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(54) **DOOR HANDLE ARRANGEMENT WITH INNER AND OUTER HANDLE**

(57) The present invention relates to a door handle arrangement (1) for arrangement on a door (100), the door handle arrangement comprising an outer handle (10) configured to be arranged on a first side of the door (100), an inner handle (20) configured to be arranged on a second side of the door (100), opposite said first side, a cam unit (30) moveable between a locking position in which it is configured to lock, when in use, a door (100) relative the door frame (110), and an open position in which it is configured to, when in use, enable opening of the door (100) relative to the door frame (110), an actuation mechanism (40) configured to translate operation of the outer handle (10) and the inner handle (20) to movement of the cam unit (30) between the locking position and the open position, an outer handle lock (50) configured to, in a locking state prevent operation of the actuation mechanism (40) by means of the outer handle (10), and to, in an unlocking state, enable operation of the actuation mechanism (40) to move the cam unit (30) to the locking position or open position, wherein operation of the actuation mechanism (40) is enabled by means of the inner handle (20) irrespective of the state of the outer handle lock (50).

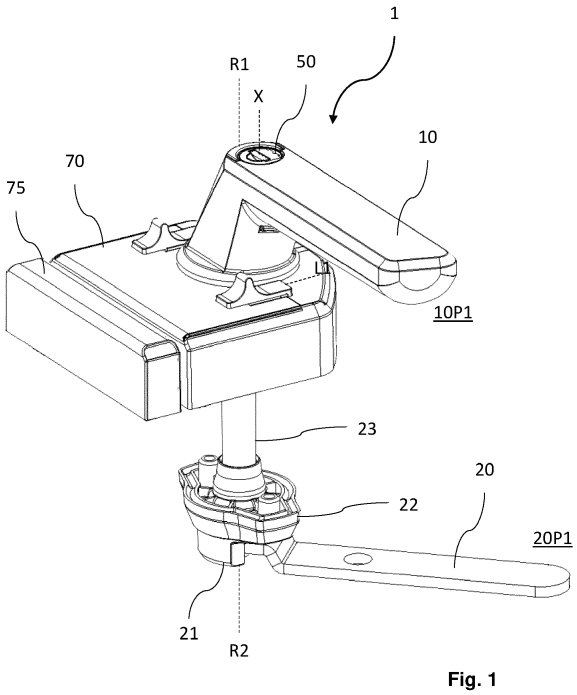

Fig. 1

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Description

Technical Field

[0001] The present disclosure relates to a door handle arrangement, and especially to a door handle arrangement with an inner and an outer handle.

Background

[0002] In certain circumstances, it is desirable that a handle arrangement for arrangement to a door can be operated from one side of the door even if the handle arrangement has been locked from the opposite side. Such a handle arrangement would be of use for instance for a door to a cold storage room. The handle arrangement would prevent unauthorized access into the cold storage room while allowing a person inside the cold storage room to get out in the event the door would be closed behind him. However, due to the limited space in a handle arrangement, it is difficult to arrange an outer handle lock in the handle arrangement. Some consequences may be a larger handle arrangement housing or added complexity to the handle arrangement. Hence, there is a need for an improved solution which alleviates problems associated with the position of the outer handle lock.

Summary

[0003] It is an object of the present invention to provide an improved solution that alleviates the mentioned drawbacks with present devices. Furthermore, it is an object to provide a reliable handle arrangement which provides the desired function.

[0004] The invention is defined by the appended independent claims, with embodiments being set forth in the appended dependent claims, in the following description and in the drawings.

[0005] According to a first aspect of the present invention, a door handle arrangement for arrangement on a door is provided. The door handle arrangement comprises an outer handle configured to be arranged on a first side of the door, an inner handle configured to be arranged on a second side of the door, opposite said first side, a cam unit moveable between a locking position in which it is configured to lock, when in use, a door relative the door frame, and an open position in which it is configured to, when in use, enable opening of the door relative to the door frame, an actuation mechanism configured to translate operation of the outer handle and the inner handle to movement of the cam unit between the locking position and the open position, and an outer handle lock configured to, in a locking state prevent operation of the actuation mechanism by means of the outer handle, and to, in an unlocking state, enable operation of the actuation mechanism by means of the outer handle, to move the cam unit to the locking position or open position, wherein operation of the actuation mechanism is enabled by means of the inner handle irrespective of the state of the outer handle lock.

[0006] By providing a handle arrangement wherein the outer handle is prevented from actuating the actuation mechanism in the locked state, and wherein the inner handle irrespective is enabled to operate the actuation mechanism, a reliable solution may be provided for an arrangement with the desired function of the inner handle in combination with the function of the outer handle. The outer handle lock may be arranged as an integrated part of the outer handle. The outer handle lock may thereby move correspondingly as the outer handle when the outer handle is operated.

[0007] The outer handle may be a handle configured to be arranged on the side of the door being on the outside of a compartment, space, room or similar to which the door provides access. The inner handle may be a handle configured to be arranged on the opposite side of such door, on the inside of a compartment, space, room or similar to which the door provides access. Hence, even if the door is closed and the outer handle lock is locked to prevent unauthorized access to the compartment, space or room inside the door, any person being inside such location may still be able to open the door.

[0008] The actuation mechanism may comprise components that interact with the inner handle and the outer handle to provide operation of the cam unit as a response to movement of the respective handles. In one embodiment, the movements of the handles may be rotational. Such rotational movement of a handle may be translated by the actuation mechanism to a rotational or linear movement of the cam unit. The outer handle lock may be provided as an intermediate member between the outer handle and the actuation mechanism. In the locking state, there may be no interaction or coupling between the outer handle and the actuation mechanism, at least no interaction that provides a movement of the cam unit to the open position. In the unlocking state, an interaction between the outer handle lock and the actuation mechanism may be enabled, such that movement of the outer handle is transferred as movement to the cam unit. The inner handle may have an interaction or coupling with the actuation mechanism that is present irrespective of the state of the outer handle lock. With the outer handle lock in the locked state, the actuation mechanism may be operated using the inner handle, without affecting or moving the outer handle. Movement of the inner handle for movement of the cam unit towards the open position, when the outer handle lock is in the unlocking state, may include corresponding movement of at least a portion of the outer handle lock.

[0009] According to one embodiment, the operation of the actuation mechanism may be enabled by a coupling member which, when the outer handle lock is in an unlocking state, is in a position to rotatably couple the outer handle with the actuation mechanism. The coupling member may be part of the outer handle lock.

[0010] According to one embodiment, the coupling

member may be rotatably moveable between a coupling position in which it rotatably couples the outer handle with the actuation mechanism and an uncoupling position in which the outer handle is uncoupled from the actuation mechanism. The coupling member may be rotated in and out of coupling engagement with the actuation mechanism. The coupling member may be rotated together with the outer handle when being rotated. In the uncoupling position, a rotation of the outer handle and thereby also the coupling member may have no effect on the actuation mechanism. When the coupling member is in the coupling position, a rotation of the outer handle, providing rotation of the coupling member in engagement with the actuation mechanism, may provide actuation of the actuation mechanism and thereby also of the cam unit.

[0011] According to one embodiment, the actuation mechanism may comprise an actuation member configured to rotate by means of the inner handle in all circumstances and also configured to rotate by means of the outer handle only when the outer handle lock is in the unlocked state. The cam unit may also be configured to be rotatable between the locking position and the unlocking position. The actuation member may comprise a set of cogs for rotatably engaging with a corresponding set of cogs on the cam unit. Thus, the inner handle or the outer handle may be operated so as to translate a movement via the actuation member to the cam unit to rotate it between the locking position and the unlocking position.

[0012] According to one embodiment, the actuation mechanism may comprise a first actuation member configured to rotate by means of the outer handle when the outer handle lock is in the unlocked state, and a second actuation member configured to rotate by means of the inner handle, wherein the actuation members may be configured to rotatably couple to the cam unit so as to move it between the locking position and the open position. The respective actuation members may provide actuation of the cam unit based on movement of the outer and the inner handles, respectively. The first actuation member may be in engagement with the coupling member, when the coupling member is in the coupling position, to translate movement of the outer handle and the coupling member to movement of the cam unit. The second actuation member may be in engagement with the inner handle to translate movement thereof to movement of the cam unit, irrespective of the state or movement of the outer handle lock and the outer handle.

[0013] According to one embodiment, the first actuation member may comprise a coupling recess for receiving the coupling member when the outer handle lock is in an unlocking state. The coupling member may, in the coupling position, be positioned in or at the coupling recess of the first actuation member so as to engage with the first actuation member. By engagement between the coupling member and the first actuation member it may be meant that movement of the coupling member may cause movement of the first actuation member. In case the coupling member is rotated when the outer handle is operated, the rotational movement of the coupling member may be transferred to the first actuation member as rotational movement. When the coupling member is in the uncoupling position, the coupling member may be outside the coupling recess, such that movement of the coupling member does not affect the first actuation member.

[0014] According to one embodiment, the coupling member and the actuation mechanism coupling portion may be provided with an inclined interface with respect to the rotational axis of the coupling member by which interact when the coupling member rotates about the cylinder lock axis into a coupling position.

[0015] According to one embodiment, the coupling member may have a cross-sectional shape along its rotational axis in the shape of a circle sector having a curved boundary such that the coupling member, in the uncoupling position, is outside the coupling recess. The rotational axis of the coupling member may in one embodiment be substantially the same as a longitudinal axis of the coupling member. The shape of the coupling member may thereby be selected to provide coupling in the coupling position and not in the uncoupling position. In another embodiment, the rotational axis of the coupling member may be separated from the longitudinal axis of the coupling member, i.e. outside the coupling member itself, such that the coupling member may rotate in and out of coupling with the first actuation member and the coupling recess irrespective of the shape of the coupling member. In another embodiment, the coupling member may be moved in a substantially non-rotational manner in and out of coupling with the first actuation member, such as a linear movement in a direction perpendicular to the rotational axis of the outer handle.

[0016] According to one embodiment, the coupling recess may be elongated in a circumferential direction of the actuation member. One or more ridges may extend along a circumference on the first actuation member, forming at least one coupling recess as an opening in or between a ridge or ridges. The coupling recess may thereby extend along said circumference. When the coupling member engage with the first actuation member, in the coupling position, it may engage with said ridges by pushing in the direction of movement.

[0017] According to one embodiment, the door handle arrangement may comprise at least one coupling member blocker. The coupling member blocker may be an element configured to move between a retracted position in which position it blocks the coupling member from moving fully to a position at which the cam unit is in its open position and an extended position in which position the coupling member is allowed to fully move to a position at which the cam unit is moved to its open position. The coupling member blocker may be configured to linearly move between the retracted position and the extended position along a first sliding axis. The door handle arrangement may comprise a coupling member blocker spring configured to bias the coupling member blocker

into the retracted position. The coupling member blocker may comprise a coupling member blocker grip for facilitated gripping of the coupling member blocker when moving the coupling member blocker between the retracted position and the extended position. The coupling member blocker may provide a housing part sized and shaped so as to conform with the housing. The coupling member may be plate shaped extending in a plane perpendicular to the rotational axis of the coupling member. By having a coupling member blocker, the coupling member may, when being in a coupling position with the actuation mechanism, in one step be moveable only a part of the moving distance towards the position at which the cam unit is in its open position. At such intermediate position, when the coupling member is blocked from further movement by the coupling member blocker, the cam unit may be in an intermediate position at which it has moved from its closed position but may still be in engagement with the cam unit receiver. In the intermediate position, the compression between the door and the door frame may have been decreased due to the movement of the cam unit from the closed position but opening of the door relative to the door frame may still be prevented. To fully move the cam unit to the open position, the coupling member blocker may be moved to the extended position, thereby enabling further movement of the coupling member, and thereby also the outer handle. Hence, from the outer side, the door may only be fully opened by means of the outer handle by first moving the outer handle a portion of its rotational movement towards open position, moving the coupling member blocker to the extended position, and then moving the outer handle for full opening of the door. The inner handle may not be affected by the coupling member blocker, providing that opening form the inside is always enabled in full, with any intermediate position preventing full opening of the door. The first sliding axis may extend in a direction perpendicular to the rotational axis of the coupling member and/or the outer handle and/or the first and/or second actuation member.

[0018] According to one embodiment, there may be provided a door handle arrangement comprising the outer handle, the cam unit, the actuation mechanism, the outer handle lock, the coupling member and the coupling member blocker as in any of the embodiments presented above, but without the inner handle. Such door handle arrangement may provide an effective two stage opening of the door with the coupling member blocker providing a safety solution for the user.

[0019] According to one embodiment, the door handle arrangement may be configured so as to allow reconfiguration of the door handle arrangement for left-hinged door or right-hinged doors. The door handle arrangement may be configured so that this reconfiguration is enabled by simply rotating the outer handle and inner handle respectively 180 degrees. The first actuation member may be sized and shaped so as to provide a coupling recess for each type of configuration. The door handle arrangement may comprise two coupling member blocker, wherein one coupling member blocker is configured to provide blocking for one configuration and wherein another coupling member blocker is configured to provide blocking for the other configuration.

[0020] According to one embodiment, the cam unit may be rotatably arranged so as to rotate between the locking position and the open position. When the actuation mechanism is operated following operation of either the inner or the outer handle, the cam unit may rotate to the locking or open position. In case the actuation mechanism comprises the first actuation member and the second actuation member, one or both of the actuation members may be rotated to operate the cam unit. The actuation member may be formed integrated with the cam unit, or comprise coupling means to transfer the rotational movement of the actuation members to the cam unit.

[0021] According to one embodiment, the cam unit may be rotatable arranged to the housing by means of a cam unit axle. In one embodiment, the cam unit axle may be adjustable so as to adjust the position of the cam unit along the cam unit rotational axis. By this, different levels of compression for a door is enabled.

[0022] According to one embodiment, the first and second actuation members each comprises a set of cogs configured to rotatably engage with corresponding respective first and second sets of cam unit cogs to rotate the cam unit between the locking position and the open position. In one embodiment, the first and second set of cam unit cogs may be integrated to be formed as one set of cam unit cogs, a part thereof configured to engage with the cogs of the first actuation member, and another part thereof configured to engage with the cogs of the second actuation member. The sets of cogs of the actuation members may be configured to transfer rotational movement of the respective actuation member, following operation of the respective handle, to the cam unit to be rotated between the locking position and the open position.

[0023] According to one embodiment, the first and second set of cam unit cogs of the cam unit may be axially displaced along the rotational axis of the cam unit. The first and second actuation members may be axially displaced along the rotational axis of either or both of the actuation members. The rotational axis of the first actuation member may coincide with the rotational axis of the second actuation member. The rotational axes of the actuation members may be separated from the rotational axis of the cam unit. The rotational axes of the actuation members may extend in parallel with the rotational axis of the cam unit. The two set of cam unit cogs may in one embodiment be rotationally fixed relative to each other. Hence, no matter which of the actuation members is rotated, such rotation may be transferred to the cam unit and both sets of cam unit cogs. This may also provide that a rotational movement of the first actuation member may be transferred to a rotational movement of the second actuation member, via the cam unit and its sets of

cam unit cogs. This further provides that an operation of the outer handle, when the outer handle lock is in the open state, provides a movement of the inner handle via the second actuation member. This also applies in the opposite direction when the outer handle lock is in the open state. In another embodiment, the first and second sets of cam unit cogs may be rotatable relative to each other, such that an operation of the outer handle causes movement of the first set of cam unit cogs to move the cam unit to the open position, and at the same time the second set of cam unit cogs is configured not to rotate correspondingly. Similarly, when the inner handle is operated to cause the cam unit to move to the open position via the second set of cam unit cogs, the first set of cam unit cogs may be configured not to rotate correspondingly.

[0024] According to one embodiment, the cogs of the first set of cam unit cogs may have a different pitch than the cogs of the second set of cam unit cogs. It may be desired to have different configuration of the outer handle and the inner handle in terms of how it should be operated to fully move the cam unit to the open position. By having separate sets of cam unit cogs for the first and second actuation members to engage with, with different pitch, the amount of rotational movement for the respective handles needed to fully move the cam unit may differ.

[0025] According to one embodiment, the outer handle and the inner handle may be rotatable around a common rotational axis. The rotational axes of the inner handle and the outer handle may thereby coincide. This may provide a stable construction through the handle arrangement, wherein the rotational axis of the two handles extend through the door. However, the outer and inner handle may not necessarily be directly rotationally fixed relative to each other along said rotational axis but may in some embodiments by rotationally coupled to each other via other components of the arrangement as discussed above. The door handle arrangement may comprise a shaft extending through the door to connect the inner handle with the adjustment mechanism. Said shaft may extend along the rotational axis of the handles. In embodiments wherein the handle arrangement comprises the first and second actuation member, the rotational axes of the first and second actuation member may further coincide with the rotational axis of the outer and inner handles. The rotational axis of the coupling member may be separated from but in parallel with the rotational axis of the handles.

[0026] According to one embodiment, the door handle arrangement may comprise a pre-biased slider unit configured to move relative the housing along a second sliding axis toward an extended position at which the slider unit extends out of the housing. The slider unit may be configured so that it, when the cam unit is in a locking position, extends out of the housing into the cam unit receiver. The slider unit may in the extended position abut an interior of the cam unit receiver. When the cam unit is moved from the locking position to the unlocking position, the door handle arrangement may be configured so that cam unit coupling member engages with the slider unit, thereby causing the slider unit to move away from the extended position to a retracted position. When the cam unit moves to the fully open position, the slider unit may be fully retracted out of the cam unit receiver opening, thereby allowing the cam unit receiver to disengage from the rest of the door handle arrangement, which consequently allows a door to be opened. In one embodiment, slider unit may be configured to linearly move between the extended position and the retracted position. In one embodiment, the slider unit may be biased toward the extended position by means of one or more slider unit springs. In one further embodiment, the door handle arrangement may be configured so that when operation of the inner and outer handles is cancelled, the one or more slider unit spring push the slider unit toward the extended position, thereby preventing accidental closing of the door in the door frame. Further, if the door is closed, the slider unit may facilitate the cam unit to move from the open position to the locking position.

[0027] According to one embodiment, the door handle arrangement may comprise an inner housing member and the slider unit may be configured to engage with the inner housing member. The inner housing member may be sized and shaped so as to define two slider unit recesses by which corresponding portions of the slider unit may interact in a sliding manner. The sliding unit may comprise one or more, preferably two, slider unit stops configured to abut an interior of the cam unit received when in the fully extended position. The sliding unit may comprise one or more, preferably two, additional slider unit stops configured to abut the inner housing member in the fully retracted position. By this, further movement is hindered in this direction. The sliding unit may comprise an opening through which an axle of the cam unit extends. The opening may be elongated so as to enable the sliding unit to move between the extended and retracted position.

[0028] The second sliding axis may extend in a direction perpendicular to the rotational axis of the cam unit. The second sliding axis may extend in a direction in parallel with the first sliding axis.

[0029] According to one embodiment, the sliding unit may comprise a set of cam unit recesses sized and shaped so as to allow the cam unit coupling member to be rotated there into and to allow the cam unit coupling member to be securely received when in the open position.

[0030] According to a second aspect of the present invention, a door comprising a door handle arrangement according to any of the embodiments above may be provided. The door may be arranged to be openable relative to a door frame. The door handle arrangement may be configured to enable or prevent opening of the door relative to the door frame.

Brief Description of the Drawings

[0031] The invention will in the following be described in more detail with reference to the enclosed drawings, wherein:

Fig. 1 shows a perspective view of the handle arrangement according to one embodiment;
Fig. 2 shows a close-up perspective side view of the internal components of the handle arrangement according to one embodiment when the outer handle lock is in a locking state according to one embodiment;
Fig. 3 shows a close-up perspective rear view of the internal components of the handle arrangement according to one embodiment when the outer handle lock is in a locking state according to one embodiment;
Fig. 4 shows a perspective view of the handle arrangement when the inner handle is operated when the outer handle lock is in a locking state according to one embodiment;
Fig. 5 shows a perspective side view of the handle arrangement wherein the cam unit is in the open position when the outer handle lock is in a locking state according to one embodiment;
Figs. 6-7 show perspective side views of the handle arrangement when the outer handle lock is in an unlocking state according to one embodiment;
Figs. 8-9 show perspective side views of the handle arrangement when the cam unit is operated into an open position by means of the outer handle;
Figs. 10 - 13 show cross sectional views of the actuation mechanism and the outer handle lock in various positions according to one embodiment;
Fig 14 show the handle arrangement according to one embodiment when arranged to a door;
Fig. 15 shows a perspective view of the internal components of the handle arrangement according to one embodiment;
Fig. 16 shows the coupling member of the door handle arrangement according to one embodiment;
Fig. 17 shows the door handle arrangement according to one embodiment;
Fig. 18 shows a cross sectional view of the door handle arrangement according to one embodiment;
Figs. 19-20 show a perspective view of the internal components of the door handle arrangement according to one embodiment;
Figs. 21 - 22 show a perspective view of some of the components of the door handle arrangement according to one embodiment.

Description of Embodiments

[0032] The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, like numbers refer to like elements.

[0033] Fig. 1 shows a perspective view of the door handle arrangement 1 according to one embodiment. The door handle arrangement 1 comprises an outer handle 10 and an inner handle 20. Although not shown in Fig. 1, the outer handle 10 is configured to be arranged on a first side of the door 100 while the inner handle 20 is configured to be arranged on a second side of the door, opposite said first side. See further fig. 14.

[0034] The outer handle 10 is configured to rotate about a first rotational axis R1 between a first position 10P1 and a second position 10P2. Likewise, the inner handle 20 is configured to rotate about a second rotational axis R2 between a first position 20P1 and a second position 20P2. In the embodiment shown in Fig. 1, the first and the second rotational axes R1, R2 are parallel and aligned coaxially. However, the door handle arrangement 1 may be configured so that the first and second rotational axes R1, R2 are offset relative each other.

[0035] As further seen in figs. 3-13, the door handle arrangement 1 further comprises a cam unit 30 which is configured to be moveable between a locking position in which it is configured to lock, when in use, a door 100 relative the door frame 110, and an open position in which it is configured to, when in use, enable opening of the door 100 relative to the door frame 110. The door handle arrangement 1 further comprises an actuation mechanism 40 configured to translate operation of the outer handle 10 and the inner handle 20 to movement of the cam unit 30 between the locking position and the open position.

[0036] Both the cam unit 30 and the actuation mechanism 40 are arranged inside a housing 70. The cam unit 30 and the actuation mechanism 40 are hidden from view by the housing 70 in fig. 1 but are visible in e.g. Figs. 2 and 3.

[0037] The door handle arrangement 1 further comprises a cam unit receiver 75. The housing 70 is provided with a side opening configured to face a cam unit receiver opening 76 (see e.g. Figs. 2 and 3). In the locking position, the cam unit 30 is configured to extend into the opening 76 of the cam unit receiver 75 and engage with the cam unit receiver 75. In the open position, the cam unit 30 is configured to be retracted or moved at least partly into the housing 70 so that the cam unit 30 disengages from the cam unit receiver 75. The cam unit receiver is configured to be arranged to a door frame 110. Thus, the door handle arrangement 1 may lock a door 100 to a door frame by means of the cam unit 30 and the cam unit receiver 75.

[0038] The door handle arrangement 1 further comprises an outer handle lock 50 configured to, in a locking

state prevent operation of the actuation mechanism 40 by means of the outer handle 10, and to, in an unlocking state, enable operation of the actuation mechanism 40 by means of the outer handle 10 to move the cam unit 30 to the locking position or open position. The outer handle lock 50 is arranged to extend into the outer handle 10 along a cylinder lock axis X. The door handle arrangement 1 may be configured so that the rotational axis of the outer handle 10, i.e. the first rotational axis R1, and the cylinder lock axis X are parallel. In the embodiment shown in Fig. 1, the first rotational axis R1 and the cylinder lock axis X are parallel and mutually offset from each other. In one embodiment, the outer handle lock 50 is a cylinder lock configured to rotate about the cylinder lock axis X.

[0039] The door handle arrangement 1 is further configured such that operation of the actuation mechanism 40 is enabled by means of the inner handle 20 irrespective of the state of the outer handle lock 50. The inner handle lock 20 comprises an inner handle coupling portion 21 which is configured to couple to the actuation mechanism 40 via an inner handle shaft 23. The inner handle shaft 23 extends through a through-hole of an inner handle door plate 22 configured to be attached to the second side of the door 100.

[0040] Figs. 2 and 3 show close-up perspective side and rear views of the internal components of the handle arrangement 1 according to one embodiment. A top part of the housing 70 is omitted from view, leaving only a house bracket 71 on which the components of the door handle arrangement 1 are arranged. The house bracket 71 may be configured to be attached to a first side of the door, to arrange the housing 70 to the door. In Fig. 2, the cam unit 30 is in a locking position 30P1. As explained in relation to Fig. 1, the cam unit 30 is configured to extend into a cam unit receiver opening 76 when in the locking position. In addition, the cam unit 30 comprises a cam unit coupling member 31 which is configured to, when the cam unit 30 is in the locking position, to engage with a cam unit receiver protrusion 77 arranged inside the cam unit receiver 75. The cam unit receiver protrusion 77 extends from an inside wall of the cam unit receiver 75 in a direction toward the side configured to face the door frame 110 when the cam unit receiver 75 is arranged thereto. At the tip of the protrusion 77, a cam unit receiver protrusion recess 78 is arranged which is shaped so as to receive the cam unit coupling member 31 when the cam unit is in the locking position 30P1.

[0041] Moreover, as indicated in Fig. 2, the cam unit 30 is rotatably arranged to the housing 70 and rotatable about a cam unit axis C. The cam unit 30 may upon operation of the outer handle 10 or the inner handle 20 move between the locking position 30P1 and the unlocking position.

[0042] In addition to the cam unit 30 and the actuation mechanism 40, the door handle arrangement 1 comprises a coupling member 60. The operation of the actuation mechanism 40 is enabled by the coupling member 60 which, when the outer handle lock 50 is in an unlocking state, is in a position to rotatably couple the outer handle 10 with the actuation mechanism 40.

[0043] As can be seen in Fig. 2, the actuation mechanism 40 comprises a first actuation member 41 configured to rotate by means of the outer handle 10 when the outer handle lock is in the unlocked state. The actuation mechanism 40 further comprises a second actuation member 42 configured to rotate by means of the inner handle 20. The actuation members 41, 42 are configured to rotatably couple to the cam unit 30 so as to move it between the locking position and the open position.

[0044] Both the first and the second actuation members 41, 42 each comprises a set of cogs 43, 44 configured to rotatably engage with corresponding respective first and second sets of cam unit cogs 33, 34 to rotate the cam unit 30 between the locking position 30P1 and the open position. The first and second set of cam unit cogs 33, 34 of the cam unit 30 are axially displaced along the rotational axis of the cam unit 30. The first and second set of cam unit cogs 33, 34 are rotationally fixed relative to each other.

[0045] The cam unit 30 comprises a substantially cylindrical portion and the first and second set of cam unit cogs 33, 34 are arranged to extend outward from the cam unit 30. Likewise, the first and second actuation members 41, 42 also comprises substantially cylindrical portions and the first and second set of cam unit cogs 43, 44 are arranged to extend outward from the first and second actuation members 41, 42 respectively.

[0046] The cogs of the first set of cam unit cogs 33 have a different pitch than the cogs of the second set of cam unit cogs 34. This is more readily shown in Fig. 10, wherein the first set of cam unit cogs 33 has a first pitch 33Z and the second set of cam unit cogs 34 has a second pitch 34Z. The first pitch 33Z and the second pitch 34Z are different, which can be seen that the cogs of the first and second set 33, 34 facing the actuation member 41, 42 are aligned more closely on top of each other than the cogs of the first and second set of cam unit cogs facing towards the sides.

[0047] The actuation mechanism 40 further comprises an actuation member coupling portion 46 and the coupling member 60 is configured to abut the actuation member coupling portion 46 when the outer handle lock 50 is in an unlocking state. Thereby, the outer handle 10 can, when operated, move the cam unit 30 between the locking position and the open position.

[0048] Further, the coupling member 60 is rotatably moveable between a coupling position in which it rotatably couples the outer handle 10 with the actuation mechanism 40 and an uncoupling position in which the outer handle is uncoupled from the actuation mechanism. The coupling member 60 is configured to be rotatable about the cylinder lock axis X (see e.g. Fig. 1) so that it couples and decouples with the actuation mechanism 40 when the outer handle lock 50 is operated accordingly.

[0049] The first actuation member 41 comprises a cou-

pling recess 45 for receiving the coupling member 60 when the outer handle lock 50 is in an unlocking state. The actuation mechanism coupling portion 46 may be provided on the first actuation member 41. The coupling recess 45 of the first actuation member 41 may be defined by the size and shape of the actuation mechanism coupling portion 46. In the illustrated embodiment, the actuation member coupling portion 46 is formed as two ridges each extending along a portion of the circumference of the first actuation member 41, forming the coupling recess 45 by the distance between the ridges.

[0050] In one embodiment, the coupling member 60 has a cross sectional shape along its rotational axis X in the shape of a circle sector having a curved boundary such that the coupling member, in the uncoupling position, is outside the coupling recess. Further, the coupling recess 45 is elongated in a circumferential direction of the first actuation member 41.

[0051] In Figs. 2 and 3, the coupling member 60 is in a position where it does not couple with the actuation mechanism coupling portion; rather, it is rotated so that a curved inner side faces toward the first rotational axis R1. By the curvature of the curved inner side face and the position of the coupling member 60, the first actuation member 41 can be rotate without the coupling member 60 preventing it from doing so. Hence, when the outer handle lock 50 is in a locking position, the inner handle 20 may be rotated about the second rotational axis R2 from the first position 20P1 to a second position 20P2 as indicated by the direction of the arrow in Fig. 4. This rotation of the inner handle 20 consequently causes the second actuation member 42 to rotatably interact with the cam unit via the second set of cam unit cogs 34, thereby causing the cam unit 30 to rotate about the cam unit axis C from the locking position 30P1 to an open position. However, since the coupling member 60 is not coupled with the first actuation member 41, the outer handle 10 remains in the first position 10P1 despite the first actuation member 41 being forced to rotate due to cog interaction with the cam unit 30. As can be seen in Fig. 5, the coupling member 60 resides outside the actuation mechanism coupling portion 46.

[0052] Further, in the case where the coupling member 60 is rotated, by means of the outer handle lock 50, into a coupling position, operation of the cam unit is enabled by the outer handle 10. This case is shown in Figs. 6 and 7. When rotating the outer handle 10 about the first rotational axis R1 from the first position 10P1 in the direction indicated in Fig. 8 to a second position 10P2, the cam unit 30 is rotated to an open position and the inner handle 10 also rotates. Specifically, the cam unit 30 can be rotated into a fully open position 30P2 as shown in Figs. 8 and 9.

[0053] This working principle is further shown by means of cross-sectional views depicted in Figs. 10-12. In Fig. 10, the coupling member 60 is rotated away from a coupling position so that the curved inner side faces the first and second rotational axis R1, R2. In Fig. 11, the coupling member 60 is rotated about the axis X so that it is in a position to couple with the actuation mechanism coupling portion 46. Upon operation of the outer handle 10, the coupling member 60 slides along the coupling recess 45 until it abuts the actuation mechanism coupling portion 46, see Fig. 12. Continued operation of the outer handle 10 then causes the first actuation member 41 to rotate about the first rotational axis R1, thereby causing the cam unit 30 to rotate away from the locking position 30P1 toward the open position 30P2.

[0054] Moreover, in one embodiment, the coupling member 60 is configured to reside in a housing recess 72 when the outer handle lock 50 is in a locking position. By this, operation of the outer handle 10 is prevented as the coupling member 60 rotationally fixes the outer handle 10 with the housing 70.

[0055] The door handle arrangement 1 may comprise attachment means for attaching the housing 70 to a door 100, and the cam unit receiver 75 to a door frame 110 as shown in Fig. 14. When the handle arrangement 1 is in a closed position, i.e. the cam unit 30 couples with the cam unit receiver 75, thereby holding the door 100 hinged to the door frame 110 by means of the hinges 120 in a shut state. Depending on whether the outer handle lock 50 is in a locking state or an unlocking state, the door 100 may be correspondingly opened. Further, due to the design of the door handle arrangement 1, the door 100 may be opened using the inner door handle 20, thereby ensuring that the door handle arrangement 1 only provides locking functionality in one opening direction.

[0056] Figs. 15 and 16 illustrate one embodiment of the present invention. In this embodiment, the first actuation member 41 and the second actuation member 42 of the actuation mechanism 40 engages with only a single set of cam unit cogs 33 of the cam unit 30. The cogs 43, 44 of the first and second actuation member 41, 42 may be identical in shape. They may have a different thickness along the rotational axis.

[0057] Further, the coupling member 60 and the actuation mechanism coupling portion are each provided with an inclined interface with respect to the rotational axis of the coupling member by which they interact when the coupling member 60 rotates about the cylinder lock axis X into a coupling position. The inclined interface of the actuation mechanism coupling portion is provided in a coupling recess 45 configured to receive the coupling member 60.

[0058] Fig. 17 shows a further embodiment of the present invention. The door handle arrangement 1 comprises at least one coupling member blocker 65. The purpose of the coupling member blocker 65 is to provide a two-step unlocking process of the door handle arrangement 1 and the door 100 to which the door handle arrangement 1 is arranged. The first step involves unlocking the outer handle lock 50 to an unlocking state, which moves the coupling member into a position for coupling with the actuation mechanism 40. The second step includes moving the coupling member 60, by means of the

outer handle 10, to operate the actuation mechanism 40 such that the cam unit 30 is moved towards the open position. However, the coupling member 60, and thereby also the outer handle 10, is only moveable a part of the distance towards the open position 10P2. The coupling member blocker 65 prevents the coupling member 60 from further rotation at an intermediate position. At this intermediate position, also the cam unit 30 has moved from the locking position 30P1 towards the open position 30P2 but stopped at an intermediate position. At this intermediate position, the cam unit 30 may still be engage with the cam unit receiver 75 such that full opening of the door 100 relative to the door frame 110 may be prevented. In the intermediate position, the cam unit 30 may be in a position where the compression between the door 100 and the door frame 110 has decreased.

[0059] In a third step, a sliding of the coupling member blocker 65 may be provided a distance d from a retracted position to an extended position in a sliding direction L1 so as remove a blocking edge 653 of the coupling member blocker 65 which is configured to block the coupling member 60 from moving the full distance towards the open position 30P2 of the cam unit 30. When the coupling member blocker 65 is in the retracted position, the coupling member 60 is only enabled to move a certain distance along with the actuation mechanism 40 before being blocked by the blocking edge 653 of the coupling member blocker 65. Hence, when the outer handle 10 is operated to open the door 100 and move the cam unit 30 to the open position 30P2, the outer handle 10 is rotated towards the open position 10P2, thereby moving the coupling member 60 to act on the actuation mechanism 40. At an intermediate position, the coupling member 60 is prevented from further movement by the coupling member blocker 65, leaving the cam unit 30 at an intermediate position. To fully open the door 100 and move the cam unit 30 to the open position 30P2, the coupling member blocker 65 is moved to the extended position such that the coupling member 60 is enabled to move further. The outer handle 10, the coupling member 60 and the cam unit 30 can thereby move to the open position 30P2 of the cam unit 30 to open the door 100.

[0060] Further, the coupling member blocker 65 may comprise a coupling member blocker grip 651 for facilitated gripping of the coupling member blocker 65 when moving the coupling member blocker between the retracted position and the extended position.

[0061] Further, the coupling member blocker 65 may provide a housing part 652 sized and shaped so as to conform with the housing 70.

[0062] Moreover, the coupling member blocker 65 may be biased toward the retracted position. By this, the coupling member blocker 65 may return to the retracted position from an extended position. The coupling member blocker 65 may be biased toward the retracted position by means of a coupling member blocker spring 654, see Fig. 18. The coupling member blocker spring 654 may be arranged so that one longitudinal end abuts the coupling member blocker spring 654 and an opposite longitudinal end abuts an interior part of the housing 70, for instance an inside wall of the housing 70. The coupling member blocker 65 may provide a spring recess for housing at least a portion of the coupling portion blocker spring 654 so as to keep it aligned accordingly. The housing 70 may be sized and shaped so as to enable the coupling member blocker 65 to linearly move in a controlled manner.

[0063] In addition, the door handle arrangement 1 may provide fail-safe closing functionality as shown in Figs. 18 - 22. This is enabled by means of a pre-biased slider unit 74 configured to move relative the housing 70 along a second sliding axis L2 under influence of one or more slider unit springs 744 towards an extended position at which the slider unit 74 extends out of the housing 70. Further, the slider unit 74 is configured so that it, when the cam unit 30 is in a locking position, extends into the cam unit receiver 75. The slider unit 74 may in the extended position abut an interior of the cam unit receiver 75 through the opening 76. When the cam unit 30 is moved from the locking position to the open position, the door handle arrangement 1 is configured so that the cam unit coupling member 31 engages with the slider unit 74, thereby causing the slider unit 74 to move toward a retracted position, in which position the slider unit 74 is retracted at least partly into the housing 70. Thus, when the cam unit 30 moves to the fully open position 30P2, the slider unit 74 is fully retracted out of the cam unit receiver opening 76, thereby allowing the cam unit receiver 75 to disengage from the rest of the door handle arrangement 1, which consequently allows a door 100 to be opened. However, when operation of the inner and outer handles is cancelled, the one or more slider unit springs 744 may push the slider unit 74 into the extended position, thereby preventing accidental closing of the door 100 in the door frame 110. Further, if the door is closed, the slider unit 74 may facilitate the cam unit 30 to move from the fully open position 30P2 towards the locking position 30P1.

[0064] The door handle arrangement 1 comprises an inner housing member 73 and the slider unit 74 is configured to engage with the inner housing member 73 as shown in Figs. 21 - 22. The inner housing member 73 is sized and shaped so as to define two slider unit recesses 731 by which corresponding portions of the slider unit 74 interacts in a sliding manner. The sliding unit 74 comprises a set of first slider unit stops 741 for abutting an interior of the cam unit receiver 75 in the fully extended position. The sliding unit 74 comprises a set of second slider unit stops 742 for abutting with the inner housing member 73 in the fully retracted position.

[0065] The door handle arrangement 1 further comprises a set of slider unit springs 744 arranged to extend along a slider unit recess 731 and a slider unit spring recess 745, and further configured to bias the slider unit 74 into the extended position.

[0066] In addition, the sliding unit 74 comprises a cam

unit axle opening 746 through which an axle of the cam unit 30 axle extends, which rotatably couples the cam unit 30 to the housing 70. The opening 746 is elongated so as to enable the sliding 74 unit to slide along the second sliding axis L2.

[0067] Moreover, the sliding unit 74 comprises a set of cam unit recesses sized and shape so as to allow the cam unit coupling member 31 to be rotated there into and also securely receive the cam unit 30 in the fully open position 30P2.

[0068] In the drawings and specification, there have been disclosed preferred embodiments and examples of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for the purpose of limitation, the scope of the invention being set forth in the following claims.

Reference List

[0069]

R1. First rotational axis
R2. Second rotational axis
C. Cam unit rotational axis
X. Cylinder lock axis
L1. First sliding axis
L2. Second sliding axis
1. Door handle arrangement
10. Outer handle
10P1. First outer handle position
10P2. Second outer handle position
20. Inner handle
20P1. First inner handle position
20P2. Second inner handle position
21. Inner handle coupling portion
22. Inner handle door plate
23. Inner handle axle
30. Cam unit
31. Cam unit coupling member
33. First set of cam unit cogs
33Z. First cam unit cog pitch
34. Second set of cam unit cogs
34Z. Second cam unit cog pitch
40. Actuation mechanism
41. First actuation member
42. Second actuation member
43. First actuation member cog set
44. Second actuation member cog set
45. Coupling recess
46. Actuation mechanism coupling portion
50. Outer handle lock
60. Coupling member
65. Coupling member blocker
651. Coupling member blocker grip
652. Housing part
653. Blocking edge
654. Coupling member blocker spring
70. Housing
71. Housing bracket
711. Slider unit spring stop
72. Housing recess
73. Inner housing member
731. Slider unit recess
732. Curved side wall
74. Slider unit
741. First slider unit stop
742. Second slider unit stop
743. Cam unit recess
744. Slider unit spring
745. Slider unit spring recess
746. Cam unit axle opening
75. Cam unit receiver
76. Cam unit receiver opening
77. Cam unit receiver protrusion
78. Cam unit receiver protrusion recess
100. Door
110. Door frame
120. Door hinge

Claims

1. A door handle arrangement (1) for arrangement on a door (100), the door handle arrangement comprising
an outer handle (10) configured to be arranged on a first side of the door (100),
an inner handle (20) configured to be arranged on a second side of the door (100), opposite said first side,
a cam unit (30) moveable between a locking position in which it is configured to lock, when in use, a door (100) relative the door frame (110), and an open position in which it is configured to, when in use, enable opening of the door (100) relative to the door frame (110),
an actuation mechanism (40) configured to translate operation of the outer handle (10) and the inner handle (20) to movement of the cam unit (30) between the locking position and the open position,
an outer handle lock (50) configured to, in a locking state prevent operation of the actuation mechanism (40) by means of the outer handle (10), and to, in an unlocking state, enable operation of the actuation mechanism (40) to move the cam unit (30) to the locking position or open position,
wherein operation of the actuation mechanism (40) is enabled by means of the inner handle (20) irrespective of the state of the outer handle lock (50).

2. Door handle arrangement (1) according to claim 1, wherein the operation of the actuation mechanism (40) is enabled by a coupling member (60) which, when the outer handle lock (50) is in an unlocking state, is in a position to rotatably couple the outer handle (10) with the actuation mechanism (40).

3. Door handle arrangement according to claim 2, wherein the coupling member (60) is rotatably moveable between a coupling position in which it rotatably couples the outer handle (10) with the actuation mechanism (40) and an uncoupling position in which the outer handle is uncoupled from the actuation mechanism.

4. Door handle arrangement (1) according to any of claims 1 - 3, wherein the actuation mechanism (40) comprises a first actuation member (41) configured to rotate by means of the outer handle (10) when the outer handle lock is in the unlocked state, and a second actuation member (42) configured to rotate by means of the inner handle (20), wherein the actuation members (41, 42) are configured to rotatably couple to the cam unit (30) so as to move it between the locking position and the open position.

5. Door handle arrangement (1) according to claim 4, wherein the first actuation member (41) comprises a coupling recess (45) for receiving the coupling member (60) when the outer handle lock (50) is in an unlocking state.

6. Door handle arrangement (1) according to any of claims 4-5, wherein the coupling member (60) has a cross sectional shape along its rotational axis in the shape of a circle sector having a curved boundary such that the coupling member, in the uncoupling position, is outside the coupling recess (45).

7. Door handle arrangement (1) according to any of claims 5-6, wherein the coupling recess (45) is elongated in a circumferential direction of the actuation member (41, 42).

8. Door handle arrangement (1) according to any of claims 1 - 7, wherein the cam unit (30) is rotatably arranged so as to rotate between the locking position and the open position.

9. Door handle arrangement (1) according to claim 8, wherein the first and second actuation members (41, 42) each comprises a set of cogs (43, 44) configured to rotatably engage with corresponding respective first and second sets of cam unit cogs (31, 32) to rotate the cam unit (30) between the locking position and the open position.

10. Door handle arrangement (1) according to claim 9, wherein the first and second set of cam unit cogs (31, 32) of the cam unit (30) are axially displaced along the rotational axis of the cam unit (30).

11. Door handle arrangement (1) according to any of claims 9 - 10, wherein the cogs of the first set of cam unit cogs (31) have a different pitch than the cogs of the second set of cam unit cogs (32).

12. Door handle arrangement (1) according to claim 10, wherein the first and second set of cam unit cogs (33, 34) are rotationally fixed relative to each other.

13. Door handle arrangement (1) according to any of the claims 2-12, further comprising a coupling member blocker (65) moveable between a retracted position and an extended position, wherein the coupling member blocker in the retracted position is configured to prevent the coupling member from operating the actuation mechanism (40) to fully move the cam unit (30) to the open position, and in the extended position is configured to enable the coupling member to operate the actuation mechanism to move the cam unit to the open position.

14. Door handle arrangement (1) according to any of the preceding claims wherein the outer handle (10) and the inner handle (20) are rotatable around a common rotation axis.

15. A door comprising a door handle arrangement (1) according to any of claims 1 - 14.

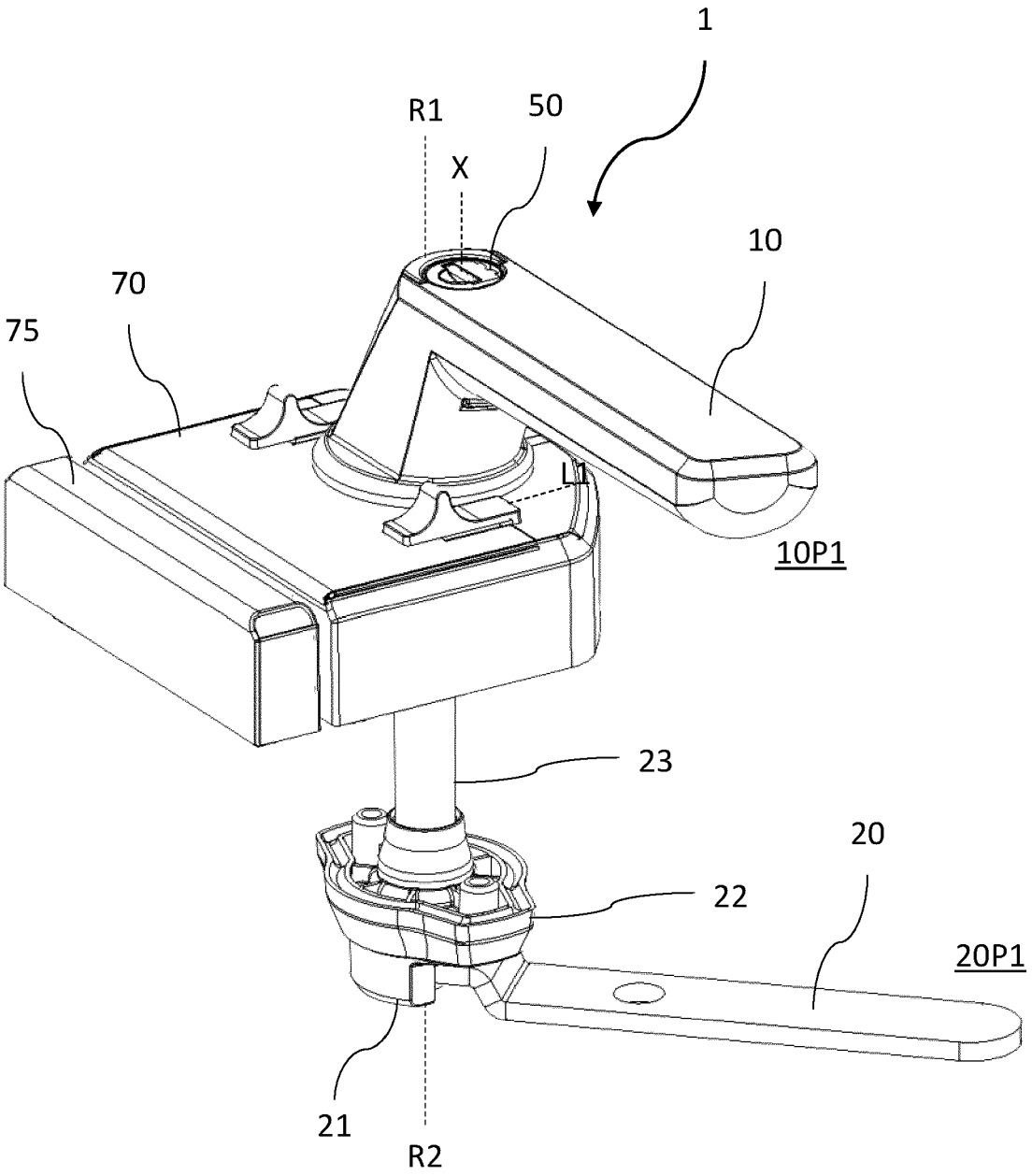

Fig. 1

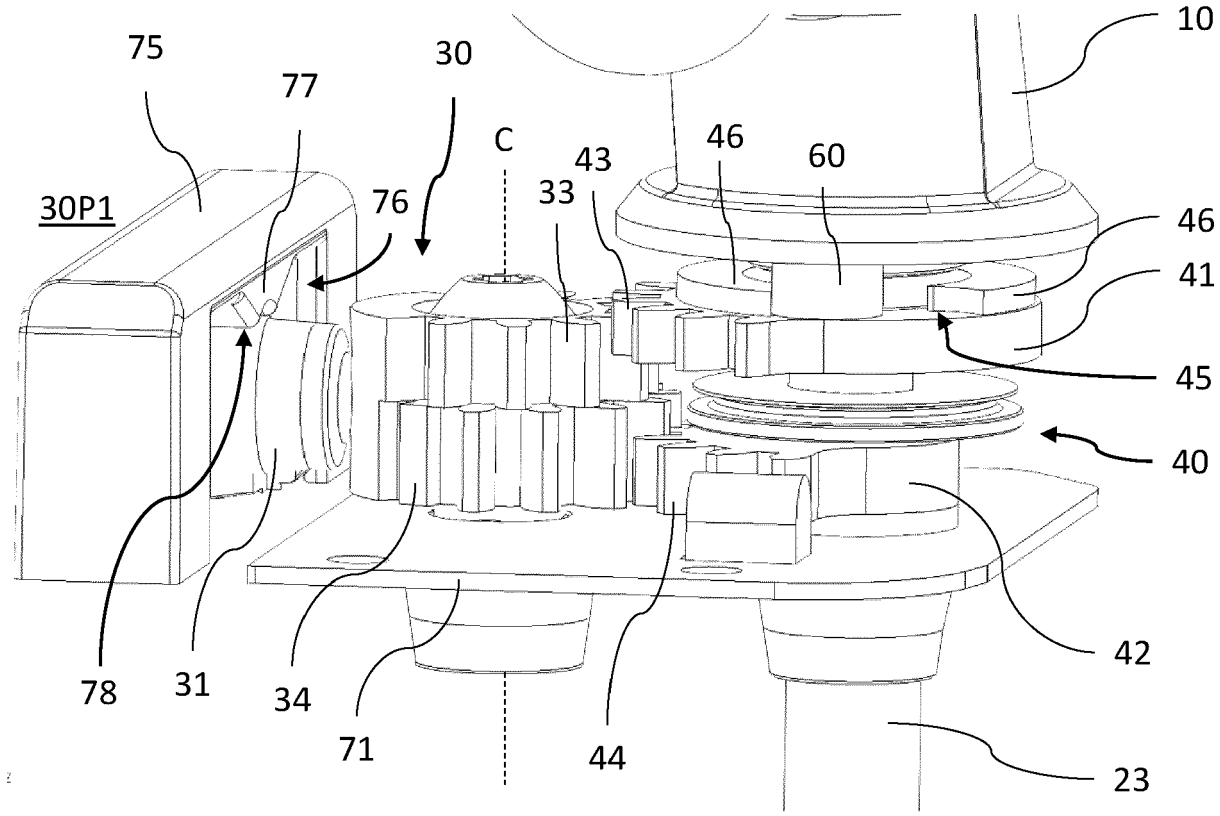
75
77
30
C
46
60
10
30P1
76
43
33
46
41
45
40
42
78
31
34
71
44
23

Fig. 2

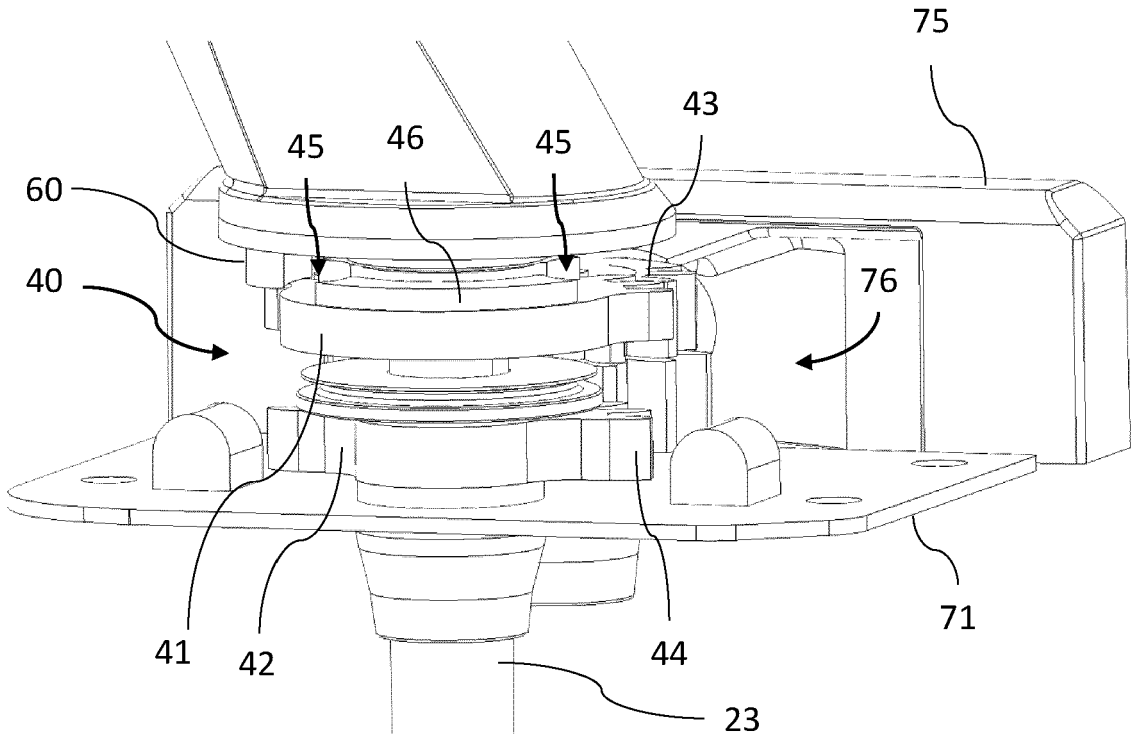
75
43
45
46
45
60
40
76
41
42
44
71
23

Fig. 3

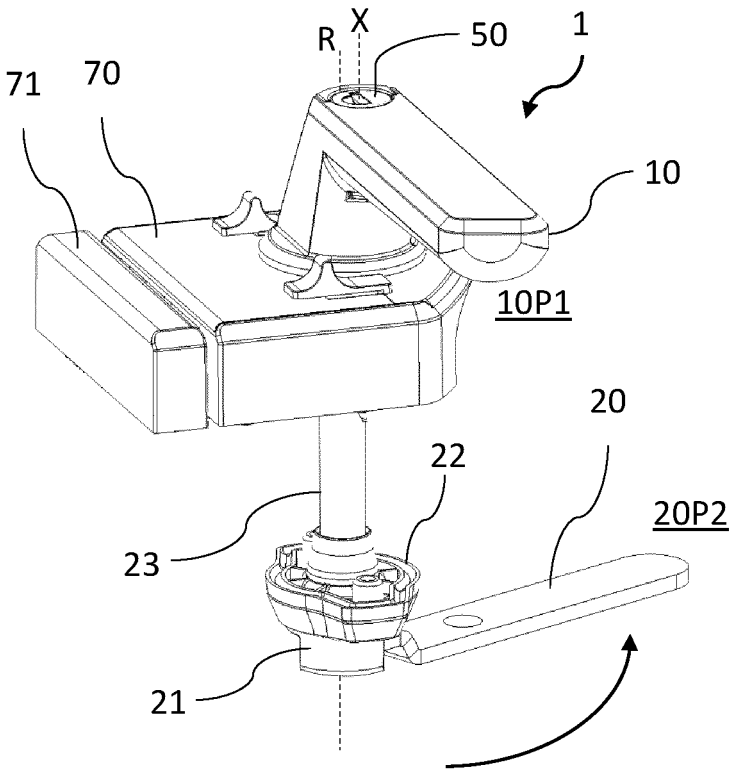
R
X
50
1
71
70
10
10P1
20
22
20P2
23
21

Fig. 4

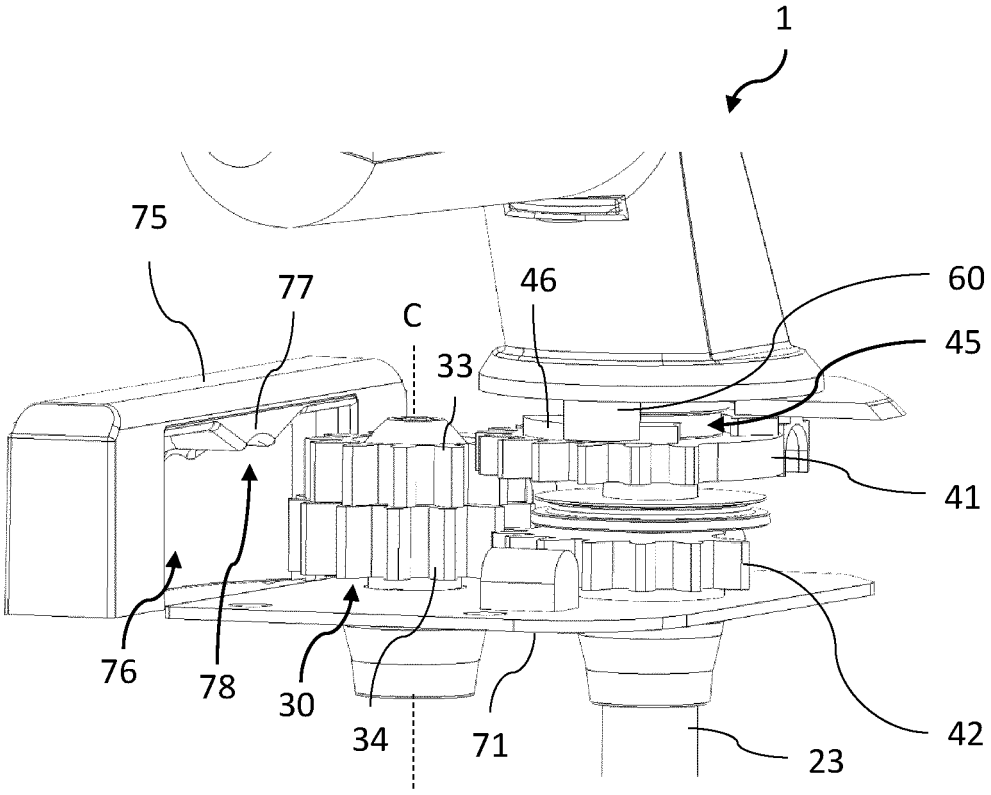
1
75
77
C
46
60
45
33
41
76
78
30
34
71
42
23

Fig. 5

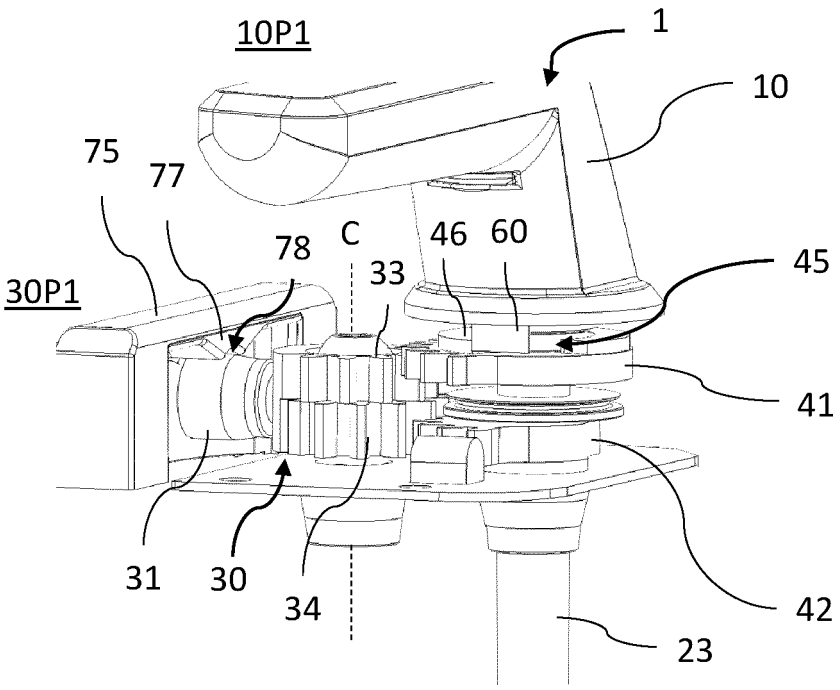
10P1
1
10
75
77
78
C
46
60
45
30P1
33
41
31
30
34
42
23

Fig. 6

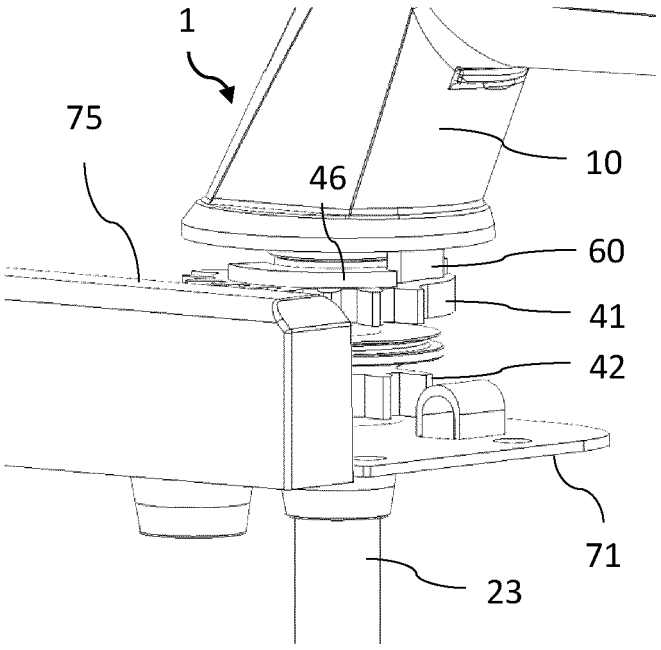
1
75
10
46
60
41
42
71
23

Fig. 7

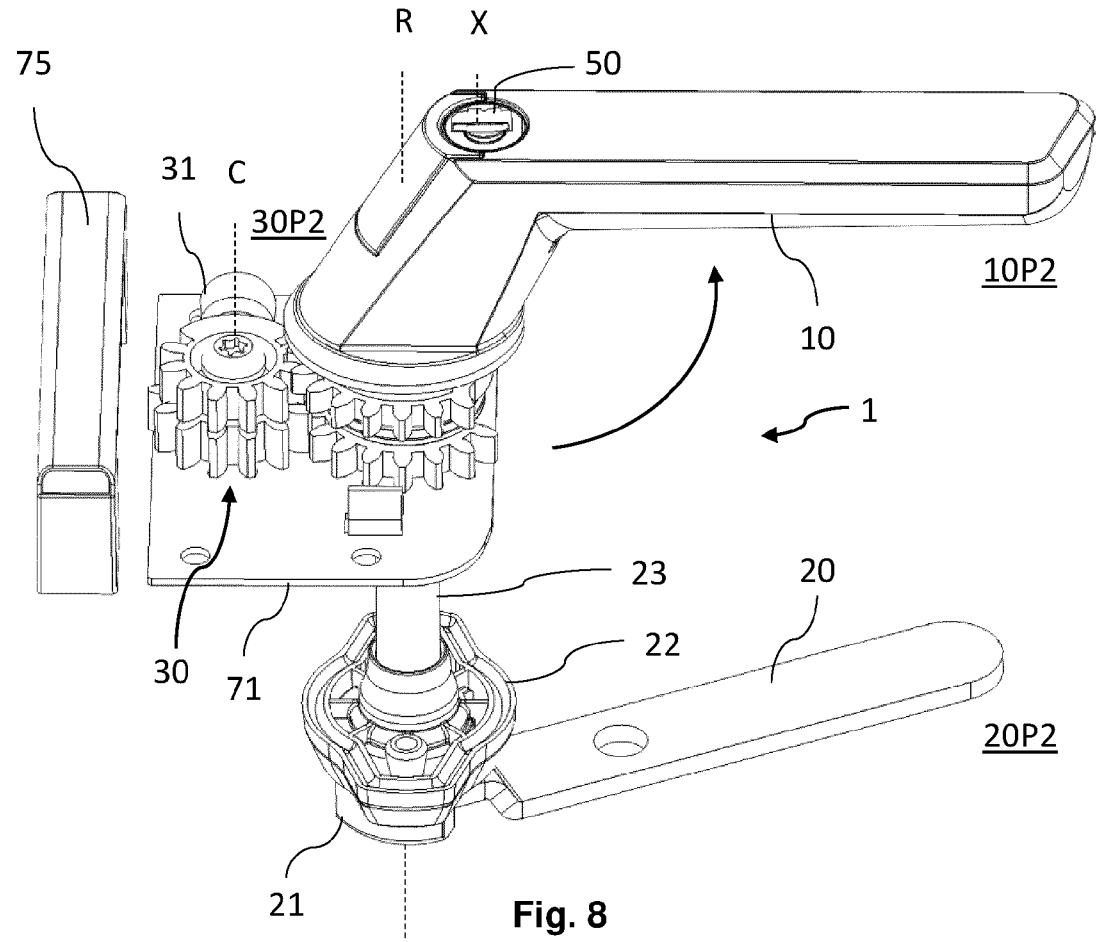
R
X
75
50
31
C
30P2
10P2
10
1
23
20
22
30
71
20P2
21

Fig. 8

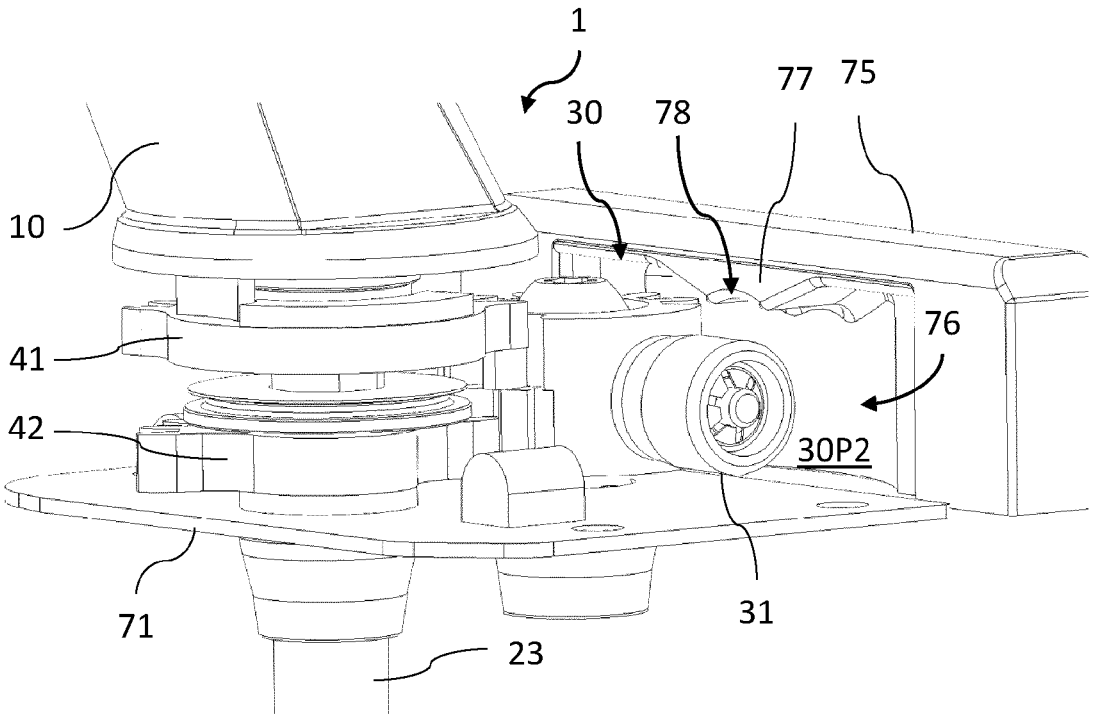
1
77
75
30
78
10
76
41
42
30P2
71
31
23

Fig. 9

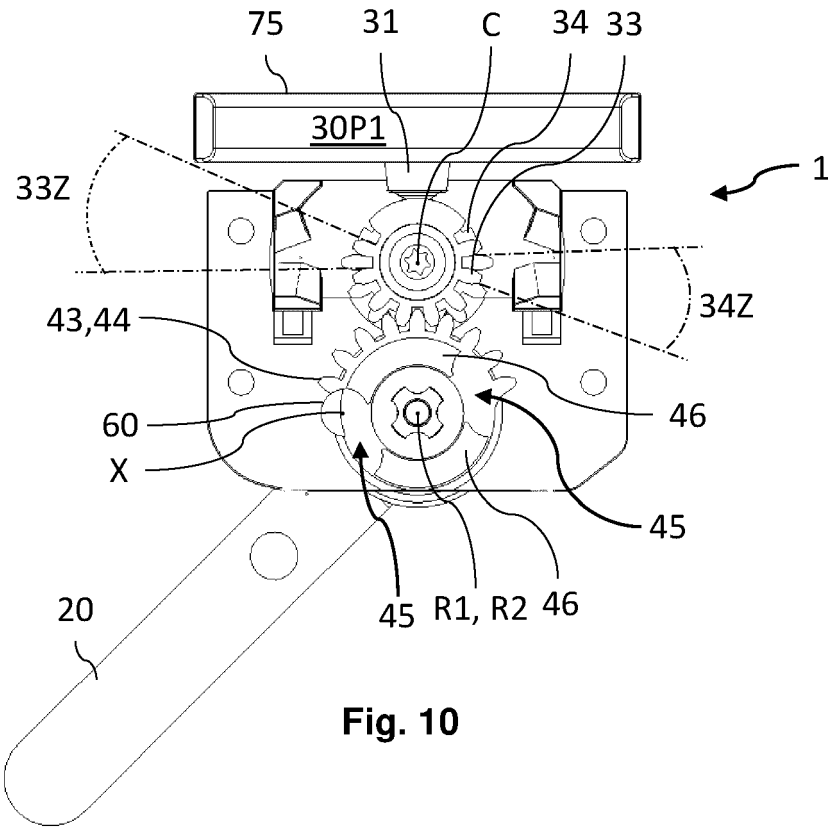
75
31
C
34
33
30P1
1
33Z
34Z
43,44
60
X
46
45
20
45
R1, R2
46

Fig. 10

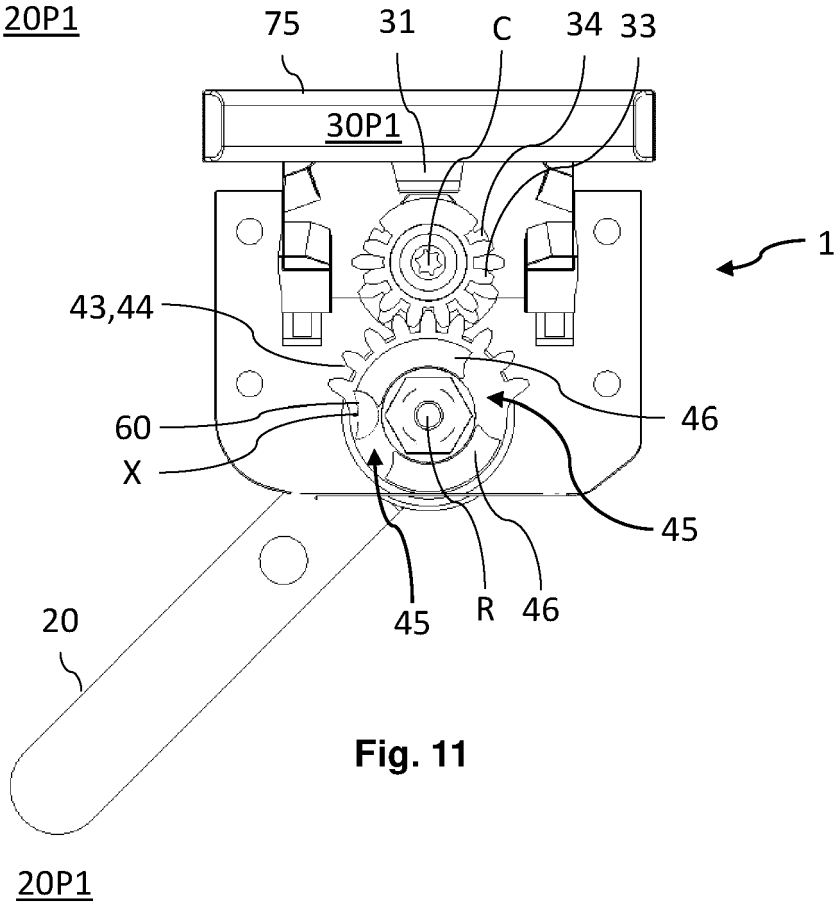
20P1
75
31
C
34
33
30P1
1
43,44
60
X
46
45
20
45
R
46
20P1

Fig. 11

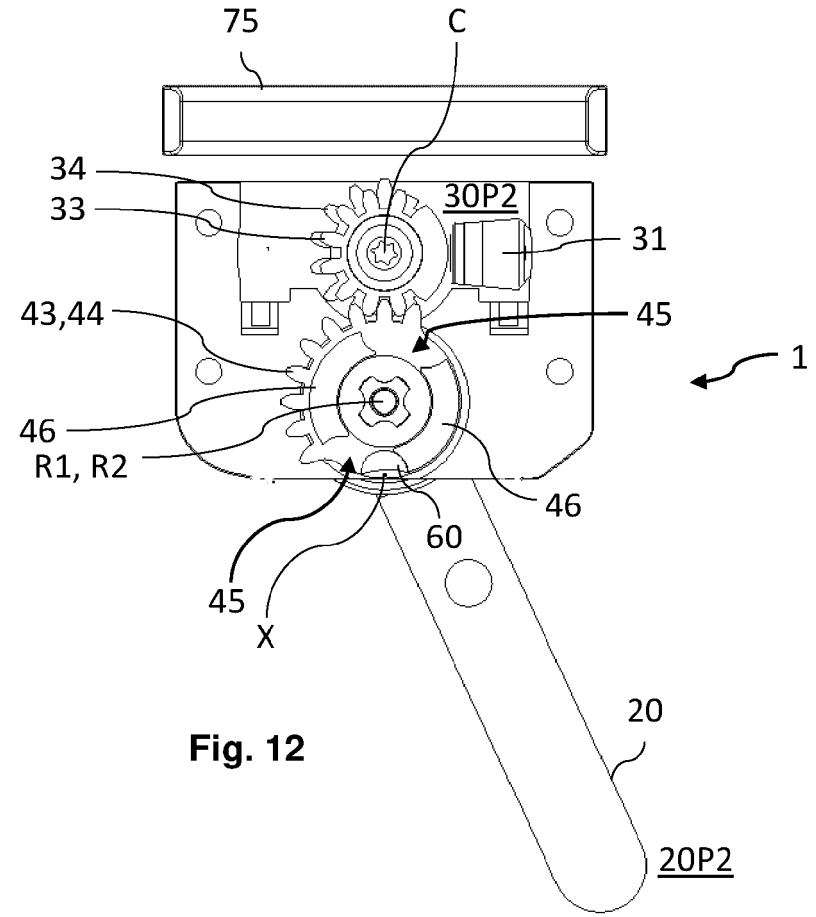
75
C
34
33
30P2
31
43,44
45
1
46
R1, R2
46
60
45
X
20
20P2

Fig. 12

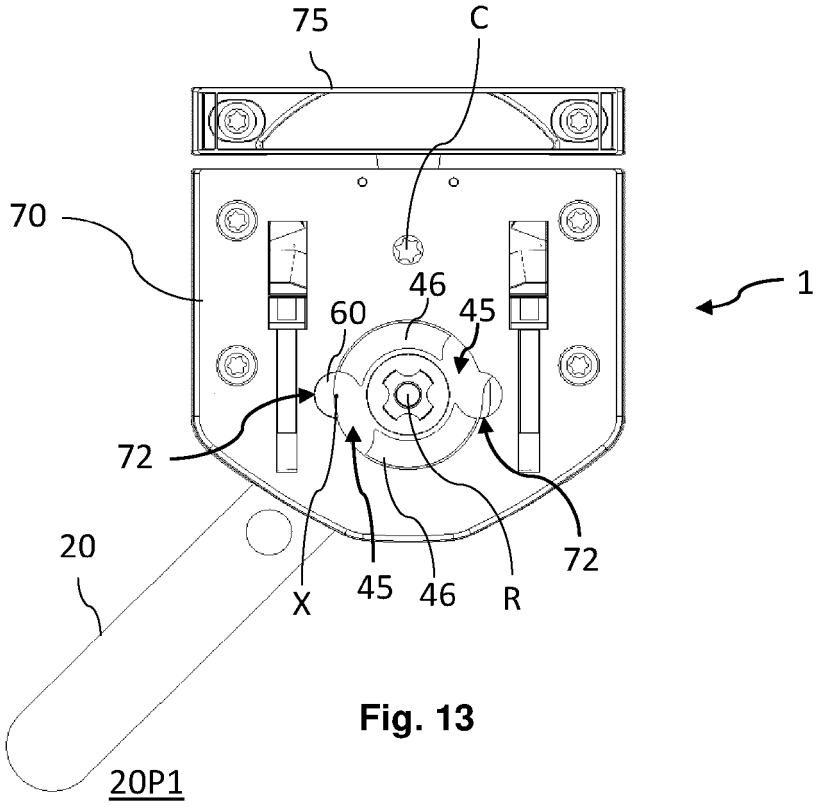
75
C
70
1
46
60
45
72
72
20
X
45
46
R
20P1

Fig. 13

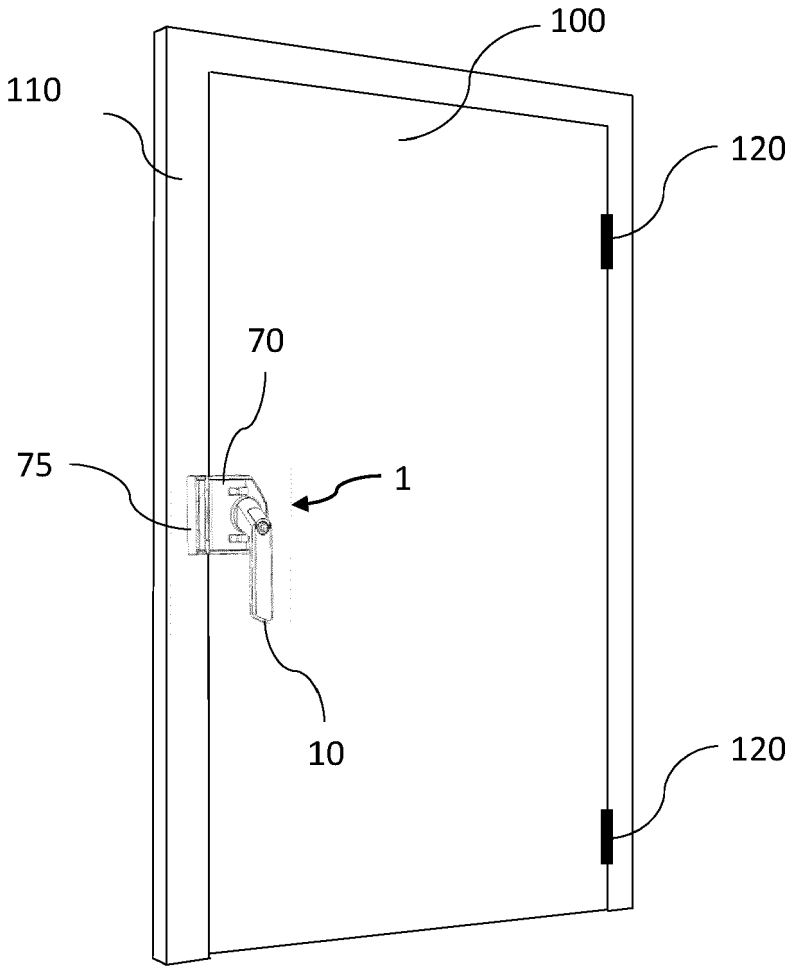

Fig. 14

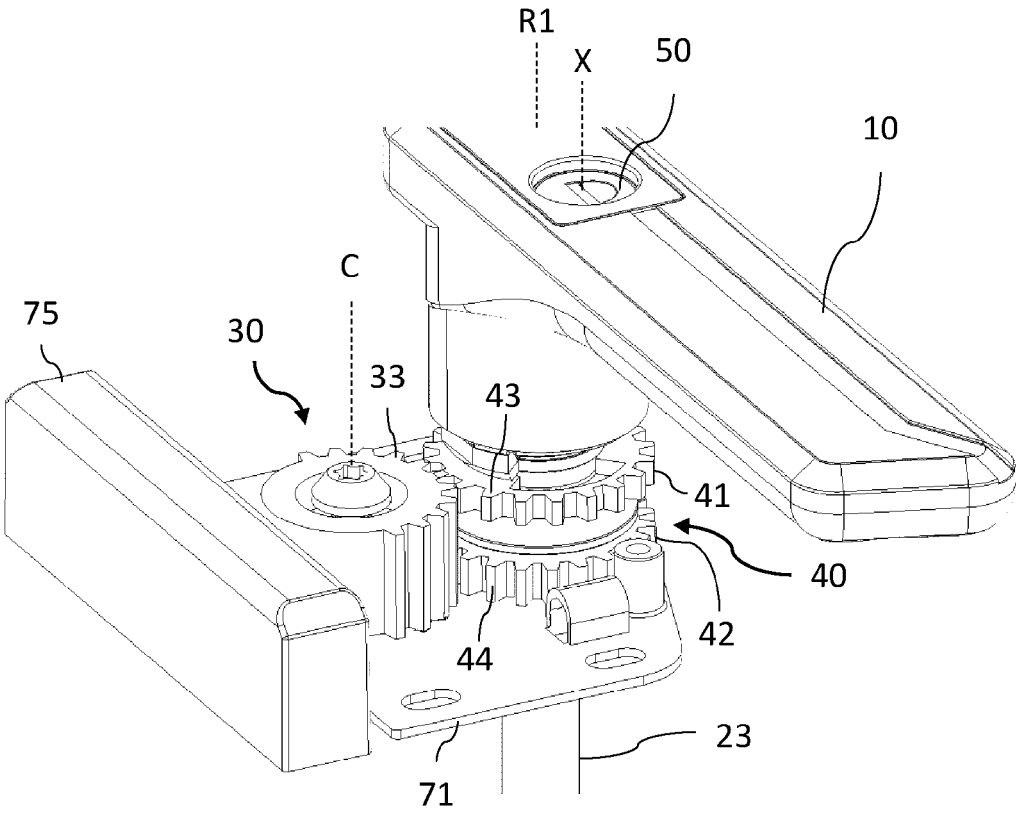

Fig. 15

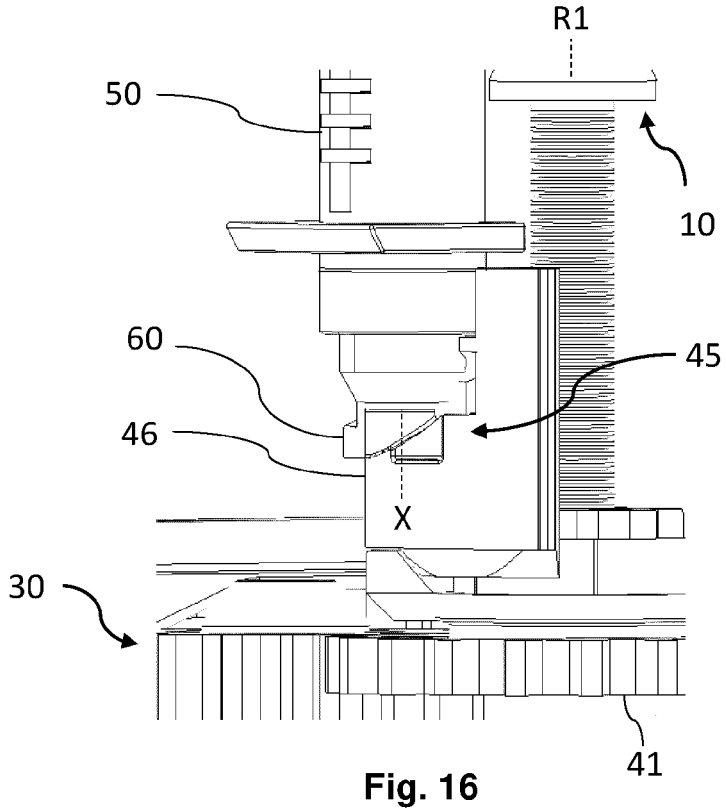

Fig. 16

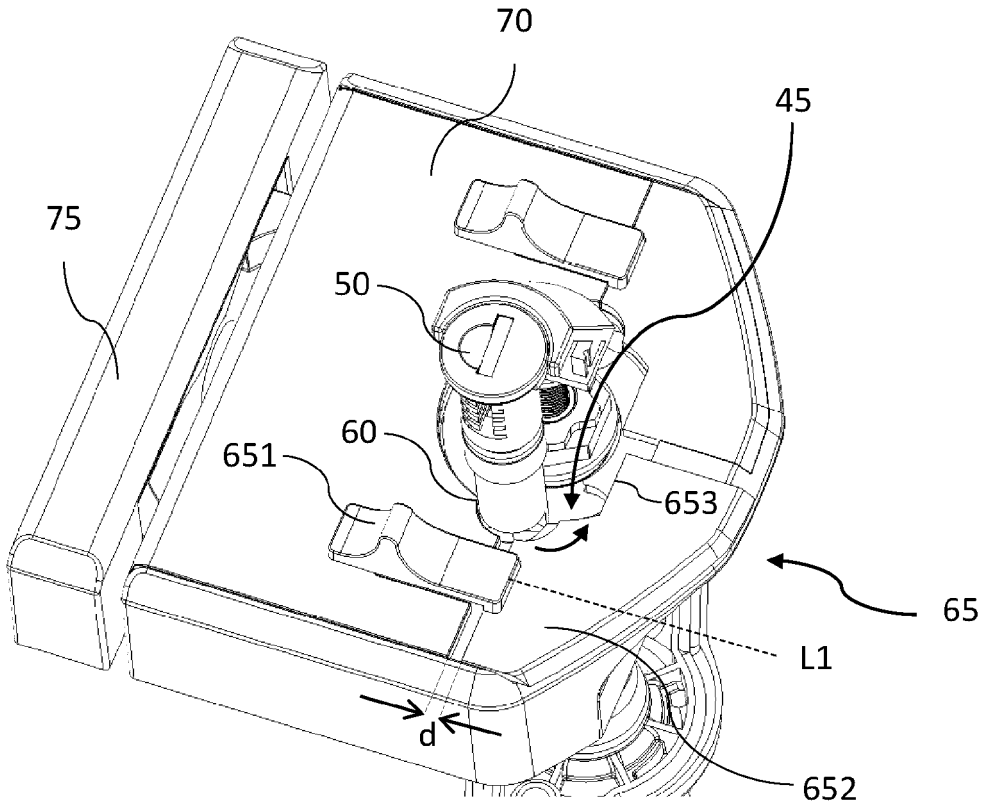
70
45
75
50
60
651
653
65
L1
d
652

Fig. 17

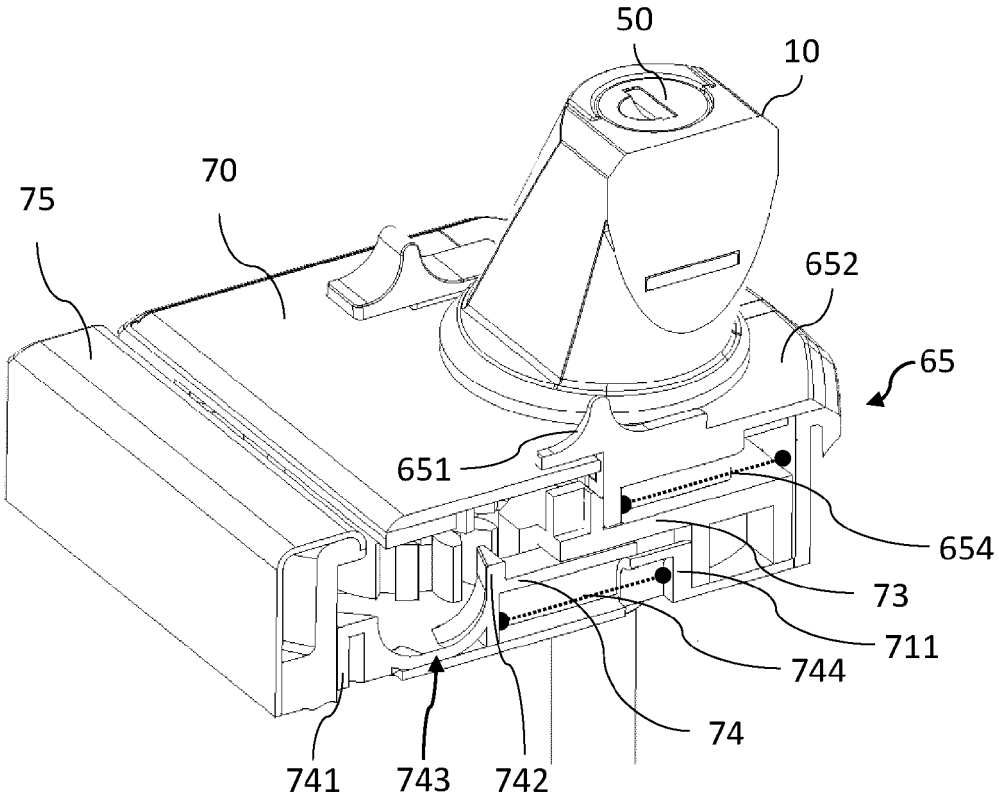
50
10
70
75
652
65
651
654
73
711
744
74
741
743
742

Fig. 18

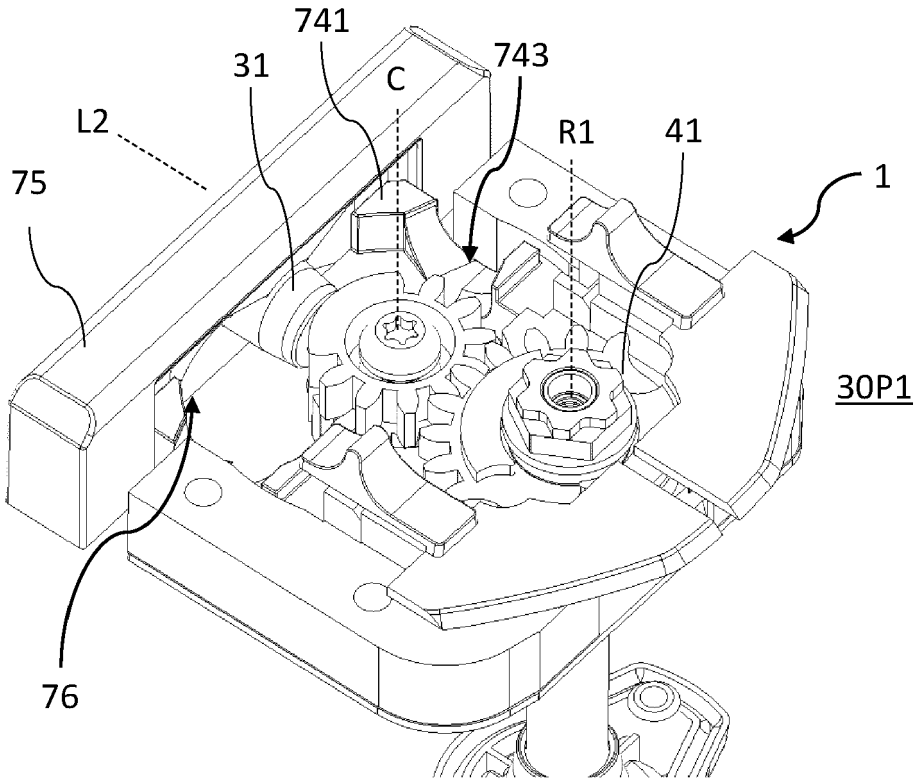

Fig. 19

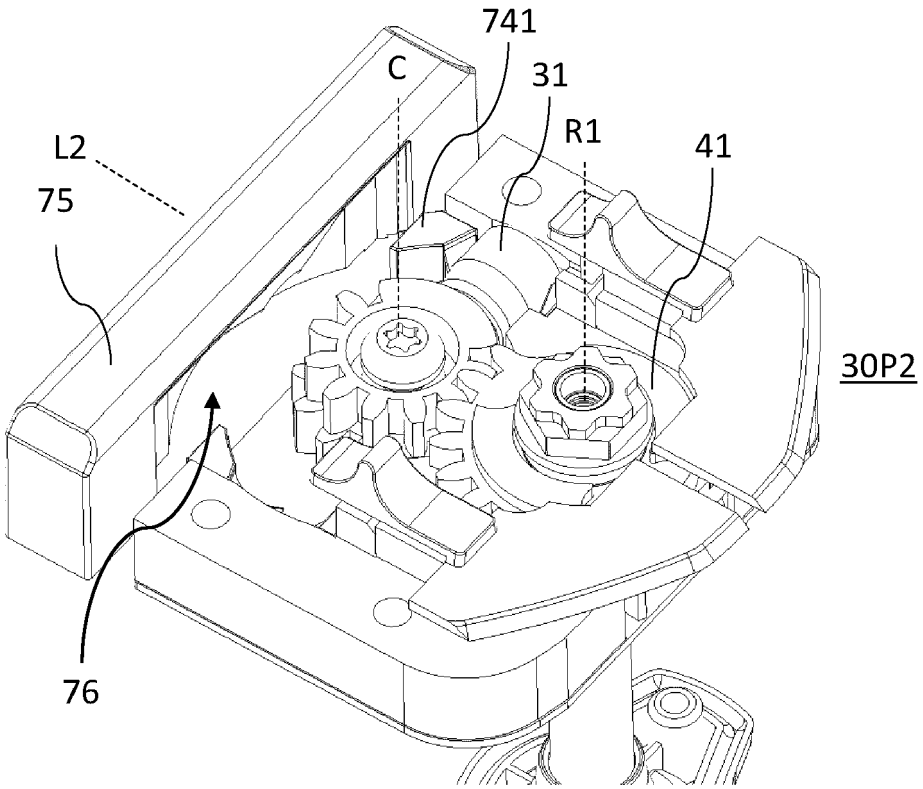

Fig. 20

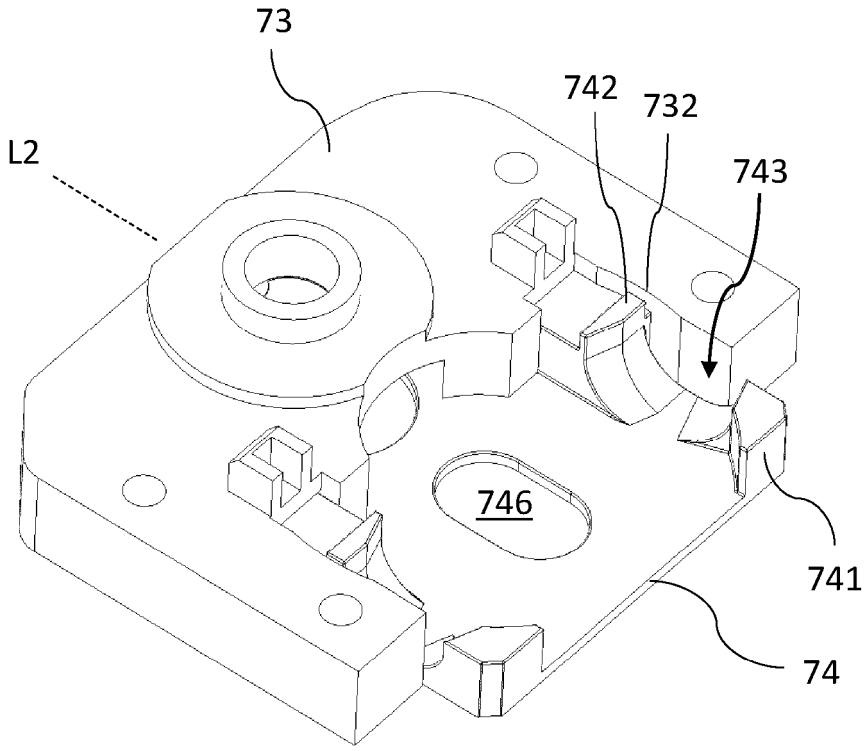

Fig. 21

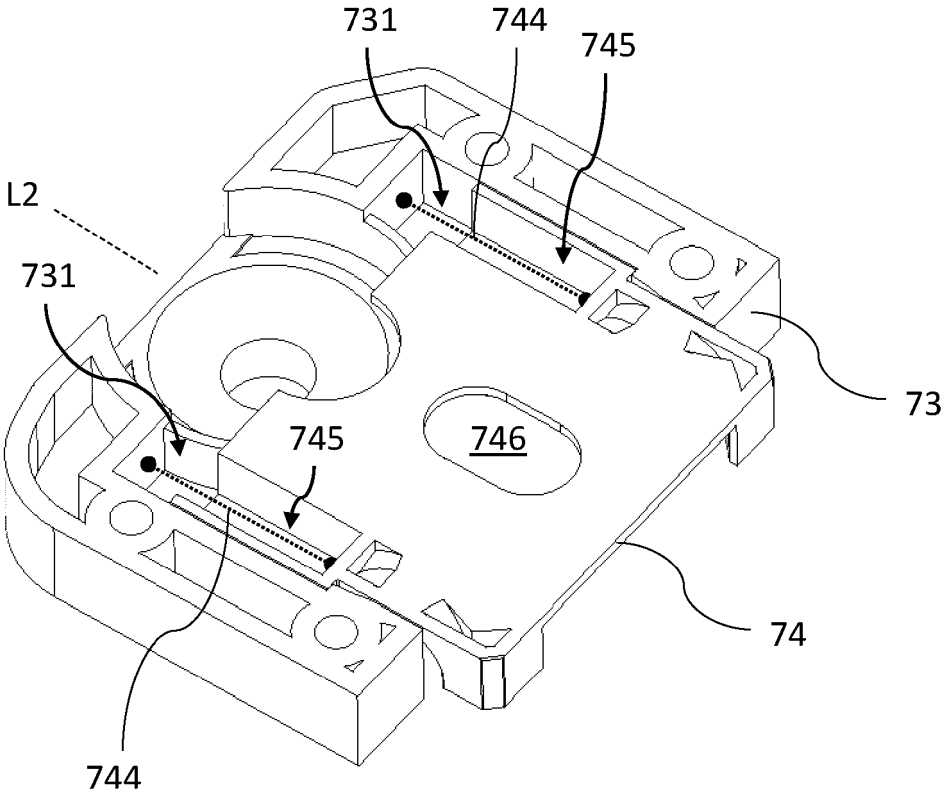

Fig. 22

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EUROPEAN SEARCH REPORT

Application Number
EP 20 17 1625

DOCUMENTS CONSIDERED TO BE RELEVANT

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Place of search	Date of completion of the search	Examiner
The Hague	20 October 2020	Pérez Méndez, José F

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X : particularly relevant if taken alone
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