

(19)



(11)

EP 4 484 633 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.01.2025 Bulletin 2025/01

(51) International Patent Classification (IPC):
D06F 39/02^(2006.01)

(21) Application number: **24174269.1**

(52) Cooperative Patent Classification (CPC):
D06F 39/022

(22) Date of filing: **06.05.2024**

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

Designated Extension States:
BA

Designated Validation States:
GE KH MA MD TN

(30) Priority: **30.06.2023 CN 202310800179**
30.06.2023 CN 202310792265
30.06.2023 CN 202310805131

(71) Applicant: **BSH Hausgeräte GmbH**
81739 München (DE)

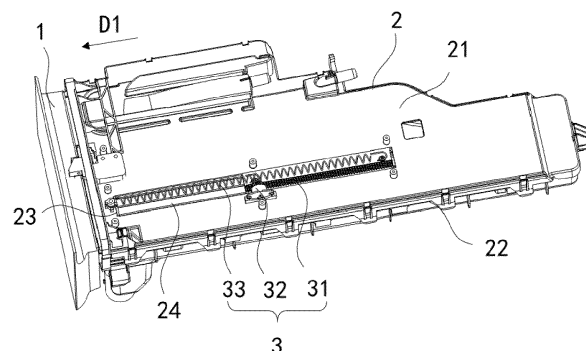
(72) Inventors:

- **Wang, Jin**
Nanjing, 210046 (CN)
- **Zhang, Shurong**
Nanjing, 210042 (CN)
- **Zhu, Yanglei**
Nanjing, Jiangsu, 210000 (CN)
- **Yang, Fan**
Nanjing (CN)
- **She, Yuhui**
Nanjing, 210000 (CN)

(54) DETERGENT BOX ASSEMBLY AND WASHING MACHINE

(57) Provided is a detergent box assembly in an embodiment of the present disclosure, which includes an inner box for containing detergent, an outer box provided with an accommodating cavity for accommodating the inner box, a driving mechanism, and an external connection terminal detachably connected to the inner box so as to form an electrical connection with the inner box, where during an opening stroke of the inner box, the inner box can be driven to move outward from the accommodating cavity in the opening direction by the driving mechanism; the driving mechanism is capable of independently driving the external connection terminal to move in the opening direction relative to the inner box,

so that the external connection terminal remains connected to the inner box; and when the inner box moves in the opening direction beyond its limit position of the opening stroke, the external connection terminal is restricted in the opening direction and thus disconnected from the inner box. The present disclosure also provides a corresponding washing machine. According to certain embodiments of the present disclosure, the structure of the detergent box assembly can be optimized, which enables the detergent box assembly to be structurally stable, easy to operate and/or prone to achievement of automatic opening.

**FIG. 1A****EP 4 484 633 A1**

Description

[0001] The present disclosure relates to the field of household appliances, and more particularly, to a detergent box assembly and a washing machine.

[0002] In a household appliance, such as a washing machine, there may be a detergent box assembly, which includes an inner box for containing detergent, and an outer box for accommodating the inner box. The inner box can be manually opened by a user through pulling to add detergent.

[0003] In order to facilitate the operation by a user, the inner box may also be set to be able to open automatically. The detergent box assembly further includes a connection terminal to provide electrical connections for elements in the inner box. The connection terminal is usually fixed to the outer box and connected to the inner box. When the inner box is opened, the inner box is disconnected from the connection terminal. Therefore, at the time of opening the inner box, a greater resistance needs to be overcome so that the inner box is disconnected from the connection terminal, which makes it difficult to achieve automatic opening of the inner box. In addition, it is necessary to ensure that the inner box is reconnected to the connection terminal when the user closes the inner box, otherwise the washing machine may not work properly. Moreover, in the opening and closing processes of the inner box, it is difficult to maintain the electrically conductive connection between the connection terminal and the inner box.

[0004] At present, the detergent box assembly has disadvantages such as inconvenient operation, high difficulty of automatic opening, and unstable structure.

[0005] It is an object of the embodiments of the present disclosure to provide an improved detergent box assembly and a washing machine so as to overcome at least one of the above-mentioned disadvantages in the related art.

[0006] According to the first aspect of the present disclosure, an embodiment of the present disclosure provides a detergent box assembly. The detergent box assembly includes: an inner box for containing detergent, an outer box provided with an accommodating cavity for accommodating the inner box, a driving mechanism, and an external connection terminal detachably connected to the inner box so as to form an electrical connection with the inner box. During an opening stroke of the inner box, the inner box can be driven to move outward from the accommodating cavity in the opening direction by the driving mechanism; and the driving mechanism is capable of independently driving the external connection terminal to move in the opening direction relative to the inner box, so that the external connection terminal remains connected to the inner box. When the inner box moves in the opening direction beyond its limit position of the opening stroke, the external connection terminal is restricted in the opening direction and thus disconnected from the inner box.

[0007] During the opening stroke of the inner box, the external connection terminal may be moved in the opening direction by the driving mechanism so as to move synchronously with the inner box without disengaging from the inner box, which means that in the process of opening the inner box, the driving force used for driving the inner box does not need to overcome the connection force between the external connection terminal and the inner box. It contributes in particular to the automatic opening of the inner box. Especially advantageous is that the external connection terminal is not driven to move outwards by the inner box during the opening stroke of the inner box, but is driven independently of the inner box by the driving mechanism. Compared to the situation where the external connection terminal is driven by the inner box and then moves outward therewith, the connection between the external connection terminal and the inner box will be more stable. This is particularly advantageous for the external connection terminal used for forming an electrical connection with the inner box. Therefore, even when the inner box is opened, a stable and reliable electrical connection can be ensured between the inner box and the external connection terminal.

[0008] According to an alternative embodiment of the present disclosure, the driving mechanism may be connected to the inner box only by means of the external connection terminal so as to indirectly drive the inner box to move in the opening direction by means of the external connection terminal. A driving element does not need to be directly connected to the inner box. Thus, the detergent box assembly has a simplified structure, and is convenient to use.

[0009] According to an alternative embodiment of the present disclosure, the external connection terminal may be in a plug-in connection with the inner box, and the direction of the plug-in connection is parallel to the opening direction. Thus, it may be convenient for the inner box to be completely withdrawn from the accommodating cavity and for the fully withdrawn inner box to be reinstalled into the accommodating cavity without the need for additional operations.

[0010] According to an alternative embodiment of the present disclosure, the driving mechanism may include a driving element movably arranged relative to the outer box, and the driving element is connected to the external connection terminal in a relatively immovable manner along the direction parallel to the opening direction. Thus, it helps to simplify the structure of the detergent box assembly and makes the detergent box assembly easy to use.

[0011] According to an alternative embodiment of the present disclosure, the outer box is provided with a limit structure. For example, the limit structure may be configured to be capable of limiting the limit position of the driving element moving in the opening direction relative to the outer box, thereby indirectly limiting the limit position of the external connection terminal moving in the opening direction relative to the outer box. Alternatively,

the limit structure may be configured to be capable of limiting the limit position of the external connection terminal moving in the opening direction relative to the outer box, thereby indirectly limiting the limit position of the driving element moving in the opening direction relative to the outer box. Thus, the detergent box assembly can be easily used with a simple structure.

[0012] According to an alternative embodiment of the present disclosure, the detergent box assembly may further include a connecting piece, and the connecting piece is connected to the driving element and the external connection terminal in a relatively immovable manner along the direction parallel to the opening direction. Thus, there is no need to complicate the structures of the driving element and the external connection terminal.

[0013] According to an alternative embodiment of the present disclosure, the connecting piece may include a limit housing, which is configured to be capable of limiting the external connection terminal in the direction parallel to the opening direction. For example, the limit housing may circumferentially surround the external connection terminal relative to the opening direction. Thus, especially when the connection is made or released between the external connection terminal and the inner box, a stable and reliable connection between the connecting piece and the external connection terminal can be ensured.

[0014] Alternatively, the connecting piece may include a sheath, which is used for accommodating at least a partial section of a cable connected to the external connection terminal, the sheath extending in the opening direction. For example, the sheath may circumferentially surround the cable relative to the opening direction. Thus, the sheath can protect the cable, and also can prevent the inner box from being stuck due to the cable during movement.

[0015] According to an alternative embodiment of the present disclosure, in a cross section perpendicular to the opening direction, the cross-sectional area of the sheath may be smaller than that of the limit housing. The sheath having a smaller cross section can effectively reduce the deformation of the cable accommodated therein.

[0016] According to an alternative embodiment of the present disclosure, the limit housing may include a first portion and a second portion. In a cross section perpendicular to the opening direction, the first portion and the second portion may have U-shaped cross sections. The first portion and the second portion are nested with each other, so that an opening of the first portion is opposite to that of the second portion, and the two side walls of the first portion are clamped by the two side walls of the second portion. The external connection terminal is located between the first portion and the second portion. For example, the external connection terminal may be configured to be mounted to the first portion in the mounting direction perpendicular to the opening direction so as to be limited by the first portion in the direction perpendi-

cular to the mounting direction. For example, the second portion may be configured to be mounted to the first portion in the mounting direction perpendicular to the opening direction. The first portion can particularly be constructed as a one-piece component with the sheath. By means of such a connecting piece, a stable and reliable connection between the connecting piece and the external connection terminal can be achieved in a simple manner.

[0017] According to an alternative embodiment of the present disclosure, the sheath may include a first wall and a second wall which are opposite to each other and extend in the opening direction, and the cable is maintained between the first wall and the second wall. The sheath may further include at least one elastic arm that extends from one of the first wall and the second wall to the other in a cantilevered manner. For example, the elastic arm may be configured to be able to undergo elastic deformation in the direction perpendicular to the opening direction. In the case where the elastic arm is not deformed, the distance between the elastic arm and the other of the first wall and the second wall may be smaller than the diameter of the cable. Thus, the cable can be installed inside the sheath in a simple way without the need for additional components or tools.

[0018] According to an alternative embodiment of the present disclosure, the driving element may be configured as a rack, which may be arranged on the outer side of the outer box facing away from the accommodating cavity. Thus, the detergent box assembly can be made more stable and reliable, and the configuration will help to reduce the volume of the outer box.

[0019] For example, a guide slot extending along the opening direction may be formed at the outer side of the outer box facing away from the accommodating cavity, and the rack is slidably arranged in the guide slot. The guide slot may be provided with a through hole, and the rack may be connected to the external connection terminal located in the accommodating cavity through the through hole. Thus, the inner box is ensured to be opened and closed stably and reliably.

[0020] Alternatively, the driving mechanism may further include a damping gear engaged with the rack, and the damping gear may be arranged at the outer side of the outer box facing away from the accommodating cavity. Thus, the movement of the rack and the subsequent inner box can be made smoother.

[0021] For example, the driving mechanism may also include an elastic element used for providing a driving force to enable the inner box to move outward in the opening direction during the opening stroke of the inner box. The elastic element may be arranged at the outer side of the outer box facing away from the accommodating cavity. One end of the elastic element is fixed to the rack, and the other end of the elastic element is fixed to the outer box. With the help of the elastic element, the inner box can be automatically opened with a simple structure.

[0022] According to an alternative embodiment of the present disclosure, the detergent box assembly further includes a deformable cable protector, which may be configured to be capable of accommodating at least a partial section of the cable connected to the external connection terminal. The cable protector may be configured to deform synchronously with the movement of the external connection terminal during the movement of the external connection terminal in the opening direction and/or the direction opposite to the opening direction. The cable protector may limit the movement and deformation of the cable, so that the cable can be protected, and the inner box can be prevented from being stuck due to the cable during movement.

[0023] For example, the cable protector may be configured to be able to undergo telescopic deformation and/or bending deformation in synchronization with the movement of the external connection terminal. The cable protector may include at least one of the following: a corrugated pipe, a telescopic sleeve, and a drag chain.

[0024] One end of the cable protector is kinetically coupled to the external connection terminal, and the other end of the cable protector is attached to the outer box, which helps to ensure that the cable protector deforms in a predetermined manner.

[0025] According to an alternative embodiment of the present disclosure, the cable protector is configured as the drag chain, which includes a plurality of drag chain units. For example, the drag chain may be arranged such that every two adjacent drag chain units in the plurality of drag chain units are in a relatively rotatable connection with each other about a rotation axis extending in the vertical direction, which contributes to a compact structure of the detergent box assembly. In particular, there is no need to increase the height of the outer box. Alternatively, the plurality of drag chain units are all located in the same horizontal plane, thereby preventing the drag chain from interfering with the movement of the inner box. Especially when the inner box is opened, the drag chain will not sag below the inner box.

[0026] For example, the plurality of drag chain units may include a first end unit and a second end unit which are respectively located at both ends of the drag chain, and at least one intermediate unit located between the first end unit and the second end unit. The at least one intermediate unit may be supported only by the drag chain units adjacent thereto. In this way, the friction between the drag chain and the inner box or the outer box during movement can be avoided, thereby preventing abrasion and noise caused thereby.

[0027] According to an alternative embodiment of the present disclosure, in the case where the inner box is at the closed position, the two ends of the sheath may be respectively located in front and rear of a second end of the drag chain in the opening direction; and in the case where the inner box is at the limit position of the opening stroke, the end of the sheath far away from the external connection terminal may be located in front of the second

end of the drag chain in the opening direction. It is beneficial for preventing the drag chain from sagging. With the help of the sheath, the relative positions of the two ends of the drag chain during movement can be set as needed.

[0028] According to an alternative embodiment of the present disclosure, one end of the sheath may be located at a first position in the closing direction on the side facing the second end of the drag chain, and the other end of the sheath may be located at a second position in the closing direction on the side facing away from the second end of the drag chain, the second position being located behind the first position in the opening direction, which helps to ensure that the drag chain deforms in a predetermined manner.

[0029] According to an alternative embodiment of the present disclosure, the inner box may be provided with a recess for accommodating the cable protector. The cable protector may be located within the recess when the inner box is at the closed position. Thus, it is helpful to reduce the size of the detergent box assembly.

[0030] According to an alternative embodiment of the present disclosure, the cable protector is arranged in a suspended manner above the inner box such that the cable protector does not come into contact with the inner box, which can prevent abrasion and noise caused by the friction of the cable protector on the inner box.

[0031] According to the second aspect of the present disclosure, an embodiment of the present disclosure provides a washing machine, which includes the detergent box assembly according to the present disclosure.

[0032] A better understanding of the principles, features and advantages of the present disclosure will be obtained by describing the present disclosure in more detail below with reference to the accompanying drawings. The drawings include:

FIG. 1A and FIG. 1B schematically illustrate a detergent box assembly according to an exemplary embodiment of the present disclosure;

FIG. 2A and FIG. 2B schematically illustrate the detergent box assembly as shown in FIG. 1A and FIG. 1B;

FIG. 3 schematically illustrates some components of the detergent box assembly according to the exemplary embodiment of the present disclosure;

FIG. 4A, FIG. 4B, and FIG. 4C schematically illustrate the detergent box assembly according to the exemplary embodiment of the present disclosure;

FIG. 5 schematically illustrates some components of the detergent box assembly according to the exemplary embodiment of the present disclosure;

FIG. 6 schematically illustrates a connecting piece of the detergent box assembly according to the exemplary embodiment of the present disclosure;

FIG. 7 schematically illustrates some components of the detergent box assembly as shown in FIG. 5 from different perspectives; and

FIG. 8A and FIG. 8B schematically illustrate a detergent box assembly according to an exemplary embodiment of the present disclosure.

List of reference numerals

[0033]

1 Inner box
 11 Electrical device
 12 Internal connection terminal
 2 Outer box
 20 Accommodating cavity
 21 Top wall
 22 Lower box body
 23 Limit structure
 24 Guide slot
 25 Through hole
 3 Driving mechanism
 31 Driving element
 32 Damping gear
 33 Elastic element
 4 External connection terminal
 40 Cable
 5 Connecting piece
 51 Limit housing
 511 First portion
 512 Second portion
 52 Sheath
 521 First wall
 522 Second wall
 523 Elastic arm
 6 Cable protector
 61 Drag chain
 62 Corrugated pipe
 610 Drag chain unit
 611 First end unit
 612 Second end unit
 613 Intermediate unit

[0034] In order to make the technical problems to be solved, technical solutions and beneficial technical effects of the present disclosure clearer, the present disclosure will be further described in detail below with reference to the accompanying drawings and a plurality of exemplary embodiments. It should be understood that the specific embodiments described herein are only intended to explain the present disclosure, rather than to limit the protection scope of the present disclosure.

[0035] First of all, in order to facilitate understanding, returning to the description in the section of background, the detergent box assembly in the related art has problems such as inconvenient operation, high difficulty of automatic opening, and unstable structure.

[0036] With respect to at least one of the above technical problems or other possible technical problems, an exemplary embodiment of the present disclosure provides a detergent box assembly. The detergent box

assembly includes: an inner box for containing detergent, an outer box provided with an accommodating cavity for accommodating the inner box, a driving mechanism, and an external connection terminal detachably connected to the inner box so as to form an electrical connection with the inner box, where during an opening stroke of the inner box, the inner box can be driven to move outward from the accommodating cavity in the opening direction by the driving mechanism; the driving mechanism is capable of independently driving the external connection terminal to move in the opening direction relative to the inner box, so that the external connection terminal remains connected to the inner box; and when the inner box moves in the opening direction beyond its limit position of the opening stroke, the external connection terminal is restricted in the opening direction and thus disconnected from the inner box.

[0037] In order to better understand the present disclosure, exemplary embodiments of the present disclosure will be described below with reference to the accompanying drawings.

[0038] Before starting the detailed description, it should be pointed out that the directional terms used in the description process refer to the normal service conditions of household appliances for convenience of description, and cannot be understood as absolute limitations to the corresponding features.

[0039] FIG. 1A and FIG. 1B schematically illustrate a detergent box assembly according to an exemplary embodiment of the present disclosure. In this embodiment, the detergent box assembly may be applied to a washing machine. In other embodiments, detergent box assemblies according to the exemplary embodiments of the present disclosure may be applied to various household appliances, such as a dishwasher, and a washer and dryer combo.

[0040] As shown in FIG. 1A and FIG. 1B, the detergent box assembly includes: an inner box 1 used for containing detergent, an outer box 2 provided with an accommodating cavity 20 for accommodating the inner box 1, a driving mechanism 3, and an external connection terminal 4, which is detachably connected to the inner box 1 so as to form an electrical connection with the inner box 1. By means of the external connection terminal 4, an electrically conductive connection can be formed between the inner box 1 and other components of the washing machine, thereby transmitting power or communication signals, for example, between the inner box 1 and the other components. In order to ensure a stable and reliable electrical connection between the external connection terminal 4 and the inner box 1, a relatively firm physical connection is generally formed between the external connection terminal 4 and the inner box 1. Therefore, it is necessary to provide a greater force to disengage the external connection terminal 4 from the inner box 1. FIG. 1A shows that the inner box 1 is in a closed state, where the inner box 1 is located substantially completely within the accommodating cavity 20. For example, in the case

where the inner box 1 is in the closed state, the detergent contained in the inner box 1 may be rinsed into a drum of the washing machine so as to be used for washing the laundry. FIG. 1B shows that the inner box 1 is in an open state, where the inner box 1 is moved outward from the accommodating cavity 20 so as to be partially exposed to the outside, thereby facilitating a user to add detergent into the inner box 1, for example. The outer box 2 may include, for example, a top wall 21 and a lower box body 22. A groove may be formed in the lower box body 22, and the inner box 1 is located inside the groove. The top wall 21 may cover the lower box body 22 so as to enclose the accommodating cavity 20 together with the lower box body 22. In FIG. 1A, the external connection terminal 4 is not visible because it is hidden by the top wall 21.

[0041] FIG. 2A and FIG. 2B schematically illustrate the detergent box assembly as shown in FIG. 1A and FIG. 1B, where the top wall 21 of the outer box 2 is omitted to illustrate the internal structure of the detergent box assembly. FIG. 2A and FIG. 2B show that the inner box 1 is in the closed and open states, respectively.

[0042] During an opening stroke of the inner box 1, the inner box 1 can be driven to move outward from the accommodating cavity 20 in the opening direction D1 by the driving mechanism 3. The driving mechanism 3 is capable of independently driving the external connection terminal 4 to move in the opening direction D1 relative to the inner box 1, so that the external connection terminal 4 remains connected to the inner box 1. When the inner box 1 moves in the opening direction D1 beyond its limit position of the opening stroke, the external connection terminal 4 is restricted in the opening direction D1 and thus disconnected from the inner box 1.

[0043] "The driving mechanism 3 independently drives the external connection terminal 4 relative to the inner box 1" means that the force transmission path or the motion transmission path through which the driving mechanism 3 drives the external connection terminal 4 does not pass through the inner box 1. For example, the driving mechanism 3 may directly drive the external connection terminal 4, or indirectly drive the external connection terminal 4 through a component other than the inner box 1.

[0044] During the opening stroke of the inner box 1, the external connection terminal 4 may be moved in the opening direction D1 by the driving mechanism 3 so as to move synchronously with the inner box 1 without disengaging from the inner box 1. The external connection terminal 4 is not disconnected from the inner box 1 until the inner box 1 moves in the opening direction D1 beyond its limit position of the opening stroke. This makes that in the process of opening the inner box 1, the driving force used for driving the inner box 1 does not need to overcome the connection force between the external connection terminal 4 and the inner box 1. It contributes in particular to the automatic opening of the inner box 1. In particular, at the time of opening the inner box 1, there is no need to provide a relatively large initial actuation force

to separate the external connection terminal 4 from the inner box 1, so the opening process of inner box 1 is smoother. Especially advantageous is that the external connection terminal 4 is not driven to move outwards by the inner box 1 during the opening stroke of the inner box 1, but is driven independently of the inner box 1 by the driving mechanism 3. Compared to the situation where the external connection terminal 4 is driven by the inner box 1 and then moves outward therewith, the connection between the external connection terminal 4 and the inner box 1 will be more stable. This is particularly advantageous for the external connection terminal 4 used for forming an electrical connection with the inner box 1. Thus, it is necessary to prevent the situation that the connection between the inner box 1 and the external connection terminal 4 from becomes loose during the opening stroke of the inner box 1, resulting in an unreliable or ineffective electrical connection therebetween. If the connection between the inner box 1 and the external connection terminal 4 becomes loose and the inner box 1 is closed without ensuring a reconnection between the inner box 1 and the external connection terminal 4, it may cause the washing machine to malfunction. According to the present disclosure, even when the inner box 1 is opened, a stable and reliable electrical connection can be ensured between the inner box 1 and the external connection terminal 4. It may also provide support for implementation of specific functions, such as detection, when the inner box 2 is opened.

[0045] As an example, the driving mechanism 3 may drive the external connection terminal 4 and the inner box 1 in parallel. For example, the driving mechanism 3 may include a driving element 31 movably arranged relative to the outer box 2, and the driving element 31 may be respectively connected to the external connection terminal 4 and the inner box 1, so that when the driving element 31 moves, the external connection terminal 4 and the inner box 1 may be driven to synchronously move by the driving element 31.

[0046] Alternatively, the driving mechanism 3 may be connected to the inner box 1 only by means of the external connection terminal 4 so as to indirectly drive the inner box 1 to move in the opening direction D1 by means of the external connection terminal 4. Therefore, the external connection terminal 4 is driven to push the inner box 1 to move outward from the accommodating cavity 20 in the opening direction D1 by the driving mechanism 3. The driving element 31 does not need to be directly connected to the inner box 1. Thus, the detergent box assembly may be convenient to use. For example, for cleaning or maintenance purposes, the inner box 1 can be fully withdrawn from the accommodating cavity 20. In this process, since the driving element 31 is not directly connected to the inner box 1, there is no need to additionally perform an operation of detaching or engaging the driving element 31 from/with the inner box 1. In addition, the structure of the detergent box assembly may be simplified. The detergent box assembly usually

has only a small installation space. In this case, a more complicated structural design is often required to realize the automatic opening of the inner box 1. By connecting the driving mechanism 3 to the inner box 1 only through the external connection terminal 4, the structure of the detergent box assembly can be simplified, and the volume of the detergent box assembly can be reduced.

[0047] For example, the external connection terminal 4 may be in a plug-in connection with the inner box 1, and the direction of the plug-in connection is parallel to the opening direction D 1. FIG. 2B schematically illustrates that inner box 1 is at its limit position of the opening stroke. Here, the external connection terminal 4 is limited in the opening direction D1. If the inner box 1 continues to move in the opening direction D1, the plug-in connection between the inner box 1 and the external connection terminal 4 will be released, so that the external connection terminal 4 is disconnected from the inner box 1. Thus, the inner box 1 can be completely withdrawn from the accommodating cavity 20. Conversely, in the process of reinstalling the fully withdrawn inner box 1 into the accommodating cavity 20, the inner box 1 can be inserted into the accommodating cavity 20 in the closing direction D2 opposite to the opening direction D1. In this process, the inner box 1 can be re-inserted into the external connection terminal 4 in the closing direction D2. Such a plug-in connection between the external connection terminal 4 and the inner box 1 can facilitate the complete withdrawal of the inner box 1 from the accommodating cavity 20 and the reinstallation of the fully withdrawn inner box 1 into the accommodating cavity 20 without the need for additional operations.

[0048] Alternatively, the driving mechanism 3 may include the driving element 31 movably arranged relative to the outer box 2, and the driving element 31 is connected to the external connection terminal 4 in a relatively immovable manner along the direction parallel to the opening direction D1. For example, the driving element 31 may be fixed to the external connection terminal 4 by means of screws. Thus, it helps to simplify the structure of the detergent box assembly and makes the detergent box assembly easy to use. Referring to FIG. 2A and FIG. 2B, in the case where the driving element 31 moves in the opening direction D1, the external connection terminal 4 will move accordingly. Further, the external connection terminal 4 can push the inner box 1 to move in the opening direction D1. Conversely, when the opened inner box 1 is inserted into the accommodating cavity 20 in the closing direction D2, the inner box 1 may push the external connection terminal 4 to move in the closing direction D2. The driving element 31 may be movable in the closing direction D2 together with the external connection terminal 4. Thus, the driving element 31 can be reset.

[0049] According to an exemplary embodiment of the present disclosure, the outer box 2 may be provided with a limit structure 23. For example, the limit structure 23 may be configured to be capable of limiting the limit position of the driving element 31 moving in the opening

direction D1 relative to the outer box 2, thereby indirectly limiting the limit position of the external connection terminal 4 moving in the opening direction D1 relative to the outer box 2. The limit structure 23 may be formed as a stopper at the upper side of the top wall 21, for example. The stopper may be configured to be capable of blocking the driving element 31 in front of the driving element 31 when the inner box 1 moves in the opening direction D1 beyond its limit position of the opening stroke.

[0050] Alternatively or additionally, the limit structure 23 may be configured to be capable of limiting the limit position of the external connection terminal 4 moving in the opening direction D1 relative to the outer box 2, thereby indirectly limiting the limit position of the driving element 31 moving in the opening direction D1 relative to the outer box 2. For example, the limit structure 23 may be formed as a stopper at the lower side of the top wall 21, which blocks the external connection terminal 4 in front of the external connection terminal 4 when the inner box 1 moves in the opening direction D1 beyond its limit position of the opening stroke.

[0051] As an example, the driving element 31 may be configured as a rack, which may be arranged on the outer side of the outer box 2 facing away from the accommodating cavity 20. Thus, the detergent box assembly can be made more stable and reliable, and the configuration will help to reduce the volume of the outer box 2. In the case where the inner box 1 is configured to be automatically ejected by means of the driving mechanism 3, the internal structure of the detergent box assembly tends to be more complicated. Providing the rack at the outer side of the outer box 2 helps to simplify the structure inside the outer box 2, which prevents interference between moving components. For example, the rack may be arranged at the upper side of the top wall 21 of the outer box 2. The rack may be arranged particularly in the middle of the inner box 1 in the width direction perpendicular to the opening direction D1, so that the inner box 1 can be moved more stably relative to the outer box 2. Referring to FIG. 1A and FIG. 1B, for example, a guide slot 24 extending along the opening direction D1 may be formed at the outer side of the outer box 2 facing away from the accommodating cavity 20. The rack may be slidably arranged in the guide slot 24. The guide slot 24 may be provided with a through hole 25, and the rack is connected to the external connection terminal 4 located in the accommodating cavity 20 through the through hole 25. The guide slot 24 and/or the through hole 25 may also serve as a limit structure 23. That is, when the inner box 1 moves in the opening direction D1 beyond its limit position of the opening stroke, the rack abuts against the end of the guide slot 24 and/or the through hole 25 and thus is blocked, so that the movement of the rack in the opening direction D1 cannot be continued. Alternatively, the through hole 25 may limit the movement range of the driving element 31 at both ends, so that the length of the through hole 25 extending in the opening direction D1 may correspond to the length of the opening stroke of the

inner box 1.

[0052] Alternatively, the driving mechanism 3 may further include a damping gear 32 engaged with the rack. The damping gear 32 may be arranged at the outer side of the outer box 2 facing away from the accommodating cavity 20. For example, the damping gear 32 may be arranged on the top wall 21 of the outer box 2. The damping gear 32 may be located next to the guide slot 24, and arranged roughly centered relative to the guide slot 24. In the process of the rack driving the inner box 1 to open, the damping gear 32 engaged with the rack rotates, thereby generating a damping force. Thus, the movement of the rack and the subsequent inner box 1 can be made smoother. In the exemplary embodiment of the present disclosure, the damping force generated by the damping gear 32 may be proportional to the rotational speed thereof. Therefore, the faster the movement speed of the rack, the faster the rotational speed of the damping gear 32, and the greater the damping force generated, and vice versa. The damping gear 32 may be, for example, a hydraulic damping gear, a spring damping gear and a rubber damping gear.

[0053] The driving mechanism 3 may also include an elastic element 33 used for providing a driving force to enable the inner box 1 to move outward in the opening direction D1 during the opening stroke of the inner box 1. The elastic element 33 may be arranged at the outer side of the outer box 2 facing away from the accommodating cavity 20. One end of the elastic element 33 is fixed to the rack, and the other end of the elastic element 33 is fixed to the outer box 2. The elastic element 33 may be implemented as a spring, and may also include components made of other elastic materials. For example, as shown in FIG. 1A and FIG. 2A, in the case where the inner box 1 is in a closed state, the elastic element 33 may be stretched and locked by a locking mechanism (not shown here) of the detergent box assembly. In the case where the locking mechanism is unlocked, the elastic element 33 may contract and pull the driving element 31 to move in the opening direction D1. Further, the driving element 31 drives the external connection terminal 4 and the inner box 1 to move in the opening direction D1. In this process, the elastic element 33 only needs to provide a force that can overcome a friction to push the external connection terminal 4 and the inner box 1, without the need to provide an additional force that can disconnect the external connection terminal 4 from the inner box 1. Thus, for example, the required deformation and/or elastic modulus of the elastic element 33 can be reduced accordingly. It contributes to improving the feasibility and reliability of opening the inner box 1 with the elastic force of the elastic element 33. As shown in FIG. 1B and FIG. 2B, when the inner box 1 is in an open state, the elastic element 33 may be in a loose state, for example. When a user pushes the inner box 1 to move towards the interior of the accommodating cavity 20 in the closing direction D2, the external connection terminal 4 may be pushed by the inner box 1 and thus drive the driving element 31 to move along

the closing direction D2. By means of the driving element 31, the elastic element 33 can be reset to a stretched state and can be locked again by the locking mechanism. The force required to be provided by the user in the reset process may also be reduced accordingly.

[0054] In the exemplary embodiment of the present disclosure, the driving mechanism 3 may also include a motor, which may be connected to the driving element 31. For example, the motor may be rotated in response to the operation of a user so as to drive the driving element 31 to move. The driving element 31 may also include a screw rod and a sliding block.

[0055] FIG. 3 schematically illustrates some components of the detergent box assembly according to the exemplary embodiment of the present disclosure. In FIG. 3, the external connection terminal 4 is connected to the inner box 1. The inner box 1 may include, for example, an electrical device 11 and an internal connection terminal 12 for electrically connecting the electrical device 11 to the external connection terminal 4. The electrical device 11 may include, for example, a pump and/or a sensor. The internal connection terminal 12 may be configured to be capable of forming a plug-in connection with the external connection terminal 4 in the direction opposite to the opening direction D1. One end of the external connection terminal 4 may be connected to the internal connection terminal 12, and the other end of the external connection terminal 4 may be connected to a power supply device and/or a control device of the washing machine, for example. For example, the other end of the external connection terminal 4 may be connected to a cable 40, and the cable 40 passes through the outer box 2 and is connected to the power supply device and/or the control device. The cable 40 may include a power cable and/or a communication cable. By means of the external connection terminal 4, electric power can be supplied to the electrical device 11 in the inner box 1. Alternatively or additionally, by means of the external connection terminal 4, for example, a communication connection may be provided between the electrical device 11 and the control device. Referring to FIG. 2A and FIG. 2B, in the closed state of the inner box 1, the cable 40 may be curlily stored in the accommodating cavity 20; in the process of opening the inner box 1, the external connection terminal 4 moves along the opening direction D1, so that the cable 40 can be unrolled under the traction of the external connection terminal 4. In the case where the inner box 1 is opened, the external connection terminal 4 can still be electrically connected to the inner box 1 stably and reliably. Therefore, the electrical device 11 of the inner box 1 is still able to operate. For example, when the inner box 1 is opened to add the detergent, the sensor in the inner box 1 can detect the amount of the added detergent and transmit the detection result to the control device, which can then notify the user of the detection result.

[0056] FIG. 4A, FIG. 4B and FIG. 4C schematically illustrate the detergent box assembly according to the exemplary embodiment of the present disclosure, where

the top wall 21 of the outer box 2 is omitted to illustrate the internal structure of the detergent box assembly. For the sake of clarity, the driving mechanism 3 is also omitted in FIG. 4C.

[0057] In this embodiment, the detergent box assembly may further include a connecting piece 5, and the connecting piece 5 is connected to the driving element 31 and the external connection terminal 4 in a relatively immovable manner along the direction parallel to the opening direction D1. In other words, the driving element 31 is connected to the external connection terminal 4 by means of the connecting piece 5. Thus, there is no need to complicate the structures of the driving element 31 and the external connection terminal 4. In particular, the concept of the present disclosure can be applied without changing the configuration of the existing external connection terminal 4.

[0058] FIG. 4A and FIG. 4B show that inner box 1 is in the closed and open states, respectively. During the opening stroke of the inner box 1, that is, in the process of moving from the state as shown in FIG. 4A to the state as shown in FIG. 4B, the driving element 31 can drive the connecting piece 5 to move outwards in the opening direction D1. Thus, the connecting piece 5 can apply a driving force to the external connection terminal 4 in the opening direction D1 so as to enable the external connection terminal 4 to move synchronously with the inner box 1. As shown in FIG. 4C, when the inner box 1 moves along the opening direction D1 to its limit position of the opening stroke, the inner box 1 can continue to move along the opening direction D1, and the external connection terminal 4 and the connecting piece 5 are limited and thus do not continue to move along the opening direction D1. Therefore, the external connection terminal 4 is disengaged from the inner box 1.

[0059] FIG. 5 schematically illustrates some components of the detergent box assembly according to the exemplary embodiment of the present disclosure. FIG. 6 schematically illustrates a connecting piece 5 of the detergent box assembly according to the exemplary embodiment of the present disclosure. FIG. 7 schematically illustrates some components of the detergent box assembly as shown in FIG. 5 from different perspectives.

[0060] As shown in FIG. 5 and FIG. 6, the connecting piece 5 may include a limit housing 51, which is configured to be capable of limiting the external connection terminal 4 in the direction parallel to the opening direction D1. The connecting piece 5 may be fixedly connected to the external connection terminal 4 in the opening direction D1 by means of the limit housing 51. In particular, the limit housing 51 may circumferentially surround the external connection terminal 4 relative to the opening direction D1. Thus, especially when the connection is made or released between the external connection terminal 4 and the inner box 1, a stable and reliable connection between the connecting piece 5 and the external connection terminal 4 can be ensured.

[0061] Alternatively, the driving element 31 may be

fixed to the connecting piece 5 by a threaded connection. For example, a screw can pass through the driving element 31 and screwed into a threaded hole of the connecting piece 5 so as to fix the driving element 31 to the connecting piece 5, in particular to the limit housing 51.

[0062] The connecting piece 5 may include, for example, a sheath 52 used for accommodating at least a partial section of the cable 40 connected to the external connection terminal 4. The sheath 52 may extend in the opening direction D1. The sheath 52 can restrain the section of the cable 40 adjacent to the external connection terminal 4, so that the section is retained within the sheath 52 even if being deformed, thereby preventing the section of the cable 40 adjacent to the external connection terminal 4 from being uncontrollably moved and deformed during the opening and closing of the inner box 1. The cable 40 can thereby be protected. It also helps to prevent the inner box 1 from being stuck due to the cable 40 during movement. For example, it can prevent the phenomenon that the curled cable 40 gets stuck between inner box 1 and outer box 2, causing the inner box 1 to be stuck during movement. The sheath 52 may in particular circumferentially surround the cable 40 relative to the opening direction D1. In other words, the sheath 52 can limit the cable 40 therein, so that the cable 40 will not leave the sheath 52 in any direction perpendicular to the opening direction D1. Thus, it is possible to effectively limit the movement and deformation of the cable 40, and prevent the cable 40 from getting stuck between relatively moving components. The connecting piece 5 is particularly capable of achieving multiple functions in a simple and easy-to-install structure.

[0063] In a cross section perpendicular to the opening direction D1, the cross-sectional area of the sheath 52 may be smaller than that of the limit housing 51. Referring to FIG. 5 and FIG. 6, the cross-sectional area of the sheath 52 is significantly smaller than that of the limit housing 51, for example, it may be less than half of the cross-sectional area of the limit housing 51. The sheath 52 having a smaller cross section can effectively reduce the deformation of the cable 40 accommodated therein.

[0064] Referring to FIG. 6, the limit housing 51 may include, for example, a first portion 511 and a second portion 512. In a cross section perpendicular to the opening direction D1, the first portion 511 and the second portion 512 may have U-shaped cross sections. The first portion 511 and the second portion 512 are nested with each other, so that an opening of the first portion 511 is opposite to that of the second portion 512, and the two side walls of the first portion 511 are clamped by the two side walls of the second portion 512. Thus, the strength of the limit housing 51 can be enhanced. The external connection terminal 4 is located between the first portion 511 and the second portion 512. This structure helps to prevent the external connection terminal 4 from being accidentally detached from the limit housing 51. As shown in FIG. 7, for example, the external connection terminal 4 may be configured to be mounted to the first

portion 511 in the mounting direction D3 perpendicular to the opening direction D1 so as to be limited by the first portion 511 in the direction perpendicular to the mounting direction D3. For example, a slot extending along the mounting direction D3 may be formed in the first portion 511, and the external connection terminal 4 may be inserted into the slot and be limited in the opening direction D1. The second portion 512 may be configured to be mounted to the first portion 511 in the mounting direction D3. The first portion 511 and the second portion 512 may be engaged with each other, for example, by a buckled connection. The first portion 511 can particularly be constructed as a one-piece component with the sheath 52. By means of such a connecting piece 5, a stable and reliable connection between the connecting piece 5 and the external connection terminal 4 can be achieved in a simple manner. The assembling process between the external connection terminal 4 and the connecting piece 5 is simple and convenient. In other embodiments, the second portion 512 may also be omitted. For example, the connecting piece 5 may consist of the first portion 511 and the sheath 52.

[0065] As shown in FIG. 6, the sheath 52 may include a first wall 521 and a second wall 522 which are opposite to each other and extend in the opening direction D1, and the cable 40 is maintained between the first wall 521 and the second wall 522. The sheath 52 may further include at least one elastic arm 523 that extends from one of the first wall 521 and the second wall 522 to the other in a cantilevered manner. The elastic arm 523 may be configured to be able to undergo elastic deformation in the direction perpendicular to the opening direction D1. The at least one elastic arm 523 may include, for example, a plurality of elastic arms 523 spaced apart in the opening direction D1. Alternatively, the sheath 52 may further include a third wall opposite to the elastic arms 523, which extends in the opening direction D1 and connects the first wall 521 to the second wall 522. The cable 40 may press the elastic arms 523 from the outer sides of the elastic arms 523 so as to enter the sheath 52 by virtue of the elastic deformation of the elastic arms 523. Thus, the cable 40 can be installed inside the sheath 52 in a simple way without the need for additional components or tools. In the case where the elastic arms 523 are not deformed, the distances between the elastic arms 523 and the other of the first wall 521 and the second wall 522 may be smaller than the diameter of the cable 40. Thus, the elastic arms 523 may retain the cable 40 within the sheath 52. The distance may be set to be greater than or equal to 0. As an example, as shown in FIG. 6, the elastic arms 523 may extend from the first wall 521 to the second wall 522. Each of the elastic arms 523 may include a narrowed section abutted on to the first wall 521 and an expanded section distal from the first wall 521, where the narrowed section has a smaller cross-sectional area than the expanded section, which contributes to the elastic deformation of the elastic arms 523.

[0066] Returning to FIG. 4A and FIG. 4B, the detergent

box assembly further includes, for example, a deformable cable protector 6, and the cable protector 6 is configured to be capable of accommodating at least a partial section of the cable 40 connected to the external connection terminal 4. The cable protector 6 may be configured to deform synchronously with the movement of the external connection terminal 4 during the movement of the external connection terminal 4 in the opening direction D1 and/or the direction opposite to the opening direction D1. The cable protector 6 may limit the movement and deformation of the cable 40. The cable 40 can thereby be protected. In addition, the inner box 1 can be prevented from being stuck due to the cable 40 during movement.

[0067] The inner box 1 may for example be provided with a recess 13 for accommodating the cable protector 6. The cable protector 6 may be located within the recess 13 when the inner box 1 is at the closed position. Thus, it is helpful to reduce the size of the detergent box assembly.

[0068] Referring to FIG. 4A and FIG. 4B, the first end of the cable protector 6 may be kinetically coupled to the external connection terminal 4, and the second end of the cable protector 6 may be attached to the outer box 2. The first end of the cable protector 6 may be attached, for example, to the external connection terminal 4, or to the connecting piece 5. Thus, the first end of the cable protector 6 can move with the external connection terminal 4, so that the cable protector 6 can be deformed in synchronization with the movement of the external connection terminal 4. By attaching the second end of the cable protector 6 to the outer box 2, it helps to ensure that the cable protector 6 is deformed in a predetermined manner. In the processes of the opening and closing of the inner box 1, the cable protector 6 is always positioned within the accommodating cavity 20.

[0069] For example, the cable protector 6 may be configured to be able to undergo telescopic deformation and/or bending deformation in synchronization with the movement of the external connection terminal 4. Alternatively, the cable protector 6 may include a corrugated pipe, a telescopic sleeve and a drag chain 61.

[0070] Here, it is shown by way of example that the cable protector 6 is configured as the drag chain 61. The drag chain 61 includes a plurality of drag chain units 610. Every two adjacent drag chain units 610 in the plurality of drag chain units 610 are in a relatively rotatable connection with each other. The cable 40 passes through all the drag chain units 610 and extends within the drag chain 61. In the processes of the opening and closing of the inner box 1, the drag chain 61 can be deformed in a predetermined manner, thereby restricting the movement and deformation of the cable 40, see FIG. 4A and FIG. 4B. The drag chain 61 may in particular be arranged such that every two adjacent drag chain units 610 in the plurality of drag chain units 610 are in a relatively rotatable connection with each other about a rotation axis extending in the vertical direction, which contributes to a compact structure of the detergent box

assembly. In particular, there is no need to increase the height of the outer box 2. Alternatively, the plurality of drag chain units 610 are all located in the same horizontal plane, thereby preventing the drag chain 61 from interfering with the movement of the inner box 1. Especially when the inner box 1 is opened, the drag chain 61 will not sag below the inner box 1. It will be appreciated that it is acceptable for the drag chain 61 to have a slight sag.

[0071] The plurality of drag chain units 610 may include a first end unit 611 and a second end unit 612 which are respectively located at both ends of the drag chain 61, and at least one intermediate unit 613 located between the first end unit 611 and the second end unit 612. It is particularly advantageous that the at least one intermediate unit 613 is supported only by the drag chain units 610 adjacent thereto. For example, referring to FIG. 5, the first end unit 611 may be mounted to the connecting piece 5. The second end unit 612 may be mounted to the top wall 21 of the outer box 2. The intermediate unit 613 is arranged in a suspended manner above the inner box 1 without being in contact with the inner box 1 and the outer box 2. Thus, it is possible to prevent the drag chain 61 from rubbing against the inner box 1 or the outer box 2 during movement, thereby preventing abrasion and noise caused thereby. The drag chain 61 is arranged such that its drag chain units 610 are all located in the same horizontal plane, which helps to arrange the intermediate units 613 of the drag chain 61 in a suspended manner.

[0072] Alternatively, the connecting piece 5 may include the sheath 52, and the first end of the drag chain 61 may be attached to the end of the sheath 52 far away from the external connection terminal 4. The sheath 52 may be provided as described above. By using the sheath 52, the length of the drag chain 61 can be reduced, thereby helping to prevent the drag chain 61 from sagging. In this case, every two adjacent drag chain units 610 in the plurality of drag chain units 610 are in a relatively rotatable connection with each other about a rotation axis extending in the vertical direction, which is particularly advantageous to prevent the drag chain 61 from sagging.

[0073] Referring to FIG. 4A, in the case where the inner box 1 is at the closed position, the two ends of the sheath 52 are respectively located in front and rear of a second end of the drag chain 61 in the opening direction D1. Referring to FIG. 4C, in the case where the inner box 1 is at the limit position of the opening stroke, the end of the sheath 52 far away from the external connection terminal 4 is located in front of the second end of the drag chain 61 in the opening direction D1. It is beneficial for preventing the drag chain 61 from sagging. With the help of the sheath 52, the relative positions of the two ends of the drag chain 61 during movement can be set as needed. In the absence of the sheath 52 in the connecting piece 5, a first end of the drag chain 61 may be attached to the limit housing 51 of the connecting piece 5 or to the external connection terminal 4, for example. When the inner box 1 is at the closed position and at the limit position of the

opening stroke, the first end of the drag chain 61 will be located in front of the second end of the drag chain 61 in the opening direction D1. This arrangement will make it easier for the drag chain 61 to sag. In other words, this arrangement makes it difficult for the drag chain 61 to meet the requirements for the length of the cable 40 connected to the external connection terminal 4 without sagging.

[0074] Referring to FIG. 5 and FIG. 7, one end of the sheath 52 may be located at a first position in the closing direction D2 on the side facing the second end of the drag chain 61, and the other end of the sheath may be located at a second position in the closing direction D2 on the side facing away from the second end of the drag chain 61, the second position being located behind the first position in the opening direction D1, which helps to ensure that the drag chain 61 deforms in a predetermined manner.

[0075] FIG. 8A and FIG. 8B schematically illustrate a detergent box assembly according to another exemplary embodiment of the present disclosure, where the cable protector 6 is configured as a corrugated pipe 62.

[0076] Although specific implementation schemes have been described above, these implementation schemes are not intended to limit the scope provided in the present disclosure, even where only a single implementation scheme is described with respect to particular features. The examples of features provided in the present disclosure are intended for illustrative purposes rather than limiting, unless stated differently. In a specific implementation, multiple features may be combined with each other according to actual needs, where technically feasible. In particular, the features in the different embodiments may also be combined with one another. Various replacements, changes, and modifications may also be contemplated without departing from the spirit and scope of the present disclosure.

Claims

1. A detergent box assembly, comprising:

an inner box (1), used for containing detergent;
an outer box (2), provided with an accommodating cavity (20) for accommodating the inner box (1);
a driving mechanism (3); and
an external connection terminal (4), which is detachably connected to the inner box (1) so as to form an electrical connection with the inner box (1), wherein
during an opening stroke of the inner box (1), the inner box (1) is allowed to be driven to move outward from the accommodating cavity (20) in the opening direction by the driving mechanism (3); the driving mechanism (3) is capable of independently driving the external connection terminal (4) to move in the opening direction

- relative to the inner box (1), so that the external connection terminal (4) remains connected to the inner box (1); and
when the inner box (1) moves in the opening direction beyond its limit position of the opening stroke, the external connection terminal (4) is restricted in the opening direction and thus disconnected from the inner box (1).
2. The detergent box assembly according to claim 1, wherein
the driving mechanism (3) is connected to the inner box (1) only by means of the external connection terminal (4) so as to indirectly drive the inner box (1) to move in the opening direction by means of the external connection terminal (4).
 3. The detergent box assembly according to claim 1 or 2, wherein
the external connection terminal (4) is in a plug-in connection with the inner box (1), and the direction of the plug-in connection is parallel to the opening direction.
 4. The detergent box assembly according to any one of claims 1-3, wherein
the driving mechanism (3) comprises a driving element (31) movably arranged relative to the outer box (2), and the driving element (31) is connected to the external connection terminal (4) in a relatively immovable manner along the direction parallel to the opening direction.
 5. The detergent box assembly according to claim 4, wherein
the outer box (2) is provided with a limit structure (23), wherein
the limit structure (23) is configured to be capable of limiting the limit position of the driving element (31) moving in the opening direction relative to the outer box (2), indirectly limiting the limit position of the external connection terminal (4) moving in the opening direction relative to the outer box (2); or
the limit structure (23) is configured to be capable of limiting the limit position of the external connection terminal (4) moving in the opening direction relative to the outer box (2), indirectly limiting the limit position of the driving element (31) moving in the opening direction relative to the outer box (2).
 6. The detergent box assembly according to claim 4 or 5, wherein
the detergent box assembly further comprises a connecting piece (5), and the connecting piece (5) is connected to the driving element (31) and the external connection terminal (4) in a relatively immovable manner along the direction parallel to the opening direction.
 7. The detergent box assembly according to claim 6, wherein
the connecting piece (5) comprises at least one of the following:
a limit housing (51), configured to be capable of limiting the external connection terminal (4) in the direction parallel to the opening direction; and
a sheath (52), used for accommodating at least a partial section of a cable (40) connected to the external connection terminal (4), the sheath (52) extending in the opening direction.
 8. The detergent box assembly according to claim 7, wherein
in a cross section perpendicular to the opening direction, the cross-sectional area of the sheath (52) is smaller than that of the limit housing (51); and/or
the limit housing (51) circumferentially surrounds the external connection terminal (4) relative to the opening direction; and/or
the sheath (52) circumferentially surrounds the cable (40) relative to the opening direction.
 9. The detergent box assembly according to claim 7 or 8, wherein
the limit housing (51) comprises a first portion (511) and a second portion (512), wherein in a cross section perpendicular to the opening direction, the first portion (511) and the second portion (512) have U-shaped cross sections, and the first portion (511) and the second portion (512) are nested with each other, so that an opening of the first portion (511) is opposite to that of the second portion (512), and the two side walls of the first portion (511) are clamped by the two side walls of the second portion (512), wherein
the external connection terminal (4) is located between the first portion (511) and the second portion (512); and/or
the external connection terminal (4) is configured to be mounted to the first portion (511) in the mounting direction perpendicular to the opening direction so as to be limited by the first portion (511) in the direction perpendicular to the mounting direction; and/or
the second portion (512) is configured to be mounted to the first portion (511) in the mounting direction perpendicular to the opening direction;

and/or

the first portion (511) and the sheath (52) are constructed as a one-piece component.

10. The detergent box assembly according to any one of claims 7-9, wherein

the sheath (52) comprises a first wall (521) and a second wall (522) which are opposite to each other and extend in the opening direction, the cable (40) being maintained between the first wall (521) and the second wall (522); the sheath (52) further comprises at least one elastic arm (523) that extends from one of the first wall (521) and the second wall (522) to the other in a cantilevered manner, wherein

the elastic arm (523) is configured to be able to undergo elastic deformation in the direction perpendicular to the opening direction; and/or in the case where the elastic arm (523) is not deformed, the distance between the elastic arm (523) and the other of the first wall (521) and the second wall (522) is smaller than the diameter of the cable (40).

11. The detergent box assembly according to any one of claims 4-10, wherein

the driving element (31) is configured as a rack, which is arranged on the outer side of the outer box (2) facing away from the accommodating cavity (20), wherein

a guide slot (24) extending along the opening direction is formed at the outer side of the outer box (2) facing away from the accommodating cavity (20), the rack is slidably arranged in the guide slot (24), the guide slot (24) is provided with a through hole (25), and the rack is connected to the external connection terminal (4) located in the accommodating cavity (20) through the through hole (25); and/or

the driving mechanism (3) further comprises a damping gear (32) engaged with the rack, and the damping gear (32) is arranged at the outer side of the outer box (2) facing away from the accommodating cavity (20); and/or

the driving mechanism (3) also comprises an elastic element (33) used for providing a driving force to enable the inner box (1) to move outward in the opening direction during the opening stroke of the inner box (1), wherein the elastic element (33) is arranged at the outer side of the outer box (2) facing away from the accommodating cavity (20), one end of the elastic element (33) is fixed to the rack, and the other end of the elastic element (33) is fixed to the outer box (2).

12. The detergent box assembly according to any one of

claims 1-11, wherein

the detergent box assembly further comprises a deformable cable protector (6), and the cable protector (6) is configured to be capable of accommodating at least a partial section of the cable (40) connected to the external connection terminal (4); and the cable protector (6) is configured to deform synchronously with the movement of the external connection terminal (4) during the movement of the external connection terminal (4) in the opening direction and/or the direction opposite to the opening direction.

13. The detergent box assembly according to claim 12, wherein

the cable protector (6) is configured to be able to undergo telescopic deformation and/or bending deformation in synchronization with the movement of the external connection terminal (4); and/or

one end of the cable protector (6) is kinetically coupled to the external connection terminal (4), and the other end of the cable protector (6) is attached to the outer box (2); and/or the cable protector (6) comprises at least one of the following: a corrugated pipe, a telescopic sleeve, and a drag chain (61).

14. The detergent box assembly according to any one of claims 11-13, wherein

the cable protector (6) is configured as the drag chain (61), and the drag chain (61) comprises a plurality of drag chain units, wherein

the drag chain (61) is arranged such that every two adjacent drag chain units in the plurality of drag chain units are in a relatively rotatable connection with each other about a rotation axis extending in the vertical direction; and/or the plurality of drag chain units are all located in the same horizontal plane; and/or

the plurality of drag chain units comprise a first end unit (611) and a second end unit (612) which are respectively located at both ends of the drag chain (61), and at least one intermediate unit (613) located between the first end unit (611) and the second end unit (612), the at least one intermediate unit (613) being supported only by the drag chain units adjacent thereto.

15. The detergent box assembly according to any one of claims 12-14, wherein

in the case where the inner box (1) is at the closed position, the two ends of the sheath (52) are respectively located in front and rear of a second end of the drag chain (61) in the

opening direction; and
in the case where the inner box (1) is at the limit
position of the opening stroke, the end of the
sheath (52) far away from the external connec- 5
tion terminal (4) is located in front of the second
end of the drag chain (61) in the opening direc-
tion.

- 16.** The detergent box assembly according to any one of
claims 12-15, wherein 10
one end of the sheath (52) is located at a first position
in the closing direction on the side facing the second
end of the drag chain (61), and the other end of the
sheath (52) is located at a second position in the 15
closing direction on the side facing away from the
second end of the drag chain (61), the second posi-
tion being located behind the first position in the
opening direction.

- 17.** The detergent box assembly according to any one of 20
claims 12-16, wherein

the inner box (1) is provided with a recess (13)
for accommodating the cable protector (6),
wherein the cable protector (6) is located within 25
the recess (13) when the inner box (1) is at the
closed position; and/or
the cable protector (6) is arranged in a sus-
pended manner above the inner box (1) such
that the cable protector (6) does not come into 30
contact with the inner box (1).

- 18.** A washing machine, wherein the washing machine
comprises the detergent box assembly according to
any one of claims 1-17. 35

40

45

50

55

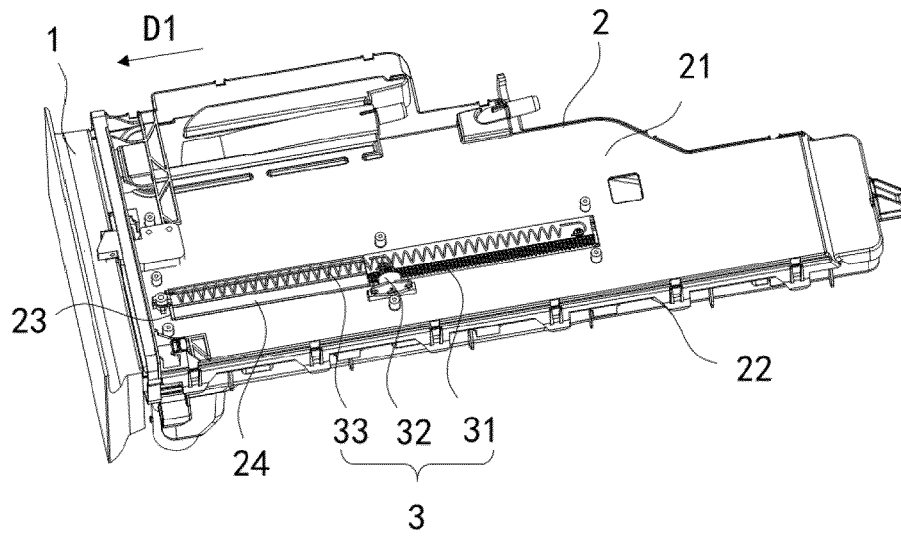


FIG. 1A

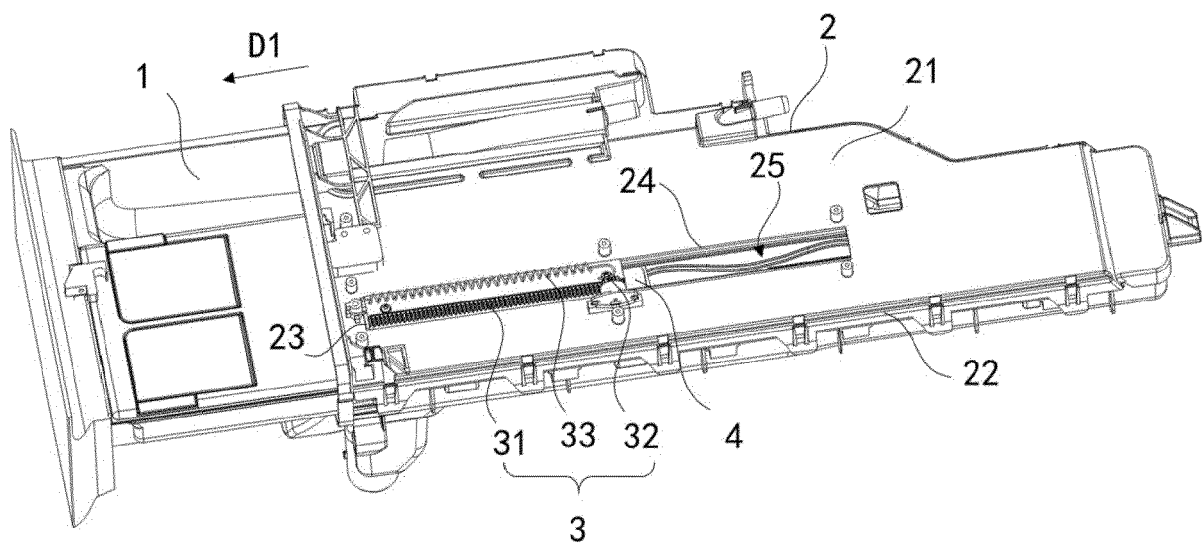


FIG. 1B

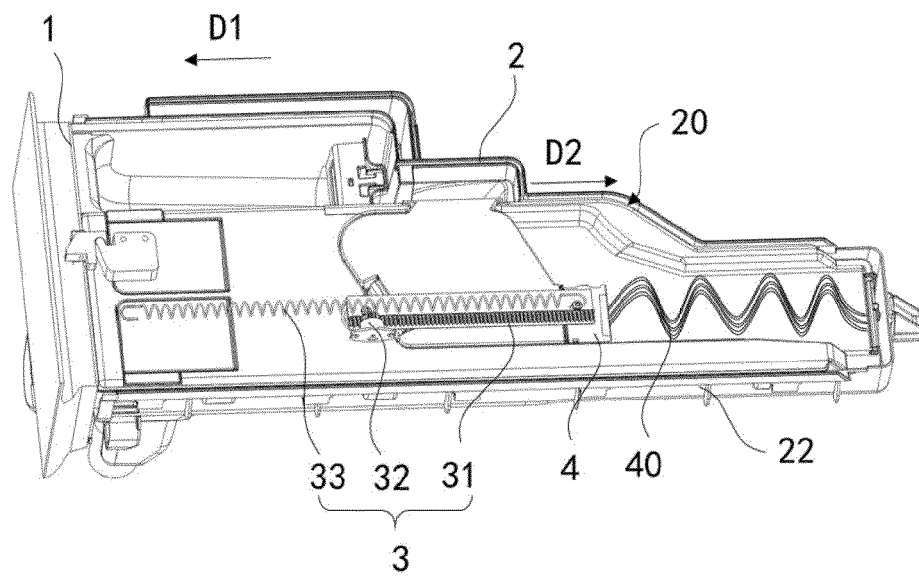


FIG. 2A

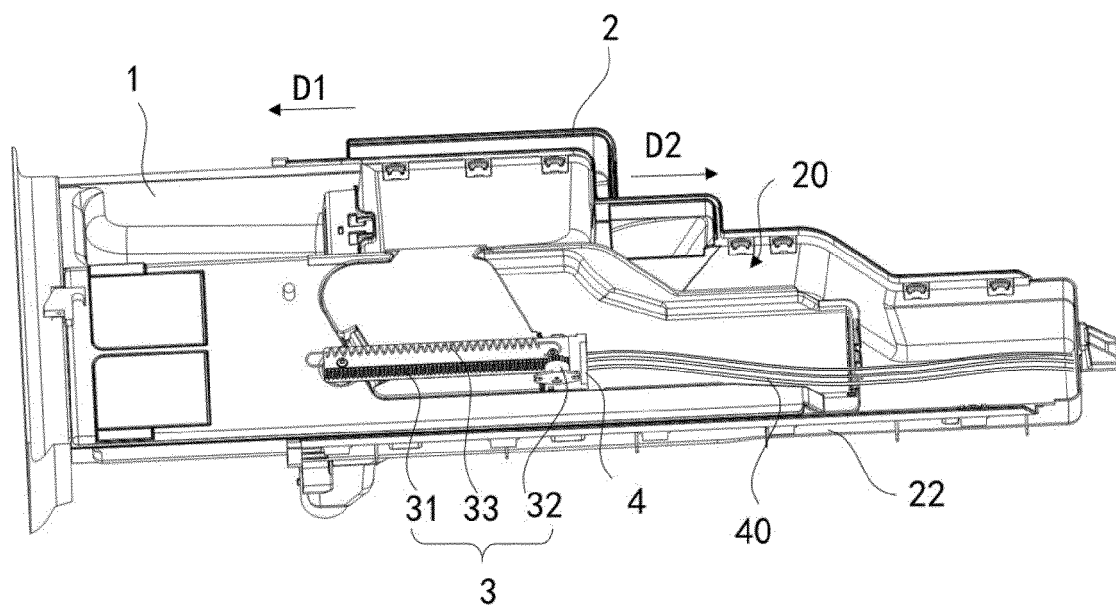


FIG. 2B

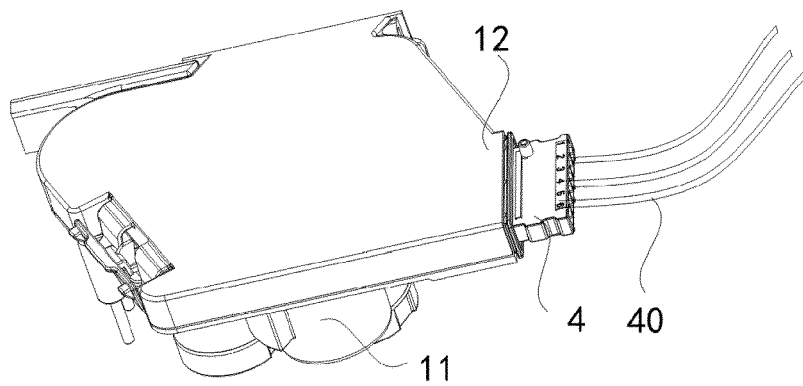


FIG. 3

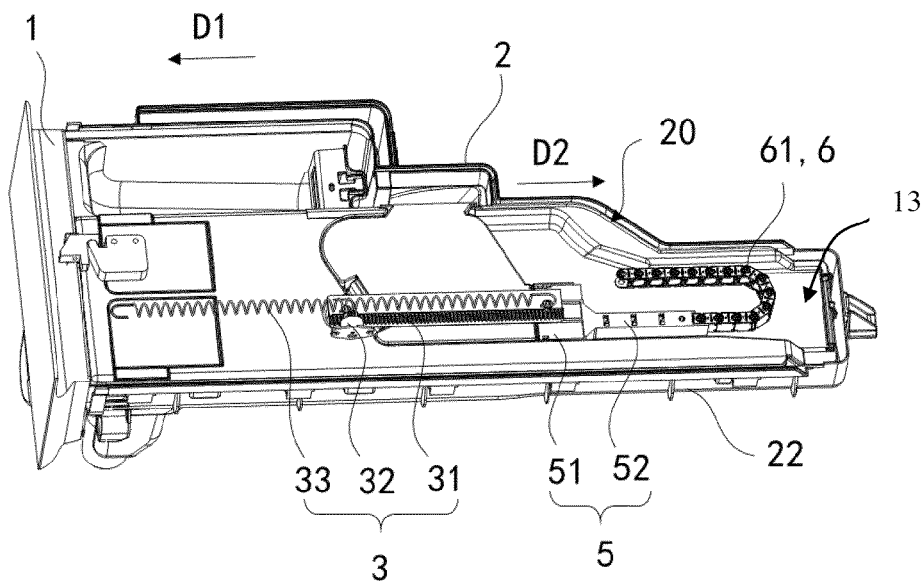


FIG. 4A

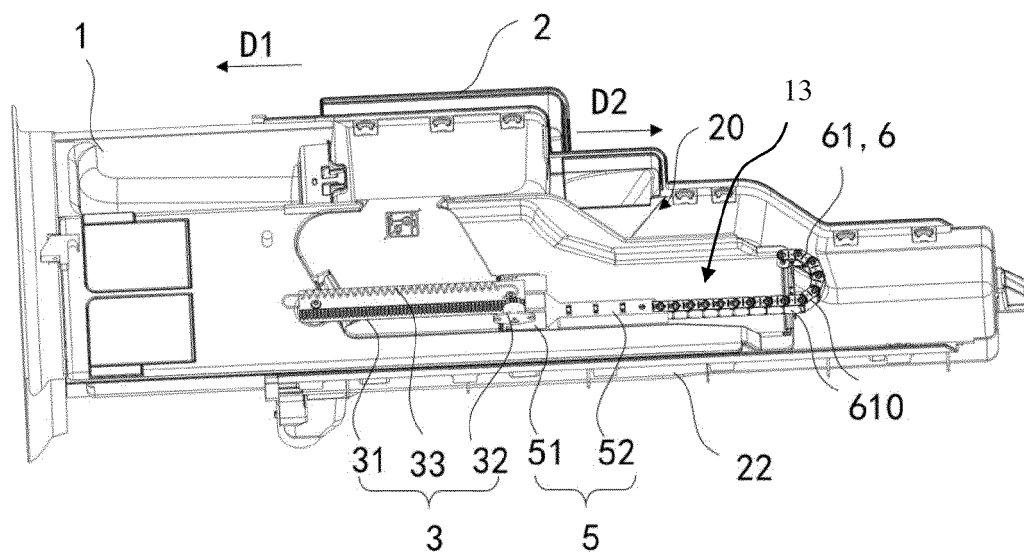


FIG. 4B

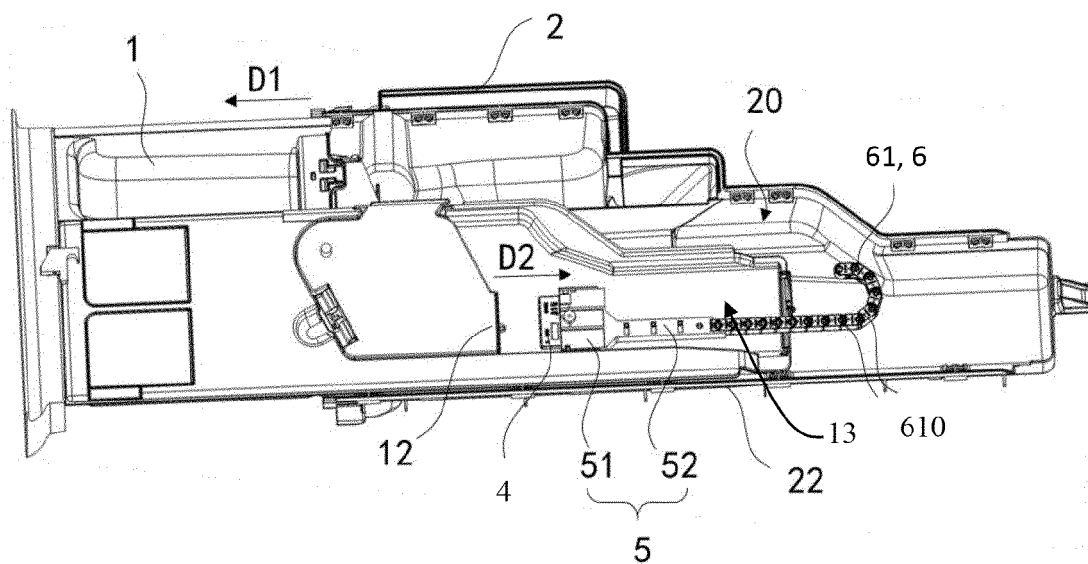


FIG. 4C

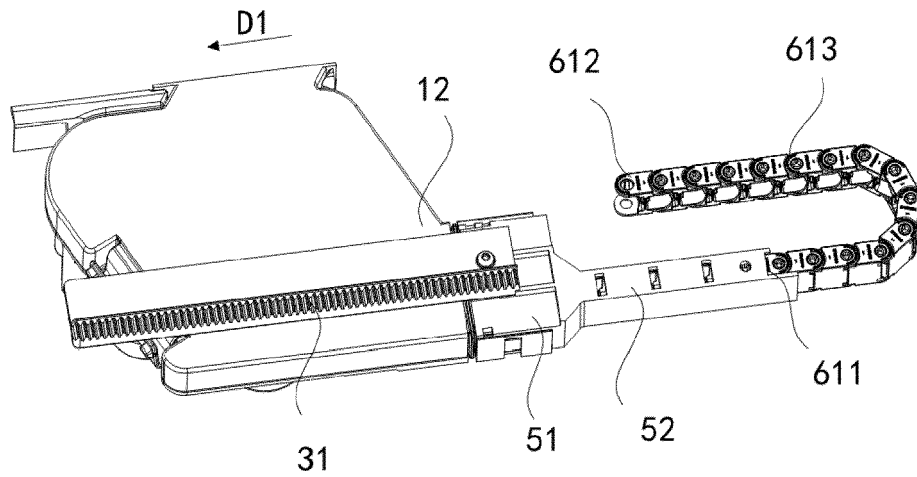


FIG. 5

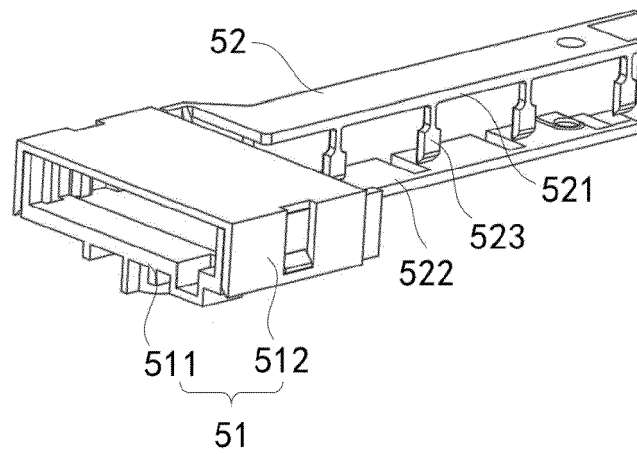


FIG. 6

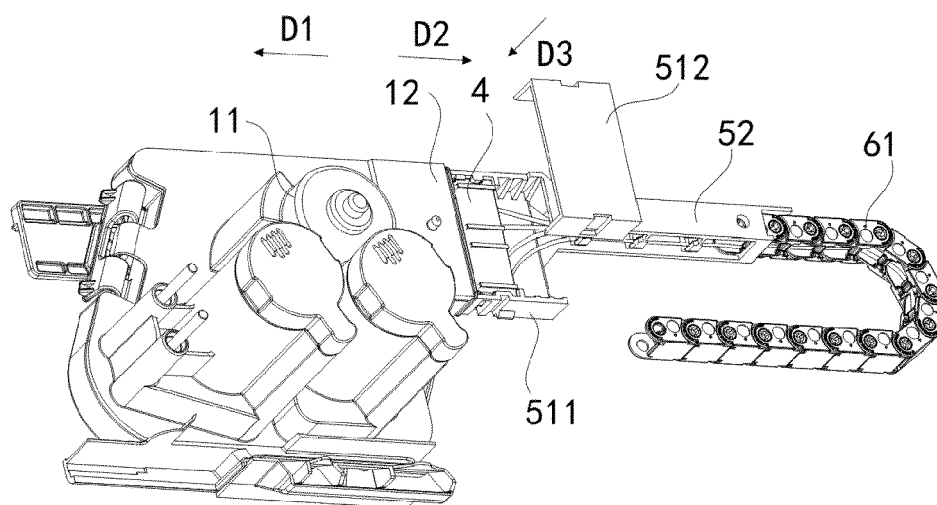


FIG. 7

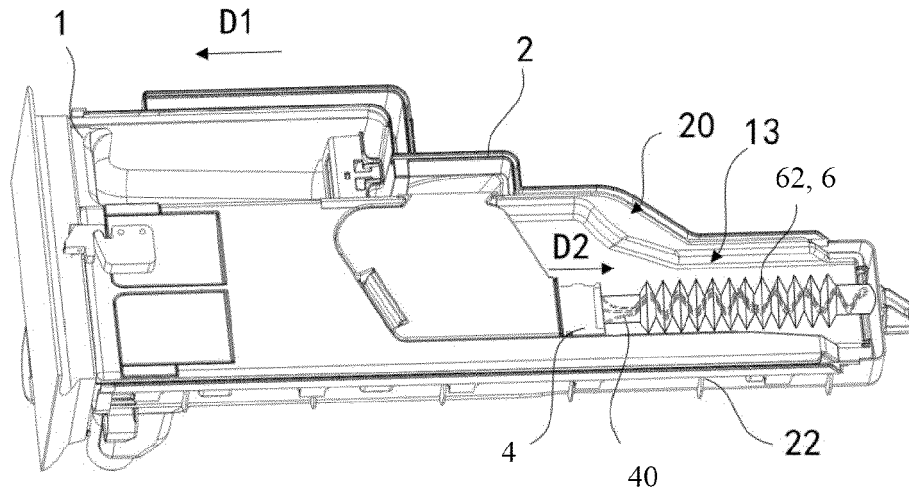


FIG. 8A

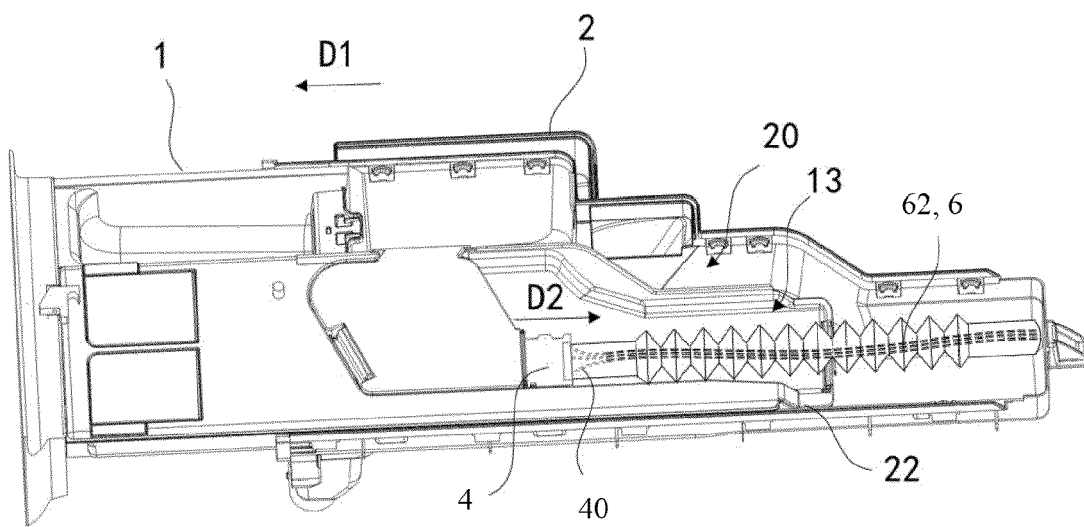


FIG. 8B



EUROPEAN SEARCH REPORT

Application Number

EP 24 17 4269

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	CN 210 886 649 U (NANJING ZHONGJINGKE ELECTRONIC TECH CO LTD) 30 June 2020 (2020-06-30) * figures 8-10 * * claim 1 *	1, 3, 18	INV. D06F39/02
A	EP 3 988 705 A1 (BSH HAUSGERAETE GMBH [DE]) 27 April 2022 (2022-04-27) * figure 1 *	1-18	
A	WO 2021/040469 A1 (LG ELECTRONICS INC [KR]) 4 March 2021 (2021-03-04) * figures 8a-8d *	1-18	
			TECHNICAL FIELDS SEARCHED (IPC)
			D06F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		26 September 2024	Werner, Christopher
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

EP 24 17 4269

5

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

26 - 09 - 2024

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CN 210886649	U	30-06-2020	NONE	

EP 3988705	A1	27-04-2022	CN 114381914 A	22-04-2022
			EP 3988705 A1	27-04-2022

WO 2021040469	A1	04-03-2021	AU 2020223729 A1	18-03-2021
			CN 112442859 A	05-03-2021
			CN 117802742 A	02-04-2024
			CN 117802743 A	02-04-2024
			CN 117802744 A	02-04-2024
			EP 3786341 A1	03-03-2021
			EP 4112800 A1	04-01-2023
			EP 4112801 A1	04-01-2023
			EP 4119717 A1	18-01-2023
			JP 7225172 B2	20-02-2023
			JP 2021030093 A	01-03-2021
			JP 2022179769 A	02-12-2022
			US 2021062395 A1	04-03-2021
			WO 2021040469 A1	04-03-2021

EPO FORM P0459

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