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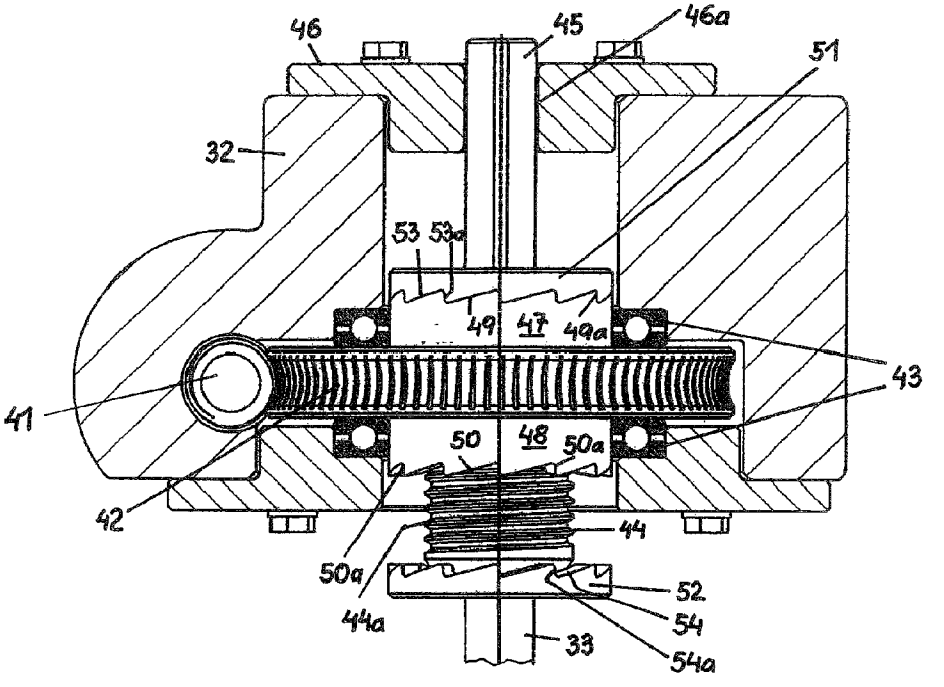
(72) Inventeur/Inventor:
MORITZHUBER, JOHANNES, AT

(73) Propriétaire/Owner:
INNOVA PATENT GMBH, AT

(74) Agent: RIDOUT & MAYBEE LLP

(54) Titre : DISPOSITIF DE CIRCULATION DES VEHICULES TELEPHERIQUES DANS UNE INSTALLATION DE TELEPHERIQUE

(54) Title: APPARATUS FOR MOVING ROPEWAY VEHICLES IN A ROPEWAY SYSTEM



(57) Abrégé/Abstract:
An apparatus for moving ropeway vehicles in a ropeway system, having at least one conveying wheel which can be adjusted in height in relation to the ropeway vehicles, by means of a lifting device, in order to be brought into abutment against said vehicles, as

(11)(21) 3 012 400

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(57) Abrégé(suite)/Abstract(continued):
a result of which the latter can be displaced along a track by means of the at least one conveying wheel. An electric lifting device is provided here and is designed with an electric drive motor, with a threaded sleeve (42) or the like, which can be retained in its height position and rotated by said drive motor, and with a lifting spindle (44), which can be adjusted in height by the threaded sleeve (42) and by means of which the at least one conveying wheel can be adjusted in height, wherein the threaded sleeve (42) and the lifting spindle (44) are designed, on the associated upper and lower end surfaces, with stops (49a, 50a, 53a, 54a), which are located at least more or less in planes normal to the direction of rotation of the threaded sleeve (42) or the like and, in the upper and the lower end positions of the lifting spindle (44), end up in abutment against one another, as a result of which any further rotation of the threaded sleeve (42) is prevented.

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(71) Anmelder: **INNOVA PATENT GMBH** [AT/AT]; Konrad-Doppelmayr-Strasse 1, 6922 Wolfurt (AT).

(72) Erfinder: **MORITZHUBER, Johannes**; Seestrasse 5a, 6971 Hard (AT).

(74) Anwalt: **BEER & PARTNER PATENTANWÄLTE KG**; Lindengasse 8, 1070 Wien (AT).

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(54) Title: APPARATUS FOR MOVING ROPEWAY VEHICLES IN A ROPEWAY SYSTEM

(54) Bezeichnung : VORRICHTUNG ZUR BEWEGUNG VON SEILBAHNFAHRZEUGEN IN EINER SEILBAHNANLAGE

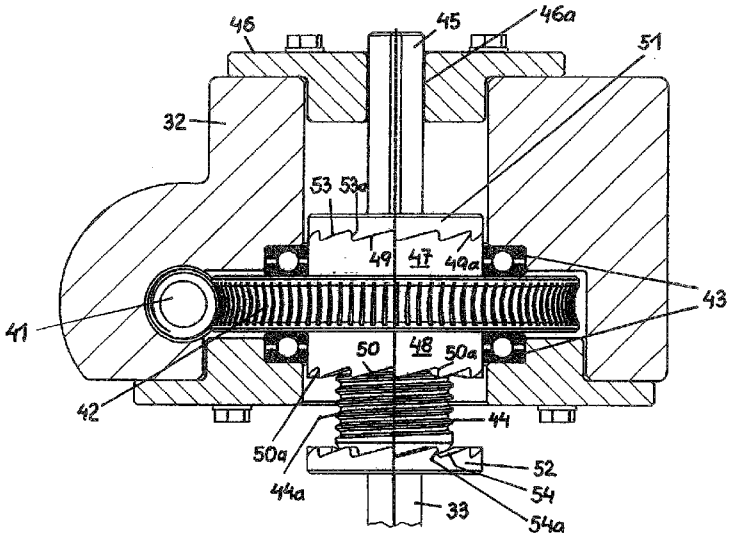

FIG.3

(57) Abstract: An apparatus for moving ropeway vehicles in a ropeway system, having at least one conveying wheel which can be adjusted in height in relation to the ropeway vehicles, by means of a lifting device, in order to be brought into abutment against said vehicles, as a result of which the latter can be displaced along a track by means of the at least one conveying wheel. An electric lifting device is provided here and is designed with an electric drive motor, with a threaded sleeve (42) or the like, which can be retained in its height position and rotated by said drive motor, and with a lifting spindle (44), which can be adjusted in height by the threaded sleeve (42) and by means of which the at least one conveying wheel can be adjusted in height, wherein the threaded sleeve (42) and the lifting spindle (44) are designed, on the associated upper and lower end surfaces, with stops (49a, 50a, 53a, 54a), which are located at least more or less in planes normal to the direction of rotation of the threaded sleeve (42) or the like and, in the upper and the lower end positions of the lifting spindle (44), end up in abutment against one another, as a result of which any further rotation of the threaded sleeve (42) is prevented.

(57) Zusammenfassung:

[Fortsetzung auf der nächsten Seite]

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Vorrichtung zur Bewegung von Seilbahnfahrzeugen in einer Seilbahnanlage mit mindestens einem Förderrad, welches mittels einer Hubeinrichtung gegenüber den Seilbahnfahrzeugen höhenverstellbar ist, um an diese zur Anlage gebracht zu werden, wodurch diese mittels des mindestens einen Förderrades längs einer Fahrbahn verfahrbar sind. Dabei ist eine elektrische Hubeinrichtung vorgesehen, welche mit einem elektrischen Antriebsmotor, mit einer durch diesen verdrehbaren und in ihrer Höhenlage gehaltenen Gewindemuffe (42) od.dgl. und mit einer durch die Gewindemuffe (42) höhenverstellbaren Hubspindel (44), durch welche das mindestens eine Förderrad höhenverstellbar ist, ausgebildet ist, wobei die Gewindemuffe (42) und die Hubspindel (44) an den einander zugeordneten oberen und unteren Stirnflächen mit zumindest angenähert in Normalebenen auf die Drehrichtung der Gewindemuffe (42) od.dgl. liegenden Anschlägen (49a, 50a, 53a, 54a) ausgebildet sind, welche in der oberen bzw. der unteren Endlage der Hubspindel (44) aneinander zur Anlage kommen, wodurch eine weitere Verdrehung der Gewindemuffe (42) verhindert wird.

APPARATUS FOR MOVING ROPEWAY VEHICLES IN A ROPEWAY SYSTEM

The present invention relates to an apparatus for moving ropeway vehicles in a ropeway system with at least one conveying wheel, the height of which relative to the ropeway vehicles may be adjusted by means of a lifting device to bring them into abutment, so that the ropeway vehicles may be moved along a track by means of the at least one conveying wheel.

Ropeway systems with storage facilities in which the ropeway vehicles may be stored, this storage being carried out in particular outside of operating hours, are known in the art. These are known as ropeway vehicle garages, to which the ropeway vehicles travel on storage rails and are arranged close to one another, for example after operation of the ropeway system has ended. To be able to store the vehicles in this way, the conveying wheels assigned to the storage rails must be adjustable in the vertical direction.

In the lower end position, the conveying wheels abut drive surfaces furnished on the ropeway vehicles, and in this way the ropeway vehicles may be moved along the storage rails by means of the conveying wheels. In the upper end position, the conveying wheels are separated from the drive surfaces of the ropeway vehicles, so that the conveying wheels cannot move the ropeway vehicles.

On this point, reference is made for example to EP 774392 A1, in which the design and manner of operation of such a storage facility is explained.

In such storage facilities known in the art, the height of the conveying wheels is adjusted using a lifting device that is driven hydraulically or pneumatically. However, such lifting devices do not meet the technical requirements placed on them, because they require significant maintenance costs.

To avoid this drawback, an electric lifting device may be furnished, having an electric motor and a height-adjustable lifting spindle. But in such a lifting device, it must be ensured that upon reaching the upper or lower end position of the lifting spindle, movement is stopped without locking or wedging the surfaces that come to abut one another, because otherwise the lifting spindle will be difficult to re-adjust.

The present invention accordingly has the objective of providing an electric lifting device wherein, at the end positions of the lifting spindle, the parts that come to abut one another are not locked or wedged together. This is achieved according to the invention by furnishing an electric lifting device, equipped with an electric drive motor, a threaded sleeve or the like that may be rotated by the motor and held at the height thereof, and a lifting spindle, the height of which may be adjusted by the threaded sleeve, by means of which the at least one conveying wheel may be adjusted in height; wherein the threaded sleeve and lifting spindle on the upper and lower end faces that are oriented to one another in their operating position have stops that are at least approximately in normal planes on the direction of rotation of the threaded sleeve or the like, which come into abutment in the upper and lower end positions of the lifting spindle, so as to prevent further rotation of the threaded sleeve.

Preferably, the lifting spindle is formed with two separated stop discs furnished with profiles, and between these stop discs the spindle is designed with an outer thread by means of which the spindle is guided in a threaded bore of the threaded sleeve, and the threaded sleeve has profiles that match the profiles of the stop discs. In this case, the threaded sleeve may be designed with axial extensions, which are formed with profiles. Preferably, the opposite end faces of the stop discs and the extensions of the threaded sleeve are designed with radially extending profiles which are provided with stop surfaces in planes that are at least approximately normal to the direction of rotation of the threaded sleeve. It is also preferable that the lifting spindle is designed with a locking bolt, polygonal in cross section, which is guided in a counter-profiled aperture of a locking plate, so that the lifting spindle is secured against rotation. In addition, the threaded sleeve is preferably formed as a worm wheel, which interacts with a drive spindle of the drive motor.

It is also preferable that the electrical winding of the drive motor is formed with a thermal contact located in the feed line of the drive motor, which is opened when a thermal limit value is exceeded in the drive motor, and as a result the drive motor is then switched off.

A lifting device according to the invention is explained below, with reference to an exemplary embodiment shown in the drawings. The drawings show the following:

FIG. 1: side view of an electric lifting device according to the invention, with the lifting spindle in its lower end position,

FIG. 1A: side view of the electric lifting device, with the lifting spindle in its upper end position,

FIG. 2: axonometric representation of the drive of the lifting device,

FIG. 3: side view and partial section of the drive of the lifting device, with the lifting spindle in its lower end position,

FIG. 3A: side view and partial section of the drive of the lifting device, wherein the lifting spindle is in its upper end position,

In FIGS. 1 and 1A, the upper components of a ropeway vehicle 1 are shown. These components are a drive with at least one roller 11 that may be moved along a guide rail 21, and a clamping device 12 by means of which the ropeway vehicle 1 may be clamped to a conveyor cable 22. The clamping device 12 is designed with an adjusting roller 13, an adjusting lever 14 with clamping jaws 15, and a support roller 16. The ropeway vehicle 1 is designed with a drive surface 17 which height-adjustable conveying wheels 23 may abut in order to bring the ropeway vehicles 1 through a ropeway station or start them in motion in a garage.

For this purpose, a lifting device 3 is furnished, by means of which the conveying wheels 23 may be adjusted to either the lower end position shown in FIG. 1, in which they rest against the drive surface 17, or the upper end position shown in FIG. 1A, in which they are lifted away from the drive surface 17.

The lifting device 3 has an electric drive motor 31, by means of which an adjusting rod 33 may be adjusted in height by means of a gear located in a housing 32. The adjusting rod 33 is rigidly

connected to a support beam 34, on which a group of conveying wheels 23 are stored, as well as pulleys 35 by means of which the conveying wheels 23 may be rotated using belt gears.

In FIG. 1, the conveying wheels 23 are moved to their lower end position by means of the lifting device 3, and as a result come up against the drive surfaces 17, so that the ropeway vehicles 1 may be moved along a track in the form of the guide rail 21. In contrast, in FIG. 1A the conveying wheels 23 are in their upper end position, and as a result are lifted away from the drive surfaces 17, so that the ropeway vehicles 1 cannot be moved.

Below, the drive of the lifting device 3 will be explained with reference to FIG. 2: This drive comprises the electric drive motor 31 by means of which a drive spindle 41 may be rotated. In the housing 32, there is a threaded sleeve in the form of a worm wheel 42, which is mounted between two bearings 43 located in the housing 32, which when in operating position are vertically separated from each other. By means of the drive spindle 41, which meshes with the worm wheel 42, the worm wheel is rotated about an at least approximately vertical axis. The worm wheel 42 is designed with a central threaded bore 42a, in which a lifting spindle 44 is guided, and which has an outer thread 44a.

At its upper end, the lifting spindle 44 is designed with a locking bolt 45, polygonal in cross section, which passes through a likewise polygonal aperture 46a in a locking plate 46 mounted on the housing 32, and as a result the lifting spindle 44 is secured against rotation.

By rotation of the worm wheel 42, the lifting spindle 44 is adjusted in the vertical direction. When adjusting the lifting spindle 44 inside the worm wheel 42 in the vertical direction, it must be ensured that as soon as the lifting spindle 44 enters the upper or lower end position, the drive is stopped to prevent the opposite surfaces of the worm wheel 42 and lifting spindle 44 from locking or wedging together.

As may be seen from FIGS. 3 and 3A, in the housing 32 are located the bearings 43 for the worm wheel 42, which is may be rotated by the drive spindle 41 around an at least approximately vertical axis. In the threaded bore 42a of the worm wheel 42, the lifting spindle 44 is guided, and is adjusted up or down by a rotation of the worm wheel 42.

In FIG. 3, the lower end position of the lifting spindle 44 is shown and in FIG. 3A, the upper end position of the lifting spindle 44 is shown. Here, the conveying wheels 23 are adjusted to the end positions shown in the FIGS. 1 and 1A.

The worm wheel 42 is designed with axial extensions 47 and 48, which are formed on the upper or lower end face with rib-like profiles 49 and 50 that extend at least approximately radially, through which stop surfaces 49a and 50a are formed, which are in normal planes in the direction of rotation of the worm wheel 42. The lifting spindle 44 is formed in the region of the worm wheel 42 with an upper stop disc 51 and lower stop disc 52, and these two stop discs 51 and 52 are furnished, at their end faces associated with the axial extensions 47 and 48, with rib-like profiles 53 and 54 that extend at least approximately radially, which are formed with stop surfaces 53a and 54a, which are also in normal planes in the direction of rotation of the worm wheel 42.

In adjusting the lifting spindle 44 to one of its two end positions, the stop surfaces 53a and 54a, which are located on the stop discs 51 and 52 of the lifting spindle 44, come to abut the stop surfaces 49a and 50a of the extensions 47 and 48. As a result, further rotation of the worm wheel 42 and thus also the drive spindle 41 is prevented, and as a result the drive motor 31 is stopped. This prevents the worm wheel 42 and lifting spindle 44 from wedging together. As a result, the lifting spindle 44 may be adjusted to the other end position without any difficulty.

Because the worm wheel 42 is blocked in its rotation at the upper and lower end positions, the drive motor 31 cannot build up any pre-tension in the thread of the lifting spindle 44. The drive motor 31 is designed so that it may stop. The total lifting time of the lifting spindle 44 from the lower end position to the upper end position is designed to be about 3 seconds. Because the electrical control is configured so that the power supply is interrupted after 5 seconds, the drive motor 31 cannot become thermally overloaded. For additional safety, the electrical winding of the drive motor 31 is designed with a thermal contact located in the feed line of the drive motor 31, which is opened when a thermal limit value is exceeded in the drive motor 31, and as a result the drive motor 31 is also switched off.

In this exemplary embodiment, the drive spindle 41 of the electric motor 31 and the lifting spindle 44 are at right angles to each other, and are coupled together by means of an angular gear. However, this spatial arrangement is irrelevant to the structural design according to the invention. For example, the drive spindle of the drive motor may be oriented parallel to the lifting spindle, the drive coupling taking place via a drive pinion.

Claims

1. Apparatus for moving ropeway vehicles (1) in a ropeway system with at least one conveying wheel (23) the height of which relative to the ropeway vehicles (1) may be adjusted by means of a lifting device (3) in order to bring them into abutment, so that these vehicles may be moved along a track (21) by means of at least one conveying wheel (23), characterized in that an electric lifting device (3) is furnished, which is designed with an electric drive motor (31), a threaded sleeve (42) or the like that may be rotated by the motor and held at the height thereof, and a lifting spindle (44), the height of which may be adjusted by the threaded sleeve (42), by means of which the at least one conveying wheel (23) may be adjusted in height; the threaded sleeve (42) and lifting spindle (44) being configured with stops (49a, 50a, 53a, 54a) that are at least approximately in normal planes in the direction of rotation of the threaded sleeve (42) on the upper and lower end faces that are oriented toward one another, which come into abutment in the upper and the lower end positions of the lifting spindle (44), preventing further rotation of the threaded sleeve (42).

2. Apparatus according to Claim 1, characterized in that the lifting spindle (44) is designed with two mutually spaced stop discs (51, 52) furnished with profiles (53, 54), and between these the spindle is designed with an outer thread (44a) that guides the spindle in a threaded bore (42a) of the threaded sleeve (42), and in that the threaded sleeve (42) is formed with profiles (49, 50) that match the profiles (53, 54) of the stop discs (51, 52).

3. Apparatus according to one of Claims 1 and 2, characterized in that the threaded sleeve (42) is designed with axial extensions (47, 48) having profiles (49, 50).

4. Apparatus according to Claim 3, characterized in that the mutually facing end faces of the stop discs (51, 52) and the extensions (47, 48) of the threaded sleeve (42) are formed with radially extending profiles (53, 54, 49, 50) provided with stop surfaces (53a, 54a, 49a, 50a) in planes that are at least approximately normal to the direction of rotation of the threaded sleeve (42).

5. Apparatus according to one of Claims 1 to 4, characterized in that the lifting spindle (44) is designed with a locking bolt (45), polygonal in cross section, which is guided in a counter-profiled aperture (46a) of a locking plate (46).

6. Apparatus according to one of Claims 1 to 5, characterized in that the threaded sleeve (42) is designed as a worm wheel, which interacts with a drive spindle (41) of the drive motor (31).

7. Apparatus according to one of Claims 1 to 6, characterized in that the electrical winding of the drive motor (31) is designed with a thermal contact located in the feed line of the drive motor (31), which is opened when a thermal limit value in the drive motor (31) is exceeded, so that the drive motor (31) is turned off.

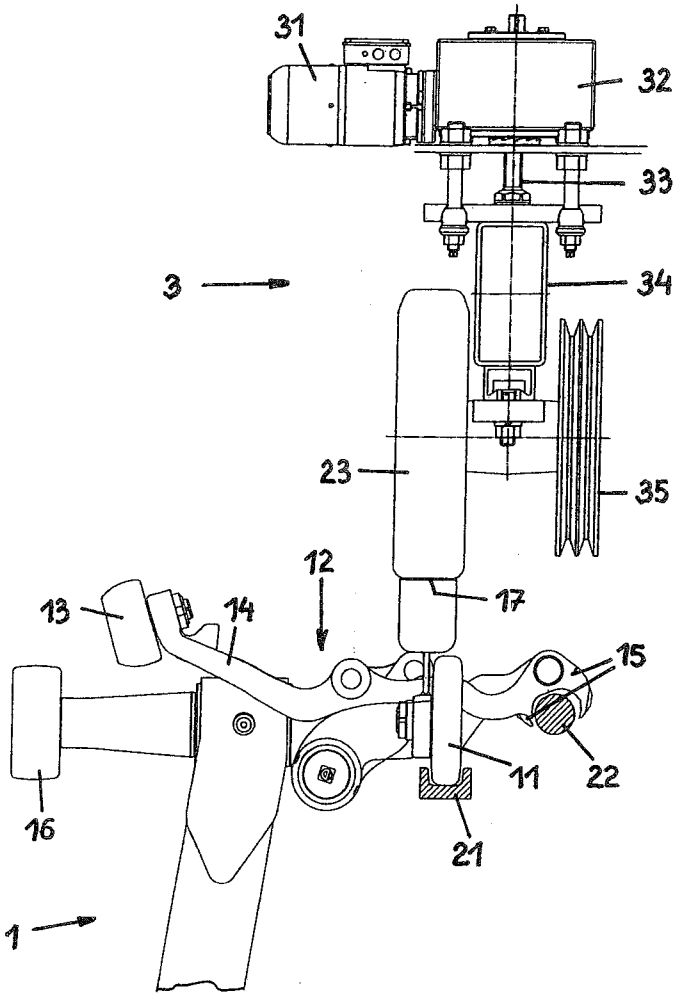
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FIG.1

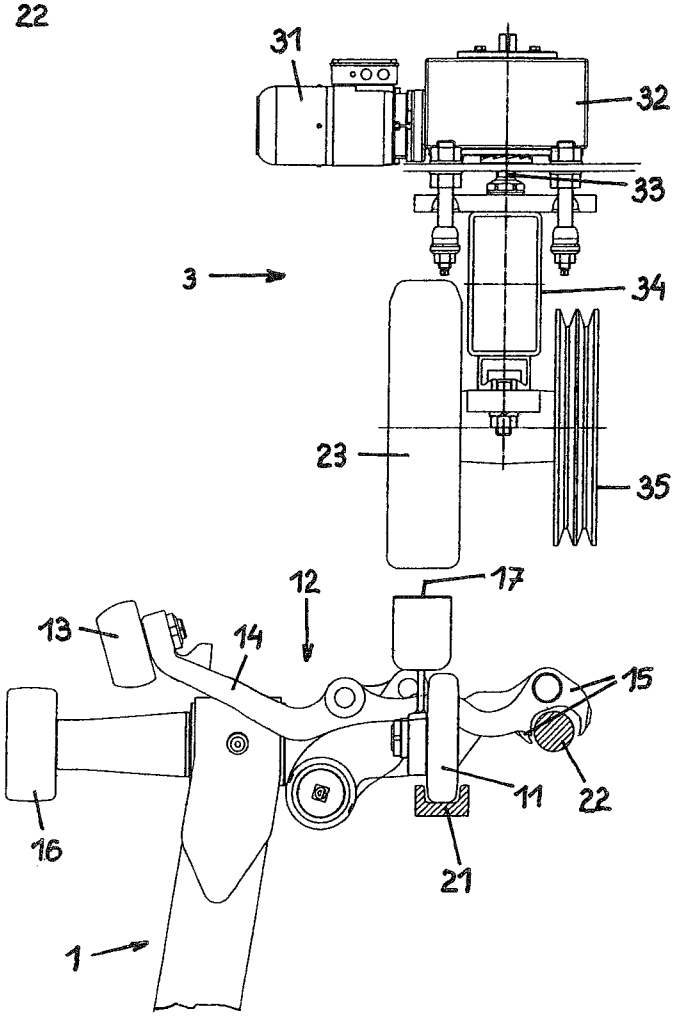
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FIG.1A

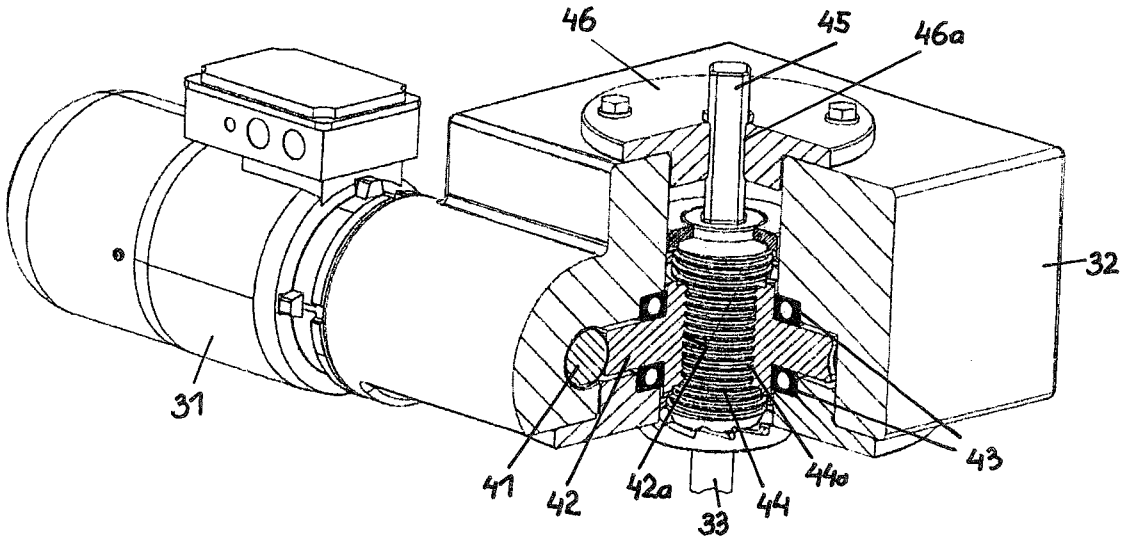

FIG.2

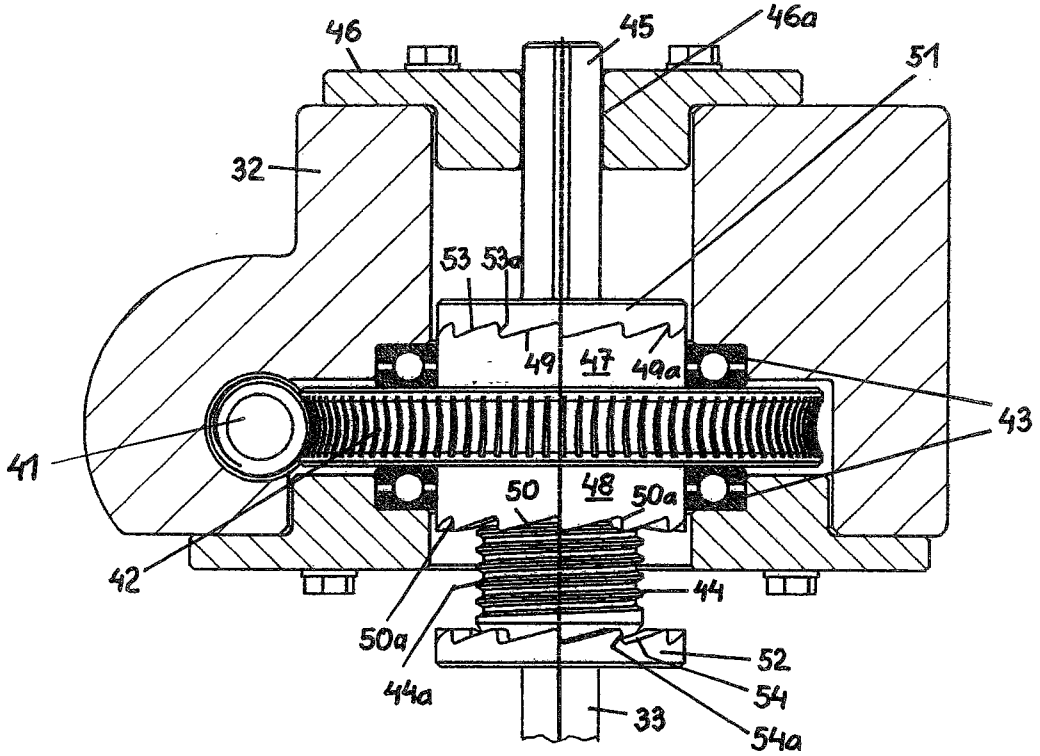
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FIG.3

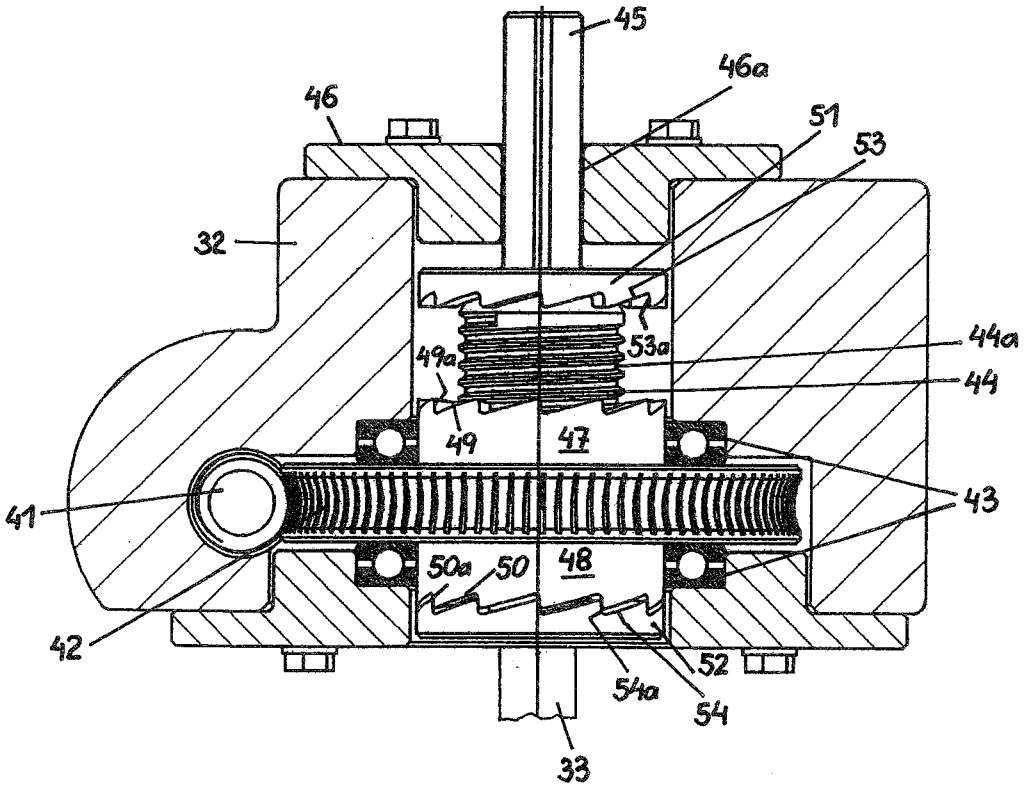
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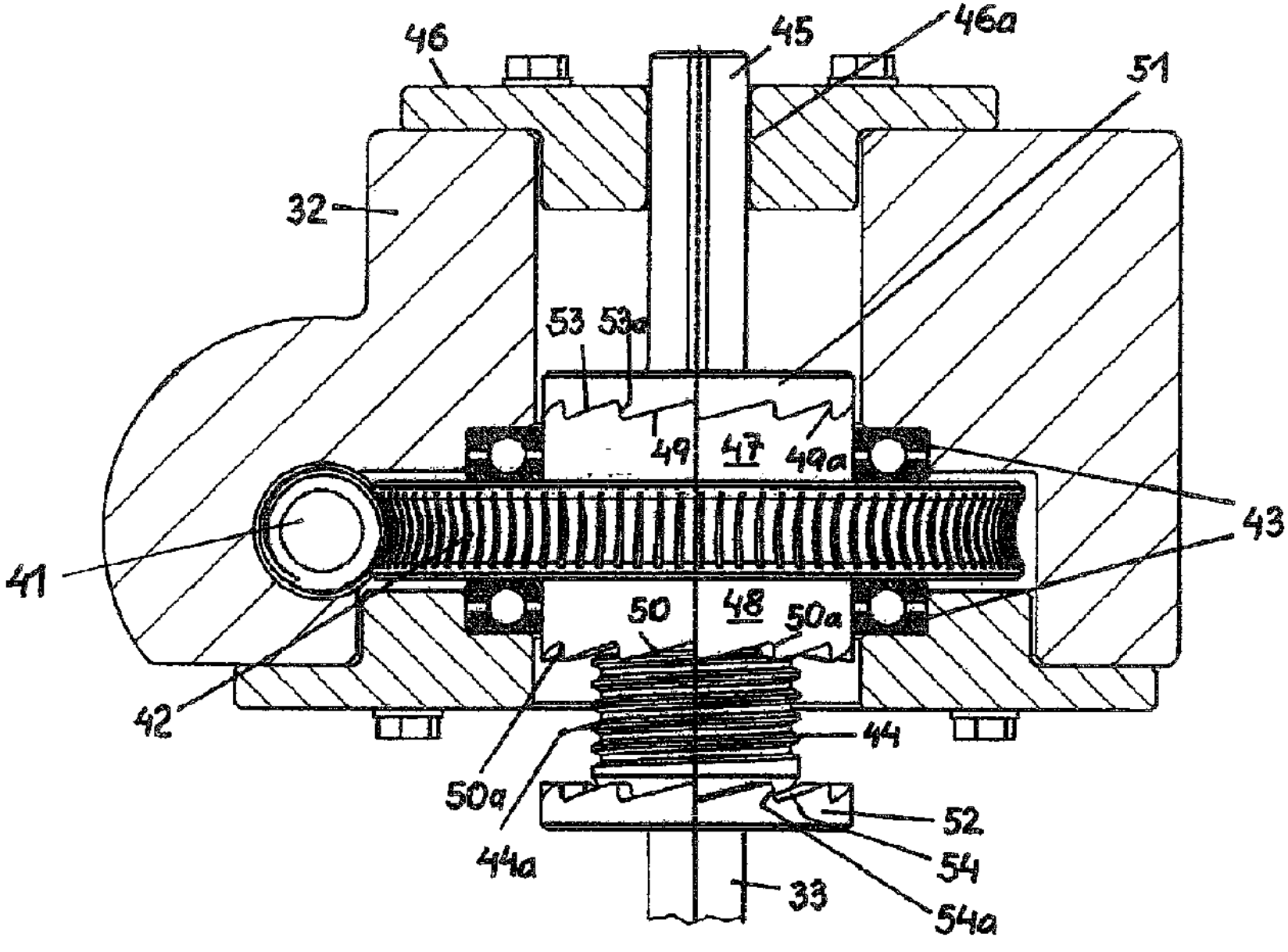
FIG.3A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