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(54) A ping-pong ball shooter.

(57) A ping-pong ball shooter including a reciprocating arm mechanism (18) composed of an abruptly returning device (21) capable of shooting out a ball, a rotating mechanism (1,2,3), a ball feeding/regaining device (23), an eye ball reciprocating mechanism and speeding changing device (9,10,11,12,4) whereby by means of slider-crank mechanism in four linkages, the eye ball reciprocating mechanism can rotate left and right and up and down like an eye, making the shot out ping-pong balls scattered within a sector area of a ping-pong table, and the rotation direction, bounding speed and bounding strength of the ball can be controlled.

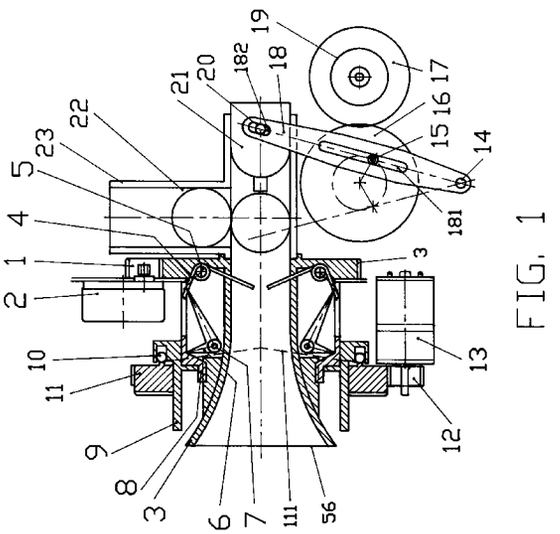

FIG. 1

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BACKGROUND OF THE INVENTION

The present invention relates to a ping-pong ball shooter. Generally, a convntional ping-pong ball shooter employs a ball-striking swinging mechanism with a torque spring to achieve the object of shooting balls. However, although such shooter has simple structure, the shooting path is too monotonous without change so that the user or trainee will feel bored and can not obtain real game experience, and will even feel that such ping-pong shooter is useless. Some other types of conventional ping-pong ball shooters employ complex mechanically controlling device to achieve various functions. However, such device must be operated by another person and is composed of a lot of components and requires long assembling time so that the cost thereof is too high to met economical principle and such device can not be mass manufactured and widely used.

It is therefore tried by the applicant to develop the present invntion to eliminate the above shortcomings existing in prior art.

SUMMARY OF THE INVENTION

It is a primary object of this invention to provide a ping-pong ball shooter employing slider-crank mechanism in four linkages to achieve various dropping positions and speeds of the shot ping-pong balls.

It is a further object thereof to provide the above ping-pong ball shooter which can be easily assembld and disassembld and the structure of which is simplified to lower the manufacture cost.

The invention as well as its many advantages may be further undrstood by reference to the following detailed description and drawings in which:

Fig. 1 is a sectional view of the shooting strength adjusting mechanism of this invntion;

Fig, 2 is a view of pushing state according to Fig. 1;

Fig. 3 is a top sectional view according to Fig. 1;

Fig. 4 is a sectional view of the eye ball reciprocating mechanism of this invention;

Fig. 5 is a view of horizontal swinging state according to Fig. 4;

Fig. 6 is a view of vertically swinging state according to Fig. 4;

Fig. 7 is a sectional view of the ball feeding mechanism of this invention;

Fig. 8 is a sectional view, showing the ball feeding path; and

Fig. 9 is a top sectional view of the ball feeding mechanism of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Please refer to Figs. 1 and 2. The ping-pong ball shooter of this invention includes an abruptly returning mechanism, a rotating mechanism, a ball feeding/regaining device, an eye ball reciprocating mechanism, and a speed changing device of a reciprocating arm, wherein the rotating mechanism includes a motor 2, a small gear 1driven thereby and a large gear 3 which is driven by the small gear 1 and in which a ball pipe 26 and a torque spring seat are disposed.

A torque spring 4 is loosely disposed on a pin 5 with one end longer and the other end shoter, whereby when the large gear 3 rotates, the torque spring 4 rotates 360 degrees along therewith. The abruptly returning mechanism of the reciprocating arm includes a DC motor 19, driving gear 17, driven gear 16, crank pin 15, pivot pin 14, rocking arm 18, and a striking head 21 with an engaging pin 21, wherein when DC motor 19 rotates to make the driving gear 17 rotarily drive the driven gear 16, the crank pin 15 thus rotates along therewith and moves within a slot 181 of the rocking arm 18. Because the rocking arm 18 is fixed by the pivot pin 14, therefore it can only swing within a certain angle about the pivot pin 14. As a consequence, the engaging pin 20 can slide within a slot 182 of the rocking arm with the striking head 21 horizontally sliding in the ball pipe 26.

When a ping-pong ball 22 is dropped into a ready position through a ball tunnel 23, the rocking arm 18 rocks to move the striking head 21 forward so as to push the ball 22 toward the torque spring 4 to bias the same outward. When the rocking arm 18 reaches a final position (indicated by dotted line), the torque spring 4 will be restored into its original position to abruptly shoot out the ball 22. The speed of shot ball is abjusted in such a manner that the crank pin 15 is located to achieve different rotating angles, making the advancing rotating angle of the rocking arm 18 larger than the backing rotating angle thereof, ie. the advancing stroke is slow and the backing stroke is fast. Moreover, the DC motor 19 serves as a power source and can be adjusted to achieve various speeds of shot ball as required.

Please refer to Figs. 1, 2, and 3, wherein the strength of shooting force exerted on the ball 22 is primarily controlled by means of changing the tension of the torque spring 4, ie. changing the angle of the torque sping 4. One end of the torque spring 4 is mounted on a swinging lever 6 which is loosely mounted on a pivot pin 7. Two sets of the torque springs 4 are symmetrically fixed on the larger gear 3 to rotate along therewith. Additionally, a rotating pushing disk 8 is also disposed on the large gear 3 to reciprocally slide and rotate whereby when the rotating pushing disk 8 moves to push the swinging lever 6 and change its angle, the angle of the torque spring 4 is thus also changed to achieve different tension so as to change the strength of shooting force for the ball 22.

The elements for reciprocating the rotating push-

ing disk 8 are a motor 13, a small gear 12, a large gear 11, a steel ball 10 and a slide guide 9, wherein the large gear 11 is provided with a cam 111, and the steel ball 10 is disposed betweem the cam 111 and slide guide 9 so that when the large gear rotates, the cam 111 rotates along therewith to push the slide guide back and forth, forcing the rotating pushing disk 8 to move. The cam 111 rotates through 360 degrees wherein from zero degree to 90 degree, ie. from the lowest position to the highest position, the torque spring 4 is compressed to a most tensional state and the ball can be shot out most strongly, and from 90 degree to 180 degree, ie. from the highest position to the lowest position, the torque spring 4 is released to a free state and the shooting force is weakest. Accordingly, there are two up and down circles in one revolution of the cam 111.

The slide guide 9 is formed with a projection so that, when within zero degree to 90 degree, the proection can touch a fine switch 24 to power on an indicator lamp for indicating the strength of shooting force. Because the slide guide 9 contacts with the rotating pushing disk 8 in a sliding frictional manner, therefore, when the large gear 11 is not rotated with the cam 111 staying in its original position, the slide guide 9 also stays where it is with the rotating pushing disk 8 located at a fixed position. However, due to the rotation of the large gear 3, although the rotating pushing disk 8 stays at the fixed position, the swinging lever 6 is urged to compress the torque spring 4 into a certain same tensional state, making the ball shooting force identical and the indicator lamp stays in a fixed point. If the motor 13 starts to rotate, then the strength of ball shooting force is also changed to achieve shooting force adjustment.

Please now refer to Fig. 4 which shows the eye ball reciprocating mechanism of this invention wherein in a spherical structure 28 is disposed a seat member 41 having a slide slot 42 engaging with a fixing pin 40 formed on a rotary eye ball member 39, whereby the rotary eye ball member 39 can horizontally or vertically rotate inside and about the shperical structure 28 according to the slider-crank mechanism.

Moreover, a crank pin 33 is disposed on a transmission gear 34 of a horizontal motor 36 which is mounted on the rotary eye ball member 39 whereby the crank pin 33 can move within a guider 30. A ball pin 35 is disposed on the rotary eye ball member 39, which move within a slot 26 of the guider 30 and is limited by the spherical structure 28, ie. the eye ball member 39 can only move horizontally relatively to the guider 30. In addition, another crank pin 38 is disposed on a transmission gear 32 of a vertical motor 25, which can move within a fixing support 37 of the spherical structure 28. Because the guider 30 is also limited by the support 37 of the spherical structure 28, making the eye ball member 39 only move vertically, therefore, when the vertical motor 25 rotarily drives the transmission gear 32 to further drive the crank pin 38 to rotate about the transmission gear 32, since the fixing support 37 of the spherical structure 28 is kept stationary, the crank pin 38 will inevitably move within a slide slot 31 of the support 37, forcing the transmission gear 32 to rotate and make the eye ball member swing about its center. In Fig. 5, a limit swinging position of the eye ball member after the rotation fo transmission gear 32 is shown. This is achieved according to the slider-crank mechanism in the four linkage.

As shown in Fig. 5, after the transmission gear 32 rotates, the eye ball member 39 is urged to swing, ie., the guider 30 will drive the ball pin 35 to force the eye ball member 39 to vertically swing along with the guider 30 about the center of the spherical structure 28. Therefore, the crank pin 38 will move within the slide slot 31 back and forth once in one revolution of the transmission gear 32, ie., the eye ball member 39 will move up and down once. Similarly, when the horizontal motor 36 rotarily drives the transmission gear 34 to further drive the crank pin 33 to move within the slide slot 26 of the guider 30, because the guider 30 is limited to only move vertically, after the transmission gear 34 is forced to rotate, the spherical structure will horizontally swing about its center as shown in Fig. 6. Therefore, in one revolution of the transmission gear 34, the crank pin 33 moves within the slide slot back and forth once, ie., the eye ball member 39 horizontally swings left and right once. By means of the above two sets of four linkage slider-crank mechanism, the rotary eye ball member 39 can rotate upward, downward, left, and right in the spherical sturcture 28. Furthermore, the two sets of four linkage mechanism can move independently from each other to form only up and down or left and right movement, or can move together to form irregular variation so that the shot out balls will be scattered within a sector area of the pingpong table and the dropping points of the balls can be altered regularly or irregularly.

Please refer to Fig. 7 wherein the ball-feeding operation is shown. A hopper slide way 47 and a boll-feeding motor 45 are disposed on a ball collector 46. A sleeve ball bag 43 is disposed at the shaft of the motor 45. One end of the ball bag 43 is closed, serving as a driving side and the other end thereof is open and inserted into the slide way 47, and three sets of blades 44 as shown in Fig. 8 and openings are disposed therein and inside a bottle-shaped fixed ball pipe 48 as shown in Figs. 8 and 9. A movable ball pipe 49 is provided with a trumpet open end 50 and a T-shaped pipe 52 and spring 51 are fixed on the rotary eye ball member 29. When the eye ball member 29 moves, the trumpet open end 50 can join with the ball pipe 48 for smoothly sending ball thereinto. The Fig. 9 shows the ball-feeding path, wherein when the ball is regained into the ball collector 46 and slides into the sleeve ball bag 43 through the hopper slide way 47, and when the sleeve ball bag 43 rotates, due to centrifugal force, the

ball 22 will slide into the bottom of the ball pipe 48 through the opening. By means of the blades 44, the ball 22 is pushed upward along the ball pipe 48 into the movable ball pipe 49 and goes through the trumpet open end 50 into the T-shaped pipe 52 located above the movable ball pipe 49 to touch a spring 51 and freely drop into the ready ball tunnel for shooting. If the ready ball tunnel is filled up with other balls, then the ball 22 will press the spring 51 to go upward through a ball-spilling pipe and slide back to the sleeve ball bag 43. The shot out ball is struck back by a player to be collected by a network into the ball collector 46. This pertains to prior art and will not be described in details.

Moreover, a leaf spring 53 is disposed on left side of the ball pipe 48 to restrict the ball 22 above the ball pipe 48 with-out sliding back to the sleeve ball bag 43 to faciltate the rotation of the blades 44.

Therefore, when the ball 22 is sent from the blades 44 of the ball collector 46 to the fixed ball pipe 48 and movable ball pipe 49, by means of the spring 51 of the T-shaped pipe 5 2, the ball 22 is dropped into the ready ball tunnel 23, and then by means of the aforesaid abruptly returning mechanism of the reciprocating arm, the ball 22 is pushed forward toward the rotating mechanism, speed changing device and eye ball reciprocating mechanism, permitting the rotation direction, speed and strength of shot ball 22 to be controlled as required.

Claims

1. A ping-pong ball shooter primarily comprising an abruptly returning mechanism, a rotating mechanism, a speed changing device, an eye ball reciprocating mechanism, a ball feeding/regaining device of a reciprocating arm.

2. A pipe-pong ball shooter as claimed in claim 1, wherein said rotating mechanism includes a motor, a small gear driven thereby and a large gear driven by said small gear, a ball pipe and a torque spring seat being disposed in said large gear, a torque spring being loosely disposed on a pin with one end longer and the other end shoter, whereby when said large gear rotates, said torque spring rotates 360 degrees along therewith.

3. A ping-pong ball shooter as claimed in claim 1, wherein said abruptly returning mechanism of said reciprocating arm includes a DC motor, driving gear, driven gear, crank pin, pivot pin, rocking arm, and a striking head with an engaging pin, wherein when said DC motor rotates to make said driving gear rotarily drive said driven gear, said crank pin rotates along therewith and moves wihtin a slot of said rocking arm, and because said rocking arm is fixed by said pivot pin, thus it can only swing within a certain angle about said pivot pin, and resultantly, said engaging pin can slide within a slot of said rocking arm with said striking head horizontally sliding in said ball pipe.

4. A ping-pong ball shooter as claimed in claim 1, wherein when a ping-pong ball is dropped into a ready position through a ball tunnel, said rocking arm rocks to move said striking head forward so as to push said ball toward said torque spring to bias the same outwards, and when said rocking arm reaches a final position, said torque spring will be restored into its original position to abruptly shoot out said ball, and the speed of shot out ball is adjusted in such a manner that said crank pin is located to achieve different rotating angles, making said advancing rotating angle of said rocking arm larger than said backing rotating angle thereof, ie., the advancing stroke is slow and the backing stroke is fast, and, moreover, the DC motor serves as a power source and can be adjusted to achieve various speeds of shot ball as required, and the strength of shooting force exerted on the ball is primarily controlled by means of changing the tension of said torque spring, one end of said torque spring being mounted on a swing lever which is loosely mounted on a pivot pin, two sets of torque springs being symmetrically fixed on said large gear to rotate along therewith, a rotating pushing disk being also disposed on said large gear to reciprocally slide and rotate whereby when said rotating pushing disk moves to push said swinging lever and change its angle, the angle of said torque spring is thus also changed to achieve different tension so as to change the strength of shooting force for the ball, a slide guide being formed with a projection so that within zero degree to 90 degree, said projection can touch a fine switch to power on an indicator lamp for indicating the strength of shooting force, and because said slide guide contacts with said rotating pushing disk in a sliding frictional manner therefore, when said large gear is not rotated with said cam staying in its original position said slide guide also stays where it is with said rotating pushing disk located at a fixed position, but due to the rotation of said large gear although said rotating pushing disk stays at said fixed position, said swinging lever is urged to compress said torque spring into a certain same tensional state, making the ball bounding force identical and said indicator lamp stay in a fixed point, and if said motor starts to rotate, then the strength of ball bounding force is also changed to achieve bounding force adjustment.

5. A ping-pong ball shooter as claimed in claim 1, wherein in a spherical structure is disposed a seat member having a slide slot engaging with a fixing pin formed on a rotary eye ball member, whereby said eye ball member can horizontally or vertically rotate inside and about said spherical structure according to the slide-crank mechanism, and a crank pin is disposed on a transmission gear of a horizontal motor which is mounted on said rotary eye ball member whereby said crank pin can move within a guider, and a ball pin is disposed on said eye ball member, which moves within a slot of said guider and is limited by said spherical structure, ie., said eye ball member can only move horizontally relatively to said guider, and in addition, another crank pin is disposed on a transmission gear of a vertical motor, which can move within a fixing support of said spherical structure, making said eye ball member only move vertically.

6. A ping-pong ball shooter as claimed in claim 1, wherein said ball feeding/regaining device includes a hopper slide way and a ball-feeding motor which are disposed on a collector, a sleeve ball bag being disposed at the shaft of said motor, one end of said ball bag being closed, serving as a driving said and the other end thereof being open and inserted into said slide way, three sets of blades and openings being disposed therein and inside a bottle-shaped ball pipe, a movable ball pipe being provided with a trumpet open end and a T-shaped pipe and spring being fixed on said rotary eye ball member, whereby by means of the rotation of said blades, the ping-pong ball is sent along said fixed ball pipe through said movable ball pipe and trumpet open end into said T-shaped pipe to touch a spring and freely drop into said ready ball tunnel for shooting, and if said ready ball tunnel is filled up with other balls, then the ball will press said spring to go upward through a ball-spilling pipe and slide back to said sleeve ball bag.

7. A ping-pong ball shooter as claimed in claim 6, wherein a leaf spring is disposed on left side of said ball pipe to restrict the ball above said ball pipe without sliding back to said sleeve ball bag.

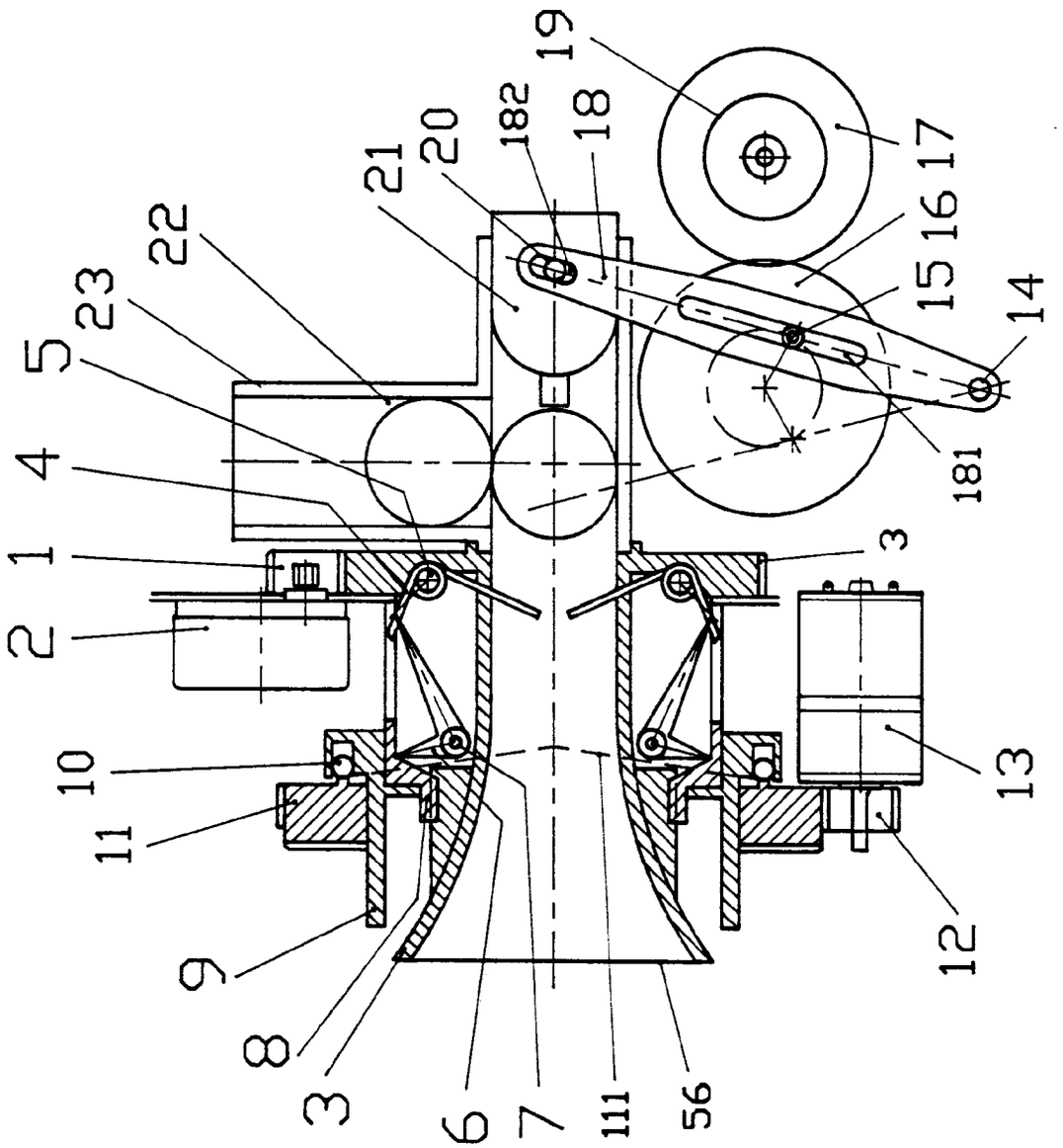


FIG. 1

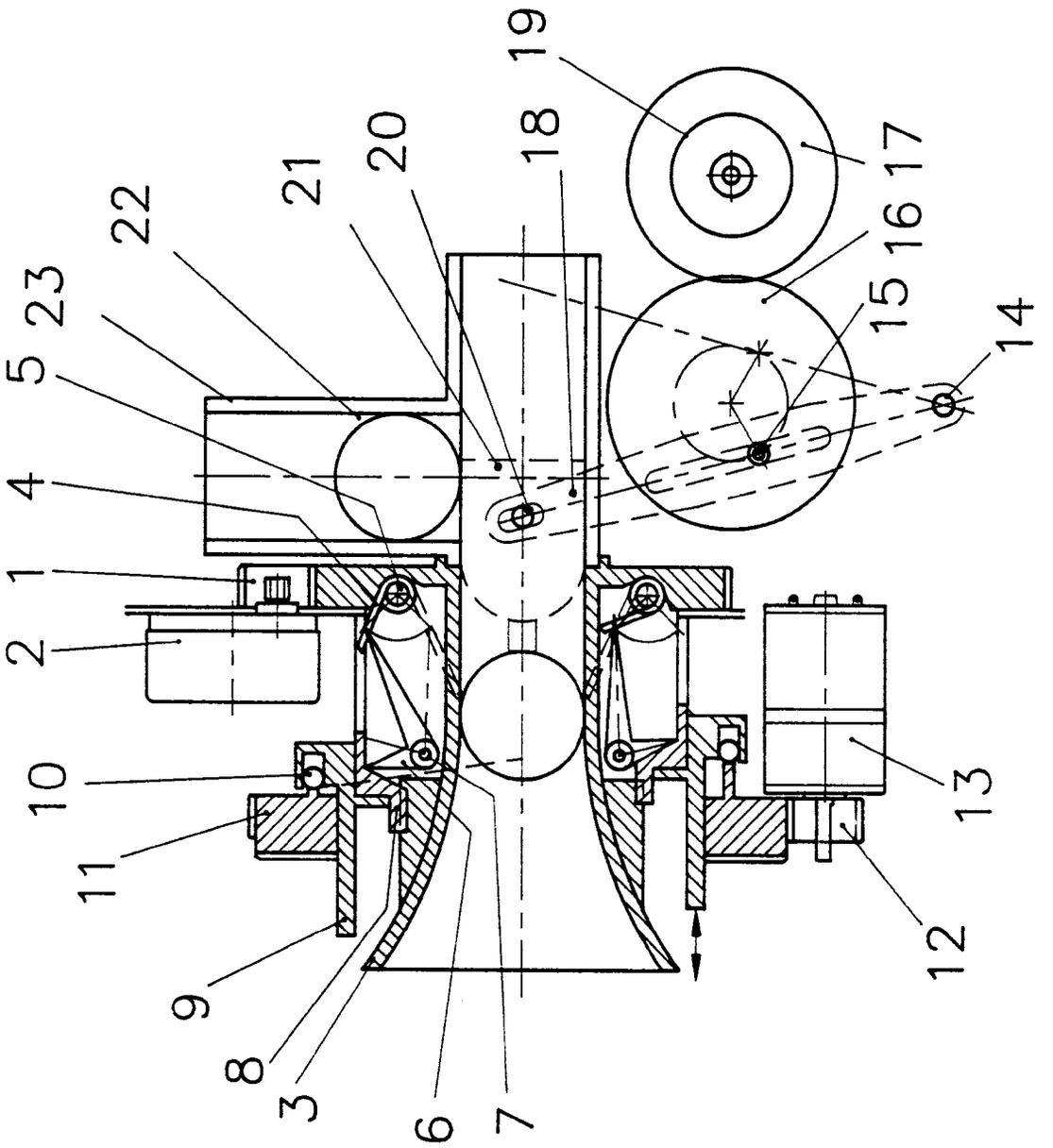


FIG. 2

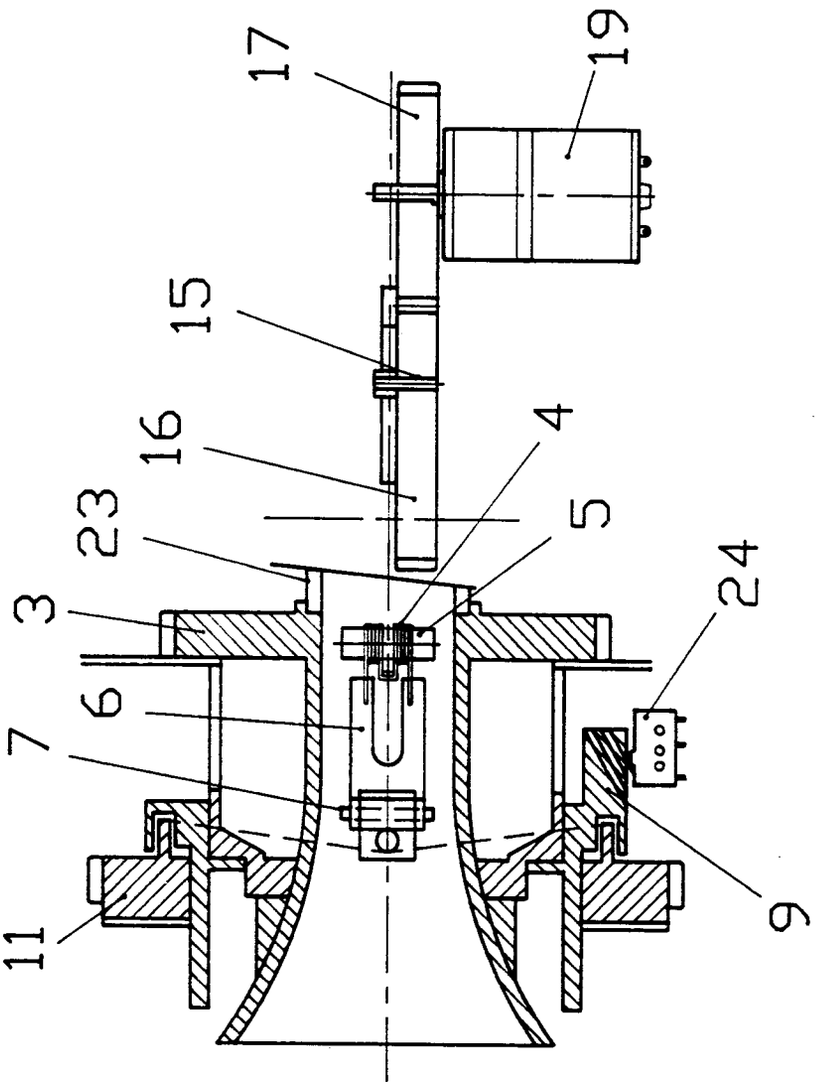


FIG. 3

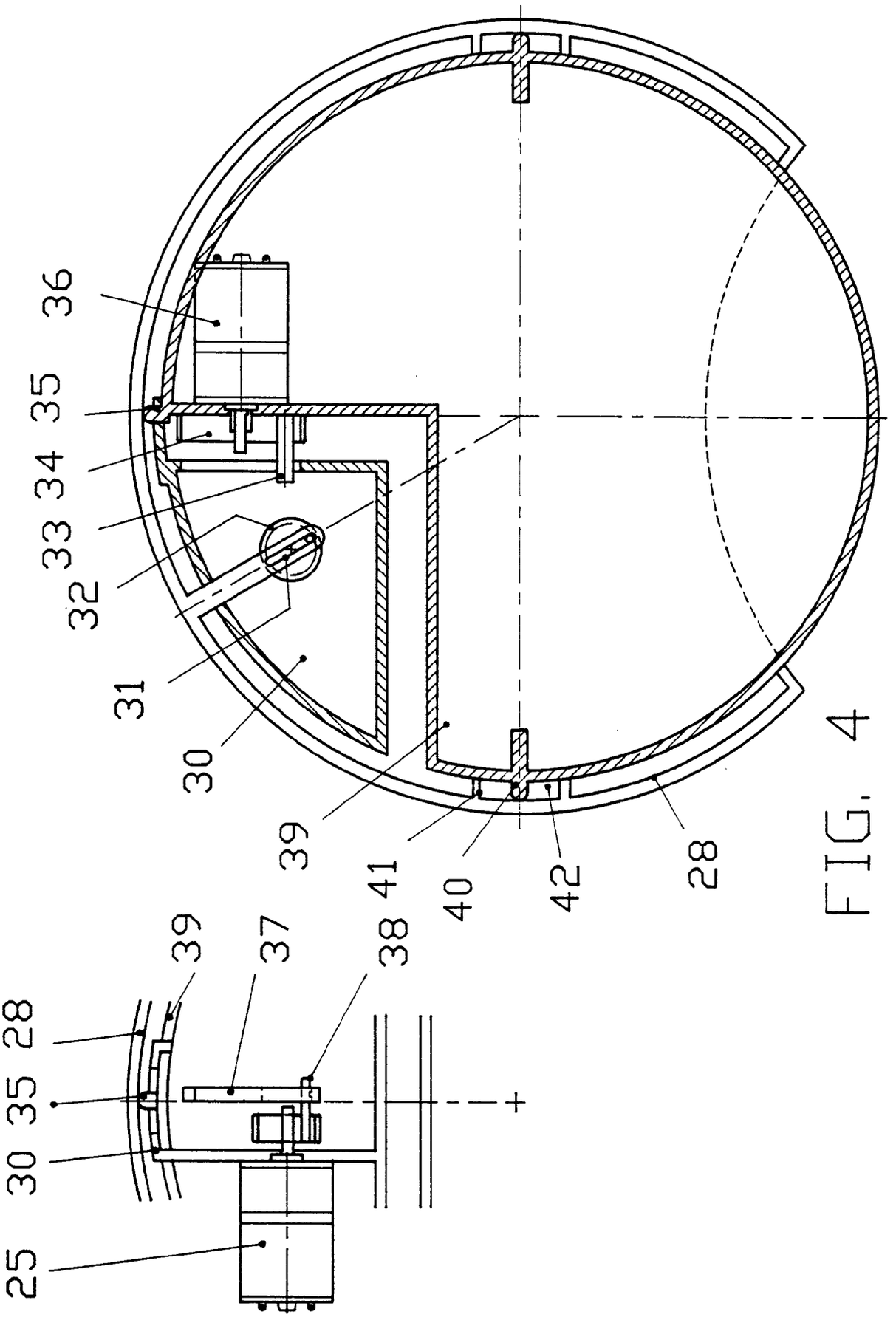
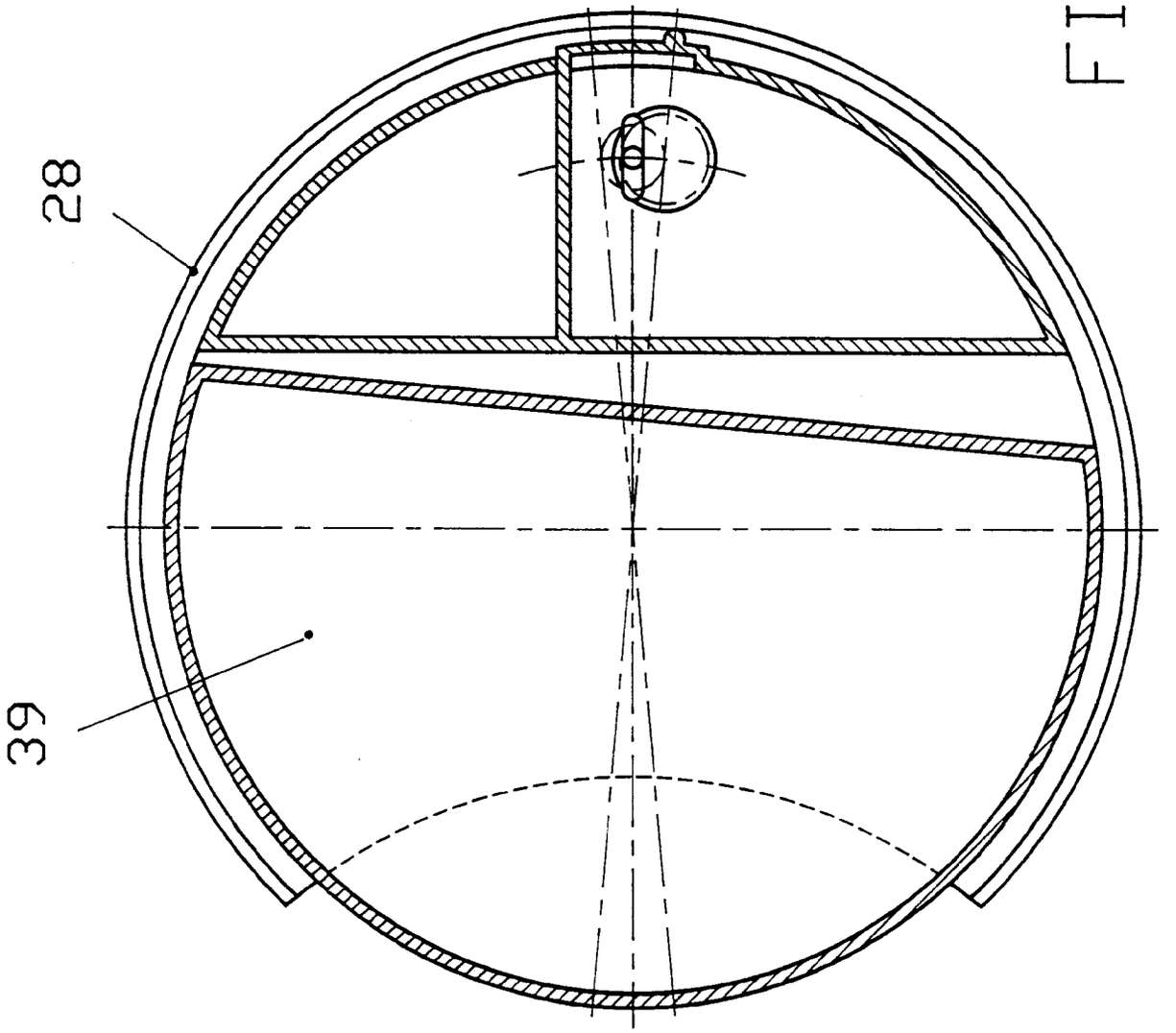


FIG. 4

FIG. 5



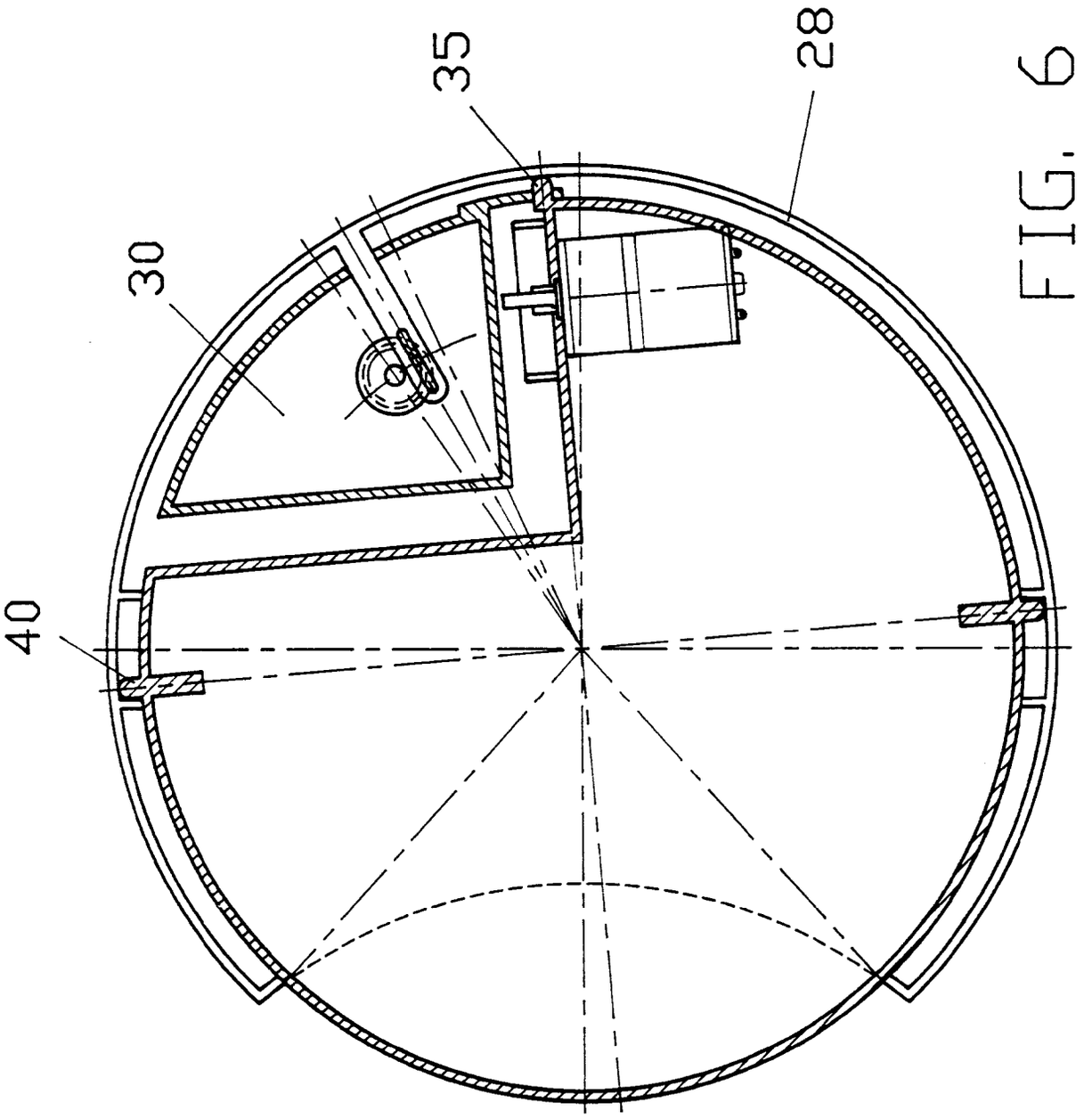


FIG. 6

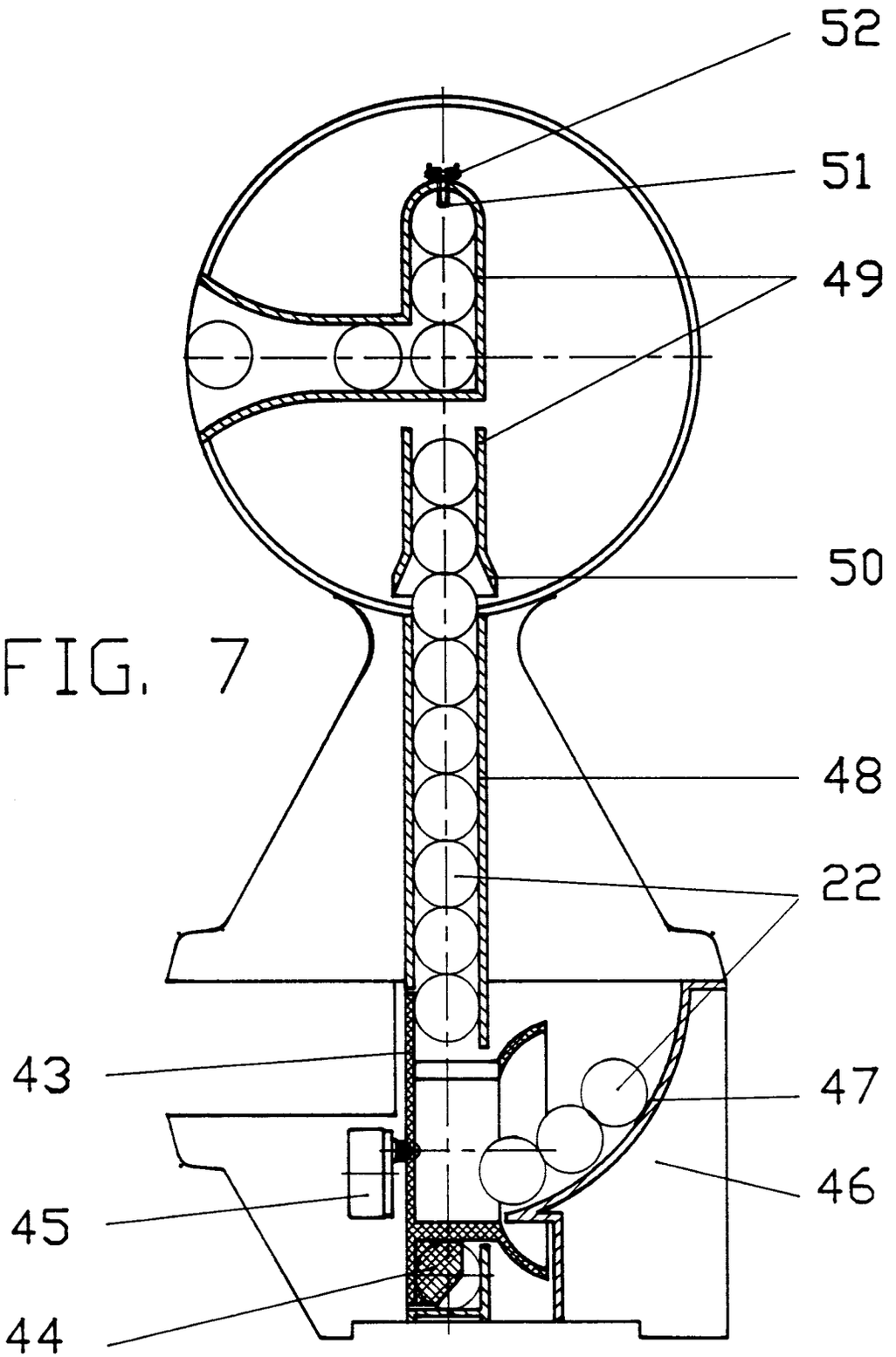


FIG. 7

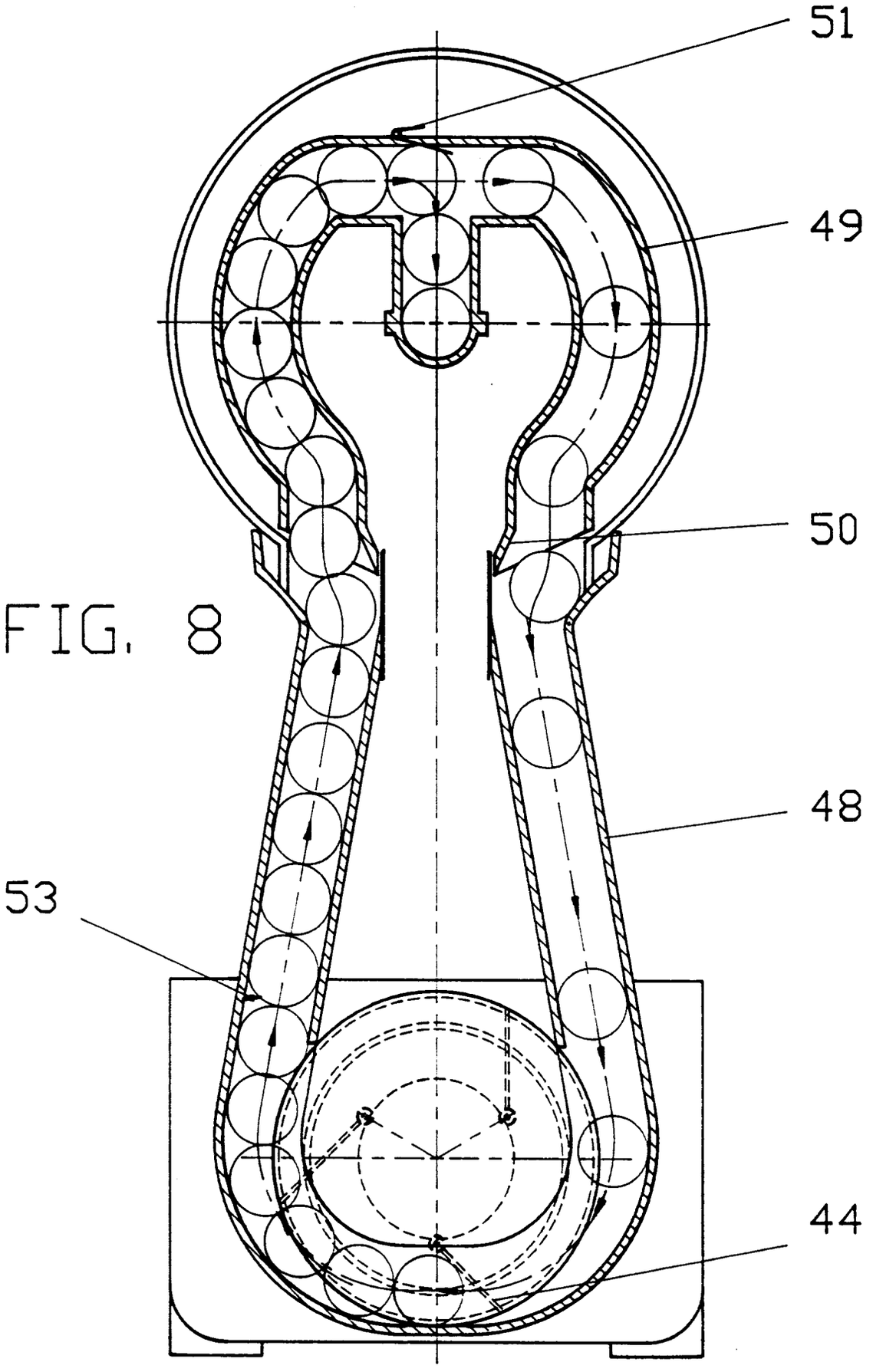


FIG. 8

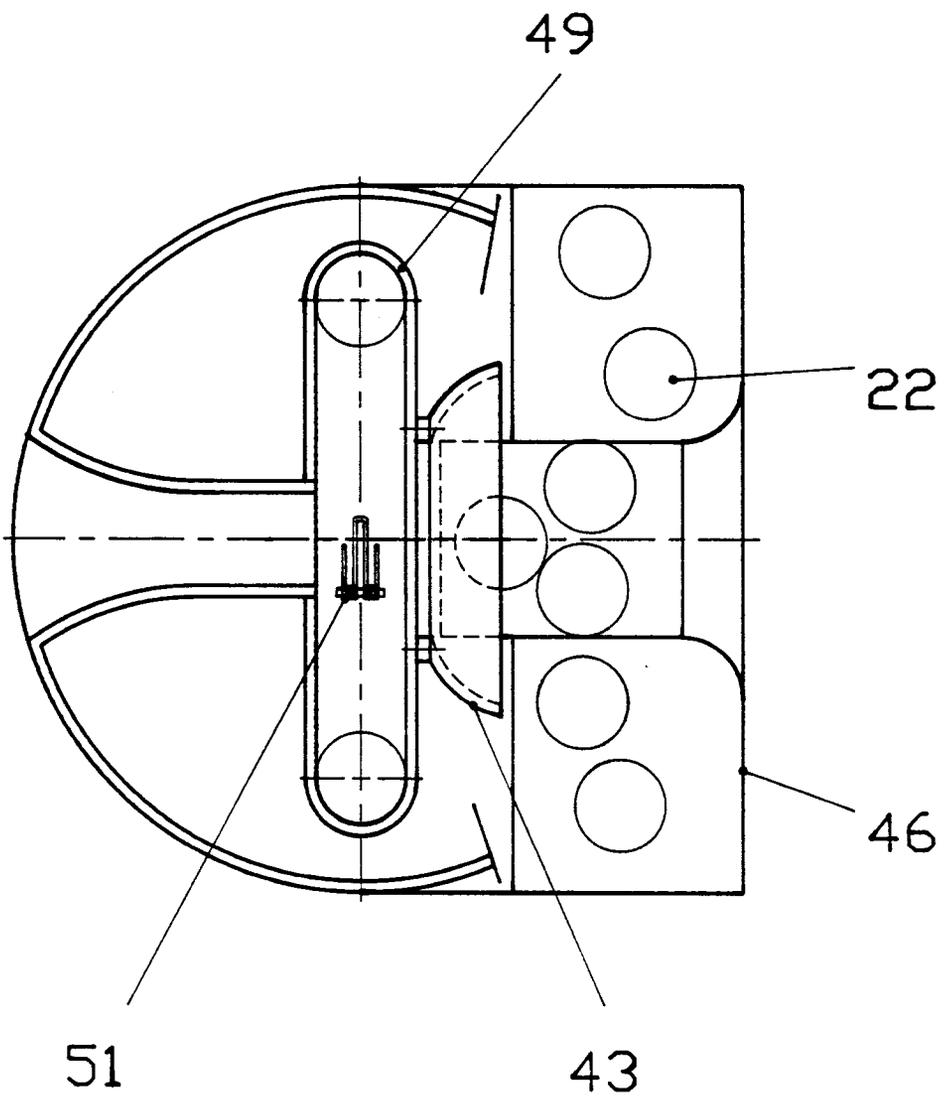


FIG. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 2058

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	CH-A-521 764 (BINGGELI ET AL.) * column 2, line 18 - line 29 * * column 3, line 57 - column 4, line 43; figures 1-6 *	1-3	A63B69/40
A		4,5	
Y	US-A-3 807 379 (VODINH) * column 9, line 40 - column 10, line 22; figures 8B,8C *	1-3	
A	GB-A-2 173 112 (GATCHEL ET AL.) * page 2, line 90 - page 3, line 28; figures 2,8 *	6	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05 NOVEMBER 1991	GIMENEZ BURGOS R.

CATEGORY OF CITED DOCUMENTS

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