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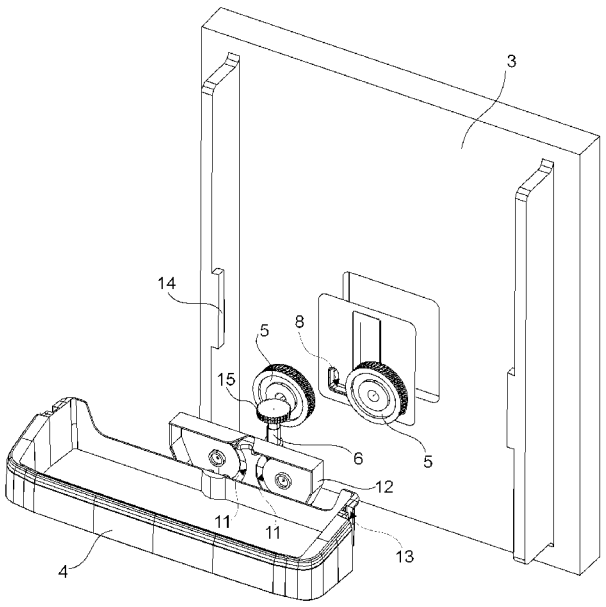
(54) Title: A COOLING DEVICE COMPRISING A HEIGHT ADJUSTABLE SHELF

Figure 3



(57) Abstract: Cooling device (1) comprising a body (2), a door (3) for accessing inside the body (2) and one or more shelves (4) mounted on the door (3) and moved in the vertical plane.

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Description

A COOLING DEVICE COMPRISING A HEIGHT ADJUSTABLE SHELF

[0001] The present invention relates to a cooling device comprising a height adjustable shelf.

[0002] In cooling devices, preferably in refrigerators, generally the objects like beverage cans, bottles, jars etc. are stored on the shelves located on the door. However while the long objects are placed on the shelf, problems are encountered such as the object hitting the upper shelf and accordingly not being able to be placed on the shelf. Therefore, shelves, the position of which in the door can be changed, are required. However, due to the restriction of space wherein the door shelf is disposed, some difficulties are encountered while disposing the mechanisms for changing the shelf position into the door.

[0003] In the state of the art American Patent Application No US2005062380, for refrigerators, a height adjuster which comprises gear portions on opposite side surfaces of the refrigerating chamber, height adjustment gears which are fastened to the gear portions and a stopper located on the shelf and providing the height adjustment gear to rotate in a controlled manner, is described.

[0004] In the state of the art American Patent Document No US5913584 a shelf for refrigerators, wherein the height can be adjusted by connecting the gears attached to a support assembly mounted thereon to an arm extending to the front side of the shelf and thus rotating by means of the arm, is described.

[0005] The aim of the present invention is the realization of a cooling device which comprises a shelf disposed on the door and the position of which can be changed by being moved in the vertical direction.

[0006] The cooling device realized in order to attain the aim of the present invention is explicated in the claims.

[0007] The cooling device of the present invention comprises a control lever located between the door and the shelf, that extends in the movement direction of the door-mounted shelf in the vertical plane, and moving the shelf upwards and downwards by being rotated around the vertical axis, at

least one channel situated on the door and a height adjustment mechanism having a pin borne in the channel such that it can be moved by the control lever. The position of the shelf in the door can be changed by rotating the control lever moving together with the shelf. Thus, long objects can be placed on the shelf.

[0008] In an embodiment of the present invention, the control lever comprises a worm gear located thereon and a handle that is utilized for rotating the worm gear by being turned. By means of the worm gear, the shelf remains in its position at the moment the user stops rotating the handle without requiring to use a separate stopping mechanism.

[0009] In another embodiment of the present invention, the height adjustment mechanism comprises at least one shaft on the rear wall of the shelf facing the door and at least one gearwheel fastened on the shelf by being inserted to the shaft to be co-operating together with the worm gear, whereto the pin is secured on its frontal surface. The motion transferred to the pin by worm gear gains flexibility by means of the gearwheel.

[0010] In another embodiment of the present invention, the height adjustment mechanism comprises two gearwheels disposed on both sides of the worm gear to operate reciprocally with the worm gear and which rotate in opposite directions to each other as the worm gear is rotated. As the worm gear is rotated, gearwheels, the cogs of which contact the cogs of the worm gear, also rotate. While the horizontal component of the angular motion created on the gearwheels provides the pins to make linear motion in the bearing, the vertical component provides the gearwheels and the shelf whereto the gearwheels are connected to move linearly in the vertical direction. Thus, the position of the shelf in the door can be adjusted by moving thereof upwards or downwards depending on the need of the user.

[0011] In an embodiment of the present invention, the height adjustment mechanism comprises two L shaped channels facing each other, whereof the horizontal portions extend in the same direction. The shelf is provided to be mounted into the door as the pin makes a sliding motion in the vertical portion of the channel and the pin is borne in the channel wherein it moves in the horizontal. The pin moves in the horizontal portion of the

channel, starting from one end, reaching to the other end and then returning to the initial position during the motion of the shelf between the uppermost position of the shelf in the body to the lowermost position. The position of the shelf in the vertical plane is changed as the pin moves in the horizontal portion of the channel.

[0012] In another embodiment of the present invention, the cooling device comprises a housing located between the channels and wherein the handle is borne. At least some portion of the handle is embedded in the door by means of the housing and thus the distance between the shelf and the door is minimized. Thus, the shelf can stand in a balanced manner when foods and beverages are loaded thereon.

[0013] In another embodiment of the present invention, the height adjustment mechanism comprises a bearing wherein the worm gear and the gearwheels are borne, secured to the shelf and having slits where through the pins are inserted. Since the pins are borne to the channel by being inserted through the slits and the slits are formed to match the shape of the gearwheels and so that the pin can make an angular movement therein. By means of the bearing, while the gearwheels and the worm gear are borne to move reciprocally, the gearwheels and the worm gear are safeguarded in a compact manner.

[0014] In another embodiment of the present invention, the slits are almost C shaped with their backs facing each other. In this embodiment, since the gearwheels sweep a 180 degree arc during the changing of the shelf from its uppermost position inside the body to its lowermost position, the shape of the slits wherein the pins rotate is also formed as 180 degree arc.

[0015] In an embodiment of the present invention, the channel is T shaped. In this embodiment, the gearwheels can rotate 360 degrees during the changing of the shelf from the uppermost position on the door to the lowermost position.

[0016] In an embodiment of the present invention, the slits are shaped as circles. In this embodiment, since the gearwheels can rotate 360 degrees during the changing of the shelf from the uppermost position on the door to the lowermost position, the shape of the slits is also a 360 degree arc.

[0017] In another embodiment of the present invention, the shelf comprises at least two slides located on its two opposite side walls. The cooling device comprises protrusions which provide guiding the pins during the assembly of the shelf by being inserted into the slides on the opposite side walls of the door. The length of the slides is shorter than the length of the shelf so as to ease the guiding process of the shelf.

[0018] By means of the cooling device of the present invention, the vertical position inside the door of the shelves, disposed in the door, can be easily adjusted without requiring the shelves to be detached from the door.

[0019] The cooling device realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

[0020] Figure 1 – is the perspective view of a cooling device.

[0021] Figure 2 – is the perspective view of a shelf.

[0022] Figure 3 – is the exploded view of a shelf and a height adjustment mechanism before the shelf is mounted on the door.

[0023] Figure 4 – is the exploded view of a shelf and a height adjustment mechanism from another perspective.

[0024] Figure 5 – is the schematic view of the shelf at the moment when the pins are inserted into the channels for mounting the shelf to the door.

[0025] Figure 6 – is the schematic view of the shelf at the uppermost position in the door.

[0026] Figure 7 – is the schematic view of the shelf at the middle position in the door.

[0027] Figure 8 – is the schematic view of the shelf at the lowermost position in the body.

[0028] Figure 9 – is the perspective view of a bearing.

[0029] Figure 10 – is the perspective view of the channels.

[0030] Figure 11 – is the perspective view of the bearing in another embodiment of the present invention.

[0031] Figure 12 – is the perspective view of the channels in another embodiment of the present invention.

[0032] The elements illustrated in the figures are numbered as follows:

1. Cooling device

2. Body
3. Door
4. Shelf
5. Gearwheel
6. Worm gear
7. Pin
8. Channel
9. Control lever
10. Housing
11. Slit
12. Bearing
13. Slide
14. Protrusion
15. Handle
16. Shaft
17. Height adjustment mechanism

[0033] The cooling device (1) comprises a body (2), a door (3) for accessing inside the body (2) and one or more shelves (4) mounted on the door (3), the position of which is changed by being moved in the vertical plane.

[0034] The cooling device (1) furthermore comprises a height adjustment mechanism (17), located between the rear wall of the shelf (4) and the door (3) and having

- a command lever (9) that extends in the movement direction of the shelf (4) in the vertical plane and moves the shelf (4) upwards and downwards by being rotated around the vertical axis,
- at least one channel (8) located on the door (3) and
- at least one pin (7) borne in the channel (8) and moved in the channel (8) by the command lever (9).

[0035] The shelf (4), in form of almost open-top box, is mounted on the door (3) such that its rear wall leans against the inner surface of the door (3). The position of the shelf (4) on the door (3) is changed by moving thereof upwards and downwards upon rotating the command lever (9) around its axis, which is disposed between the shelf (4) and the door (3) such that it

can move along with the shelf (4). Thus, the long objects can be easily placed on the shelf (4).

[0036] In an embodiment of the present invention, the command lever (9) comprises a worm gear (6) located thereon and a handle (15) for rotating the worm gear (6) by being turned. The shelf (4) is moved upwards or downwards by turning the handle (15) clockwise or counterclockwise.

[0037] In another embodiment of the present invention, the height adjustment mechanism (17) comprises at least one shaft (16) located on the rear wall of the shelf (4) facing the door (3) and at least one gearwheel (5) fitted to the shaft (16) such that it can freely rotate around the shaft (16) and fastened onto the shelf (4) so as to co-operate with the worm gear (6), with the pin (7) fixed on its frontal surface.

[0038] In another embodiment of the present invention, the height adjustment mechanism (17) comprises two gearwheels (5) disposed on both sides of the worm gear (6) to operate reciprocally with the worm gear (6) and to rotate in reverse directions to one another as the worm gear (6) is rotated. The worm gear (6) is disposed in between the gearwheels (5) such that the cogs of the worm gear (6) correspond to the cogs of the gearwheels (5). Thus, the worm gear (6), rotated by means of the handle (15), transmits this motion to the gearwheels (5) and the gearwheels (5) are enabled to rotate in opposite directions to one another. Whether the shelf (4) will move upwards or downwards depending on which direction the handle (15) is rotated is determined by the producer according to the helix angles of the worm gear (6) and the gearwheels (5) during their assembly. The pins (7) disposed on the gearwheels (5) are borne in the channel (8) located on the door (3) so as to move in the channel (8) during the assembly of the shelf (4) into the door (3). The channel (8) extends almost in the horizontal plane and the pins (7) borne therein move linearly in the channel (8). While the horizontal component of the angular motion occurring on the gearwheels (5) rotating with the rotation of the worm gear (6) provides the pins (7) to move linearly in the channel (8), the vertical component provides the gearwheels (5) to move in the vertical plane. As the gearwheels (5) move in the vertical, the shelf (4) whereto the

gearwheels (5) are connected also moves in the vertical plane. Thus, the position of the shelf (4) in the door (3) can be easily changed, moving thereof upwards and downwards by only rotating the worm gear (6). Thus, space is created for placing objects such as long bottles etc. on the shelf (4) thereby preventing this type of objects placed on the shelf (4) from hitting the upper shelves (4).

[0039] In another embodiment of the present invention, the height adjustment mechanism (17) comprises two “L” shaped channels (8). The channels (8) are positioned on the inner surface of the door (3) such that their portions extending parallel to the horizontal plane face each other. During the assembly of the shelf (4) to the inside of the door (3), the pins (7), located on the frontal surface of the gearwheels (5) fastened so as to operate reciprocally with the worm gear (6) attached on the shelf (4), are inserted through the upper end of the vertical portion of each channel (8) (Figure 5). The shelf (4) is slid in the vertical plane such that the pins (7) are seated in the horizontal portion of the channels (8). Thus, the pins (7) are borne in the channels (8) wherein they move linearly during the motion of the shelf (4) in the vertical plane. When the shelf (4) is in the uppermost position on the door (3), the pins (7) are in the farthermost position to each other inside the channels (8) (Figure 6). Moreover, the pins (7) are in the lowermost position with respect to the gearwheels (5). With the motion of the worm gear (6) and the gearwheels (5) enabled by rotating the handle (15), the pins (7) move inside the channel (8) from one end of the channel (8) toward the other end wherein they are borne such that their positions in the horizontal plane get closer to each other. When the pins (7) lean against the other end of the channels (8), the gearwheels (5) rotate such that a 90 degree arc is drawn. After this quarter turn made by the gearwheels (5), the shelf (4) is in the middle of the uppermost position and the lowermost position in the body (2). The pins (7) are in the same direction with the center of the gearwheels (5) in the horizontal and in the nearest position to each other (Figure 7). When the position of the shelf (4) is desired to be lowered further, the worm gear (6) and the gearwheels (5) are activated again by rotating the handle (15) and the pins (7) move in the

channels (8) wherein they are borne in opposite directions to each other such that they move away from one another. Thus, the gearwheels (5) draw another 90 degree arc and return to the initial position wherein each pin (7) is borne in the channel (8). In this position wherein the pins (7) are in the uppermost position with respect to the gearwheels (5), the shelf (4) is in the lowermost position in the door (3) (Figure 8). When the pin (7) is fixed near the edge of the frontal surface of the gearwheel (5), the shelf (4) can move upwards and downwards along a distance approximately as much as the diameter of the gearwheel (5).

[0040] In an embodiment of the present invention, the cooling device (1) comprises a housing (10) located on the door (3) between the channels (8) and wherein the handle (15) is borne. Since moving upwards and downwards together with the shelf (4) while the shelf (4) changes position, the handle (15), which is connected to the worm gear (6), is borne in the housing (10) so as to move freely. The housing (10) has a semi-circular cross section matching the shape of the handle (15). The shelf (4) is mounted on the door (3) such that its rear wall is almost in contact with the inner surface of the door (3) by means of the housing (10). Thus, the distance between the shelf (4) and the door (3) is minimized thereby enabling the shelf (4) to remain more balanced inside the door (3).

[0041] In another embodiment of the present invention, the height adjustment mechanism (17) comprises a bearing (12) wherein the gearwheels (5) and the worm gear (6) are disposed, fixed to the shelf (4) and having slits (11) where through the pin (7) can pass. The bearing (12), in form of a box with one side being almost open, is secured to the shelf (4) such that the open side faces the rear wall of the shelf (4) (Figures 9 and 11). Slits (11), where through the pin (7) is inserted to be borne by the channels (8), and holes, for securing the bearing (12) to the shelf (4), are located on the rear wall of the bearing (12). The slits (11) are in form as the pin (7) can move therein while the shelf (4) changes position in the door (3). The bearing (12), has the function of bearing the worm gear (6) and the gear wheels (5) such that they will operate reciprocally, also has the function of safeguarding the worm gear (6) and the gear wheels (5) in a compact

manner.

[0042] In an embodiment of the present invention, the slits (11) are almost C shaped. The orifices of the slits (11) face opposite directions to each other in accordance with the rotational direction of the gearwheels (5) (Figure 9). Since the gearwheels (5) sweep a total of 180 degree arc while the shelf (4) changes from its uppermost position on the door (3) to its lowermost position, the forms of the slits (11) are also shaped as a 180 degree arc.

[0043] In an embodiment of the present invention, the channel (8) is T shaped. In this embodiment, the gearwheels (5) can rotate 360 degrees during the changing of the shelf (4) from its uppermost position on the door (3) to its lowermost position (Figure 12).

[0044] In an embodiment of the present invention, the slits (11) are shaped as circles. In this embodiment, since the gearwheels (5) make a complete turn while the shelf (4) is changed from its uppermost position in the body (2) to its lowermost position, the form of the slits (11) is in a suitable shape for the pins (7) to rotate 360 degrees therein (Figure 11).

[0045] In another embodiment of the present invention, the shelf (4) comprises at least two slides (13) located on both of its opposite side walls. The cooling device (1) comprises at least two protrusions (14) on the inner surfaces of both of its side walls. During the assembly of the shelf (4) into the door (3), the slides (13) are fitted over the protrusions (14). The slides (13) serve to guide the shelf (4) for bearing the pins (7) in the channels (8) during the assembly of the shelf (4) into the door (3). The length of the slides (13) is shorter than the length of the shelf (4) so as to ease the guiding process. Thus, the user lifts the shelf (4) upwards from the protrusions (14) by a distance as much as the length of the slides (13) for seating the slides (13) on the protrusions (14). At the same time, the length of the slides (13) is approximately as much as the length of the channel (8) portion extending vertically, wherein the pins (7) make linear motion by being slid during the assembly of the shelf (4) to the door (3). By means of the slides (13), the guiding process becomes easier during the assembly of the shelf (4) to the door (3).

[0046] By means of the cooling device (1) of the present invention, the position of

the shelf (4) mounted into the door (3) can be adjusted conveniently without requiring the shelf to be detached. Thus, the long objects can be placed on the shelf (4).

[0047] It is to be understood that the present invention is not limited by the embodiments disclosed above and an a person skilled in the art can easily introduce different embodiments. These should be considered within the scope of the protection postulated by the claims of the present invention.

Claims

1. A cooling device (1) that comprises a body (2), a door (3) for accessing inside the body (2) and one or more shelves (4) mounted on the door (3), the position of which is changed by being moved in the vertical plane, **and characterized by** a height adjustment mechanism (17), located between the rear wall of the shelf (4) and the door (3), having
   - a command lever (9) that extends in the movement direction of the shelf (4) in the vertical plane and moves the shelf (4) upwards and downwards by being rotated around the vertical axis,
   - at least one channel (8) located on the door (3) and
   - at least one pin (7) borne in the channel (8) and moved in the channel (8) by the command lever (9).
2. A cooling device (1) as in Claim 1, **characterized by** the command lever (9) that moves in the vertical direction along with the shelf (4).
3. A cooling device (1) as in Claim 1 or 2, **characterized by** the command lever (9) comprising a worm gear (6) located thereon and a handle (15) for rotating the worm gear (6) by being rotated.
4. A cooling device (1) as in Claim 3, **characterized by** the height adjustment mechanism (17) comprising at least one shaft (16) located on the rear wall of the shelf (4) facing the door (3) and at least one gearwheel (5) fitted to the shaft (16) and fastened on the shelf (4) so as to co-operate with the worm gear (6), with the pin (7) fixed on its frontal surface.
5. A cooling device (1) as in Claim 4, **characterized by** two gearwheels (5) disposed on both sides of the worm gear (6) to operate reciprocally with the worm gear (6) and rotating in opposite directions to one another as the worm gear (6) is rotated.
6. A cooling device (1) as in Claim 3, **characterized by** the height adjustment mechanism (17) comprising a housing (10) located on the door (3), wherein the handle (15) is borne such that it can move upwards and downwards.
7. A cooling device (1) as in any one of the above Claims, **characterized by** L shaped channel (8).
8. A cooling device (1) as in any one of the Claims 1 to 6, **characterized by** T shaped channel (8).

9. A cooling device (1) as in Claim 4 or 5, **characterized by** the height adjustment mechanism (17) comprising a bearing (12) wherein the gearwheel (5) and the worm gear (6) are disposed, fixed to the shelf (4) and having at least one slit (11) where through the pin (7) can pass.
10. A cooling device (1) as in Claim 9, **characterized by** almost C shaped slit (11).
11. A cooling device (1) as in Claim 9, **characterized by** circle shaped slit (11).
12. A cooling device (1) as in any one of the above Claims, **characterized by** the shelf (4) comprising at least two slides (13) located on both of its opposite side walls.
13. A cooling device (1) as in any one of the above Claims, **characterized by** at least two protrusions (14) located on both opposite side walls of the door (3).
14. A cooling device (1) as in any one of the Claims 4 to 13, **characterized by** the shelf (4) that can move upwards and downwards along a distance almost as much as the diameter of the gearwheel (5) when the pin (7) is fixed near the edge of the frontal surface of the gearwheel (5).

Figure 1

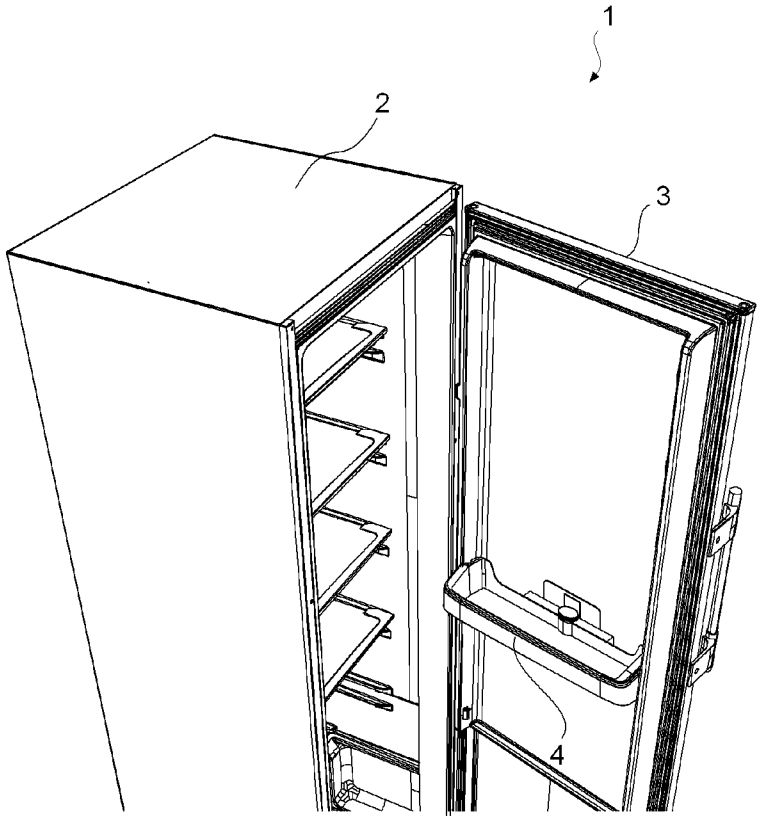


Figure 2

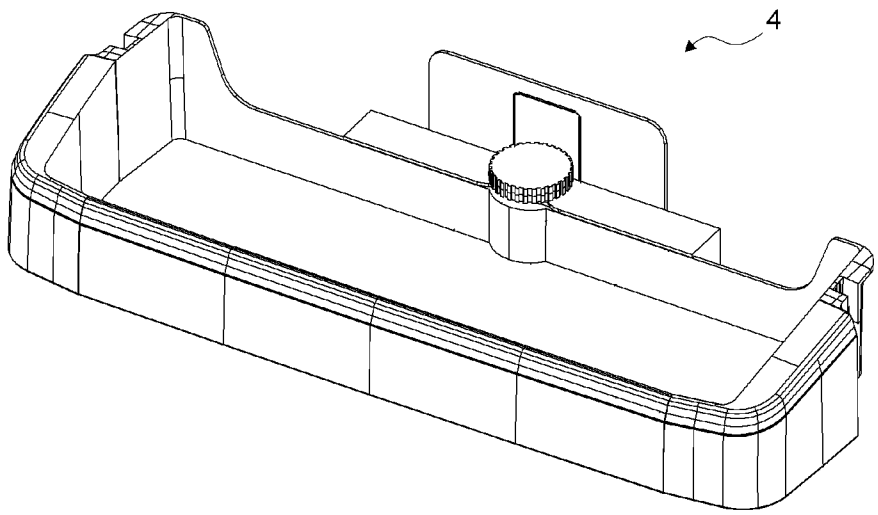


Figure 3

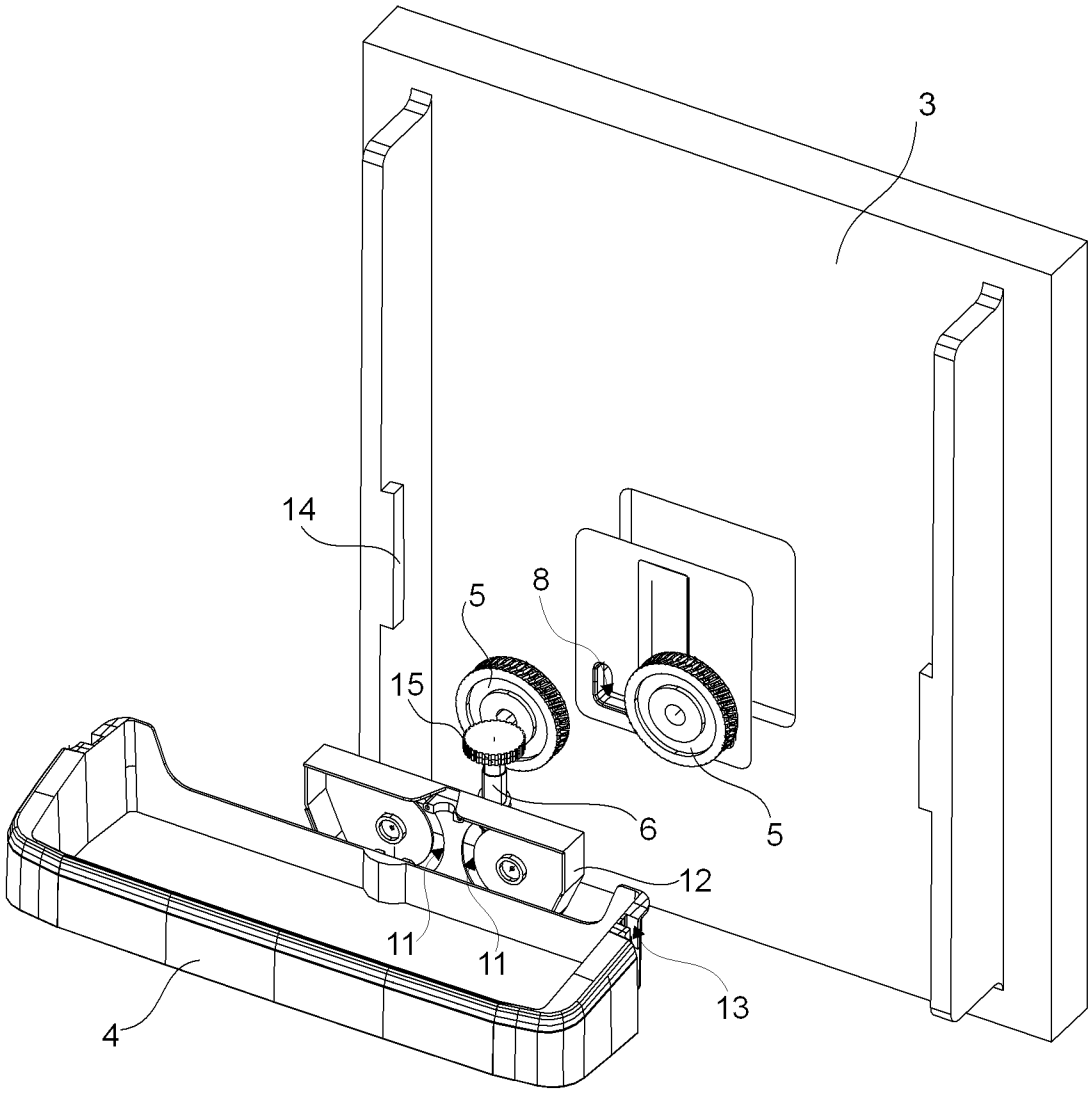


Figure 4

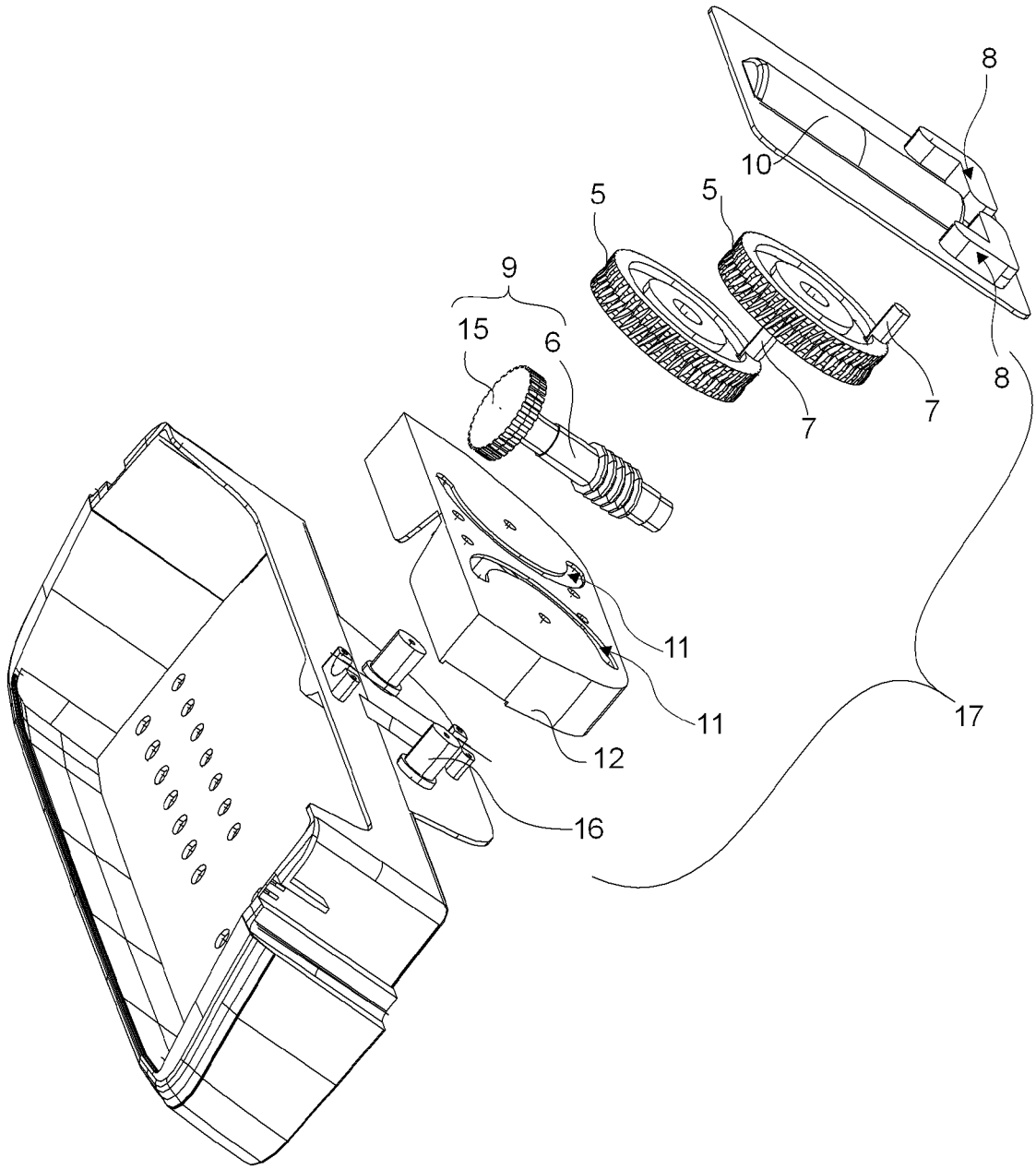


Figure 5

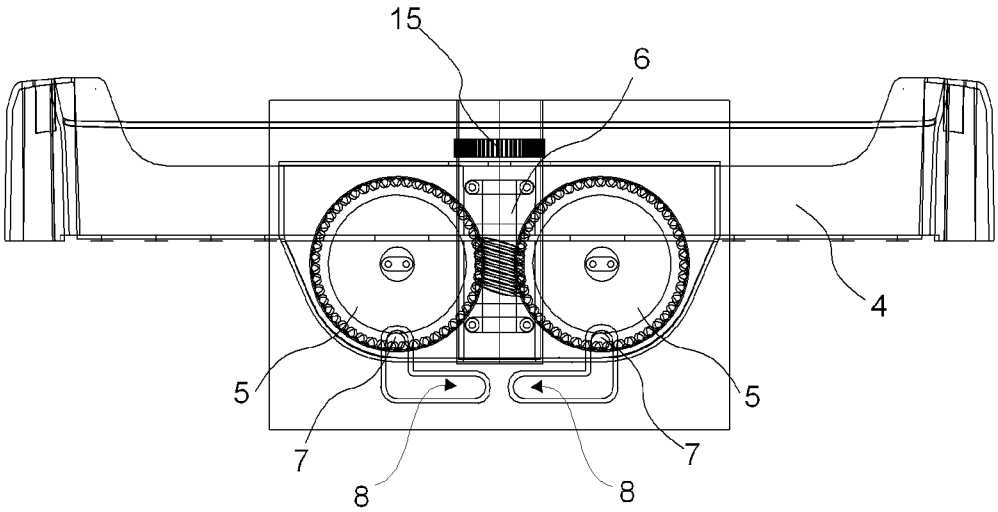


Figure 6

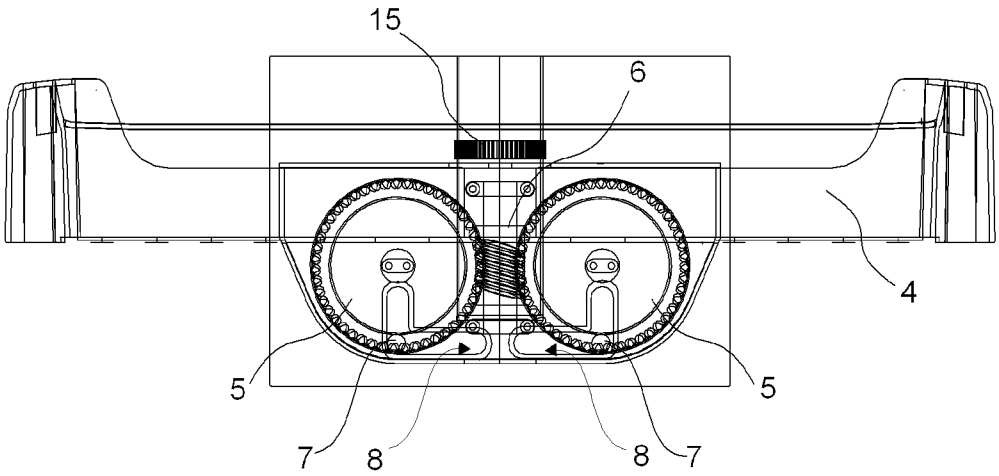


Figure 7

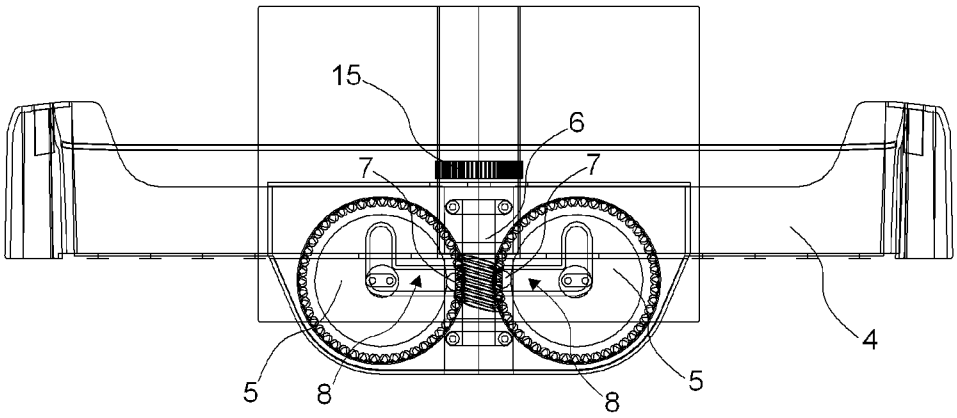


Figure 8

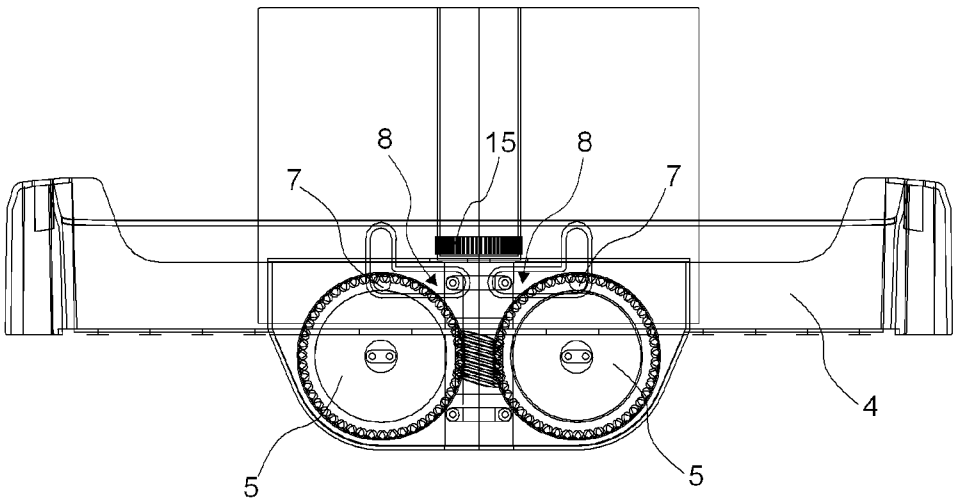


Figure 9

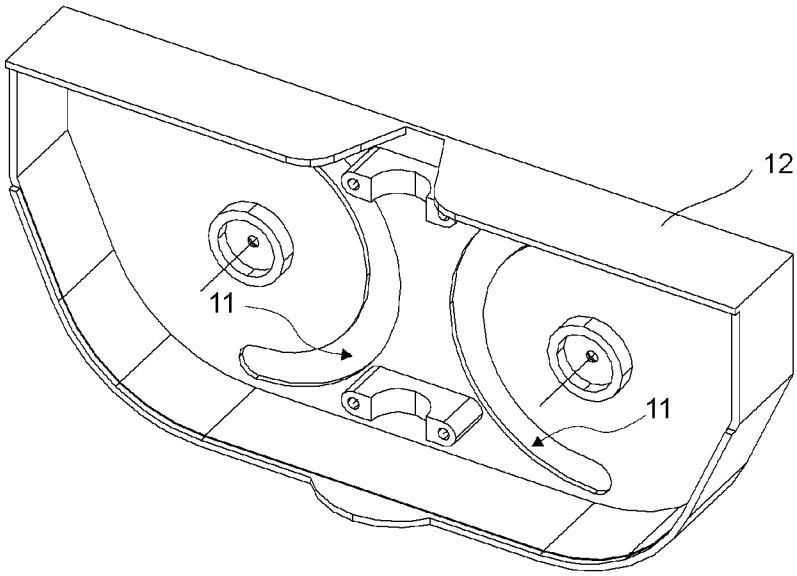


Figure 10

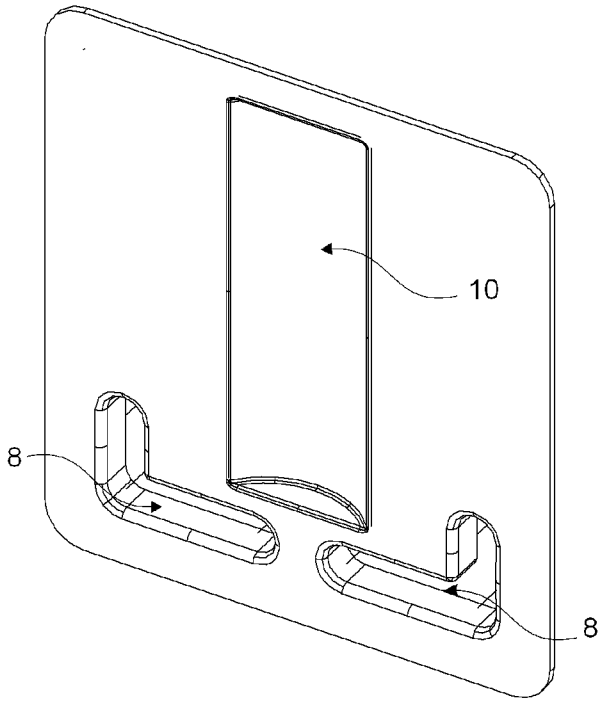


Figure 11

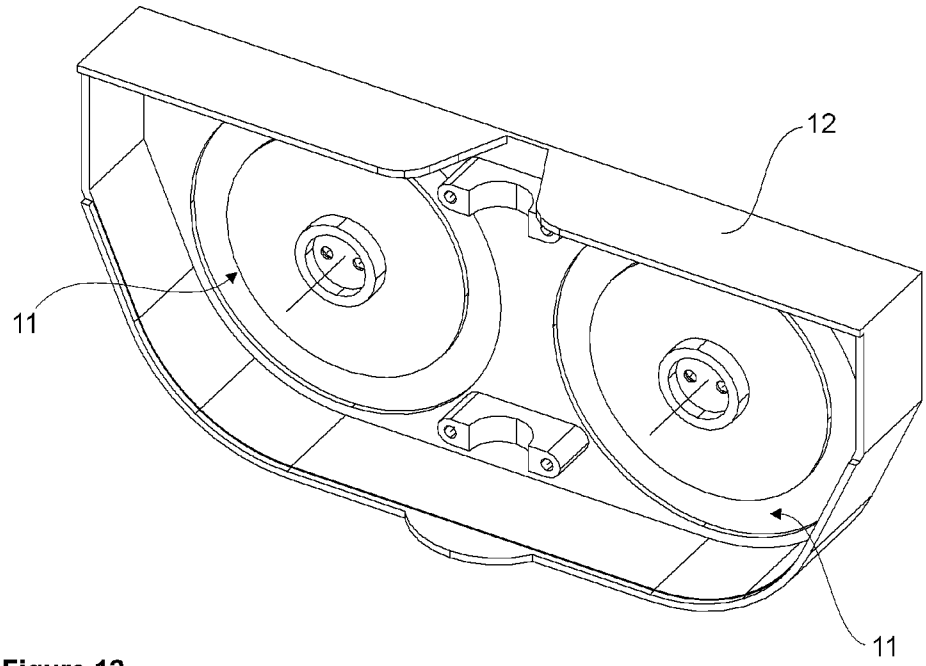
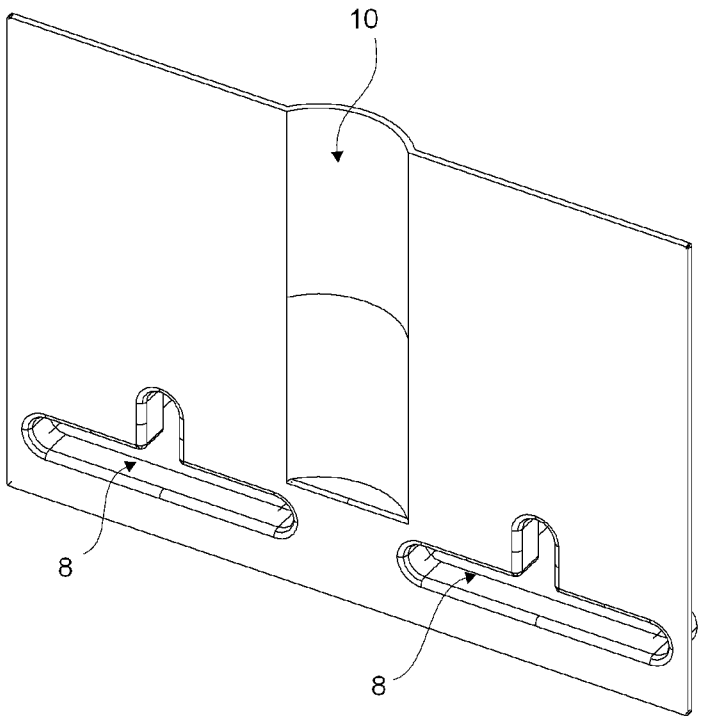


Figure 12



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/067234

A. CLASSIFICATION OF SUBJECT MATTER
INV. F25D23/04 A47B57/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F25D A47B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2005/003660 A1 (MULTIBRAS ELETRODOMESTICOS SA [BR]; KOLB FILHO RICARDO [BR]; FLOETER J) 13 January 2005 (2005-01-13) the whole document	1-14
Y	FR 2 315 888 A1 (AUBER IVAN [FR]) 28 January 1977 (1977-01-28) the whole document	1-14
A	US 2 998 290 A (SHARPE VERLOS G) 29 August 1961 (1961-08-29) the whole document	1-14
A	DE 40 17 540 A1 (THOMKINS GUSTAV NICOLAS [DE]) 5 December 1991 (1991-12-05) abstract figures 1-2B	1-14

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
29 April 2010	10/05/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Correia dos Reis, I

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/067234

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 913 584 A (SWINDELL THOMAS R [US] ET AL) 22 June 1999 (1999-06-22) abstract figures 1-5	1-14
A	US 2001/025508 A1 (NAKAJIMA NARUMI [JP] ET AL) 4 October 2001 (2001-10-04) abstract figure 6	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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