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(54) Device and method for moving paper sheets impregnated and/or coated with polymeric resin, in particular for floor panelling or surfacing of furniture, walls, etc.

(57) A device (1) for moving paper sheets impregnated and/or coated with polymeric resin, in particular for floor panelling or surfacing of furniture, walls, etc., comprises a system (3) for feeding a series of sheets (2) in sequence, a main motor (4) which drives the feed system, a brake (5) to slow the speed of the sheets, and a rotating pusher member (6) cyclically cooperating with each of the sheets (2) to push the sheets against the brake; the pusher member (6) is driven by an auxiliary motor (24), independent of the main motor (4); a control unit (27) controls the operation of the auxiliary motor (24) and thus in particular the speed of rotation of the pusher member (6) on the basis of the instantaneous position and speed of each sheet detected by a position sensor (25) and by a speed sensor (26) both arranged upstream of the pusher member (6).

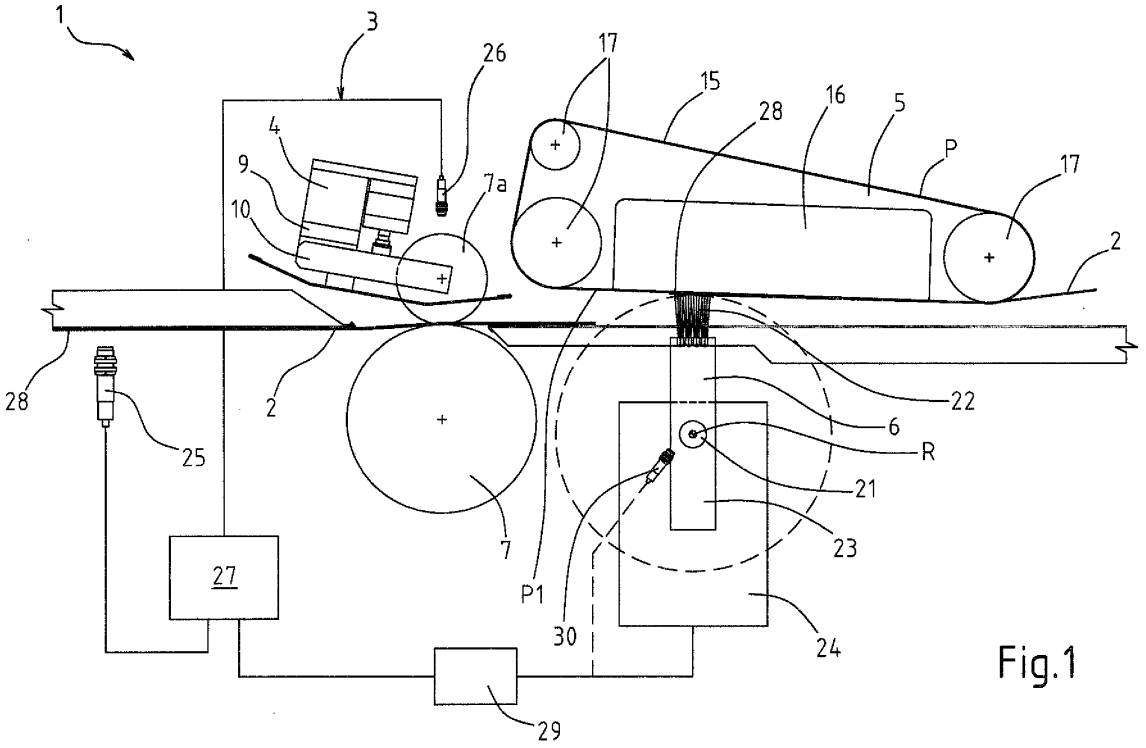

Fig.1

EP 2 090 534 A2

Description

[0001] The present invention relates to a device and to a method for moving paper sheets impregnated and/or coated with polymeric resin, in particular for floor panelling or surfacing of furniture, walls, etc.

[0002] As is known, decorative paper sheets impregnated and/or coated with polymeric resin and used to manufacture floor panelling or surfacing of furniture, walls, etc. are stacked in packs by specific workstations arranged at the end of the production line and equipped with brakes that reduce the speed at which the sheets are fed before these are deposited on the pack being formed.

[0003] A normal brake comprises belt-type braking members that cooperate with the sheets and a pressure/suction system to make the sheets adhere to the belts; a brush mounted on a rotating cylinder presses the end portion or tail-end of each sheet against the brake. In the systems known in the prior art, the movement of the brush is controlled by a mechanical device connected by means of couplings and reducers to the main motor that guarantees paper conveying and in particular the feeding of the sheets.

[0004] This type of solution requires accurate initial phasing of the system according to the size of the sheets, so that the rotating brush always comes into contact with the tail-end of the sheets at exactly the right moment (and thus in the right position); errors of even a few millimetres in the point of contact can result in malfunctions and even cause the system to stop. The phasing positions are defined before starting production and stored as a function of each sheet size.

[0005] This type of solution is not very flexible and is subject to malfunctions. It requires continuous adjustments during the production process, also due to wear on the control mechanics.

[0006] An object of the present invention is to provide a device and a method for moving paper sheets impregnated and/or coated with polymeric resin, in particular for floor panelling or surfacing of furniture, walls, etc., which overcomes the drawbacks of the prior art described above; in particular, an object of the invention is to provide a device and a method that are simple, effective and reliable even at high machining speeds.

[0007] The present invention thus relates to a device for moving paper sheets impregnated and/or coated with polymeric resin, in particular for floor panelling or surfacing of furniture, walls, etc., such as defined in its essential terms in claim 1 and, in its secondary features, in the dependent claims.

[0008] The invention also relates to a method for moving paper sheets impregnated and/or coated with polymeric resin, in particular for floor panelling or surfacing of furniture, walls, etc., as claimed in claim 11.

[0009] The device and the method according to the invention are simple and relatively economical and at the same time completely efficient and reliable even at high machining speeds.

[0010] Further characteristics and advantages of the present invention will become clear from the following description of a non-limiting embodiment thereof, with reference to the figure attached hereto which is a schematic longitudinal cross-sectional view of a device for moving paper sheets impregnated and/or coated with polymeric resin according to the invention.

[0011] In the attached figure indicated as a whole by number 1 is a device for moving paper sheets 2 impregnated and/or coated with polymeric resin, in particular for floor panelling or surfacing of furniture, walls, etc., coming from a production line of a type that is known in the prior art and is not illustrated.

[0012] The device 1 comprises a sheet feed system 3, a main motor 4 that drives the feed system 3, a brake 5 to slow the speed of the sheets 2, and a rotating pusher member 6 that cyclically cooperates with each of the sheets 2 to push the sheets 2 against the brake 5.

[0013] The feed system 3 conveys a series of sheets 2, for example coming from a cutting machine (of a known type and not illustrated), in sequence one after the other and slightly spaced from one another and separated by respective gaps; the sheets 2 are moved substantially along a feeding direction D; the system 3 comprises for example rollers 7 to convey the sheets 2, and in particular at least one motor-powered roller 7a, connected to the main motor 4 by means of a transmission system 9 and a reducer 10 (known and not described or illustrated in detail for the sake of simplicity).

[0014] The brake 5 is arranged downstream of the rollers 7 along the direction D of feeding of the sheets 2 and comprises a plurality of movable braking members 15 and a pressure/suction system 16 to make the sheets 2 adhere to the braking members 15. In particular, the braking members 15 are substantially in the form of belts and are provided with holes/nozzles connected to the pressure/suction system 16; the braking members 15 are arranged round pulleys 17 and are moved along a closed loop path P defined by the pulleys 17 by means of a pulling system (of a known type and not illustrated). The path P has a section P1 that faces the sheets 2 moving in the direction D.

[0015] The pusher member 6 is carried by a shaft 21 that rotates about an axis R of rotation; in particular, the pusher member 6 comprises a longitudinally elongated brush 22 that extends substantially parallel to the axis R and extends radially from a support 23 integrally attached to the shaft 21; the brush 22 is arranged transversely with respect to the sheets 2 and is substantially orthogonal to the direction D of feeding of the sheets 2.

[0016] The pusher member 6 is driven by an auxiliary motor 24, independent of the main motor 4.

[0017] Preferably, the auxiliary motor 24, for example a brushless motor, directly drives the shaft 21, which is thus directly connected to a drive shaft of the auxiliary motor 24, without reducers.

[0018] The device 1 also comprises a position sensor

25 and a speed sensor 26, both arranged upstream of the pusher member 6 to detect respectively the instantaneous position and speed of each sheet 2; and a control unit 27 that controls the operation of the auxiliary motor 24 and thus in particular the speed of rotation of the pusher member 6 on the basis of position and speed signals detected and sent to the control unit 27 by the position sensor 25 and by the speed sensor 26.

[0019] The position sensor 25 is for instance a photoelectric cell that detects the gap between the sheets 2 being moved along the direction D and thus determines the position of a rear margin or tail-end 28 of each sheet 2.

[0020] The speed sensor 26 is for example mounted on one of the rollers 7 that convey the sheets 2 (for instance the motor-powered roller 7a) and detects its speed of rotation, on the basis of which the relative speed at which the sheets 2 are being fed in the direction D is calculated.

[0021] The control unit 27 is connected to the sensors 25, 26 and to the auxiliary motor 24, which it controls directly or via a servo-drive 29, for example a servo-drive with an internal cam profile.

[0022] The operation of the device 1 in order to implement the method according to the invention, in particular to slow the speed of the sheets 2 in the direction D of feeding, is as follows.

[0023] The sheets 2 are conveyed in the direction D by the feed system 3 driven by the main motor 4.

[0024] The sensors 25, 26 detect the instantaneous position and speed of each sheet 2 that passes through the device 1 and send signals corresponding to said parameters to the control unit 27.

[0025] The distance between the position sensor 25 and the pusher member 6, and the desired position in which the pusher member should come into contact with each sheet (measured for instance as the distance of the point of contact from the tail-end 28 of the sheet 2) are set and/or saved in the control unit 27.

[0026] On the basis of the data that are set and those detected by the sensors 25, 26, the control unit 27 synchronizes the operation of the auxiliary motor 24 and thus the movement of the pusher member 6 with the movement of the sheets 2 determined by the feed system 3.

[0027] In particular, the control unit 27 sends to the auxiliary motor 24, possibly via the servo-drive 29, a command signal corresponding to the desired speed, calculated in such a way that the pusher member 6 strikes the sheet 2 in the desired position, i.e. at a predetermined distance from the rear margin or tail-end 28 of the sheet 2, on the basis of the previously set data and the signals from the sensors 25, 26.

[0028] In this way, the control unit 27 automatically regulates the speed of the auxiliary motor 24 according to the instantaneous position and speed of each sheet 2, thus ensuring that the pusher member 6 strikes each sheet 2 in the desired position.

[0029] The control unit 27 and/or the servo-drive 29 are optionally connected to another additional sensor 30 connected to the shaft 21 to detect the angular speed and/or position of the shaft 21 and thus of the pusher member 6. In this way, the control unit 27 can increase the precision of the action of the pusher member 6, of which the angular position and/or speed are known in every moment.

[0030] Lastly, it is clear that modifications and changes may be made to the device and to the method described and illustrated herein without departing from the scope of the attached claims.

Claims

1. Device (1) for moving paper sheets impregnated and/or coated with polymeric resin, in particular for floor panelling or surfacing of furniture, walls, etc.; the device comprising a system (3) for feeding a series of sheets (2) in sequence, a main motor (4) which drives the feed system, a brake (5) to slow the speed of the sheets, and a rotating pusher member (6) that cyclically cooperates with each of the sheets (2) to push the sheets against the brake; the device being **characterized in that** the pusher member (6) is driven by an auxiliary motor (24), independent of the main motor (4); and **in that** the device comprises a position sensor (25), arranged upstream of the pusher member (6) to detect the instantaneous position of each sheet (2); and a control unit (27) that controls the auxiliary motor (24) and thus the speed of rotation of the pusher member (6) on the basis of position signals detected and sent to the control unit (27) by the position sensor (25).

2. Device according to claim 1, **characterized by** also comprising a speed sensor (26) arranged upstream of the pusher member (6) to detect the instantaneous speed of the sheets (2); the control unit (27) controlling the auxiliary motor (24) and thus the speed of rotation of the pusher member (6) also on the basis of speed signals detected and sent to the control unit (27) by the speed sensor (26).

3. Device according to claim 1 or 2, **characterized in that** the pusher member (6) is carried by a rotating shaft (21) and the auxiliary motor (24) is directly connected to the shaft (21).

4. Device according to one of the previous claims, **characterized in that** the pusher member (6) comprises a brush (22) that extends radially from a support (23) integrally carried by a rotating shaft (21).

5. Device according to one of the previous claims, **characterized in that** the auxiliary motor (24) is a brushless motor.

6. Device according to one of the previous claims,

characterized in that the control unit (27) comprises a servo-drive (29) connected to the auxiliary motor (24).

7. Device according to one of the previous claims, **characterized in that** the position sensor (25) is a photoelectric cell.

8. Device according to one of the previous claims, **characterized in that** the speed sensor (26) is mounted on a roller (7) that conveys the sheets (2) and detects the speed of rotation of the roller (7).

9. Device according to one of the previous claims, **characterized in that** the brake (5) comprises belt-type braking members (15) that cooperate with the sheets (2), and a pressure/suction system (16) to make the sheets (2) adhere to the braking members (15).

10. Method for moving paper sheets impregnated and/or coated with polymeric resin, in particular for floor panelling or surfacing of furniture, walls, etc.; the method comprising the steps of:

- feeding a series of sheets (2) in sequence by means of a feed system (3) driven by a main motor (4);
- pushing each sheet (2) against a brake (5) by means of a rotating pusher member (6) that cyclically cooperates with the sheets (2);
- slowing the speed of the sheets (2) by means of the brake (5);

the method being **characterized in that** the pusher member (6) is driven by an auxiliary motor (24) independent of the main motor (4); and the method comprises the steps of:

- detecting the instantaneous position of each sheet (2) by means of a position sensor (25), arranged upstream of the pusher member (6); and
- controlling the operation of the auxiliary motor (24) and thus the speed of rotation of the pusher member (6) on the basis of position signals detected by the position sensor (25).

11. Method according to claim 10, **characterized by** comprising the step of detecting the instantaneous speed of the sheets (2) by means of a speed sensor (26) arranged upstream of the pusher member (6); the operation of the auxiliary motor (24) being controlled also on the basis of speed signals detected by the speed sensor (26).

12. Method according to claim 11, **characterized by** comprising the steps of:

- calculating, on the basis of the instantaneous position and speed of the sheets (2) detected by the position sensor (25) and by the speed sensor (26), the desired speed of rotation of the pusher member (6) in order that the pusher member (6) strikes the sheet (2) in a predetermined position on the sheet (2); and
- sending to the auxiliary motor (24) a command signal corresponding to the desired speed of rotation of the pusher member (6).

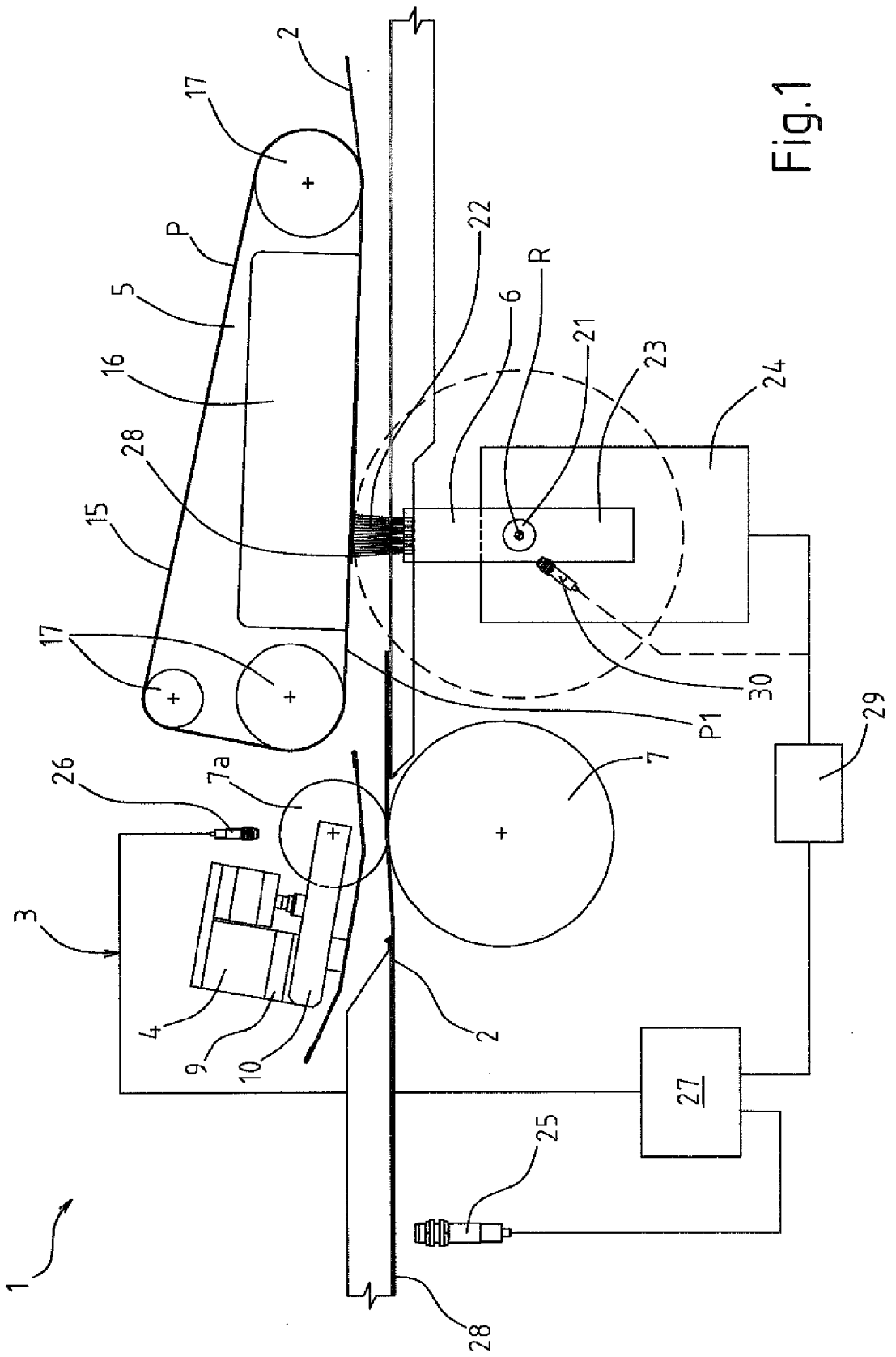

Fig.1