

US 20230285842A1

(19) **United States**

(12) **Patent Application Publication**
Bartos

(10) **Pub. No.: US 2023/0285842 A1**

(43) **Pub. Date: Sep. 14, 2023**

(54) **MULTIPLE ASPECT ARCADE GAME DEVICE**

(52) **U.S. Cl.**
CPC *A63F 7/027* (2013.01)

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(57) **ABSTRACT**

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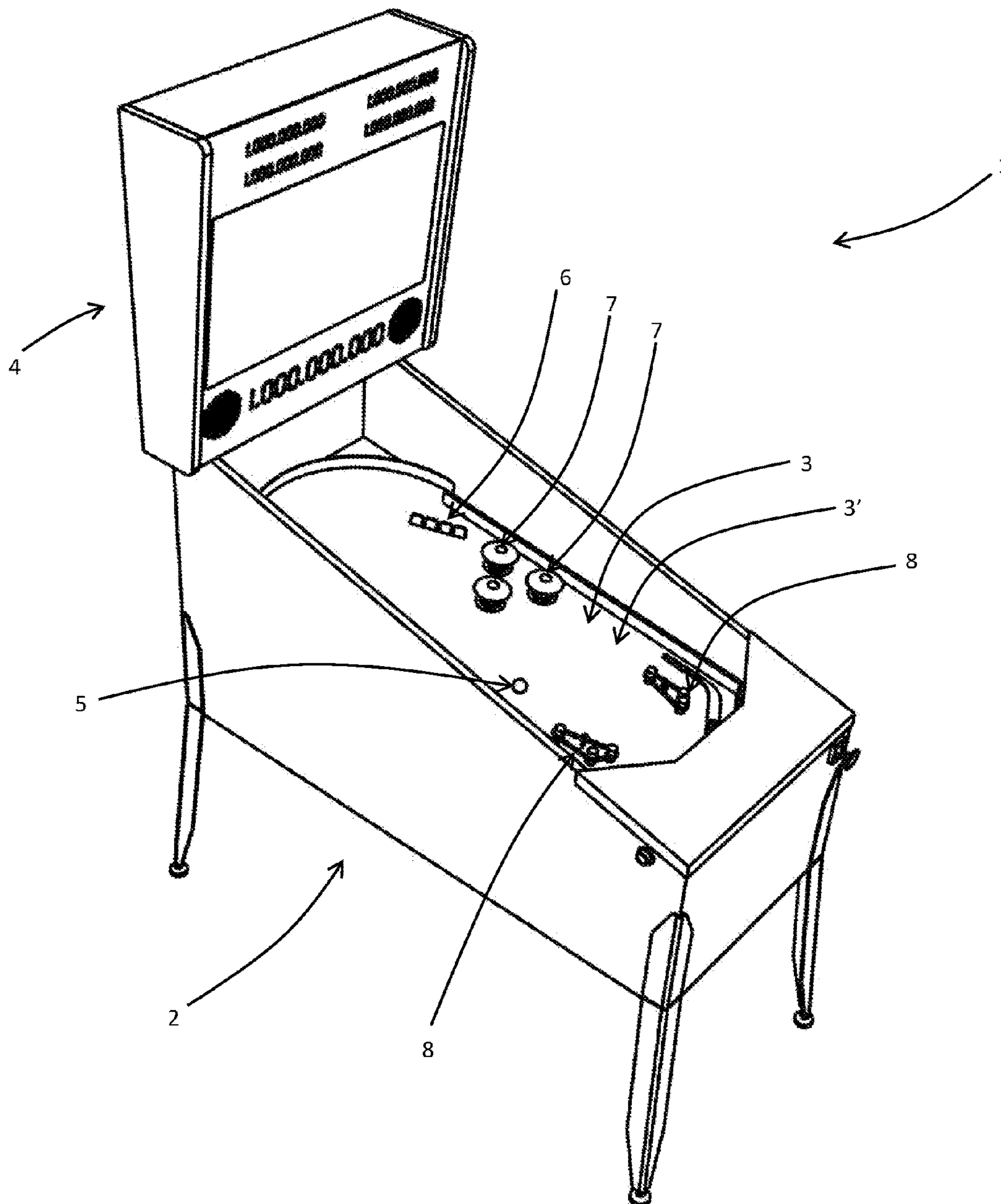
With the introduction of multi-level playfields all playfields being of a significant area within the gaming cabinet there is an as yet unrealised opportunity to develop scoring devices that each serve all or at least more than one playfield. These scoring devices can be specifically designed to only obstruct the view of and the playing on of a minimal proportion of playable area. That they serve more than one level also provides the chance to construct elaborate game rules involving scoring in sequence on various parts of the devices. The scoring device embodied here is specifically a new bumper device.

(21) Appl. No.: **17/692,228**

(22) Filed: **Mar. 11, 2022**

Publication Classification

(51) **Int. Cl.**
A63F 7/02 (2006.01)



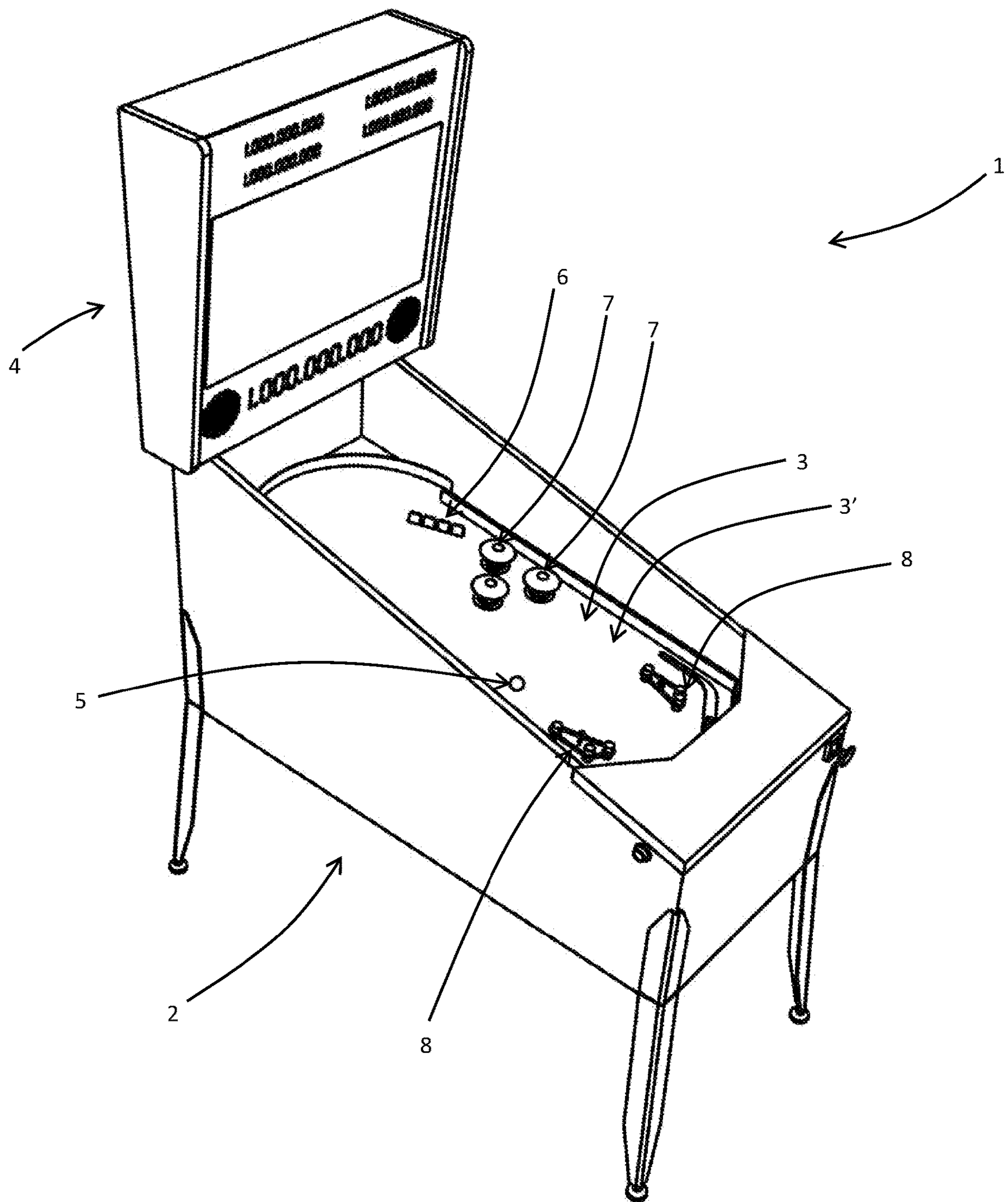


Fig. 1

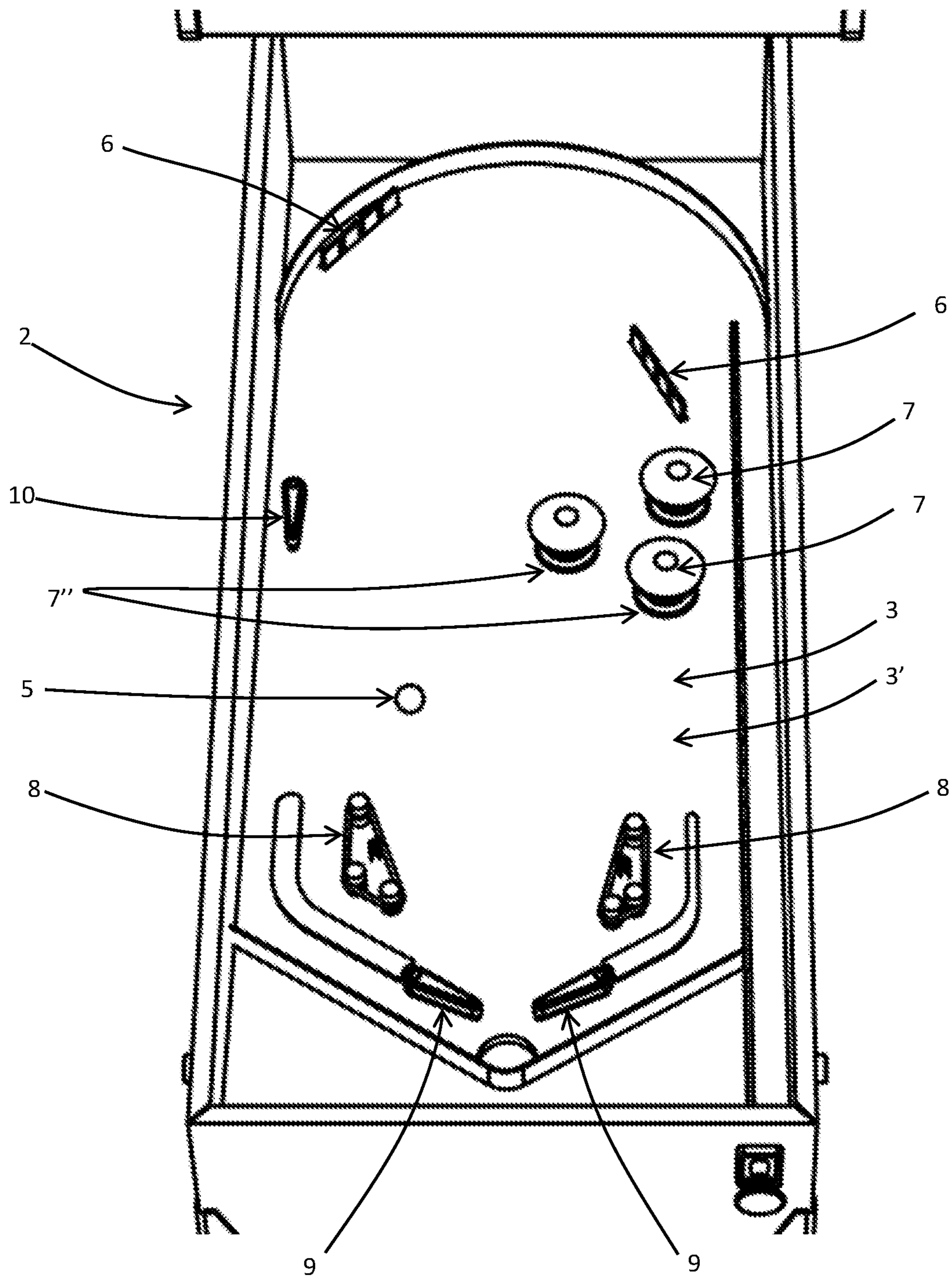


Fig. 2

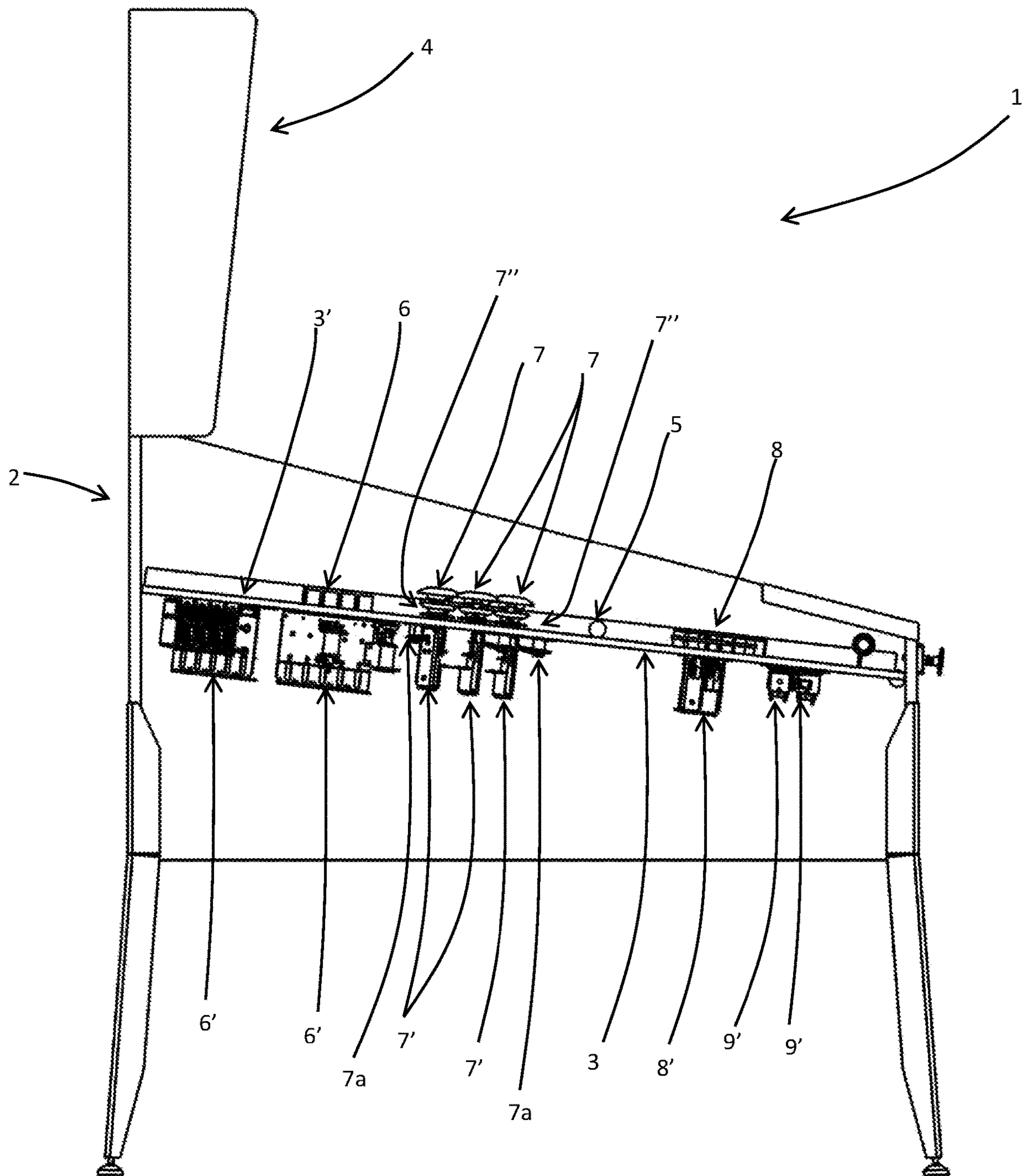


Fig. 3

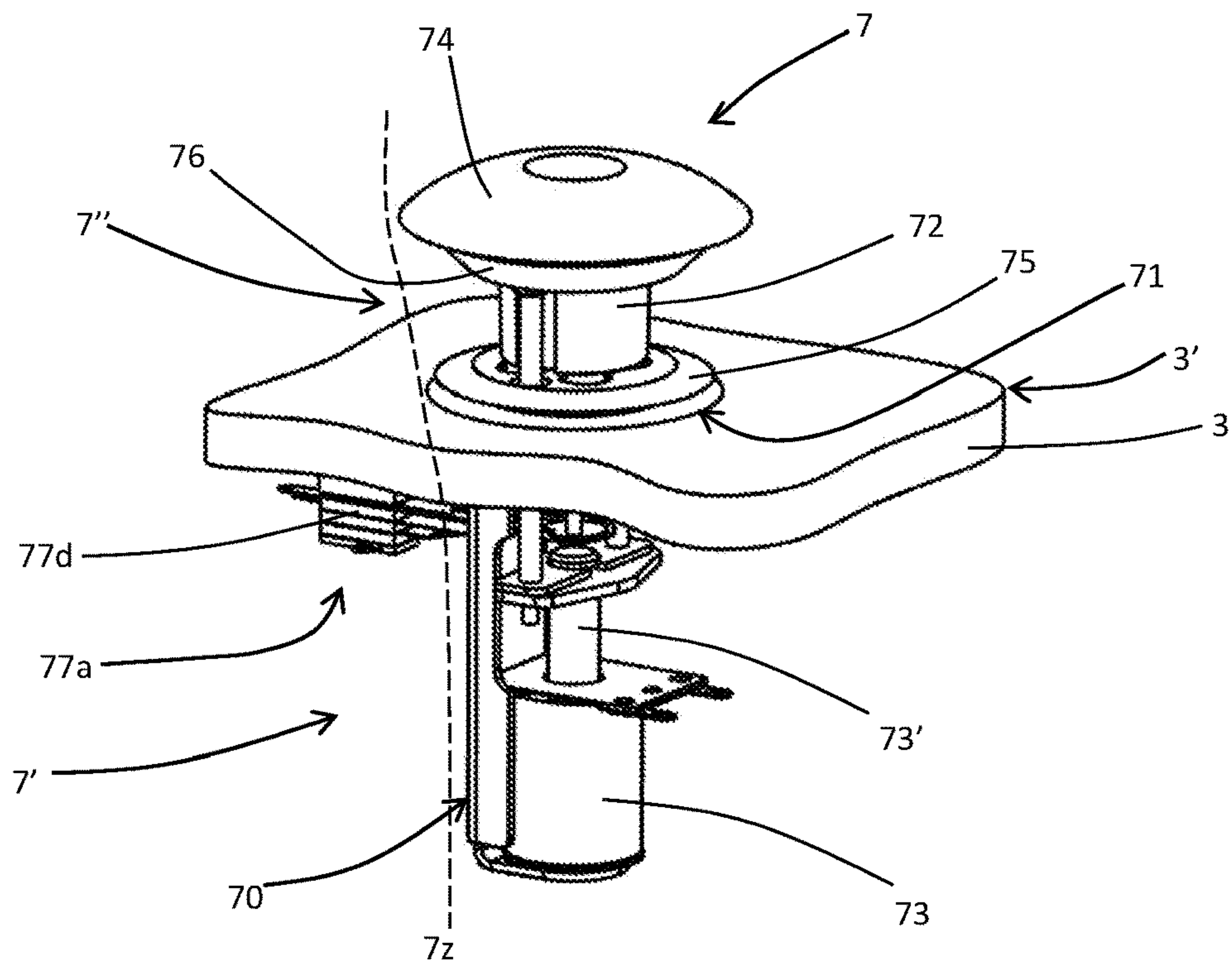


Fig. 4

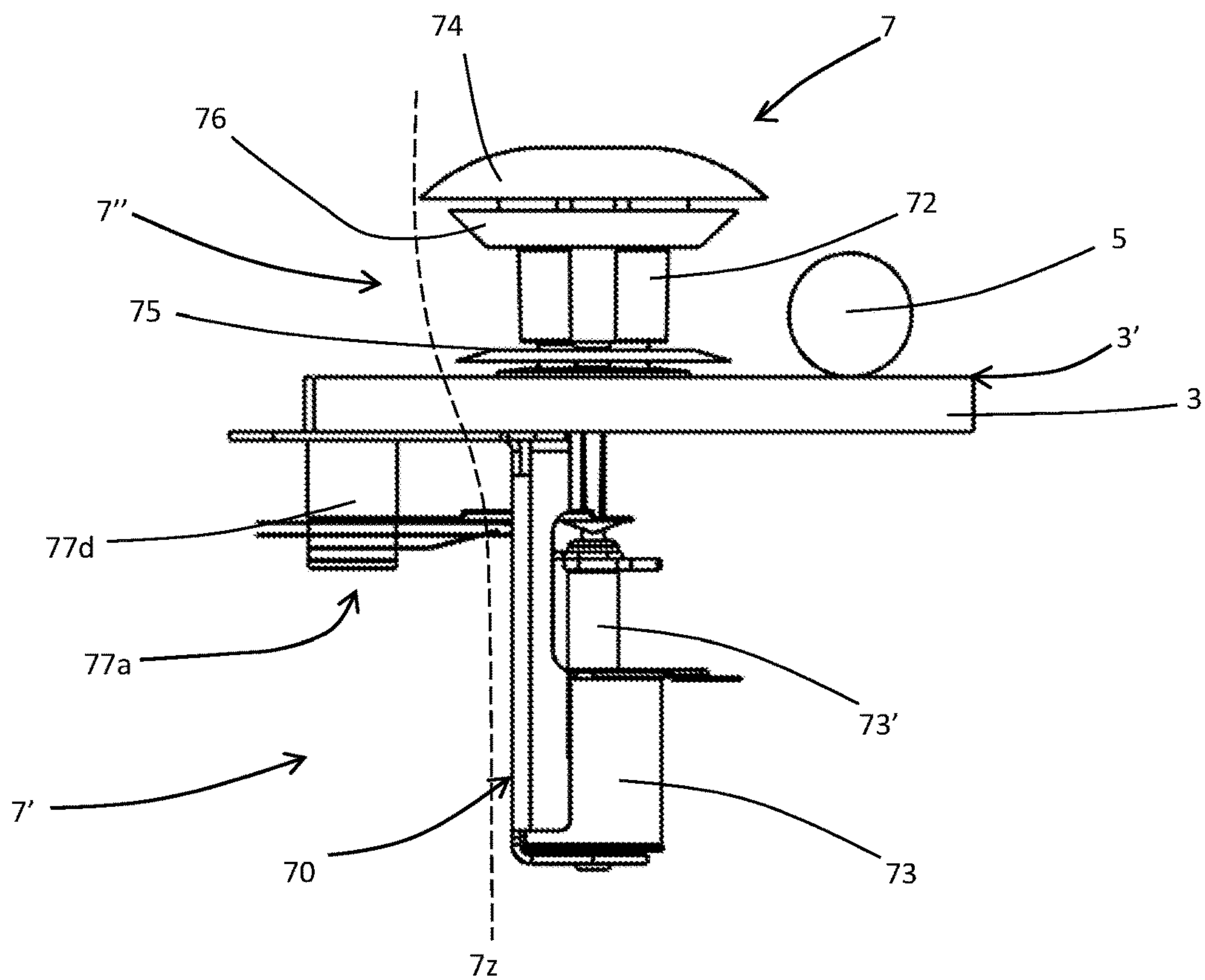


Fig. 5

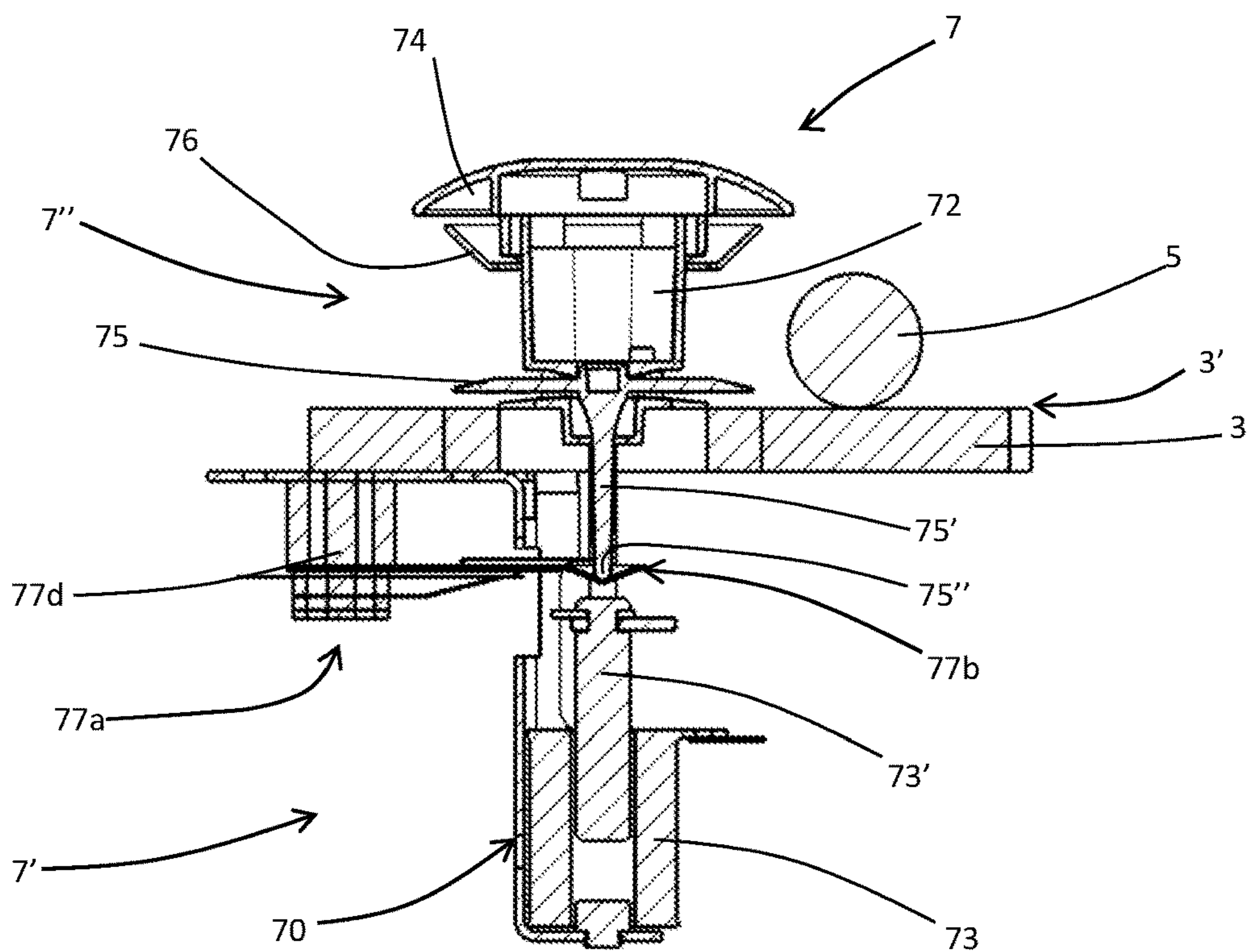


Fig. 6

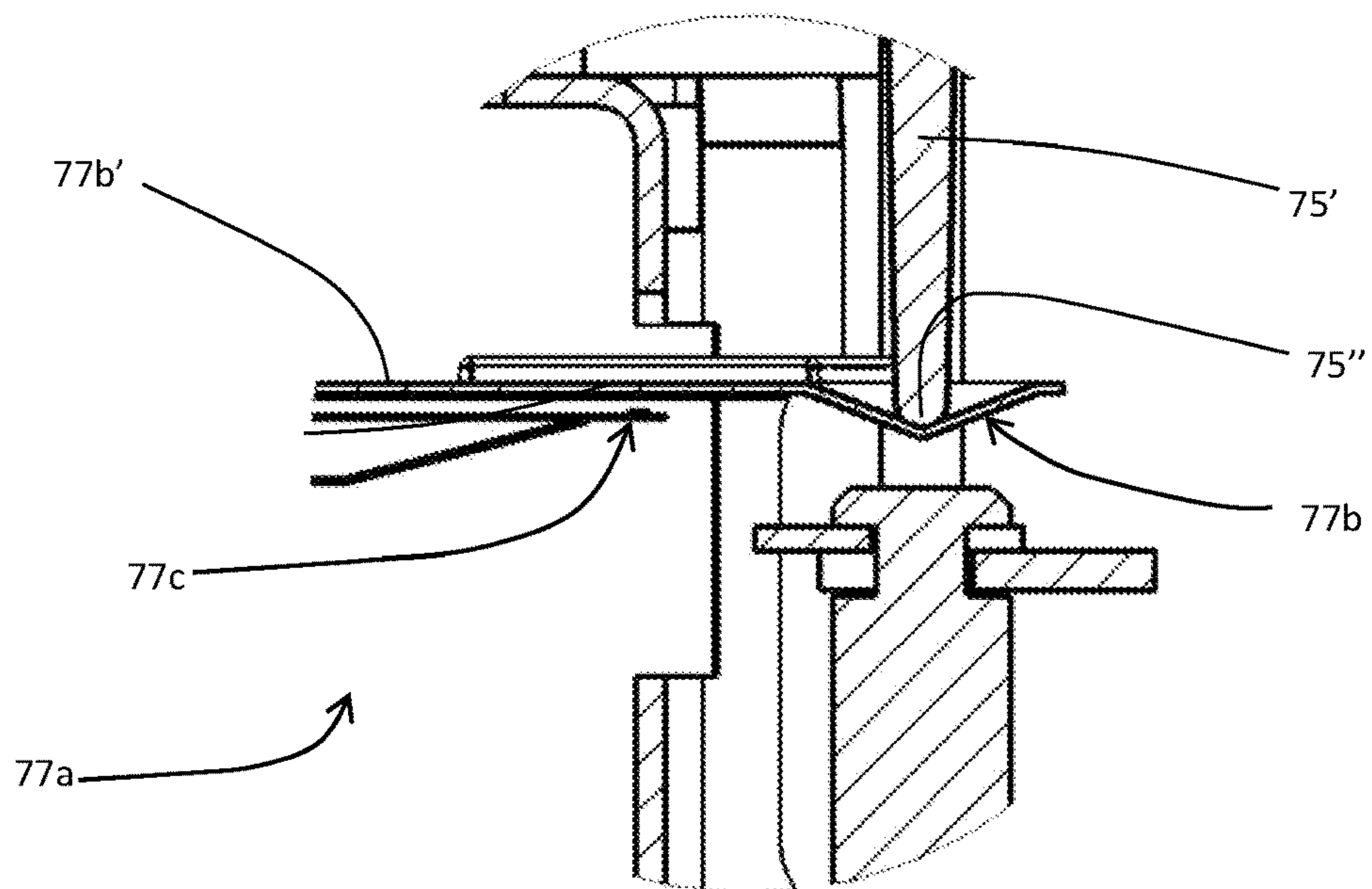


Fig. 7

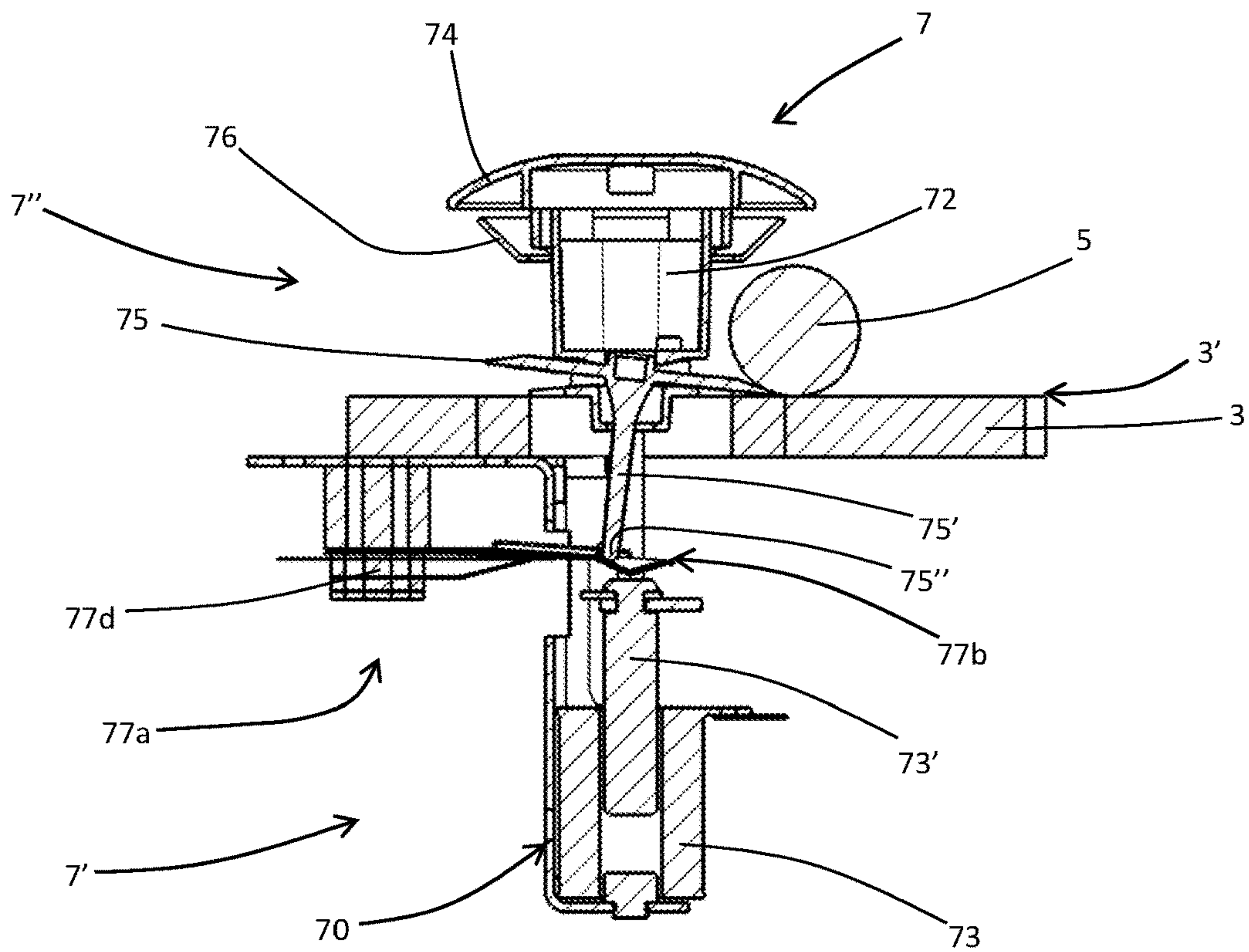


Fig. 8

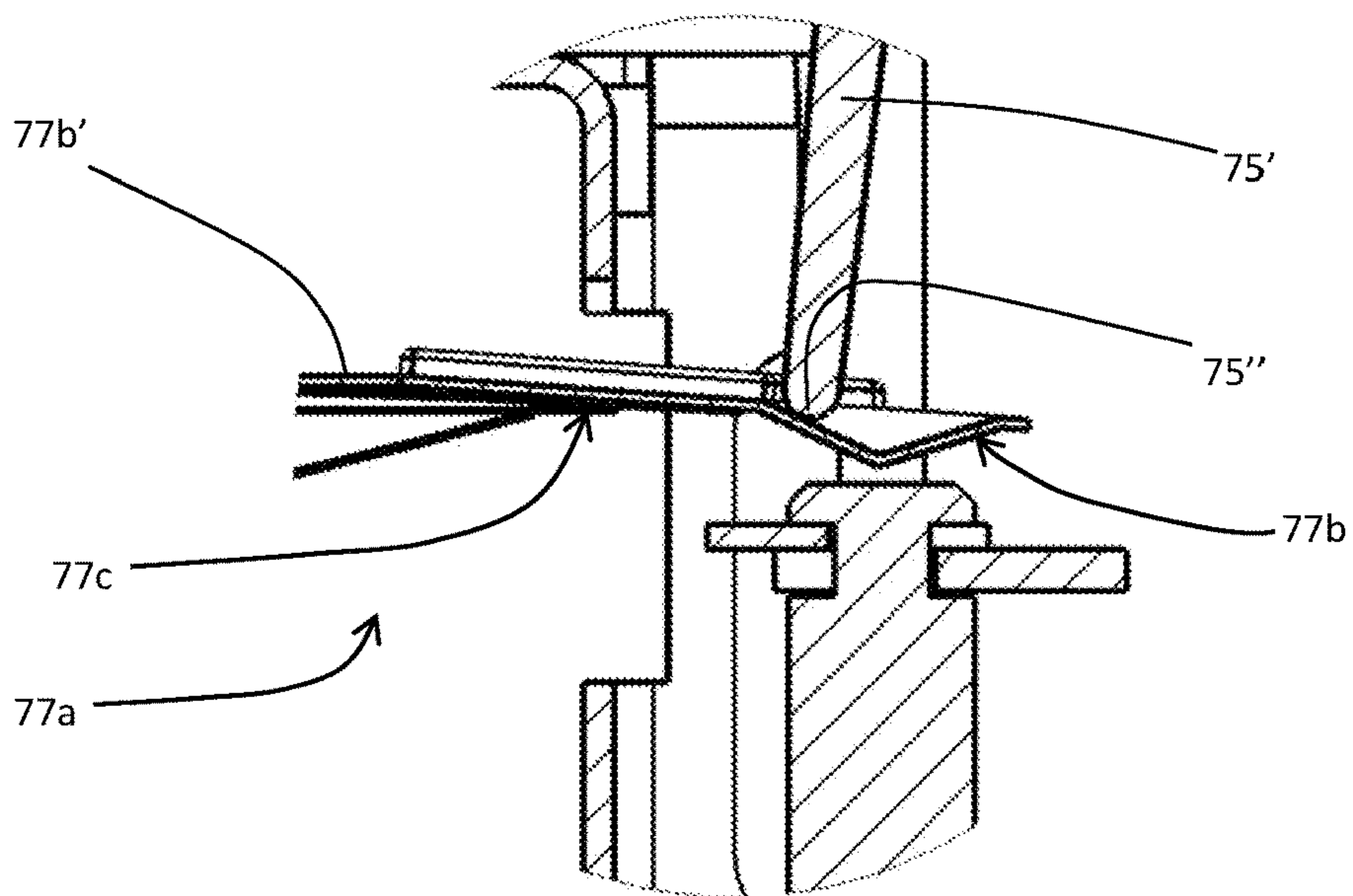


Fig. 9

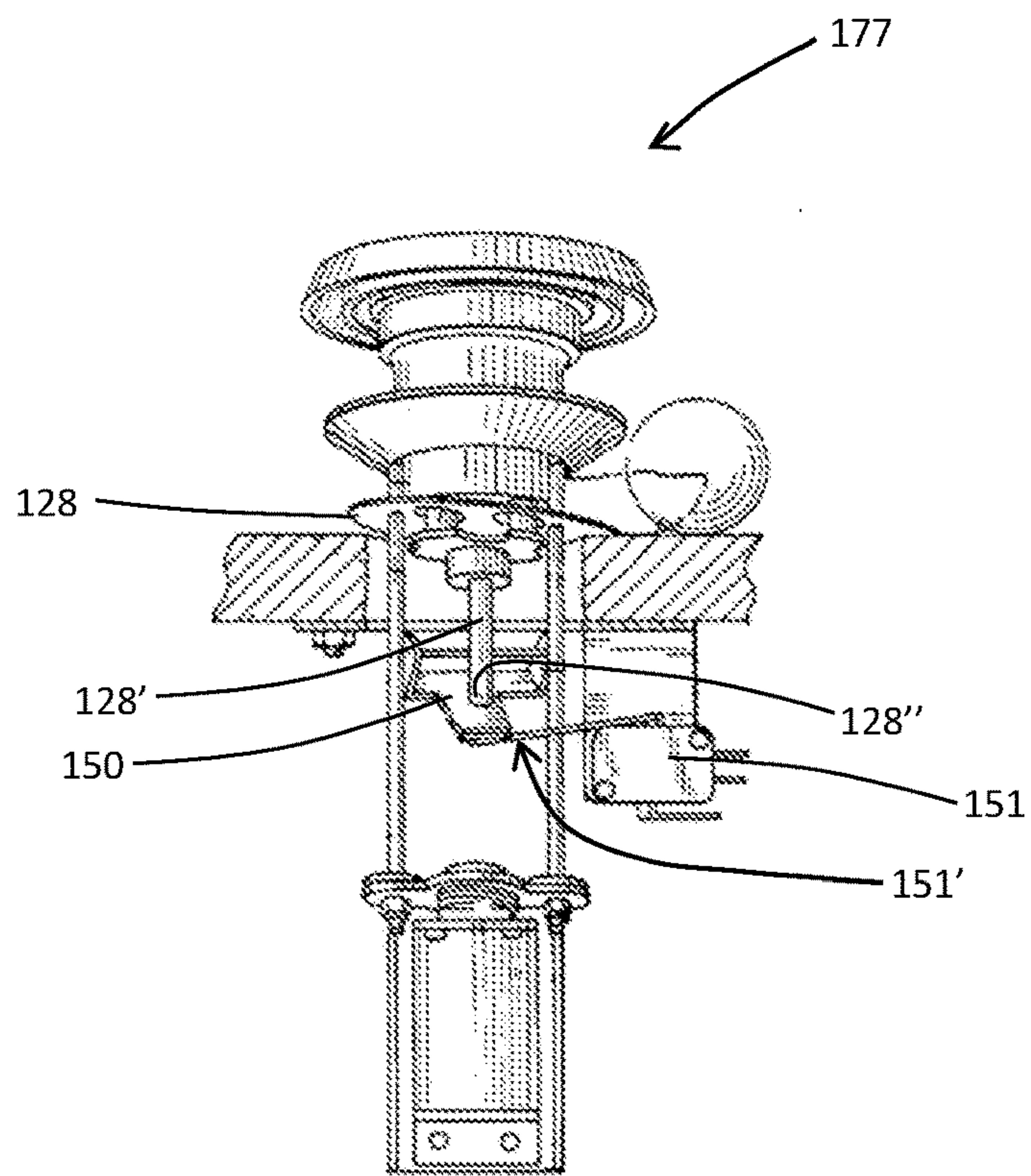


Fig. 10

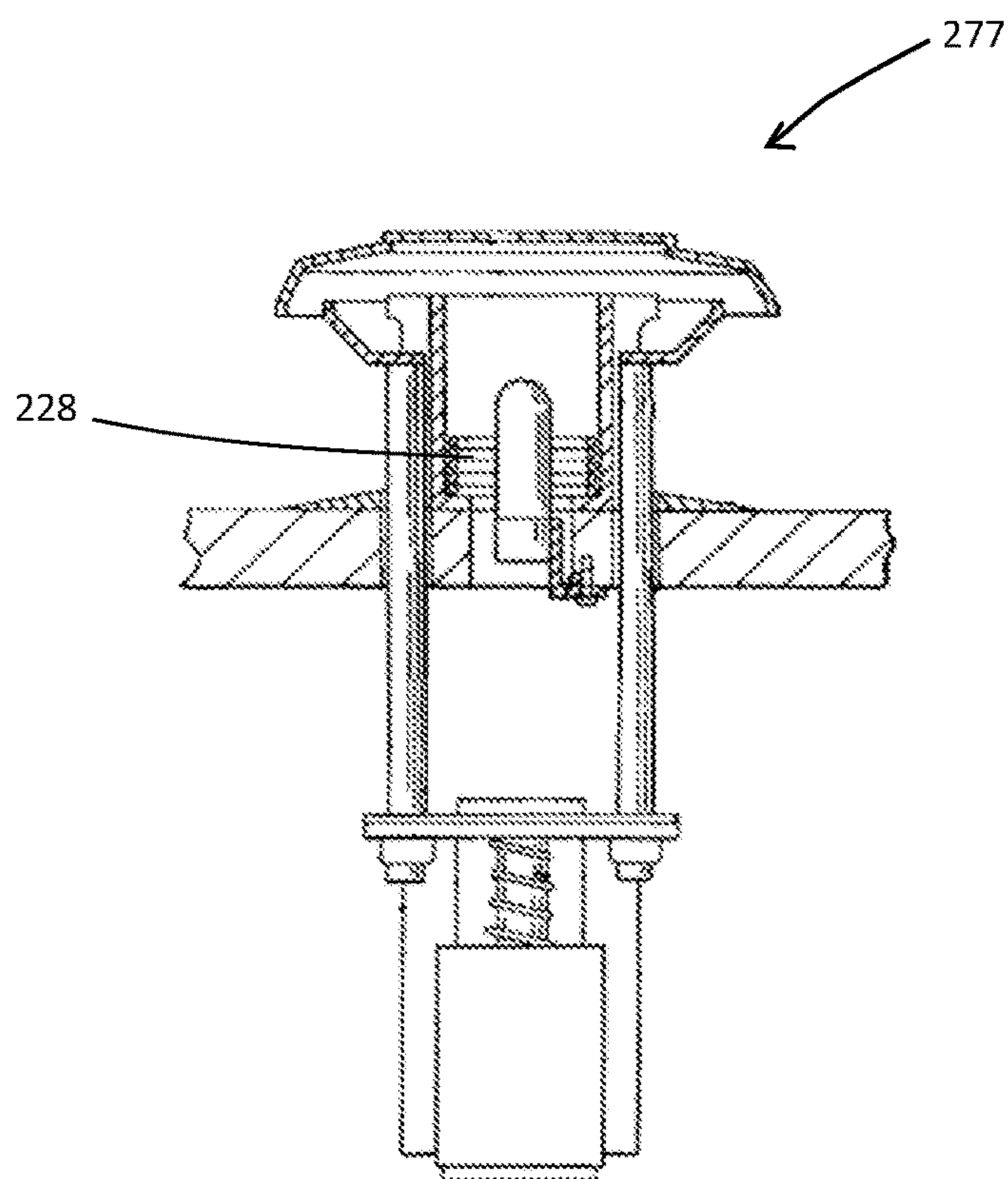


Fig. 11

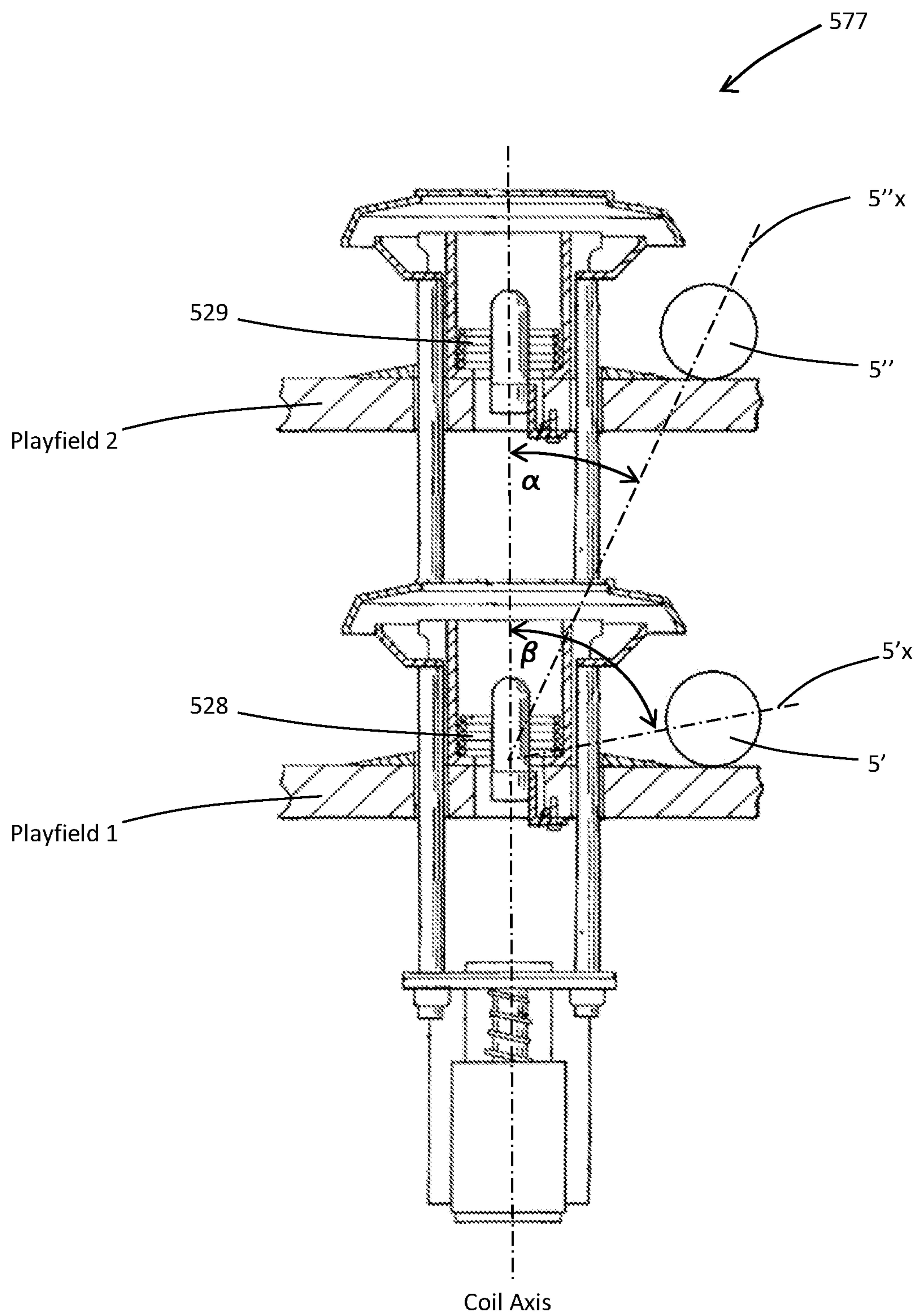
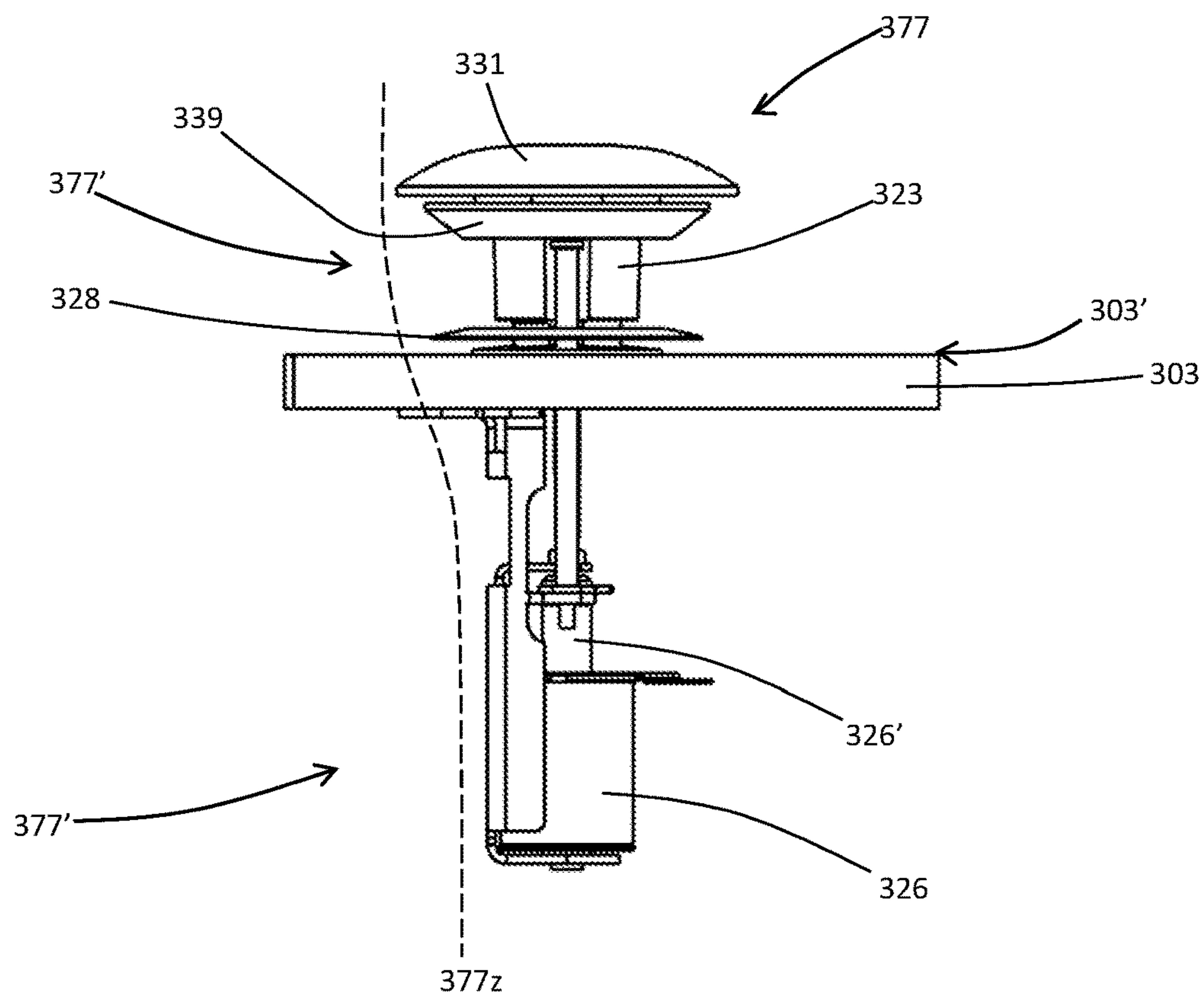
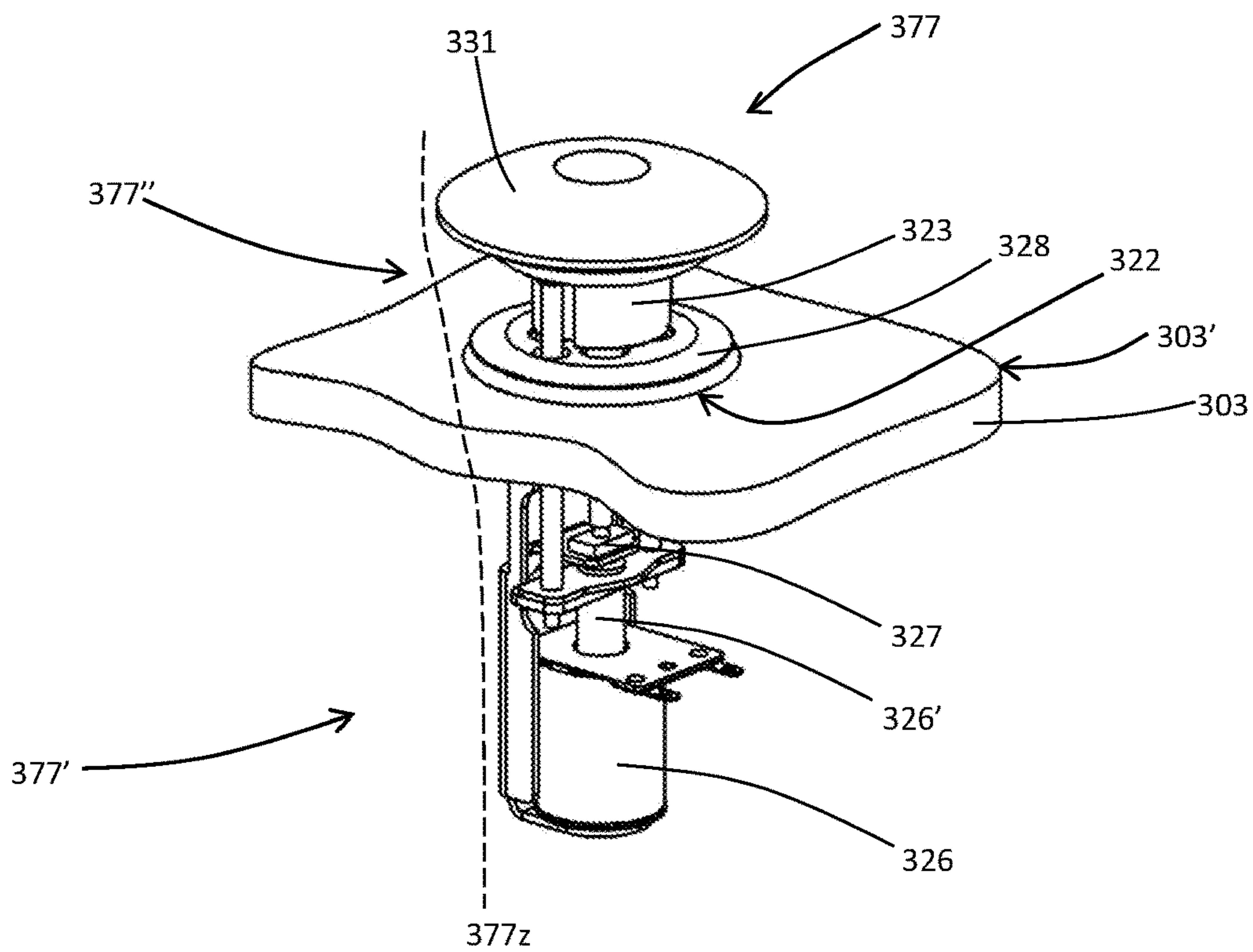


Fig. 12



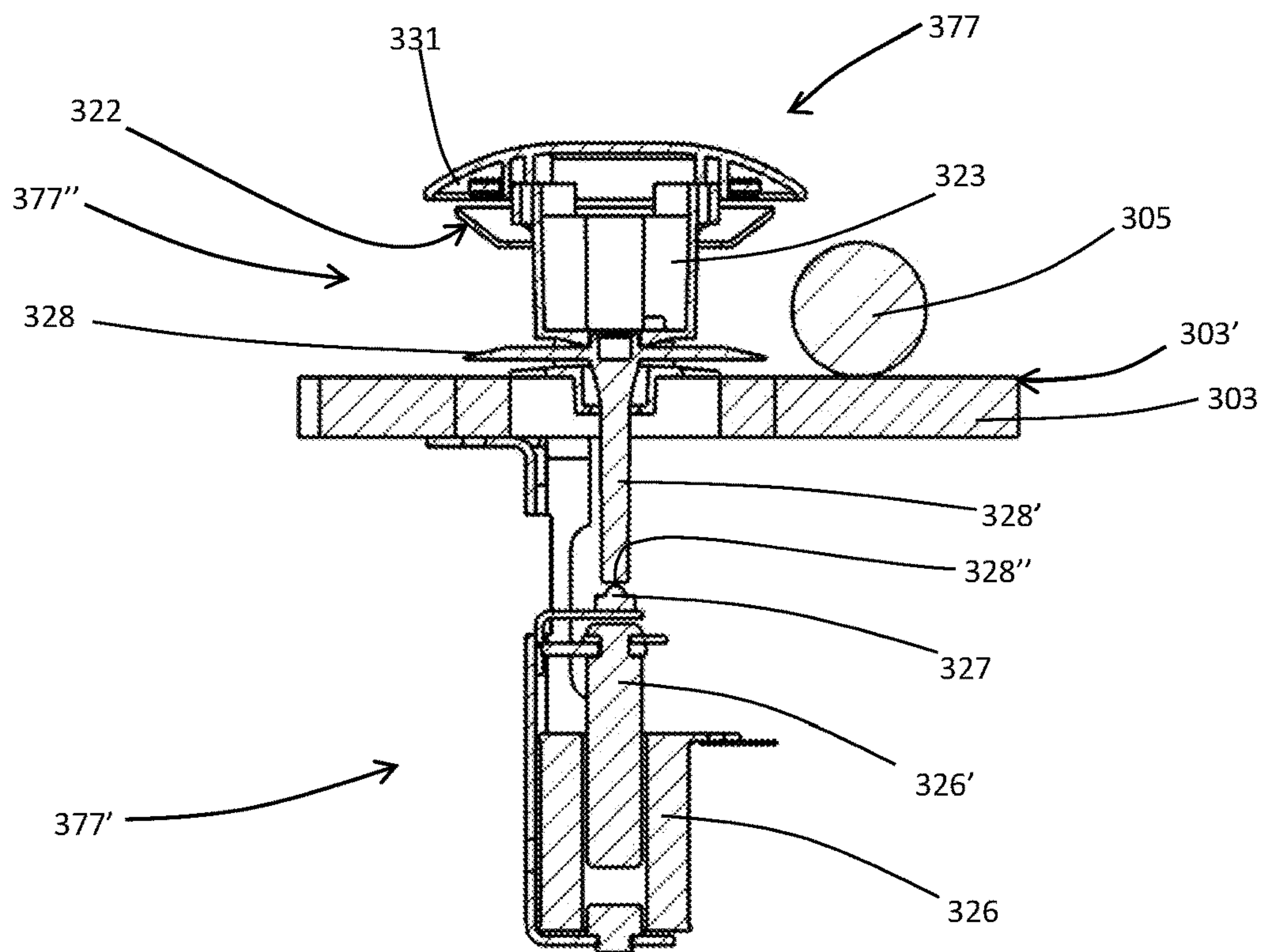


Fig. 15

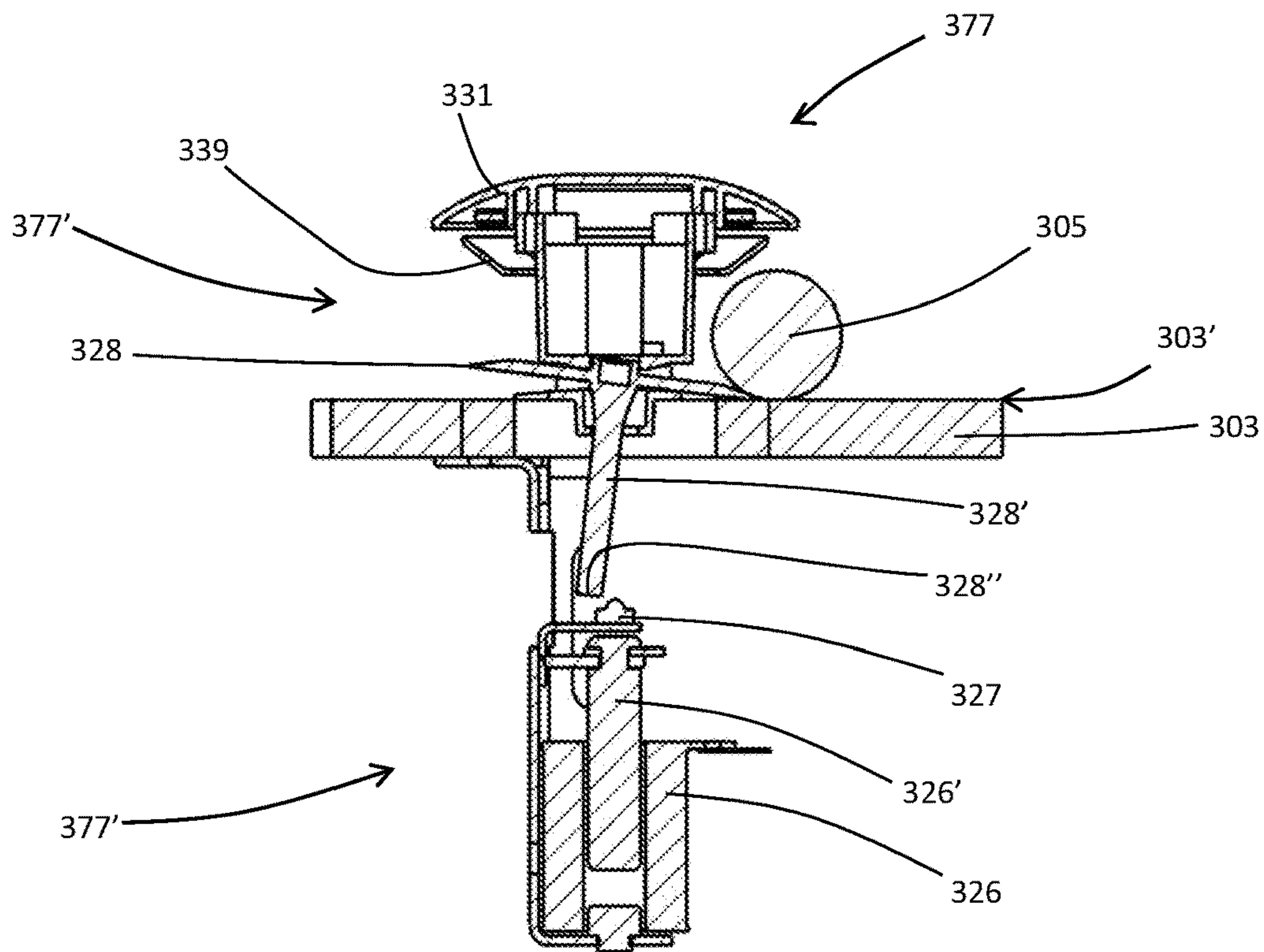


Fig. 16

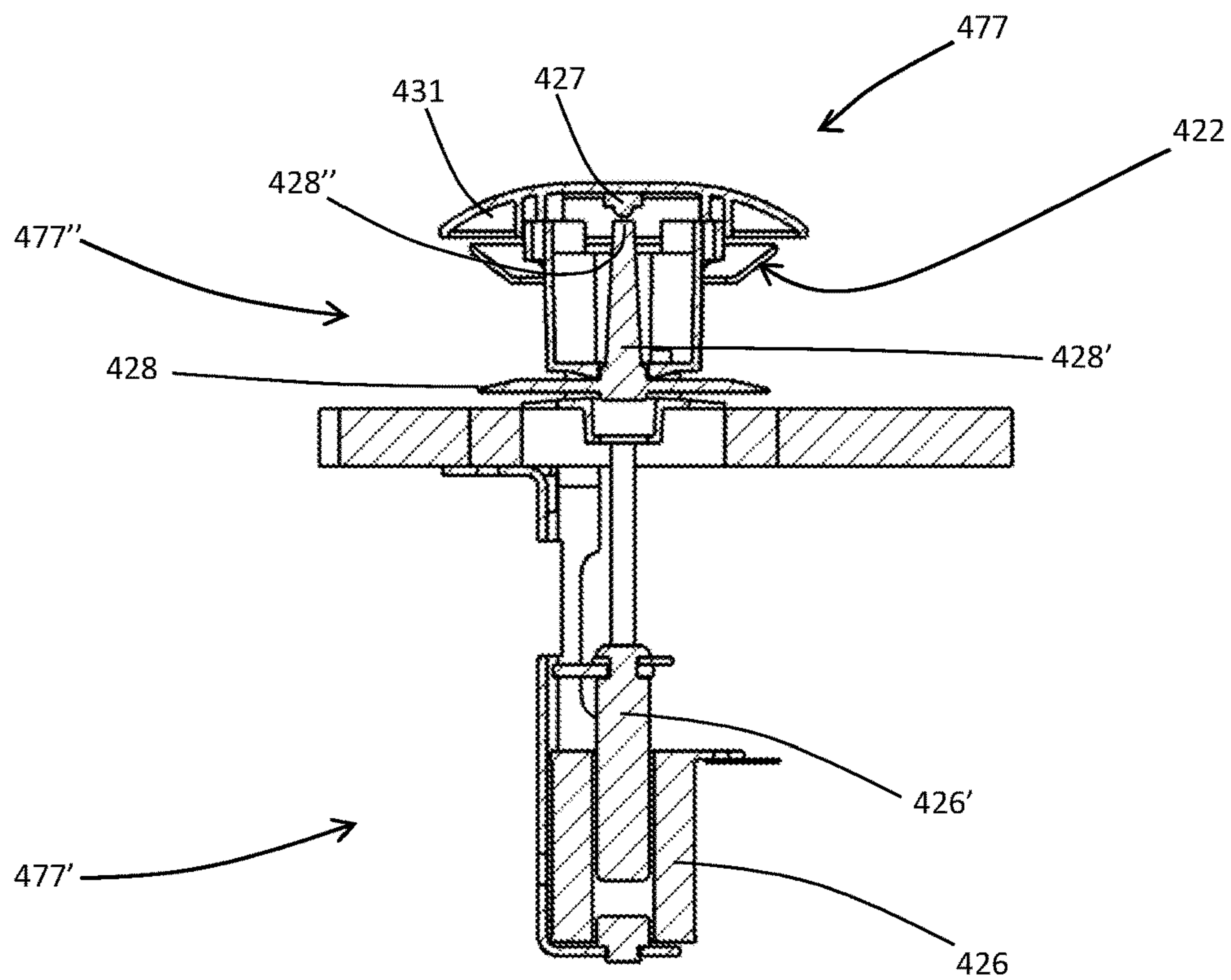


Fig. 17

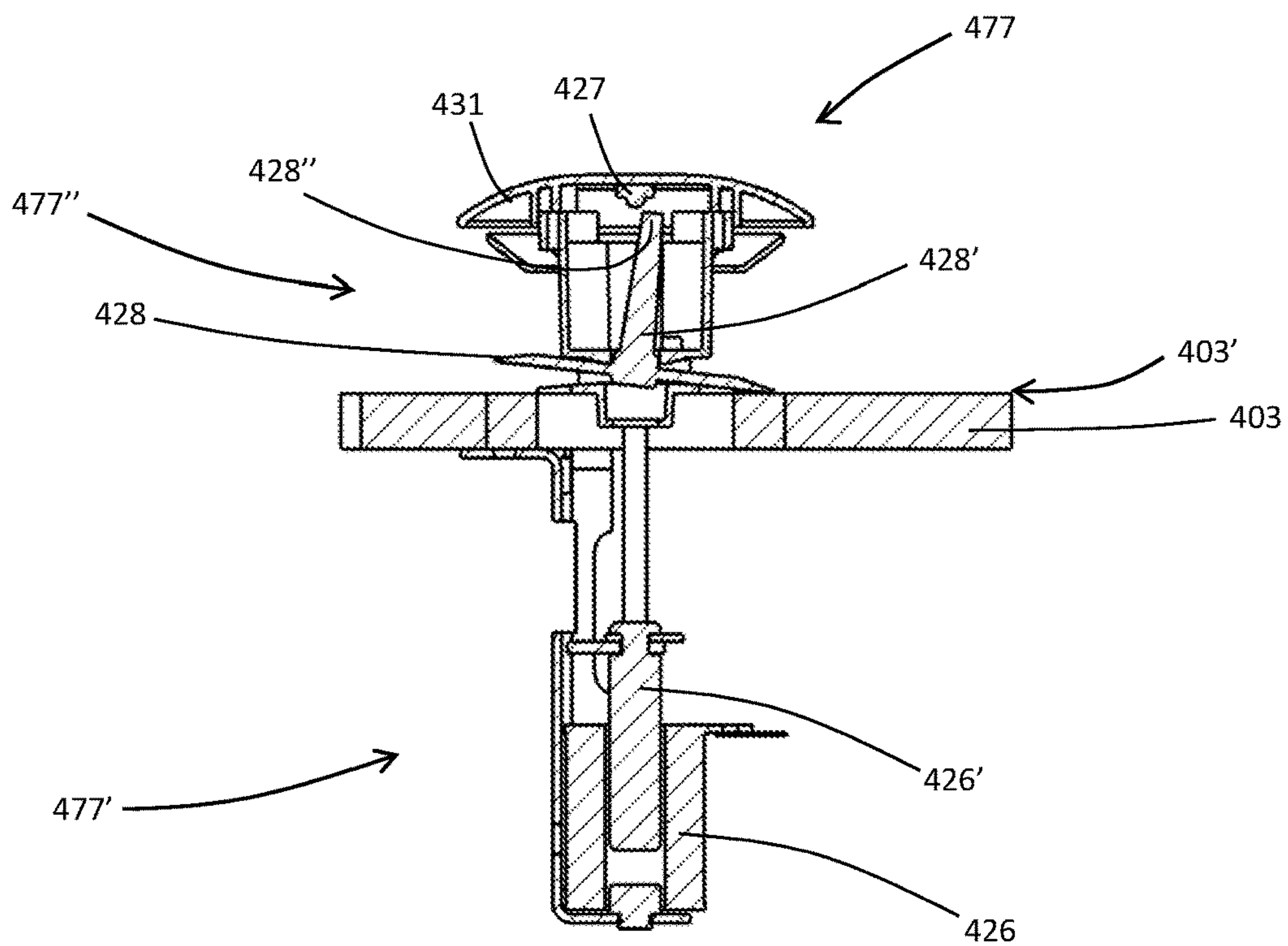


Fig. 18

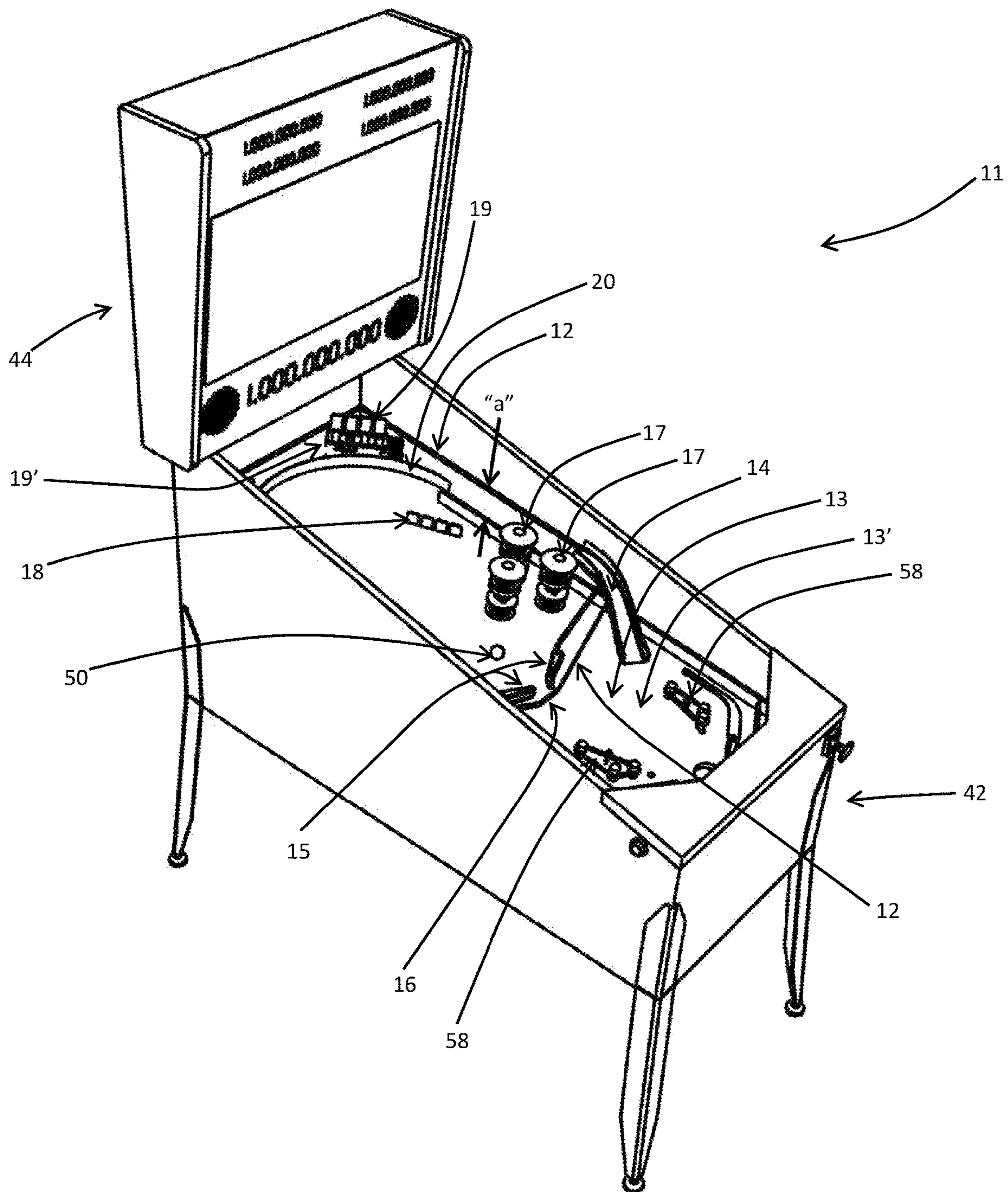


Fig. 19

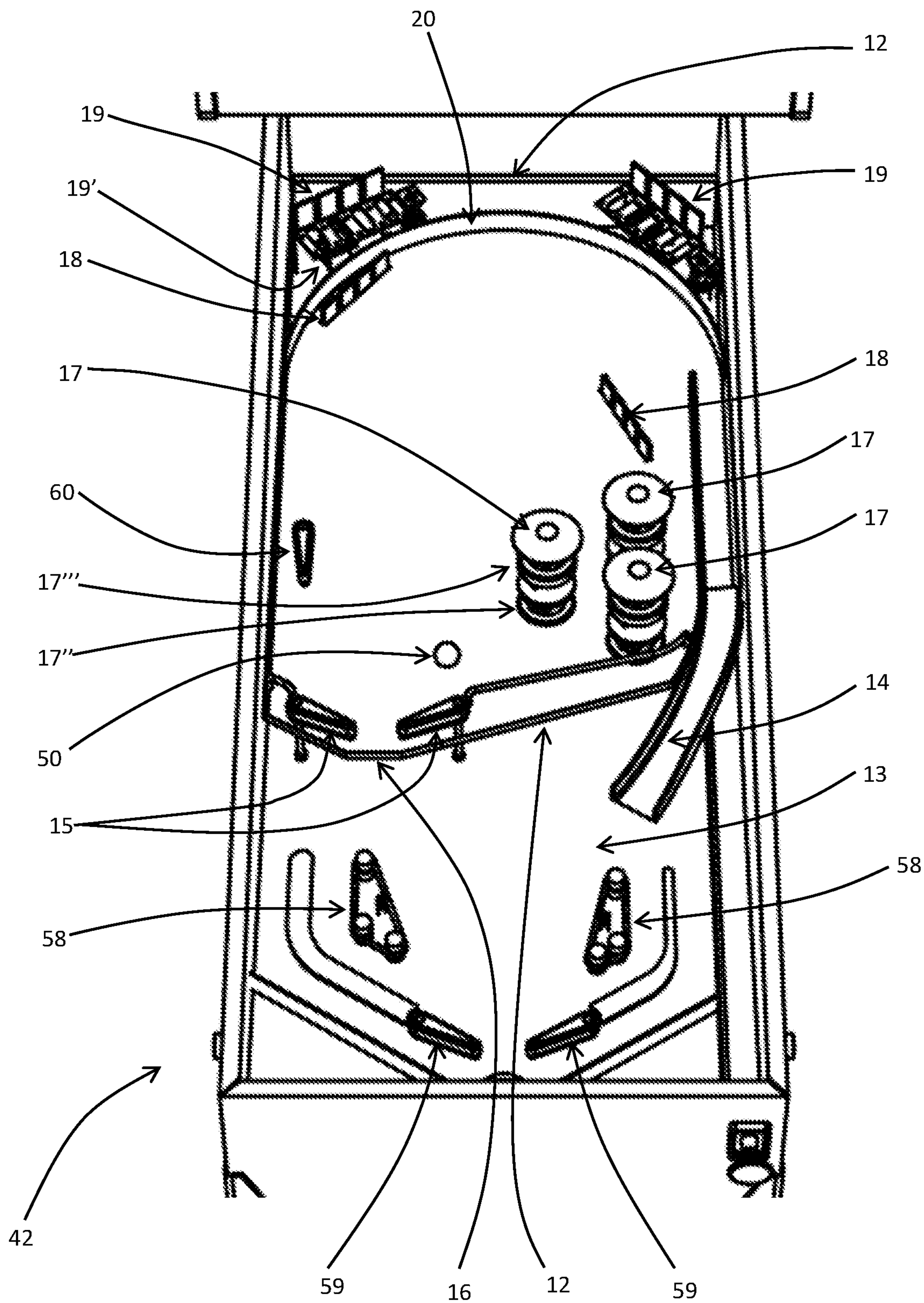


Fig. 20

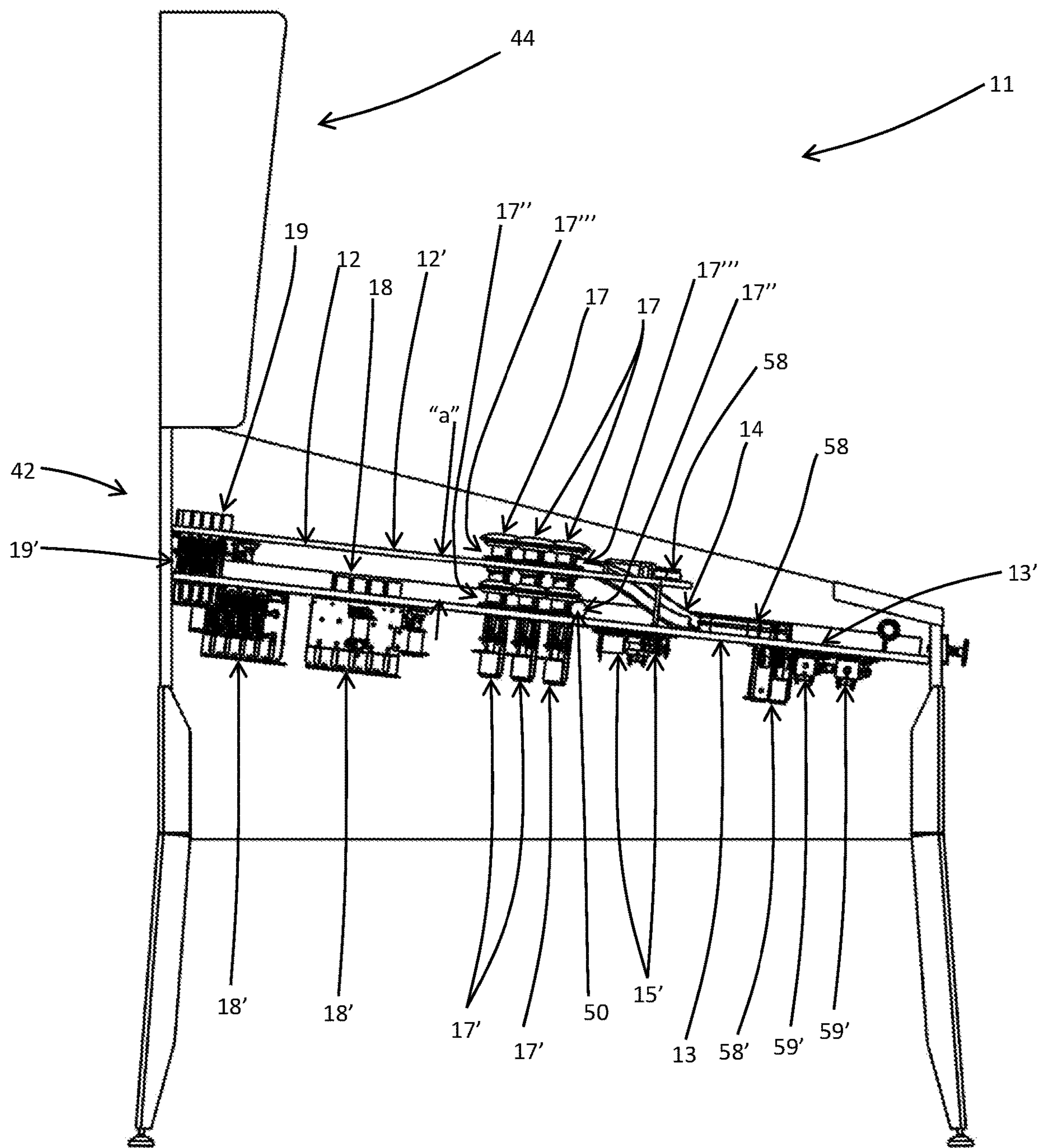


Fig. 21

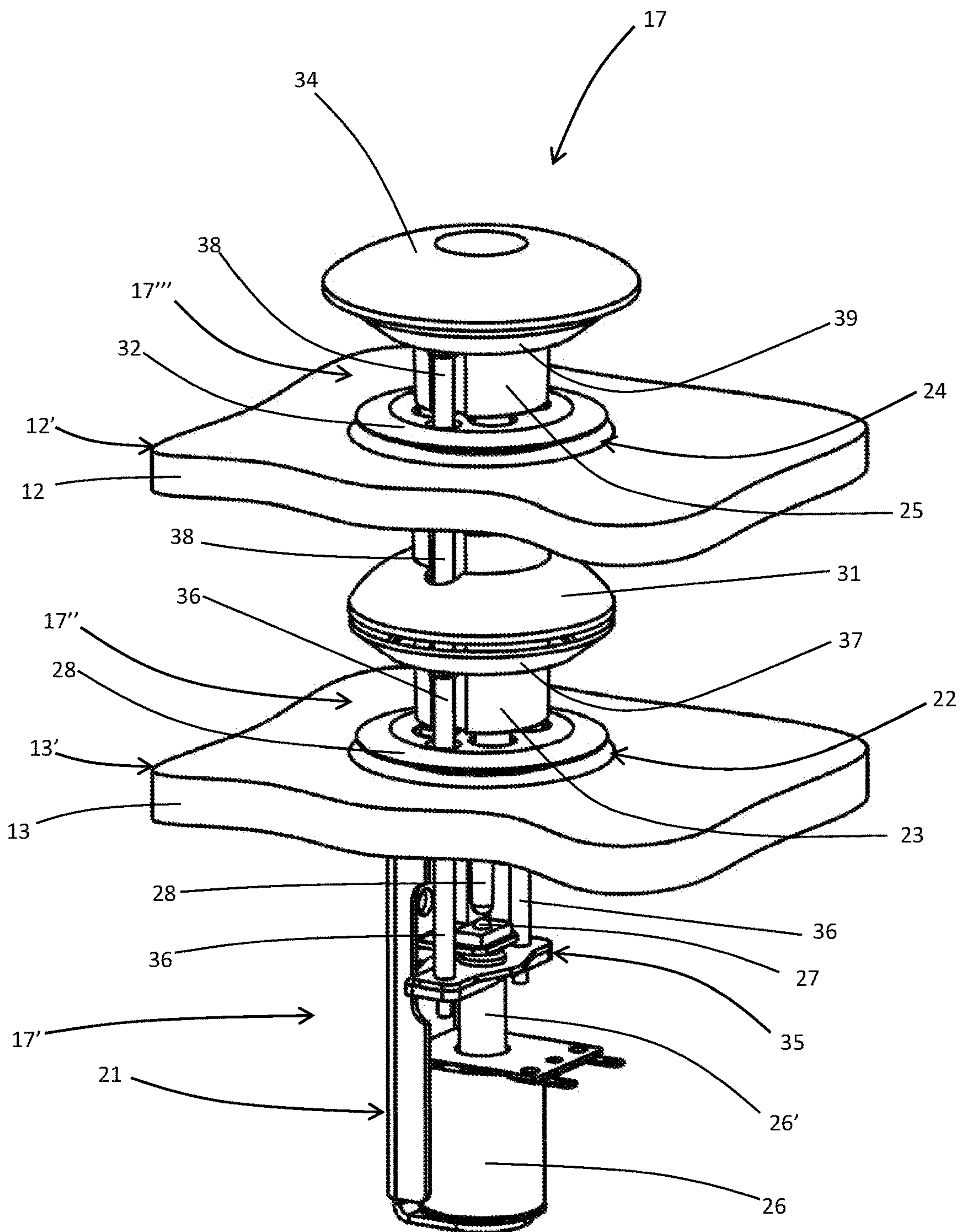


Fig. 22

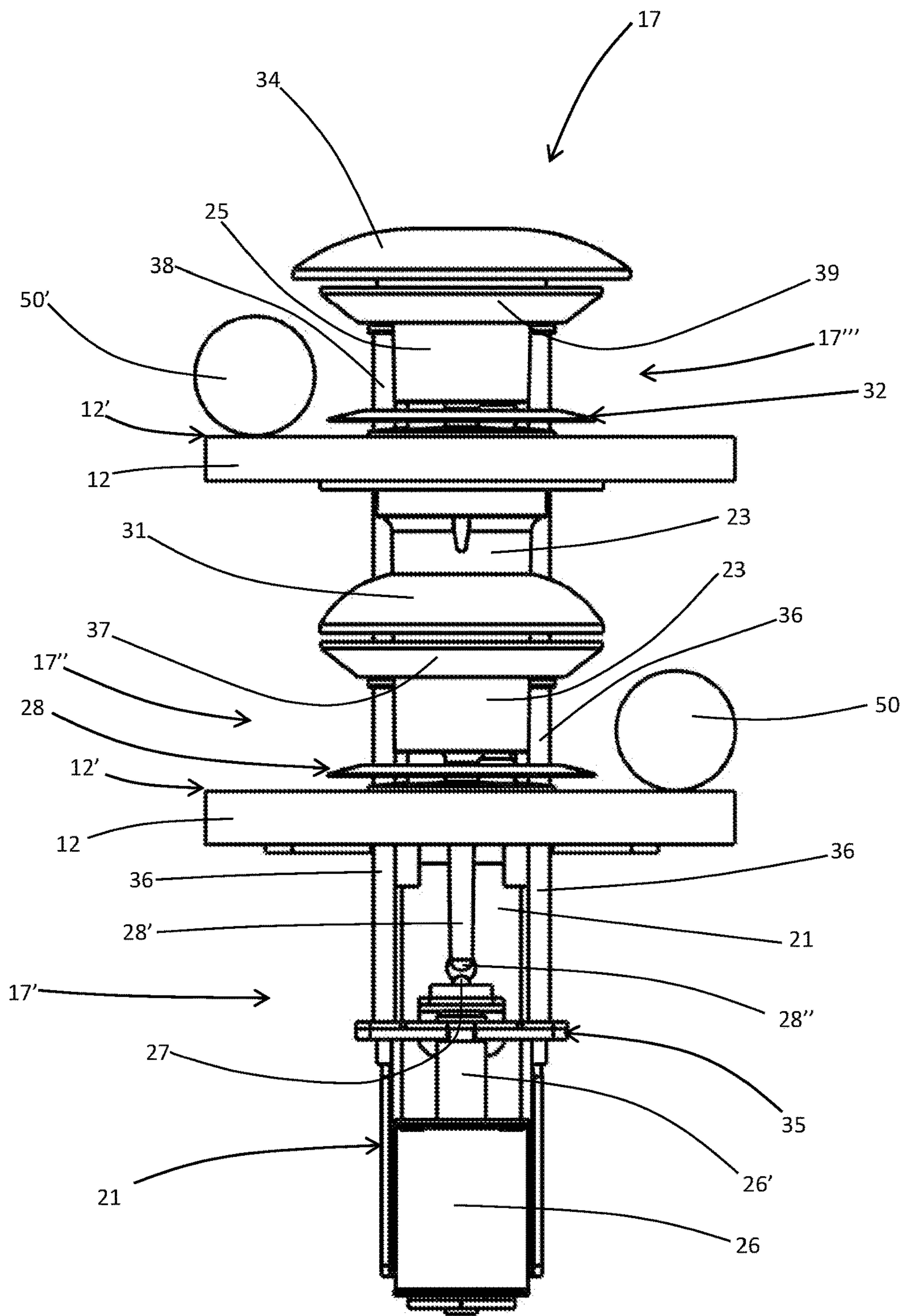
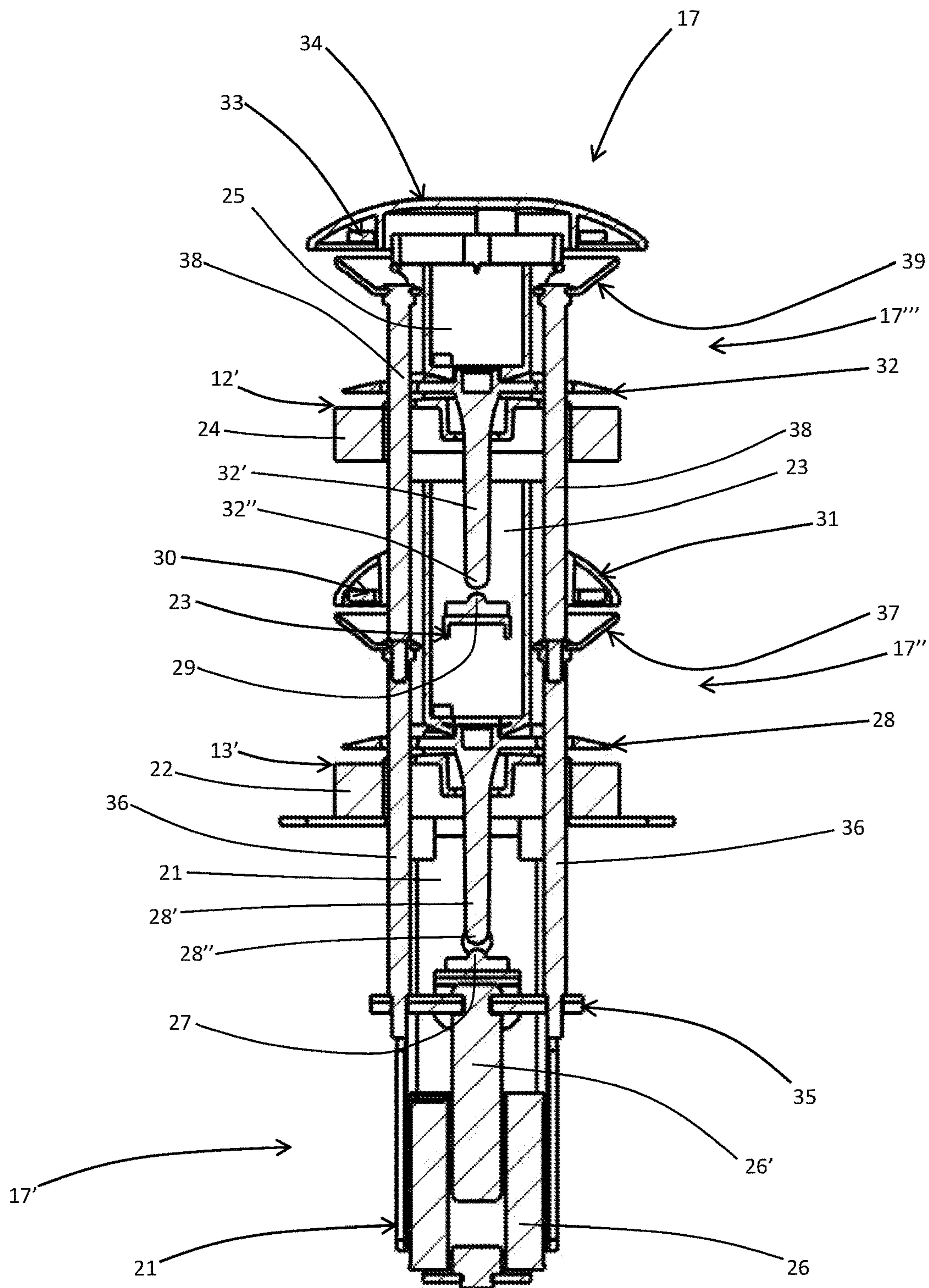


Fig. 23



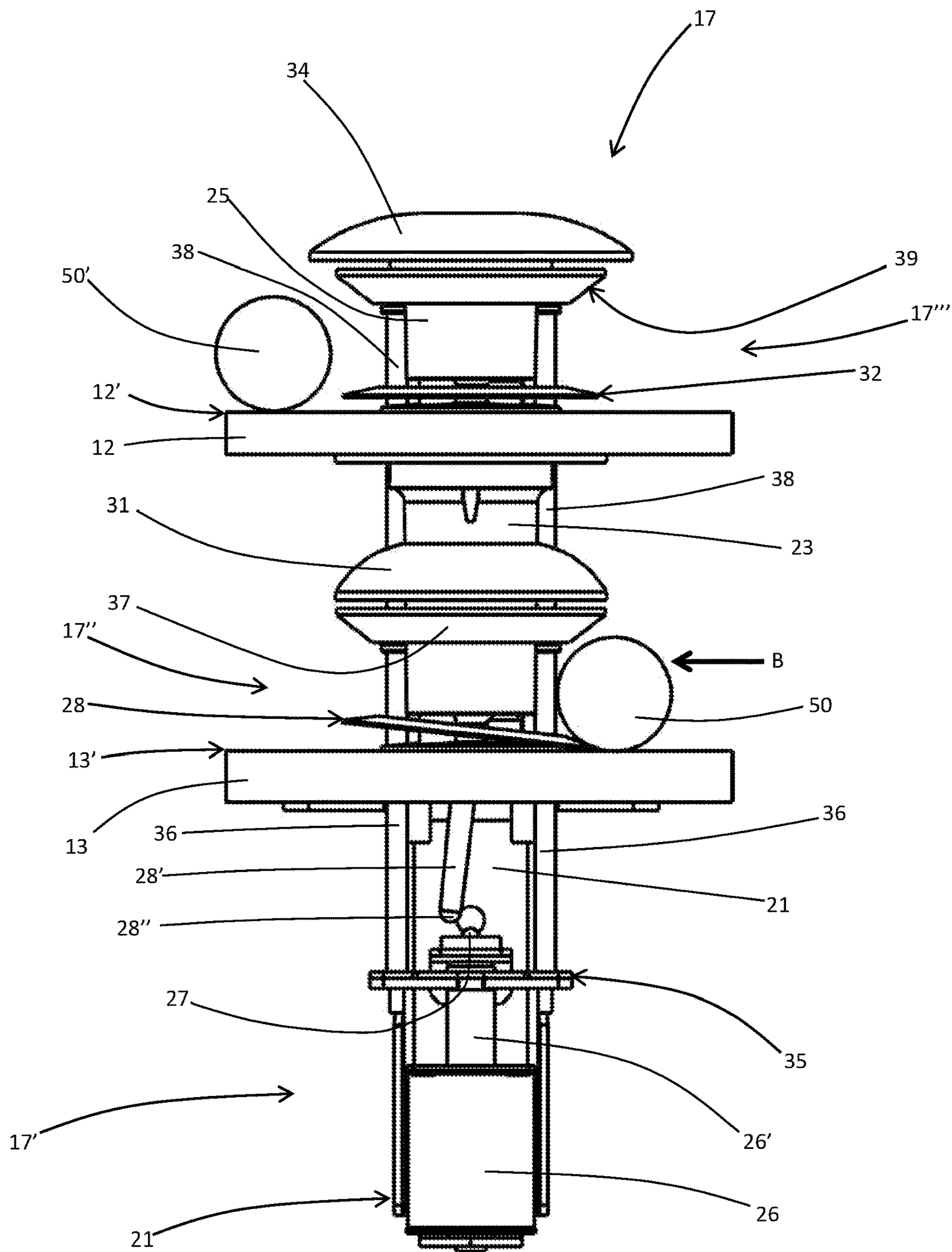


Fig. 25

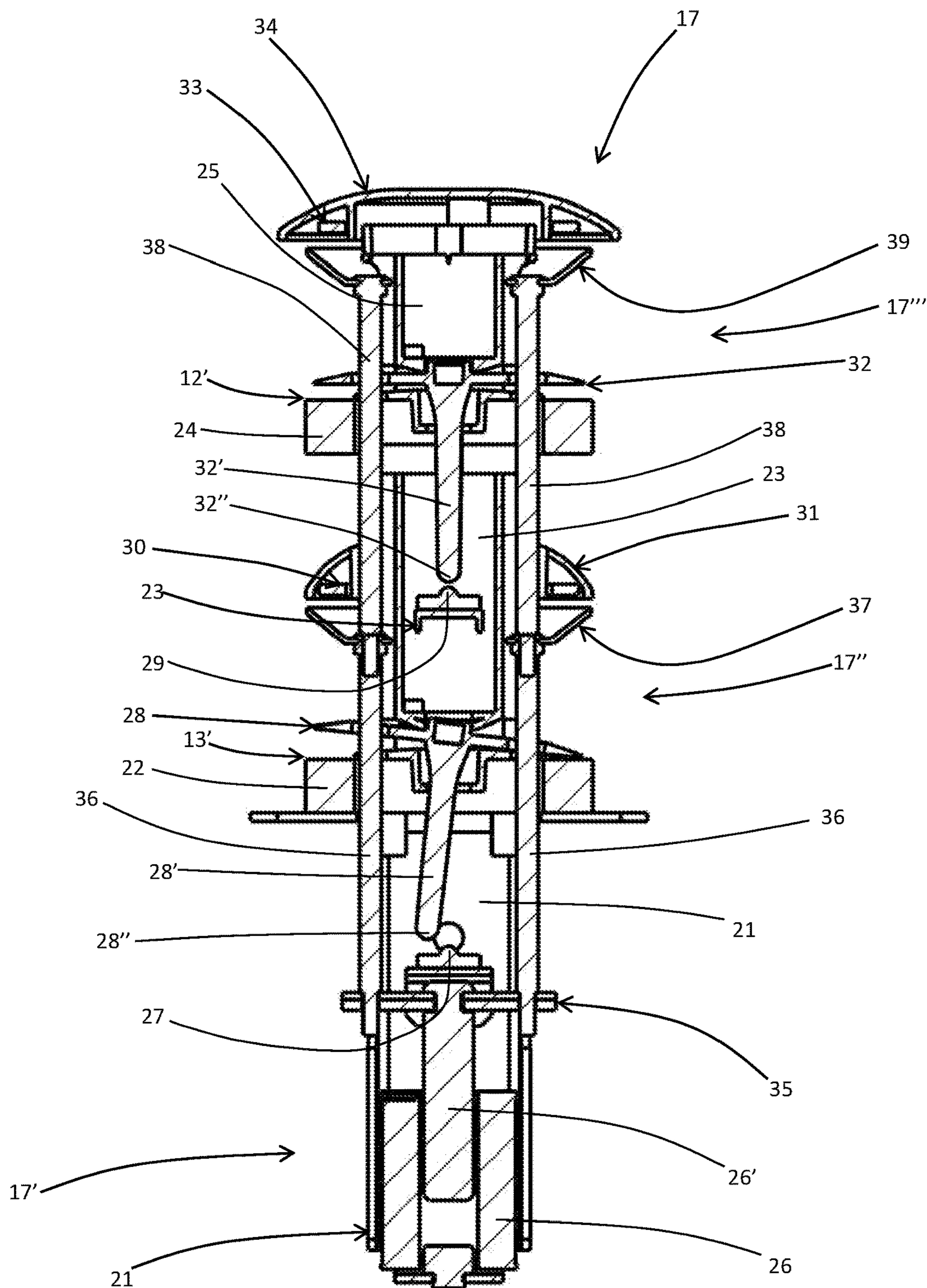


Fig. 26

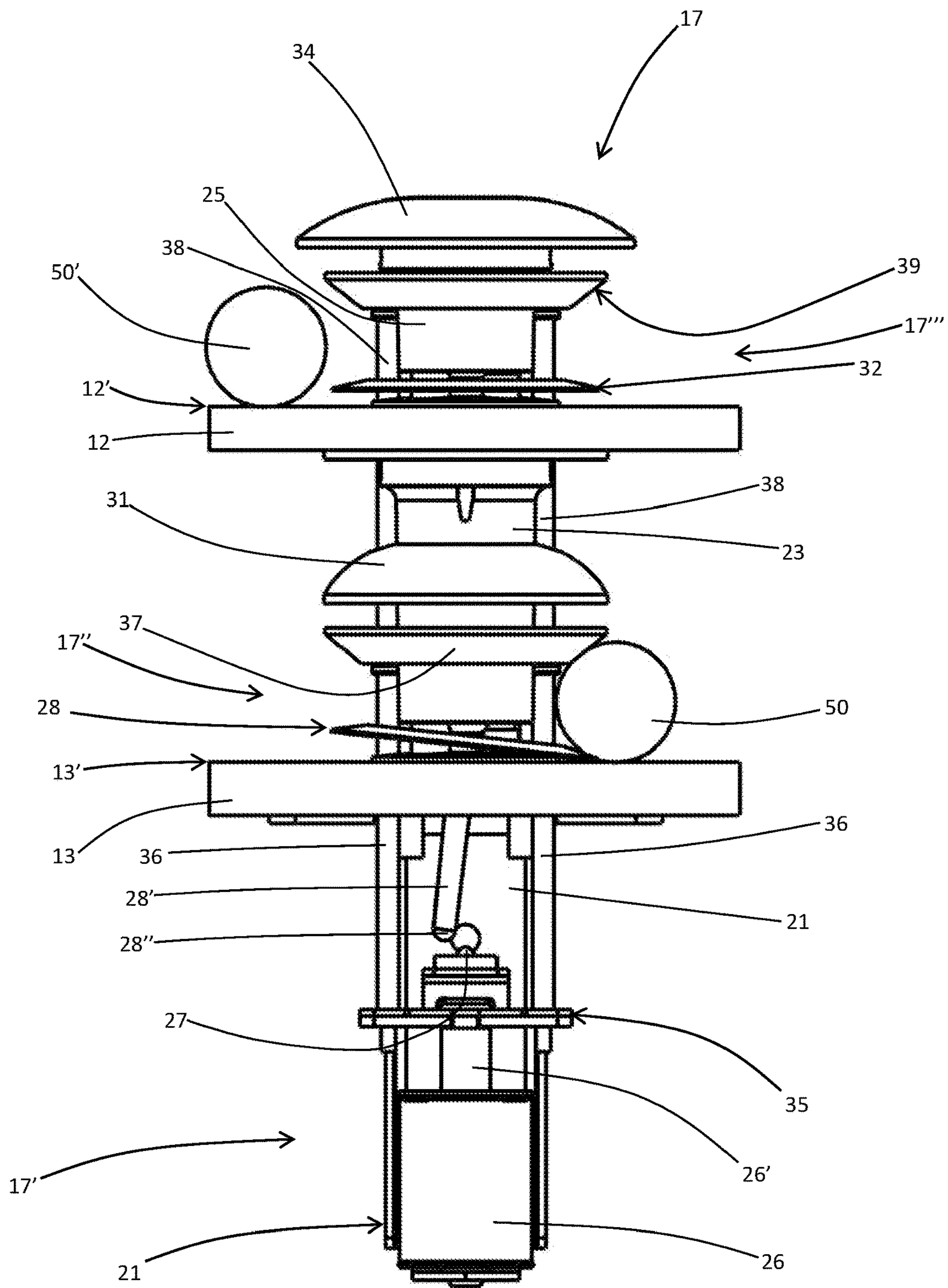


Fig. 27

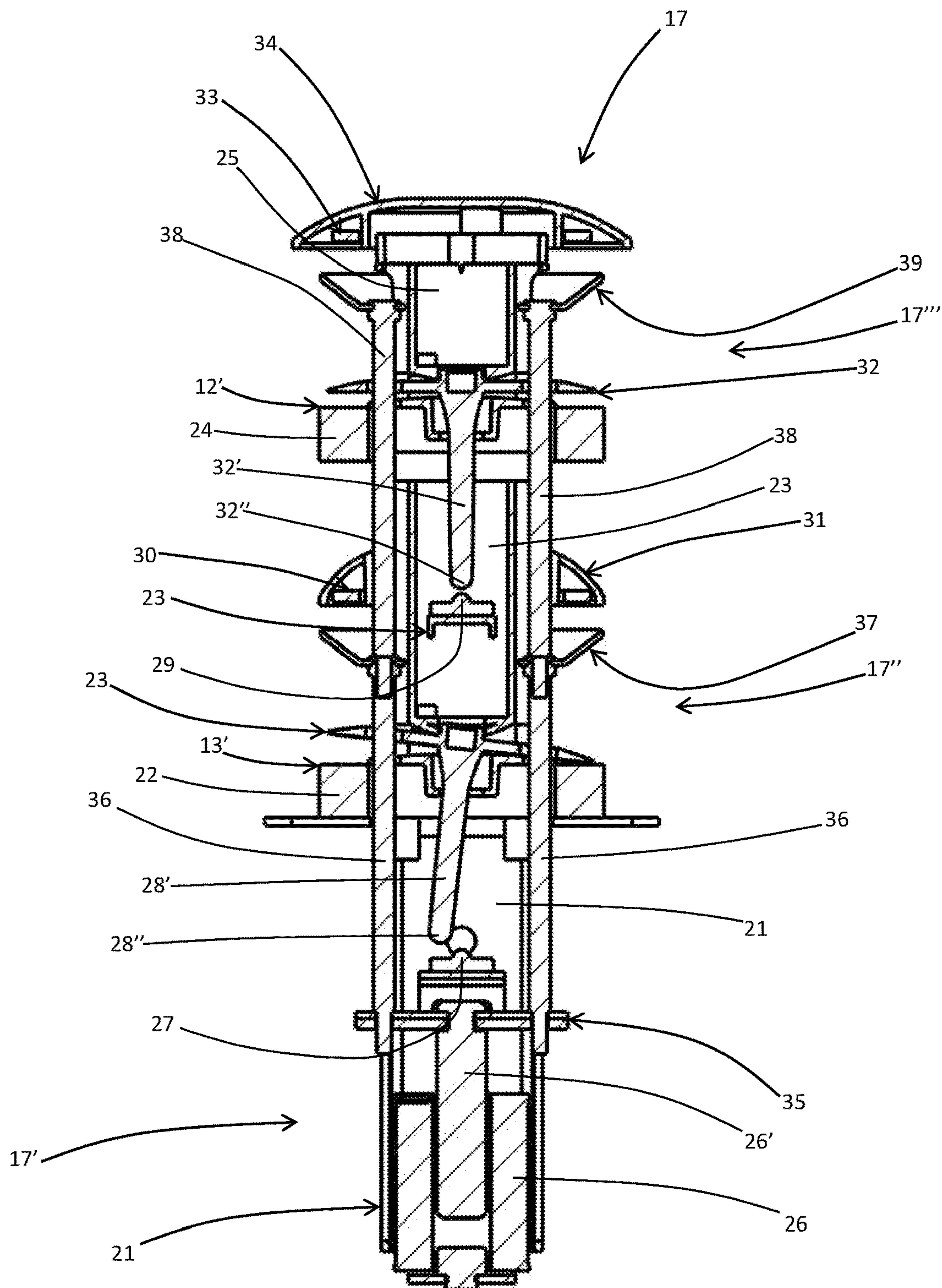


Fig. 28

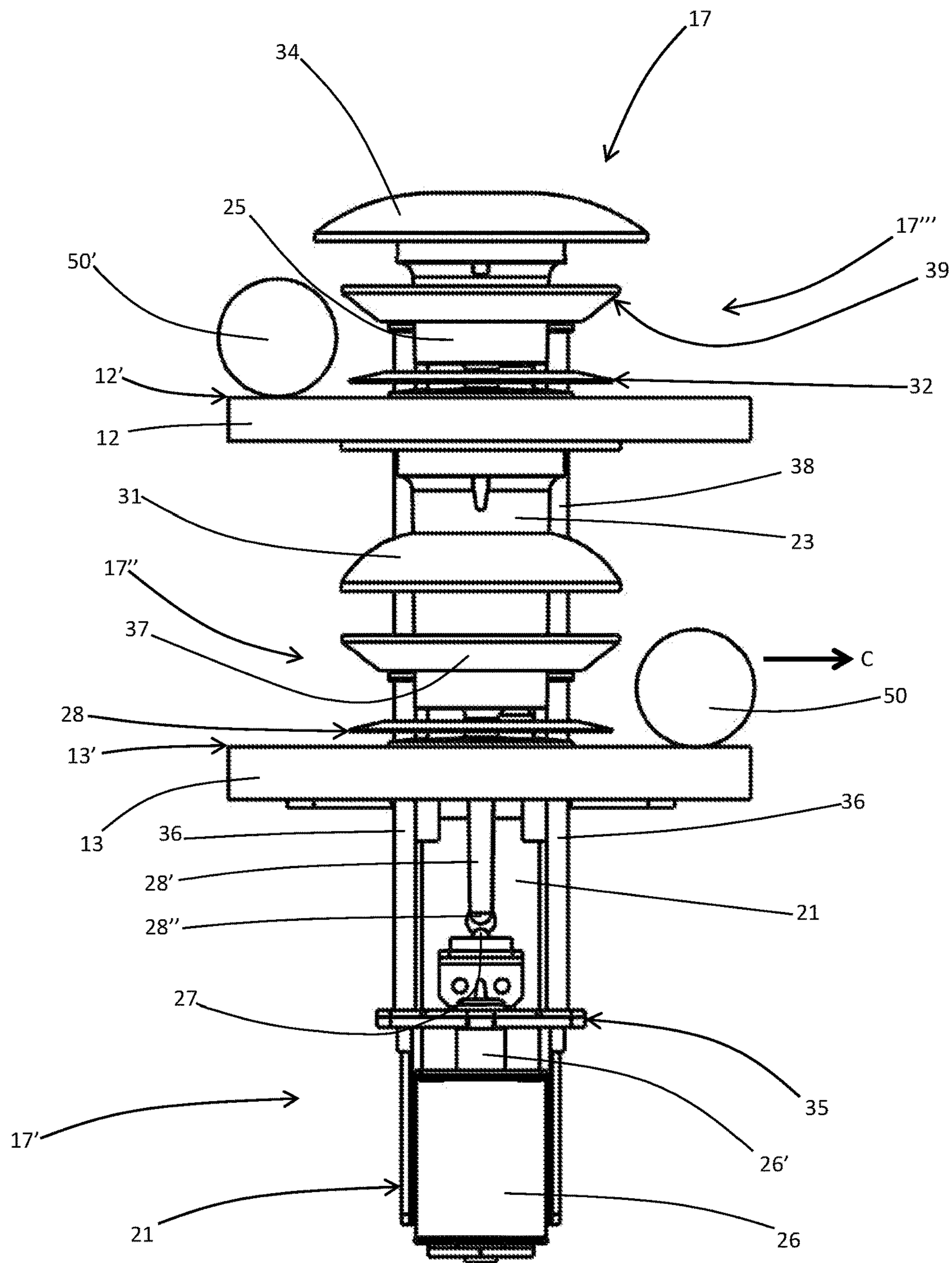


Fig. 29

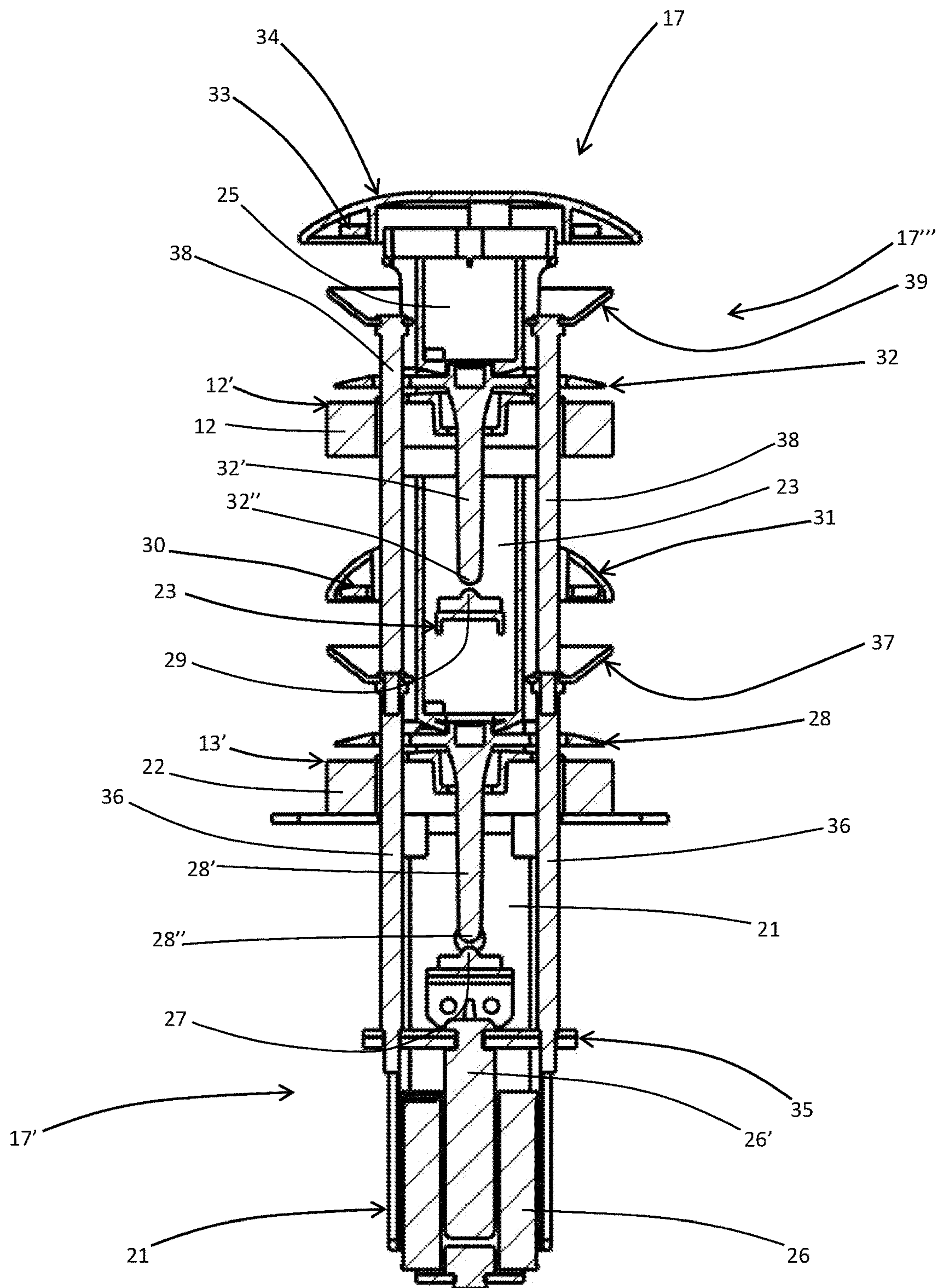


Fig. 30

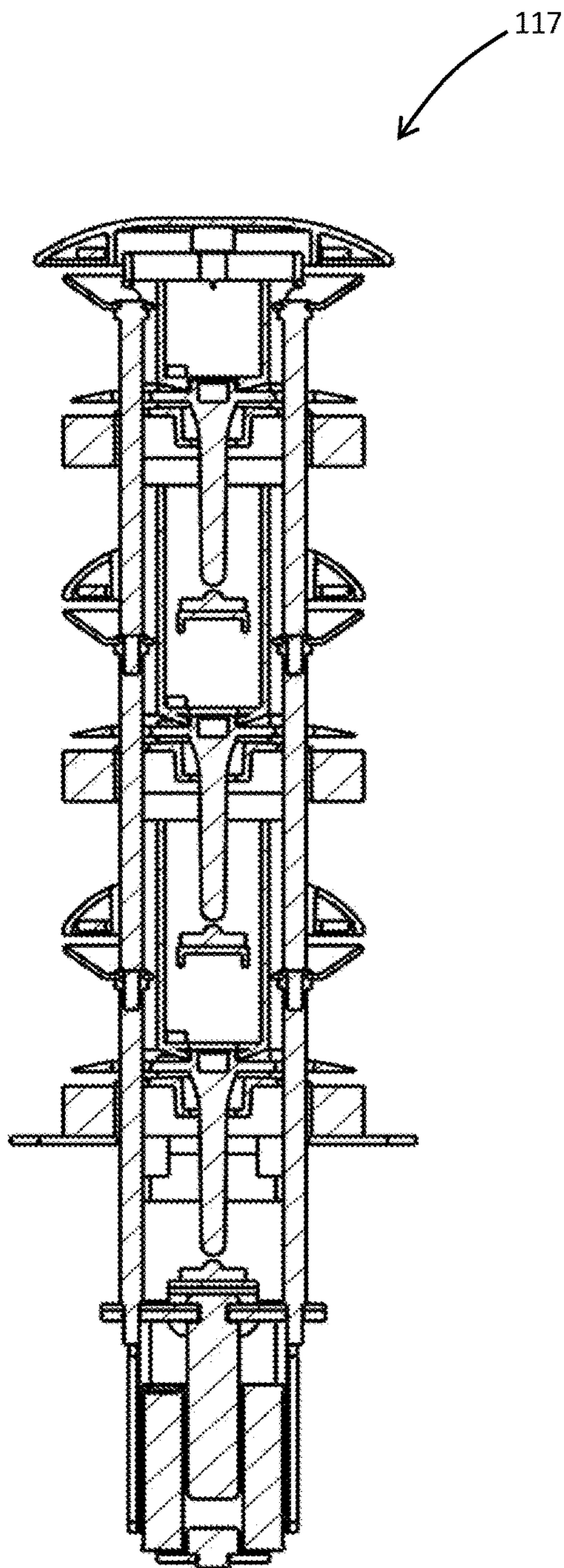


Fig.31

MULTIPLE ASPECT ARCADE GAME DEVICE

BACKGROUND OF THE INVENTION

[0001] Amusement games such as pinball machines are well known in the art. By way of example U.S. Pat. No. 5,833,236 of 1998 for Williams Electronic Games Inc. and 2013/0228970 for Multimorphic Inc. illustrate and describe amusement games having a main cabinet body housing a playfield on which the main game actions are carried out.

[0002] The most common configuration for a pinball machine as described is to have a main cabinet containing a game playfield. The cabinet is of such a size as has become an accepted standard in the industry by providing a good balance between being large enough to give a player an extensive enough field of play for interest while not being so large that there cannot be found room to house the pinball machine itself. The playfield generally extends to cover as much of the area available inside the bounds of the main cabinet walls as possible to provide the player with as extensive a game area as possible. The main cabinet has a glass top over the playfield mainly to protect all operating mechanisms on the playfield from interference, damage and dirt but also from manipulation by a player to increase their score. Usually at the rear end of the cabinet furthest from the player and mounted on top of the main cabinet is the backbox which may include among other things scoring displays, a graphic either moving or still reflecting the games theme and loudspeakers giving sound effects and instructions for the player.

[0003] The playfield within the cabinet is made up of a generally flat nearly horizontal surface inclined at a shallow angle sloping down towards the front end of the cabinet where the player stands. This shallow angle is designed to encourage the pinball or pinballs in play on the playfield to roll down towards the front end of the playfield and cabinet where an outlet or drain hole is positioned to take the pinball or pinballs out of play should the player not be able to stop this downwards roll. Indeed it is the main object of the game for the player to maintain the pinball or pinballs in play and direct it or them over the playfield and so contact as many scoring aspects as possible before it or they drain. The main playfield device that the player uses to influence the pinball's travel over the playfield are one or more flippers or paddles that can be actuated at chosen times by not only but often including the player to impact and direct the pinball in a limited number of directions and often including back upwards over the sloping playfield. These flippers are positioned on the playfield in strategic positions that will allow a skilled player to direct a pinball over the playfield to achieve all scoring objectives required by the game play rules. The scoring objectives may require that the player directs the pinball to roll along the playfield surface and interact with a number of different types of playfield devices on the playfield surface that then register that interaction on scoringly interactive aspects and signal that same interaction with some signal to the electronics of an associated game controller which is also associated with a software program that among other things registers that interaction and initiates appropriate resulting game electro-mechanical actions, lighting displays and scoreboard records. Some but not all of the common scoring devices with aspects that react to the presence or impact of a pinball are targets, bumpers, sling-shots, rollovers, spinners, target holes and ramps and these

are generally known in the art. Targets are described for instance in U.S. Pat. No. 4,354,681 of 1982 for Gottlieb and Co. and bumpers have been described at least as early as 1941 in U.S. Pat. No. 2,318,394 for Raymond Moloney. Various games have also included custom designed versions of these or other targets to create something at least visually special for that game. An example of such a special scoring feature is included in the game Medieval Madness of 1997 from Williams Electronic Games Inc. In this game a feature is provided in the shape of a castle. The main scoring target in the game requires the player to hit the castle drawbridge with the pinball causing the drawbridge to lower, then to strike the same target area again with the pinball a number of times to lower the portcullis, and then strike the pinball to the same target area again so that it enters the castle door where-upon the castle breaks apart and the greatest single game score is gained. In this game example a specific visual feature in the form of a castle with the scoring aspect being its drawbridge has been teamed with the game's medieval storyline and game rules kept in the form of a software program and which are either satisfied by a player's actions gaining a score increase or left not completed and the player with a lower score.

Deficiencies of the Prior Art

[0004] A number of strategies have been adopted in the known art to increase player interest but all have limitations and none have made full use of the possible advantages provided by using multi-level playfields. The most fundamental way to increase player interest is to provide more scoringly interactive aspects of scoring devices on the playfield in a game and particularly in a way where the player can actively interact with the scoringly interactive aspects in skilled and intentional ways that have not been available before. That is the player can score by using skill to direct a pinball to various playfield scoring aspects following a strategy rather than just waiting and hoping for some nearly random score increase. This preferably needs to be achieved without increasing game machine size to a point where the machines can't realistically be housed. Alternately and commonly machines with the same basic scoring devices have been given a new look and feel through light displays, playfield decoration and modelled features such as the castle described previously, backbox video graphics and increased complexity of game rules. This comes some way to adding to player interest but doesn't perhaps add many extra actual device scoring aspects to interact with.

[0005] Some specific examples of how pinball machines have developed to increase player interest apart from visual appearance and rule changes are outlined here to give a full understanding of physical game layout development so far.

[0006] Pinball machines have been offered with increased cabinet size, most commonly but not solely increased to what has become termed a wide-body machine, allowing the playfield within to be larger and so increase the number of playfield devices with scoring aspects that can be fitted, increase the complexity of the game strategy or storyline and so increase player interest. These pinball machines are as the name suggests however wider than standard and so take up more space which is a disadvantage to arcade proprietors who desire to house the largest number of machines in their available space to attract more players at one time and is also a similar disadvantage for private owners wanting to fit machines in their own residential dwellings or elsewhere.

Twilight Zone is an example of a wide-body pinball machine released in 1993 by Bally Manufacturing Corporation. A further way to add player interest has been to include extra small playfield areas within one machine and there have been a number of playfield layouts devised as such. Sometimes this is achieved by dividing up the one surface of a playfield area into separate playable areas each with their own set of playfield devices and game rules. An example of such is the Split Second pinball game of 1981 from Stern Electronics Inc. Here a small area of playfield is fenced off within the main playfield and contains its own flippers and scoring devices. This does not increase the overall playable area though or provide more area for playfield devices. Similarly U.S. Pat. No. 2013/0228970 for Multimorphic Inc. describes an amusement game where part of the playfield area can be fenced off from another part at different times during a game these times depending on game rules. This action again does not add playfield area or extra playfield devices to the game apart from the moveable fence that partitions the playfield.

[0007] Another method to increase player interest has been to provide extra small playfield areas either above or beneath the main playfield surface. An example of this is given by patent FR1422335 of 1964 for Marcel Roussille describing a pinball machine with both a small lower playfield beneath the main playfield and viewable from above through a window section in the main playfield and also a second small playfield area raised over the main playfield which then obscures that area of the main playfield beneath but which is raised sufficiently that a pinball travelling over the main playfield can still travel across that obscured main playfield surface. The lowered and raised playfield areas have scoring devices but no player interaction with flippers etc. The main playfield surface directly above the small lowered playfield area is provided as a window and although the pinball can pass over this window as part of the main playfield surface the window area is so small that no devices can be mounted on this window area as their mechanisms would interfere with the lower playfield area underneath and in any case they would obstruct the player's view of the lower area. So even with the provision of these two additional small playfields on different levels no extra interactive playable area has been added to the game. Merely portions of it have been moved to different places. Another game detailed in patent EP0068451 of 1981 for Gottlieb details a main playfield with a second lower playfield area placed beneath it and also visible through a window part of the upper playfield surface. Here too playfield devices each only serve the one playfield surface that they are associated with. No playfield devices can be arranged above the playfield placed beneath and so this main upper playfield area is reserved to solely be an uninterrupted window area. And although in this case both levels are provided with flippers so that active player interaction can occur on both levels the total interactive area has not been much increased.

[0008] Similar strategies to increase player interest have been offered by a number of pinball companies.

[0009] Some include the game Black Knight of 1980 from Williams Electronic Games Inc. and the games Farfalla and Pinball Champ both of 1983 from Zaccario. Here the smaller upper playfields have either a see-through or solid base and also flippers and scoring devices, while the area of the main playfield below has scoring devices but relies on the pinball

being acted on from elsewhere on that main playfield to send it into this lower area. The strategy of adding small areas at different levels to increase interest has also been continued recently in the game Pirates Of The Caribbean of 2018 by Jersey Jack Pinball but here also active play or interaction with the pinball is not possible under this games' small raised area and so the interactive playfield area is not increased.

[0010] So it can be seen that over many years of pinball manufacturing, without changing the size of the main cabinet, there has been no great advance in increasing interactive playfield area or increasing the number of scoringly interactive aspects available in a game to pique player interest. Similarly as yet scoring playfield devices have remained unchanged in that they largely only act or are acted on in relation to the one playfield level and surface that they are mounted on. In any case the construction of known art scoring devices does not encourage their application to scoring on more than one playfield as their electromechanical workings are often larger than their scoringly interactive aspects and in simply duplicating both to serve two playfields the duplicated electromechanical workings would obscure and prevent play on some parts of those playfields.

[0011] For explanation of how the known art playfield devices are currently installed included here are FIGS. 1,2,3. With reference to the Figures, a typical example from the known art of a pinball machine 1 is shown in FIG. 1 and this layout of main cabinet 2 with playfield 3 and backbox 4 is well known in the art. Single Playfield 3 provides one largely flat surface area 3' over which the pinball 5 is directed. FIG. 2 shows a view of some playfield devices such as scoring targets 6, scoring bumpers 7, scoring kickers 8 and pinball motivating flippers 9 and 10. For example scoring bumpers 7 each have a scoringly interactive aspect 7" where the pinball can interact with the bumper and so generate a score and as is the general nature and intention for a bumper known in the art after scoring the pinball is then impulsed away from the bumper by a bumper generated impulse moving the pinball in some generally random direction to continue moving over the playfield surface 3'. FIG. 3 is provided with a main cabinet side panel removed to show an exposed view of the electromechanical workings of playfield devices below the playfield 3 and with flipper 10 removed for clarity. From FIG. 3 the usually unseen electromechanical mechanisms 6', 7', 7a, 8', 9' that are needed to cause operation of and monitor their respective visible playfield devices can be seen to be extensive in size and make up the bulk of that known art device assembly. It can also be seen that these known art devices are mounted to and serve only one playfield 3 with player interactive scoring through interactive movement of a pinball possible on the surface 3' of that playfield 3 only. If considering adding a second playfield above playfield 3, then to simply duplicate these playfield devices on an upper playfield the electromechanical mechanisms of those higher playfield devices would obscure parts of the lower playfield from player view and also even prevent play on some of that lower playfield area as the pinball simply could not travel where obstructed by those electromechanical mechanisms.

[0012] Illustrating this FIG. 19 shows a possible new pinball machine 11 that has a main cabinet 42 and backbox 44. This machine 11 has a second playfield 12 with a surface 12' of a significantly large area with respect to main playfield 13 and spaced at a distance "a" above the main playfield 13

and its associated surface 13'. Both second playfield 12 and its surface 12' are transparent so viewing of playfield 13 below is not obstructed. FIG. 20 shows a closer view of the 2 playfields and the layout and spacing of playfield devices in FIG. 20 is very similar to the known art pinball machine 1. The playfield devices in FIG. 20 are arranged to provide both the main playfield 13 and the second playfield 12 with scoring devices and flippers. The main playfield 13 includes scoring targets 18, scoring bumpers 17, scoring kickers 58 and pinball motivating flippers 59 and pinball motivating flipper 60. Second clear playfield 12 raised above main playfield 13 includes scoring targets 19, scoring bumpers 17 and pinball motivating flippers 15.

[0013] Describing how current art playfield scoring devices would occupy significant space in such a multi-level playfield, FIG. 21 is provided with a main cabinet side panel removed to show an exposed view of the electromechanical workings of playfield devices and with flipper 60 removed for clarity. FIG. 21 shows target devices 18 serving main playfield 13 and target devices 19 serving second playfield 12. It can be seen that the mechanisms 19' take up a large volume below second playfield 12 that is also a large area of the main playfield 13 such that an area of main playfield 13 has to be sectioned off with barrier 20 to prevent a pinball travelling on playfield surface 13' from contacting the mechanisms 19'. If the example target devices 19 had been positioned on playfield 12 in some position towards the centre of that playfield away from the playfield edges as shown, the obstruction of view of and ball travel on the lower playfield 13 would have been even more significant.

[0014] Alternately when conceiving of a single bumper device to serve more than 1 playfield level, that the known art switch items 7a on bumpers 7 in FIG. 3 project out sideways from the main electromechanical mechanisms 7' is a big disadvantage because if they were simply duplicated within the new single bumper device their bulk would be a big obstruction to both view and play. But even though this disadvantage is known, this bulky construction is still employed in the majority of bumper switches manufactured today as little better has been conceived and in any case no bumper devices have thus far been constructed to service multi-level playfields. Other disadvantages of this currently accepted switching arrangement are now described. FIGS. 4,5,6 show the known art bumper device 7 fitted to playfield 3 with playfield surface 3' as previously shown in FIGS. 1,2,3. There has been no contact made on the bumper 7 by a pinball 5. The frame of bumper 7 holding all parts in place is the set of joined parts including mounting frame 70, base 71, and body 72. Mounting frame 70 enables the bumper to be fastened to the underside of main playfield 3 and also holds solenoid coil 73 and within solenoid coil 73 is its associated plunger 73'. These lower components make up the electromechanical mechanisms 7' that lie below playfield 3. Body 72 supports light cap 74. Base 71 provides a mount for body 72 and a pivot mount for skirt 75 which is so mounted that it can pivot around a central point if struck by a pinball 5 from any position around the bumper but when not acted upon by any outside influences it is urged to sit level and horizontal by a skirt spring not shown. These items along with impulse cone 76 make up the scoringly interactive aspect 7" of bumper 7. The skirt 75 has an associated pin sensor activator 75' which sits straight up and down perpendicular to the skirt 75 and further the associated tip 75" when in an uninfluenced state lies central within switch cup 77b

shown in detail in FIG. 7. At this time switch cup 77b lies risen as held upwardly by switch cup arm 77b' and switch cup arm 77b' is not contacting switch contact 77c so no electrical circuit is complete. This set of components along with switch body 77d make up switch 77a which is bulky and extends outside the main bumper edges 7z.

[0015] FIGS. 8,9 show bumper 7 when it is being contacted by a pinball 5 in scoringly interactive aspect 7". Pinball 5 has moved close enough to deflect skirt 75 against a skirt spring not shown. As skirt 75 has tipped over its associated pin sensor activator 75' has tipped sideways and taken its associated tip 75" away from the centre of switch cup 77b. Switch cup 77b has moved downwards as urged by associated tip 75" so bending compliant switch cup arm 77b' which has then closed onto switch contact 77c completing an electrical circuit and the triggering signal then generated being used to trigger some electronic action or event recording controlled by the electronics of an associated game controller which is also associated with a software program. This switch arrangement works well in that skirt 75 moves very reliably in response to contact with a pinball 5. It also works adequately in that overall there is low friction within the mechanism as switch cup arm 77b' is long and thin and bending of it only requires a small force. However it has disadvantages in that switch cup arm 77b' has had to be made long so that bending it is easy and this makes the switch assembly large overall. Also switch cup 77b moves down only a little from being inactivated to being activated so the switch contact gap at 77c is small and construction needs to be precise to be reliable. Another disadvantage is that the switch contacts are open to the environment and subject to dust and dirt contamination also causing switching to be unreliable.

[0016] FIG. 10 shows one suggested switching alternative from U.S. Pat. No. 5,044,635 of 1991 for Data East Pinball. This shows bumper 177 using a microswitch 151 to provide switching contacts. Equivalent associated tip 128" moves with pin sensor activator 128' to influence pivot lever 150 in turn moving microswitch arm 151' and so switching microswitch 151 to generate a triggering signal. Although this arrangement seals the switching contacts from dust and dirt there is added friction in the chain of movement caused by extra pivot lever 150 and microswitch pressures and this switching arrangement is seldom used.

[0017] FIG. 11 shows another alternate pinball contact sensing method from U.S. Pat. No. 5,697,612 of 1997 for Williams Electronic Games Inc. Here a bumper 277 has coil 228 set up to act as a metal detector and the changes in magnetic forces and subsequent electrical changes due to a pinball coming close to coil 228 can be used to provide a triggering signal. This sensing method has the advantage of being compact and free from problems of dust and dirt and also having no moving parts but such magnetic sensing has proved unreliable in use even for just detecting a close pinball on a single playfield game. To work accurately such magnetic use of a coil prefers the metal being sensed to be near the coil axis to give the strongest signal. First considering sensing coil 528 in bumper 577 of FIG. 12 it can be seen that pinball 5' with approach axis 5'x is nearly completely oblique to the coil axis at an angle b. This gives low sensing signal strength but is the best this design can offer positioning the coil axis to similarly sense a pinball approaching from all sides of the bumper 577. This depiction in FIG. 12 discussed so far represents possible sensing

performance within a single playfield game. FIG. 12 is however also extended to show this type of coil sensor being used in a possible two level playfield game as is part of the novel desire to be included in the claimed invention described later. FIG. 12 shows however that when using this form of sensing that a pinball 5" on playfield 2 has an approach axis 5"x to lower coil 528 of only a degrees and so is quite possibly more likely to be misread by coil 528 as being close than by coil 529 which is in fact supposed to sense the pinball's proximity. Similarly pinball 5' has an approach axis closer to the axis of coil 529 than coil 528 and so its position might be similarly misread. So the poor single playfield performance and then even more problematic sensing within a multi-playfield game using this sensing method would be very unreliable.

Object of the Invention

[0018] It is the object of this invention to increase player interest by providing a new reliable pinball scoring playfield device that effectively serves more than one playfield without creating obstruction of the view or play on those playfields and so facilitates more player scoring interaction and scoring interaction in ways that have not been offered before.

SUMMARY

[0019] Herein is described a new playfield bumper device that allows gameplay and scoring in different and perhaps more complex ways than previous devices allowed and so challenges players more. It facilitates scoring interaction between all or at least more than one playfield level during a game. It satisfies the necessity of having compact electro-mechanical mechanisms that don't obstruct either the view of or the play on those playfields. As these new devices are compact and can be mounted in the middle of a clear playfield without significantly obstructing the view beneath, these new devices facilitate the use of significantly sized multi-layer playfield layouts. This greatly increases total player interactive playfield area, allows provision of more scoring aspects, and gives the opportunity for more elaborate game strategy requiring certain ordered interaction with those scoring aspects within a main cabinet of standard size. These advancements totaled together greatly increase player challenge and interest. Constructing a compact and reliable sensing and signalling mechanism that would fit within the physical boundaries of the new multi-level bumper device was a significant problem to be overcome when developing forward from the current art.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] A preferred embodiment of the invention will now be described by way of example only with reference to the accompanying drawings wherein:

[0021] FIG. 1 is a pictorial view of a typical pinball machine as known in the current art.

[0022] FIG. 2 is a view looking down from above of the playfield area of the pinball machine in FIG. 1.

[0023] FIG. 3 is a left side view of the pinball machine in FIG. 1 with a side panel removed allowing a view of the inner workings.

[0024] FIG. 4 is a pictorial view of a known art bumper assembly in a rest position and mounted within a playfield.

[0025] FIG. 5 is a side view of the bumper assembly in FIG. 4 with an associated pinball active during playing of a pinball game.

[0026] FIG. 6 is a side section view of the bumper assembly in FIG. 5.

[0027] FIG. 7 is a detail of part of the bumper section view shown in FIG. 6.

[0028] FIG. 8 is a side section view of the bumper assembly in FIG. 5 with the associated pinball interacting with the bumper.

[0029] FIG. 9 is a detail of part of the bumper section view shown in FIG. 8.

[0030] FIG. 10 is an alternate bumper sensing detail from existing patent known art.

[0031] FIG. 11 is a further alternate bumper sensing detail from existing patent known art.

[0032] FIG. 12 is a possible 2 playfield arrangement of the bumper sensing detail from FIG. 11.

[0033] FIG. 13 is a pictorial view of an embodiment to describe the switching component of the current invention with all items at rest.

[0034] FIG. 14 is a side view of the embodiment shown in FIG. 12.

[0035] FIG. 15 is a side section view of the embodiment in FIG. 13 showing an associated pinball.

[0036] FIG. 16 is a side section view of the embodiment in FIG. 13 with the associated pinball interacting with the bumper.

[0037] FIG. 17 is a side section view of an alternative arrangement of the embodiment in FIG. 13 with all items at rest.

[0038] FIG. 18 is a side section view of an alternative arrangement of the embodiment in FIG. 13 showing internal component movement as if interacted with by a pinball.

[0039] FIG. 19 is a perspective view of a pinball machine associated with an embodiment of the current invention.

[0040] FIG. 20 is a view looking down from above of the playfield area of the pinball machine in FIG. 18.

[0041] FIG. 21 is a left side view of the pinball machine in FIG. 18 with a side panel removed allowing a view of the inner workings.

[0042] FIG. 22 is a pictorial view of the embodiment of the present invention bumper assembly in a rest position and mounted within 2 playfield surfaces in accordance with an embodiment of the present invention.

[0043] FIG. 23 is a front view of the bumper assembly in FIG. 21 showing associated pinballs during playing of a pinball game but with all items at rest.

[0044] FIG. 24 is a front section view of the bumper assembly in FIG. 22.

[0045] FIG. 25 is a front view of the bumper assembly in FIG. 21 with the lower associated pinball interacting with the bumper assembly.

[0046] FIG. 26 is a front section view of the bumper assembly in FIG. 24.

[0047] FIG. 27 is a front view of the bumper assembly in FIG. 21 with the lower associated pinball interacting with the bumper assembly and the bumper assembly being activated to impulse the pinball away from the bumper assembly.

[0048] FIG. 28 is a front section view of the bumper assembly in FIG. 26.

[0049] FIG. 29 is a front view of the bumper assembly in FIG. 21 with the lower associated pinball having been impulsed away from the bumper assembly.

[0050] FIG. 30 is a front section view of the bumper assembly in FIG. 28.

[0051] FIG. 31 is a front section view of a non-described 3 playfield level bumper assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0052] The following description is not intended to limit the invention to being in the embodiment as depicted and described here but as those with only ordinary skill in the art are able to appreciate the form size and shape may be adapted to fit many assembled situations.

[0053] To allow for a multi-level bumper assembly to be constructed a compact reliable pinball contact sensing and switching device is needed. Skirt interaction with a pinball gives reliable movement of that skirt. Turning to FIG. 13,14 a new layout for a bumper using improved sensing is shown. It can be seen that there are no switch components extending past the boundary 377z of the bumper 377. FIGS. 15,16 show bumper 377 with no contact with pinball 305 and then having contact with pinball 305 respectively. FIG. 15 shows Skirt 328 sitting on base 322 and is so mounted that it can pivot around a central point but when not acted upon by any outside influences it is urged to sit level and horizontal by a skirt spring not shown. Skirt 328 has an associated pin sensor activator 328' which sits straight up and down perpendicular to the skirt and further its associated tip 328" when in an uninfluenced state lies central over but clear of associated tip position sensor 327 which signals this close proximity. Tip position sensor 327 may be a glass reed switch or a hall effect transistor or some such device that reacts and gives an appropriate signal in response to the proximity of a magnet that may be mounted to or be a part of associated tip 328". Alternately tip position sensor 327 may be an optical sensor that responds in one way to associated tip 328" being directly over it and then giving a different response and hence different signal when associated tip 328" has moved aside. The exact sensing particulars are not critical and a number of sensing methods are known. Importantly a frictionless, reliable sensing method can be implemented that is compact and not subject to dust or dirt. FIGS. 17,18 outline an alternate arrangement for placement of a tip position sensor 427 after the inversion of the pin sensor activator 428' and its associated tip 428" with respect to its associated skirt 428. In some instances this may be a preferred arrangement of components with all sensing and switching items here being immediately adjacent their respective scoringly interactive aspect. The exact construction and part arrangement of a suitably performing switch mechanism is not limited to that just described but these embodiments serve to show preferred construction arrangements that provide the required functionality for use within a multi-level bumper assembly.

[0054] Now to continue progressing conception of a multi-level bumper. Re-confirming FIG. 19 shows a new pinball machine 11 that has a main cabinet 42 and backbox 44. This machine 11 has a second playfield 12 with a surface 12' of a significantly large area with respect to main playfield 13 and spaced at a distance "a" above the main playfield 13 and its associated surface 13'. Both second playfield 12 and its surface 12' are transparent and can be seen through so

viewing of playfield 13 below is not obstructed. Although depicted here in the size chosen for FIG. 19 it can be seen that second clear playfield 12 and its area 12' could indeed be of any size extending up to and including over all of the main playfield 13 and its surface area 13' or alternately covering very little of main playfield 13. Similarly there is no limiting factor that prevents more than one extra playfield from being provided and multiple extra levels each of any size are equally possible. As depicted in FIG. 19 Ramp 14 allows a pinball to travel to this second level and the pinball so may return to the main playfield level by rolling down ramp 14 or by passing between flippers 15 and falling over the edge 16 of second playfield area 12. If indeed some higher level playfield 12 covered all of some lower level playfield 13 the top end of some ramp 14 could offer the pinball so through a hole in the higher level playfield to that playfield and as a method of proceeding from the higher level playfield to the lower playfield after the pinball passed between some flippers 15 that pinball could drop through a hole in the higher playfield to the lower playfield.

[0055] And also re-confirming FIG. 20 shows a closer view of the 2 playfields and although the layout and spacing of playfield devices in FIG. 20 is very similar to the known art pinball machine 1. The playfield devices in FIG. 20 are arranged to provide both the main playfield 13 and the second playfield 12 with scoring devices and flippers. The main playfield 13 includes scoring targets 18, scoring bumpers 17, scoring kickers 58 and pinball motivating flippers 59 and pinball motivating flipper 60. Second clear playfield 12 raised above main playfield 13 includes scoring targets 19, scoring bumpers 17 and pinball motivating flippers 15. It can be seen that the embodiment of the invention bumpers 17 are of a double height construction and so can provide both scoringly interactive aspects 17" and 17'" that can be interacted with by a pinball on both or either playfield levels. It should also be noted that although the bumpers shown in this example of FIG. 20 have only two scoringly interactive aspects there is no physical limit preventing the construction of multiple additional scoringly interactive aspects to serve any number of multiple playfield levels that may be constructed. FIG. 31 is included as a non-described variant of a 3 scoringly interactive aspect bumper assembly 117 and as will be clear to those versed in the art construction and function are an extension of the embodiments otherwise thoroughly described here.

[0056] The bumper devices 17 however each have only the same electromechanical mechanisms 17' by physical size as shown in FIG. 21 as the electromechanical mechanisms 7' in earlier known bumpers 7. Additionally the electrical sensing and switching aspects of the electromechanical mechanisms no longer sit outwards of the bumper assembly as did switching items 7a in FIG. 3 and now reside in a much more compact arrangement. The visible and scoringly interactive aspects 17" and 17'" on each playfield level of each bumper 17 are also each only as large as the visible scoringly interactive items 7" of the earlier bumpers. So it can be seen that the new embodiment of the invention bumpers 17 provide ways of scoring interactively with different levels of the pinball machine within the one single compact assembly without removing or obscuring from view any significant playing area as would happen when using known art devices. This allows a pinball machine designer to increase the number of scoringly interactive aspects that can be made available for a player to strive to hit while still having easy

viewing access to undiminished playfield areas. In addition it provides the possibility to increase complexity by constructing game rules that require a player to proceed to and score on the bumpers on all different playfield levels during the game and interact with the different scoringly interactive aspects in order to maximise their score. This game rules strategy could ultimately extend to one level of scoring aspect being made non-scoring on a bumper or bumpers until that or those bumpers sense a scoring hit on their other scoringly interactive aspect or aspects or some other scoring strategy.

[0057] The exact construction and part arrangement of a suitably performing bumper is not limited to that described in the following but this one embodiment of the invention bumper 17 serves to show one preferred construction arrangement that provides the required functionality for increased player interest.

[0058] FIGS. 22,23,24 will describe the construction of a preferred embodiment of the invention bumper 17 and then FIGS. 25-30 further describe the operation of the preferred embodiment of the invention bumper 17 as described here.

[0059] FIGS. 22,23 show the bumper 17 fitted so that its electromechanical mechanism 17' is positioned below main playfield 13 and playfield 13 is shown here in cutout form. The first scoringly interactive aspect 17'' of bumper 17 where scoring can occur through interaction with a pinball is then above main playfield 13 where a pinball 50 can roll over playfield surface 13' and contact this scoringly interactive aspect of the bumper identified here as 17''. Above this again is second playfield 12 which is transparent also shown here in cutout form and with its associated surface 12'. And yet further above surface 12' is positioned the second level of bumper 17 where scoring can occur through interaction with a pinball where pinball 50' can roll over playfield surface 12' and interact with this second scoringly interactive aspect of the bumper identified here as 17'''.

[0060] FIG. 24 shows a sectioned view of bumper 17 as last depicted in FIG. 23 with all its elements in a rest or non-interacted with position. The frame of bumper 17 holding all parts in place is the set of joined parts including mounting frame 21, base 22, body 23, base 24 and body 25. Mounting frame 21 enables the bumper to be fastened to the underside of main playfield 13. Mounting frame 21 also holds solenoid coil 26 and tip position sensor 27. Base 22 provides a pivot for skirt 28. Body 23 provides a mount for tip position sensor 29 and also supports light ring 30 and light cap 31. Light ring 30 could be an RGB LED colour changing display or some other simple light source well known in the art. Base 24 provides a pivot for skirt 32. Body 25 supports light ring 33 and light cap 34. Light ring 33 could be an RGB LED colour changing display or some other simple light source well known in the art and could also extend to additionally cover or be re-positioned instead under the centre of light cap 34. Within solenoid coil 26 is its associated plunger 26' and this plunger 26' is urged in an upwardly direction out of the solenoid coil 26 by a plunger spring not shown. The plunger 26' remains in this upwardly urged position when the solenoid coil 26 is not energised. Plunger 26' is further connected to yoke 35 which in turn connects through pull rods 36 to impulse cone 37 and then in turn also within the one assembly connects with pull rods 38 through to impulse cone 39. All of these parts move directly together along with any movement imparted to plunger 26' and so also rest in an upwardly position held

upwardly by the plunger spring when no force is generated by solenoid coil 26. When solenoid coil 26 is energised however and its downwards pulling force overcomes the upwardly urging force from the plunger spring then plunger 26' is drawn downwards and further into solenoid coil 26. Plunger 26' then in turn acts on parts 35, 36, 37, 38, 39 and all move downwards together and they stay in this downwards position until the solenoid coil is no longer energised at which time plunger 26' along with all associated parts 35, 36, 37, 38, 39 return to their upwardly position under the influence of the plunger spring. Skirts 28 and 32 sit respectively on their bases 22 and 24 and are so mounted that they can pivot around a central point but when not acted upon by any outside influences they are urged to sit level and horizontal by a skirt spring not shown. The skirts each have an associated pin sensor activator 28' and 32' which sit straight up and down perpendicular to their respective skirt and further the respective associated tips 28'' and 32'' of each associated pin activator when in an uninfluenced state lie directly above while not contacting their further respectively associated tip position sensor 27 and 29. Tip position sensors 27 and 29 are of such configuration that they can sense the proximity of their respectively associated tips 28'' and 32'' and produce an electronic signal reflective of the level of respective tip proximity to that sensor the signal then being used to trigger some electronic action or event recording controlled by the electronics of an associated game controller which is also associated with a software program. The exact nature of the sensing method is not important to the generic function of generating an electronic signal but that sensing may be simply that the tips 28'' and 32'' are magnetic and position sensors 27 and 29 can sense differing magnetic strength as the tips 28'' and 32'' move over and then away from position sensors 27 and 29. Or sensing may be done by the sensors optically seeing the tips over the sensors or by some other sensing means. That this sensing arrangement is available for use contributes greatly to the feasibility of making this embodiment of the invention bumper 17 as particularly for the combination of tip position sensor 29 and its associated sensed moving item 32'' must in total be compact enough to fit within body 23 in keeping with the compact profile of the bumper 17 assembly. Many traditional skirt movement sensors as known in the art are not of a sufficiently small size to be used in this new invention bumper.

[0061] FIG. 25 shows a pinball 50 moving on playfield surface 13' in direction B and it has so moved close enough to the bumper 17 assembly to contact and deflect the edge of skirt 28 so that skirt 28 no longer lies horizontal. Movement of skirt 28 can also be seen in sectioned view in FIG. 26. As the skirt 28 lies completely around bumper 17 the pinball can make the same influential contact on the skirt from all sides of bumper 17. This movement of skirt 28 has in turn encouraged pin sensor activator 28' to leave the vertical so that its tip 28'' is no longer immediately above tip position sensor 27. Tip position sensor 27 senses this change in proximity of the tip 28'' and signals to the game operating computer that the pinball has made contact with skirt 28 and so a score can be awarded to the player. Simultaneously that same signal from tip position sensor 27 can be used to cause solenoid 26 to be energised so drawing downwards solenoid plunger 26' and its associated assembly so that impulse cone 37 also moves downwards and impacts on the top of pinball 50 as shown in FIG. 27. A sectioned view of bumper 17 in

this same activated state is shown in FIG. 28. By the nature of the conical shape of impulse cone 37 pinball 50 is then driven outwards and away from bumper 17 in direction C as can be seen in FIG. 29 and this movement of bumper 17 components can also be seen in sectioned view in FIG. 30. As the impulse cone 37 lies completely around bumper 17 it can make that same influential contact on the pinball 50 from all sides of bumper 17. FIGS. 29,30 show that after contacting pinball 50 and urging pinball 50 away from bumper 17 impulse cone 37 has continued its downwards travel still drawn by plunger 26' or moved downwards under its own continuing momentum until it is at its lowest position. FIGS. 29,30 also show that simultaneously as pinball 50 moves away from bumper 17 pinball 50 no longer contacts skirt 28 which then returns to its at rest horizontal position and so its associated pin sensor activator 28' returns to the vertical and in turn its further associated tip 28" returns to a position directly over tip position sensor 27. Position sensor 27 then senses this new level of tip proximity and so signals to the electronics of an associated game controller which is also associated with a software program that skirt 28 is now at rest and so the energising of solenoid coil 26 can be discontinued so allowing solenoid plunger 26' to return to its upwards rest position urged by the plunger spring and also further returning impulse cone 37 to its upwards rest position as shown in FIGS. 23,24.

[0062] It can be seen that exactly the same interaction between a pinball 50' on playfield surface 12' and invention bumper 17 would occur should pinball 50' contact skirt 32. Skirt 32 would interact with tip position sensor 29 through movement of tip 32" signalling the game computer to energise solenoid coil 26 so retracting plunger 26' and drawing down impulse cone 39 as impulse cone 39 is also directly associated with solenoid plunger 26'. Impulse cone 39 would contact pinball 50' and drive it outwards and away from invention bumper 17 as has been previously described when impulse cone 37 contacted pinball 50. And so embodiment of the invention bumper 17 as a single physical assembly allows scoring interaction with a pinball on more than 1 playfield level, only uses one operating electromechanical mechanism, employs a reliable frictionless compact sensing and signalling system, has a physical size on each playing level that occupies and obscures only a minimal amount of area of the playfield below, and also opens the game software to including strategy requiring scoring by the player on interactively scoring aspects on more than one playfield and also further possibly in some required sequence on those different playfields to maximise a players score.

CITATION LIST

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[0066] Hooker, D. E. (1943). Game Apparatus (U.S. Pat. No. 2,318,394A). U.S. Patent and Trademark Office.

[0067] Roussille, M. M. (1965). Billard Mecanique (French Patent No. FR1422335A). Ministere De L'Industrie, Republique Francaise

[0068] Yingst, G. D. et al (1983). Pinball Machine (European Patent No. EP0068451A2). European Patent Office
The claims defining the invention are as follows:

1. A scoring device in the form of a single physical bumper assembly for a pinball game including;

scoringly interactive aspects that register scoring interaction with a pinball on that single physical bumper assembly on at least 2 different playfields spaced vertically within a pinball game;

each scoringly interactive aspect including a sensing element that moves when interacted with by a moving pinball;

each sensing element including an aspect that allows the sensing element to interact with an electrical or electronic sensing and signalling element;

and where the electrical or electronic sensing and signalling element needs no physical contact with the aspect it is sensing during its sensing operation.

2. A scoring device as claimed in claim 1, where each scoringly interactive aspect includes an impulse providing element that can contact a pinball in a driven way and cause movement of it.

3. A scoring device as claimed in claim 2, wherein that electrical or electronic sensing and signalling element and that sensing element aspect and that impulse providing element together are so compact as to be housed completely within the outer boundaries of the single bumper assembly and do not impinge on the view of or play on any of the playfields associated with the single bumper assembly.

4. A scoring device as claimed in claim 3, wherein any one of the scoringly interactive aspects of that single physical bumper assembly can register interaction with a pinball and each interaction can result in a score without the other scoringly interactive aspect or aspects of that single physical bumper assembly having registered any interaction with a pinball.

5. A scoring device as claimed in claim 4, wherein interactions of a pinball may be required by gameplay rules at any time during an active game to be made with specific scoringly interactive aspects of that single physical bumper assembly in sequence to maximise a players' score.

6. A scoring device as claimed in claim 4, wherein the scoringly interactive aspects of that single physical bumper assembly that allow interaction with a pinball are on more than 2 different playfields.

7. A scoring device as claimed in claim 6, wherein interactions of a pinball may be required by gameplay rules at any time during an active game to be made with specific scoringly interactive aspects of that single physical bumper assembly in sequence to maximise a players' score.

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