Title: STAIR CLIMBABLE WHEEL CHAIR AND HORIZON ADJUSTER

Abstract: There is provided a wheelchair for patients or for special needy people capable of climbing stairs up or down. The principle of the stair-climbing-mechanism is built on partial rubber flexible wheels which are able to be pressed towards the wheel axis and are form locking to the edges of the stairs to climb. Each wheel is supplied with separate electric motors. The wheelchair is provided with one or two smart rotating lifts (8). To allow more comfort for the user and to prevent him from falling down, the wheelchair is supplied with a special suspension and control system to guarantee more stability by keeping its seat (1) horizontal even if it is moved along a slope ways.
1- The title:

Stair climbable wheel chair and horizon adjuster:

2- The technical explanation :

A-Previous technical invention:

Many kinds of it which use several essentials as:

1. One of them has two or four groups of wheels each group contain three wheels making an angle of 120 degrees between them as Mercedes logo, rounding about (1) its axis and (2) about the group of the three axis

2. Some had legs to pull and push by stages to carry it step by step.

3. Or to make an angle backward to become The chair nearly parallel to the stair and then use either pusher or smart rotating carrier .
B - Detailed explanation of the invention:

First of all, of course, there are limits for design, as every things has limits, so this wheelchair has a limits, as to climb steps not more than so and so centimetres, due to users demand, (so demander can choose a wider or narrower limits for his chair as to climb higher stairs) and the horizontal distance between each two steps, has to be more than so and so, otherwise could be really dangerous for user and because it will be out of its limits.

The main components of the Stair climbable wheel chair our invention are those:

1. The frame: its metal and can be pressed to reduce its dimensions, fixed on it the four wheels and other parts, so the frame has to be lower from the front to permit the seat to set down enough while user climbing from the front.

2. The Wheels: it could be either partial and flexible Wheel: consists of separate and equals units each unit mean an arch of the wheel circle, this arch is rubber from out side and metal inside, those arches fixed to axis of the wheel by metal radius, and in different ways, and an impulsive push this units out of the circle, when the wheel press the stair edge some of those arcs will press and make a gap mean a fixation on the stair to climb the stair, meantime relaxing the user while the chair walking on rough surfaces, as it is supported by shock absorber, as figure 1, 2, and 3 Or partial rubber flexible Wheels: its as regular wheels but its different by existing a blocks and channels between them, and all are parallel to wheel axis, its dimensions are suitable, and those blocks can be pressed toward the axis only, as figure No. 4, so whenever the wheel press the edge of the stair the block will enter and the next block will catch the edge,

3. Separate electric motors for each wheel: to help the chair climb and down the stairs easily and firmly, it could be compacted with the wheel or out fixing.
4. **The smart rotating lift group:** its two similar pulleys electric motor driven vertically mounted, with a suitable belt round about, and fix on it two or more rests each one straight up on the belt and equal distances between them, as illustrated in figures No. 5, 6, and 7. Those rests are able to carry the chair from the front, so one of the rests will bind on the edge of a stair and the motor will raise up the front of the chair until the front wheels reach the stair to follow waking, while those two pulleys, belt, and rests are fixed on the frame by the upper pulley axis, the pulleys axis parallel to the back axis, this group fixed with the frame by the upper pulleys axis, and provide smart rotating round the upper pulley around 25 degree with the versifier of the wheel station plane, it means the lower pulley go to the front and back, depending on climbing stairs from the front or back, or going down stairs, to give more fixation on the stair, we can supply the wheel chair with smart rotating lift in two different ways: 1 either one on the middle front between the front wheels, or 2 two smart rotating lifts fixed between the front wheels near them and smart rotating simultaneously, to be each two rests by horizon line, I prefer the first way, the smart rotating lift motor starts rotating whenever the lift touched the stair, and start rotating as programmed as clock wise or opposite (relatively with right hand user witness) regarding the smart rotating lift heel direction backward or foreword.

5. **Smart rotating lift motor control:** to give orders to the smart rotating lift E motor, direction, start time, stop time.

6. **Seat regulator to follow the horizon:** A suitable E motor to fix in different ways one of them: fixing the motor and the screw under the seat, and a coincident nut fixed on the frame, so whenever the chair goes up or down stairs the seat will differ its angle with horizon, which bother the user and could unfix balance, to solve this problem the control circle will order to its motor to, the time of smart rotating, direction, stop time, so whenever motor and screw rotate properly, the screw will slide on nut that means the front edge of the seat will go up and down to pace the horizon and keeping the unglue between the back and the seat as it is.
7. **The telescopic screw and nut:** in case the Seat regulator screw length is not enough, especially if the stair angle is big, or even we reverse the nut and the screw to back of the seat, we will solve it by let us call it the telescopic screw and nut, the telescopic nut is a long nut double screwed from outside and inside lets call it the dual nut, on the frame we fix a nut to be compatible with the out side screw of the dual nut, the screw ended by short screw which its diameter compatible with the inner screw of the dual nut, so we solved the problem of the assimilating the screw length fig No 8 paragraphs from 5 to 8

8. **Seat regulator motor control:** One of its components is the horizon sensor, to give the order of smart rotating in the proper time, direction, time of starting, time of stopping, this circle duty is to keep the seat pacing the horizon, this feature could be unique so user can drive comfortably while driving up or down a hill

9. **Power rechargeable battery:** which proper user demands.

10. **Suspension system:** simply consisting of two tubes fixed on both sides of the conjoint of the seat surface and the back surface, and two suitable bars go threw it fixed on the back edge of the seat, or the opposite, No 7 figure No 5, 6 so its an articulation. A proper screw rotated by E motor fixed under the seat, and the coincident nut fixed on the frame, when the E motor rotate the nut will slide the screw up and down, the result will be raising or lowing the front edge of the seat all for keeping the seat pacing the horizon

11. **The seat, the back and the hand rest:** user can change the angle between the seat and the back, back and seat fixed on the frame by suspension system, which specially designed to keep the seat pacing the horizon.

12. **Control panel:** as the main switch to be used by the user personal key, 2 a knob with four directions key to drive the chair wheel as desired, 3 for children protection, to supply it with preventing system to avoid playing and harming, 4 a switch for determining stair climbing or descending
13. A **mechanism to adjust the distance X between the rear and the front axis**: the distance 10 fig 5, and 6 its X, we can adjust this by two ways, manual by special key, or electrical way, this distance is two telescopic tubes fixed with one of them nut and with the other a suitable screw, this for more convening the chair with a stairs which has unfamiliar dimensions, which repeatedly used as his home stairs.

**The mechanism**: this wheelchair help handicap people to go up or down stairs for some stairs, also can climb stairs of the buildings, also go downstairs, it works by two ways:

1. By the user muscles if can for little not wheeld stairs, and when a stair met the chair the smart rotating lift will heel and start smart rotating to raise the front of the chair, while the back wheels could raise either by muscles or electrically, this way used for saving energy to keep batteries for his unexpected reasons.

2. Or using the electric power saved in its batters, when he met a stair he will reduce his speed and start going down or up stairs
Some Excellencies of this design:

1. The existing of Seat regulator to follow horizon and the control circle, to pace the seat always horizontally, this feature could be unique in this field specially when the user going up or down a hill, giving the user a special canny sensation as if he is driving on a horizontal plane knowing that he is driving in an aslope way.

2. If we use a compacted electric motor with the wheel, we can press its dimensions which other similar chairs could not reach it.

3. The existing of the Seat regulator and the control circle to follow horizon give the wheel chair and the user a high stability, the cause of always this group (Seat regulator and the control circle,) tring to return its weight centre to the middle of its base (the rectangle which the four wheels touching points on the land) because as well known in physics as if the subtractive of weight centre nearest to centre of base as it is fixer, and the mass keel whenever its weight centre is out of the centre of base.

4. It can be able to climb some divergent stairs frontally or backward as ease of the user.

5. User can use his own power if want, while waking on a horizontal plane and when he wanted to climb a divergent stairs (the distance between two sequent stairs more than between the back and front wheel axis), the smart rotating lift will turn whenever touching the stair to lift the front wheels till touching the surface of the stair, then user continue till the back wheels touch the stair edge, then to continue raising the rear wheels either by his muscles force or his assistance or its electrical way.
One of the partial and flexible Wheel design

1. The wheel axis which could round about it the wheel electric motor
2. The connecting between the axis and the wheel, and could be the E motor
3. The rubber part which contact the land and the expected stairs
4. A suitable impulsive for relaxing the user by absorbing shocks when walking, meantime to be pressed when meeting the stairs edges, and for fixing the wheel
5. The axis of the pressurable arc (one peace of the partial and flexible Wheel) meantime its the impulsive axis

Those flexible parts (arcs) around the wheel, when the stair edge press on it, those pressed parts will enter toward the axis and will make a gap and a good fixation on the stair
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Those flexible parts (arcs) around the wheel, when the stair edge press on it, those pressed parts will enter toward the axis and will make a gap and a good fixation on the stair
The large contrast stamp rubber wheel

1. The wheel axis which could round about it the wheel electric motor
2. The raised rubber part which will contact the land and the expected stairs, those stamps is parallel to the wheel axis, and it has to be raised enough to fix the wheel on the stair edge, meantime those small blocks should be suitable for peace and comforting while walking (it might be another drawing for the stamps but the horizontal is the most important
3. The deep rubber channel from the wheel
4. One of the expected stair met the wheel

Those raised rubber part, when the stair edge press on the wheel, the wheel will slip until meet a chamiel to be a good fixation point between the wheel and the edge
Fig 5

A sketchy drawing for wheel chair supplied with one smart rotating lift fixed on the middle front of the chair

1. The seat of the user
2. The back rest of the user
3. The frame
4. The suitable screw to keep the seat horizontally
5. The screw electric motor
6. The nut fixed on the frame
7. The articulation.
8. The smart rotating lift
9. One rest of the smart rotating lift
10. The distance $X$ between both rear wheels and the front wheel along the axis
Fig 6

A sketchy drawing for wheel chair supplied with two smart rotating lifts fixed front of the chair both inner sides

1. The seat of the user
2. The back rest of the user
3. The frame
4. The suitable screw to keep the seat horizontally
5. The screw electric motor
6. The nut fixed on the frame
7. The two articulation.
8. The smart rotating lift
9. One rest of the smart rotating lift
10. The distance X between both rear wheels and the front wheel axis
The smart rotating lift
1. One of the two pulleys
2. The pulley axis
3. The belt between the pulleys
4. One of the rests
5. 1 - The chair climbing backward position, so the pulleys will turn anti clock wise direction 2 - and descending the chair backward, so the pulleys will turn clock wise direction, till touching one of its rests on the top of the stair and stop, then the brake allow smart rotating anti clock wise direction.
6. The chair climbing forward position, so the pulleys will turn clock wise direction 2 - and descending the chair forward, so the pulleys will turn anti clock wise direction, till touching one of its rests on the top of the stair and stop, then the brake allow smart rotating clock wise direction.
7. The angle between the versifier of the wheel station plane and the new smart rotating lift position when pushed by a step

Never the smart rotating lift motor will start unless a stair will touch it, it will rotate as programmed due to the smart rotating lift heel direction forward or backward, and never rotate if the angle is equal to 0 more or less 2 degrees for instance
Fig 8

Number of smart rotating lift in different numbers of rests
1. A smart rotating lift with two rests
2. A smart rotating lift with four rests
3. A smart rotating lift with six rests
4. A smart rotating lift with three rests
5. The telescopic screw and nut
6. the telescopic nut is a long nut double screwed from outside and inside lets call it the dual nut
7. the nut which compatible with the outside screw of the dual nut we fix it on the frame
8. the screw which ended by short screw compatible with the inner screw of the dual nut

Rests number could be single, anyhow distances between the rests should be equal
4. **Claims that must be protected:**

1. The wheelchair is for the handicaps, which can climb and down the stairs lightly and easily, it is superiority with its low weigh and simple design, to give the user high reliability and comfort, depending on its technical design and the highly coordinate between its components, let us start with wheels which could be either partial and flexible Wheel, or partial rubber flexible Wheels, with Separate electric motors for each wheel, The smart rotating lift we can supply the wheel chair in two ways, either one on the middle front between the front wheels, or two smart rotating lifts fixed between the front wheels near them and rotate simultaneously, Seat regulator to follow horizon, Seat regulator motor control, the suitable Suspension system, The frame containing its parts, A mechanism to adjust the distance X between the rear and the front axis, The telescopic screw and nut, fixed from 1 to 8

2. **Partial and Flexible Wheel:** the wheelchair for the patient is our subject, which can climb and down the stairs lightly and easily, it is superiority with its low weigh and simple design, its idea built on a partial and flexible Wheel fig No 1 , 2, and 3, it is consisting of separate and equals units, each unit mean an arch of the wheel circle and altogether forming the wheel, those arches fixed to axis of the wheel by metal radius, and in some points of the metal radius and different ways, fixing impulsive to push this units out of the circle, meantime give relaxing while the chair walking on rough surfaces, as it is supported by shock absorber, if the wheel is over a lump some will pressed while over it to absorb vibration and shocks

3. **Separate Electric Motors for each wheel:** to help the chair climb and down the stairs easily and firmly with no hard shakes, motors could be compatible with wheels which is better, or could be outside, Motors should be able to start moving from 0 to maximum but progressively till the max speed if wanted, rotating in both directions, with good torque, and to be able to brake the chair for easy climbing and importantly for descending
4. The smart rotating lift: its two similar pulleys as fig No 5, 6, 1
7, 8, driven by electric motor, vertically mounted, with a suitable
belt round about, and fix on the belt two or more rests each one
straight up on the belt with equal distances between them, those
rests are able to raise or descend the chair from the front, so one
of the rests will bind on the edge of a stair and the E motor will
raise up or descend the front of the chair until the front wheels
reach the stair to follow its walking, while those two pulleys, belt,
and rests are fixed on the frame by the upper pulley axis, so the
pulleys axis and the rear chair axis are parallel, and provide smart
rotating round the upper pulley nearly 25 degree, the angle be-
tween the versifier of the wheel station plane and the smart rotat-
ing lift position when pushed by a step, to the front and back, so
that means the lower pulley will go toward front or back.

5. we supply the wheel chair with smart rotating lift: in one of
two different ways: 1 either one smart rotating lift fixed on the
middle front between the front wheels, or 2 two smart rotating
lifts fixed between the front wheels near to the wheels and rotat-
ing simultaneously, should each two rests by the same horizon
line, I prefer the first way, as illustrated in figures No. 5, 6, and
7 the smart rotating lift motor starts rotating whenever the
lift touched the stair, and start rotating as programmed as
clock wise or opposite regarding the smart rotating lift heel
direction backward or foreword

6. Seat regulator to follow horizon: A suitable E motor to fix
in different ways one of them: fixing the motor and the screw un-
der the seat, and a coincident nut fixed on the frame, so whenever
the chair goes up or down stairs the seat will differ its angle with
horizon, which bother the user and could unfix balance, to solve
this problem the control circle will order to its motor, time of ro-
tating, direction, stop time, so whenever motor and screw rotate
properly, the screw will slide by its nut that means the front of the
seat will go lip and down to pace the horizon due to rotating di-
rection, and keeping the angle between the back and the seat as it
is, as fig No 5, 6,
7. **Seat regulator motor control:** One of its components is the horizon sensor to give the order of smart rotating in the proper time, direction, time of starting, time of stopping, this circle duty is to keep the seat pacing the horizon, this feature could be unique so user can drive comfortably while driving up or down a hill.

8. **Suspension system:** simply consisting of two tubes fixed on both sides of the conjoint of the seat surface and the back surface, and two suitable bars so threw it fixed on the back edge of the frame, or the opposite. No 7 figure No 5, 6 so its an articulation. A proper screw rotated by E motor fixed under the seat, and the coincident nut fixed on the frame, so whenever motor and screw rotate properly, the screw will slide by its nut that means the front of the seat will go up and down to keep pacing the horizon.

9. **The frame:** has to be lower from the front to permit the seat to set clown enough. The frame is metal and the user can press it to reduce its dimensions.

10. **Descendiiig position and smart rotating lift:** whatever the descending position is, it is frontally or backwardly, the smart rotating lift must turn on properly till touching the stair and stop, then for descending must turn oppositely and quietly to avoid crashing on the next step.

11. **Upstairing position and smart rotating lift:** whatever upstairmg position is, it is frontally or backward, the smart rotating lift must turn on properly tulying to touch one of its rests on the top of the stair and raise the chair from the front and continue.

12. **A mechanism to adjust the distance X between the rear and the front axis:** the distance 10 fig 5, and 6 its X, we can adjust this by two ways, manual by special key, or electrical way, part of this distance is two telescopic tubes fixed with one of them nut and with the other a suitable screw, this for more convening the chair with a stairs which has unfamiliar dimensions, which repeatedly used as his home stairs.
13. **The telescopic screw and nut:** in case the Seat regulator screw length is not enough, and no enough room to put especially if the stair angle is big, or even we reverse the nut and the screw-to back of the seat, we will solve it by let us call it the telescopic screw and nut, the telescopic nut is a long nut double screwed from out side and inside lets call it the dual nut, on the frame we fix a nut to be compatible with the out side screw of the dual nut, the screw ended by short screw which its diameter compatible with the inner screw of the dual nut, so we solved the problem of the assimilating the screw length fig No 8 paragraphs from 5 to 8

14. **There are many claims, we could met when we start execution this design, we will solve the problems when we face it**

15. **If the user desire to upstairing frontally**
   - When the front wheels reach the stair edge some pails of partial wheels may press, and the smart rotating lift will heel to the back
   - then the E motor of the smart rotating lift will turn pulleys clockwise direction, (relatively with right user witness), trying to touch one of its rests on the stair and raise the chair from the front
   - so when the rear wheels touch the stair edge some of partial wheel will pressed catching the stair to avoid slipping, and the motors continue raising the chair
   - in every change of the seat angle with the horizon, (within a range the user can adopt it in a permitted range lets say +- 3 degrees), the horizon regulator motor will work to keep seat horizontally

16. **If the user desire to upstair backward:**
   - so when the rear wheels touch the stair edge some of partial wheel will pressed catching the stair to avoid slipping, and the motors continue raising the chair
   - When the front wheels reach the stair edge some parts of partial wheels may press, and the smart rotating lift will heel to the front
   - then the E motor of the smart rotating lift will turn pulleys anti clockwise direction, (relatively with right user witness), trying to touch one of its rests on the top of the stair and raise the chair from the front
   - in every change of the seat angle with the horizon, of course (within a range the user can adopt it in a permitted range lets say +- 3 degrees), the horizon regulator motor will work to keep the seat horizontally
While downstairing will be as

17 - If the user desire to downstairs frontally

- When the front wheels reach the stair edge some parts of partial wheels will press, and the smart rotating lift will touch the stair and heel it to the back
- then the E motor of the smart rotating lift will turn pulleys anti clockwise direction, (relatively with right user witness), trying to touch one of its rests on the stair and stop, then to avoid crashing on the next step, the smart rotating lift will take care of descending the front wheels gently by let pulleys brake smart rotating clock wise direction slowly, that if became on the smart rotating lift part of the chair weigh due to chair move on little frontally
- so when the rear wheel touch the stair edge, some of partial wheel will pressed catching the stair to avoid slipping, in order to the user, the wheels motor brakes will release till the wheels descending gently
- in every change of the seat angle with the horizon, of course (within a rang the user can adopt it in a permitted range lets say + 3 degrees), the horizon regulator motor will work to keep the seat horizontally

18 - If the user desire to downstairs backward

- when the rear wheel touch the stair edge some of partial wheel will pressed catching the stair to avoid slipping, in order to the user, the wheels motor brake will release till the wheels descending gently
- When the front wheels reach the stair edge some parts of partial wheels will press, and the smart rotating lift will heel to the front
- then the E motor of the smart rotating lift will turn pulleys clockwise direction, (R W R Ur W), trying to touch one of its rests on the top of the stair and stop, then to avoid crashing on the next step, the smart rotating lift will take care of descending the front wheels gently by let pulleys brake smart rotating anti clock wise direction slowly, that if became on the smart rotating lift part of the chair weigh due to chair move on little backward
- in every change of the seat angle with the horizon, of course (within a rang the user can adopt it in a permitted range lets say + 3 degrees), the horizon regulator motor will work to keep the seat horizontally
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC*: A61G 5/06 (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. MINIMUM DOCUMENTATION SEARCHED
IPC*: A61G 5/06, B62D 55/075
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>FR 2 574 740 A1 (Societe d’applications multiples) 20 June 1986 (20.06.1986) abstract; fig. 1-5</td>
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<td>NL 89001 28 A (ABRAHAM SNOEK) 16 August 1990 (16.08.1990) abstract; fig. 1-6</td>
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<tr>
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<td>abstract; fig. 1-6</td>
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X Further documents are listed in the continuation of Box C.

H1 See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search
24 November 2010 (24.11.2010)

Date of mailing of the international search report
3 January 2011 (03.01.2011)

Name and mailing address of the ISA/AT
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Dresdner Stralie 87, A-1200 Vienna

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Continuation of first sheet

Continuation No. ii:

Observations where certain claims were found unsearchable

(Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

Claims Nos.: 14 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

the claim does not disclose any technical features and therefore is not acceptable.

Continuation No. IV:

Text of the abstract

(Continuation of item 5 of the first sheet)

There is provided a wheelchair for patients or for special needy people capable of climbing stairs up or down. The principle of the stair-climbing-mechanism is built on partial rubber flexible wheels which are able to be pressed towards the wheel axis and are form locking to the edges of the stairs to climb. Each wheel is supplied with separate electric motors. The wheelchair is provided with one or two smart rotating lift/s (8). To allow more comfort for the user and to prevent him from falling down, the wheelchair is supplied with a special suspension and control system to guarantee more stability by keeping its seat (1) horizontal even if it is moved along aslope ways.
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<td>EP 1 637 111 A1 (BOCK HEALTHCARE IP GMBH) 22 March 2006 (22.03.2006) abstract; fig. 1-4; claim 1</td>
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