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(54) **Machine for targeted spraying of adhesive substance on panels**

(57) This invention relates to a machine for targeted spraying of adhesive substance on panels, which comprises a spraying station (A) situated between two coplanar support planes (B and C), respectively situated upstream and downstream the said spraying station (A), which incorporates all the operating units: a series of

spraying heads (1) with corresponding electromagnetic valves, a pump (2), adjustment means of the distance between the spraying heads (1), means to move the panel (P) to be processed, an engine with transmission unit, an electronic unit for programming, management and control of the machine operating cycle.

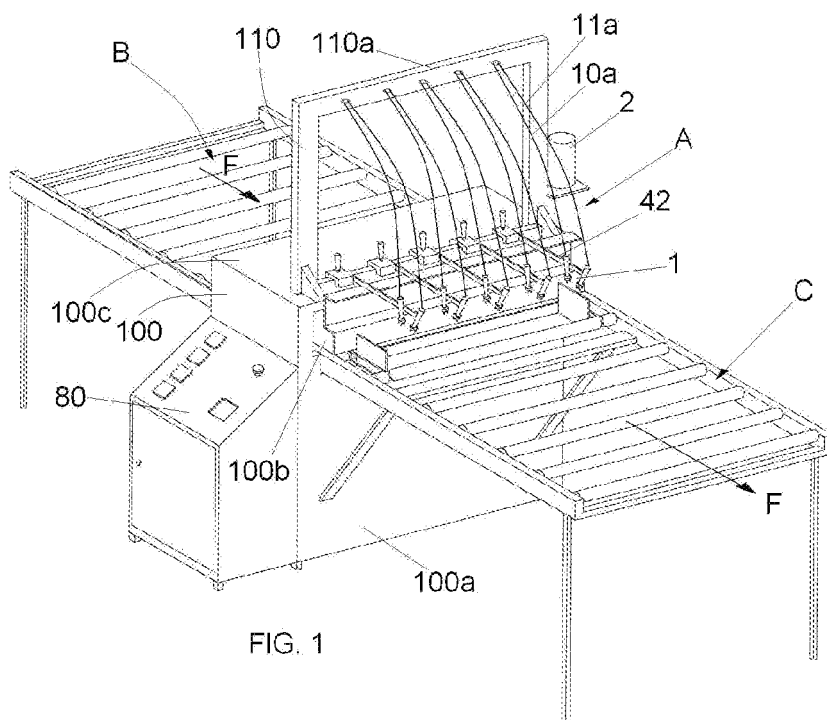


FIG. 1

Description

[0001] This patent application relates to a machine for targeted spraying of adhesive substance on panels, in particular polyurethane panels, of the type normally used to manufacture pipes for air distribution in heating or air conditioning systems.

[0002] In this technological sector the old ducts made of press bended sheet metal have been replaced with the new polyurethane pipes characterised by lower weight and higher thermal insulation coefficient.

[0003] The said pipes are manufactured from rectangular polyurethane panels coated on both sides with an aluminium film, according to a technology in which, after being cut to size both in width and length, each panel is notched with three longitudinal notches, at a predefined distance, in such a way that the panel is divided into four parallel bands designed to be folded perpendicularly until the first band is joined with the fourth band, originating a closed duct with quadrangular cross-section, with walls coinciding with the said four bands.

[0004] The above operation is obtained with notching machines that comprise a notching station situated between two conveyor belts, generally of roller type, designed to move the panel coming in and out of the said notching station provided with five notching heads to make surface longitudinal notches with 45° inclination.

[0005] More precisely, the first and the fifth notching head round off at 45° the two external longitudinal borders of the panel, and each of the remaining three notching heads makes a V-shaped surface notch with 90° angle in the centre, in such a way that the four portions of panel bordered by the said notches can be easily and perfectly folded perpendicularly, using as hinges the notches that do not affect the entire thickness of the panel, which maintains its monolithic structure.

[0006] Then the panel with notches is glued, by spreading a layer of adhesive substance on each longitudinal notch, in such a way that, after the panel has been folded perpendicularly, the matching borders of the various notches can adhere immediately and firmly.

[0007] Currently, the said gluing operation is carried out manually by using brushes or spraying pistols, with work cycles that require a large amount of time and expensive labour.

[0008] The critical examination of the state of the art has resulted in the present invention, whose main purpose is to devise a machine used to spray adhesive substance on a panel, operating simultaneously on various parallel spraying lines, with distance selected from time to time according to the characteristics of the processed panel.

[0009] An additional purpose of the invention is to devise a machine with the aforementioned characteristics, which is simple and inexpensive to make, as well as provided with devices designed to optimise the use of adhesive substance.

[0010] These and other advantages offered by the ma-

chine of the invention will become evident after the description below.

[0011] The machine of the invention comprises a spraying station that incorporates all the vital devices of the machine, namely:

- a series of spraying nozzles with electromagnetic valves
- a pump and feed tanks of the said nozzles
- means to adjust the distance between the nozzles
- means used to automatically open and close the said electromagnetic valves
- means to move the panel to be processed
- motor with transmission unit.

[0012] The machine of the invention also comprises two support planes of roller type for the panel to be processed, which are situated upstream and downstream the spraying station, respectively, and not motorized, being simply designed to support the panel when coming in and out of the station.

[0013] For major clarity, the description of the machine of the invention continues with reference to the enclosed drawings, which are only for illustrative, not limitative purposes, whereby:

- fig. 1 is a diagrammatic axonometric view of the machine of the invention;
- fig. 3 is a diagrammatic axonometric view of a panel coming out from the spraying station of the machine of the invention;
- fig. 3 is a view of a specific part of the machine of the invention;
- fig. 4 is a diagrammatic view of part of the base of the machine of the invention sectioned with a vertical plane parallel to the travel direction of the panel to be processed.

[0014] With reference to the aforementioned figures, the machine of the invention comprises a spraying station (A) situated between two coplanar support planes (B and C) of roller type, situated upstream and downstream the spraying station (A), respectively, which are simply designed to support the panel (P) to be processed when coming in and out of the station (A).

[0015] The rollers of the said planes (B and C) are free to idle and are not motorized, since the means used to move the panel are incorporated in the spraying station (A) that comprises:

- the spraying heads (1) with corresponding electromagnetic valves
- the pump (2) and feed tanks of the said spraying heads (1)
- means to enable the automatic opening and closing of the said electromagnetic valves
- means to adjust the distance between the spraying heads (1)

- means to move the panel (P) to be processed
- motor with transmission unit.

[0016] More precisely, the said station (A) comprises an empty base (100) with parallelepiped shape, with longitudinal axis extending in orthogonal direction to the forward direction of the panel (P), shown with an arrow (F) in the enclosed figures.

[0017] The base (100) is composed of a closed lower compartment (100a), which houses an electrical motor and relevant transmission unit, along with the tanks of the substances to be sprayed, and an upper compartment (100b) opened in the opposite longitudinal sides, in such a way that it can be freely crossed by a panel (P) laid on the roller plane (B) and moving towards the roller plane (C).

[0018] A track (40) is fixed above the wall (100c) that closes the open upper compartment (100b), extending in parallel direction to the longitudinal axis of the base (100) and acting as guide for five slides (41) provided with ordinary fast-locking and unlocking means, in such a way that they can be manually moved by the operator along the track (40), easily and quickly, in order to change the distance between the five slides (41), each of them acting as support for a horizontal arm (42) that protrudes forward (according to the forward direction of the panel) and supports the spraying heads (1) in projecting position.

[0019] A graduated bar (43) with millimetric scale runs parallel to the track (40), being surmounted by a reference claw (44) provided on each slide (41), in such a way that the operator can have a reference index and a graduated scale to set the correct distance between the five slides (41), which is determined from time to time by the width of the panel (P) to be processed and by the distance between the V-shaped longitudinal notches (S), as shown in fig. 2.

[0020] Each spraying head (1) comprises a pair of spraying nozzles (10 and 11) that lay on the same vertical plane parallel to the forward direction (F) of the panel.

[0021] One (10) of the nozzles is fed with adhesive substance by means of corresponding delivery pipes (10a), while the other nozzle (11) is fed with a catalysing substance by means of corresponding delivery pipes (11a), it being evident that the sprays of both nozzles (10 and 11) converge in the same point of the panel (P) that moves through the station (A).

[0022] The delivery pipes (10a and 11 a), which come from corresponding tanks contained in the closed lower compartment (100a), are tightened along the cross-piece (110a) of a portal structure (110) that protrudes from the base (100), in such a way that the said pipes reach the corresponding spraying head (1) by making a descending travel from the said cross-piece (110a) towards the head (1).

[0023] With reference to fig. 2, a collection tank (90) extends under the series of five spraying heads (1), designed to intercept and collect possible sprays coming

from the nozzles (10 and 11) that are not completely intercepted by the moving panel (P), as it especially occurs along the two external borders of the same panel, which are rounded off at 45°.

[0024] The open compartment (100b) houses the set of rollers that are used to move the panel (P): in particular, they are five main rollers (51, 52, 53, 54 and 55) that extend in parallel direction to the longitudinal axis of the base (100).

[0025] With reference to fig. 4, the set of five rollers can be divided into a lower set of three coplanar driving rollers (51, 52, 53) and an upper set of two coplanar idle rollers (53, 54).

[0026] The lower set of three rollers (51, 52, 53) is spaced in such a way that the first (51) and the third (53) roller are respectively positioned on the entrance mouth and on the exit mouth of the open compartment (100b), while the second roller (52) is perfectly centred with respect to the other two rollers (51, 53).

[0027] The central roller (52) is driven into rotation by the electrical motor housed in the closed lower compartment (100a), while the first and the third roller (51, 53) are driven in rotations with the same direction by the second roller (52) by means of corresponding driving belts (51 a and 53a).

[0028] The upper set of two coplanar rollers (53, 54) is not motorised, being simply designed to be dragged on the moving panel (P), maintaining it pressed on the set of three driving rollers (51, 52, 53) in order to prevent the panel from losing adherence with the said set of three rollers, consequently interrupting the regular forward travel towards the station (A).

[0029] The said set of three driving rollers (51, 52, 53) is assisted by a fourth auxiliary driving roller (56), which is situated outside the open compartment (100b), with a pair of protruding arms (101) in downstream position, which are simply designed to support at the ends the said fourth driving roller (56) parallel and coplanar to the third roller (53), to which it is joined by means of transmission belts (56a).

[0030] The fourth auxiliary roller (56) has been provided to guarantee that the panel (P) comes out completely from the open compartment (100b), since the said roller (56) is able to drive the panel (P) also after the panel (P) has lost contact with the third roller (53) situated at the exit mouth of the open compartment (100b).

[0031] The means designed to enable the automatic opening and closing of the electromagnetic valves are mounted inside the compartment (100b).

[0032] The said means comprise a sensor (3), preferably of photocell type, that detects the passage of the panel (P) and actuates, with the help of a timer (not shown in the enclosed drawings), the spraying heads (1), opening the electromagnetic valves after a predefined period of time from the moment in which the sensor (3) has detected the passage of the panel (P); the delayed opening of the electromagnetic valves is calculated according to the travel speed of the panel in such a way that the

nozzles (10 and 11) start spraying only when the front transversal border of the panel enters the area of action of the sprays generated by the said nozzles (10 and 11).

[0033] After a set time interval, the timer closes the electromagnetic valves, it being evident that the said valves must be closed as soon as the back transversal border of the moving panel comes out of the area of action of the sprays generated by the said nozzles (10 and 11).

[0034] Also in such a case, the closing time of the electromagnetic valves can be easily programmed according to the length and travel speed of the panel.

[0035] In any case, the correct operation of the machine is guaranteed by an electronic unit with programming, calculation, management and control functions, with control panel identified with numeral (80) in fig. 1.

Claims

1. Machine for targeted spraying of adhesive substance on panels, **characterised in that** it comprises a spraying station (A) situated between two coplanar support planes (B and C), respectively situated upstream and downstream the said spraying station (A), which incorporates all the operating units: .

- a series of spraying heads (1) with opening and closing electromagnetic valves
- a pump (2) and tanks that contain the substances used to feed the said spraying heads (1)
- means to enable the timed opening and closing of the said electromagnetic valves
- means to adjust the distance between the spraying heads (1)
- means to move the panel (P) to be processed
- a motor with transmission unit
- an electronic unit for programming, management and control of the machine operation cycle.

2. Machine according to the above claim, **characterised in that** the said station (A) comprises an empty base (100) with parallelepiped shape, with longitudinal axis extending in orthogonal direction to the forward direction of the panel (P); the said base (100) being composed of a closed lower compartment (100a) and an upper compartment (100b) opened in the opposite longitudinal sides, in such a way that it can be freely crossed by a panel (P) laid on the roller plane (B) and moving towards the roller plane (C).

3. Machine according to the above claim, **characterised in that** the adjustment means of the distance between the spraying heads (1) are provided above the wall (100c) that closes the open compartment (100b), which comprise a track (40) that extends in parallel direction to the longitudinal axis of the base (100) and acts as guide for five slides (41) provided

with ordinary fast-locking and unlocking means, each of them acting as support for a horizontal arm (42) that protrudes forward and supports the spraying heads (1) in projecting position.

4. Machine according to the above claim, **characterised in that** a graduated bar (43) with millimetric scale runs in parallel direction to the track, being surmounted by a reference claw (44) provided on each slide (41).

5. Machine according to one or more of the above claims, **characterised in that** each spraying head (1) comprises a pair of spraying nozzles (10 and 11) that lay on the same vertical plane parallel to the forward direction (F) of the panel (P) and fed with adhesive substance and catalysing substance, respectively, it being provided that the sprays of both nozzles (10 and 11) converge in the same point of the panel (P) that moves through the station (A).

6. Machine according to one or more of the above claims, **characterised in that** the open compartment (100b) houses means to drive the panel (P) to be processed, which comprise a set of five rollers (51, 52, 53, 54 and 55) that extend in parallel direction to the longitudinal axis of the base (100).

7. Machine according to the above claim, **characterised in that** the set of rolls comprises a lower set of three coplanar driving rollers (51, 52, 53) and an upper set of two coplanar idle rollers (53, 54), in which the lower set of three rollers (51, 52, 53) is spaced in such a way that the first (51) and the third (53) roller are respectively positioned on the entrance mouth and on the exit mouth of the open compartment (100b), while the second roller (52) is perfectly centred with respect to the other two rollers (51, 53).

8. Machine according to the above claim, **characterised in that** the central roller (52) is driven into rotation by the electrical motor housed in the closed lower compartment (100a), while the first and the third roller (51, 53) are driven in rotations with the same direction by the second roller (52) by means of corresponding driving belts (51a and 53a).

9. Machine according to claim 6, **characterised in that** the upper set of two coplanar rollers (53, 54) is not motorised and is dragged on the moving panel (P), maintaining it pressed on the set of three driving rollers (51, 52, 53).

10. Machine according to one or more of claims 6 to 9, **characterised in that** the set of three driving rollers (51, 52, 53) is assisted by a fourth auxiliary driving roller (56), situated outside the open compartment (100b), with a lateral pair of protruding arms (101) in

downstream position to support at the ends the said fourth driving roller (56) parallel and coplanar to the third roller (53), to which it is joined by means of transmission belts (56a).

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11. Machine according to one or more of the above claims, **characterised in that** the support planes (B and C) are of idle roller type.

12. Machine according to one or more of the above claims, **characterised in that** means to actuate the timed opening and closing of the electromagnetic valves are housed in the compartment (100b), the said means comprising a sensor (3), preferably of photocell type, that detects the passage of the panel (P) and actuates, with the help of a timer, the spraying heads (1), opening the electromagnetic valves after a predefined period of time from the moment in which the sensor (3) has detected the passage of the panel (P), in such a way that the said opening occurs as soon as the front transversal border of the panel enters the area of action of the sprays generated by the said nozzles (10 and 11).

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13. Machine according to one or more of the above claims, **characterised in that**, after a set time interval, the electronic unit sends a command to close the electromagnetic valves, in such a way that the said valves are closed as soon as the back transversal border of the moving panel comes out of the area of action of the sprays generated by the said nozzles (10 and 11).

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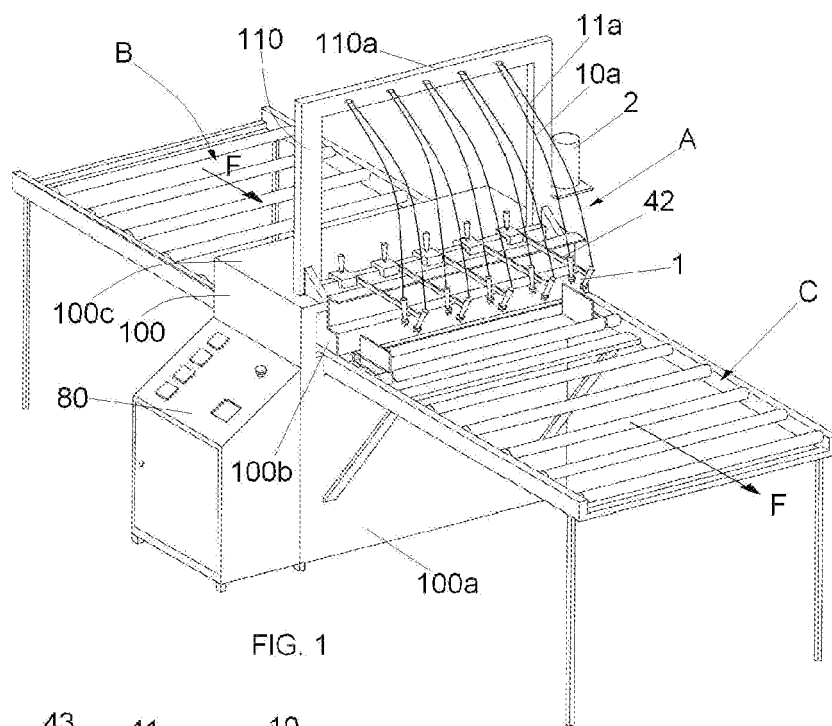


FIG. 1

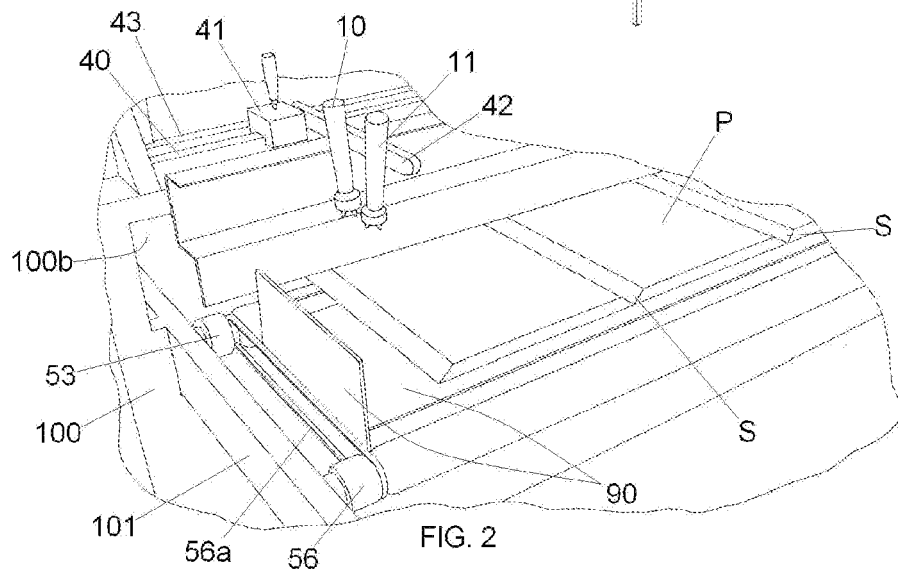


FIG. 2

