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(71) Applicant: **KABUSHIKI KAISHA MITSUISHI FUKAI TEKKOSHO**
Bizen-shi, Okayama 709-0132 (JP)

(72) Inventors:
- **HAGUCHI, Hiroshi,**
  K.K. Mitsuishi Fukai Tekkosho
  Bizen-shi, Okayama 705-0132 (JP)
- **YOSHIMOTO, Mitsuru,**
  K.K. Mitsuishi Fukai Tekkosho
  Bizen-shi, Okayama 705-0132 (JP)

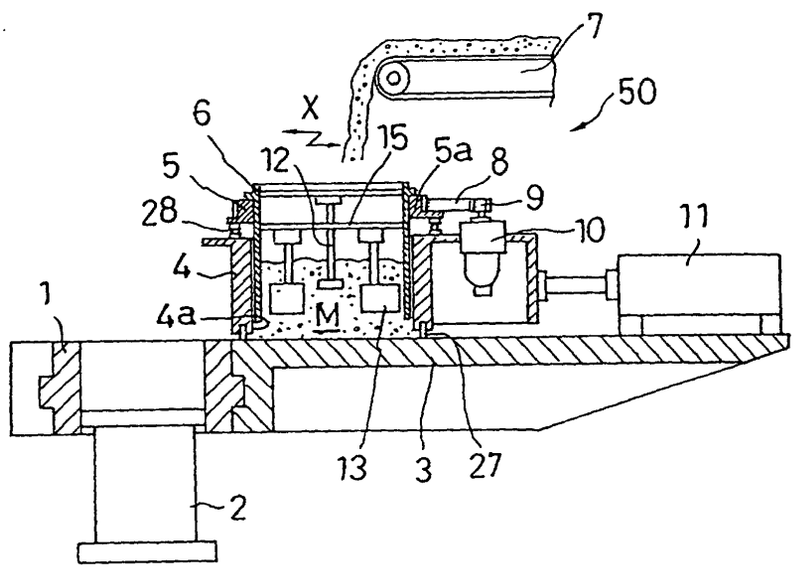
(74) Representative: **Stevens, Jason Paul**
Frank B. Dehn & Co.
179 Queen Victoria Street
London EC4V 4EL (GB)

(54) RAW MATERIAL FEEDER FOR FIREBRICK MAKING MACHINES

(57) The present invention relates to a material feeder for a refractory brick molding machine which is capable of easily charging materials, effortlessly cleaning the inside of a charger and mixing blades, smoothly detaching and replacing the charger and the mixing blades, readily visually checking the materials inside the charger, and simply adjusting the mixing blades.

A charger (50) comprises a charger body (4) reciprocated on a table (3), a cylindrical charger case (6) which is detachable and rotatable provided in an opening (4a) formed in the charger body (4), and a plurality of mixing blades (12, 13) suspended in the charger case (6).

Fig. 1



EP 1 260 335 A1

Description

BACKGROUND OF INVENTION

FIELD OF INVENTION

[0001] The invention relates to a material feeder for a refractory brick molding machine, which feeder reciprocates on a table, mixes materials in a charger and feeds materials in the charger to a die of a molding machine.

DESCRIPTION OF PRIOR ART

[0002] Conventionally, a powder molding machine for a refractory brick is already known, i.e. Japanese Utility Model Application Publication No. 62-22328 and Japanese Patent Application Publication No. 5-57077, which were filed by the applicant.

[0003] In Japanese Patent Application Publication No. 5-76881, the applicant discloses a device for supplying materials to the above-mentioned molding machine.

[0004] In order to understand the present invention clearly, a conventional feeder machine will be explained hereinafter with reference to Figs. 5 and 6.

[0005] A charger 51 shown in Fig. 5 is adaptable to feed materials into a single cavity (die) 16, which cavity is placed lengthwise in a horizontal direction as shown in Fig. 5. A charger 52 shown in Fig. 6 is adaptable to feed materials into a plurality of cavities 17, which cavities are arranged side by side.

[0006] In each of the charger 51 and the charger 52, two pairs of mixing blades 19, 22, which blades rotate around the vertical shafts in an opposite direction to each other, are arranged in an oblong circle-shaped charger case 18 or 21.

[0007] In Fig. 5, the mixing blades 19, 19 are aligned in a reciprocating (forward and backward) direction X, and driven by a single drive unit 31 which unit is positioned in an upper area. On the other hand, in Fig. 6, the mixing blades 22, 22 are aligned in a direction being rectangular to the reciprocating direction X, and the drive units 32, 32 are positioned in upper areas respectively.

[0008] Materials fed into the charger case 18 (21) are advanced and fed into the cavity 16 (17) of a die while being mixed by the mixing blades 19 (22). Thus, the mixture of refractory materials being composed of coarse grain and fine powder is fed evenly without segregation of the mixture of refractory materials. The term "segregation" means a separation between coarse grain and fine powder.

[0009] In the above-mentioned prior art shown in Figs. 5 and 6, a direction of arrangements of cavities in a die is different from a reciprocating direction of the charger (51, 52). In other words, in examples shown in Figs. 5 and 6 a center lines of lengthwise shaped bricks to be molded are rectangular to a traveling direction of chargers (51, 52). In such the case, it is necessary to rotate the charger at 90 degrees in order to put such the charger in position. However, in aspect of constructions of brick forming machine, it is almost impossible to rotate such the charger at 90 degrees.

[0010] In order to put such the charger in position, in the prior art, a molding machine (press) includes chargers, traveling directions of which correspond to the cavities arrangement direction and the center lines of lengthwise shaped bricks, respectively.

[0011] In order to solve the above-mentioned disadvantage, as shown in Figs. 7 and 8, a charger 53 capable of meeting any arrangement of cavities in a vertical direction and/or horizontal direction has been developed. In a charger case 23 capable of covering each of the cavities 16 and 17 placed in vertical and lateral directions, mixing blades 24 are provided and driven by a reduction motor 10 via a drive unit 33 including a bevel gear 33a, which gear 33a is located above the mixing blades 24. The charger case 23 is moved forward and backward in the direction X on the table 3 by an actuator 11.

[0012] Any of the aforementioned chargers 51 to 53 in the above-mentioned prior art have a significant effectiveness. However, when the compound is fed into the charger case (18, 21, 23), a position for charging the materials is limited due to the drive unit (31, 32, 33) located in the upper portion of the charger case. Additionally, once the mixing blades (19, 21, 24) are set, a charging state of materials cannot be visually checked sufficiently, due to the casing of the drive unit. Thus, as counter measure, a way of adjusting the feeding of materials is merely employed by detecting the thickness of the materials in the charger using a supersonic type level gauge, or by detecting the drive torque of the mixing blades.

[0013] Furthermore, a replacement of the mixing blades and a cleaning when materials are changed are difficult. It is necessary to clean an inside of the charger case or the mixing blades after the charger is withdrawn to the front end of the die, or after the charger is rotated upwardly around 120 degrees by means of a special device.

[0014] Thus, it is an object of the present invention to provide a material feeder for a refractory brick molding machine, which reciprocates on a table and mixes materials in a charger in order to feed the materials into a die in the molding machine, said charger comprises a charger body reciprocating on the table, a cylindrical charger case being provided so as to be removable from and be able to rotate in an opening formed in the charger body, a rotation means for rotating the charger case, and a plurality of mixing blades being suspended in the charger case.

DISCLOSURE OF INVENTION

[0015] According to the present invention, in the material feeder for the refractory brick molding machine,

said charger case is held in the charger body so as to be removable from and be able to rotate via a bearing by a rotation base, which base is secured on the upper portion in an outer surface of said charger case.

[0016] Also, in the present invention, each of said mixing blades is suspended from a support bar, both ends of which are secured on the inner surface of said charger case so as to bridge said charger case.

[0017] Furthermore, in the present invention, said mixing blade is provided with a blade portion at one end of a shaft portion thereof, which end is opposite from the other end being secured on the inner face of said charger case.

[0018] In consequence, according to the present invention, after material is fed into the opening formed in the charger body, the cylindrical charger case placed in the opening is rotated, whereby the material is mixed by the mixing blades secured on the inner face of the charger case. The charger is reciprocated forward and backward on the table to discharge the materials into a die.

[0019] The charger case is held in the charger body through a bearing by the rotation base which is fixed on the upper portion of the outer surface of the charger case, and additionally, the rotation base is rotated by a drive unit which is placed in the outside so as not to position any drive unit in the upper portion of the charger, resulting in a wider area of the charging portion and facilities of visually checking the mixing conditions and adjusting the mixing blades.

Furthermore, the charger case is provided detachably, so that the inside thereof and the mixing blades are smoothly cleaned and also can be removed and replaced.

BRIEF EXPLANATION OF DRAWINGS

[0020]

Fig. 1 is a side sectional view showing a preferred embodiment of the present invention;

Fig. 2 is a plan view of Fig. 1:

Fig. 3 is a drawing for showing operations of embodiment in which cavities are arranged in parallel;

Fig. 4 is a sectional view showing another preferred embodiment of the mixing blades being included in the present invention:

Fig. 5 is a plan view of a conventional material feeder;

Fig. 6 is a plan view of another conventional material feeder;

Fig. 7 is a plan view of still another conventional material feeder; and

Fig. 8 is a vertical sectional view of Fig. 7.

EMBODIMENT OF INVENTION

[0021] Preferred embodiments according to the present invention will be described below with reference to the accompanying drawings.

[0022] In Fig. 1 and Fig. 2, on a lower plunger 2 attached to a metallic frame 1 in a refractory brick molding machine, a cavity 16 for molding a brick is formed. For transfer of materials M into the cavity 16, a table 3 is provided and a charger indicated in its entirety by reference numeral 50 is formed on the table 3.

[0023] A charger body 4 constructing a fragmentary portion of the charger 50 is provided to be reciprocated to and fro in a direction of arrow X by an actuator 11 which is secured on the table 3. In the charger body 4, a circle-shaped opening 4a which receives materials M charged from a conveyor 7 located above the charger body is formed so that the lower end thereof is opened onto the face of the table 3, and leakage of materials M is prevented by a seal 27 formed around the peripheral contact face. Inside the opening 4a, a cylindrical charger case 6 is provided to be rotated by means of a bearing 28 by a rotation base 5 secured on the external circumferential face thereof, and detachably (removably) held in the charger body 4. Inside the cylindrical shape of the case 6, a retention space for materials M. illustrated with reference symbol S, which covers the cavity 16 placed in a longitudinal shape as shown in Fig. 2 and a plurality of cavities 17 arranged side by side perpendicularly to the reciprocating direction X as shown in Fig. 3, is formed.

[0024] In the upper portion inside the charger case 6, support bars 14 and 15 each of which ends are secured on the inner face of the case 6 are vertically arranged to be perpendicular to each other, and respectively suspend a plurality of mixing blades 12 and 13. On the exterior circumferential face of the rotation base 5, a pulley provided with a tooth form 5a is formed, and additionally a tooth belt 8 is wound on between the pulley and a drive pulley 9 of the reduction motor 10 fixed to the charger body 4.

[0025] Specifically, the charger body 4 is reciprocated to and fro on the table 3 by the actuator 11, while the charger case 6 in the charger body 4 is rotated by the reduction motor 10 via the tooth belt 8. The materials M charged from the opening 4a of the charger body 4 by the conveyor 7 are mixed in the space, which is formed by the periphery of the charger case 6 and the top face of the table 3, by the mixing blades 12 and 13 which are rotated with the rotation of the charger case 6, and then advanced on the table 3 to be transferred into the cavity 16. Note that the depth of the materials M in the case 6 is adjusted to achieve an optimum depth by a supersonic type level gauge (not shown).

[0026] Hence, since the drive unit is not placed above the charger case 6, an area of a material charging portion is larger, and the mixing conditions can be visually checked, and moreover, the mixing blades 12 and 13 are readily regulated. Additionally, the charger case 6 is detachable with the mixing blades 12 and 13, so that the inside of the case 6 and the mixing blades 12 and 13 are easily cleaned.

[0027] In a charger 50A in another embodiment which is shown in Fig. 4, a lower portion of a charger case 6A is shorter in length. A plurality of mixing blades 12A and 13A are each directly attached on the inner face of the case 6A at one end of a shaft portion thereof, and a blade portion is formed at the other end thereof. Thus, in the embodiment, an area of the case 6A for charging the materials is larger and the handling of the detaching/attaching operation or the like is effortless due to the shorter height of the case.

[0028] The present invention is constructed as described hereinbefore and the following effects are obtained:

(1) when a charger requires to be cleaned because of the changing of materials, the cleaning operation is simply performed by detaching an entire charger case;
(2) even when bricks to be molded are placed in any shape of longitudinal dimension and lateral dimension and in any arrangement, the charger is allowed to be commonly used;
(3) a drive unit is not placed in the upper portion of the charger, so that its height is lower so as to shorten a stroke of a press, and so that an opening can defined to be larger, resulting in the simple maintenance and checking; and
(4) it is possible to change the size and position of mixing blades in the charger, so that the charger can be selected in relation to variations of molding materials and molding shapes, and additionally, a mixing/distribution state of materials can be changed by changing the number of and the attaching height of support bars.

Claims

1. A material feeder for a refractory brick molding machine, which reciprocates on a table and mixes materials in a charger in order to feed the materials into a die in the molding machine, **characterized in that** said charger comprises:

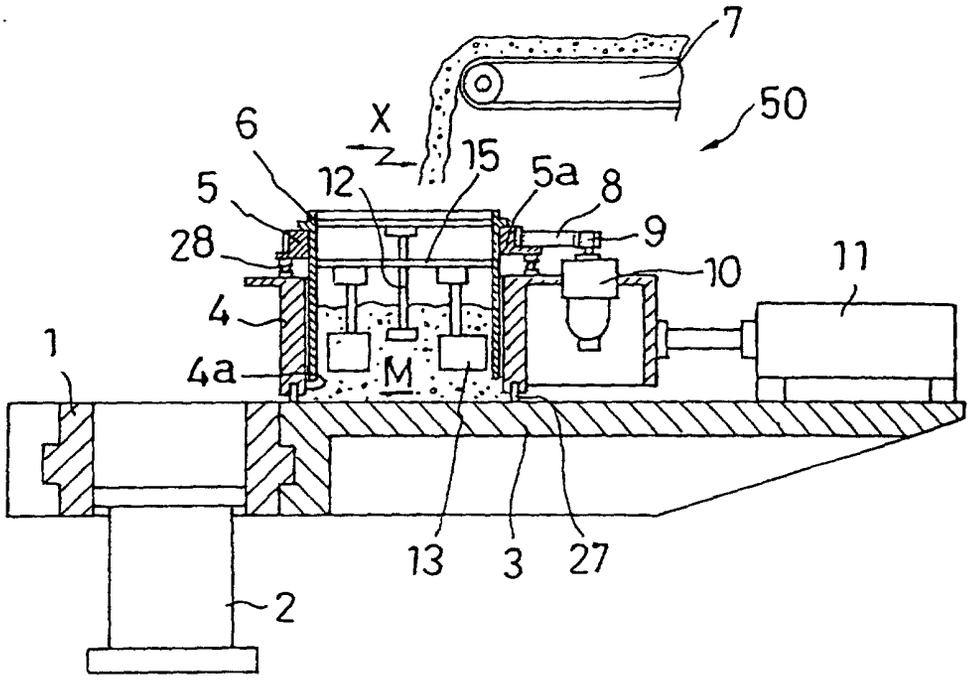
   a charger body reciprocating on the table;
   a cylindrical charger case being provided so as to be removable from and be able to rotate in an opening formed in the charger body;
   a rotation means for rotating the charger case; and
   a plurality of mixing blades being suspended in the charger case.

2. A material feeder as claimed in claim 1, wherein said charger case is held in the charger body so as to be removable from and be able to rotate by means of a bearing by a rotation base, which base is secured on the upper portion in an outer surface of said charger case.

3. A material feeder as claimed in claim 1 or 2, wherein each of said mixing blades is suspended from a support bar, both ends of which are secured on the inner surface of said charger case so as to bridge said charger case.

4. A material feeder as claimed in claim 1 or 2, wherein said mixing blade is provided with a blade portion at one end of a shaft portion thereof, which end is opposite from the other end being secured on the inner face of said charger case.

Fig. 1


7
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5a
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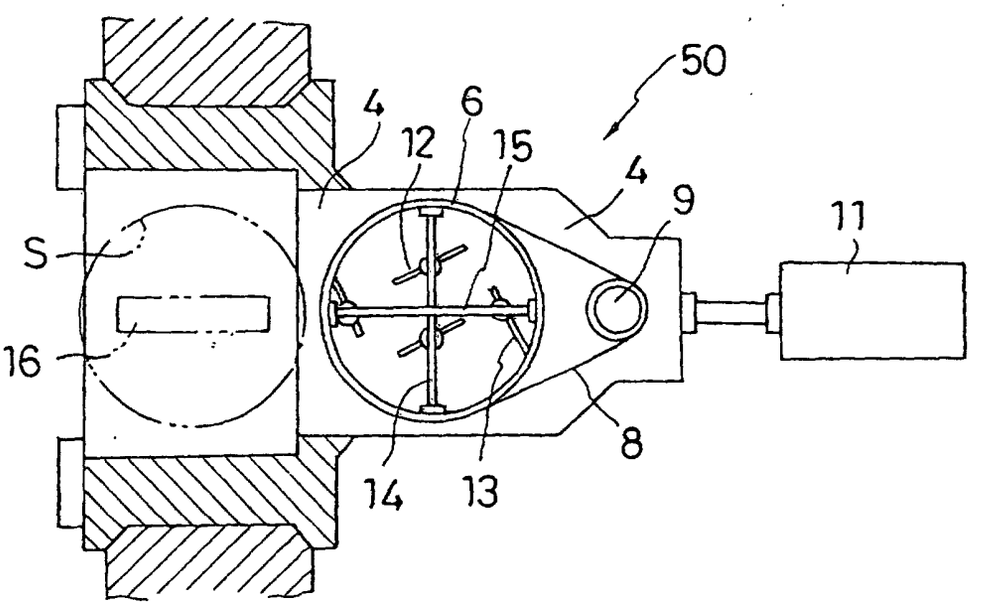
Fig. 2


50
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12
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Fig. 3

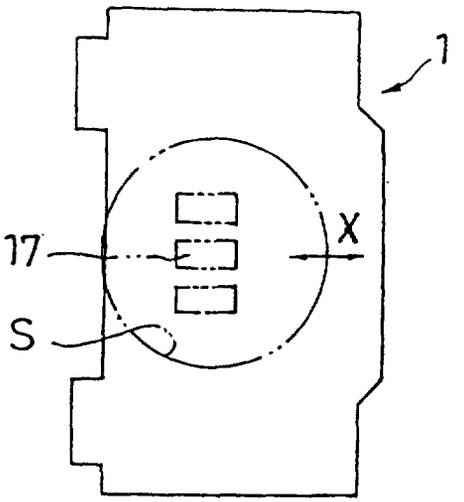


Fig. 4

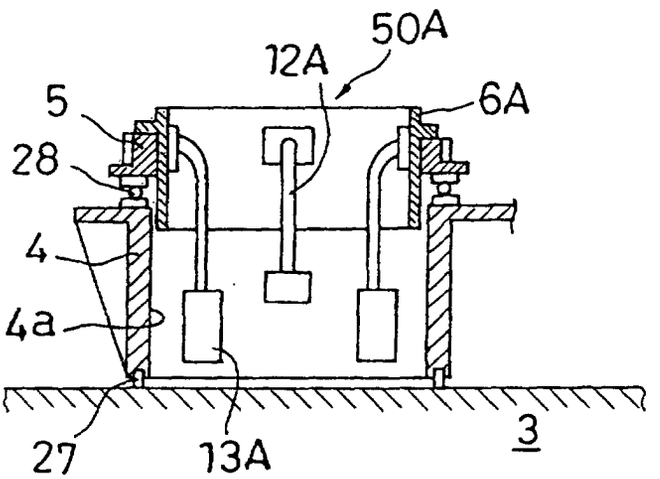


Fig. 5

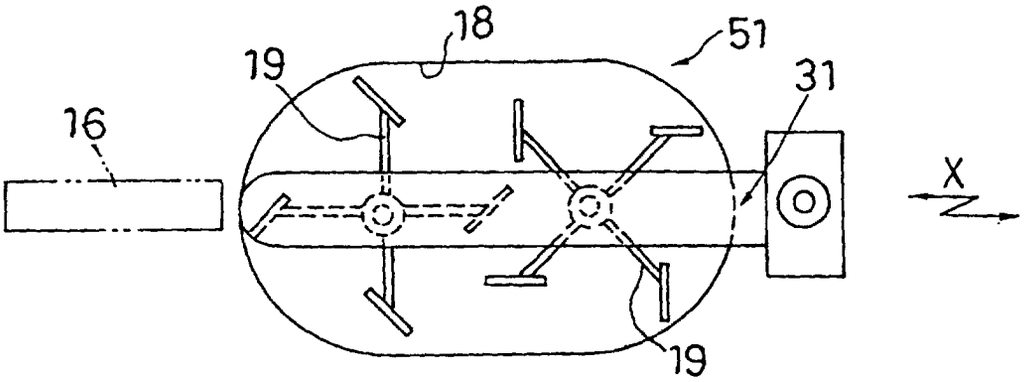


Fig. 6

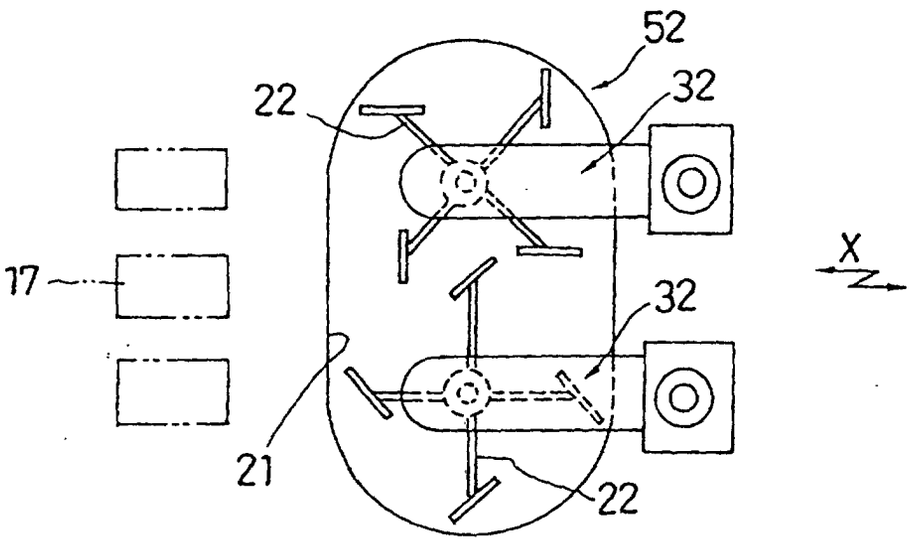


Fig. 7

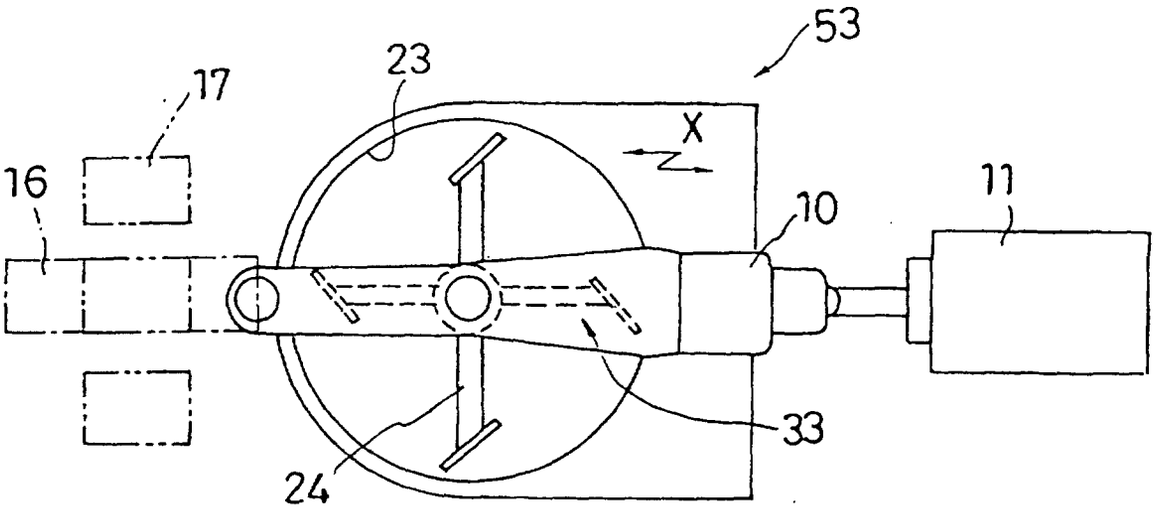
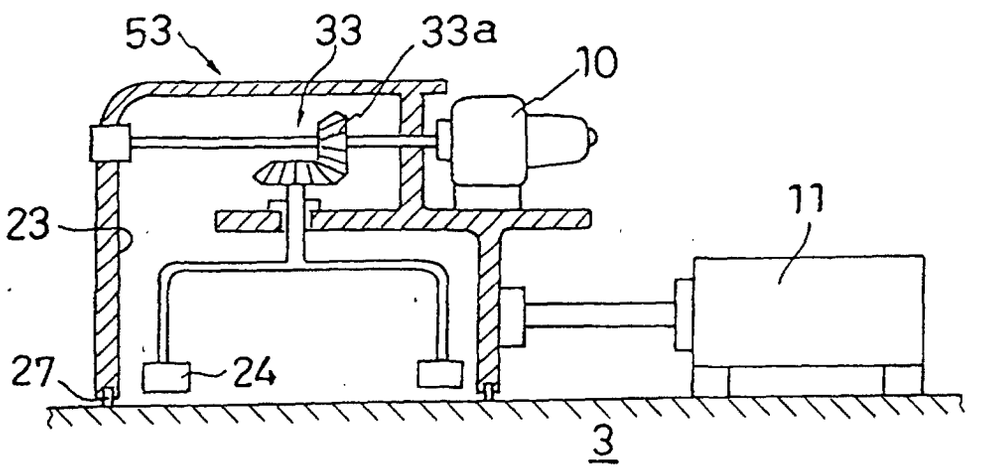


Fig. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/00032

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B28B3/02, B28B13/02

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)
Int.Cl[7] B28B3/02, B28B13/02, B28C, B01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2000
Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1996-2000

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.
EX	JP, 2000-37718, A (Mitsuishi Fukai Tekkosho K.K.), 08 February, 2000 (08.02.00), Claims; drawings	1-4
A	US, 5074774, A (Kabushiki Kaisha Mitsuishi Fukai Tekkousyo), 24 December, 1991 (24.12.91), Claims; drawings & EP, 412834, B1 & JP, 3-69311, A & AU, 9058950, A & BR, 9003870, A & CN, 1049475, A & DE, 69006658, E & ES, 2051474, T3	1-4
A	JP, 4-31007, A (Mitsuishi Fukai Tekkosho K.K), 03 February, 1992 (03.02.92), page 3, upper left column, lines 11 to 15; Figs. 5,6 (Family: none)	1-4
A	JP, 1-123703, A (Mitsuishi Fukai Tekkosho K.K.), 16 May, 1989 (16.05.89), Claims; drawings (Family: none)	1-4

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 March, 2000 (09.03.00)	21 March, 2000 (21.03.00)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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