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(54) **STAIR SYSTEM**

(57) A stair system (1) comprising a set of stable stairs (2), each of the stable stairs (2) comprising a first horizontal surface (3), an empty space (4) within the stable stair (2), a first wall (5) substantially perpendicular to the horizontal surface (3), and an opening (6) in the first wall (5) to facilitate into or out of the empty space (4), and a set of movable stairs (7), each of the movable stair

(7) is adapted to be in a normal position (8) or an extended position (9), such that while being in the normal position (8), the movable stair (7) is adapted to be placed within the empty space (4) of one of the stable stairs (2), and while being in the extended position (9), the movable stair (7) is adapted to be extended out of the stable stair (2) through the opening (6).

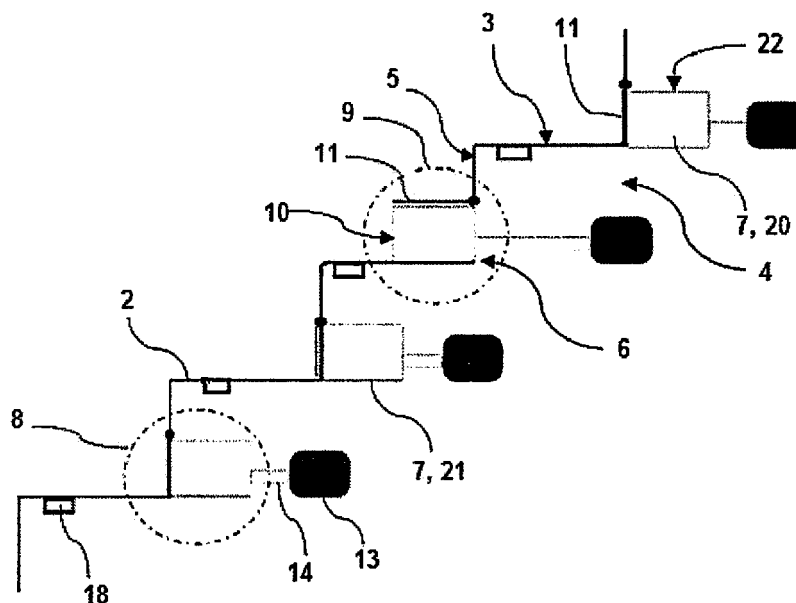


Fig. 2

Description

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

Background of the Invention

[0002] In normal course, to climb up to a location, stairs are provided. However, differently abled persons cannot use these stairs without problems. For example, children, elderly people and people with disabilities have difficulties climbing up these stairs which are generally designed for normally abled people. The small legs of children cause balance problems when going down and going up on the stairs. For a high step, where old people will pull themselves up, powering their legs will cause pain or is problematic as such, and they will have to spend a lot of power. The higher the stairway steps, the bigger the problem. People with disabilities always have the same difficulty in stairs, since they cannot even use them. If the height of the steps of the stairs is designed small, then a structure that is difficult to use for normal people will emerge.

[0003] US Application No. US5924249 discloses a stairway step assembly for use as an aid in climbing a stairway. The assembly comprises a plurality of step members having predetermined horizontal dimensions and a predetermined height which is approximately one-half the height or rise distance of a standard step. The assembly further comprises an attachments mechanism for connecting the step members in place on the top or horizontal section of standard steps.

Object of the Invention

[0004] It is therefore the object of the present invention is to provide a stair system which can be adapted in such a way that it can be used by both differently abled person, as well as by normally abled person.

Description of the Invention

[0005] The before mentioned object is solved by a stair system according to claim 1.

[0006] A stair system comprising a set of stable stairs, each of the stable stairs comprising a first horizontal surface, an empty space within the stable stair, a first wall substantially perpendicular to the horizontal surface, and an opening in the first wall to facilitate into or out of the empty space, and a set of movable stairs, each of the movable stair is adapted to be in a normal position or an extended position, such that while being in normal position, the movable stair is adapted to be placed within the empty space of one of the stable stairs, and while being in the extended position, the movable stair is adapted to be extended out of the stable stair through the opening.

[0007] This provides for the stairs to be adaptive for person with differently abled, who either cannot take

higher steps due to there height issue, or requires to put excessive efforts for climbing the stairs with more heights. The stair system provides for introducing movable stairs to be intermittently placed. So that the differently abled person need not climb two succesively placed stable stairs. As for them, the movable stairs extends in extended position, and appears between two consecutively placed stable stairs so that the user steps on the movable stair in between to climb upto the height of two sucscive stable stairs.

[0008] Further preferred embodiments are subject-matter of dependent claims and/or of the following specification parts.

[0009] According to a preferred embodiment of the stair system, each of the movable stair comprises a second wall parallel to the first wall of the stable stair into which the movable stair is placed.

[0010] This embodiment is beneficial as it provides for similar structure of the movable stairs with respect to the stable stairs, which do not surprise a user of the stair system while climbing up, as his movement shall be sunchronized due to synchronized stable and movable stairs when he is climbing up.

[0011] According to a further embodiment of the stair system, the stable stairs comprise a door for allowing opening or closing of the opening, wherein the door is adapted to be horizontally placed and ii perpendicular to the second wall, when the movable stair is in extended position.

[0012] This embodiment is helpful, as it provides a proper storage of the movable stairs, as the movable stair is suitably enclosed within the empty space which is generally non-accesable due to the door. Further, the door can become stepping surface for the movable stair, if there is no stepping surface provided to the movable stair. Even in case, when a stepping surface is provided to the movable step, the door strengthen the stairs when the stair is in extended position.

[0013] According to another embodiment of the stair system, each of the movable stair comprises a second horizontal surface placed perpendicularly to the second wall.

[0014] This embodiment is beneficial, as it provides a simple formulation for the movable stair with the second horizontal surface as the stepping surface for the user while climbing the stair, and when the movable stair is in extended position. In case, when there is no door, it is substantially required to enable stepping function for the user, as in absence of the door, the second horizontal surface shall be functioning as the stepping surface.

[0015] According to a further preferred embodiment of the invention, the stair system comprises an automatic mechanism adapted to move the movable stair between extended position and normal position.

[0016] This embodiment is beneficial, as it provides an easy and automatic way for managing positions of the movable stairs without bothering the user of the stairs to handle the positions of the movable stairs.

[0017] According to another embodiment of the stair system, the automatic mechanism comprises at least one driver and at least one piston, the piston is in movement coupling to the movable stairs, such that the driver drives the piston to facilitate movement of the movable stairs between the positions.

[0018] This embodiment is beneficial, as it provides a mechanism to easily functionalize movement of the movable stairs between the positions.

[0019] According to a further preferred embodiment of the stair system, each movable stair is adapted to be in movement coupling with one piston, and each of the piston is adapted to move the movable stair to which it is coupled to.

[0020] This embodiment is beneficial, as it provides another simple embodiment, where each of the piston is responsible for each of the movable stairs. Having each piston for each movable stair makes the movement of the movable stairs in the stair system efficient.

[0021] According to a further embodiment of the stair system, the automatic system comprises one driver for each of the movable stairs.

[0022] This embodiment is beneficial, as it provides another simple embodiment, where each of the piston is handled through a separate driver for moving each of the movable stairs. Having each driver for each piston makes the movement of the movable stairs in the stair system efficient.

[0023] According to another embodiment of the stair system, the stair system comprises an user detection sensor adapted to sense height of an user approaching the stair system, and adapted to generate a user height data, and a microcontroller in communication coupling to the user detection sensor, the microcontroller is adapted to receive and process the user height data, to determine height of the user, and adapted to trigger the automatic mechanism to move the movable stairs between the positions based on the determination of height of the user.

[0024] This embodiment is beneficial, as it helps to further automate the stair system by automatically identifying whether the user using the stair system is of lower height, and further accordingly triggering the automatic mechanism for moving the movable stairs. In absence of such automatic system, the user has to manually activate the automatic system for moving the movable stairs according to his needs.

[0025] According to a further embodiment of the stair system, the user detection sensor is an imaging sensor adapted to capture an image of an environment of the stair system, and the microcontroller is adapted to receive and process the image, to determine a height of the user, and adapted to trigger the automatic mechanism to move the movable stairs between the positions based on the determination of the height of the user.

[0026] This embodiment is beneficial, as it helps to accurately identify the height of the user 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 movable stairs.

[0027] According to a further preferred embodiment of the stair system, the stair system comprising a position sensor placed in vicinity of each of the stairs, the position sensor is adapted to sense presence of the user, and generate a user presence data, wherein the microcontroller is in communication coupling with the position sensor, the microcontroller adapted to receive the user presence data from the position sensor, to process the user presence data, to determine a position of the user, and adapted to trigger the automatic mechanism to move the movable stairs between the positions based on the position of the user.

[0028] This embodiment is beneficial, as it provides for identifying position of the user climbing the stairs of the stair system, and to move only those movable stairs which are being used or about to be used, and not to extend all the movable stairs to the extended position. This shall help for using of the stairs by other people also who may not require the movable stairs while climbing.

[0029] According to another embodiment of the stair system, the microcontroller is adapted to trigger the automatic mechanism to move a next movable stair to be in extended position, the next movable stair is the stair which is lying next to the stable stair onto which the user is positioned or about to move onto.

[0030] This embodiment is beneficial, as it helps to provide a mechanism to move a next movable stair while the user is on the stable stair previous to the next movable stair or on the movable stair which is previous to the next movable stair. By this embodiment, the user need not wait for moving of the next movable stair to the extended position, and he can keep on climbing in a regular and synchronizing fashion.

[0031] According to a further preferred embodiment of the stair system, the microcontroller is adapted to trigger the automatic mechanism to move a previous movable stair to be in normal position, when the user has moved from previous movable stair to subsequent stable stair or subsequent movable stair.

[0032] This embodiment is beneficial, as it makes the stair system ready to be used by a normally abled person, who need not manually realign the stair system for his requirement. It is a general fact that there is more normally abled person than the differently abled person, 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 differently abled person.

[0033] According to another embodiment of the stair system, the microcontroller is adapted to actuate the position sensor based on the determination of at least one of the approaching of the user or the presence of the user.

[0034] 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.

[0035] According to a further preferred embodiment of the stair system, the position sensor is either pressure based sensor or optic based sensor.

[0036] This embodiment is beneficial, as it provides for position sensors which are efficient in identifying presence of the user, and further helpful in determining position of the user.

[0037] 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.

[0038] The invention is just exemplarily described with respect to the attached figure in the following.

Brief Description of the Drawings

[0039]

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

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

Detailed Description of the Drawings

[0040] Fig. 1 shows a stair system 1 which includes stairs 2, 7, automatic mechanism 12, sensors 15, 18, and microcontroller 17.

[0041] There are two types of stairs 2, 7 provided with the stair system 1, stable stairs 2, and movable stairs 7. The stable stairs 2 are stationary and with fixture to a stair case, while the movable stairs 7 are hidden behind the stable stairs 2 and moves into two positions, one is a normal position, and another is an extended position. The normal position is a position in which the movable stair 7 remains completely within an empty space provided in the stable stairs 2. While, in the extended position, the movable stairs 7 completely or partially extends out of the stable stairs 2. However, the movable stairs 7 shall at least extends out of the stable stairs 2 such that a user of the stairs 2, 7 can at least keep his steps properly onto them. At the same time, the movable stair 7 cannot extend to an extent which shall leave lesser space for a user to keep foot properly onto a remaining part of the stable stair 2 onto which the movable stair 7 extends out.

[0042] The automatic mechanism 12 is provided to move the movable stairs 7. The automatic mechanism can be any mechanism which can substantially functionalize the movement between positions of the movable stairs 7, like a motor and pulley combination, where the movable stair 7 can be connected to the pulley to effectuate the movement of the movable stairs 7. Another pos-

sible way is to provide driver and piston mechanism, where the pistons are attached to the movable stairs 7 to effectuate movement of the movable stairs 7 between the positions.

[0043] There are two types of sensors 15, 18 provided, one is user detection sensor 15, and another type is position sensor 18.

[0044] The user detection sensor 15 senses height of a user approaching the stair system 1, and generate a user height data 16. The user detection sensor 15 can be any sensor like infrared sensor, ultrasonic sensor, optical sensor, or any other sensor which can efficiently detect approaching user, and which can further detect height of the user. To detect height of the user accurately, the sensors can be placed in such a way that they can detect the height accurately. One possible location can be roof of the place where the stair system 1 is placed, or one of the walls in proximity to the stair system 1 and before beginning of the stairs 2, 7. In one embodiment, the height detection need not be accurate, rather it can be approximate, and should be just enough to determine whether the user is having less height or less leg length, and whether he should have difficulty in climbing up the stable stairs 7 due to the height between each of the stable stairs 7. In one embodiment, the user detection sensor 15 is an imaging sensor adapted to capture an image 16 of an environment of the stair system 1, such that whenever a user of stair system 1 approaches the stair system 1, his image 16 is captured, and can be further processed to identify height of the user accurately.

[0045] The position sensor 18 is placed in vicinity of each of the stairs 2, 7. The position sensor 18 senses presence of the user on or near to a particular stair 2, 7, and generates a user presence data 19. The position sensors 18 can be pressure based sensors, like piezoelectric 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, 7. Presence of the user on a particular stair 2, 7 further determines his position onto the stair system 1 which he is climbing.

[0046] The microcontroller 17 is in communication coupling to the user detection sensor 15 and the position sensor 18.

[0047] The microcontroller 17 receives and processes the user height data 16 from the user detection sensor 15, and based on the processing determines a height of the user. Based on the determination of the height of the user, the microcontroller 17 triggers the automatic mechanism 12 to move the movable stairs 7 between the normal position and the extended position.

[0048] In the embodiment, where the user detection sensor 15 is the image sensor, the microcontroller 17 receives and processes the image 16, determines a height of the user based on processing of the image. And further based on determination of the height of the user, the microcontroller 17 triggers the automatic mechanism 12 to move the movable stairs 7 between the extended position and the normal position.

[0049] The microcontroller 17 also receives the user presence data 19 from the position sensor 18, processes the user presence data 19, and determines the position of the user. Based on the position of the user, the microcontroller 17 triggers the automatic mechanism 12 to move the movable stairs 7 between the normal position and the extended position. When a user detected to be at a position just before a particular movable stair 7, the microcontroller 17 triggers the automatic mechanism 12 to actuate that particular movable stair 7 to be in extended position, so that the movable stair 7 shall be ready to be accessed by the user while climbing without wait. Once, it is detected the position of the user has changed, i.e., he has moved ahead on a next stable stair 2 or movable stair 7, a movable stair 7 previously placed shall be moved back from the extended position to the normal position.

[0050] In one embodiment, the position sensors 18 are generally kept in inactive state, and are activated by the microcontroller 17 only when a need is required, i.e., when it is detected that a user is approaching the stair system 1 and his height is in the range where the movable stairs 7 are required. In one embodiment, only specific position sensors 18 are activated which are required to detect the position of a user at particular time. For example, when a user is on a particular stair 2, 7, the position sensors 18 which are placed in proximity to that stair 2, 7 where the user is present.

[0051] In another embodiment, the microcontroller 17, and sensors 15, 18 are not required, however, a user can manually switch on and off the automatic mechanism 12.

[0052] In one embodiment, where the user is not a kid, but rather a person with normal height, but quite weak or old to climb steep steps, the user detection sensor 15 provides for a normal height and so the microcontroller 17 do not triggers the automatic mechanism 12. In such scenario, a manual switch is provided for such user, so that the user can push the manual switch to send a signal to the microcontroller 17 to trigger the automatic mechanism 12.

[0053] Fig. 2 shows stairs 2, 7 of the stair system 1 with the position sensors 18 and the automatic mechanism of pistons 14 and drivers 13.

[0054] Each of the stable stairs 2 has a first horizontal surface 3, an empty space 4 within the stable stair 2, a first wall 5 substantially perpendicular to the horizontal surface 3, and an opening 6 in the first wall 5 to facilitate into or out of the empty space 4.

[0055] Each of the movable stair 7 moves into two positions 8, 9, a normal position 8 or an extended position 9. While being in the normal position 8, the movable stair 7 is placed within the empty space 4 of one of the stable stairs 2, and while being in the extended position 9, the movable stair 7 is extended out of the stable stair 2, partially or completely, through the opening 6.

[0056] Each of the movable stair 7 has a second wall 10 parallel to the first wall 5 of the stable stair 2 into which

the movable stair 7 is placed. In one embodiment, the second wall 10 need not be in parallel to the first wall 5, rather the second wall 10 can be having an angle with respect to the first wall 5.

[0057] The stable stairs 2 has a door 11 for allowing opening or closing of the opening 6. The door 11 is horizontally placed and in perpendicular to the second wall 10, when the movable stair 7 is in extended position 9.

[0058] Each of the movable stair 7 also has a second horizontal surface 22 placed perpendicularly to the second wall 10. The horizontal surfaces 3, 22 works as stepping surfaces for a user climbing the stairs 2, 7. In one embodiment, when the movable stair 7 do not have the second horizontal surface 22, the door 11 works as a step for a user climbing the stair 7.

[0059] The automatic mechanism includes one driver 13 and one piston 14 for each of the movable stairs 7. The piston 14 is in movement coupling to the movable stairs 7. The driver 13 drives the piston 14 to facilitate movement of the movable stairs 7 between the positions 8, 9.

[0060] In one embodiment, there can be only one driver 13 and one piston 14 facilitating movement of the movable stairs 7 between the positions 8, 9. In another embodiment, there can be one driver 13 for all the pistons 14 in the stair system 1. In yet another embodiment, there can be more than one driver 13 for all the pistons 14 in the stair system.

[0061] The stair system 1 also shown with the position sensors 18 present for each of the stable stairs 2. In one embodiment, the position sensors 18 can also be placed onto the movable stairs 7, in spite of the stable stair 2, or in addition to the position sensors 18 provided on the stable stairs 2. The position sensors 18 are described in detail while explaining the Fig 1. The stair system also includes the user detection sensors which is not shown in the Fig. 2, however it is described in details while explaining the Fig. 1.

[0062] When a differently abled user starts using the stair system, the microcontroller triggers the driver 13 to move the piston 14 of a next movable stair 20 lying next to the stable stair 2 onto which the user is positioned or about to move to, so that to move the next movable stair 20 to be in extended position 9.

[0063] Once a user moves to a subsequent stable stair 2, the microcontroller triggers the driver 13 to move the piston 14 of a previous movable stair 21, so that to move the previous movable stair 21 to be in normal position 8.

[0064] By moving the movable stairs 7 to be in extended position 9 only when the user is using the movable stair 7 and returning back the movable stair 7 into the normal position 8 when the user has moved ahead onto a subsequent stable stair 2, the stair system is kept ready to be used by another user who is not differently abled. This makes stair system dynamic to be used by both differently abled, and well as normally abled people at the same time.

[0065] Current invention provides for a solution where

same stair system can be used by both normally abled people and differently abled people, which also keeps in mind different requirements of the normally abled people and differently abled people, and provides a technique to adapt the stairs as per requirements of them. Also, unique feature of one of the embodiment of the current invention is that the stair system can be used by both differently abled, and normally abled at the same time.

[0066] Thus, the present invention provides for a stair system 1 comprising a set of stable stairs 2, each of the stable stairs 2 comprising a first horizontal surface 3, an empty space 4 within the stable stair 2, a first wall 5 substantially perpendicular to the horizontal surface 3, and an opening 6 in the first wall 5 to facilitate into or out of the empty space 4, and a set of movable stairs 7, each of the movable stair 7 is adapted to be in a normal position 8 or an extended position 9, such that while being in the normal position 8, the movable stair 7 is adapted to be placed within the empty space 4 of one of the stable stairs 2, and while being in the extended position 9, the movable stair 7 is adapted to be extended out of the stable stair 2 through the opening 6.

List of reference numbers

[0067]

1	stair system
2	stable stair
3	first horizontal surface
4	empty space
5	first wall
6	opening
7	movable stair
8	normal position
9	extended position
10	second wall
11	door
12	automatic mechanism
13	driver
14	piston
15	user detection sensor
16	user height data, image
17	microcontroller
18	position sensor
19	user presence data
20	next movable stair
21	previous movable stair
22	second horizontal surface

Claims

1. A stair system (1) comprising:

- a set of stable stairs (2), each of the stable stairs (2) comprising a first horizontal surface (3), an empty space (4) within the stable stair

(2), a first wall (5) substantially perpendicular to the horizontal surface (3), and an opening (6) in the first wall (5) to facilitate into or out of the empty space (4); and

- a set of movable stairs (7), each of the movable stair (7) is adapted to be in a normal position (8) or an extended position (9), such that while being in the normal position (8), the movable stair (7) is adapted to be placed within the empty space (4) of one of the stable stairs (2), and while being in the extended position (9), the movable stair (7) is adapted to be extended out of the stable stair (2) through the opening (6).

2. The stair system (1) according to claim 1, wherein each of the movable stair (7) comprises a second wall (10) parallel to the first wall (5) of the stable stair (2) into which the movable stair (7) is placed.

3. The stair system (1) according to the claim 2, wherein the stable stairs (2) comprises a door (11) for allowing opening or closing of the opening (6), wherein the door (11) is adapted to be horizontally placed and in perpendicular to the second wall (10), when the movable stair (7) is in extended position (9).

4. The stair system (1) according to any of the claims 2 or 3, wherein each of the movable stair (7) comprises a second horizontal surface (22) placed perpendicularly to the second wall (10).

5. The stair system (1) according to any of the claims 1 to 4 comprising:

- an automatic mechanism (12) adapted to move the movable stair (7) between extended position (9) and normal position (8).

6. The stair system (1) according to the claim 5, wherein the automatic mechanism (12) comprises at least one driver (13) and at least one piston (14), the piston (14) is in movement coupling to the movable stairs (7), such that the driver (13) drives the piston (14) to facilitate movement of the movable stairs (7) between the positions (8, 9).

7. The stair system (1) according to the claim 6, wherein each movable stair (7) is adapted to be in movement coupling with one piston (14), and each of the piston (14) is adapted to move the movable stair (7) to which it is coupled to.

8. The stair system (1) according to the claim 7, wherein the automatic mechanism (12) comprises one driver (13) for each of the movable stairs (7).

9. The stair system (1) according to any of the claims 5 to 8 comprising:

- an user detection sensor (15) adapted to sense height of an user approaching the stair system (1), and adapted to generate a user height data (16); and
 - a microcontroller (17) in communication coupling to the user detection sensor (15), the microcontroller (17) is adapted to receive and process the user height data (16), to determine height of the user, and adapted to trigger the automatic mechanism (12) to move the movable stairs (7) between the positions (8, 9) based on the determination of height of the user.
10. The stair system (1) according to the claim 9, wherein the user detection sensor (15) is an imaging sensor adapted to capture an image (16) of an environment of the stair system (1), and the microcontroller (17) is adapted to receive and process the image (16), to determine a height of the user, and adapted to trigger the automatic mechanism (12) to move the movable stairs (7) between the positions (8, 9) based on the determination of the height of the user.
11. The stair system (1) according to any of the claims 5 to 10 comprising:
- a position sensor (18) placed in vicinity of each of the stairs (2, 7), the position sensor (18) is adapted to sense presence of the user, and generate a user presence data (19),
- wherein the microcontroller (17) is in communication coupling with the position sensor (18), the microcontroller (17) adapted to receive the user presence data (19) from the position sensor (18), to process the user presence data (19), to determine a position of the user, and adapted to trigger the automatic mechanism (12) to move the movable stairs (7) between the positions (8, 9) based on the position of the user.
12. The stair system (1) according to claim 11, wherein the microcontroller (17) is adapted to trigger the automatic mechanism (12) to move a next movable stair (20) to be in extended position (9), the next movable stair (20) is the stair (7) which is lying next to the stable stair (2) onto which the user is positioned or about to move onto.
13. The stair system (1) according to the claim 9, wherein the microcontroller (17) is adapted to trigger the automatic mechanism (12) to move a previous movable stair (21) to be in normal position (8), when the user has moved from the previous movable stair (21) to subsequent stable stair (2) or subsequent movable stair (7).
14. The stair system (1) according to any of the claims 10 to 13, wherein the microcontroller (17) is adapted to actuate the position sensor (18) based on the determination of at least one of the approaching of the user or the presence of the user.
15. The stair system (1) according to any of the claims 11 to 14, wherein the position sensor (18) is either pressure based sensor or optic based sensor.

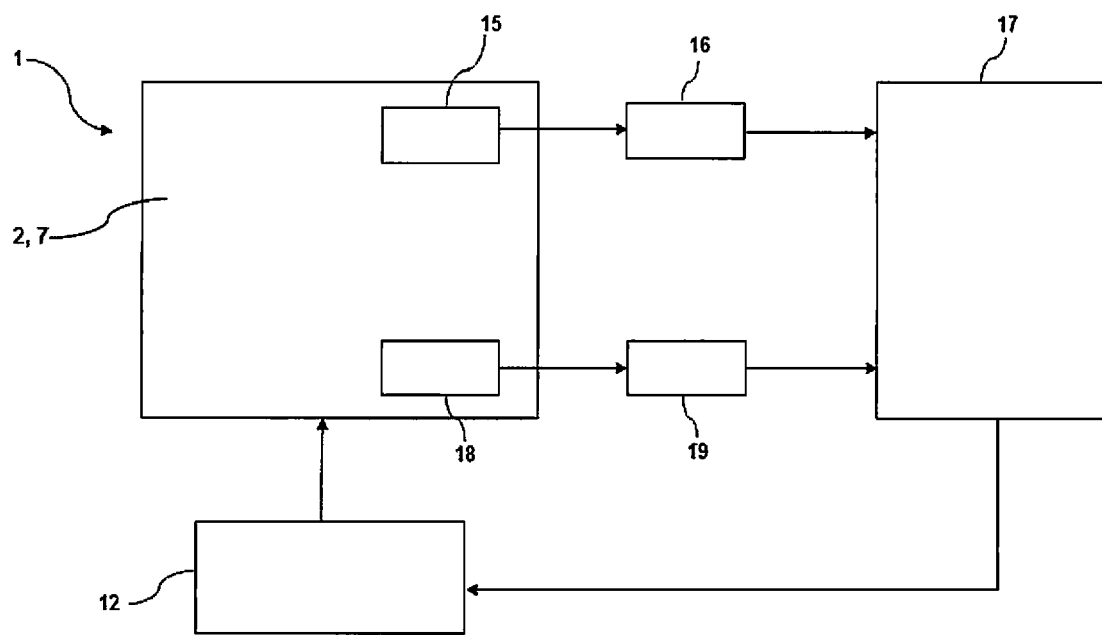


Fig. 1

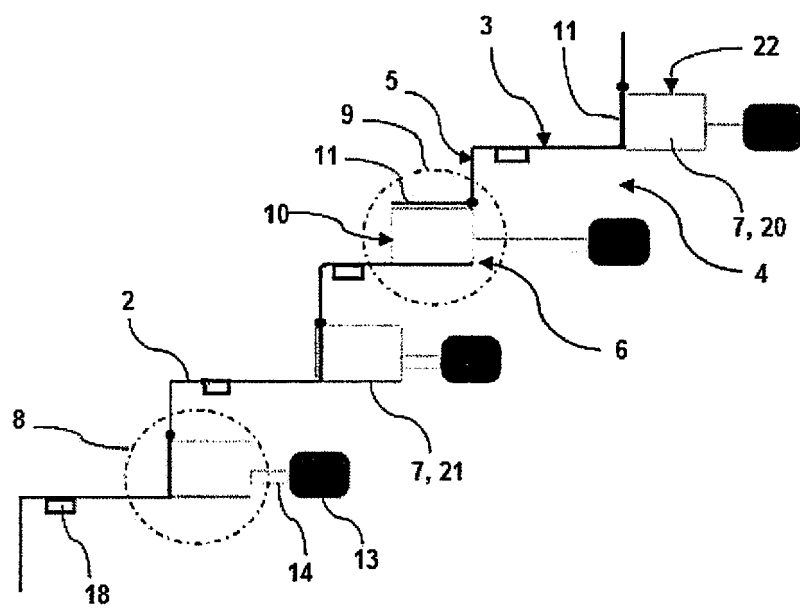


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 17 17 2701

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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	JP 2001 065133 A (MATSUDA SEISAKUSHO [JP]) 13 March 2001 (2001-03-13)	1-4	INV. E04F11/104 E04F11/02 E04F11/00
A	* paragraphs [0007] - [0009] * * figure 2 *	5-15	
A	GB 2 495 414 A (GOODENOUGH CLIFFORD [GB]) 10 April 2013 (2013-04-10) * figure 4 *	1-15	
A	JP H11 314871 A (FUJITA HIROSHI [JP]) 16 November 1999 (1999-11-16) * abstract; figure 1 *	1-15	
A	DE 203 17 692 U1 (BERNHARDT JOHANNES [DE]) 18 March 2004 (2004-03-18) * figure 1 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04F
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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EPO FORM 1503 03/82 (P04C01)

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

EP 17 17 2701

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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30-10-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2001065133 A	13-03-2001	NONE	
GB 2495414 A	10-04-2013	NONE	
JP H11314871 A	16-11-1999	NONE	
DE 20317692 U1	18-03-2004	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5924249 A [0003]