presses, of printed strips, particularly intended to form magazines, with their covers which are printed separately from the printed strips, characterised in that it consists of arranging the covers (14) in the form of separate sheets wound with partial superpositioning onto a known unwinding drum (15), and of supplying the separate sheets (14) successively to the accumulator cylinder (3) of the folding machine (P) in a controlled manner and in synchronism with the advance of the printed strips (2).

2. A method according to Claim 1, characterised in that the controlled and synchronised supply of the separate sheets (14) comprises the steps of:

- unwinding the separate sheets (14) from the unwinding drum (15) and transferring them to a linear path of advance (13) towards the accumulator cylinder (3) downstream of the arrival point (31) of the signatures (2') of the printed strips (2),

- separating the separate sheets (14) along the path of advance (13), arranging them in

positions in which they are spaced apart and not superposed, and obtaining signals corresponding to their positions along the supply path (13),

- obtaining reference signals for the signatures (2') of the printed strips (2) upstream of the accumulator cylinder (3), and

- comparing the position signals with the reference signals and, on the basis of this comparison, intervening on the speed of advance of the separate sheets (14) and/or the distance of their advance, so that the separate sheets (14) arrive at the accumulator cylinder (3) in phase with the signatures (2').

3. A device for the in-register combination of printed strips, particularly intended to form magazines, with their covers which are printed separately from the printed sheets, in an accumulator-cylinder-type folding machine for rotary printing presses, characterised in that it comprises:

- an unwinding drum (15) of known type, onto which the covers (14) are wound in the form of partly superposed, separate sheets,

- a conveyor line (13) from the unwinding drum (15) to the accumulator cylinder (3) of the folding machine (P), downstream of the arrival point (31) of the signatures (2') of the printed strips (2), the conveyor line (13) including, in succession, unwinding means (16) for transferring the covers (14) from the drum (15) to the conveyor line (13), accelerator means (18) for placing the covers (14) in positions in which they are spaced apart and not superposed, and means (23) for varying the distance travelled by the covers along the conveyor line (13),

- means (36, 37) for detecting the positions of the covers (14) along the conveyor line (13) upstream of the accelerator means (18) and upstream of the distance-varying means (23) respectively, and adapted to provide corresponding detection signals,

- sensor means (34) adapted to provide reference signals for the signatures (2') of the printed strips (2) arriving at the accumulator cylinder (3), and

- control means (35, 38, 39) which are supplied with the detection signals and with the reference signals, and are arranged to compare these signals and to pilot the accelerator means (18) and/or the means (23) for varying the distance travelled in dependence on this comparison.

4. A device according to Claim 3, characterised in that the accelerator means (18) include two motor-driven endless belts (19) arranged on opposite sides of the path of advance of the covers (14) so that their respective conveyor passes define a conveyor channel (22) for the covers (14), and means (38, 20) for varying the speed of the belts (19) piloted by the control means (35).

5. A device according to Claim 3, characterised in that the means (23) for varying the distance travelled by the covers (14) include

two motor-driven endless belts (24) arranged on opposite sides of the path of advance of the covers (14) so that their respective conveyor passes define a conveyor channel (27) for the covers (14), and means (39, 25) for varying the length of this channel (27) piloted by the control means (35).

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6. A device according to any one of Claims 3 to 5, in which the folding machine (P) includes means (8) for cutting the printed sheets (2) upstream of the accumulator cylinder (3), characterised in that the sensor means (34) for providing reference signals for the signatures (2') of the printed strips (2) are operatively associated with the cutting means (8).

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