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(54) PLANT FOR PAINTING PIPES, IN PARTICULAR PIPES FOR TUBULAR ELECTRIC MOTORS

(57) A plant for painting pipes (2), in particular pipes (2) for tubular electric motors, has an input station (3) for the entry of the pipes (2) to be painted into the plant, an output station (14) for the exit of the painted pipes (2) from the plant, a painting station (12) for the pipes (2), a polymerization station (13) for the powder paint applied to the pipes (2), a first conveying unit (16) to feed the pipes (2) through the painting station (12), a second conveying unit (17) to feed the pipes (2) through the polymerization station (13), and a first transfer station (19) to connect the first conveying unit (16) and the second conveying unit (17) to one another and transfer the pipes (2) from the first conveying unit (16) to the second conveying unit (17).

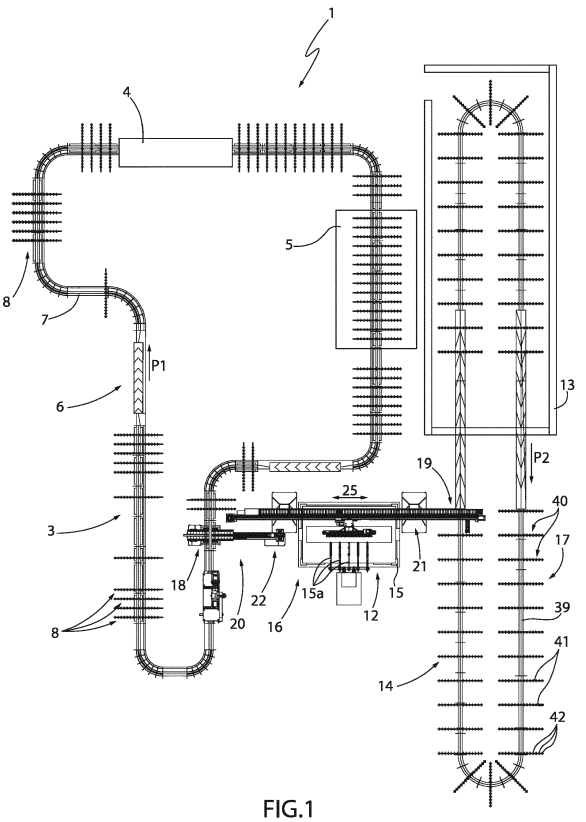

FIG.1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from Italian patent application no. 102023000003492 filed on February 27, 2023, the entire disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to a plant for painting pipes, in particular pipes for tubular electric motors.

BACKGROUND

[0003] In particular, the present invention relates to a painting plant of the type comprising an input station for the entry of the pipes to be painted into the plant; an output station for the exit of the painted pipes from the plant; a painting station for powder painting an outer surface of the pipes; at least one washing station for the pipes mounted between the input station and the painting station; and a polymerization station mounted between the painting station and the output station for the polymerization of the powder paint applied to the pipes.

[0004] The plant further comprises a conveying unit, which extends along a ring path and is configured to move the pipes forward from the input station to the output station through the washing station, the painting station, and the polymerization station.

[0005] Generally, the conveying unit comprises a plurality of carriages, each of which is movable along the ring path and is equipped with a plurality of holding rods.

[0006] Each holding rod projects downwards from its carriage and is provided with a closing cap, which is configured to engage within an upper end of the pipe and cooperates with a leaf spring mounted along the holding rod to hold the pipe.

[0007] The holding rod is tubular in shape and is connected to a pneumatic supply device to blow compressed air into the pipe and prevent the paint from reaching an inner surface of the pipe.

[0008] Since the number of carriages and holding rods is relatively high and the holding rods are relatively complex and expensive, the well-known plants of the type described above for painting pipes, in particular pipes for tubular electric motors, have some drawbacks mainly due to the fact that the conveying unit is relatively complex and expensive.

[0009] In addition, the well-known plants of the type described above for painting pipes, in particular pipes for tubular electric motors, have the additional drawback that the closing caps do not allow the correct washing of the inner surface of the pipes.

SUMMARY

[0010] The object of the present invention is to provide a plant for painting pipes, in particular pipes for tubular electric motors, which is free from the drawbacks described above and simple and inexpensive to produce.

[0011] According to the present invention, a plant for painting pipes, in particular pipes for tubular electric motors, is provided as claimed in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The present invention will now be described with reference to the accompanying drawings, which illustrate a non-limiting embodiment thereof, wherein:

Figure 1 is a schematic plan view, with parts removed for clarity, of a preferred embodiment of the plant of the present invention;

Figures 2 and 3 are two schematic side views, with parts removed for clarity, of a detail of the plant in Figure 1;

Figure 4 is a schematic plan view, with parts removed for clarity, of the detail in Figures 2 and 3; and

Figure 5 is a schematic perspective view, with parts removed for clarity, of a detail in Figures 2, 3, and 4.

DESCRIPTION OF EMBODIMENTS

[0013] With reference to Figure 1, number 1 indicates, as a whole, a plant for painting pipes 2, in particular pipes for tubular electric motors.

[0014] The plant 1 comprises, in succession and in order, an input station 3 for the entry of the pipes 2 into the plant 1; a washing station 4 for the washing of the pipes 2; and a drying station 5 for the drying of the pipes 2.

[0015] The plant 1 is further provided with a first conveying unit 6 comprising a guide device 7 extending along a ring-closed path P1 through the stations 3, 4, and 5, and a plurality of support devices 8 distributed along the device 7 and movable along the path P1.

[0016] Each device 8 comprises a bracket 9, which projects downwards from the device 7, is substantially C-shaped, and is coupled in a known manner to the device 7 to move along the path P1.

[0017] The bracket 9 has a lower crosspiece 10 substantially horizontal and transverse to the path P1 and is provided with a plurality of support pins 11, which are parallel to each other, are distributed along the crosspiece 10, project upwards from the crosspiece 10 and are configured to receive and hold respective pipes 2 by gravity.

[0018] The plant 1 further comprises a painting station 12 for powder painting an outer surface of the pipes 2; a polymerization station 13 for stabilizing the powder paint applied to the outer surface of the pipes 2; and an output station 14 for the exit of the pipes 2 from the plant 1.

[0019] The plant 1 is also provided with a painting booth

15 mounted in the station 12, a second conveying unit 16 to move the pipes 2 forward through the station 12, and a third conveying unit 17 to move the pipes 2 forward through the stations 13 and 14.

[0020] The unit 16 is connected to the unit 6 at a first transfer station 18 and to the unit 17 at a second transfer station 19, and comprises a first conveyor device 20 connected to the unit 6 at the station 18, a second conveyor device 21 connected to the unit 17 at the station 19, and a third transfer station 22 to connect the devices 20 and 21 together.

[0021] The device 20 has a portal 23 provided with a guiding side member 24 mounted below the brackets 9 parallel to a horizontal direction 25; a horizontal slide 26 slidably coupled to the side member 24 to make straight movements, in relation to the side member 24, between the stations 18 and 22 in direction 25; and a vertical slide 27 coupled to the slide 26 to move, in relation to the slide 26, in a vertical direction 28 transverse to direction 25 between a raised position and a lowered position.

[0022] The slide 27 supports a pair of gripping jaws 29, which are arranged, in use, on opposite sides of the crosspiece 10 of the bracket 9 arranged right then in the station 18, and are hinged to the slide 27 to rotate around respective fulcrum axes 30 parallel to direction 25.

[0023] The jaws 29 are moved around their axes 30 between a clamping position and a release position of the pipes 2 by means of respective actuator cylinders 31, each of which is hinged to the slide 27 and has an output rod 32 hinged to its jaw 29.

[0024] Each jaw 29 has a plurality of seats 33 of semicylindrical shape, which are aligned with each other in direction 25, are equal in number to the number of pins 11 of a support device 8, and cooperate with the corresponding seats 33 of the other jaw 29 to disengage the pipes 2 from the pins 11 of the support device 8 arranged right then in the transfer station 18.

[0025] The device 21 comprises a portal 34 provided with a guiding side member 35 extending between the stations 19 and 22 parallel to direction 25; a horizontal slide 36 slidably coupled to the side member 35 to make straight movements, in relation to the side member 35, between the stations 19 and 22 in direction 25; and a vertical slide 37 coupled to the slide 36 to move, in relation to the slide 36, between a raised position and a lowered position in direction 28.

[0026] The slide 37 supports a plurality of well-known holding rods 38, which are equal in number to the number of pins 11 of a support device 8, and therefore to the number of seats 33 of a jaw 29, are aligned with each other in direction 25, and project downwards from the slide 37 in direction 28.

[0027] Each rod 38 engages and holds a pipe 2 in a known manner, has a tubular shape, and is connected to a pneumatic device under pressure to blow compressed air into and through the pipe 2.

[0028] The booth 15 is equipped with a plurality of painting nozzles 15a configured to apply powder paint to the outer surface of the pipes 2, while the compressed air supplied by the rods 38 through the pipes 2 prevents the powder paint from adhering to the inner surface of the pipes 2.

[0029] The booth 15 is further provided with a plurality of blowing nozzles (not shown) to remove the powder paint from the rods 38 as they move from the station 19 to the station 22.

[0030] The conveying unit 17 comprises a guide rail 39 extending along a ring-closed path P2 through the stations 19, 13, and 14, and a plurality of support devices 40 distributed along the rail 39 and movable along the path P2.

[0031] Each device 40 comprises a substantially horizontal elongated bar 41, which extends transversely to the rail 39 and is coupled in a known manner to the rail 39 to move along the path P2.

[0032] The bar 41 is provided with a plurality of support pins 42 parallel to each other, which are equal in number to the number of rods 38, are distributed along the bar 41, and project upwards from the bar 41 in direction 28.

[0033] As shown in Figure 5, each pin 42 is provided with a leaf spring 43, which is fixed along the pin 42, and is configured to receive and hold a respective pipe 2 while maintaining it at a certain distance from the respective bar 41.

[0034] In particular, the spring 43 substantially has the shape of a V with a concavity facing the pin 42, and two free ends fixed to the pin 42.

[0035] Accordingly, the assembly of the pin 42 and the spring 43 is configured to hold the pipe 2 only at an inner surface thereof and to leave an outer surface and the two end faces of the pipe 2 free.

[0036] The operation of the painting plant 1 will now be described with reference to a single support device 8 and starting from an instant in which the device 8 in question is arranged in the input station 3 to allow the staff in charge to load a pipe 2 on each support pin 11 of the respective bracket 9.

[0037] The device 8 in question is moved forward from the input station 3 through the washing station 4, through the drying station 5, and into the transfer station 18.

[0038] At the station 18, the crosspiece 10 of the bracket 9 in question is positioned between the gripping jaws 29 of the conveyor device 20; and the jaws 29 are first moved by the cylinders 31 to their clamping position and then lifted by the vertical slide 27 in direction 28 to disengage the pipes 2 from the respective pins 11.

[0039] At this point, the pipes 2 are moved by the horizontal slide 26 along the side member 24 in direction 25 from the station 18 to the station 22, at which station the pipes 2 are first engaged by the holding rods 38 of the conveyor device 21 and then lifted in direction 28 and disengaged from the jaws 29.

[0040] Subsequently, the pipes 2 are moved forward by the conveyor device 21 in direction 25 first to the painting booth 15 and then to the transfer station 19, at which station the slide 37 is first lowered to engage the pipes

2 onto the support pins 42 and the respective springs 43 of a support device 40 in order to maintain the pipes 2 at a certain distance from the respective bar 41, and is then lifted to disengage the rods 38 from the pipes 2.

[0041] Finally, the pipes 2 are moved forward by the bar 41 along the guide rail 39, through the polymerization station 13, and into the output station 14; and the rods 38 are moved again from the station 19 to the station 22 to be cleaned by the above mentioned blowing nozzles (not shown) and be ready for a new operating cycle.

[0042] According to a variant, not shown, the second conveying unit 16 is defined by a single conveyor device configured to transfer the pipes 2 from the station 18 to the station 19 through the painting booth 15.

[0043] The plant 1 has some advantages mainly due to the fact that:

since the presence of the conveying units 6, 16 and 17 allows a relatively small number of holding rods 38 to be used, the plant 1 is relatively simple and inexpensive;

since the holding rods 38 are configured to rotate the pipes 2 around their longitudinal axes, the thickness of the powder paint applied to the pipes 2 is relatively even and constant over the entire outer surface of the pipes 2;

the presence of the springs 43 allows to maintain the pipes 2 at a certain distance from the bars 41, ensure the correct polymerization of the powder paint applied in the area of the lower end face of the pipes 2, and prevent the formation of paint encrustations;

the compressed air blown by the holding rods 38 through the pipes 2 ensures that there is no paint on the inner surface of the pipes 2;

the washing station 4 for washing the pipes 2 uses a washing product capable of ensuring a salt spray resistance of at least 500 hours and preventing oxidation of the pipes 2 during the storage of the pipes 2; and

[0044] since the conveying units 6, 16, 17 are separate from and independent of each other, their maintenance and cleaning are relatively simple, fast, and inexpensive.

Claims

1. A plant for painting pipes (2), in particular pipes (2) for tubular electric motors, the plant comprising an input station (3) for the entry of the pipes (2) to be painted into the plant; an output station (14) for the exit of the painted pipes (2) from the plant; a painting station (12) for the pipes (2); a polymerization station (13) for the powder paint applied to the pipes (2); and a first conveying unit (16) to feed the pipes (2) through the painting station (12); and being **characterized in that** it further comprises a second conveying unit (17) to feed the pipes (2) through the polymerization station (13) and a first transfer station (19) to connect said first and second conveying units (16, 17) to one another and transfer the pipes (2) from the first conveying unit (16) to the second conveying unit (17).

2. The plant according to claim 1, wherein the second conveying unit (17) extends along a first ring-closed path (P2) through the first transfer station (19), the polymerization station (13) and the output station (14).

3. The plant according to claim 1 or 2, wherein the first conveying unit (16) comprises at least one first carriage (36), which is movable at least through the painting station (12) and is provided with at least one holding rod (38), which projects downwards from the first carriage (36) in order to be engaged inside a pipe (2) and hold it, has a tubular shape and is connected to a pneumatic supply device to blow compressed air into the pipe (2) itself.

4. The plant according to claim 3, wherein the painting station (12) is provided with a cleaning device, in particular a blowing device, to clean the holding rods (38) before they engage the pipes (2).

5. The plant according to any one of the preceding claims and further comprising a third conveying unit (6) to feed the pipes (2) starting from the input station (3) and a second transfer station (18) to connect said first and third conveying units (16, 6) to one another and transfer the pipes (2) from the third conveying unit (6) to the first conveying unit (16).

6. The plant according to claim 5, wherein the third conveying unit (6) extends along a second ring-closed path (P1) through the input station (3) and the second transfer station (18).

7. The plant according to claim 5 or 6 and further comprising a washing station (4) for the pipes (2) mounted between the input station (3) and the second transfer station (18).

8. The plant according to any one of the claims from 5 to 7, wherein the first conveying unit (16) comprises one single conveyor device to transfer the pipes (2) from the second transfer station (18) to the first transfer station (19) .

9. The plant according to any one of the claims from 5 to 7, wherein the first conveying unit (16) comprises a first conveyor device (20) connected to the third conveying unit (6) in the area of the second transfer station (18), a second conveyor device (21) connected to the second conveying unit (17) in the area of the first transfer station (19) and a third transfer sta-

tion (22) to connect said first and second conveyor devices (20, 21) to one another.

10. The plant according to claim 9, wherein the second conveyor device (21) comprises at least one first carriage (36), which is movable between said first and third transfer stations (19, 22), and at least one holding rod (38), which projects downwards from the first carriage (36) in order to be engaged inside a pipe (2) and hold it, has a tubular shape and is connected to a pneumatic supply device to blow compressed air into the pipe (2) itself.

11. The plant according to claim 9 or 10, wherein the first conveyor device (20) comprises at least one second carriage (26) movable between said first and third transfer stations (18, 22) and provided with a pair of jaws (29), which are movable between a clamping position and a release position clamping and releasing at least one pipe (2), and is movable parallel to the pipe (2) in order to disengage the pipe (2) itself from the third conveying unit (6).

12. The plant according to any one of the claims from 5 to 11, wherein the third conveying unit (6) comprises at least one third carriage (9), which is movable between the input station (3) and the second transfer station (18), and at least one first pin support element (11) projecting upwards from the third carriage (9).

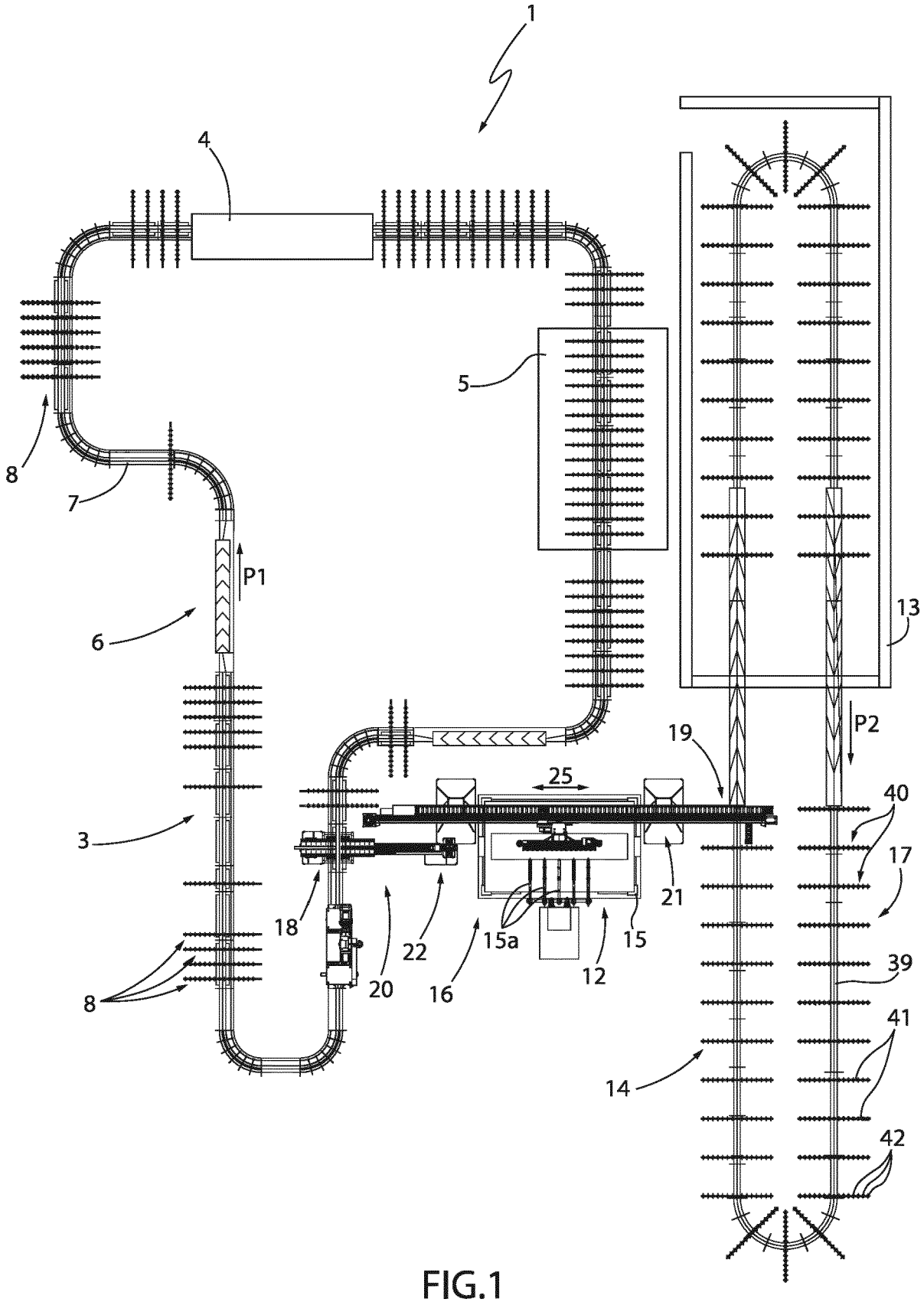

FIG.1

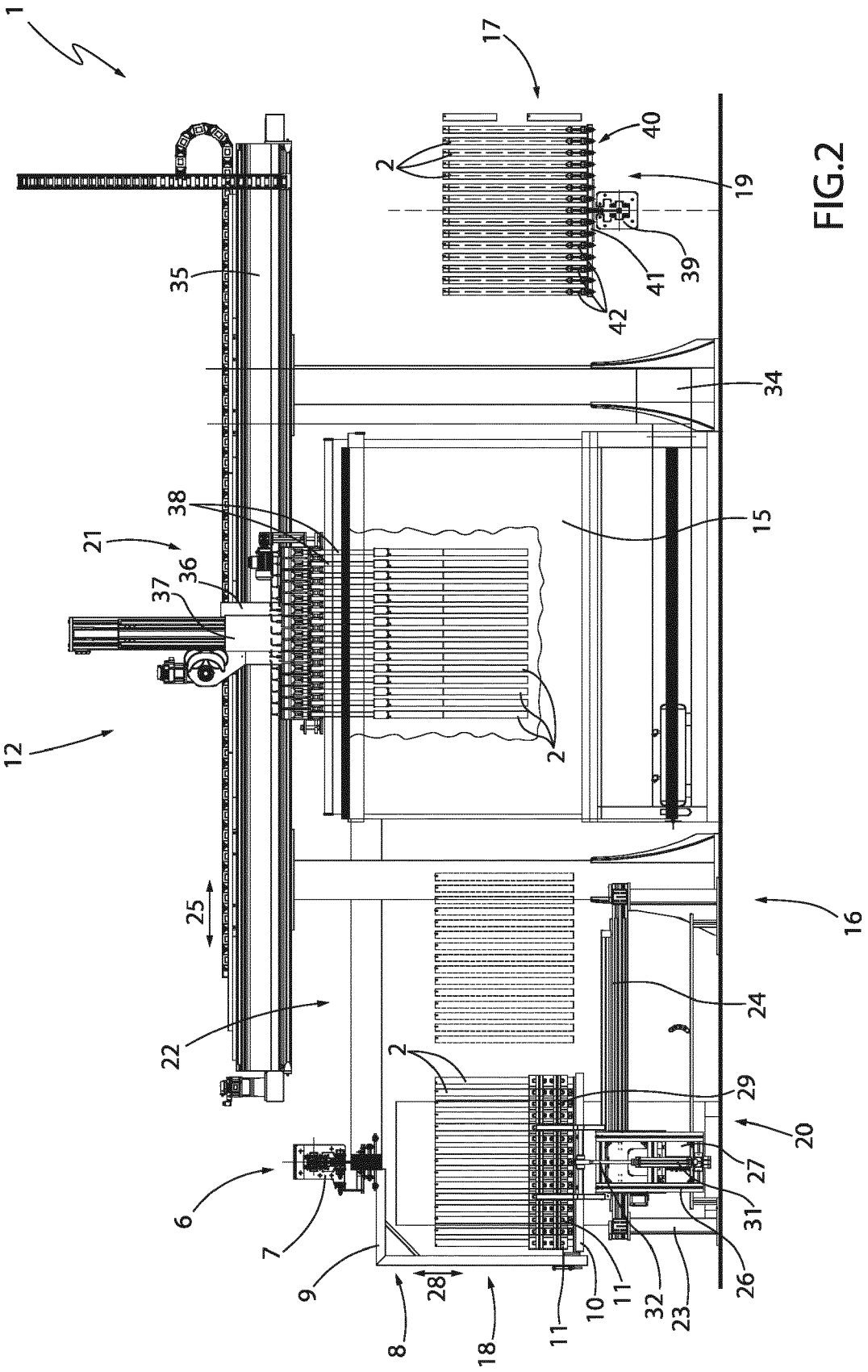
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FIG.2

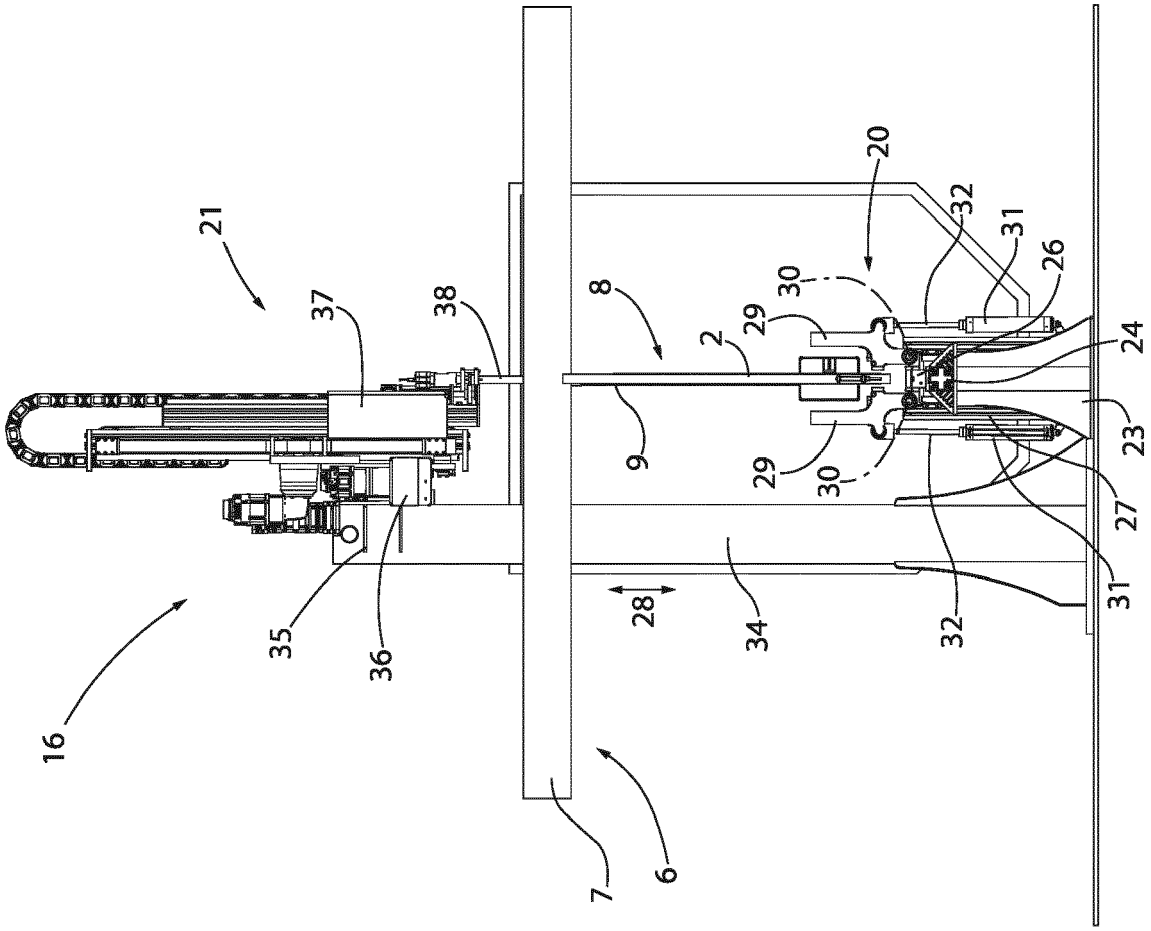

FIG.3

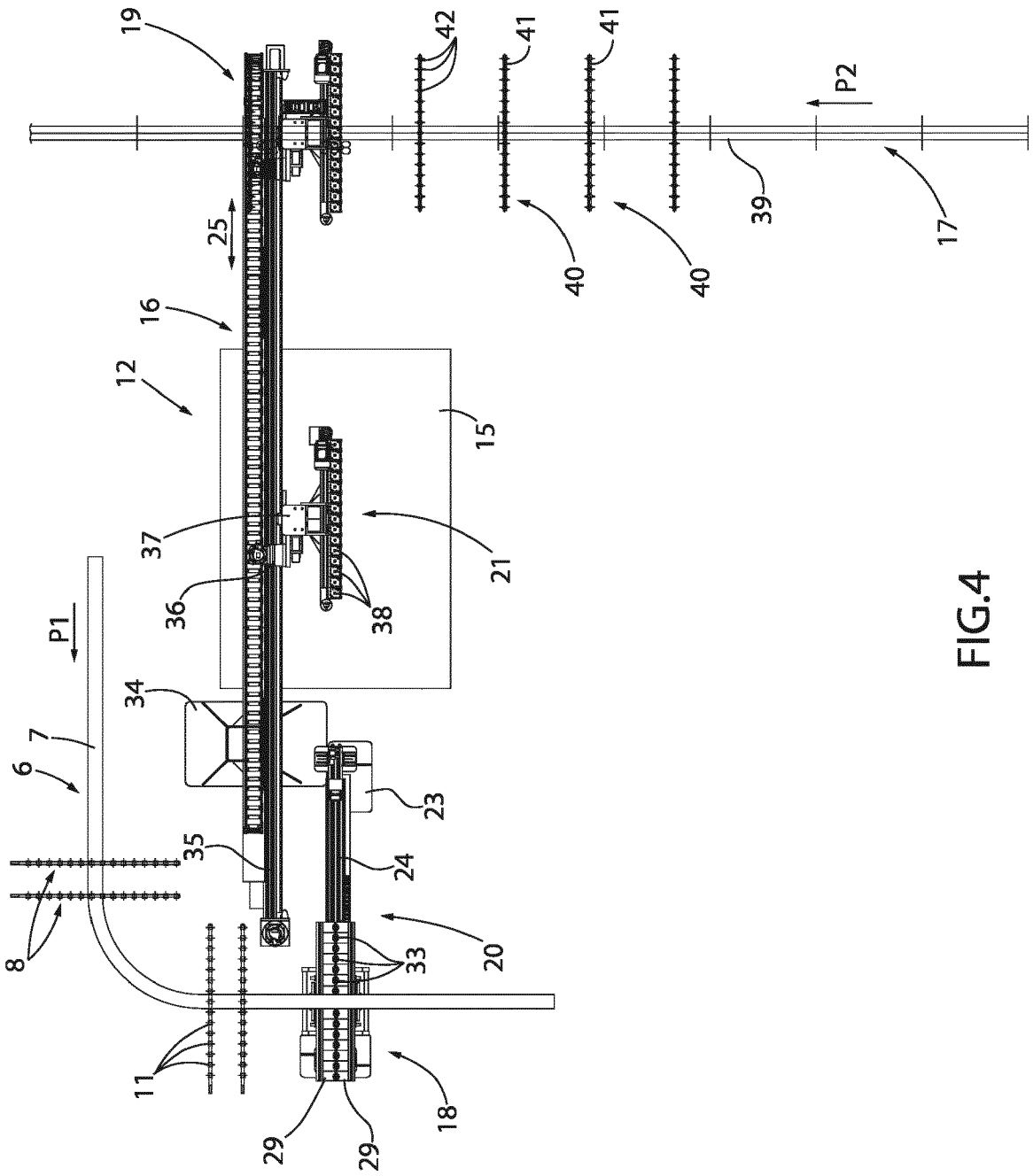
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FIG.4

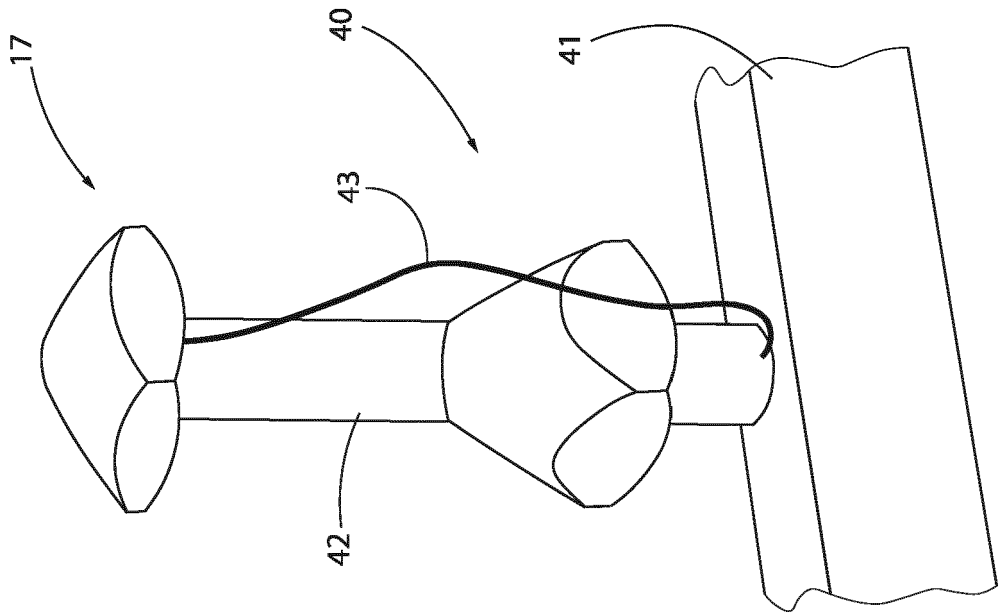

FIG.5

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EUROPEAN SEARCH REPORT

Application Number
EP 24 15 9359

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2013 242429 A (SHARP KK) 5 December 2013 (2013-12-05) * figure 2 * -----	1,2,5-9	INV. B05B12/00 B05B13/00 B05B16/00
A	EP 0 192 617 A2 (BERNACCHIONI SEBASTIANO) 27 August 1986 (1986-08-27) * figures 11,12 * -----	1	B08B9/00

TECHNICAL FIELDS SEARCHED (IPC)

B05B
B08B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 June 2024	Eberwein, Michael

CATEGORY OF CITED DOCUMENTS

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