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(71) Applicant: **ArvinMeritor Light Vehicle Systems (UK) Ltd**
Birmingham,
West Midlands, B30 3BW (GB)

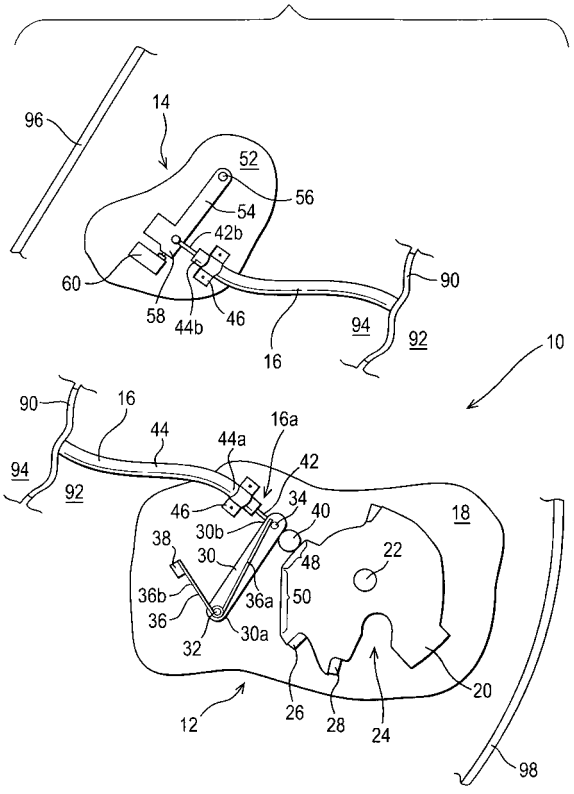
(72) Inventors:
- **Nigel V Spurr**
  Solihull B90 2PS (GB)
- **Folley, Robert F.**
  Staffordshire WS 12 4PY (GB)

(74) Representative: **Jones, John Bryn**
Withers & Rogers LLP
Goldings House,
2 Hays Lane
London SE1 2HW (GB)

(54) Door Latch

(57) A vehicle door latch comprising: a latch chassis and a latch bolt rotatably mounted on the latch chassis, the latch bolt arranged to releasably retain a striker in a closed position, the latch including a follower moveably mounted on the latch chassis for following the position of the latch bolt, the follower engaging a transfer mechanism capable of operating a switch remote from the latch chassis in response to a change in the position of the latch bolt.

FIG. 1



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Description

[0001] The following invention relates to door latches, and in particular, but not exclusively to central locking vehicle door latches for land vehicles such as cars.

[0002] A vehicle central door locking system for a car will typically comprise a central control unit which controls a number of door latches including, for example, a drivers door latch, passenger door latch, and two rear door latches. In addition, the central control unit (CCU) will typically control a boot or lift gate latch. The control unit controls the lock status of each of the latches following a command from the operator to change the lock status of the latches, usually via a key fob or drivers door sill button. In the situation where all of the vehicle doors are closed, the control unit simply instructs each of the door latches to drive to a locked condition. However, there may be an occasion where one of the doors is open, and the door latch of that particular door cannot therefore be centrally locked.

[0003] In order to detect when this is the case, each of the door latches is provided with a status switch to detect the position of the respective latch bolts. When a particular switch detects that the latch bolt is in either the open position, or the first safety position, the switch indicates to the central control that that particular latch cannot be locked. The first safety position, otherwise known as the intermediate position, corresponds to a condition of the latch in which the door is held closed but the door is not flush with the vehicle body.

[0004] However, there are number of problems associated with this form of central locking latch. Firstly, the presence of a status detection switch in the latch necessitates a cable harness to be attached to the latch for carrying a signal between the latch and the CCU. Furthermore, since the latch is mounted on the wet side of the door, the electrical switch is frequently subject to contamination by water and/or dirt. It will be appreciated that the term "wet side" refers to the outside of the door which is not sealed completely from the outside environment but is which partially protected by the outer skin of the door. Car doors are typically constructed with a door module which mounts to an inner skin which, along with the outer skin, provides for the structural integrity of the door. The door module provides a mount for, amongst other components, the door latch, window, and window power drive components, all of which are mounted to the exterior (or wet) side of the door module.

[0005] The door trim is then mounted to the interior (or dry) side of the door module which is sealed from the wet exterior side of the module. The conventional arrangement, in which the central locking latch is arranged on the wet side of the door and includes the status detection switch, is clearly disadvantageous in that it can result in electrical failure of the switch.

[0006] It is an object of the present invention to provide a vehicle door latch which at least mitigates some of the problems outlines above.

[0007] Accordingly, there is provided a vehicle door latch comprising:

a latch chassis
a latch bolt rotatably mounted on the latch chassis, the latch bolt moveable between an open position, and a closed position, and an intermediate position and arranged to releasably retain a striker in the closed position and the intermediate position,
the open position corresponding to an open condition of the latch, the closed position corresponding to a closed condition of the latch and the intermediate position corresponding to an intermediate condition of the latch in which the latch is not closed but cannot be opened,
the latch including a follower moveably mounted on the latch chassis for following the position of the latch bolt,
the follower engaging a mechanism capable of operating a switch remote from the latch chassis in response to a change in the position of the latch bolt.

[0008] In this way, the status detection switch can be moved away from the wet side of the door reducing the likelihood of failure of the switch by contamination. This has the additional benefit of eliminating the need to run an additional electric harness to the wet side of the door.

[0009] The invention will now be described, by way of example only, and with reference to the following drawings in which:-

Figure 1 is a schematic representation of a vehicle door latch according to the present invention.
Figure 2 is a schematic representation of the second embodiment of vehicle door latch according to the present invention, and
Figure 3 is a schematic representation of the third embodiment of the vehicle door latch according to the present invention.

[0010] In figure 1, a vehicle door latch shown schematically at 10 comprises a latch assembly 12 and a switch assembly 14. The latch assembly 12 and switch assembly 14 are connected by a cable 16, typically in the form of a bowden cable.

[0011] The latch assembly 12 has a latch chassis shown schematically at 18 on which is mounted a latch bolt 20 for rotation about a latch bolt pivot 22. The latch bolt 20 is biased in the anticlockwise direction by a latch bolt spring (not shown for clarity) in a known manner. The latch bolt 20 defines a mouth 24 for receiving an associated striker (not shown for clarity). The latch bolt 20 further defines a first and second detent 26, 28 for engagement by a pawl (not shown for clarity) to retain the latch bolt in first safety position and fully closed position in a known manner.

[0012] A follower arm 30 is mounted for rotation on the latch chassis 18 by way of a pivot 32 arranged at a first

end 30A of the follower arm. A second end 30B of the follower arm 30 defines an abutment 34. A torsion spring 36 is mounted on the pivot 32 and has a first arm 36A which rests against the abutment 34 and a second arm 36B which rests against a stop 38 fixed to the latch chassis 18. In this way, the second end 30B of the follower arm 30 is biased towards the latch bolt 20 by the leaf spring 36.

[0013] Arranged on the follower arm 30 at its second end 30B is a follower 40. In this particular embodiment, the follower 40 is shown as a unitary member attached to the follower arm 30. However, in alternative embodiments, the follower maybe a roller bearing, a journal bearing, a nylon bush or any similar low friction device.

[0014] In use the latch assembly is fitted to the wet side of a vehicle door, with an associated striker being mounted on the vehicle body. The latch assembly is particularly suited to sliding vehicle doors which frequently have a latch controller which will be described in further detail shortly.

[0015] Referring now to the cable 16, the cable comprises an inner core 42 and a cable shroud 44. A first end 42A of the inner core 42 is attached to the second end 30B of the follower arm 30, whilst a first end 44A of the cable shroud 44 is secured to the latch chassis 18 by way of cable flange 46.

[0016] The outer perimeter of the latch bolt in the region proximate the follower 40 is defined by a first surface 48 and a second surface 50. The purpose of these two surfaces will be explained in further detail shortly.

[0017] The cable 16 is schematically depicted as having a break in its length. This is to illustrate that the cable may be of any length dependent on the particular application. However, it is most likely that the cable will be of length sufficient to allow the switch assembly 14 to be located in a latch controller (not shown for clarity) mounted on the dry side of the vehicle door. A latch controller is provided to control the latch both mechanically and electronically. For example, the latch controller may include a power drive to lock and unlock the latch, and possibly a power drive to power close the latch. The latch controller may include electronic control in order to instruct a change in latch lock status following an input from a central control unit (CCU). It is conceivable however that the switch might be located in a CCU, which would clearly require a significantly longer cable than if it were mounted on the dry side of a door module.

[0018] In line with the above, the term remote with respect to the position of the switch is taken to mean sufficiently remote from the wet side of the door to allow mounting on the dry side of the door.

[0019] Referring again to figure 1, a seal 90 is depicted schematically to show a wet side 92 of the seal 90 and a dry side 94 of the seal 90. A portion of door trim is depicted schematically at 96 and a portion of outer skin at 98.

[0020] The switch assembly 14 has a switch chassis indicated schematically at 52. A switch arm 54 is rotatably mounted on a pivot 56 and defines a projection 58 which operates a switch 60. The switch is an on/off type switch, the operation of which will be discussed in further detail shortly. A second end 42B of the cable inner core 42 is attached to the switch arm 54. A second end 44B of the cable shroud is mounted to the switch chassis 52 by way of a cable flange 46.

[0021] The switch 60 is in electronic communication with a central control unit (not shown for clarity) so as to inform the CCU of the condition of the latch assembly 12.

[0022] As shown in figure 1, the latch assembly 12 is in the open position. The follower 40 is resting against the first surface 48 of the latch bolt, and with the latch assembly 12 in the open position, the switch assembly 14 is shown with the switch arm 54 activating the switch 60.

[0023] However, upon closure of the vehicle door in which the latch assembly 12 is mounted, the striker associated with the latch assembly 12 will engage the latch bolt mouth 24 to rotate the latch bolt 20 in the clockwise direction. This will cause the latch bolt 20 to be driven to the first safety position in which the associated pawl (not shown for clarity) retains the latch bolt by way of the first detent 26. In this position, the first surface 48 will have rotated past the follower 40 causing the follower 40 to rest against the second surface 50. This will cause the follower 40 to be driven away from the latch bolt pivot 22. Movement of the follower arm away from the latch bolt pivot 22 causes the switch arm 54 to rotate in an anticlockwise direction under the action of the cable 16, thereby disengaging the switch 60. The switch 60 then provides a signal to the CCU to alert the CCU that the latch assembly 12 has moved to the first safety position (i.e. is no longer open).

[0024] In figure 2, a second embodiment of vehicle door latch 110 is shown having a latch assembly 112 and a switch assembly 114. The latch assembly 112 differs from the latch assembly 12 of the first embodiment in that the latch bolt 120 has a different outer profile to the latch bolt 20 of the first embodiment. Furthermore, the switch 160 of the switch assembly 114 differs from the switch 60 of the first embodiment, in that the switch 160 is capable of detecting three positions in the follower arm 154 rather than the two positions of the switch 60 of the first embodiment. Alternatively, two binary switches may be provided which in combination detent the position of the follower arm in a known manner. The purpose of this difference with the first embodiment will become evident shortly. The cable 116 and follower arm 130 of the second embodiment are identical to those of the first embodiment.

[0025] The latch assembly 112 has a latch bolt 120 rotationally mounted on latch chassis 118 by way of a pivot 122. In common with latch bolt 20 of the first embodiment, latch bolt 120 has first and second detents 126, 128 for engaging a pawl (not shown for clarity) in a known manner.

[0026] In distinction from the first embodiment, the

latch bolt 120 defines a first surface 170, a second surface 172 and a third surface 174. It will be appreciated that the second surface 172 is arranged further from the latch bolt pivot 122 then is the first surface 170. Similarly, the third surface 174 is arranged further from the latch bolt pivot 122 and is the second surface 172.

[0027] As shown in figure 2, the latch assembly 112 is in the open position and the follower 140 is resting against the first surface 170 under the action of the leaf spring 136.

[0028] Upon closure of the latch assembly 112, the associated striker (not shown for clarity) will drive the latch bolt 120 in a clockwise direction to bring the first detent 126 into engagement with the pawl (also not shown for clarity). The latch bolt 120 will therefore be rotated so that the follower 140 rests against the second surface 172 and will therefore have been moved away from the latch pivot 122. This movement in the follower 140 causes the switch arm 154 to move position accordingly, that movement being detected by the switch 160. Upon detection of the movement the switch 160 sends a signal to the CCU to inform the unit that the latch assembly 112 is in the first safety position.

[0029] Further rotation of the latch bolt 120 to the closed position will cause the second detent 128 to be engaged by the pawl and the follower 140 will be driven onto the third surface 174 accordingly. As a result, the follower 140 will have been moved yet further away from the pivot 122 which will cause further deflection in the switch arm 154. Unlike the switch 60 of the first embodiment, the switch 160 of the second embodiment is capable of detecting three positions in the switch arm 154. Accordingly, the switch 160 detects that the switch arm has moved to a third position indicating that the latch assembly 112 is in the closed position. The switch 160 accordingly transmits the signal to the central control unit to inform the unit of the new position of the latch assembly 112.

[0030] In figure 3, a third embodiment of door latch 210 is shown having a latch assembly 212 and a switch assembly 214. The switch arm 254 of the switch assembly 214 is attached to a release handle 276 by way of a bowden cable 278. The first end 42A of the inner core of the cable 216 is attached to a pawl lifter (shown in bidden detail at 279) 280 to disengage the pawl 280 from the latch bolt 220 in a known manner. A tab 281 of the pawl lifter 279 acts on the pawl.

[0031] The switch 260 is therefore able to detect movement of the pawl between the open position (as shown in figure 3) and the first safety and closed positions achieved when the pawl 280 engaged the first and second detents 266, 268 respectively.

[0032] This embodiment has the advantage that not only is the necessity for an electrical harness removed, but the provision of a separate actuation cable is also removed.

[0033] Nevertheless, in an alternative embodiment to that shown in figure 3, the release handle may be directly mechanically attached to the pawl 280 by a dedicated bowden cable running in parallel to the cable 216.

[0034] It will be appreciated that the features of latch bolts of figures 1 to 3 are not drawn to scale and that alternative profiles of latch bolts may be provided to achieve the desired displacement in the switch arm.

Claims

1. A vehicle door latch comprising:

   a latch chassis
   a latch bolt rotatably mounted on the latch chassis, the latch bolt moveable between an open position, and a closed position, and arranged to releasably retain a striker in the closed position, the open position corresponding to an open condition of the latch, the closed position corresponding to a closed condition of the latch,
   the latch including a follower moveably mounted on the latch chassis for following the position of the latch bolt,
   the follower engaging a transfer mechanism capable of operating a switch remote from the latch chassis in response to a change in the position of the latch bolt.

2. The vehicle door latch of claim 1 wherein the follower means engages a first portion of a periphery of the latch bolt when the latch bolt is in the open position and a second portion of the periphery when the latch is in the closed position.

3. The vehicle door latch of claim 1 or 2 wherein the latch bolt is moveable to an open position, a closed position and an intermediate position, the intermediate position corresponding to an intermediate condition of the latch in which the latch is not closed but cannot be opened.

4. The vehicle door latch of claim 3 wherein the follower means engages a third portion of the periphery of the latch bolt when the latch bolt is in the intermediate position.

5. The vehicle door latch of claim 2, 3 or 4 wherein the first portion is radially displaced from the second portion.

6. The vehicle door latch of any preceding claim wherein the follower means is biased towards the periphery of the latch bolt by a biasing means.

7. The vehicle door latch of claim 6 wherein the biasing means is a torsion spring grounded on the latch chassis.

8. The vehicle door latch of any preceding claim wherein the transfer mechanism is capable of operating the door latch to open the latch.

9. The vehicle door latch of any preceding claim wherein the transfer mechanism comprises a bowden cable.

10. The vehicle door latch of any preceding claim wherein the follower means engages a transfer mechanism input, and a transfer mechanism output is provided for intermittent engagement with the remote switch.

11. The vehicle door latch of claim 10 wherein the transfer mechanism output is operated by a release lever.

12. The vehicle door latch of claim 10 or 11 wherein the latch includes a pawl for releasably retaining the latch bolt in the intermediate position and the closed position, the transfer mechanism input comprising a pawl lifter for operating the pawl to open the latch.

13. The vehicle door latch of any preceding claim wherein the remote switch is a microswitch or reed switch.

14. The vehicle door latch of any preceding claim wherein the latch bolt is configured for fitment on a "wet" side of a vehicle door and the switch is configured for fitment on a "dry" side of a vehicle door.

FIG. 1

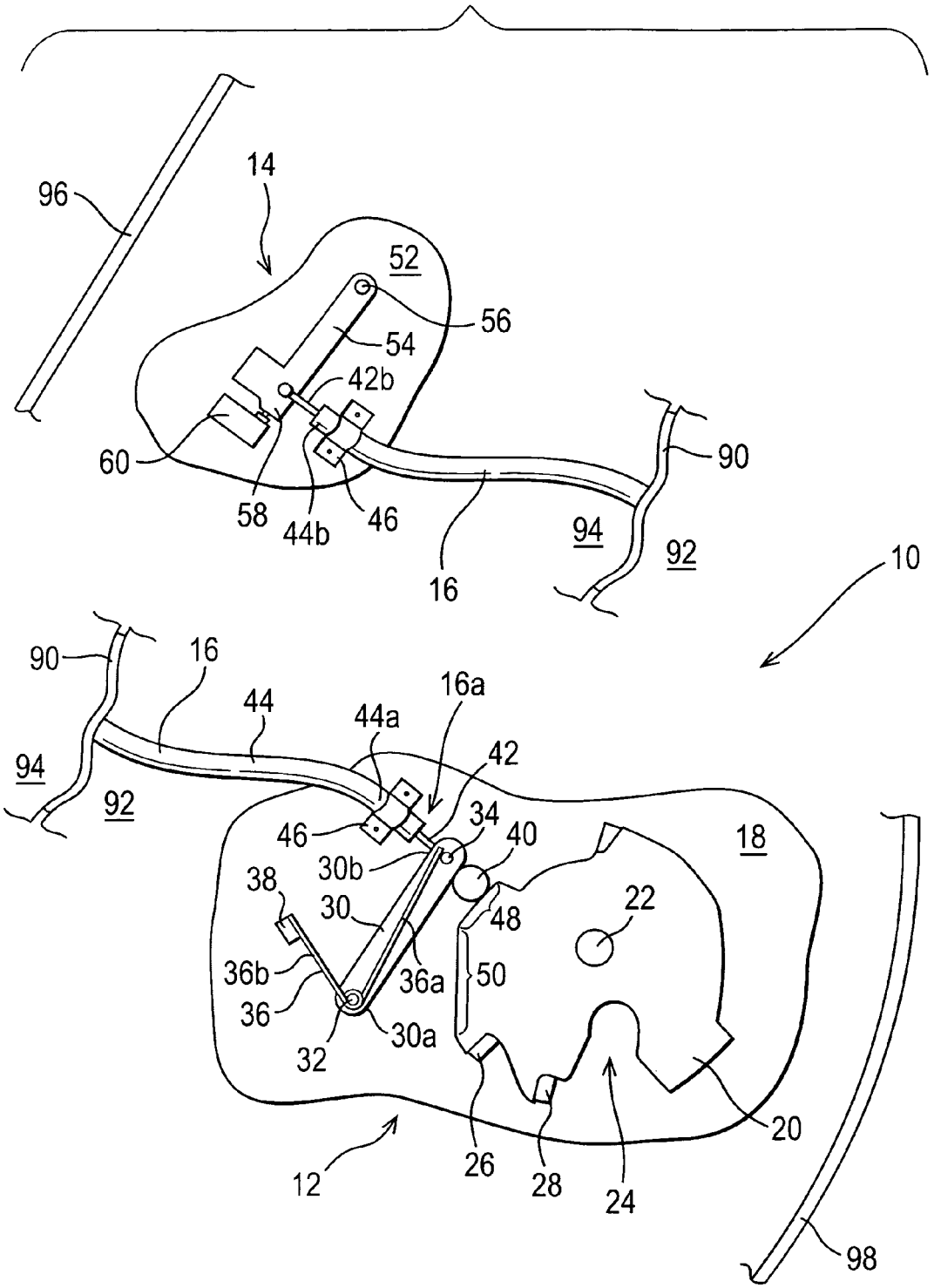
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FIG. 2

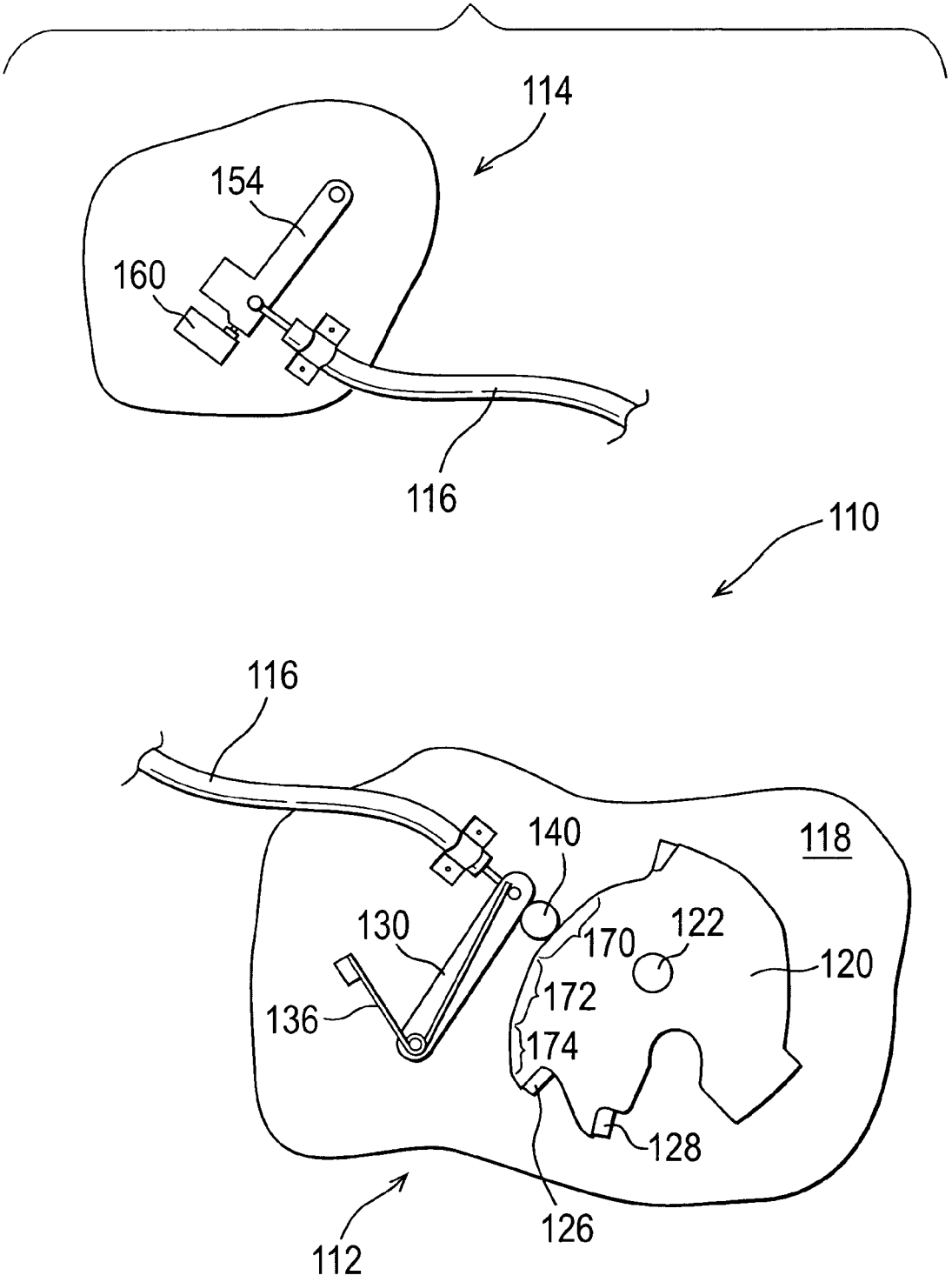
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FIG. 3