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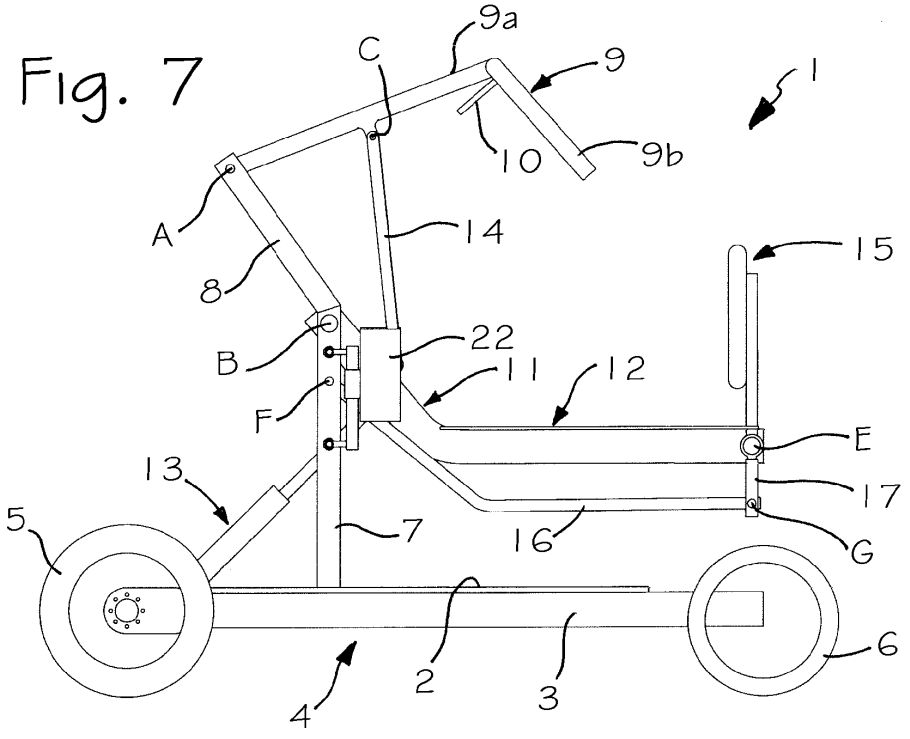
(54) **Device for raising and moving people having functional limitations of the lower limbs**

(57) A device for raising and moving people having functional limitations of the lower limbs comprises a fixed framework (7, 8) borne by a base (2) provided with wheels (5, 6) and a first support element (12) for supporting a part of the body of the user, borne by a moveable structure (11) which is articulated (b) to the fixed framework (7, 8). The device (1) further comprises actuator means (13) which can be selectively actuated by a user to cause displacement of the moveable structure (11) between a reclined position and a raised position. Mounted in a moveable manner on the moveable structure (11) is a second support element (15) for supporting a part of the body of the user. The second support element (15) is displaceable between an inoperative position and at least one operative position, in the latter the second support element (15) providing a support for a region of the back of the user even with the moveable structure (11) in the reclined position.

Fig. 7



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Description

[0001] The present invention refers to a device for raising and moving people having functional limitations of the lower limbs. The invention was developed with particular attention being paid to devices conceived for allowing both the so-called *"verticalisation"* of a user, intended as raising from a sitting posture up to an upright posture, and to allow the user the horizontal movement.

[0002] In case of too much time spent in a sitting position or supine position people having functional limitations of the lower limbs are subjected to worsening of the related clinical condition: for such reason, these people, hereinafter also referred to as *"disabled"* for simplification purposes, must be periodically made to acquire, and temporarily maintain, an upright position. For this purpose, various types of devices have been proposed, having different structures and methods of use, also configured depending on the type of joint limitation of the disabled person. Alongside obtaining the verticalisation of the disabled person some of these devices also allow the latter to move autonomously. in the domestic environment remaining at the upright position, and they are provided - for such purpose - with one or more motorised wheels.

[0003] Some of these raising and movement devices are intended for disabled people having full efficiency of the upper limbs and allow the disabled person to move in an self-sufficient manner onto the device, with a forward motion translation movement, starting from a sitting position, for example on a bed or on a wheelchair. The devices of this type, with rear access, typically include a base provided with wheels, which supports a fixed framework associated to which is a front gripping member. Furthermore, joined to the fixed framework is a moveable structure, which bears an element for supporting a part of the body of the disabled user. The device further includes an actuator, usually electric, which is selectively actuatable by the user to cause the movement of the moveable structure between a reclined position and a raised position.

[0004] The moveable structure and the support element are configured to allow the user, in sitting position for example on a wheelchair, to move autonomously onto the device. For this purpose, with the moveable structure in the respective reclined position, the user grasps - using the hands - the gripping member and drags his body onto the device, with a forward motion translation movement, up to moving his glutei onto the support element, serving as a seat. When the user is sitting on the support element, he can control, through suitable control means, the actuation of the actuator to cause the movement of the moveable structure from the reclined position to the raised position. During such movement, the support element substantially slides along the back of the user up to attaining, when the moveable structure is in its final entirely raised position, a support for the back. The user is also capable of controlling, through further control means, one or more motors for actuating the wheels associated to the base of the device, in such a manner to be able to move within the environment in question, maintained in upright position.

[0005] A device of the described type, and having the characteristics of the preamble of claim 1, is currently manufactured by Chinesport S.p.A., Udine, Italy, and identified by the trade name of *"Struzzo Plus"*.

[0006] Though fairly efficient for allowing the disabled person to achieve verticalisation in an autonomous manner, the raising and movement devices with rear access of the indicated type are conceived to allow movement practically only in the domestic environment, being scarcely suitable for use outdoors and not suitable to overcome small architectural barriers, such as small steps or slight slopes.

[0007] The present invention essentially proposes to overcome this drawback of the prior art. Within this frame, an aim of the invention is that of providing a device of the aforementioned type capable of being easily used by a disabled person as movement means even in slightly uneven environments, such as outdoor environments. Another aim of the invention is that of providing one such device in which the body of the disabled person is supported and/or protected in an enhanced manner with respect to the solutions according to the prior art. Still, another aim of the invention is that of providing one such device being easy to manufacture and inexpensive.

[0008] These and other aims, which will be apparent hereinafter, are attained according to the present invention by a device for raising and moving people having functional limitations of the lower limbs having the characteristics indicated in the attached claims. The claims form an integral part of the technical teaching provided herein in relation to the invention.

[0009] The aims, characteristics and advantages of the invention shall be clear from the description provided with reference to the attached drawings, given for exemplifying and non-limiting purposes, wherein:

- figure 1 is a schematic perspective view of a device according to the present invention, in a first condition;
- figures 2 and 3 are schematic perspective views, from different angles, of the device according to the present invention, in a second condition and on a different scale with respect to figure 1;
- figure 4 is a schematic perspective view of the device according to the present invention in a third condition, on a different scale with respect to figure 1;
- figures 5-9 are schematic side views of the device according to the invention, in a plurality of conditions, on a different scale with respect to figure 1;
- figures 10 and 11 are schematic perspective views of a part of the device according to the invention, with a manually switchable lock/release system to allow the displacement of a support element of the device between an operative position (figure 10) and an inoperative position (figure 11);
- figures 12 and 13 are, respectively, a schematic per-

spective view of a part of the lock/release system of figure 11 and an exploded view of such part, such figures being on different scales;

- figures 14 and 15 are schematic side views of a portion of a device made according to a variant embodiment of the invention, provided with a further support element which is illustrated respectively in an inoperative position and in an operative position.

[0010] In figures 1 - 9, a device for raising and moving people having functional limitations of the lower limbs, made according to the principles of the present invention is indicated with 1 as a whole.

[0011] The device 1 includes a base 2, which in the represented example includes a footboard 3 supported by a quadrangular framework made up of four tubular elements 4 integrally joined to each other at the respective ends. Four wheels are associated to the base 2 in a rotating manner. Still referring to the represented schematic example, the two front wheels, indicated with 5, are actuatable in movement through respective motor means, particularly electric motors of the per se known type, while the rear wheels, indicated with 6, are associated in an idle manner to the base 2; the abovementioned motor means and the hubs of the wheels 5, 6 were not represented in the figures. In this solution, in order to allow varying the motion direction of the device 1, the motors associated to the front wheels 5 are controlled in such a manner that the wheels 5 have a different speed with respect to each other, all according to per se known methods. In an alternative solution, not represented, both the front wheels 5 are actuatable through a single electric motor and the rear wheels 6 are replaced by one or two steerable wheels through a mechanism, also of per se known conception and provided with respective actuator means.

[0012] Associated to the base 2 is a fixed, or stationary, framework articulated to which are a series of moveable parts of the device 1, described hereinafter. In the represented example the framework comprises a pair of tubular uprights 7, at the upper ends of which are further articulated two tubular elements 8, tilted forward.

[0013] Joined to the framework, and particularly to its part made up of the elements 8, is a gripping member or front grasping member, indicated with 9 as a whole. In the example, the member 9 consists of a rod having an arm 9a for hinging between the elements 8, in such a manner to be able to rotate around the axis indicated with A. At the opposite end, the member 9 has a fork portion substantially defining two handles 9b. Associated to the member 9, at its fork portion, is an element for supporting a front part of the body of the user, or a chest rest, indicated with 10. Still articulated to the fixed framework, and particularly to the part thereof made up of uprights 7, is a moveable structure 11, which in the example is essentially represented by a substantially tubular lever, with an intermediate obtuse-angle bending. The moveable structure 11 has an end region interposed between the uprights 7, to which it is hinged in such a manner to be able to rotate around the axis indicated with B. The moveable structure 11 supports a further element, indicated with 12, for supporting a part of the body of the user. For simplification purposes, this support element 12 shall be hereinafter referred to using the term *"seat"*.

[0014] An actuator 13, particularly a linear electric actuator, represented to make drawings clearer only in figures 5-9, is operatively interposed between the moveable structure 11 and the base 2. In the example illustrated in these figures the lower part of the actuator, indicated with 13, is hinged in a front region of the footboard 3, while the upper part of the actuator 13 is hinged to the moveable structure 11. In an alternative embodiment, not represented, the actuator is hinged in the lower part thereof to the fixed framework 7-8.

[0015] The actuator 13 is selectively actuatable by a user of the device 1 to cause the displacement of the moveable structure 11 between a reclined position, observable for example in figures 1 and 5 and a raised position, observable for example in figures 4 and 9. For such purpose, the device 1 is provided with a suitable user interface or control panel, not represented, preferably mounted on the gripping member 9. This panel may include for example three buttons for controlling the actuator 11, one of such buttons being for controlling the actuation required for generating the movement of the moveable structure 11 from the reclined position to the raised position, another button for controlling an inverse actuation and another one for stopping the actuator 13, at any intermediate position between the two aforementioned extreme positions. In a different solution, on the contrary, only two buttons may be provided for, one for controlling the raising of the structure 11 and one for controlling the lowering of the same, with instantaneous stop of the movement in progress when the respective button is released. The control panel may further include a device, preferably of the joystick type, for controlling the two motors for actuating the front wheels 5 in a coordinated manner, also allowing varying the motion direction of the device 1; in case of a single motor for the wheels 5, the abovementioned joystick device is also provided for to control the system for actuating the steerable rear wheel/s.

[0016] Operatively interposed between the moveable structure 11 and the portion 9a of the gripping member 9 is an articulated connection, represented herein by a rod 14. The rod 14 is hinged at the two ends, respectively to the gripping member 9 and to the moveable structure 11, to rotate around the axes indicated with C and D. As deducible from the figures (see in particular the sequence of figures 5-9), the articulated connection 14 is such that the movement of the moveable structure 11 between the respective reclined and raised positions, obtainable through the actuator 13, causes a corresponding displacement of the gripping member 9 between respective lowered (figures 5-7) and raised (figure 9) positions, the movements of the two moveable components 9 and 11

being coordinated or synchronised with each other.

[0017] According to the main aspect of the present invention, mounted in a moveable manner on the structure 11 is a second element for supporting a part of the body of the user. Such an auxiliary support element is indicated with 15 as a whole in the figures and which shall hereinafter be referred to as "b*ackrest"* only for the sake of description simplicity.

[0018] As previously mentioned, the raising and movement devices with rear access according to the prior art are not suitable to allow an appropriate mobility for a disabled person outdoors or in presence of small architectural barriers. For this reason, the device 1 according to the invention is configured in such a manner to allow its use for movement even with the user at the sitting position, in an entirely safe manner and even outdoors. It should be observed that the devices with rear access according to the prior art are not conceived to support the user when the latter is in the sitting position. As a matter of fact, known devices are conceived in a manner such that the sitting position is only temporary, and maintained by the user only for a period of time strictly necessary to activate the actuator means meant to cause the raising or verticalisation of the user himself.

[0019] As will be clear hereinafter, the device according to the invention is conceived to allow a disabled person to move outdoors, both in upright and sitting position, overcoming small architectural barriers, such as steps and slopes. According to the invention, provision of the backrest 15 associated to the moveable structure 11 allows the user to maintain the sitting position for a long period of time and in a safe manner when moving the device on wheels 5, 6, even in slightly uneven surfaces. However, providing for the backrest 15 should not be a hindrance to the forward motion translation movement of the user, when the latter moves from a wheelchair to the device. For this reason, according to a further characteristic of the invention, the backrest 15 is mounted on the moveable structure 11 in such a manner to be able to acquire an inoperative position and at least one operative position.

[0020] In the device 1 according to the invention, when the moveable structure 11 is in the respective reclined position, the backrest 15 can be displaced between the abovementioned inoperative position, or lowered position (figures 1 and 5), or an operative position, or raised position (figures 2, 3 and 7). As deducible, when the backrest is in its lowered position, it does not represent a hindrance to the forward motion translation movement performed by the user to move onto the seat 12. On the contrary, when the user reaches the sitting position on the device 1, the backrest 15 may be moved in the respective raised position, in such a manner to attain a support for the back of the user. In the example, the backrest 15 provides a rest for the lumbar region of the body of the user, but clearly the dimensions of the backrest itself may vary from the ones schematised.

[0021] Furthermore, in the preferred embodiment of the invention, the backrest 15 is adapted to acquire also at least one second operative position, useful when the moveable structure 11 is in the respective upright or raised position. As observable, particularly in figures 4 and 9, in the second operative position thereof, the backrest 15 provides a rest or support for a rear part of the body of the user which is different from the one that is supported by the backrest itself when the structure 11 is in the reclined position. Depending on the dimensions and configurations selected for the structure 11, the seat 12 and the backrest 15, the latter may provide, when in its second operative position, a rest for an upper region of the back, or for a region of the neck, or also provide a sort of a headrest.

[0022] Still in the preferred embodiment of the invention, the device 1 is provided with actuation means to cause the displacement of the backrest 15 in an assisted manner at least between its two mentioned operative positions. Furthermore, preferably, these actuation means are configured to coordinate and/or synchronise the displacement of the backrest 15 with the displacement of the moveable structure 11, and thus the seat 12.

[0023] In the illustrated embodiment, the backrest 15 is articulated to the moveable structure 11 in such a manner to rotate around the axis indicated with E, and the respective actuation means are made up of an articulated connection including at least one rod operatively interposed between the fixed framework 7-8 and the backrest 15. Referring to the illustrated example, the articulated connection comprises two rods parallel to each other, indicated with 16, having a general shape similar to that of the moveable structure 11 and arranged below the latter, having the reclined position of the structure as reference. A first end of these rods 16 is hinged to a respective upright 7, to rotate around an axis F found beneath axis B and parallel thereto. Hinged at the second end of the rods 16 are the first ends of two further rods 17, whose second ends are in turn connected to a frame of the backrest 15.

[0024] In the illustrated non-limiting embodiment, the backrest 15 is mounted to be manually displaceable between the respective lowered and raised positions. Provided for such purpose are suitable means for locking the frame of the backrest 15, whose means are actuatable manually to alternatively acquire an engagement condition and a release condition. In the abovementioned engaged position, the mentioned locking means constrain the frame of the backrest 15 to the articulated connection 16-17, and in particular to at least one of the rods 17, such that a displacement of the articulated connection 16-17 causes a displacement of the backrest 15. On the contrary, in the abovementioned release position, the mentioned locking means free the frame of the backrest 15 from the articulated connection 16-17, such that the backrest may be manually displacement between its lowered and raised positions.

[0025] A possible embodiment, merely exemplifying, of the abovementioned locking means is illustrated in fig-

ures 10-13. In figures 10 and 11 is shown the frame of the backrest 15, which in the example comprises two vertical uprights 18, associated to which is a component of the backrest 19, preferably a soft and padded component. The two uprights 18 are integrally joined, at their lower ends, to a horizontal pin 20, passing in a respective housing of the structure 11 and moveable angularly according to the axis indicated with E, parallel to the axis G (in the exemplified embodiment, all rotation axes A-G are substantially horizontal and parallel to each other). As observable, also in figures 1-4, the seat 12 has, at its rear edge, cavities adapted to receive the uprights 18, when the backrest 15 is in the raised position. Furthermore, shown in figures 10 and 11 are two pin elements, indicated with 20', used for articulating the ends of the rods 16 to the respective ends of the rods 17. In other variants not represented, the pin 20 is made up of two separate pins and the pins 20' are replaced by a single pin.

[0026] The pin 20 passes, in respective end regions, in the holes of two eyelets, each made at the upper end of a respective rod 17. One of these eyelets is indicated with 17a in figure 13, and the respective hole is indicated with 17b. The length of the pin 20 is such that its ends project towards the external of the eyelets 17a (see for example figure 12), and these ends have respective axial grooves 20a. Furthermore, each eyelet 17a has, in its face directed towards the external of the device, a grooved ring 17c. The locking means further include two substantially drinking-glass-shaped hand grips 21, graspable manually by the user. As observable in figure 13, each hand grip 21 has a blind grooved cavity 21a, adapted to cooperate with the grooves 20a of the pin 20. The body of the hand grip 21 is then provided with a toothed ring 21b, which surrounds the opening of the grooved cavity 21a.

[0027] Shown in figure 10 is the engagement condition of the locking means. In such condition, the hand grips 21 are fitted onto the ends of the pin 20 with the grooved coupling 20a-21a active and with the teeth of the ring 21b engaged in the groves of the ring 17c. As deducible, in this manner, the rods 17 are in a fixed coupling condition with respect to the pin 20, and only a possible angular movement of the rods 17 can cause a rotation of the pin 20, and hence a rotation of the backrest 15, around the axis E.

[0028] Shown in figure 11 instead is the release condition of the locking means, obtainable by exerting an axial traction on the hand grips 21 outwards, i.e. in the sense of moving them away from the slots 17a. Following such axial movement, the grooved coupling 20a-21a remains active, but the teeth of the ring 21b are no longer engaged in the grooves of the ring 17c. As deducible, in this manner, the rods 17 are no longer coupled to the pin 20, and the latter (and thus the backrest 15) may be freely rotated manually around the axis E, so as to be displaced from the lowered position to the raised one, and vice versa. The raising of the backrest 15 may be performed by means of the hand grips 21, given that, as mentioned, the grooved coupling 20a-21a always remains active. It is also clear that, in order to block the frame of the backrest 15 again with respect to the rods 17 it is sufficient to push the hand grips axially in the direction opposite to the previous one, with a minimum rotation - if required - to collimate the teeth of the ring 21b with the grooves of the ring 17c. In the preferred practical embodiment, the hand grips 21 are mechanically constrained to the ends of the pin 20, possibly also with interposition of a return spring, so as to prevent the latter from inadvertently slipping off the former. The practical means for attaining this stop mechanism of the axial movement of the hand grips 21 can be of any conception, clearly within thereach of a man skilled in the art.

[0029] As mentioned, the mechanism aimed at allowing the displacement of the backrest between the inoperative and operative positions and its locking in position can be different from the one represented for exemplifying purposes, without prejudice to its general functionalities. For example, provided for this purpose may be a lock member (for example of the sliding latch type) which, instead of operating directly on the hinge of the backrest, operates between a part of the frame of the backrest and at least one of the rods 17, such member being easily accessible and selectively actuatable by the user.

[0030] Lastly, indicated with 22 in the figures are two rest elements for the knees of the user. These elements 22, preferably including a concave-shaped body, are each integrally joined to a respective upright 7, in an adjustable manner in height and length.

[0031] Use and operation of the device according to the invention shall now be described with reference to figures 5 - 9. In figure 5 the device 1 has the moveable structure 9 in the respective reclined position and with the backrest 15 in lowered position. In this configuration, the movement of a user from a wheelchair (or from a bed, or any other place where the user is in a sitting position) occurs, through some successive steps:

a) approaching the wheelchair to the rear part of the device 1, in such a manner to position the seat pan of the chair close to the rear region of the seat 12;
b) positioning the feet of the user on the footboard 3;
c) movement of the user from the wheelchair onto the seat 12, using the gripping member 9.

[0032] In practice, in order to perform step c), the user grasps - using the hands - the handles 9a of the gripping member 9, drags his body on the device 1, with a forward motion translation movement, until he moves his glutei onto the seat 12. In this step, the backrest 15 is lowered and therefore it is of no hindrance whatsoever. Upon attaining the sitting position, the user may grasp the hand grips 20 and rotate them, in such a manner to move the backrest 15 in the raised position (figures 6 and 7), and then cause the coupling between the teeth of the ring 21b and the grooves of the ring 17c (see the description

provided with reference to figures 10-13): in such manner, the backrest is maintained in position (figure 7).

[0033] With this configuration, the device 1 may be easily used by the user as a locomotion means, in a manner similar to a motorised wheelchair. Conditions of correct posture and safety during movement are ensured by the presence of the rear support represented by the backrest 15, which also prevents risks of the subject on the seat 12 sliding backwards and ensures the stability of the same. The control of the motor/s that generate the movement of the device by means of the wheels 5, 6 occurs, as mentioned, by means of a user interface mounted on the gripping member 9. It should be observed that in this configuration of use the member 9 is in lowered position and hence easily accessible for the user.

[0034] Instead, should the user want to use the device 1 as an aid for verticalisation, all he has to do is control the actuator 13, still through the abovementioned user interface. The actuation of the actuator 13 causes the rotation of the moveable structure 9 around the axis B, in the upward direction (figure 8). As mentioned, given the articulated connection 14, the movement of the structure 9 also causes the coordinated upward movement of the gripping member 9, around the axis A. Furthermore, in this step, the articulated connection 16-17 causes a variation of the position of the backrest 15, from its first operative position (figure 7) to its second operative position (figure 9). As a matter of fact, the upwards rotation of the structure 9 causes the upwards rotation of the rods 16, around the axis F, with the ensuing coordinated angular movement of the rods 17 around the axis G, and hence of the backrest 15 around the axis E. The articulated connection is such that, during the verticalisation movement of the structure 11, the rods 17 always remain vertical: therefore, the backrest 15, which is integrally joined to the rods 17, always maintains the same angle of inclination during the movement of the structure. During the verticalisation, the different rest parts of the device 1 involved, and specifically the seat 12, the backrest 15 and the chest rest 10, accompany the movement of the user to guarantee the stability of the latter.

[0035] Upon attaining the raised position of the structure 11, the device appears as illustrated in figure 9. This configuration allows the user to maintain an upright posture due to the support of the elements 22 for resting the knees, the seat 12, the backrest 15 and the chest rest 10; furthermore, the handles 9a of the gripping member 9 allow constraining the movement of the user, so as to prevent possible lateral loss of balance. It shall be observed that, upon attaining the condition of figure 9, the seat 12 now substantially serves as the main support for the back of the user, while the backrest 15 serves as an auxiliary support for the back (for example in the shoulder region, or as a support for the neck region, or also provides a sort of a headrest, obviously all according to the configurations and dimensions of the mentioned parts and of the subject).

[0036] Also in the verticalisation condition, the device 1 may be used by the user as a movement aid, even in slightly uneven outdoor environments, in a safe manner. First and foremost, this possibility is allowed by the fact that the dimensions of the base 2 of the device 1 are increased with respect to the prior art devices. For such purpose, the overall dimensions of the device in length and width may indicatively be 1000-1500 mm and 600-700 mm, respectively, while the diameter of the wheels may indicatively be in the range between 250 and 300 mm. In the currently preferred version, the overall length dimension is about 1400 mm and the overall width dimension is about 700 mm. On the other hand, given the presence and position of the backrest 15, the conditions of correct posture and stability of the user in the verticalisation condition are increased with respect to the prior art solutions, with a consequent enhancement of safety in case of movement in outdoor and slightly uneven environments.

[0037] Obviously, for the user to get off the device, the moveable structure 9 shall be returned in the respective reclined position and the backrest 15 lowered, all according to the ways substantially inverse with respect to the one described previously.

[0038] As mentioned beforehand, the actuator means and the motors provided for on the device 1, of per se known conception, are preferably powered electrically, and provided for on the base 2 - for such purpose - are one or more rechargeable batteries, not represented, also them being of a type known per se. The main mechanical components of the device are preferably made of metal material, such as steel or aluminium. Furthermore, preferably, the fixed framework and the moveable components associated thereto are arranged in such a manner to allow the variation of the position of the hinging points, so as to allow a wide range of adjustment and thus adapt the device to the size of the user. In this sense, one or more of the rods of the various articulations may also be of the telescopic type and/or adjustable in length.

[0039] The described device may be used by people entirely or partially lacking functionality of the lower limbs both to attain an upright posture, and for movements in outdoor environments in a safe manner, even overcoming small architectural barriers, such as small steps or slight slopes. In all the use configurations of the device according to the invention, the body of the disabled person is supported and/or protected in an improved manner with respect to the solutions according to the prior art. The possibility of movement in the two sitting and upright positions, determines a wide versatility of the device. The proposed device is easy to manufacture and it is inexpensive.

[0040] In the practical embodiment of the invention, the device shall be provided with usual equipment and accessories, such as belts for supporting the body of the user, to be associated to the fixed structure or moveable parts of the device, or also sandals and/or heel pads to be associated to the footboard 3, for positioning the feet of the user, and so on and so forth.

[0041] It is clear that many variants are possible for a a man skilled in the art to the device described for exemplification purposes, without departing from the scope of the invention as defined in the claims that follow.

[0042] In the solution described above for simplification purposes a low number of actuators is provided for, so as to reduce the weight of the device and thus enhance its operating self-sufficiency through batteries. However, in possible variant embodiments, the device is provided with further actuators to assist the movement of its moveable components. For example, in a first variant not represented, an electromechanical system for the adjustment of the seat 12 in height may be associated to the moveable structure 11. In another embodiment, the displacement of the backrest 15 between the respective raised and lowered positions may be controlled through a specific actuator, particularly an electric stepper motor, for example with a rotor associated to a pin 20, and hence without the necessity of manual locking/release means. Such stepper motor can be borne for example by the structure 11 or by the frame 18 of the backrest, and replace the articulated connection 16-17. In the latter case, the system for controlling the device 1 is conveniently configured, by means of technique known per se, to synchronise and coordinate the actuations of the abovementioned stepper motor and actuator 13 to each other, so as to obtain a displacement of the backrest 15 similar to that obtainable through the connection 16-17.

[0043] Illustrated in figures 14 and 15 is a further possible variant embodiment, according to which the gripping member 9 is provided with further means for resting a front part of the body of the user, such means being intended to operate in a higher position with respect to the chest rest 10, and capable of assisted displacement between a respective inoperative position and at least one respective operative position. This rest means, indicated with 30 as a whole, has at least one moveable support rod 31, associated to which is a rest element 32. The rest element 32 is preferably coupled in an adjustable manner to the rod 31, i.e. in a manner such to be able to be fixed to the rod 31 in several alternative positions. Also provided for are actuation means for causing the assisted displacement of the rod 31 between a lowered position (figure 14) and a raised position (figure 15). Preferably, also these actuation means are configured to coordinate and/or synchronise the displacement of the rod 31 with the displacement of the moveable structure 9 (and hence of the structure 11). In the illustrated example, these actuation means include a connecting rod member 33, integrally joined to the lower end of the rod 31. The connecting rod member 33 is hinged to the portion 9a of the gripping member 9, so as to be able to rotate around the axis indicated with H (figure 15), which is in fixed position with respect to the portion 9a. The actuation means also include a lever 34, with an obtuse angle intermediate bending, having an end joined to the connecting rod member 33, with possibility of rotating around the axis indicated with J. The other end of the lever 34 is hinged to the rod 14, i.e. the rod that causes the assisted movement of the gripping member 9 as explained previously, so as to be able to rotate around the axis indicated with L, which is parallel to axes C, H and J.

[0044] As observable in figure 14, with the gripping member 9 in the respective lowered position (corresponding to the reclined position of the moveable structure 11), the rest means 30 is in an inoperative or lowered position. The raising of the structure 11 causes the movement of the rod 14, also so as to generate the upward movement of the gripping member 9. This movement also determines the actuation of the articulated connection provided by the lever 34 and the connecting rod 33, thus also causing the progressive raising of the support rod 31, up to the position observable in figure 15, which corresponds to the maximum raising of the structure 11. As observable, in this condition, the rest element 32 is in an operative position above the chest rest 10, in such a manner to provide a further help to maintain the correct upright posture by the user and avoid the risk of the latter losing balance forward. It goes without saying that the kinematic arrangement aimed at generating the assisted movement of the support means 30, exploiting the movement of the structure 11, may be different from the one exemplified in the figures.

Claims

1. A Device for raising and moving people having functional limitations of the lower limbs, comprising:

- a base (2) associated to which is a plurality of wheels (5, 6),
- a fixed framework (7, 8) borne by the base (2),
- a front gripping member (9), preferably borne by the framework (7, 8),
- a first support element (12) for supporting a part of the body of a user, borne by a moveable structure (11) which is articulated (B) to the fixed framework (7, 8),
- actuator means (13), selectively actuatable by the user to cause displacement of the moveable structure (11) between a reclined position and a raised position,

wherein the moveable structure (11) and the first support element (12) are configured to allow the user, when the moveable structure (11) is in the respective reclined position, to perform a forward motion translation movement towards the front gripping member (9), so as to shift his/her glutei onto the first support element (12), and wherein, after passage of the moveable structure (11) from the reclined position to the raised position, the first support element (12) provides a support for a first region of the back of the user, **characterised in that**

- mounted in a moveable manner on the moveable structure (11) is a second support element (15) for supporting a part of the body of the user, the second support element (15) being capable of taking on an inoperative position and at least one operative position, and
- the second support element (15) is displaceable between an inoperative position and the abovementioned first operative position, when the moveable structure (11) is in the respective reclined position, in the inoperative position the second support element (15) not representing a hindrance to the performance of the abovementioned forward motion translation movement by the user, and in the first operative position the second support element (15) providing a support for a second region of the back of the user, particularly the lumbar region.

2. The device according to claim 1, wherein the second support element (15) is also capable of taking on a second operative position when the moveable structure (11) is in the respective raised position, in the second operative position the second support element (15) providing a support for a rear part of the body of the user that is different from said first and second region of the back of the user, the device (1) further comprising first actuation means (16, 17) to cause in an assisted manner the displacement of the second support element (15) at least between the respective first and second operative position, the first actuation means comprising in particular an actuator, such as a stepper motor.

3. The device according to claim 2, wherein the first actuation means (16, 17) are configured for

- coordinating and/or synchronising the displacement of the second support element (15) between the respective first and second operative position with the displacement of the moveable structure (11) between the respective reclined and raised positions, and/or
- causing in an assistend manner also the displacement of the second support element (15) between the inoperative position and the operative position.

4. The device according to claim 2 or 3, wherein the second support element (15) is articulated to the moveable structure (11) to rotate according to an axis (E) that is parallel to a rotational axis of the moveable structure (11) with respect to the fixed framework (7, 8).

5. The device according to claim 2 or 3, wherein the first actuation means comprise a first articulated connection (16, 17) operatively interposed between the fixed framework (7, 8) and the second support element (15), the first articulated connection (16, 17) being configured such that the displacement of the moveable structure (11) between the respective reclined and raised positions causes the displacement of the second support element (15) at least between the respective first and second operative position.

6. The device according to claim 1, wherein the front gripping member (9) is articulated to the fixed framework (7, 8) to be displaceable between a respective reclined position and a respective raised position and second actuation means (14) are provided, to cause in an assisted manner the displacement of the gripping member (9) between the respective reclined and raised positions, the second actuation means (14) being particularly configured for coordinating and/or synchronising the displacement of the gripping member (9) with the displacement of the moveable structure (11).

7. The device according to claim 6, wherein the second actuation means comprise a second articulated connection (14) operatively interposed between the fixed framework (7, 8) and the gripping member (9), the second articulated connection (14) being configured such that the displacement of the moveable structure (11) between the respective reclined and raised positions causes the displacement of the gripping member (9) between the respective reclined and raised positions.

8. The device according to claim 1, further comprising a third support element (30) for a part of the body of the user, articulated to the gripping member (9) and capable of taking on a respective inoperative position and at least one respective operative position, in the operative position the third support element providing a support for a front part of the body of the user, particularly a chest region.

9. The device according to claim 8, wherein third actuation means (33, 34) are provided, for causing in an assisted manner the displacement of the third support element (30) between the respective operative and inoperative positions, the third actuation means (32, 33) being particularly configured for coordinating and/or synchronising the displacement of the third support element (30) between the respective inoperative and operative positions with the displacement of the moveable structure (11) between the respective reclined and raised positions.

10. The device according to claims 7 and 9, wherein the third actuation means comprise a third articulated connection (33, 34) operatively interposed between the second articulated connection (14) and the gripping member (9), the third articulated connection (33,

34) being configured such that the displacement of the moveable structure (11) between the respective reclined and raised positions determines both the displacement of the gripping member (9) between the respective reclined and raised positions and the displacement of the third support element (30) between the respective inoperative and operative positions.

11. The device according to claim 1, wherein the second support element (15) is mounted on the moveable structure (11) in such a manner to be manually displaceable between the inoperative position and the first operative position.

12. The device according to at least one of the preceding claims, wherein locking means (17a-17c, 20a, 21) are provided, selectively actuatable manually and capable of taking on an engagement condition and a release condition, where

- in the engagement condition, the locking means (17a-17c, 20a, 21) maintain the second support element (15) in the first operative position, and
- in the release condition, the second support element (15) is displaceable manually between the inoperative position and the first operative position.

13. The device according to at least one of the preceding claims, comprising at least one of

- motor means for rotating one or more of the wheels (5, 6),
- a steerable wheel,
- manual control means, particularly supported by the gripping member (9), operatable by the user so as to control the actuator means and/or motors of the device.

14. The device according to claims 5 and 12, wherein

- in said engagement condition, the locking means (17a-17c, 20a, 21) constrain the second support element (15) to the first articulated connection (16, 17) such that a displacement of the first articulated connection causes a displacement of the second support element (15), and
- in the release condition, the locking means (17a-17c, 20a, 21) free the second support element (15) from the first articulated connection (16, 17), such that the second support element (15) is displaceable manually between the inoperative position and the first operative position, particularly through an angular movement according to an axis (G) parallel to a rotational axis (E, F) of the first articulated connection (16, 17).

15. A device for raising and moving people having functional limitations of the lower limbs, particularly but not exclusively according to claim 1, including:

- a base (2) associated to which is a plurality of wheels (5, 6),
- a fixed framework (7, 8) borne by the base (2),
- a front gripping member (9), particularly borne by the fixed framework (7, 8), having a first support element (10) for supporting a part of the body of a user,
- a second support element (12) for supporting a part of the body of the user, borne by a moveable structure (11) which is articulated (B) to the fixed framework (7, 8),
- actuator means (13), selectively actuatable by the user to cause the displacement of the moveable structure (11) between a reclined position and a raised position,

wherein the moveable structure (11) and the second support element (12) are configured to allow the user, when the moveable structure (11) is in the respective reclined position, to perform a forward motion translation movement towards the front gripping member (9), so as to shift his/her glutei onto the second support element (12), and wherein, after passage of the moveable structure (11) from the reclined position to the raised position, the first support element (10) provides a support for a first region of the front part of the body of the user and the second support element (12) provides a support for a first region of the rear part of the body of the user, **characterised in that**:

- articulated to at least one of the front gripping member (9) and the moveable structure (11) is a third support element (15; 30) for supporting a part of the body of the user, the third support element (15; 30) being mounted to be displaceable from a first position to a second position during the displacement of the moveable structure (11) from the reclined position to the raised position,
- in the second position, the third support element (15; 30) provides a support for a part of the body of the user that is different from said first region of the front part of the body of the user and first region of the rear part of the body of the user,
- the device (1) further comprises actuation means (16, 17; 14, 33, 34) for causing in an assistend manner the displacement of the third support element (15; 30) between the respective first and second position,

where in particular the actuation means (16, 17; 14, 33, 34)

- are configured for coordinating and/or synchronising the displacement of the third support element (15; 30) between the respective first and second position with the displacement of the moveable structure (11) between the respective reclined and raised positions, and/or
- comprise an articulated connection (16, 17; 14, 33, 34) configured such that the displacement of the moveable structure (11) between the respective reclined and raised positions causes the displacement of the third support element (15; 30) at least between the respective first and second position.

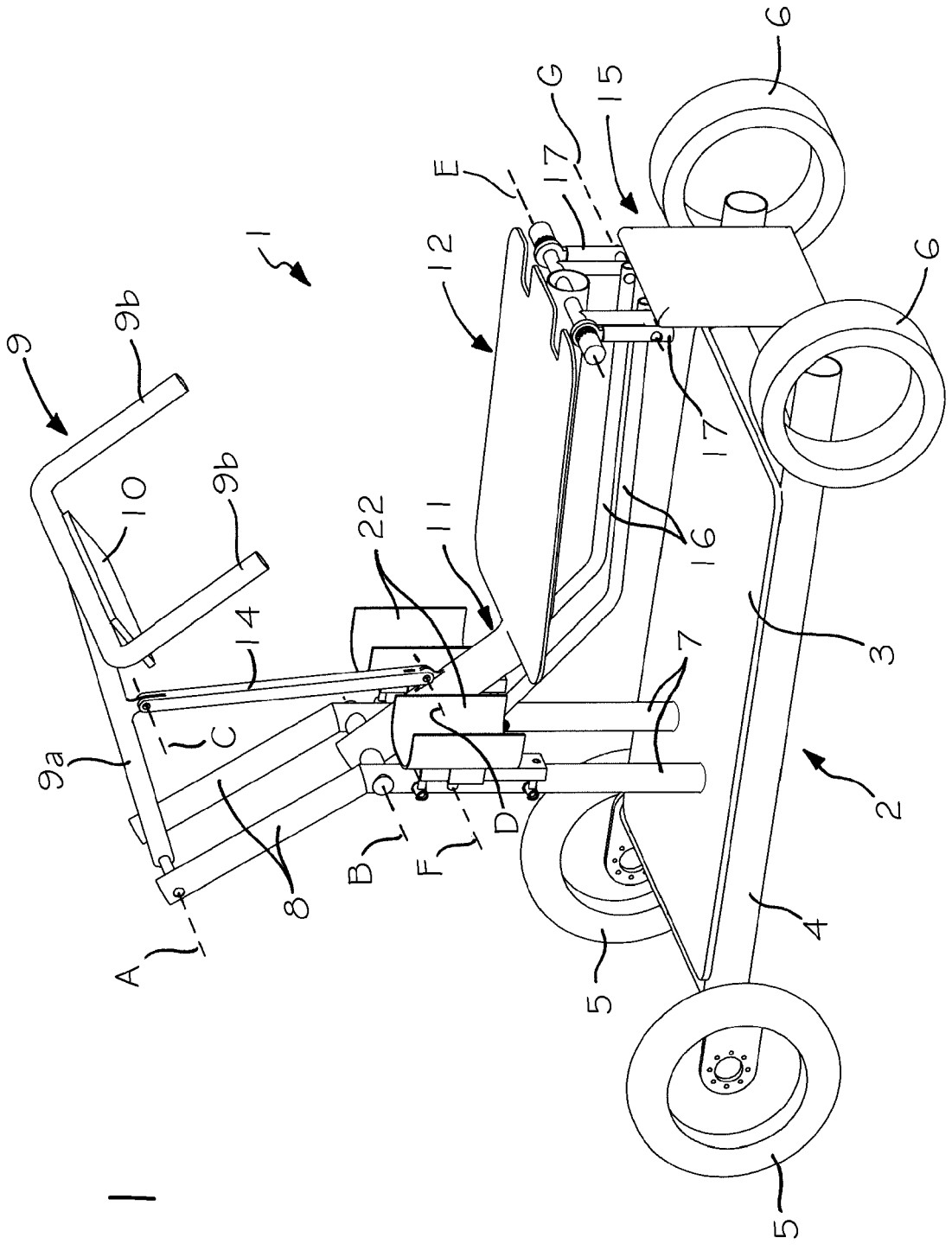

Fig. 1

Fig. 2

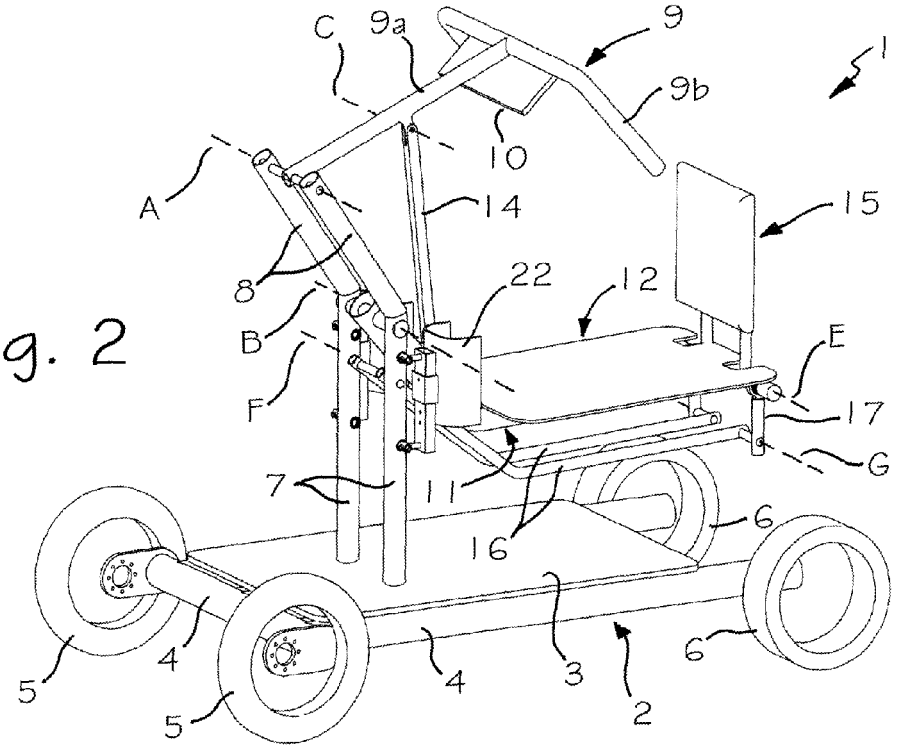
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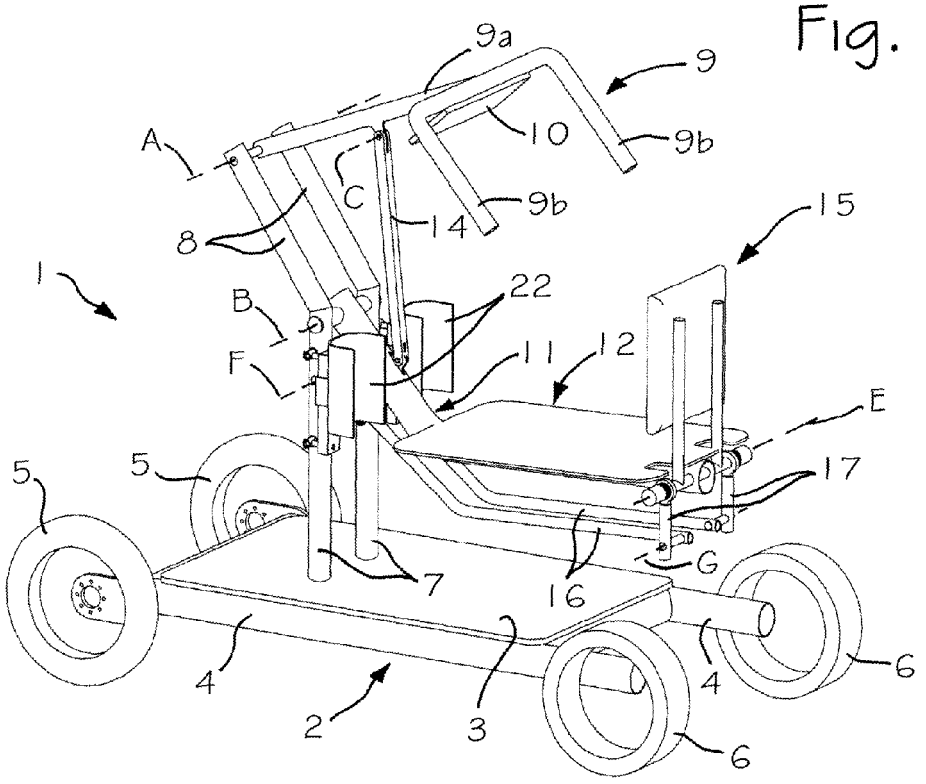
Fig. 3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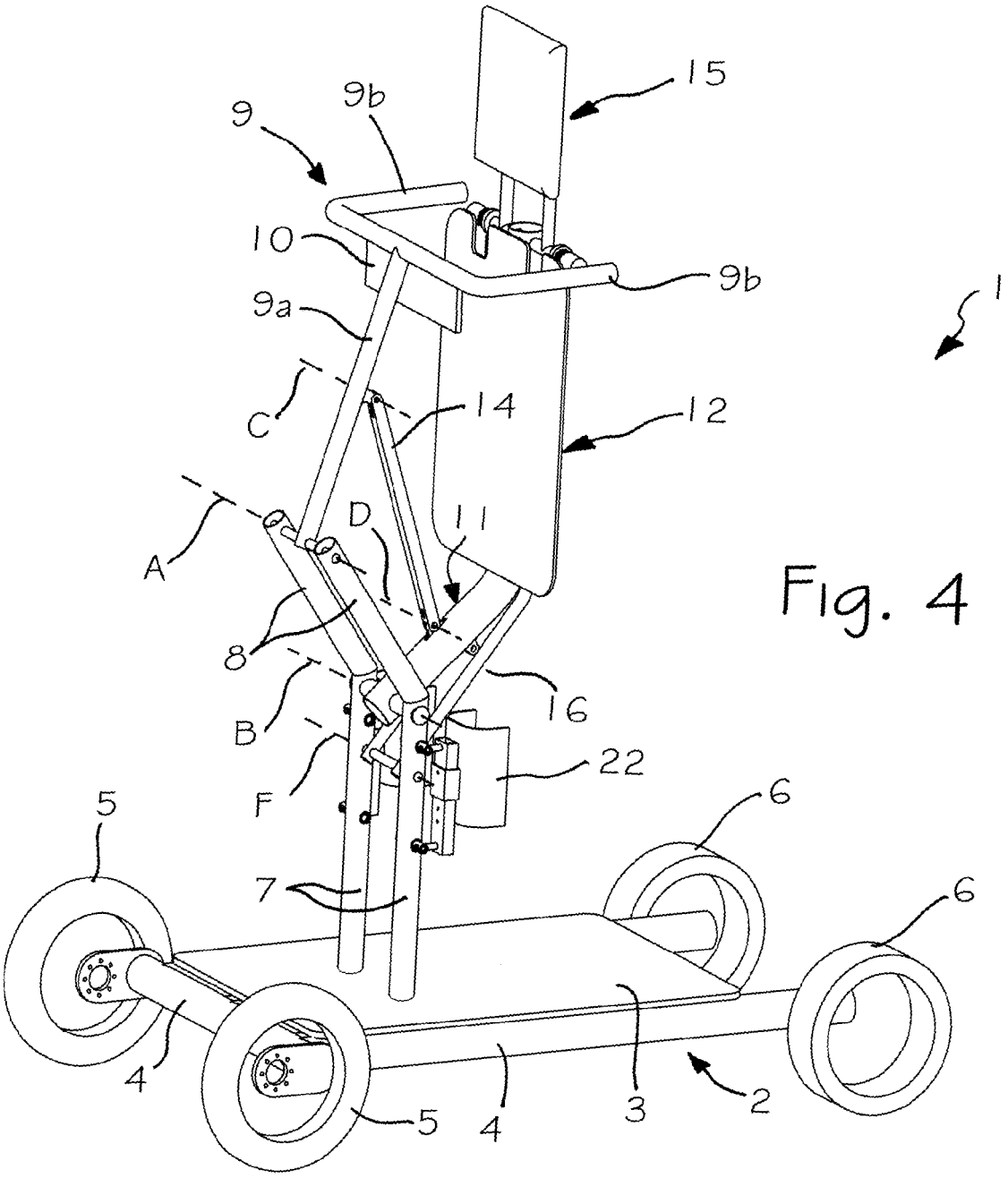

Fig. 4

Fig. 5

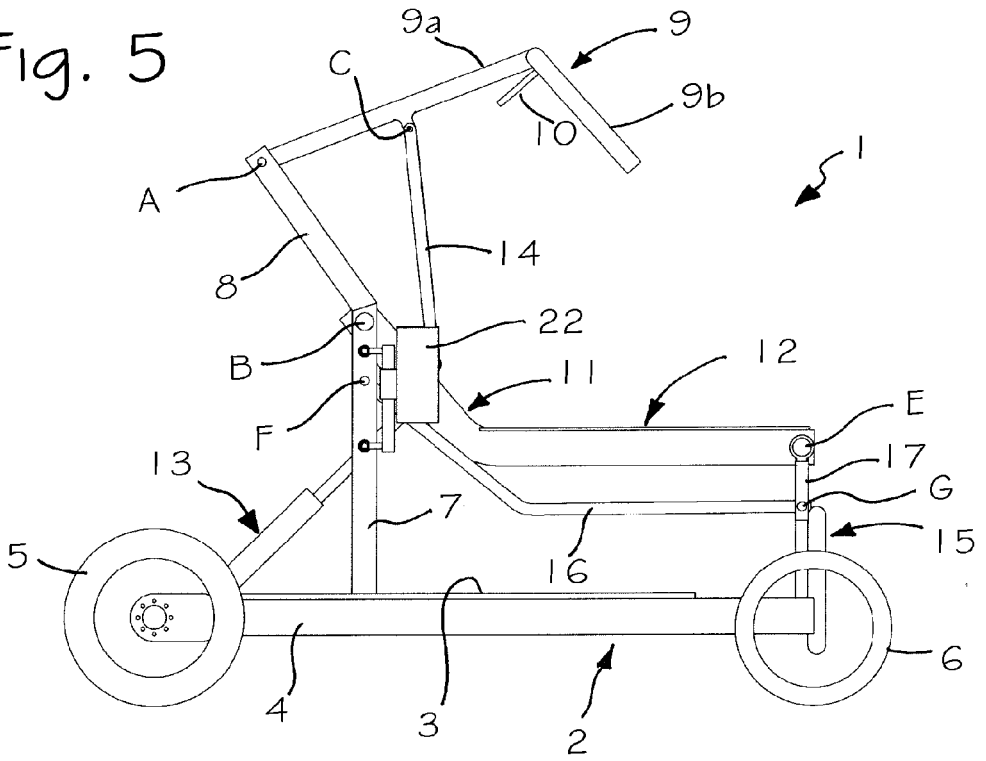
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Fig. 6

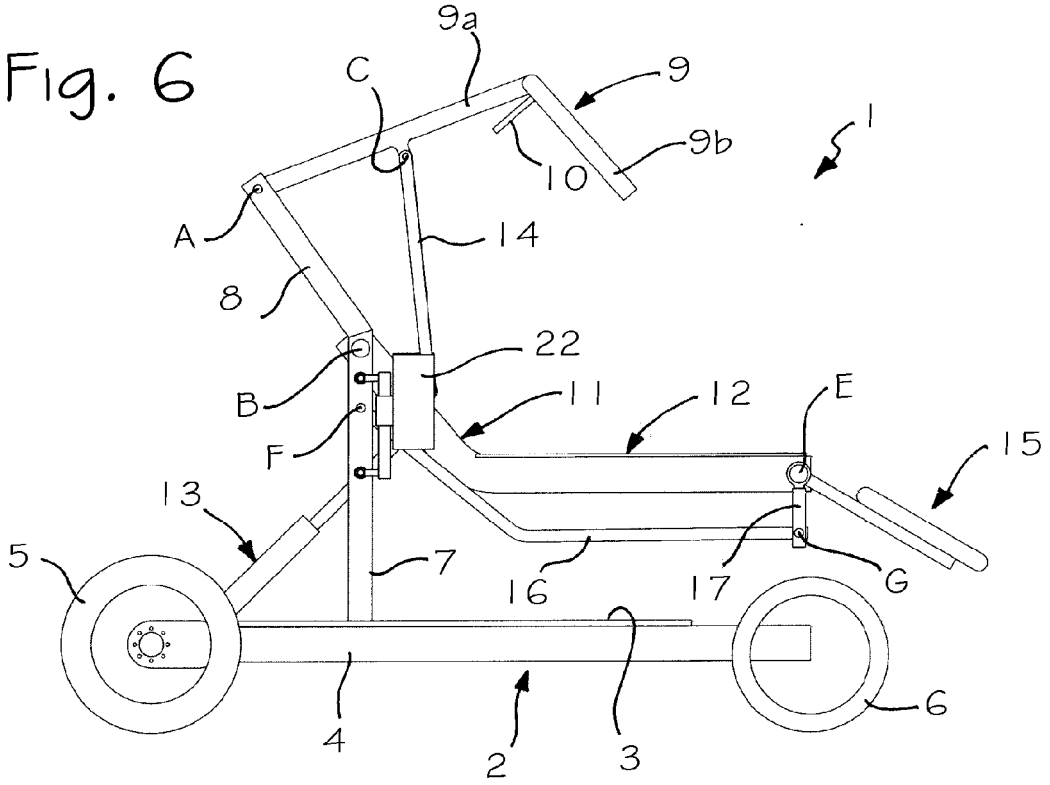
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Fig. 7

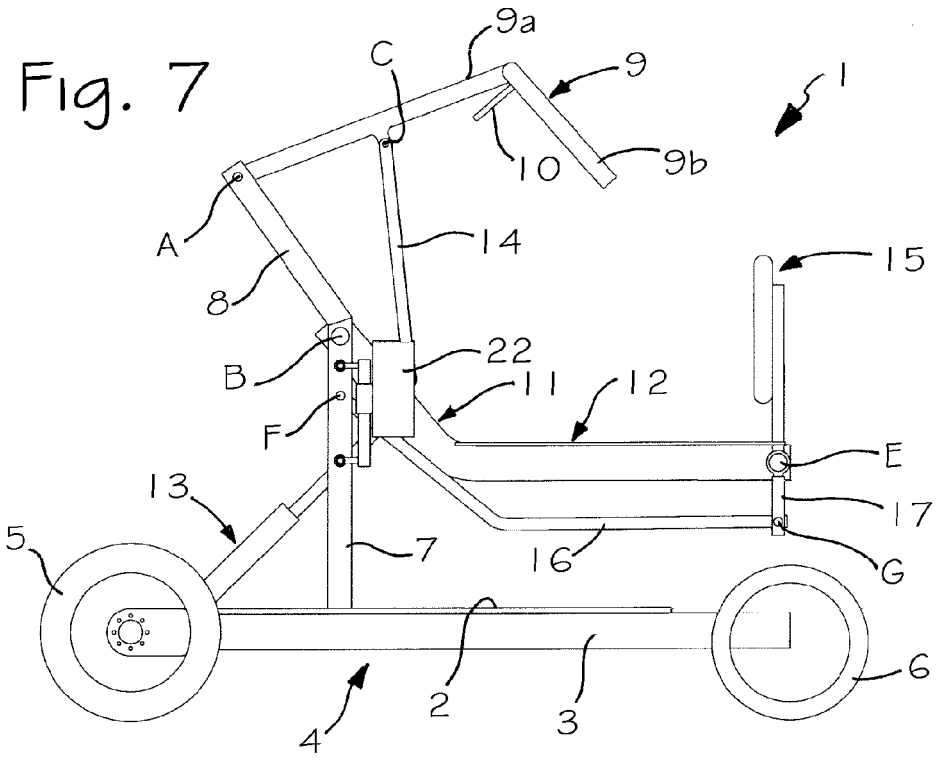
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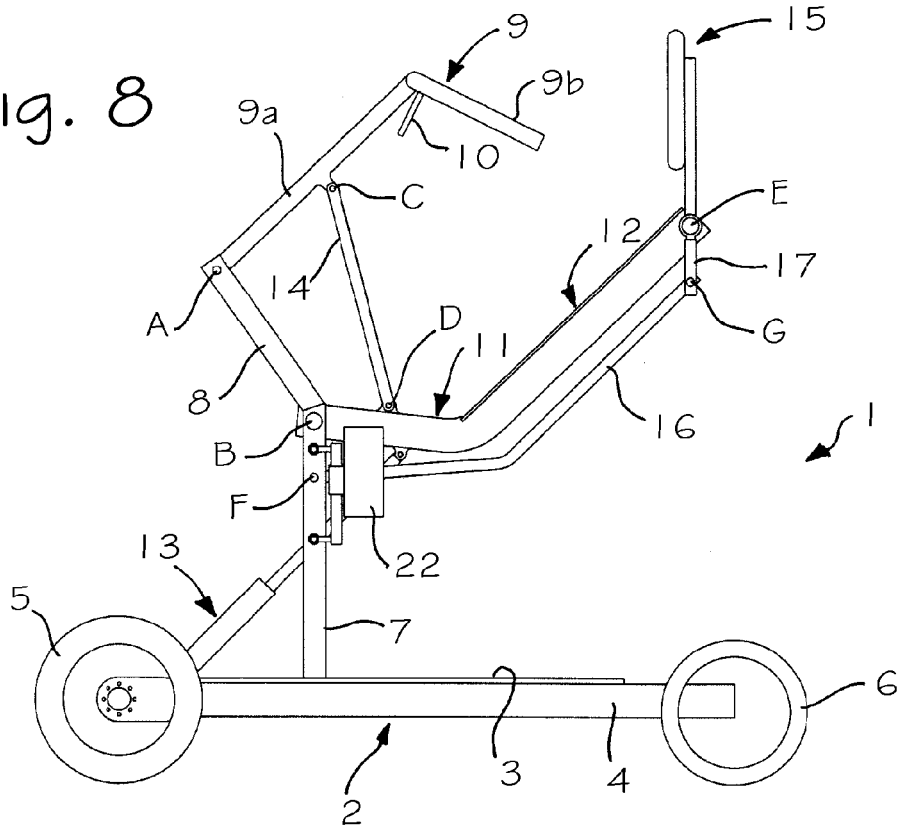
Fig. 8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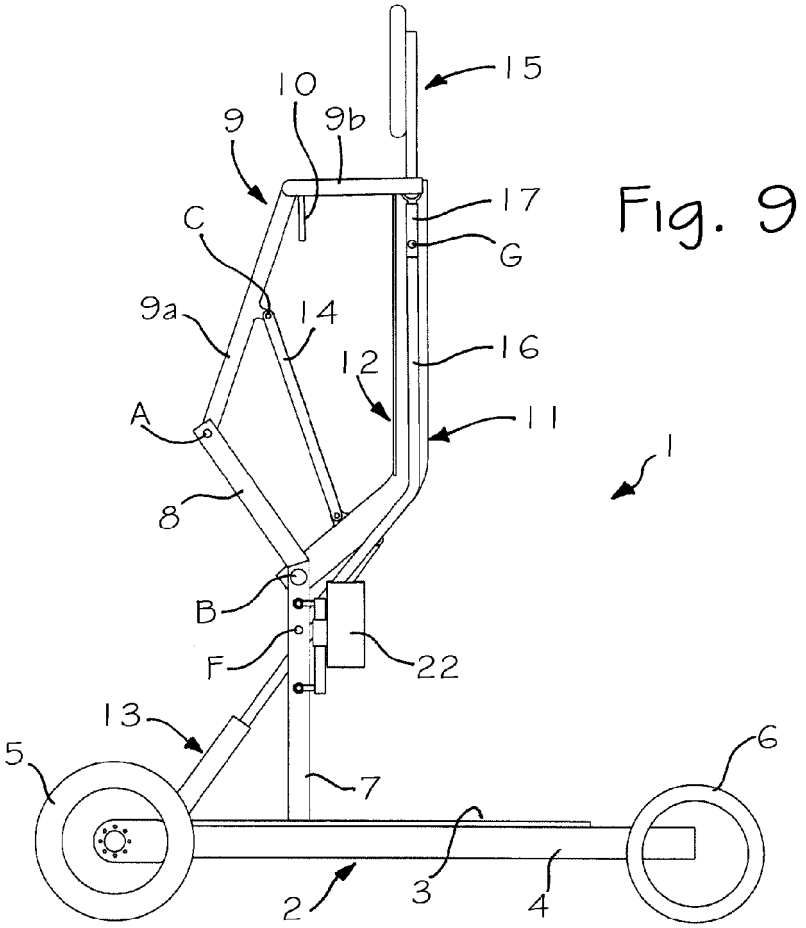
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Fig. 9

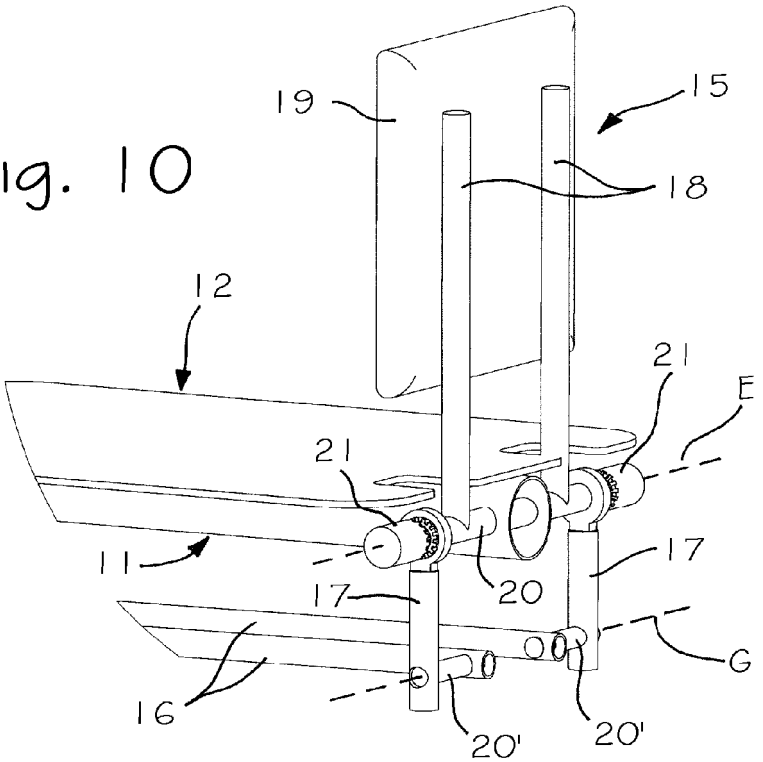
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Fig. 10

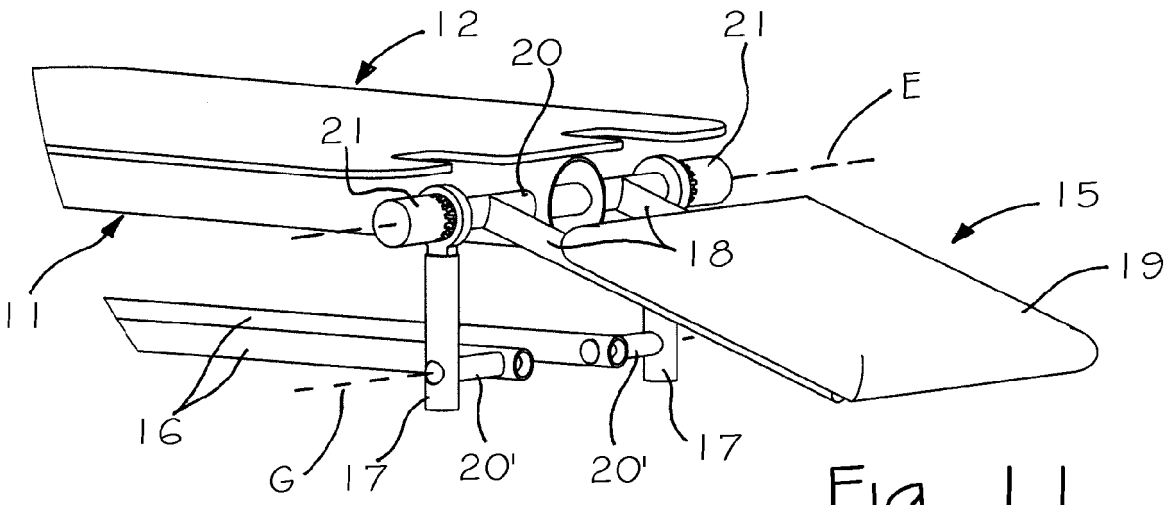

Fig. 11

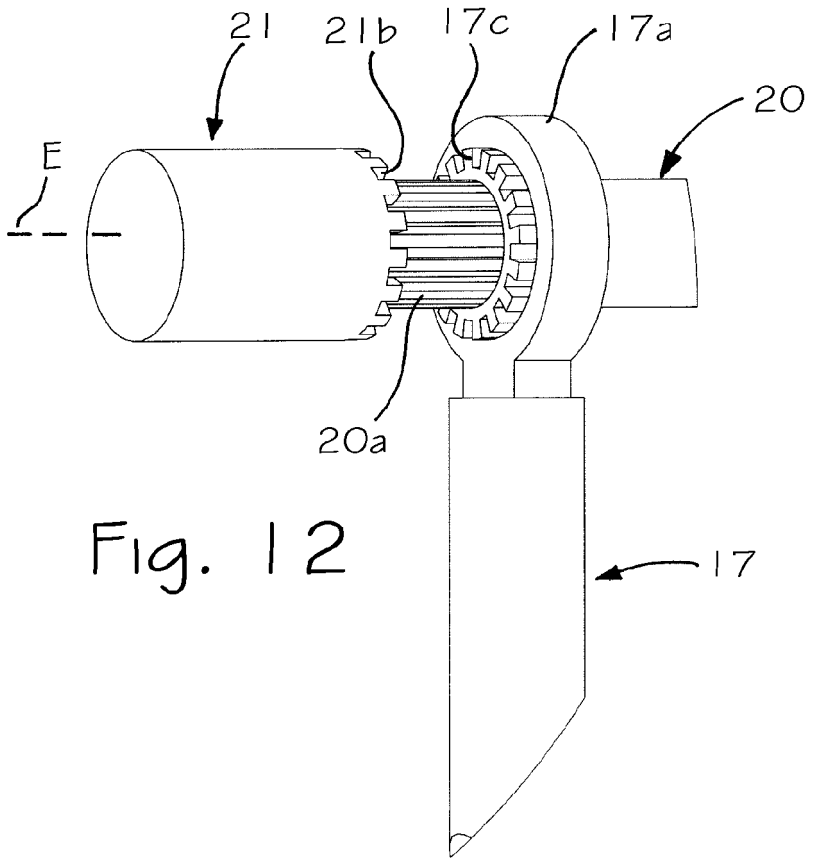

Fig. 12

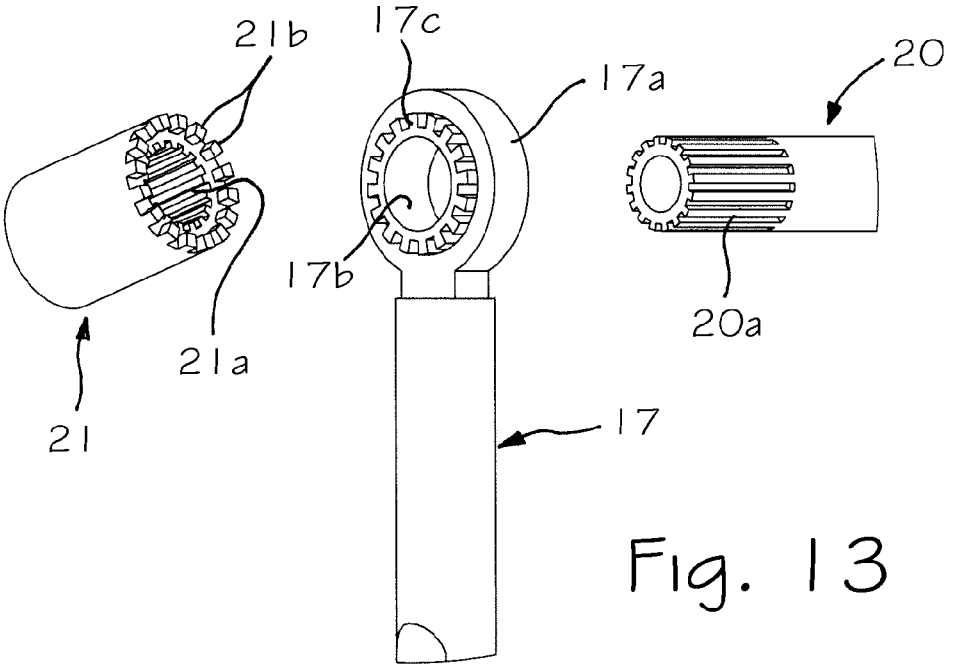

Fig. 13

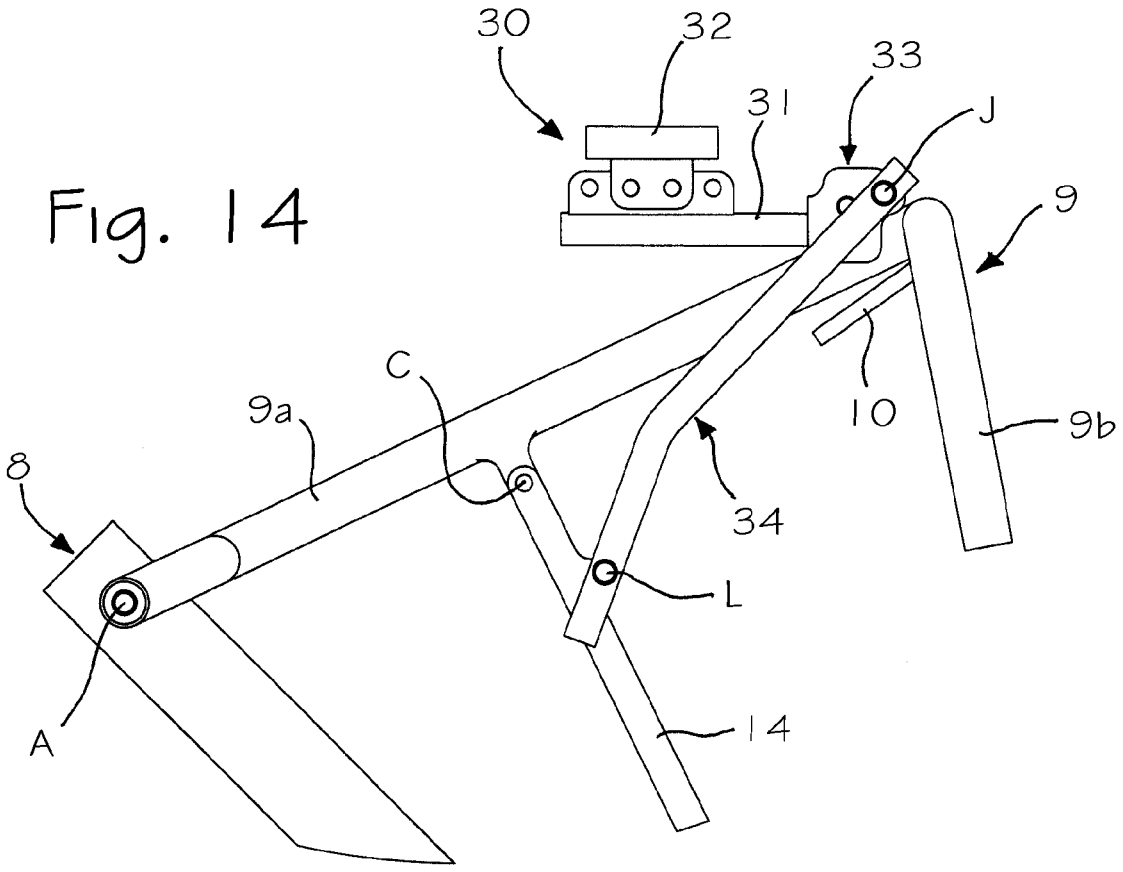

Fig. 14

Fig. 15