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(71) Applicant: **Toyo Seikan Group Engineering Co., Ltd.**
Yokohama-shi, Kanagawa 230-0001 (JP)

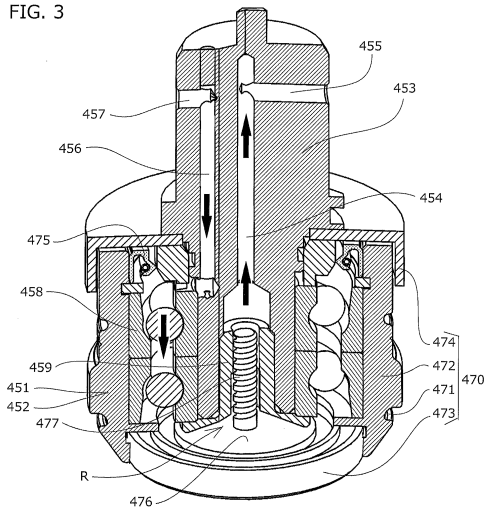
(72) Inventors:
- **HENDA, Shinichiro**
  Yokohama-shi, Kanagawa 230-0001 (JP)
- **TAKAHASHI, Kazuki**
  Yokohama-shi, Kanagawa 230-0001 (JP)
- **OBATA, Kazumoto**
  Yokohama-shi, Kanagawa 230-0001 (JP)

(74) Representative: **dompatent von Kreisler Selting Werner -**
Partnerschaft von Patent- und Rechtsanwälten mbB
Deichmannhaus am Dom
Bahnhofsvorplatz 1
50667 Köln (DE)

(54) SEAMING DEVICE

(57) The present invention has an object of providing a seaming device that does not need the supply of a lubricant at a high pressure from an outside, obtains a sufficient flow rate while suppressing the leakage of the lubricant, and obtains sufficient lubricating performance and heat exhausting performance even when the seaming device is used at a low speed or at a high load. Seaming rolls (451) and (452) have, therein, a lubricant pump mechanism that transfers a lubricating oil between a lubricant path (454) of a seaming roll pin (453) and a bearing (458).

FIG. 3



EP 4 119 255 A1

Description

[Technical Field]

[0001] The present invention relates to a seaming device including a seaming roll that seams a lid to a can.

[Background Art]

[0002] Conventionally, a seaming device including a seaming roll that seams a lid to a can in which a beverage or the like is filled is known.

[0003] In order to smoothly rotate the seaming roll, a known seaming device includes: a seaming roll pin that has a lubricant path extending in a vertical direction formed therein, a lateral peripheral wall that has a seaming part formed on a lateral peripheral surface thereof and is provided to be rotated via a bearing relative to the seaming roll pin, and a bottom wall that closes the bottom part of the lateral peripheral wall and faces the opening of the lubricant path of the seaming roll pin, wherein the bearing is lubricated by the lubricant supplied from the lubricant path.

[0004] The lubrication of the bearing serves also to exhaust generated heat, and therefore the lubricant needs to sufficiently flow. For this reason, the lubricant is generally supplied under pressure to flow. However, if a flow rate increases due to an increase in the pressure of the lubricant, there is a possibility that the lubricant leaks from a sealed portion.

[0005] Further, the seaming device needs a lubricant supply mechanism that is able to ensure a necessary pressure and a flow rate on an outside thereof.

[0006] In an example shown in Patent Literature 1, a lubricant is sprayed while a bearing space part is kept in a pressurized state, and the rotating operation of a seaming roll is used as a pump. Thus, a circulation path is formed in which the lubricant is forcibly discharged from the bearing space part of the seaming roll to the outside of the seaming roll to circulate the lubricant in the bearing space part at all times. On the other hand, if a flow rate increases with an increase in the pressure of the lubricant, there is a possibility that the lubricant leaks from a sealed portion. In an example shown in Patent Literature 2, a seal ring that is able to transfer a lubricant while preventing the leakage of the lubricant and improve lubrication and a lubrication device therefor are proposed.

[0007] Accordingly, in an example shown in Patent Literature 3, a lubricant feeding path 23 (lubricant path) inside seaming roll pins 12 is in communication with a space 37 below bearings 24 of seaming rolls 8 and 9 provided in the seaming roll pins 12, and a space 38 above the bearings 24 serves as a closed circuit that is in communication with the lubricant feeding path 23 by a return path 39, a lubricant enclosed in the lubricant feeding path 23 (lubricant path) inside the seaming roll pins 12 and 12 flows to the bearings 24 outward by a centrifugal force and lubricates the bearings 24. Then, the lubricant returns to the feeding path 23 (lubricant path) after passing through the space 38 and the return path 39, and is delivered to the space 37 again. In the same manner as the above, the lubricant circulates by a centrifugal force.

[0008] Thus, it is possible to eliminate an external lubricant supply mechanism and suppress the leakage of the lubricant.

[Citation List]

[Patent Literature]

[0009]

[Patent Literature 1] Japanese Patent Application Laid-open No. H08-090118
[Patent Literature 2] Japanese Patent Application Laid-open No. H09-182927
[Patent Literature 3] Japanese Patent Application Laid-open No. 2003-170996

[Summary of Invention]

[Technical Problem]

[0010] However, in the known seaming device, the lubricant is caused to flow only by a centrifugal force. Therefore, a sufficient flow rate cannot be obtained, and sufficient lubricating performance and heat exhausting performance cannot be obtained when the seaming device is used at a low speed or at a high load.

[0011] The present invention has been made in order to solve the above problems and has an object of providing a seaming device that does not need the supply of a lubricant at a high pressure from an outside, obtains a sufficient flow rate while suppressing the leakage of the lubricant, and can obtain sufficient lubricating performance and heat exhausting performance even when the seaming device is used at a low speed or at a high load.

[Solution to Problem]

[0012] In order to solve the above problems, the present invention provides a seaming device including: a seaming roll that seams a lid to a can, wherein the seaming roll has a seaming roll pin having a lubricant path extending in a vertical direction formed therein, a lateral peripheral wall that has a seaming part formed on a lateral peripheral surface thereof and is provided to be rotated via a bearing relative to the seaming roll pin, and a bottom wall that closes a bottom part of the lateral peripheral wall and faces an opening of the lubricant path of the seaming roll pin, and the seaming roll has, therein, a lubricant pump mechanism that transfers the lubricant between the lubricant path of the seaming roll pin and the bearing.

[Advantageous Effects of Invention]

[0013] In a seaming device according to claim 1, a seaming roll has a lubricant pump mechanism that transfers a lubricant between the lubricant path of a seaming roll pin and a bearing therein. Therefore, the seaming device does not need the supply of the lubricant at a high pressure from an outside, obtains a sufficient flow rate while suppressing the leakage of the lubricant, and makes it possible to obtain sufficient lubricating performance and heat exhausting performance even when the seaming device is used at a low speed or at a high load.

[0014] In a configuration according to claim 2, a bottom wall has a screw member that extends upward and has a spiral incision formed on a peripheral surface thereof, and the lubricant pump mechanism is constituted by the lubricant path and the screw member. Thus, a so-called screw pump is constituted, which makes it possible to reliably ensure a flow rate.

[0015] Further, as the flow of the lubricant from the bearing to the lubricant path, it is also possible to make the pressure at a sealed portion above the bearing negative to be sucked by the screw pump. Thus, the leakage of the lubricant can be further effectively prevented.

[0016] In a configuration according to claim 3, the bottom wall has a fin member radially formed on an upper surface thereof, and the lubricant pump mechanism is constituted by the fin member. Thus, a so-called centrifugal pump is constituted, which makes it possible to reliably ensure a flow rate.

[0017] In a configuration according to claim 4, the seaming roll pin has a second lubricant path that is in communication with a space at an upper part of the bearing and formed independently of the lubricant supply path. Thus, it is possible to supply the lubricant from the outside and discharge the lubricant to the outside. By performing pressurization from the outside and suction into the outside, it is possible to more reliably ensure a flow rate.

[0018] Further, it is possible to reliably address the degradation of the lubricant or the mixing of foreign matter, while reliably exhausting heat.

[Brief Description of Drawings]

[0019]

[Fig. 1] Fig. 1 is a schematic view showing an example of the configuration of a seaming device according to an embodiment of the present invention.

[Fig. 2] Fig. 2 is a cross-sectional view showing an example of the configuration of the seaming device according to the embodiment of the present invention.

[Fig. 3] Fig. 3 is a cross-sectional view showing an example of the configuration of seaming rolls in the seaming device according to the embodiment of the present invention.

[Fig. 4] Fig. 4 is a cross-sectional view showing an example of the configuration of seaming rolls in a seaming device according to another embodiment of the present invention.

[Fig. 5] Fig. 5 is a schematic view showing the flow of a lubricant in the seaming device according to the embodiment of the present invention.

[Description of Embodiments]

[0020] Hereinafter, the present invention will be described in detail.

[0021] As shown in Fig. 1, a seaming device 100 according to an embodiment of the present invention includes: a seaming turret 101 that performs the seaming process of a can C and a lid F; a carrying-in conveyor 102 that supplies a can C before seaming to the seaming turret 101 in a non-rotated state; a lid supply device 104 that supplies a lid F and includes a lid separation unit 210 and a lid conveyance turret 250; a discharge turret 107 that carries out a can CM after seaming from the seaming turret 101; and a carrying-out conveyor 108 that carries out a can CM from the discharge turret 107 to an outside.

[0022] Each of the seaming turret 101, the discharge turret 107, and the lid conveyance turret 250 has pockets P that separately accommodate and convey cans C and CM and a lid F on their outer peripheral parts, and the carrying-in conveyor 102 has attachments 103 that separately engage and convey a can C.

[0023] The rotation speeds of the seaming turret 101, the discharge turret 107, and the lid conveyance turret 250, the movement speed of the attachments 103 of the carrying-in conveyor 102, and a timing at which the respective pockets P and the attachments 103 are linked to each other are adjustably designed so that cans C and CM and a lid F are smoothly transferred between the respective turrets and the conveyors.

[0024] As shown in Fig. 2, the seaming turret 101 that performs the seaming process of a can C and a lid F includes: a can mounting unit 350 that mounts a can C and rotates the same; a chuck unit 320 that is provided facing the can mounting unit 350 and has a chuck 321 that positions a lid F mounted on a can C and a knockout pad 322 that is fitted to be vertically movable inside the chuck 321 so as to press the lid F mounted on the can C; and a seaming unit 410 having first and second seaming rolls 451 and 452 that seam a lid F to a can C in each of the pockets P.

[0025] The seaming turret 101 is arranged to be rotatable about the center shaft 109 with its central axis X extending in a vertical direction.

[0026] The lid separation unit 210, the lid conveyance turret 250, and the carrying-in conveyor 102 are mechanically driven by the driving mechanism 151 of the seaming turret 101 via a transmission mechanism.

[0027] The chuck unit 320 is arranged to be rotatable about the center shaft 109 with its central axis X extending in a vertical direction and face the can mounting unit

at an equal angular interval, and an outer surface gear 323 of a rotating shaft that supports the chuck 321 at its lower end engages a sun gear 324 supported by the center shaft 109. The chuck unit 320 revolves with the rotation of the center shaft 109 and a center column, and the chuck 321 rotates on its axis with the engagement between the sun gear 324 and the outer surface gear 323.

[0028] The chuck 321 is provided to be fixed and rotatable in a vertical direction. As shown on the right side of the central axis X in Fig. 2, the centering of a lid F is performed in such a manner that a can C on which the lid F has been mounted by lifting the can mounting unit 350 is fitted with the lower end outer peripheral surface of the chuck 321 while being sandwiched between the knockout pad 322 and the can mounting unit 350.

[0029] The seaming unit 410 performs double seaming with seaming rolls 451 and 452 each pivotally fitted to both ends of a seaming lever 450 so as to rotate, the seaming lever 450 having its central part fixed to the lower end of a revolving roll swinging shaft 132. In a double seaming process, a curled portion of a lid F is wrapped into a flange portion of a can C by the seaming roll 451 in primary seaming, and then crimping and bonding are performed by the fastening of seaming roll 452 to maintain sealing in secondary seaming.

[0030] As shown in Fig. 3, the seaming rolls 451 and 452 have a seaming roll pin 453 extending in a vertical direction. At the lower end outer periphery of the seaming roll pin 453, a bearing 458 is fixed to the lower end of the seaming roll pin 453 by a bearing clamp 459, and a rolling part 470 is provided to be rotated via the bearing 458 with respect to the seaming roll pin 453.

[0031] The rolling part 470 has a cylindrical lateral peripheral wall 472 that has a concavo-convex annular seaming part 471 for seaming a can C and a lid F formed on its lateral peripheral surface and is opened at its upper and bottom parts, a bottom wall 473 that is liquid-tightly attached to the lower end on the inner peripheral side of the lateral peripheral wall 472 to close the bottom part, and an upper wall 474 that closes the upper part of the lateral peripheral wall 472. The lateral peripheral wall 472 is provided to be rotated via the bearing 458 with respect to the seaming roll pin 453, and the bottom wall 473 is rotated together with the lateral peripheral wall 472.

[0032] Inside the seaming roll pin 453, a first lubricant path 454 extending in the vertical direction at the center in a radial direction is formed, and a second lubricant path 456 extending in the vertical direction on the outer peripheral side in the radial direction is formed. At the upper end of the first lubricant path 454, a horizontal path 455 that is in communication with a lubricant path (see Fig. 5) inside a roll swinging shaft 132 is formed. At the upper end of the second lubricant path 456, a horizontal path 457 that is in communication with the lubricant path (see Fig. 5) inside the roll swinging shaft 132 is formed. The lower end of the second lubricant path 456 is in communication with the upper part of the bearing 458. The lower end of the bearing 458 is opened into a space R between the lower end of the seaming roll pin 453 and the bottom wall 473. The bottom wall 473 faces an opening at the lower end of the first lubricant path 454 of the seaming roll pin 453 via the gap (space R). Therefore, the space R is in communication with the lower end of the first lubricant path 454. A space between the upper end of the bearing 458 and the upper wall 474 is sealed by a lubricant seal ring 475.

[0033] The bottom wall 473 has a disc part 476 that closes the bottom part of the lateral peripheral wall 472 and a screw member 477 that has spiral incisions formed on its peripheral surface, extends in an upper direction from the upper surface of the disc part 476 at the center of the disc part 476, and is inserted into the first lubricant path 454 of the seaming roll pin 453 (the lubricant path of the bearing clamp 459 inserted into the first lubricant path 454 in the present embodiment).

[0034] In the seaming device 100 of the embodiment, a lubricant circulation path is formed in which the horizontal path 457, the second lubricant path 456, the bearing 458, the space R, the lubricant path 454, and the horizontal path 455 are in communication with each other, and a lubricant pump mechanism is constituted in which a lubricating oil is transferred in the path by a screw pump effect due to the rotation of the screw member 477 accompanied by the rotation of the rolling part 470.

[0035] In seaming a can C, winding or crimping is performed in such a manner that the concavo-convex annular shape of the seaming part 471 of the lateral peripheral wall 472 comes in contact with the flange part of a lid F and the rolling part 470 is driven to rotate when the rolling part 470 is pressed against the lid F mounted on the can C via the seaming roll pin 453 by the roll swinging shaft 132.

[0036] When the can C is seamed, the lubricating oil having been supplied to the second lubricant path 456 via the horizontal path 457 from the lubricant path inside the roll swinging shaft 132 flows into the bearing 458 from the second lubricant path 456 by a negative pressure generated by the lubricant pump mechanism and gravity. After lubricating the bearing 458 while flowing down on the same, the lubricating oil reaches the space R. The lubricating oil flows into the first lubricant path 454 by an ejection force generated by the screw pump effect due to the rotation of the screw member 477 accompanied by the rotation of the rolling part 470, and returns to the inside of the in-machine housing after passing through a return lubricant path inside the roll swinging shaft 132 via the horizontal path 455. The returned oil is used to lubricate an upper part inside the machine again and then flows into the seaming unit 410 according to its natural drop due to gravity, and is delivered to the bearing 458 again.

[0037] As shown in Fig. 4, seaming rolls in a seaming device according to another embodiment have the same configuration as that of the seaming rolls in the seaming device 100 according to the first embodiment except that the upper surface of a bottom wall has a shape that has

radially extending fin members and obtains a centrifugal pump effect. In Fig. 4, parts having the same configurations as those of the seaming rolls according to the first embodiment are denoted by the same symbols.

[0038] A bottom wall 493 has radially extending fin members 497 on the upper surface of a disc part 496 that closes the bottom part of a lateral peripheral wall 472.

[0039] In the seaming device of the embodiment, a lubricant pump mechanism is constituted in which a lubricating oil is transferred in a lubricant circulation path, in which a horizontal path 455, a first lubricant path 454, a space R, a bearing 458, a second lubricant path 456, and a horizontal path 457 are arranged in this order, by a centrifugal force accompanied by the rotation of the fin members 497.

[0040] When a can C is seamed, the lubricating oil having been supplied to the first lubricant path 454 via the horizontal path 455 from a lubricant path inside a roll swinging shaft 132 reaches the space R from the first lubricant path 454 by a negative pressure generated by a centrifugal pump effect due to the lubricant pump mechanism and gravity. After flowing into the bearing 458 outward by an ejection force generated by the rotation of the fin members 497 and lubricating the bearing 458, the lubricating oil returns to the inside of an in-machine housing after passing through a return lubricant path inside the roll swinging shaft 132 via the second lubricant path 456 and the horizontal path 457 and is delivered to the bearing 458 again.

[0041] Note that the lubricant may be any substance such as oil, grease, and a water-soluble lubricant so long as the lubricant is a fluid.

[0042] The basic operation of the seaming device 100 thus configured will be described.

[0043] A can C to which a lid F has been seamed is conveyed while engaging each of the attachments 103 of the carrying-in conveyor 102 and directed to the seaming turret 101 rotated by the driving mechanism 151.

[0044] On the other hand, the lid F is cut out one by one from the lid separation unit 210, transferred to each of the pockets P of the lid conveyance turret 250, and directed to the seaming turret 101 by the rotation of the lid conveyance turret 250 (see Fig. 1) .

[0045] The speeds and timings of the carrying-in conveyor 102 and the lid conveyance turret 250 are adjusted according to the speed and timing of the seaming turret 101 so that the centers of the can C and the lid F are aligned with each other at a merging point G. When the can mounting unit 350 of which the rotation is controlled via appropriate gears, a cam mechanism, or the like by the driving mechanism 151 is lifted at the merging point G, the lid F is mounted on the can C mounted on the plate 360.

[0046] After that, the can mounting unit 350 is further lifted, the knockout pad 322 inside the chuck 321 presses the lid F, and the chuck 321 of which the rotation is controlled via appropriate gears, a cam mechanism, or the like by the driving mechanism 151 is fitted into the lid F to perform the centering of the lid F. The can C on which the lid F has been mounted is sandwiched between the plate 360, the chuck 321, and the knockout pad 322 at a constant axial load necessary for seaming.

[0047] Then, the seaming turret 101 further rotates, and the plate 360 and the chuck 321 accelerate up to their rotation numbers necessary for seaming before the sandwiched lid F and the can C reach a seaming interval E shown in Fig. 1.

[0048] While passing through the seaming interval E, the seaming lever 450 fixed to the lower end of the roll swinging shaft 132 of the seaming unit 410 is swung. Thus, the two seaming rolls 451 and 452 for primary and secondary seaming each pivotally fitted to both ends so as to rotate are sequentially pressed against the can C and the flange of the lid F mounted on the can C from their lateral sides toward the chuck 321 to perform double seaming.

[0049] The can CM having completed the seaming is transferred from the seaming turret 101 to the discharge turret 107 and then transferred from the discharge turret 107 to the carrying-out conveyor 108 to be carried out to a next process such as inspection and packaging.

[Reference Signs List]

[0050]

100	Seaming device
101	Seaming turret
102	Carrying-in conveyor
103	Attachment
104	Lid supply device
107	Discharge turret
108	Carrying-out conveyor
109	Center shaft
122	Vertical movement mechanism
123	Vertical movement cam
124	Vertical movement cam follower
132	Roll swinging shaft
133	Vertical movement mechanism
134	Vertical movement cam
135	Vertical movement cam follower
151	Driving motor
156	Driving motor (servo motor)
158	Driving motor
210	Lid separation unit
215	Path
320	Chuck unit
321	Chuck
322	Knockout pad
410	Seaming unit
450	Seaming lever
451	Seaming roll (primary seaming)
452	Seaming roll (secondary seaming)
453	Seaming roll pin
454	First lubricant path
455	Horizontal path

456	Second lubricant path
457	Horizontal path
458	Bearing
459	Bearing clamp
470	Rolling part
471	Seaming part
472	Lateral peripheral wall
473	Bottom wall
474	Upper wall
475	Lubricant seal ring
476	Disc part
477	Screw member
480	Seaming roll
493	Bottom wall
496	Disc part
497	Fin member
C	Can (before seaming lid)
F	Lid
CM	Can (after seaming lid)
P	Pocket
K	Spline
E	Seaming interval
R	Space
V	Chuck space
X	Central axis

Claims

1. A seaming device comprising:

a seaming roll that seams a lid to a can, wherein the seaming roll has a seaming roll pin having a lubricant path extending in a vertical direction formed therein, a lateral peripheral wall that has a seaming part formed on a lateral peripheral surface thereof and is provided to be rotated via a bearing relative to the seaming roll pin, and a bottom wall that closes a bottom part of the lateral peripheral wall and faces an opening of the lubricant path of the seaming roll pin, and
the seaming roll has, therein, a lubricant pump mechanism that transfers the lubricant between the lubricant path of the seaming roll pin and the bearing.

2. The seaming device according to claim 1, wherein

the bottom wall has a screw member that extends upward and has a spiral incision formed on a peripheral surface thereof, and
the lubricant pump mechanism is constituted by the lubricant path and the screw member.

3. The seaming device according to claim 1, wherein

the bottom wall has a fin member radially formed on an upper surface thereof, and
the lubricant pump mechanism is constituted by the fin member.

4. The seaming device according to any of claims 1 to 3, wherein
the seaming roll pin has a second lubricant path that is in communication with a space at an upper part of the bearing and formed independently of the lubricant path.

FIG. 1

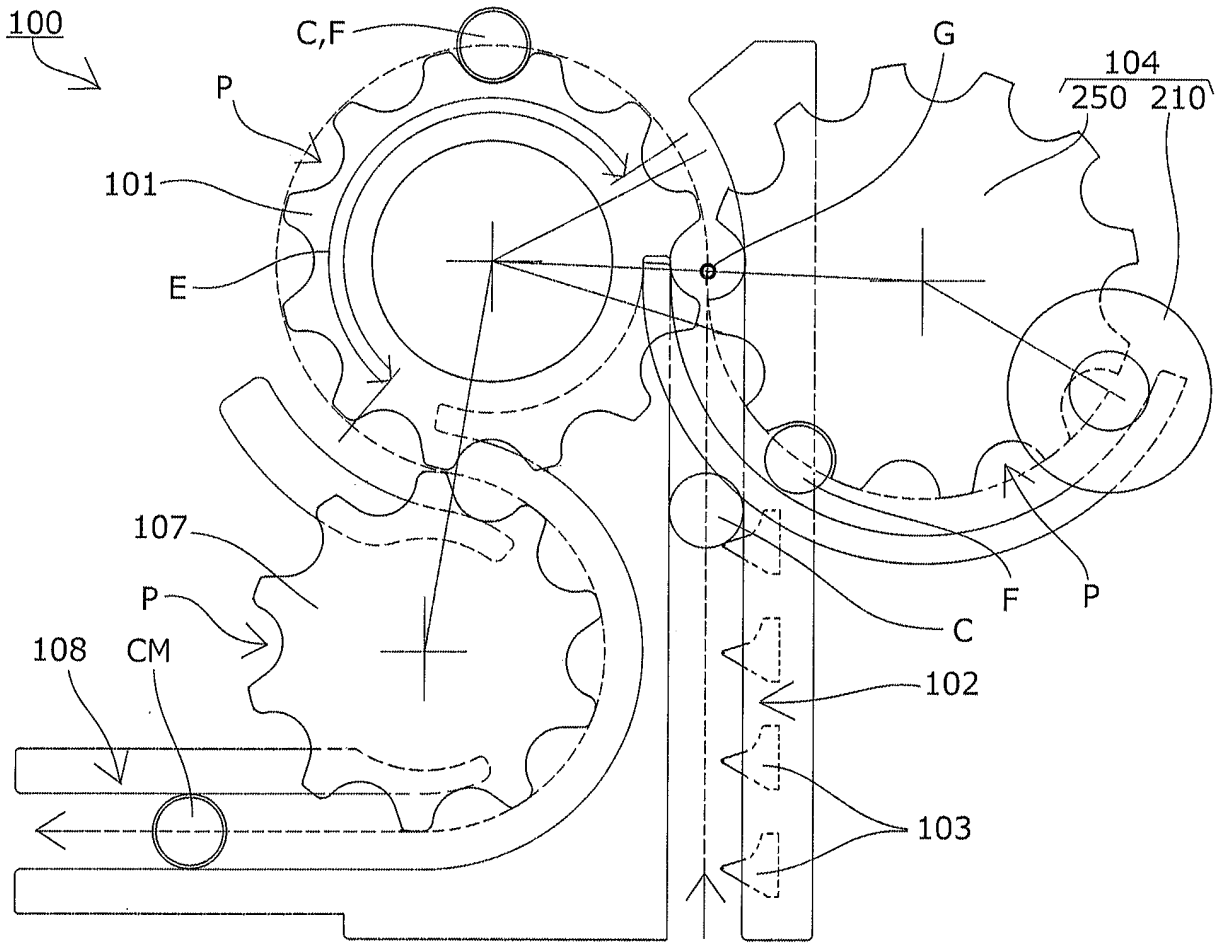


FIG. 2

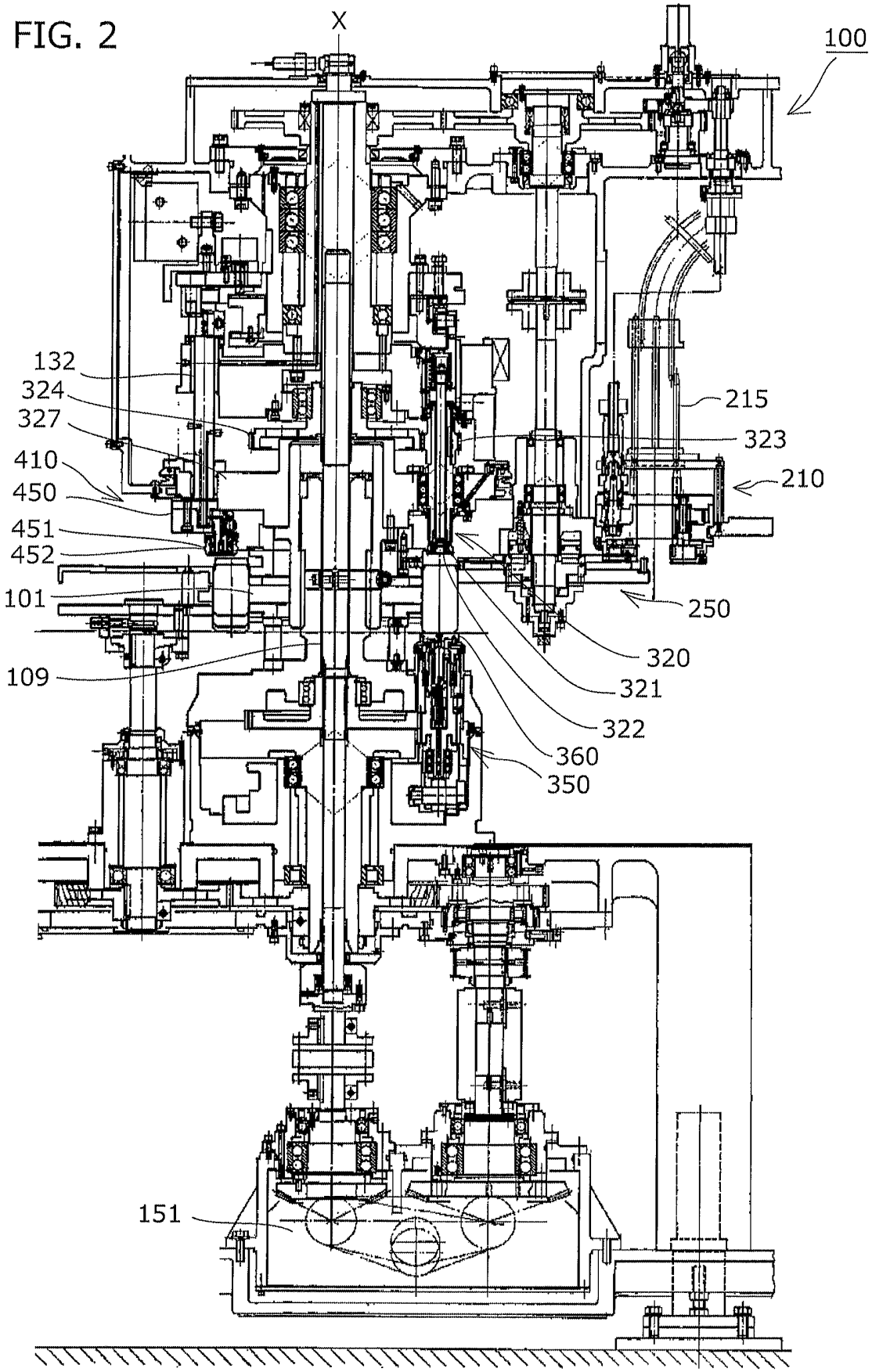

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FIG. 3

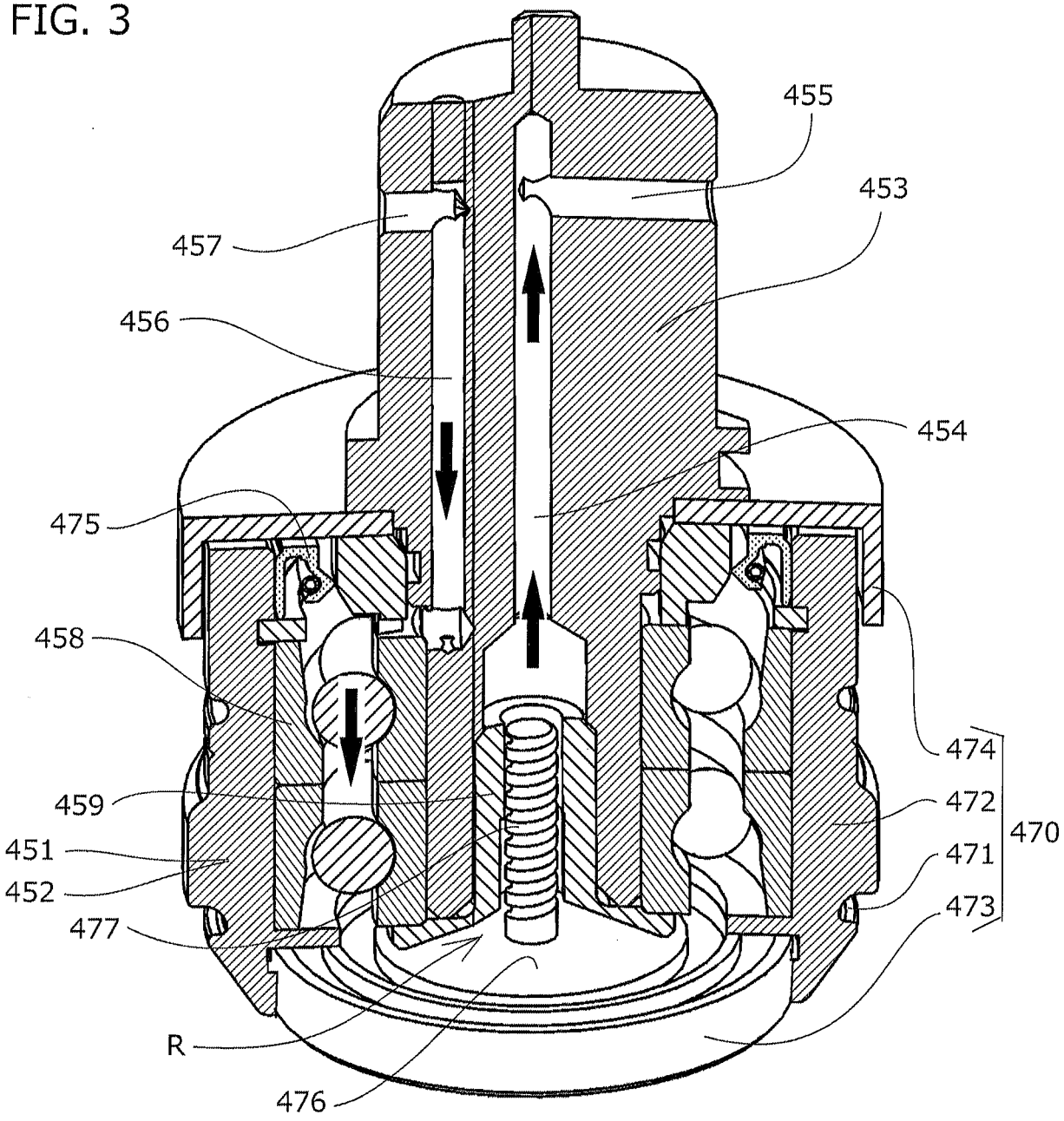
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FIG. 4

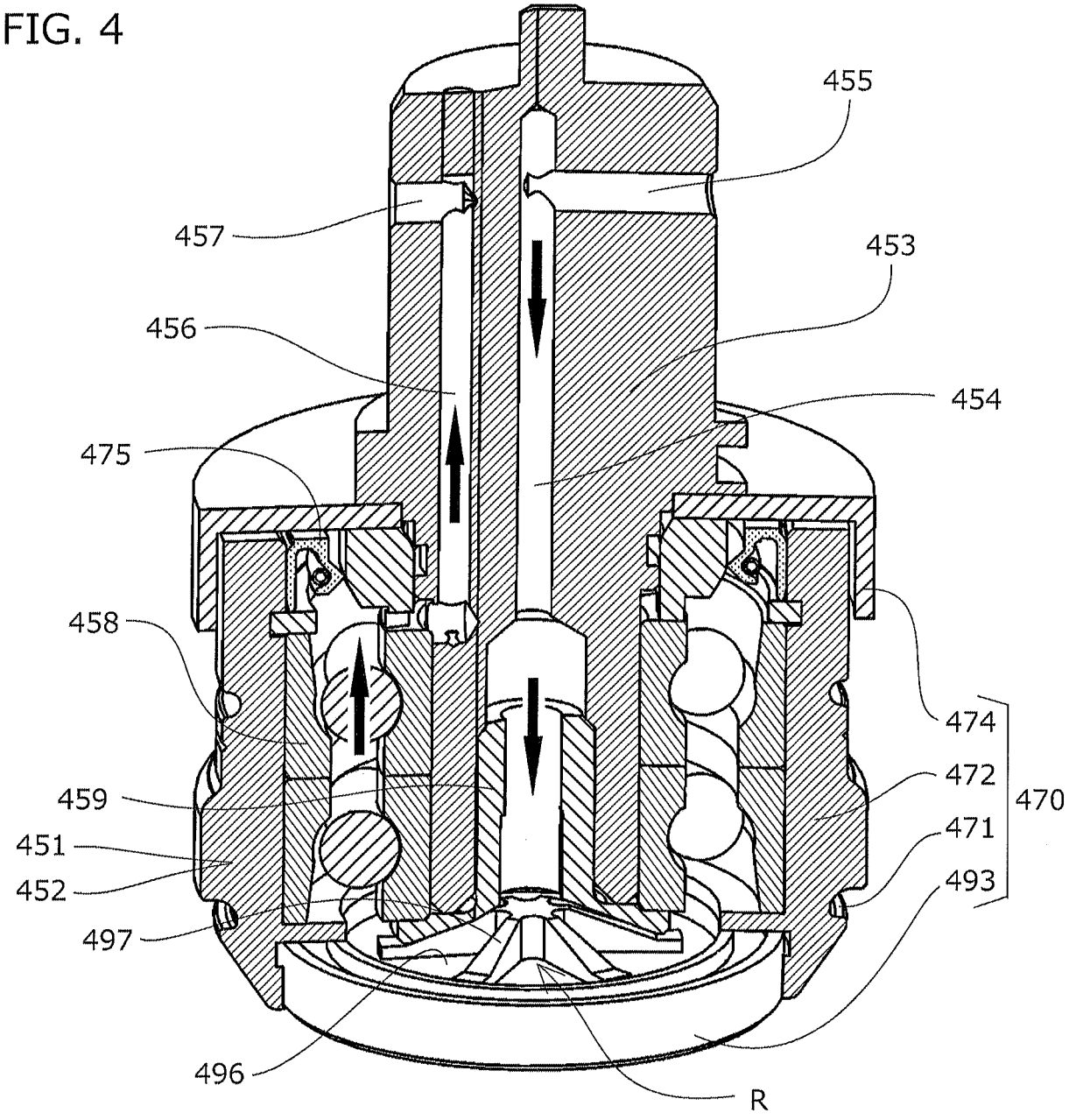
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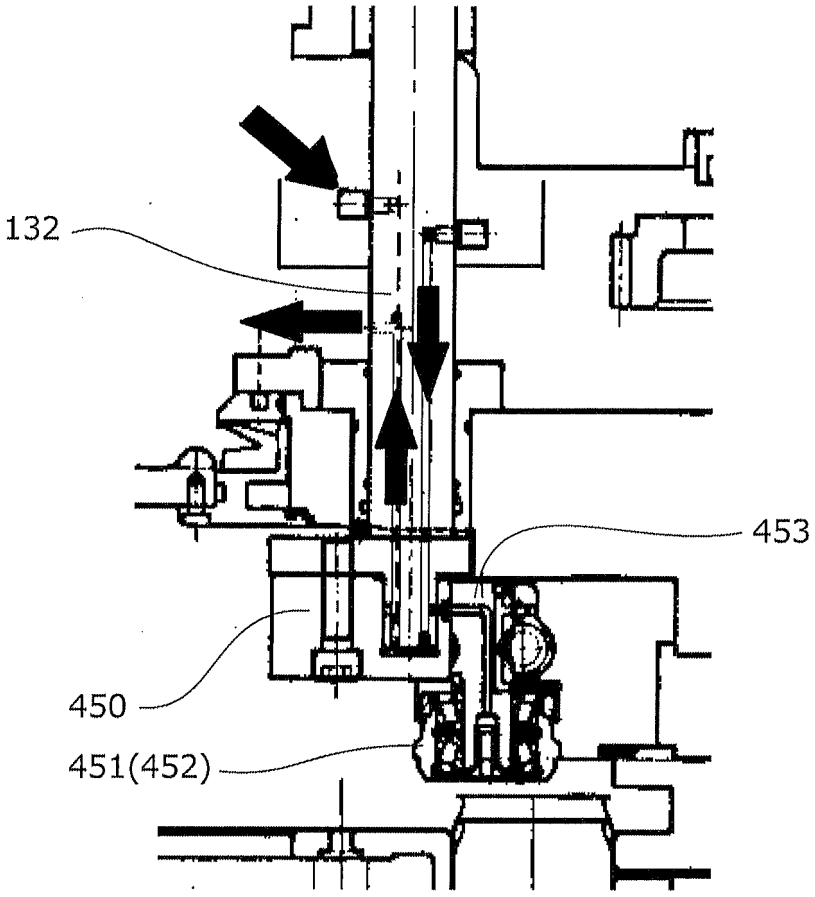
FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/044475

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. B21D51/30(2006.01)i
FI: B21D51/30 L, B21D51/30 D, B21D51/30 C, B21D51/30 B

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. B21D51/30

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2020
Registered utility model specifications of Japan 1996-2020
Published registered utility model applications of Japan 1994-2020

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.
A	WO 2016/199649 A1 (TOYO SEIKAN KAISHA, LTD.) 15 December 2016	1-4
A	JP 9-308930 A (MITSUBISHI HEAVY INDUSTRIES, LTD.) 02 December 1997	1-4

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search	Date of mailing of the international search report
09.12.2020	28.12.2020
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2020/044475

Patent Documents referred to in the Report	Publication Date	Patent Family	Publication Date
WO 2016/199649 A1	15.12.2016	US 2018/0065168 A1 EP 3308872 A1	
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REFERENCES CITED IN THE DESCRIPTION

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