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(54) **ADAPTIVE STAIR SYSTEM**

(57) An adaptive stair system (1) comprising a set of stairs (2), each stair (2) comprising two movable parts (3), a first part (3) and second part (4), the parts (3) are adapted to be perpendicular to each other in a first position (5) of the stair (2), and adapted to rotate to be in

parallel to each other to form a ramp in a second position (6), and an automatic mechanism (8) adapted to move the parts (3) of the stairs (2) between the first position (5) and the second position (6).

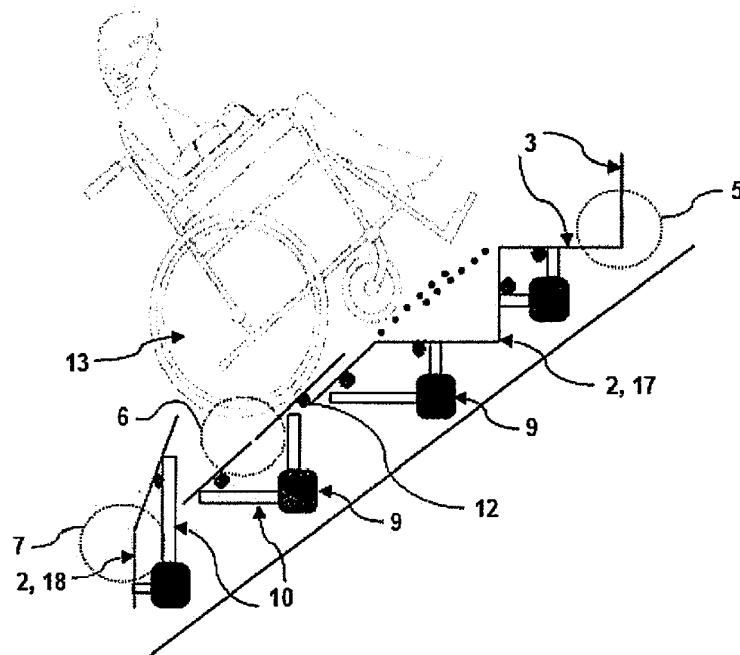


Fig. 2

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Description

[0001] This invention refers to an adaptive stair system according to claim 1.

Background of the Invention

[0002] In normal course, to climb up to a location, stairs are provided. However, the stairs are only available for people who can walk and not for the person who are differently abled to walk or climb up on feet. Generally, these people use wheelchairs to move around. However, the stairs are not adapted for wheelchairs. To move wheelchairs on normal stairs made for abled persons, is not just dangerous, rather it required huge efforts which can be much more than the normal climbing by an abled person. To help out differently abled persons, who are on wheelchairs, a regular pathway with gradient is provided, so that the wheels can easily roll up on the pathway. However, these sloppy pathways have a risk of slipping for abled people who are walking on pathway to climb up. This risk of slipping increases, when the pathway is having slippery floor, or when water is scattered on the floor of the pathway. To avoid these scenario, a separate climbing medium is required to be kept for both differently abled, and normally abled, i.e., both stairs and sloppy pathway is required. However, this leads to engaging extra space in premises for same purpose of climbing, which takes away substantial space which could have been used for different utility.

[0003] US Application No. US5439342 discloses a safety barrier/ramp actuation mechanism for combination folding stair and platform wheelchair lifts which translate from one configuration to the other depending upon the purpose to be served and have a combination safety barrier/ramp at the outboard end of the platform, the mechanism comprising a triple link mechanism and internally contained piston and bell crank for reciprocating said barrier/ramp, and a pressure relief for said system to prevent raising said barrier/ramp when a load is resting thereon in ramp position, and the invention includes new steps in the method of operation of the stair and lift combination to enhance the safety thereof.

[0004] This prior art mentions a changeable stair. In this method, steps get flattened to a base from where the wheelchair can be loaded on the flattened part, and further the flattened part lifts the wheelchair. This system is not suitable for buildings, because long stairs cannot be flattened. Also in this prior art, whole stair converts into flattened surface for wheelchair and normal people cannot use the stairs at the same time.

Object of the Invention

[0005] It is therefore the object of the present invention is to provide an adaptive stairs which can be used for both wheelchair's ramping up for differently abled person, as well as for climbing up on foot by normally abled per-

son.

Description of the Invention

[0006] The before mentioned object is solved by an adaptive stair system according to claim 1.

[0007] An adaptive stair system comprising a set of stairs, each stair comprising two movable parts, the parts are adapted to be perpendicular to each other in a first position of stair, and adapted to rotate to be in parallel to each other to form a ramp in a second position, and an automatic mechanism adapted to move the parts of the stairs between the first position and the second position.

[0008] This provides for a technique to enable a stair which is available for normally abled person, to also be enabled for a wheelchair user. With the ramp created by the automatic mechanism, there is no human effort required for adapting the same stairs for the wheelchair.

[0009] Further preferred embodiments are subject-matter of dependent claims and/or of the following specification parts.

[0010] According to a preferred embodiment of the adaptive stair system, the stairs are adapted to be in a third position, wherein the parts are adapted to be at a degree more than 90 degrees with respect to each other, and the automatic mechanism is adapted to move the parts between the positions.

[0011] This embodiment is beneficial as it provides a mechanism to hold the wheelchair while climbing up, so that the wheelchair do not falls back or start moving in backward direction due to the gradient of the ramp. This really helps to reduce human efforts to hold the wheelchair from falling back. Also, it also reduces requirement of a wheelchair with an efficient break or stopper, which always needs to be used by the wheelchair user to support his manual effort from keeping the wheelchair from falling back.

[0012] According to a further preferred embodiment of the adaptive stair system, the automatic mechanism comprises at least one driver and a set of pistons, which are in movement coupling to the parts of the stairs, such that the driver drives the pistons to facilitate movements of the parts of the stairs between the positions of the stairs.

[0013] This embodiment is beneficial, as it provides a mechanism to easily functionalize movement of the parts of stairs between the positions.

[0014] According to another embodiment of the adaptive stair system, each stair is adapted to be in movement coupling with two pistons, and each of the pistons are adapted to move each part of the stairs.

[0015] This embodiment is beneficial, as it provides another simple embodiment, where each of the piston is responsible for moving each part of the stairs. Having each piston for each part of the stairs makes adapting of the stairs to form the ramp efficient.

[0016] According to a further preferred embodiment of the adaptive stair system, the automatic mechanism

comprises one driver and two pistons for each of the stairs.

[0017] This embodiment is beneficial, as it provides another simple embodiment, where the pistons of one stair is handled through a separate driver for moving the parts of the stairs. Having each driver for pistons handling parts one stair makes adapting of the stairs to form the ramp further efficient.

[0018] According to another embodiment of the invention, the adaptive stair system comprises a user detection sensor adapted to sense a wheelchair approaching the adaptive stair system, and adapted to generate a wheelchair approaching data, and a microcontroller in communication coupling to the user detection sensor, the microcontroller is adapted to receive and process the wheelchair approaching data, to determine approaching of the wheelchair, and adapted to trigger the automatic mechanism to move the parts of the stairs between the positions based on the determination of approaching of wheelchair.

[0019] This embodiment is beneficial, as it helps to further automate the adaptive stair system by automatically identifying approaching of the wheelchair towards the adaptive stair system, and further accordingly triggering the automatic mechanism for moving the parts of the stairs.

[0020] In absence of such automatic system, the user has to manually activate the automatic mechanism for moving the parts of the stairs according to his needs.

[0021] According to another embodiment of the adaptive stair system, the user detection sensor is an imaging sensor adapted to capture an image of an environment of the stair adaptive system, and the microcontroller is adapted to receive and process the image, to determine approaching of the wheelchair, and adapted to trigger the automatic mechanism to move the parts of the stairs between the positions based on the determination of approaching of wheelchair.

[0022] This embodiment is beneficial, as it helps to accurately identify the approaching of the wheelchair due to usage of the imaging sensor. Further, the image so captured can be stored for future auditing of the stair system to determine proper functionality of the imaging sensor, microcontroller, and functioning of parts of the stairs.

[0023] According to a further embodiment of the adaptive stair system, the microcontroller is adapted to process the image, to define the wheelchair, and adapted to trigger the automatic mechanism to move the parts of the stairs between the positions based on the definition of the wheelchair.

[0024] This embodiment is beneficial, as it defined the wheelchair, i.e., how much is the distance between rear and forward wheels, and other such parameters of wheelchair, which may help to align the microcontroller for movement of the parts of the stairs.

[0025] According to a further preferred embodiment of the invention, the adaptive stair system comprises a po-

sition sensor placed in vicinity of each of the stairs, the position sensor is adapted to sense presence of the wheelchair, and generate a wheelchair presence data, wherein the microcontroller is in communication coupling with the position sensor, the microcontroller adapted to receive the wheelchair presence data from the position sensor, to process the wheelchair presence data, to determine a position of the wheelchair, and adapted to trigger the automatic mechanism to move the parts of the stairs between the positions based on the position of the wheelchair.

[0026] This embodiment is beneficial, as it provides for identifying position of the wheelchair climbing the stairs of the adaptive stair system, and to move parts of only those stairs which are being used or to be used, and not to move parts of all the stairs. This shall help for using of the stairs by other people also who may not be using the wheelchair while climbing.

[0027] According to a further embodiment of the adaptive stair system, the wheelchair comprises a near field communication component, and at least one of the user detection sensor and the position sensor is a complementary near field communication component to the wheelchairs near field communication component, so that both the components are adapted to be in communication coupling to at least generate one of the wheelchair approaching data or the wheelchair presence data.

[0028] This embodiment is beneficial, as it provides an easy and accurate sensor system for identifying approach of the wheelchair and position of the wheelchair on the stairs.

[0029] According to another embodiment of the adaptive stair system, the microcontroller is adapted to actuate the position sensor based on at least one of the determination of approaching of the wheelchair or position of the wheelchair.

[0030] This embodiment is beneficial, as it helps to save lot of electrical energy and also helps to enhance life of the position sensors, as it only activates the position sensor when it is needed, that is when the user is either near to the stair system or near to a particular stair.

[0031] According to a further embodiment of the adaptive stair system, the microcontroller is adapted to trigger the automatic mechanism to move the parts of a next stair to be in second position, the next stair is the stair which is lying next to the stair onto which the wheelchair is positioned.

[0032] This embodiment is beneficial, as it helps to provide a mechanism to move parts of a next stair to be in the second position to provide the ramp, while the user is on the stair previous to the next stair. By this embodiment, the user need not wait for moving of the parts of the next stair to be in the second position, and he can keep on climbing the wheelchair in a regular and synchronizing fashion.

[0033] According to a further preferred embodiment of the adaptive stair system, the microcontroller is adapted to trigger the automatic mechanism to move parts of a

previous stair to be in third position, when the wheelchair has moved from previous stair to the stair which is next to the previous stair.

[0034] This embodiment is beneficial, as it helps to provide a mechanism to move parts of the previous stair to be in the third position to provide a stopper for the wheelchair, while the wheelchair has moved onto a subsequent stair to the previous stair. By this embodiment, the user is provided a timely support for relieving himself when he has exerted strength and effort to move onto stair subsequent to the previous stair, and looking to rest his hands or body parts used for moving and holding the wheelchair.

[0035] According to another embodiment of the adaptive stair system, the microcontroller is adapted to trigger the automatic mechanism to move parts of the stairs from the third position to the first position, when the wheelchair has passed ahead of the stair subsequent to the previous stair.

[0036] This embodiment is beneficial, as it makes the adaptive stair system ready to be used by a normally abled person, who need not manually realign the adaptive stair system for his requirement. It is a general fact that there is more normally abled person than the person using wheelchair, hence, this embodiment is really helpful and saves time for the users while adapting the stairs for normally abled person, after being used by the persons with wheelchair.

[0037] According to a further embodiment of the adaptive stair system, the parts of the stairs are adapted to be overlappingly placed onto each other to form the ramp while being in the second position.

[0038] This embodiment is beneficial, as it strengthens the ramps while the user of the wheelchair is using the ramp.

[0039] Further benefits, goals and features of the present invention will be described by the following specification of the attached figures, in which components of the invention are exemplarily illustrated. Components of the devices and method according to the inventions, which match at least essentially with respect to their function, can be marked with the same reference sign, wherein such components do not have to be marked or described in all figures.

[0040] The invention is just exemplarily described with respect to the attached figure in the following.

Brief Description of the Drawings

[0041]

Fig. 1 shows a schematic diagram of the adaptive stair system.

Fig. 2 shows stairs of an adaptive stair system with sensors and an automatic mechanism of pistons and drivers.

Detailed Description of the Drawings

[0042] Fig. 1 shows a stair system 1 which includes stairs 2, an automatic mechanism 8, sensors 11, 12, and a microcontroller 15.

[0043] The stair 2 has two movable parts. The parts are perpendicular to each other in a first position of the stair 2, and rotates to be in parallel to each other to form a ramp in a second position. The stairs 2 are also adapted to be in a third position, where the parts are adapted to be at a degree more than 90 degrees with respect to each other. The third position provides for a stopper for the wheelchair, so that wheelchair do not falls back while climbing up the stairs 2. In one embodiment, the adaptive stair system 1 do not provide for the stairs 2 to be in the third position, i.e., the stopper is not provided, and the user of the wheelchair has to use his own strength or any breaks provided in the wheelchair to keep the wheelchair in a resting position while ramping up on the stairs 2 of the adaptive stair system 1.

[0044] The automatic mechanism 8 is provided to move the stairs 2 between the first, second and third positions. The automatic mechanism 8 can be any mechanism which can substantially functionalize the movement of the stairs 2 between the positions, like a motor and pulley combination, where the parts of the stair 2 can be connected to the pulley to effectuate the movement of the parts of the stairs 2. Another possible way is to provide driver and piston mechanism, where the pistons are attached to the parts of the stairs 2 to effectuate movement of the parts of the stairs 2 between the positions.

[0045] There are two types of sensors 11, 12 provided, one is a user detection sensor 11, and another type is a position sensor 12.

[0046] The user detection sensor 11 senses a wheelchair approaching the adaptive stair system 1, and generate a wheel chair approaching data 14. The user detection sensor 11 can be any sensor like infrared sensor, ultrasonic sensor, optical sensor, or any other sensor which can efficiently detect the approaching wheelchair. To detect approaching of the wheelchair accurately, the sensors can be placed in such a way that they can detect the wheelchair and it's approaching, both accurately. One possible location can be roof of the place where the adaptive stair system 1 is placed, or one of the walls in proximity to the adaptive stair system 1 and before beginning of the stairs 2. Multiple user detection sensors 11 may be used to clearly capture the wheelchair and it's approaching accurately. In one embodiment, the user detection sensor 11 need not detect approaching of the wheelchair, and just the presence of the wheelchair, and same shall be used by the microcontroller 15 for activating the automatic mechanism 8. In one embodiment, the user detection sensor 15 is an imaging sensor which captures an image 14 of an environment of the adaptive stair system 1, such that whenever a user of the adaptive stair system 1 approaches the adaptive stair system 1 with the wheelchair, his image is captured, and which is further

processed to identify approaching of the wheelchair. For accurate determination of approaching of the wheelchair, more than one images 14 are required to be captured and processed. When a wheelchair is approaching, in subsequent captured images 14, it can easily be identified, if in subsequent images 14 size of the wheelchair is changed. The change in size of the wheelchair is used to determine approaching of the wheelchair to the adaptive system 1. Even more than one image sensors 11 can be used to capture the images 14 at different distances, and at different time frames, which can be processed to determine approaching of the wheelchair accurately.

[0047] The position sensor 12 is placed in vicinity of each of the stairs 2. The position sensor 12 senses presence of the wheelchair on or near to a particular stair 2, and generates a user presence data 16. The position sensors 12 can be pressure based sensors, like piezo-electric sensors which can be placed under the stairs, or can be optic based sensors and can be placed on the sides of the stairs 2. Presence of the wheelchair on a particular stair 2 further determines his position onto the adaptive stair system 1 which the wheelchair is climbing.

[0048] The microcontroller 15 is in communication coupling to the user detection sensor 11 and the position sensor 12.

[0049] The microcontroller 15 receives and processes the wheelchair approaching data 14 from the user detection sensor 11, and based on the processing determines approaching of the wheelchair. Based on the determination of the approaching of the wheelchair, the microcontroller 11 triggers the automatic mechanism 8 to move parts of the stairs 2 between the first, second, and third positions.

[0050] In the embodiment, where the user detection sensor 11 is the image sensor, the microcontroller 15 receives and processes the image 14, determines approaching of the wheelchair based on processing of the image 14. And further based on determination of the approaching of the wheelchair, the microcontroller 15 triggers the automatic mechanism 8 to move the parts of the stairs 2 between the first, second and third positions.

[0051] In one embodiment, the microcontroller 15 processes the image 14, and defines the wheelchair 13. The microcontroller 15 triggers the automatic mechanism 8 to move the parts of the stairs 3 between the positions based on the definition of the wheelchair. Defining of the wheelchair is significant in the scenarios where there is larger or shorter distance between the rear and front wheels of the wheelchair. In such scenario, it may be required to change the parts of the subsequent stairs 2 into positions differently than a normal or standard scenario.

[0052] The microcontroller 15 also receives the wheelchair presence data 16 from the position sensor 12, processes the wheelchair presence data 16, and determines the position of the wheelchair on the adaptive stair system 1. Based on the position of the wheelchair, the microcon-

troller 15 triggers the automatic mechanism 8 to move the parts of the stairs 2 between the first, second and third positions. When a wheelchair is detected to be at a position just before a particular stair 2, the microcontroller 15 triggers the automatic mechanism 8 to move parts of that particular stair 2 to be in second position, so that the stair 2 shall be converted into a ramp, and to be ready for being accessed by the wheelchair while climbing without wait. Also, as the wheelchair moves onto that particular stair 2, the previous stair moves into the third position to provide a stopper for the wheelchair, for diminishing or eliminating possibilities of falling back of the wheelchair. This is quite helpful for eliminating any causalities while ramping up of the wheelchair on stair 2. Once, it is detected that the position of the wheelchair has changed, i.e., the wheelchair has moved further ahead, the stair which is in the third position returns back to the first position.

[0053] In one embodiment, the position sensors 12 are generally kept in inactive state, and are activated by the microcontroller 15 only when a need is required, i.e., when it is detected that a wheelchair is approaching the adaptive stair system 1. In one embodiment, only specific position sensors 12 are activated which are required to detect the position of the wheelchair at particular time. For example, when the wheelchair is on a particular stair 2, the position sensors 12 which are placed in proximity to that stair 2 where the wheelchair is present.

[0054] In one embodiment, the wheelchair includes a near field communication component, and at least one of the user detection sensor 11 and the position sensor 12 is a complimentary near field communication component. The near field communication components form a communication coupling when they are in proximity to each other, so that to at least generate one of the wheelchair approaching data 14 or the wheelchair presence data 16.

[0055] In Fig. 2, stairs 2 of the adaptive stair system with the position sensors 12 and an automatic mechanism of pistons 10 and drivers 9 is shown.

[0056] Each stair 2 has two movable parts 3. The parts 3 are perpendicular to each other in a first position 5 of the stair 2, and rotates to be in parallel to each other to form a ramp in a second position 6 of the stairs 2.

[0057] Each of the stairs 2 can also be in a third position 7. The parts 3 of the stair 2 moves to be at a degree more than 90 degrees with respect to each other to be in the third position. In alternate embodiment, where stopper functionality in the adaptive stair system is not required to be provided, the parts 3 of the stairs 2 do not move into the third position 7.

[0058] The automatic mechanism is provided in form of drivers 9 and pistons 10. Each of the stair 2 is connected to two pistons 10 and one driver 9. Each piston 10 is connected to one part 3 of the stair 2. The driver 9 moves the pistons 9 to move the parts 3 of the stairs 2 to be in the first position 5, the second position 6, or the

third position 7. In one embodiment, there can be only one driver 9 handling all the pistons 10 of the adaptive stair system. In another embodiment, each part 3 of the stair 2 need not have individual pistons 10 associated to them, rather one piston 10 can be responsible for moving more than one parts 3, wherein the parts 3 may belong to the same stair 2 or different stairs 2. In one embodiment, there can be more than one drivers 9 handling movement of the pistons 10 of the adaptive stair system, such that one driver 9 shall be handling movement of more than one stair 2.

[0059] When the wheelchair ramps up onto the stairs 2, the microcontroller 15 keeps on identifying the position of the wheelchair, so that it can move various stairs 2 between the first position 5, the second position 6, or into the third position 7. The microcontroller 15 triggers the automatic mechanism to move the parts 3 of a next stair 17 to be in second position 6, while the wheelchair 13 is being on a stair 2 which is preceding to the next stair 17.

[0060] The microcontroller 15 triggers the automatic mechanism to move parts 3 of a previous stair 18 to be in third position 7, when the wheelchair 13 has moved from previous stair 18 to the stair 2 which is next to the previous stair 18.

[0061] The microcontroller 15 triggers the automatic mechanism to move parts 3 of the stairs 2 from the third position 7 to the first position 5, when the wheelchair 13 has passed ahead of the stair 2 subsequent to the previous stair 18.

[0062] The movement of the parts 3 of the stairs 2 back to the first position 5 ensures that the adaptive stair system is ready and available to be further used by a normally abled person who is climbing the stairs on foot, or for another wheelchair which is behind the current wheelchair which is ramping up.

[0063] The parts 3 of the stairs 2 are overlappingly placed onto each other to form the ramp while being in the second position 6. This provides strength and stability to the formulated ramp. In an alternate embodiment, the parts 3 can be placed adjoining while being in the second position 6 to form the ramp.

[0064] Current invention provides for using of the same stairs by both a normally abled user, and a person using a wheelchair. In one embodiment, both the normally abled person, and the wheel chair user can use the adaptive stair system at the same time.

[0065] Thus, the present invention provides for an adaptive stair system 1 comprising a set of stairs 2, where each stair 2 comprising two movable parts 3, the parts 3 are adapted to be perpendicular to each other in a first position 5 of the stair 2, and adapted to rotate to be in parallel to each other to form a ramp in a second position 6, and an automatic mechanism 8 adapted to move the parts 3 of the stairs 2 between the first position 5 and the second position 6.

List of reference numbers

[0066]

5	1	adaptive stair system
	2	stair
	3	parts
	5	first position
	6	second position
10	7	third position
	8	automatic mechanism
	9	driver
	10	piston
	11	user detection sensor
15	12	position sensor
	13	wheelchair
	14	wheelchair approaching data
	15	microcontroller
	16	wheelchair presence data
20	17	next stair
	18	previous stair

Claims

- 25 1. An adaptive stair system (1) comprising:
 - a set of stairs (2), each stair (2) comprising two movable parts (3), the parts (3) are adapted to be perpendicular to each other in a first position (5) of the stair (2), and adapted to rotate to be in parallel to each other to form a ramp in a second position (6); and
 - an automatic mechanism (8) adapted to move the parts (3) of the stairs (2) between the first position (5) and the second position (6).
- 30 2. The adaptive stair system (1) according to claim 1, wherein the stairs (2) are adapted to be in a third position (7), wherein the parts (3) are adapted to be at a degree more than 90 degrees with respect to each other, and the automatic mechanism (8) is adapted to move the parts (3) between the positions (5, 6, 7).
- 35 3. The adaptive stair system (1) according to any of the claims 1 or 2, wherein the automatic mechanism (8) comprises at least one driver (9) and a set of pistons (10), the pistons (10) are in movement coupling to the parts (3) of the stairs (2), such that the driver (9) drives the pistons (10) to facilitate movements of the parts (3) of the stairs (2) between the positions (5, 6, 7) of the stairs (2).
- 40 4. The adaptive stair system (1) according to claim 3, wherein each stair (1) is adapted to be in movement coupling with two pistons (10), and each of the pistons (10) are adapted to move each part (3) of the

stairs (2).

5. The adaptive stair system (1) according to the claim 4, wherein the automatic mechanism (8) comprises one driver (9) and two pistons (10) for each of the stairs (2).

6. The adaptive stair system (1) according to any of the claims 1 to 5 comprising:

- an user detection sensor (11) adapted to sense a wheelchair (13) approaching the adaptive stair system (1), and adapted to generate a wheelchair approaching data (14); and
- a microcontroller (15) in communication coupling to the user detection sensor (11), the microcontroller (15) is adapted to receive and process the wheelchair approaching data (14), to determine approaching of the wheelchair (1), and adapted to trigger the automatic mechanism (8) to move the parts (3) of the stairs (2) between the positions (5, 6, 7) based on the determination of approaching of the wheelchair (13).

7. The adaptive stair system (1) according to the claim 6, wherein the user detection sensor (11) is an imaging sensor adapted to capture an image (14) of an environment of the stair adaptive system (1), and the microcontroller (15) is adapted to receive and process the image (14), to determine approaching of the wheelchair, and adapted to trigger the automatic mechanism (8) to move the parts (3) of the stairs (2) between the positions (5, 6, 7) based on the determination of approaching of wheelchair (13).

8. The adaptive stair system (1) according to the claim 7, wherein the microcontroller (15) is adapted to process the image (14), to define the wheelchair (13), and adapted to trigger the automatic mechanism (8) to move the parts (3) of the stairs (2) between the positions (5, 6, 7) based on the definition of the wheelchair (13).

9. The adaptive stair system (1) according to any of the claims 1 to 8 comprising:

- a position sensor (12) placed in vicinity of each of the stairs (2), the position sensor (12) is adapted to sense presence of the wheelchair (13), and generate a wheelchair presence data (16),

wherein the microcontroller (15) is in communication coupling with the position sensor (12), the microcontroller (15) adapted to receive the wheelchair presence data (16) from the position sensor (12), to process the wheelchair presence data (16), to determine a position of the wheelchair (13), and adapted to trigger the automatic mechanism (8) to move the parts

(3) of the stairs (2) between the positions (5, 6, 7) based on the position of the wheelchair (13).

10. The adaptive stair system (1) according to any of the claims 6 to 9, wherein the wheelchair (13) comprises a near field communication component, and at least one of the user detection sensor (11) and the position sensor (12) is a complimentary near field communication component to the wheelchairs near field communication component, so that both the components are adapted to be in communication coupling to at least generate one of the wheelchair approaching data (14) or the wheelchair presence data (16).

11. The adaptive stair system (1) according to any of the claims 9 or 10, wherein the microcontroller (15) is adapted to actuate the position sensor (12) based on at least one of the determination of approaching of the wheelchair (13) or position of the wheelchair (13).

12. The adaptive stair system (1) according to any of the claims 6 to 11, wherein the microcontroller (15) is adapted to trigger the automatic mechanism (8) to move the parts (3) of a next stair (17) to be in second position (6), the next stair (17) is the stair (2) which is lying next to the stair (2) onto which the wheelchair (13) is positioned.

13. The adaptive stair system (1) according to the claim 12, wherein the microcontroller (15) is adapted to trigger the automatic mechanism (8) to move parts (3) of a previous stair (18) to be in third position (7), when the wheelchair (13) has moved from previous stair (18) to the stair (2) which is next to the previous stair (18).

14. The adaptive stair system (1) according to the claim 13, wherein the microcontroller (15) is adapted to trigger the automatic mechanism (8) to move parts (3) of the stairs (2) from the third position (7) to the first position (5), when the wheelchair (13) has passed ahead of the stair (2) subsequent to the previous stair (18).

15. The adaptive stair system (1) according to any of the claims 1 to 14, wherein the parts (3) of the stairs (2) are adapted to be overlappingly placed onto each other to form the ramp while being in the second position (6).

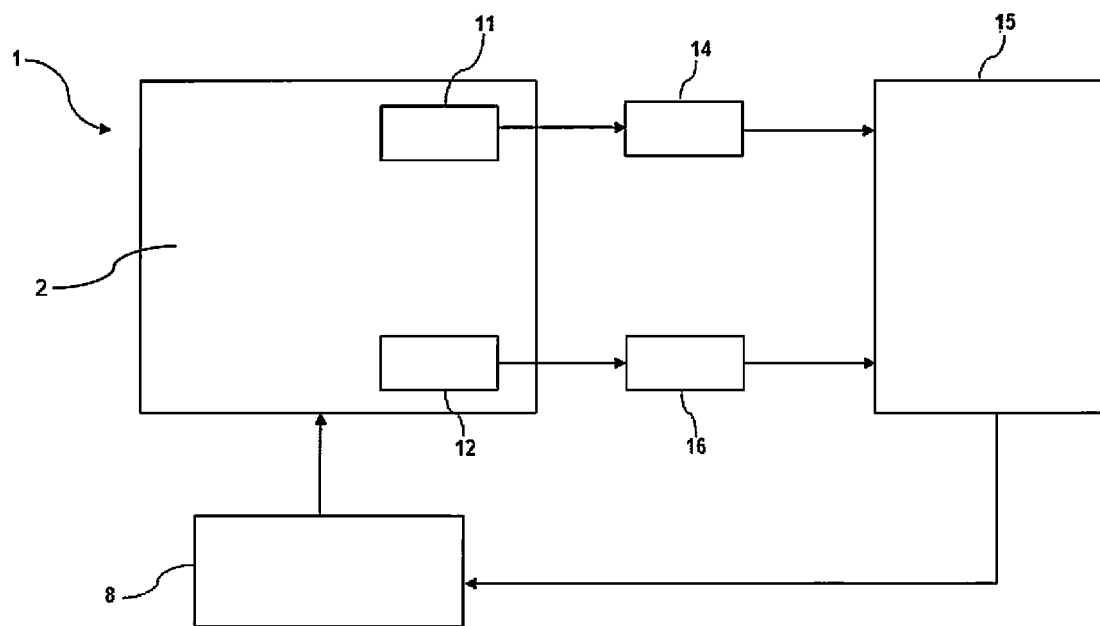


Fig. 1

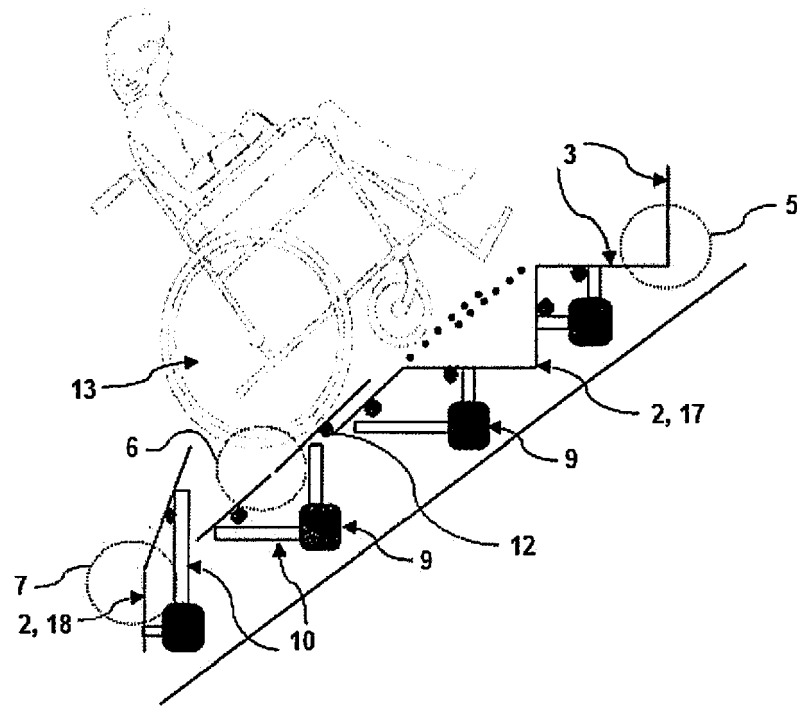


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 17 17 2700

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 454 196 A (GAINES SAMUEL L [US] ET AL) 3 October 1995 (1995-10-03)	1,3-5	INV. E04F11/02 E04F11/00
A	* column 1, lines 7-10 * * column 6, lines 15-28 * * column 7, lines 2-15, 35-45 * * column 9, lines 22-26 * * figures 1-3,5 *	2,6-15	
X	----- KR 100 658 159 B1 (HWANKYUNG ARCHITECTS AND ENGIN [KR]) 8 December 2006 (2006-12-08)	1,3-5	
A	* figures 1-7 *	2,6-14	
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A	* column 1, lines 5-11, 40-52 * * column 3, lines 36-42 * * column 6, lines 30-31 * * figures 1,2,5,6 *	2,6-15	TECHNICAL FIELDS SEARCHED (IPC) E04F
A	----- GB 2 441 321 A (NGUYEN SANG NGOC [GB]; STEVENSON RICHARD CARL SATCHWE [GB]) 5 March 2008 (2008-03-05) * figure 1 *	1-15	
A	----- KR 100 653 213 B1 (JOONG WON ARCHITECTS CO LTD [KR]) 27 November 2006 (2006-11-27) * figures 5a,5b,6 *	2	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 October 2017	Examiner Arsac England, Sally
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