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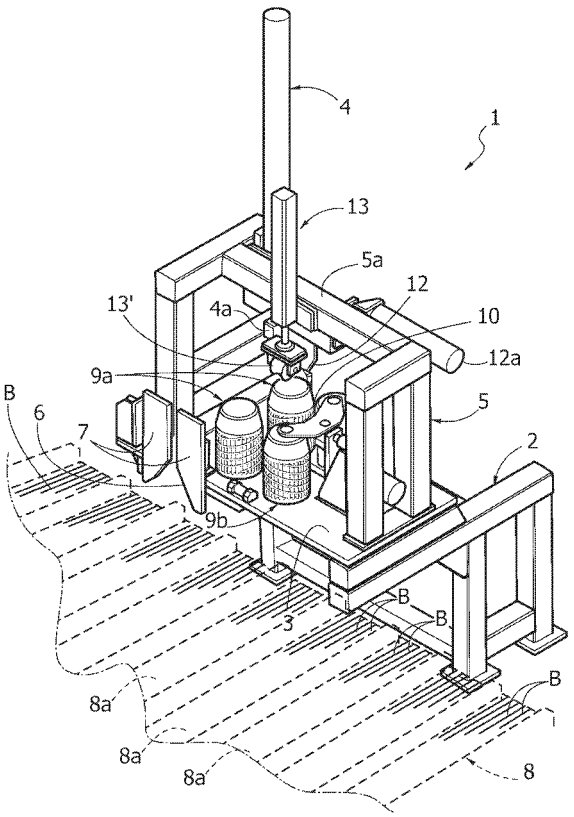
(54) Unit and method for loading metal bars

(57) A unit for automatically loading a predetermined number of metal rods from a storage station (8), wherein the rods are arranged in a bundle (B), to a downstream station.

Such unit comprising means (4,12) for picking up a predetermined number of bars or portions of bars from the bundle (B) which is located at the storage station (8) and for transferring them, one by one, to conveyor means (9a,9b) which cause them to advance along their longitudinal direction towards said downstream station.

The conveyor means (9a,9b) are adapted to advance each bar along its longitudinal direction arranged side-by-side or superimposed, and offset lengthwise, with respect to one or more rods previously fed to said conveyor means and still being moved by the latter.

FIG. 1



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Description

[0001] The present invention refers to units for automatically loading a predetermined number of metal rods from a storage station, wherein the rods are arranged in a bundle, to a downstream station.

[0002] In particular, the present invention refers to units of this type which comprise means for picking up a predetermined number of rods, or portions of rods, from the bundle located at the storage station and transferring them one by one to conveyor means, which cause them to advance along their longitudinal direction towards the downstream station.

[0003] A loading unit of this type is for example described in document EP 1 356 875 B1. In such known solution the ends of a plurality of rods are picked up and raised from the bundle located at the storage station. Once raised, such rod ends are transferred transversely one at a time, in a predetermined number, up to a gathering area. From such gathering area, the abovementioned rod ends are then moved together in their longitudinal direction by conveyor means. In such manner, the rods whose ends were picked and transferred to the gathering area are pulled out longitudinally from the bundle located at the storage station. This solution imposes excessive limits to the loading capacity of the unit, both due to the fact that the abovementioned gathering zone cannot be extensive and thus cannot accommodate a large number of rods, and due to the fact that simultaneously pulling out many rods from the bundle requires too much force, due to the resistance caused by such movements against the other rods of the bundle lying the rods to be pulled out and/or entangled therewith, also alongside and above all due to the fact that even considering applying the force required to simultaneously pull out a high number of rods from the bundle there would still be a high risk of deformation of the rods entangled to each other or even breaking thereof in case of rods having a small diameter.

[0004] The object of the present invention is that of improving loading units of the abovementioned type. The main object of the present invention in particular is that of providing a unit for automatically loading metal rods, with longitudinal movement of the rods, having a greater loading capacity and characterized by enhanced performance.

[0005] Such object is attained by providing a unit for automatically loading a predetermined number of metal rods having the characteristics of claim 1. In particular, the loading unit according to the invention provides for conveyor means suitable for simultaneously advancing a plurality of rods arranged side-by-side or lying over each other and offset with respect to each other lengthwise. In a preferred embodiment, such conveyor means comprise at least one pair of rollers for longitudinally advancing the rods interposed therebetween, such rods superimposed or arrange side-by-side with respect to each other along the opposite surfaces of such pair of rollers.

[0006] In a corresponding manner, the present invention also regards a method for automatically loading a predetermined number of metal rods from a storage station, wherein the rods are arranged in a bundle, to a downstream station, according to the characteristics of claim 11.

[0007] Due to the abovementioned characteristics, the longitudinal movement of the rods in the loading unit according to the present invention is more efficient and such to improve the loading capacity of the unit, making it particularly suitable to operate in association to large and high productivity machines for machining metal rods.

[0008] Further advantageous characteristics of the invention form an object of the dependent claims attached, whose content shall be deemed as an integral part of the present description.

[0009] Now, the invention shall be described with reference to the attached drawings, strictly provided for exemplifying and non-limiting purposes, wherein:

- figure 1 represents a perspective view of the loading unit according to the present invention;
- figure 2 represents a front view of the unit of figure 1;
- figure 3 represents a front view of a detail of the loading unit of figure 1;
- figure 4 represents a plan view of a detail of the unit of figure 1;
- figure 5 represents an operating diagram of the loading unit according to the present invention;
- figure 6 represents a method of application of the loading unit according to the present invention.

[0010] Referring to figures 1 to 4, a loading unit according to the present invention is indicated with reference number 1. The loading unit comprises a support structure 2 bearing means for picking up, transferring, and conveying the rods on a raised plane 3.

[0011] The pick-up means comprise a device 4 for raising the rods which, in the embodiment of the figures, comprises a linear actuator bearing - at the lower end - a magnet 4a, controlled by the actuator between a lowered position and a raised position. The raising device 4 is fixed to the crosspiece 5a of a portal 5 lying on the plane 3 of the structure 2.

[0012] The pick-up means further comprise a reduced vertical passage 6 substantially aligned, plan view, with the magnet 4a along a direction parallel to the longitudinal direction for conveying the rods, described hereinafter, and defined by the opposite lateral edges of two plates 7 arranged, with reference to figure 1, on the front side of the loading plane 3, adjacent to each other at a given distance. The opposite edges of the plates 7 in particular have, starting from the bottom, a first oblique section followed by a substantially vertical section, in such a manner to define a reduced passage 6 substantially shaped to form a capsized funnel. The distance between the two plates 7 may be varied in order to adjust the width of the reduced passage 6 depending on the diameter of the

rods to be loaded, for reasons to be explained hereinafter.

[0013] The loading unit 1 is located in proximity to an area for storing metal rods bundles B. For example, as illustrated in figures 2 and 6, such storage zone is represented by a storage station 8 (also indicated with the dashed line in figure 1) which is provided with several compartments 8a which receive rod bundles B, different from each other in terms of diameter and/or length of the rods. Inside each compartment 8a, the rods lie on crib-shaped metal sheet supports 8b, in such a manner to be distributed thereon forming an upper extended surface, to facilitate pick-up operations. The unit 1 faces an end of the storage station 8, so as to be adjacent to an end of the bundle of rods located beneath the magnet 4a. The structure of the storage station 8 comprises a metal framework mounted on wheels 8c (figure 2,6), in order to allow the movement of the storage station 8 in the direction indicated with X in figures 2,6, transversal with respect to the length of the rods B borne by the storage station. In such manner, the storage station 8 may be moved to provide the pick-up magnet 4a with the desired compartment 8a. The construction details of the storage station 8 and the respective motor means for controlling the movement of the storage station in direction X are neither described nor illustrated herein, in that they may be made in a known manner, and also with the aim of simplifying and making the drawings more understandable. Obviously, the fixed structure of the unit and the structure of the storage station are configured in such a manner to avoid any interference therebetween during the movements of the storage station towards direction X. Furthermore, the storage station may also be mounted on tracks instead of wheels.

[0014] As observable in figure 1, the plates 7 and the raising device 4 are arranged on the loading plane 3 in such a manner to project cantilevered with respect to the structure 2 in such a manner to be arranged above a compartment 8a of the storage station 8, with the direction of alignment between the raising device 4 and the reduced passage 7 parallel to the extension direction of the rods B in the storage station 8.

[0015] Also arranged on the loading plane 3 are means for conveying metal rods B along their longitudinal direction. Such conveyor means are made up of two pairs of rollers 9a,9b with substantially vertical rotation axis, defining a passage 10 therebetween which identifies the longitudinal direction for conveying the rods.

[0016] The pairs of rollers 9a,9b are preferably arranged in such a manner that the passage 10 is moved laterally (on the right with reference to figures 1 and 2) with respect to the reduced passage 6 and the raising device 4.

[0017] As observable in figure 4, each pair of rollers comprises motorized rollers 9a and a freely rotating roller 9b opposite thereto. In the illustrated example, the rollers 9a are actuated by the same chain system comprising a chain 100 which is drawn by a driver crown 101 (driven by a motor not shown in the drawings) and engages a respective ring gear associated to the rollers 9a. The rollers 9b are instead mounted rotating freely at the opposite ends of a bracket 103 which is moveable in the direction transversal to the conveying direction by means of an actuator 105. It is thus possible to adjust the width of the passage 10 to the diameter of the metal rods to be loaded. As a matter of fact, as better described hereinafter, the bracket 103 may be moved between an open position, wherein the rollers 9b are moved away from the motorized rollers 9a, and a closed position (shown in figure 4), wherein rollers 9b are pushed towards rollers 9a, in such a manner to cause the forward movement of the metal rods interposed therebetween.

[0018] As better observable hereinafter, the movement of the bracket 103 towards the closed position is determined in an automatic manner by the electronic control of the unit, according to the method described hereinafter in detail. In the closed condition, the actuator 105 exerts pressure sufficient to ensure that the rotation of the rollers causes the forward movement of the metal rods interposed therebetween.

[0019] Alternatively to the description outlined above, the width of the passage 10 defined by the pairs of rollers 9a,9b may be controlled through the help of sensors which measure the distance between the rollers of each pair and transmit such information to the electronic means for controlling the loading unit, which in turn, according to such information, control the actuator 105, adjusting the width of the passage 10 to the requested value.

[0020] Furthermore, as observable from the figures, all rollers have an upper portion having a tapered end. The tapered upper portions of each pair of opposite rollers 9a,9b thus defining a mouth for easier introduction of the rods into the space comprised between the rollers from above.

[0021] As mentioned previously, in the loading unit according to the present invention the conveyor means are adapted to simultaneously advance a plurality of rods adjacent or superimposed with respect to each other and offset with respect to each other lengthwise.

[0022] In the illustrated embodiment, this occurs by laying the rods over each other inserting them from above in the space defined between the opposite surfaces of the pairs of rollers 9a,9b. As better described hereinafter with reference to figure 5, the rollers 9a,9b may be actually used on most of their axial extension.

[0023] As mentioned previously, the loading unit represented in the figures further comprises transferring means 11, which are mounted slidingly on the crosspiece 5a of the portal 5 and they serve to move the rods picked up by the device 4 to the conveyor means 8. In the implementation example illustrated in figure 2, the transferring means 11 comprise a gripper member 12 moveable along the crosspiece 5a, above the plates 7 and the pairs of rollers 9a,9b, between a position substantially aligned (with reference to figure 2) with the reduced passage 6, wherein the gripper member 12 is capable of engaging

the rods picked up by the pick-up device 4, and a position substantially aligned with the passage 10, wherein the gripper member 12 unloads the rods between the rollers 9a,9b. The movement of the gripper member 12 is controlled by an actuator 12a (figure 1) borne by the fixed structure. The construction details of the gripper member 12 and the respective means for controlling the opening and the closure of the jaws of the gripper member 12 are neither described nor illustrated, in that they may be obtained in any known manner and also with the aim of simplifying the drawings and making them more understandable.

[0024] In the specific illustrated example, a pushing element 13 is also arranged on the crosspiece 5a above the longitudinal passage 10 and controls the vertical position of a pressing member 13' made up of a freely rotating roller, shaped having a reduced central section for an improved engagement astride a rod, intended to push the rods unloaded by the gripper member 12 downwards into the passage 10, also so as to facilitate the mutual nearing of the portions of the rod that are vertically superimposed between the two pairs of rollers 9a,9b.

[0025] Now, following is the description of the operation of the loading unit 1.

[0026] The magnet 4a of the raising device 4 is lowered until it comes to contact with the ends of the metal rods B of the bundle that is in the compartment 8a positioned beneath the magnet. The device 4 thus raises the magnet 4a, which drags the ends of one or more metal rods therewith due to the magnetic effect. The power of the magnet is adjusted according to the weight and/or diameter of the single rods to be loaded.

[0027] It should be observed that alongside providing for the movement indicated above which allows changing the compartment 8a from which loading is carried out, the storage station 8 also provides for the possibility of carrying out small movements with respect to the magnet 4a, preferably by means of automatic control, so that the latter may reach all the rods of the bundle as the latter is progressively used.

[0028] In the return travel of the magnet 4a to its raised position, the ends of the rods raised thereby are forced to lie over each other to pass through the reduced passage 6, therefore only one rod remains attached to the magnet and reaches the abovementioned raised position while the other rods drop back into the bundle.

[0029] Thus, the gripper member 12 grips the end of the raised rod and, moving along the crosspiece 5a, it takes it above the longitudinal passage 10. In such position, the gripper member 12 frees the rod, which falls into the longitudinal passage 10, between the rollers 9a, 9b, due to gravity. The roller 13' serves to facilitate and quicken the disengagement of the rod from the gripper 12 and simultaneously direct it into the passage 10.

[0030] When the first rod of the bundle is moved, the rollers 9b are in the position away from the corresponding rollers 9a. When such first rod is released by the gripper member 12, the opening of the gripper is detected by the electronic control means, which automatically activate the actuator 105, to move rollers 9b against rollers 9a, pressing the unloaded rod therebetween (such solution is preferred, due to its simplicity, with respect to the abovementioned alternative solution, which provides for an active adjustment of the width of the passage according to the signal of a sensor). The motorized rollers 9a start rotating simultaneously in such a manner to immediately move the end of the rod forward towards the downstream station associated to the loading unit, entirely pulling out the rod itself from the bundle in the storage station 8.

[0031] The pick-up cycle is carried out a number of times equivalent to the number of rods intended to be loaded and transferred to the downstream station, while the rollers 9a,9b continue rotating, without interruption, until all the picked-up rods are transferred. The counting of the rods picked-up and transferred to the conveyor means is carried out for example according to the number of times that a sensor arranged on the gripper member 12 detects the gripping of a rod. Preferably, the gripper member 12 has a structure apt to engage one single rod at a time so as to prevent errors of counting due to the accidental gripping of a plurality of rods at once by the magnetic means. However, the sensor may be positioned in any other manner, for example at the height of the pick-up device or elsewhere.

[0032] Given that each rod is immediately moved forward in the longitudinal direction as soon as it reaches between the rollers 9a,9b, each rod that reaches between the rollers is receded, and thus offset lengthwise, with respect to the rod that had been unloaded earlier on between the rollers. Hence, as mentioned beforehand, the conveyor means of the loading unit according to the invention, which in the case of the illustrated example are made up of the pairs of rollers 9a,9b, are adapted to simultaneously move a plurality of rods forward superimposed and offset lengthwise thereof. Given that each rod is moved longitudinally forward as soon as it reaches the area between the rollers, the unit acquires a considerable loading capacity. As a matter of fact, no space is required to gather the rods to be moved longitudinally forward together, and the rods may be removed and disentangled from the bundle without requiring applying excessive forces and without the risk of damaging the rods.

[0033] By adjusting the offset degree lengthwise between the rods fed by the rollers 9a,9b, as described in detail hereinafter with reference to figure 5, it is possible to control the force required to remove the rods from the bundle and establish a superimposition condition of the rods capable of allowing a simultaneous movement of the largest number of rods possible. The loading operation may be carried out, in any case, always continuously, regardless of the number of rods intended to be loaded.

[0034] In this manner, numerous groups of metal rods may be transferred to the conveyor means, in that they may be removed or disentangled from the bundle without requiring applying excessive force and without the risk

of damaging the rods.

[0035] Furthermore, as already described, in the loading unit described above, the pick-up means and transferring means may continuously feed one rod after the other to the conveyor means, even though one or more previously fed rods are still being moved by the conveyor means, thus without requiring providing any intermediate gathering zones between the pick-up and transferring means and the conveyor means.

[0036] Furthermore, as outlined above, it is clear that given that the pick-up means, transferring means and conveyor means operate continuously, idle times are reduced to the minimum and the loading operations are much more efficient.

[0037] Figure 5 shows an operating diagram of the conveyor rollers described previously. As observable from such figure, as the single rods B' are successively arranged between the rollers, the rods, continuously moving in the longitudinal direction, are partly superimposed on each other. Once the first rods are unloaded by the rollers, the rods free a lower space of the passage 10 such space being immediately occupied by the rods still engaged by the rollers moving downwards. In such manner, the rods that move downwards in turn free an upper space of the passage 10, into which further rods may thus be fed by the gripper member 12. The downwards movement of the rods is facilitated by the helical configuration provided for on each roller, as mentioned previously.

[0038] The flow of rods that is formed in the passage 10 is thus characterised by a movement C provided by a first component in longitudinal direction L and by a second component in vertical direction V, from the top towards the bottom.

[0039] The functionality of the conveyor means, for the indicated purposes, depends on their specific design characteristics which vary depending on the configuration of such means. For example, in the embodiment of the figures, the parameters to be taken into account are the height of the rollers and the rotation velocity thereof.

[0040] The information outlined above clearly shows how conveyor means described herein allow a better management of the operating cycle of the loading unit. In particular, the method of operating such conveyor means allows transforming the conveying times into disguised work cycle times and thus reduce the idle times of the operating cycle of the loading unit.

[0041] Due to the indicated characteristics, the loading unit described thus has a great versatility characteristic and high loading capacity.

[0042] It is clear that embodiments wherein two or more rods at a time are picked-up and transferred to the conveyor means are in any case to be considered equivalent to the preferred one, which has been up to here described, and included within the scope of the present invention. In such embodiments, the pick-up and transferring means, instead of taking single rods in succession to the conveyor means, take to the latter a succession of rod batches. Moreover, in the preferred embodiment wherein the conveyor means are constituted by the opposed rollers, the rods of a batch that all together are taken to the conveyor rollers, enter in any case one after the other, in succession, within the interspace between the two rollers, so that the latter make them all the same to advance in the side-by-side, or superimposed, lengthwise offset arrangement, as in the embodiment shown in the figures. In the case wherein the conveyor means are constituted by conveyor belts or the like, conversely, are the rod batches themselves, which are taken to the conveyor means in succession, to advance in the side-by-side, or superimposed, lengthwise offset arrangement.

[0043] In the preferred embodiment described above the conveyor means are made up of rollers with substantially vertical rotation axis. However, it is also possible to provide for conveyor means for the same purposes indicated above which are made up of rollers with transverse or substantially horizontal rotation axis, same case also applying to conveyor means of any other type which are however adapted for the simultaneous forward movement of a plurality of rods partly arranged side-by-side or superimposed with respect to each other along their longitudinal direction. For example provided for may be conveyor means made up of rotating belts.

[0044] Generally, the downstream station referred to herein may not be the final station where the rods are subjected to a determined operation, for example cutting. As a matter of fact, such downstream station may be an intermediate station, from which the rods are then transferred by any suitable means up to the subsequent machining step.

[0045] The electronic control means of the unit are programmed to control the various members part of the unit according to a predefined logic. In particular the electronic control means are adapted to receive signals coming from the sensor for counting transferred rods and interrupt the operation of at least one of said pick-up means upon reaching a predetermined number of rods.

[0046] In a possible variant, used instead of the gripper 12, is a pushing device for the transverse transfer of the raised rods up to the conveyor means, sliding them on a support surface provided for such purpose.

Claims

1. A unit for automatically loading a predetermined number of metal rods from a magazine, in which the rods are arranged in a bundle, to a downstream station, comprising:

- means (4, 12) for picking up a plurality of rods, or portions thereof, from the bundle located at the magazine,
- conveyor means (9a, 9b)for advancing the rods along their longitudinal direction towards said

downstream station,
- means for transferring the picked-up rods, or portions thereof, one by one to said conveyor means, and
- control means,

said unit being **characterized in that** said control means are configured for controlling said pick-up and transferring means to feed the rods one after the other to the conveyor means (9a, 9b), so that in the conveyor means each rod is made to advance along its longitudinal direction in a side-by-side, or superimposed, lengthwise offset arrangement with respect to one or more rods that have been previously fed to said conveyor means and that are still being moved thereby.

2. Unit according to claim 1, **characterized in that** it comprises pick-up means (4, 4a) for picking up a predetermined number of rods (B), or portions thereof (B), from the bundle located at the magazine and transferring means (11, 12), different from said pick-up means (4, 4a), for transferring the picked-up rods (B), or portions thereof, one by one to said conveyor means (9a, 9b).

3. Unit according to claim 1 or claim 2, **characterized in that** said conveyor means comprise at least one pair of rollers (9a, 9b), of which at least one is motorized, for longitudinally advancing the rods (B) or portions thereof interposed therebetween, said rods reciprocally superimposing or placing themselves in a side-by-side arrangement along the opposed surfaces of said at least one pair of rollers.

4. Unit according to claim 3, **characterized in that** each pair of rollers of said conveyor means includes a motorized roller (9a) having a stationary axis and a pressing roller (9b) carried by a movable support (103) which is pushed towards the motorized roller.

5. Unit according to claim 3 or claim 4, **characterized in that** said rollers (9a, 9b) have their rotation axes arranged transversely with respect to a horizontal plane.

6. Unit according to any of claims 3-5, **characterized in that** at least one roller of said at least one pair of rollers (9a, 9b) has a lateral surface with a helical portion adapted to engage the rods interposed between the rollers so as to cause them to move close to each other in a side-by-side or superimposed relationship.

7. Unit according to any of claims 3-6, **characterized in that** at least one roller of each pair of rollers (9a, 9b) has a tapered end portion for defining an inlet mouth for the introduction of the rods within the space between the rollers.

8. Unit according to any of the previous claims, **characterized in that** it comprises an adjustable reduced passage (6), at a fixed position, through which the picked-up rods have to pass, so that only one rod at a time can reach said transferring means.

9. Unit according to any of the previous claims, **characterized in that** it comprises means for counting the picked-up and/or transferred rods, or portions thereof, which are operatively connected to said control means so that said control means interrupt the operation of at least said picking-up means when a predetermined number of rods is reached.

10. Unit according to any of the previous claims, **characterized in that** said pick-up means comprise a magnetic effect device (4a).

11. Unit according to any of the previous claims, **characterized in that** said pick-up means (4, 4a) are adapted to move vertically between a lowered position and a raised position.

12. Unit according to any of claims 2-11, **characterized in that** said transferring means comprise a gripper member (12) which is adapted to move along a substantially horizontal direction, between a position in which said gripper member grips the rod or portion thereof that has been picked up by said pick-up means, and an unloading position, over said conveyor means, in which said gripper member releases said rod or portion thereof.

13. Unit according to any of claims 2-11, **characterized in that** said transferring means comprise a pushing member apt to push each rod in the transfer direction.

14. A method for automatically loading a predetermined number of metal rods from a magazine, in which the rods are arranged in a bundle, to a downstream station,
comprising the steps of picking up a plurality of rods (B), or portions thereof, from the bundle located at the magazine, transferring the picked-up rods, or portions thereof, one by one to said conveyor means (9a, 9b) and advancing the rods by said conveyor means (9a, 9b) along their longitudinal direction towards said downstream station,
characterized in that the rods are fed to said conveyor means (9a, 9b) one after the other and **in that** by means of said conveyor means (9a, 9b) each rod is made to advance along its longitudinal direction in a side-by-side or superimposed relationship, offset lengthwise, with respect to one or more rods that have been previously fed to said conveyor means and that are still being moved thereby.

15. Method according to claim 14, **characterized in that** the rods, or portions thereof, are picked up in a predetermined number from said bundle according to a movement in a substantially vertical direction during which they are caused to pass through a reduced passage (6) and **in that** the rods (B) or portions thereof that have been picked up are then transferred to said conveyor means (9a, 9b) according to a movement in a direction transverse to the longitudinal conveying direction.

FIG. 1

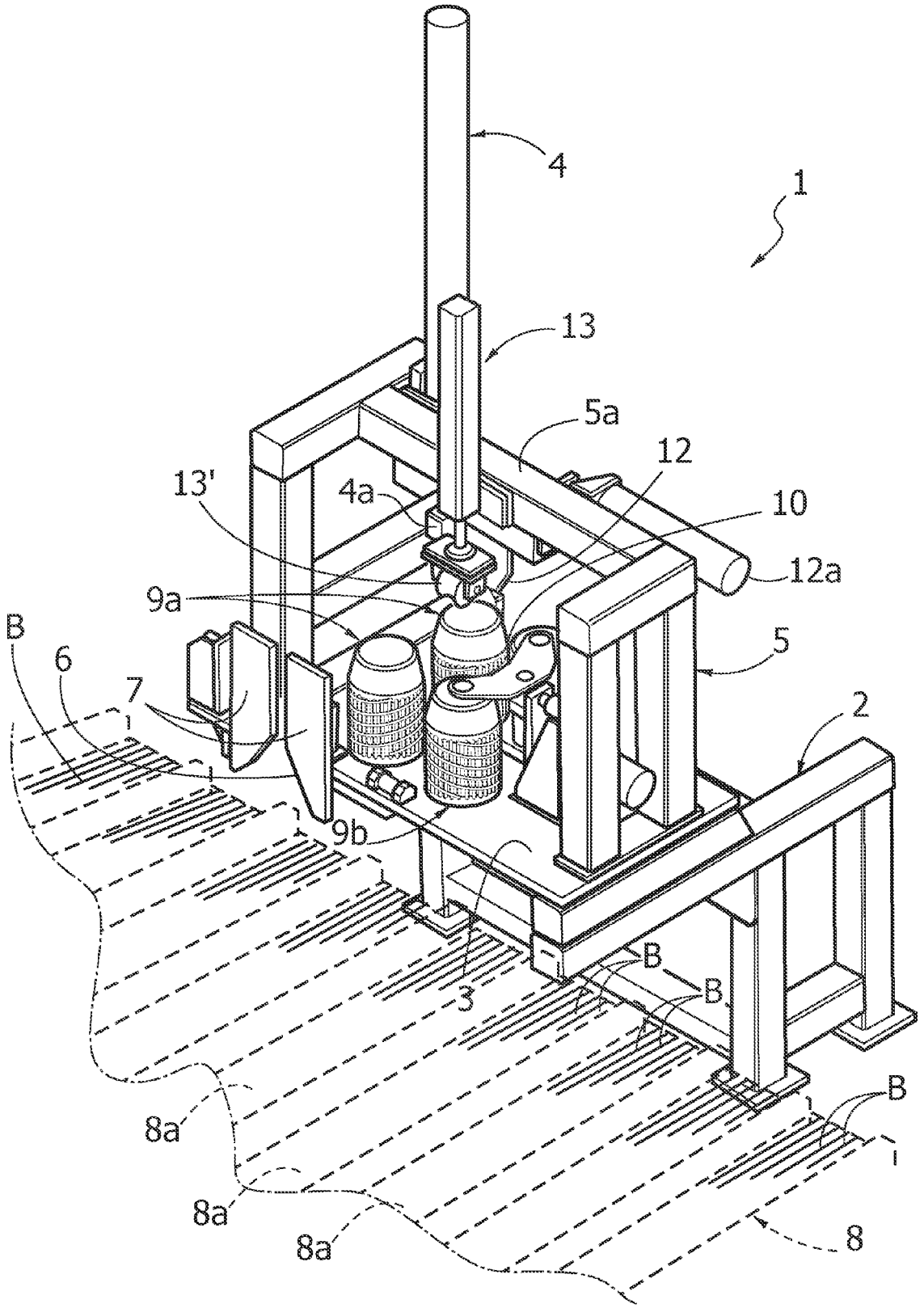


FIG. 2

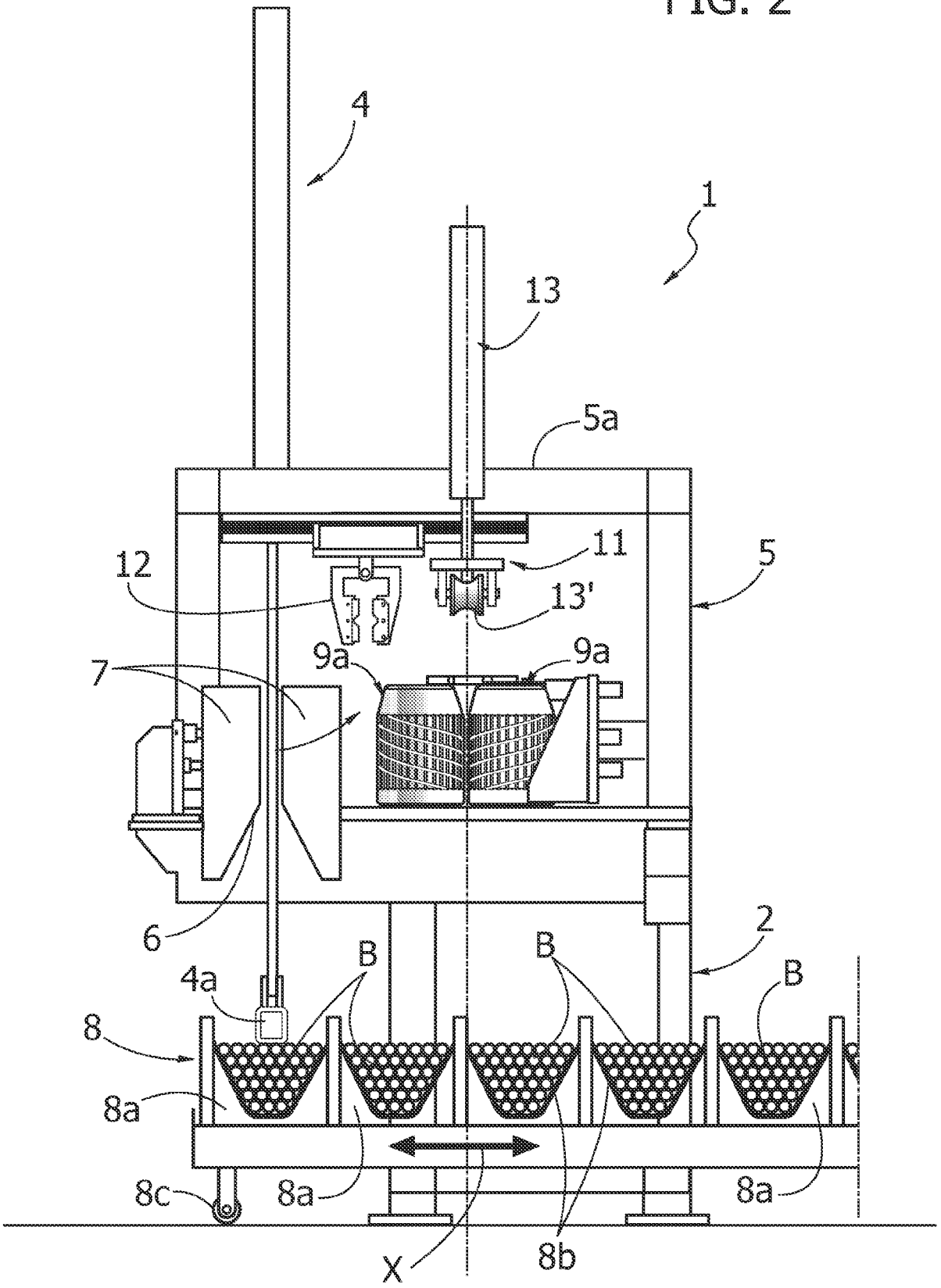


FIG. 3

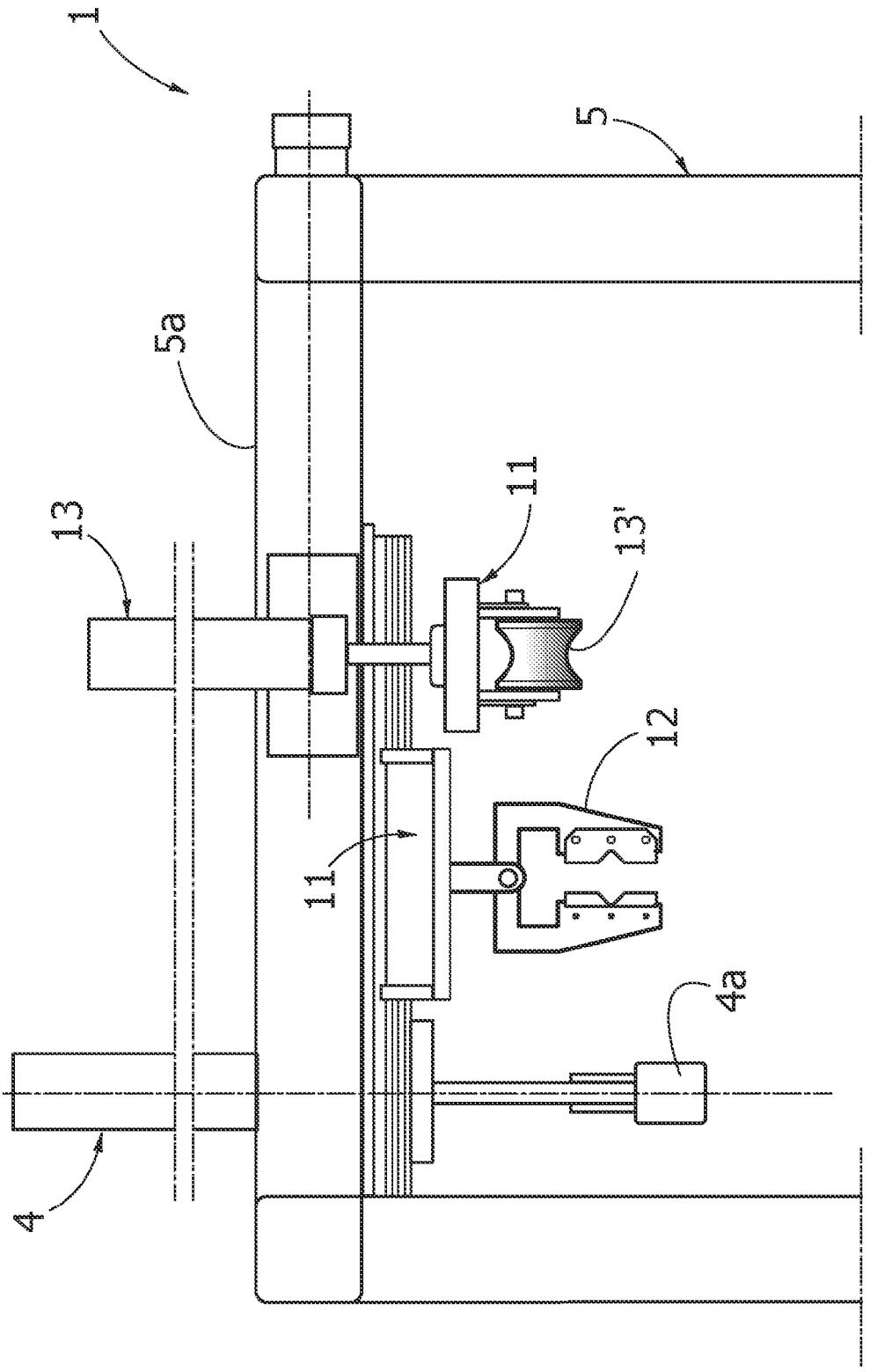


FIG. 4

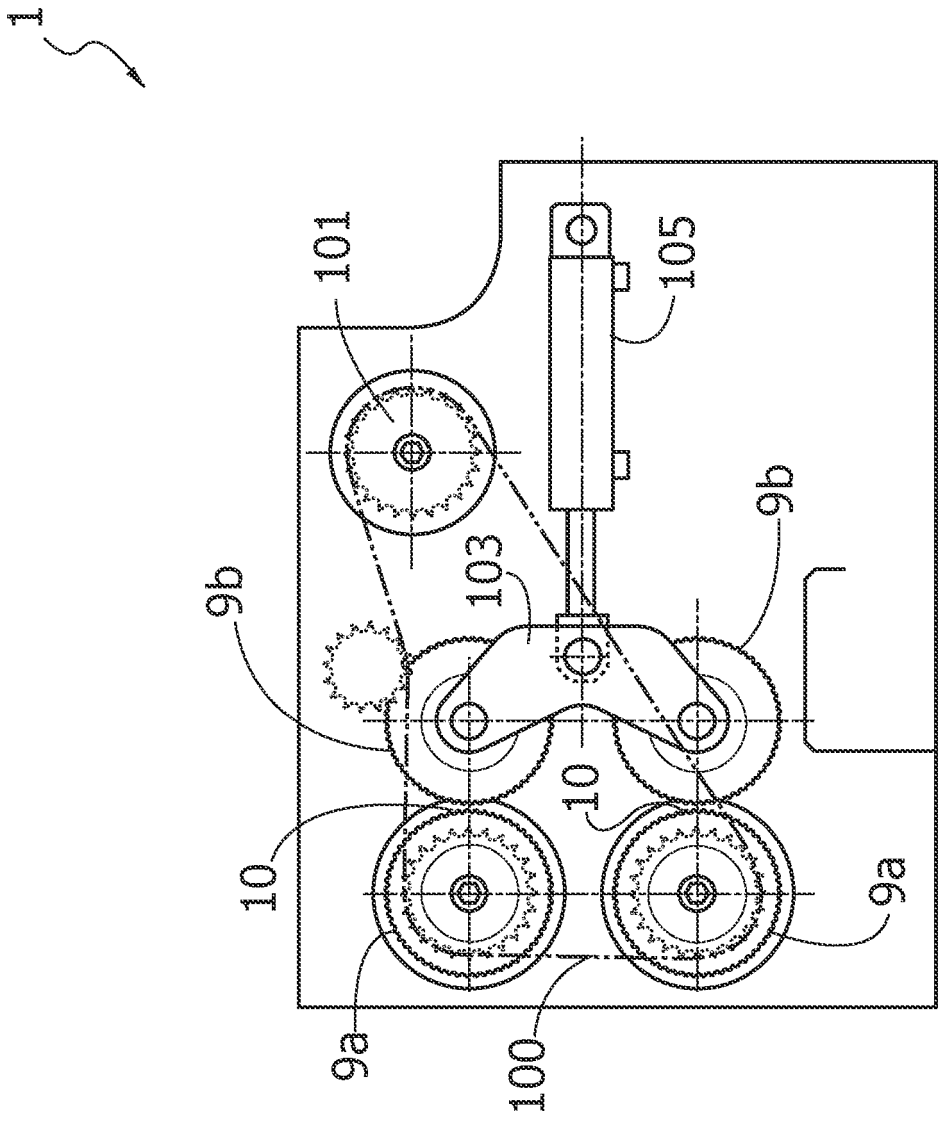


FIG. 5

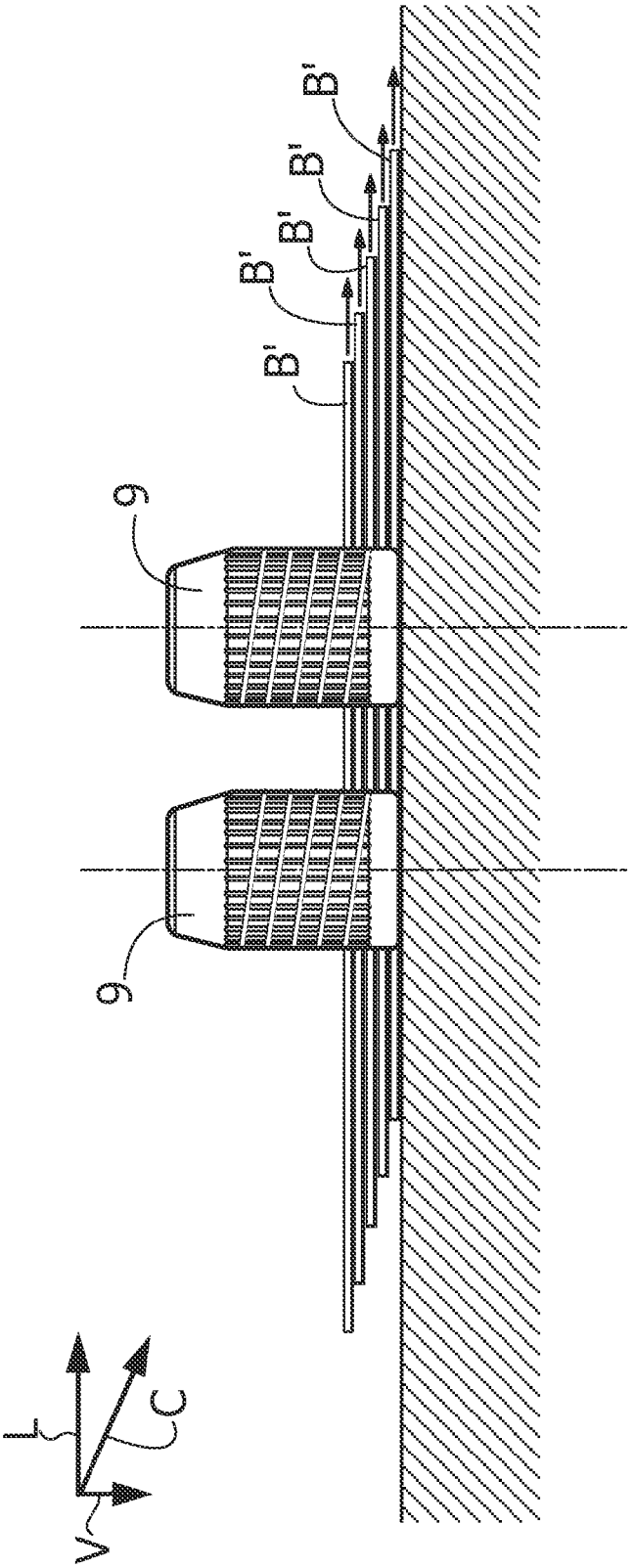
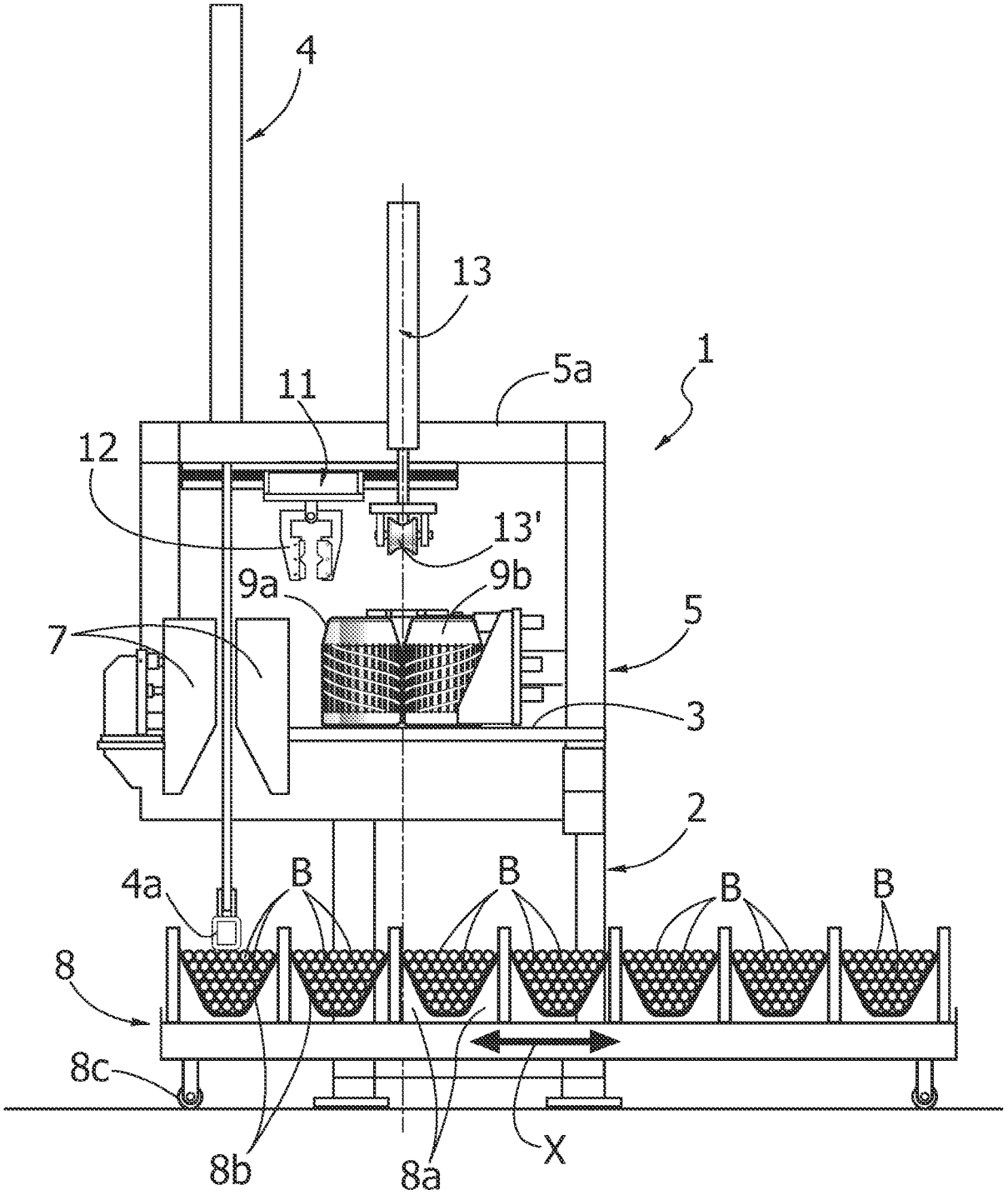


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 09 17 1527

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 0 790 086 A (BOEHLER EDELSTAHL [AT]) 20 August 1997 (1997-08-20) * column 4, line 23 - column 6, line 27; claims 9-13; figures 1,2 *	1-2, 10-12, 14-15	INV. B21F23/00 B21D43/00 B65G47/14
A,D	EP 1 356 875 A (SCHNELL SPA [IT]) 29 October 2003 (2003-10-29) * column 6, line 11 - column 7, line 55; figures 15-28 *	1-3, 9-11, 14-15	
A	EP 1 738 843 A (PIEGATRICI MACCH ELETTR [IT]) 3 January 2007 (2007-01-03) * column 3, line 8 - column 4, line 58; figures 1,2 *	1-4, 10-11, 14-15	
A	EP 1 845 040 A (PIEGATRICI MACCH ELETTR [IT]) 17 October 2007 (2007-10-17) * column 3, line 39 - line 56; figures 2-4 *	1-2, 10-11, 14-15	TECHNICAL FIELDS SEARCHED (IPC) B21F B21D B65G
A	IT 1 206 893 B (OSCAM SPA [IT]) 11 May 1989 (1989-05-11) * figures 1-5 *	1,3,6,14	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 January 2010	Ritter, Florian

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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