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(54) MACHINE FOR CALIBRATING A TENSIONING HEAD OF A THREAD CARRIER OF A BRAIDING OR SPIRALLING WIRE USED FOR PRODUCING A HIGH PRESSURE TUBE

(57) The machine for calibrating a tensioning head 2 of the braiding or spiralling wire of a high pressure tube comprises a first and a second rotation means 5 and 6 for rotating the head 2 and a translation means 7 for translating said head towards and away from said second rotation means, said first and second rotation means 5 and 6 for rotating said head 2 and said translation means 7 interacting with each other to detect the calibration of said head and possibly change it as a function of the tension to be obtained of said braiding or spiralling wire of said tube.

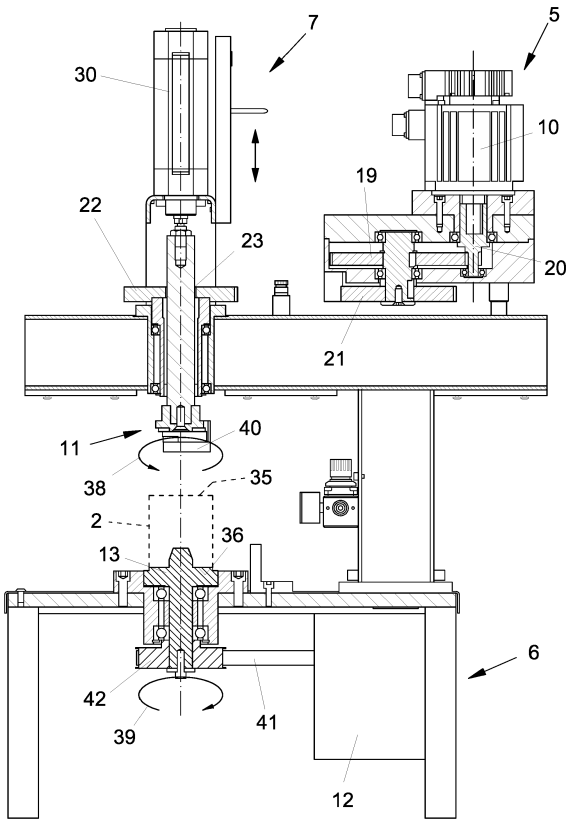

FIG. 1

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Description

[0001] The present invention relates to a machine for calibrating a head of the braiding or spiralling wire of a high pressure tube.

[0002] As is known, the calibration of a head of the braiding or spiralling wire of a high pressure tube is currently performed completely manually using a tensiometer for the purpose.

[0003] It is completely clear that, after various hours of work, a worker no longer has the strength and sensitivity to guarantee the perfect calibration of the braiding or spiralling wire of a high pressure tube.

[0004] Consequently, the calibration may be subject over time to variations precisely due to the manual skill with which it is performed.

[0005] Furthermore, such calibration of the braiding or spiralling wire of a high pressure tube does not allow the quality of each head to be assessed as it does not consider the fact that, in the long term, the heads lose suitability to be calibrated with precision as the springs that compose them are worn and need to be replaced. The task set for the present invention is that of realising a machine for calibrating a head of the braiding or spiralling wire of a high pressure tube that does not have the drawbacks of the prior art.

[0006] Within the context of this task, an aim of the invention is to realise a machine for calibrating a head of the braiding or spiralling wire of a high pressure tube that replaces the manual calibration job currently applied.

[0007] Another aim of the invention is to realise a machine for calibrating a head of the braiding or spiralling wire of a high pressure tube that is precise and constant over time.

[0008] Yet another aim of the invention is to realise a machine for calibrating a head of the braiding or spiralling wire of a high pressure tube that can indifferently be used with any type of head for braiding or spiralling wire without any structural modifications but simply by changing the operating algorithm of the load cell. Another aim of the invention is to realise a machine for calibrating a head of the braiding or spiralling wire of a high pressure tube that allows such operation to be performed extremely quickly.

[0009] Another aim of the invention is to realise a machine for calibrating a head of the braiding or spiralling wire of a high pressure tube that allows the suitability of each head for the use thereof to be checked.

[0010] This task as well as these and other aims are reached by a machine for calibrating a tensioning head 2 of the braiding or spiralling wire of a high pressure tube characterised in that it comprises a first and a second rotation means 5 and 6 for rotating the head 2 and a translation means 7 for translating said head towards and away from said second rotation means, said first and second rotation means 5 and 6 for rotating said head 2 and said translation means 7 interacting with each other to detect the calibration of said head and possibly change it as a function of the tension to be obtained of said braiding or spiralling wire of said tube.

[0011] The object of the present invention is also a process for the calibration of a head of the braiding or spiralling wire of a high pressure tube characterised in that the first and second rotation means 5 and 6 for rotating the head 2 are activated simultaneously in contrast to each other, the equal and opposite force of rotation is increased on two opposite zones of said head until a clutch positioned inside said head starts to slip and said force of rotation is measured at the moment at which said clutch starts to slide.

[0012] The dependent claims more fully specify the further characteristics of the machine according to the invention.

[0013] Additional features and advantages will become more apparent from the description of preferred but non-exclusive embodiments of the invention that are illustrated by way of indicative and non-limiting example in the appended drawings, in which :

fig. 1 is a partially sectioned front view of the machine according to the invention;
fig. 2 is a lateral raised view of the machine according to the invention; and fig. 3 is a plan view of the machine according to the invention.

[0014] With particular reference to the figures described above, the machine for calibrating a tensioning head 2 of the braiding or spiralling wire of a high pressure tube (not shown) is indicated generally by number 1.

[0015] Tensioning head means any head on the market and in particular the heads commercially known as Omec and Mayer inside which there is a clutch and springs that must be calibrated to be able to perform the braiding or spiralling of a tube.

[0016] The machine 1 comprises a first and a second rotation means 5 and 6 for rotating the head 2 and a translation means 7 for translating said head towards and away from said second rotation means 6.

[0017] The first and the second rotation means 5 and 6 for rotating the head 2 and the translation means 7 interact with each other for detecting the calibration of the head 2 and possibly change it as a function of the tensioning that is to be obtained for the wire during the braiding or spiralling of the tube.

[0018] The first rotation means 5 comprises a first motor 10 for rotating a gripping means 11 of the head whereas the second rotation means 6 comprises a second motor 12 for detecting the rotation of a connection spindle 13 with said head. The gripping means is supported by the translation means 7.

[0019] The first rotation means 5 comprises a first kinematic mechanism to transform a rotation motion of the first motor 10 into a translation motion of a first rack 14. The first rack 14 is associated with a second rack 15 through a load cell 19.

[0020] In particular, the first kinematic mechanism comprises a pinion 20 associated with the shaft of the

first motor 10 which is engaged, through a toothed motion transmission wheel 19, with a first toothed wheel 21 that by rotating places the first rack 14 in translation.

[0021] The second rack 15 is engaged with a second toothed wheel 22 that has a grooved hole 23 in the centre thereof.

[0022] The translation means comprises a fluid dynamic piston 30 supporting a grooved shaft 31 that is freely slidable axially inside the grooved hole 23 but which is solid in rotation with the second toothed wheel 22.

[0023] In this way the movement of the second rack allows the rotation of the associated gripping means 11 on the end of the grooved shaft.

[0024] Consequently, it is possible to translate the gripping means 11 for engaging the head 2 between them and the spindle 13 and subsequently acting on the head 2 with a rotation movement adapted to verify the load of the torsion springs inside the head so as to be able to determine the work load thereof.

[0025] The gripping means 11 can be made in different ways, e.g. with a gripping head 40 having a conformation adapted to be engaged during rotation with the head 2. Through a particular algorithm the PLC transforms the value of the force detected by the load cell 19 placed on the first and second rack into the exact calibration value of the head and, therefore, of the tension of the wire.

[0026] Once the head springs have been calibrated by the operator to the predefined value, the process is repeated to verify the correctness of the calibration.

[0027] This verification is also used to evaluate whether the head is suitable or not for working as after various calibrations that are not validated with each other it means that the head springs are worn and need to be changed.

[0028] Advantageously, together with checking the calibration of a head and/or the calibration thereof to a predefined value either for the braiding or spiralling of the wire, it is also possible to verify the quality of the head by detecting its suitability to work or to be regenerated.

[0029] Furthermore, by changing the algorithm for detecting the force performed by the load cell it is possible to use the machine for the calibration and the verification thereof for any type of head.

[0030] In particular, once the machine is on, the head is placed on the spindle 13 and the gripping head 40 is moved down until it engages with the head 2.

[0031] The first motor 10 and the second motor 12 are activated so that on the two opposite upper and lower parts 35 and 36 of the head 2, two equal and opposite forces of rotation are progressively exerted.

[0032] The first motor 10, as seen, transmits a translation motion to the first rack which in turn transmits it to the second rack through the load cell 19.

[0033] By rotating, the motor 10 places in rotation, through the grooved shaft, the gripping head 40 which starts to exert a force of rotation on the head 2 which is kept locked by the spindle 13 in turn still locked by the action of the second motor 12, through a toothed belt 41 that acts on the toothed wheel for the transfer of movement 42, the toothed wheel being solidly constrained to the spindle 13, according to opposite rotations as indicated by the arrows 38 and 39.

[0034] When the force of rotation applied to the head 2 reaches a determined value, the clutch (not shown) inside the head slides, allowing the lower part 36 of the head associated with the spindle to rotate thanks to the force of rotation exerted thereon by the second motor 12.

[0035] The second motor 12, which until then was locked (exerting a force of rotation gradually equal and opposite to that of the rotation head 40), thanks to the slipping of the clutch of the head, performs a small rotation which is detected by the PLC which locks the first motor and detects the value of the load cell.

[0036] The detected value of the load cell, appropriately treated, allows the exact tension of the head springs to be known and therefore the measurement of the real calibration kilograms thereof.

[0037] The operator can at this point perform the calibration of the spring or springs present in the head.

[0038] By repeating the process described above the operator detects the tensioning value of the head until the desired value is reached.

[0039] The machine for calibrating a tensioning head of the braiding or spiralling wire of a high pressure tube according to the invention is susceptible to many modifications and variations, all falling within the scope of the invented concept; furthermore, all the details are replaceable by technically equivalent elements. The materials used, as well as the dimensions, can be any according to the needs and the state of the art.

Claims

1. A machine for calibrating a tensioning head 2 of the braiding or spiralling wire of a high pressure tube **characterised in that** it comprises a first and a second rotation means 5 and 6 for rotating the head 2 and a translation means 7 for translating said head towards and away from said second rotation means, said first and second rotation means 5 and 6 for rotating said head 2 and said translation means 7 interacting with each other to detect the calibration of said head and possibly change it as a function of the tension to be obtained of said braiding or spiralling wire of said tube.

2. The machine according to claim 1 **characterised in that** said first rotation means 5 comprises a first motor 10 for rotating a gripping means 11 of said head.

3. The machine according to claim 1 **characterised in that** said second rotation means 6 comprises a second motor 12 for driving in rotation a connection spindle 13 with said head.

4. The machine according to claim 1 **characterised in that** said translation means 7 comprises said gripping means.

5. The machine according to claim 4 **characterised in that** it comprises between said translation means and said first motor 10 a load cell 19.

6. The machine according to claim 2 **characterised in that** said first rotation means comprises a first kinematic mechanism to transform a rotation motion of said first motor into a translation motion of a first rack 14 associated with a second rack 15 through said load cell 19, said second rack acting on a second toothed wheel 18 solidly constrained in rotation with said gripping means 11 and that allows the translation of the latter inside it to engage said head 2 between said gripping means and said spindle 13.

7. The machine according to claim 6 **characterised in that** said translation means comprises a fluid dynamic piston 30 supporting a grooved shaft 31 slidable in said second toothed wheel 18 and supporting at its end said gripping means of said head, said grooved shaft being driven in rotation by said second toothed wheel 18 activated by said second rack.

8. The machine according to claim 7 **characterised in that** the rotation of said gripping means is adapted to verify the load of the torsion spring or springs inside said head and determines the work load thereof.

9. A process for calibrating a head of the braiding or spiralling wire of a high pressure tube **characterised in that** it activates simultaneously in contrast with each other a first and a second rotation means 5 and 6 for rotating the head 2, increases the force of rotation which is equal and opposite on two opposite zones of said head until the start of the slipping of a clutch placed inside said head and measuring said force of rotation at the moment at which said clutch starts to slip.

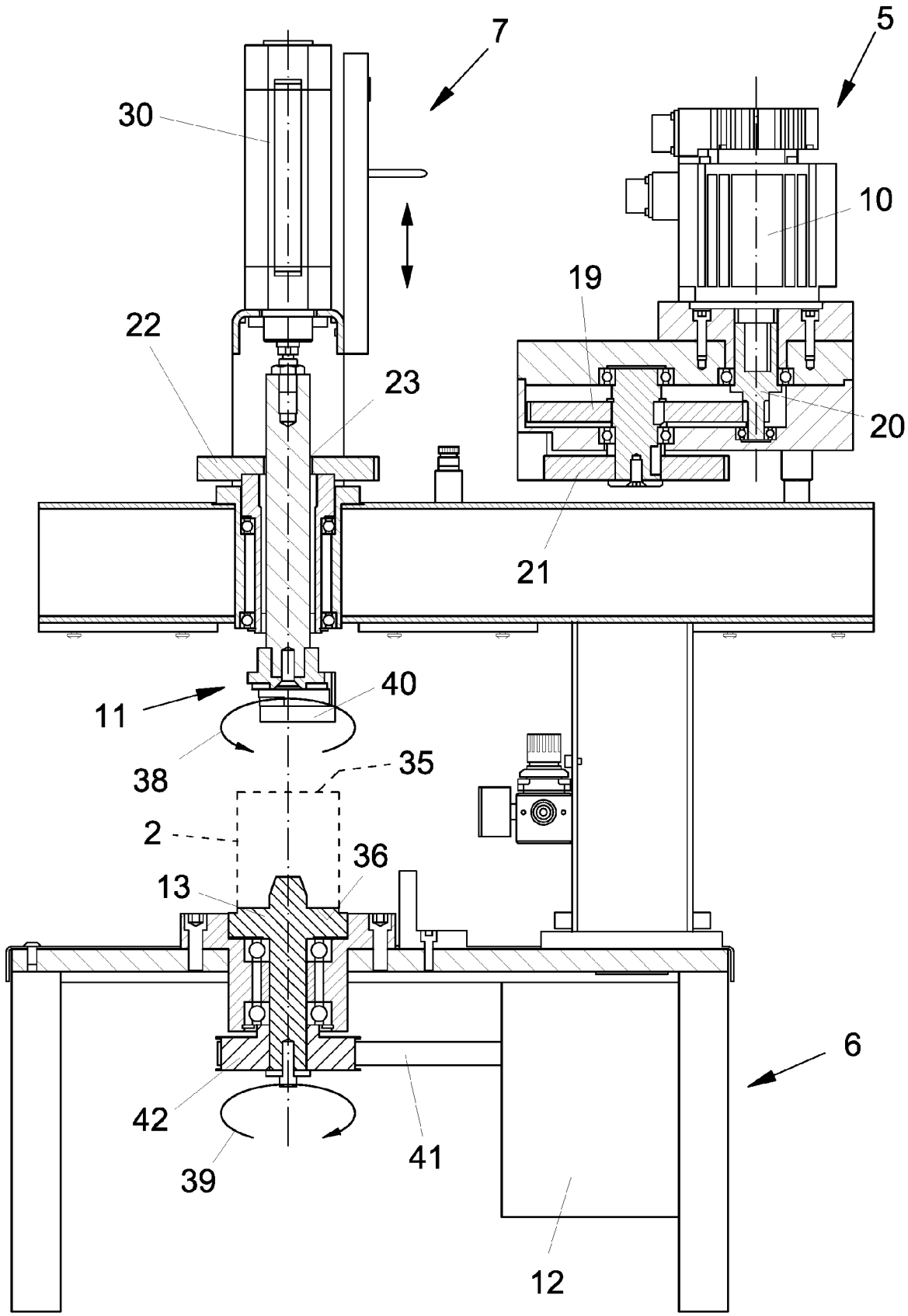

FIG. 1

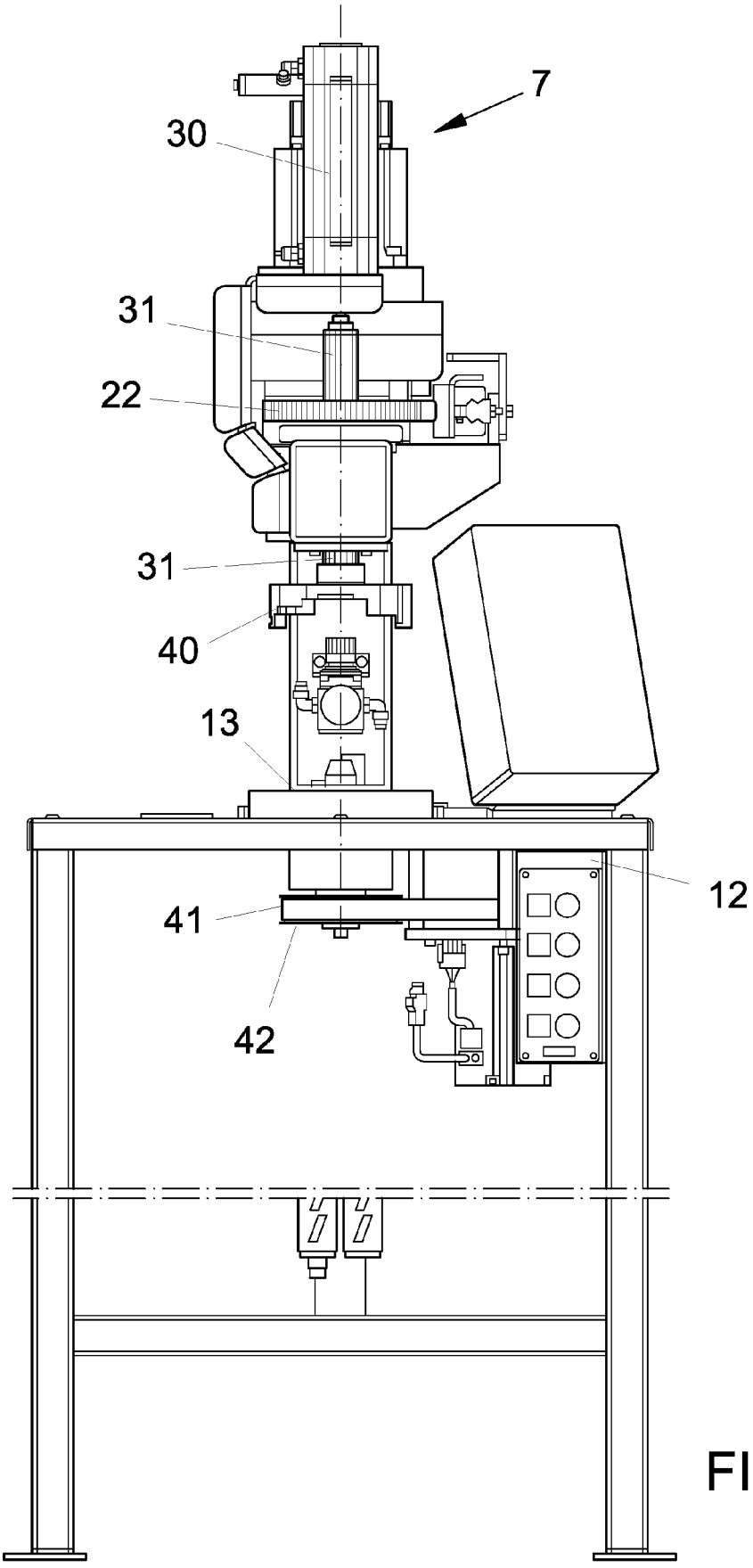

FIG. 2

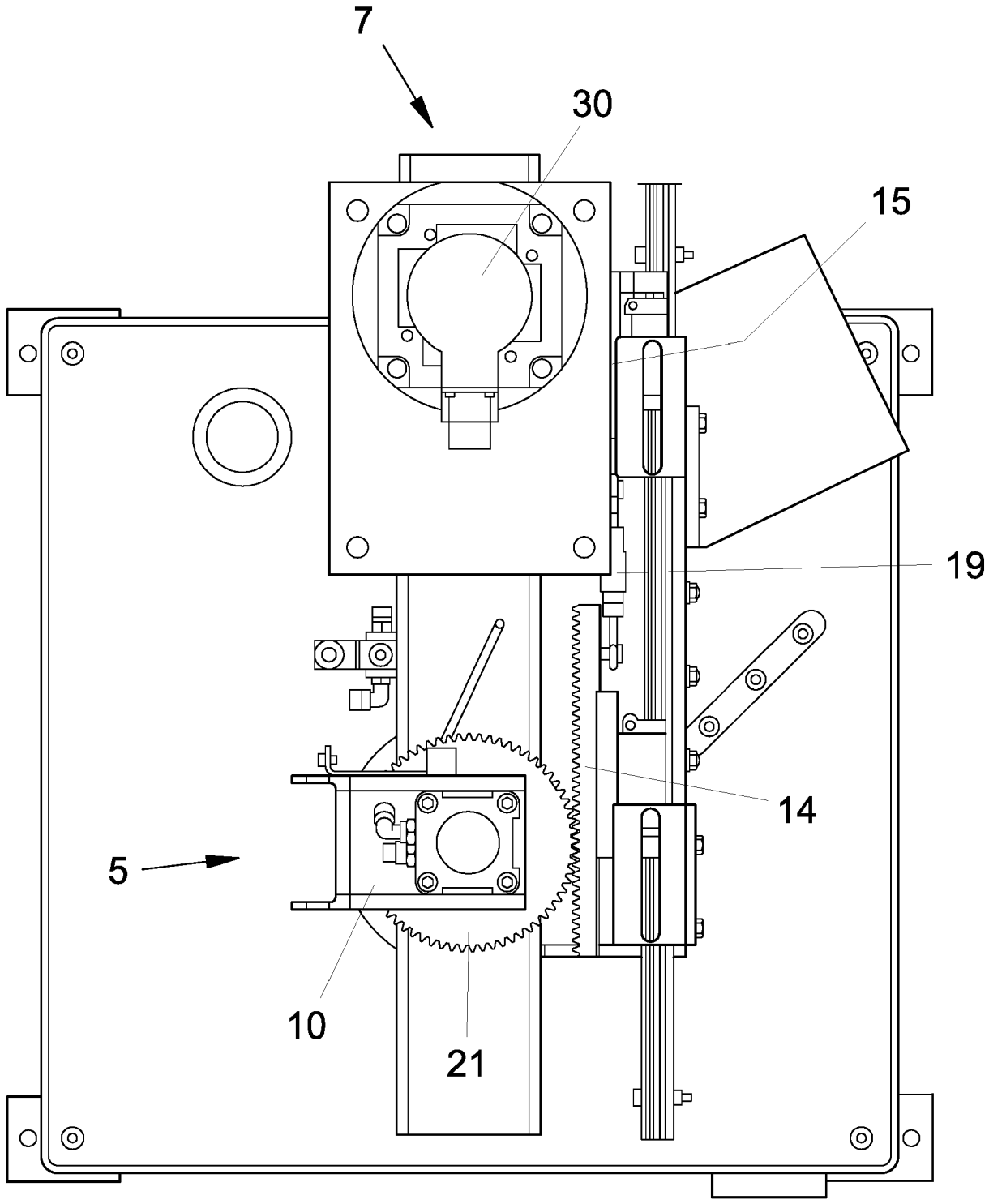

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 19 17 5298

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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	11 June 2019	Braun, Stefanie

CATEGORY OF CITED DOCUMENTS

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