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(54) **REEL, MACHINE FOR PRODUCING THE REEL AND RESPECTIVE OBTAINING METHOD**

(57) A reel for receiving a flexible linear material comprising: a tubular body (2) for winding said flexible linear material; a first flange (1) and a second flange (1) arranged at opposite ends of the tubular body (2), to stop the axial displacement of the flexible linear material along the tubular body (2); wherein each flange (1) has a central opening to receive the respective end of the tubular body; wherein each flange is joined to the tubular body (2) by riveting the respective end of the tubular body (2) on an outer face of the respective flange (1). A machine for producing said reel and the method of obtaining the reel.

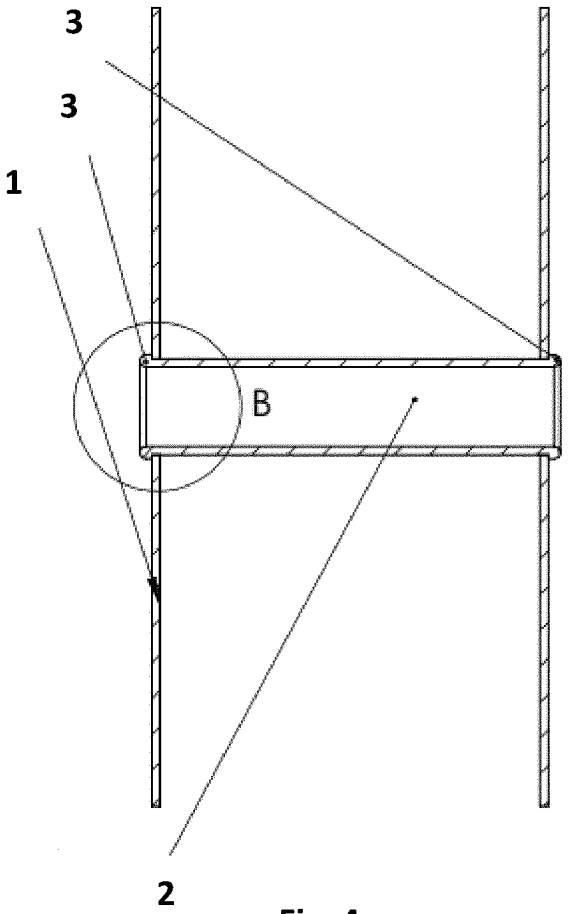

Fig. 4

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Description

TECHNICAL FIELD

[0001] The present description refers to a reel made entirely of cardboard or paper, for winding a flexible linear material such as fibers, yarns, fabrics, cords, tubes, among others. It also concerns a machine for producing the respective cardboard or paper reel and production method.

BACKGROUND

[0002] Reels to support flexible linear materials such as fibers, yarns, fabrics, cords, tubes, among others, have been used for years. These reels have the function of storing and dispensing the respective materials they support.

[0003] The reels comprise a tubular body where the flexible linear material will wind, and two flanges to prevent the flexible linear material from axially shifting off the tubular body. Each of the flanges are arranged on each of the ends of the respective tubular body.

[0004] Some paper/cardboard reels solutions have been identified.

[0005] Document EP2205515B1 describes a collapsible reel or spool. The collapsible reel comprises a core, around which a flexible material is wound, and flanges. The core is formed by a first and second pieces that, before assembly have hub portions and a plurality of spaced tabs that project from the hub portions. To form the core, the tabs of each piece are folded and the tabs of the first blank are secured to the corresponding tabs of the second blank. The flanges are then adhered to the outer surface of the hub portions.

[0006] Document CN107709204 describes a reel made of cardboard. The body of the reel is composed of a plurality of parts that extend in radial directions that, when folded form the body. The parts of the body comprise locking sections that are inserted into flange openings and bent to fix the body to the flanges.

[0007] None of the identified solutions present a solution composed only of paper or cardboard and that is easy to assemble.

[0008] These facts are described in order to illustrate the technical problem solved by the embodiments of the present document.

GENERAL DESCRIPTION

[0009] The present description refers to a reel to receive a flexible linear material which comprises:

a tubular body for winding said flexible linear material;

a first flange and a second flange arranged at opposite ends of the tubular body, to stop the axial displacement of the flexible linear material along the tubular body;

wherein each flange has a central opening to receive the respective end of the tubular body;

wherein each flange is joined to the tubular body by riveting the respective end of the tubular body on an outer face of the respective flange.

[0010] The first flange and the second flange can also be named first disc or second disc, respectively.

[0011] In an embodiment, the tubular body and the first and second flange are of the same material.

[0012] In an embodiment, the tubular body and the first and second flanges are made of paper or cardboard.

[0013] The reel (or spool) is made of a single material, preferably a biodegradable material. Preferably it is obtained in a single step, without being necessary any plastic element or other material required to join the flanges to the tubular body. Surprisingly, the tubular body is deformed to secure the flanges and mount the reel, thus avoiding the use of adhesives or other materials to join the different parts of the reel.

[0014] The reel has good resistance and durability, and can receive any type of winded flexible linear material.

[0015] In an embodiment, the ends of the tubular body are projected outwards in a ring shape.

[0016] In an embodiment, the tubular body has a thickness of 1 to 20 mm, preferably 1.5 to 15 mm, more preferably 2 to 5 mm, more preferably 2.5 to 3 mm.

[0017] In an embodiment, the tubular body is a tube with a circular cross section.

[0018] In an embodiment, the circular cross section has a diameter between 10 and 50 mm, preferably between 20 to 30 mm, more preferably 25 mm.

[0019] In an embodiment, the first and second flanges have a thickness of 1.5 to 20 mm, preferably 2 to 10 mm, more preferably, more preferably from 2.5 to 5 mm, even more preferably 3 mm.

[0020] In an embodiment, the central opening of the flange is circular.

[0021] The present description also concerns a machine for producing the reel which comprises:

a support to retain the tubular body;

a first riveting matrix and a second riveting matrix arranged to rivet respective ends of the tubular body;

wherein each matrix is rotatable and linearly movable to rivet a respective end of the tubular body on an outer face of the respective flange.

[0022] In an embodiment, the matrix comprises a circular recess to rivet the respective end of the tubular body.

[0023] In an embodiment, the circular recess has a triangular shaped cross section ended in a rounded shape.

[0024] In an embodiment, the machine comprises a first actuator to move the first riveting matrix and/or the second riveting matrix.

[0025] In an embodiment, the machine comprises a second actuator to rotate the first riveting matrix and/or the second riveting matrix.

[0026] In an embodiment, the machine comprises a motor to rotate the first riveting matrix and/or the second riveting matrix.

[0027] In an embodiment, the support comprises an upper support and a bottom support configured to receive the tubular body between them.

[0028] In an embodiment, the upper support is movable between an opening position and a closing position.

[0029] In an embodiment, the first riveting matrix and the second riveting matrix are movable between a stationary or resting position and a riveting position.

[0030] In an embodiment, the matrix comprises along an external surface a plurality of protrusions to dissipate the heat resulting from riveting.

[0031] In an embodiment, the first actuator and the second actuator are motors.

[0032] In an embodiment, the matrix comprises a detector for detecting the length of the tubular body.

[0033] In an embodiment, the machine comprises a plurality of elements for the displacement of the matrix, in particular the elements are a plurality of wheels or casters.

[0034] The present description further describes a method of obtaining the reel described, which comprises the following steps:

placing the first flange at one of the ends of the tubular body and the second flange at the opposite end of the tubular body to form a reel;
placing the reel on a bottom support;
moving an upper support from the opening position to the closing position;
moving simultaneously each of the matrices from a stationary or resting position to a riveting position, in order to rivet the ends of the tubular body.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] For an easier understanding, figures are herein attached, which represent preferred embodiments that do not intend to limit the object of the present description.

Figure 1: Schematic representation of an embodiment of the paper reel.

Figure 2: Schematic representation of an embodiment of the paper reel.

Figure 3: Schematic representation of an embodiment of the flanges.

Figure 4: Schematic representation of an embodiment of a flange with the central opening.

Figure 5: Schematic representation of a reel section.

Figure 6: Schematic representation of an embodiment of the matrix of the machine to produce the reel.

Figure 7: Schematic representation of an embodiment of the matrix of the machine to produce the reel.

Figure 8: Schematic representation of an embodiment of the matrix of the machine to produce the reel, in section view.

Figure 9: Schematic representation of an embodiment of the matrix of the machine to produce the reel.

Figure 10: Schematic representation of an embodiment of the matrix of the machine to produce the reel, lateral view.

Figure 11: Schematic representation of an embodiment of the matrix of the machine to produce the reel, front view.

Figure 12: Schematic representation of an embodiment of the machine to produce reels.

Figure 13: Schematic representation of an embodiment of the machine to produce reels.

Figure 14: Schematic representation of an embodiment of the machine to produce reels.

Figure 15: Schematic representation of an embodiment of the machine to produce reels.

Figure 16: Schematic representation of an embodiment of the machine to produce reels.

Figure 17: Schematic representation of an embodiment of the machine to produce reels.

Figure 18: Schematic representation of a section view of the machine to produce reels.

Figure 19: Schematic representation of a section view of the machine to produce reels.

DETAILED DESCRIPTION

[0036] The present description refers to a reel (or spool) for flexible linear material, a machine to produce reels and to its respective production method. The reel has a high resistance and durability, being able to receive any type of winded flexible linear material.

[0037] In an embodiment, the flexible linear material is a yarn, cord, rope, fibers, textiles, among others.

[0038] The present description refers to a reel to receive a flexible linear material which comprises:

a tubular body for winding a flexible linear material;

a first flange and a second flange arranged at opposite ends of the tubular body, to stop the axial displacement of the flexible linear material along the tubular body;
wherein each flange has a circular central opening to receive the end of the tubular body;
wherein each flange is joined to the tubular body by riveting the ends of the tubular body.

[0039] Preferably, the material of the reel is paper or cardboard.

[0040] In an embodiment, when riveting, the ends of the tubular body form a rim on the outer surface of the flanges, particularly in the circular central opening of the flanges, to fix the flanges and thus prevent the axial displacement of the flexible material along the tubular body.

[0041] In an embodiment, the tubular body and the first and second flange are of the same material. In particular, they are selected between paper or cardboard. Preferably the paper shall have a grammage of 5 to 300 g/m^2, preferably 5.5 to 200 g/m^2; preferably from 6.5 to 160 g/m^2, more preferably from 20 to 110 g/m^2, more preferably from 80 to 105 g/m^2.

[0042] In an embodiment, the surface of the tubular body has a thickness of 1 to 20 mm, preferably from 1.5 to 15 mm, more preferably from 2 to 5 mm, more preferably 2.5 to 3 mm.

[0043] In an embodiment, the tubular body is a tube with a circular cross section.

[0044] In an embodiment, the circular cross section has a diameter between 10 and 50 mm, preferably between 20 to 30 mm, more preferably 25 mm.

[0045] In an embodiment, the first and second flanges have a thickness of 1.5 to 20 mm, preferably 2 to 10 mm, more preferably, more preferably from 2.5 to 5 mm, even more preferably 3 mm.

[0046] In an embodiment, the diameter of the flanges is from 20 to 300mm, preferably between 50 to 200 mm, preferably between 70 to 100 mm.

[0047] In an embodiment, the machine for producing the reel comprises:

a support to retain the tubular body;
a first riveting matrix and a second riveting matrix arranged to rivet respective ends of the tubular body;
wherein each matrix is rotatable and linearly movable to rivet a respective end of the tubular body on an outer face of the respective flange.

[0048] In an embodiment, the method of obtaining the reel comprises the following steps:

placing the first flange at one of the ends of the tubular body and the second flange at the opposite end of the tubular body to form a reel;
placing the reel on a bottom support;
moving an upper support from the opening position to the closing position;
moving simultaneously each of the matrices from a stationary or resting position to a riveting position, in order to rivet the ends of the tubular body.

[0049] In an embodiment, **Figure 1** represents the reel of paper or cardboard.

[0050] In an embodiment, **Figure 2** represents the obtention of several flanges **1**.

[0051] In an embodiment, **Figure 3** represents the flange that comprises the central opening. Preferably, the central opening of the flange has a circular cross section, to receive the tube which also has a circular cross section. While riveting, the end of the pipe becomes a rim **3** that secures the flange.

[0052] In an embodiment, **Figure 4** represents a lateral section of the reel, being visible the flange **1,** the tubular body **2** and **3** corresponds to the tab or edge resulting from the riveting. Preferably, edge **3** forms a rim.

[0053] In an embodiment, **Figure 5** represents an enlargement of part **B** of Figure 4, being represented the tubular body **2** and the edge **3** formed by riveting.

[0054] In an embodiment, **Figure 6** represents the riveting matrix, wherein **4** corresponds to the matrix, **5** the protrusion, **6** the drive shaft and **7** the bearing housing to support the moving elements, namely the bearings or wheels or casters.

[0055] In an embodiment, **Figure 7** represents the riveting matrix.

[0056] In an embodiment, **Figure 8** represents a section of matrix **4**, being represented the plurality of protrusions **5**, the axis or drive shaft **6**, a bearing housing **7**, and **8** the moving elements, preferably the bearings, or wheels or casters.

[0057] In an embodiment, the bearing housing **7** is a metal element where the rotating drive shaft **6** is housed.

[0058] In an embodiment, **Figure 9** represents a matrix with the recess **9**, for flatten the end of the tubular body. Preferably the recess is circular.

[0059] More preferably the recess **9** is circular and has a triangular shaped cross section ended in a rounded shape.

[0060] In an embodiment, the recess has a conical shape.

[0061] In an embodiment the matrix comprises a plurality of protrusions that extend from the outer surface of the matrix to the outside in order to dissipate heat resulting from riveting.

[0062] In an embodiment, **Figure 10** represents a matrix **4**.

[0063] In an embodiment, **Figure 11** represents a front view of the matrix.

[0064] In an embodiment, **Figure 12** represents a machine for producing reels or spool. Represented are **1** the flange or disc, **2** the tubular body, **4** the matrix, **6** the drive shaft, **11** and **12** are supports to receive the tubular body, more specifically these supports comprise the **13** upper support, or upper plate and **14** bottom support, or bottom

plate, **15** the first actuator to move the matrix, preferably a motor, more preferably a servo control motor.

[0065] In an embodiment, **Figure 13** represents the machine, being represented **1** the flange or disc, **4** the matrix, **7** the bearing housing comprising moving elements, **11** and **12** are supports to receive the tubular body, **15** the first actuator to move the matrix, preferably a motor, more preferably a servo control motor, **16** the second actuator, more specifically a motor to rotate the matrix, more preferably a three-phase asynchronous motor, **17** the worm gear reducer, **18** the support structure of the motorized assembly, preferably the structure is made of aluminium, **19** sliding element for linear displacement of the matrix and first actuator, **20** the linear guide.

[0066] In an embodiment, the bearing housing **7** comprises within it a plurality of bearings, wheels or casters to rotatably moving the matrix.

[0067] In an embodiment, **Figure 14** represents the machine, with the upper support **13** in the closed position of the tubular body.

[0068] In an embodiment, **Figure 15** represents the machine, more specifically in the riveting step. This figure demonstrates that the circular recess of the matrix receives the ends of the tubular body for carrying out riveting.

[0069] In an embodiment, **Figure 16** represents the machine, more specifically the removal step of the reel from the machine. In this figure the final step is visible, the upper support is in the opening position and the matrix is in the initial position, in the resting or stationary position.

[0070] In an embodiment, **Figure 17** represents the machine.

[0071] In an embodiment, **Figure 18** and **Figure 19** represent section views of the machine.

[0072] In an embodiment, the controller mounted on the matrix is configured so that when detecting the ends of the body, an actuator will shift and rotate the recess of the matrix in order to fix the first and the second flange on the tubular body. Preferably the controller is a sensor.

[0073] In an embodiment, the machine comprises a plurality of elements to move the matrix, in particular the elements are a plurality of wheels or casters.

[0074] In an embodiment, the method of producing the reel comprises the following steps:

placing the first flange at one of the ends of the tubular body and the second flange at the opposite end of the tubular body to form a reel;
placing the reel on a bottom support;
moving an upper support from the opening position to the closing position;
moving simultaneously each of the matrices from a resting or stationary position to a riveting position, in order to rivet the ends of the tubular body.

[0075] The term "comprises" or "comprising" whenever used in this document is intended to indicate the presence of stated features, elements, integers, steps and components, but not to preclude the presence or addition of one or more other features, elements, integers, steps and components, or groups thereof.

[0076] The present invention should not be seen in any way restricted to the embodiments described in this document and a person with average skills in the art may foresee many possibilities of modification and substitution of technical characteristics by equivalent ones, depending on the requirements of each situation, as defined in the appended claims.

[0077] The following claims define additional embodiments of the present description.

Claims

1. Reel to receive a flexible linear material comprising:

   a tubular body (2) for winding said flexible linear material;
   a first flange and a second flange arranged at opposite ends of the tubular body (2), to stop the axial displacement of the flexible linear material along the tubular body;
   wherein each flange (1) has a central opening to receive the respective end of the tubular body;
   wherein each flange (1) is joined to the tubular body (2) by riveting the respective end of the tubular body (2) on an outer face of the respective flange.

2. Reel according to the previous claim wherein the material of the tubular body (2) and the first and second flanges is paper or cardboard.

3. Reel according to any one of the previous claims wherein the central opening of each flange 1 is circular.

4. Reel according to any one of the previous claims wherein the ends of the tubular body (2) are projected outwards in a ring shape.

5. Reel according to any one of the previous claims wherein the tubular body (2) has a thickness of 1 to 20 mm, preferably from 1.5 to 15 mm, more preferably from 2 to 5 mm, more preferably 2.5 to 3 mm.

6. Reel according to any one of the previous claims wherein the tubular body (2) is a tube with a circular cross section.

7. Reel according to any one of the previous claims wherein the first and second flange have a thickness of 1.5 to 20 mm, preferably 2 to 10 mm, more preferably 2.5 to 5 mm, even more preferably 3 mm.

8. Machine for producing the reel according to any one of the previous claims which comprises:

a support to retain the tubular body;
a first riveting matrix (4) and a second riveting matrix (4) arranged to rivet respective ends of the tubular body (2);
wherein each matrix (4) is rotatable and linearly movable to rivet a respective end of the tubular body (2) on an outer face of the respective flange.

9. Machine according to the previous claim wherein the matrix comprises a circular recess (9) for riveting the respective end of the tubular body (2), preferably the circular recess (9) has a triangular shaped cross section ended in a rounded shape.

10. Machine according to any one of claims 8 to 9 comprising a motor to rotate the first riveting matrix (4) and/or the second riveting matrix (4).

11. Machine according to any one of claims 8 to 10 comprising a first actuator (15) to move the first riveting matrix and/or the second riveting matrix and/or a second actuator (16) to rotate the first riveting matrix and/or the second riveting matrix.

12. Machine according to any one of claims 8 to 11 wherein the support comprises an upper support (13) and a bottom support (14) configured to receive the tubular body between them, preferably the upper support is movable between an opening position and a closing position.

13. Machine according to any one of claims 8 to 12 wherein the first riveting matrix and the second riveting matrix are movable between a stationary position and a riveting position.

14. Machine according to any one of claims 8 to 13 wherein each matrix comprises along an external surface a plurality of protrusions to dissipate the heat resulting from riveting.

15. Method of obtaining the reel according to claims 1 to 8, that comprises the following steps:

placing the first flange at one of the ends of the tubular body (2) and the second flange at the opposite end of the tubular body (2) to form a reel;
placing the reel on a bottom support (14);
moving an upper support (13) from the opening position to the closing position;
moving simultaneously each of the matrices (4) from a stationary position to a riveting position, in order to rivet the ends of the tubular body.

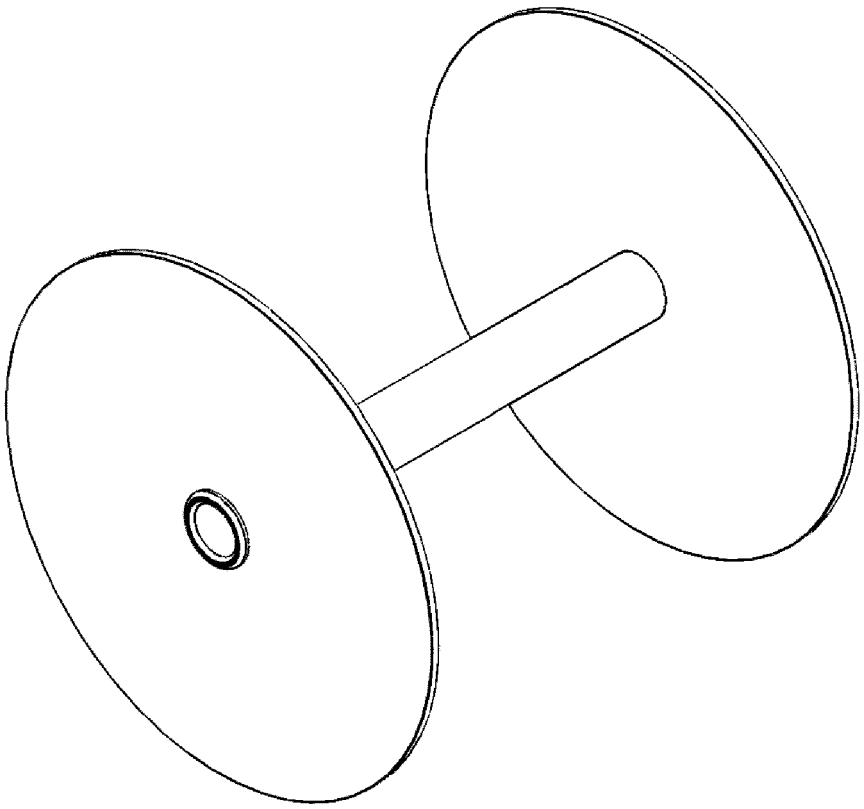

Fig. 1

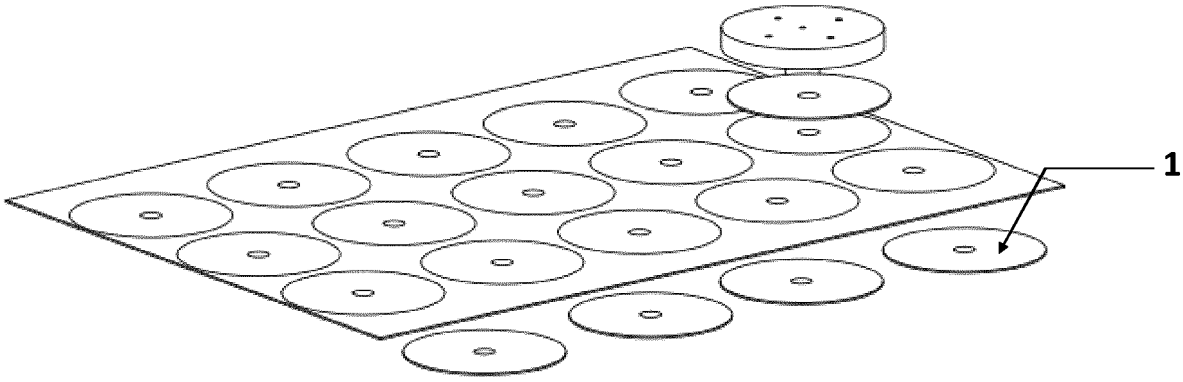

Fig. 2

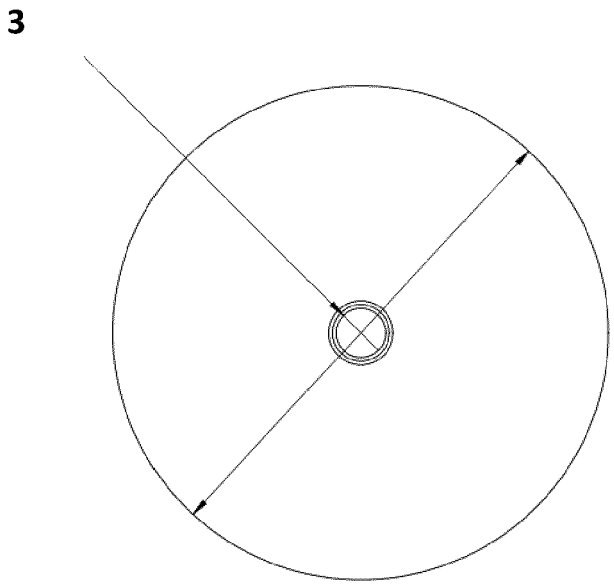

Fig. 3

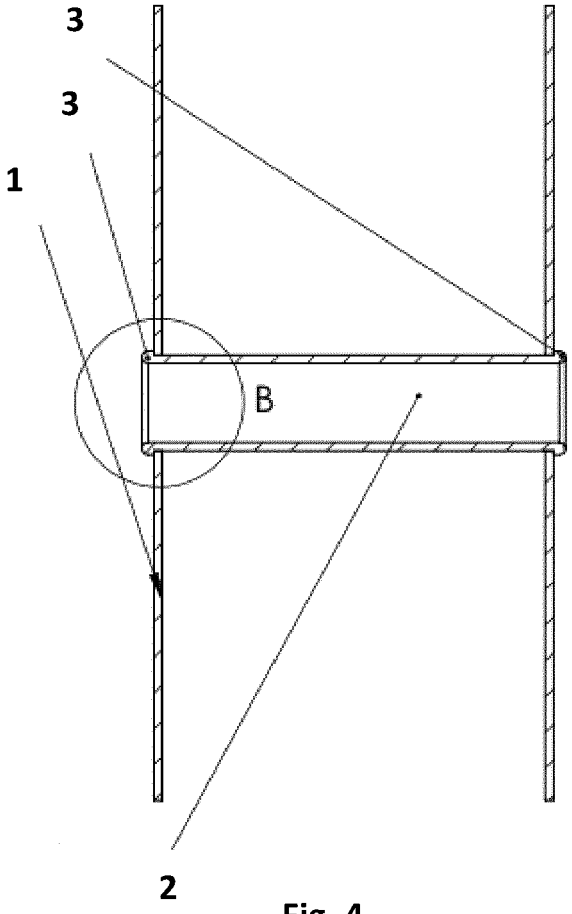

Fig. 4

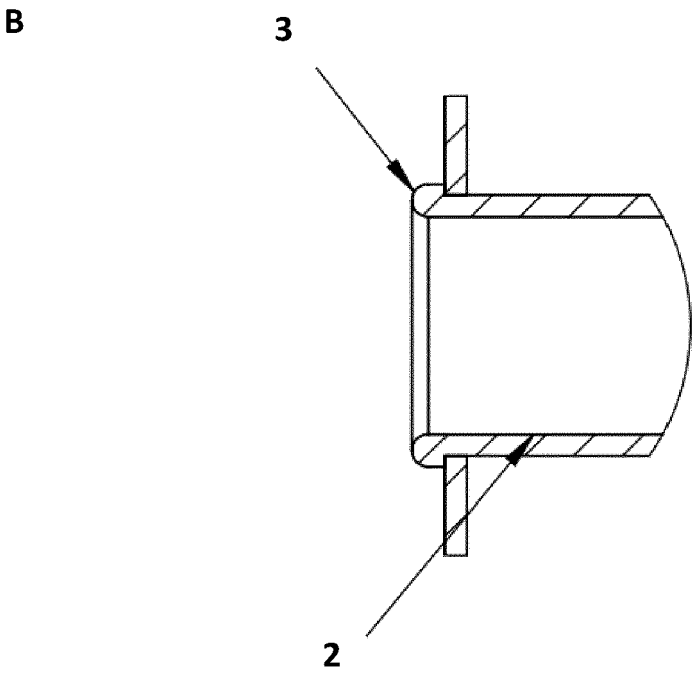

Fig. 5

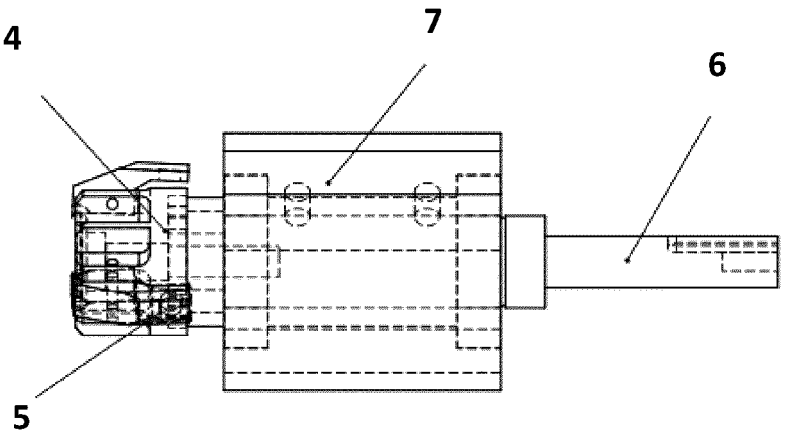

Fig. 6

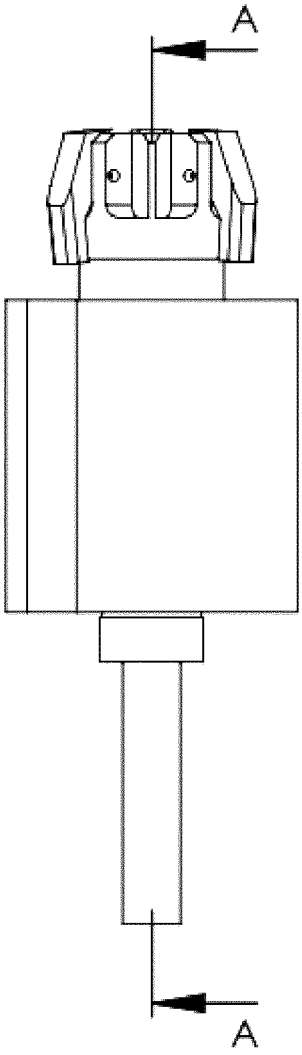

Fig. 7

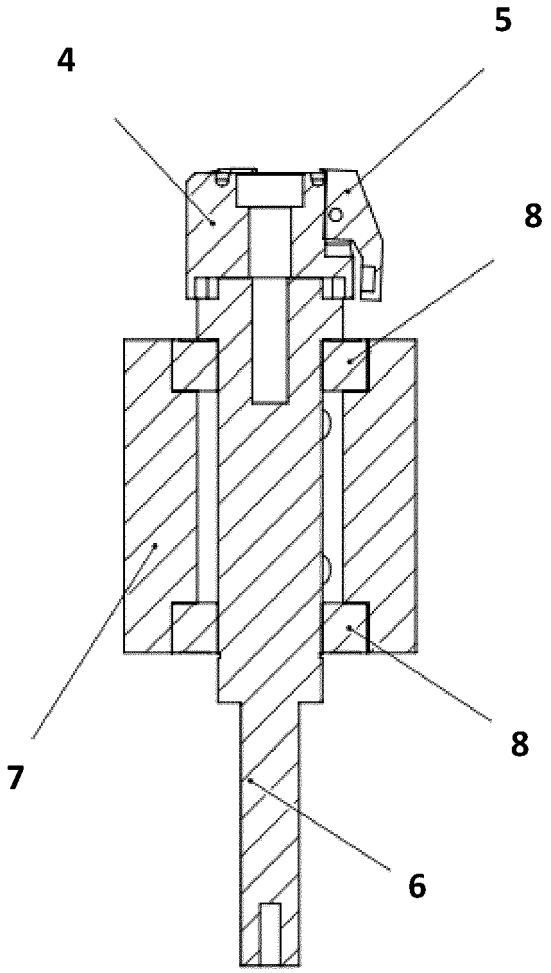

Fig. 8

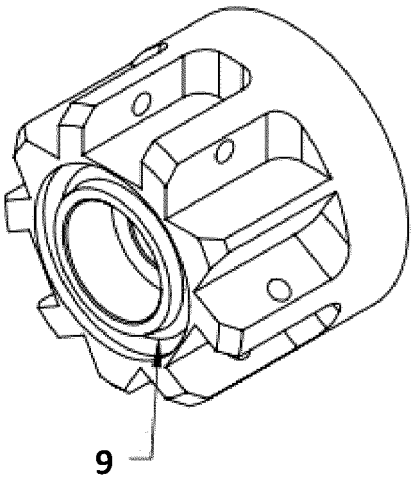

Fig. 9

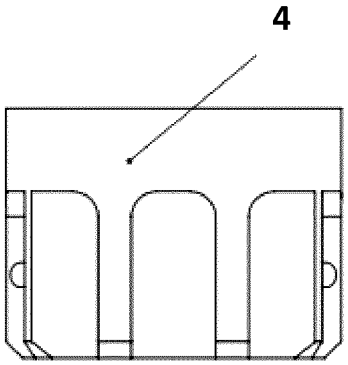

Fig. 10

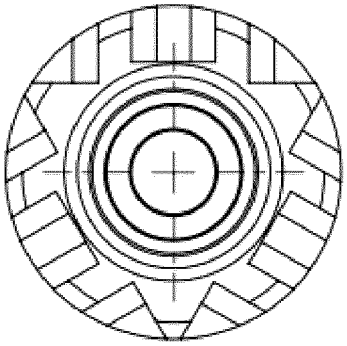

Fig. 11

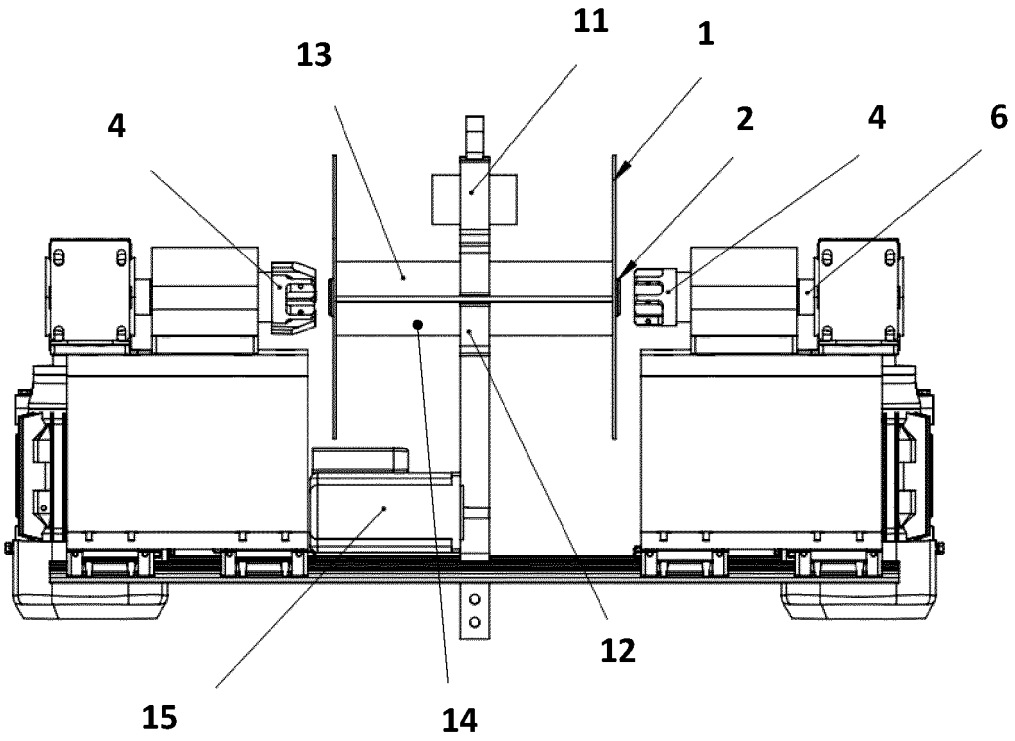

Fig. 12

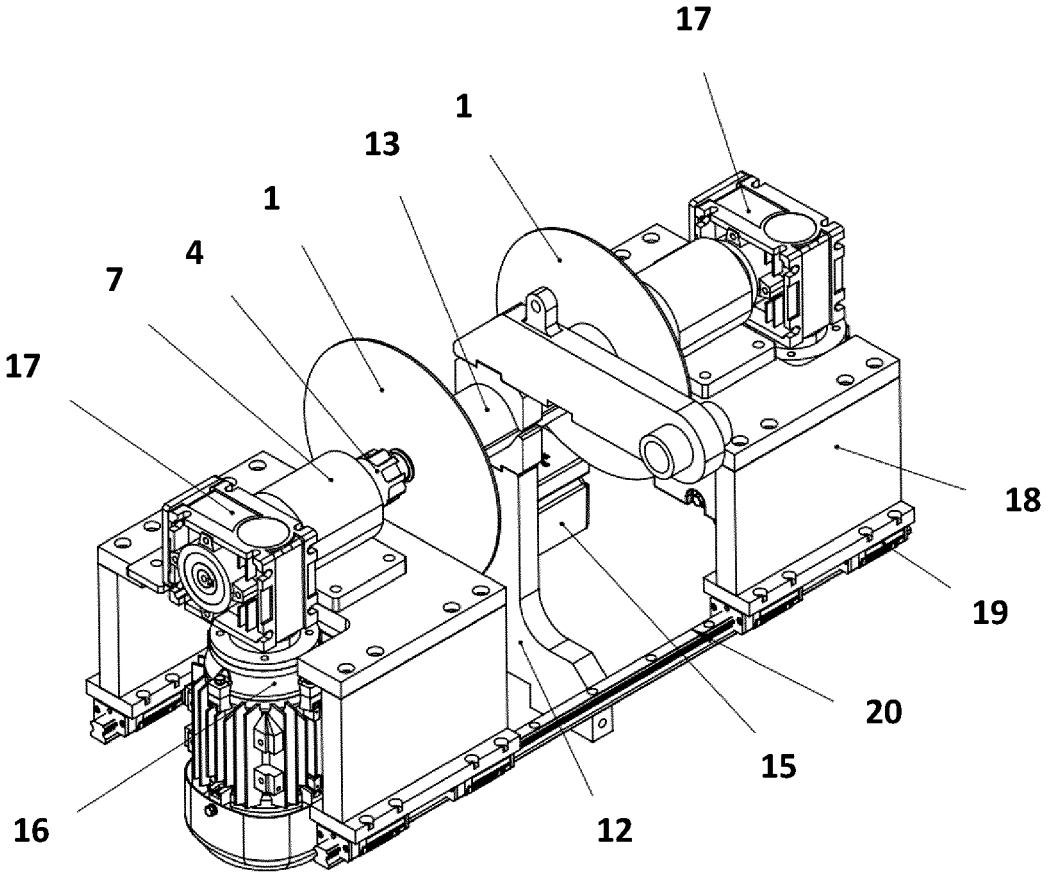

Fig. 13

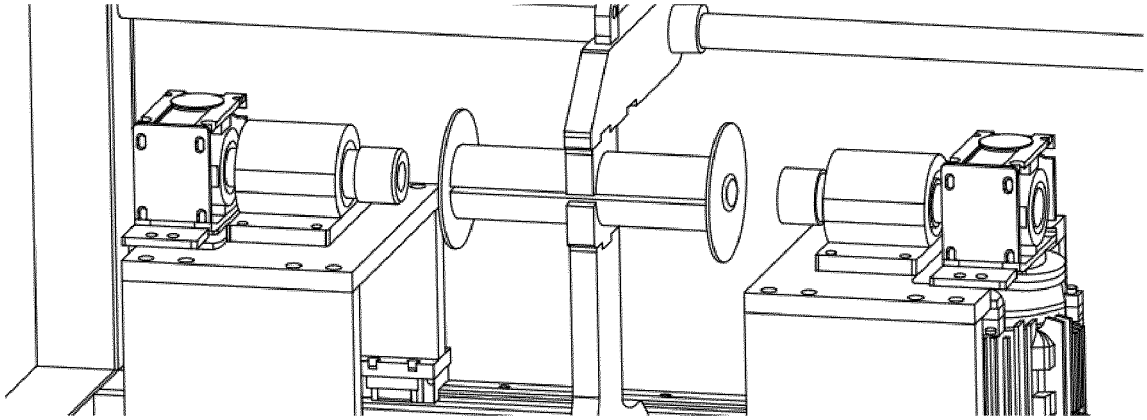

Fig. 14

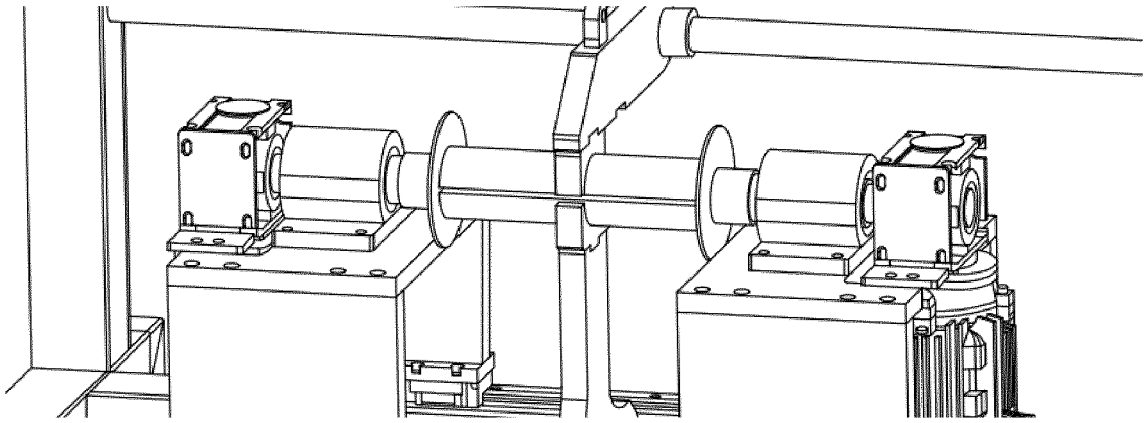

Fig. 15

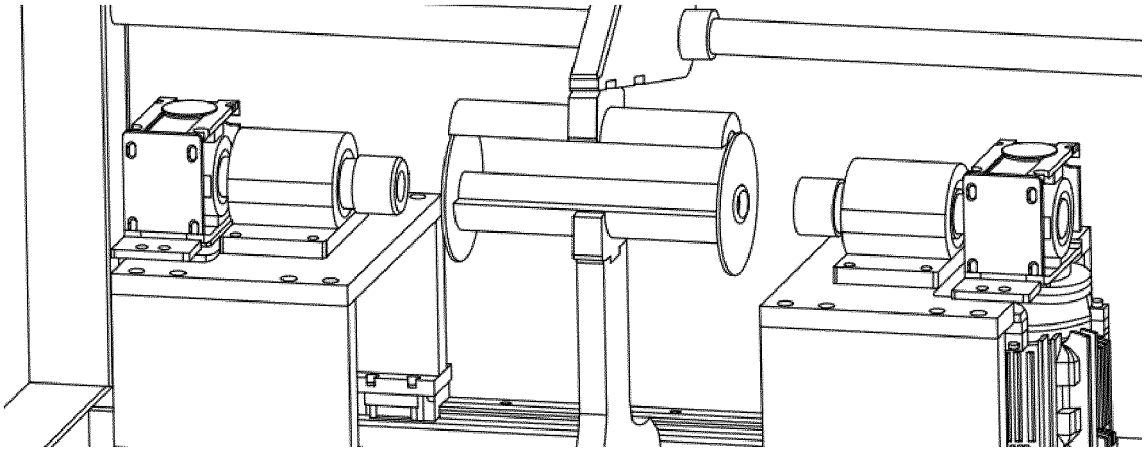

Fig. 16

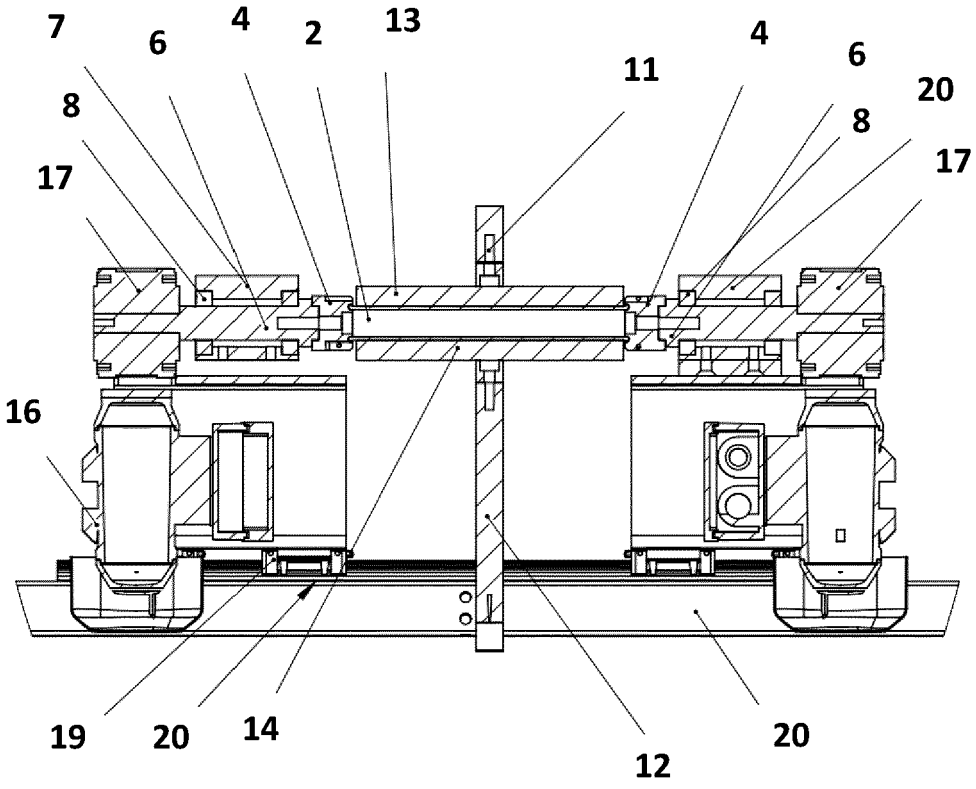

Fig. 17

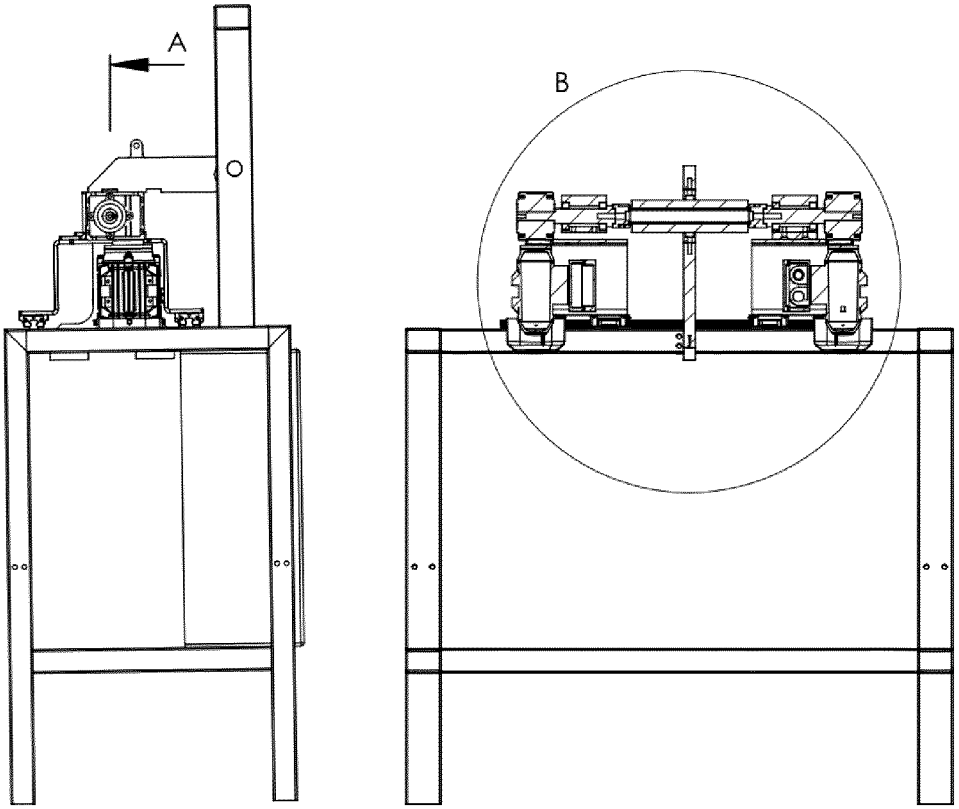

Fig. 18

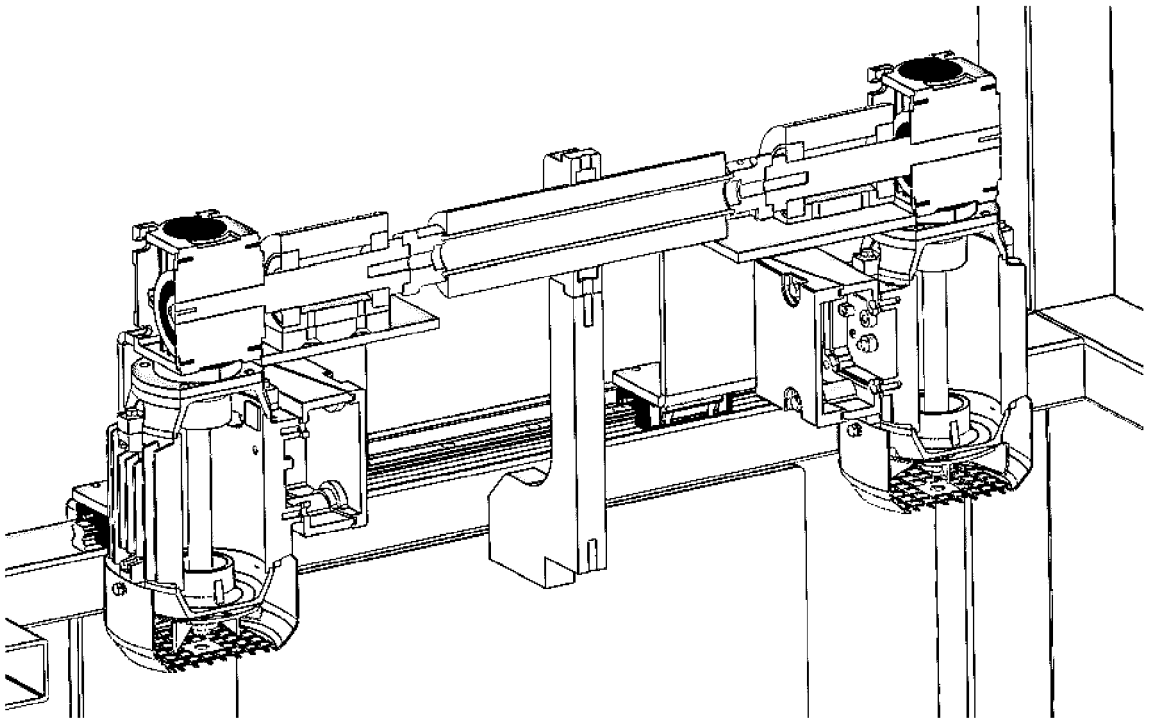

Fig. 19

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EUROPEAN SEARCH REPORT

Application Number
EP 24 22 3052

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Place of search	Date of completion of the search	Examiner
The Hague	23 April 2025	Pussemier, Bart

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