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(54) **Log saw machine**

(57) A log saw machine includes a first arm (21), a second arm (22) parallel to the first arm, a shaft (30) having a first end (31) and an opposite second end (32), and a circular knife (40) fixed on the shaft (30). The first end (31) of the shaft (30) is rotatably installed on the first

arm (21). The second end (32) of the shaft (30) is rotatably installed on the second arm (22). The circular knife (40) is positioned between the first and second arms (21, 22), and the plane of the circular knife (40) is parallel to the extending direction of the first and second arms (21, 22).

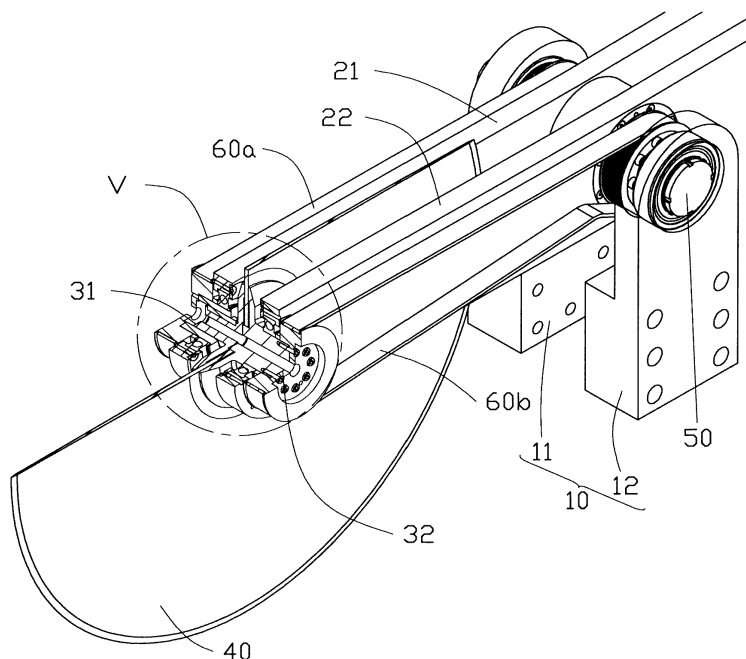


FIG. 4

Description

Technical Field

[0001] The present disclosure generally relates to a log saw machine for cutting web material wound to form logs or rolls, e.g. on tubular winding cores, and particularly to a log saw machine for cutting JRT (Jumbo Roll Tissue). The cutting is performed by a rotating circular knife.

Description of the Related Art

[0002] In typical applications, a log such as a wound tissue paper log is cut into rolls of smaller size by a rotating knife of a log saw machine. The knife rotates around a shaft, and moves toward the log normal to the axis of the log to cut the log.

[0003] In conventional systems, the rotational movement of the knife is generally driven by one belt and the knife is mounted on the shaft in a cantilever position. This cantilever position, especially when cutting high density logs, causes a deflection of the shaft which can affect the angle of the knife as it cuts. In other words, the forces on the knife can cause the rotating knife to deflect so it is not perfectly aligned at a right angle to the axis of the log but has some angle of deviation from the right-angle orientation relative to the axis of the log that is needed for best operation.

[0004] Therefore, what is needed is a log saw machine which can mitigate the described limitations.

Summary of the Invention

[0005] According to one aspect, a log saw machine is provided comprising

a first arm;

a second arm parallel to the first arm;

a shaft comprising a first end and an opposite second end, the first end rotatably installed on the first arm, and the second end rotatably installed on the second arm; and a circular knife fixed on the shaft, the circular knife being positioned between the first and second arms, and the knife defining a plane parallel to the first and second arms.

[0006] According to some embodiments, the log saw machine can further comprise a support and at least one driving spindle, the at least one driving spindle rotatably installed on the support, and at least one transmission component or transmission arrangement being disposed on the driving spindle and the shaft to transfer a rotational drive from the driving spindle to the shaft. In some preferred embodiments, the transmission component can be comprised of two transmission components, the two transmission components respectively being cooperatively associated with the first and second ends of the shaft. The two transmission components can be symmetrical with respect to the plane of the circular knife. In

some embodiments, the log saw machine can comprise two driving spindles instead of just one driving spindle. Each of the transmission components can be cooperatively associated with a corresponding one of said two driving spindles.

[0007] The driving spindle or both driving spindles can be rotatably installed on the first arm and the second arm.

[0008] In some embodiments the support can comprise a first bracket and a second bracket standing preferably generally parallel to each other. The driving spindle can be installed on the first and second brackets.

[0009] When the support comprises first and second brackets, the first and second arms can be arranged so as to extend between the first and second brackets.

[0010] In some preferred embodiments, to facilitate mounting and dismounting of the circular knife, the first and second ends of the shaft can be detachably engaged with each other, and the circular knife is secured and sandwiched between the first and second ends of the shaft. For instance, the first end can comprise a first mounting section and a first holding section extending from the first mounting section. The first mounting section can be engaged with the first arm. In some embodiments, a recess can be defined in the first holding section. Moreover, in some embodiments, the second end of the shaft can be comprised of a second mounting section and a second holding section extending from the second mounting section. The second mounting section can be engaged with the second arm. In preferred embodiments, a protrusion extending from the second holding section can be provided and configured to be received in the recess, if such recess is provided in the first holding section. The circular knife can be mounted on the protrusion and sandwiched between the first and second holding sections.

[0011] According to a further aspect, a log saw machine is provided, comprising:

a support having a first bracket and a second bracket standing parallel to each other;

a first arm and a second arm extending between the first and second brackets and each having a free end apart from the first and second brackets;

a driving spindle rotatably installed on the first and second brackets;

a shaft comprising a first end and an opposite second end, the first end rotatably installed on the free end of the first arm, and the second end rotatably installed on the free end of the second arm;

a circular knife fixed on the shaft, the circular knife being positioned between the first and second arms and defining a plane, and the plane of the circular knife being parallel to the first and second arms; and

two transmission components cooperatively associated with the shaft and the driving spindle for transferring a rotational drive from the driving spindle to the shaft, the transmission components being respectively installed on the first and second ends of the shaft, wherein the two transmission components can be generally symmetrical with respect to the plane of the circular knife.

[0012] In some embodiments of the log saw machine disclosed herein the driving spindle is rotatably installed on the first and second arms.

[0013] The transmission arrangement, and more specifically each transmission component can be comprised of a flexible endless member. The endless member can be selected from the group consisting of an endless belt, an endless rope, an endless chain or combination thereof. In some embodiments the belt can be a toothed belt.

[0014] According to a further aspect, a log saw machine is disclosed herein, which comprises:

a support;

a first arm and a second arm fixed on the support and the first arm having an extending direction parallel to that of the second arm;

a shaft rotatably installed on the first and second arms and being perpendicular to the extending directions of the first and second arms;

a circular knife fixed on the shaft and positioned between the first and second arms, and the plane of the circular knife being parallel to the extending directions of the first and second arms; and

a driving module engaged with the support and the shaft for driving the shaft to rotate.

Brief Description of the Drawings

[0015]

FIG. 1 is a front-side view of a part of a log saw machine, according to an exemplary embodiment of the present disclosure.

FIG. 2 is a left-side view of the log saw machine of FIG. 1.

FIG. 3 is a cross-sectional view of FIG. 1, taken along line III-III thereof.

FIG. 4 is an isometric view of the log saw machine of FIG. 1, wherein removed portion has been removed to clearly show an inner structure thereof.

FIG. 5 is an enlarged view of a circled portion V of

FIG. 4.

Detailed Description of Embodiments

[0016] Referring to FIG. 1, FIG. 2 and FIG. 3, a log saw machine in accordance with an exemplary embodiment of the present disclosure comprises a support 10, a fixing arm 20 connecting the support 10, a shaft 30 rotatably installed on the fixing arm 20, and a circular knife 40 secured on the shaft 30. The circular knife 40 and the shaft 30 are capable of rotating rapidly to perform a cutting of a log 101 such as a wound paper, tissue paper, film, etc.

[0017] Acting as a carrier, the support 10 sustains related structures such as the fixing arm 20 and the circular knife 40. The support 10 may be engaged with a transport mechanism (not shown) for moving the support 10 to change the position of the fixing arm 20 and the circular knife 40, to thereby facilitate the cutting of the log.

[0018] The fixing arm 20 comprises a first arm 21 and a second arm 22 about parallel to the first arm 21. Each of the first and second arms 21, 22 has an elongated shape. The extending direction of the first and second arms 21, 22 is about and generally perpendicular to the axial direction of the log. In other words, the extending direction of the first and second arms 21, 22 is about parallel to the plane of the circular knife 40.

[0019] The shaft 30 comprises a first end 31 and a second end 32 opposite to the first end 31. The axis of the shaft 30 is substantially perpendicular to the extending direction of the first and second arms 21, 22 and typically parallel to the axis of the log 101 as it is being cut. The first end 31 is rotatably mounted on a free end of the first arm 21, and the second end 32 is rotatably mounted on a free end of the second arm 22. Bearings (not shown) such as sliding bearings or ball bearings are familiar elements used to sustain such a connection between the shaft 30 and the fixing arm 20.

[0020] The circular knife 40 is positioned between the first arm 21 and the second arm 22. The circular knife 40 comprises a securing portion 41 at a center thereof and an edge portion 42 extending radially from a periphery of the securing portion 41. The securing portion 41 is engaged with the shaft 30 to secure the circular knife 40 onto the shaft 30. The rotating of the circular knife 40 is synchronous with the rotating of the shaft 30. When the circular knife 40 moves toward the log 101, the edge portion 42 of the rotating circular knife 40 penetrates into the log 101 to perform the cutting operation.

[0021] During the operation of the log saw machine provided by the present disclosure, with the first and second ends 31, 32 of the shaft 30 are both supported by the fixing arm 20, the deflection of the shaft 30 and the circular knife 40 during the cut can be substantially reduced, even when cutting high density logs. Thus, the circular knife 40 can remain orthogonal to the shaft 30 and the axis of the log, and the cut surface of the log is aligned at a right angle to the axis of the log. Likewise,

the deflection of first and second arms 21, 22 can also be substantially reduced.

[0022] The rotation of the shaft 30 is driven by a driving module 70. In the present embodiment, the driving module 70 comprises a driving spindle 50 and a transmission arrangement 60. The driving spindle 50 is mounted on the support 10. The driving spindle 50 is parallel to the shaft 30. The driving spindle 50 can be an output shaft of a power supply such as an electric motor (not shown). Alternatively, the driving spindle 50 can be connected to the output shaft of the power supply, and used to transfer a rotational drive from the power supply to the shaft 30. The driving spindle 50 is connected to the shaft 30 by the transmission arrangement 60. The transmission arrangement 60 transfers the rotational drive from the driving spindle 50 to the shaft 30.

[0023] The transmission arrangement 60 can be transmission belt, transmission chain, rope, etc. In the present embodiment, the transmission arrangement 60 is transmission belt, and pulleys 61, 62 are arranged on the shaft 30 and the driving spindle 50 for accommodating the transmission belt. It is understood that other types of arrangements such as sprockets (not shown) can be installed on the shaft 30 and the driving spindle 50 according to different types of the transmission arrangement 60.

[0024] In one embodiment, both the first and second ends 31, 32 of the shaft 30 are respectively equipped with a transmission component 60a, 60b, to avoid the torsional deflection of the shaft 30 during the rotating operation. In this manner, torque being applied simultaneously on both sides of the shaft 30 about the circular knife 40 reduces the tendency for the applied torque to cause deflection of the circular knife 40. Specifically, the first end 31 of the shaft 30 extends to penetrate into the first arm 21 or otherwise connect securely with the first arm 21, and a corresponding transmission component 60a is associated with the first arm 21 and adapted to transmit torque to the first end 31 of the shaft 30. The second end 32 of the shaft 30 oppositely extends to penetrate into the second arm 22 or otherwise connect securely with the second arm 22, and another corresponding transmission component 60b is associated with the second arm 22 and adapted to transmit torque to the second end 31 of the shaft 30. In this embodiment, the two transmission components 60a, 60b as shown are symmetrical with the surface of the circular knife 40, though they need not be strictly symmetrical.

[0025] In an alternative embodiment (not shown), more than one driving spindle 50 may be provided, and the two transmission components 60a, 60b can be independently connected with the respective driving spindles 50. The driving spindles 50 can be disposed at different positions of the support 10. Thus, there is an opportunity to independently control the two transmission components 60a, 60b.

[0026] The support 10 in the depicted embodiment comprises a first bracket 11 and a second bracket 12 standing substantially parallel to each other. The driving

spindle 50 is rotatably installed on the first and second brackets 11, 12.

[0027] Specifically, the driving spindle 50 is rotatably installed on the first and second arms 21, 22 of the fixing arm 20. In other words, as depicted, the driving spindle 50 is rotatably installed on the fixing arm 20 and the support 10, though other orientations and configurations are possible within the scope of the present invention. The first and second arms 21, 22 of the fixing arm 20 extend between the first and second brackets 11, 12 of the support 10, and the free ends of the first and second arms 21, 22 are apart from the first and second brackets 11, 12.

[0028] Further, in some embodiments the shaft 30 may be designed to be separable into two parts to allow an easy replacement of the circular knife 40 when worn. As shown in more detail in FIG. 5, the first and second ends 31, 32 are detachably engaged with each other, and the circular knife 40 is fixed between the first and second ends 31, 32 of the shaft 30. Upon detachment of the first and second ends 31, 32 relative to each other, an operator can relatively easily perform the replacement of the circular knife 40 fixed therebetween, which can eliminate the need for time-consuming disassembly of the fixing arm 20 and the support 10.

[0029] FIG. 4 and FIG. 5 show the detailed structures of the shaft 30 in accordance with an exemplary embodiment. The first end 31 of the shaft 30 comprises a first mounting section 311 and a first holding section 312 extending from the first mounting section 311. The first mounting section 311 inserts into the first arm 21, and is rotatably installed in the first arm 21 via bearings. The first holding section 312 has a disk shape. The first holding section 312 is positioned between the first and second arms 21, 22 for holding and securing the circular knife 40. A recess 313 is defined in the first holding section 312. The recess 313 faces the second arm 22.

[0030] The second end 32 of the shaft 30 comprises a second mounting section 321 and a second holding section 322 extending from the second mounting section 321. The second mounting section 321 inserts into the second arm 22, and is rotatably installed in the second arm 22 via bearings. The second holding section 322 has a disk shape. The second holding section 322 is positioned between the first and second arms 21, 22 and cooperates with the first holding section 312 for holding and securing the circular knife 40. A protrusion 323 extends outwardly from the second holding section 322 and faces the recess 313 of the first holding section 312. When the circular knife 40 is assembled, the protrusion 323 is received in the recess 313, and the circular knife 40 is mounted on the protrusion 323 and intimately sandwiched between the first and second holding sections 312, 322.

[0031] The engagement of the first and second ends 31, 32 of the shaft 30 can be accomplished by inserting a connector such as screw (not shown) through a penetrating hole defined in the first and second ends 31, 32, which extend along the axial direction of the shaft 30.

Alternatively, or at the same time, a plurality of securing holes can be defined in the first and second holding sections 312, 322 for connectors extending therethrough to combine the first and second holding sections 312, 322 together. Of course, the circular knife 40 may also be provided with corresponding securing holes thereon for the connectors extending therethrough.

[0032] It is to be further understood that even though numerous characteristics and advantages have been set forth in the foregoing description of embodiments, together with details of the structures and functions of the embodiments, the disclosure is illustrative only; and that changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the disclosure to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

Claims

1. A log saw machine comprising:

a first arm (21);
 a second arm (22) generally parallel to the first arm (21);
 a shaft (30) comprising a first end (31) and an opposite second end (32), the first end (31) rotatably installed on the first arm (21), and the second end (32) rotatably installed on the second arm (22); and
 a circular knife (40) fixed on the shaft (30), the circular knife (40) being positioned between the first and second arms (21, 22), and the circular knife (40) defining a plane generally parallel to the first and second arms (21, 22).

2. The log saw machine of claim 1 further comprising a support (10) and at least one driving spindle (50), the at least one driving spindle rotatably installed on the support, and at least one transmission arrangement (60) being disposed on the driving spindle (50) and the shaft (30) to transfer a rotational drive from the driving spindle to the shaft.

3. The log saw machine of claim 2, wherein the at least one transmission arrangement (60) comprises two transmission components (60a, 60b), the two transmission components (60a, 60b) respectively being cooperatively associated with the first and second ends (31, 32) of the shaft (30).

4. The log saw machine of claim 3, wherein the transmission components (60a, 60b) are generally symmetrical with respect to the plane of the circular knife (40).

5. The log saw machine of claim 3 or 4, further com-

prising an additional driving spindle, and each of the transmission components (60a, 60b) is cooperatively associated with said at least one driving spindle and said additional driving spindle, respectively.

6. The log saw machine of any one of claims 2 to 5, wherein the at least one driving spindle is rotatably installed on the first arm (21) and the second arm (22).

7. The log saw machine of claim 6, wherein the support (10) comprises a first bracket (11) and a second bracket (12) standing generally parallel to each other, the at least one driving spindle (50) is installed on the first and second brackets (11, 12), and the first and second arms (21, 22) extend between the first and second brackets (11, 12).

8. The log saw machine of any one of claims 1 to 7, wherein the first and second ends (31, 32) of the shaft (30) are detachably engaged with each other, and the circular knife (40) is secured and sandwiched between the first and second ends (31, 32) of the shaft (30).

9. The log saw machine of claim 8, wherein the first end (31) comprises a first mounting section (311) and a first holding section (312) extending from the first mounting section (311), the first mounting section (311) being engaged with the first arm (21), and a recess (313) being defined in the first holding section (312), and wherein the second end (32) comprises a second mounting section (321) and a second holding section (322) extending from the second mounting section (321), the second mounting section (321) being engaged with the second arm (22), a protrusion (323) extending from the second holding section (322) and being received in the recess (313), and the circular knife (40) being mounted on the protrusion (323) and sandwiched between the first and second holding sections (321, 322).

10. A log saw machine comprising:

a support (10) having a first bracket (11) and a second bracket (12) standing generally parallel to each other;
 a first arm (21) and a second arm (22) extending between the first and second brackets (11, 12) and each having a free end apart from the first and second brackets (11, 12);
 a driving spindle (50) rotatably installed on the first and second brackets (11, 12);
 a shaft (30) comprising a first end (31) and an opposite second end (32), the first end rotatably installed on the free end of the first arm (11), and the second end (32) rotatably installed on the free end of the second arm (32);

a circular knife (40) fixed on the shaft (30), the circular knife (40) being positioned between the first and second arms (21, 22) and defining a plane, and the plane of the circular knife (40) being parallel to the first and second arms (21, 22); and

two transmission components (60a, 60b) cooperatively associated with the shaft (30) and the driving spindle (50) for transferring a rotational drive from the driving spindle (50) to the shaft (30), the transmission components (60a, 60b) being respectively installed on the first and second ends (31, 32) of the shaft (30).

11. The log saw machine of claim 10, wherein the driving spindle (50) is rotatably installed on the first and second arms (21, 22). 15
12. The log saw machine of claim 10 or 11, wherein the transmission components (60a, 60b) are symmetrical with respect to the plane of the circular knife (40). 20
13. The log saw machine of claim 10 or 11 or 12, wherein the transmission components (60a, 60b) are selected from a belt, rope, and chain. 25
14. The log saw machine of any one of claims 10 to 13, wherein the first and second ends (31, 32) of the shaft (30) are detachably engaged with each other, and the circular knife (40) is secured and sandwiched between the first and second ends (31, 32) of the shaft (30). 30
15. The log saw machine of claim 14, wherein the first end (31) comprises a first mounting section (311) and a first holding section (312) extending from the first mounting section (311), the first mounting section (311) inserting in the first arm (21), and a recess (313) being defined in the first holding section (312), and wherein the second end (32) comprises a second mounting section (321) and a second holding section (322) extending from the second mounting section (321), the second mounting section (321) inserting in the second arm (22), a protrusion (323) extending from the second holding section (322) and being received in the recess (313), and the circular knife (40) being mounted on the protrusion (323) and sandwiched between the first and second holding sections (312, 322). 35 40 45 50
16. The log saw machine of any one of claims 10 to 15, wherein the first end (31) of the shaft (30) extends to penetrate through the first arm (21), and a corresponding transmission component (60a) is mounted on the part of first end (31) which extends beyond the first arm (21), and wherein the second end (32) of the shaft (30) oppositely extends to penetrate through the second arm (22), and another corre-

sponding transmission component (60b) is mounted on the part of the second end (32) which extends beyond the second arm (22).

5 17. A log saw machine comprising:

a support (10);
a first arm (21) and a second arm (22) fixed on the support (10) and the first arm (21) having an extending direction generally parallel to that of the second arm (22);
a shaft (30) rotatably installed on the first and second arms (21, 22) and being generally perpendicular to the extending directions of the first and second arms (21, 22);
a circular knife (40) fixed on the shaft (30) and positioned between the first and second arms (21, 22), the circular knife (40) forming a substantially parallel to the extending directions of the first and second arms (21, 22); and
a driving module (70) engaged with the support (10) and the shaft (30) for driving the shaft (30) to rotate.

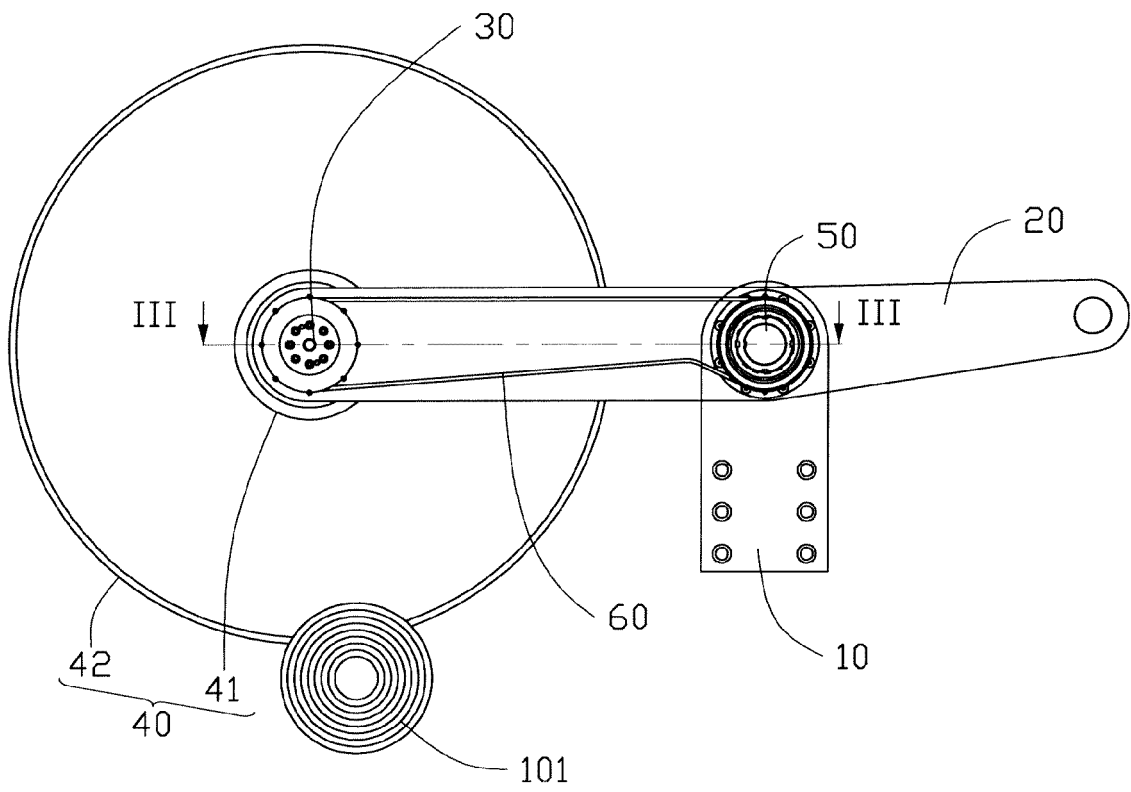


FIG. 1

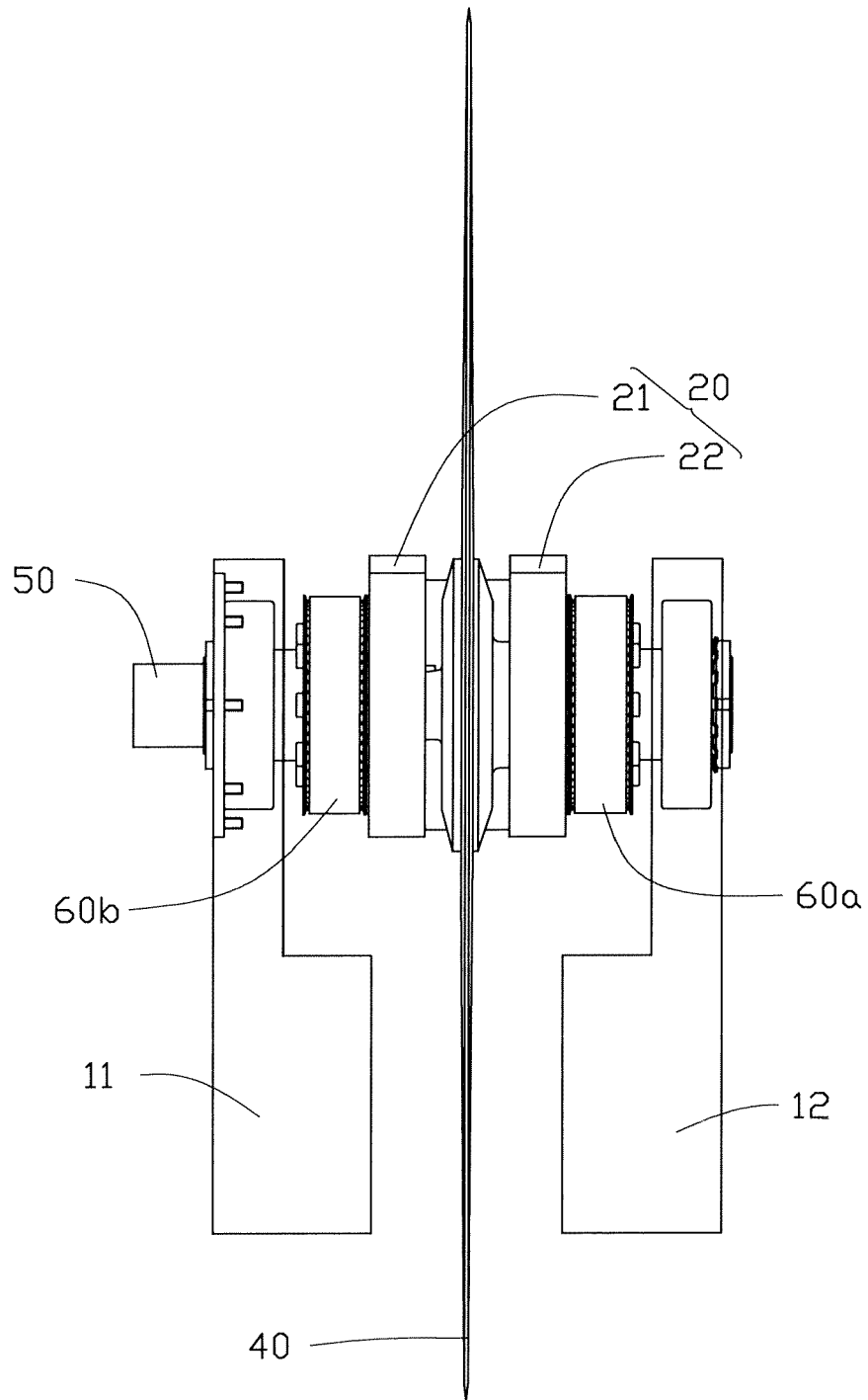


FIG. 2

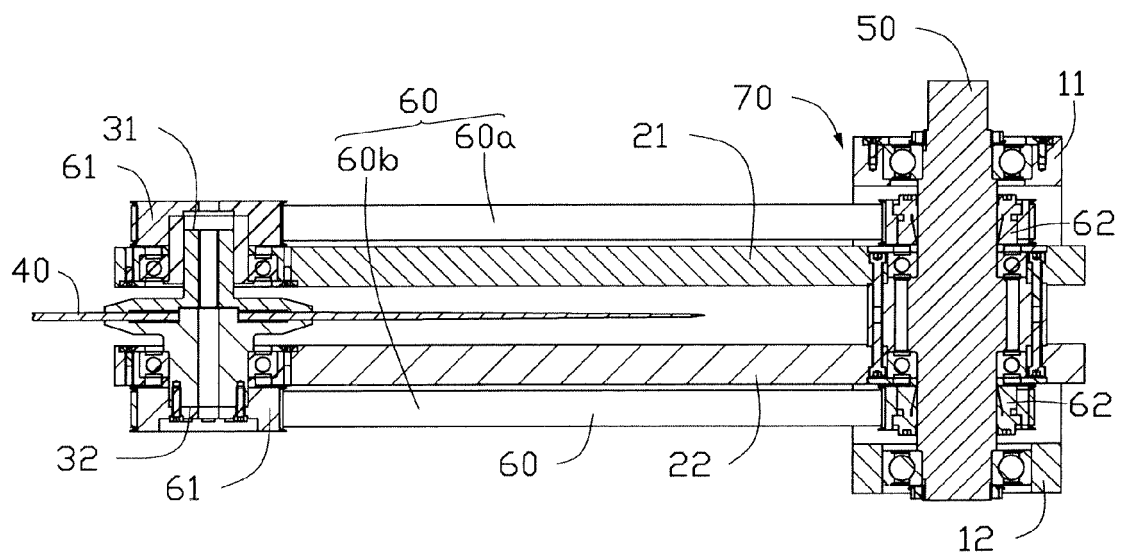


FIG. 3

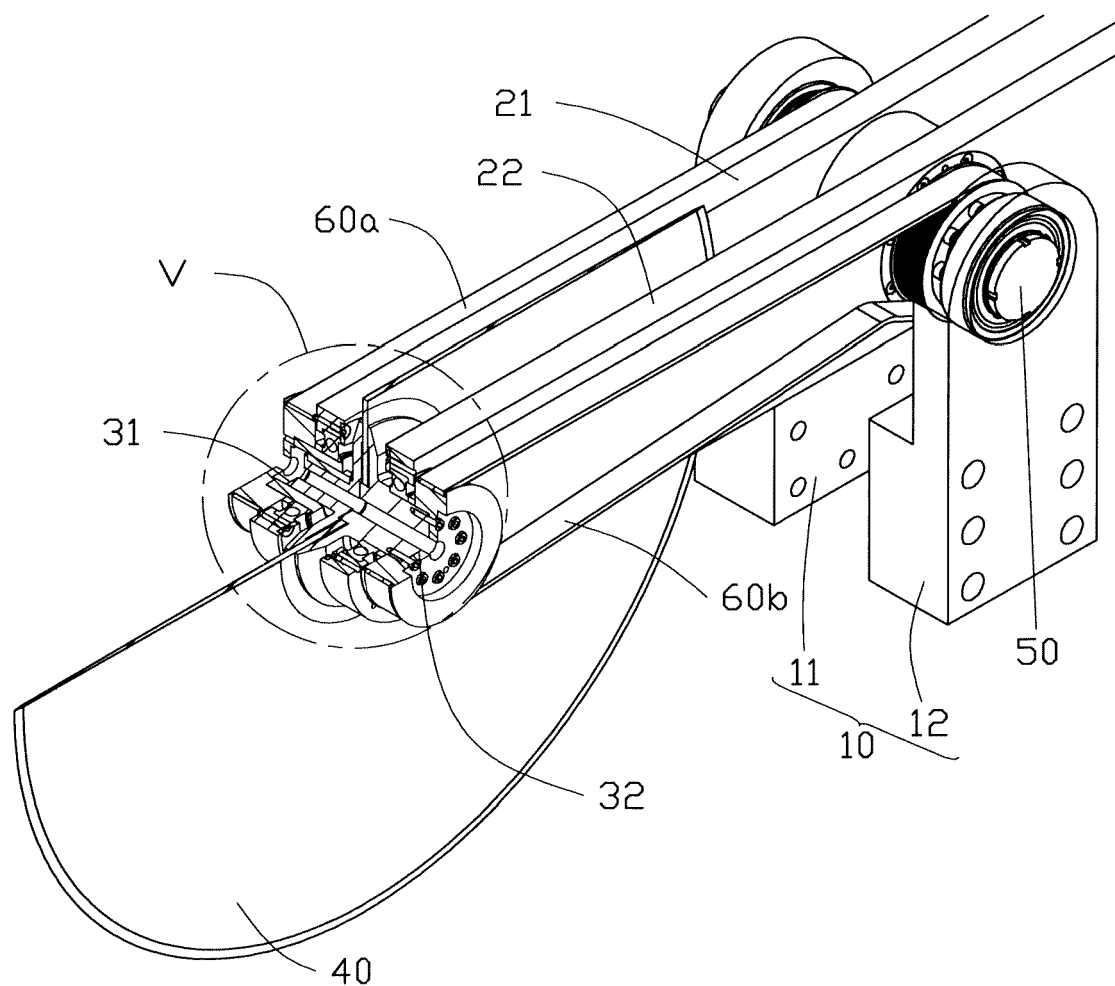


FIG. 4

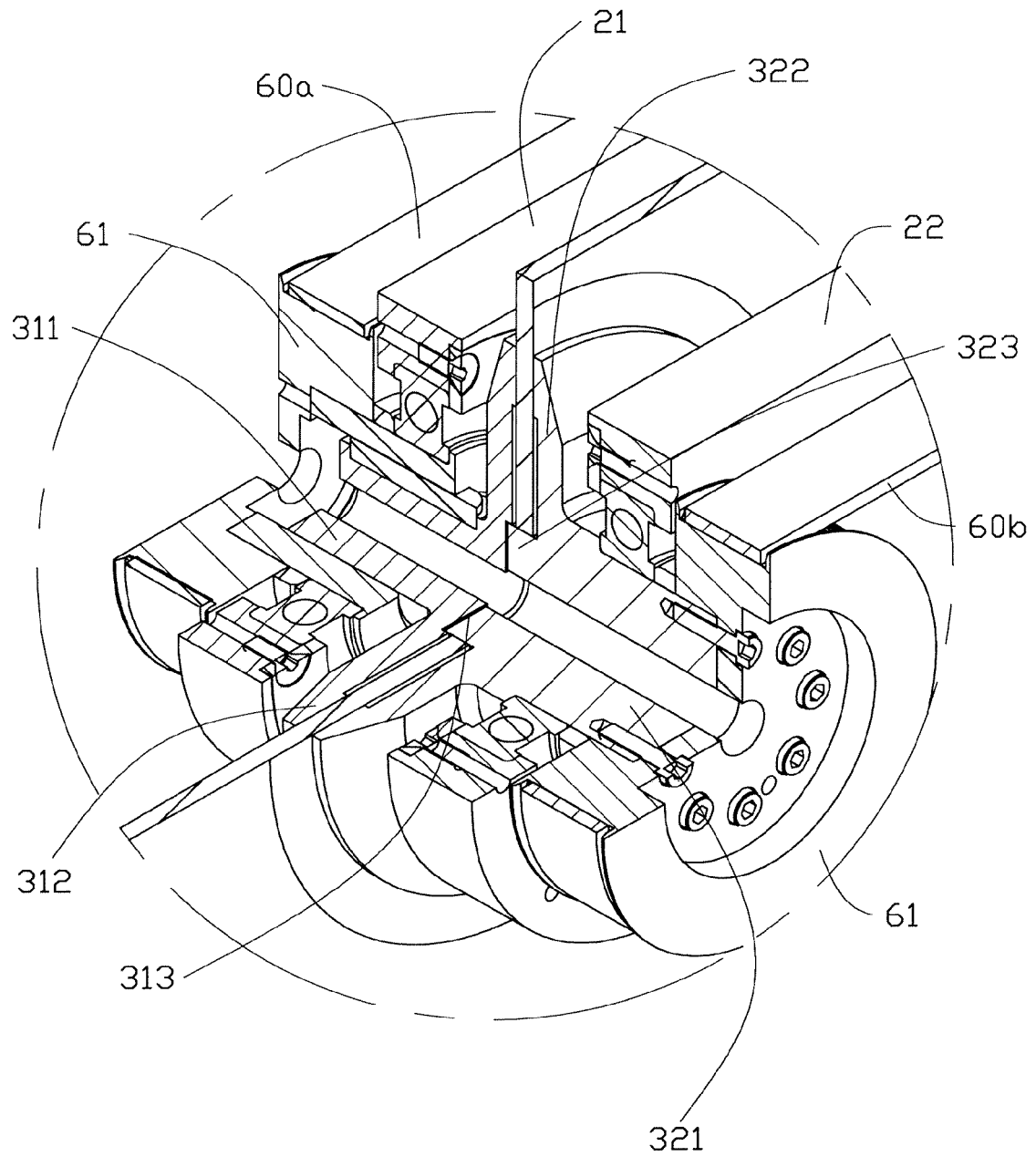


FIG. 5



EUROPEAN SEARCH REPORT

Application Number
EP 14 42 5033

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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