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(71) Applicant: **Flainox S.r.l.**
**13854 Quaregna (Biella) (IT)**

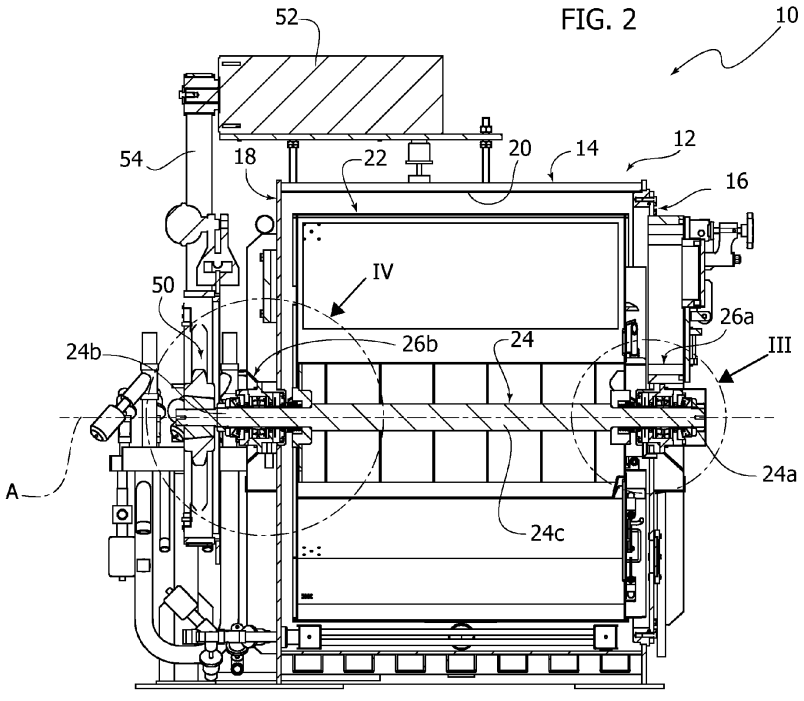
(72) Inventor: **Bozzo, Giovanni**
**I-13854 Quaregna (Biella) (IT)**

(74) Representative: **Marchitelli, Mauro**
**Buzzi, Notaro & Antonielli d'Oulx Srl**
**Via Maria Vittoria 18**
**10123 Torino (IT)**

# (54) Rotary drum machine wih thrust bearings for dyeing, washing or the like of textile articles

(57) Rotary drum machine for dyeing, washing or the like of textile articles, comprising:
- a stationary support structure (12) having a pressurizable treatment chamber (20),
- a rotary drum (22) located inside said treatment chamber (20),
- a shaft (24) fastened to the drum (22) and having two ends (24a, 24b) rotatably supported by the stationary support structure (12) by means of respective support assemblies (26a, 26b), and
- two flat walls (16, 18) that delimit the treatment chamber (20) from opposite sides with respect to the drum (22),
wherein said support assemblies (26a, 26b) comprise respective thrust bearings (32a, 32b) that transmit the forces generated on said flat walls (16, 18) by the pressure within said treatment chamber (20) to the shaft (24).

FIG. 2

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## Description

### TEXT OF THE DESCRIPTION

Field of the invention

**[0001]** The present invention relates to a rotary drum machine for industrial treatments of dyeing, washing or the like of textile articles.

**[0002]** More precisely, the invention relates to a machine equipped with a pressurizable treatment chamber configured to carry out treatments of textile articles at temperatures above 100°C.

Description of the prior art

**[0003]** Industrial dyeing treatments of synthetic articles (e.g. polyester) require that the treatment is carried out at temperatures of above 100°C. For example, the dyeing of polyester articles is carried out at temperatures on the order of 140°C. To carry out treatments at temperatures above 100°C it is necessary to pressurize the treatment chamber.

**[0004]** The equipment usually used for these types of treatments are autoclaves with a rotary drum equipped with a stationary structure having a cylindrical wall closed at its ends by two curved walls. Typically, one of the two curved walls is fixed and the second constitutes an openable door, articulated to the stationary structure by means of hinges. The use of curved walls is necessary for withstanding the working pressure inside the treatment chamber without deformation. The working pressure varies as a function of the temperature and with a temperature of 140°C can be on the order of 3 bar.

**[0005]** The use of curved walls requires a high cost of the machine, both for the intrinsic cost of the curved walls and for the complexity of the sealing closure device of the openable door. Machines with curved walls also have a large footprint.

**[0006]** To overcome the drawbacks arising from the use of curved walls, pressurizable rotary drum machines equipped with flat end walls have already been proposed. Flat-walled machines of the known type have front and rear walls with a very high thickness, on the order of 40-50 mm, to ensure that such walls support the working pressure of the machine without deformation. The high thickness of the end walls does not allow a significant reduction of the cost of the machine with respect to solutions with curved walls.

Object and summary of the invention

**[0007]** The present invention aims to provide a pressurizable rotary drum machine which overcomes the problems of the prior art.

**[0008]** According to the present invention this object is achieved by a machine having the characteristics forming the subject of the claims.

**[0009]** The claims form an integral part of the disclosure provided in relation to the invention.

Brief description of the drawings

**[0010]** The present invention will now be described in detail with reference to the accompanying drawings, provided purely by way of non-limiting example, wherein:

- Figure 1 is a perspective view of a machine according to the present invention,
- Figure 2 is a section along the line II-II of Figure 1, and
- Figures 3 and 4 are sections on a larger scale according to the arrows III and IV of Figure 2.

Detailed description of embodiments of the invention

**[0011]** With reference to the Figures, numeral 10 indicates a rotary drum machine for treatments of dyeing, washing or the like of textile articles. The machine 10 comprises a stationary support structure 12 including a cylindrical wall 14 with a horizontal axis A and two flat walls 16, 18. The flat walls 16, 18 are orthogonal to the axis A and close the opposite ends of the cylindrical wall 14.

**[0012]** With reference to Figure 2, the cylindrical wall 14 and the flat walls 16, 18 define a pressurizable treatment chamber 20. A rotary drum 22 is housed inside the treatment chamber 20 and is carried by the stationary support structure 12 in a rotatable manner around the axis A. The drum 22 is fastened to a shaft 24 having a front end 24a, a rear end 24b and a central portion 24c. The front end 24a and the rear end 24b extend outside of the drum 22 on the front side and on the rear side of the machine 10, and the central portion 24c of the shaft 24 extends through the drum 22. The shaft 24 is rotatably carried by the two flat walls 16, 18 by means of respective support assemblies 26a, 26b, illustrated in greater detail in Figures 3 and 4. The front support assembly 26a and the rear support assembly 26b are essentially the same. Hereinafter the components of the front support assembly 26a are marked with the suffix "a" and components of the back support assembly 26b are marked with the suffix "b".

**[0013]** With reference to Figures 3 and 4, each support assembly 26a, 26b comprises a seal 28a, 28b, a radial bearing 30a, 30b and a thrust bearing 32a, 32b. The seals 28a, 28b seal the treatment chamber 20 on the rotating shaft 24. The seals 28a, 28b are normal mechanical seals for rotating shafts of the type commonly used for pressurizable rotary drum machines. In the illustrated example, each seal 28a, 28b is carried by a fixed flange 34a, 34b fixed to the respective flat wall 16, 18. Each seal 28a, 28b acts on a respective sleeve 36a, 36b fixed on the respective end 24a, 24b of the shaft 24.

**[0014]** The radial bearing 30a, 30b is for example an adjustable roller bearing. The outer ring of the bearing 30a, 30b is fastened to a supporting body 38a, 38b fas-

tened to the fixed flange 34a, 34b.

**[0015]** The thrust bearing 32a, 32b is preferably an adjustable roller thrust bearing. The bearing 32a, 32b has a fixed ring 40a, 40b which rests against an opposing flange 42a, 42b axially pressed against the support body 38a, 38b. The thrust bearing 32a has a rotating ring 44a, 44b which axially rests against a lock washer 46a, 46b which is fastened to the end 24a, 24b of the shaft 24 by means of a fixing ring nut 48a, 48b.

**[0016]** With reference to Figures 2 and 4, a pulley 50 is fastened to the end 24b of the shaft 24. The pulley 50 is driven into rotation by an electric motor 52 via a belt 54.

**[0017]** With reference to Figures 1 and 2, the front flat wall 16 is fixed relative to the support structure 12 and is equipped with an openable door 56 to introduce and extract the textile articles from the drum 22. The wall 16 may be equipped with devices 58 for opening and locking the door 16. As illustrated in Figure 1, the front flat wall 16 may be equipped with reinforcing ribs 60. Such reinforcements can also be envisaged on the rear flat wall 18.

**[0018]** During operation, the articles to be treated are placed in the drum 22 via the door 56. After loading, the door 56 is closed and the treatment cycle is initiated. During operation, the drum 32 is put in rotation by means of the motor 52. The machine 10 is equipped with devices for the supply and heating of a water bath inside the treatment chamber 20. When the temperature of the treatment water bath rises to above 100°C inside the chamber 20 steam develops which pressurizes the treatment chamber 20. The seals 28a, 28b seal the treatment chamber 20. The working pressure in the treatment chamber 20 depends on the temperature. For example, with a temperature of 140°C working pressures in the treatment chamber 20 will be on the order of 3 bar.

**[0019]** The working pressure acts on the internal surfaces of the walls 16, 18 and generates a pressure force that tends to deform the walls 16, 18 outwards. The pressure force is transmitted from the walls 16, 18 to the shaft 24 by means of the thrust bearings 32a, 32b. In greater detail, with reference to Figures 3 and 4, the pressure acting on the inner surfaces of the walls 16, 18 is transmitted from the walls 16, 18 to the fixed flanges 34a, 34b, to the support bodies 38a, 38b, to the opposing flanges 42a, 42b and to the thrust bearings 32a, 32b. The thrust bearings 32a, 32b finally transmit the pressure forces generated by the pressurization of the treatment chamber 20 on the flat walls 16, 18 to the shaft 24. The thrust forces transmitted to the shaft 24 by the two thrust bearings 32a, 32b are opposite to each other. The shaft 24 is subjected to traction by the opposite thrust forces transmitted by the thrust bearings 32a, 32b. The shaft 24 acts as a tie rod which absorbs the forces produced on the flat walls 16, 18 by the pressurization of the working chamber 20.

**[0020]** In this way, it is possible to considerably reduce the thickness of the flat walls 16, 18. In particular, the thickness of the flat walls 16, 18 may be greatly reduced compared to the previously known pressurizable flat-walled machines. The higher cost due to the addition of the two thrust bearings 32a, 32b is more than compensated by the reduction of the cost from using thinner flat walls 16, 18. Therefore, the solution according to the present invention allows the realization of pressurizable rotary drum machines with flat walls having a cheaper and more lightweight structure than the machines of known type.

**[0021]** Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary widely with respect to those described and illustrated without departing from the scope of the invention as defined by the claims that follow.

## Claims

1. Rotary drum machine for dyeing, washing or the like of textile articles, comprising:

   - a stationary support structure (12) having a pressurizable treatment chamber (20),
   - a rotary drum (22) located inside said treatment chamber (20),
   - a shaft (24) fastened to the drum (22) and having two ends (24a, 24b) rotatably supported by the stationary support structure (12) by means of respective support assemblies (26a, 26b), and
   - two flat walls (16, 18) that delimit the treatment chamber (20) from opposite sides with respect to the drum (22),

   **characterised in that** said support assemblies (26a, 26b) comprise respective thrust bearings (32a, 32b) that transmit the forces generated on said flat walls (16, 18) by the pressure within said treatment chamber (20) to the shaft (24).

2. Machine according to claim 1, **characterised in that** each of said support assemblies (26a, 26b) is carried by a respective flat wall (16, 18).

3. Machine according to claim 1 or claim 2, **characterised in that** each of said support assemblies comprises a seal (28a, 28b) acting on the respective end (24a, 24b) of the shaft (24).

4. Machine according to any one of the preceding claims, **characterised in that** each of said support assemblies (26a, 26b) comprises a radial bearing (30a, 30b) that supports the respective end (24a, 24b) of the shaft (24).

5. Machine according to any one of the preceding claims, **characterised in that** each of said thrust bearings (32a, 32b) comprises a fixed ring (40a, 40b) which rests against an opposing flange (42a, 42b)

fixed with respect to the respective flat wall (16, 18), and a rotating ring (44a , 44b) which axially rests against a respective lock washer (46a, 46b) fixed to the respective shaft end (24a, 24b) by means of a fixing ring nut (48a, 48b).

**6.** Machine according to any one of the preceding claims, **characterised in that** said thrust bearings (32a, 32b) are adjustable roller thrust bearings.

**7.** Machine according to any one of the preceding claims, **characterised in that** said radial bearings (30a, 30b) are adjustable roller bearings.

FIG. 1

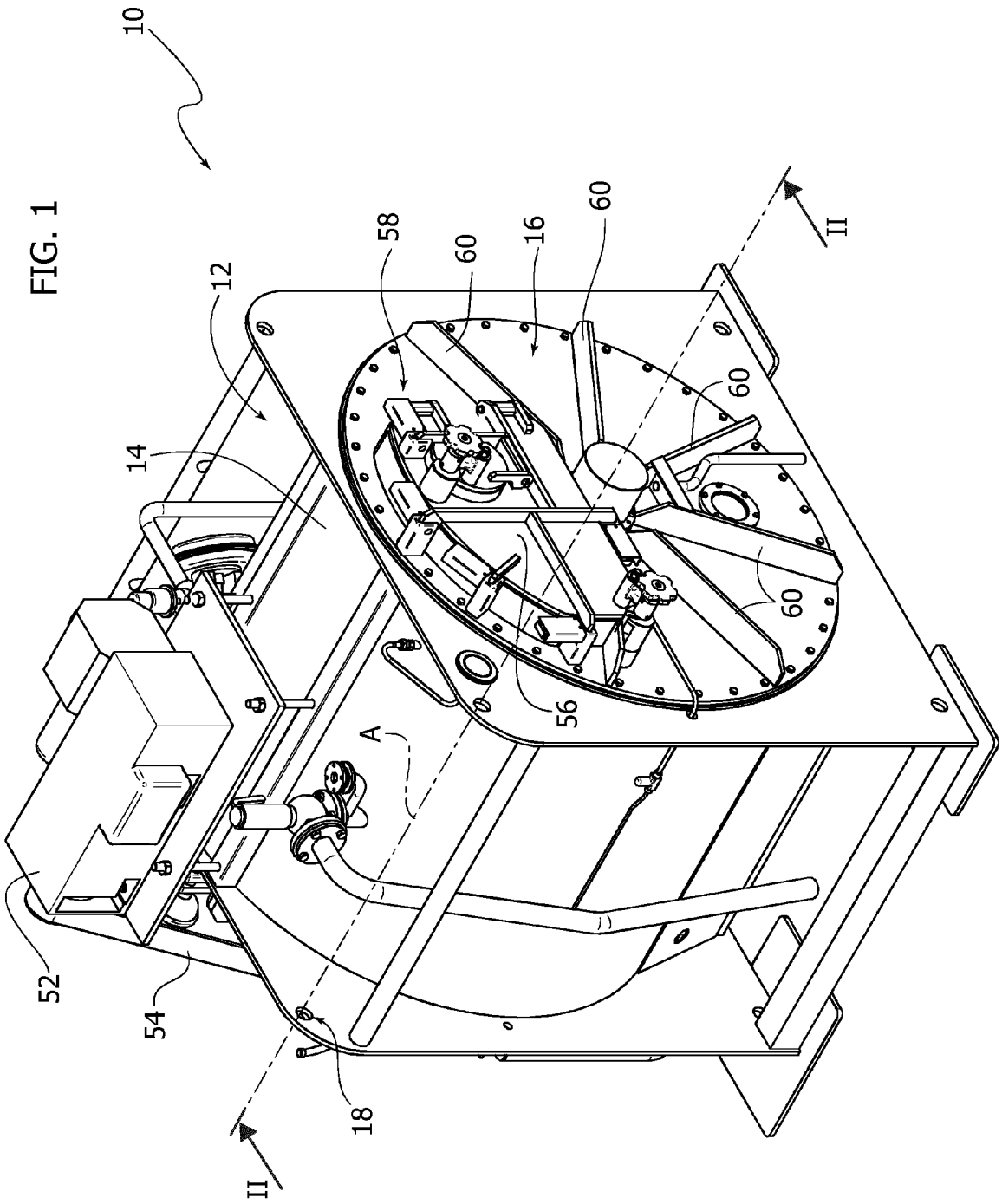


FIG. 2

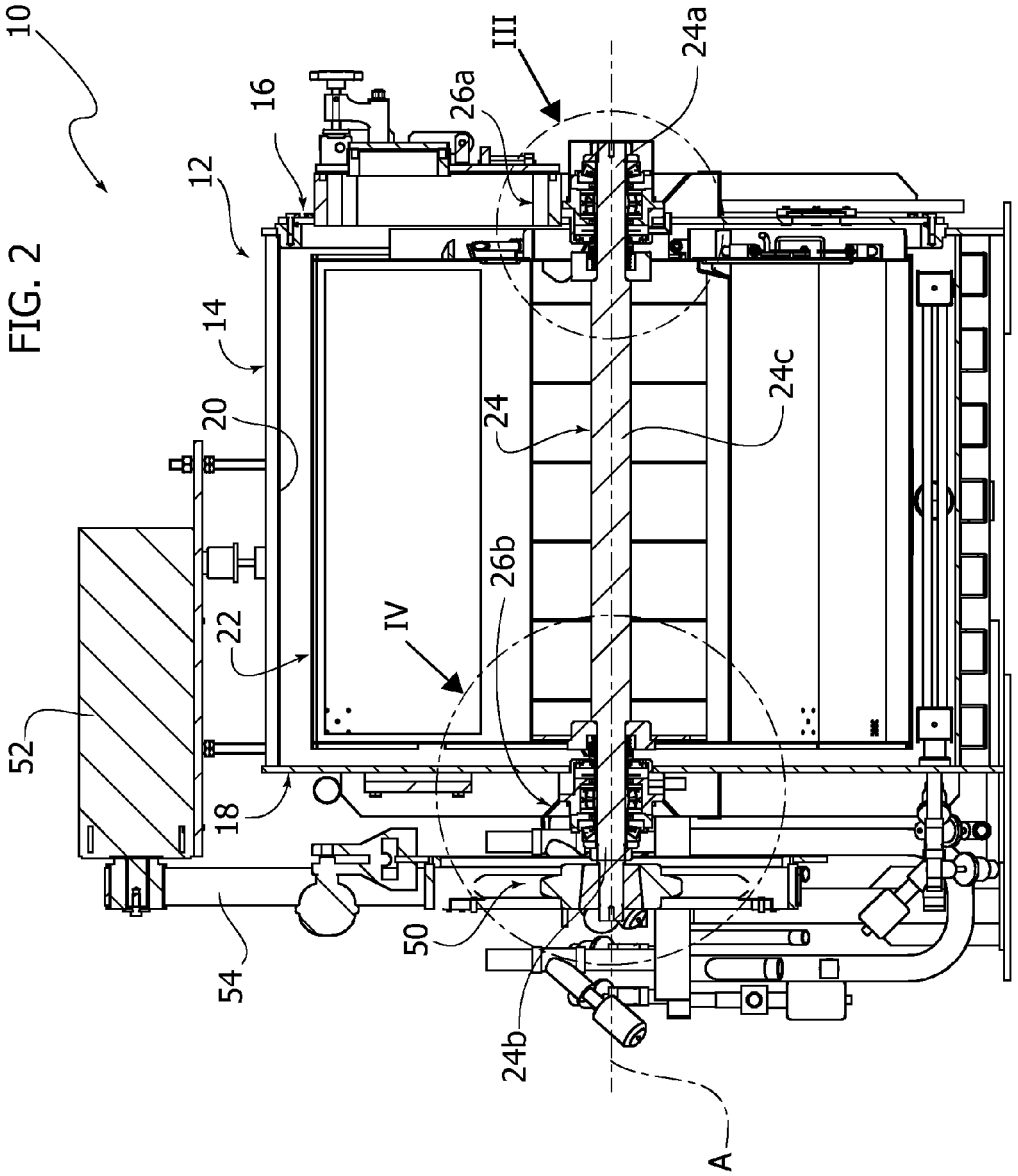


FIG. 3

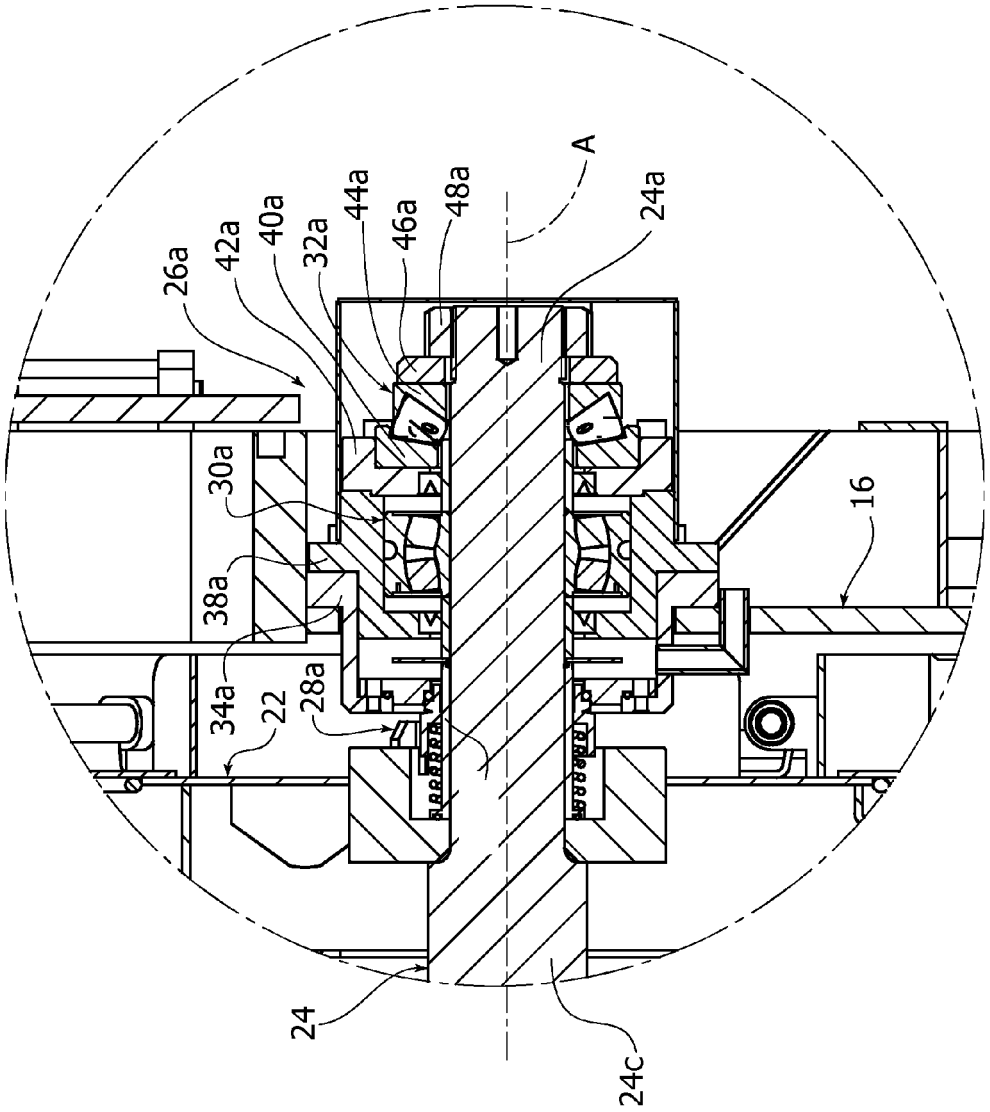
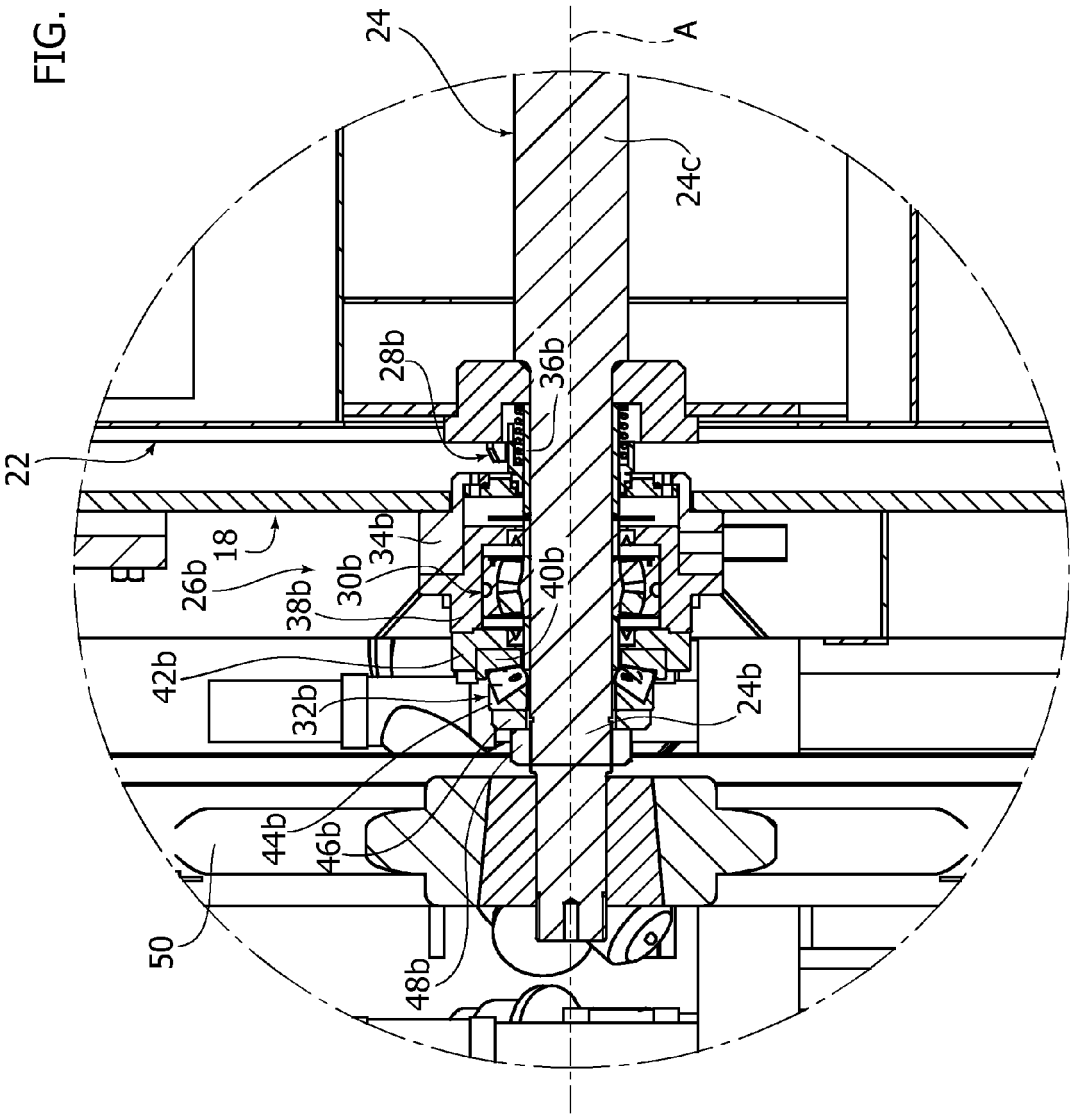


FIG. 4


24
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24c
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36b
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34b
26b
30b
38b
40b
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48b

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# EUROPEAN SEARCH REPORT

Application Number
EP 13 18 5510

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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 30 October 2013 | Prosig, Christina |

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82