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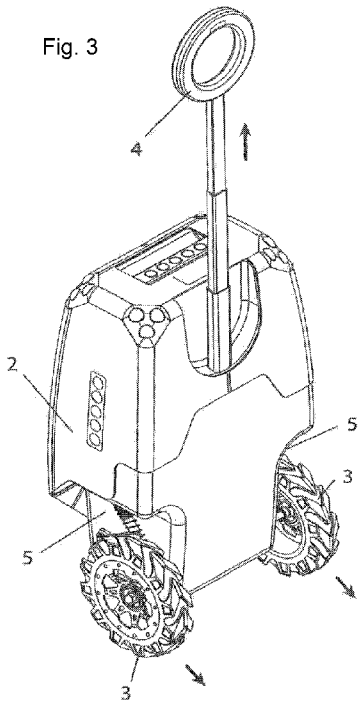
(54) **Title:** IMPROVED TYPE OF TROLLEY WITH EXTRACTABLE WHEELS

Fig. 3



(57) **Abstract:** A trolley is provided, comprising a body (2), a handle (4) and wheels (3), with a suspension system for cushioning the wheels (3) along an axis (X) transverse to the axis of the hub of those same wheels (3), in which the aforementioned suspension system comprises a telescopic piston on which a spring is inserted which serves to push the wheels (3) from the retracted position to the extracted position in relation to the body (2). The trolley also has the advantage of providing cushioned wheels, which reduces the noise of the trolley and facilitates its transport even on heavily rugged terrain and on stairs.

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IMPROVED TYPE OF TROLLEY WITH EXTRACTABLE WHEELS

The present invention relates to an improved trolley equipped with extractable wheels of the type specified in the preamble of the first claim.

The invention is a trolley with extractable wheels, suitable for facilitating transport.

These current trolleys are equipped with a mechanism specifically designed to extract the wheels from the body and retract them. However, this mechanism has the disadvantage of making the structure of the trolley significantly more complicated, leading to a greater risk of something braking and an increased overall product cost.

Traditional trolleys also have wheels that are rigidly fixed to the relative supports on the body, which produce a lot of noise when running on irregular and uneven surfaces, and even lead to the wheels breaking.

The actual trolleys are also designed simply for the transport of objects only, lacking crucial and useful accessories, such as lighting of the handle in poor lighting conditions and a visual indication of the load weight.

In this situation, the technical task underlying the present invention is to invent an improved trolley with extractable wheels capable of substantially alleviating at least some of the aforementioned drawbacks.

It is the goal of this invention to equip a trolley with extractable wheels which, with respect to traditional trolleys, offers the possibility of extracting and retracting the wheels quickly and easily, with reliable and non-auxiliary or additional means compared to the usual methods.

A further goal of the invention is to create a trolley suitable for use on uneven on highly irregular surfaces and where there are steps, in a silent manner and without

the risk of breaking the wheels.

Another goal of the invention is to provide a trolley with extractable wheels, which is equipped with lighting and signalling systems for the transported weight.

Finally, another goal of the invention is to provide a trolley with systems suitable for the operation of devices generally powered by electricity, such as mobile phones and the like.

The technical task and the specified goals are achieved by an improved type trolley equipped with extractable wheels as claimed in the annexed Claim 1.

Preferred technical solutions are highlighted in the dependent claims.

The characteristics and the advantages of the invention are hereafter clarified by the detailed description of preferred executions of the invention, with reference to the attached drawings, in which:

Figure 1 shows in axonometry, the invention with handle in closed position and with wheels completely folded into the body;

Figure 2 shows the trolley as shown in Figure 1 with a partially extracted handle;

Figure 3 shows the trolley as shown in Figure 1 with handle and wheels completely extracted;

Figures 4 to 6 show the trolley as shown in figure 3 from a posterior, lateral and front view respectively;

Figure 7 shows the trolley as shown in figure 5 in section AA;

The figures from **8 to 10** show the mechanism for activating the wheels of the trolley of the invention, in the version with two wheels in the retracted position, respectively with a view to the activating members, with a view of the wheel which carries the mechanism and with a front view of the wheel itself;

Figures 11 to 13 show the mechanism as shown in Figures 8 to 10, viewed in an extracted or exposed position with respect to the body of the trolley;

Figures 14 to 19 correspond to the previous figures from 8 to 13, when the trolley has 4 wheels;

Figure 20 shows the inside of the wheel activating mechanism of the invention, starting from the handle and with the wheel in the retracted position;

Figure 21 shows the detail of the wheel opening mechanism as shown in figure 20;

Figure 22 shows the wheel as shown in figure 20 in the extracted position;

Figure 23 shows in detail the mechanism as shown in figure 22;

Figure 24 shows the details of the mechanism as shown in figure 20, with a view of the wheel suspension system;

Figure 25 shows the details of the mechanism of figure 22, with a view of the aforementioned suspension system;

Figures 26 and 27 show the rotating support system of the wheels of the trolley as shown in figure 14, with a transversal arrangement of the wheels with respect to the body of the trolley;

Figures 28 and 29 show the system as shown in Figures 26 and 27, with wheels arranged parallel to the body;

Figure 30 shows the general electric circuit mounted on the trolley of the invention;

Figure 31 shows the location of the dynamo of the circuit as shown in figure 30 on the trolley of the previous figures;

Figures 32 and 33 show the lighting devices of the handle and of the display mounted on the trolley of the invention;

Figures from 34 to 36 show the electrical storage system with relative inputs for powering electronic devices;

The **figures from 37 to 39** show the mechanism used to open the trolley of the invention;

Figure 40 shows the trolley of the previous figures in the condition of use with all four wheels extracted;

Figure 41 shows exploded view of the handle of the trolley of the previous figures, with a view to the projector and LED lighting system; and

Figures 42 and 43 show the handle as shown in Figure 41 from the front and side respectively.

The **figures from 44 to 46** show the mechanism for activating the wheels of the trolley of the invention in the preferred configuration, in the version with two wheels in the retracted position, respectively with a view to the activating members, with a view of the wheel which carries the mechanism and with a front view of the wheel itself;

Figures 47 to 49 show the mechanism as shown in Figures 44 to 46, viewed in an extracted or exposed position with respect to the body of the trolley;

Figure 50 shows the complete extraction mechanism for the large and small wheel of the trolley when the invention is in the retracted position;

Figure 51 shows the complete extraction mechanism of the large and small wheel of the trolley when the invention is in the extracted position;

The **figures from 52 to 53** correspond to the previous figures from 44 to 49, when the trolley is equipped with four wheels in the retracted position;

The **figures from 54 to 55** correspond to the previous figures from 44 to 49, when the trolley is equipped with four wheels in the retracted position;

Figure 56 shows the details of the mechanism as shown in figure 51, with a view of the wheel suspension system in a retracted position;

Figure 57 shows the details of the mechanism of figure 51, with a view of the aforementioned suspension system in an extracted position;

Figure 58 shows an axonometric view of the wheel-pulling mechanism of a trolley according to the invention in a preferred configuration with the dynamo detail;

Figure 59 shows the inside of the wheel drive mechanism of the invention, starting from the handle and with the wheel in the retracted position;

Figure 60 shows the wheel as shown in figure 29 in the extracted position;

Figure 61 shows the detail of the wheel opening mechanism as shown in figure 59;

Figure 62 shows in detail the mechanism as shown in figure 60;

The **figures 63-64** show the detail of the cable of an extracting mechanism connected to the handle of a trolley in accordance with the invention;

Figure 65 shows an example of configuring buttons on the handle of a trolley according to the invention;

Figure 66 shows a top perspective view of the upper portion of a trolley according to the invention;

Figure 67 shows an example of the arrangement of the projector inside a trolley according to the invention including the image projected on the ground;

The **figures 68-69** show examples of images including any data projected on the ground or on the medium; and

Figure 70 shows a second example of a general electric circuit mounted on the trolley of the invention in a preferred configuration.

In this document, measurements, values, shapes and geometric references (such

as perpendicularity and parallelism), when associated with words such as "roughly/about" or other similar terms such as "almost" or "substantially", are to be understood to a lesser extent as measurement errors or inaccuracies due to production and/or manufacturing errors and, above all, less as a slight divergence from the value, measurement, geometric shape or reference to which it is associated. For example, these terms, if associated with a value, ideally indicate a divergence of no more than 10% of the value.

Moreover, when used, terms such as "first", "second", "higher/upper", "lower", "primary" and "secondary" do not necessarily identify an order, a relationship priority or relative position, but can simply be used to more clearly distinguish between their different components.

The measurements and data reported in this text are to be considered, unless otherwise indicated, as performed in ICAO International Standard Atmosphere (ISO 2533:1975).

With reference to the Figures, the improved trolley equipped with extractable wheels according to the invention is hereinafter referred to with the number **1**.

It is made up of a body **2**, on which two large wheels **3** are mounted and an extractable handle **4**.

When the trolley 1 is in the position shown in figure 2, the handle 4 is partially extracted and the wheels 3 are still in the retracted position inside the body 2. When in the position shown by Figure 3, the handle 4 is instead completely extracted, together with the wheels 3, which move from their position **5** in the body 2 which at the same time as the handle 4 is extracted. When in the positions shown in Figures 4 to 7, the invention is also equipped with two large wheels 3, and two small wheels **6**, arranged on the body 2 as best shown in Figure 40.

The mechanism for extracting the large wheels 3 from the body 2 by operating the handle 4 is shown in Figures 8 to 13. In particular, the mechanism shown in Figure 8 comprises a telescopic piston **7**, the end of which **9** is fixed to the plate **33** in turn integral with the body 2 of the trolley, while at the opposite end **10** it is fixed to a lever **11**. The latter is in turn pivoted about the plate 33 of the body 2 at the end **12** and is fixed, at the other end, to the pin **13** of the wheel 3. A spring 8 is inserted on the piston 7 which serves to push the wheel 3 from the retracted position to the position extracted from the body 2.

Therefore, the mechanism for extracting the large wheels 3 is actuated on command by means of the handle 4 so as to define at least two positions of stable equilibrium respectively in which the wheel 3 is retracted and in which the wheel 3 is extracted with respect to the body 2.

The activation of the extraction mechanism, in particular of the telescopic piston 7, is preferably carried out by means of a button **4a** placed on the handle 4. However, the activation could be carried out automatically following the extraction of the handle 4, for example by means of simple position sensors adapted to detect the position of the handle 4 and connected to a control unit.

The same spring and piston mechanism also serves to cushion the shocks to which the wheel 3 is subjected during the movements of the trolley. The damping effect is achieved along the axis **X** transverse to the hub axis **43** of the same wheels 3 (figures 4 and 5).

In the extracted position of the wheel 3, as shown in Figures 11 to 13, the spring 8 has controlled the complete extension of the telescopic piston 7, which has caused the removal of the end 10 of the piston 7, with consequent rotation of the lever 11 around the pin 12 in the direction of the arrow **F**. As a consequence there is a

corresponding rotational translation of the pin 13 of the wheel 3 along the plane intercepted by the body 2.

The extension of the telescopic piston 7 takes place, for example, through a mechanism in which, in the retracted position, the spring 8 is obstructed and, in order to reach the extracted position, the spring 8 is released. The obstruction can be made by mechanical blocks on the spring 8 or on the large wheels 3 themselves, for example in correspondence with the movable pin 13.

In the preferred configuration, shown in figures 44-58, the extraction mechanism should be linked to a plate **32**. The plate 32 should be a frame which can be fixed onto the plate 33 so that the extraction mechanism can be easily removed.

The extraction mechanism, moreover, preferably comprises auxiliary elements suitable for allowing the transmission of the movement of the large wheel 3 and the small wheel 6. As shown in detail in Figure 57, the mechanism includes, in addition to the piston system 7 and lever 11, an arm **14** equipped with a groove **15** to guide the extremity **16** of lever 11. The arm 14 should be a rigid element, preferably L-shaped or V-shaped, adapted to rotate integrally or proportionally to the lever 11.

In particular, the end 16 of the lever 11 should be readily linked to the arm 14 at the groove 15. In particular, the end 16 should be able move along at least one axis with respect to the arm 14.

In this way, when the lever 11 rotates, the arm 14 will also rotate. In a solid sense it is not meant that the rotation is exactly the same, but simply that the rotation of the lever 11 activates a rotation of the arm 14 and that these rotations occur simultaneously as a consequence of one another.

In detail, the end 16 behaves like a cursor able to move within the groove 15.

Moreover, the arm 14 is therefore also linked to the plate 32 at the end **19** defined

by the angular position of the arm 14 to L or V. At the end 19 a pivot is arranged so as to allow rotation of the arm 14 with respect to the plate 32.

The small wheel 6, which is constrained to the free end of the arm 14, can then pass, together with the large wheel 3, from a retracted position to an extraction position.

In an alternative configuration, shown in the position shown in figures 14 to 19, the movement of the lever 11 also has an effect on the small wheel 6 in a different manner. As shown in particular in Figure 17, the mechanism comprises, in addition to the piston system 7 and lever 11, an arm **14** equipped with a groove **15** which guides the extremity **16** of the stem **17** of the small wheel 6. The arm 14 and the stem 17 of the wheel 6 are furthermore articulated by a further lever **18**, at its ends 19 and 20 respectively. The mechanism uses a spring **21** which joins the stem 17 to the lever 18. When in use, the wheel 6 is retracted into its position 5 in the body 2 and the spring 21 is extended. When instead the wheel 6 is extracted, the spring 21 is not extended as shown in figure 17.

The described re-entry movement of the small wheels 6 could, however, be hampered by the possibility that they may rotate freely around the stem 17, moving into an interference position with the body 2. To avoid this, and as better shown in figures 26 to 29, the wheel movement control mechanism 6 comprises a toothed crown. **35** fixed pivotally to a pin 36 on the stem 17. A similar toothed crown 37 is also provided with the rotating bracket **38** of the wheel 6. The ring gear 37 has a seat **39**, inside which a pivot 40 is housed fixed to the lower end of the stem 17. Two latches 41 complete the mechanism provided on the side of the ring gear 35 facing an arm **42** fixed to the body 2 of the trolley.

When in use, the thrust of the wheel 6 towards the body 2 causes the rotation of the

crown 35 to mesh with the crown 37, with consequent rotation of the wheel 6 in the direction of the arrow F as shown in figure 28, up to the stop of the aforementioned latches 41 on the arm 42. In this position the wheel 6 is placed on the same plane of its location 5 in the body 2, allowing it to retract into the body 2.

In the extraction mechanism, a cable **22** made of a flexible and resistant material is shown in detail, which connects the lever 11, near its end 12, to the end 16 of the stem 17. A cable **23** connecting the lower end **34** of the handle 4 to the end **24** of the lever **25** is also provided.

Figures 20 to 23 show, in more detail, the complete extraction of the handle 4, which involves the pulling of the cable 23 which joins the handle 4 to the end 24 of an L shaped lever 25, which rotates around the pin 26 in turn fixed to the plate 33 of the body 2. The end **27** of the lever 25 also has a cable **28** connected to a pin **29**, which moves in contrast with a spring **30** inside a corresponding hole **31** obtained on the plate 32 which holds the aforementioned lever 25. Then the rotation of the lever 25 around the pin 26 results in the re-entry of the pin 29 into the hole 31 of the plate 32, therefore releasing the lever 11 of the mechanism as shown in figure 8. The pin 29 in the position as shown in figure 24 blocks the movement of the lever 11, which keeps the wheel 3 in a withdrawn position in its position 5 in the body 2.

The actuation of the lever 25 by extracting the handle 4 causes the pin 29 to be recalled and the consequent release of the lever 11, which can then rotate about its end 12 by thrusting the spring 8, which in this way causes the wheel 3 to escape from its position 5 on the body 2. This mechanism is substantially an example of the extraction mechanism and the spring obstruction system 8 and the telescopic piston 7.

In the ideal configuration, the spring obstruction mechanism 8 is much simpler.

The direct link between the arm 14 and the lever 11 allows, in fact, to avoid the use of the cable 22 and makes the structure of the small wheel 6 even more stable. Preferably, the spring obstruction system 8, in this case and as shown in Figures 59-62, comprises only a cable 23 which connects the lower end 34 of the handle 4 to the end 24 of the lever 25.

Also in this case the complete extraction of the handle 4 involves the pulling of the cable 23, as shown in Figures 63-64, for example favoured by the distension of a pre-loaded spring on the closed handle 4, which joins the handle 4 to the end 24 of a L-shaped lever 25, rotating around the pin 26, which in turn is fixed to the plate 33 of the body 2. The end 27 of the lever 25, in this case, is readily linked to the pin 29 in such a way as to move it in a predetermined direction. The pin 29, also in this case, moves in contrast with a spring 30 inside a corresponding hole 31 formed on the plate 32 which holds the aforementioned lever 25. Then the rotation of the lever 25 about the pin 26 results in the re-entry of the pin 29 into the hole 31 in the plate 32, which unlocks the lever 11 of the mechanism as shown in figures 50-51. The pin 29 in the position as shown in figure 24 blocks the movement of the lever 11, which keeps the wheel 3 in a withdrawn position in its position 5 in the body 2.

In any case, the opposite re-entry phase of the wheels 3 and 6 in their position 5 in the body 2 is obtained simply by pushing the trolley on the support plane of the wheels, thereby causing opposite movements with respect to those described above.

According to the invention, the trolley of the preceding figures is also provided with the electric circuit shown in figures 30 to 39.

In particular, as better shown in Figure 31, on the hub 43 of at least one of the wheels 3 of the trolley is a dynamo **44**, suitable for generating the electric charge

current of a battery or an accumulator **45**, fixed to the body 2 of the trolley. An electric cable **46** serves as a link between the dynamo and the rechargeable battery. To this, the battery 45 is connected, by means of an electric cable **47**, with a support **48** for one or more USB ports **49** which can be used to charge mobile phones and other electronic devices **50**. Advantageously, the aforementioned support 48, in its rest position, is housed inside its respective housing **51** in the body 2 of the trolley and can be extracted with a suitable pressure control device, not shown, so as to allow access to the aforementioned port 49.

Advantageously, the trolley of the invention also has LED lighting **52** on the handle 4 as shown in Figures 30 and 32, it should be positioned on the inner surface of the ring-shaped handle 4.

In addition, a chip is also provided **53**, powered by the same battery 45, which is connected with the electric cable **54** to the LED 52 of the handle 4. In this way the LED 52 can be activated whether or not the handle 4 has been extracted or not, lighting up with different colours.

The same handle 4 is also equipped with a projector **55**, which can project on the body 2, for example the weight of the trolley detected by a special sensor **56** mounted on the wheel 3. Advantageously, the surface in view of the aforementioned support 48 is made of a material suitable for reproducing the image **57** projected from the projector 55. However, the image 57 projected by the projector 55 can also be projected outside the support 48 and, therefore, away from the body 2, as shown in Figure 67; in this case the projector 55 is directed to the floor in such a way as to make the image 57 more visible to a user. This solution allows you to enlarge and modify the image 57 in relation to the projection distance between the projector 55 and the floor.

Image 57 can therefore include information relating to the date, time, battery status and all the information received by the sensors on the trolley 1, such as the load weight. A motion sensor can also be placed among the sensors **65**inside the trolley 1.

In general, the projector 55 is therefore capable of projecting the aforementioned data onto an external support, such as a wall or the ground.

The projector 55 can therefore be arranged in various positions, including on the handle of the trolley, or on the upper portion of the trolley or, preferably, on the body 2 of the trolley above one of the large wheels 3.

The handle 4 of the trolley of the invention should also be equipped with a switch **58** to control the projector 55.

According to the invention the chip 53 also has an electrical connection **59** and an electronic push-button panel **60**, which in turn control the activation of a relay **61**, equipped with a tooth **62** coupling and uncoupling with respect to a similar tooth **63** connected to the lid **64** of the trolley, which controls its opening and closing.

The improved trolley equipped with extractable wheels 1 has important advantages. In fact, in relation to the current trolley, it offers the advantage of achieving the movements of the wheels coming out of the body and re-entering it with simple movements, applied directly starting from the handle of the trolley, which means that the device doesn't need any expensive auxiliary devices.

The trolley of the invention also offers the advantage of providing cushioned wheels, which reduces the noise of the trolley and facilitates its transport even on heavily rugged terrain and on stairs. To this end, the dimensions of the wheels are also sufficiently large in diameter, so as to overcome any obstacles or uneven surfaces.

The new trolley also has the advantage of having illuminated parts, suitable for

showing the weight of the trolley and for making parts visible in the dark, such as the extractable handle.

Finally, the new trolley has the advantage of generating, with the movement of the wheels, the energy necessary for the operation and charging of electronic devices such as mobile phones and the like.

The invention is amenable to variations falling within the scope of the inventive concept that is defined in the patent claims.

In this context, all details may be substituted by equivalent elements and the materials, shapes, and sizes may vary greatly.

CLAIMS

1. Trolley of the type comprising a body (2), a handle (4) and the wheels (3), comprising a mechanism for extracting said wheels (3) in the direction of the axis (X) transverse to the axis of the hub (43) of the same wheels (3) and characterised in that said mechanism for extracting said wheels (3) is operated on command with the aforementioned handle (4) so as to define at least two positions of stable equilibrium respectively in which the wheel (3) is retracted and in which the wheel (3) is extracted with respect to the body (2).

2. Trolley according to claim 1, characterised in that said extraction mechanism also acts as a cushioning system,

3. Trolley according to claim 2, characterised in that the cushioning system comprises a telescopic piston (7) on which a spring (8) is inserted which serves to push the wheels (3) from the retracted position to the extracted position outside of the body (2).

4. Trolley according to claim 3, characterised in that the piston (7) has one end (9) attached to the body (2) of the trolley and an opposite end (10) fixed to a lever (11) having an end (12) pivoted on said body (2) and an end (13) fixed to the pin (13) of said wheel (3).

5. Trolley according to claim 1, characterised in that the aforementioned body (2) has housing (5) for the wheels (3) in their retracted position.

6. Trolley according to claim 1, characterised in that additional wheels (6) and a mechanism are provided, which includes, in addition to the piston system (7) and lever (11), an arm (14) with a groove (15) for guiding the end (16) of the lever (11), the arm (14) being easily attached to the lever (11) in such a way as to rotate integrally or proportionally to said lever (11).

7. Trolley according to claim 1, characterised in that it is foreseen additional wheels (6) and a mechanism which includes, in addition to the piston system (7) and lever (11), an arm (14) with a groove (15) for guiding the end (16) of the shank (17) of the wheels (6).

8. Trolley according to claim 7, characterised in that said arm (14) and said shank (17) of the wheels (6) are operated with a separate lever (18), at its ends respectively (19, 20).

9. Trolley according to claim 8, characterised in that it also foreseen a spring (21) which joins said shank (17) to said lever (18), a cable (22) of a flexible and resistant material is also provided for connecting said lever (11) to the end (16) of said shank (17).

10. Trolley according to claim 9, characterised in that it also provided a cable (23) which connects the lower end (34) of the handle (4) to the end (24) of an L-shaped lever (25), which rotates about a pin (26) fixed to said body (2).

11. Trolley according to claim 10, characterised in that said lever (25) has one end (27) fixed to a cable (28) connected to a pin (29) which moves in contrast with a spring (30) in and out of a corresponding hole (31) on the plate (32) which holds said lever (25).

12. Trolley according to claim 11, characterised in that it also provide a toothed crown (35) fixed rotatable to a pin (36) on said shank (17) of the wheels (6), a toothed crown (37) connected to the revolving bracket (38) on the same wheels (6), the toothed crown (37) presents a seat (39),with a pivot (40), rotatably fixed to the lower end of said shank (17), two pawls (41) are also located on the side of the toothed crown (35) facing an arm (42) fixed to the body (2) of the trolley.

Fig. 1

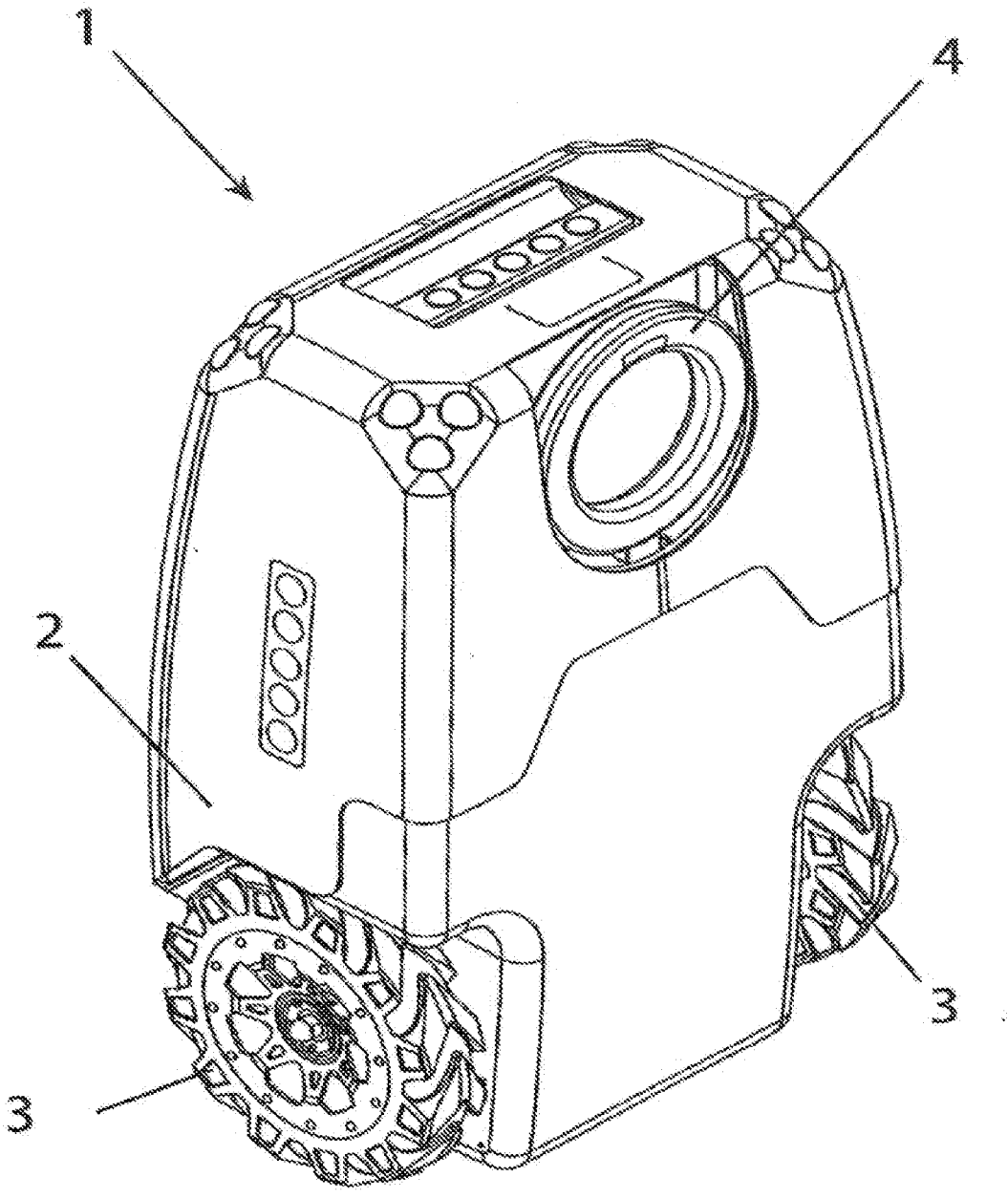


Fig. 2

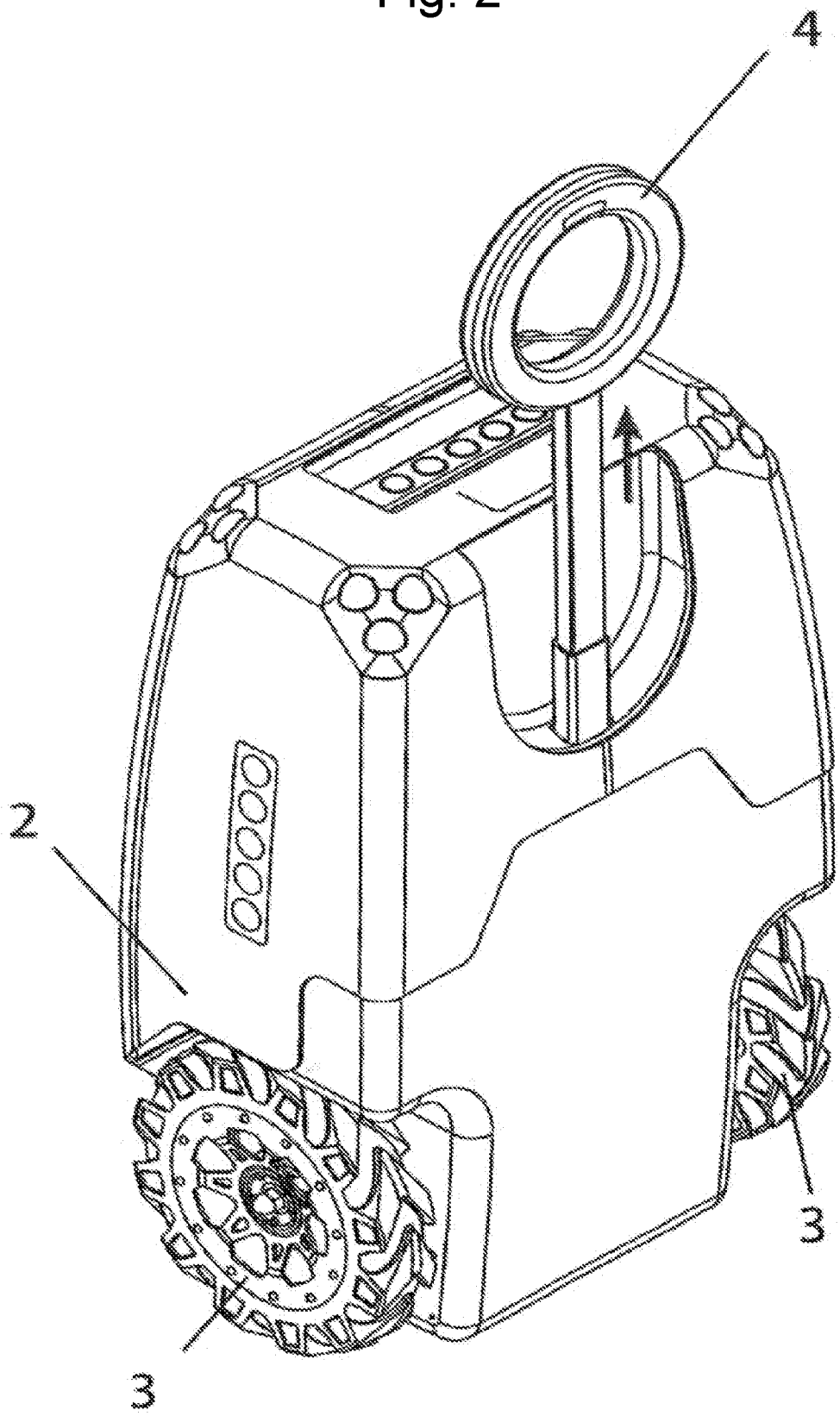


Fig. 3

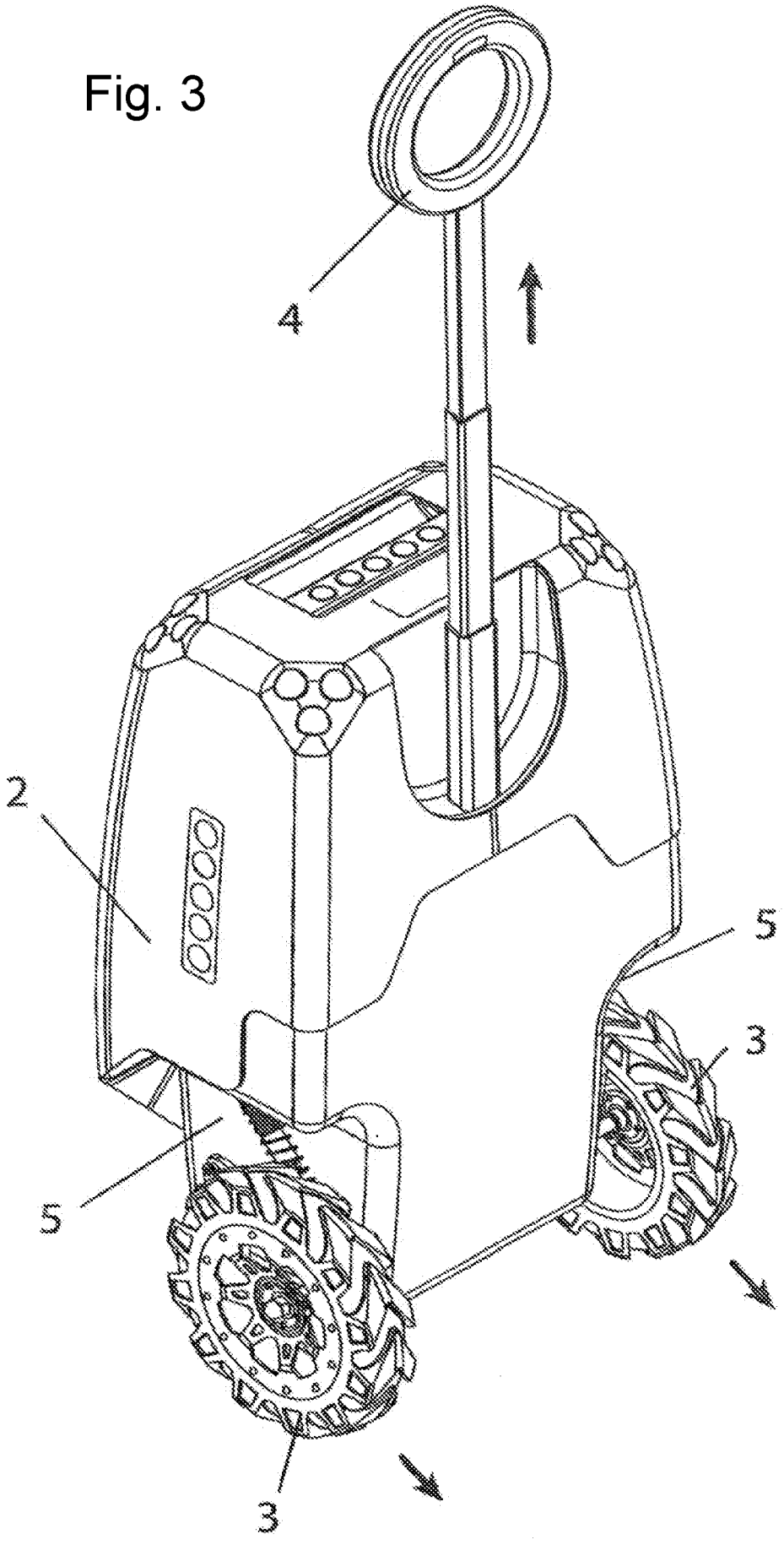


Fig. 4

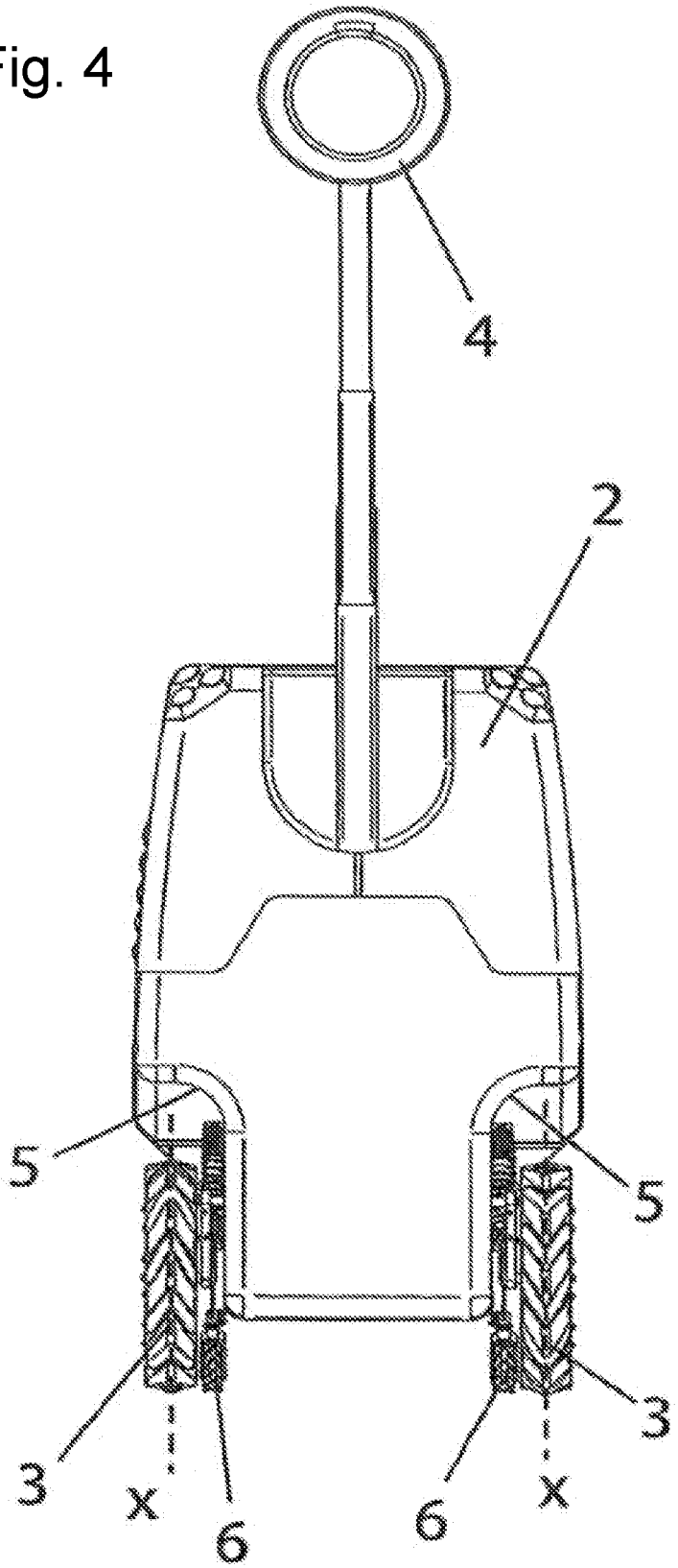


Fig. 5

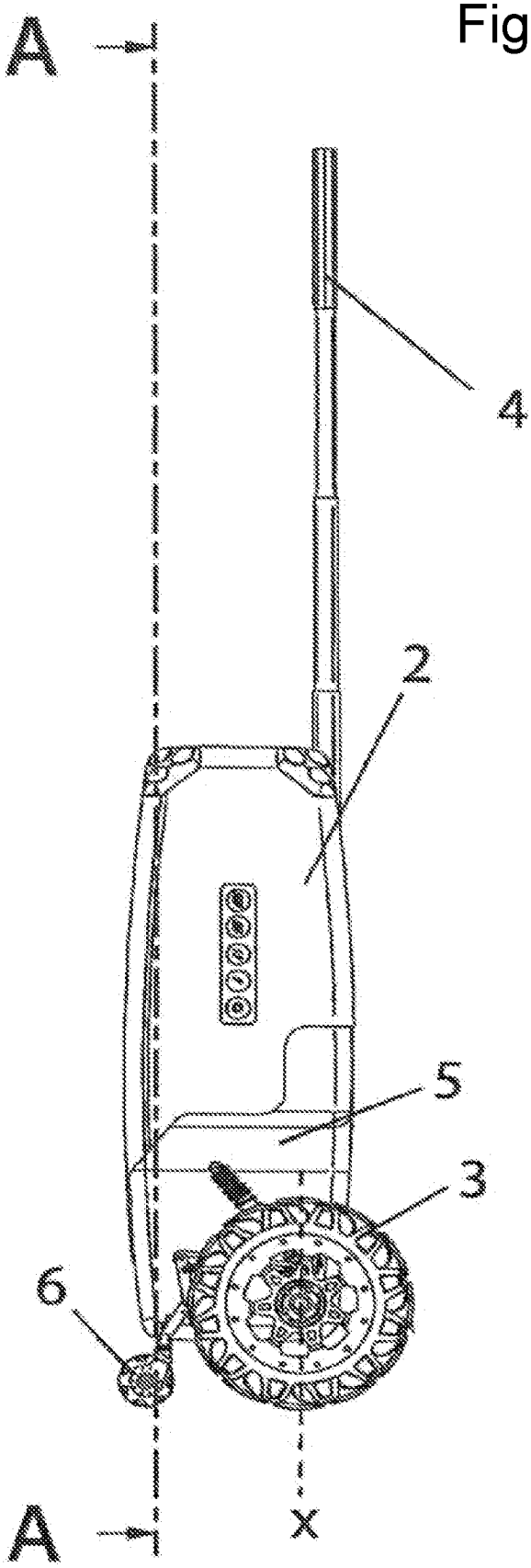


Fig. 6

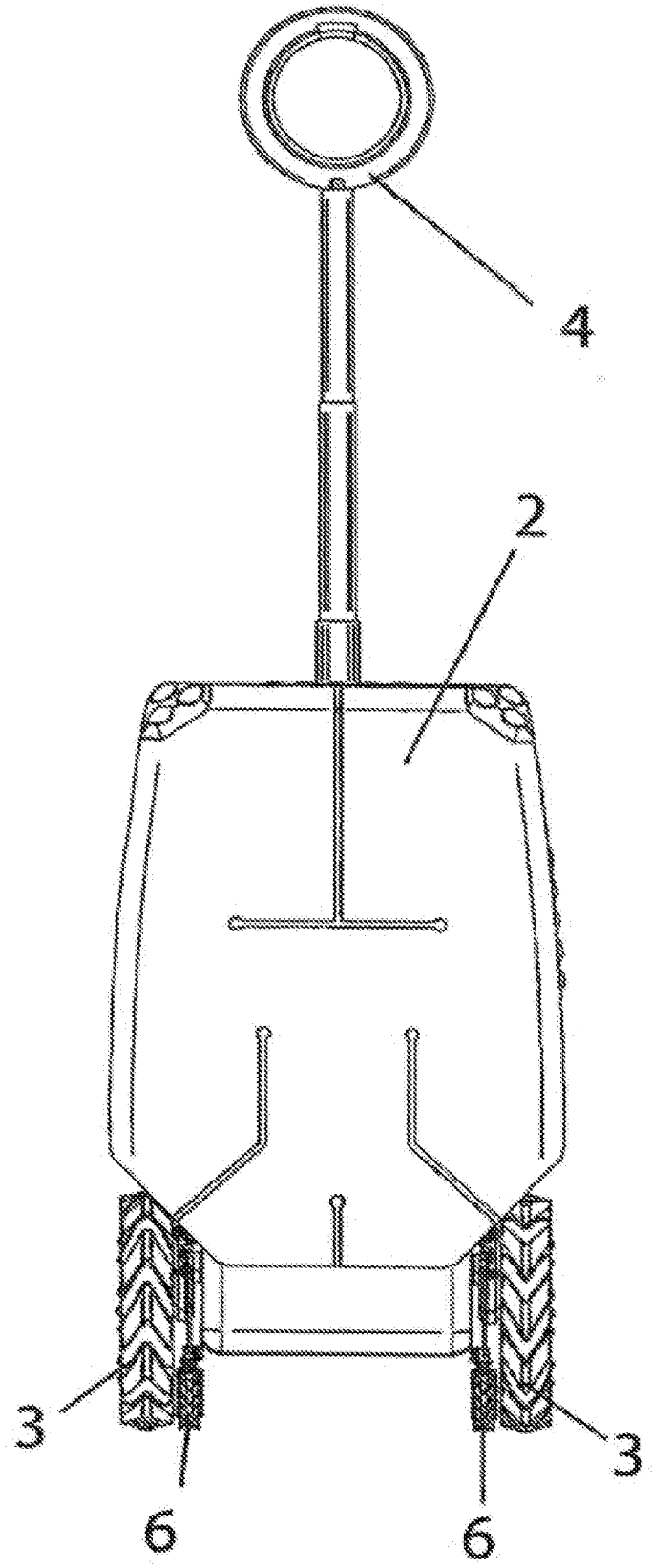
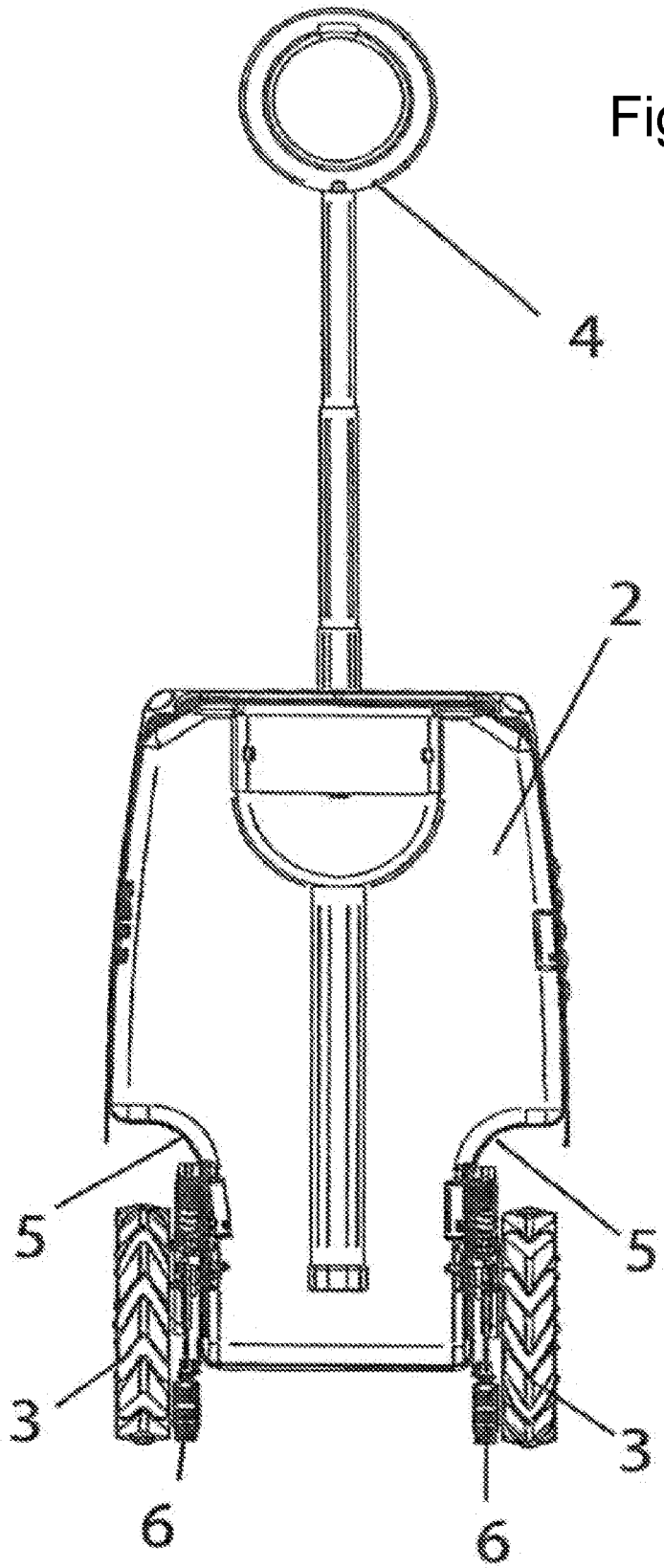


Fig. 7



A-A

Fig. 8

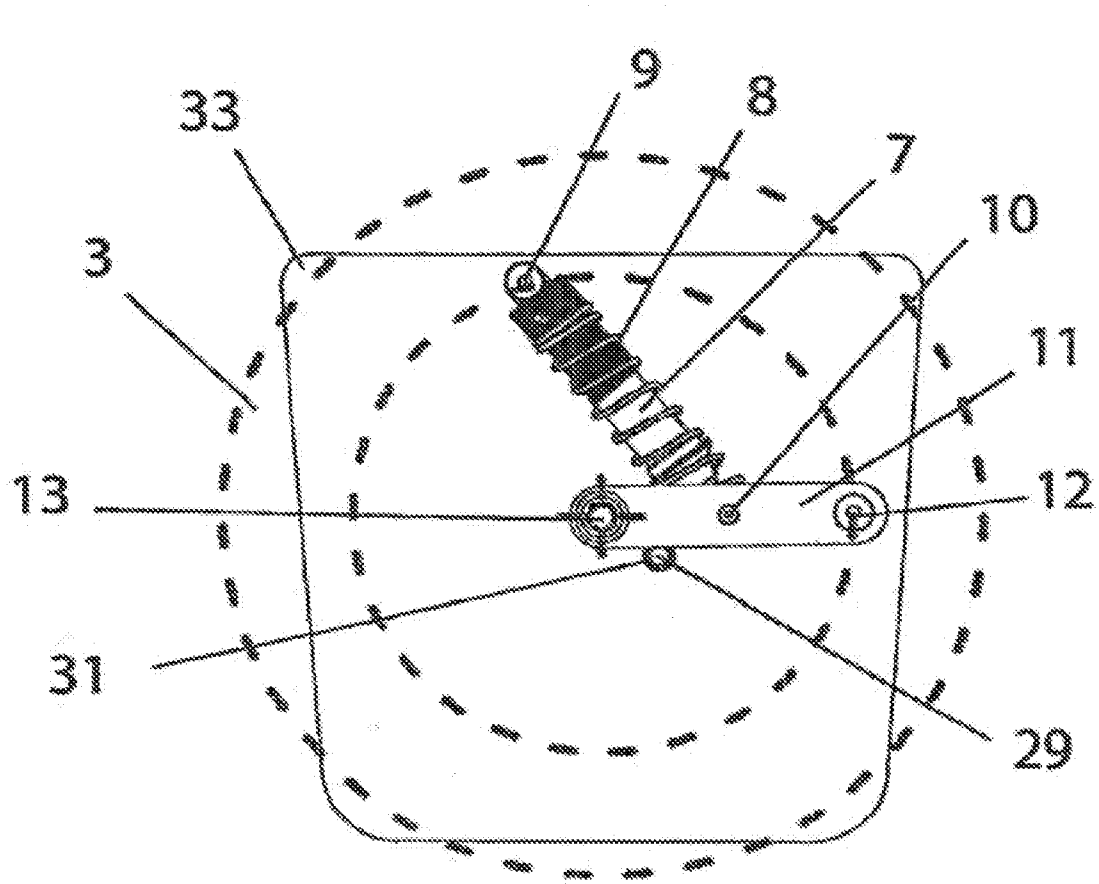


Fig. 9

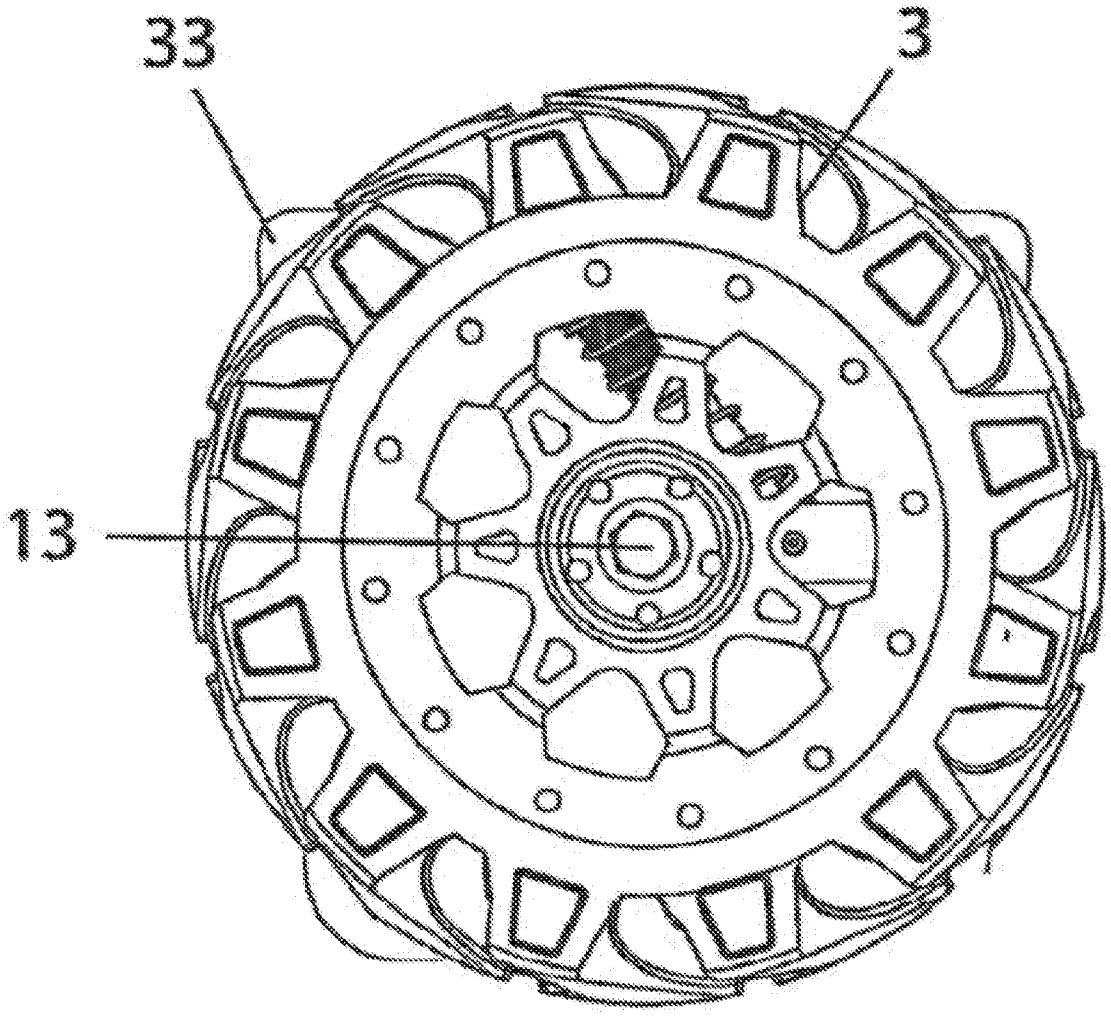


Fig. 10

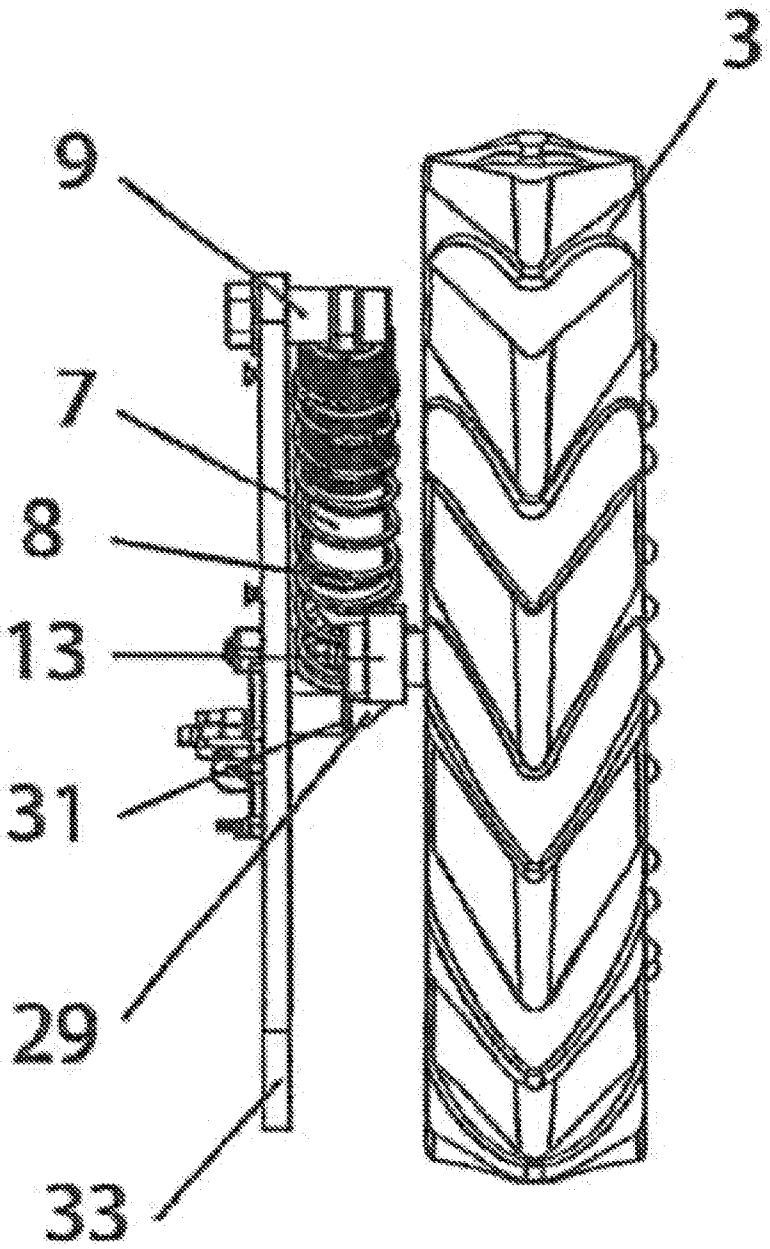


Fig. 11

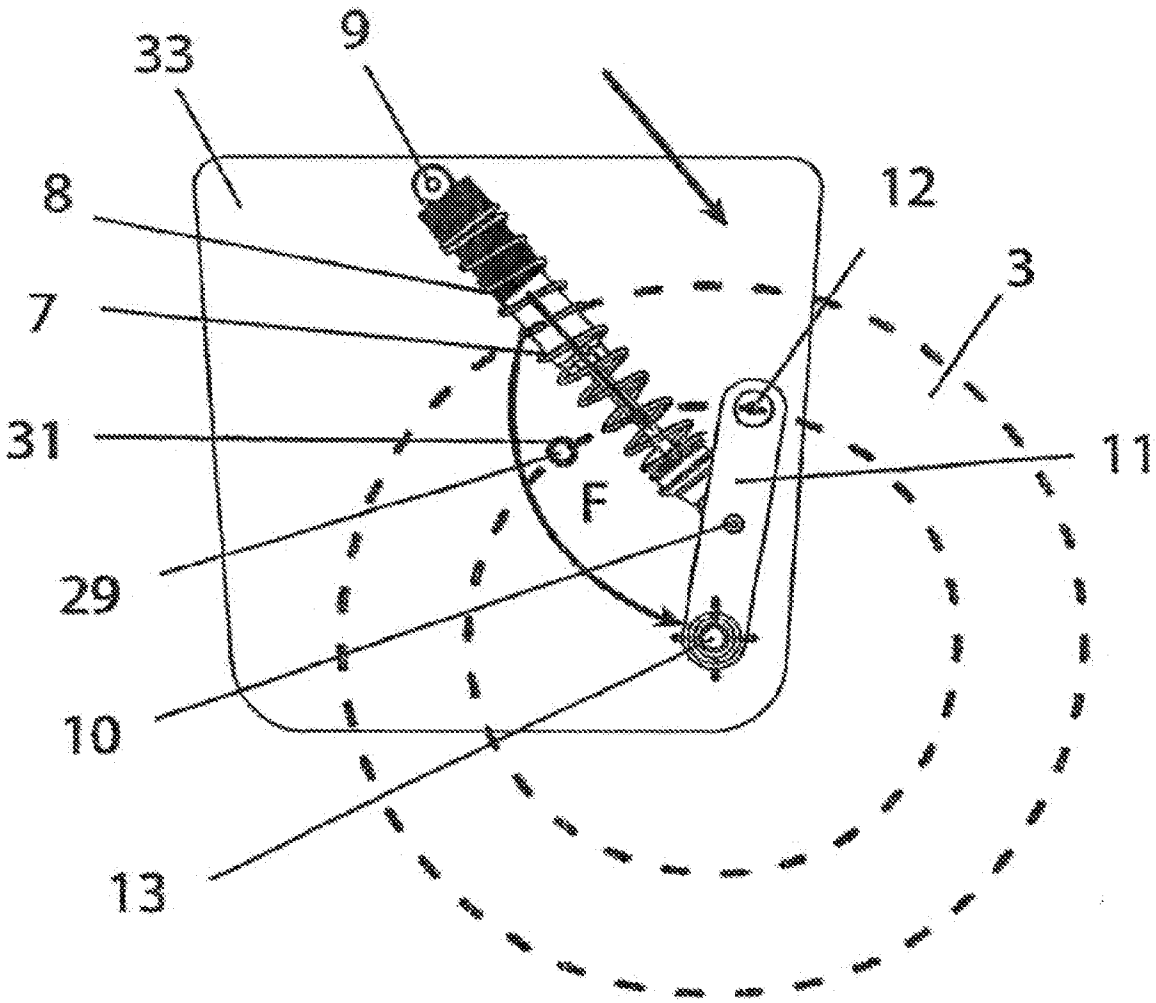


Fig. 12

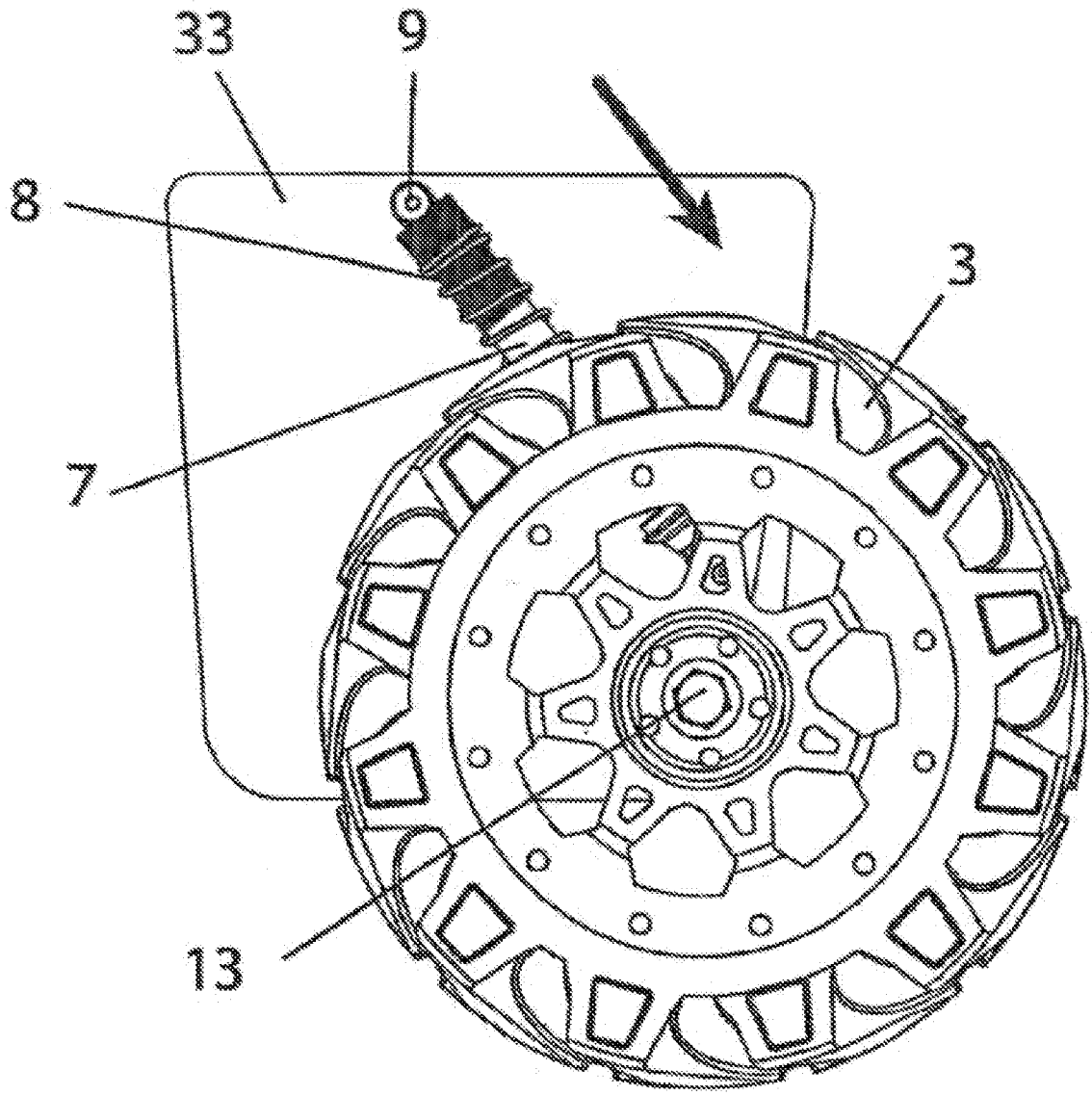


Fig. 13

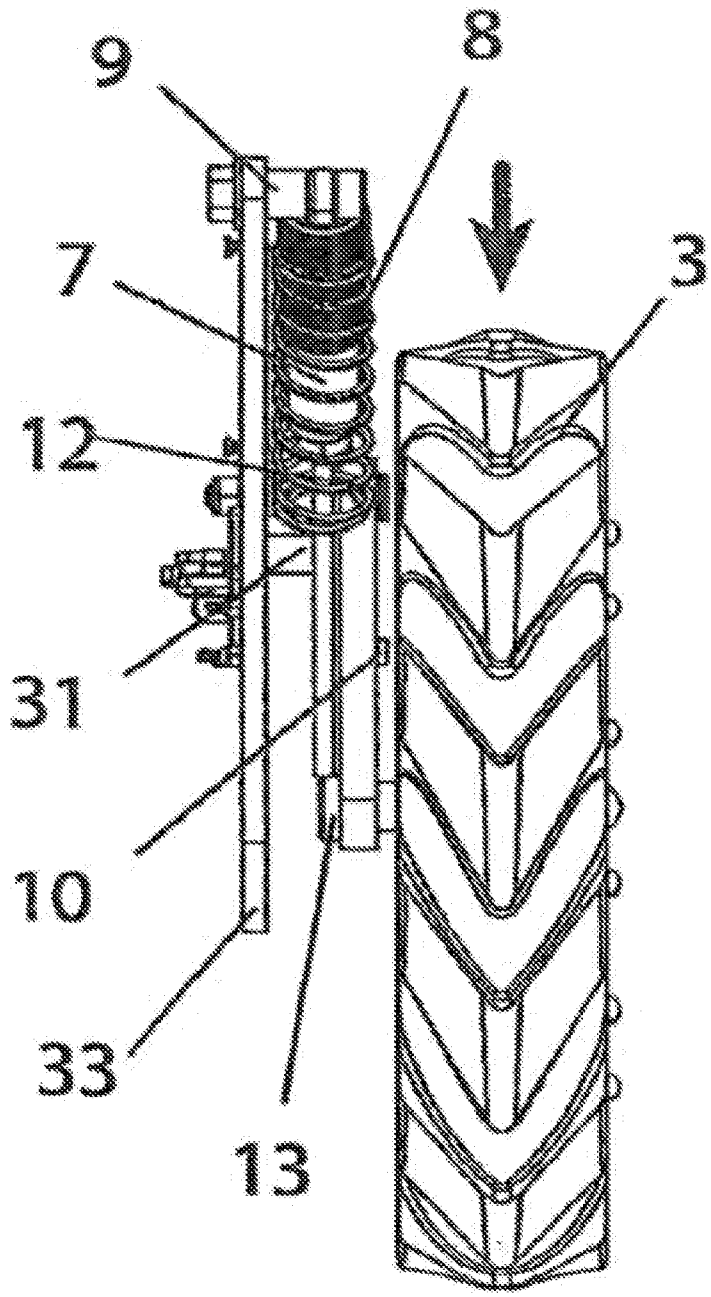


Fig. 14

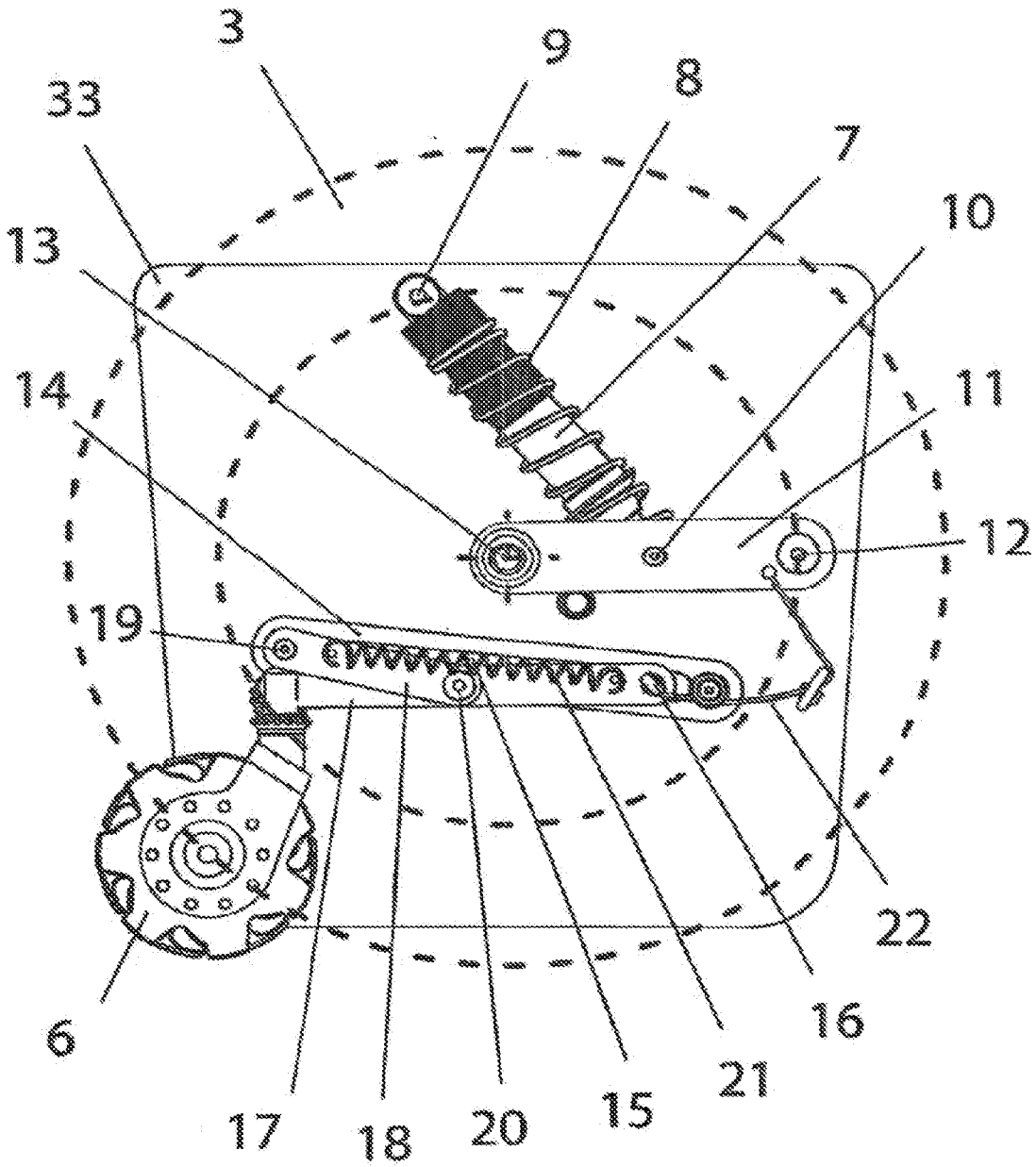


Fig. 15

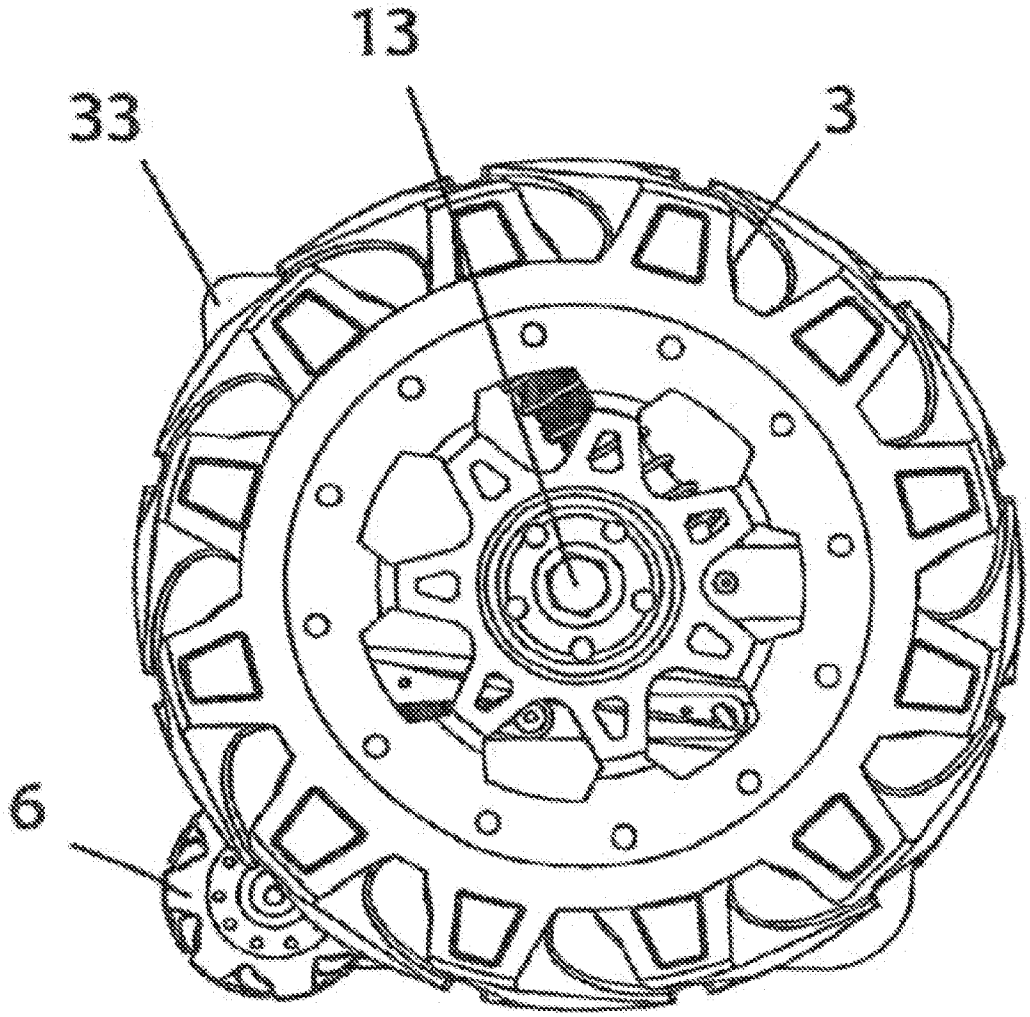


Fig. 16

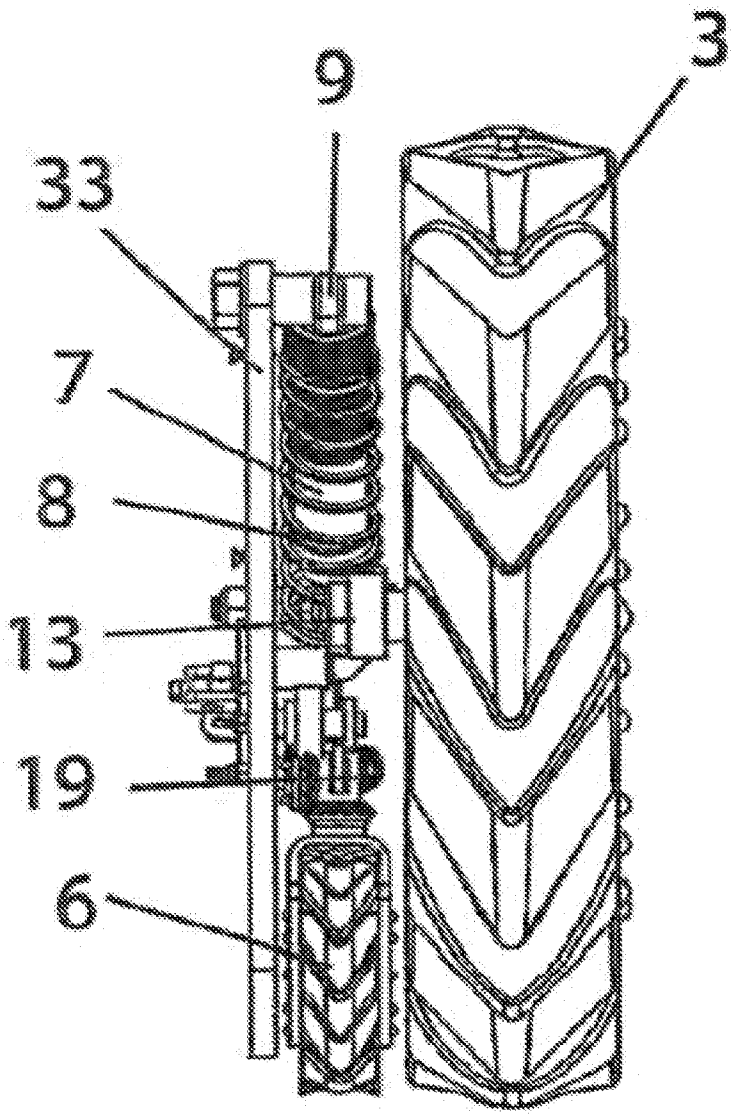


Fig. 17

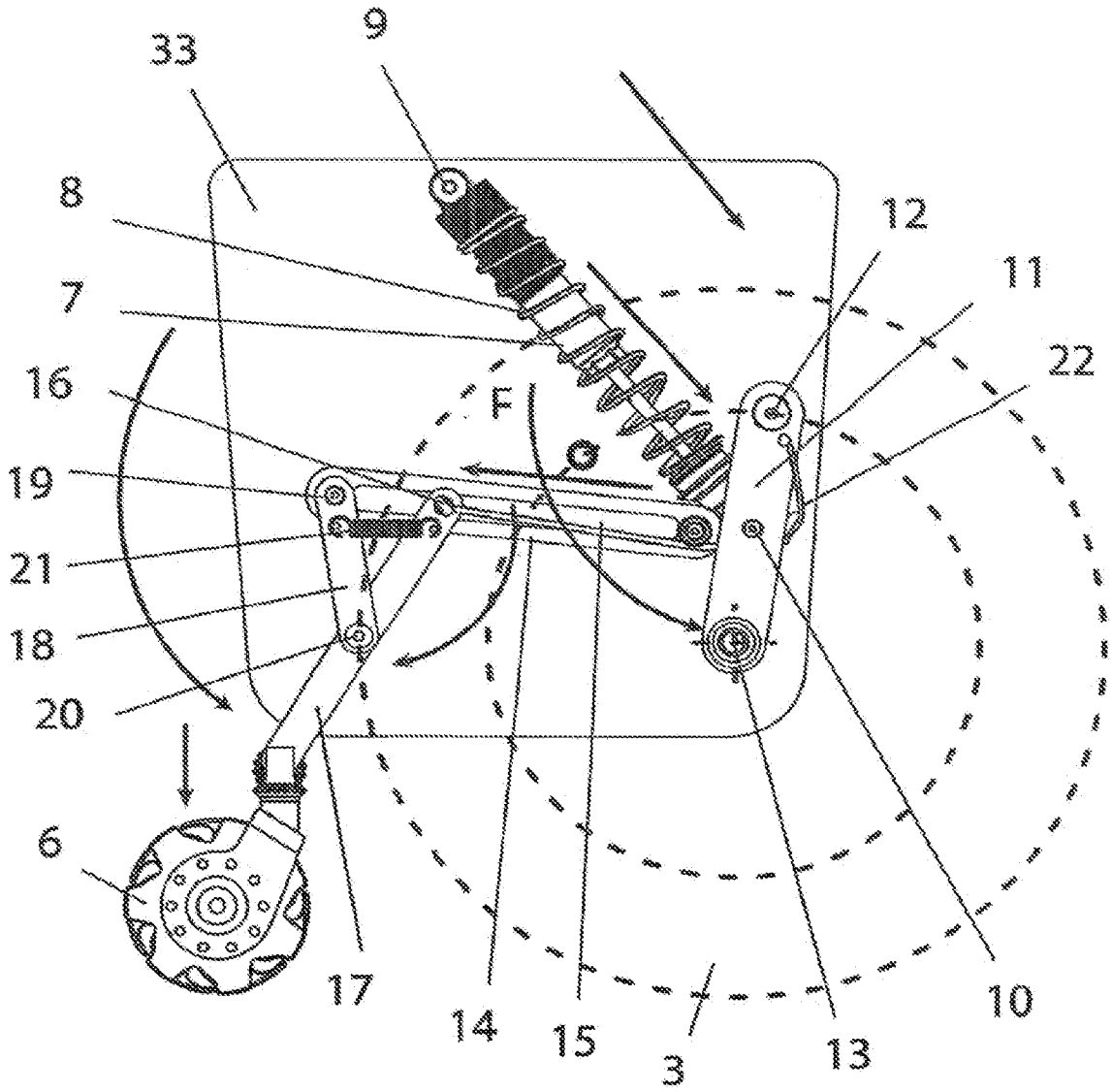


Fig. 18

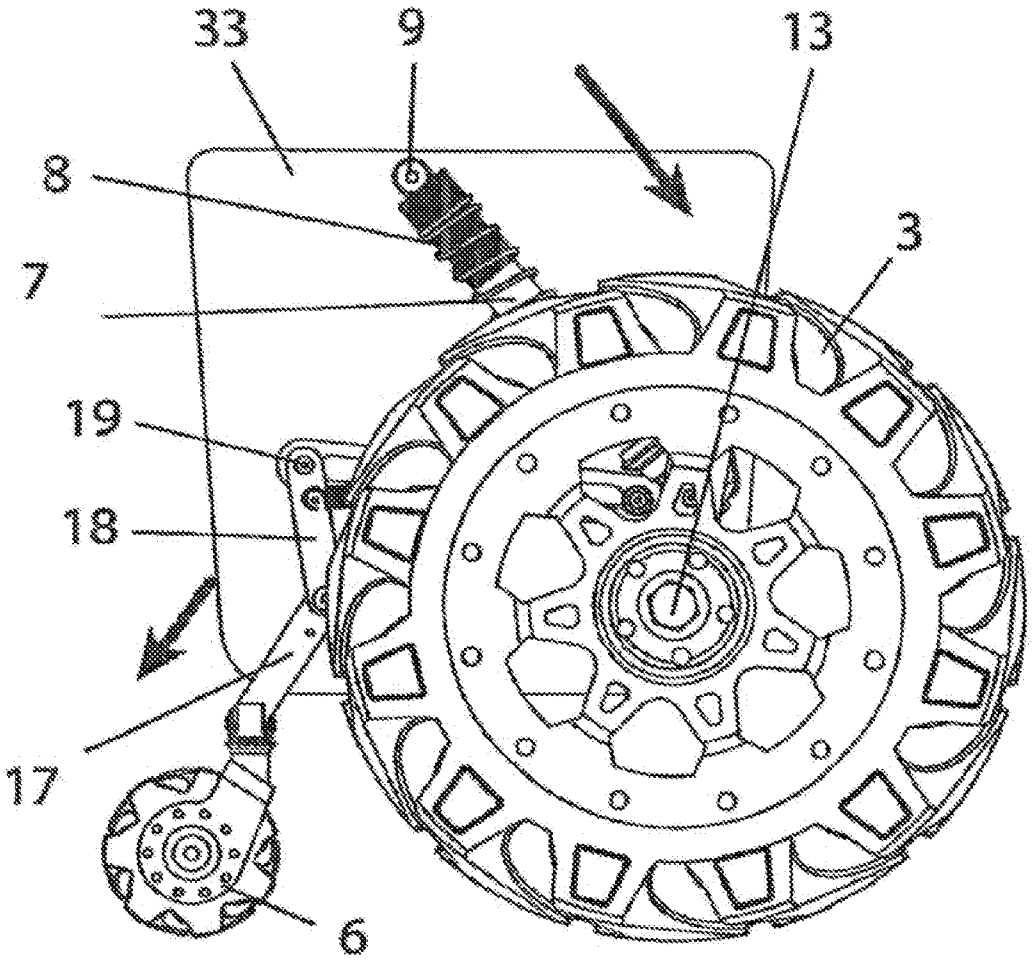


Fig. 19

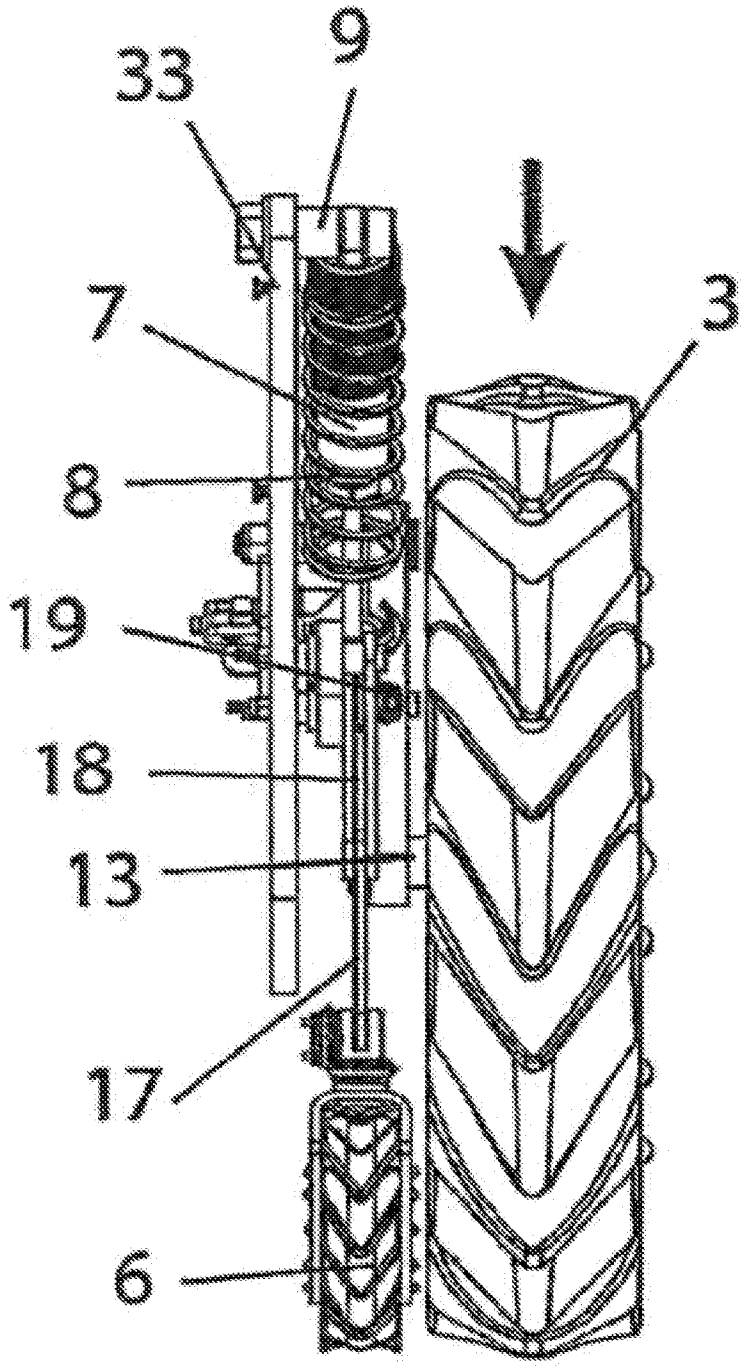


Fig. 20

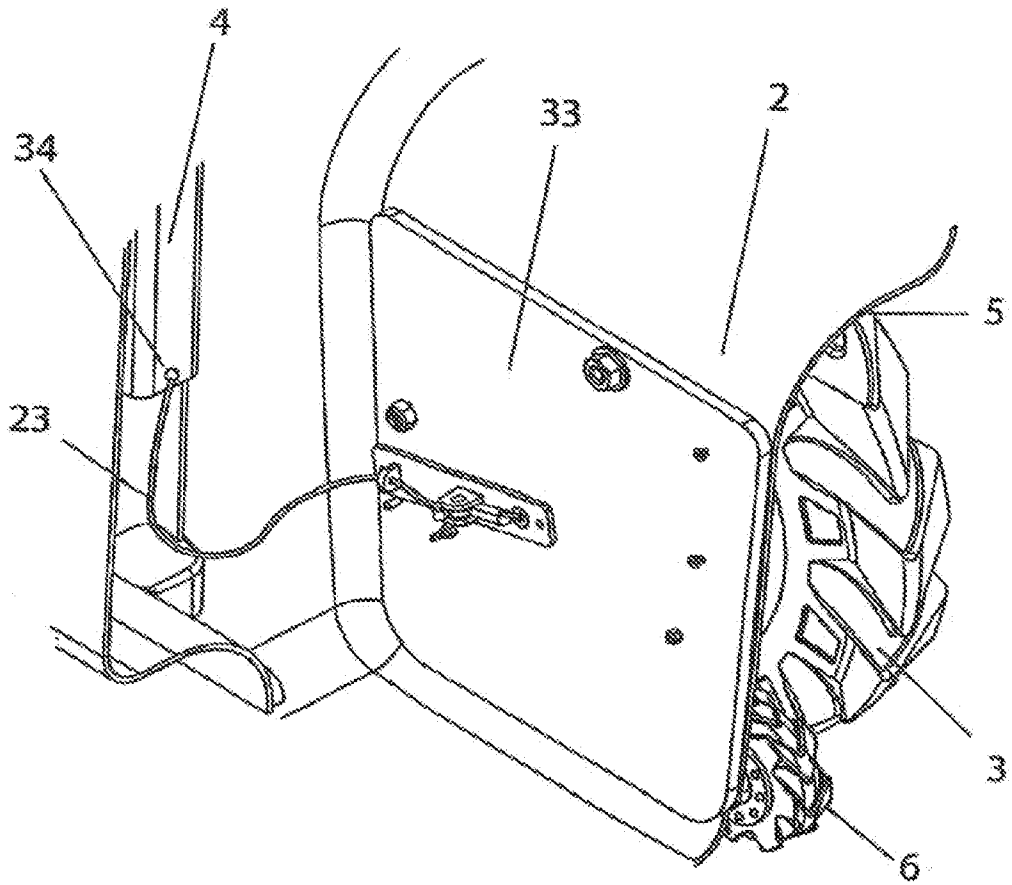


Fig. 21

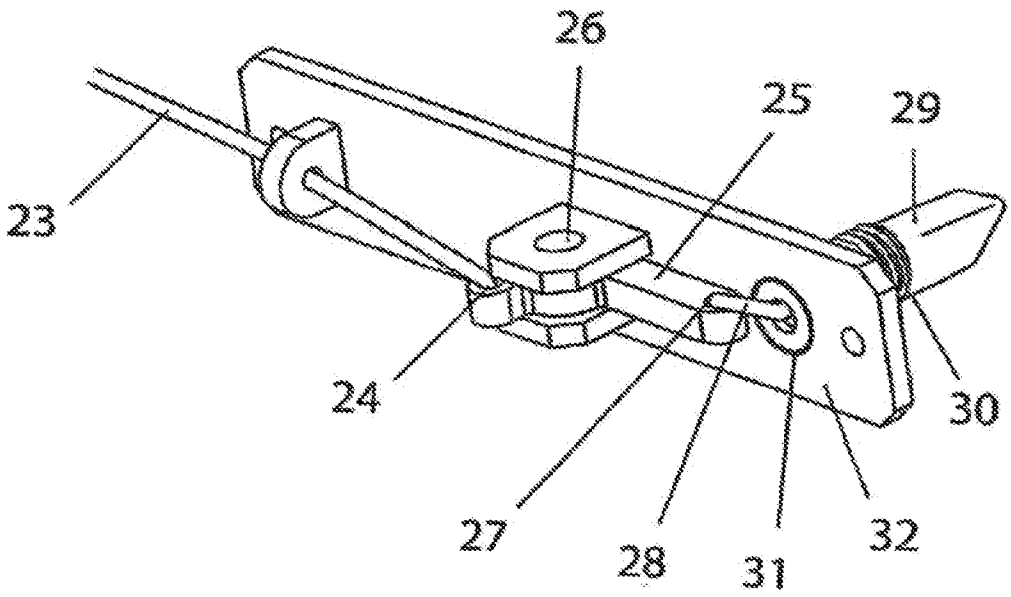


Fig. 22

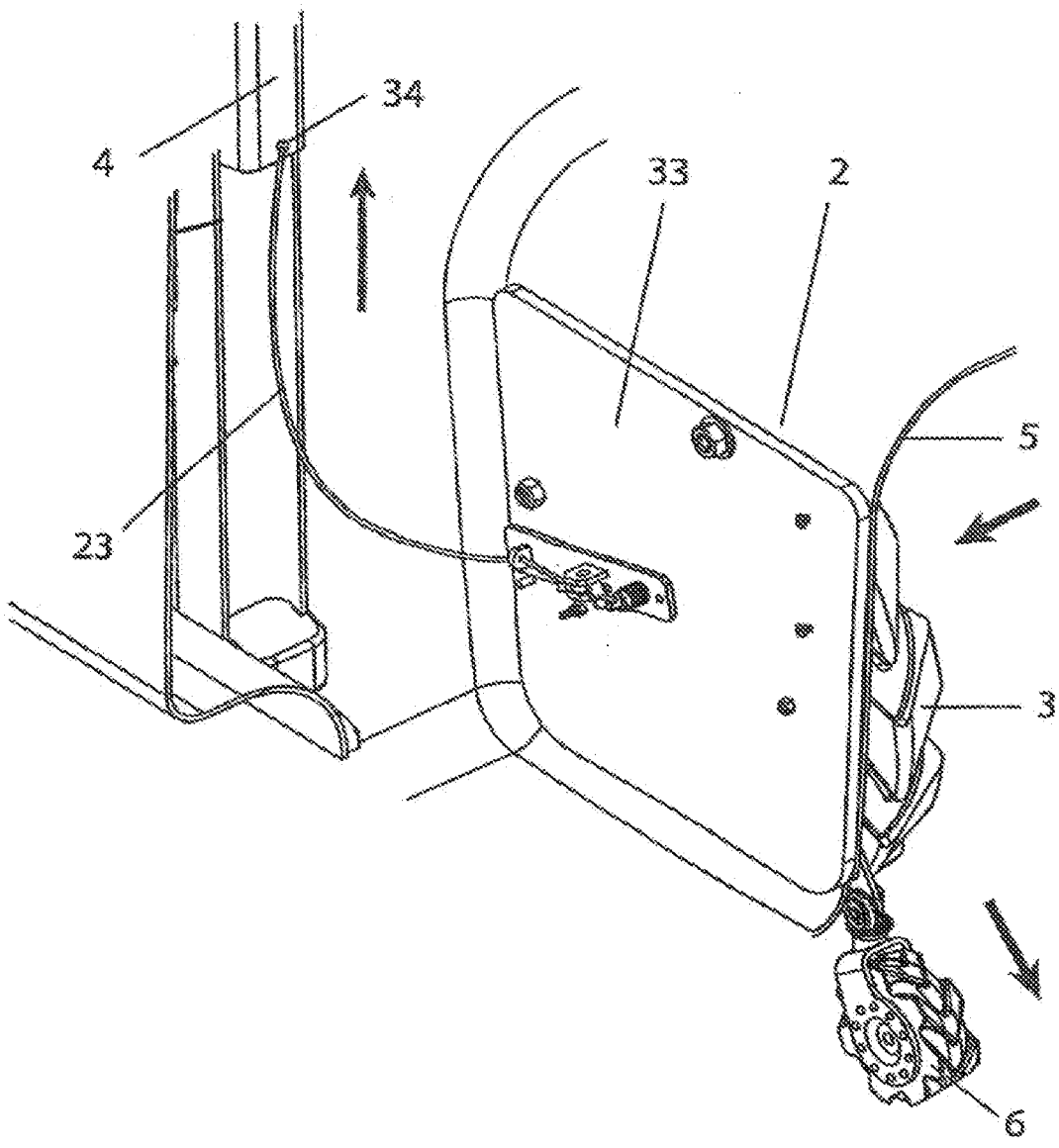


Fig. 23

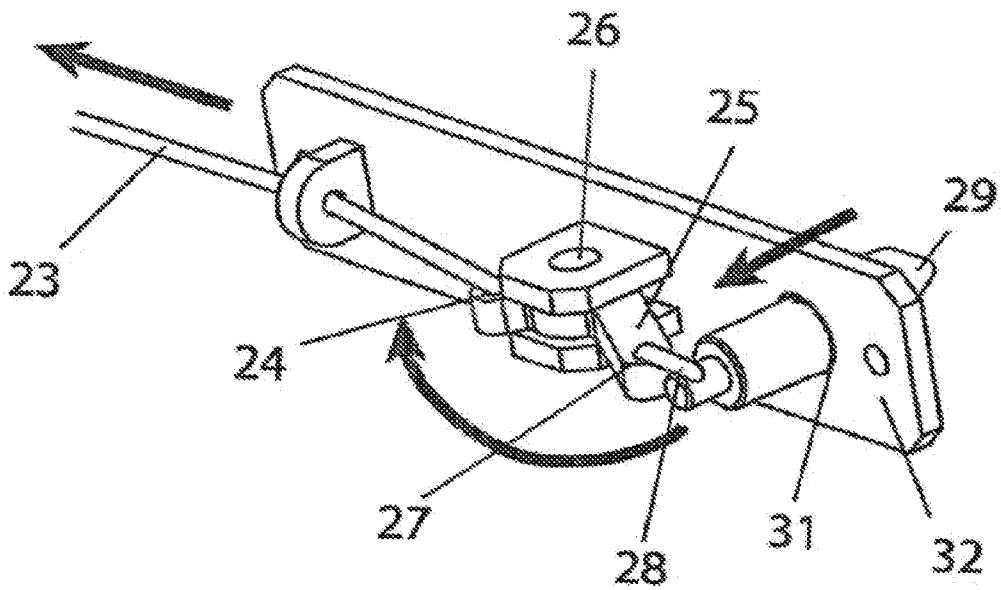


Fig. 24

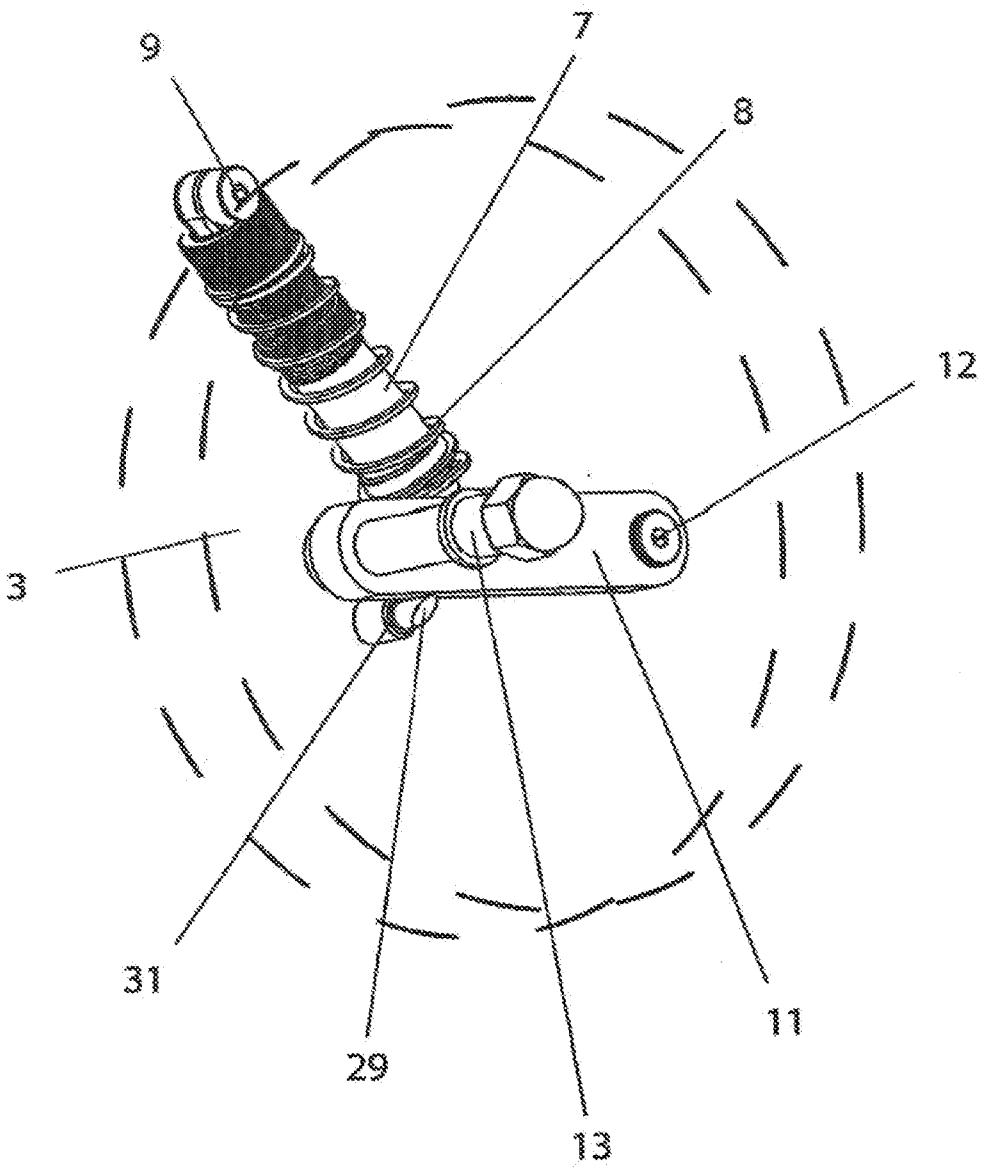


Fig. 25

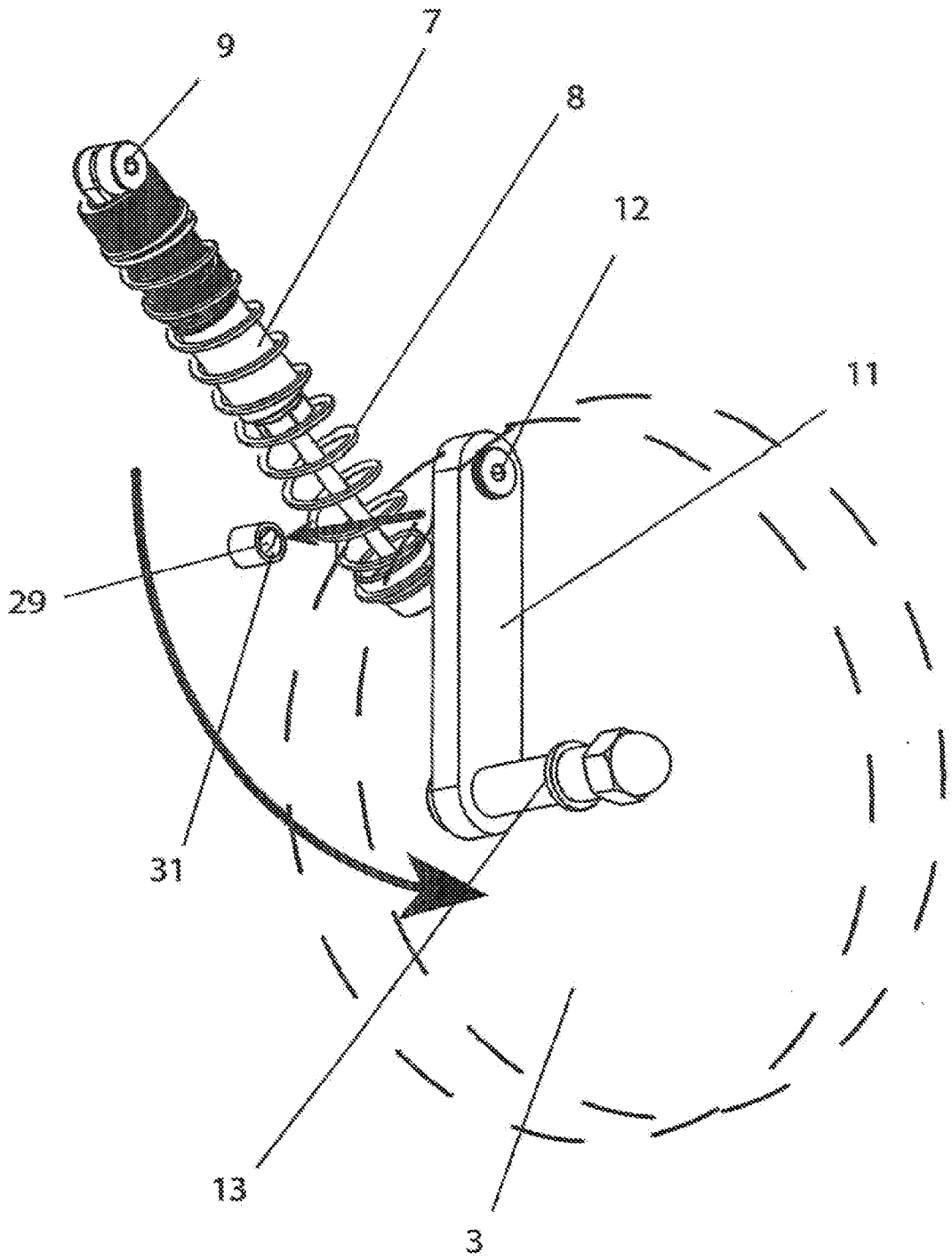


Fig. 26

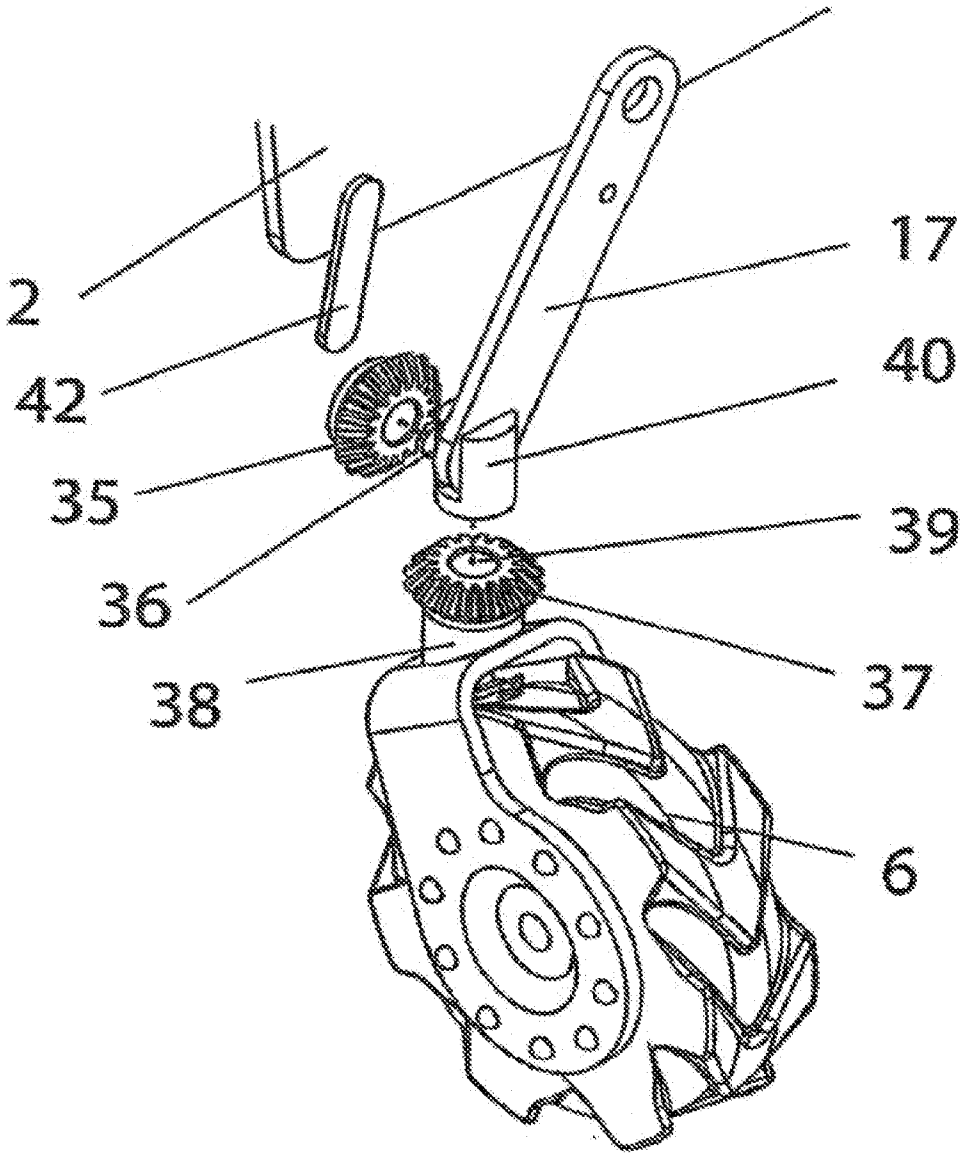


Fig. 27

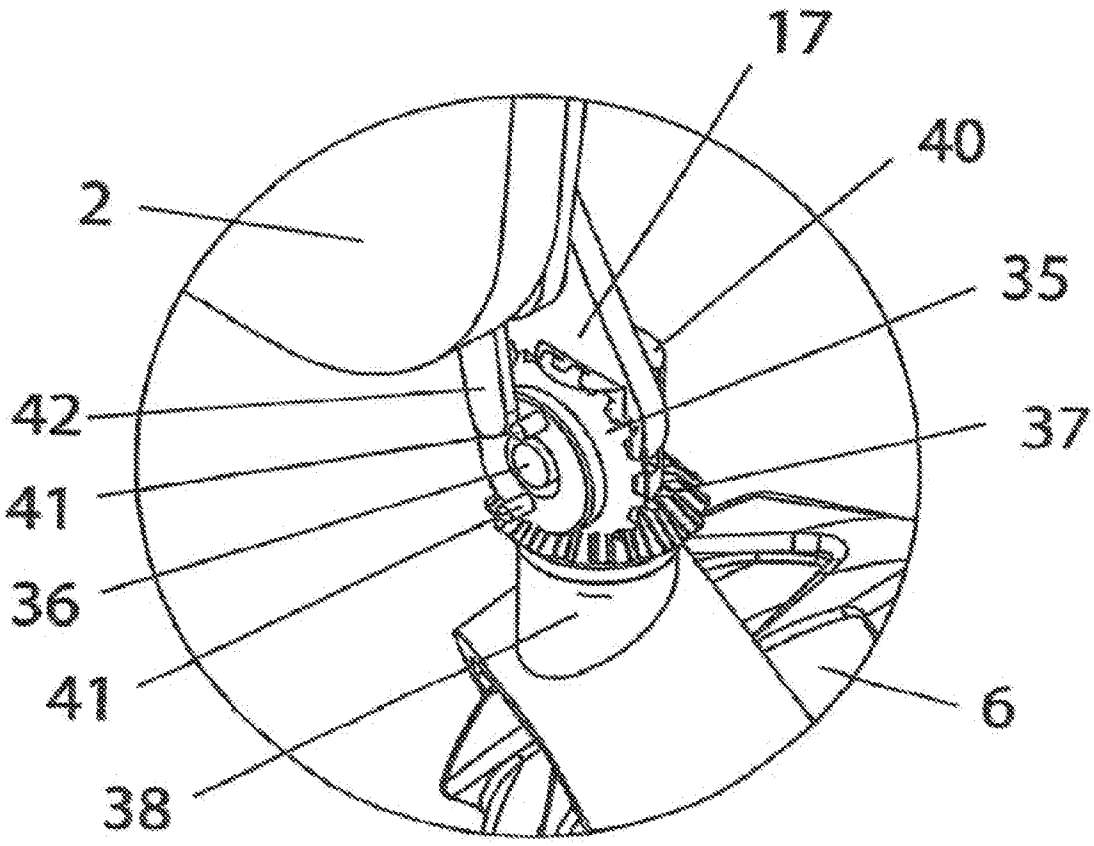


Fig. 28

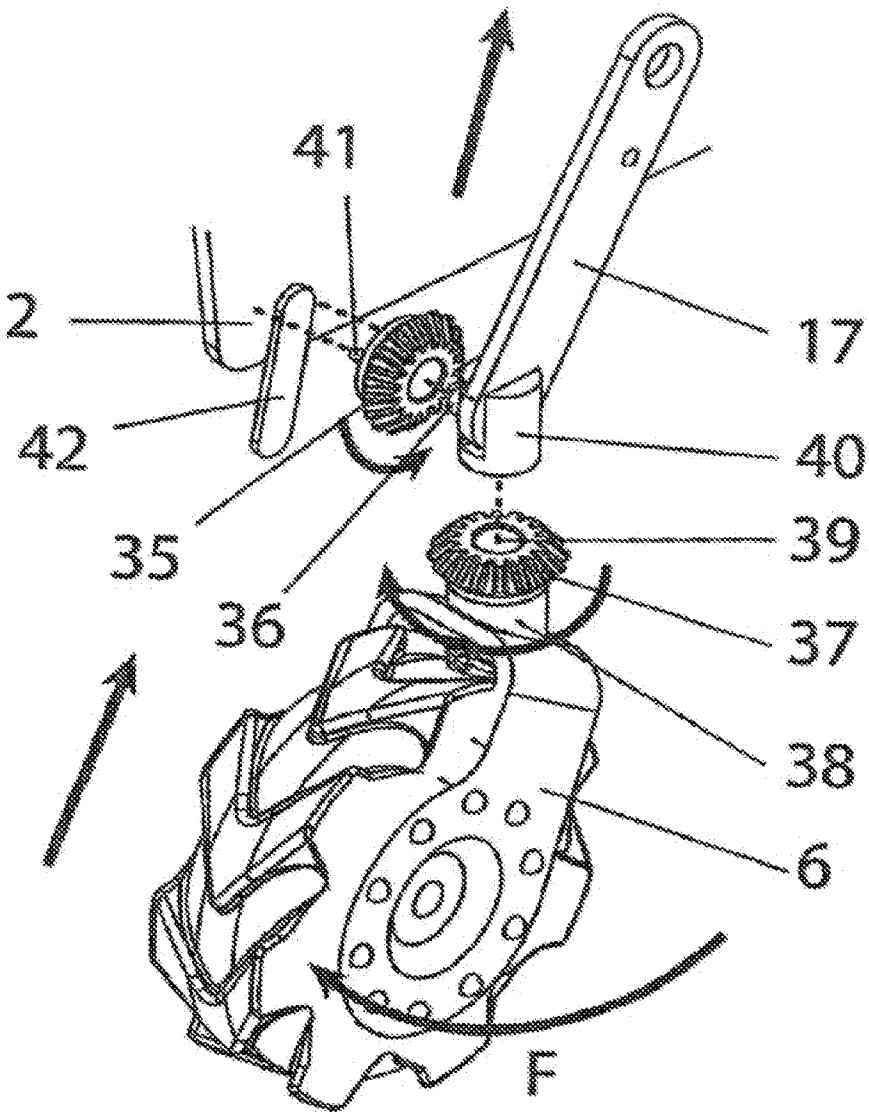


Fig. 29

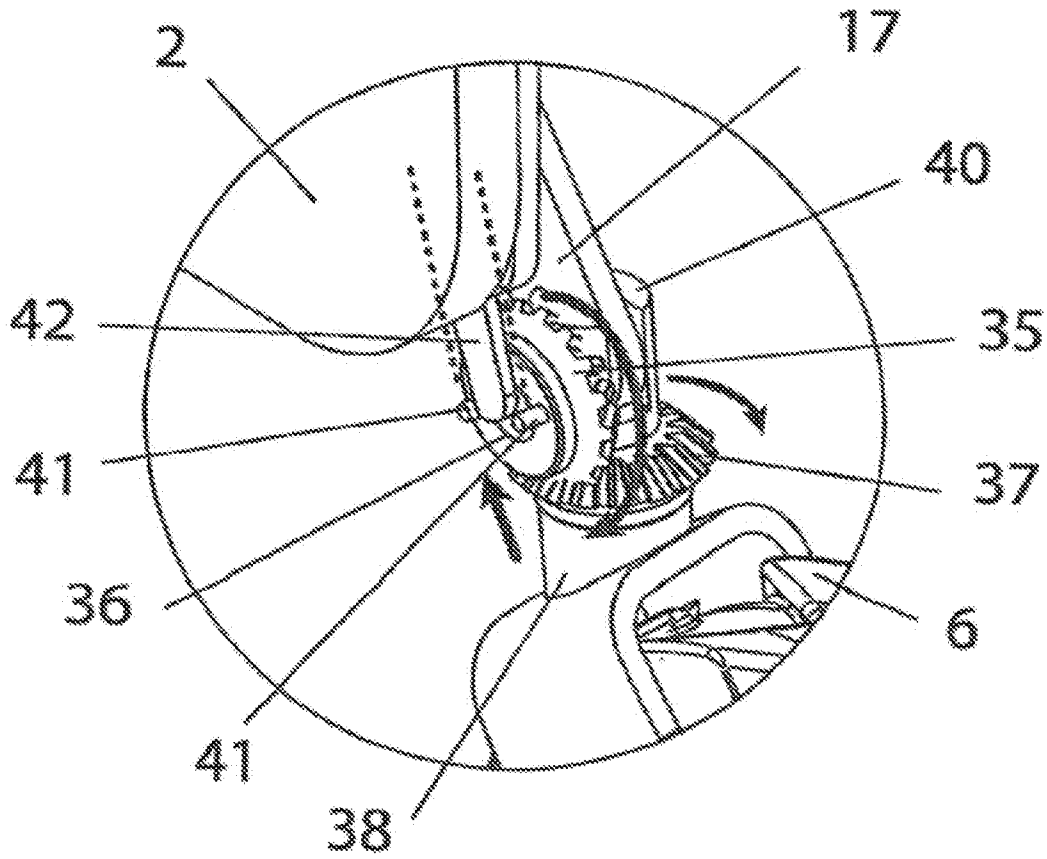
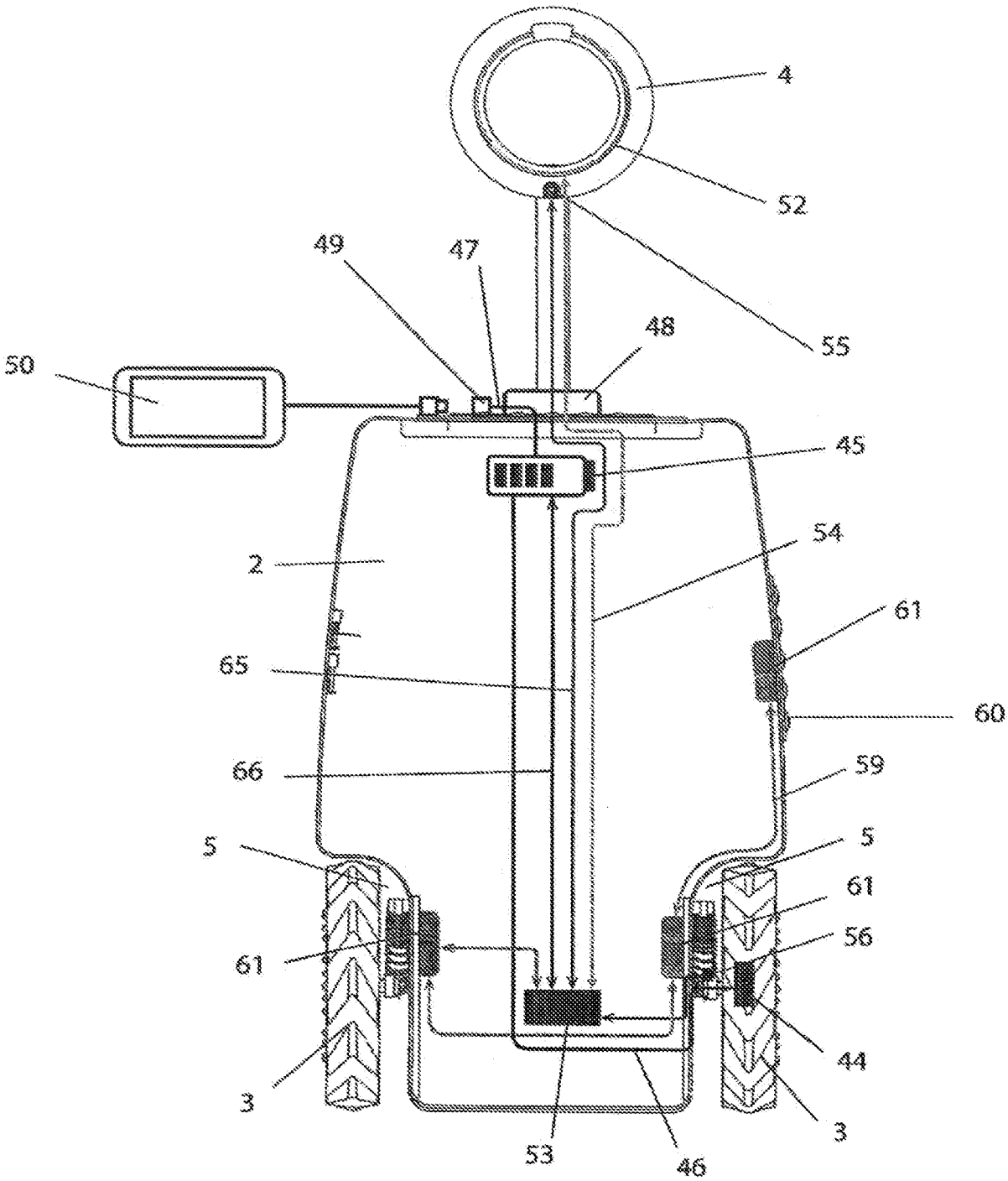


Fig. 30



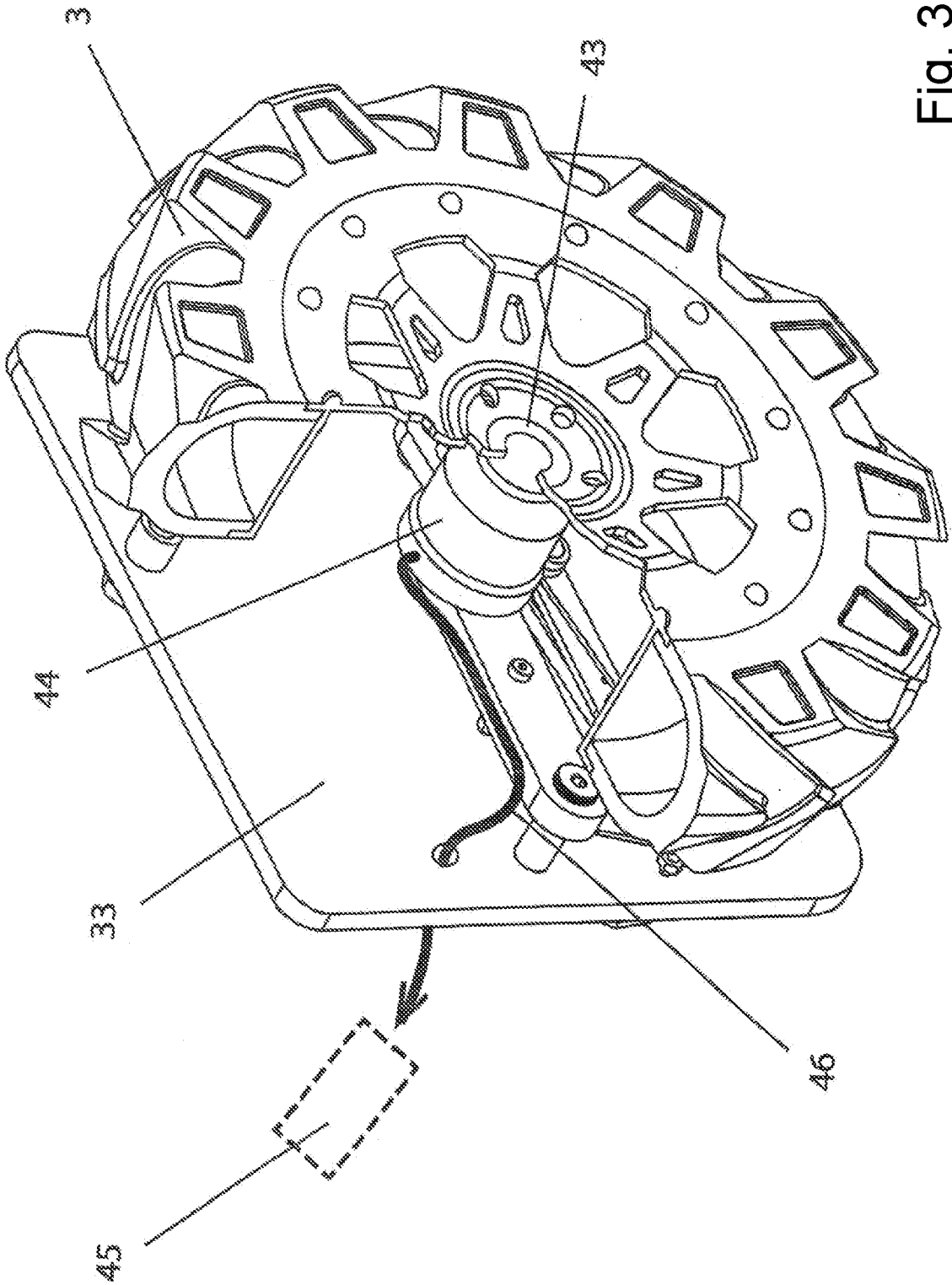


Fig. 31

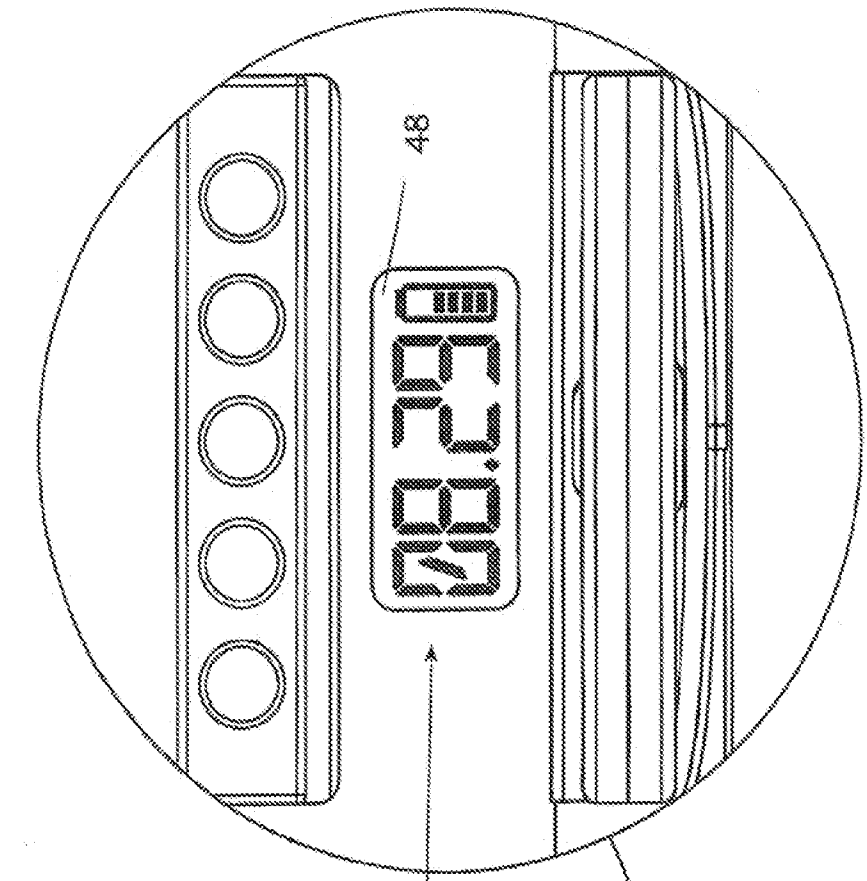


Fig. 33

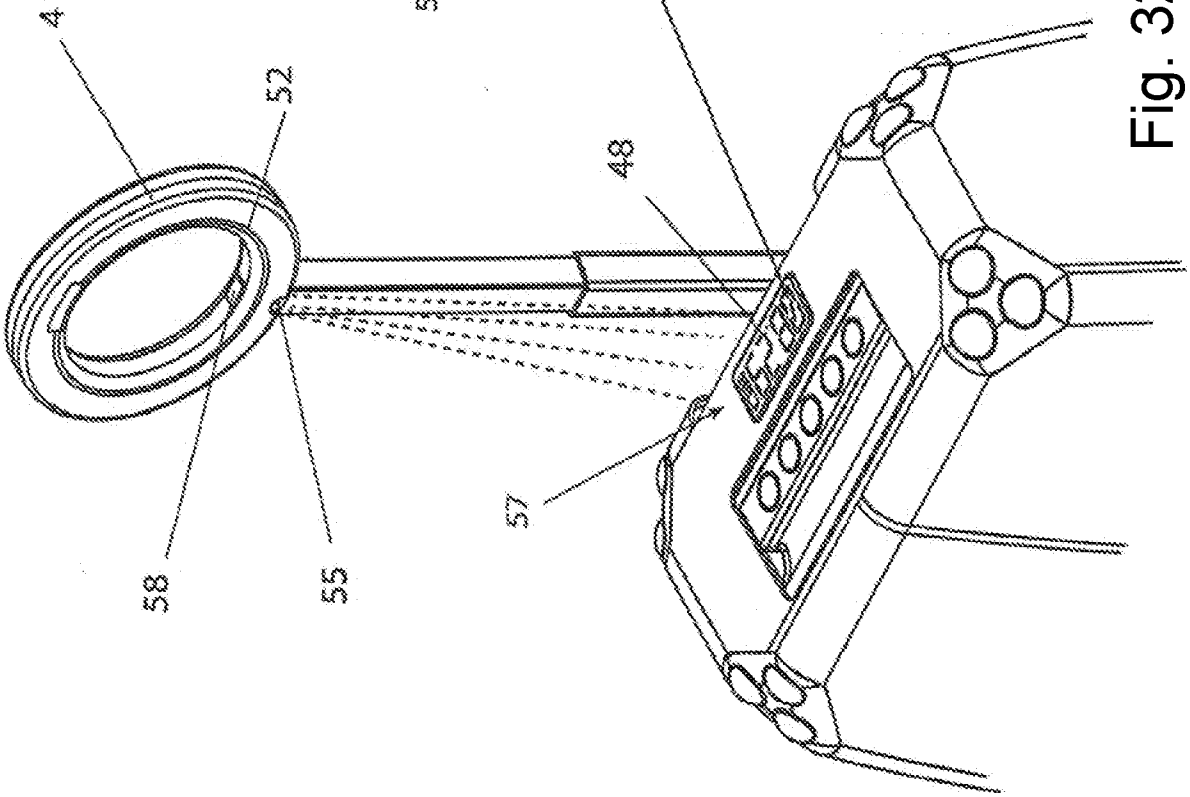
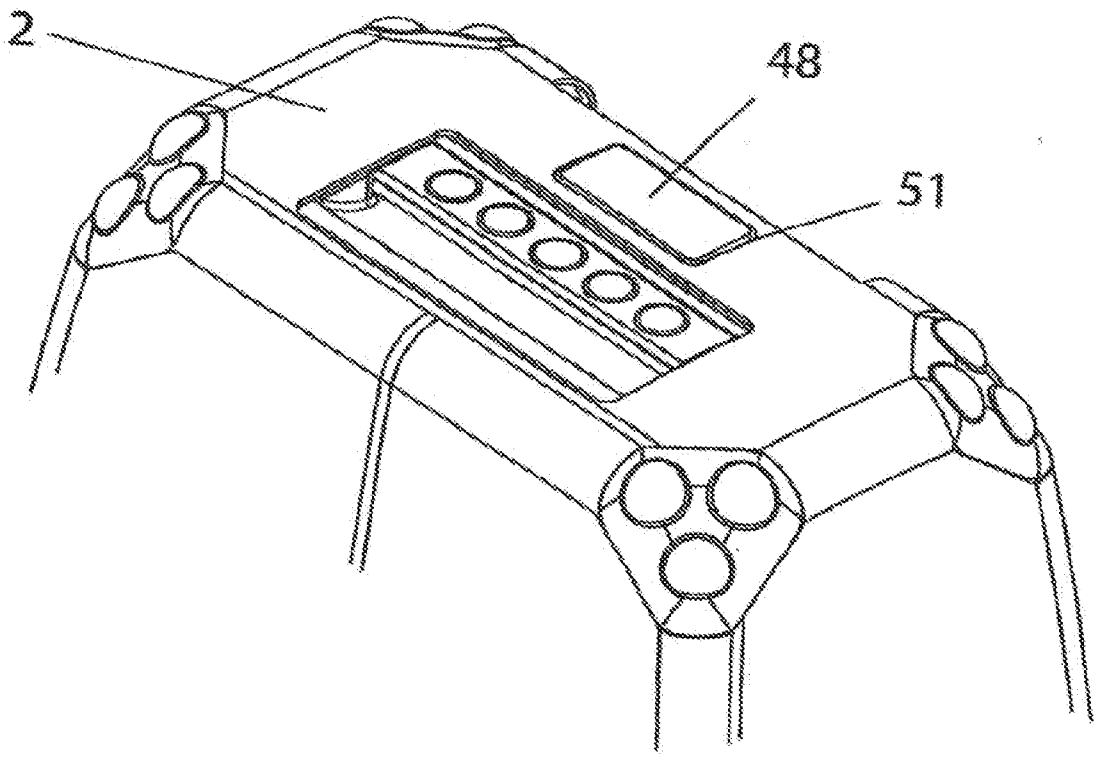


Fig. 32

Fig. 34



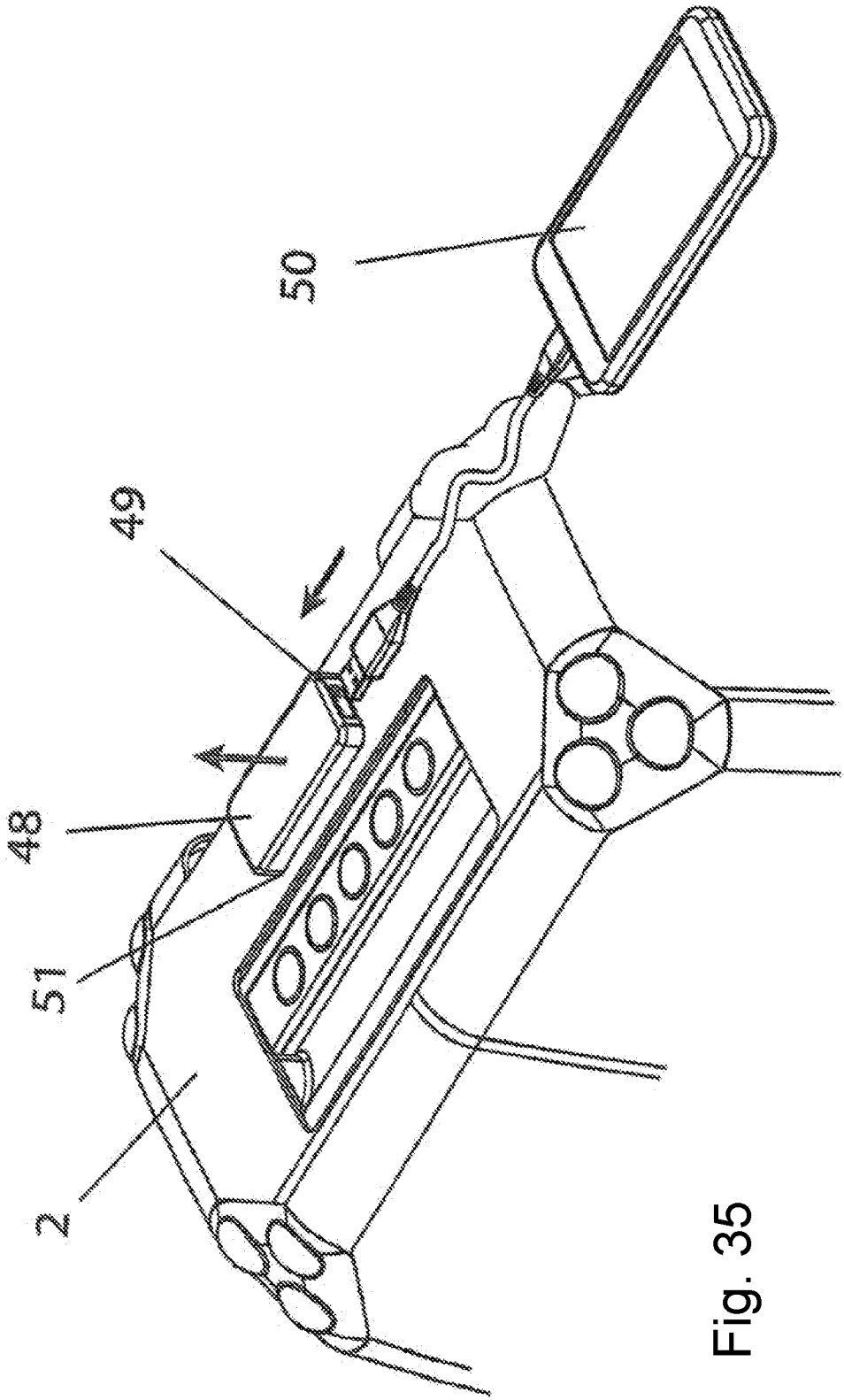


Fig. 35

Fig. 36

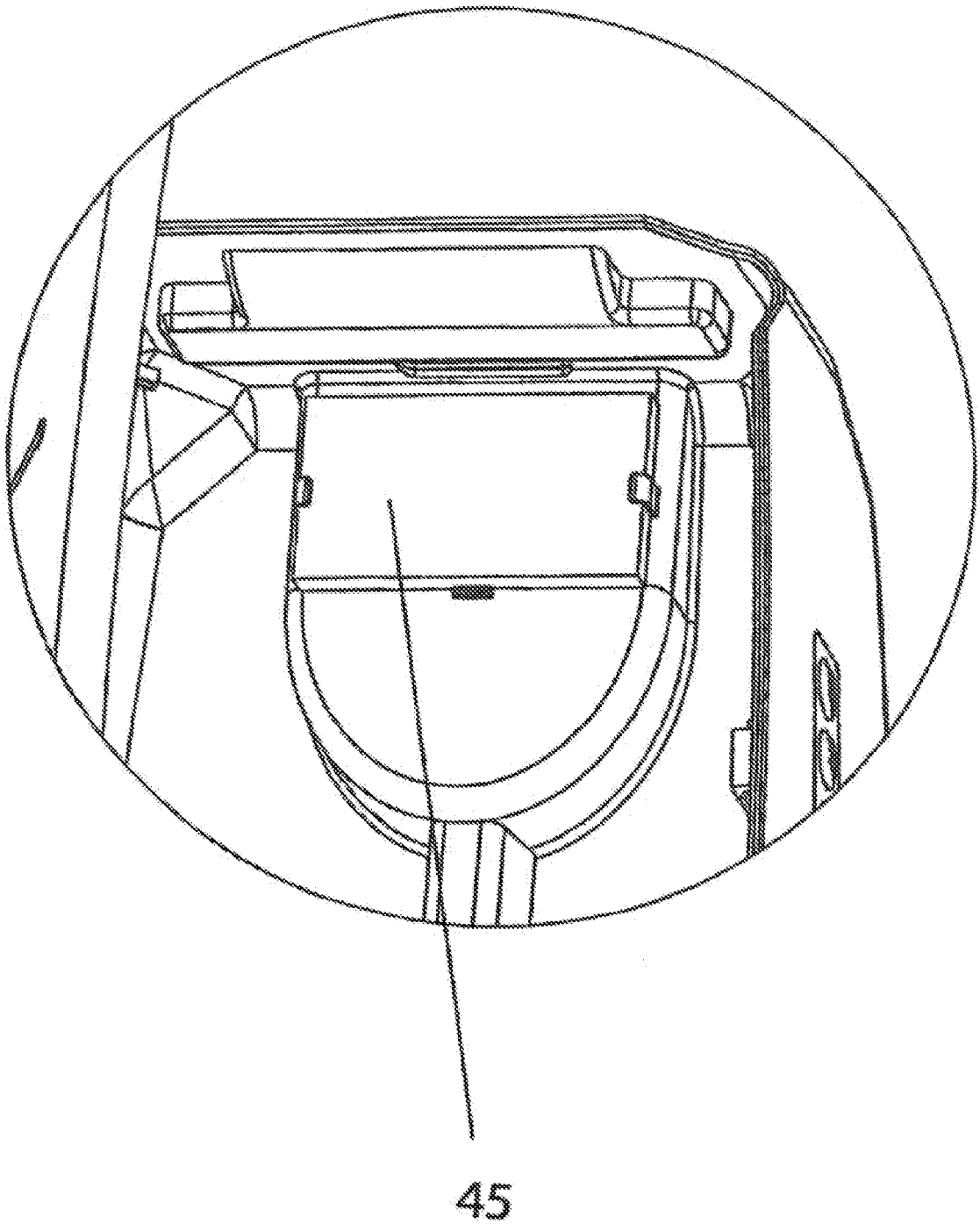


Fig. 37

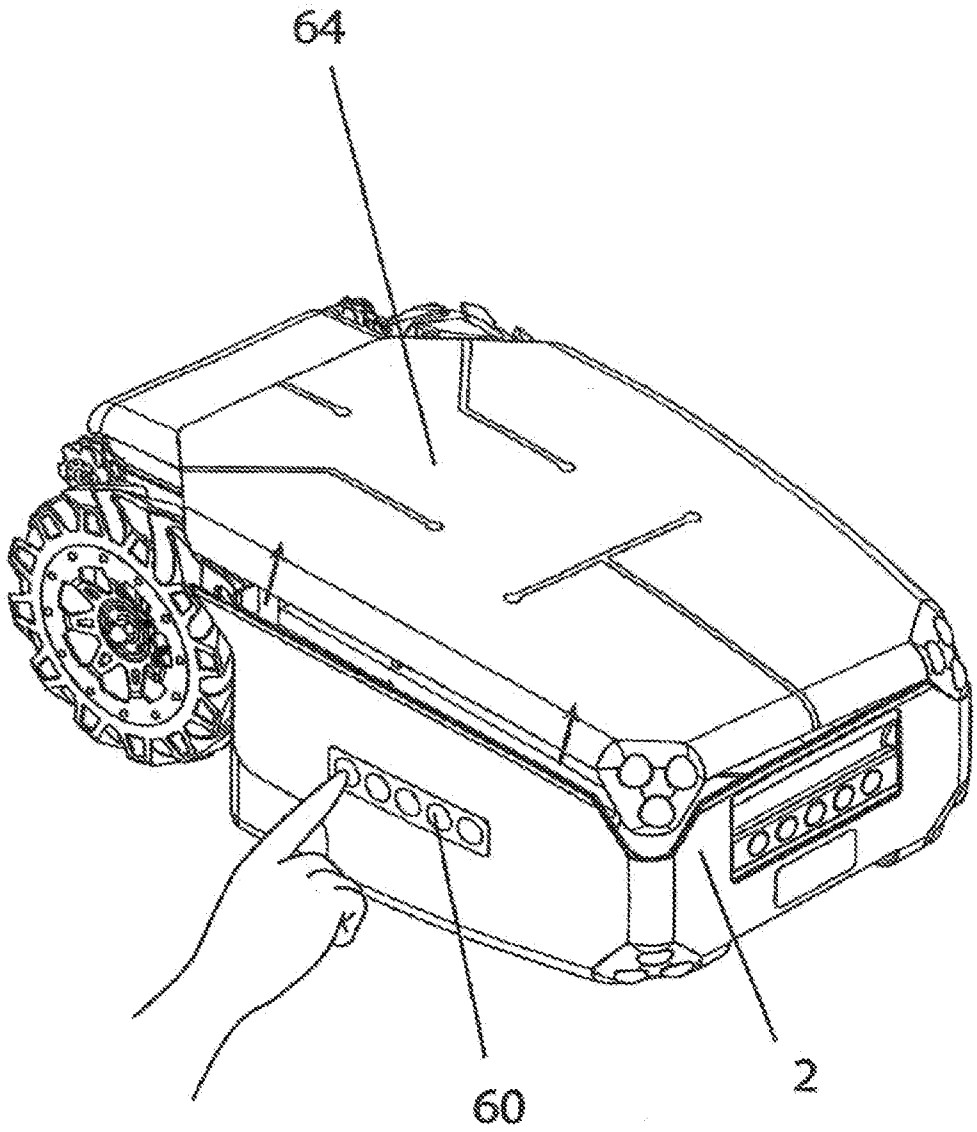


Fig. 38

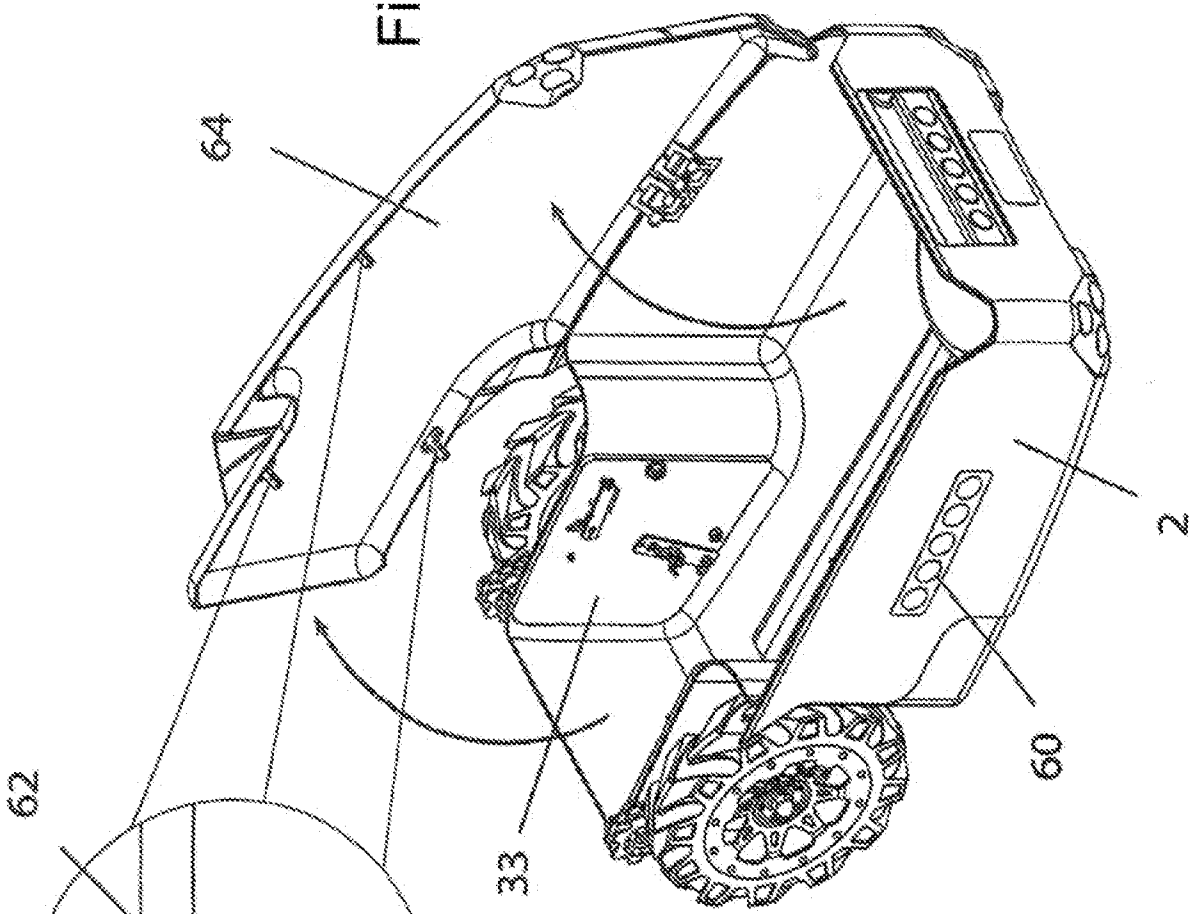


Fig. 39

Fig. 40

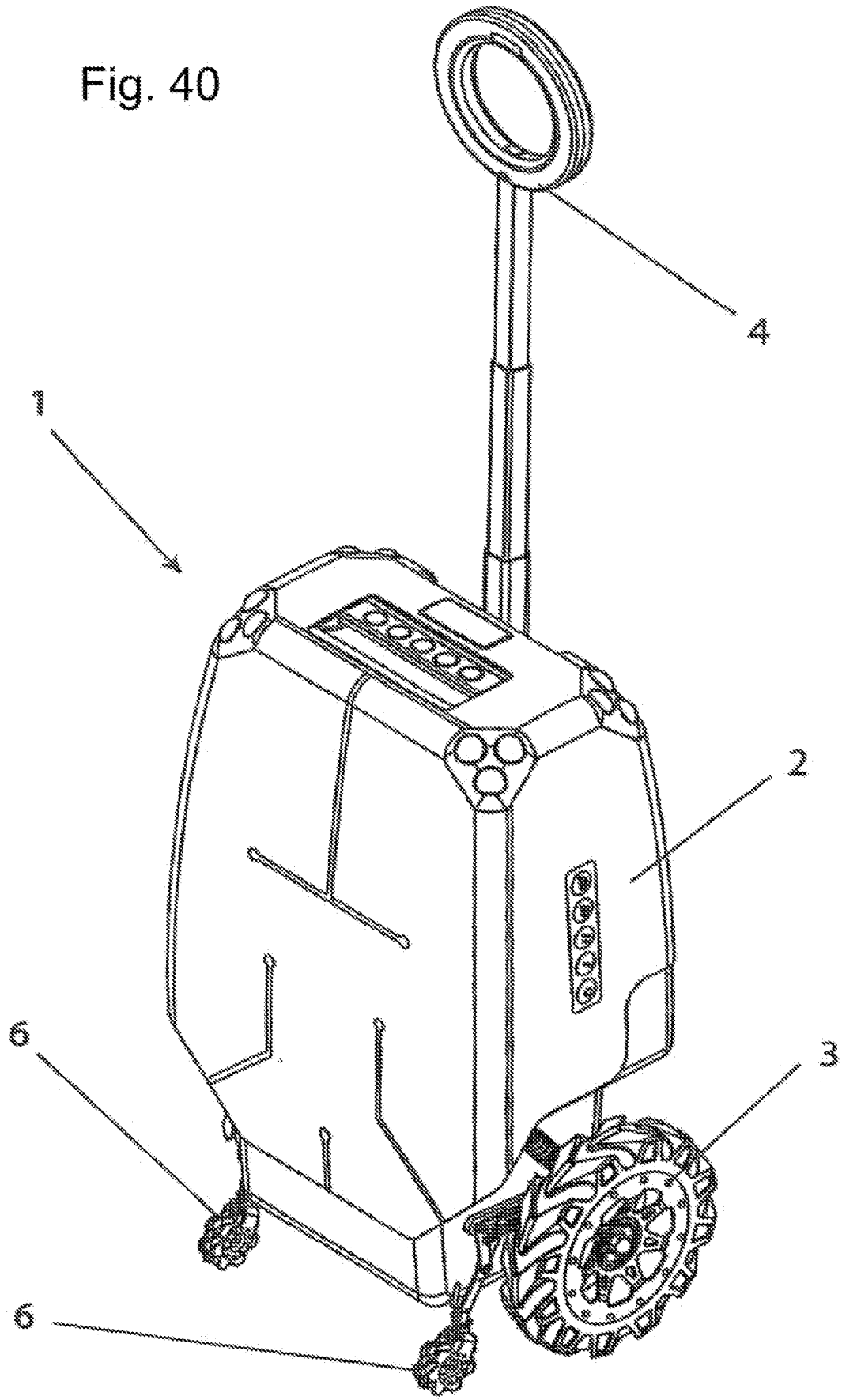
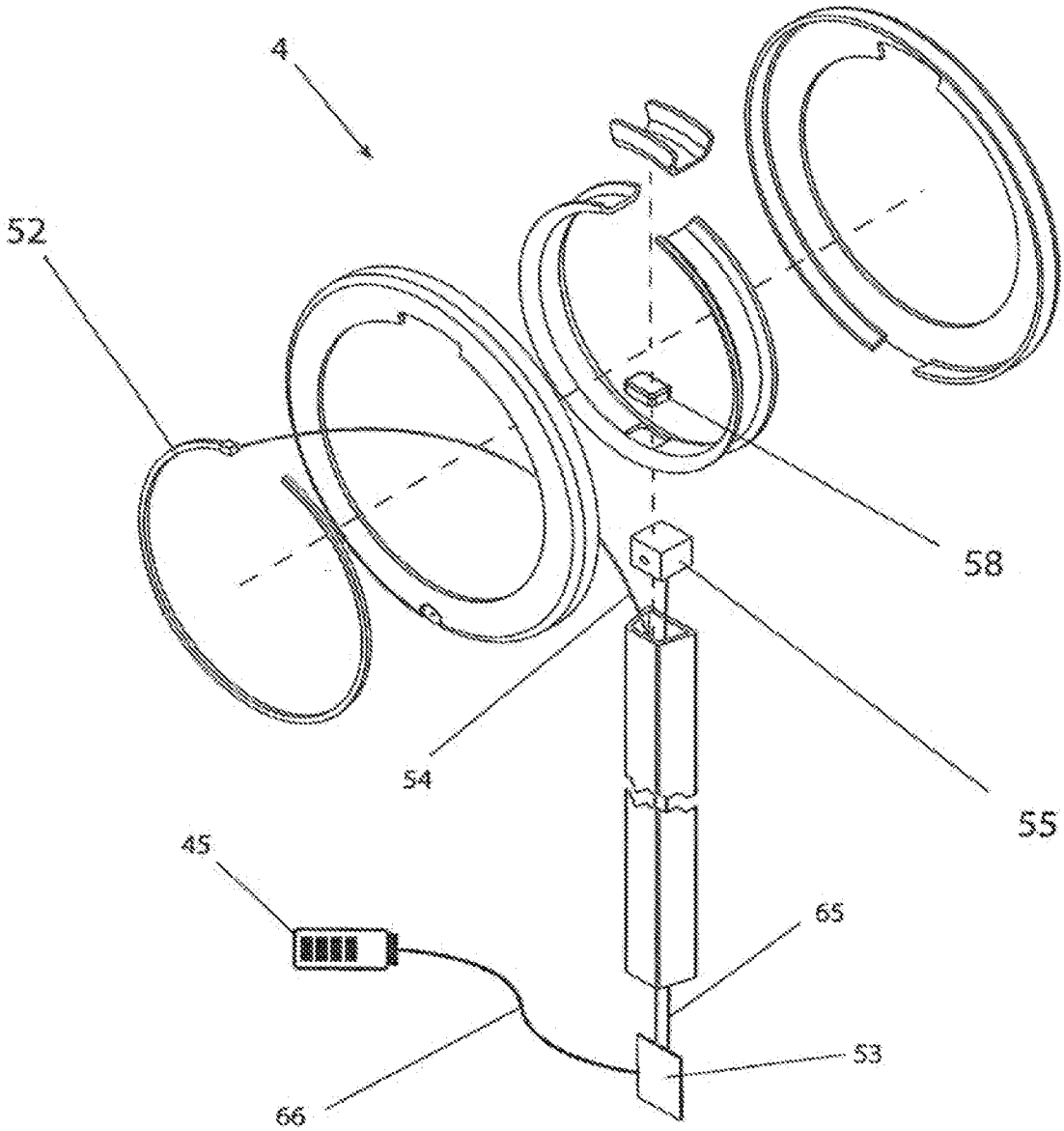


Fig. 41



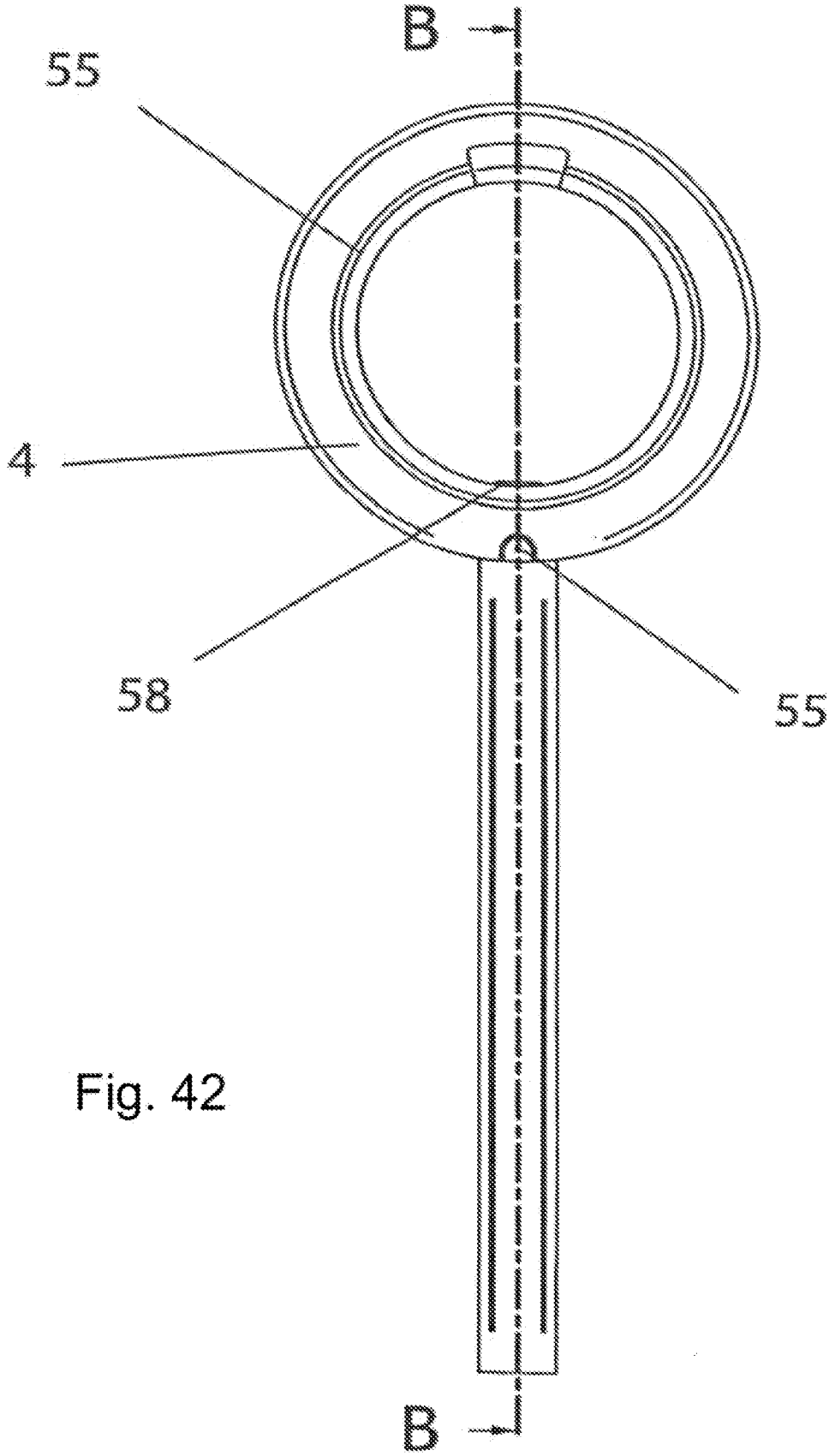
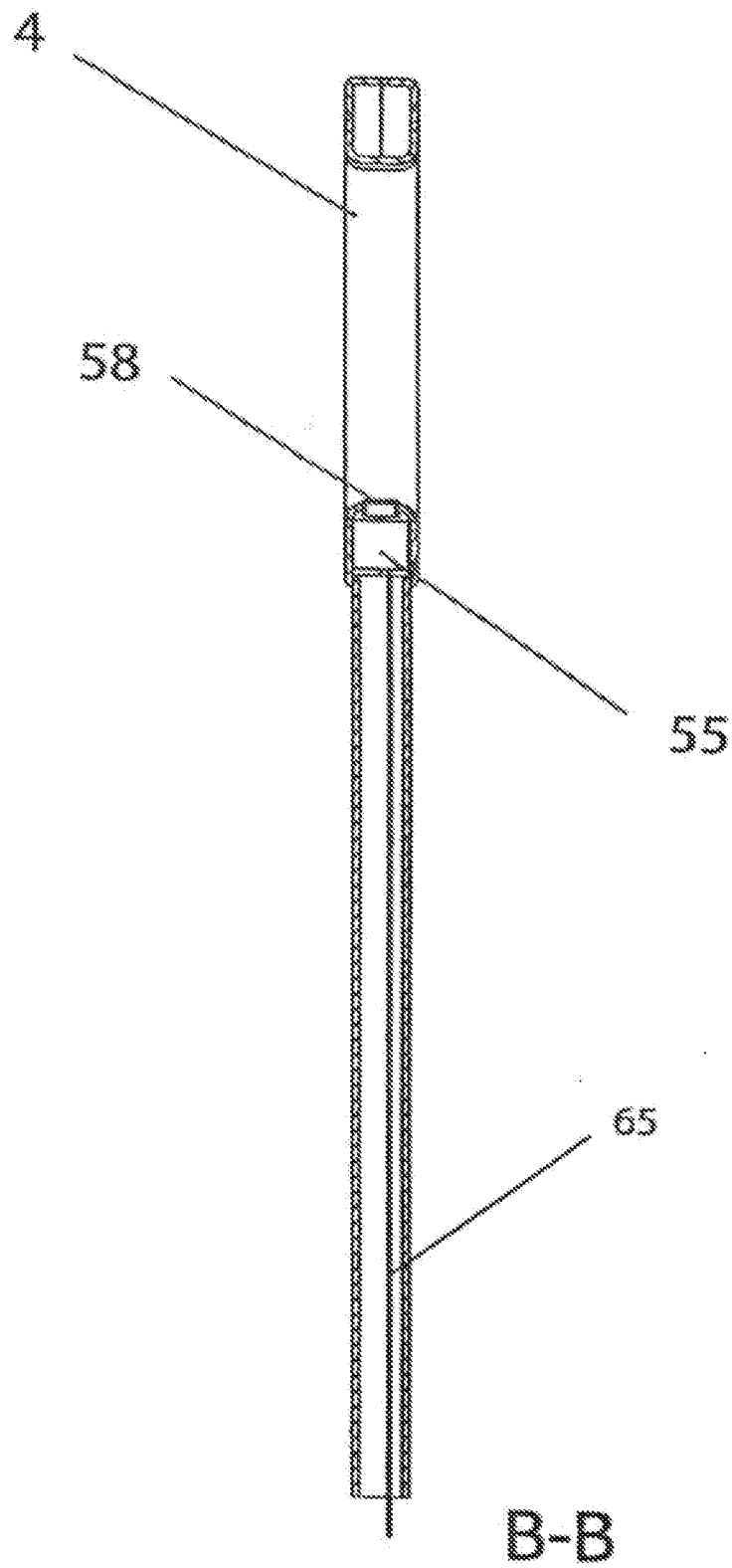


Fig. 42

Fig. 43



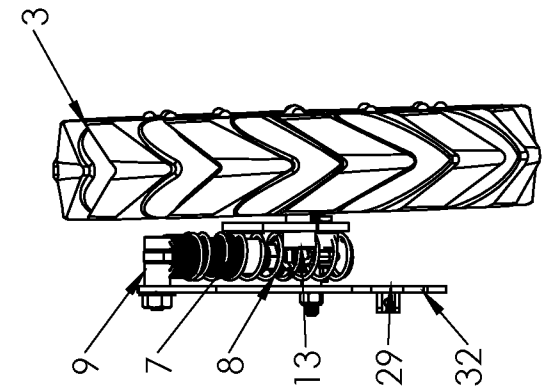


Fig. 46

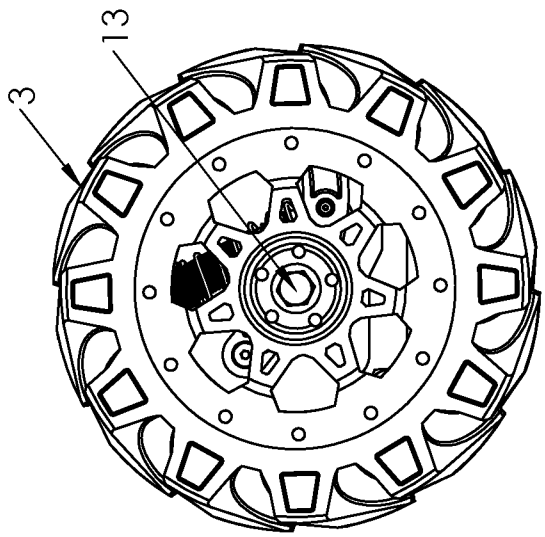


Fig. 45

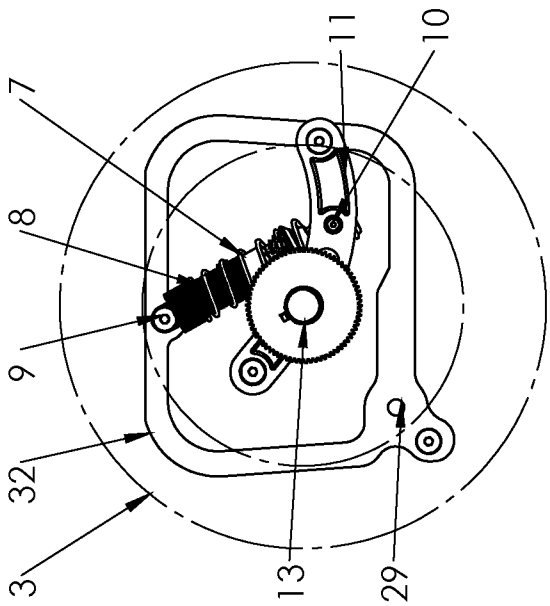


Fig. 44

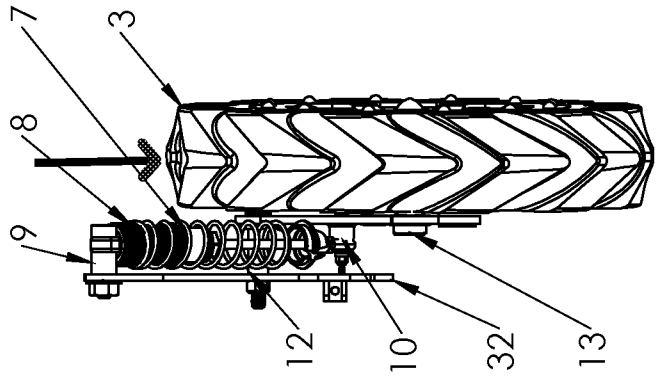


Fig. 49

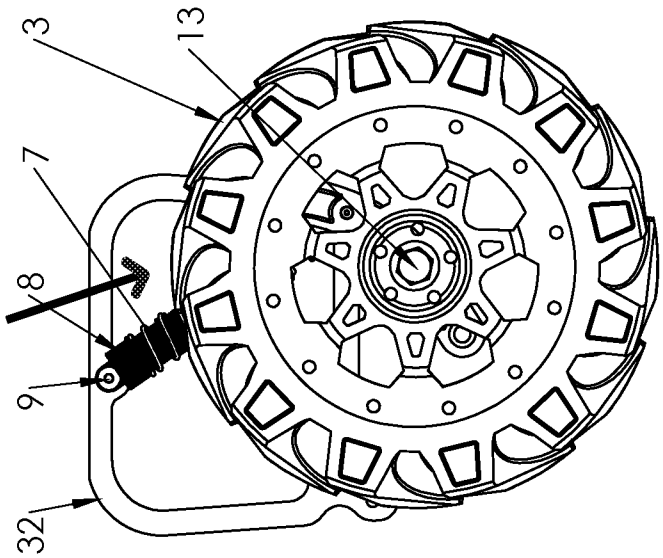


Fig. 48

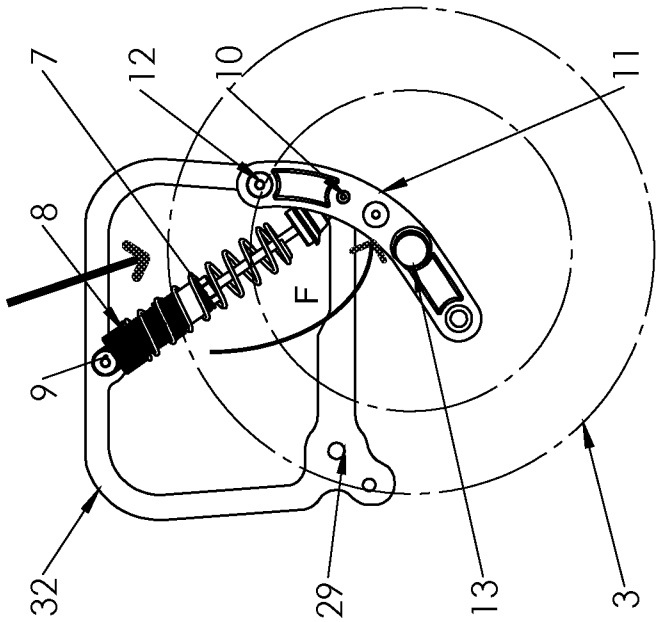


Fig. 47

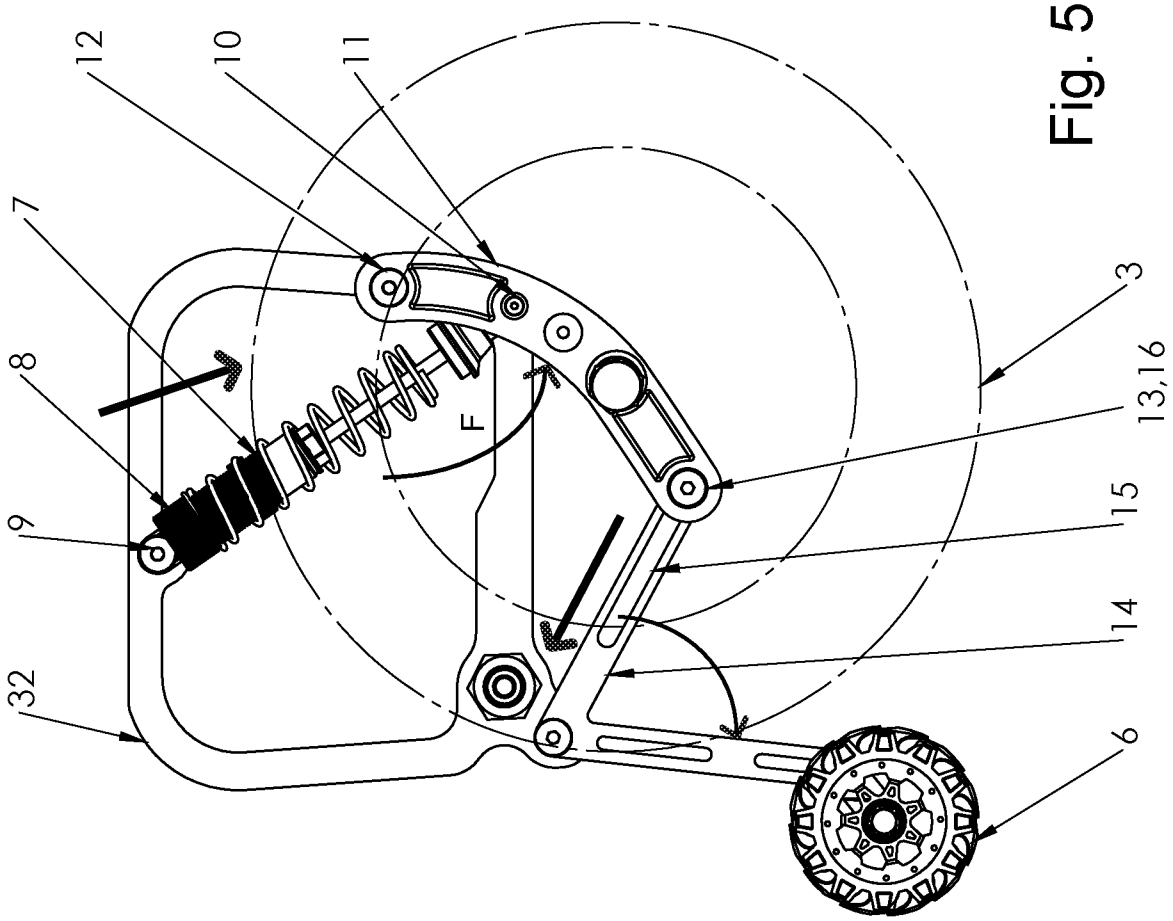


Fig. 51

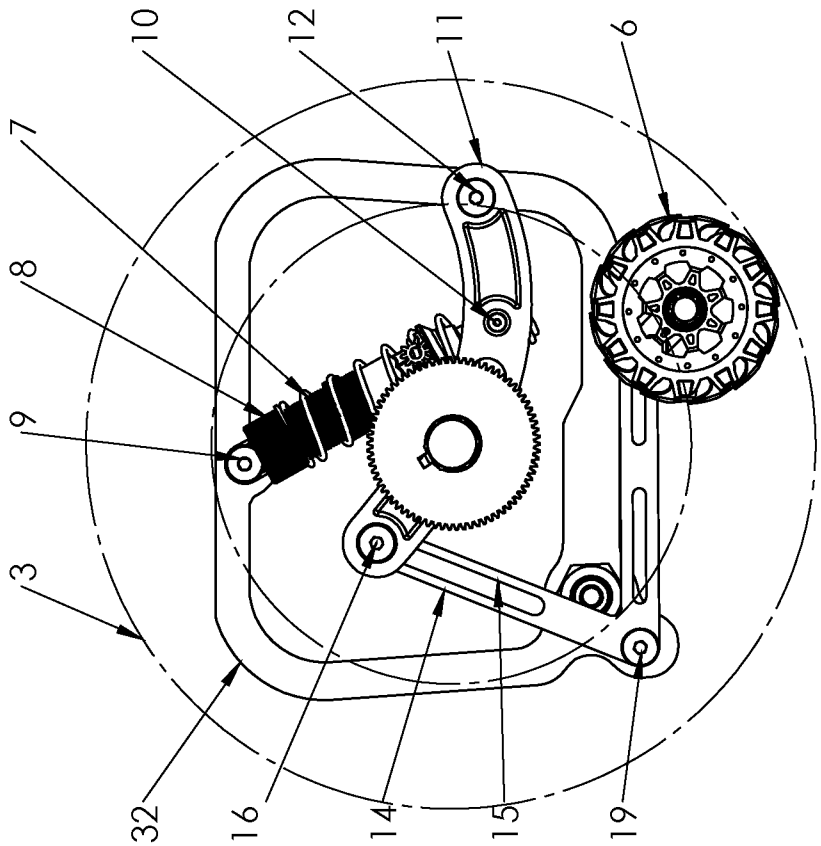


Fig. 50

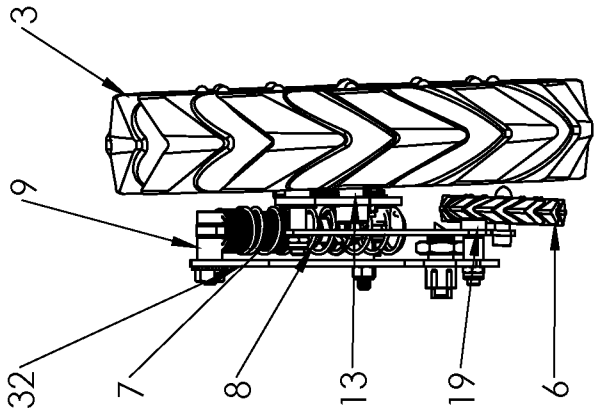


Fig. 53

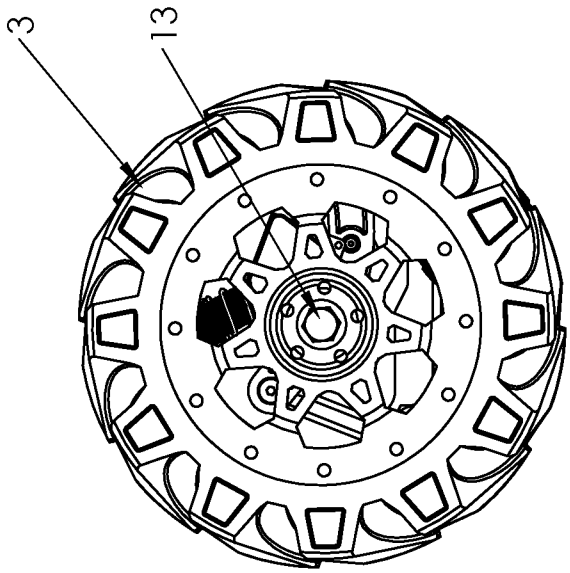


Fig. 52

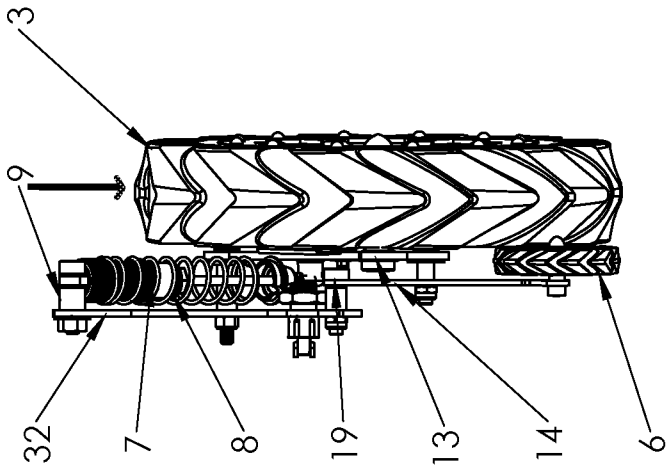


Fig. 55

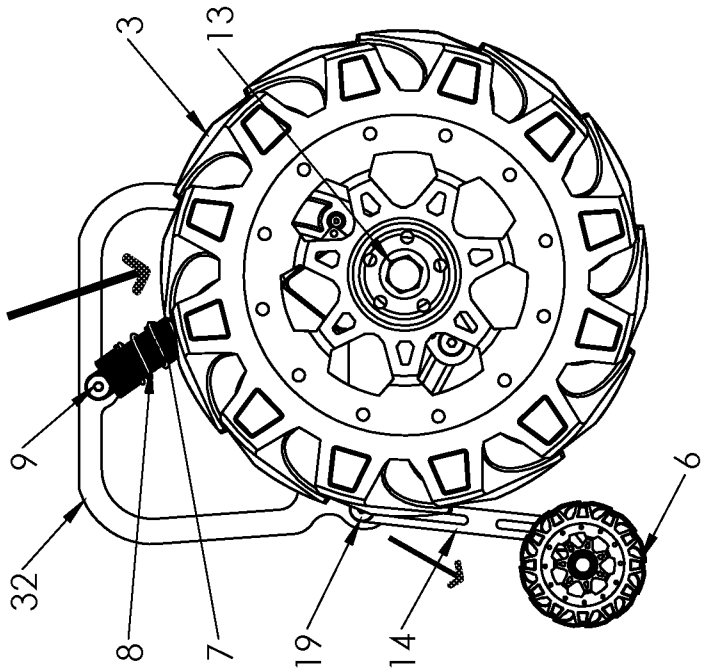


Fig. 54

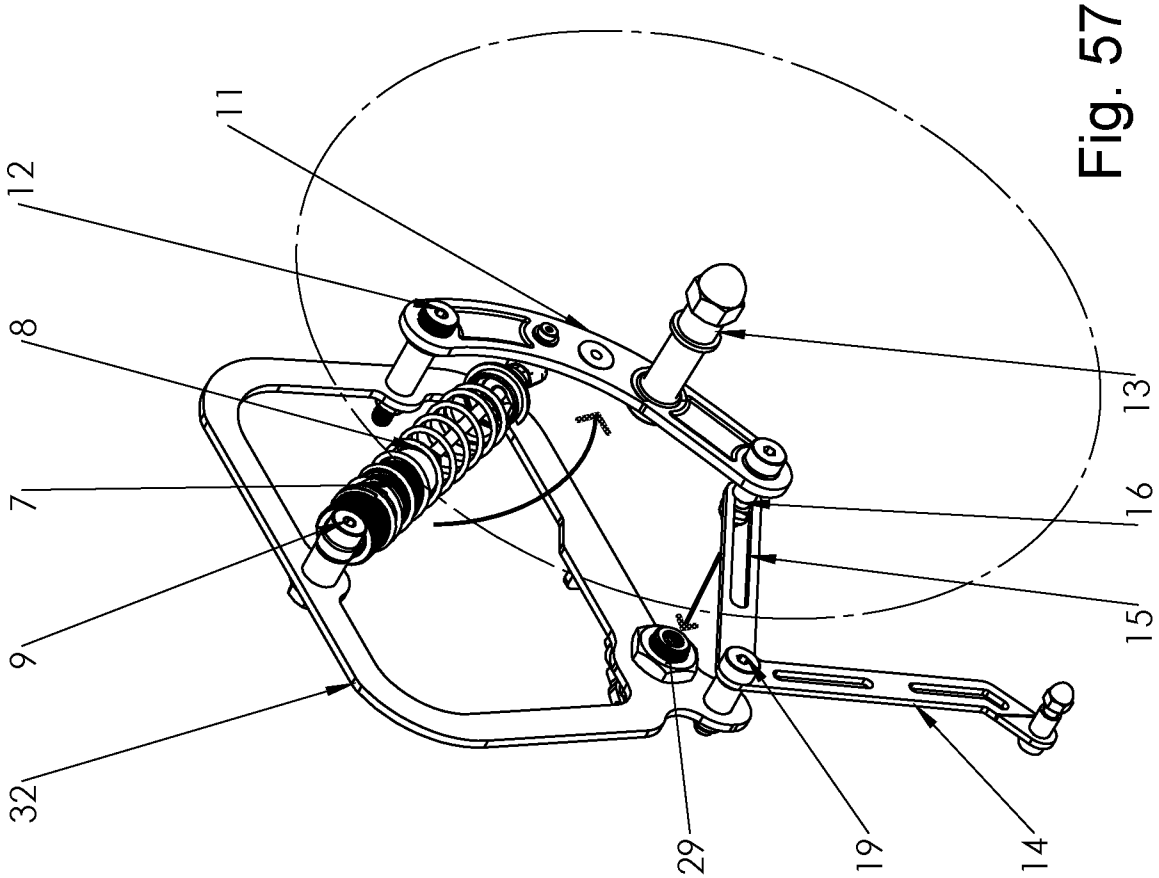


Fig. 57

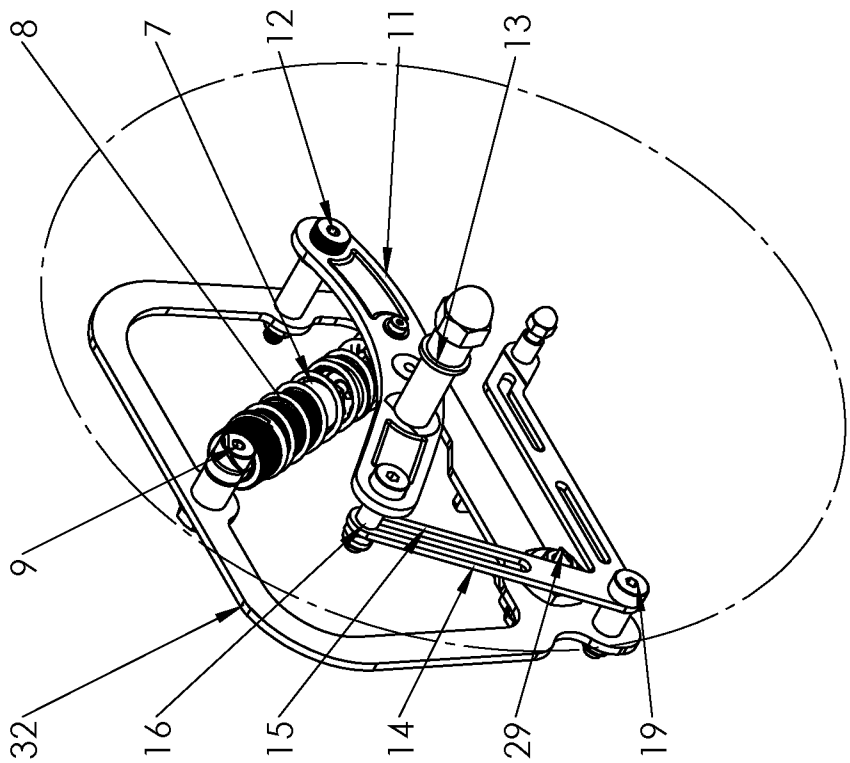


Fig. 56

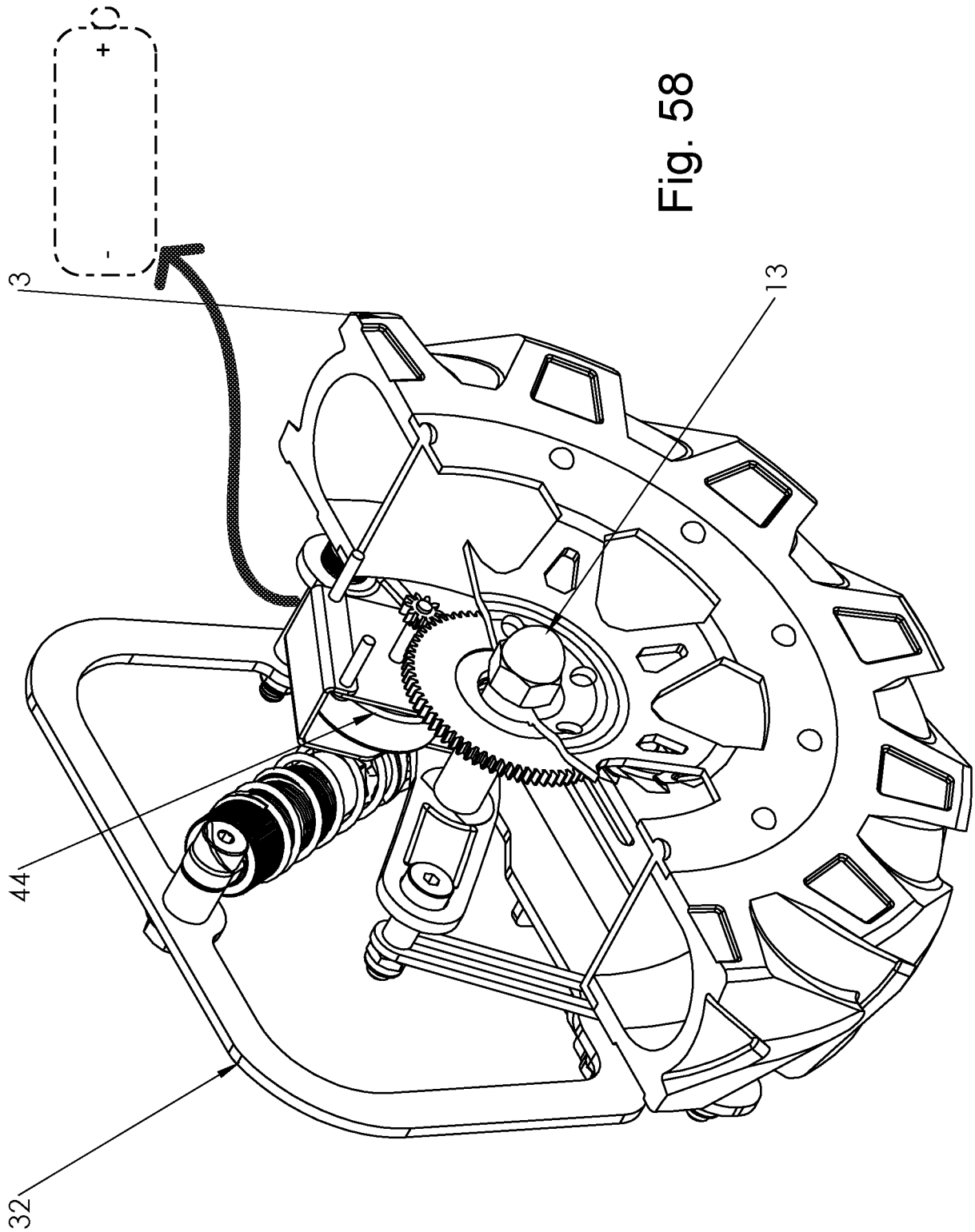


Fig. 58

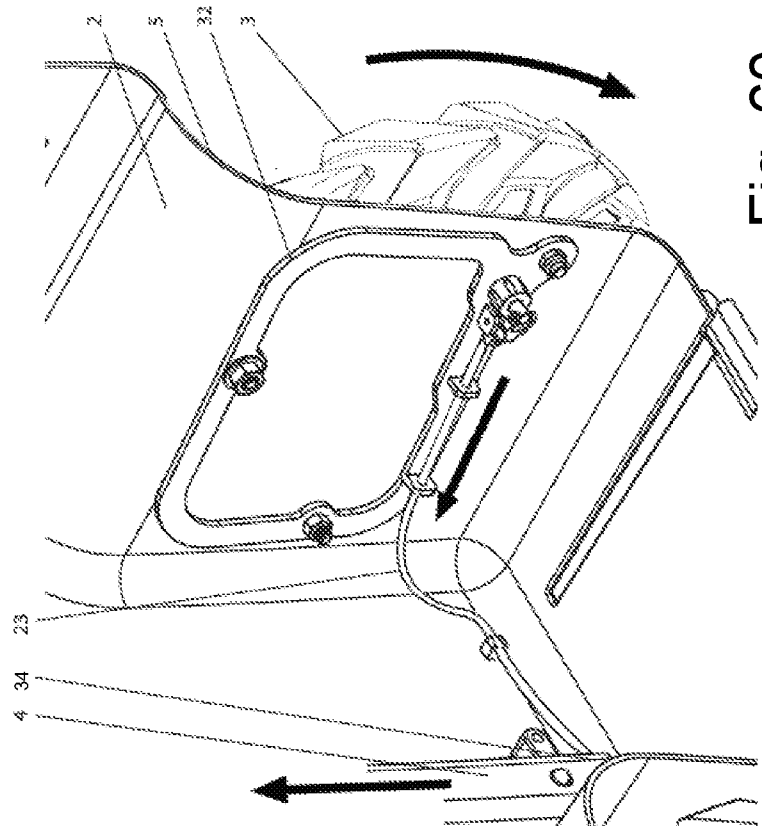


Fig. 60

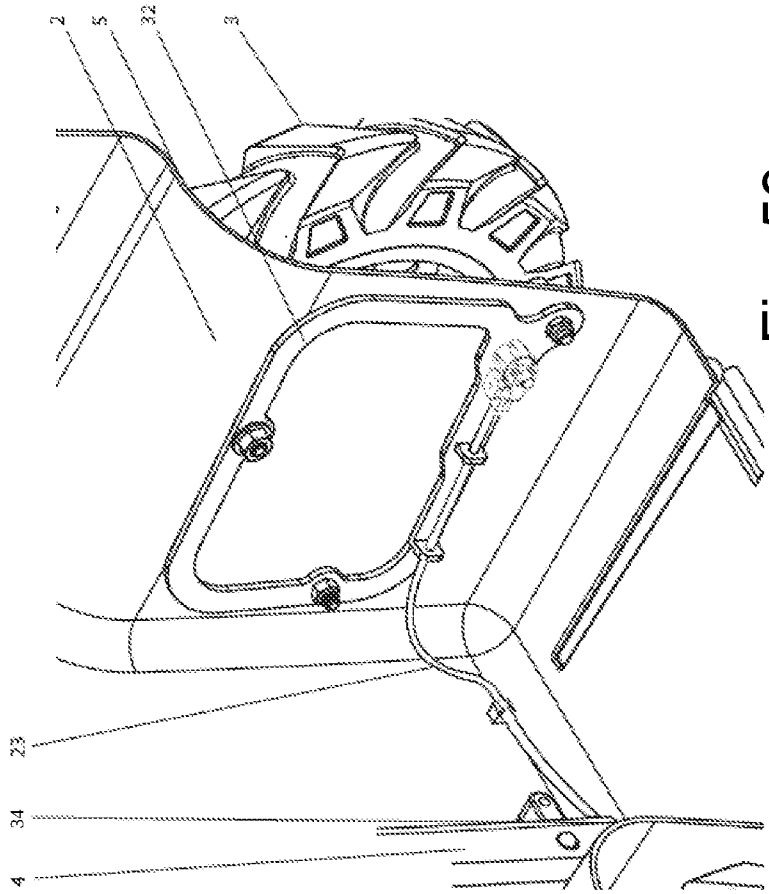


Fig. 59

Fig. 62

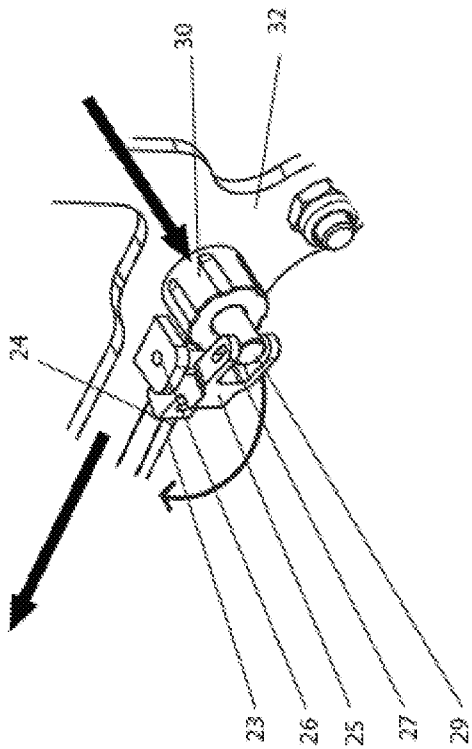
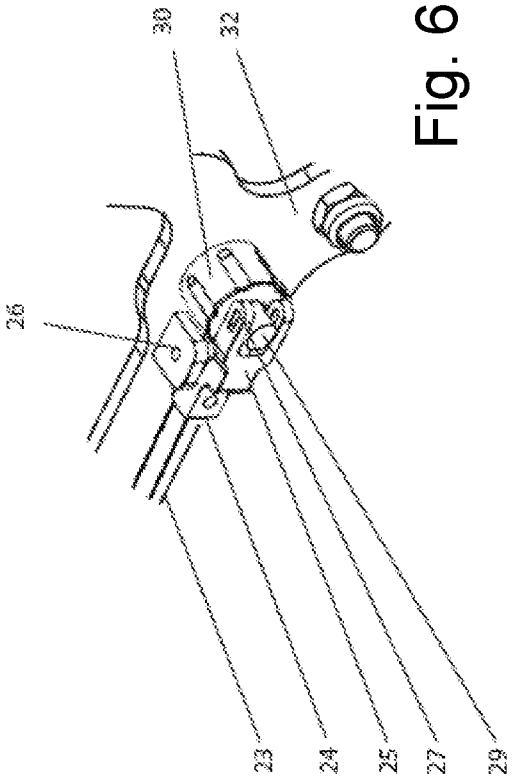


Fig. 61



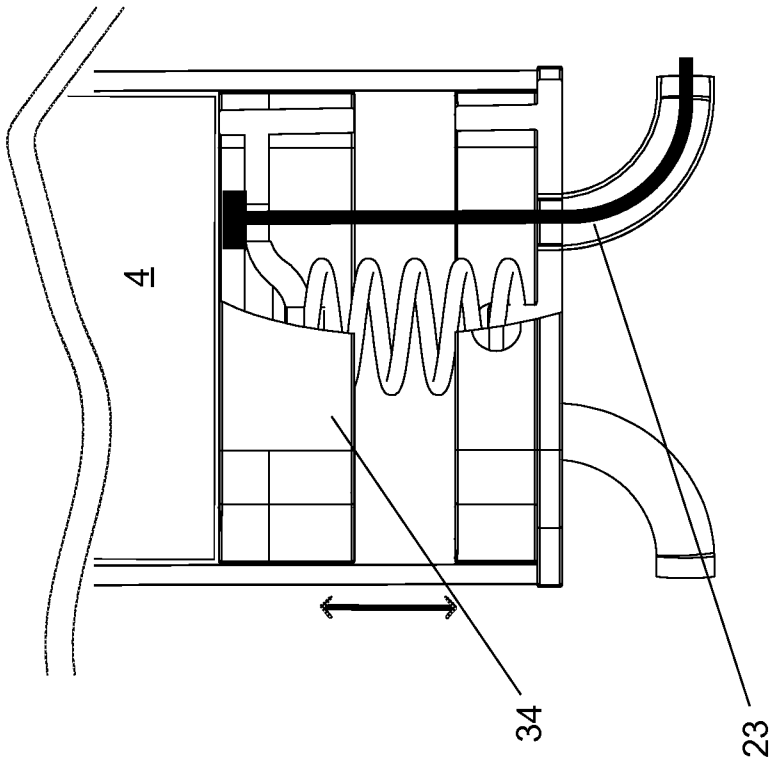


Fig. 64

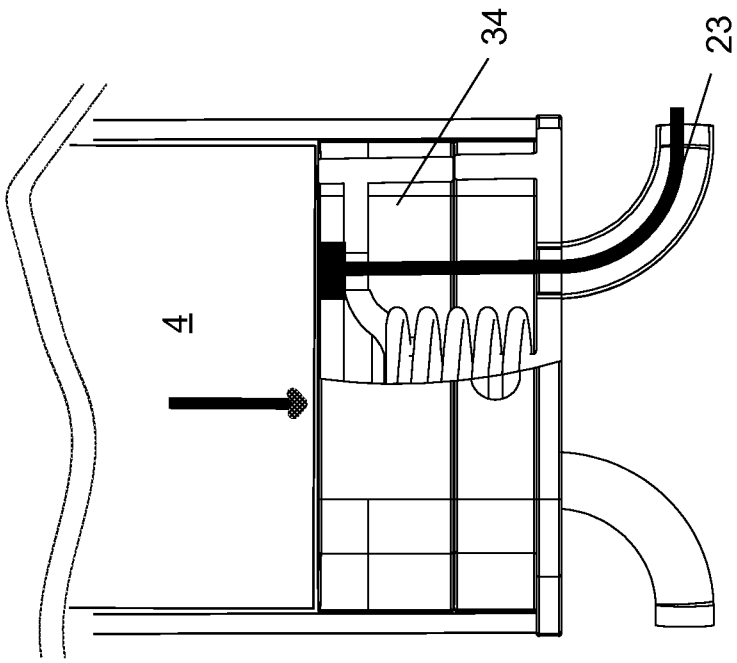


Fig. 63

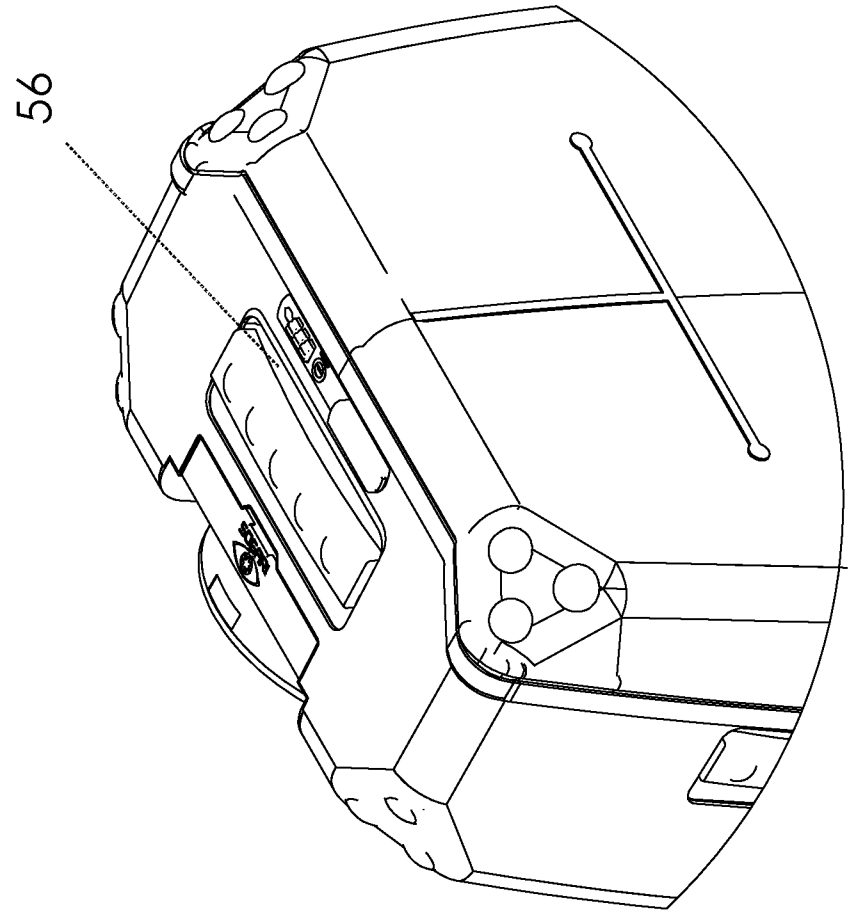


Fig. 66

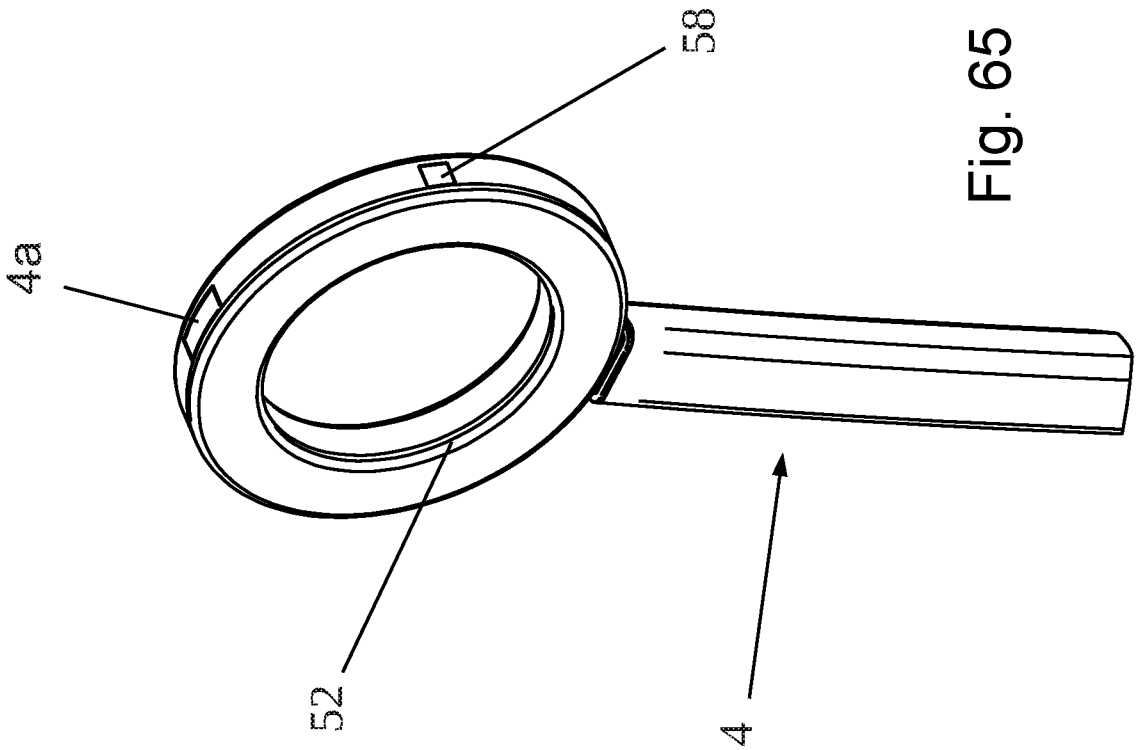


Fig. 65

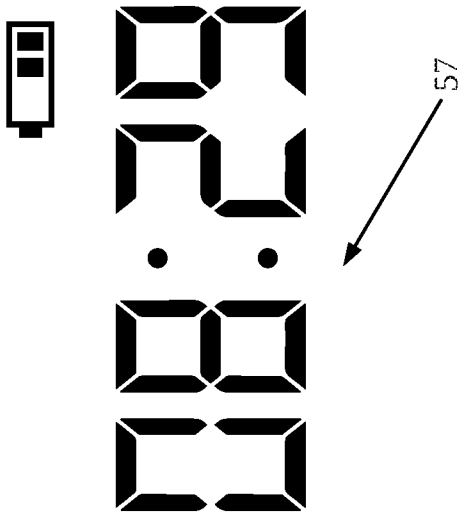


Fig. 68

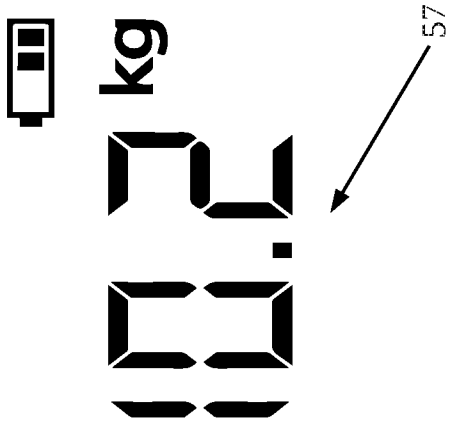


Fig. 69

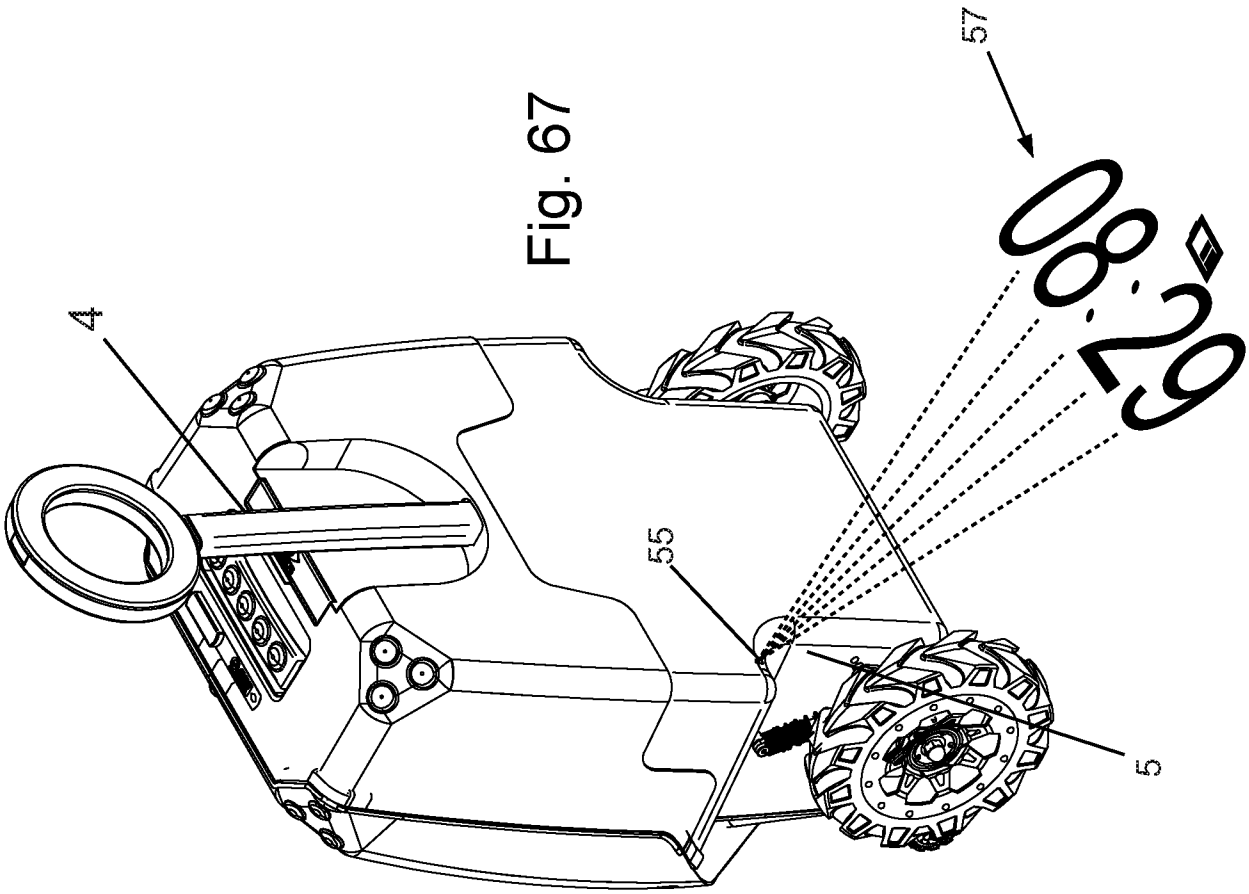
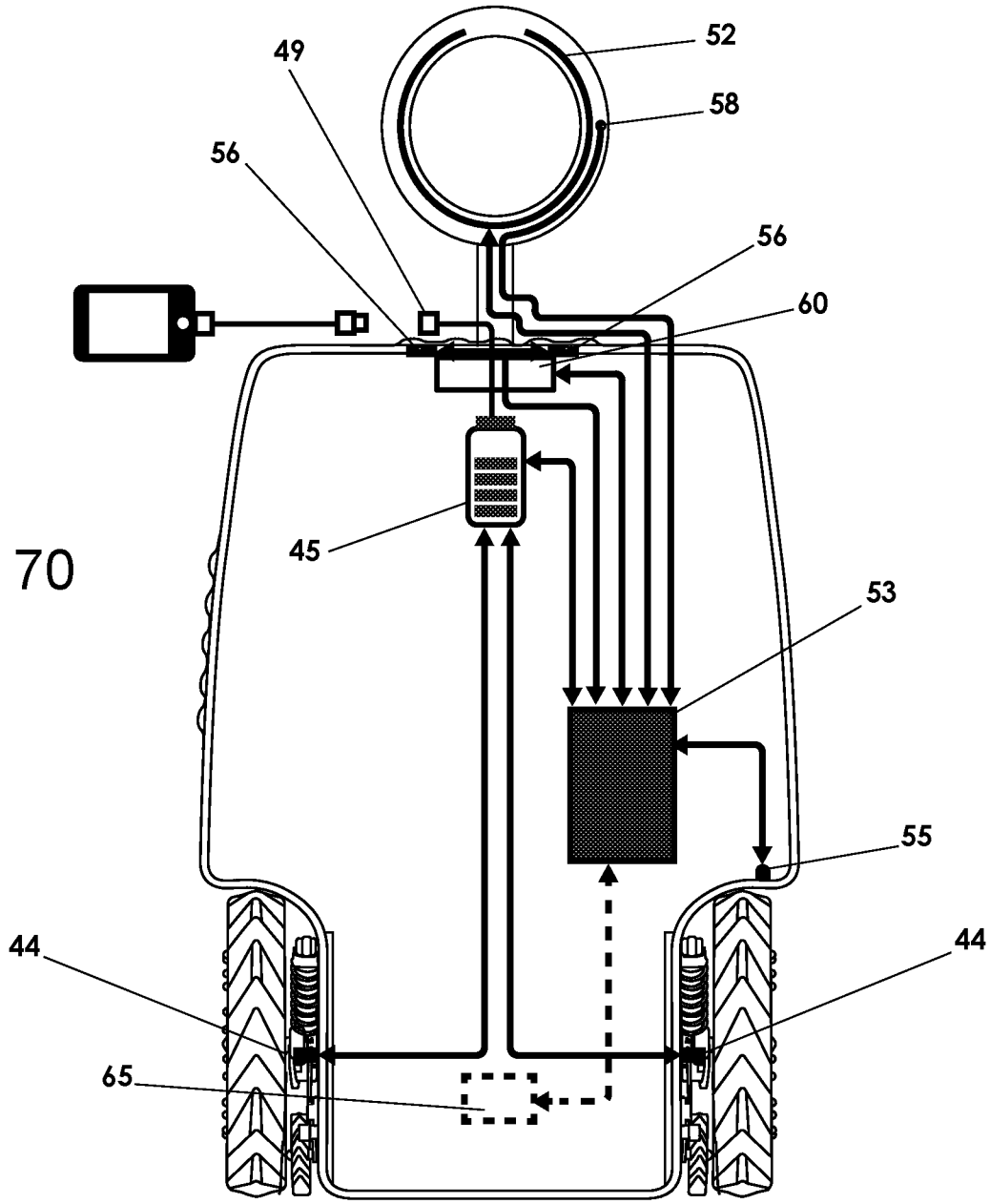


Fig. 67

Fig. 70



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/055560

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60B33/04 B60B33/06 A45C5/14 A45C15/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60B A45C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	EP 2 206 445 A1 (CHEN CHUN-TE [TW]; TSAI MING-CHU [TW]) 14 July 2010 (2010-07-14) figures	1-11

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
26 October 2018	06/11/2018

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Landriscina, V

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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