



(11)

EP 1 701 310 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.09.2006 Bulletin 2006/37

(51) Int Cl.:
G07D 1/00 (2006.01) G07F 1/04 (2006.01)

(21) Application number: **06380046.0**

(22) Date of filing: **10.03.2006**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**
Designated Extension States:
AL BA HR MK YU

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(30) Priority: **10.03.2005 ES 200500566**

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(54) Coin accumulating device

(57) The present invention relates to a coin accumulating device, comprising a coin storage and a drive mechanism, the storage of which made up of a disc (7) rotatable about its axis with independent chambers receiving coins perpendicular to the axis, which come out into the periphery of the disc. The chambers (8, 9) are located on at least two planes perpendicular to the axis of the disc, the consecutive chambers (8, 9) of two adjacent planes being angularly offset from each another. A movable coin guide (14) leading the coins towards the mouth of the chambers of one or the other plane is arranged in the coin inlet position.

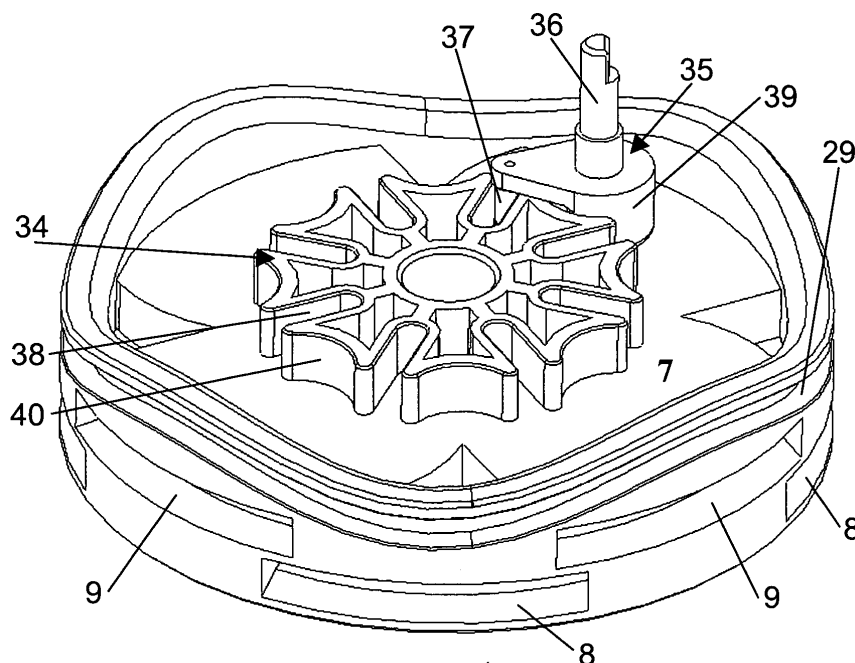


FIG. 3

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Description

[0001] The present invention relates to a coin accumulating device through which the storage, collection and return of coins in automatic coin-operated machines or apparati take place, and which are applicable, e.g. in payphones. These devices store the previously identified and accepted coins, collect the coins stored until reaching the value of the service provided, and return the rest of the coins to the user. To that end, accumulating devices may form part of the coin reception mechanism having coin identification and selection means.

[0002] More specifically, the device of the invention is of the type comprising a coin storage made up of a disc rotatable around its axis, internally having a series of coin receiving chambers coming out into the periphery thereof, this disc being surrounded by a surface that closes the mouth of the chambers, surface which has three breaks or ports to which an identical number of chamber mouths is selectively faceable, for the inlet and outlet of coins. To that end, the disc is connected to a drive mechanism, for example of the Geneva type, by means of which the chambers, the mouth of which must be facing the ports of the closing surface, are selected. Of these ports, for example numbering three, one will function as a coin inlet slot, another as a return slot and the third one as a collection slot, the last two being capable of being provided with plugging means.

[0003] Devices with the structure set forth are disclosed, for example, in EP 0 496 588, to GPT LIMITED, and in ES 9 100 464 and EP 1 052 600, from the same applicants as those of the present invention, and in WO 03/046844 to COIN CONTROLS LTD. All these documents disclose coin storage devices in which all the chambers of the disc forming the storage are located on the same plane, perpendicular to the axis of the disc. One of the main problems of these devices is the size of the disc, which is determined by the size of the chambers and the number of coins to be stored. Since the size of the chambers is determined by the diameter of the coins, if the capacity, i.e. the number of chambers, is to be increased, it will be necessary to increase the diameter of the disc. This assumes that the volume of the disc depends directly on the amount of coins it can store.

[0004] When the device is intended to be installed in devices with relatively small dimensions, as occurs for example in payphones, it is important for the accumulator to be of small dimensions, whereupon the disc will not allowed to have a large number of storage chambers.

[0005] Devices are also known for the purpose set forth wherein the storage area comprises a drum which rotates about its axis, having axial chambers coplanar with the axis of the drum which come out into the outside through the bases of said drum, for the inlet and outlet of coins, the drum being connected to a drive mechanism. According to one embodiment, the drum is arranged with the axis upright and on one of its bases it has fixed a circular plate forming part of a "Geneva" mechanism as a drum drive means. Spanish utility model no. 293,103, EP 0 921 500 and WO 80/01117 may be cited as having this structure. Said structure allows having a large number of chambers but has the problem that the drum occupies considerable space and does not allow its application in apparati of relatively small dimensions, as is the case of payphones.

[0006] The object of the present invention is to solve the problems set forth by means of a coin accumulating device, the storage of which is made up of a disc which rotates about its axis, occupies a small space and may have a large number of chambers.

[0007] The device of the invention is of the type comprising a coin storage, made up of a disc rotatable about its axis and provided with chambers perpendicular to the axis of the disc for coins, and a disc drive mechanism, which may be of the "Geneva" type or of any other type. The device of the invention is characterized in that said chambers are located in at least two different planes perpendicular to the axis of the disc, all the chambers being independent from one another. Thereby, by means of a slight increase of the thickness of the disc with regard to the traditional devices of the same type which include only chambers located on a single plane, providing the storage with a larger number of receiving chambers is achieved. The chambers may be located on two or more independent planes, depending on the desired storage capacity and on the possibilities of increasing the thickness of the disc.

[0008] The chambers located on consecutive planes will preferably be angularly offset from one another, and in order to obtain the minimum disc diameter, every two consecutive chambers located on the same plane will be separated by a width lower than the angular width of the intermediate chamber of the adjacent plane or planes.

[0009] According to another feature of the invention, a movable coin guide, which selectively leads the inserted coins towards the mouth of the facing chamber of one or the other plane, is located at the inlet position. This coin guide may be made up of a chute receiving the inserted and accepted coins and may be transversally shifted into a number of consecutive positions equal that of planes on which the chambers of the disc are located and in each one of the positions of which the outlet of the chute is facing the mouth of a chamber. The shifting of the coin guide or chute may be angular, by swinging on an axis perpendicular to the axis of the disc. In this case, the swinging of the coin guide may be achieved by connecting said coin guide to the disk by means of a guide system which controllably causes the swinging of said coin guide.

[0010] The coin guide may further be provided with means which detect the presence of coins therein, which emit a signal every time a coin completely enters or comes out of the coin guide.

[0011] When the coin guide is devised as a chute, the means for detecting the presence of coins may consist of faced holes made on the chute walls, through which a light beam is made to pass which will be intercepted when a coin completely enters said chute and which will be released when the coin completely comes out of the chute, i.e. when it goes into one of the chambers of the disc.

[0012] In one embodiment, the chambers are located on the disc on two different planes, and the guide system is made up of a rotating cylindrical body which is synchronized in its rotation with the disc and has a peripheral channel of undulating path, in the channel of which a pivot enters projecting from the coin guide or chute. The undulations of the channel generate a transverse movement of the coin guide of amplitude and direction coincident with the spacing and position of the consecutive chambers located on both planes of the disc. The rotating cylindrical body on which the peripheral channel is made may consist of the disc itself wherein the chambers for coins are formed.

[0013] As indicated above, the disc drive mechanism may be of the "Geneva" type, the wheel or cross of this mechanism being lock together to one of the flat surfaces of the disc in a coaxial position therewith.

[0014] The disc drive mechanism could also be made up of a gearwheel locked together to the disc in a coaxial position therewith, with which a drive pinion meshes, pinion which includes two sectors on its periphery, one lacking teeth and another one toothed, with a series of identical teeth delimited between two end teeth, preferably of greater pitch. On the other hand, the wheel will include toothed sections with a number and pitch to mesh with the set of identical teeth of the toothed sector of the pinion, these toothed sections being separated by two spaces, each of them of amplitude coincident with that of the end teeth of the pinion, separated by an intermediate tooth of identical amplitude to the identical teeth of the pinion. Furthermore, the gearwheel and the pinion will have mutually engageable means which lock the rotation of the wheel while the section lacking teeth of the pinion coincides in its turn with the section of the wheel defined by the spaces of amplitude coinciding with larger teeth of said pinion.

[0015] In a possible configuration, the cavities of the disc intended for containing the coins come out into periphery thereof in a slightly tangential direction, which allows obtaining a more compact system as the coin can be inserted in the disc from a lower height.

[0016] With said structure, a disc-shaped storage can be available which, with a thickness slightly greater than that of the traditional disc-shaped storages, may be provided with a larger number of storage cavities or chambers.

[0017] Furthermore, with the disc-shaped storage of the invention the rotation of the disc is minimized so as to pass from one cell or chamber to another, and the inertia of the disc loaded with coins is lower than that of a disc of the same capacity with coins in a single level or plane.

[0018] As in other systems, the device of the invention may have a classifier after one of the outlets for leading the coins to other devices of the machine such as moneyboxes, return devices, etc.

[0019] Driving of the disc may be carried out by means of motor, through a transmission system, e.g. of the "Geneva" type or of another type, ensuring in any case the correct positioning of the disc, causing the rotation thereof until achieving its positioning, then keeping it locked while the motor keeps rotating for a section of its travel referred to as "dead travel".

Thus, having the mouth of the chambers face the corresponding port at every moment is achieved, the disc then being held stopped until the input or output of coins is carried out. The transmission mechanisms of the type indicated have the advantage that the motor starts without load, providing a positioning of the disc that is precise and tolerant of inertias of the motor.

[0020] Next, the features of the device of the invention, as they are included in the claims, are set forth in greater detail with the aid of the attached drawings, in which a non-limiting embodiment is shown.

[0021] In the drawings:

Figure 1 is a front elevational view of a coin receiving mechanism including the coin accumulating device of the invention.

Figure 2 is a rear view of the same mechanism.

Figure 3 is a perspective view of the coin storage of the device of the invention including a drive mechanism thereof.

Figure 4 is a another perspective view of the storage with the coin guide.

Figure 5 is a sectional view of the storage perpendicular to its axis showing the arrangement of chambers located on one plane.

Figure 6 is a partial sectional view of one of the chambers of the storage according to sectional line VI-VI of figure 5.

Figure 7 is a perspective view similar to figure 4 from another angle.

Figure 8 is a view similar to figure 4 showing a possible way of carrying out the drive mechanism of the coin guide.

Figure 9 is a front elevational view of the storage with the coin guide facing one of the chambers on the left plane.

Figure 10 is an elevational view similar to figure 9 with the coin guide facing one of the chambers located on the right plane.

Figure 11 is a detailed perspective view of the guide elements of the coin guide.

Figure 12 shows a perspective view of a variant of execution of the drive mechanism of the storage.

Figure 13 shows a front elevational view of a detail of the drive mechanism of figure 12.

[0022] Figure 1 shows, in a simplified manner and in a front elevational view, a coin receiving mechanism of a traditional structure including a coin inlet 1, a sensing module 2 located in the trajectory or path on which the coins must travel and being intended for validating the inserted coins, and a selection blade 3 which will deflect the coins 4 towards a rejected coin outlet 5, in case the sensing module has detected the invalidity of the coin, or towards an accumulator including a coin storage 6, figure 2, located by the rear side of the mechanism.

[0023] As can be best seen in figures 4 to 8, the storage 6 is made up of a disc 7 of cylindrical shape having chambers 8 and 9 located on two planes perpendicular to the axis of the disc. As can be seen in figure 5, these chambers are sized so as to be capable of housing the greater sized coins acceptable by the selector and come out into the periphery of the disc, it being possible for this mouth to be oriented in a slightly oblique, non radial, direction such that the exit of the coins will take place in a slightly tangential direction, which will allow achieving a more compact system since the insertion of the coin in the disc 7 may be carried out from a lower height. Furthermore, the bottom of chambers 8 and 9 may have a flat and oblique section 8' with a slant with regard to the larger surfaces laterally delimiting said chambers. With this arrangement, the risk of bouncing of the coins that may enter the chambers at an excessive speed, and which could cause the mechanism to jam due to the recoil of the coins, is eliminated.

[0024] The mouth of chambers 8 and 9 is closed by a wall, consisting of a fixed portion 10, belonging to the receiving mechanism, and a movable portion 10', forming part of the coin guide, figure 2, which defines three ports which are referenced with numbers 11, 12 and 13, the first of them serving for the inlet of coins in chambers 8 or 9, the second referenced with number 13 as return outlet and the third referenced with number 12 as collection outlet. Return and collection outlets 12 and 13 may be provided with locks or gates, as will be set forth below.

[0025] A coin guide 14, which is in charge of directing the coins accepted as valid by the selector towards chambers 8 or 9 of one or the other plane, is arranged on port 11, through which the coins enter chambers 8 or 9. To this end, the coin guide 14 must be facing on one side the reception of coins from selection blade 3, while it must be facing on the outlet the mouth of chambers 8 or 9.

[0026] As shown in figures 4, 7 and 8, coin guide 14 may be made up of a chute 15 swinging on an axis perpendicular to the axis of disc 7, such that the outlet of said chute may move among a number of consecutive positions equal to that of planes on which chambers 8 and 9 of the disc are located.

[0027] In the depicted example, disc 7 includes only chambers 8 and 9 located on two planes perpendicular to the axis of said disc but it could have chambers located on a larger number of planes, depending on the storage capacity that is desired and on the possibilities of increasing the thickness of disc 7, for the application the coin selector is intended for.

[0028] Chute 15 may have a slanted bottom 16 which facilitates the coins rolling towards the inlet of chambers 8 and 9, and its walls 17 may diverge towards the mouth so as to facilitate the reception of the coins deflected by the selection blade 3 of the selector.

[0029] The coin guide 14, made up of chute 15 attached to an arm 18, defining portion 10' of the closing wall of chambers 8 and 9 and which is mounted on the accumulator by means of a hinge axis 19 which is perpendicular to the axis 20 of disc 7, this axis 19 functioning as a pivoting or swinging means of chute 15, is shown in figures 2 and 4.

[0030] As can be seen best in figure 3, two consecutive chambers 8 or 9, located on the same plane, are spaced from each other by an angle lower than that occupied by one of chambers 9 or 8 of adjacent planes. Furthermore, the mouth of each one of the chambers which are located on the same plane is equidistant from the mouth of the adjoining chambers located on adjacent planes.

[0031] With this structure, the mouth of chambers 8 and 9 located on different planes occupies axially and angularly spaced positions.

[0032] As can be seen in figure 7, the walls 17 of chute 15 constituting the coin guide may have pairs of facing holes 22 and 23, in the first of which an optical emitter 25 and an optical receiver 26 may be installed, while a prism 27 is arranged in holes 23. With this arrangement and properly placing holes 22 and 23, when a coin interrupts the beam emitted by emitter 25, this will indicate that the coin has completely entered the chute and thus the acceptance lock may be closed. Likewise, when the coin frees the beam, it may be considered that it has completely entered the storage 6, the disc 7 then being able to perform the necessary movements.

[0033] The coin guide 14 will be connected with a guide mechanism synchronized with the rotation of disc 7 so as to cause the shift or swing of said coin guide between positions facing the mouth of chambers 8 and 9 in one and the other plane in a controlled manner. In the embodiment shown in figures 3 to 7 and 9 to 11, this mechanism is made up of a channel 29 made on the periphery of disc 7, of an undulating trajectory, the undulations of the channel being such that they generate a transverse movement in the coin guide of an amplitude and direction coincident with the spacing and position of the mouth of consecutive chambers 8 and 9 located on different planes. Entering this channel there is a pivot 30 projecting from an arm 31 integral with chute 15 and which freely slides along the channel during the rotation of disc 7. With this arrangement, during the rotation of disc 7, chute 15 will swing on axis 19 between positions shown in figures 8 and 9 in which the outlet of the chute is facing the mouth of chambers 8 or 9, such that the coin received in the chute will pass to the corresponding chamber.

[0034] According to another embodiment shown in figure 8, channel 29 of undulating trajectory may be made on the periphery of a cylinder 33 in which pivot 30 projecting from arm 31 will enter. Evidently, the rotation of cylinder 33 will be synchronized with the rotation of disc 7. This mechanism allows a better control of the movement of the coin guide, being for example able to position it during the portion of the rotation of the cam 35 or pinion 43 not producing a rotation of the storage, thereby avoiding jamming due to the recoil of the coins.

[0035] As can be seen in figures 3 and 8, the drive mechanism of disc 7 may be of the "Geneva" type, consisting of a wheel 34, which makes up the "Geneva" mechanism, which is fixed in a coaxial position to the disc 7, and a cam 35 the shaft 36 of which is connected to a drive motor. Cam 35 includes a traction pivot 37 insertable in the slots 38 of the "Geneva" mechanism, and a locking surface 39 engageable on the concave-curved surfaces 40 of wheel 34 which are located between every two consecutive slots 38. With this mechanisms, a rotational movement is transmitted from the shaft 36 to disc 7 during a section of the travel of cam 35 by means of traction pivot 37, which enters the slots 38 of wheel 34. This wheel and disc 7 will remain locked during the remainder of the travel of the cam by means of the locking surface 39 which is engaged on the concave-curved sections 40 of wheel 34.

[0036] As an alternative to the described mechanism, an assembly of gearwheel 42, which may be integral to disc 7 in a coaxial position therewith, and a drive pinion 43, which meshes with wheel 42, all of which is shown in figures 12 and 13, may be used. As can be seen best in figure 13, pinion 43 includes two sectors, one of them referenced with number 44 lacking teeth, and another completing the periphery, which is toothed with a series of identical teeth 45 delimited between two end teeth 46, preferably of greater angular amplitude. On the other hand, wheel 42 has toothed sections 47, with teeth 48 identical to the teeth 45 of pinion 43, such that these sections 47 may be engageable with the set of teeth 45 of the pinion. Between every two sections 47 of teeth 48 there are two spaces 49 and 50 of amplitude coincident with the end teeth 46 of pinion 43, which in the example depicted in the drawings are of a greater amplitude than teeth 48, spaces which are separated by an intermediate tooth 51 identical to teeth 48. Furthermore, wheel 42 and pinion 43 have mutually engageable means consisting of a series of concave-curved surfaces 52 gearwheel 42 has on one of its surfaces and of a flap 53 projecting from the pinion. The concave-curved surfaces 52 are coincident with the spacing between every two consecutive toothed sections 47 of teeth 48 of the wheel. The flap 53 is perpendicular to the axis of pinion 43 and is provided with a section 54 of convex-curved surface on the free edge, the convex-curved free edge of the flap and the concave-curved surfaces 52 being of complementary curvature, with angular amplitude and radii approximately the same.

[0037] With this mechanism an effect similar to the effect of the "Geneva" type mechanism is achieved, as the rotation of wheel 42 and thus of disc 7 will take place during the meshing of the teeth 45 of pinion 43 with the teeth 48 of the sections 47 of wheel 42, whereas during the engagement of flap 53 in the concave-curved surfaces 52 of wheel 42, which will coincide with the section 44 lacking teeth of pinion 43 facing the wheel, said wheel will be locked. Although the rotational and blocking effect is similar to that achieved with the "Geneva" type mechanism, the proposed mechanism has the following advantages:

- The useful traction angle of the wheel may be defined in a wide range.
- A movement with a constant speed ratio is achieved.
- Friction is considerably reduced.

[0038] All this translates into a more efficient operation of the accumulator and a reduction of the electricity consumption, which improves the features and the scope of application of the device.

[0039] Ports 12 and 13, figure 2, will have such a width that allows the coins of chambers 8 and 9 located in different planes to exit. These ports may be closed by locks which are moved away in order to allow a certain coin to pass into the corresponding collection or return channel.

[0040] If the receiving mechanism with the accumulator of the invention incorporates both locks at the collection outlet 12 and return outlet 13 and if it is applied e.g. to a telephone, during a call, the coin to be collected may be selected. To this end, disc 7 is positioned such that the coin to be collected remains on top of the collection lock, and the trapdoor is opened, allowing the coin to come out by gravity through this collection outlet. At the end of the call, any coin of the storage may be collected or returned by positioning disc 7 in the appropriate position and actuating the corresponding lock, thereby achieving a tight collection system.

[0041] A sequential collection system may also be provided, for which the locks are removed from the return and collection openings 12 and 13, such that coin storage 6 is closed at its periphery by closing surfaces 10 and 10' and both the collection and the return outlets are unobstructed. With this arrangement, there is no possibility of selecting the coin to be collected, as the coins have to be collected in the same order in which they have been inserted. During the call, once the disc 6 is full, each advance in position thereof entails the collection of the corresponding coin, following the order of insertion. At the end of the call, the disc keeps advancing in the same direction collecting coins, following the insertion order, until the requested amount is reached. Then the disc rotates in the reverse direction so as to return the rest of the coins which remain in the storage, releasing them through return opening 12.

[0042] A tight collection system may also be provided at the end of the call. To this end, the return lock is removed from port 12 such that the chambers are closed at their periphery by the closing surfaces and the collection lock located on port 13, the return outlet 12 being left unobstructed. During the call, a sequential collection is carried out. That is, once the disc 7 of the accumulator 6 is full, collection of the coins is carried out following the order of insertion thereof. With the disc full, each advance in position thereof entails the positioning of the coin on top of the collection lock and the actuation of the latter, which entails the collection of the corresponding coin. At the end of the call, any coin of the storage may be collected or returned. Disc 7 advances positions, and if the collection lock located at port 13 is activated, the coin which is on top of the trapdoor falls through this outlet, whereas if it remains closed, at the following advance of disc 7, the coin falls through the return outlet 12.

[0043] All in all, with the accumulating device of the invention, a means with a large number of storage chambers 8 and 9, located on at least two different planes perpendicular to the axis 20 of the disc, may be provided, and all that with a reduced volume which makes the device particularly applicable in those devices in which there is not a great deal of volume available for the installation of these components.

Claims

1. A coin accumulating device, comprising a coin storage (6) and a drive mechanism, the storage of which is made up of a disc (7) rotatable about its axis, internally having a series of independent chambers (8-9) receiving coins (4) which are perpendicular to the axis of the disc and come out into the periphery thereof, said disc being surrounded by a surface (10-10') closing the mouth of the chambers and having ports (11-12-13) to which an identical number of mouths of the chambers is selectively faceable, for defining coin inlet and outlet positions, **characterized in that** said chambers are located on at least two planes perpendicular to the axis of said disc, and the consecutive chambers of two adjacent planes are angularly offset from each another; and **in that** a movable coin guide (14) leading the introduced coins towards the mouth of the chambers of one or the other plane is arranged in the coin inlet position.
2. A device according to claim 1, **characterized in that** the coin guide (14) consists of a chute (15) through which the coins are led towards the mouth of chambers (8-9), the chute of which may be transversally shifted between a number of consecutive positions equal to that of planes on which the chambers of the disc are located, the outlet of the chute facing the mouth of one of the chambers located on one of said planes in each one of these positions.
3. A device according to claim 2, **characterized in that** said chute is swingable on an axis (19) perpendicular to the axis (20) of the disc (7).
4. A device according to claim 1, **characterized in that** the mouth of the chambers located on the same plane is equidistant from the mouth of the adjacent chambers located on the adjacent planes.
5. A device according to claims 1 and 4, **characterized in that** the consecutive chambers of a same plane are separated from one another by an angle smaller than that occupied by each one of the chambers of the adjacent plane or planes.
6. A device according to claim 1, **characterized in that** the mouth of the chambers runs in a slightly oblique, non radial, direction, and the bottom of said chambers has a flat, transversally slanted, section against which the coins (4) strike upon entering the chambers.
7. A device according to claim 2, **characterized in that** the walls (17) of the chute (15) have facing holes (22-23) through which a light beam is made to pass which is intercepted when a coin completely enters said chute and is released when said coin goes into one of the chambers of the disc.
8. A device according to claims 1 and 2, **characterized in that** the coin guide (14) is connected to a guide mechanism synchronized with the rotation of the disc (7), controllably causing the shifting or swinging of said coin guide between positions facing the mouth of the chambers located on the different planes.
9. A device according to claim 8, **characterized in that** the chambers are located on two different planes and the guide mechanism is made up of a channel (29) of undulating trajectory formed on the periphery of a rotatable cylindrical body, synchronized in its rotation with the disc, and by a pivot (30) projecting from the coin guide (14) and entering the channel with the ability to slide therealong; the undulations of which generate an alternating transverse movement of the coin guide of an amplitude and direction coinciding with the axial separation and position of the mouth of the consecutive chambers located on different planes.

10. A device according to claim 9, **characterized in that** the cylindrical body is made up of the disc (7), on the periphery of which the channel is made.
- 5 11. A device according to claim 9, **characterized in that** the cylindrical body (33) on which the channel has been made is independent of the disc (7) and is synchronized with the movement the latter.
12. A device according to claim 1, **characterized in that** the drive mechanism of the disc is of the "Geneva" type, the wheel (34) of which is locked together to one of the flat surfaces of the disc (7) in a coaxial position therewith.
- 10 13. A device according to claim 1, **characterized in that** the drive mechanism of the disc consists of a gearwheel (42) locked together to the disc (7) in a coaxial position, with which a drive pinion (43) meshes; the pinion of which has two sectors, one (44) lacking teeth and the other one (45) toothed, and the wheel (42) of which includes toothed sections (47) meshable with the set of teeth (45) of the toothed sector of the pinion, the gearwheel (42) and pinion (43) having mutually engageable means which lock the rotation of the wheel while the teeth of the toothed section 15 (45) of the pinion do not mesh with one of the toothed sections (47) of the wheel.
14. A device according to claim 13, **characterized in that** the toothed sector (45) of the pinion (43) consists of a series of identical teeth and two ends (46) of greater pitch, and the wheel (42) of which includes toothed sections (47) meshable with the set of identical teeth of the toothed sector (45) of the pinion, between the sections of which two 20 spaces (49-50) of amplitude coincident with that of the larger end teeth (46) of the pinion (43) are inserted, separated by an intermediate tooth (51).
15. A device according to claim 13, **characterized in that** the means locking the rotation of the wheel consist of a flap (53) projecting from the pinion (43), perpendicular to the axis of the pinion and ended in a convex-curved surface (54) and in a series of equal and equidistant concave-curved surfaces (52), in a number equal to that of toothed 25 sectors of the wheel, which project in an axial direction from one of the flat surfaces of the wheel and are annularly distributed, with the concavity directed outwardly; the convex-curved surface (54) of the flap and the concave-curved surfaces (52) of the wheel being surfaces of revolution complementary to each another, of axes parallel to the axes of the wheel and pinion and of approximately equal angular radius and amplitude.
- 30 16. A device according to claim 15, **characterized in that** said concave surfaces (52) and the convex-curved layout (54) of the flap of the pinion are of cylindrical configuration.

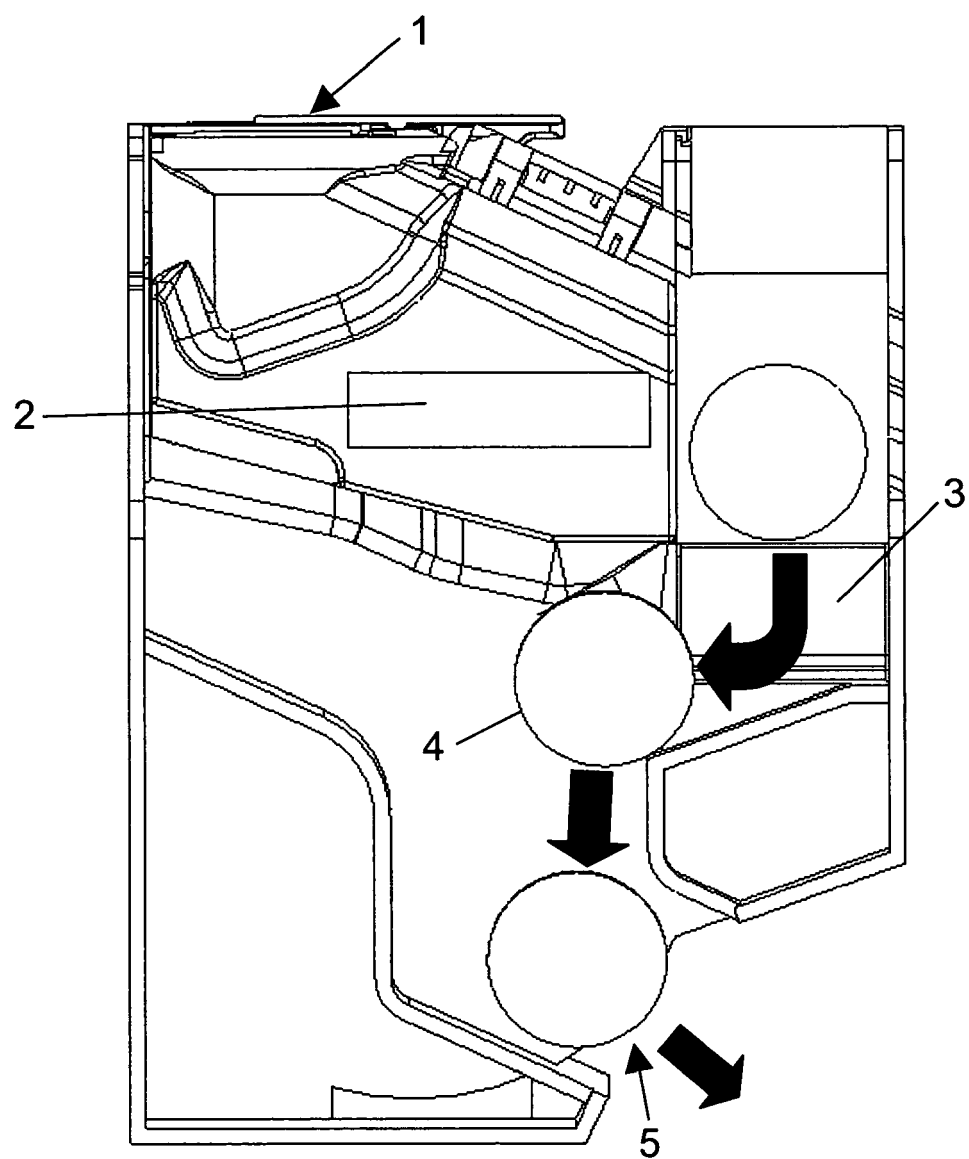


FIG. 1

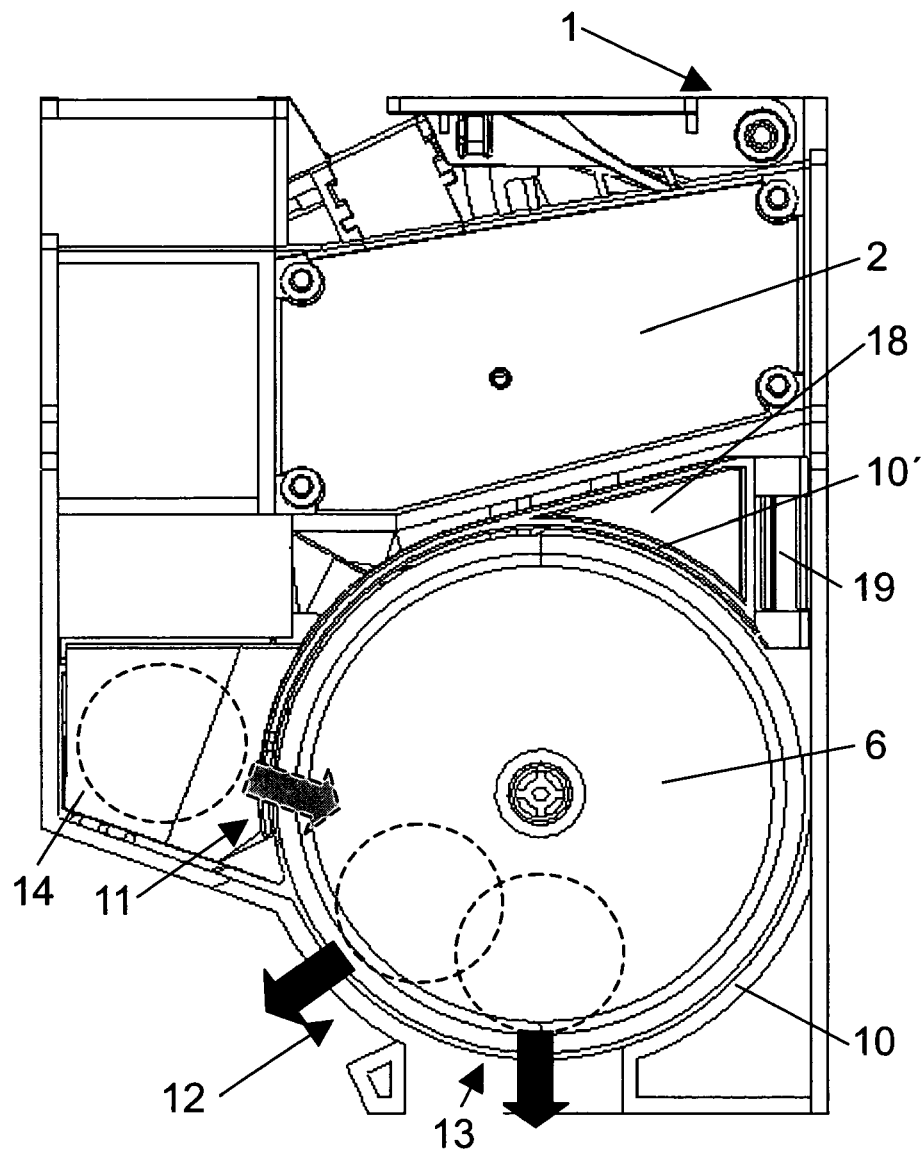


FIG. 2

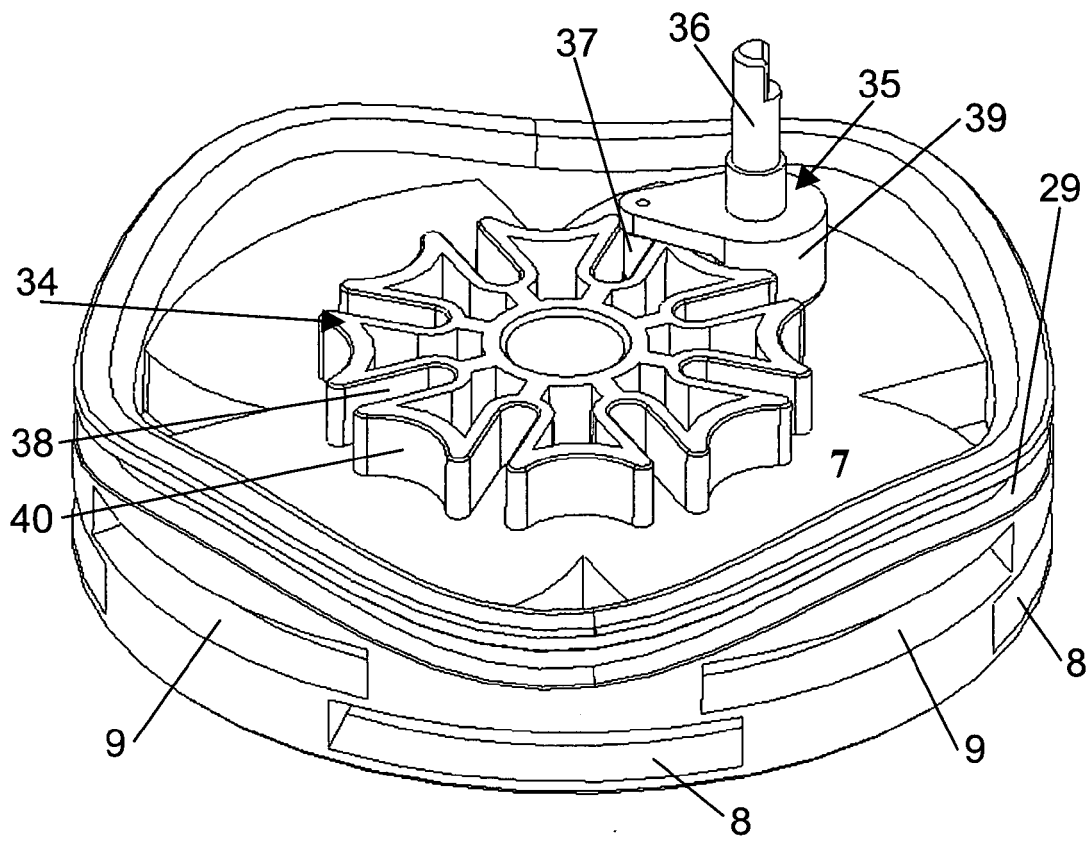


FIG. 3

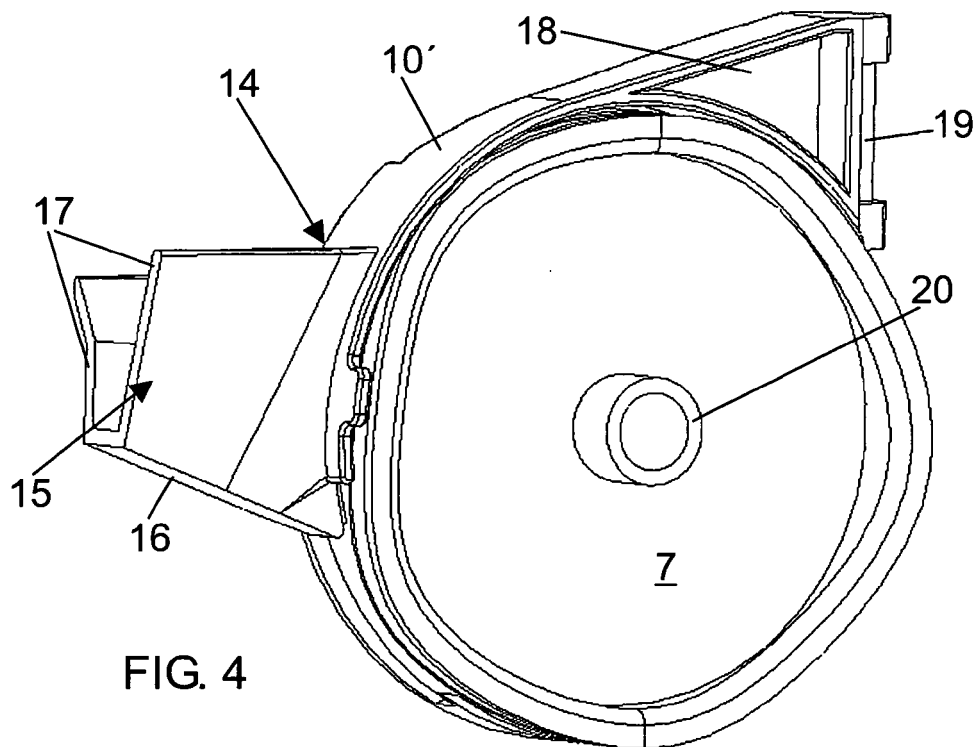


FIG. 4

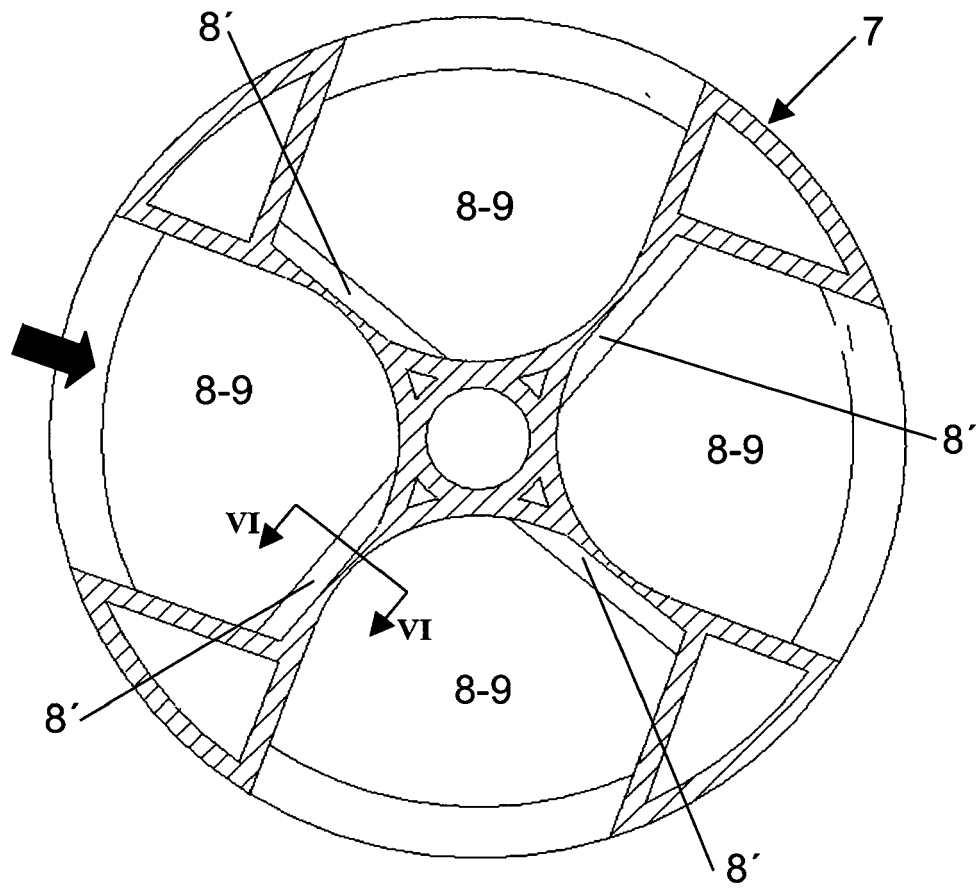


FIG. 5

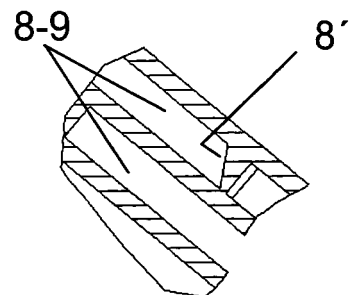
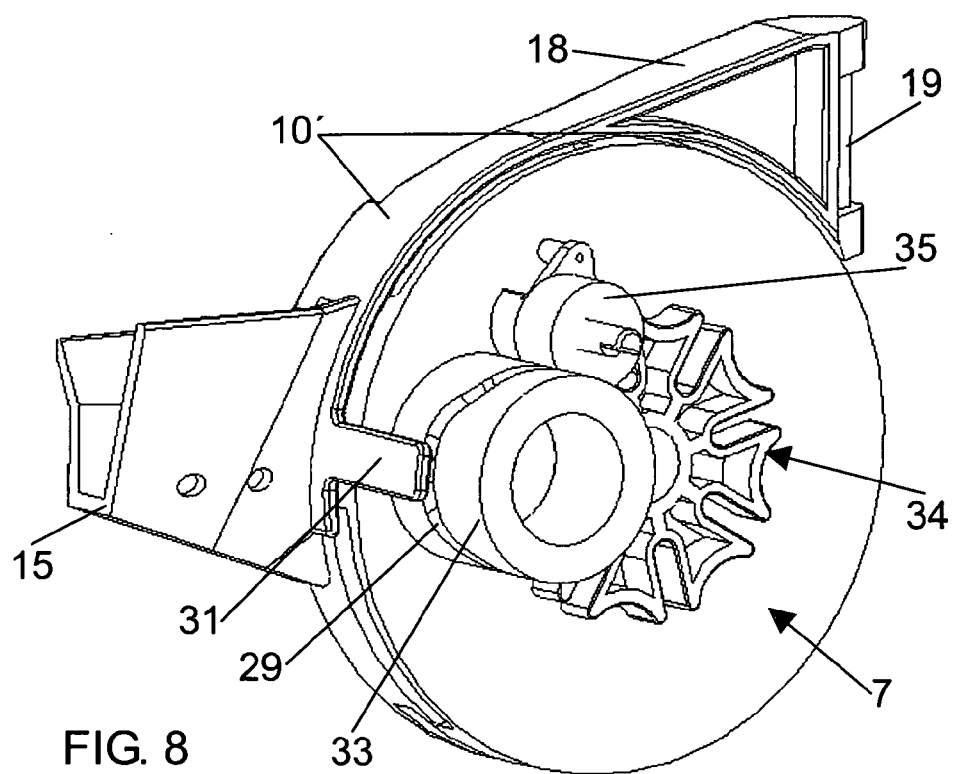
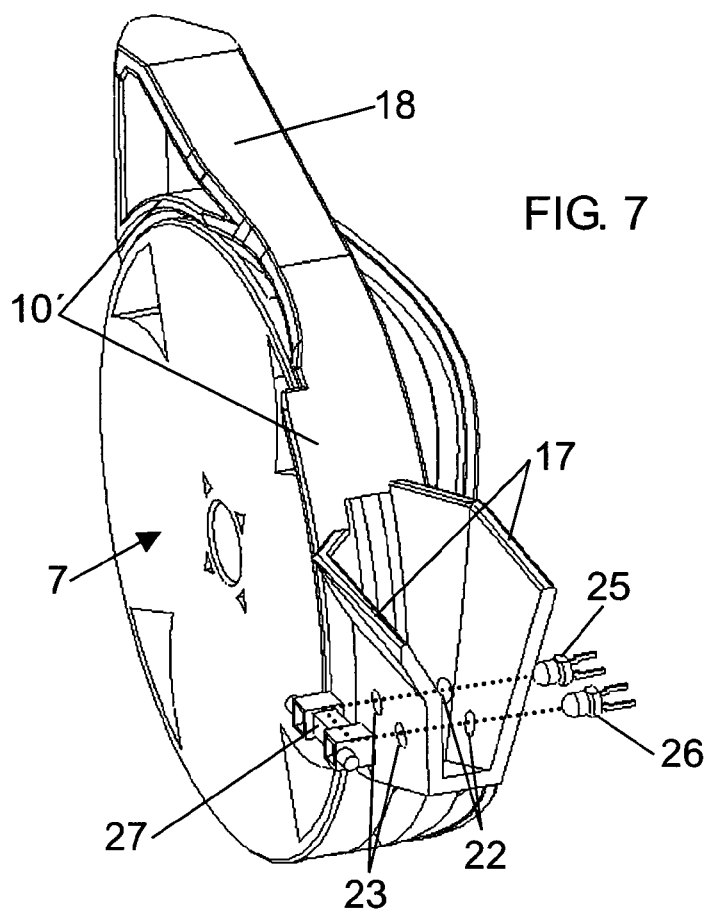
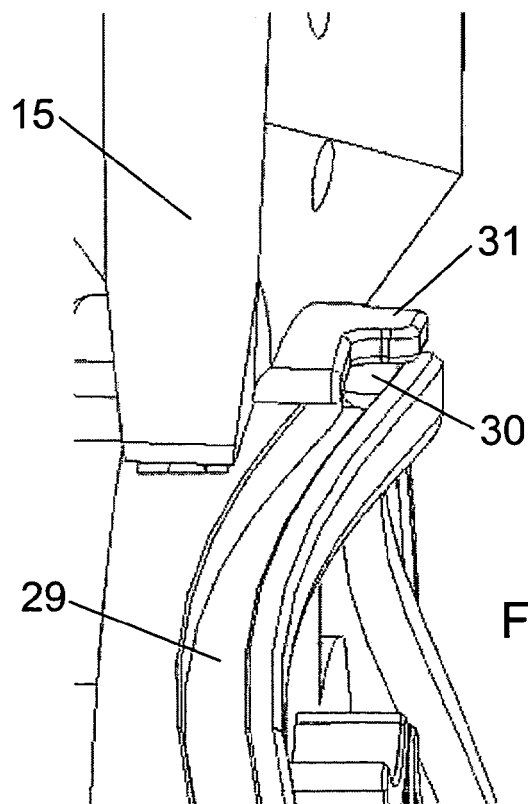
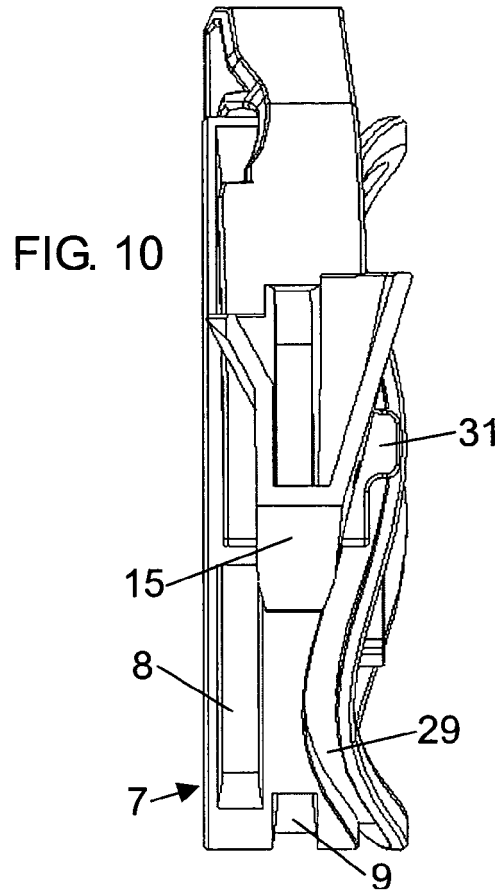
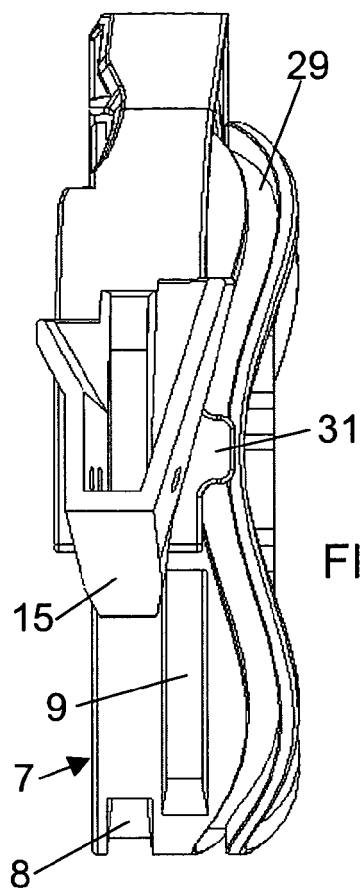


FIG. 6





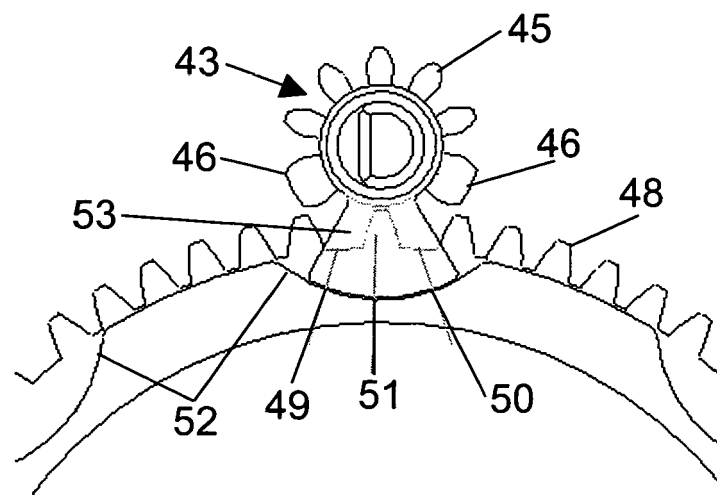
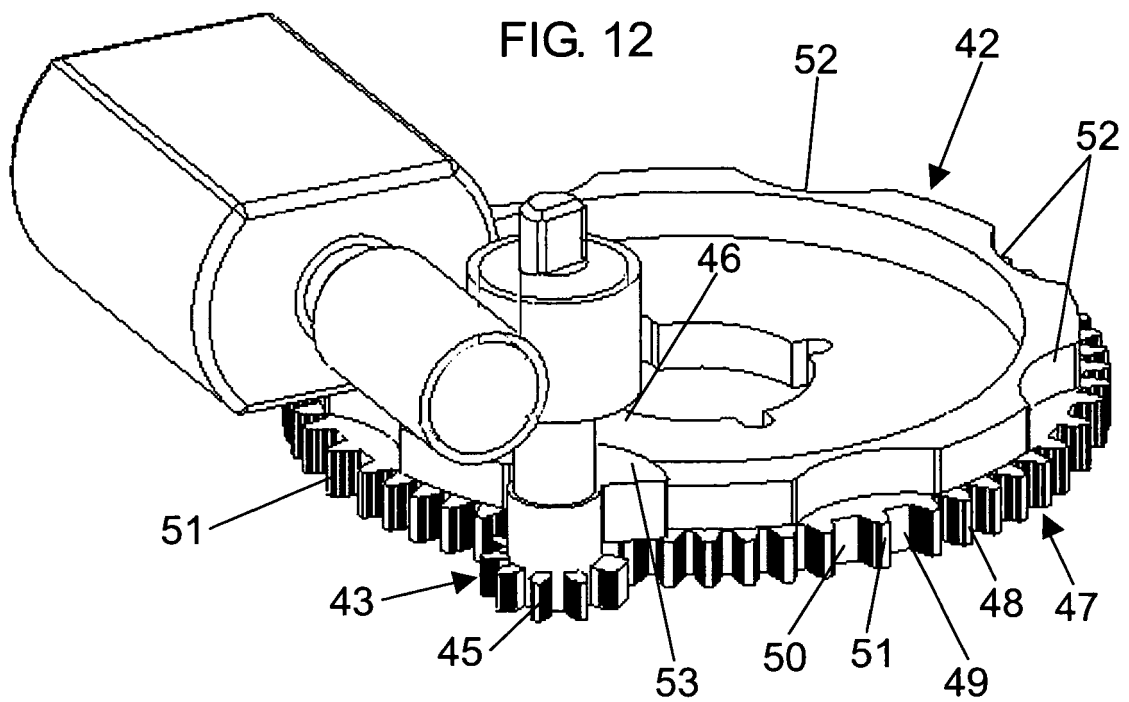


FIG. 13

REFERENCES CITED IN THE DESCRIPTION

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