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(54) **APPARATUS FOR WASHING A SLIT COATING HEAD**

(57) The apparatus (1) is aimed at washing a glazing head (2) which, when at work, applies liquid ceramic glaze on ceramic tiles or slabs.

The glazing head (2) comprises a hopper (20) composed of two parts (20F, 20M), movable one with respect to the other between an operative close position (W) and an inoperative open position (A), suitable for internal washing. The apparatus (1) comprises: lifting means (11), aimed at vertically moving the glazing head (2) between a lowered operating position (B), and a raised maintenance position (H), in which the hopper (20) is placed in its open position (A); a cleaning unit (12), provided with spraying means (120), capable of dispensing detergent fluid under pressure into the afore-mentioned hopper (20). The cleaning unit (12) is provided with moving means (13), aimed at moving horizontally the cleaning unit between a rest position (N), in which the afore-mentioned cleaning unit (12) is spaced from the afore-mentioned glazing head (2), and a washing position (L) in which it is positioned below the afore-mentioned glazing head (2), which has been previously brought to its raised maintenance position (H): in this way the spraying means (120) are centred with respect to the hopper (20), and it is possible to dispense the detergent liquid that hits and washes the internal walls of the latter.

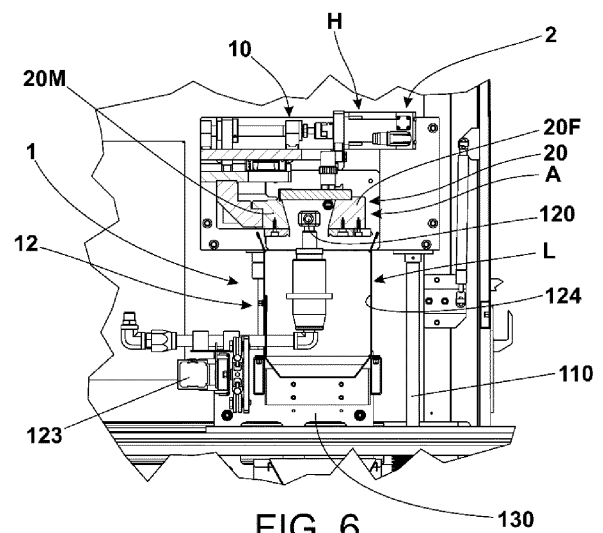


FIG. 6

Description

[0001] The present invention relates to the technical field concerning machinery used in the ceramic industry for decorating ceramic tiles or slabs.

[0002] In particular, there are machineries which apply a uniform layer of liquid glaze on the entire, or on a part of facade of the afore-mentioned ceramic tiles or slabs, the afore-mentioned machineries being also known to those skilled in the art as glazing heads.

[0003] A glazing head is essentially composed of a hopper fed with the liquid glaze, preferably of the so-called 'in solution' type. In its lower part, the hopper has a calibrated outlet slot, from which a curtain of the afore-mentioned liquid glaze comes out and settles on the ceramic tiles or slabs passing below, arranged in orderly succession and pushed forward with constant speed on a rectilinear transport line.

[0004] The hopper, like other parts through which the glaze passes, must be thoroughly cleaned every time the colour of the glaze is to be changed, as a matter of course, but also at regular intervals, even if the colour of the glaze remains the same, in order to remove any lumps or encrustations that may be formed and that could alter the quality of the layer of applied glaze.

[0005] Preferably, the hopper is cleaned by washing with liquid (water with detergent added if necessary) sprayed under pressure from one or more nozzles.

[0006] For this purpose, the hopper must be made up of two parts, so that it can be opened during the washing phase, to allow the introduction and handling of the afore-mentioned nozzles inside it and to facilitate the evacuation of the washing liquid from the lower part of the same hopper.

INVENTION CORRELATED PRIOR ART

[0007] A technical solution, patented by the industrial invention patent application No. 102021000011846, filed by the same Applicant, describes a device which allows opening the hopper of a curtain coating head, made up of two parts for this purpose, a first fixed part and a second movable part, the latter being connected to motorised operating means aimed at moving it in a rectilinear horizontal direction.

[0008] With the second moving part brought closer to the first fixed part, so as to adjust a corresponding calibrated outlet slot, an operating position of the afore-mentioned hopper is defined.

[0009] With the two parts moved apart, an open position of the hopper is configured, which allows the hopper to be washed with cleaning fluid under pressure.

[0010] In order to facilitate access to the lower area of the hopper, and thus facilitate washing operations, the afore-mentioned application also describes lifting means, connected to the glazing head to move it vertically between two extreme positions, respectively, a lowered working position, in which the calibrated outlet slot is lo-

cated close to the ceramic tiles passing below, and a raised washing position, in which the glazing head is placed at a suitably higher level.

[0011] The description mentions a generic cleaning unit that can be positioned below the curtain coating head, placed in the raised position and with the hopper open, to spray cleaning liquid: in this case, what is meant is a device, which is separated from the production line, put in place, activated and subsequently removed by an operator.

[0012] The reference prior art does not propose solutions in which a glazing head can be washed by a cleaning unit originally arranged and integrated in the production line, of which the glazing head itself is a part.

OBJECTS OF THE INVENTION

[0013] Therefore, it is an object of the present invention to propose an apparatus for washing a glazing head which is manufactured from the beginning as an integral part of the relative production line and which presents constructive characteristics suitable for interacting functionally with the afore-mentioned curtain coating head.

[0014] Another object of the invention is to provide a washing apparatus shaped in such a way as to be particularly suitable for a curtain coating head, such as the one described in the above patent application of the same Applicant.

[0015] A further object of the invention is to provide a washing apparatus having compact dimensions and which, when not in use, does not impair in any way the performance of the glazing head and/or, more generally, the performance of the production line to which it is connected.

[0016] According to a still further object of the invention, the proposed washing apparatus can be operated in a fully automatic manner, while the production line is stopped and with the necessary preliminary operations to be carried out in the hopper prior to its washing.

[0017] Yet another object of the invention is to propose a washing apparatus obtained with simple constructive solutions and therefore reliable over time.

SUMMARY OF THE INVENTION

[0018] These and other objects are fully achieved by means of an apparatus for washing a curtain coating head, with the latter being placed above a rectilinear conveying line, on which tiles or ceramic slabs are advancing, and aimed at uniformly covering a part or the entire upper surface of the tiles or ceramic slabs with liquid ceramic glaze, with the afore-mentioned glazing head comprising: a hopper consisting of two parts, a first part and a second part, movable with respect to each other; operating means, aimed at configuring an operating position of the hopper, in which the afore-mentioned first part and second part are suitably brought close to each other to define a calibrated outlet slot for the afore-mentioned liq-

uid ceramic glaze, as well as aimed at setting the hopper in open position, in which the first part and second part are moved away from each other.

[0019] The above-mentioned apparatus includes:

- lifting means, connected to the afore-mentioned glazing head and aimed at vertically moving the glazing head between at least two characteristic positions, respectively a lowered working position, in which the calibrated outlet slot is located at a predetermined height from the above-mentioned ceramic tiles or slabs passing below, and a raised maintenance position, in which the above-mentioned glazing head is placed at an appropriately raised height from the transport line;
- a cleaning unit, arranged transversely to the straight conveying line and parallel to the curtain coating head;
- spraying means, provided in the afore-mentioned cleaning unit to dispense cleaning fluid under pressure inside the afore-mentioned hopper, when it is in the afore-mentioned open position;
- moving means, connected to the afore-mentioned cleaning unit, aimed at moving the latter in a longitudinal direction with respect to the afore-mentioned straight conveying line, between a rest position, in which the same cleaning unit is spaced from the afore-mentioned curtain coating head, so as to allow the latter to be placed in its lowered working position, and a washing position, in which the afore-mentioned cleaning unit is situated below the above-mentioned curtain coating head, previously placed in the afore-mentioned raised maintenance position, and with the afore-mentioned hopper configured in its open position, so that the afore-mentioned spraying means are substantially centered with respect to the hopper, so that the cleaning liquid ejected therefrom hits and washes the respective internal walls of the hopper.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The features of the proposed invention will be apparent from the following description of a preferred embodiment of the apparatus for washing a curtain coating head, referred to above, in accordance with the content of the claims and with the aid of the appended drawing plates, in which:

- Fig. 1 is an axonometric view of a module of a production line which includes, inter alia, a glazing head and the apparatus for washing the latter;
- Fig. 2 is a plan view of what is illustrated in Fig. 1;
- Fig. 3 is a longitudinal section view of the module of Fig. 1 with the glazing head in working position and a cleaning unit of the proposed apparatus at a rest position;
- Fig. 4 is an enlarged view of the part of Fig. 3 com-

prising the glazing head and the cleaning unit;

- Fig. 5 is a longitudinal section view similar to Fig. 3, with the glazing head raised to an inoperative position and the cleaning unit moved below it to clean the hopper;
- Fig. 6 is an enlarged view of the part of Fig. 5 comprising the glazing head and the cleaning unit;
- Fig. 7 is an axonometric view of the cleaning unit;
- Fig. 8 is a rear view of the cleaning unit;
- Fig. 9 is a plan view of the cleaning unit;
- Fig. 10 is an axonometric view of the curtain coating head;
- Fig. 11 is a rear view of the curtain coating head.

15 DETAILED DESCRIPTION OF THE INVENTION

[0021] In the above-mentioned figures, the reference number 1 indicates the apparatus for washing a glazing head proposed by the present invention, as a whole.

[0022] The apparatus 1 is integrated in a module M comprising a glazing head 2, situated above a rectilinear conveying line 3, on which tiles or ceramic slabs (not illustrated) arranged in orderly succession advance with constant speed.

[0023] The aforesaid module M, as illustrated in particular in Figs. 1 and 2, is provided with an external cover casing C, substantially box-shaped and formed by a plurality of panels, removable for maintenance, so as to constitute a safety protection for the workers during the operation of both the glazing head 2 and the apparatus 1.

[0024] The glazing head 2 considered in the illustrated example is preferably of the type produced by the same Applicant and subject of a previous patent application, referred to in the introduction, and essentially including a hopper 20, having in its lower part a calibrated outlet slot 21, from which a curtain of liquid ceramic glaze exits to uniformly cover a part or, more often, the entire upper surface of the ceramic tiles or slabs.

[0025] In particular, the hopper 20 consists of two parts, namely a first fixed part 20F and a second movable part 20M; operating means 10 are connected to the second movable part 20M and are aimed at setting the afore-mentioned hopper 20 in an operating position W, in which the fixed part 20F and the movable part 20M are suitably brought close to each other to define the above-mentioned calibrated outlet slot 21 for releasing the liquid ceramic glaze (Figs. 3 and 4), and aimed also at configuring an open position A of the hopper 20, in which the second movable part 20M is moved away from the first fixed part 20F (Figs. 5 and 6).

[0026] Obviously, nothing precludes the use of a different hopper 20 in which both the afore-mentioned first and second parts 20F, 20M are movable.

[0027] The washing apparatus 1, in the preferred embodiment shown in the figures, comprises lifting means 11, connected to the afore-mentioned glazing head 2 and aimed at moving vertically the same between at least two characteristic positions, respectively a lowered working

position B (Figs. 3 and 4), in which the calibrated outlet slot 21 is located at a predetermined height from the ceramic tiles or slabs passing below (not illustrated) and a raised maintenance position H (Figs. 5 and 6), in which the same glazing head 2 is located at a height suitably raised from the afore-mentioned transport line 3.

[0028] Advantageously, the afore-mentioned lifting means 11 comprise two linear actuators 110 with a recirculating ball screw, driven synchronously by common motor means, through transmission means, or by respective electric motors, for example, brush-less or stepper motor, mechanically separated but synchronised and electronically controlled according to known techniques (motors not illustrated).

[0029] Alternatively, the lifting means 11 can be provided with actuators and/or motor means of other types, for example, pneumatic, toothed belt systems and whatever else is available and considered suitable in the commercial actuating components.

[0030] The apparatus 1 further comprises a cleaning unit 12, situated transversally to the afore-mentioned rectilinear transport line 3 and parallel to the transverse extension of the glazing head 2.

[0031] Spraying means 120, provided in the cleaning group 12, dispense detergent fluid under pressure, supplied by a respective, non-illustrated supply system, to wash the interior of the afore-mentioned hopper 20, when it is in its the afore-mentioned open position A, as further described below.

[0032] Moving means 13, connected to said cleaning unit 12, are provided for moving the latter in a longitudinal direction with respect to the afore-mentioned straight conveying line 3, between a rest position N, in which the cleaning unit 12 is withdrawn and spaced from the said glazing head 2 (Figs. 3 and 4), so as to allow the latter to be placed in its lowered working position B, and a washing position L, in which the afore-mentioned cleaning unit 12 is moved forward and positioned below the afore-mentioned glazing head 2 (Figs. 5 and 6), previously placed in the afore-mentioned raised maintenance position H, and with the said hopper 20 configured in its open position A.

[0033] In the latter washing position L, the afore-mentioned spraying means 120 are substantially centred with respect to the hopper 20, so that the detergent liquid ejected thereby hits and washes the internal walls of the hopper.

[0034] In the preferred constructive solution, illustrated in the figures, the afore-mentioned spraying means 120 comprise an omnidirectional multiple jet head, mounted on a slide 121 engaged with a linear guide 122 having sufficient extension to allow the head 120 to move over the entire internal width of the afore-mentioned hopper 20, in a transversal direction with respect to the afore-mentioned straight conveying line 3.

[0035] The movements of the slide 121 and the head 120, in both directions, are controlled by actuating means 123, consisting of, for example, a stem-less pneumatic

cylinder.

[0036] An alternative to the illustrated example could be the afore-mentioned spraying means 120 of the cleaning unit 12 comprising an elongated tubular element (not illustrated as intuitively comprehensible), extending over almost the entire inner width of the afore-mentioned hopper 20, in a transverse direction with respect to the straight transport line 3, and closed at one end.

[0037] The detergent liquid is fed under pressure into the afore-mentioned tubular element and exits through a plurality of nozzles distributed along the latter, which are variously positioned and oriented.

[0038] In the illustrated, non-limiting example embodiment, the above-mentioned moving means 13 are of motorised type (see in particular Figs. 7 and 9) and comprise:

- two wheeled carriages 130, symmetrically fixed to the sides of the cleaning unit 12;
- two linear guides 131, connected to the bearing structure of the afore-mentioned apparatus 1 and extended longitudinally to the rectilinear transport line 3, with the corresponding carriages 130 slidingly engaged with the afore-mentioned guides 131;
- at least one linear actuator 132, for example comprising a stem-less pneumatic cylinder, capable of determining the movements of the afore-mentioned cleaning unit 12 between the afore-mentioned respective rest position N and washing position L.

[0039] However, in a possible embodiment variant, not illustrated, the afore-mentioned moving means 13 are of manual type and comprise at least one gripping handle, connected to the cleaning unit 12, for example with one of the afore-mentioned wheeled carriages 130, for making the afore-mentioned cleaning unit 12 move between the respective rest position N and washing position L.

[0040] The cleaning unit 12 is advantageously provided with lateral splash guards 124, for example four, arranged in a rectangle (see in particular Fig. 7), suitable for encircling the area around the lower part of the afore-mentioned hopper 20, during the active phases of the afore-mentioned spraying means 120, limiting the splashes of cleaning liquid.

[0041] In order to maximise the action of the spraying means 120, i.e. of the cleaning liquid, the height distance between the spraying means and the inner walls of the hopper 20 is advantageously reduced as much as possible.

[0042] In a preferred constructive solution, referred to in the illustrated embodiment, the lifting means 11, connected to the glazing head 2, are suitable for defining, for the latter, an additional raised introduction position (not illustrated), at a higher level than the afore-mentioned raised maintenance position H.

[0043] This raised position is selected in phase relation with the afore-mentioned movement of the cleaning unit 12 between the respective rest position N and washing position L, and vice versa, in order to avoid collisions

between the afore-mentioned spraying means 120 and the afore-mentioned hopper 20, and also between the latter and the afore-mentioned lateral side splash guards 124.

[0044] This expedient allows an adjustment of the level of the said raised maintenance position H of the hopper 20 (i.e., of the glazing head 2), so that, when centred with respect to the hopper 20, the spraying means 120 are also partially introduced therein (see in particular Fig. 6).

[0045] Similarly, the restraining action of lateral side splash guards 124 is optimised.

[0046] Alternatively, or in addition to what has just been said, the cleaning unit 12 can be provided with means (not illustrated) for moving vertically the afore-mentioned spraying means 120 from a lowered rest position to a raised position, in which they are partially introduced into the afore-mentioned hopper 20.

[0047] Finally, the washing apparatus 1 comprises a collection tank 14, underlying the afore-mentioned glazing head 2 and the afore-mentioned cleaning unit 12, aimed at receiving, by gravity, the detergent liquid used in the washing phase of the afore-mentioned hopper 20 and the particles of dirt removed from the afore-mentioned hopper 20 (Figs. 8 and 9).

[0048] The waste liquid flowing into the collection tank 14 is then evacuated through a duct 15 in order to be duly treated.

[0049] The operation of the apparatus 1 is managed in accordance with the operation of the glazing head 2 by means of the usual electronic systems, such as processing units, PLCs and suitable software, commonly used in automation; such components, not illustrated nor described in detail since they are not relevant for the purposes of the invention, can be integrated in the module M or external to it and be part of a more complex management system that governs the management of the whole production line.

[0050] As can already be understood from the above structural description, the apparatus 1 is inactive during the normal operation of the glazing head 2, therefore:

- the glazing head 2 is situated in its lowered working position B by the lifting apparatus 11;
- the hopper 20 is configured in its operating position W, in which the fixed part 20F and movable part 20M define the calibrated outlet slot 21 for the release of the liquid ceramic glaze onto the ceramic tiles passing below;
- the cleaning unit 12 is in its rest position N, withdrawn and spaced from the afore-mentioned glazing head 2;
- the spraying units 120 are deactivated.

[0051] When washing and cleaning the hopper 20 is necessary, if the colour of the glaze is to be changed or any lumps or encrustations are to be removed after they have been formed in the calibrated outlet slot 21 altering the quality of the final result of the decoration, it is nec-

essary to stop production in the glazing head 2, according to the procedures provided for this purpose and known to those skilled in the art; when the machine stops, the following steps follow, in this order:

- the lifting means 11 take the glazing head 2 to its temporary introduction raised position (when required), or directly to the maintenance raised position H;
- the hopper 20 is configured in its open position A;
- the cleaning unit 12, controlled by the moving means 13, is moved forward, to reach its washing position L, in which it is situated below the afore-mentioned glazing head 2;
- if applicable, the glazing head 2 is slightly lowered from its raised position to the maintenance position H;
- if applicable, the means for lifting the afore-mentioned spraying means 120 are operated to introduce them, at least partially, into the afore-mentioned hopper 20;
- the spraying means 120 are supplied with pressurised cleaning liquid and, when required, moved in one direction and the other, together with the slide 121, by the actuating means 123 along the linear guide 122, for the predetermined number of times in the washing cycle.

[0052] Upon completion of the predetermined washing cycle, the normal operation of the glazing head 2 is restarted by the above listed actions performed in reverse order.

[0053] The above description brings to light with extreme clarity all the advantageous aspects of the proposed apparatus, which already from the beginning is prepared as an integral part of a module including the glazing head with which it must interact functionally.

[0054] The preferred described embodiment of the proposed washing apparatus is particularly suitable for the glazing head produced by the Applicant, however it is evident that it can easily be used, with necessary adjustments but with a similar construction design, also for different curtain coating heads, provided that they can be opened, with the simple application of the afore-mentioned lifting means.

[0055] As a further advantageous aspect, it is worth noting that the proposed washing apparatus is compact and, when not in operation, it does not affect the functions of the glazing head and/or the associated production line in any way.

[0056] The module that incorporates both the apparatus and the glazing head makes it possible to best prepare what is necessary to implement a fully automatic operation of the washing cycles, in phase relation with the shutdown of the production line and with the preliminary operations of the hopper, without the intervention of operators and also with remote control, laying the foundations for compliance with the requirements of the re-

cent legislation known as Industry 4.0.

[0057] Advantageously, the washing apparatus is realised with simple construction solutions, extensively tested as for automation, guaranteeing correct, constant and reliable operation over time.

[0058] However, it is understood that what is described above is illustrative and not limiting, therefore any detail variations that may be necessary for technical and/or functional reasons are considered from now on within the same protection scope defined by the claims below.

Claims

1. Apparatus for washing a glazing head (2), the glazing head being situated above a straight conveying line (3) on which ceramic tiles or slabs are made to advance, and with the head being aimed at uniformly coating with liquid ceramic glaze a part or all of the upper surface of said ceramic tiles or slabs, with said glazing head (2) comprising: a hopper (20) including two parts, a first part (20F) and a second part (20M), movable with respect to each other; operating means (10), designed to set an operating position (W) of said hopper (20), in which said first part (20F) and second part (20M) are suitably moved close to each other to define a calibrated outlet slot (21) for said liquid ceramic glaze, and also designed to set said hopper (20) in an open position (A), in which said first part (20F) and second part (20M) are moved away from each other, with said apparatus (1) **characterized in that** it includes:

- lifting means (11), connected to said glazing head (2) and provided for moving vertically the latter between at least two characteristic positions, respectively a lowered working position (B), in which said calibrated outlet slot (21) is located at a predetermined height from said ceramic tiles or slabs passing below, and a raised maintenance position (H), in which said glazing head (2) is placed at an appropriately raised height from said transport line (3);
- a cleaning unit (12), situated transversely to said straight conveying line (3) and parallel to said glazing head (2);
- spraying means (120), provided in said cleaning unit (12) to dispense cleaning fluid under pressure inside said hopper (20), when it is in its said open position (A);
- moving means (13), connected to said cleaning unit (12), provided for moving the latter in a longitudinal direction with respect to said straight conveying line (3), between a rest position (N), in which the same cleaning unit (12) is spaced from said glazing head (2), so as to allow the latter to be placed in its lowered working position (B), and a washing position (L), in which said

cleaning unit (12) is located below said glazing head (2), previously placed in the afore-mentioned raised maintenance position (H), and with said hopper (20) being in its open position (A), so that said spraying means (120) are substantially centred with respect to said hopper (20), so that the cleaning liquid ejected therefrom hits and washes the respective internal walls of said hopper (20).

2. Apparatus according to claim 1, **characterized in that** said lifting means (11) connected to the glazing head (2) are provided for defining an additional introduction raised position for the curtain coating head, at a higher level than said maintenance raised position (H), which is selected in phase relation with said moving of the cleaning unit (12) between the respective rest position (N) and washing position (L), and vice versa, in order to avoid collisions between said spraying means (120) and said hopper (20).
3. Apparatus according to claim 1 or 2, **characterized in that** said lifting means (11) include two linear actuators (110) with recirculating ball screw, driven synchronously by at least one motor device.
4. Apparatus according to claim 1, **characterized in that** said spraying means (120) in said cleaning unit (12) comprise an omnidirectional multiple jet head, and **in that** said jet head (120) is mounted on a slide (121) engaged in a linear guide (122) of sufficient extension to enable the jet head (120) to move across the entire inside width of said hopper (20), in a direction transverse to said straight conveying line (3), and **in that** actuating means (123) are connected to said slide (121) for operating the same, together with said jet head (120), in both directions.
5. Apparatus according to claim 4, **characterized in that** said actuating means (123) comprise a stemless pneumatic cylinder.
6. Apparatus according to claim 1, **characterized in that** said spraying means (120) in said cleaning unit (12) consist of an elongated tubular element, extending over almost the entire inside width of said hopper (20), in a transverse direction to said straight conveying line (3), and **in that** said elongated tubular element (120) includes multiple nozzles variously positioned and oriented therein.
7. Apparatus according to claim 1 or 4 or 6, **characterized in that** moving means are provided in said cleaning unit (12) for vertically moving said spraying means (120) from a lowered rest position to a raised position in which they are partially introduced into said hopper (20).

8. Apparatus according to claim 1, **characterized in that** said moving means (13), connected to said cleaning unit (12), include: two wheeled carriages (130), symmetrically attached to the sides of said cleaning unit (12); two linear guides (131), coupled with the bearing structure of said apparatus (1) and extending longitudinally to said straight conveying line (3), with said carriages (130) being slidably engaged in said guides (131). 5
9. Apparatus according to claim 8, **characterized in that** said moving means (13) are of a motorized type and comprise at least one linear actuator (132) capable of making said cleaning unit (12) move between respective said rest (N) and washing (L) positions. 10 15
10. Apparatus according to claim 9, **characterized in that** said at least one linear actuator (132) comprises a stem-less pneumatic cylinder. 20
11. Apparatus according to claim 8, **characterized in that** said moving means (13) are of a motorized type and comprise at least one gripping handle, coupled with said cleaning unit (12), for imparting movements of said cleaning unit between said rest (N) and washing (L) positions, respectively. 25

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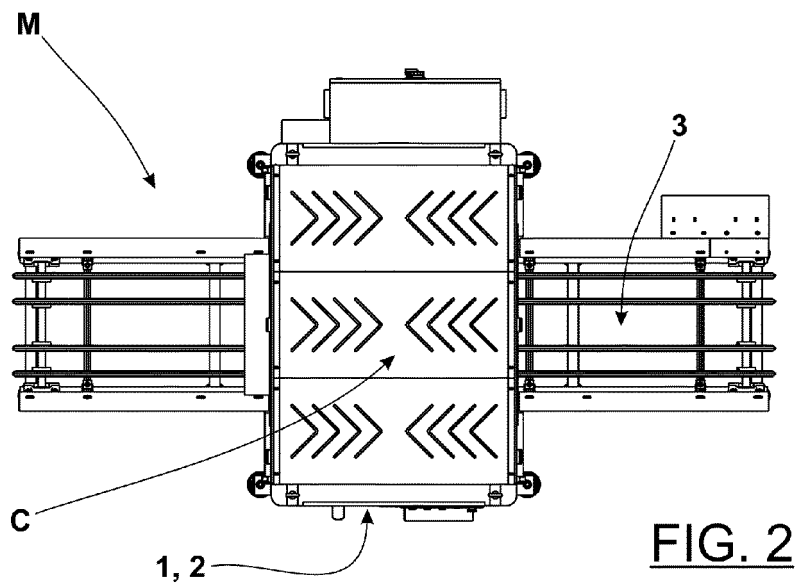
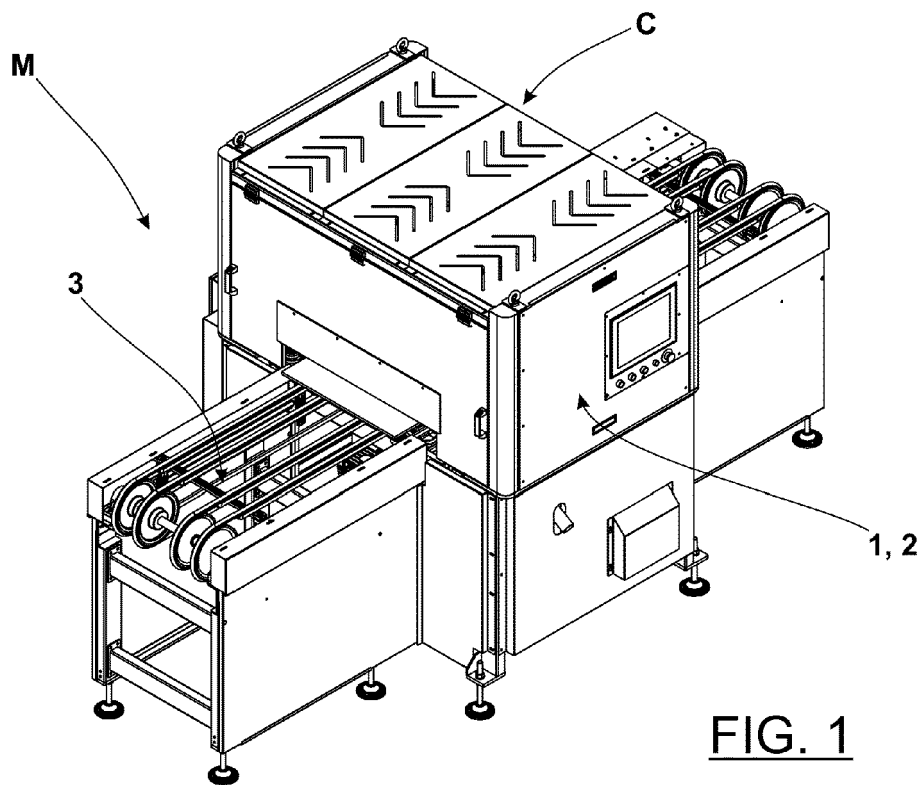
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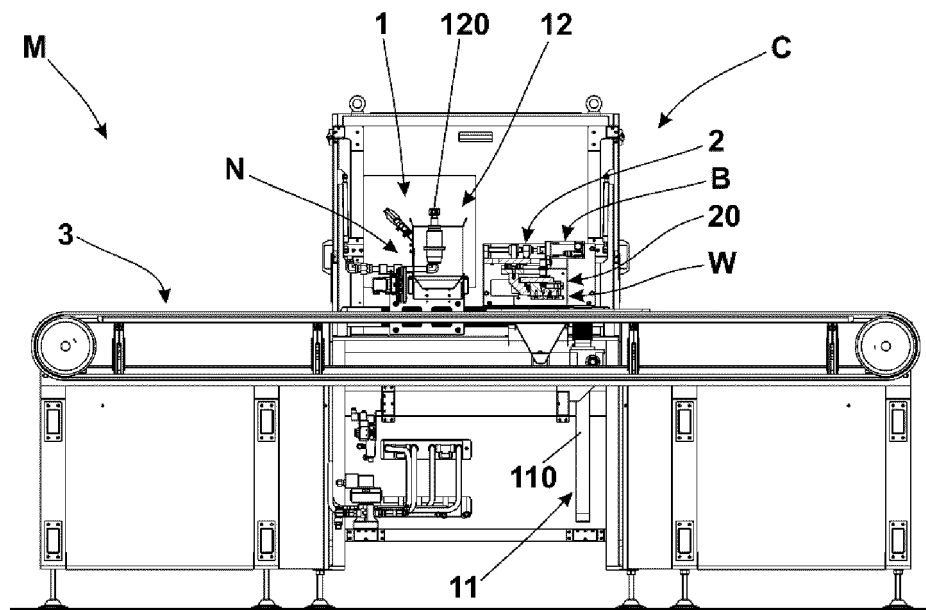


FIG. 3

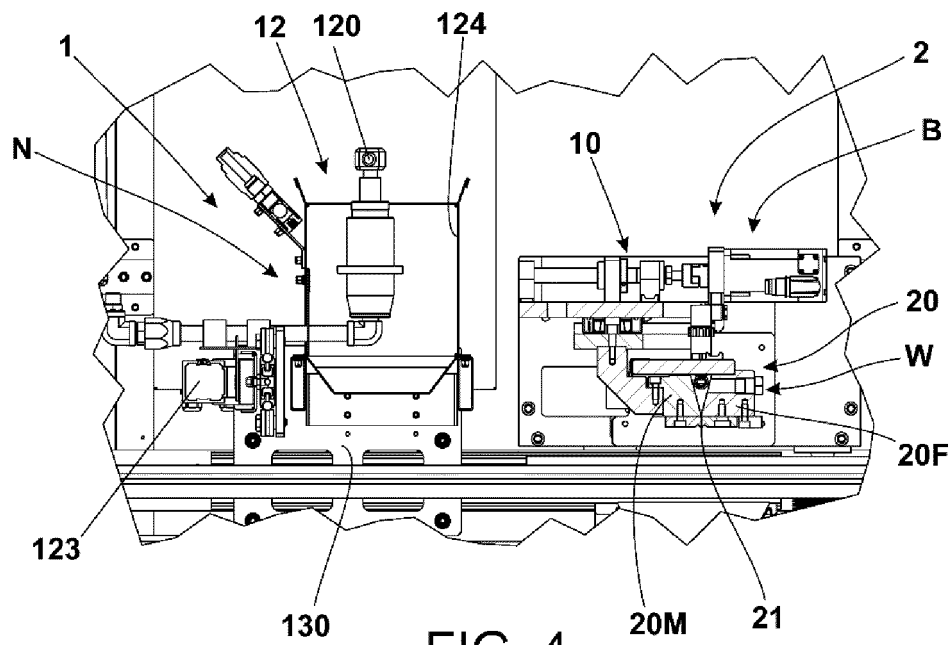


FIG. 4

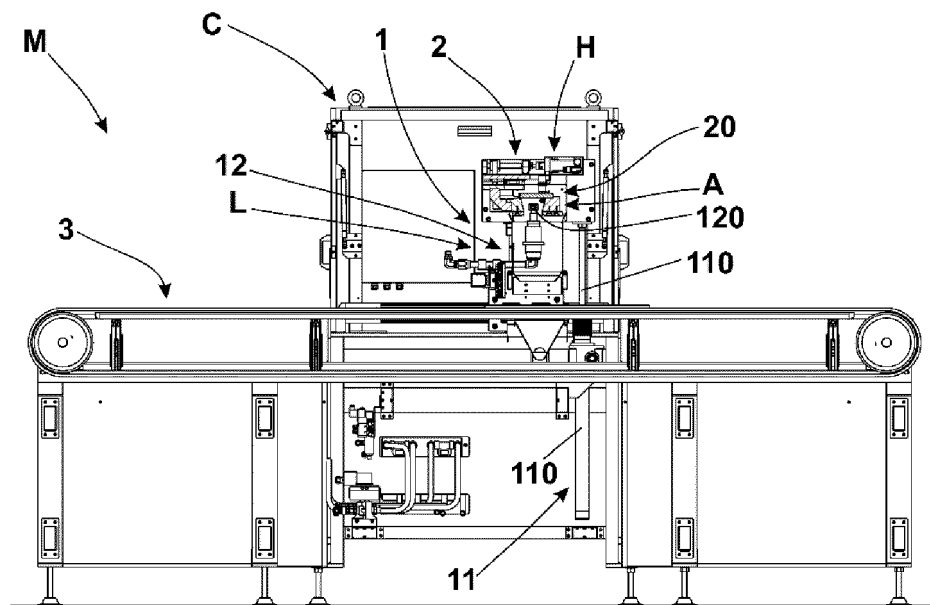


FIG. 5

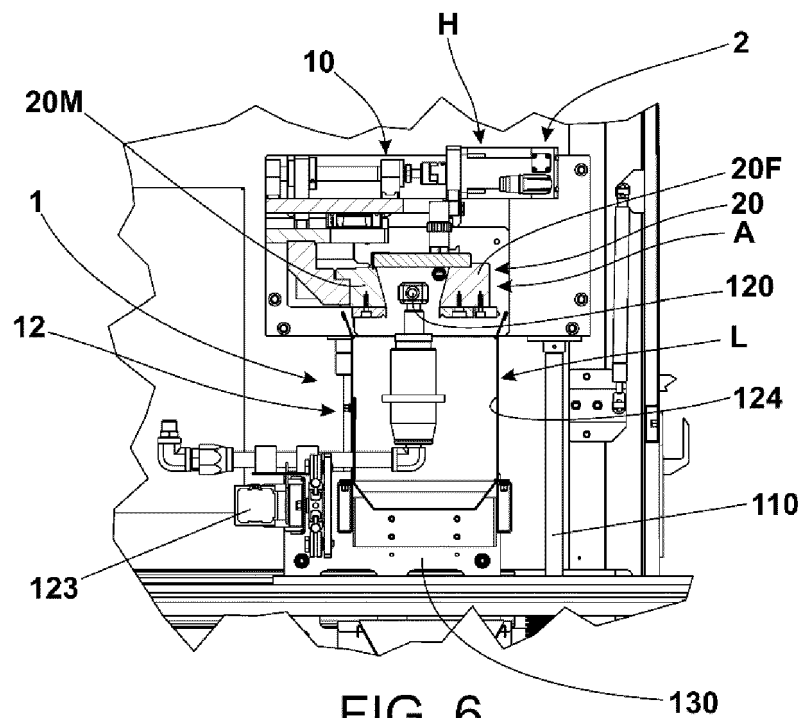
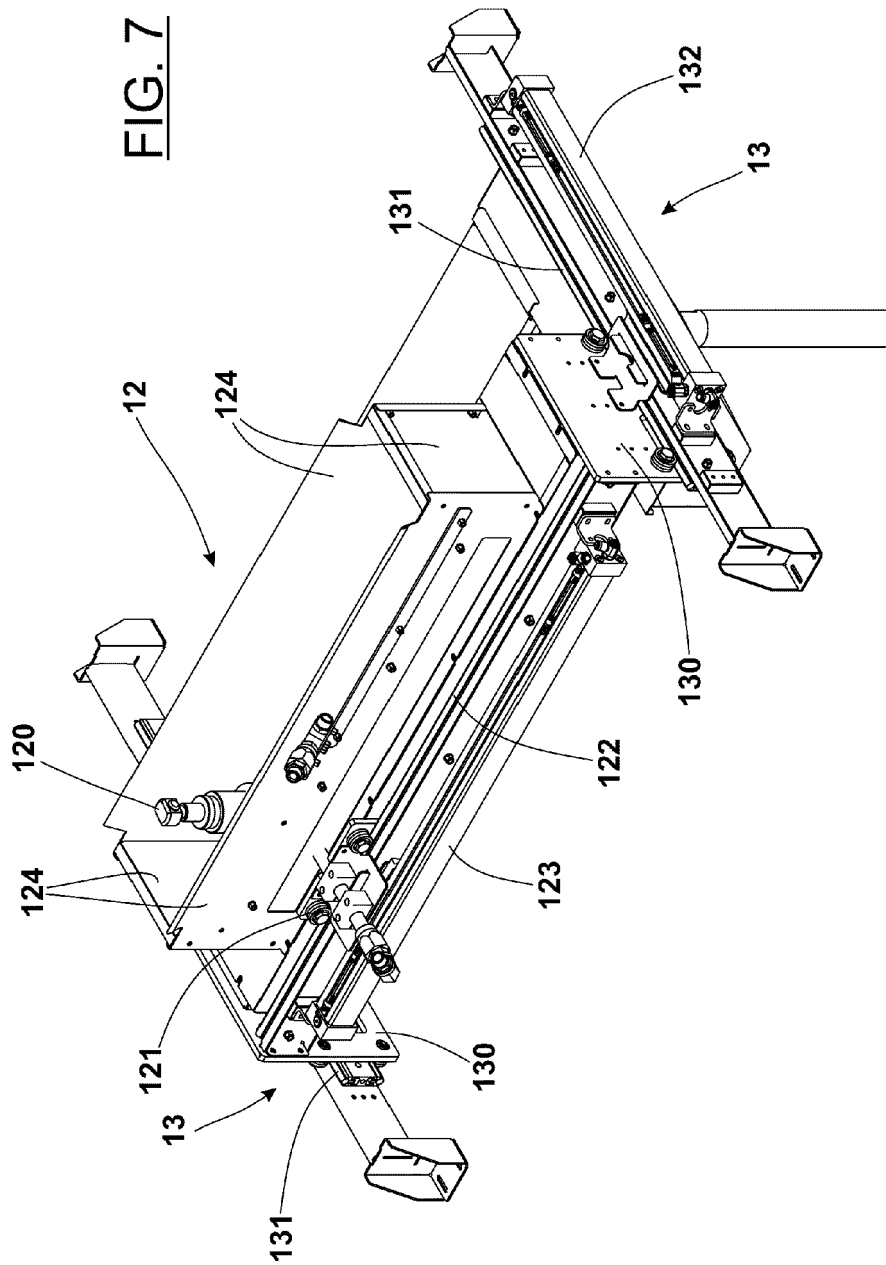


FIG. 6

FIG. 7



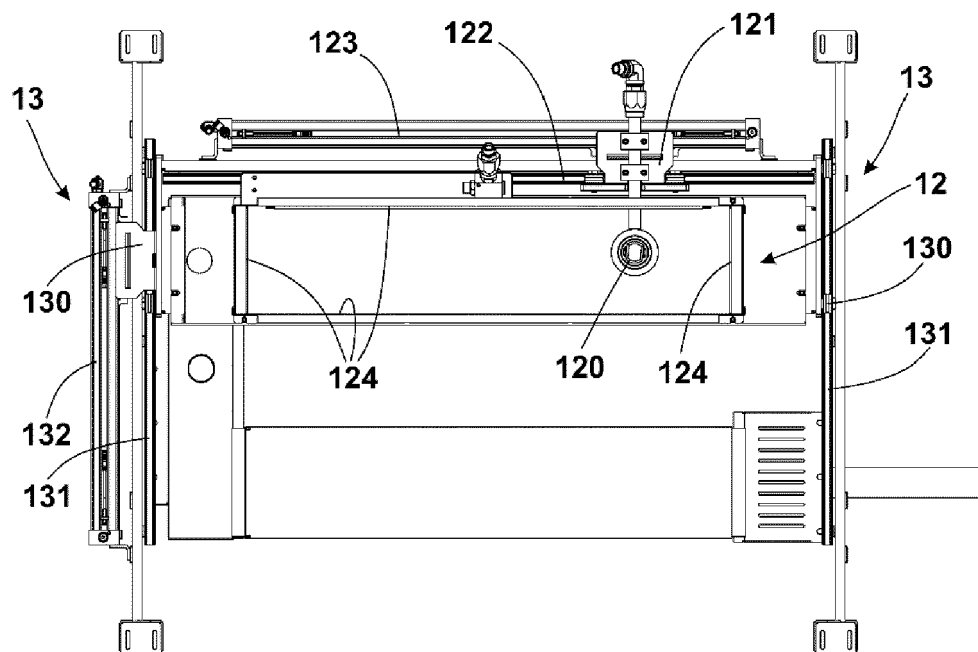
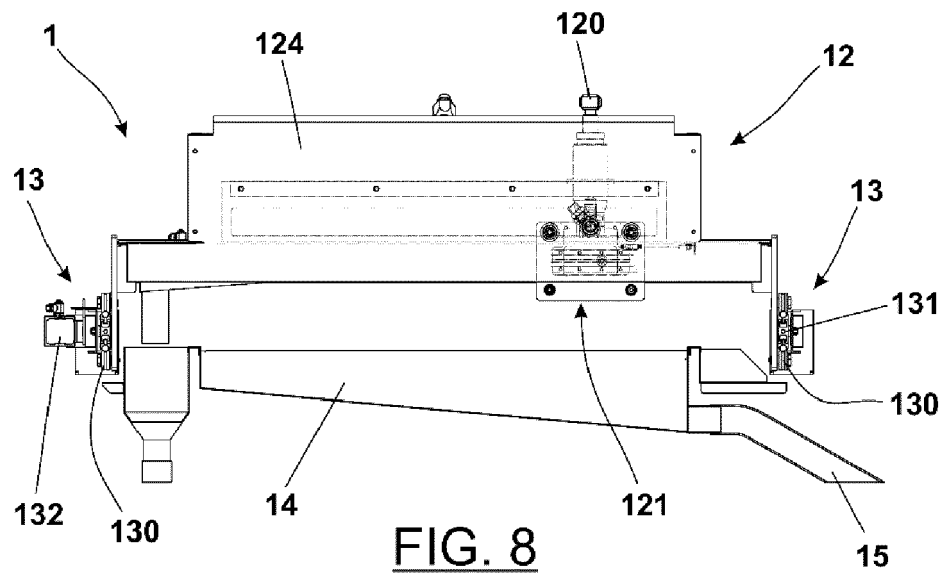


FIG. 10

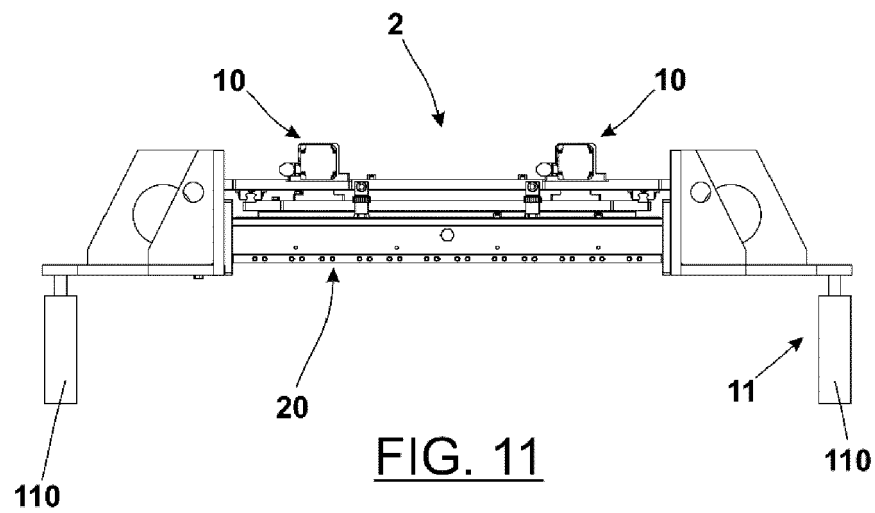
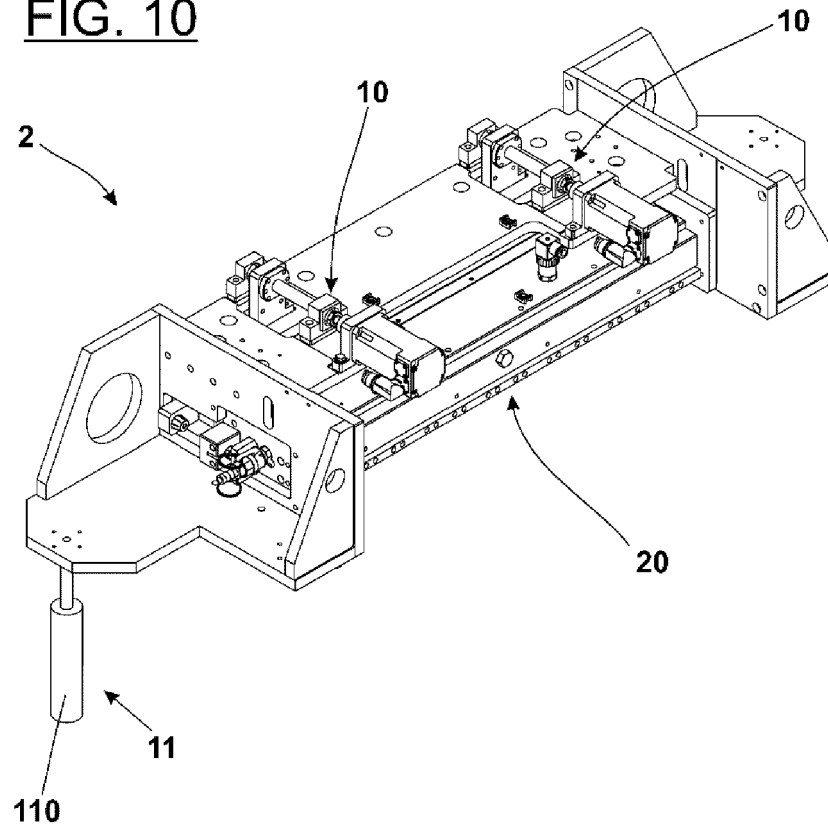


FIG. 11



EUROPEAN SEARCH REPORT

Application Number

EP 23 20 6360

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 March 2024	Examiner Roldán Abalos, Jaime
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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