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(54) Apparatus and method for processing and filling kegs

(57) An apparatus (1) for processing containers of liquids; in particular, the apparatus according to the present invention is adapted to move containers, particularly kegs (8), meant to be processed for example with washing operations and/or be filled with liquids such as beverages, from and toward a processing station (3). The apparatus is characterized in that it comprises a plurality of processing stations (3), which are arranged in a linear fashion and on which the kegs being processed are mutually aligned, and in that it further comprises a loading conveyor (2) and an unloading conveyor (4), each arranged at one of the two opposite sides of said processing stations (3) and substantially parallel thereto. A handling unit (5) is capable of handling the kegs from the loading conveyor to the processing station and from the processing station to the unloading conveyor very simply and rapidly. The system (1) according to the present invention achieves the aim of providing a system which is extremely simple and easy to manage and maintain, at the same time obtaining a system in which the steps of the processing cycle are variable and can be set according to specific user requirements. The precision of the keg loading/unloading system is obtained by means of controllers and actuators managed by numeric-control encoders.

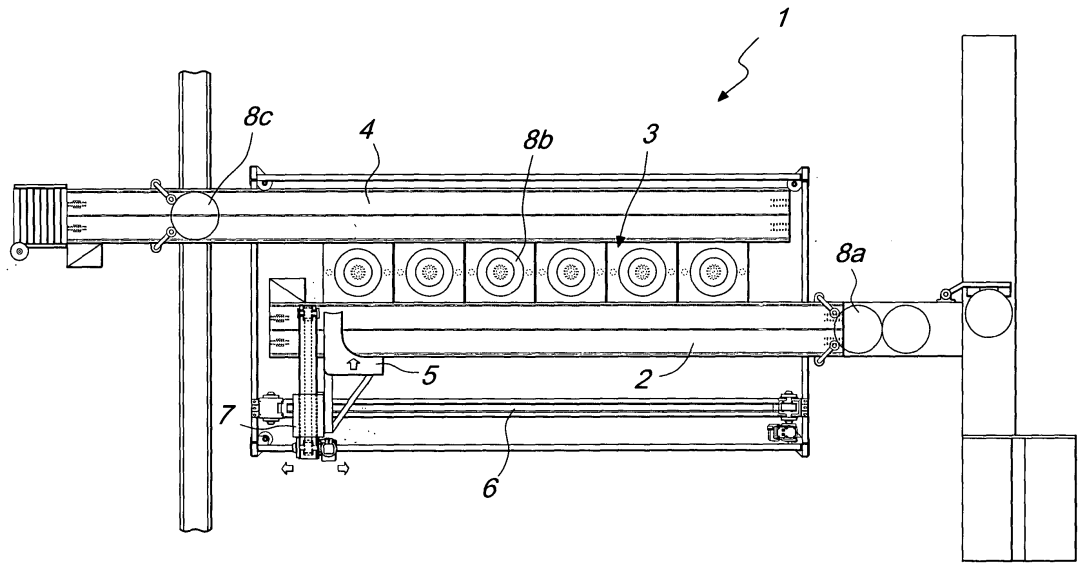

Fig. 1

EP 1 762 540 A1

Description

[0001] The present invention relates to an apparatus for processing and filling containers for liquids. In particular, the present invention relates to the field of apparatuses for filling beverage kegs.

[0002] The processing of kegs can comprise for example the handling of the kegs in order to perform operations for washing them.

[0003] The present invention relates to the field of apparatuses adapted to perform the positioning of kegs, typically suitable for containing liquid products, such as for example beverages, on a processing station. Once they have been positioned on the processing station, the kegs can be washed or filled with any product, depending on the situation, and are subsequently unloaded from the processing station and sent to the subsequent processing step.

[0004] As is known, in the field of apparatuses for processing and particularly filling kegs for beverages in general, rotary transfer machines are usually used on which the keg to be processed is loaded automatically or manually and is then transferred in succession to the various processing stations.

[0005] This known type of solution entails the provision of very complicated, bulky and inflexible machines, with a fixed processing cycle which depends on the angular rotation rate of the machine and cannot be modified even in the presence of containers of a different format.

[0006] Another disadvantage of a rotary apparatus is that it is not possible to replace from the processing cycle a keg which is defective or which, for any reason, has to be excluded from the processing; this operation is instead possible on the innovative machine.

[0007] In order to eliminate or reduce the drawbacks noted above which affect known types of apparatuses, and mainly in order to optimize the keg processing cycle, Applicant has devised a machine for filling kegs of the linear and non-rotary type, which is disclosed in patent no. W003014003.

[0008] This type of processing apparatus comprises a keg feeding conveyor, which can be constituted by a linear element such as a substantially straight conveyor belt, a plurality of units for processing the individual kegs arranged in mutual alignment, and a keg unloading conveyor, which is laterally adjacent to the keg processing line on the opposite side with respect to the side of the feeding conveyor. The apparatus thus configured is further characterized in that it comprises a grip clamp, which is designed to handle the kegs. Such grip clamp is capable of gripping the keg during handling and of arranging it on the machine in the correct position for filling. Once the keg has been filled, the grip clamp positions a new keg to be filled in the processing station and at the same time, by means of push rods with which said clamp is provided, an already-filled keg is pushed away from the processing station toward the output conveyor.

[0009] This type of machine has allowed to arrange a plurality of processing units in a line and allows to perform the processing and filling of the individual kegs independently, so as to be able to reject rapidly any defective kegs. Moreover, the provision of an apparatus of this type has allowed to simplify considerably the mechanical systems of the entire machine with respect to machines commonly used in the background art.

[0010] The aim of the present invention is to provide an apparatus for processing and filling kegs, typically kegs for beverages in general, which allows to improve further the steps for handling and transferring the kegs, so as to make the entire processing method more efficient, thus improving the productivity of the apparatus.

[0011] Within this aim, an object of the present invention is to provide an apparatus for processing and filling kegs which has an extremely simple structure and is therefore cheaper as regards its manufacture and as regards its maintenance.

[0012] Another object of the present invention is to provide an apparatus for processing and filling kegs which is extremely reliable thanks to the highly simplified mechanical systems and is subjected to less stress for an equal production rate with respect to conventional machines.

[0013] Another object of the present invention is to provide an apparatus which solves or reduces the drawbacks which affect currently known machines of the background art. In particular, with respect to rotary-type machines, the apparatus according to the present invention allows to act very easily in order to vary the times of the keg processing cycles, also differentiating them among the various processing stations (times which are "inherently" fixed for rotary machines and therefore cause the high number of kegs rejected by these machines).

[0014] Moreover, the apparatus according to the present invention allows the distribution of fluids to the heads to occur by means of simple static ducts, which are practically immune to breakages, differently from the extremely complicated, expensive and fragile rotary distribution unit of rotary machines.

[0015] This aim and these and other objects, which will become better apparent hereinafter, are achieved by an apparatus for processing and filling kegs, particularly suitable for containing liquids such as beverages and the like, of the type which comprises a processing station of the linear type, in which said kegs are mutually aligned, characterized in that it comprises a loading conveyor, which is arranged laterally to said processing station, and an unloading conveyor, which is also arranged laterally to said processing station and on the opposite side with respect to said loading conveyor, and in that it furthermore comprises a handling unit which is adapted to move said kegs from and toward said processing station.

[0016] The processing station can perform operations such as keg filling, washing or any operation of another kind.

[0017] Further characteristics and advantages of the present invention will become better apparent from the

following detailed description, given by way of non-limiting example and illustrated in the accompanying figures, wherein:

Figure 1 is a schematic plan view of the apparatus according to the present invention in a first embodiment and in a step in which all the kegs are arranged on the processing station;

Figure 2 is a plan view of the same apparatus of Figure 1 in a step for the unloading of a keg from the processing station;

Figure 3 is a view of a step which follows the step of Figure 2 and in which a new loaded keg is pushed onto the processing station;

Figure 4 is a view of a step which follows the step of Figure 3 and in which the keg being loaded on the processing station is in its final position;

Figure 5 is a schematic plan view of the apparatus according to the present invention according to a second embodiment and in a step in which a new keg engages the loading conveyor;

Figure 6 is a view of the same apparatus of Figure 5 in a step which follows the step of Figure 5 and in which the new keg is locked by the handling unit at a preset position of the processing station;

Figure 7 is a view of a step which follows the step of Figure 6 and in which a keg which has ended the processing cycle is unloaded from the processing station while the new keg is arranged in its place;

Figure 8 is a view of a step which follows the step of Figure 7 and in which the new keg is in its final position on the processing station and the handling unit is moved away from the processing station and arranged at the loading conveyor while a new keg is already on the loading conveyor;

Figure 9 is a view of a detail of the handling unit according to the first embodiment of the apparatus according to the present invention;

Figure 10 is a view of a detail of the handling unit provided with a paddle according to a second embodiment of the apparatus according to the present invention.

[0018] With reference to the cited figures, the apparatus for processing and filling kegs for beverages according to the present invention, generally designated by the reference numeral 1, comprises a conveyor 2 for feeding or loading the kegs 8a in input, which can be of any type. Advantageously, said loading conveyor 2 can be constituted by a conveyor belt or by a similar system.

[0019] The apparatus according to the present invention comprises a processing station 3, on which the kegs 8b to be processed are positioned. The operations that the processing station can perform are several, from the filling to the washing of the kegs, and the type of process does not affect the structure of the apparatus according to what is described here. Once the kegs 8b have been positioned on the processing station, they can be for example filled with liquid substances, such as beverages, medicines, oils and the like, or with solid products, such as powders, pastes, amalgams and the like.

[0020] The apparatus 1 according to the present invention further comprises an unloading conveyor 4. Advantageously, said unloading conveyor 4 can be constituted by a conveyor belt or by a similar system. The unloading conveyor 4 and the loading conveyor 2 are arranged on opposite sides of the processing station 3, which is substantially longitudinally elongated, so that it can accommodate the kegs being processed in an aligned condition. Accordingly, in the embodiments illustrated by way of example in the accompanying figures, the loading conveyor 2 and the unloading conveyor 4 also are substantially rectilinear and longitudinally elongated and can lie substantially parallel to said processing station. Of course, a non-rectilinear processing station flanked by loading and unloading conveyors which are also non-rectilinear is still within the scope of the inventive concept on which the present invention is based according to the content of the appended claims.

[0021] Again with reference to Figure 1, at the side of the apparatus where the loading conveyor 2 is located, the apparatus 1 according to the present invention is provided with a handling unit 5, which is capable of moving longitudinally along the loading conveyor, substantially parallel thereto and therefore along the processing station 3 parallel thereto, since the loading conveyor lies substantially parallel to the processing station 3, and transversely, i.e., at right angles to the longitudinal direction of the processing station, from the loading conveyor 2 toward the processing station 3, and vice versa, by means of an appropriate motor drive. The handling unit can therefore move both parallel and at right angles to the processing station.

[0022] In particular, the handling unit 5 can be constituted by a body 7 and by an adequate handling system of a known type. In the embodiment illustrated by way of example in the accompanying drawings, the handling unit can be mounted on a framework which connects it to a double system of toothed belts, which allow said handling unit to move along the two mutually perpendicular directions.

[0023] The handling unit 5 is conveniently shaped so that it can block the stroke of an incoming keg 8a which moves by being conveyed by the loading conveyor 2. At the same time, the handling unit 5 must have a configuration adapted to release the keg that must be processed once said keg has been positioned on the processing station 3.

[0024] One possible configuration of the handling unit suitable to be mounted on the apparatus according to the present invention is shown in Figure 9. According to this specific configuration given by way of example, the handling unit 5 is substantially L-shaped, with two mutually parallel axes, axis A and axis B. Considering the longitudinal extension of the apparatus, the handling unit according to this first embodiment may conveniently have

the side perpendicular to the longitudinal direction of the processing station which determines axis A, and the side that is parallel to the longitudinal direction of the processing station which forms with said perpendicular side a connecting portion which forms a first supporting surface 5a with a concavity which is adapted to rest against the side wall of a keg and to stop and retain the keg which is moving on the loading conveyor 2, keeping said keg rested against said first supporting surface 5a.

[0025] Axis B is aligned with the transverse axis of the keg when said keg is in contact with the surface 5a. Likewise, axis A must align itself with a transverse axis of the keg which must be unloaded from the processing station 3. The handling unit 5 is further provided with a second supporting surface 5b, which is adapted to make contact with the side wall of a keg so that it can apply a thrust to said keg. Figure 9 illustrates two axes A and B which are substantially mutually parallel.

[0026] In an alternative embodiment of the handling unit 5, such unit is provided with a movable arm or paddle 10. In particular, the handling unit 5 has, in this case also, a first supporting surface 5a with a concavity which is suitable to rest against the side wall of the keg, but at the end of the handling unit that during operation is directed toward the processing station the handling unit comprises a movable arm or paddle 10, which is mounted on an axis 9 which allows the rotation of the movable arm 10.

[0027] The figures are all plan views, i.e., top views, of the apparatus according to the present invention. Likewise, Figure 10 also is a top view of the handling unit. Taking therefore the plane of Figure 10 as a horizontal plane, the arm 10 can rotate about the axis 9, tracing a circle centered on the axis 9 and substantially at right angles to the horizontal plane. The rotation of the arm 10 allows to release the keg, which rests on the concave surface 5a of the handling unit. Figure 10 indeed illustrates the arm 10 in the lowered configuration.

[0028] The arm 10 can be provided advantageously with an element 11 which constitute a second supporting surface which is shaped so as to be adapted to make contact with the lateral surface of a keg.

[0029] Operation of the apparatus for processing and filling kegs according to the present invention is now described.

[0030] With reference to Figure 1, a first embodiment of the apparatus according to the present invention provides a handling unit 5 of the type shown in Figure 9 and described above.

[0031] The handling unit 5, which is capable of sliding along the loading conveyor 2, advances along said direction until it is arranged at a keg 8b, which lies on the processing station 3 and has ended the processing step, so that it must be unloaded from the processing station.

[0032] The movements of the handling unit 5 in a longitudinal and transverse direction are obtained by means of mechanical systems of a known type. Movements in the longitudinal and transverse direction of the handling unit 5 are achieved by means of known types of mechanical systems. In particular, the longitudinal movement of the handling unit 5 can be provided by mounting said unit on a toothed belt provided with a motor. Likewise, the transverse movement can be provided by means of a similar system with a transverse belt.

[0033] In an alternative embodiment, the handling unit can be provided with a motor in the body 7, which is adapted to move longitudinally said handling unit along a longitudinal rail. In another possible embodiment, the transverse movement can occur by virtue of a hydraulic piston which is arranged at the body 7 of said handling unit.

[0034] Going back to the processing steps of the apparatus, when the handling unit 5 has the axis A at the transverse axis of the keg to be unloaded, the numeric control system, of a known type, with which the machine is provided and which coordinates all the movements of the apparatus, stops the handling unit 5. At this point the handling unit 5 moves in a transverse direction and its second supporting surface 5b, which lies at the axis A of Figure 9, makes contact with the lateral surface of the keg, pushing it out of the processing station 3 and moving said keg onto the unloading conveyor 4. The keg 8c is then unloaded from the processing station and at the same time, as illustrated in Figure 2, a new keg 8a is placed on the loading conveyor 2. The control system adjusts, depending on the rate of motion of the loading conveyor 2 and of the position of the handling unit 5, the moment when the new keg 8a is placed on the loading conveyor 2. Once the keg 8c has been unloaded (Figure 3) the handling unit performs an L-shaped movement, which returns it at the loading conveyor 2, so that it can affect the new incoming keg 8a by means of the surface 5a. In this step, the handling unit has aligned the axis B with the transverse axis of the new keg 8a and said axis B is conveniently centered by the control system at the exact position of the processing station 3 in which the new keg 8a must be inserted, which coincides with the position that has just been cleared because the keg 8c has been unloaded.

[0035] Once the axis B has been aligned with the destination position of the new keg on the processing station, the handling unit 5 performs a new transverse movement (Figure 4) which allows to position the keg on said processing station. The handling unit 5 then retracts again, performing a new transverse translational motion and returning at the loading conveyor, and a new processing cycle can begin.

[0036] Figure 10 illustrates a second embodiment of the handling unit 5. The apparatus according to the present invention provided with the handling unit according to the embodiment of Figure 10 provides a processing cycle which is characterized by loading and unloading steps, which differ, in some of their parts, from what has been described for the first embodiment. The steps of this processing cycle are described hereafter.

[0037] With reference to Figure 5, the handling unit 5 is arranged at the loading conveyor 2 and a new keg 8a

is placed on the loading conveyor 2. The control system arranges the handling unit 5 at a keg 8b which is located on the processing station 3 and has ended processing and is therefore ready to be unloaded. The control system aligns the axis C of the handling unit 5, illustrated in Figure 10, with the transverse axis of the keg to be unloaded. As shown in Figure 6, the handling unit accommodates the new keg 8a before unloading the keg 8b from the processing station, differently from what occurred with the handling unit according to the first embodiment described above. Again with reference to Figure 6, the handling unit moves transversely, pushing, by means of the arm 10 which is in the lowered position, the keg 8b, unloading it from the processing station 3 and moving it onto the unloading conveyor 4. In particular, the second supporting surface 11 abuts against the lateral surface of the keg to be unloaded, allowing to push said keg toward the unloading conveyor.

[0038] As can be seen from Figure 7, when the keg 8b has been pushed onto the unloading conveyor and at the same time the new keg 8a is in the corresponding position on the processing station 3, the arm 10 is raised so that the handling unit 5 can be retracted without the keg just positioned on the processing station being moved again by said handling unit.

[0039] Figure 8 shows that while the handling unit 5 retracts, returning with a transverse movement at the loading conveyor, the control system has already placed a new keg 8a on said loading conveyor. The arm 10 of the handling unit is then lowered again so that the handling unit is in the cycle start configuration and is ready to accommodate the new keg to be arranged on the processing station 3. At this point, a new operating cycle of the apparatus can begin.

[0040] As shown by the description of the steps of the operation of the apparatus, the two different embodiments of the handling unit 5 allow a different optimization of the keg handling times. In particular, the handling unit provided with a movable arm allows to perform a single transverse movement of the handling unit to unload the already-processed keg and at the same time load the new keg to be processed. In comparison with the greater complexity of the handling unit and therefore of the control system which must also move the movable arm, the system thus structured allows to optimize the loading and unloading steps and to reduce the number of strokes of the handling unit.

[0041] The two illustrated embodiments for the apparatus considered here are within the scope of the same inventive concept on which the present invention is based. The optimization of the cycle for handling the kegs from and toward the processing station is in fact obtained by the apparatus as described in the appended claims.

[0042] It has thus been shown that the present invention achieves the proposed aim and objects. In particular, an apparatus has been described which is capable of optimizing the steps for handling the kegs to be processed and/or filled, reducing the time required for loading and unloading the kegs from a linear processing station and at the same time simplifying considerably the apparatus with respect to what is currently available in the field from the background art.

[0043] Of course, numerous modifications are evident and can be performed promptly by the person skilled in the art without thereby abandoning the scope of the protection of the present invention.

[0044] Therefore, the scope of the protection of the claims must not be limited by the preferred embodiments or illustrations given in the description by way of example, but rather the claims must comprise all the characteristics of patentable novelty which can be deduced from the present invention, including all the characteristics that would be treated as equivalent by the person skilled in the art.

[0045] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An apparatus (1) for processing and filling kegs (8), particularly suitable for containing liquids such as beverages and the like, of the type which comprises a processing station (3) of the linear type, in which said kegs are mutually aligned, **characterized in that** it comprises a loading conveyor (2), which is arranged laterally to said processing station (3), and an unloading conveyor (4), which is also arranged laterally to said processing station (3) and on the opposite side with respect to said loading conveyor (2), and **in that** it further comprises a handling unit (5) which is adapted to move said kegs (8) from and toward said processing station (3).

2. The apparatus (1) according to the preceding claim, **characterized in that** said linear processing station determines a substantially rectilinear longitudinal direction.

3. The apparatus (1) according to the preceding claim, **characterized in that** said loading conveyor (2) and said unloading conveyor (4), each arranged at one of the two sides of said processing station (3), also are substantially longitudinally elongated and are substantially parallel to the longitudinal axis of said processing station (3).

4. The apparatus (1) according to any one of the preceding claims, **characterized in that** said handling unit (5) can move parallel and at right angles to the longitudinal axis of said processing station.

5. The apparatus (1) according to any one of the preceding claims, **characterized in that** said handling unit (5) is L-shaped, with one side arranged in a parallel direction and one side arranged at right angles with respect to the direction defined by the longitudinal axis of said linear processing station.

6. The apparatus (1) according to the preceding claim, **characterized in that** said handling unit (5) comprises, at the portion connecting said perpendicular side and said parallel side to the direction defined by the longitudinal axis of said linear processing station, a first concave supporting surface (5a), which is adapted to make contact with the lateral surface of a keg, and a second supporting surface (5b), which is also adapted to make contact with the lateral surface of a keg and is arranged at the end of the perpendicular side of the handling unit (5).

7. The apparatus (1) according to the preceding claim, **characterized in that** a first axis (A) and a second axis (B) can be identified on said handling unit (5) respectively at the side of the handling unit which is L-shaped and perpendicular to the longitudinal axis of the processing station (3) and at said first supporting surface (5a), said axes being used as reference in order to align said handling unit (5) with a position of said processing station.

8. The apparatus (1) according to claim 5, **characterized in that** said handling unit (5) comprises, at the portion connecting said perpendicular side and said side which is parallel to the longitudinal axis of said processing station, a first concave supporting surface (5a), which is adapted to make contact with the lateral surface of a keg, and a second supporting surface (11), which is also adapted to make contact with the lateral surface of a keg and is arranged at a movable arm (10), which is rotationally associated with said handling unit (5) at the side of the L-shaped handling unit which is perpendicular to the longitudinal axis of the processing station.

9. The apparatus (1) according to the preceding claim, **characterized in that** said arm (10) can move between a first lowered position, in which it is horizontal and substantially parallel to the longitudinal direction, and a second position, in which said arm is raised, i.e., perpendicular to a horizontal plane.

10. The apparatus (1) according to the preceding claim, **characterized in that** said movable arm (10) can rotate about a horizontal transverse axis (9), which coincides with the axis of the side of the handling unit (5) which is L-shaped and perpendicular to the longitudinal axis of the processing station.

11. A method for feeding a linear processing station with kegs particularly adapted to contain liquid such as beverages and the like, comprising the steps of:

a) providing a handling unit, which can move both parallel and perpendicular to said linear processing station (3), which is substantially longitudinally elongated;
b) positioning said handling unit (5) at an already-processed keg which must be unloaded from the processing station (3);
c) moving the handling unit (5) at right angles to the longitudinal axis of said processing station, pushing the already-processed keg onto an unloading conveyor (4), which is arranged laterally to said processing station on the side that lies opposite the side where said loading conveyor (2) is located;
d) while the handling unit (5) pushes the already-processed keg onto the unloading conveyor (4), introducing a new keg (8) to be processed on a loading conveyor (2) located laterally to said linear processing station (3) and substantially parallel to said station;
e) moving the handling unit at right angles to the longitudinal axis of the processing station until it returns at said loading conveyor (2), and stopping by means of said handling unit (5) the new keg to be processed which is moving on the loading conveyor (2);
f) moving the handling unit at right angles to the longitudinal axis of the processing station so as to move the new keg to be processed onto the processing station;
g) moving the handling unit at right angles to the longitudinal axis of the processing station until it returns at said loading conveyor (2), obtaining again the configuration of step a).

12. The method for feeding a processing station according to the preceding claim, **characterized in that** the steps for unloading the already-processed keg and for loading the new keg to be processed on the processing station occur in a single step.

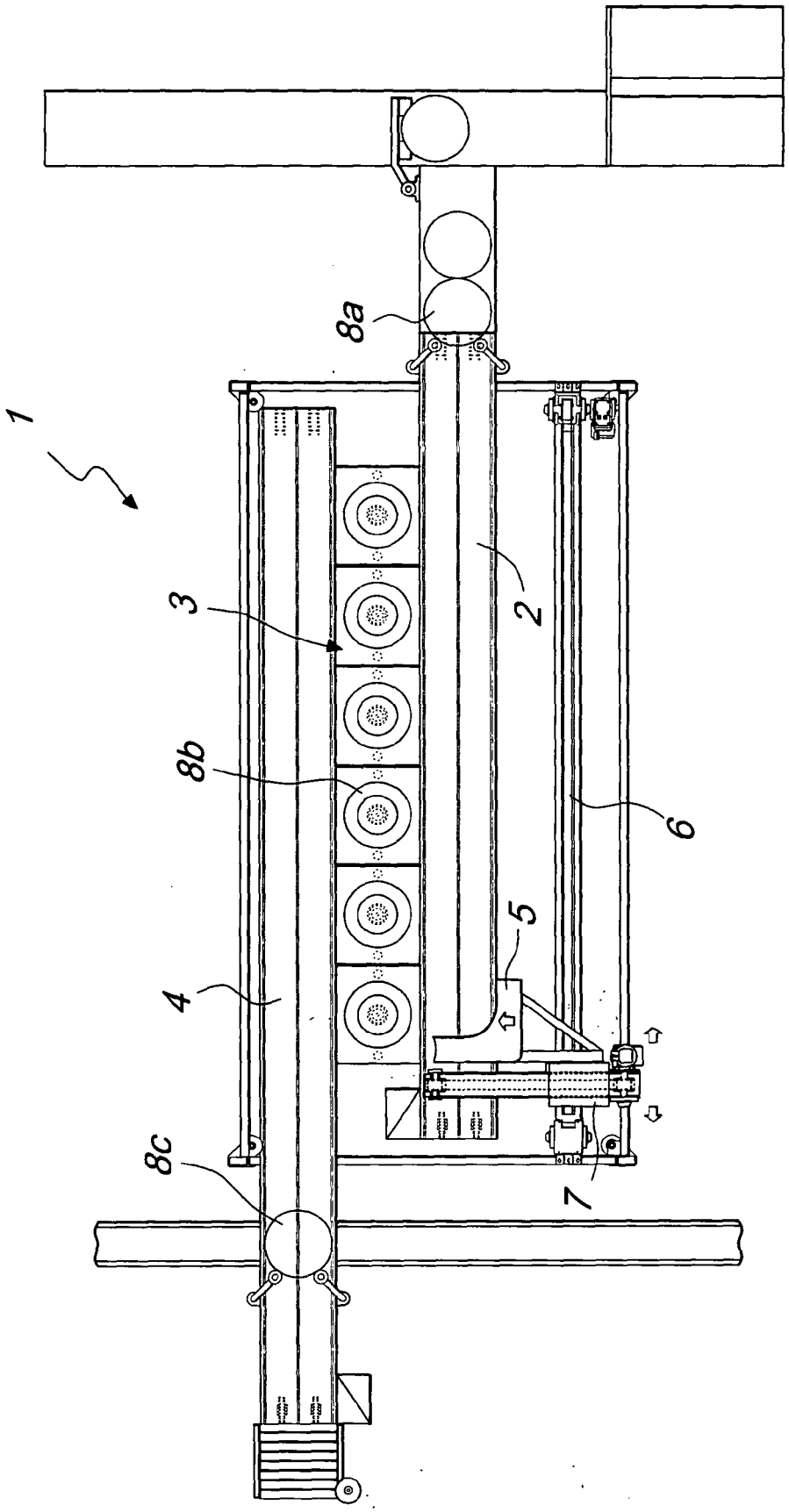

Fig. 1

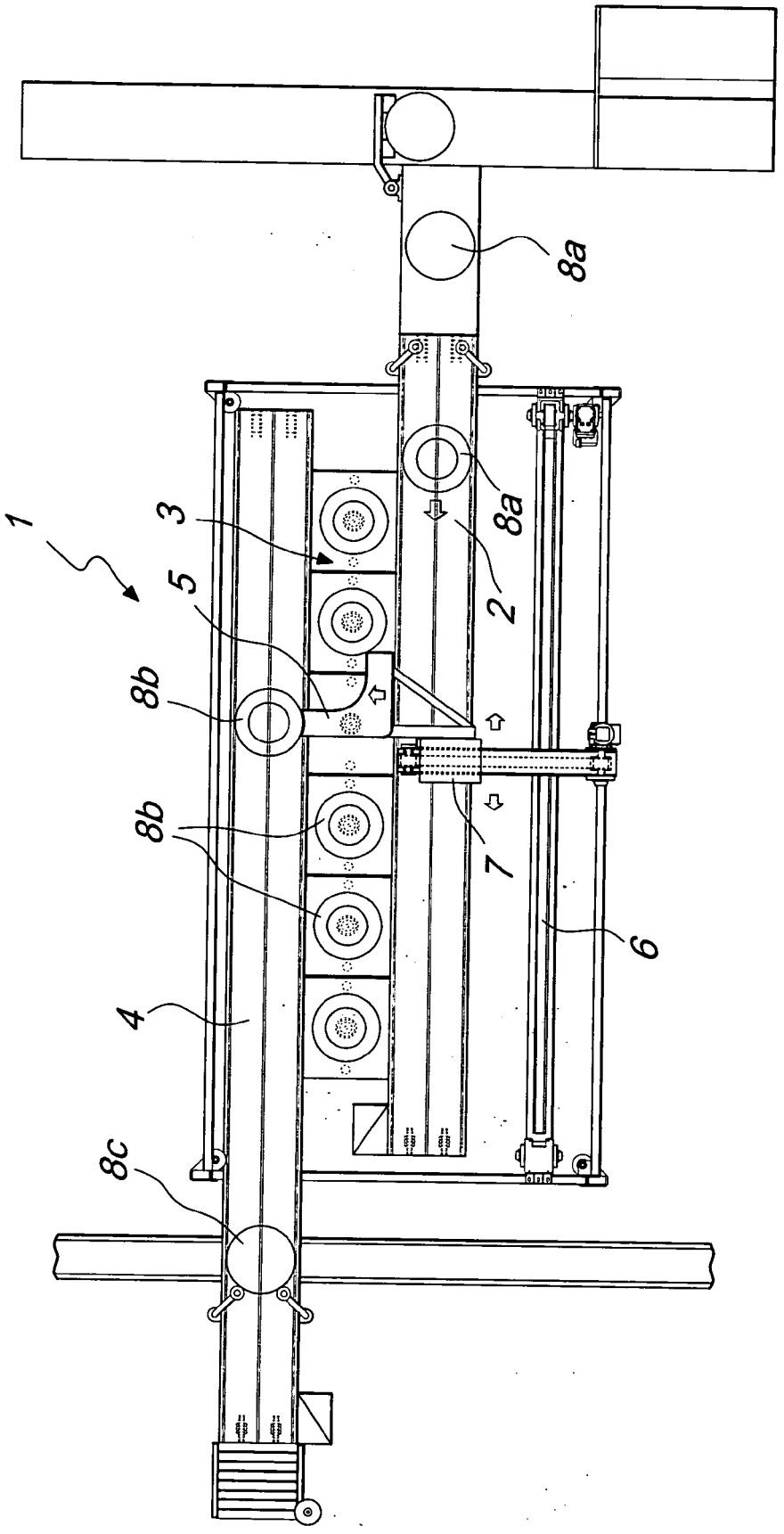

Fig. 2

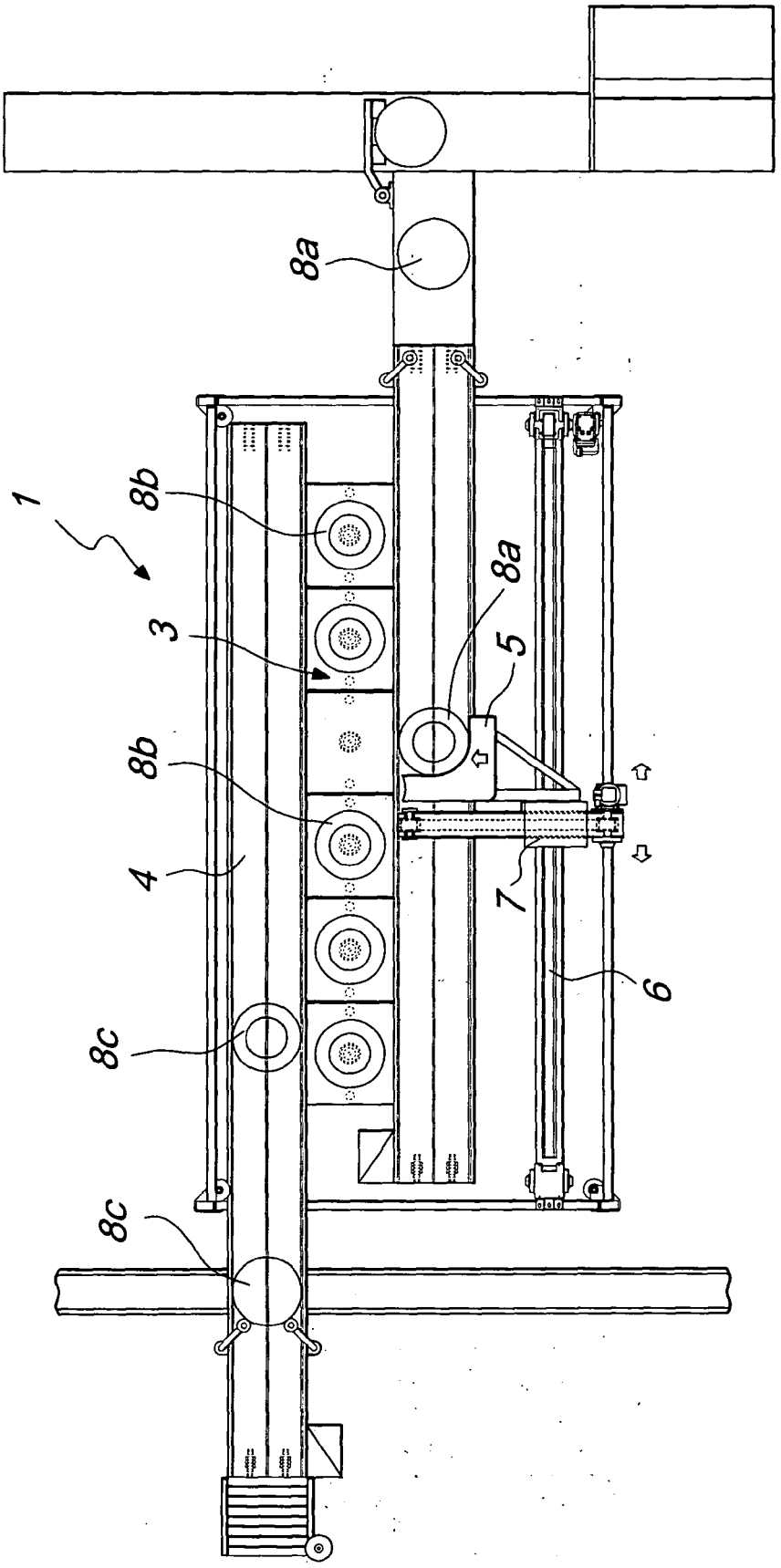

Fig. 3

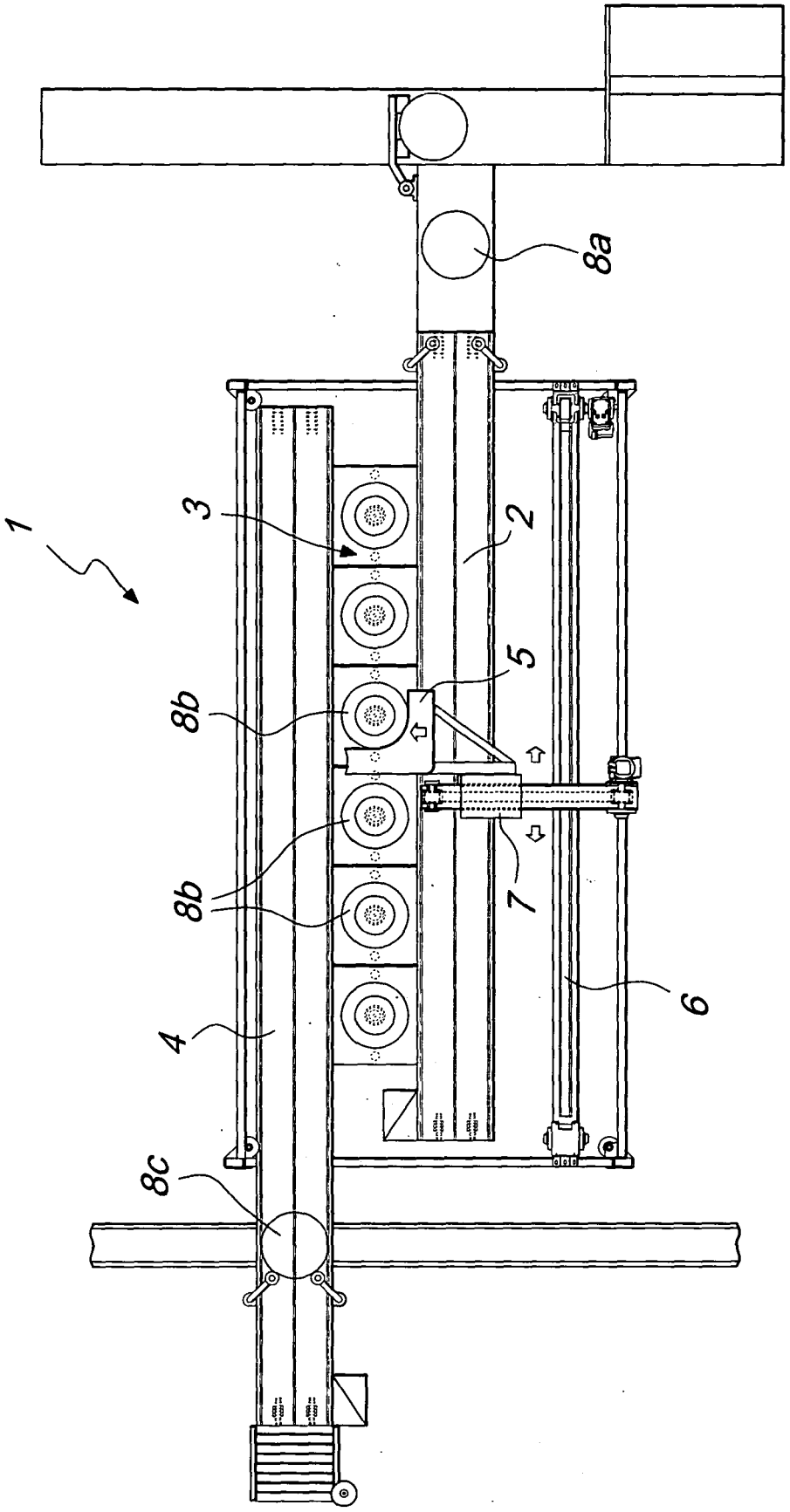

Fig. 4

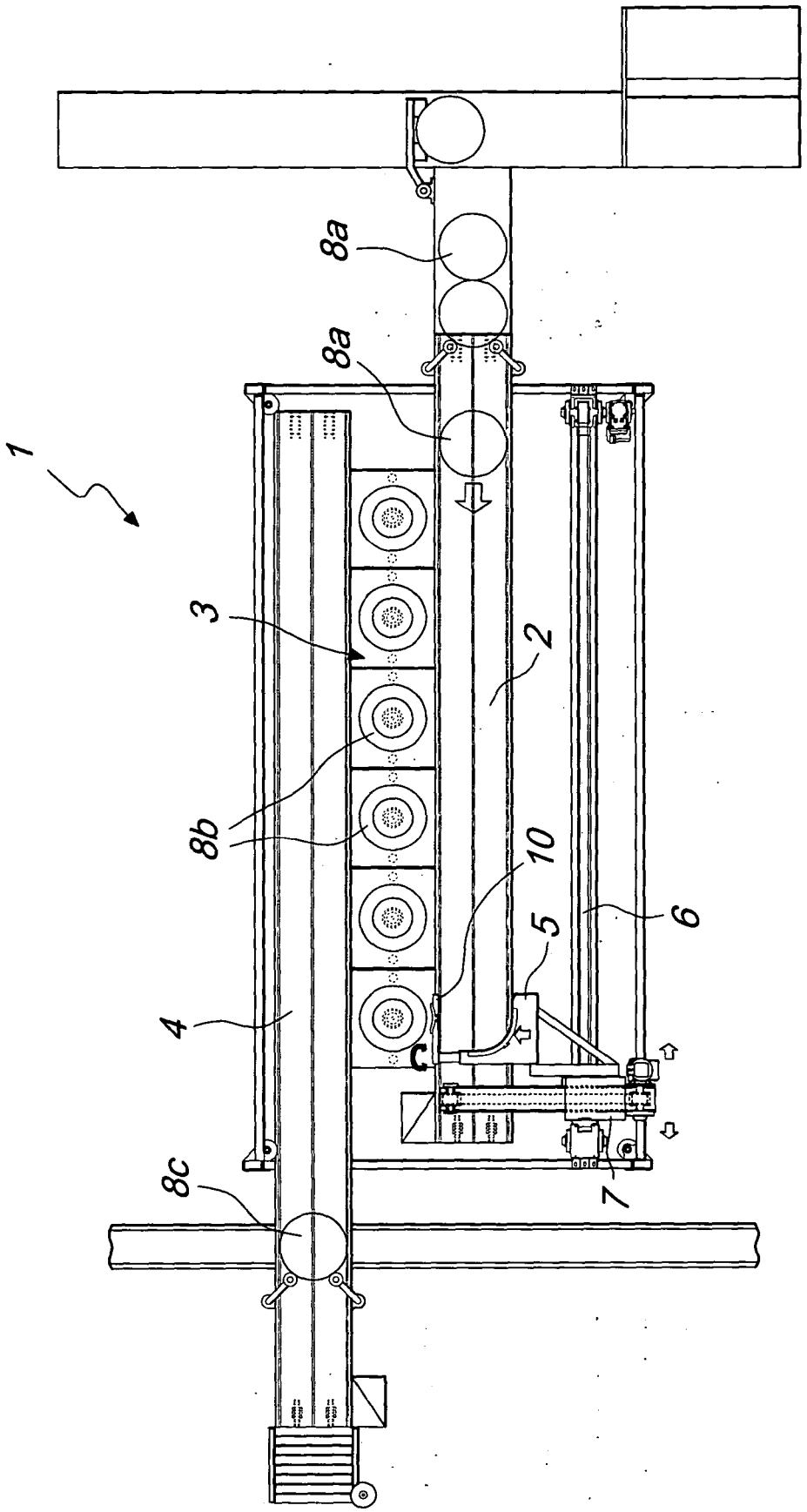

Fig. 5

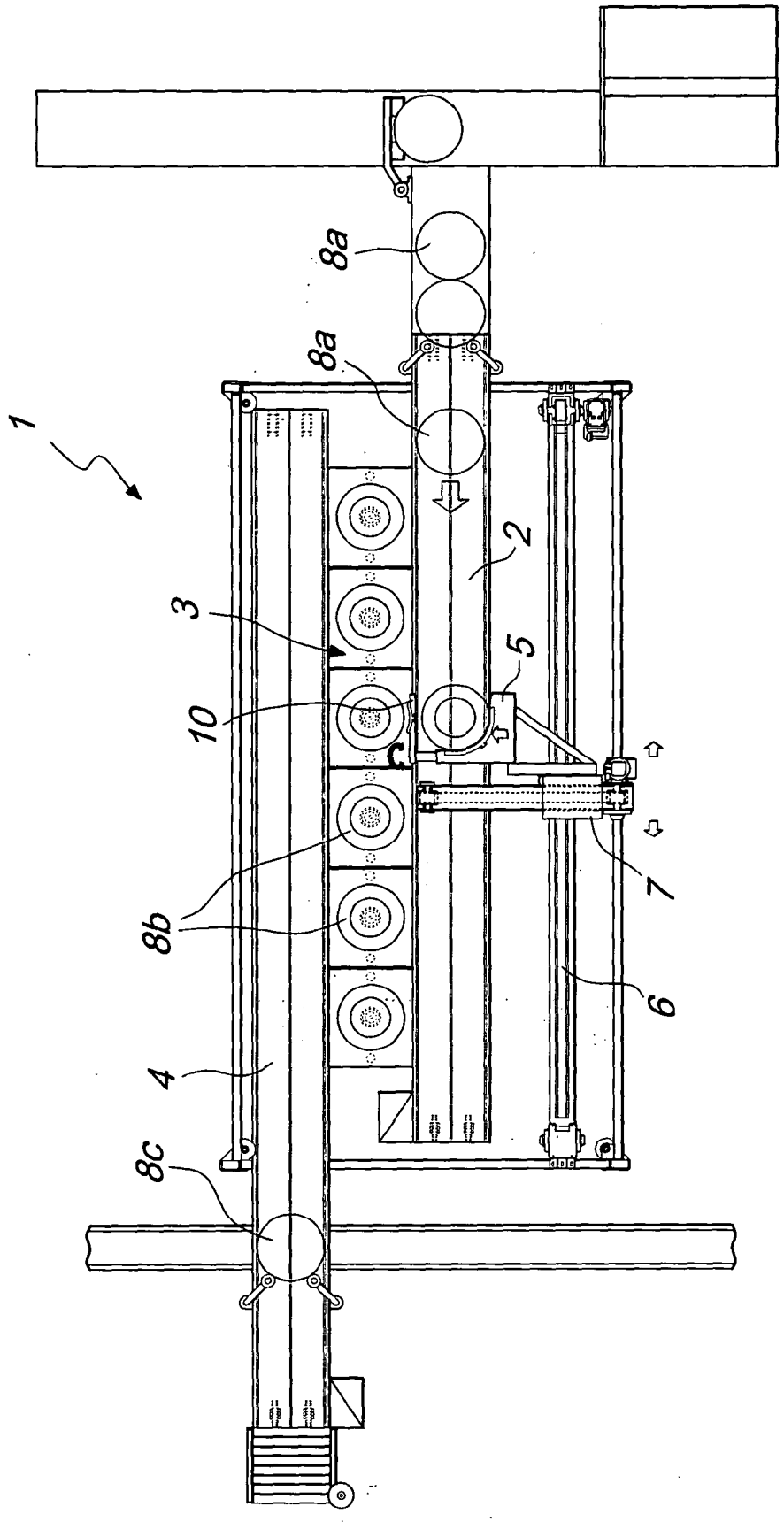

Fig. 6

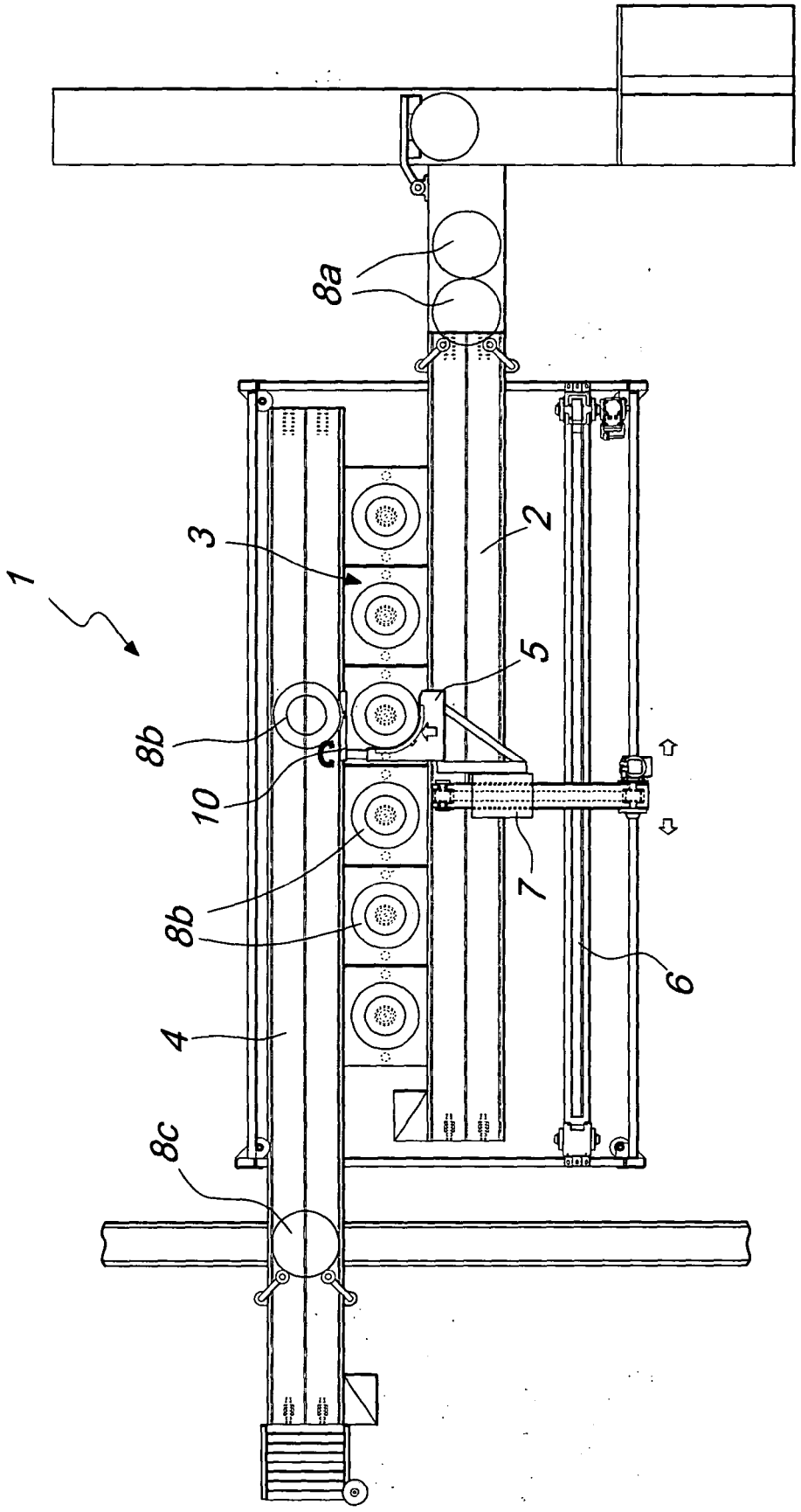

Fig. 7

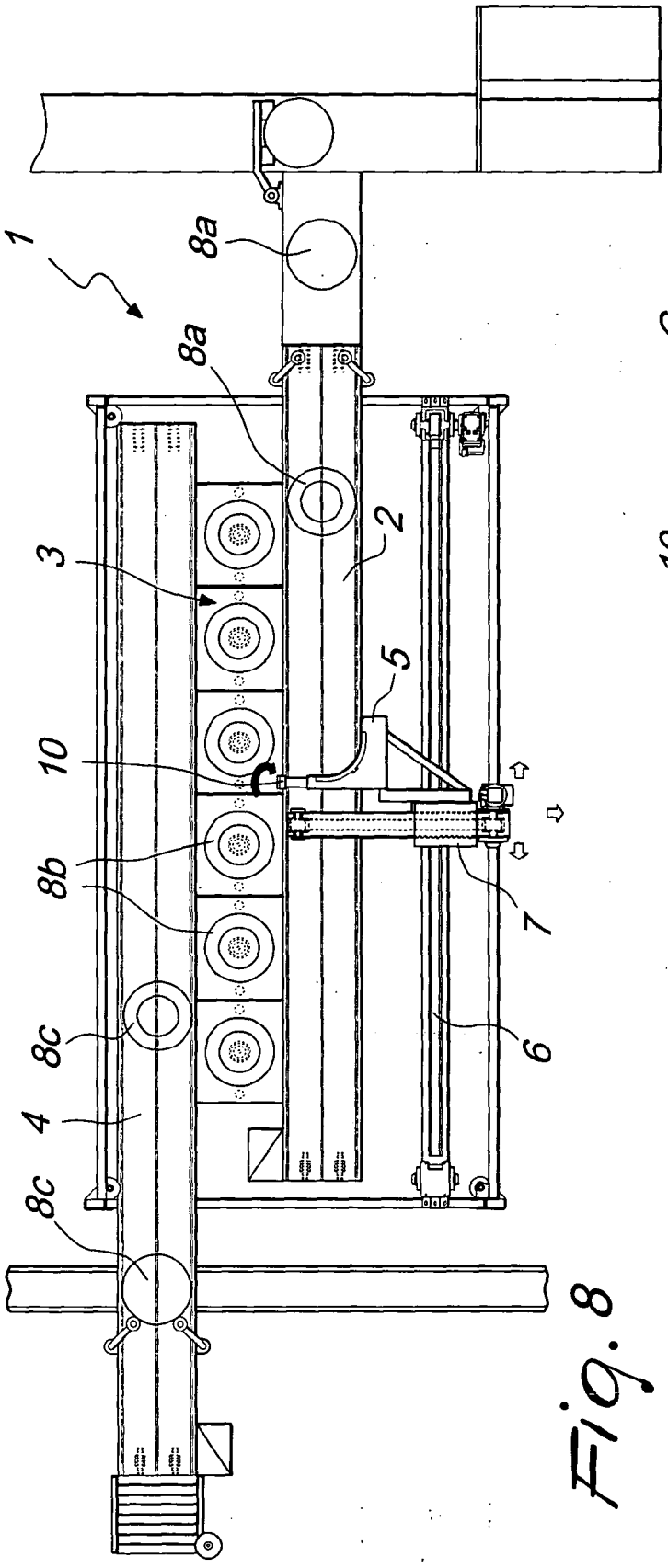

Fig. 8

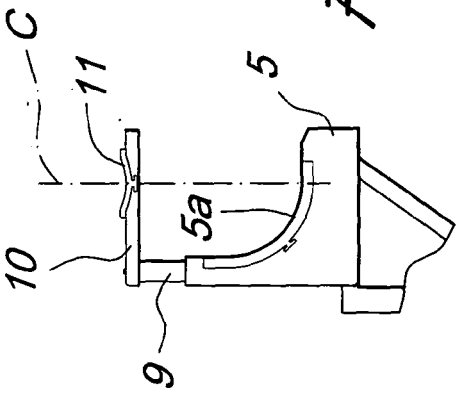

Fig. 10

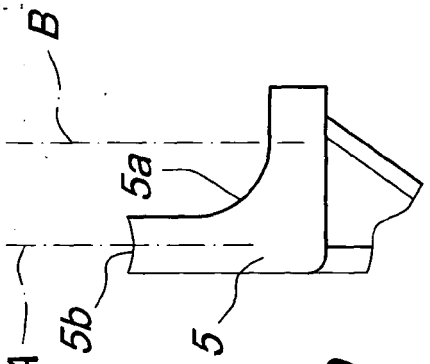

Fig. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5637

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	DE 39 11 781 A1 (GEA TILL GMBH & CO, 6239 KRIFTEL, DE; GEA TILL GMBH & CO, 65830 KRIFTE) 25 October 1990 (1990-10-25)	1-3	B67C3/30 B08B9/08 B65B43/48
A	* column 6, line 6 - line 21; figure 2b *	11	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	23 January 2006	Martínez Navarro, A.

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