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(54) **An apparatus for bringing bottles to a desired temperature in a bottling plant**

(57) The present invention relates to an apparatus for bringing bottles to a desired temperature in a bottling plant. More particularly, the invention concerns an apparatus in which the bottles are conveyed in alignment through a heating/cooling zone, so that the order of the

bottles leaving said heating/cooling zone is the same as that of the bottles entering said zone. The invention is especially applied as an apparatus for heating cold bottles, of a kind intended for use in a bottling plant before a labelling machine.

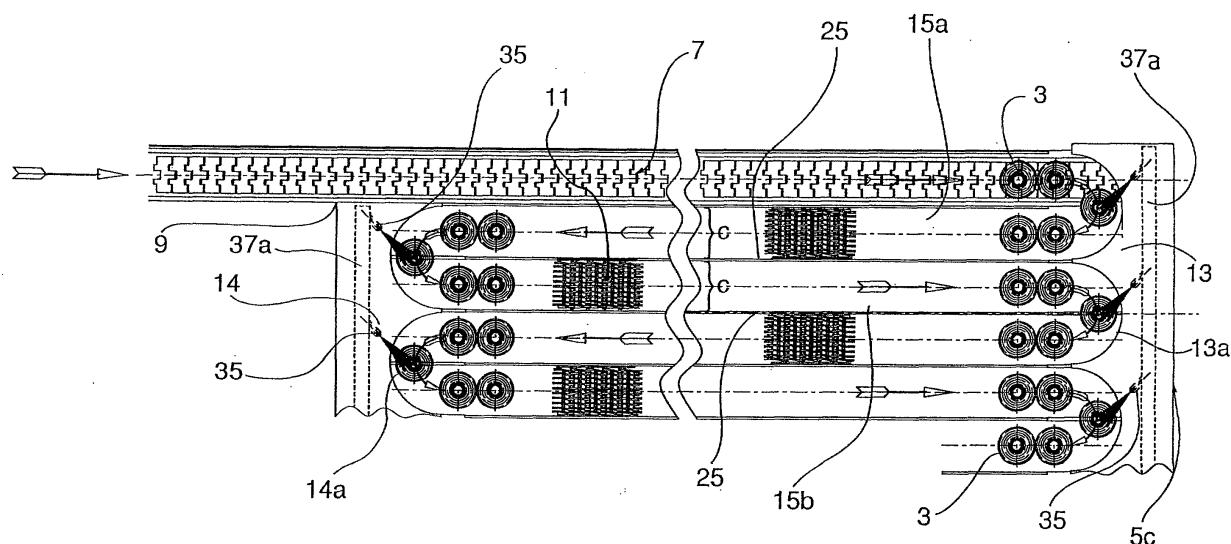


Fig. 2

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Description

[0001] The present invention relates to an apparatus for bringing bottles to a desired temperature in a bottling plant.

[0002] More particularly, the invention concerns an apparatus for heating cold bottles, the apparatus being of a kind intended for use in a bottling plant before a labelling machine.

[0003] The present invention is especially concerned with plants for bottling products, such as champagne-type sparkling wines, for which the bottles are filled at low temperature.

[0004] The large bottling plants generally comprise a series of automated apparatuses performing the several operations of the bottling cycle, such as washing and drying the inside of the bottles, filling the bottles, corking or capping the bottles, washing and drying the bottle outside, labelling and packaging the bottles.

[0005] When bottling special products, such as champagne-type wines and other sparkling wines, bottle filling takes place at very low temperature, close to 0°C, since the wine is stored at such temperature. Since the subsequent labelling step takes place at ambient temperature, generally close to 25°C, condensate could form onto the outside surface of the bottles, what would be detrimental to label application. To avoid formation of said condensate, it is necessary to provide, before the labelling station, an automated apparatus bringing the bottles from the bottling temperature to ambient temperature.

[0006] In present plants, such heating is performed immediately after bottle closing and is performed, according to the prior art, either by randomly immersing the bottles into a water-containing tank and then by injecting high-temperature steam into the tank, or by moving the bottles, randomly arranged on a conveyor belt, through downwards directed hot water jets (at about 70°C).

[0007] Since the bottles are randomly placed on the conveyor belt making them advance through the hot water jets, a major problem in present plants is that it is impossible to determine how long each bottle remained under the hot water jets is. A similar drawback is encountered in plants based on bottle immersion into a tank and steam injection, since also in that case the exposure time of the bottles to the heat source is considerably different for the different bottles, since time spent by each bottle inside the tank is random.

[0008] It is a primary object of the present invention to provide an apparatus that allows setting predetermining heating time and modalities identical for all bottles.

[0009] A second problem, closely related to the first one, is the need to use water at very high temperature for heating. Indeed, water must be sufficiently hot to bring to ambient temperature also bottles remaining in the heating station less than an average time.

[0010] The need to use water at so high a temperature

(about 70°C) leads to two different drawbacks: on the one side, the high energy cost for causing so high a temperature variation in a considerable liquid mass; on the other side, the risk of negatively affecting the quality of the wine contained in the bottles, that risk being particularly significant for bottles remaining in the heating station longer than an average time.

[0011] Thus, it is another object of the present invention to provide a bottle heating station having such characteristics that use of water at mild temperature (about 30°C) is possible.

[0012] Another problem related with the heating phase is the high acoustic pollution caused by collisions among bottles on the conveyor belt.

[0013] Therefore, it is a third object of the present invention to provide an apparatus exhibiting a reduced noise level.

[0014] Lastly, a further problem related with the heating phase is the need to obtain, for large-scale production, a high processing speed, so that no delay is created along the bottling plant.

[0015] Thus, it is a further object of the present invention to provide an apparatus allowing heating large amounts of bottles in a limited time.

[0016] The above and other objects are achieved by an apparatus for heating cold bottles as defined in the appended claims.

[0017] According to the invention, the bottles to be heated are made to advance through a heating zone, where the bottles are hit by a warm fluid, e. g. water, by means of a conveyor line, e. g. a conveyor belt, on which the bottles are kept aligned and in upright position.

[0018] Thanks to the fixed and aligned arrangement, the order of the bottles when entering the heating zone is exactly the same as when leaving such zone: the first bottle in is certainly also the first out.

[0019] Consequently, all bottles remain for the same time interval within the heating zone, and such time interval can be previously known and can be modified according to the needs, by simply varying the advancing speed of the conveyor belt.

[0020] Thus it is possible, i.e., to use water at lower temperature than normally used in the prior art systems for heating the bottles. It is sufficient to set a time for moving across the heating zone which is long enough for the temperature of the water used to heat the bottles may fall down even below 30°C.

[0021] Advantageously, according to the invention, the conveyor line inside the heating zone is divided into a plurality of sections arranged parallel to each other or according to different directions, so as to reduce the longitudinal extension of the apparatus and, consequently, its overall size.

[0022] The invention provides for walls arranged along the conveyor line acting as partitions between adjacent and parallel sections of said conveyor line, to prevent contact between bottles advancing in different directions on the conveyor line.

[0023] Advantageously, the invention provides for the possibility of arranging partitions of different thickness, to adapt such thickness to the diameter of the different bottles being introduced into the heating zone.

[0024] The reduction of the apparatus size attainable according to the invention allows enclosing said apparatus into a compact structure. Thus, reduction of the level of acoustic pollution in the environment where the apparatus is used is possible.

[0025] Noise reduction in the apparatus is moreover favoured in that collision during heating are greatly reduced, as the bottles are orderly aligned on the conveyor line.

[0026] Since the conveyor line is divided into several parallel sections in which the bottles move in opposite direction, the invention provides for introducing means capable of forcing the transfer of the bottles from one section to another in the conveyor line.

[0027] The apparatus according to the invention is especially intended for plants for bottling cold bottles, but it could be included into a general bottling plant, used both for bottles filled at low temperature and for bottles filled at ambient temperature, by simply providing an additional conveyor line bypassing the heating station.

[0028] A preferred embodiment of the invention will be better described with reference to the accompanying drawings, in which:

- Fig. 1 is a plan view of the apparatus according to the invention;
- Fig. 2 is an enlarged view of a detail of Fig. 1;
- Fig. 3 is an external side view of the apparatus shown in Fig. 1;
- Fig. 4 is an internal side view of the apparatus shown in Fig. 1;
- Fig. 5 is a cross-sectional view of the conveyor device.

[0029] With reference to Fig. 1, there is shown an apparatus according to the invention, generally denoted by reference numeral 1, including a substantially rectangular bottle heating zone A, defined by a base 5a, side walls 5b - 5e and a roof 5f.

[0030] A device 15 for conveying the bottles is provided inside heating zone A, which device guides the aligned and upright standing bottles along a zigzag path.

[0031] According to the invention, conveyor device 15 comprises a plurality of parallel conveyor belts 15a, 15b, each moving in opposite direction with respect to the adjacent ones.

[0032] More particularly, and referring still to Fig. 1, conveyor belts 15a move from the right to the left, and belts 15b from the left to the right. Conveyor belts 15a, 15b are separated by partitions 25 defining a rectilinear channel or path of which the width only just exceeds the diameter of the bottles moving on the belt.

[0033] Said conveyor belts further co-operate with two shaped guides 13 and 14, located in correspond-

ence of right wall 5c and left wall 5e, respectively, of zone A, so as to allow transferring the bottles from a belt to another one.

[0034] The bottles enter and leave zone A through corresponding entrance and exit openings 9 and 19, respectively, diagonally opposed on sides 5e and 5c.

[0035] A pair of conveyor belts, denoted 7 and 17, respectively, run externally of zone A and parallel to belts 15a, 15b and extend inside apparatus 1 up to shaped guides 13 and 14, respectively. Belts 7, 17 connect apparatus 1 with the remaining parts of the bottling plant, before and past apparatus 1.

[0036] In the whole, according to the invention, conveyor device 15 so defined allows the bottles to travel along a path substantially covering the whole area of zone A from opening 9 on left side 5e up to opening 19 on right side 5c.

[0037] Turning now to Fig. 2, shaped guides 13, 14 are preferably made each of a member of metal sheet or plastics or any other material with substantially rectangular development, shaped so as to define, on its side facing conveyor belts 15a, 15b, corresponding half-circular concave portions 13a, 14a, the radius of which substantially corresponds with the distance between two adjacent partitions 25 and hence with the width of the passage for bottles 3 in channel C defined between the two partitions 25.

[0038] Fig. 2 further shows the means provided by the invention to force bottles 3 to pass from a conveyor belt to the subsequent one. Such means comprise a set of deflecting nozzles 35 inclined by about 45° with respect to the advancing direction of bottles 3, so as to send a jet of fluid under pressure, here water, against the external surfaces of bottles 3. Nozzles 35 are provided in each concave portion 13a, 14a of guides 13, 14 and are suitably positioned and oriented so as to favour the change of direction of bottles 3.

[0039] In the embodiment shown, nozzles 35 are arranged along a pipe 37a and are fed with the same liquid as used for heating the bottles, through a piping system 37. Consequently, the water jets from said nozzles 35 not only cause the transfer of bottles 3 from a conveyor belt to another, but they also contribute to bottle heating.

[0040] In steady state operation of apparatus 1, the action of deflecting nozzles 35 could be superfluous: indeed, to make a bottle pass from one conveyor belt to another, the push by the following bottles on the conveyor line could be enough. Thus, it is possible to conceive a variant of the described embodiment, in which valves are provided to control the opening and closing of deflecting nozzles 35. Thus, nozzles 35 could be operated only when necessary, e.g. during an unloading phase of the bottles remained in apparatus 1.

[0041] Lastly, Fig. 2 shows a detail of the structure of conveyor belts 15a, 15b: they comprise a set of mutually articulated meshes 11 of plastic material. Said meshes 11 have a plurality of holes with such a size that they allow water used for heating bottles 3 to flow away.

[0042] As it can be better seen in Fig. 3, the particular zigzag path bottles 3 are to follow allows reducing the size of heating zone A and containing same within a closed and compact structure. Heating the bottles inside a closed structure allows, i. a., reducing the noise generated by apparatus 1.

[0043] Fig. 3 further shows that side walls 5b-5e of structure 5 include a set of inspection doors 71 making maintenance operations easier.

[0044] Fig. 4 shows the means for heating bottles 3. Such means essentially comprise a set of spraying nozzles 41 arranged along the whole length of conveyor belts 15a, 15b. In the embodiment shown, nozzles 41 are located above bottles 3, in correspondence with the centre line of conveyor belts 15a, 15b and are downwards directed. Nozzles 41 emit water jets at a temperature higher than that of bottles 3, which jets impinge against the outer surfaces of said bottles 3.

[0045] It will be appreciated that, according to the plan of the invention, bottles 3 move in alignment and in a predetermined order on conveyor line 15 under the water jets coming from spraying nozzles 41. Consequently, all bottles 3 remain inside heating zone A for the same time interval, and such time interval can be set according to the needs, by simply acting on the advancing speed of conveyor belts 15a, 15b. Thus, by increasing the permanence time of bottles 3 in the heating zone, it is possible to lower the temperature of water used to heat the bottles according to the needs. Referring to the illustrated embodiment, water from spraying nozzles 41 may be at a temperature in the range 25°C to 30°C, such temperature being sufficient to effectively bring bottles 3 to ambient temperature in such a reasonable time that the bottling plant is not slowed down.

[0046] Always referring to Fig. 4, the water used to heat bottles 3 passes through perforated meshes 11 of conveyor belts 15a, 15b and is collected by a tray 49 with inclined bottom, located beneath conveyor belts 15a, 15b and communicating with a recovery tank 51. Water is taken from recovery tank 51 by means of a pump 43. Said pump 43 supplies a piping circuit 37, including in particular pipes 37a equipped with deflecting nozzles 35 and pipes 37b equipped with nozzles 41.

[0047] Due to thermal exchange with bottles 3 and to possible dispersions, water collected in recovery tank 51 is at lower temperature than water coming out from nozzles 41 and 35. Thus, to maintain water in circuit 37 at the desired temperature, it is necessary to provide heating means, e.g. a water/steam heat exchanger exploiting, for water heating, steam generally present in industrial plants.

[0048] Lastly Fig. 4 shows the driving mechanism of conveyor belts 15a, 15b. Such belts are driven by the rotation of pinions 59 and 61, respectively, of which the teeth are such that they mesh with the holes in the plastic meshes forming belts 15a, 15b. Pinions 59 and 61 are in turn driven into rotation by gear motors 67 and 69 through chains 63 and 65.

[0049] Turning to Fig. 5, each section 15a, 15b of conveyor device 15 runs on inverted-T bearings 21. Bearings 21 support conveyor belts 15a, 15b on both sides, while leaving the central belt portions free to allow water used for heating bottles 3 to flow away through meshes 11 forming said belts 15a, 15b.

[0050] Fig. 5 shows in detail the structure of partitions 25 used to avoid contact between bottles advancing in different directions.

[0051] More particularly, Fig. 5 shows that partitions 25 comprise a portion 25a secured to bearings 21 and two movable portions 25b which, advantageously, can have different thickness depending on the size of bottles 3 to be heated. Movable portions 25b comprise a set of bearing feet 29, which are received in corresponding grooves provided in the bases of bearings 21.

[0052] In that manner, movable portions 25b can be quickly removed and replaced with portions of different thickness, so that the width of the channel in which the bottles move is adapted to the bottle diameter.

[0053] It will be further appreciated that the arrangement of the spraying nozzles shown in Fig. 5 does not correspond with the arrangement shown in Fig. 4. Indeed Fig. 5 shows a variant of the invention, in which spraying nozzles 41 are located at a lower level, preferably on a horizontal plane substantially passing through the bottle necks. Nozzles 41 therefore are at a lower level than the corks (caps) of bottles 3 and are so oriented that the water jets impinge against the side surfaces of bottles 3 below the necks, where the amount of liquid contained in a bottle to be heated is greater.

[0054] Fig. 5 also shows further spraying nozzles 57, possibly included into apparatus 1. Nozzles 57 are located beneath conveyor belts 15a, 15b and are upwards oriented, so that water impinges against the bottle bottoms, where the amount of liquid to be heated is greater.

[0055] Similarly to nozzles 41, also nozzles 57 are arranged along a section 37c of hydraulic circuit 37 supplying all nozzles of apparatus 1 with warm water.

[0056] Whilst the invention has been disclosed in connection with a fluid at a temperature higher than that of the bottles, in order to heat the bottles, it is possible however to use a cold fluid to lower the bottle temperature, if required.

Claims

1. An apparatus for bringing bottles to a desired temperature in a bottling plant, the apparatus comprising:
 - a zone (A) for heating/cooling the bottles, which zone has an entrance and an exit for the bottles;
 - means for transferring the bottles through said heating/cooling zone (A);

characterised in that said transfer means com-

- prise a conveyor device (15) in which the bottles (3) are conveyed in alignment through said heating/cooling zone (A), so that the order of the bottles (3) leaving said heating/cooling zone (A) is the same as that of the bottles (3) entering said heating/cooling zone (A). 5
2. An apparatus as claimed in claim 1, wherein said conveyor device (15) guides the bottles (3) in alignment and in upright position along a zigzag path through said heating/cooling zone (A). 10
3. An apparatus as claimed in claim 2, wherein said conveyor device (15) comprises a plurality of parallel conveyor belts (15a, 15b), each advancing in opposite direction with respect to the adjacent belts. 15
4. An apparatus as claimed in claim 3, wherein said conveyor belts (15a, 15b) are separated by partitions (25) defining a rectilinear path or channel (C) of which the width only just exceeds the diameter of the bottles (3) moving on the conveyor belts (15a, 15b). 20
5. An apparatus as claimed in claim 4, wherein said partitions (25) comprise a fixed portion (25a) and a removable portion (25b), allowing modifying the thickness of said partitions (25) and consequently the width of said channel (C). 25
6. An apparatus as claimed in claim 4 or 5, further comprising two shaped guides (13, 14), located in correspondence of the end walls of the zone (A), at opposite ends of said conveyor belts (15a, 15b), so as to allow transversally transferring the bottles (3) from one belt to another thanks to the push by the following bottles. 30
7. An apparatus as claimed in claim 6, wherein said shaped guides (13, 14) are obtained from a member of metal sheet or plastic with substantially rectangular development, shaped so as to define, on the side facing the conveyor belts (15a, 15b), corresponding half-circular concave portions (13a, 14a), of which the radius substantially corresponds with the distance between two adjacent partitions (25) and the width of the channel (C) for the bottles (3) defined between two partitions (25). 35
8. An apparatus as claimed in claim 6 or 7, further comprising, in correspondence with said concave portions (13a, 14a), means for forcing the bottles (3) to pass from a conveyor belt (15a, 15b) advancing in one direction to the subsequent belt advancing in opposite direction, said means comprising a set of deflecting nozzles (35) inclined so as to send a jet of fluid under pressure against the external surfaces of the bottles (3), thereby favouring the 40
- change of direction of the bottles (3).
9. An apparatus as claimed in claim 8, wherein said deflecting nozzles (35) are arranged along a pipe (37a) substantially perpendicular to the advancing direction of conveyor belts (15a, 15b) and parallel with the surface of said heating/cooling zone (A). 45
10. An apparatus as claimed in any of claims 3 to 9, further comprising two further conveyor belts (7, 17), for introducing and removing the bottles into and from the zone (A), which belts partly extend outside the zone (A) and run parallel with the conveyor belts (15a, 15b) located inside the zone (A), as long as they reach, inside the apparatus (1), the shaped guides (13, 14).
11. An apparatus as claimed in any preceding claim, wherein said zone (A) has a substantially rectangular shape and is defined by a base (5a), vertical side walls (5b - 5e) and a roof (5f).
12. An apparatus as claimed in claim 11, wherein said side walls (5b - 5e) include a plurality of inspection doors (71).
13. An apparatus as claimed in claim 11, wherein said openings for bottle entrance and exit into and from the zone (A) are arranged diagonally opposed on the walls of said zone (A).
14. An apparatus as claimed in any preceding claim, wherein said conveyor device (15) runs inside said zone (A) so that the bottles (3) are made to travel along a path substantially covering the whole area of said zone (A) from said entrance opening (9) up to exit (19).
15. An apparatus as claimed in any of claims 3 to 10, wherein said conveyor belts (15a, 15b) are made of a plurality of mutually articulated meshes (11) of plastic material.
16. An apparatus as claimed in claim 15, wherein said meshes (11) have a plurality of holes.
17. An apparatus as claimed in any preceding claim, wherein said heating/cooling zone (A) is equipped with a plurality of nozzles (41, 57) connected to a hydraulic circuit and emitting a fluid at higher/lower temperature than the bottles (3) passing in said heating/cooling zone (A), said nozzles being arranged so that the fluid impinge against said bottles.
18. An apparatus as claimed in claim 17, wherein said nozzles (41, 57) are arranged along parallel pipes in said hydraulic circuit (37), which pipes are located above said conveyor device (15) at a level higher 55

than the bottle level, so that the fluid impinges against the bottles from above.

19. An apparatus as claimed in claim 17, wherein said nozzles (41, 57) are arranged along parallel pipes of said hydraulic circuit (37), which pipes are located above said conveyor device (15) at substantially the same level as the bottle necks, so that the fluid laterally impinges against the bottles. 5 10
20. An apparatus as claimed in claim 17, wherein said nozzles (41, 57) are arranged along parallel pipes of said hydraulic circuit (37), which pipes are located beneath said conveyor device (15), so that the fluid impinges against the bottles from beneath. 15
21. An apparatus as claimed in any of claims 17 to 20, wherein said fluid is water.
22. An apparatus as claimed in claims 7 and 17, wherein said deflecting nozzles (35) and said heating/cooling nozzles (41) are fed with the same liquid. 20
23. An apparatus as claimed in any of claims 16 to 21, wherein a tray (49) with inclined bottom is located beneath said conveyor device (15) and is in communication, at its lower portion, with a recovery tank (51). 25
24. An apparatus as claimed in claim 23, wherein said hydraulic circuit (37) includes a pump (43) taking the liquid from said recovery tank (51) and sending the liquid under pressure to said hydraulic circuit, and means for heating/cooling said liquid. 30 35
25. An apparatus as claimed in claim 23, wherein said liquid is heated to a temperature of about 30°C.
26. An apparatus as claimed in claim 25, wherein said means for heating/cooling said liquid include a water/steam heat exchanger. 40

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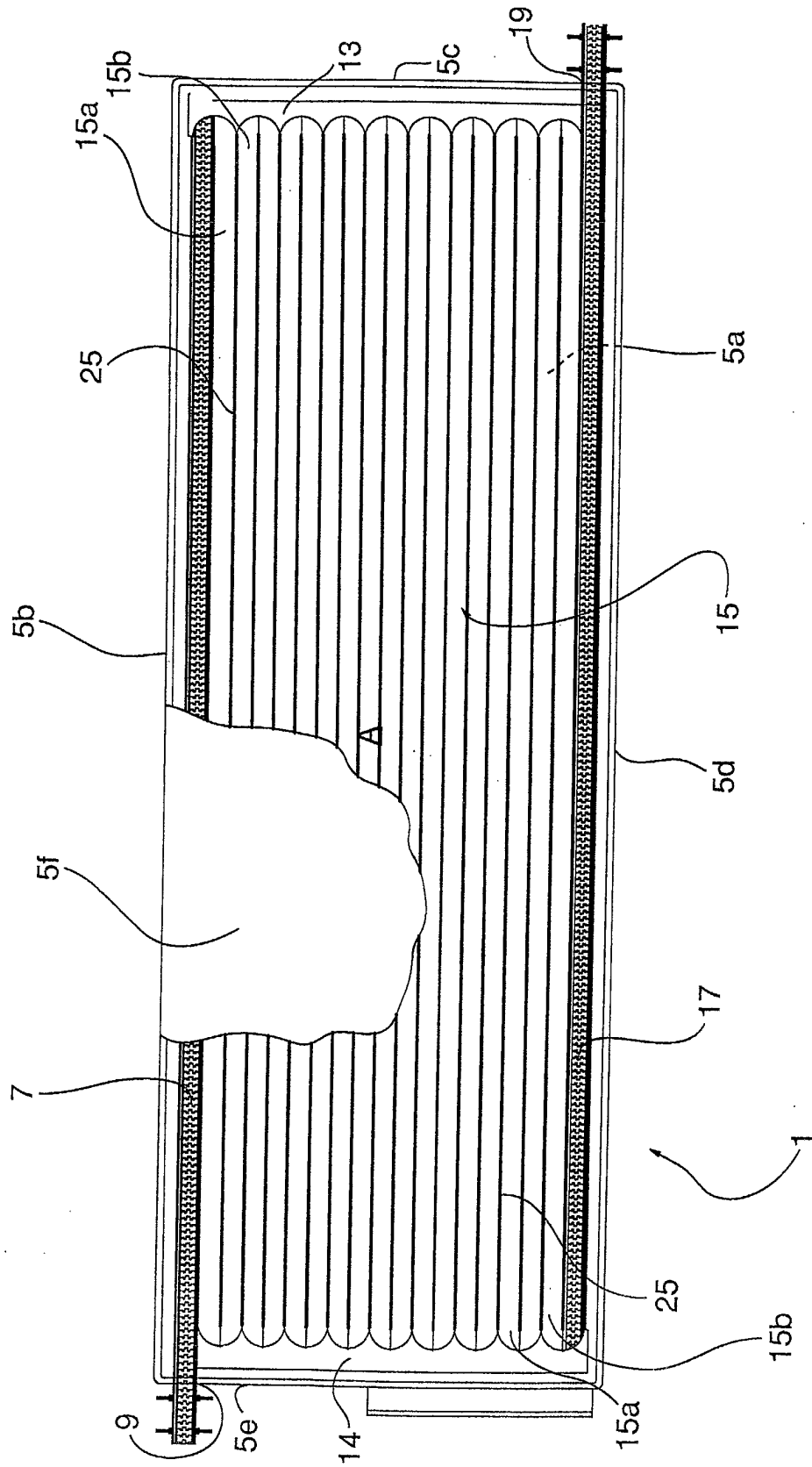


Fig. 1

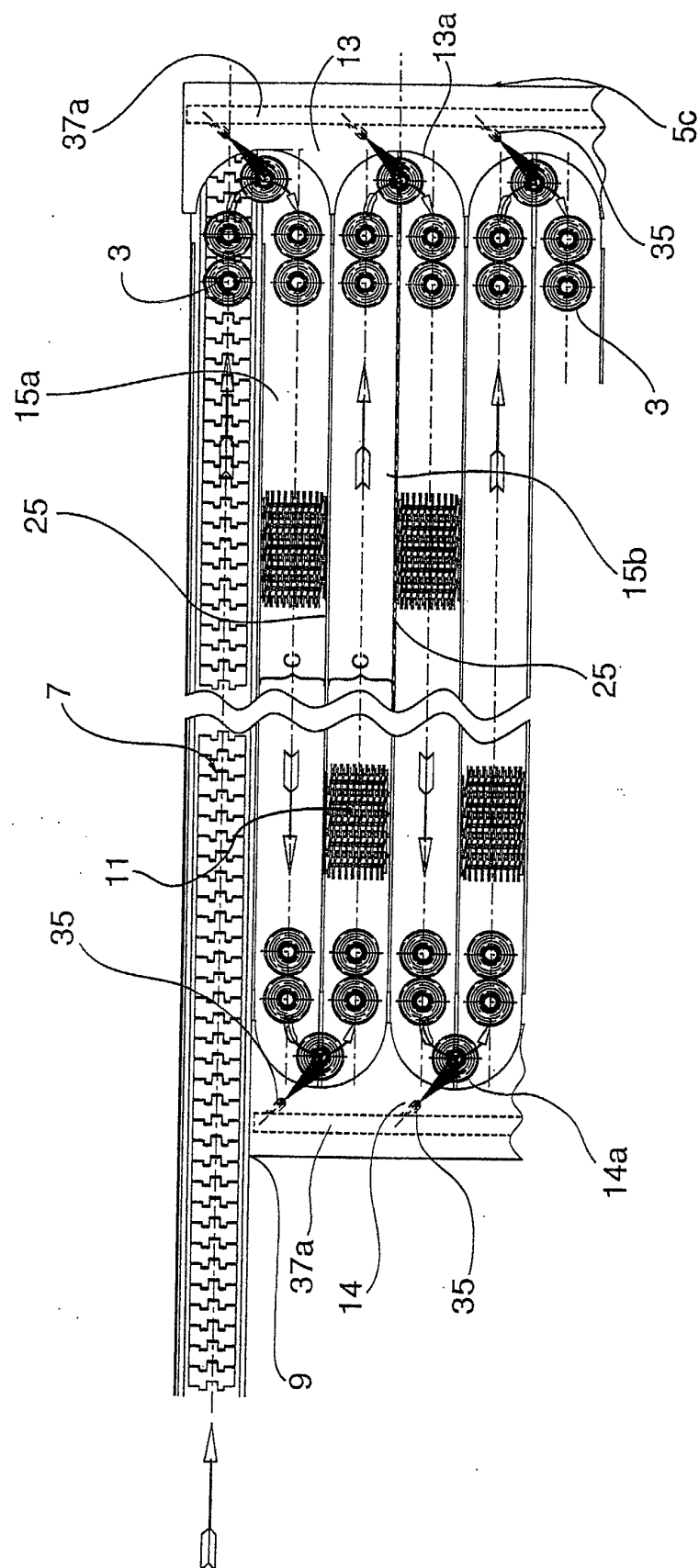


Fig. 2

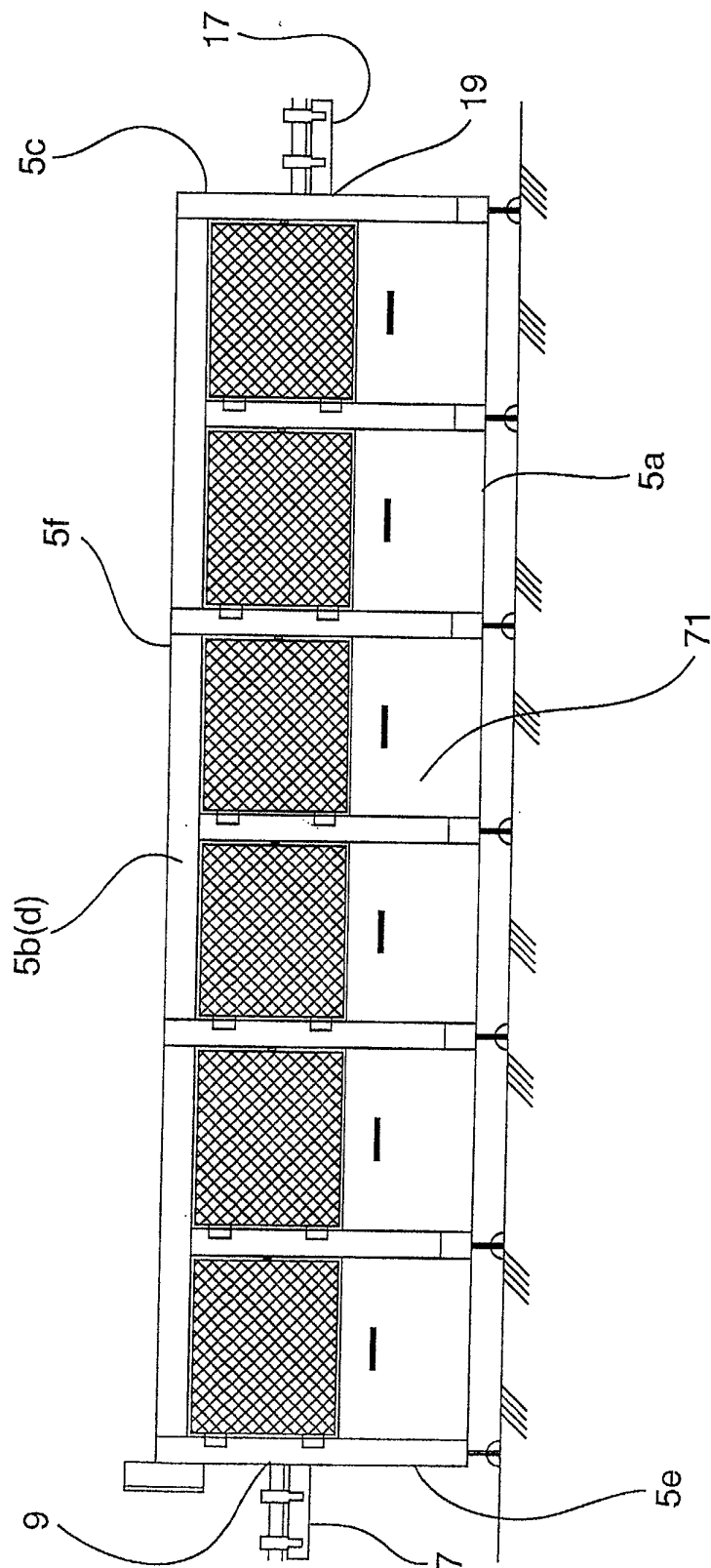


Fig. 3

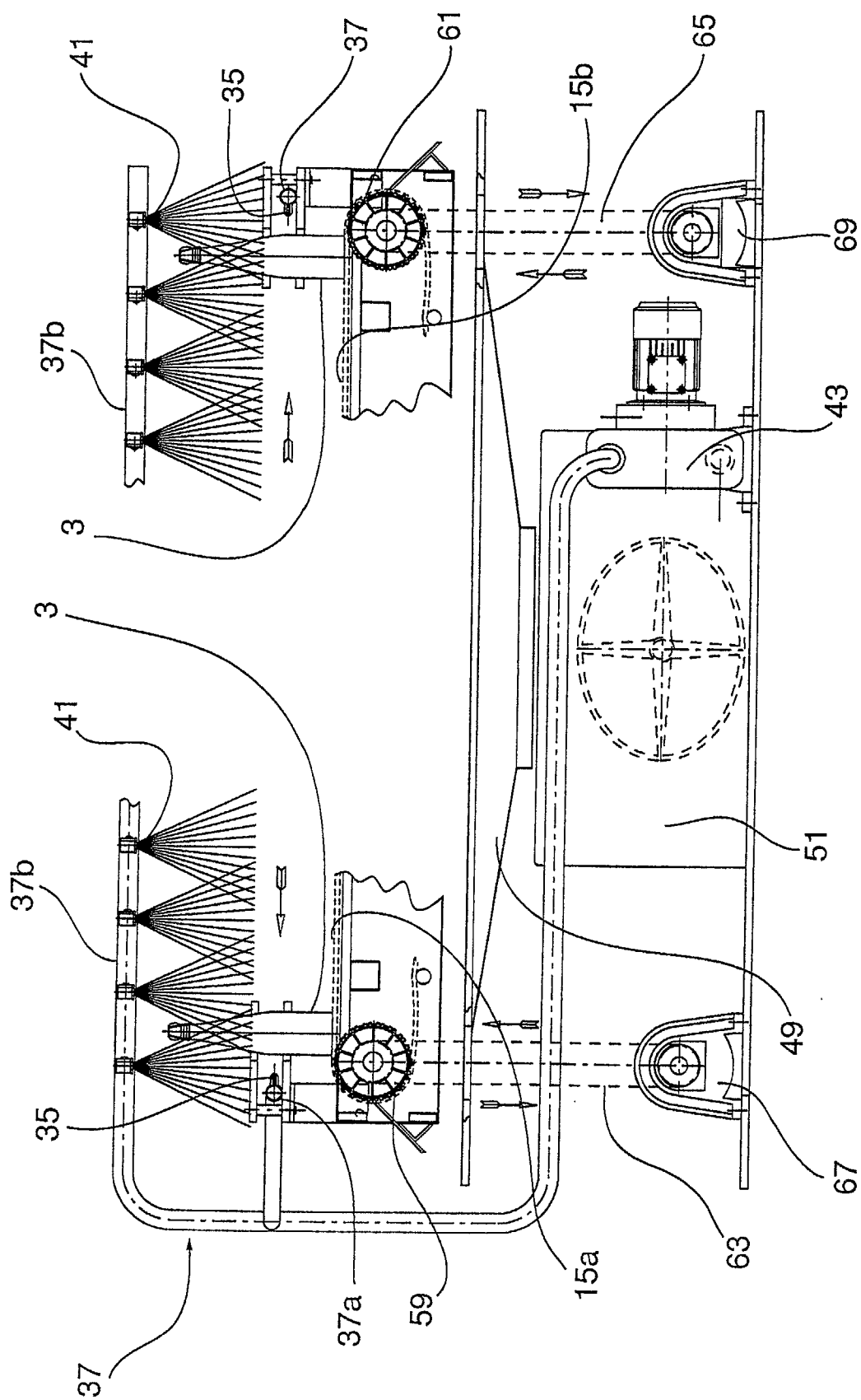


Fig. 4

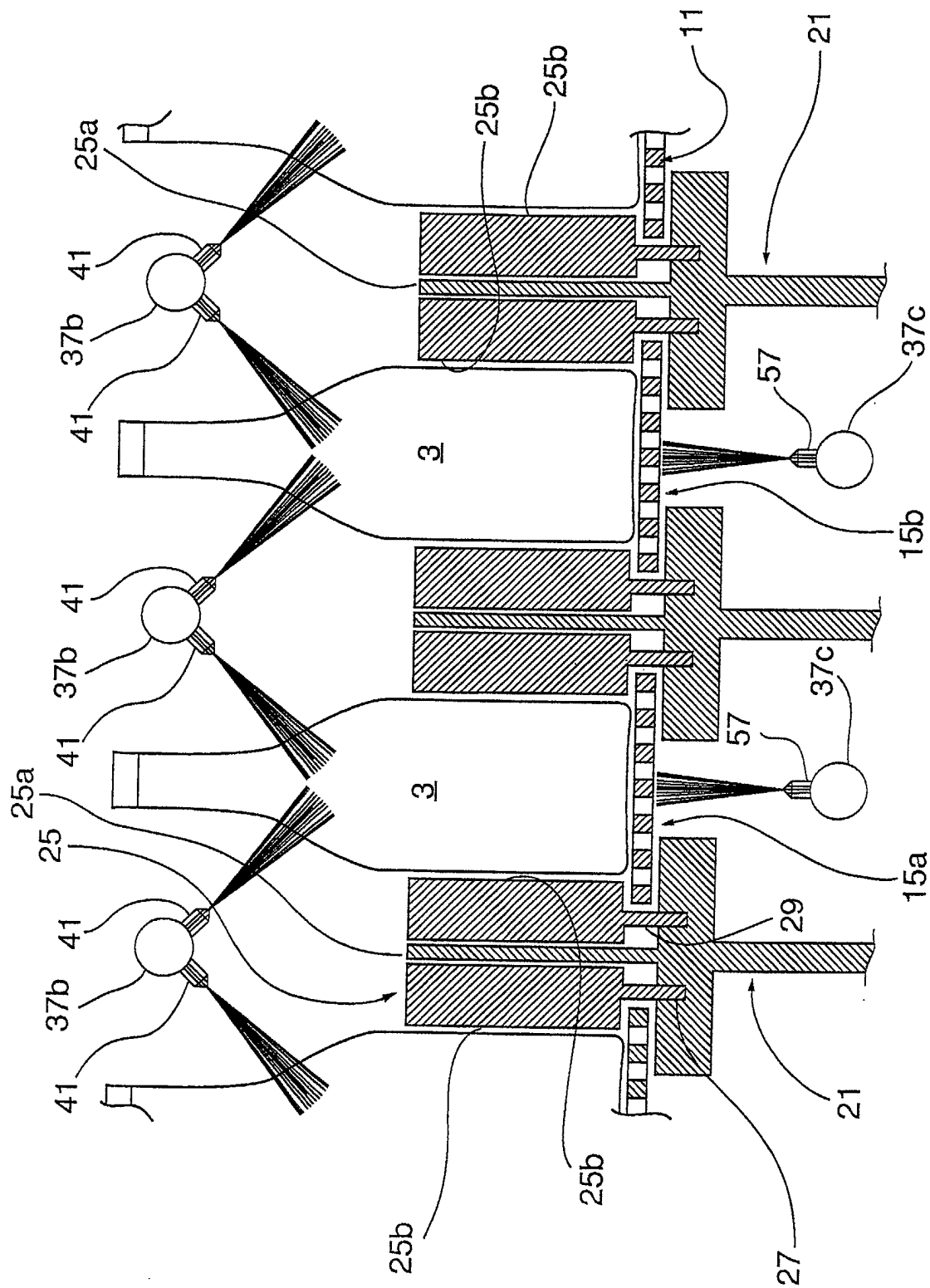


Fig. 5



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Application Number
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Place of search		Date of completion of the search	Examiner
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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