



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.11.2017 Bulletin 2017/44

(51) Int Cl.:
A63C 5/08 (2006.01) **A63C 9/00 (2012.01)**
A63C 9/08 (2012.01) **A63C 13/00 (2006.01)**

(21) Application number: **17168454.1**

(22) Date of filing: **27.04.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(72) Inventors:
• **Casarino, Andrea**
16121 Genova GE (IT)
• **Rossi, Maurizio**
16121 Genova GE (IT)

(74) Representative: **Bonvicini, Davide et al**
Perani & Partners
Patent
Piazza San Babila, 5
20122 Milano (MI) (IT)

(30) Priority: **28.04.2016 IT UA20162956**

(71) Applicant: **Gogreen S.a.s. di Rossi Maurizio**
16121 Genova (GE) (IT)

(54) **STEP ASSISTING DEVICE FOR FOOTWEAR WALKING EQUIPMENT**

(57) It is disclosed a step assistance device applied to a walking equipment that is adapted to be functionally connected to shoes worn by a user. The equipment comprises first and second substantially elongate plates, having binding means for connection with first and second shoes. The assistance device comprises respective slide guides and sliding units functionally connected to said guides. Particularly, the sliding units comprise a motor that drives them and a sensor, which are functionally associated with a control unit. In a stance phase, the sensor

detects a load signal, and the control unit operates the motor for moving the sliding unit along the guide between a first rearward position and a second forward position, such that said first sliding unit, and hence the shoe will travel relative to the first plate. In a swing phase, the control unit operates the motor for moving the sliding unit between the forward position and the rearward position to bring the sliding unit back to the starting position. A battery for supplying power to the motor is fixed to the sliding unit and is manually removable.

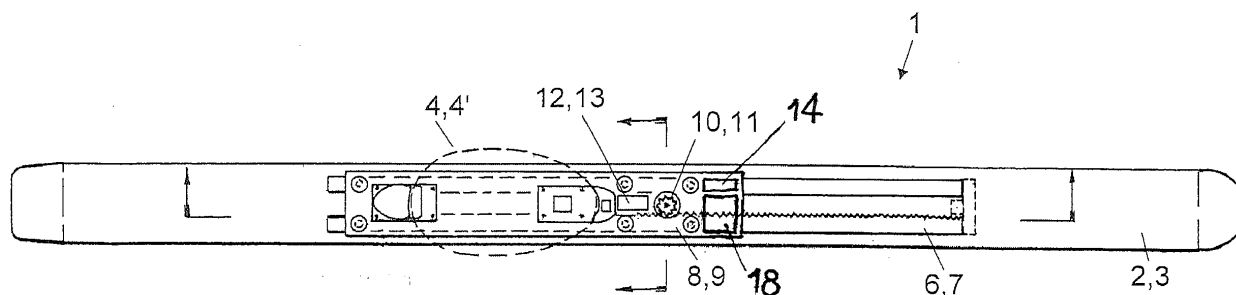


Fig. 1

Description

Field of the Invention

[0001] The present invention relates to a step assistance device for footwear walking equipment, particularly alpine skis, cross-country skis, snowshoes or the like.

Discussion of the related art

[0002] Walking equipment, such as alpine skis, cross-country skis or snowshoes are known to be applied to the foot of a wearer by means of appropriate boots, to assist the wearer as he/she moves on surfaces that are typically covered with snow or ice.

[0003] Particularly, a ski is an elongate and flat instrument associated with a boot. The ski and the boot comprise removable binding means, for mutual mechanical connection thereof. The binding means are calibrated according to the wearer's weight for automatic release in case of a fall.

[0004] The equipment structure changes according to the various sports for which it is designed; for example, alpine skis, cross-country skis and snowshoes (rackets) are known. The latter types of equipment are mainly used to move on plane ground or uphill. Conversely, alpine skis are used downhill.

[0005] All these types of equipment are operated and controlled only by the physical force of the user, who generates the motion required to move on a straight path, to turn or stop.

[0006] In view of this technology, there is the need of facilitating the physical effort and performance of the user when he/she uses these instruments.

[0007] WO 2014205472 discloses a sports equipment in which boot bindings are not directly connected to the ski. A sliding member is connected to the top surface of the ski, and the boot bindings are fixed on the sliding member. A motor fixed to the ski allows back-and-forth displacement of the sliding body along the ski to increase the step length of a user. The motors of the two skis are connected to a battery and a control unit which are carried by the user, e.g. in a backpack or a belt.

[0008] A cable must be provided between the batteries and the motor. This cable, which extends, for instance, from a backpack of the user to the ski-mounted motors, continuously moves during walking. This, it may easily become entangled in some obstacle, such as the user's limbs or the sticks, if any. Such entangling may cause sudden disconnection of the motor from the battery, resulting in an expected displacement of the sliding unit relative the slide guide, which might cause the user to fall.

[0009] Also, during skiing, the apparatus required to move the sliding body along the slide guide is of hindrance, and various parts thereof are exposed to potentially hazardous impacts.

Summary of the Invention

[0010] An object of the present invention is to provide a step assistance device for a walking equipment that facilitates the movement of the user by reducing the required physical effort and by increasing the traveling distance.

[0011] Another object of the present invention is to provide a step assistance device for a walking equipment which can be applied to known instruments, such as alpine skis, cross-country skis, snowshoes or the like.

[0012] A further object of the present invention is to provide a step assistance device for a walking equipment that also has a simple construction and low manufacturing costs.

[0013] Yet another object of the invention is to provide a step assistance device that is reliable both during walking and during skiing.

[0014] A further object of the present invention is to provide a footwear equipment that integrates said step assistance device.

[0015] These and other objects are fulfilled by a step assistance device as defined in any of the accompanying claims. The device of the invention finds application to a walking equipment having a plate, such as skis or snowshoes. The device includes a slide guide adapted to be fixed to the ski or snowshoe, and a sliding unit which is movable longitudinally along the slide guide. Common binding means are fixed to the sliding unit to secure a boot to the sliding unit. A motor is mounted to the sliding unit, and allows the sliding unit to move back and forth relative to the slide guide. Electronic means are able to identify the various walking phases for optimized motor control. A battery for supplying power to the motor is removably fixed to the sliding unit.

[0016] Thus, the step assistance device of the present invention, when applied to walking equipment such as alpine skis, cross-country skis, snowshoes or the like, can facilitate the user's walk by translation of the boot relative to the plate, i.e. the ski or snowshoe. In other words, the boot translates on the ski and runs a stroke that "extends the stride" thereby providing advantages to the user in terms of travelling distance and physical effort.

[0017] The battery is rigidly joined to the motor, with connection being established therebetween by means of a small cable, which is not exposed to deformation during operation. The risk of entanglement during walking is thus avoided. Conversely, during skiing, the battery may be easily removed and protected from any impact.

[0018] Preferably, the motor and its control unit are also removable from the sliding unit. When the motor is removed, lock members are provided to prevent the runner from freely moving relative to the slide guide.

[0019] Advantageously, the sliding unit comprises:

a support plate, with the binding means for the user's boots fixed thereto;

a sliding member associated with the respective motor which is mounted to said support plate, said sliding member being adapted to slide along said slide guide to translate between said first and second positions.

[0020] Advantageously, a pair of substantially parallel slide guides are mounted to the plate.

[0021] In a first embodiment, said pair of guides comprises a gear rack guide associated with a linear guide, and said sliding member is at least one gear adapted to mesh with said rack-type guide. Thus, the gear meshes with the rack and translates the support plate.

[0022] Preferably at least one stop element is provided on said gear rack guide. Advantageously, a pair of stop elements are provided to limit the travel.

[0023] In a second embodiment, each of said first and second pairs of guides comprises first and second linear guides and said sliding member is at least one runner supported by bearings which slides while being guided between said first and second linear guides.

[0024] Advantageously, said control unit comprises program means which are configured to control the sliding speed of said first and second sliding units.

[0025] Preferably, an encoder is provided to determine the travel of each sliding unit, and it is placed on the axis of rotation of said motor, to determine and control the travel.

[0026] Advantageously, a load sensor calibration function is advantageously provided by the interface.

[0027] In another aspect of the invention, a walking equipment is disclosed which comprises one or two plates, i.e. skis or rackets, and corresponding step assistance devices. The motors associated with the two plates may be individually controlled. Backup batteries and charging devices, such as solar panels, may be provided to extend the run time of the batteries on the sliding unit.

Brief description of the drawings

[0028] Further features and/or advantages of the present invention will appear more clearly from the following description of one embodiment, which is given by way of example and without limitation with reference to the annexed drawings, wherein:

- Figure 1 shows a schematic view of a step assistance device applied to a ski, according to the present invention;
- Figure 2 shows an enlarged view of a sliding member which slides, while being guided between a pair of guides;
- Figures 3 and 4 show a side view of the assistance device in one phase of operation, namely during a stance phase;
- Figures 5 and 6 show a side view of the assistance device in one phase of operation, namely during a

swing phase;

- Figure 7 shows a top view of a variant embodiment of the assistance device of the present invention, applied to a racket;
- 5 - finally, Figure 8 shows a block diagram which identifies the operation phases of the device of Figure 1.

Detailed description

[0029] Referring to Figure 1, a step assistance device 1 is shown, which is applied to a walking equipment 2, particularly a pair of skis or rackets 20 (see Fig. 7) or the like, which are in turn functionally connected to footwear, particularly boots 4, 4', worn by the user, as best shown in Figures 3 and 4.

[0030] Particularly, the equipment comprises first 2 and second 3 substantially elongate plates, particularly a pair of skis or rackets or the like, extending in the longitudinal direction and having a greater support surface as compared with a shoe. Reference will be made hereinafter to a ski. First and second skis 2, 3 shall be intended to be required for the user to walk. Throughout the figures, the same parts are designated by identical numerals, whereas different numerals are used when a part is connected to the first ski or the second ski. Figure 7 shows a variant applied to a racket 20.

[0031] Each ski 2, 3 comprises a first face 2', 3' which defines a ground-bearing surface T and a second face 2'', 3'' opposite to the first face 2', 3' (see Figs. 3 and 4).

[0032] Binding means 5 of known type are provided on the second face 2'' for removable connection of the boot 4 with the skis 2, as it is also schematically shown in Figures 4 and 5. The binding means are mounted as described below in greater detail.

[0033] According to the present invention, each ski 2 is equipped with an assistance device 1 having at least one slide guide 6 which extends in the longitudinal direction and which is adapted to be removably fixed to the second face 2'' of the ski 2. Particularly, each ski 2 has a pair of slide guides 6, both longitudinally extending on the second face 2'' of each ski, and mounted in parallel relationship. The sliding guides of the second ski are referenced 7.

[0034] Furthermore, the device 1 comprises a first sliding unit 8 which is mounted to the first ski 2 and which is functionally connected to the first pair of slide guides 6. The binding means 5 are fixed to the sliding unit 8 and are configured to removably secure a user's shoe to the sliding unit 8, such that the first sliding unit 8 will be connected, in operation, with its respective boot 4, by the binding means 5.

[0035] A second sliding unit 9, associated with the second ski 3, is functionally connected to the second pair of slide guides 6, and is also connected in operation with a boot 4' using known binding means 5.

[0036] As best shown in Figures 3 and 5, the sliding unit 8 is movable in the longitudinal direction relative to its guides 6 between a forward position B and a rearward

position A. More in detail, the sliding unit 8 selectively moves in a first direction d1, which is the same as the direction of progression of the user, and in a second direction d2 opposite to the user's progression.

[0037] Particularly, each device 1 comprises a motor 10 which is rigidly joined to the sliding unit 8. The motor 10 is operable to move the sliding unit 8 relative to the slide guide 6 along the slide guide 6, between the forward position and the rearward position. The motor of the second ski is referenced 11.

[0038] The motor 10 may be advantageously manually removable from the sliding unit 8, in order to be applied thereto as needed. By this arrangement, the motors 10, 11 of the two skis 2, 3, may be used when walking on plane ground or uphill, and they may be easily removed for the skis 2, 3 to be used as normal downhill, cross-country or alpine skis. Thus, the motors 10, 11 will not be exposed to impacts during skiing, and the skier will have a greater freedom of movement.

[0039] The device 1 further comprises lock members, which are configured to prevent the sliding unit 8 from moving in the longitudinal direction relative to the slide guide 6. Particularly, the lock members shall be disabled for the motor 10 to operate during walking, and may be enabled when the motor 10 is separated from the sliding unit 8. This will prevent unexpected dangerous movements of the sliding unit 8 relative to the slide guide 6 during skiing.

[0040] Instead, in a non-power assisted arrangement, the device comprises a fixed binding, whereby the motor 10 cannot be removed from the sliding unit, or special tools are required for removal thereof, such as a screw driver.

[0041] The device 1 comprises electronic means 12, 14 for measuring a load produced by the user on the slide guide 6 and for controlling the motor 10. More in detail, a sensor 12, particularly a load cell or possibly an optical sensor or a mechanical or magnetic pressure switch, is associated with each motor 10. The sensor of the second ski 3 is referenced 13.

[0042] According to the operating principle, as also shown in the block diagram of Figure 8, the sensor 12 is adapted to detect a signal, particularly a load P (see Fig. 3) produced by the user on the respective slide guide 6 or, equivalently, on the support surface of the ski, at the second face 2". A control unit 14 is programmed to receive the signal from the sensor 12 and to control the operation parameters of the motor 10, as described hereinafter in greater detail.

[0043] Particularly, the control unit 14 is configured in such a manner that, in a stance phase of the ski (see Figs. 3 and 4), when the sensor 12 detects the first load signal on one of the skis, the control unit 14 will operate the corresponding motor 10. Thus, the corresponding sliding unit 8 will translate along the pair of guides between a first rearward position A (see Fig. 3) and a second forward position B (see Fig. 4) in a first direction d1.

[0044] In other words, the sliding unit 8 will slide relative

to the ski when the user is in a stance phase of his/her step.

[0045] Still according to the operating principle, in a swing phase of the ski (see Figs. 5 and 6), i.e. when the ski is lifted from the ground, the sensor 12 is configured to detect the lack of the load signal, and the control unit 14 operates the motor 10 such that the sliding unit 8 will translate between the second forward position B and the first rearward position in the second direction d2, to bring the first sliding unit 8 back to the first rearward position A. Thus, the step assistance device 1 of the present invention facilitates the walking step of the user by translating the boot relative to the ski. With the same stride, the user will cover a longer walking distance.

[0046] In a preferred embodiment, the control unit 14 of each device 1 is connected to the sliding unit 8 and can be manually removed from the sliding unit 8. As a result, the control unit 14 will be also able to be removed from the device 1 and hence from the ski 2 to preserve the control unit 14 and facilitate skiing for the user. Here, for the two devices 1 to be used on the two skis 2, each control unit 14 is configured to control its motor 10 independently of the control unit 14 of the other device 1.

[0047] In another embodiment, a single control unit 14 may be provided for both the devices 1 associated with the skis 2. This control unit 14 may be in signal communication with the motors 10 or the sensors 12 of both devices 1 by a wired or wireless communication arrangement. By the provision of a single control unit 14, when the user steadily rests with both skis on the ground, e.g. before starting to walk, the control unit 14, still by receiving a signal from respective sensors 12, may maintain the first 10 and second 11 motors in an inactive configuration.

[0048] The device 1 comprises a battery 18 connected to the motor 10 for supplying power to the motor 10. In one aspect of the invention, the battery 18 is removably fixed to the sliding unit 8 and can be preferably removed therefrom manually, i.e. without using special tools, such as a screw driver. The battery 18 may be also used to supply power to the control unit 14.

[0049] Advantageously, the battery 18 and the motor 10, which are both rigidly joined to the sliding unit 8 are also rigidly joined to each other. This will afford a considerable benefit as compared with the situation in which the battery 18 is carried in a movable position relative to the motor, e.g. in a backpack carried by the user. The connecting cable between the battery 18 and the motor 10 is stable and maintains its position. This will prevent cable entanglement and reduce wear.

[0050] If small batteries 18 are used for the purpose of reducing the bulk for the skis 2 having the device 1 mounted thereto, a backup battery may be provided advantageously for replacement of the battery 18 of the device, and may be carried by the user, for instance, in a backpack. This will both provide the desired run time and avoid the presence of long freely-moving cables. In order to further increase the run time, a portable charging appa-

ratus may be provided, e.g. a solar panel which is configured to recharge the battery 18 of the device 1 and/or the backup battery when they are not in operation.

[0051] In one embodiment, the step assistance device 1 may be improved by the addition of further electronic devices adapted to be powered by the batteries 18. For example, the device 1 may comprise hazard lights fixed to the sliding unit 8 or the slide guide 6. In a further embodiment, the device 1 comprises electrical connection members which extend through the binding means 5, and the boots 4 comprise a heating resistor which is configured to receive power from the electrical connection members which extend through the binding means 5.

[0052] In certain construction detail aspects, particularly as shown in Figures 1 and 3, each sliding unit 8 comprises a support plate 15 with the binding means 5 for the user's boots fixed thereto. The binding means 5 protrude from the sliding unit in a vertical direction, i.e. in a direction perpendicular to the support plate 15 and the faces 2', 2" of the ski 2.

[0053] In one embodiment, the motor 10 is a servomotor comprising a stator and a rotor. The stator and the rotor have a substantially cylindrical shape, and the stator has a cavity in which the rotor is accommodated. The stator is fixed to the sliding unit 8 and particularly to the edge of the support plate 15, such that the rotor can be rotated relative to the stator about an axis extending in the vertical direction.

[0054] A sliding member 17 (see Fig. 2) is associated with the servomotor 10 and is operable thereby, e.g. by being connected to its rotor. Particularly, the sliding member 17 is adapted to cooperate with the slide guide to slide along the slide guide 4, 5 and to translate the sliding unit 8, particularly the support plate 15, between the first position A and the second position B.

[0055] More in detail, the pair of guides 6 comprise, in a first embodiment, a gear rack guide and a linear guide, i.e. a guide that does not have the characteristic teeth of a rack. The sliding member is a gear 17, which is adapted to mesh with the gear rack guide 6. Thus, the gear meshes with the gear rack and translates the support plate 15. The linear guide 6 is located opposite to the gear rack guide 6 and has the purpose of guiding the sliding member 17 and preventing it from separating from the gear rack guide 6.

[0056] In this variant, a stop member 16 is provided on the gear rack guide 6. More generally, two stop members may be provided to limit the travel of the sliding unit 8 at the head and tail of the guides, i.e. between the rearward position A and the forward position B. This will prevent the sliding unit 8 from being released from the guides. Furthermore, the travel of each sliding unit along the guides, i.e. the distance covered by the unit between the rearward position A and the forward position B may be adjusted.

[0057] More preferably, two pairs of stop members 16 are provided, each comprising a magnetic service stop member and a rubber safety stop member. The safety

stop member is arranged to operate in case of a service stop member failure.

[0058] In a variant embodiment, first and second linear guides are provided, and the sliding member 17 is at least one runner supported by bearings which slides while being guided between the first and second linear guides.

[0059] In another embodiment, the motor 10 is a linear motor. The linear motor comprises two elements which extend in the longitudinal direction, and which are commonly known as stator and rotor, by analogy with rotating electric motor, although the operation of a linear motor does not involve the rotation of the rotor relative to the stator. Conversely, the rotor is adapted to translate relative to the stator, in the longitudinal direction. The stator is fixed to the slide guide 6 and the rotor is fixed to the sliding unit 8. Either the stator or the rotor may comprise permanent magnets, whereas the other part requires power supply. Preferably, the stator comprises permanent magnets, such that the power supply for the rotor, i.e. the battery 18, fixed to the sliding unit 8, is rigidly joined to the rotor, which is also fixed and rigidly joined to the sliding unit 8. This configuration simplifies the mechanism required by the motor 10 to move the sliding unit 8, thereby increasing the reliability of the device.

[0060] As shown in the block diagram of Figure 8, the control unit 14 comprises program means configured to control the step assistance device.

[0061] Particularly, in a starting phase 151, the control unit 14 checks that the unit is in the rearward position, identified as "REAR". Then the rearward stop 152, referenced "RLS", is identified. This corresponds to the zero position of the encoder.

[0062] In other functions, the control unit 14 can control the sliding speed of the first 8 and second 9 sliding units.

These can control the rotation speed of the motor 10 and, as a result, the forward step speed of the unit along the slide guides. The latter speed is a function of the walking speed of the user. Therefore, the user can control the speed of response of the sliding unit as needed, using an interface with the unit, e.g. a pair of buttons. The interface may be optionally within reach of the user, on a ski stick, having a processor in signal communication with the control unit 14. Preferably, such communication is a wireless communication, e.g. using a Bluetooth technology. The interface may also provide information about the charge of the battery 18.

[0063] In a preferred embodiment, sensors are provided, e.g. an accelerometer, which can sense the walking speed variation and adapt the response of the sliding unit.

[0064] Still in a preferred embodiment, an encoder is provided to determine the travel of each sliding unit 8, and it is placed on the axis of rotation of the motor 10, to determine and control the forward travel 154 and the forward stop 155. This has the purpose of adapting the operation of the device to the user's requirements by varying the travel length of the unit along the slide guides.

[0065] The interface may be advantageously used to adjust the calibration of the load sensor 153, i.e. to set

the weight of the user in order to adapt the assistance device.

[0066] The foregoing description of specific embodiments can illustrate the concepts of the invention such that these specific embodiments may be changed and/or adapted to various applications, with knowledge of the prior art, without requiring any further research and without departure from the inventive concept, whereby these changes and adaptation will be deemed as technical equivalents. The means and materials to carry out the various functions may be of various natures without departure from the scope of the invention. The terms and wording as used herein shall be intended merely by way of illustration and without limitation.

Claims

1. A step assistance device (1), adapted to be applied to a walking equipment (2), particularly a ski or a snowshoe, wherein said assistance device (1) comprises:

- a slide guide (6) which extends in a longitudinal direction and which is adapted to be removably fixed to a face (2") of the equipment (2),
- a sliding unit (8) connected to the slide guide (6), the sliding unit (8) being movable in the longitudinal direction relative to the slide guide (6) between a forward position (B) and a rearward position (A),
- binding means (5) fixed to the sliding unit (8) and configured to removably secure a user's shoe to the sliding unit (8),
- a motor (10) rigidly joined to the sliding unit (8) and operable to move the sliding unit (8) relative to the slide guide (6) between the forward position and the rearward position,
- a battery (18) connected to the motor (10) for supplying power to the motor (10),
- electronic means (12, 14) for measuring a load produced by the user on the slide guide (6) and for controlling the motor (10),

characterized in that

the battery (18) is removably fixed to the sliding unit (8).

2. A device (1) as claimed in claim 1, wherein the sliding unit (8) comprises:

- a support plate (15), the binding means (5) for the user's boots being fixed to the sliding unit (8) at the support plate (15), and
- a sliding member (17) operable by the motor (10), the sliding member (17) cooperating with the slide guide (6) to move the sliding unit (8) between the forward position (B) and the rear-

ward position (A).

3. A device (1) as claimed in claim 2, wherein:

- the binding means (5) protrude from the sliding unit in a vertical direction,
- the motor (10) comprises a stator and a rotor which is rotatable relative to the stator about an axis extending in the vertical direction,
- the sliding member (17) is connected to the rotor of the motor (10).

4. A device (1) as claimed in claim 2 or 3, wherein the slide guide (6) is a gear rack guide, and the sliding member (17) is a gear adapted to mesh with the gear rack guide (6).

5. A device (1) as claimed in claim 2, comprising a pair of parallel linear slide guides (6), wherein the sliding member is a runner supported by bearings which slides while being guided between the two guides (6).

6. A device (1) as claimed in claim 1, wherein the motor (10) is a linear motor having a stator and a rotor which extend in the longitudinal direction, the rotor being adapted to translate relative to the stator in the longitudinal direction, wherein the stator is fixed to the slide guide (6) and the rotor is fixed to the sliding unit (8).

7. A device (1) as claimed in any of claims 1 to 6, comprising two stop members (16) fixed to the slide guide (6) to limit the travel of the sliding unit (8) relative to the slide guides (6) between the rearward position (A) and the forward position (B).

8. A device (1) as claimed in claim 7, comprising two pairs of stop members (16), each pair of stop members (16) comprising a magnetic service stop member and a rubber safety stop member, the safety stop member being arranged to operate in case of a service stop member failure.

9. A device (1) as claimed in any of claims 1 to 8, wherein the motor (10) is manually removable from the sliding unit (8).

10. A device (1) as claimed in claim 9, comprising lock members configured to prevent the longitudinal movement of the sliding unit (8) relative to the slide guide (6) when the motor (10) is separated from the sliding unit (8).

11. A device (1) as claimed in any of claims 1 to 10, wherein said electronic means (12, 14) comprise a sensor (12) adapted to measure a load produced by the user on the slide guide (6), and a control unit (14)

adapted to control the motor (10), the control unit (14) being removably connected to the sliding unit (8).

12. A walking equipment comprising: 5
- a substantially elongate plate (2) extending in the longitudinal direction, the plate comprising a first face (2') defining a ground-bearing surface (T), and a second face (2'') opposite to the first face (2'), 10
 - a step assistance device (1) as claimed in claim 11, the slide guide (6) of the device (1) being fixed to the second face (2'') of the plate (2), wherein: 15
 - in a stance phase of the plate (2), the sensor (12) is configured to detect a load signal and the control unit (14) is configured to operate said motor (10) for moving the sliding unit (8) from the rearward position (A) to the forward position (B), and 20
 - in a swing phase of the plate (2), the sensor (12) is configured to detect the lack of a load signal and the control unit (14) is configured to operate the motor (10) for translating the sliding unit (8) from the forward position (B) to the rearward position (A). 25
13. A walking equipment as claimed in claim 12, comprising two plates (2) and two step assistance devices (1), each device (1) being associated to a respective plate (2), wherein the control unit (14) of each device (1) is configured to control its respective motor (10) independently of the control unit (14) of the other device (1). 30 35
14. A walking equipment comprising:
- a device (1) as claimed in any one of claims 1 to 11; 40
 - a backup battery for replacement of the battery (18) of the device (1), and
 - a portable charging apparatus configured to recharge the battery (18) of the device (1) and/or the backup battery. 45
15. A walking equipment as claimed in claim 14, wherein the charging device comprises a solar panel. 50

55

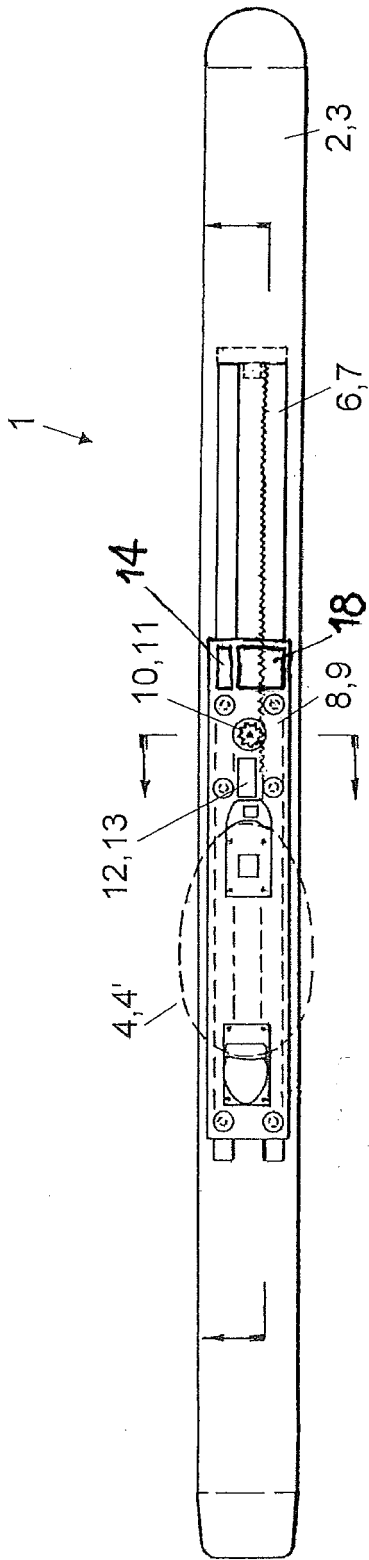


Fig. 1

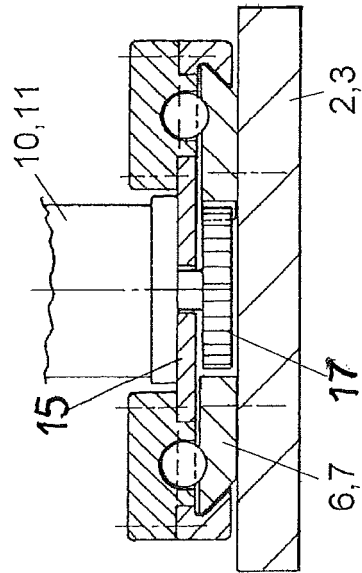
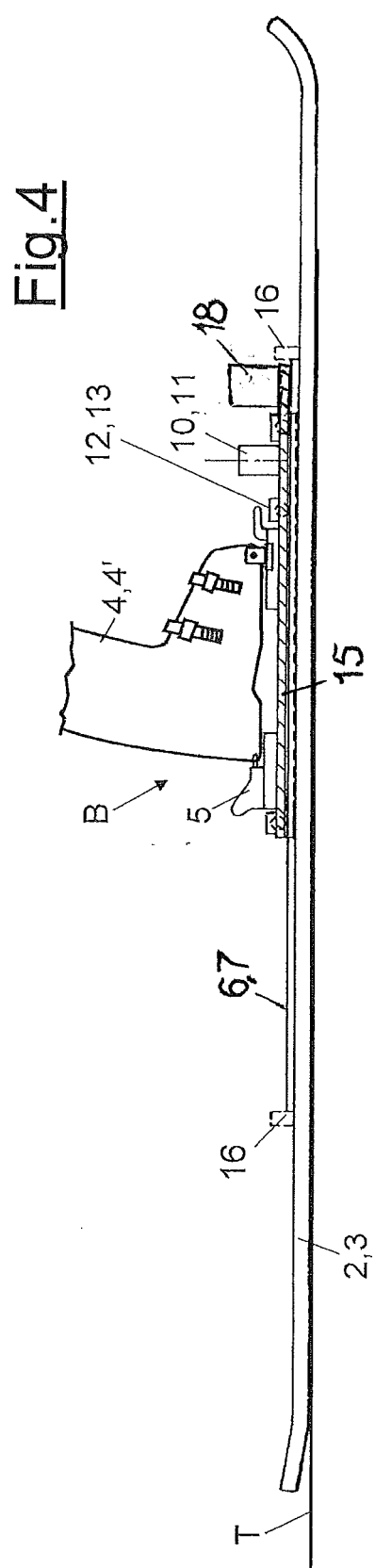
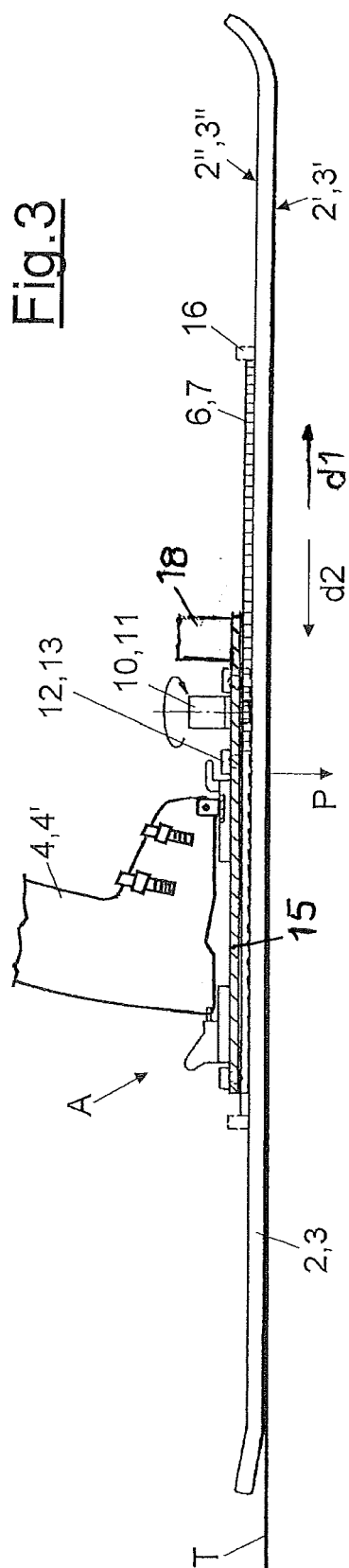
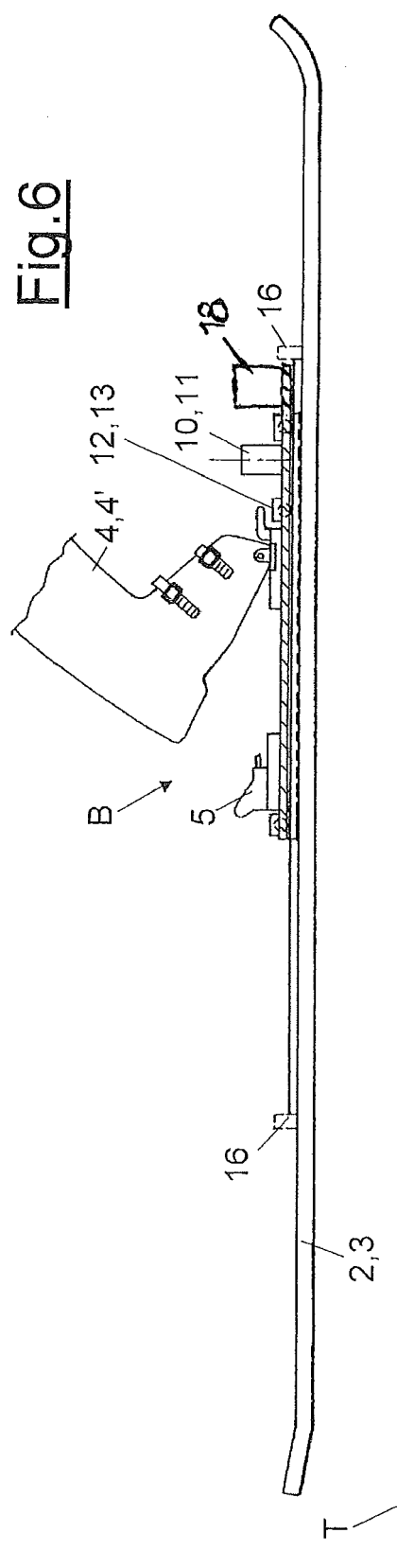
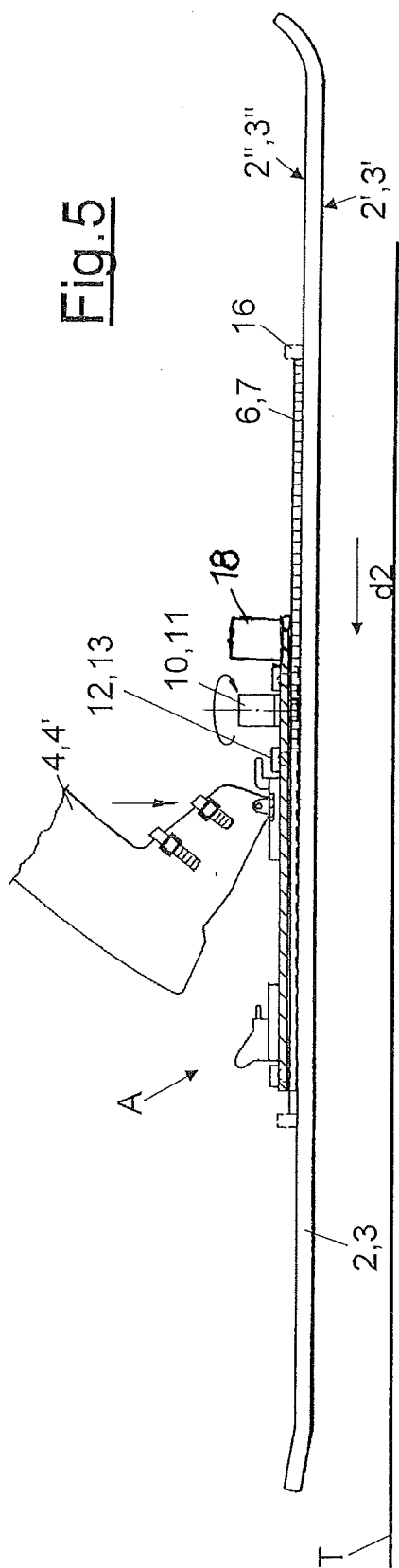


Fig. 2





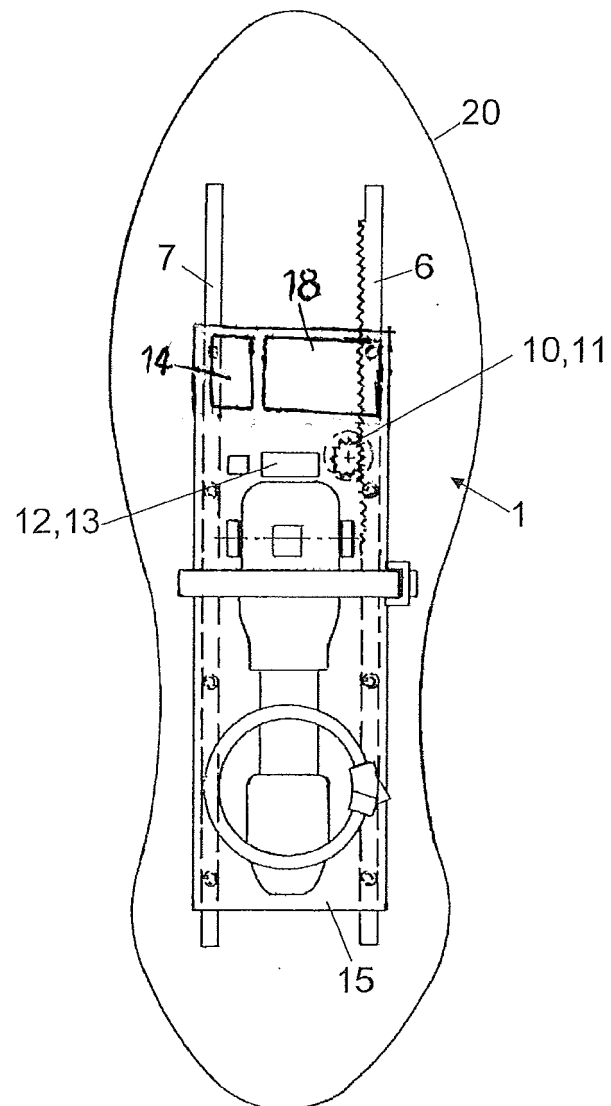


Fig.7

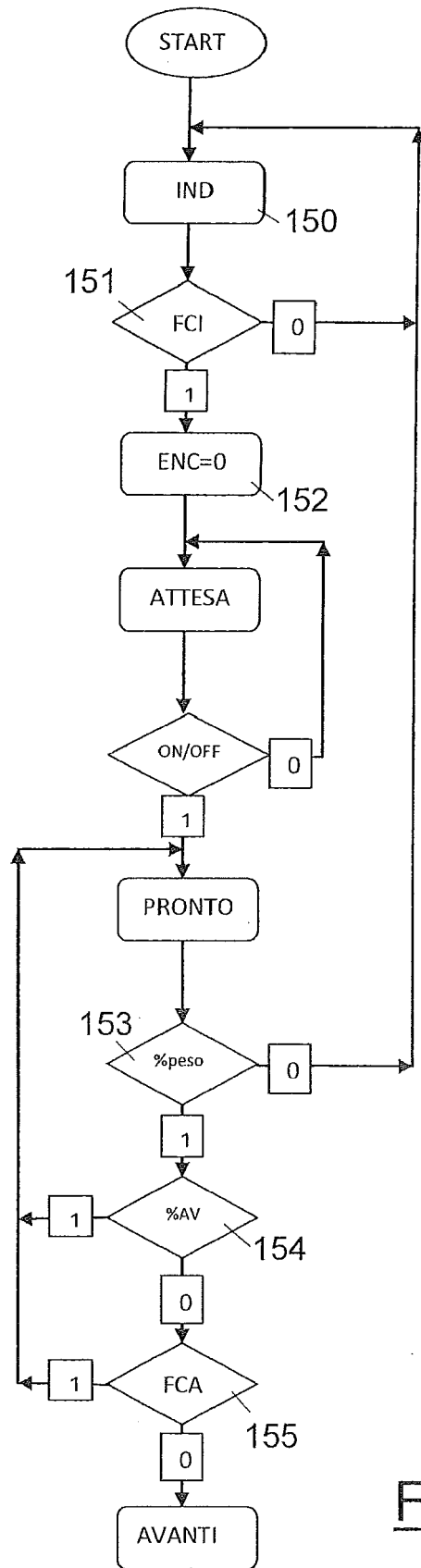


Fig.8



EUROPEAN SEARCH REPORT

Application Number
EP 17 16 8454

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2014/205472 A1 (ATOMIC AUSTRIA GMBH [AT]) 31 December 2014 (2014-12-31) * page 10, line 29 - page 15, line 24; figures 1-4 * * page 19, line 17 - page 24, line 21; figures 12-14 * * page 15, line 31 - page 17, line 3; figures 5-7 *	1-15	INV. A63C5/08 A63C9/00 A63C9/08 A63C13/00
Y	US 2012/297646 A1 (BRAULT JEAN [CA]) 29 November 2012 (2012-11-29) * paragraph [0017]; claim 4; figure 2 *	1-15	
A	AT 382 518 B (MUELLER FRANZ) 10 March 1987 (1987-03-10) * page 4, lines 1-3; claim 3 *	1-15	
A	US 7 159 891 B1 (NIGGEMANN DALE [US]) 9 January 2007 (2007-01-09) * figure 3 *	1-15	
A	AT 403 659 B (CREPAZ FRIEDRICH [AT]) 27 April 1998 (1998-04-27) * figure 1 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) A63C
A	DE 649 153 C (MARGARETHE KATZ GEB PHENN) 16 August 1937 (1937-08-16) * the whole document *	1-15	
A	FR 2 296 443 A1 (ZUBER DIDIER [FR]) 30 July 1976 (1976-07-30) * the whole document *	1-15	
A	US 5 735 063 A (MC MANUS JOHN H [US]) 7 April 1998 (1998-04-07) * figures 1-3 *	1-15	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 September 2017	Examiner Vesin, Stéphane
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 16 8454

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-09-2017

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014205472 A1	31-12-2014	EP 3013443 A1 WO 2014205472 A1	04-05-2016 31-12-2014
US 2012297646 A1	29-11-2012	CA 2747903 A1 US 2012297646 A1	23-11-2012 29-11-2012
AT 382518 B	10-03-1987	NONE	
US 7159891 B1	09-01-2007	NONE	
AT 403659 B	27-04-1998	NONE	
DE 649153 C	16-08-1937	NONE	
FR 2296443 A1	30-07-1976	NONE	
US 5735063 A	07-04-1998	NONE	

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2014205472 A [0007]