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(54) **Title:** TOY PROJECTILE LAUNCHER WITH HORIZONTAL DRUM

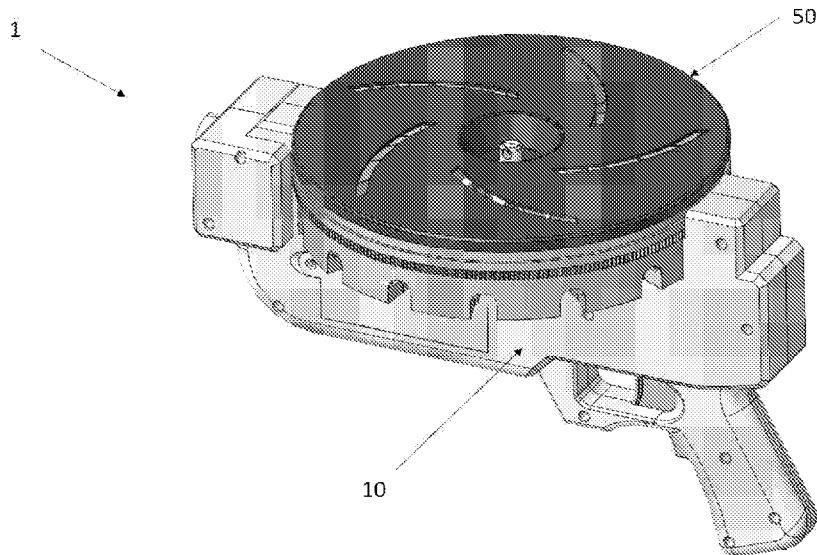


FIG. 1

(57) **Abstract:** A toy projectile launcher including a main body, a launch barrel, a horizontal drum rotatably mounted to the main body and flywheels disposed within the main body. The launch barrel has a central longitudinal axis that extends in a horizontal plane. The horizontal drum stores projectiles so that the projectiles extend longitudinally within the horizontal plane. The flywheels launch the projectiles from the main body as the projectiles are continuously fed from the horizontal drum to the flywheels.



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TOY PROJECTILE LAUNCHER WITH HORIZONTAL DRUM

RELATED APPLICATIONS

[0001] This application claims priority to and the benefit of U.S. Provisional Application No. 63/224,446, entitled TOY PROJECTILE LAUNCHER WITH HORIZONTAL DRUM and filed July 22, 2021, the contents of which are incorporated herein by reference in their entirety.

FIELD

[0002] The present disclosure is generally related to a toy projectile launcher, such as a toy pistol, gun, and the like, for launching toy projectiles, such as foam bullets, darts, balls, and the like, with a simplified construction and improved performance.

BACKGROUND

[0003] Traditional toy projectile launchers have utilized various forms of rifles, pistols, blasters, machine guns, and the like, for launching toy projectiles, such as foam balls, darts, to name a few. Such toy launchers have varied in size, power, storage capacity, to name a few. More specifically, toy launchers of foam projectiles—bullets (or “darts”), balls, and the like—have become ubiquitous. One standard for foam bullets has been marketed under the brand name Nerf® with a rubber tip and a foam body that totals approximately 71.5 mm in length. Other high-performance darts may be shorter in length. There have been various types of rifles, machine guns, and the like, that have been marketed for launching such foam projectiles.

[0004] The caps of the toy darts are generally made of a material other than foam that allows the dart to be shot from the launcher at a targeted person or object and/or propelled over an appropriate distance and/or at a relatively quick speed.

[0005] Some known toy projectile launchers include a vertically mounted drum, such as the launcher described in U.S. Patent Application No. 17/339,486, the contents of which are incorporated herein by reference in their entirety. Such launchers are efficient and effective, but unfortunately exhibit some ergonomic and performance drawbacks. For example, a vertical drum protrudes under the blaster main body, and in particularly in the case of a wide diameter, large capacity vertical drum, the drum obstructs the user’s arm holding the front of the blaster.

Also, the darts are loaded from the front of the drum, and as the user points the blaster downwards while running around during a dart war game, for example, some of the darts tend to drop out of the drum.

[0006] Accordingly, there is a need to provide a toy launcher with a drum that does not obstruct a user's free hand/arm and which is aesthetically pleasing yet has high capacity.

SUMMARY

[0007] To address the above, the present disclosure is generally related to an improved toy launcher for launching projectiles, such as foam darts. According to an exemplary embodiment of the present disclosure, a toy projectile launcher is equipped with a horizontal drum that feeds a continuous stream of projectiles to a position within the launcher where the projectiles are then launched in sequence in a seamless manner. The launcher may be battery operated and the horizontal drum may be a large capacity drum mounted on top of the launcher.

[0008] A toy projectile launcher according to an exemplary embodiment of the present invention comprises: a main body comprising a launch barrel that has a central longitudinal axis that extends in a horizontal plane; a horizontal drum rotatably mounted on the main body that stores projectiles so that the projectiles extend longitudinally within the horizontal plane; and flywheels within the main body that launch the projectiles from the main body as the projectiles are continuously fed from the horizontal drum to the flywheels.

[0009] In an exemplary embodiment, the horizontal drum comprises compartments that extend in a radial direction around a center of the drum.

[0010] In an exemplary embodiment, the compartments are configured to hold three or more projectiles in a stacked configuration.

[0011] In an exemplary embodiment, the horizontal drum comprise a plurality of teeth.

[0012] In an exemplary embodiment, upon rotation of the horizontal drum, a pawl that is pivotally attached to the main body engages with one of the plurality of teeth in a sequential manner, so that, with each engagement of one of the teeth with the pawl, the pawl pivots from a first position to a second position and a corresponding projectile is fed from the drum to the flywheels by the pivoting of the pawl.

[0013] In an exemplary embodiment, the pawl is operatively connected with a wheel that is rotatably mounted to the main body and which comprises a plurality of protrusions, so

that, when the pawl pivots from the first position to the second position, one of the plurality of protrusions is rotated into engagement with a corresponding one of the projectiles to feed the projectiles from the drum in sequence.

[0014] In an exemplary embodiment, the pawl is operatively connected with the wheel by a first lever arm that reciprocates between first and second horizontal positions due to the pivoting of the pawl.

[0015] In an exemplary embodiment, the pawl is further operatively connected with the wheel by a rotating gear connected to the wheel and which rotates with each reciprocal movement of the first lever arm between the first and second horizontal positions.

[0016] In an exemplary embodiment, the toy projectile launcher further comprises a second lever arm that pivots between a first position in which the second lever arm prevents the rotating gear from rotating and a second position to which the second lever arm has been pushed due to rotation of the rotating gear by the first lever arm.

[0017] In an exemplary embodiment, the toy projectile launcher further comprises a gear that rotates the horizontal drum and a motor that actuates the gear.

[0018] In an exemplary embodiment, the toy projectile launcher further comprises a trigger assembly configured for operation by a user to activate the motor.

[0019] In an exemplary embodiment, the horizontal drum further comprises a plurality of top panels each disposed within a corresponding one of the compartments, wherein the projectiles are disposed below the plurality of top panels.

[0020] In an exemplary embodiment, the horizontal drum further comprises a plurality of resilient arms that exert a downward force to the plurality of top panels so that the plurality of top panels are pushed downwards on top of the stacked configurations of projectiles.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Exemplary embodiments of the present disclosure will be described with references to the accompanying figures, wherein:

[0023] FIG. 1 is a perspective view of a toy projectile launcher according to an exemplary embodiment of the present disclosure;

[0024] FIG. 2A is a schematic partial cross-sectional side view of key elements of a toy projectile launcher according to an exemplary embodiment of the present disclosure;

[0025] FIG. 2B is a schematic partial cross-sectional top view of key elements of a toy projectile launcher according to an exemplary embodiment of the present disclosure;

[0026] FIG. 3 is a perspective and partial cross-sectional view of a horizontal drum according to an exemplary embodiment of the present disclosure; and

[0027] FIG. 4 is an exploded perspective view of a horizontal drum according to an exemplary embodiment of the present disclosure.

DETAILED DESCRIPTION

[0028] The present disclosure is generally related to an improved toy launcher that includes a horizontal drum. The horizontal drum is rotatably attached to the main body of the launcher so that the projectiles stored in the drum are sequentially fed from the drum into a firing position within the launcher as the drum rotates. The continuous feeding of the projectiles from the horizontal drum results in seamless and continuous firing of projectiles from the launcher. The placement and horizontal orientation of the drum does not obstruct the user's free arm holding the front of the launcher and provides the launcher with an aesthetically pleasing overall design.

[0029] FIG. 1 is a perspective view of a toy projectile launcher, generally designated by reference number 1, according to an exemplary embodiment of the present invention. As shown, projectile launcher 1 is shaped to resemble a pistol. In exemplary embodiments, launcher 1 may be in various other shapes and arrangements without departing from the spirit and the scope of the disclosure. The launcher 1 includes a main body 10 to which is rotatably attached a horizontal drum 50. The main body 10 includes a handle 12, a launch barrel 14 and a trigger assembly 16. As explained in further detail below, operation of the trigger assembly 16 results in rotation of the horizontal drum 40 relative to the main body 10, which in turn results in sequential firing

of projectiles from the horizontal drum 40 through the launch barrel 14 towards a target. In exemplary embodiments, the launcher 1 is configured to launch foam darts having a substantially cylindrical shape made up of a main body and cap. The cap may be made of a rubber material, or the like. In exemplary embodiments, the darts may have a total length, e.g., within a range of approximately 33 mm to 45 mm, such as 35 mm, 36 mm, 37 mm, or 40 mm, to name a few. The darts may have an outer cross-sectional diameter at its widest point of 12.9 mm. In alternative exemplary embodiments, darts may have an outer cross-sectional diameter at their widest point of, for example, 12.5 mm, 13 mm, 14 mm, or 15 mm, to name a few. In exemplary embodiments, the darts may incorporate one or more recesses and corresponding ridges on their foam bodies—for example, as disclosed in U.S. Patent Application No. 16/895,172 filed on June 8, 2020, the entire contents of which are incorporated by reference herein.

[0030] FIG. 2A is a schematic partial cross-sectional side view and FIG. 2B is a schematic partial cross-sectional top view of key elements of the toy projectile launcher 1 according to an exemplary embodiment of the present disclosure. For clarity and simplicity in illustrating the key elements and mechanisms of toy projectile launcher 1, portions that are not necessary to understand the scope and the spirit of the present disclosure are not shown. One of ordinary skill in the art would readily understand the supporting elements needed to house and support the various illustrated elements with various design choices that would not depart from the spirit and scope of the present disclosure.

[0031] As illustrated in FIGS. 2A and 2B, the horizontal drum 50 is a generally disk-shaped member having a side wall 52 and a central opening 54. The drum 50 is rotatably attached to the main body 10 by a post 19 of the main body 10 that extends upwards through the central opening 54 of the drum 50. A gear ring 56 extends around the side wall 52 of the drum 50. The gear ring 56 is disposed on the side wall 52 at a height so as to be in engagement with a gear 18 that extends from the main body 10. A motor 20 within the main body is mechanically linked to the gear 18 by a set of secondary gears 22. Operation of the motor 20 results in rotation of the gear 18 through the secondary gears 22, which in turn results in rotation of the drum 50 via the linkage between the gear 18 and the gear ring 56 of the drum 50. The motor 20 may be activated by a user pulling the trigger in the trigger assembly 16. In exemplary embodiments, the trigger assembly 16 may be configured so that the motor 20 operates only while the trigger assembly 16 is activated by a user, or the trigger assembly 16 may be configured so that the motor

operates upon a first activation of the trigger assembly 16 and then the motor is turned off upon a second activation of the trigger assembly 16.

[0032] The drum 50 includes a plurality of teeth 58 that are disposed around and extend into the central opening 54 of the drum 50. In the exemplary embodiment shown, the drum 50 is configured to store forty-five projectiles, with three projectiles stored one on top of the other within fifteen separate compartments 60 that extend outwards from the center of the drum 50, similar to spokes on a wheel. The number of teeth 58 is the same as the number of compartments 60, so that in this exemplary embodiment there are fifteen teeth 58 arranged around the central opening 54. It should be appreciated that the number of compartments 60 is not limited to fifteen, and other exemplary embodiments may involve the use of less or more than fifteen compartments 60 and therefore less or more than fifteen corresponding teeth 58. As the drum 50 rotates, the teeth 58 sequentially contact and therefore sequentially activate a pawl 24 that extends upwards through an opening at the top of the main body 10, which, as explained in more detail below, results in continuous firing of projectiles from the drum 40.

[0033] The pawl 24 is pivotally attached to an inner wall of the main body 10 of the launcher 1 at a pivot point located between an upper portion and a lower portion of the pawl 24. Thus, each time one of the teeth 58 contacts the upper portion of the pawl 24, the upper portion is pushed towards the front of the main body 10 and the lower portion pivots backward towards the back of the main body 10. The pawl 24 is pivotally linked with a first lever arm 28, which is in turn slidably engaged with a wall of the main body 10. In an exemplary embodiment, the slidable engagement between the first lever arm 28 and the main body 10 is achieved using one or more pins that slide within corresponding grooves. The first lever arm 28 is biased towards the front of the main body 10 through operation of a first spring 29. Thus, with each activation of the pawl 24 by one of the teeth 58, the first lever arm 28 reciprocates linearly from a first, forward position to a second, backward position and then back to the first, forward position. For the purposes of this disclosure, movement of the first lever arm 28 from the first, forward position to the second, backward position and then back to the first, forward position may be considered a single “stroke”.

[0034] The first lever arm 28 in turn has a camming surface 30 that contacts and therefore actuates a rotating gear 32 in the counter-clockwise direction with each stroke of the first

lever arm 28. The rotating gear 32 is attached to a wheel 36 so that the wheel 36 rotates counter-clockwise in correspondence with the rotation of the rotating gear 32.

[0035] The rotating gear 32 in turn is in contact with a second lever arm 34. The second lever arm 34 is pivotally attached at its upper end portion to an inner wall of the main body 10. A second spring 35 biases a lower end portion of the second lever arm 34 towards the back of the main body 10. With each stroke of the first lever arm 28 (and hence with each actuation of the rotating gear 32 by the first lever arm 28), the second lever arm 34 is pivoted towards the front of the main body 10 against the bias of the second spring 35 until one of the arms on the rotating gear 32 passes underneath the second lever arm 34, at which point the second lever arm 32 is pulled back by the second spring 35 into contact with the next arm of the rotating gear 32. Thus, the second lever arm 34 operates to momentarily prevent the rotating gear 32 from further rotating between each stroke of the first lever arm 28.

[0036] The wheel 36 includes protrusions 37 that extend outwardly around the wheel 36. As the wheel 36 is rotated, each protrusion 37 in turn approaches and extends through a slot 38 (FIG. 2B) in the top of the main body 10. The protrusion 37 comes into contact with the rear portion of a projectile 100 (the lowest projectile in the stack of projectiles within the corresponding compartment 60) and as the protrusion 37 continues to rotate forward through the slot 38, the projectile 100 is pushed forward by the protrusion 37 towards two flywheels 40A, 40B. As viewed from the top of the launcher 1, the flywheel 40A on the left side is continuously rotated in the counter-clockwise direction while the flywheel 40B on the right side is continuously rotated in the clockwise direction. In exemplary embodiments, the flywheels 40A, 40B may be operated by the motor 20 or by a second, separate motor. The slot 38 is aligned with the flywheels 40 such that the projectile 100 is pushed by the protrusion 37 into a position between the flywheels 40, at which point the flywheels 40 launch the projectile 100 through the launch barrel 14. In this way, the launcher 1 seamlessly and continuously fires projectiles to the extent there are projectiles remaining in the drum 50.

[0037] As explained previously, the second lever arm 34 operates to momentarily prevent the rotating gear 32 from further rotating between each stroke of the first lever arm 28. This in turn also prevents the wheel 36, which is connected to the rotating gear 32, from rotating between strokes of the first lever arm 28, which in turn prevents over or under rotation of the wheel 36 between strokes, which might cause the gun to stutter versus firing seamlessly.

[0038] In exemplary embodiments, the wheel 36 turns 90° with each stroke of the first lever arm 28 so that the four protrusions 37 around the wheel 36 come into contact and push a corresponding projectile in sequence. It should be appreciated that in other exemplary embodiments, where the number of protrusions on the wheel are less or more than four, appropriate angular and/or size adjustments may be made as needed to ensure that the protrusions push each projectile out of the barrel 50 in sequence without over or under shooting. For example, if the wheel 36 includes six protrusions 37, the wheel 36 may be made to rotate 60° with each stroke of the first lever arm 28.

[0039] FIGS. 3 and 4 illustrate further details of the drum 50 according to exemplary embodiment of the present invention. As mentioned previously, the drum 50 includes fifteen compartments 60, each housing three projectiles in a stacked configuration. As shown in FIG. 4, the open ends of each compartment 60 includes a lip 61 which allows for easy insertion of a resilient projectile, such as foam dart 100, while also preventing the projectile from falling out of the compartment 60. That is, a friction fit is formed between the projectile and the lip 61 to secure the projectile within the compartment 60.

[0040] As shown in the exploded view of FIG. 4, a top panel 62 is disposed within each compartment 60, and a resilient arm 64 extends downwards into engagement with each top panel 62. The resilient arms 64 may be made of flexible material, such as, for example, plastic or metal. Each top panel 62 includes side walls 63 with protrusions 67 that extend into corresponding slots 65 within side walls of the compartments 60. The position and length of the slots 65 within the side walls of the compartments 60 maintain the top panels 62 above a certain height within the corresponding compartment 60 to allow clearance for insertion of the first projectile, while also allowing the top panels 62 to slide upwards within the slots 65 as further projectiles are sequentially loaded into the compartment 60 below the first projectile. As the top panels 62 slide upwards, the resilient arms 64 exert a downward force on the corresponding top panels 62, thereby maintaining the top panels 64 in position over the stack of projectiles within each compartment 60. The drum 50 includes a cover 68 disposed over the internal components of the drum 50, including the resilient arms 64, top panels 62 and compartments 60.

[0041] Turning back to FIG. 2A, the front side of the drum 50 shows a compartment 60 in which all but one projectile has been fired, so that the corresponding top panel 62 is at its low-

est position and the corresponding resilient arm 64 is at rest on top of the top panel 62. Meanwhile, the back side of the drum 50 shows a compartment 60 in which none of the projectiles have yet been fired, so that the corresponding top panel 62 is at its highest position and the corresponding resilient arm 64 is flexed upwards into engagement with the top of the top panel 62. The side walls 63 of the top panels 62 create a groove in which the resilient arms 64 are able to freely slide as the resilient arms 64 flex to accommodate the loading and firing of projectiles from each compartment 60.

* * * * *

[0042] While particular embodiments of the present disclosure have been shown and described in detail, it would be obvious to those skilled in the art that various modifications and improvements thereon may be made without departing from the spirit and scope of the disclosure. It is therefore intended to cover all such modifications and improvements that are within the scope of this disclosure.

CLAIMS:

1. A toy projectile launcher comprising:
 - a main body comprising a launch barrel that has a central longitudinal axis that extends in a horizontal plane;
 - a horizontal drum rotatably mounted on the main body that stores projectiles so that the projectiles extend longitudinally within the horizontal plane; and
 - flywheels within the main body that launch the projectiles from the main body as the projectiles are continuously fed from the horizontal drum to the flywheels.
2. The toy projectile launcher of claim 1, wherein the horizontal drum comprises compartments that extend in a radial direction around a center of the drum.
3. The toy projectile launcher of claim 2, wherein the compartments are configured to hold three or more projectiles in a stacked configuration.
4. The toy projectile launcher of claim 1, wherein the horizontal drum comprise a plurality of teeth.
5. The toy projectile launcher of claim 4, wherein, upon rotation of the horizontal drum, a pawl that is pivotally attached to the main body engages with one of the plurality of teeth in a sequential manner, so that, with each engagement of one of the teeth with the pawl, the pawl pivots from a first position to a second position and a corresponding projectile is fed from the drum to the flywheels by the pivoting of the pawl.
6. The toy projectile launcher of claim 5, wherein the pawl is operatively connected with a wheel that that is rotatably mounted to the main body and which comprises a plurality of protrusions, so that, when the pawl pivots from the first position to the second position, one of the plurality of protrusions is rotated into engagement with a corresponding one of the projectiles to feed the projectiles from the drum in sequence.

7. The toy projectile launcher of claim 6, wherein the pawl is operatively connected with the wheel by a first lever arm that reciprocates between first and second horizontal positions due to the pivoting of the pawl.
8. The toy projectile launcher of claim 7, wherein the pawl is further operatively connected with the wheel by a rotating gear connected to the wheel and which rotates with each reciprocal movement of the first lever arm between the first and second horizontal positions.
9. The toy projectile launcher of claim 8, further comprising a second lever arm that pivots between a first position in which the second lever arm prevents the rotating gear from rotating and a second position to which the second lever arm has been pushed due to rotation of the rotating gear by the first lever arm.
10. The toy projectile launcher of claim 1, further comprising a gear that rotates the horizontal drum and a motor that actuates the gear.
11. The toy projectile launcher of claim 10, further comprising a trigger assembly configured for operation by a user to activate the motor.
12. The toy projectile launcher of claim 3, wherein the horizontal drum further comprises a plurality of top panels each disposed within a corresponding one of the compartments, wherein the projectiles are disposed below the plurality of top panels.
13. The toy projectile launcher of claim 12, wherein the horizontal drum further comprises a plurality of resilient arms that exert a downward force to the plurality of top panels so that the plurality of top panels are pushed downwards on top of the stacked configurations of projectiles.

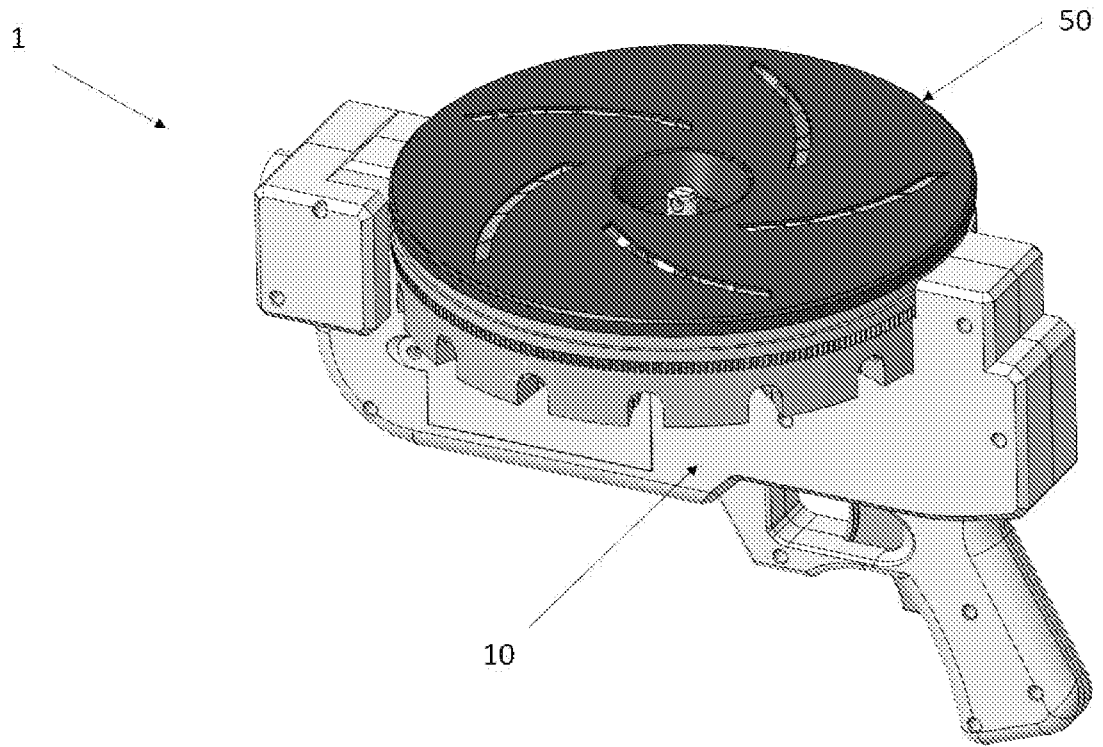


FIG. 1

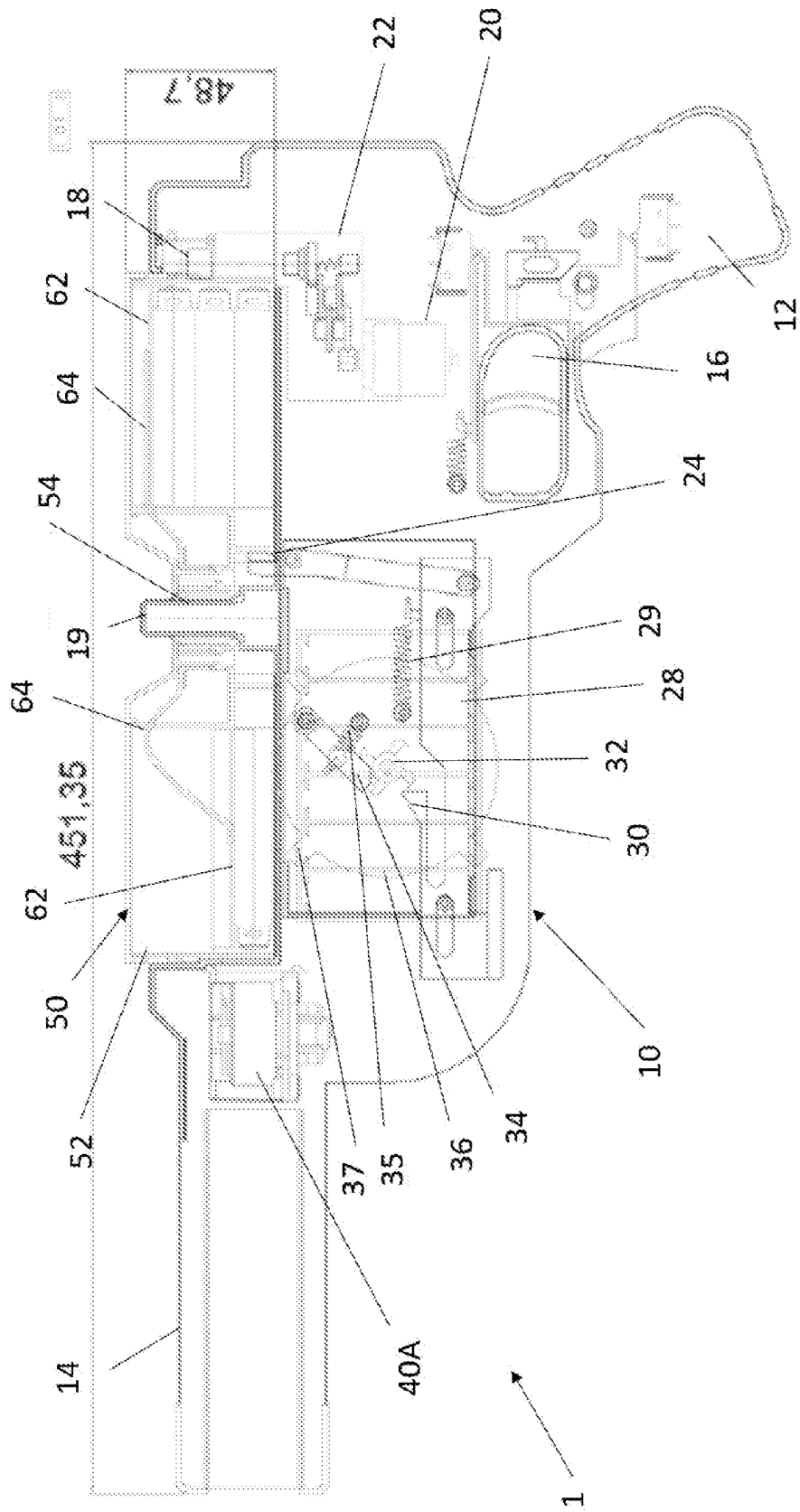


FIG. 2A

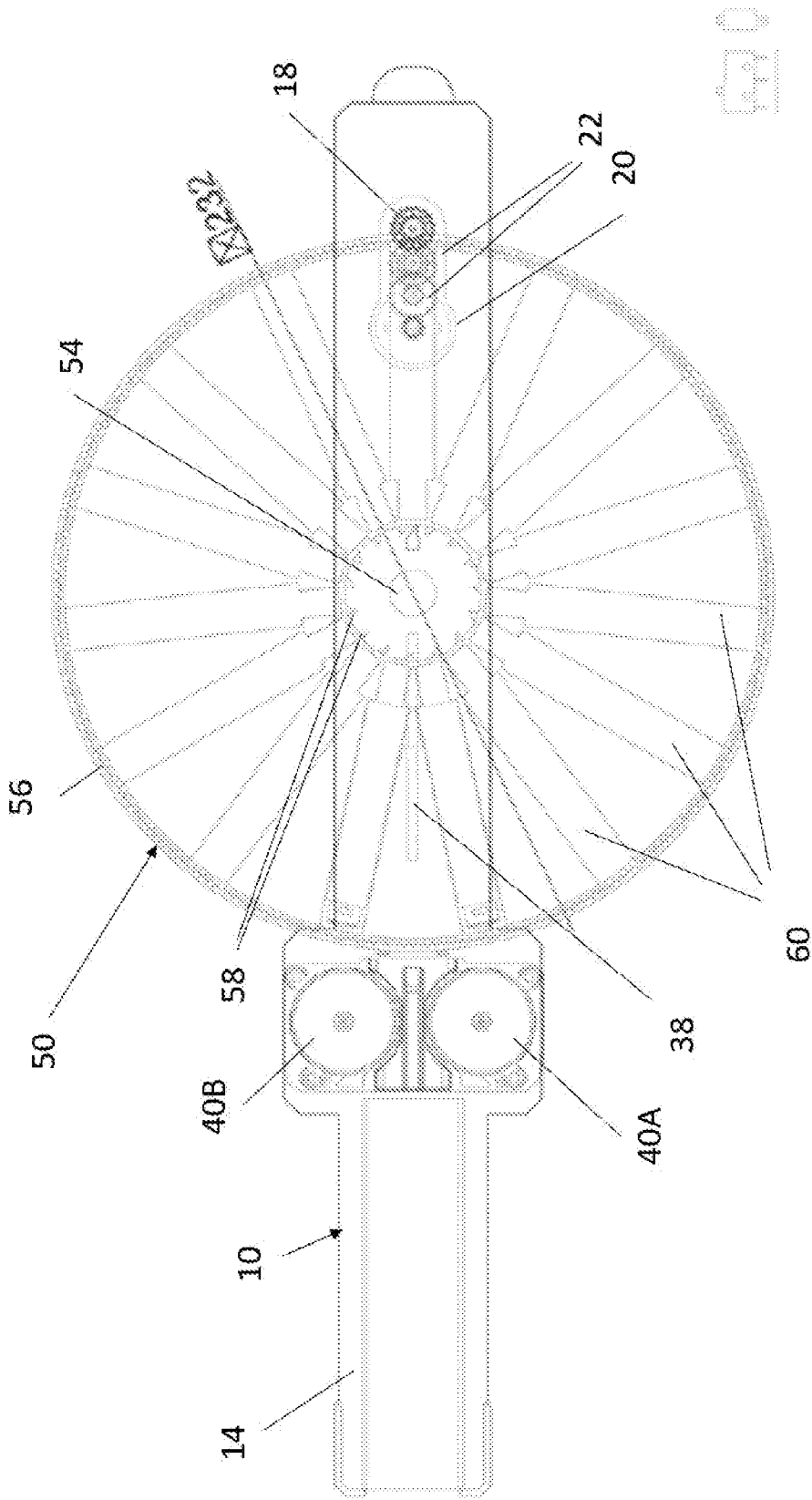


FIG. 2B

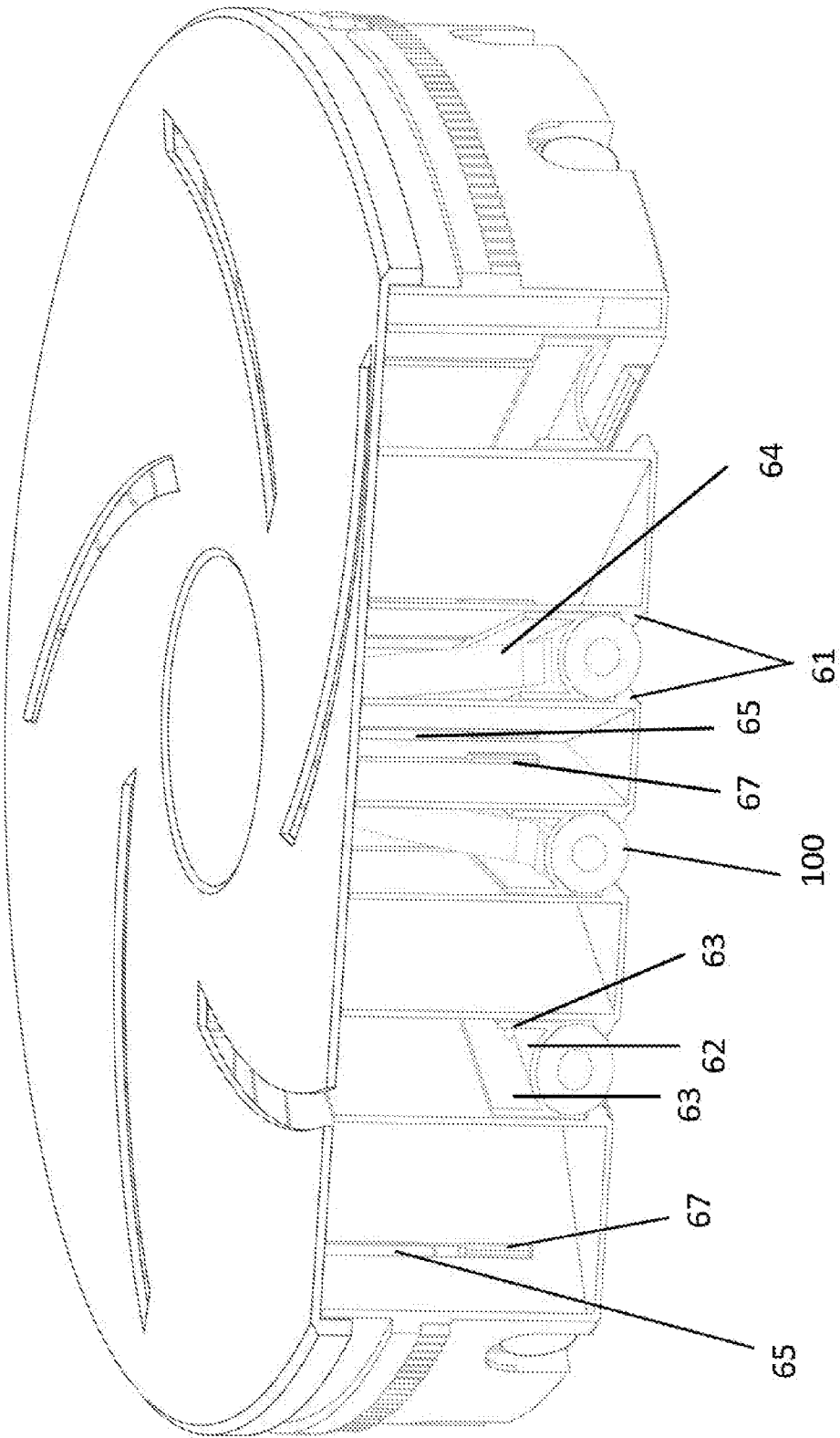


FIG. 3

