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(72) Inventor: **YAMAMOTO, Masatoshi**
Toyokawa-shi
Aichi 441-1205 (JP)

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(74) Representative: **HOFFMANN EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

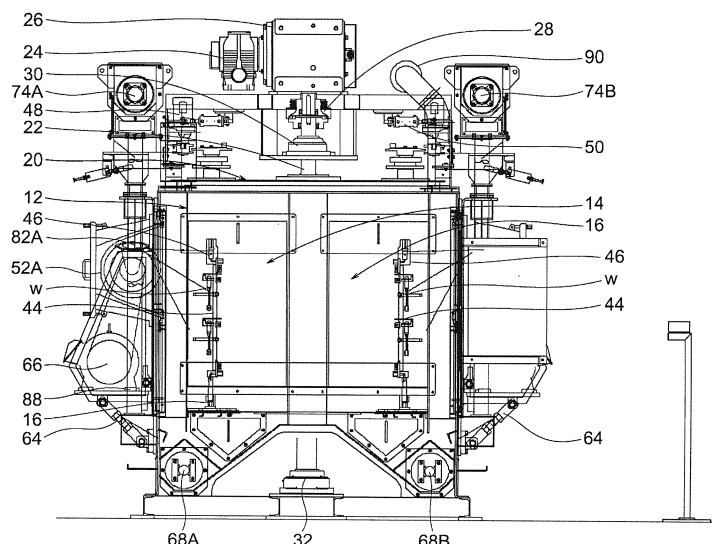
(71) Applicant: **Sintokogio, Ltd.**
Naka-ku, Nagoya-shi
Aichi 460-0003 (JP)

(54) **SHOT PROCESSING DEVICE**

(57) A shot processing device 10 is provided with a cabinet 12, a rotary hanger 20, a revolution driving motor 24 configured to rotate the rotary hanger 20, a rotation driving motor 48 configured to allow a hanger provided in a chamber 42 located in projection material projection areas 18A to 18D in the cabinet 12 among a plurality of the chambers 42 on the rotary hanger 20 to rotate, centrifugal projectors 52A to 52D configured to apply shot processing to a work W by projecting a projection material to the chamber 42 located in the projection material pro-

jection areas 18A to 18D among the plurality of chambers 42 from the outside in a radial direction of a turntable 34 constituting the rotary hanger 20, a plurality of lower screw conveyers 68A and 68B configured to recover the projection material projected from the centrifugal projectors 52A to 52D and convey the projection material in a horizontal direction, and a plurality of bucket elevators 70A and 70B configured to convey the projection material conveyed by these lower screw conveyers 68A and 68B upward.

Fig.1



Description

Technical Field

[0001] A mode of the present invention relates to a shot processing device.

Background Art

[0002] Patent Literature 1 discloses a shot processing device provided with a shot processing jig (1) having a cage (24), jig rotation holding means (3) for rotationally holding the shot processing jig (1), a projection chamber body (2) for sealing the jig rotation holding means (3), a projecting device (7) for projecting a projection material, and projection material circulating means (8) for recovering the projected projection material and supplying it to the projecting device (7).

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Patent Application Publication No. 2010-82727

Summary of Invention

Technical Problem

[0004] However, in a shot processing device provided with this type of shot processing jig, reduction of the overall height of the entire device is in demand.

[0005] In this technical field, a shot processing device whose overall height of the entire device can be reduced is in demand.

Solution to Problem

[0006] A shot processing device according to an aspect of the present invention is provided with a cabinet formed having a box shape and having a projection material projection area therein, a rotary hanger having a turntable arranged rotatably in a horizontal direction inside the cabinet, a plurality of partition materials provided on the turntable and dividing a space on the turntable into a plurality of parts in a circumferential direction of the turntable, and a plurality of hangers provided on each of a plurality of chambers divided by the plurality of partition materials and each suspending and holding a work or a cage into which the work is inserted, a revolution driving motor configured to rotate the rotary hanger so as to sequentially move the plurality of chambers to the projection material projection area in the cabinet, a rotation driving motor configured to rotate the hanger provided in the chamber located in the projection material projection area among the plurality of chambers, a projector configured to apply shot processing to the work by pro-

jecting the projection material to the chamber located in the projection material projection area among the plurality of chambers from outside in the radial direction of the turntable, a first projection material conveying mechanism configured to recover the projection material projected from the projector and convey the projection material in the horizontal direction, and a plurality of second projection material conveying mechanisms configured to convey the projection material conveyed by the first projection material conveying mechanism upward.

[0007] According to this shot processing device, since a plurality of the second projection material conveying mechanisms configured to convey the projection material upward are provided, each second projection material conveying mechanism can be reduced in size in the height direction. As a result, the overall height of the entire device can be reduced.

[0008] In an embodiment, the shot processing device may be further provided with a third projection material conveying mechanism configured to convey the projection material conveyed by the plurality of second projection material conveying mechanisms in the horizontal direction, a first projection material tank and a second projection material tank configured to store the projection material conveyed by the third projection material conveying mechanism, a level sensor configured to detect an amount of the projection material stored in the second projection material tank, a balance tank provided in parallel with the projector, and a switching mechanism configured to have the projection material supplied from the first projection material tank to the balance tank when a detected value of the level sensor exceeds a specified value set in advance, and configured to have the projection material supplied from the balance tank to the first projection material conveying mechanism while having the projection material supplied from the second projection material tank to the projector when the detected value of the level sensor falls under the specified value.

[0009] According to this shot processing device, when the detected value of the level sensor exceeds the specified value set in advance, the projection material is supplied from the first projection material tank to the balance tank. On the other hand, when the detected value of the level sensor falls under the above-described specified value, the projection material is supplied from the second projection material tank to the projector and the projection material is supplied from the balance tank to the first projection material conveying mechanism. Therefore, a good balance can be kept in a transport amount of the projection material without shortage of the projection material.

[0010] In the embodiment, the shot processing device may be further provided with a separator provided between the plurality of second projection material conveying mechanisms and the third projection material conveying mechanism and configured to perform wind selection of the whole amount of the projection material conveyed by the second projection material conveying

mechanism and a vibration sieve vibration sieve classify a part of the projection material conveyed by the third projection material conveying mechanism.

[0011] According to this shot processing device, the separator is provided between the plurality of second projection material conveying mechanisms and the third projection material conveying mechanism, and the whole amount of the projection material conveyed by the second projection material conveying mechanism is subjected to wind selection by this separator. Therefore, the classification performance of the projection material can be ensured even for works producing many burrs and fine powders. Moreover, by means of this separator, the vibration sieve classify a part of the projection material conveyed by the third projection material conveying mechanism and a structure in which the projection material is not projected but passed through the separator and the vibration sieve again by storage of the projection material in the above-described balance tank and supply of the projection material from this balance tank, the classification performance of the projection material can be ensured.

[0012] In the embodiment, the projector may be configured to have an impeller configured to project a projection material with rotation, a driven pulley rotatably supported with respect to the cabinet and rotated integrally with the impeller, a driving pulley rotated by a driving motor, a driving belt wound around the driving pulley and the driven pulley, a rotating member rotatably supporting the driving pulley and also rotatably supported by the cabinet capable of adjusting a distance between the driving pulley and the driven pulley, and an expansion/contraction mechanism connecting a rotation end portion of the rotating member and the cabinet and capable of adjusting a length in an axial direction.

[0013] According to this shot processing device, by adjusting the length in the axial direction of the expansion/contraction mechanism, the rotating member is rotated, whereby the distance between the driving pulley and the driven pulley is adjusted, and a tension of the driving belt can be adjusted. Therefore, since it is not necessary to loosen a bolt of a mounting portion of the driven pulley into the cabinet in order to adjust the tension of the driving belt, for example, workability can be made favorable.

[0014] In the embodiment, the partition material may be configured to have a pair of side wall portions opposite to each other and extending in the radial direction of the turntable, respectively, and a bottom wall portion connecting end portions on the center side of the turntable in the pair of side wall portions and inclined toward the center side of the turntable as it goes from one of the pair of side wall portions to the other.

[0015] According to this shot processing device, the bottom wall portion of the partition material is inclined toward the center side of the turntable as it goes from one of the pair of side wall portions to the other. Therefore, even if the projection material projected by the projector from the outside in the radial direction of the turntable

hits the bottom wall portion, bouncing of this projection material to the projection side can be suppressed. As a result, durability of the projector can be ensured.

5 Advantageous Effects of Invention

[0016] As described above, according to the various aspects and the embodiment of the present invention, the overall height of the entire device can be reduced.

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Brief Description of Drawings

[0017]

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[Figure 1] Figure 1 is a front view illustrating a shot processing device according to an embodiment of the present invention.

[Figure 2] Figure 2 is a side view of the shot processing device illustrated in Figure 1.

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[Figure 3] Figure 3 is a rear view of the shot processing device illustrated in Figure 1.

[Figure 4] Figure 4 is a plan view of the shot processing device illustrated in Figure 1.

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[Figure 5] Figures 5 are diagrams illustrating a configuration of a centrifugal projector illustrated in Figure 1, in which Figure 5(A) is a plan view, Figure 5(B) is a front view, and Figure 5(C) is a side view.

[Figure 6] Figures 6 are diagrams illustrating a configuration of another centrifugal projector illustrated in Figure 1, in which Figure 6(A) is a plan view, Figure 6(B) is a front view, and Figure 6(C) is a side view.

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[Figure 7] Figure 7 is a planar sectional view of a cabinet illustrated in Figure 1.

[Figure 8] Figure 8 is a rear view of the shot processing device (circulation portion) illustrated in Figure 1.

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[Figure 9] Figure 9 is a front view illustrating a variation of a shot processing device according to an embodiment of the present invention.

[Figure 10] Figure 10 is a side view of the shot processing device illustrated in Figure 9.

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[Figure 11] Figure 11 is a rear view of the shot processing device illustrated in Figure 9.

[Figure 12] Figure 12 is a plan view of the shot processing device illustrated in Figure 9.

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[Figure 13] Figures 13 are diagrams illustrating a configuration of a centrifugal projector illustrated in Figure 9, in which Figure 13(A) is a front view and Figure 13(B) is a side view.

[Figure 14] Figures 14 are diagrams illustrating a configuration of another centrifugal projector illustrated in Figure 9, in which Figure 14(A) is a side view and Figure 14(B) is a front view.

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[Figure 15] Figure 15 is a planar sectional view of a cabinet illustrated in Figure 9.

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Description of Embodiments

[0018] An embodiment of the present invention will be

described below by referring to Figures 1 to 9. Figure 1 is a front view of a shot processing device 10 according to the embodiment, and Figure 2 is a side view of the shot processing device 10 illustrated in Figure 1. As illustrated in Figures 1 and 2, the shot processing device 10 according to the embodiment of the present invention is provided with a cabinet 12. Figure 7 is a planar sectional view of the cabinet 12. As illustrated in Figure 7, this cabinet 12 is formed having a box shape having a pentagonal cross section. Inside this cabinet 12, a work carrying-in area 14 for performing carrying-in of a work W, a work carrying-out area 16 for performing carrying-out of the work W, and projection material projection areas 18A to 18D for projecting a projection material to the work W are provided.

[0019] At a center part inside this cabinet 12, a rotary hanger 20 is provided. This rotary hanger 20 is rotated by a revolution driving motor 24 around a revolution shaft 22 extending in the vertical direction as illustrated in Figure 1.

[0020] On the revolution shaft 22, a revolution indexing device 26 and a torque limiter 28 are provided. Moreover, this revolution shaft 22 is rotatably supported by an upper bearing 30 and a lower bearing 32.

[0021] The rotary hanger 20 includes, as illustrated in Figure 7, a turntable 34 arranged rotatably in a horizontal direction in the cabinet 12 and a plurality of partition materials 36 provided on this turntable 34 and dividing a space on the turntable 34 into a plurality of parts in the circumferential direction of the turntable 34.

[0022] The partition material 36 includes a pair of side wall portions 38 and a bottom wall portion 40. The pair of side wall portions 38 are opposite to each other and extending in the radial direction of the turntable 34, respectively. The bottom wall portion 40 connects end portions on the center side of the turntable 34 in the pair of side wall portions 38 and are inclined toward the center side of the turntable 34 as it goes from one of the pair of side wall portions 38 to the other.

[0023] The rotary hanger 20 is rotated by the revolution driving motor 24 (See Figure 1). By the means of rotation, a plurality of chambers 42 divided by the above-described plurality of partition materials 36 are moved sequentially to the work carrying-in area 14, the work carrying-out area 16, and the projection material projection areas 18A to 18D.

[0024] That is, the chamber 42 located in the work carrying-in area 14 among the plurality of chambers 42 is used as the work carrying-in chamber, and the chamber 42 located in the work carrying-out area 16 among the plurality of chambers 42 is used as the work carrying-out chamber. Moreover, the chamber 42 located in the projection material projection areas 18A to 18D among the plurality of chambers 42 is used as the projection chamber. As described above, the above-described plurality of chambers 42 are switched sequentially to the work carrying-in chamber, the work carrying-out chamber, and the projection chamber by means of rotation of the rotary

hanger 20.

[0025] In this embodiment, the work W is a forging, a pressing, a welded structure and the like, or more specifically automobile related components, for example.

[0026] Moreover, in each of the plurality of chambers 42 divided by the above-described plurality of partition materials 36, as illustrated in Figure 1, a hanger (not shown) for suspending and holding a cage 44 into which the work W is to be inserted is provided. The work W may be directly held by this hanger.

[0027] On an upper part of the cage 44, a rotation shaft 46 is provided. To this rotation shaft 46, a rotation chain wheel (not shown) provided above the rotary hanger 20 is connected, and this rotation chain wheel is rotated by a rotation driving motor 48, respectively, only if it is located in any of the above-described projection material projection areas 18A to 18D (See Figure 7).

[0028] As a result, the hanger provided in the chamber 42 located in the projection material projection areas 18A to 18D (that is, the chamber 42 used as the projection chamber) among the plurality of chambers 42 is rotated. Moreover, the above-described rotation chain wheel is switched by a connection driving cylinder 50 and the like between a state connected to the rotation driving motor 48 and a state where the connection to the rotation driving motor 48 is released.

[0029] Moreover, as illustrated in Figure 7, on the side wall portions of the cabinet 12, centrifugal projectors 52A to 52D as a plurality of projectors configured to apply shot processing to the work W by projecting a projection material to the chamber 42 located in the projection material projection areas 18A to 18D among the plurality of chambers 42 from the outside in the radial direction of the turntable 34 are provided.

[0030] Figure 5 is a diagram illustrating a configuration of the centrifugal projector 52A, in which Figure 5(A) is a plan view, Figure 5(B) is a front view, and Figure 5(C) is a side view. The centrifugal projector 52A includes, as illustrated in Figure 5, an impeller 54, a driven pulley 56, a driving pulley 58, a driving belt 60, a rotating member 62, an expansion/contraction mechanism 64, and a driving motor 66. The impeller 54 includes a plurality of blades and is configured to project a projection material with rotation. The driven pulley 56 is supported rotatably with respect to the cabinet 12 and is rotated integrally with the impeller 54. The driving pulley 58 is rotated by the driving motor 66, and the driving belt 60 is wound around the driving pulley 58 and the driven pulley 56.

[0031] The rotating member 62 is formed having a plate shape and rotatably supports the driving pulley 58. Moreover, this rotating member 62 includes one end side rotatably connected to an impeller base door. As a result, with the rotation of the rotating member 62, a distance between the driving pulley 58 and the driven pulley 56 can be adjusted.

[0032] Moreover, the expansion/contraction mechanism 64 connects a rotation end portion of the rotating member 62 and the impeller base door. This expansion/

contraction mechanism 64 includes a bolt and a nut, and by rotating the bolt among them, a length can be adjusted in the axial direction. The other centrifugal projectors 52B to 52D also have configurations similar to that of the centrifugal projector 52A (See Figure 6, for example).

[0033] As illustrated in Figure 1, on a lower part of the cabinet 12, lower screw conveyers 68A and 68B as a first projection material conveying mechanism are provided. The lower screw conveyers 68A and 68B are arranged in the horizontal direction and recover the projection material falling from the chamber 42 which is used as the projection chamber among the plurality of chambers 42 and convey it in the horizontal direction.

[0034] Figure 3 is a rear view of the shot processing device 10, Figure 4 is a plan view of the shot processing device 10, and Figure 8 is a rear view of a circulating portion of the shot processing device 10. To distal ends of the lower screw conveyers 68A and 68B, as illustrated in Figure 3, lower parts of bucket elevators 70A and 70B as a second projection material conveying mechanism are connected. The bucket elevators 70A and 70B are arranged in the vertical direction and convey the projection material conveyed by the lower screw conveyers 68A and 68B upward.

[0035] To upper parts of the bucket elevators 70A and 70B, upper screw conveyers 74A and 74B as a third projection material conveying mechanism are connected through separators 72A and 72B. The upper screw conveyers 74A and 74B are arranged in the horizontal direction and convey the projection material conveyed by the bucket elevators 70A and 70B in the horizontal direction.

[0036] To the upper screw conveyers 74A and 74B, first to fourth projection material conveying paths are connected in order from the upstream side to the downstream side. The first projection material conveying path is, as illustrated in Figure 2, to supply the projection material to a balance tank 76 and includes a projection material tank 78A as a first projection material tank, a flow-rate adjuster 80A, and an inlet pipe 82A. The second projection material conveying path is to supply the projection material to inclined vibration sieves 84A and 84B (See Figure 3) as the vibration sieves and includes a projection material tank 78B, a flow-rate adjuster 80B, and an inlet pipe 82B.

[0037] Moreover, the third projection material conveying path is to supply the projection material to the centrifugal projector 52C and includes a projection material tank 78C, a flow-rate adjuster 80C, and an inlet pipe 82C. The fourth projection material conveying path is to supply the projection material to the centrifugal projector 52D and includes a projection material tank 78D as a second projection material tank, a flow-rate adjuster 80D, and an inlet pipe 82D. These first to fourth projection material conveying paths are provided in parallel.

[0038] Moreover, in the projection material tank 78D, a level sensor 86 configured to detect an amount of the projection material stored in this projection material tank 78D is provided.

[0039] Moreover, on a downstream end of the upper screw conveyor 74B, a projection material tank 78E is provided, and the projection material supplied from this projection material tank 78E flows to an overflow pipe 88 and then, returns to the cabinet 12 and flows to the lower screw conveyor 68B which is the beginning of a circulation system again.

[0040] The separators 72A and 72B illustrated in Figure 3 applies wind selection to the whole amount of the projection material conveyed by the bucket elevators 70A and 70B. That is, these separators 72A and 72B separate fine powders in air by sucking the air. In the separators 72A and 72B, ducts 90 are provided, respectively, and the air and fine powders flow through the ducts 90 and are separated into the fine powders and the coarse powders in a settling chamber 92.

[0041] Moreover, the finer powders are conveyed with air in the duct 90 and enter a dust collector 94. Only the air filtered in the dust collector 94 is discharged into the atmospheric air. The fine powders are accumulated in a fine-powder receiving box 96 provided under the dust collector 94. Moreover, the coarse powders separated in the settling chamber 92 are conveyed to the lower screw conveyor 68B.

[0042] Moreover, when a detected value of the above-described level sensor 86 exceeds a specified value set in advance, that is, when there is sufficient projection material in the circulation system, the flow-rate adjusters 80A to 80D as the switching mechanisms are controlled so that the projection material is supplied from the projection material tank 78A to the balance tank 76.

[0043] On the other hand, when the detected value of the level sensor 86 falls under the above-described specified value, the flow-rate adjusters 80A to 80D are controlled so that the projection material is supplied from the projection material tank 78D to the centrifugal projector 52D and the projection material is supplied from the balance tank 76 to the lower screw conveyor 68B.

[0044] Among the projection material having flowed to the inclined vibration sieves 84A and 84B, usable projection material flows to the lower screw conveyers 68A and 68B, while unusable projection material is accumulated in the fine-powder receiving box 96 provided under the inclined vibration sieves 84A and 84B.

[0045] Moreover, in the middle of a path from the duct 90 to the dust collector 94, a sucked-air fire-prevention damper 98 and a precoat supply duct 100 are provided. To the precoat supply duct 100, a precoat supply device 102 is connected. By means of them, flammable powders are precoat and made incombustible.

[0046] Moreover, in the dust collector 94, a dust collector fan 104 and a discharged-air fire-prevention damper 106 are provided. The discharged-air fire-prevention damper 106 shuts off the flow of air together with the sucked-air fire-prevention damper 98 (in collaboration) in the case of a fire. A rotary valve 108 to the dust collector 94 serves a role of continuously discharging dusts. Reference numeral 114 denotes a control panel.

[0047] Subsequently, an operation of the shot processing device 10 having the above-described configuration will be described.

[0048] First, into the cage 44 in the chamber 42 located in the work carrying-in area 14 among the plurality of chambers 42, one or a plurality of works W are inserted. Then, the revolution driving motor 24 is operated, the rotary hanger 20 is rotated around the revolution shaft 22 by 60 degrees, and the work W is moved to the projection material projection area 18A.

[0049] Subsequently, the connection driving cylinder 50 is operated, and the rotation chain wheel (not shown) corresponding to the chamber 42 having been moved to the projection material projection area 18A is connected to the rotation driving motor 48. When the rotation driving motor 48 is driven, the rotation shaft 46 is rotated through the rotation chain wheel.

[0050] Moreover, the flow-rate adjusters 80C to 80F are opened, and the projection material is projected from the centrifugal projector 52A. By the means of them, the work W arranged on the upper part of the cage 44 is ground in a concentrated manner.

[0051] Subsequently, the revolution driving motor 24 is operated, the rotary hanger 20 is rotated around the revolution shaft 22 by 120 degrees, and the chamber 42 having been moved to the projection material projection area 18B is used as the projection chamber. Then, the connection driving cylinder 50 is operated, and the rotation chain wheel (not shown) corresponding to this chamber 42 is connected to the rotation driving motor 48. Moreover, when the rotation driving motor 48 is driven, the rotation shaft 46 is rotated through the rotation chain wheel (not shown).

[0052] Moreover, the projection material is projected from the centrifugal projector 52B. By the means of projection, the work W arranged on the lower part of the cage 44 is ground in a concentrated manner. Similarly, the projection material is projected from the centrifugal projector 52C. By the means of projection, the work W arranged on the lower part of the cage 44 is ground in a concentrated manner.

[0053] Lastly, when the projection material is projected from the centrifugal projector 52D, the work W arranged on the upper part of the cage 44 in the chamber 42 having been moved to the projection material projection area 18D is ground in a concentrated manner.

[0054] Then, the revolution driving motor 24 is operated, the rotary hanger 20 is rotated around the revolution shaft 22 by 300 degrees, and the work W is conveyed to the work carrying-out area 16 and taken out. Moreover, the revolution driving motor 24 is operated, the rotary hanger 20 is rotated around the revolution shaft 22 by 360 degrees, and the work W is inputted again.

[0055] By means of continuous repetition of the above-described series of steps, a large number of works W are sequentially subjected to shot processing.

[0056] Subsequently, actions and effects of the embodiment of the present invention will be described.

[0057] As described above in detail, according to the shot processing device 10 according to the embodiment of the present invention, since the plurality of bucket elevators 70A and 70B configured to convey the projection material upward are provided, each of the bucket elevators 70A and 70B can be reduced in size in the height direction. As a result, the overall height of the entire device can be reduced.

[0058] Moreover, when the detected value of the level sensor 86 exceeds the specified value set in advance, the projection material is supplied from the projection material tank 78A to the balance tank 76, but when the detected value of the level sensor 86 falls under the above-described specified value, the projection material is supplied from the projection material tank 78D to the centrifugal projector 5252D and the projection material is supplied from the balance tank 76 to the lower screw conveyers 68A and 68B. Therefore, a good balance can be kept in the transport amount of the projection material without shortage of the projection material.

[0059] Moreover, the separators 72A and 72B are provided between the bucket elevators 70A and 70B and the upper screw conveyers 74A and 74B, and the whole amount of the projection material conveyed by the bucket elevators 70A and 70B are subjected to wind selection by the separators 72A and 72B.

[0060] Therefore, the classification performance of the projection material can be ensured even for a work W producing many burrs and fine powders. Moreover, by means of these separators 72A and 72B, the inclined vibration sieves 84A and 84B configured to classify a part of the projection material conveyed by the upper screw conveyers 74A and 74B and a structure in which the projection material is not projected but passed through the separators 72A and 72B and the inclined vibration sieves 84A and 84B again by storage of the projection material in the above-described balance tank 76 and supply of the projection material from this balance tank 76, the classification performance of the projection material can be ensured.

[0061] Moreover, by adjusting the length in the axial direction of the expansion/contraction mechanism 64, the rotating member 62 is rotated, whereby the distance between the driving pulley 58 and the driven pulley 56 is adjusted, and the tension of the driving belt 60 can be adjusted. Therefore, since it is not necessary to loosen a bolt of a mounting portion to the impeller base door of the driven pulley 56 in order to adjust the tension of the driving belt 60, for example, workability can be made favorable.

[0062] Moreover, the bottom wall portion 40 of the partition material 36 is inclined toward the center side of the turntable 34 as it goes from one of the pair of side wall portions 38 to the other. Therefore, even if the projection material projected by the projector from the outside in the radial direction of the turntable 34 hits the bottom wall portion 40, bouncing of this projection material to the projection side can be suppressed. As a result, durability of

the projector can be ensured.

[0063] In this embodiment, the shot processing device 10 is an example, and its form can be changed in various ways. Figures 9 to 15 illustrate a shot processing device 110 according to a variation.

[0064] A basic configuration of this shot processing device 110 is similar to that of the shot processing device 10 according to the above-described embodiment of the present invention. Here, regarding the shot processing device 110, the same reference numerals are used for the members having the functions similar to those of the shot processing device 10 according to the above-described embodiment of the present invention, and the explanation will be omitted. Reference numerals 84 and 112 indicated in Figures 9 to 15 are a vibration inclined sieve and a hanger (a hook), respectively.

[0065] The embodiment of the present invention has been described, but the present invention is not limited to the above but naturally can be put into practice with various deformations within a range not departing from its gist other than the above.

Reference Signs List

[0066] 10, 110...shot processing device, 12...cabinet, 14...work carrying-in area, 16...work carrying-out area, 18A to 18D...projection material projection area, 20...rotary hanger, 22...revolution shaft, 24...revolution driving motor, 34...turntable, 36...partition material, 38...side wall portion, 40...bottom wall portion, 42...chamber, 44...cage, 46...rotation shaft, 48...rotation driving motor, 52A to 52D...centrifugal projector, 54...impeller, 56...driven pulley, 58...driving pulley, 60...driving belt, 62...rotating member, 64...expansion/contraction mechanism, 66...driving motor, 68A, 68B...lower screw conveyer (first projection material conveying mechanism), 70A, 70B...bucket elevator (second projection material conveying mechanism), 72A, 72B...separator, 74A, 74B...upper screw conveyer (third projection material conveying mechanism), 76...valance tank, 78A...projection material tank (first projection material tank), 78D...projection material tank (second projection material tank), 80A to 80D...flow-rate adjuster (switching mechanism), 84A, 84B...inclined vibration sieve (vibration sieve), 86...level sensor, W...work.

Claims

1. A shot processing device comprising:
 - a cabinet formed having a box shape and having a projection material projection area therein;
 - a rotary hanger having a turntable arranged rotatably in a horizontal direction inside the cabinet, a plurality of partition materials provided on the turntable and dividing a space on the turntable into a plurality of parts in a circumferential

direction of the turntable, and a plurality of hangers provided on each of a plurality of chambers divided by the plurality of partition materials and each suspending and holding a work or a cage into which the work is inserted;

a revolution driving motor configured to rotate the rotary hanger so as to sequentially move the plurality of chambers to the projection material projection area in the cabinet;

a rotation driving motor configured to rotate the hanger provided in the chamber located in the projection material projection area among the plurality of chambers;

a projector configured to apply shot processing to the work by projecting the projection material to the chamber located in the projection material projection area among the plurality of chambers from outside in the radial direction of the turntable;

a first projection material conveying mechanism configured to recover the projection material projected from the projector and convey the projection material in the horizontal direction; and

a plurality of second projection material conveying mechanisms configured to convey the projection material conveyed by the first projection material conveying mechanism upward.

2. The shot processing device according to claim 1, further comprising:

a third projection material conveying mechanism configured to convey the projection material conveyed by the plurality of second projection material conveying mechanisms in the horizontal direction;

a first projection material tank and a second projection material tank configured to store the projection material conveyed by the third projection material conveying mechanism;

a level sensor configured to detect an amount of the projection material stored in the second projection material tank;

a balance tank provided in parallel with the projector; and

a switching mechanism configured to have the projection material supplied from the first projection material tank to the balance tank when a detected value of the level sensor exceeds a specified value set in advance, and configured to have the projection material supplied from the balance tank to the first projection material conveying mechanism while having the projection material supplied from the second projection material tank to the projector when the detected value of the level sensor falls under the specified value.

3. The shot processing device according to claim 2, further comprising:

a separator provided between the plurality of second projection material conveying mechanisms and the third projection material conveying mechanism and configured to perform wind selection of the whole amount of the projection material conveyed by the second projection material conveying mechanism; and
a vibration sieve configured to classify a part of the projection material conveyed by the third projection material conveying mechanism.

4. The shot processing device according to any one of claims 1 to 3, wherein the projector includes:

an impeller configured to project a projection material with rotation;
a driven pulley rotatably supported with respect to the cabinet and rotated integrally with the impeller;
a driving pulley rotated by a driving motor;
a driving belt wound around the driving pulley and the driven pulley;
a rotating member rotatably supporting the driving pulley and also rotatably supported by the cabinet capable of adjusting a distance between the driving pulley and the driven pulley; and
an expansion/contraction mechanism connecting a rotation end portion of the rotating member and the cabinet and capable of adjusting a length in an axial direction.

5. The shot processing device according to any one of claims 1 to 3, wherein the partition material includes:

a pair of side wall portions opposite to each other and extending in the radial direction of the turntable, respectively; and
a bottom wall portion connecting end portions on the center side of the turntable in the pair of side wall portions and inclined toward the center side of the turntable as it goes from one of the pair of side wall portions to the other.

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Fig.1

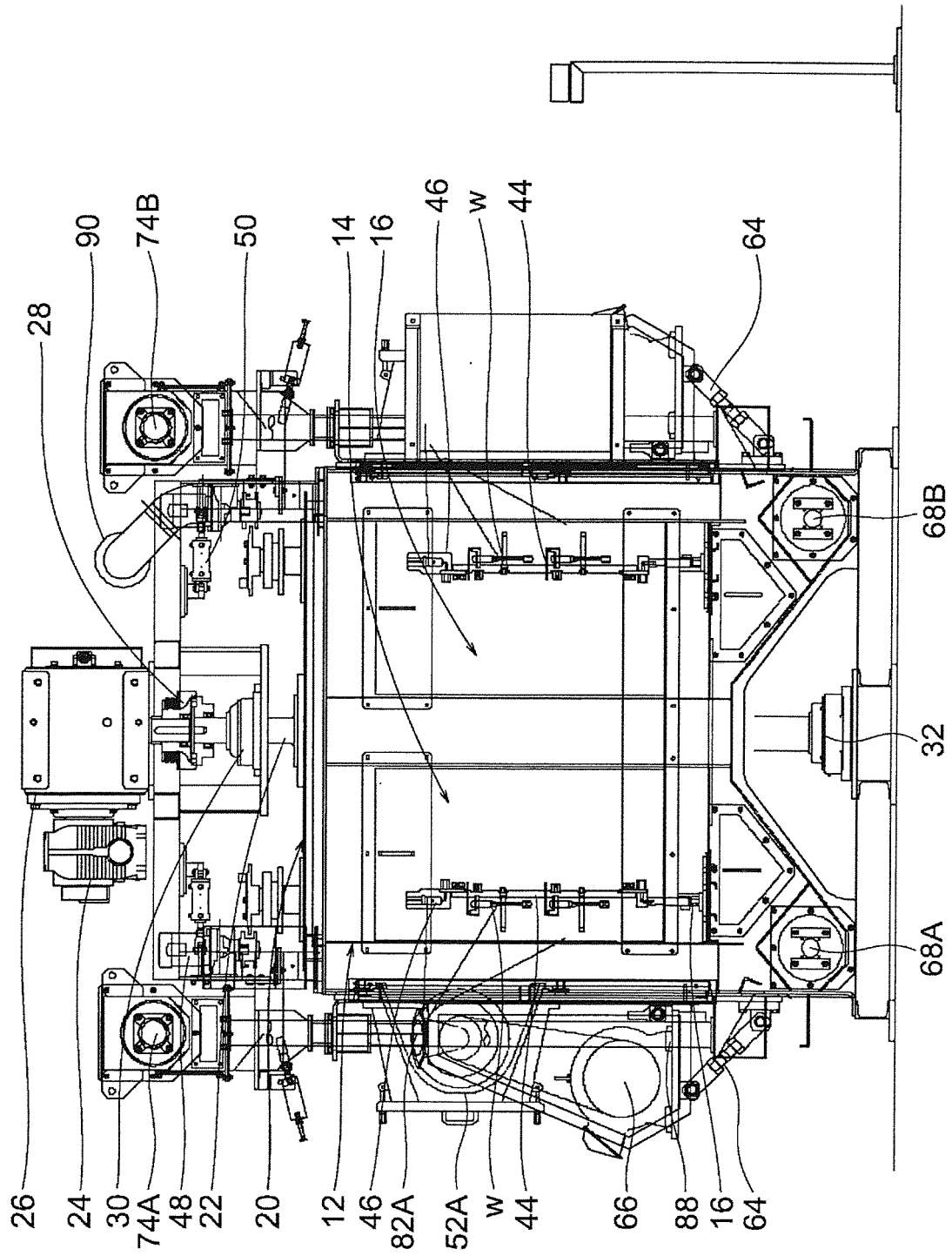


Fig.2

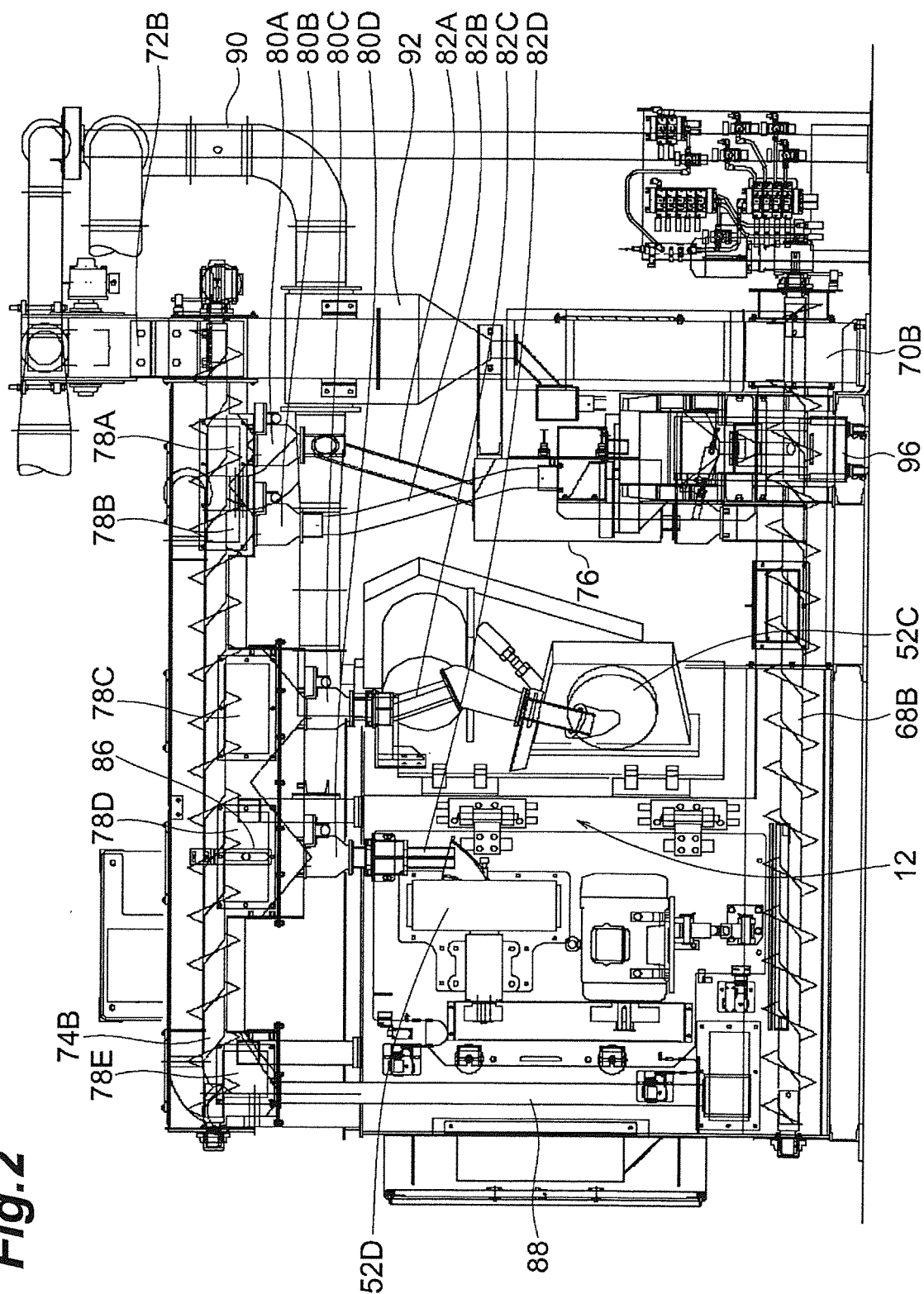


Fig.3

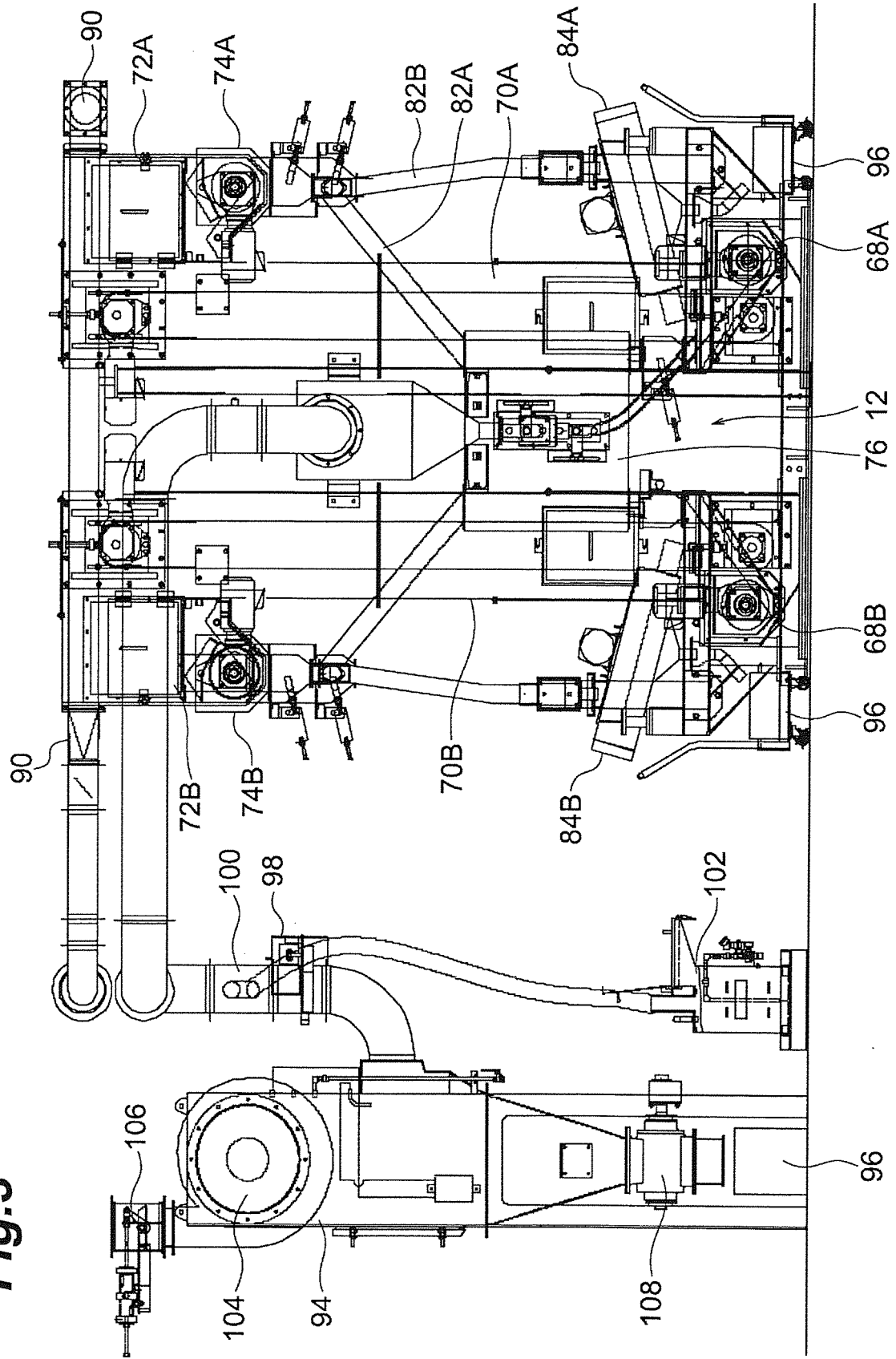
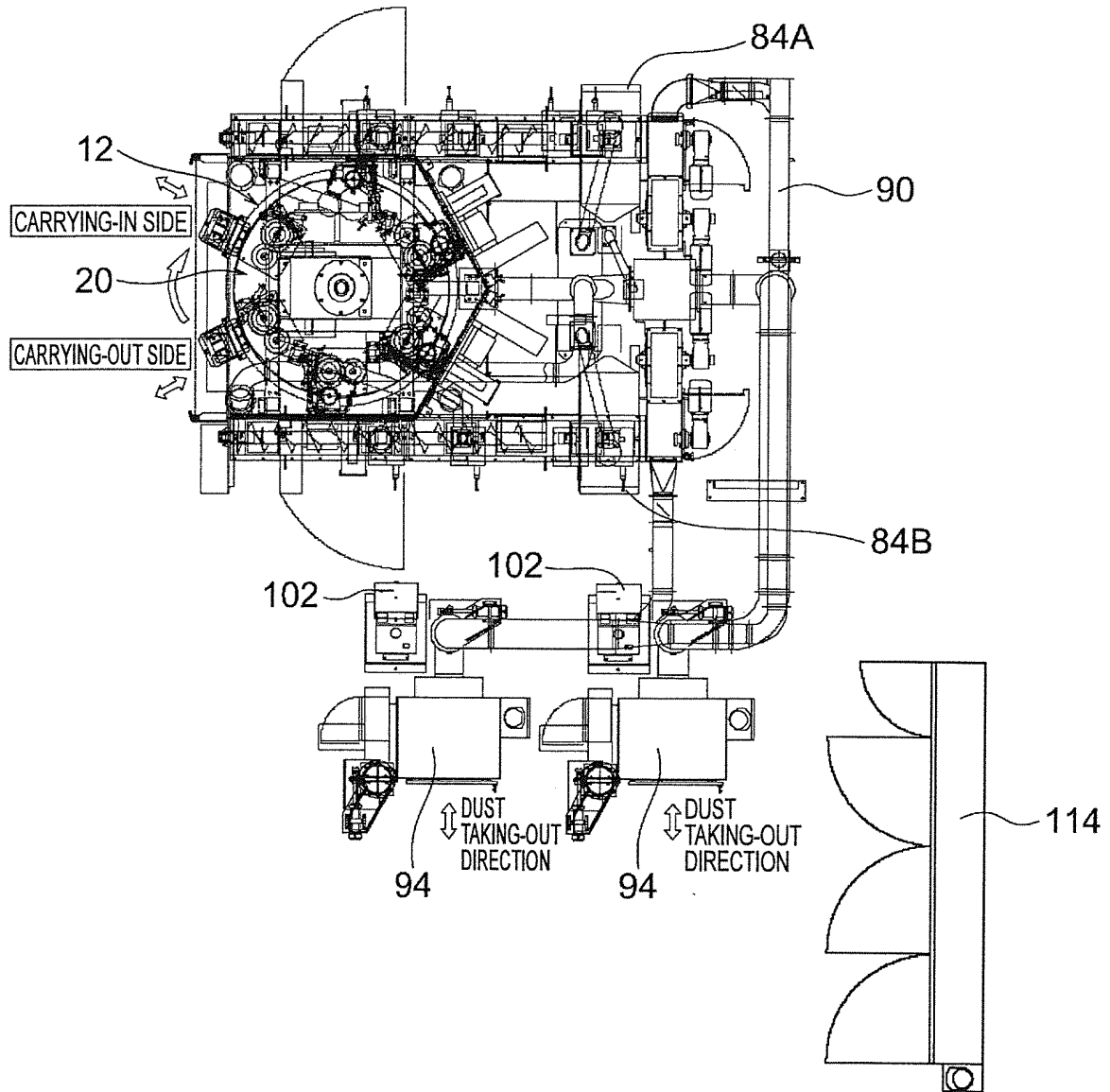


Fig.4



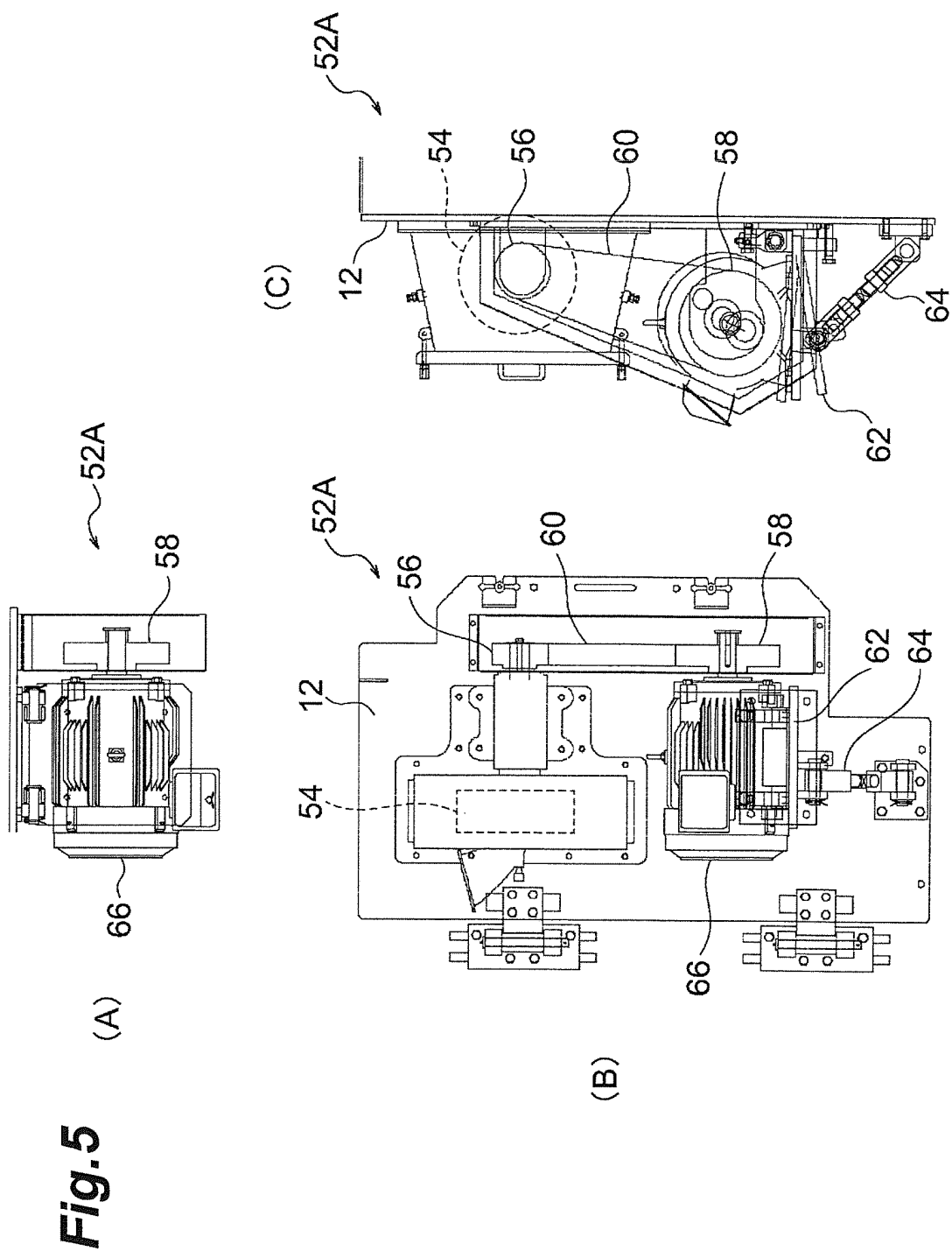


Fig. 6

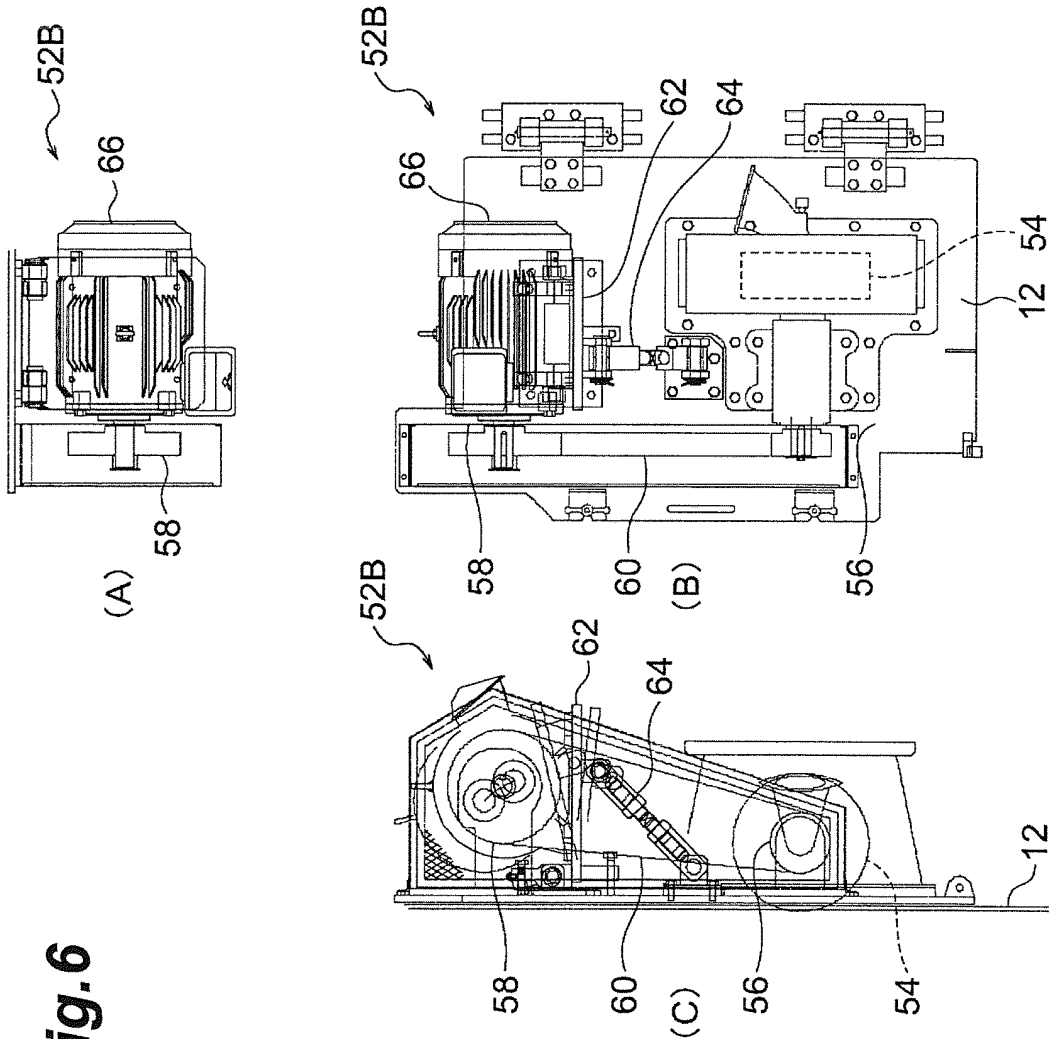


Fig.7

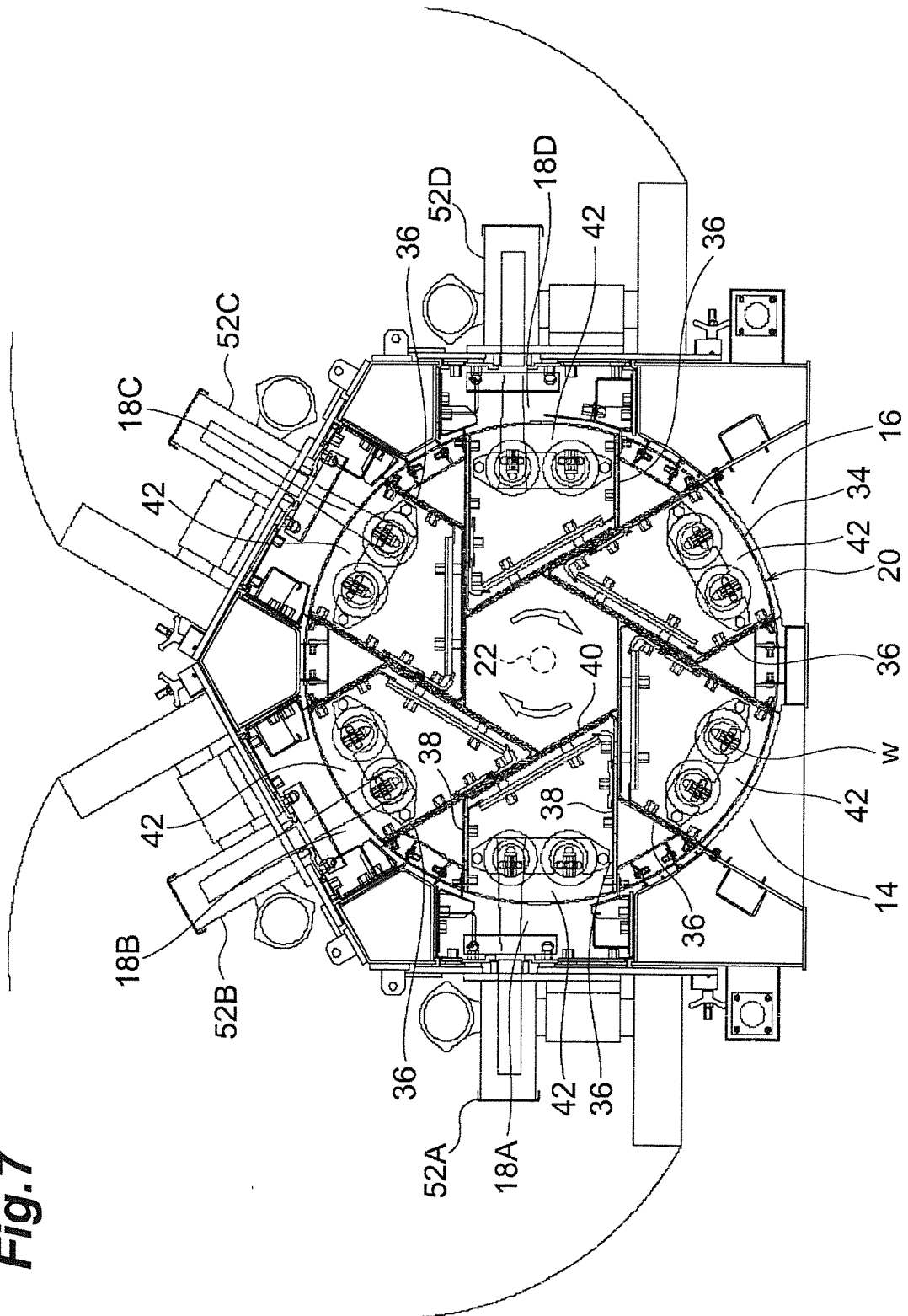


Fig.8

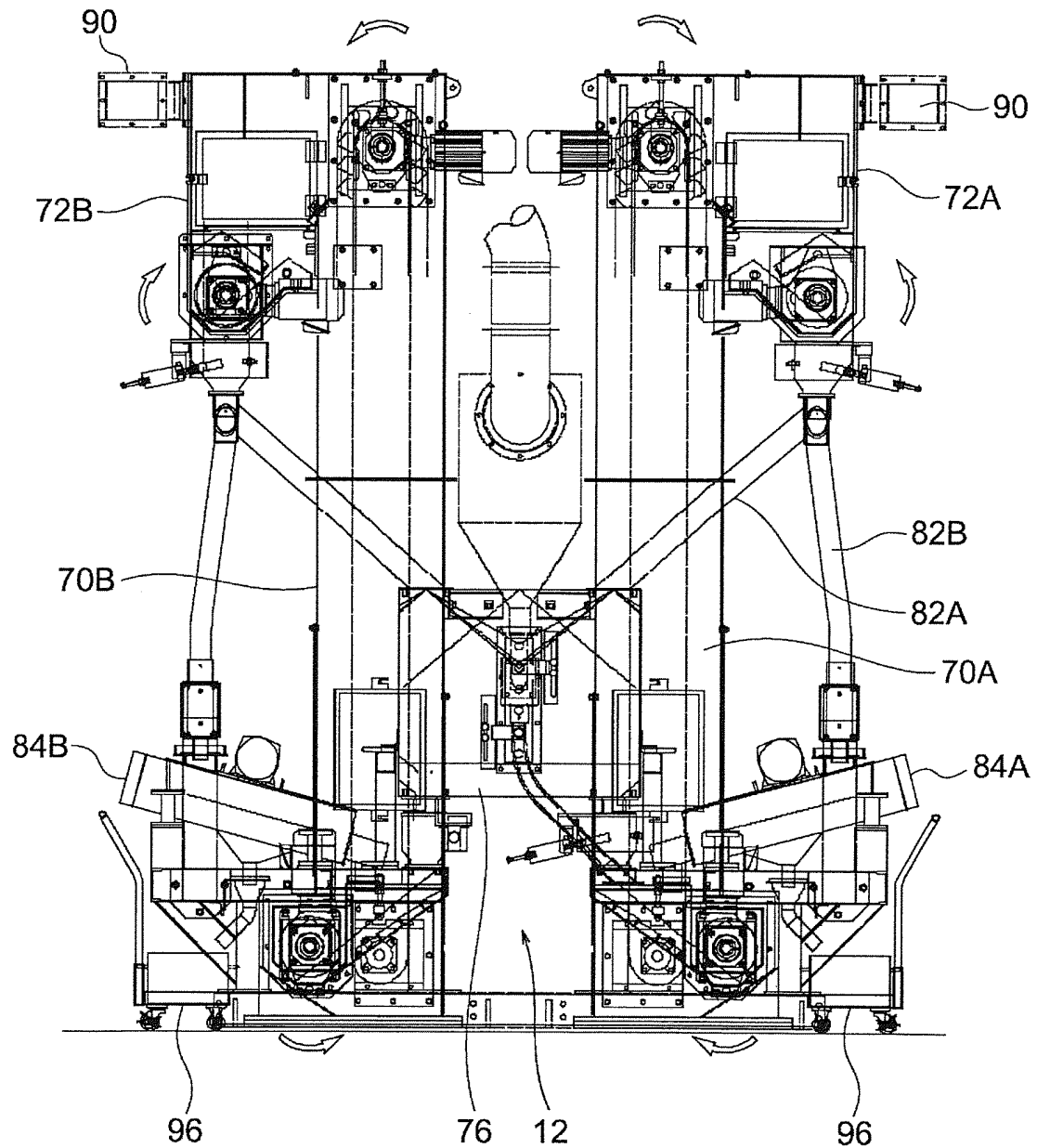


Fig.9

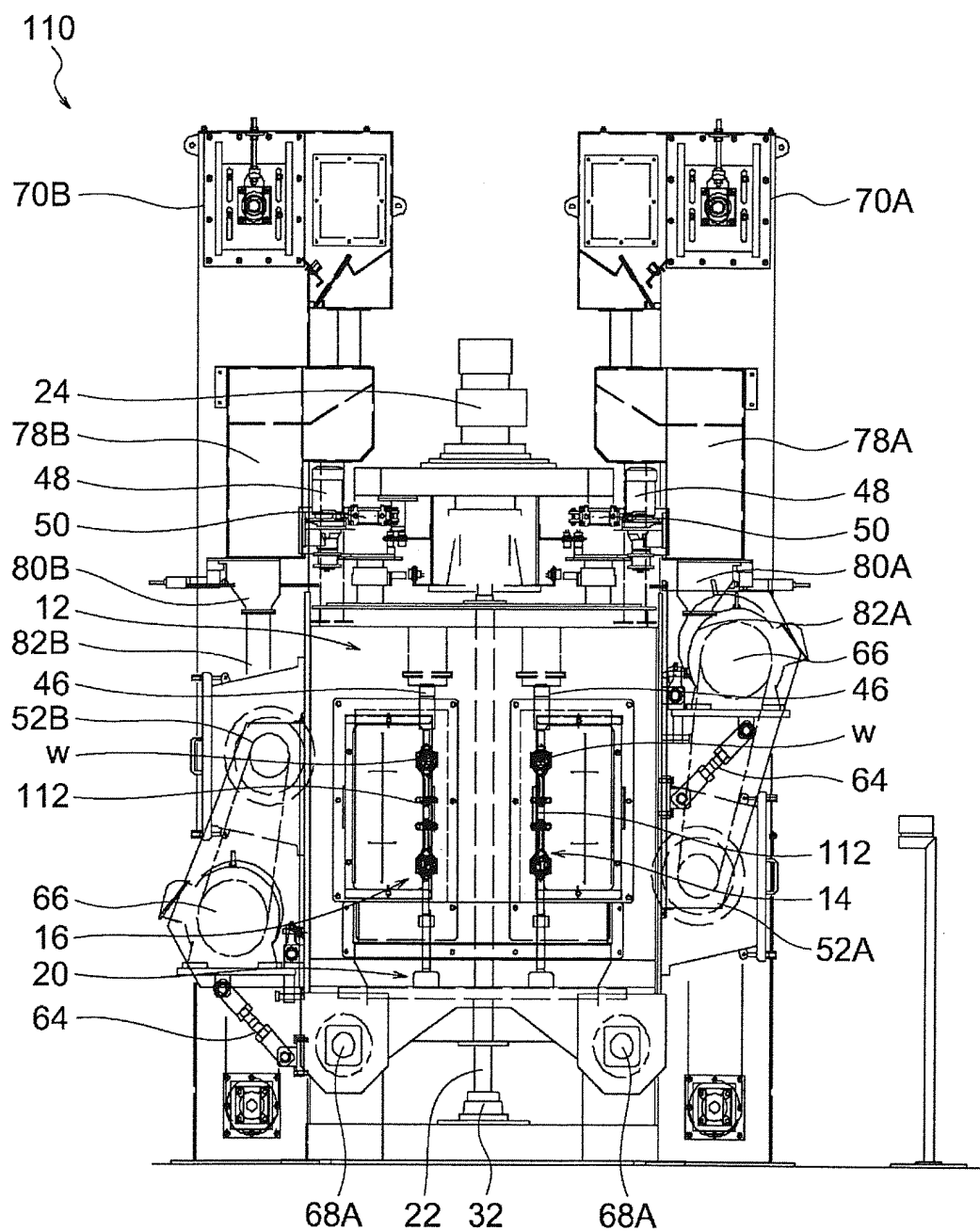


Fig.10

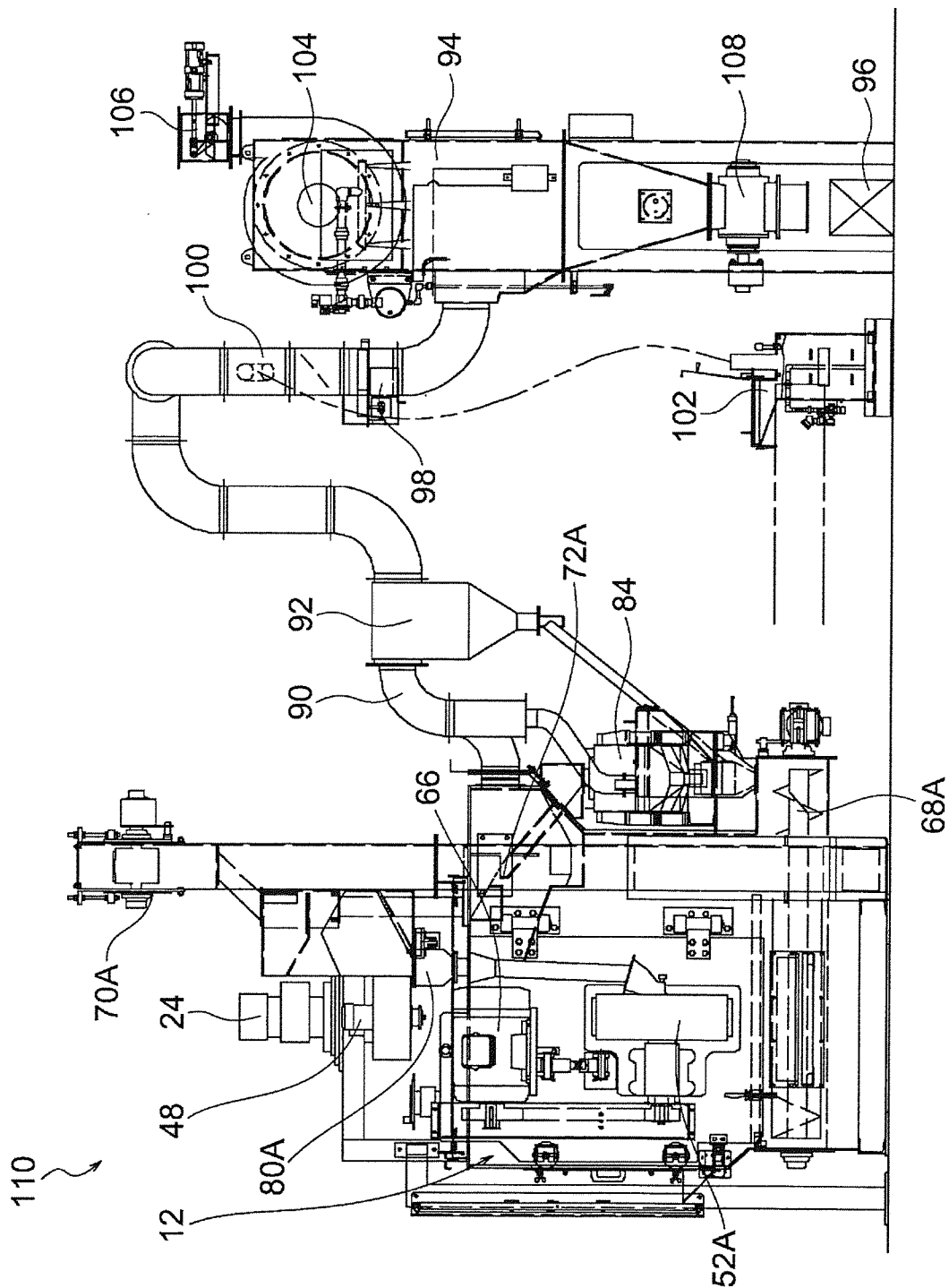
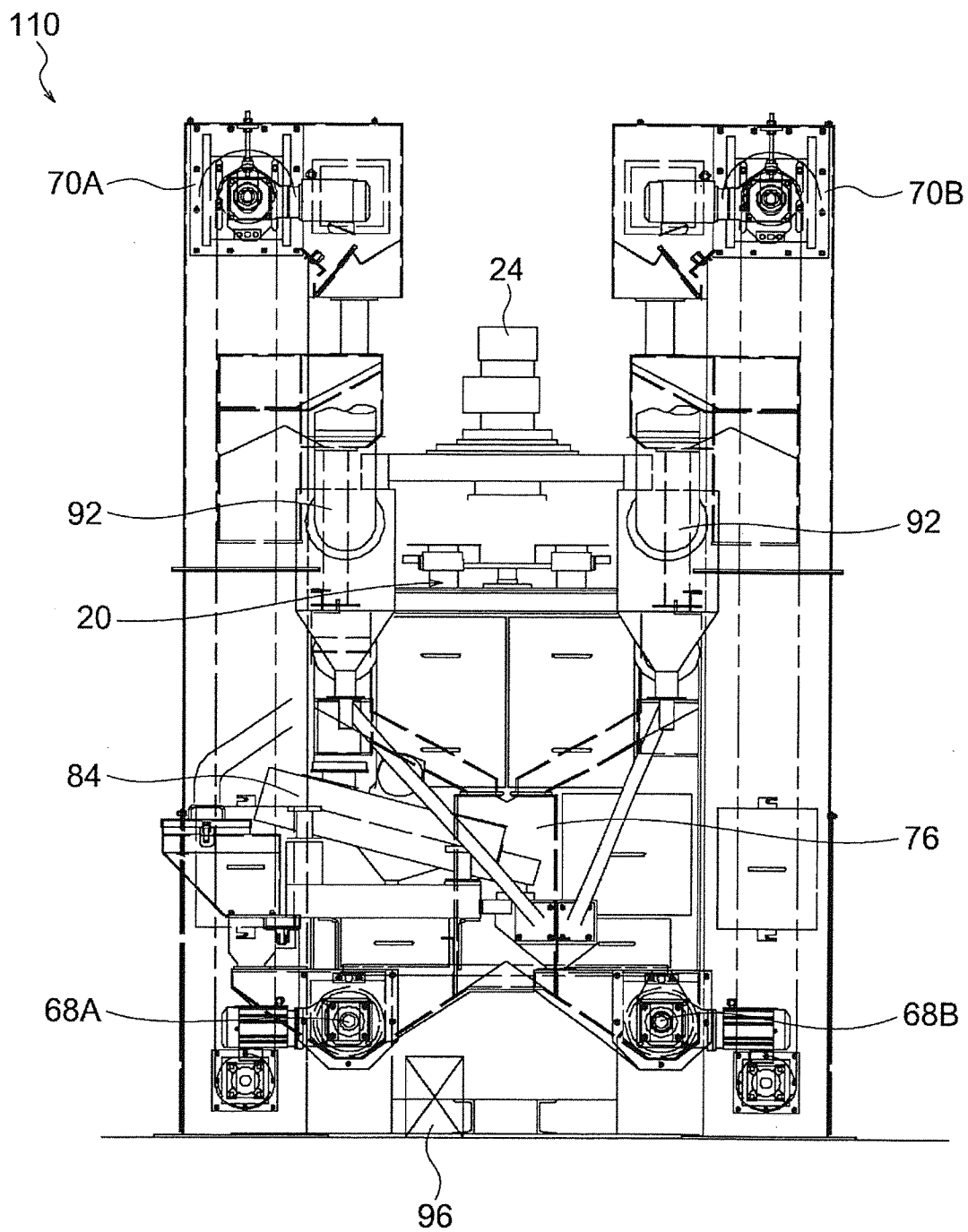


Fig.11



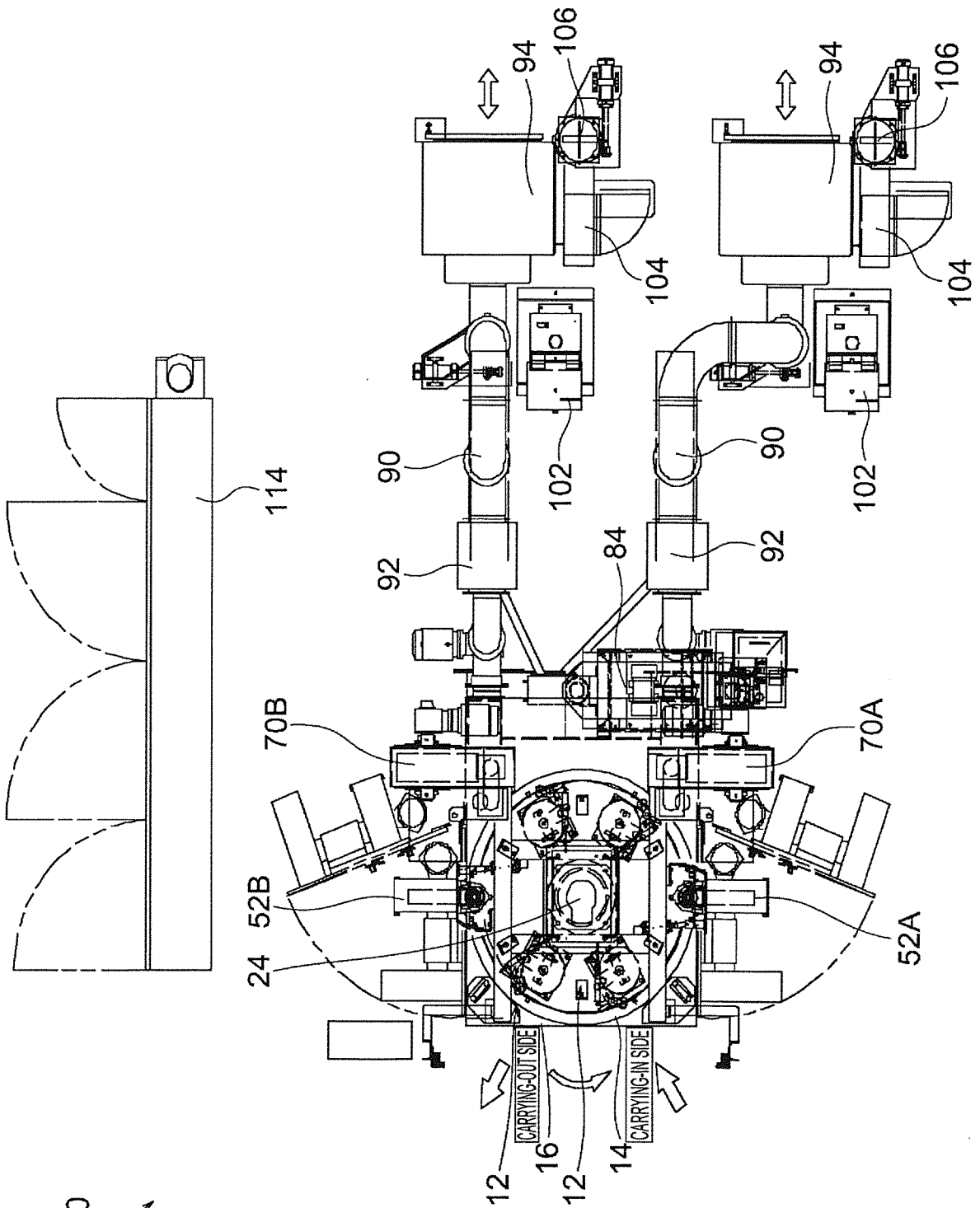


Fig.13

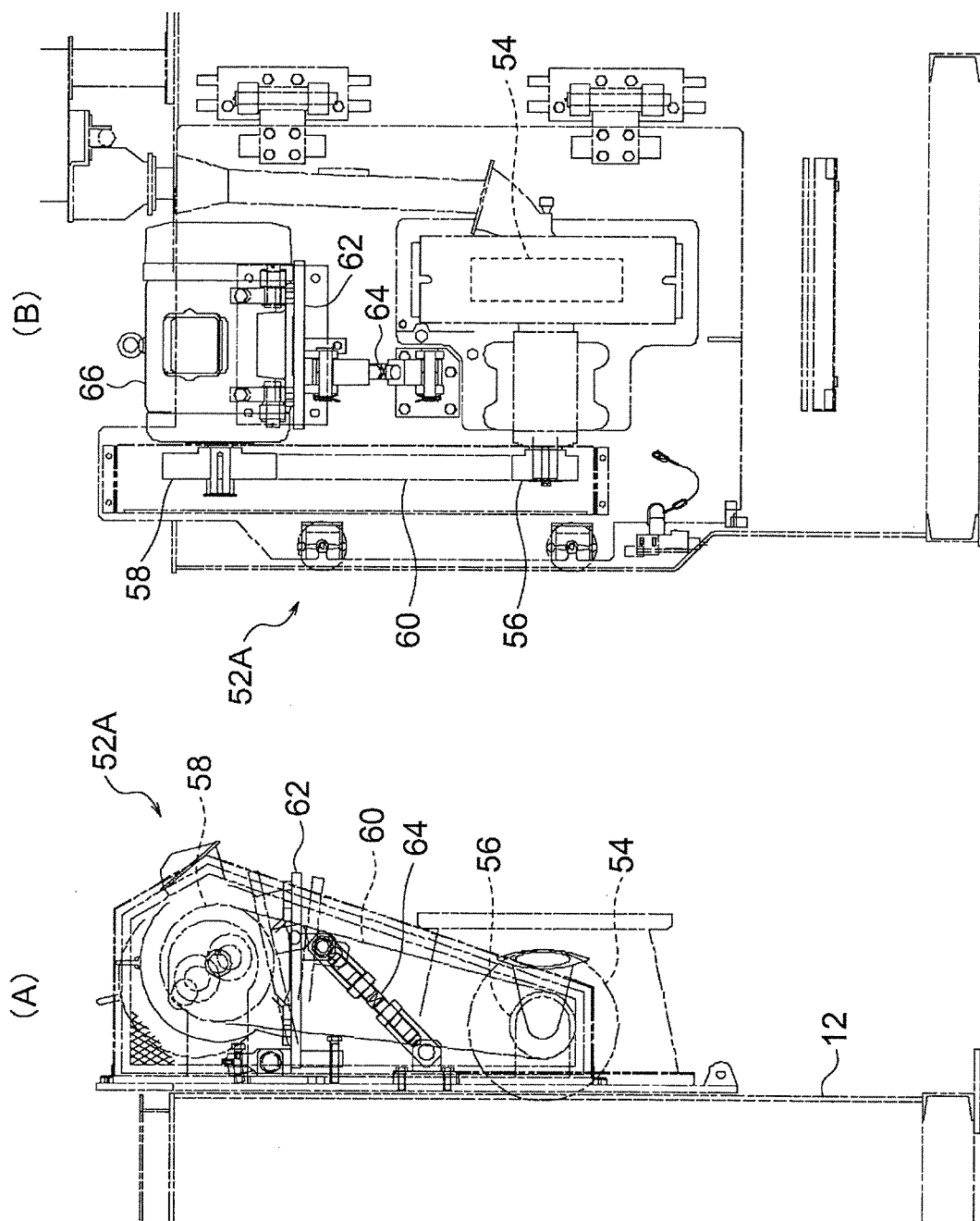


Fig.14

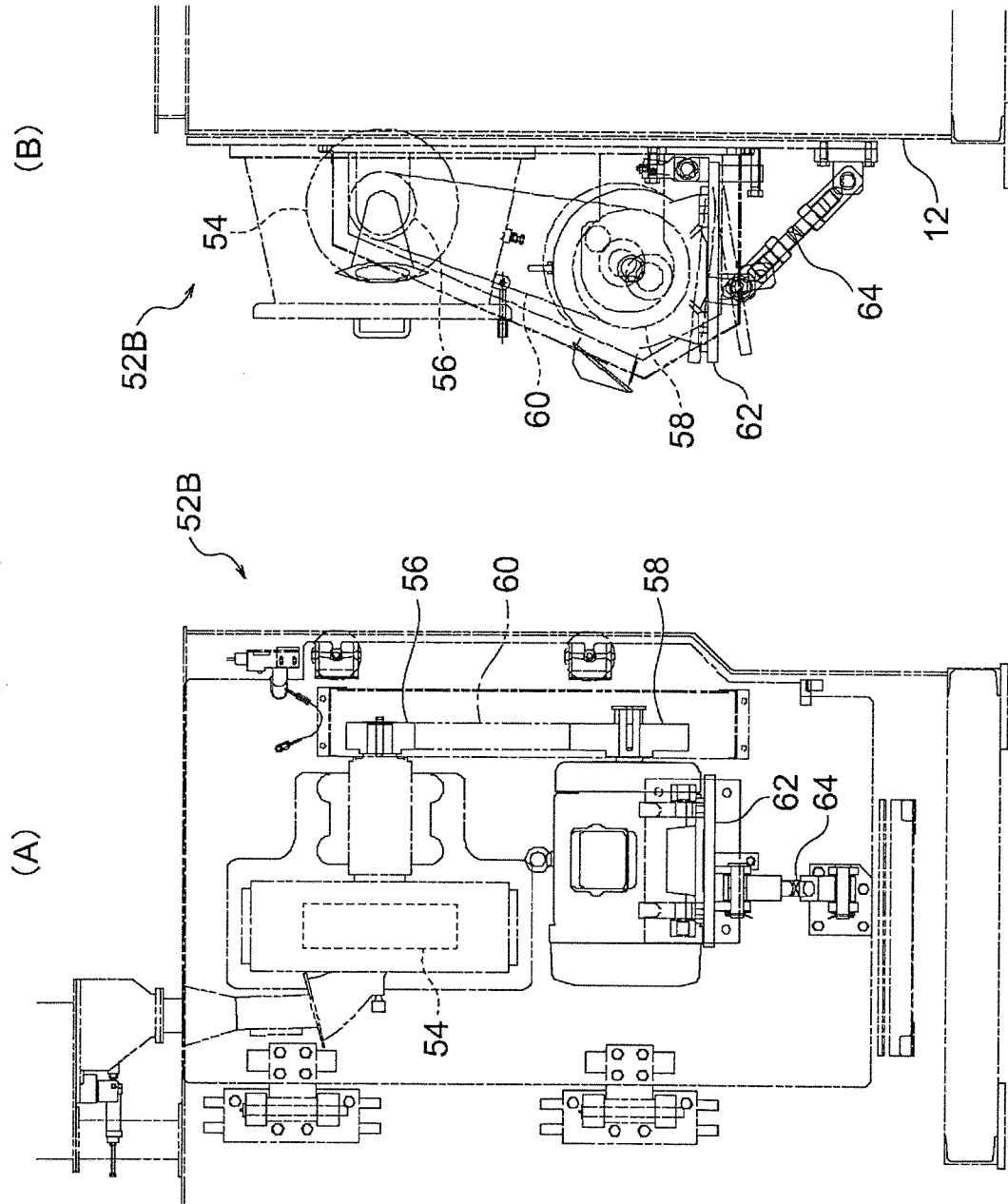
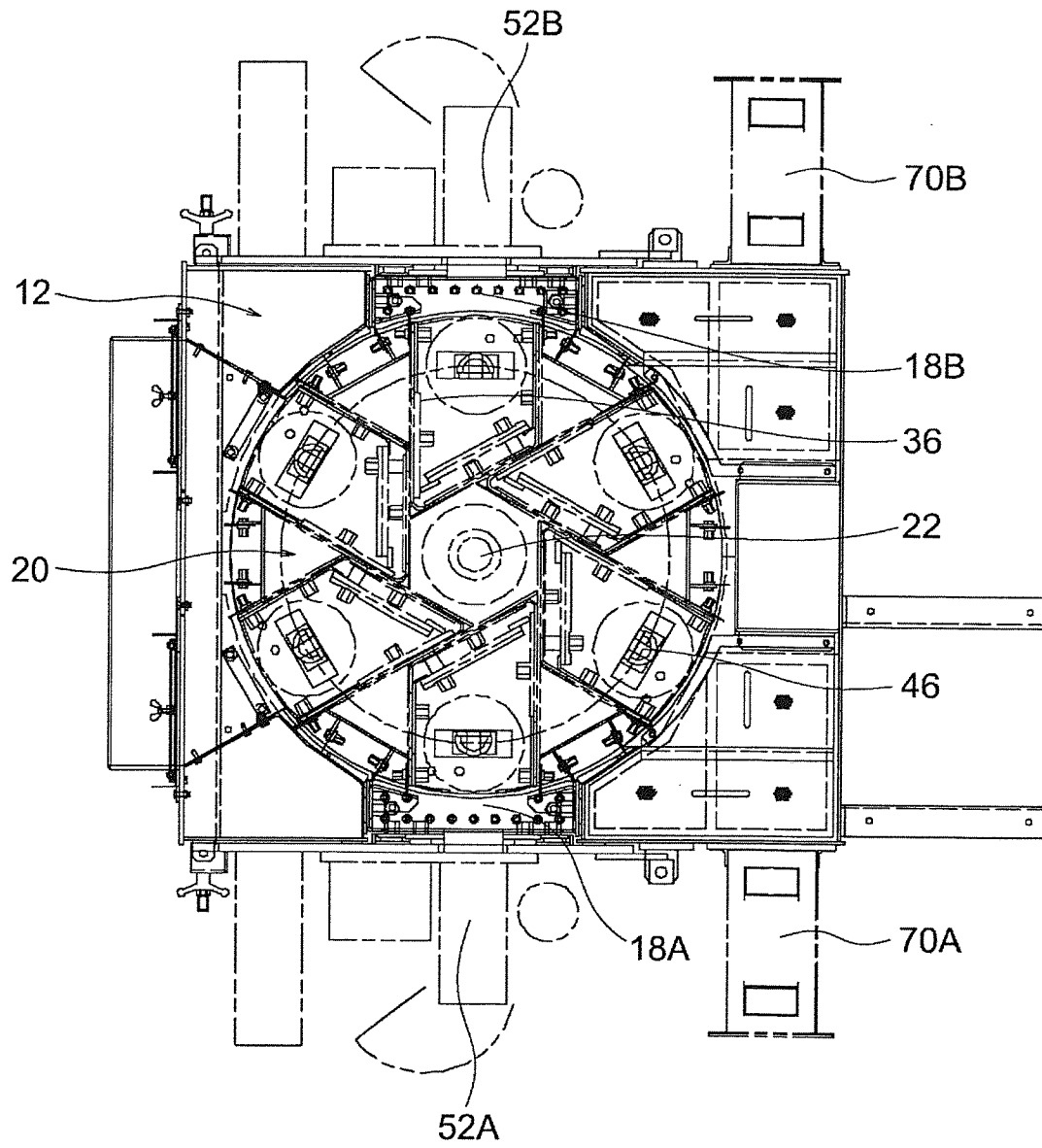


Fig.15



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/061113

A. CLASSIFICATION OF SUBJECT MATTER <i>B24C3/24(2006.01) i, B24C1/00(2006.01) i, B24C9/00(2006.01) i</i>										
According to International Patent Classification (IPC) or to both national classification and IPC										
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) <i>B24C3/24, B24C1/00, B24C9/00</i>										
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched <table border="0"> <tr> <td>Jitsuyo Shinan Koho</td> <td>1922-1996</td> <td>Jitsuyo Shinan Toroku Koho</td> <td>1996-2012</td> </tr> <tr> <td>Kokai Jitsuyo Shinan Koho</td> <td>1971-2012</td> <td>Toroku Jitsuyo Shinan Koho</td> <td>1994-2012</td> </tr> </table>			Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2012	Kokai Jitsuyo Shinan Koho	1971-2012	Toroku Jitsuyo Shinan Koho	1994-2012
Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2012							
Kokai Jitsuyo Shinan Koho	1971-2012	Toroku Jitsuyo Shinan Koho	1994-2012							
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)										
C. DOCUMENTS CONSIDERED TO BE RELEVANT										
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.								
Y A	WO 2009/001639 A1 (Sinto Kogyo Ltd.), 31 December 2008 (31.12.2008), paragraphs [0009] to [0012]; fig. 1 to 4 & CN 101652225 A	1, 3 2, 4-5								
Y A	JP 2005-329482 A (Sinto Kogyo Ltd.), 02 December 2005 (02.12.2005), paragraphs [0016] to [0027]; fig. 1 to 4 & US 2008/0066512 A1 & WO 2005/110680 A1 & KR 10-2007-0015617 A & CN 1980772 A	1, 3 2, 4-5								
Y A	JP 5-329774 A (Kawasaki Steel Corp.), 14 December 1993 (14.12.1993), paragraphs [0010] to [0012]; fig. 1 to 3 (Family: none)	3 1-2, 4-5								
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.										
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Date of the actual completion of the international search 07 June, 2012 (07.06.12)		Date of mailing of the international search report 19 June, 2012 (19.06.12)								
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer								
Facsimile No.		Telephone No.								

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/061113

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	WO 2011/013521 A1 (JFE Mechanical Co., Ltd.), 03 February 2011 (03.02.2011), paragraphs [0026] to [0028]; fig. 1 to 5 (Family: none)	3 1-2, 4-5
Y A	JP 2-9583 A (Sinto Kogyo Ltd.), 12 January 1990 (12.01.1990), page 2, lower left column, line 8 to lower right column, line 11; fig. 1 (Family: none)	3 1-2, 4-5
A	JP 8-323628 A (Sinto Kogyo Ltd.), 10 December 1996 (10.12.1996), entire text; all drawings (Family: none)	1-5
A	JP 9-300220 A (Fuji Manufacturing Co., Ltd.), 25 November 1997 (25.11.1997), entire text; all drawings (Family: none)	1-5
A	JP 2004-181578 A (Goshi Kaisha Kamei Tekkosho), 02 July 2004 (02.07.2004), entire text; all drawings & KR 10-2004-0048862 A & CN 1504294 A	1-5

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