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## Description

The invention relates to an additional castor mounted in a rigid frame, it being possible to raise or lower the additional castor and the frame relative to a chassis, to which said castor is to be attached, by means of pivoting, a drive motor fastened to the frame additionally being provided for the additional castor, and a separate pivot drive being provided for raising and lowering the additional castor.

A hospital bed comprising an additional castor is known from CA 2457182 A1. The additional castor is accommodated in a housing which is connected in a pivotable manner to the chassis. Acting at the free end of the housing is a separate pivot drive, which is connected in a pivotable manner to the chassis.

A hospital bed comprising an additional castor is also known from US 6772850 B1. The additional castor and the drive motor are accommodated by a housing which is fitted at one end of a leaf spring. The other end of the leaf spring is connected to the chassis. The leaf spring forces the additional castor towards the floor. In order for the additional castor to be spaced apart from the floor, a mechanism is provided which acts on the leaf spring at an end which projects beyond the housing, and biases said leaf spring. The mechanism is rigidly connected to the chassis. If the mechanism releases the leaf spring, the additional castor is moved towards the floor.

Furthermore, reference is also made to the following prior art: CA 2010543 A, DE 10120316 C1, FR 2735019 A1, US 5083625 A, US 6725956 B1, US 6752224 B2 and WO 01/19313 A1. US 5135063 A discloses a motor-drivable additional castor for a wheelchair.

The object of the invention is to give an additional castor mounted in a rigid frame an advantageous design.

This object is achieved by the subject matter according to the features of claim 1, this being based on the fact that the separate pivot drive is fastened, in its entirety,

to the frame and pivots together with said frame, the compact design of the unit consisting of the frame, the drive motor and the additional castor being advantageous in terms of strengthening existing hospital beds or independently thereof.

As a result of a design of this kind, the pivot drive, the additional castor and the drive motor, together with the frame, form a unit. The frame thus also fully absorbs the weight of the pivot drive. All that is still necessary, in principle, is a joint which pivots in relation to the frame, relative to the chassis. The unit as a whole can be fitted in an extremely straightforward manner to a chassis of a hospital bed. This makes it possible, within the context of preassembly at the factory, for the pivot drive, specifically an eccentric, as described in detail below, to be already aligned in relation to the additional castor. There is a concentration of weight.

This object is achieved by the subject matter of claim 1, this being based on the fact that the compact unit consisting of the frame, the drive motor and the additional castor, which is advantageous in terms of strengthening existing hospital beds using an additional castor of this kind or independently thereof, is formed having a separate pivot drive which is fastened, in its entirety, to the frame and pivots together with said frame.

Furthermore, a mounting plate is also preferably provided, to which the frame is connected in a pivotable manner. A supporting arm is also preferably part of the mounting plate. The eccentric is thus hinged (by a pivot bearing) or supported, optionally also by means of the above-described compression spring, only relative to a part which can be readily incorporated in the subassembly consisting of the frame together with the additional castor and the pivot drive. The mounting plate alone is rigidly connected to the chassis. The frame is connected to the mounting plate only in a pivotable manner.

Correspondingly, upgrading a hospital bed with the additional castor is further simplified to a significant extent by the mounting plate. All that is required is, for example, for the holes for fastening the mounting plate to be made in the chassis of the hospital bed.

It thus proves to be advantageous if the pivot drive uses an eccentric to move the frame relative to the chassis or the mounting plate, on which the eccentric is supported. Only contacting interaction with the mounting plate is necessary for this purpose, but no hinged connection for example. Rather, as has yet to be explained, this can be achieved independently of a hinged connection. In addition, the number of movable parts is advantageously reduced. The eccentric may be formed by an eccentric disc fixed to the shaft. The rotary movement for the eccentric is generated by the pivot drive. If the arrangement is provided such that the axes of the pivot drive and of the eccentric intersect, a gear mechanism is necessary in order to transmit the driving force from the pivot drive to the eccentric. It is preferred, however, if the axes or shafts are parallel or aligned. A drive shaft of the pivot drive may for this purpose advantageously carry the aforementioned eccentric disc directly.

As long as the eccentric is supported on the mounting plate, this also provides a (constant) stop in respect of a floor-contact position of the additional castor. This provides comparatively rigid interaction (in the pressure direction of the additional castor) between the additional castor and the mounting plate, as is the case anyway in respect of the conventional castors in a hospital bed of this kind. Conversely, supporting the additional castor on the mounting plate merely by way of the eccentric can also be utilised in that, in the floor-contact position, the eccentric does not abut the mounting plate directly, but rather by way of a compensating part. A compensating part of this kind may, more preferably, be a spring part, which is appropriately supported, at one end, on the mounting plate and on the additional castor, or specifically on the eccentric, at the other end. A suitable spring in this respect is a compression spring which biases the frame (in its entirety) into the lowered position. This compression spring then acts like a shock absorber when the additional castor is lowered and in contact with the floor. The contact of the additional castor with the floor is also ensured when the hospital bed is moving quickly and over uneven ground.

At the same time, corresponding regions of unevenness in the floor are compensated for by the spring without there being any need, for example, for adjustment of the eccentric or for compensation by a gear mechanism.

It is more preferably provided that the aforementioned compression spring acts on the eccentric by means of a pressure lever located on a pin which is mounted on the mounting plate. The pressure lever can pivot about the same pin as the additional castor. This is usually also the same pin that secures the frame on the mounting plate in a pivotable manner.

The direct interaction with the eccentric can be produced by means of the pressure lever. It is not necessary for the spring to directly abut the eccentric. In order to also advantageously provide for loading in respect of the necessary relative movements between the pressure lever and the eccentric, a rolling element, for example a ball race, may be provided on the pressure lever or, optionally, also on the eccentric. This results in advantageous roller transmission during movement.

However, it is not the case that the eccentric interacts with the mounting plate only via the spring, because this would mean that the frame would always be in the lowered position. Rather, for raising and lowering purposes, rigid support of the eccentric in relation to the mounting plate is also necessary, at least in respect of a certain region of the lowering or raising path. A supporting arm is provided for this purpose, with which the eccentric likewise interacts in a manner which is offset circumferentially, as far as the eccentric is concerned, in relation to the interaction between the above-described pressure lever and the eccentric (if the pressure lever is provided). It is also recommended in respect of said supporting arm to produce a rolling movement, by the ball-bearing-like formation already described in conjunction with the pressure lever.

The supporting arm forms the already mentioned stop for the eccentric.

In respect of the frame itself, it is preferably provided that it comprises two opposite frame walls, along the longitudinal extent of which the shafts of the additional castor and of the eccentric are mounted one behind the other. It may further be provided that, in addition to being connected by the aforementioned shafts, the frame walls are also interconnected by means of a transverse connection which is used only for stiffening purposes. The additional castor, the eccentric, the pivot drive, the pressure lever, together with the spring, and the supporting arm are accommodated between the frame walls. The frame walls advantageously protect these components from external influences.

An additional transverse connection, as has been mentioned, is preferably provided to the effect that it is used to obtain a measured value which makes it possible to determine which (lowered) position the additional castor is in. For this purpose, for example an inductive proximity sensor may be provided on the supporting arm, which sensor registers the distance between this strut formation and the supporting arm. The supporting arm is fixed, while the transverse connection moves together with the frame during lowering or raising. For this purpose, the transverse connection may consist of, for example, a simple sheet-metal strip, since the absorption of forces is not critical.

The pivot drive for the eccentric is also preferably arranged, in its entirety, between the frame walls. In contrast, a drive motor and/or a gear mechanism for the additional castor may be arranged on the outside of one of the frame walls. It is advantageous here, on balance, if the drive motor is readily accessible. Since, furthermore, the drive motor for the additional castor is in any case significantly larger than, for example, the drive motor for the pivot drive, there would otherwise be a considerable amount of empty space between the frame walls.

The additional castor may be a fixed castor, the running surface of which is comparatively soft (for example made of soft rubber in order to achieve good traction). The diameter of the additional castor is preferably equal to, or smaller than, the diameter of the other, conventional castors attached to the chassis of a hospital bed. The gear mechanism which is preferably connected between the drive motor

for the additional castor and the additional castor is, more preferably, designed such that it does not have a self-locking function, that is to say it has only the lowest possible coefficient of friction. This is advantageous in that, even if the motor fails or, for example, if the motor, for relatively short distances, is not supposed to be switched on, a hospital bed can advantageously be easily moved even when the additional castor is lowered. The additional castor has, in this sense, a freewheeling capability.

In order to supply the drive motor and the pivot drive with electrical power, it is preferably provided that there is a corresponding connection to a storage battery, which is usually already present, in a hospital bed. For example, for the purpose of adjusting head parts and/or foot parts of the bed, electric drives are usually already present in the hospital bed, and these can be supplied with power by means of a storage battery. For control purposes, that is to say, in particular, for activating and deactivating the additional castor and/or for lowering and raising the additional castor, corresponding switches and a control unit are preferably provided on the hospital bed. The switch may be a push button, which has to be actuated for the entire time during which the assistance of the additional castor is required. This is advantageous in that it provides for accurate actuation. Upon actuation of the push button, on the one hand, the additional castor can pivot, by means of the pivot drive, out of the release position into the floor-contact position and, on the other hand, the drive motor can drive the additional castor.

This described sequence can be stored, for example, in a controller of the control device. Furthermore, in particular as an addition, it is also preferred for the additional castor to be controlled in terms of drive, by means of the control device, so as to produce slow acceleration. In a further preferred configuration of the controller, it is also provided that the drive motor of the additional castor switches off of its own accord when the power remaining in the storage battery drops below a certain, predetermined value. In particular, this is also intended to ensure that the remaining power is sufficient for the additional castor to be moved into the release position by means of the pivot drive.

In order to detect the position of the additional castor, an appropriate detection mechanism may be provided. An example of a suitable mechanism is an inductive proximity sensor, which senses the position of the additional castor relative to the chassis. In a more specific embodiment, it may be provided, for this purpose, that a proximity sensor of this kind is attached on the supporting arm, which projects between the frame walls from the underside of the chassis. If the frame is then lowered, the distance between the proximity sensor, which is attached on the supporting arm, and a part which pivots together with the frame can be sensed by the proximity sensor, which can derive the position of the additional castor therefrom.

The invention will be explained in more detail below with reference to the accompanying drawing, which, however, merely illustrates an embodiment. In the drawing:

Fig. 1 is a perspective view of a hospital bed to the chassis of which an additional castor is fitted, the additional castor being in the release position;

Fig. 2 is a bottom view of the additional castor as seen in viewing direction II from Fig. 1;

Fig. 3 is a perspective bottom view of the additional castor;

Fig. 4 is a section along the line IV-IV from Fig. 2;

Fig. 5 is a side view of the additional castor in the intermediate position as seen in viewing direction V from Fig. 2; and

Fig. 6 is a section corresponding to Fig. 4, but in this case the additional castor is in the floor-contact position.

Fig. 1 is a perspective view of a hospital bed 3 having a chassis 2 and an additional castor 1 arranged thereon, a storage battery and various operating elements not, however, being shown. The additional castor 1 can be arranged between the castors 4 of the head end or foot end of the hospital bed 3. It is also conceivable, however, for the additional castor 1 to be fixed to the chassis 2 in the centre in relation to the four casters 4 arranged at the corners of the chassis 2, respectively. The additional castor 1 is preferably oriented in each case such that the running direction of the additional castor 1 extends in parallel with the longitudinal extent of the hospital bed 3.

The additional castor 1 is accommodated in a frame 5 which, in the embodiment, comprises two frame walls 6, 6′ arranged in parallel with one another. The additional castor 1 is arranged between the frame walls 6, 6′. As can clearly be seen in Fig. 2, the additional castor 1 is off-centre, that is to say in closer proximity to the frame wall 6′. This achieves advantageous integration with the rest of the units yet to be described. The running direction of the additional castor 1 is parallel to the frame walls 6, 6′. The shaft 7 of the additional castor 1 is accommodated, with bearing support, by the frame wall 6, without passing therethrough, and projects through the frame wall 6′, the frame wall also providing bearing support. The shaft 7 is rigidly connected to the additional castor 1. The end of the shaft 7 which projects out of the frame wall 6′ is connected to a gear mechanism 8, by means of which gear mechanism 8 a drive motor 9 drives the additional castor 1. The gear mechanism 8 and the drive motor 9 are fastened to the frame wall 6′ from the outside. The drive motor 9 is an electric motor. The gear mechanism 8 is designed such that it does not have a self-locking function and has the lowest possible level of internal friction. This makes it possible to achieve a freewheeling action. In order to supply the drive motor 9 with power, a plug-in connection 35 is provided on the gear mechanism 8.

A mounting plate 10 is provided in addition to the frame walls 6, 6′. In the embodiment, the mounting plate 10 is arranged between the frame walls 6, 6′, regions of which are associated with the underside of the chassis of the hospital bed. The frame 5 is connected in a pivotable manner, by means of a pin 11, to the mounting

plate 10 which, in the installed state, is rigidly connected to the chassis of the hospital bed. In the embodiment, the pin 11 is screw-connected to the frame walls 6, 6′. The frame walls 6, 6′ are connected not just by the pin 11, but also by the shaft 7 of the additional castor 1. The frame 5 is also provided with transverse connections 12, 13. One transverse connection 12 is arranged in the vicinity of the additional castor 1 and an additional transverse connection 13, in the form of an auxiliary metal plate, is arranged in the vicinity of the pin 11. The transverse connection 12 is formed by a bolt which has a reduced-diameter portion 14. The bolt thus forms a strut formation between the frame walls 6, 6′. The portion 14 is associated with the additional castor 1. In the embodiment, the transverse connection 13 is connected by means of screws to the end faces of the frame walls 6, 6′.

In order to rigidly connect the mounting plate 10 to the chassis 2 of the hospital bed 3, holes 15 are formed in the mounting plate 10, and, in the embodiment, these holes have cylinder head screws 16 passing therethrough. The cylinder head screws 16 are screwed in corresponding threaded holes 17 in the chassis 2.

Fig. 4 and 6 are each a section through a hole 15 having a cylinder head screw 16 positioned therein. As is particularly clear from Fig. 2 and 4, the mounting plate 10 forms an open-edged recess 36 in the direction of the pin 11. The mounting plate 10 tapers in the region of the open-edged recess 36 and thus forms an obliquely extending cover 37. This cover 37 extends over only part of the recess 36. In the end region, the recess 36 passes all the way through the mounting plate 10. The cover 37 is at an angle of approximately 20° in relation to the lying surface of the hospital bed 3. The recess 36 is arranged centrally in the mounting plate 10 and is approximately half the overall width of the mounting plate 10 (see Fig. 2).

An end portion 38 of a supporting arm 18 is inserted in the recess 36. The end portion 38 is adapted in terms of shape to the width of the recess 36. The basic width of the supporting arm 18 is greater than the width of the recess 36, and the

supporting arm 18 thus provides lateral shoulders 39, which rest against the mounting plate 10. The supporting arm 18 is rigidly connected to the mounting plate 10 by the pin 11. The shoulders 39 help to join the supporting arm 18 fixedly to the mounting plate 10. The supporting arm 18 is angled at approximately a right angle to the mounting plate 10 and projects into the gap between the two frame walls 6, 6′. Arranged at the free end of the supporting arm 18 is an annular body 19, which is rotatable on balls in a manner corresponding to the outer race of a ball bearing. In specific terms, for this purpose, the pin which receives the balls and the annular body 19 is mounted between two legs 40.

As can be seen in particular in Fig. 2, an eccentric 20 interacts with the annular body 19. The annular body 19 allows rolling relative to the eccentric 20. In the embodiment, the eccentric 20 is arranged centrally on a shaft 21, between the frame walls 6, 6′.

It can also be seen in Fig. 2 that the shaft end which is associated with the frame wall 6 is part of a gear mechanism 22. By means of the gear mechanism 22, the shaft 21 can be driven by the pivot drive 23. The pivot drive 23 and the gear mechanism 22 are fastened to the inside of the frame wall 6 and, together, form the pivoting unit for the additional castor 1. The pivot drive 23 is connected, via a cable 24, to a power source, also by means of an interposed control device. As can also be seen from Fig. 2, the pivot drive 23 extends laterally along the additional castor 1. An advantageous overall size of the frame 5 can be achieved by arranging the additional castor 1 and the pivot drive 23 one beside the other.

As can further be seen from Fig. 2 and 5, the two axes of symmetry of the pivot drive 23 and of the drive motor 9 extend approximately in parallel with one another. The axes of symmetry of the shafts 7, 21 of the additional castor 1 and the eccentric 20, respectively, extend approximately at right angles to one another (see Fig. 2).

A pressure lever 25 is provided in addition to the supporting arm 18. The pressure lever 25 is located directly in the pivoting path of the eccentric 20, or more precisely of the shaft 21, when the frame 5 is pivoted. The pressure lever 11, which can be pivoted about a pin 25, is supported by a spring 27 which abuts, at one end, the chassis of the hospital bed, or specifically, in the embodiment, the mounting plate 10, and abuts the eccentric 20 by means of the pressure lever 25, at the other end. In the embodiment, the pressure lever 25 is also mounted on the supporting arm 18. For this purpose, the supporting arm 18 has, at the chassis end, a recess 41, and a pin 11, which passes through the foot of the pressure lever 25. As has also already been explained in reference to the supporting arm 18, the pressure lever 25 also has, on the eccentric end, an annular body 26. Correspondingly, the annular body 26 is also mounted by balls (not shown), in a manner corresponding to a ball bearing, at the end of the pressure lever 25, specifically, again, by a pin between two legs 42 of the pressure lever 25.

The pressure lever 25 is forced by the spring 27 in an anticlockwise direction, as seen with reference to Fig. 4 and 6. Clearly, the pressure lever 25 thus always abuts the eccentric 20, whereas this need not necessarily be the case for the supporting arm 18; cf. Fig. 6. In this respect, the pressure lever 25 interacts with the spring 27 in the manner of a shock absorber. The movement of the additional castor 1 on the floor, that is to say in the lowered position, can thus be compensated for and damped (in respect of movements in the vertical direction).

More specifically, one end of the compression spring 27 is accommodated in a receiving cavity 28 in the pressure lever 25. The other end of the spring 27 is positioned in a receiving cavity 29 in the cover 37 of the recess 36 in the mounting plate 10.

As can also be seen from Fig. 2 and 3, a sensor 30 is arranged laterally on the supporting arm 18. The sensor 30 may be, for example, an inductive proximity sensor. A connection cable 31, which is necessary for the sensor 30, is attached on the additional-castor 1 side of the sensor 30. This connection cable 31, furthermore, is routed through a hole 32 extending in parallel with the mounting plate

10. The sensor 30 is arranged level with the transverse connection 13 (see Fig. 4 and 6).

As can likewise clearly be seen in Fig. 2 and 3, a stop pin 33, extending from the frame wall 6′, projects into the gap between the two frame walls 6, 6′. It can clearly be seen in Fig. 4 that the stop pin 33 prevents the frame 5 from pivoting too far in the clockwise direction. In the release position, the lateral surface of the stop pin 33 strikes against the surface of the mounting plate 10 and thus limits the pivoting path of the frame 5.

The shafts 7, 21 are preferably accommodated by ball bearings, which have not been shown in the drawings. The ball bearings here are positioned in receiving holes in the frame walls 6, 6′ of the frame 5.

The operation of the additional castor 1 according to the invention will be described in more detail below:

In Fig. 1 to 4, the additional castor 1 is located in the release position. The additional castor 1 is limited towards the release position by the stop pin 33, which strikes against the mounting plate 10. The additional castor 1 is spaced apart from the floor 34.

If the assistance of the additional castor 1 is then required, a directional switch can be used to select the drive direction of the additional castor 1, and then a push button can be used to move the additional castor 1 into its floor-contact position (Fig. 6). Actuation of the button starts the pivot drive 23, such that the eccentric 20 is moved from the position in Fig. 4 into the position in Fig. 6. In Fig. 4 (release position), the region having the greatest extent (the spacing between the outer circumference of the eccentric disc and the centre point of the eccentric axis) of the eccentric 20 abuts the annular body 19 of the supporting arm 18. The annular body 26 of the pressure lever 25 abuts the eccentric 20 and is spaced apart in this case from the axis of symmetry of the shaft 21 by a considerably smaller extent than the annular body 19, specifically in a circumferential region

which is located in the vicinity of, or at an extremely small spacing from, the eccentric axis. Fig. 5 shows an intermediate position. In Fig. 6, the eccentric 20 has been moved in the anticlockwise direction by means of the pivot drive 23. In this position (floor-contact position), the region having the greatest extent of the eccentric 20 abuts the annular body 26 of the pressure lever 25. The shaft 21 is then spaced apart from the annular body 19 by a considerably smaller extent, although the eccentric 20 and the annular body 19 are preferably not in contact. The spacing which remains there, and is also illustrated, between the outer circumference of the eccentric 20 and the annular body 19 provides for "sprung deflection" of the additional castor 1 if the floor has regions of unevenness. This will be explained in detail below. In the floor-contact position, the spring 27 is compressed to a greater extent than in the release position. This achieves high contact pressure between the additional castor 1 and the floor 34. The high contact pressure also makes possible good traction of the additional castor 1 on floors which provide little grip, for example after cleaning. Proceeding from Fig. 4 and 6, the spring 27 and the pressure lever 25 move the frame 5, together with the additional castor 1, in the anticlockwise direction about the pin 11. In Fig. 6, the additional castor 1 has been pushed onto the floor 34 by the force of the spring 27. In this floor-contact position, the eccentric 20 is spaced apart by a certain extent from the annular body 19 of the supporting arm 18. This achieves "sprung deflection" of the additional castor 1 such that, if the floor 34 has regions of unevenness, the spring 27 can move the additional castor 1 further in the anticlockwise direction, such that the additional castor 1 is always in contact with the floor. The spring 27 compensates for the regions of unevenness in the floor 34. Once the additional castor 1 has been moved into the position according to Fig. 6, the control device activates the drive motor 9 of the additional castor 1, such that said drive motor can slowly start operating the additional castor 1. A person who is moving the hospital bed 3 is then assisted by the additional castor 1 for as long as the person actuates the push button. If the push button is released, the additional drive is withdrawn by the drive motor 9 and the pivot drive moves the eccentric 20 into the position as shown in Fig. 4. Here, the eccentric 20 runs on the annular body 19 and increases the spacing between the axis of

the annular body 19 and the axis of the shaft 21. The frame 5 is pivoted about the pin 11 towards the release position.

It is also preferred for assistance by the additional castor 1 to be provided only until a predetermined power level of the storage battery has been reached. When this energy level is reached, the control device switches off the drive motor 9 for the additional castor 1. However, the energy level is still sufficient for the additional castor 1 to be moved back again, by means of the pivot drive 23, into its release position. Important functions of the hospital bed 3 are thus maintained.

As can be seen in Fig. 4 and 6, the different positions of the additional castor 1 also give rise to different spacings between the transverse connection 13 and the supporting arm 18, on which the sensor 30 is also arranged. Owing to the different spacings, the control device can derive the position of the additional castor 1 by means of the sensor 30. The transverse connection 13 is moved in proportion with the movement of the additional castor 1.

**Patentkrav**

1. Hjælperulle med en fast ramme, hvorved hjælperullen er lejret i den faste ramme og er indrettet til sammen med rammen (5) at kunne hæves eller sænkes ved svingning i forhold til et chassis, hvorpå den er anbragt, hvorved der endvidere er tilvejebragt en på rammen fastgjort drivmotor (9) til hjælperullen, og et separat svingningsdrev (23) til hævningen og sænkningen af hjælperullen (1), hvorved den kompakte konstruktion af enheden af rammen (5), drivmotoren (9) og hjælperullen (1) er fordelagtig med henblik på en styrkelse af en eksisterende sygehusseng eller uafhængigt heraf, **kendetegnet ved,** at det separate svingningsdrev (23) er fastgjort i det store og hele på rammen (5) og svinger sammen med denne.

2. Hjælperulle ifølge krav 1, **kendetegnet ved,** at svingningsdrevet (23) ved hjælp af en ekscenter (20) bevæger rammen (5) i forhold til chassiset (2), hvorpå ekscenteren (20) også er understøttet.

3. Hjælperulle ifølge krav 2, **kendetegnet ved,** at ekscenteren (20) endvidere samvirker med en fjeder (27), hvis anden ende forstøtter sig på chassiset (2).

4. Hjælperulle ifølge krav 3, **kendetegnet ved,** at fjederen (27) er en trykfjeder, som forspænder rammen i den nedsænkede stilling.

5. Hjælperulle ifølge et af kravene 3 eller 4, **kendetegnet ved,** at fjederen (27) påvirker ekscenteren (20) ved hjælp af en trykstang (25), som er påhængslet en på chassiset værende fast aksel (11).

6. Hjælperulle ifølge et af kravene 2 til 5, **kendetegnet ved,** at ekscenterens (20) understøtning på chassiset (2) er realiseret ved hjælp af en fast støttearm (18).

7. Hjælperulle ifølge krav 6, **kendetegnet ved,** støttearmen (18) strækker sig inden for rammen (5).

8. Hjælperulle ifølge et af de foregående krav, **kendetegnet ved,** at der er tilvejebragt en montageplade (10), hvormed rammen (5) er svingbart bevægeligt forbundet, hvorved montagepladen (10) er fast forbundet med chassiset (2).

9. Hjælperulle ifølge krav 8, **kendetegnet ved,** at støttearmen (18) er en del af montagepladen (10).

10. Hjælperulle ifølge et af kravene 8 eller 9, **kendetegnet ved,** at trykstangen (25) er påhængslet samme aksel (11), som forbinder montagepladen (10) med rammen (5).

11. Hjælperulle ifølge et af kravene 2 til 10, **kendetegnet ved,** at rammen (5) består af to over for hinanden beliggende rammevægge (6, 6'), i hvis længdeudstrækning hjælperullens (1) og ekscenterens (20) aksler (7, 21) er lejret efter hinanden.

12. Hjælperulle ifølge krav 11, **kendetegnet ved,** at rammevæggene (6, 7) endvidere og/eller ud over akselen (7, 21) også er forbundet med hinanden ved hjælp af en ekstra tværforbindelse (12, 13).

13. Hjælperulle ifølge et af kravene 5 til 13, **kendetegnet ved,** at rammen (5) er forbundet ved hjælp af akslen (11).

14. Hjælperulle ifølge et eller flere af de foregående krav 2 til 13, **kendetegnet ved,** at rammen (5) består af to over for hinanden beliggende rammevægge (6, 6'), og at svingningsdrevet (23) til ekscenteren (20) er anbragt imellem rammevæggene (6, 6').

15. Hjælperulle ifølge et af de foregående krav, **kendetegnet ved,** at rammen (5) består af to over for hinanden beliggende rammevægge (6, 6'), og at drivmotoren (9) og/eller et drev (8) til hjælperullen (1) er anbragt udvendigt på en af rammevæggene (6').

Fig. 1

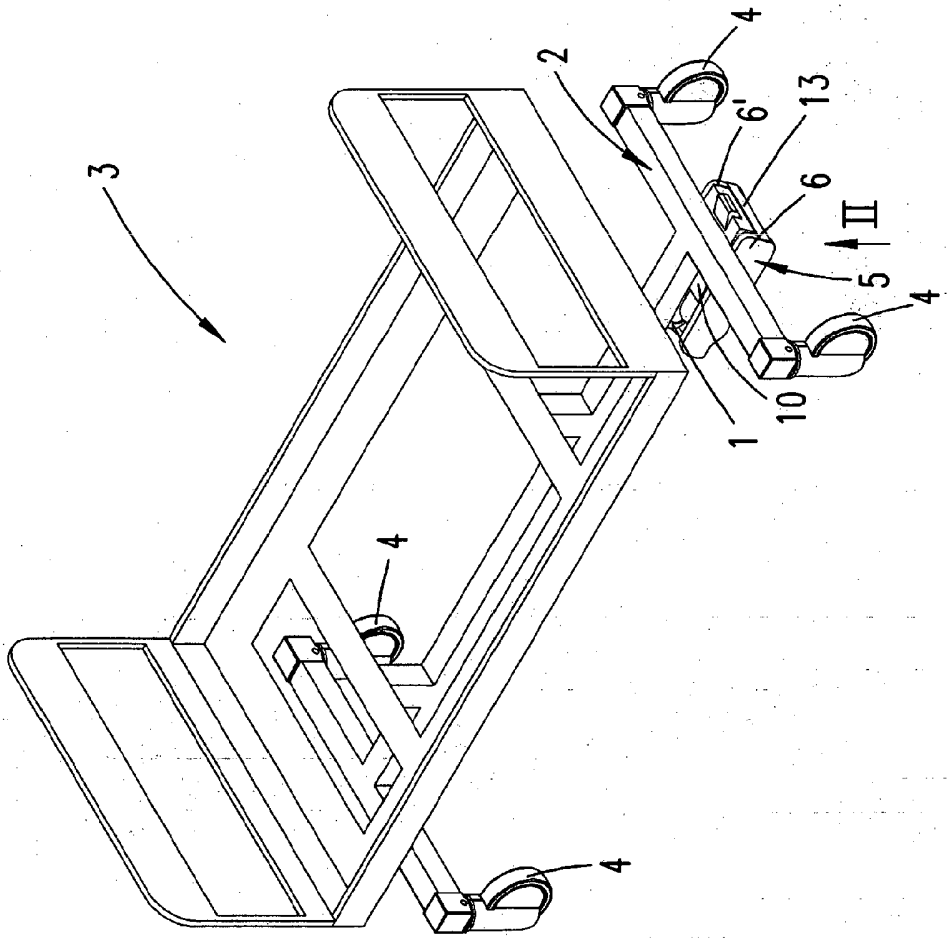
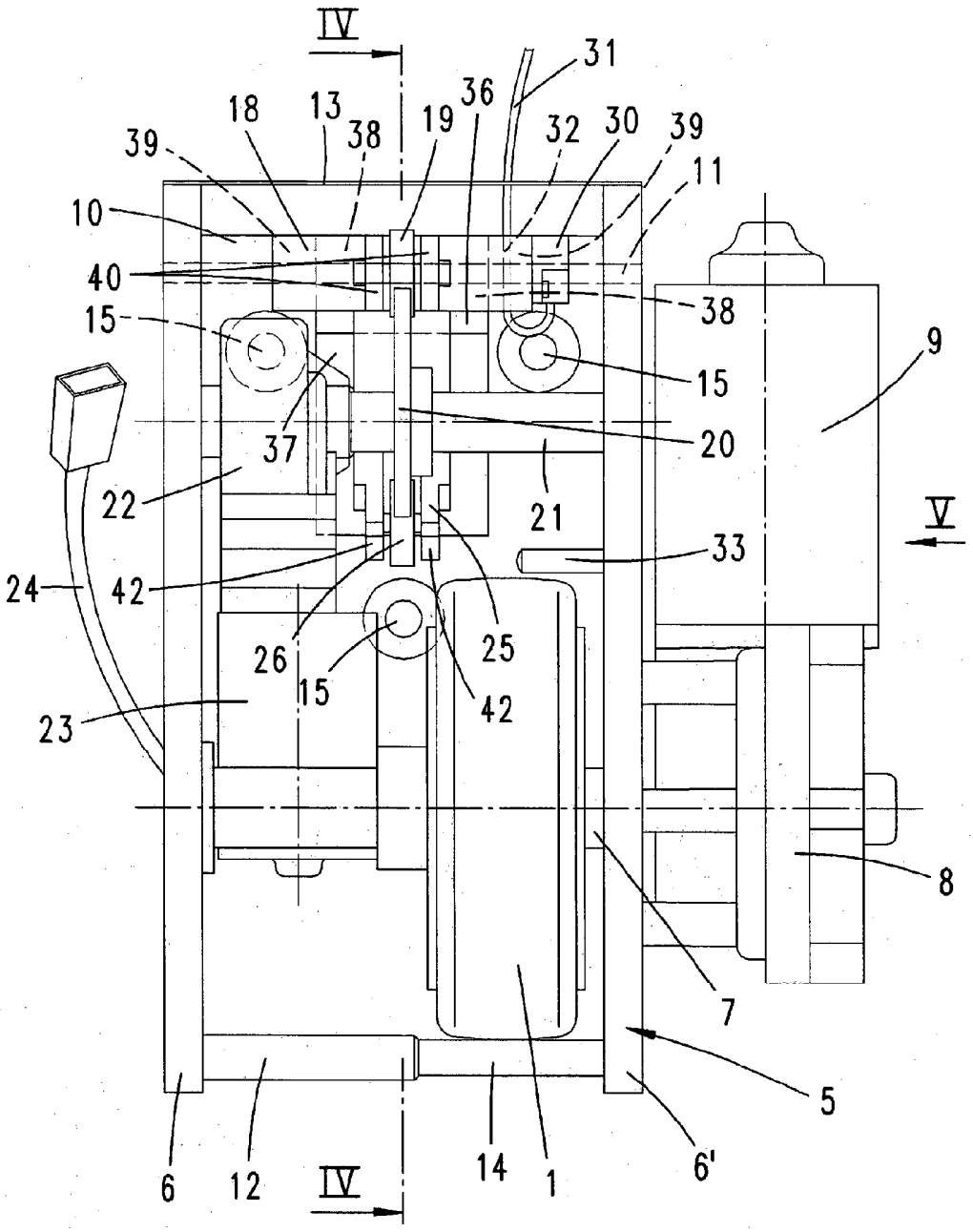


Fig: 2


IV
31
36
18
13
19
32
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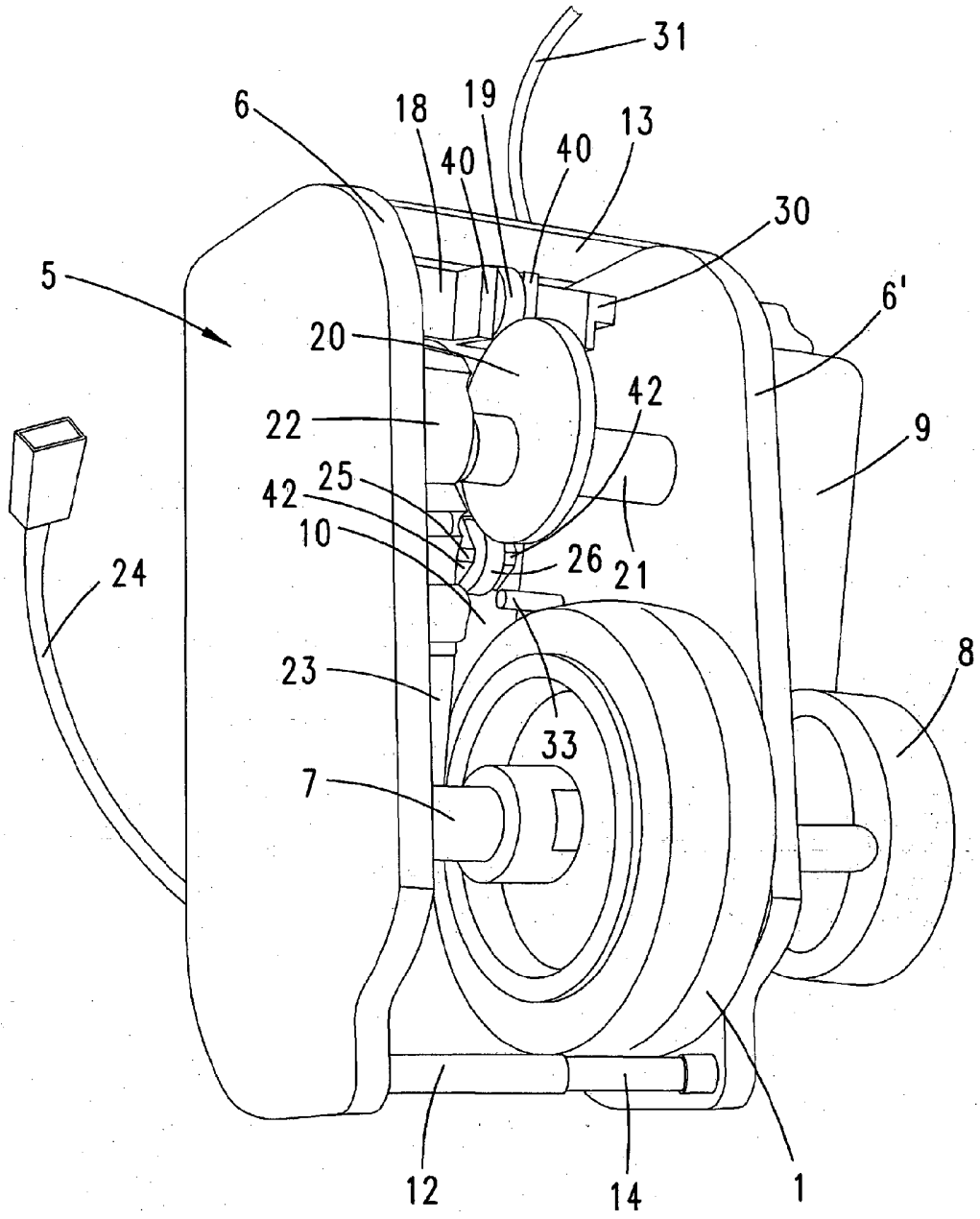
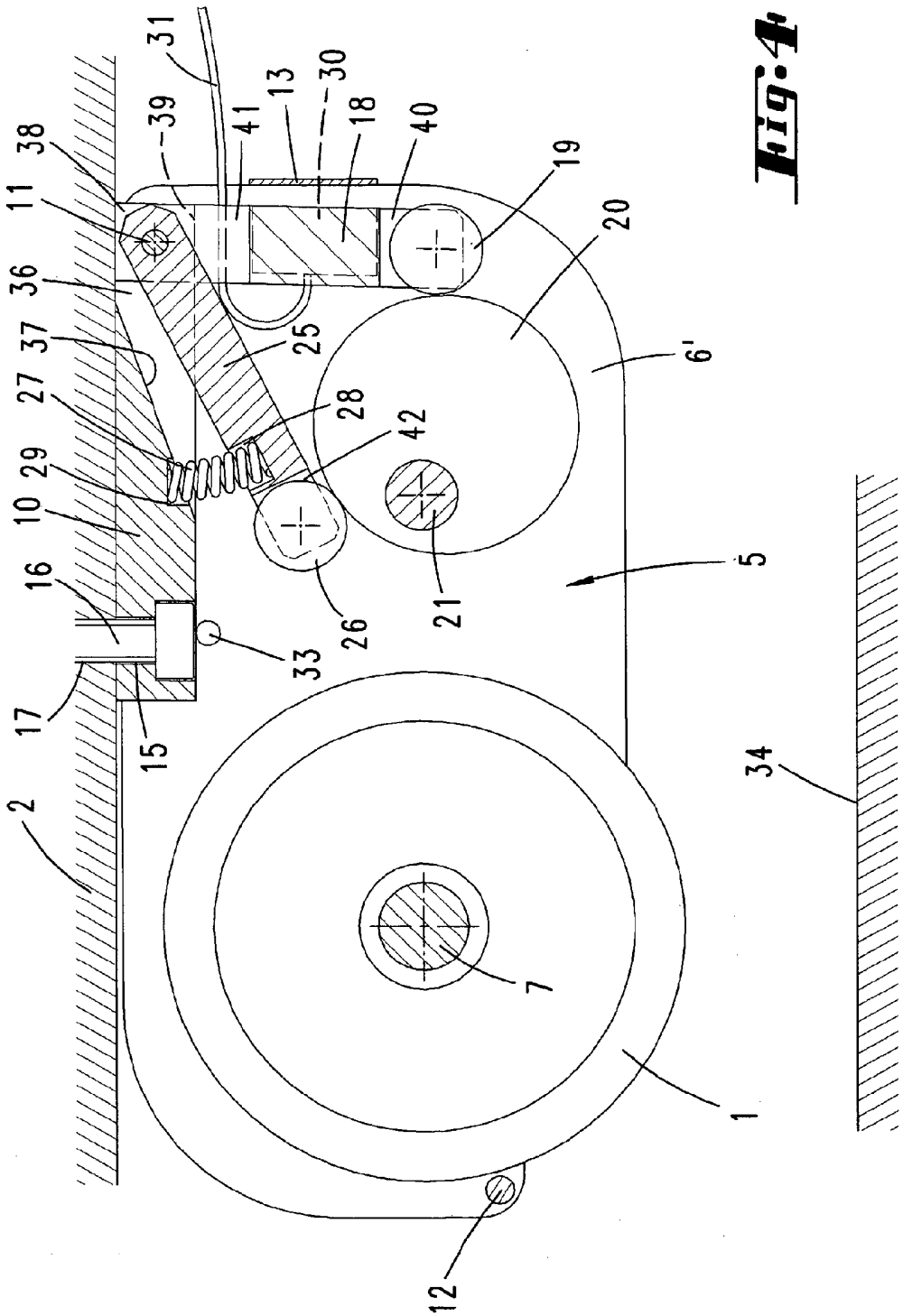
39
39
38
11
10
40
38
15
9
15
37
20
22
21
V
33
24
42
26
25
15
42
23
8
7
5
6
12
IV
14
1
6'

Fig: 3




31
39
41
13
30
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40
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36
37
25
6'
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28
42
29
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16
26
21
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17
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34
2
7
1
12

Fig.4

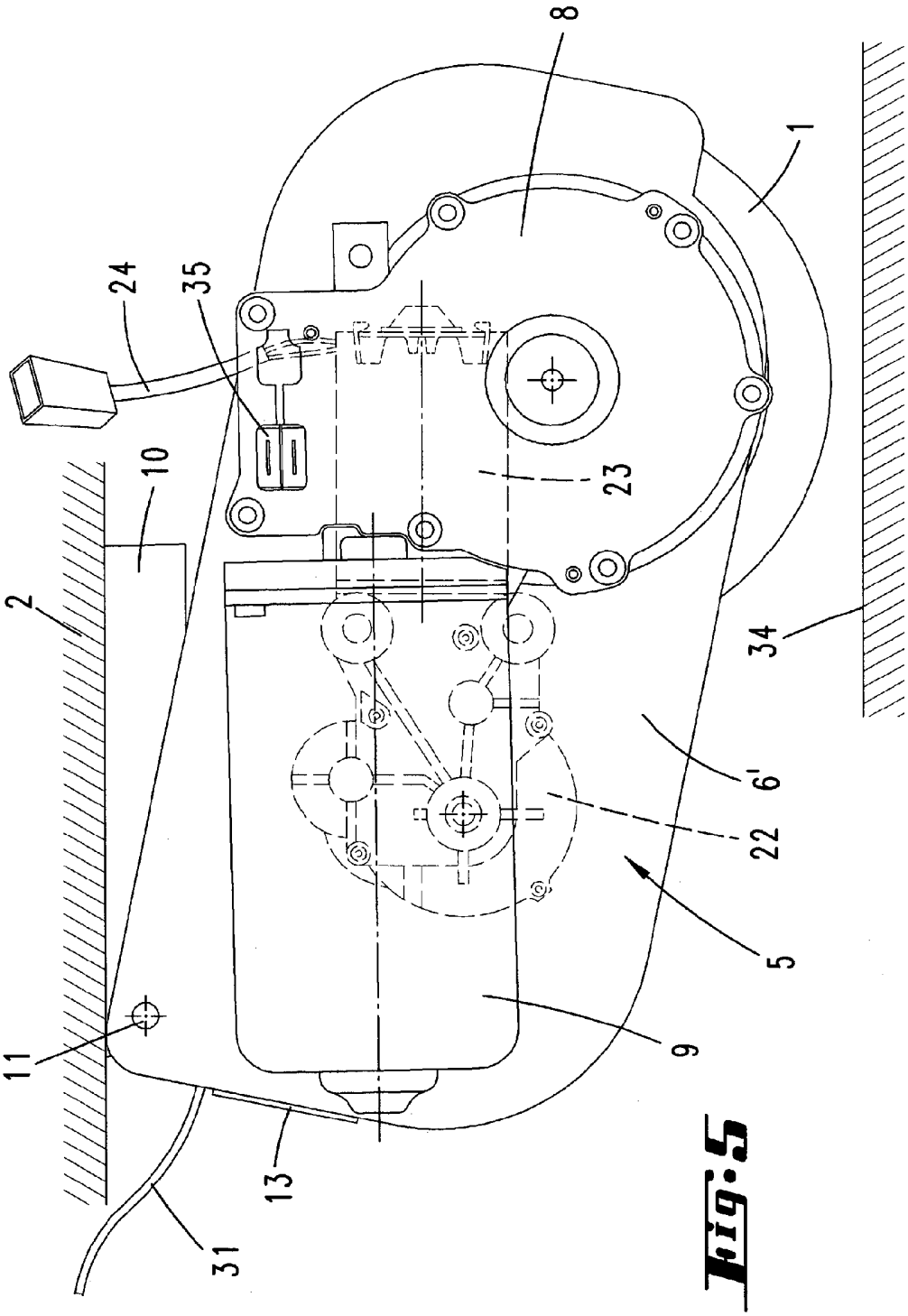
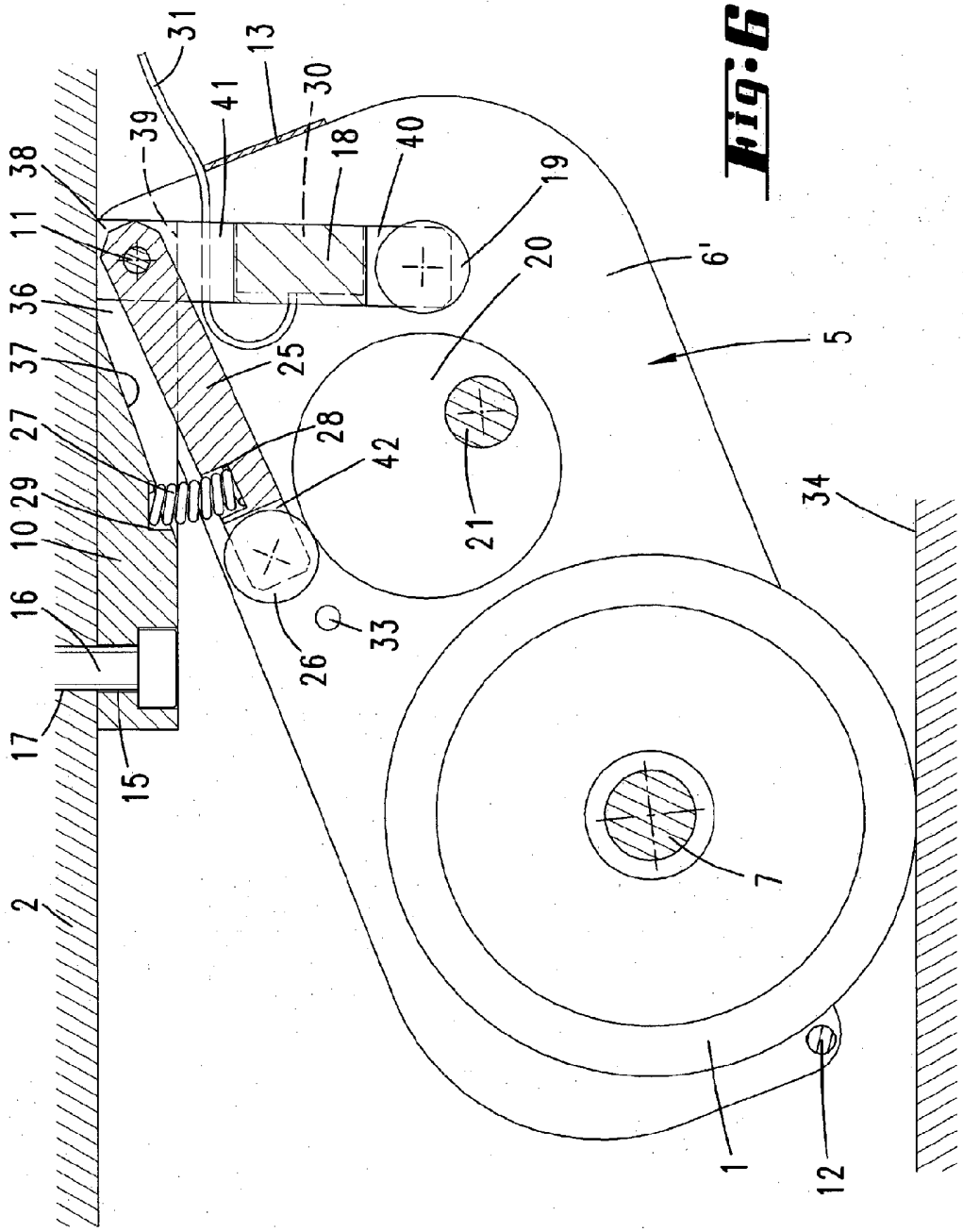



Fig.5


31
13
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18
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6'
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42
29
21
34
10
16
26
33
17
15
2
7
1
12

Fig. 6