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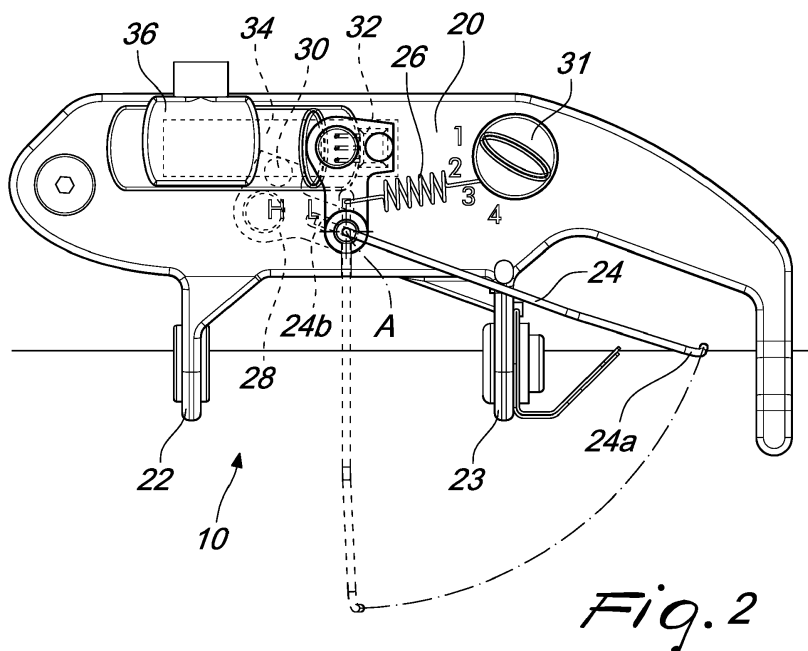
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(54) **YARN BREAKAGE SENSOR FOR TEXTILE APPARATUSES**

(57) A yarn breakage sensor for textile apparatuses, which comprises:

- a body (20),
- a rod (24) which is adapted to engage the yarn (Y) with a portion (24a) thereof and is pivoted to the body (20) about an axis (A) in order to rotate from a first position to a second position following yarn breakage,
- detection means, comprising a first detection element (30) which is integral with the rod (24) and a second de-

tection element (32) which is integral with the body (20) and is arranged substantially along the trajectory of the first detection element (30) in order to face it, with the rod (24) in said second position, and generate a corresponding breakage signal, either said first detection element (30) or said second detection element (32) is supported in a position that can be adjusted substantially along the trajectory of the first detection element (30) by adjustable support means (36).



Description

[0001] The present invention relates to a yarn breakage sensor for textile apparatuses.

[0002] As is known, in textile processes the yarn can be fed to a downstream textile machine, particularly a knitting machine, by an "accumulator" yarn feeder.

[0003] An accumulator yarn feeder is generally provided with a drum that supports, wound thereon, a plurality of yarn loops that are adapted to be unwound on request of the downstream machine. As the yarn is unwound from the drum, it can be reloaded by a motorized arm which rotates like a swivel about an axis that is coaxial to the axis of the drum, or, in other types of feeders, by rotating the drum itself.

[0004] Accumulator yarn feeders can be provided with a sensor that is adapted to detect the accidental breakage of the yarn. The sensor is typically arranged immediately downstream of the drum, and can comprise a rod that is pivoted at an intermediate point about an axis that is transverse to the advancement direction of the yarn. One end of the rod carries a magnet, while the opposite end is pressed to slideably engage the yarn in output from the drum by a spring which is functionally connected to the rod.

[0005] In the event of yarn breakage, the rod is freed and rotates upon pressing from the spring, thus bringing the magnet in front of a Hall effect sensor which is installed on a printed circuit that is integral with the body of the sensor. The Hall effect sensor as a consequence generates a yarn breakage signal which is sent to the feeder control unit.

[0006] As is well known to the person skilled in the art, it is essential that the yarn breakage signal arrive in the shortest time possible. In fact, the promptness of intervention of the sensor is a determining factor in order to prevent drawbacks on the machine downstream, such as the breakage of needles, the loss of yarn from needles, etc.; drawbacks that, obviously, limit productivity in that they lead to downtimes to restore the correct operating conditions of the machine.

[0007] The only way currently known to make the sensor more reactive is to adjust the force exerted by the spring, by increasing the preloading.

[0008] However, as is known, the preloading cannot be increased beyond certain limits, especially when the operating tension, i.e. the tension at which the yarn is fed to the machine, is relatively low, since it would subject the yarn to excessive disturbances that could be harmful both to the operation of the machine, and to the quality of the knitting produced.

[0009] Moreover, the intervention time of the sensor varies according to the yarn count and yarn type being processed.

[0010] Therefore, the aim of the present invention is to provide a yarn breakage sensor for textile apparatuses that overcomes the above mentioned drawbacks of conventional systems, and in particular makes it possible to

adjust the reactivity of the sensor, including on the basis of the yarn count and yarn type being processed, without modifying the return force of the spring.

[0011] Another object of the invention is to provide a yarn breakage sensor that is relatively simple and low cost to manufacture.

[0012] This aim and these and other objects, which will become better apparent from the description that follows, are achieved by a yarn breakage detection sensor having the characteristics recited in the appended claim 1, while the appended dependent claims define other characteristics of the invention which are advantageous, although secondary.

[0013] Now the invention will be described in more detail, with reference to some preferred, but not exclusive, embodiments thereof, which are illustrated for the purposes of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic side view of a generic textile apparatus that includes a yarn breakage detection sensor;

Figure 2 is a side view of a yarn breakage detection sensor according to the invention, in a first active position;

Figure 3 is a similar view to Figure 2, showing the sensor in a second active position;

Figure 4 is an enlarged view of a detail of Figure 2;

Figure 5 is an enlarged view of a detail of Figure 3.

[0014] Figure 1 schematically illustrates a yarn breakage sensor 10 which is installed on an accumulator yarn feeder 12. The feeder 12 is provided with a drum 14 that carries a yarn Y wound on it. The yarn Y is adapted to be unwound on demand by a textile machine downstream, particularly a knitting machine 16.

[0015] The sensor 10 is fixed to an arm 18 that protrudes longitudinally from the body of the feeder 12, and intercepts the yarn immediately downstream of a weft braking device 19 applied to the output of the drum 14.

[0016] The feeder 12 and the knitting machine 16 can be conventional and therefore they will not be described here in detail.

[0017] With particular reference now to Figures 2-5, the sensor 10 comprises a body 20 that supports a yarn-guiding entry bush 22 and a yarn-guiding exit bush 23, which are mutually coaxial.

[0018] A rod 24 is pivoted at an intermediate point to the body 20 between the two yarn-guiding bushes 22, 23, about an axis A that is spaced apart from, and substantially transverse to, the axis of the yarn-guiding bushes.

[0019] A first end 24a of the rod 24 is pressed to slideably engage the yarn Y downstream of the yarn-guiding exit bush 22 by a spring 26 (shown only schematically in Figures 2 and 3) which is functionally connected to the rod 24. The opposite end 24b integrally supports a holder 28 which incorporates a magnet 30. The preloading of

the spring 26 is adjustable, in a conventional manner, by way of a knob 31.

[0020] In a conventional manner, in the event of yarn breakage, the rod 24 is freed and rotates when the spring 26 returns, thus bringing the magnet 30 in front of a Hall effect sensor 32 which is mounted on a circuit board 34 accommodated in the body 20. The Hall effect sensor 32 as a consequence generates a yarn breakage signal which is sent to the control unit (not shown) of the feeder 12.

[0021] According to the invention, in order to adjust the delay in the response of the sensor, the Hall effect sensor 32 is supported in a position that can be adjusted substantially along the trajectory of the magnet 28 by a slider 36 on which the circuit board 34 is fixed.

[0022] The slider 36 can slide with respect to the body 20 in a direction parallel to the axis of the yarn-guiding bushes 22, 23, between a low-sensitivity position, shown in Figures 2 and 4, and a high-sensitivity position, shown in Figures 3 and 5. In the low-sensitivity position, the rod 24 has to trace an angle α (e.g., 70°-80° approximately) in order to bring the magnet 30 in front of the Hall effect sensor 32. In the high-sensitivity position, the rod 24 has to trace a smaller angle β (e.g., 35°-45° approximately), thus significantly reducing the intervention time of the sensor after the yarn breakage.

[0023] The yarn breakage detection sensor according to the invention operates in a manner similar to traditional sensors, but according to the set aims it makes it possible to adjust the reactivity of the sensor, even on the basis of the yarn count and yarn type being processed, without modifying the preloading of the spring but simply by varying the position of the slider.

[0024] In the embodiment described herein it is still possible to vary the preloading of the spring for greater versatility.

[0025] Some preferred embodiments of the invention have been described, but obviously the person skilled in the art may make various modifications and variations within the scope of protection of the claims.

[0026] For example, there could be intermediate adjustment positions of the slider in order to further refine the adjustment of the sensitivity.

[0027] Also, the slider could slide along a trajectory that is curved instead of a straight in order to better follow the trajectory of the rod 24, or it could even be substituted by other adjustable support means, e.g., an arm hinged about the axis A which integrally supports the Hall effect sensor at one of its ends.

[0028] Furthermore, in the embodiment described the position of the magnet with respect to the arm 24 is fixed, while the position of the Hall effect sensor with respect to the body 20 is adjustable. However, a reverse solution would also be possible, with the Hall effect sensor fixed and the magnet mounted on the rod in a position that can be adjusted along the trajectory of the magnet proper.

[0029] Moreover, it goes without saying that the positions of the magnet 30 and of the Hall effect sensor 32

could be inverted; that is to say, the magnet 30 could be integral with the slider 36 and the Hall effect sensor 32 could be integral with the rod 24.

[0030] Furthermore, the rod could be pivoted at an end instead of at an intermediate point, and the magnet can be fixed to an intermediate point of the rod.

[0031] The spring 26, although useful to ensure the precision of operation of the sensor, may not be essential if the weight force of the rod 24 ensures sufficient repeatability.

[0032] Also, the oscillation axis of the rod does not necessarily have to be perpendicular to the advancement direction of the yarn, but could even be parallel, as long as the rod is arranged so as to engage the yarn with one of its portions (not necessarily an end portion), and is pressed so as to rotate in the event of yarn breakage.

[0033] Last but not least, it is possible to use detection means other than the magnetic sensor described herein, as long as such means are made up of two detection elements that are capable of generating a signal when they approach each other. For example, an optical sensor could be used, made up of an emitter of light and a photocell, or a contact sensor made up of a mechanical switch and a locator, and the like.

[0034] The disclosures in Italian Patent Application No. 102017000053150 from which this application claims priority are incorporated herein by reference.

[0035] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A yarn breakage sensor for textile apparatuses, which comprises:

- a body (20),
- a rod (24) which is adapted to engage the yarn (Y) with a portion (24a) thereof and is pivoted to the body (20) about an axis (A) in order to rotate from a first position to a second position following yarn breakage,
- detection means, comprising a first detection element (30) which is integral with the rod (24) and a second detection element (32) which is integral with the body (20) and is arranged substantially along the trajectory of the first detection element (30) in order to face it, with the rod (24) in said second position, and generate a corresponding breakage signal,

characterized in that either said first detection element (30) or said second detection element (32) is

supported in a position that can be adjusted substantially along the trajectory of the first detection element (30) by adjustable support means (36).

against the yarn by elastic means (26).

2. The yarn breakage sensor according to claim 1, **characterized in that** said adjustable support means (36) comprise a slider (36) which can slide between a low-sensitivity position, in which said rod (24) has to trace a first angle (α) in order to bring said first detection element (30) in front of said second detection element (32), and a high-sensitivity position, in which said rod (24) has to trace a second angle (β) that is smaller than the first angle in order to bring said first detection element (30) in front of said second detection element (32). 5
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3. The yarn breakage sensor according to claim 2, **characterized in that** said first angle is comprised between 70° and 80° and said second angle is comprised between 35° and 45°. 20
4. The yarn breakage sensor according to claim 2 or 3, **characterized in that** said slider (36) supports said second detection element (32) integrally and is slideably mounted with respect to the body (20). 25
5. The yarn breakage sensor according to claim 4, **characterized in that** it comprises a yarn-guiding entry bush (22) and a yarn-guiding exit bush (23), which are mutually coaxial and are integral with the body (20), said slider (36) being able to slide in a straight direction that is substantially parallel to the axis of said yarn-guiding bushes. 30
6. The yarn breakage sensor according to claim 5, **characterized in that** said yarn-guiding bushes (22, 23) define a path that is substantially perpendicular to said axis (A). 35
7. The yarn breakage sensor according to one of claims 1-6, **characterized in that** either said first detection element or said second detection element is a Hall effect sensor (32) and the other detection element is a magnet (30). 40
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8. The yarn breakage sensor according to claim 7, **characterized in that** said first detection element (30) is a magnet.
9. The yarn breakage sensor according to one of claims 1-8, **characterized in that** said rod (24) is pivoted to the body (20) at an intermediate point, engages the yarn (Y) with a first end (24a), and supports said first detection element (30) integrally at a second, opposite end (24b). 50
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10. The yarn breakage sensor according to one of claims 1-9, **characterized in that** said rod (24) is pressed

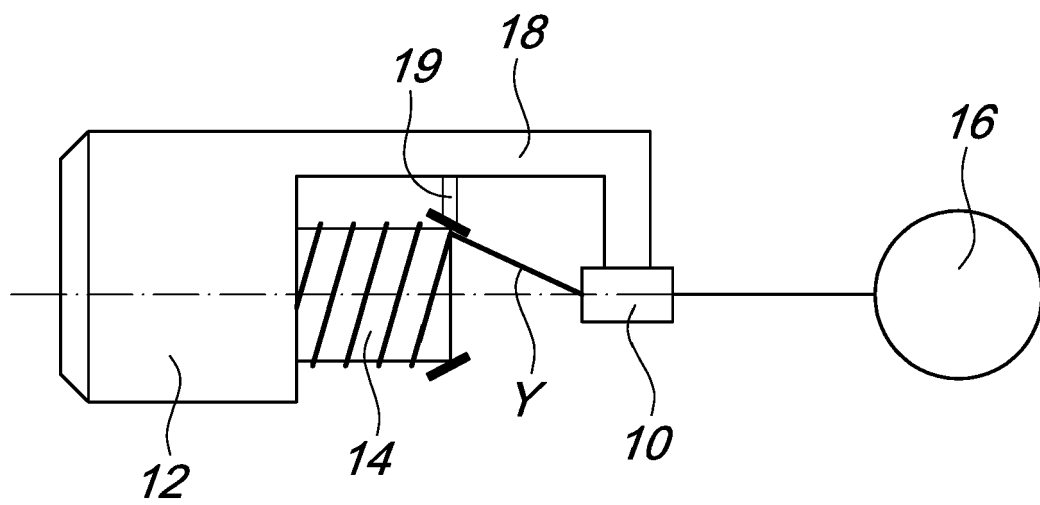
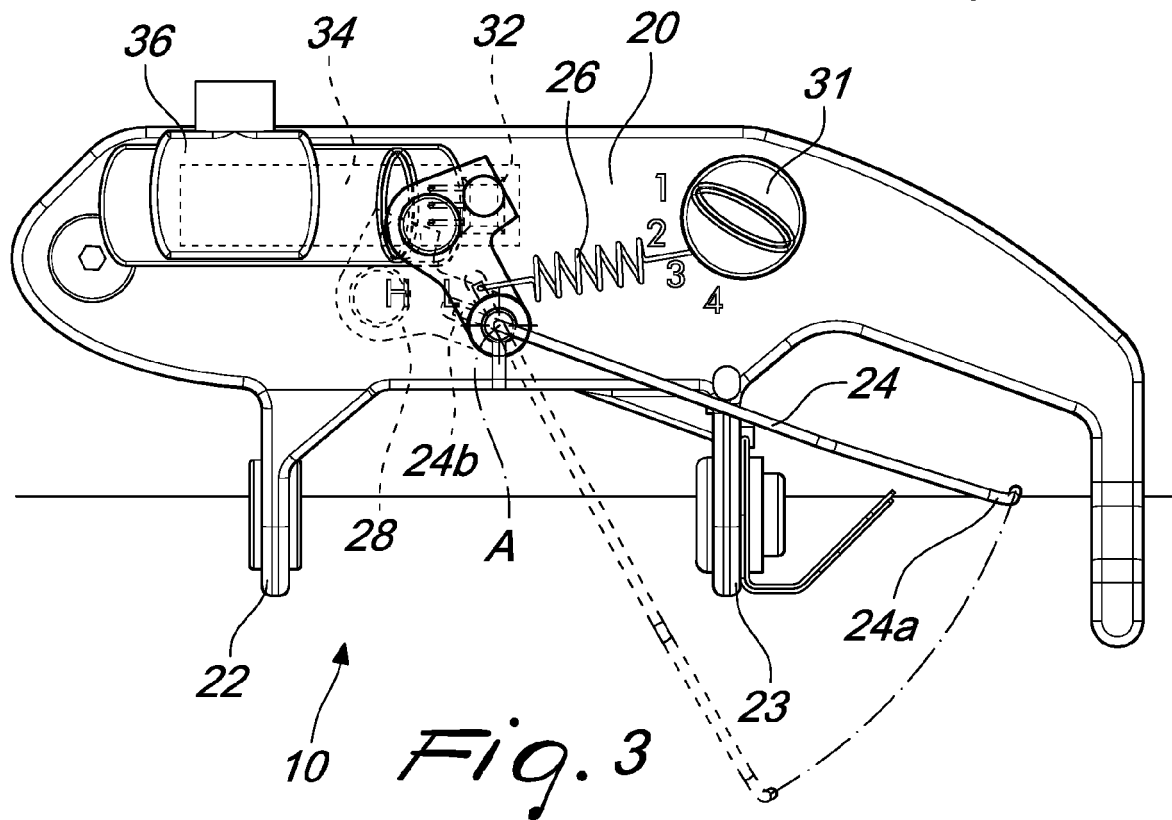
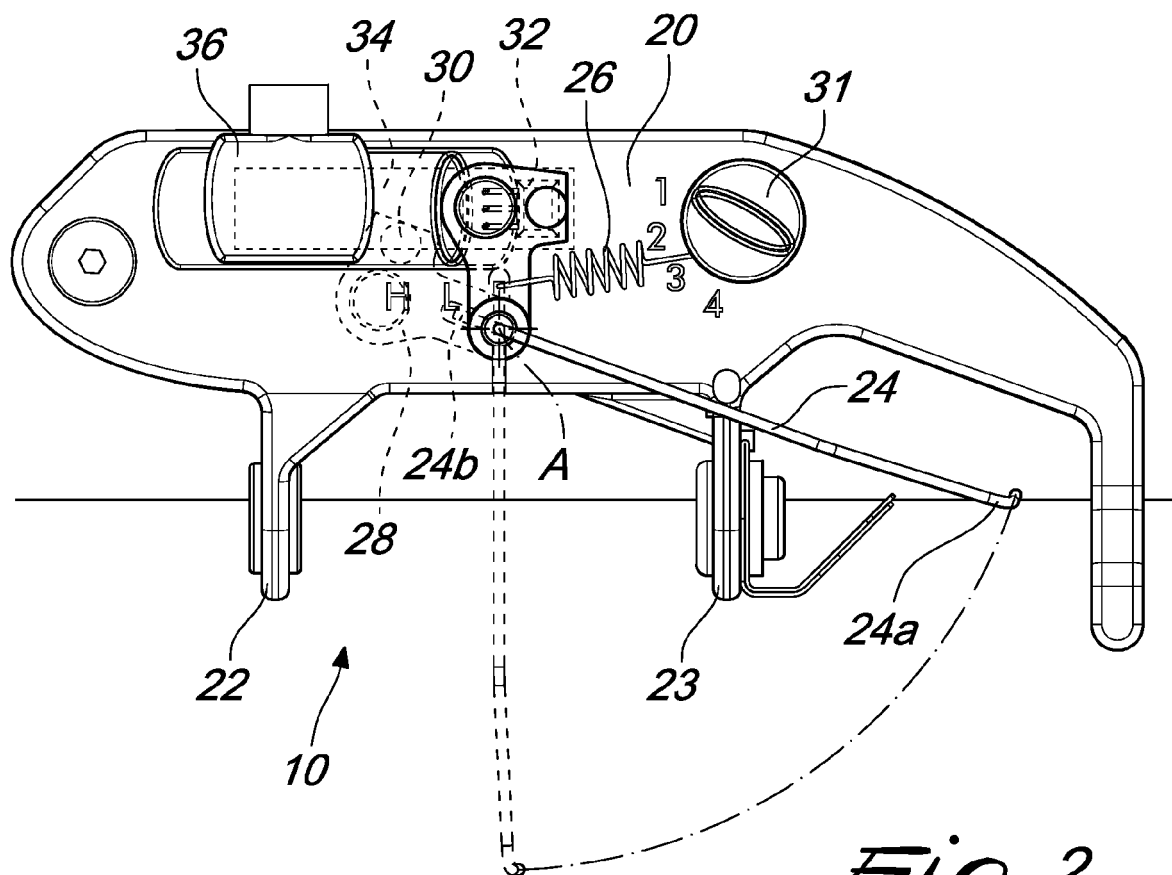
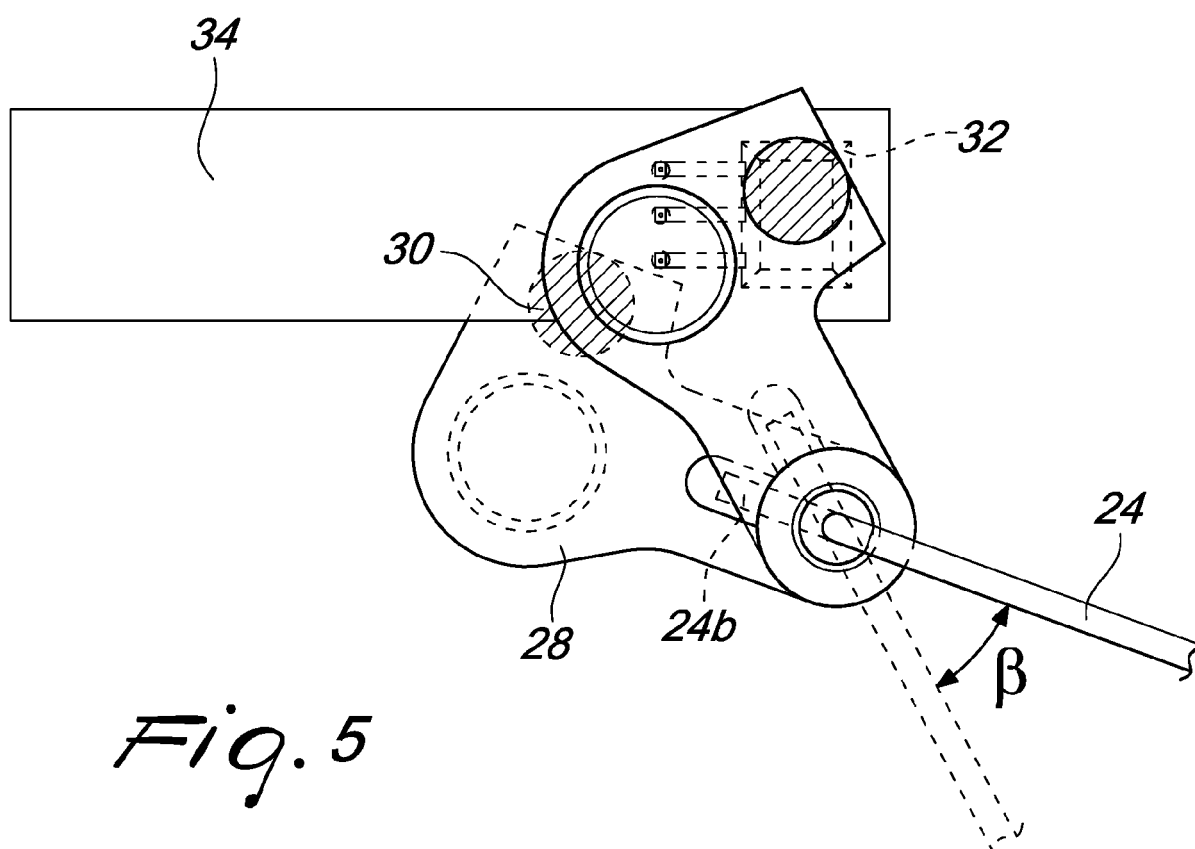
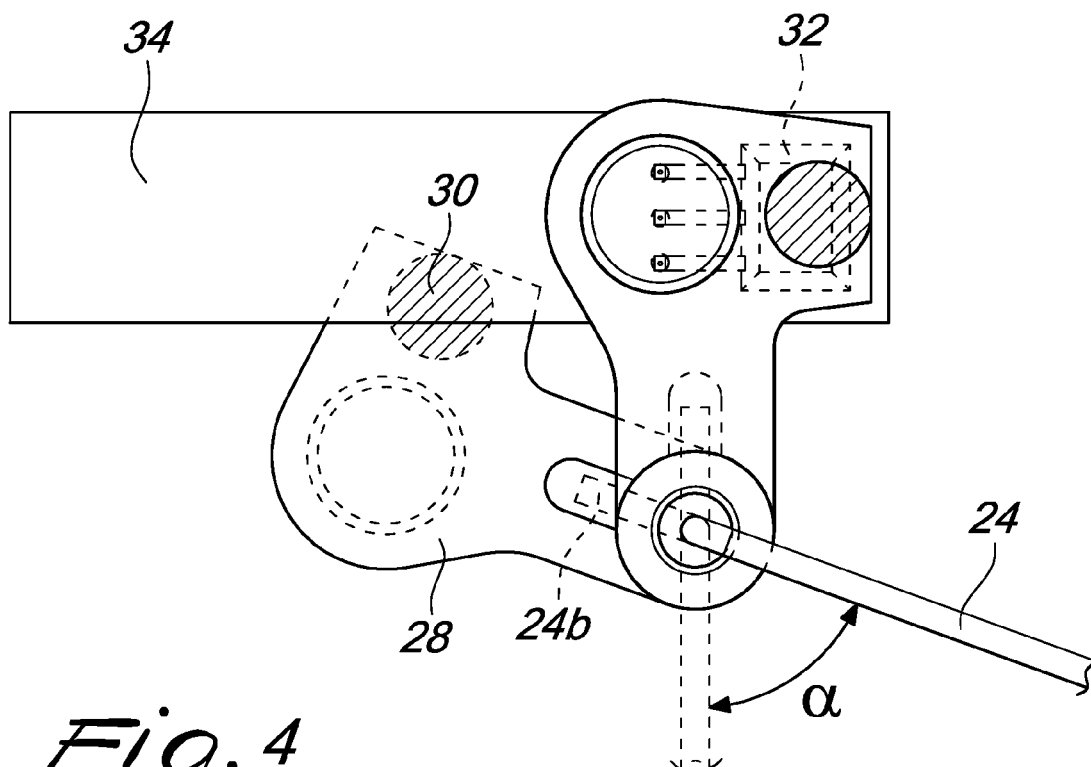


Fig. 1







EUROPEAN SEARCH REPORT

Application Number
EP 18 16 7173

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 September 2018	Examiner Pussemier, Bart
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