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(54) Title: RETROFIT AUTOMATIC TOILET FLUSH APPARATUS

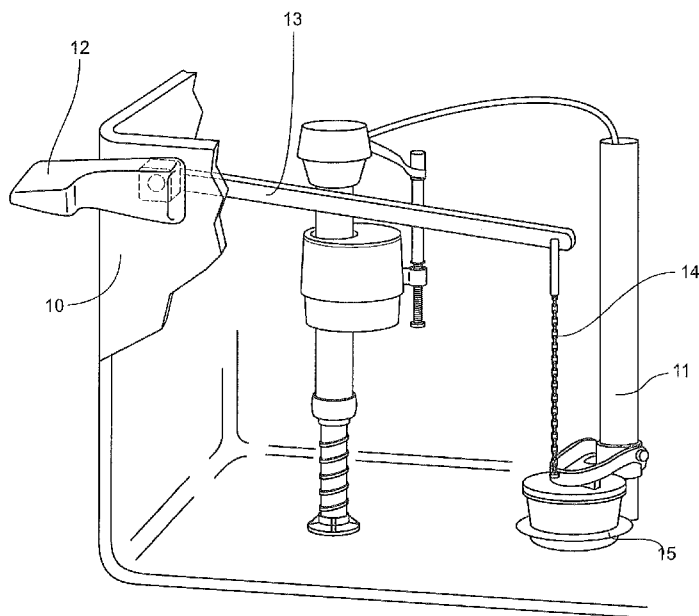


Fig. 1
Prior Art

(57) Abstract: An automatic flush apparatus for converting a manual flush toilet to an automatic flush toilet, and including a sensor for being mounted on an exterior wall of a tank of the toilet for detecting a condition predetermined to initiate a flush operation of the toilet. A signal transmitter conveys a signal indicating the occurrence of the condition, and a motor is provided for being positioned in the tank for receiving an electric current indicative of the condition from the signal transmitter. A flush valve is positioned proximate a bottom wall of the tank and is operatively connected to the motor for being opened by the motor upon receipt by the motor of the electric current.



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RETROFIT AUTOMATIC TOILET FLUSH APPARATUS

TECHNICAL FIELD AND BACKGROUND OF THE INVENTION

[0001] Manually-actuated flush toilets have been in use for over a century for sanitary disposal of human waste. Manually-actuated flush toilets typically include a manual flushing handle, such as a lever or lift handle, on the toilet tank that the user must employ after use of the toilet to actuate the flushing mechanism. As a result of the current increase in health awareness, it is becoming more customary for users to avoid touching the manual flush handle and instead to attempt either to actuate the flush mechanism by kicking the handle with the foot, sometimes breaking the handle or the flush mechanism in the tank to which the handle is attached, or to fail to employ the manual flushing mechanism at all. Breakage causes unsanitary conditions or unavailability of the toilet for use until the damaged parts can be replaced.

[0002] Automatic flushing toilets for new or replacement installation have been developed and are well known. However, many manual flush toilets remain in both homes and businesses and will remain so indefinitely due to the expense of replacement.

SUMMARY OF THE INVENTION

[0003] Accordingly, it is an object of the invention to provide an automatic flushing apparatus for retrofitting manual flushing toilets that overcomes the disadvantages of prior art manual-flushing and automatic toilets, while further reducing maintenance costs, increasing sanitation, and making use of the tank and bowl of existing toilets to reduce the cost of purchasing a new fixture.

These and other objects and advantages of the invention are achieved by providing an automatic flush apparatus for converting a manual flush toilet to an automatic flush toilet. The apparatus includes a sensor for being mounted on an exterior wall of a tank of the toilet for detecting a condition predetermined to initiate a flush operation of the toilet, a signal transmitter for conveying a signal indicating the occurrence of the condition, a motor for being positioned in the tank for receiving an electric current indicative of the condition from the signal transmitter, and a flush valve for being positioned proximate a bottom wall of the tank and operatively connected to the motor for being opened by the motor upon receipt by the motor of the electric current.

According to one embodiment of the invention, the sensor is adapted to communicate with the motor through a manual flush handle hole in the tank.

According to another embodiment of the invention, the sensor comprises a motion sensor.

According to another embodiment of the invention, the sensor and the motor are powered by at least one electric battery contained in the sensor.

According to another embodiment of the invention, a gear train is driven by the motor and a connector connects the gear train and the flush valve for opening the flush valve upon receipt by the motor of the electric current from the sensor.

According to another embodiment of the invention, the gear train includes an eccentrically-mounted rotatable lever to which the connector is connected for being reciprocated between a first position wherein the flush valve is in a closed position and a second position wherein the flush valve is moved to an open position to permitting the toilet to flush.

According to another embodiment of the invention, the connector comprises a chain and the lever includes an arcuate outer surface around which the chain is retracted as the flush valve is moved to the open position.

According to another embodiment of the invention, the connector is pivotally attached to the gear train at a point on a gear displaced from the center of the gear. As the gear rotates, the gear connector combination moves from a first position wherein the flush valve is closed, to a second position wherein the flush valve is open permitting the toilet to flush, and back to the first position.

According to another embodiment of the invention, the connector comprises a rod portion pivotally attached to the gear and a chain portion attached to the flush valve.

According to another embodiment of the invention, the sensor includes a motion sensor adapted to communicate with the motor through a manual flush handle hole in the tank. The sensor and the motor are powered by at least one electric battery contained in the sensor, and a gear train is provided for being driven by the motor. A connector is provided for connecting the gear train and the flush valve for opening the flush valve upon receipt by the motor of the electric current from the sensor. The gear train includes an eccentrically-mounted rotatable lever to which the connector is connected for being reciprocated between a first position wherein the flush valve is in a closed position and a second position wherein the flush valve is moved to an open position to permitting the toilet to flush.

According to another embodiment of the invention, the connector includes a chain, and the lever includes an arcuate outer surface around which the chain is retracted as the flush valve is moved to the open position.

According to another embodiment of the invention, an automatic flush toilet is provided that includes a toilet bowl, a toilet seat, and a water tank positioned on the bowl

for flushing water contained in the tank into the toilet bowl. A sensor is mounted on an exterior wall of a tank of the toilet for detecting a condition predetermined to initiate a flush operation of the toilet, and a signal transmitter is provided for conveying a signal indicating the occurrence of the condition. A motor is positioned in the tank for receiving an electric current indicative of the condition from the signal transmitter, and a flush valve is positioned proximate a bottom wall of the tank and operatively connected to the motor for being opened by the motor upon receipt by the motor of the electric current.

According to another embodiment of the invention, the gear train includes an eccentrically-mounted rotatable lever to which a chain is connected for being reciprocated between a first position wherein the flush valve is in a closed position and a second position wherein the flush valve is moved to an open position to permitting the toilet to flush.

According to another embodiment of the invention, an automatic flush toilet is provided, and includes a toilet bowl, a toilet seat, and a water tank positioned on the bowl for flushing water contained in the tank into the toilet bowl. A motion sensor is provided for detecting a condition predetermined to initiate a flush operation of the toilet, the optical sensor being mounted on an exterior wall of a tank of the toilet and communicating with the interior of the tank through a manual flush handle hole in the tank, and a signal transmitter is provided for conveying a signal indicating the occurrence of the condition. A motor is positioned in the tank for receiving an electric current indicative of the condition from the signal transmitter, and a gear train is driven by the motor. A chain connects the gear train and a flush valve on the bottom of the tank for opening the flush valve upon receipt by the motor of the electric current from the sensor. The gear train includes an eccentrically-mounted rotatable lever to which the chain is connected for being reciprocated between a

first position wherein the flush valve is in a closed position and a second position wherein the flush valve is moved to an open position to permitting the toilet to flush.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Features, aspects, and advantages of a preferred embodiment of an automatic flushing kit are better understood when the following detailed description is read with reference to the accompanying drawing, in which:

[0005] FIG. 1 is a partial cutaway view of a tank and prior art flush mechanism of a conventional manual flush toilet;

[0006] FIG. 2 is a perspective view, with a fragmentary enlarged view, of a toilet that has been retrofitted with an automatic flush apparatus according to a preferred embodiment of the invention;

[0007] FIG. 3 is a partial cutaway view of a tank of a conventional toilet tank that has been retrofitted with an automatic flush apparatus, with the flapper in the closed position;

[0008] FIG. 4 is a partial cutaway view of the tank and automatic flushing apparatus of FIG. 3 showing the flapper in the open position;

[0009] FIG. 5 is a partial cutaway view of a tank of a conventional toilet tank that has been retrofitted with an automatic flush apparatus according to an alternate embodiment, with the flapper in the closed position;

[0010] FIG. 6 is a partial cutaway view of the tank and automatic flushing apparatus of FIG. 5 showing the flapper in the open position; and

[0011] FIG. 7 is a perspective view of the automatic flush apparatus according FIGS. 3 and 4 that shows how the flush apparatus is installed over an existing overflow tube.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] A preferred embodiment of an automatic flushing apparatus will now be described more fully hereinafter with reference to the accompanying drawings. It is envisioned that the automatic flushing apparatus may be embodied in many different forms and should not be construed as limited to the representative embodiment set forth herein. The exemplary embodiment is provided so that this disclosure will be both thorough and complete, and will fully convey the scope of the invention and enable one of ordinary skill in the art to make, use, and practice the invention.

[0013] Referring to Fig. 1, a tank 10 of a conventional manual flush toilet "T" is shown. The toilet "T" includes a tank (10), a bowl (11), a chain (14), a flush valve and flapper (15), and an overflow tube (16). The toilet "T" is flushed by manually depressing handle (12) and attached lever (13) to raise the flapper 15 and allow water in the tank 10 to flow out of the bottom of the tank 10 into the bowl 11. The handle (12) is typically located on the left portion of the front of the tank 10, as shown in Figure 1, though it may also be located on the right or center portions of the tank as well as the left or right sides of the tank or on the lid.

[0014] Referring now to Figure 2, 3, 4, & 7, the toilet "T" is retrofitted into an automatic flush toilet by replacing the flush handle 12 with a motion detector 20. The motion detector 20 is mounted on the outside of the tank 10 over the hole through which the handle 12 previously extended. The motion detector 20 includes optical sensors 21 that detect motion within its field of view. The motion detector is powered by one or more batteries 29, for example AA batteries, that deliver a signal current along wiring 22 to a gear train 23 driven by a motor 28.

[0015] For example, as shown in Fig. 5, the gear train (23) is mounted to a tube (25) that is positioned over the overflow tube (16). The tube (25) is open at the top to ensure that the overflow tube (16) functions properly.

[0016] In operation, the motion detector (21) detects motion at a predetermined level to indicate movement and transmits an output signal to the motor 28 to operate the gear train (23). The gear train includes a lever (24) eccentrically-mounted such that rotation of the lever 24 by the gear train lifts the flush valve chain (14) to lift the flush valve flapper (15) in the same manner as a manual toilet, releasing water from the tank (10) into the bowl (11). The operation of the lever 24 is shown by comparing the views of Figures 3 and 4.

[0017] While the invention has been described with reference to a motion detector, other means of determining when to flush the toilet may be utilized, such as a timer that flushes the toilet at predetermined intervals, a heat sensor that determine proximity of an individual to the toilet, a light detector that detects a predetermined variation in light intensity, or a noise detector that detects noise in the vicinity of the toilet.

[0018] While an automatic flushing apparatus has been described with reference to a preferred embodiment, it is envisioned that various details may be modified by those skilled in the art without departing from the spirit and scope of the invention.

Referring now to Figs. 5 & 6, the toilet "T" is retrofitted into an automatic flush toilet as in Figs 2-4 that utilizes a pivot connection 29 of the connector 27 to the flush valve 15. This pivot connection 29 is attached to the gear train 23 at a point on a gear 26 displaced from the center of the gear 26. As the connector 27 rotates from a first position wherein the flush valve 15 is closed, as in Fig. 5, to a second position wherein the flush valve 15 is opened, as in Fig. 6, the toilet is flushed. The connector 27 of Figs 5 & 6 includes a rod portion and a

chain portion, the rod portion being that portion pivotally attached 29 to the gear 26 and the chain portion being that portion attached to the flush valve 15.

I Claim:

1. An automatic flush apparatus for converting a manual flush toilet to an automatic flush toilet, and comprising a sensor for being mounted on an exterior wall of a tank of the toilet for detecting a condition predetermined to initiate a flush operation of the toilet, a signal transmitter for conveying a signal indicating the occurrence of the condition; a motor for being positioned in the tank for receiving an electric current indicative of the condition from the signal transmitter; and a flush valve for being positioned proximate a bottom wall of the tank and operatively connected to the motor for being opened by the motor upon receipt by the motor of the electric current.

2. The automatic flush apparatus according to Claim 1, wherein the sensor is adapted to communicate with the motor through a manual flush handle hole in the tank.

3. The automatic flush apparatus according to Claim 1, wherein the sensor comprises a motion sensor.

4. The automatic flush apparatus according to Claim 1, wherein the sensor and the motor are powered by at least one electric battery contained in the sensor.

5. The automatic flush apparatus according to Claim 1, and including a gear train driven by the motor and a connector connecting the gear train and the flush valve for opening the flush valve upon receipt by the motor of the electric current from the sensor.
6. The automatic flush apparatus according to Claim 5, wherein the gear train includes an eccentrically-mounted rotatable lever to which the connector is connected for being reciprocated between a first position wherein the flush valve is in a closed position and a second position wherein the flush valve is moved to an open position to permitting the toilet to flush.
7. The automatic flush apparatus according to Claim 6, wherein the connector comprises a chain and the lever includes an arcuate outer surface around which the chain is retracted as the flush valve is moved to the open position.
8. The automatic flush apparatus according to Claim 5, wherein the connector is pivotally attached to the gear train at a point on a gear displaced from the center of the gear and wherein the connector moves from a first position wherein the flush valve is closed, to a second position wherein the flush valve opened to permit the toilet to flush, and back to the first position.

9. The automatic flush apparatus according to Claim 8 wherein the connector comprises a rod portion pivotally attached to the gear and a chain portion attached to the flush valve.
10. The automatic flush apparatus according to Claim 1, wherein the sensor comprises a motion sensor adapted to communicate with the motor through a manual flush handle hole in the tank, the sensor and the motor are powered by at least one electric battery contained in the sensor, a gear train is provided for being driven by the motor and a connector is provided for connecting the gear train and the flush valve for opening the flush valve upon receipt by the motor of the electric current from the sensor, the gear train including an eccentrically-mounted rotatable lever to which the connector is connected for being reciprocated between a first position wherein the flush valve is in a closed position and a second position wherein the flush valve is moved to an open position to permitting the toilet to flush.
11. The automatic flush apparatus according to Claim 10, wherein the connector comprises a chain and the lever includes an arcuate outer surface around which the chain is retracted as the flush valve is moved to the open position.

12. An automatic flush toilet, comprising:
- (a) a toilet bowl, a toilet seat, and a water tank positioned on the bowl for flushing water contained in the tank into the toilet bowl;
 - (b) a sensor mounted on an exterior wall of a tank of the toilet for detecting a condition predetermined to initiate a flush operation of the toilet,
 - (c) a signal transmitter for conveying a signal indicating the occurrence of the condition;
 - (d) a motor positioned in the tank for receiving an electric current indicative of the condition from the signal transmitter; and
 - (e) a flush valve positioned proximate a bottom wall of the tank and operatively connected to the motor for being opened by the motor upon receipt by the motor of the electric current.
13. An automatic flush toilet according to claim 12, wherein the sensor is adapted to communicate with the motor through a manual flush handle hole in the tank.
14. The automatic flush toilet according to Claim 12, wherein the sensor comprises a motion sensor.
15. The automatic flush toilet according to Claim 12, wherein the sensor and the motor are powered by at least one electric battery contained in the sensor.

16. The automatic flush toilet according to Claim 12, and including a gear train driven by the motor and a connector connecting the gear train and the flush valve for opening the flush valve upon receipt by the motor of the electric current from the sensor.

17. The automatic flush toilet according to Claim 16, wherein the gear train includes an eccentrically-mounted rotatable lever to which the connector is connected for being reciprocated between a first position wherein the flush valve is in a closed position and a second position wherein the flush valve is moved to an open position to permitting the toilet to flush.

18. The automatic flush apparatus according to Claim 17, wherein the connector comprises a chain and the lever includes an arcuate outer surface around which the chain is retracted as the flush valve is moved to the open position.

19. The automatic flush toilet according to Claim 16, wherein the connector is pivotally attached to the gear train at a point on a gear displaced from the center of the gear and wherein the connector moves from a first position wherein the flush valve is closed, to a

second position wherein the flush valve is opened to permit the toilet to flush, and back to the first position.

20. The automatic flush apparatus according to Claim 19 wherein the connector comprises a rod portion pivotally attached to the gear and a chain portion attached to the flush valve.

21. An automatic flush toilet, comprising:

- (a) a toilet bowl, a toilet seat, and a water tank positioned on the bowl for flushing water contained in the tank into the toilet bowl;
- (b) a motion sensor for detecting a condition predetermined to initiate a flush operation of the toilet, the optical sensor being mounted on an exterior wall of a tank of the toilet and communicating with the interior of the tank through a manual flush handle hole in the tank;
- (c) a signal transmitter for conveying a signal indicating the occurrence of the condition;
- (d) a motor positioned in the tank for receiving an electric current indicative of the condition from the signal transmitter; and
- (e) a gear train driven by the motor and a connector connecting the gear train and a flush valve on the bottom of the tank for opening the flush valve upon receipt by the motor of the electric current from the sensor, the connector including a pivotal attachment to the gear train at a point on a gear displaced from the center of the gear and wherein the

connector moves from a first position wherein the flush valve is closed, to a second position wherein the flush valve is opened to permit the toilet to flush, and back to the first position.

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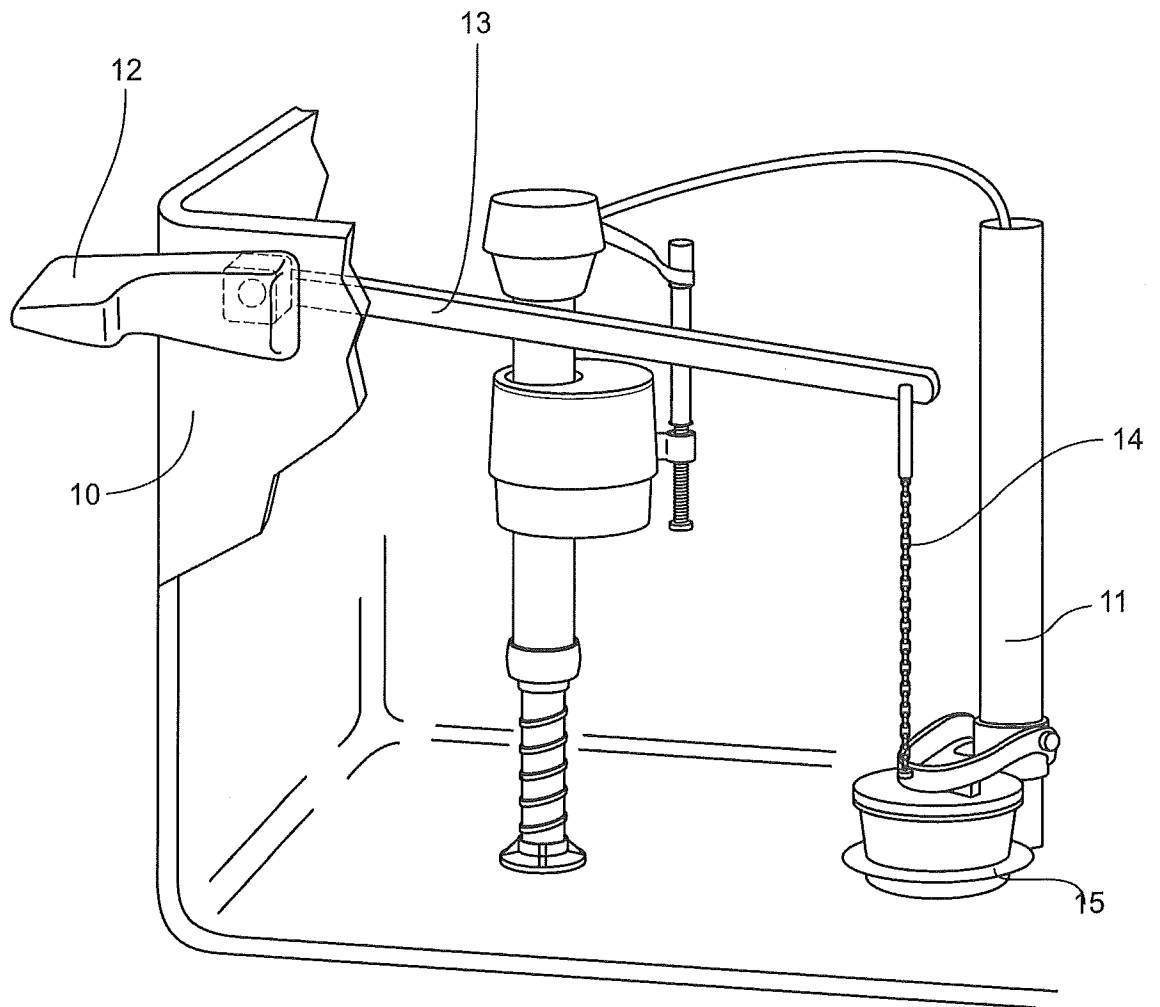


Fig. 1
Prior Art

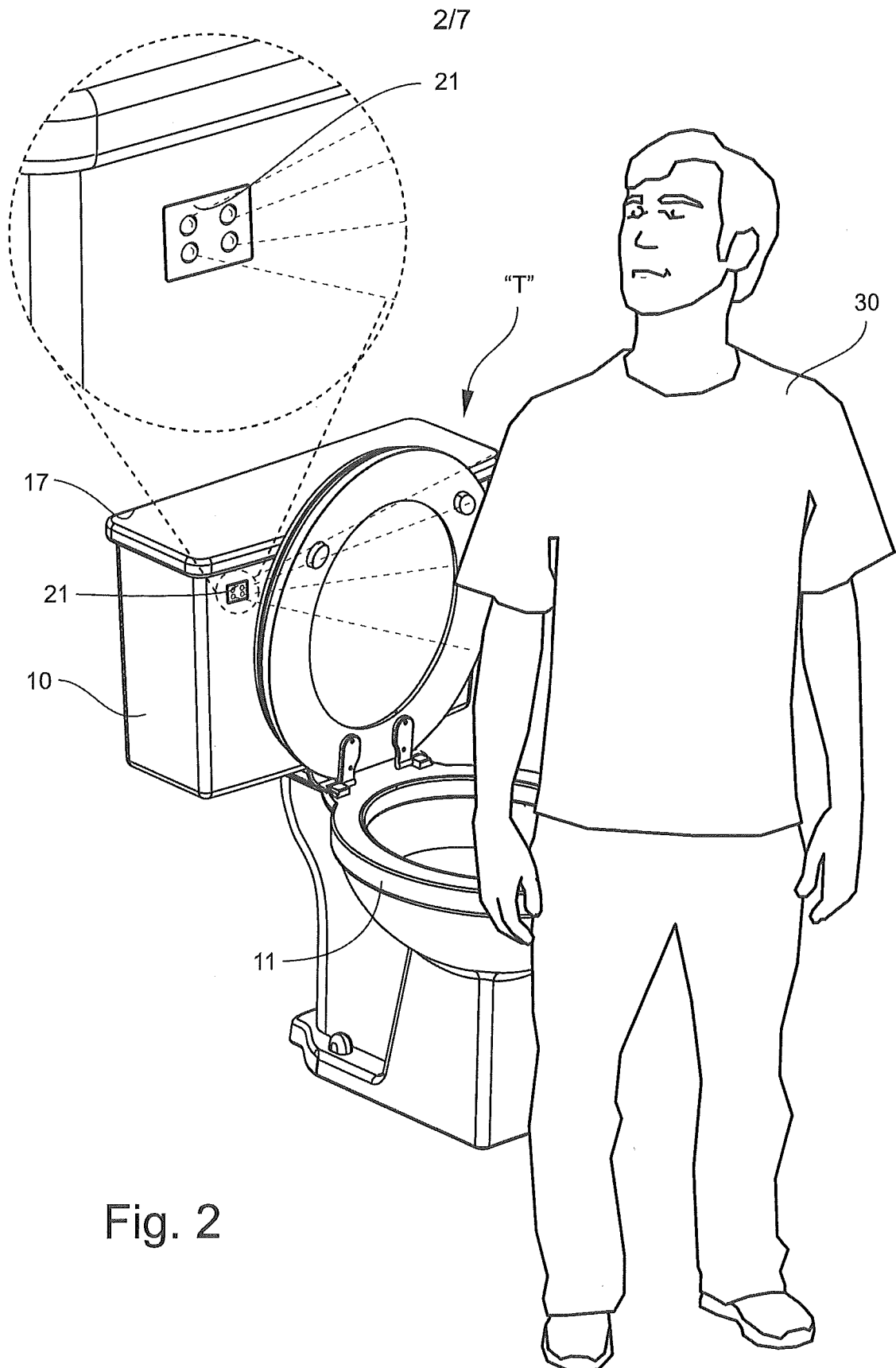


Fig. 2

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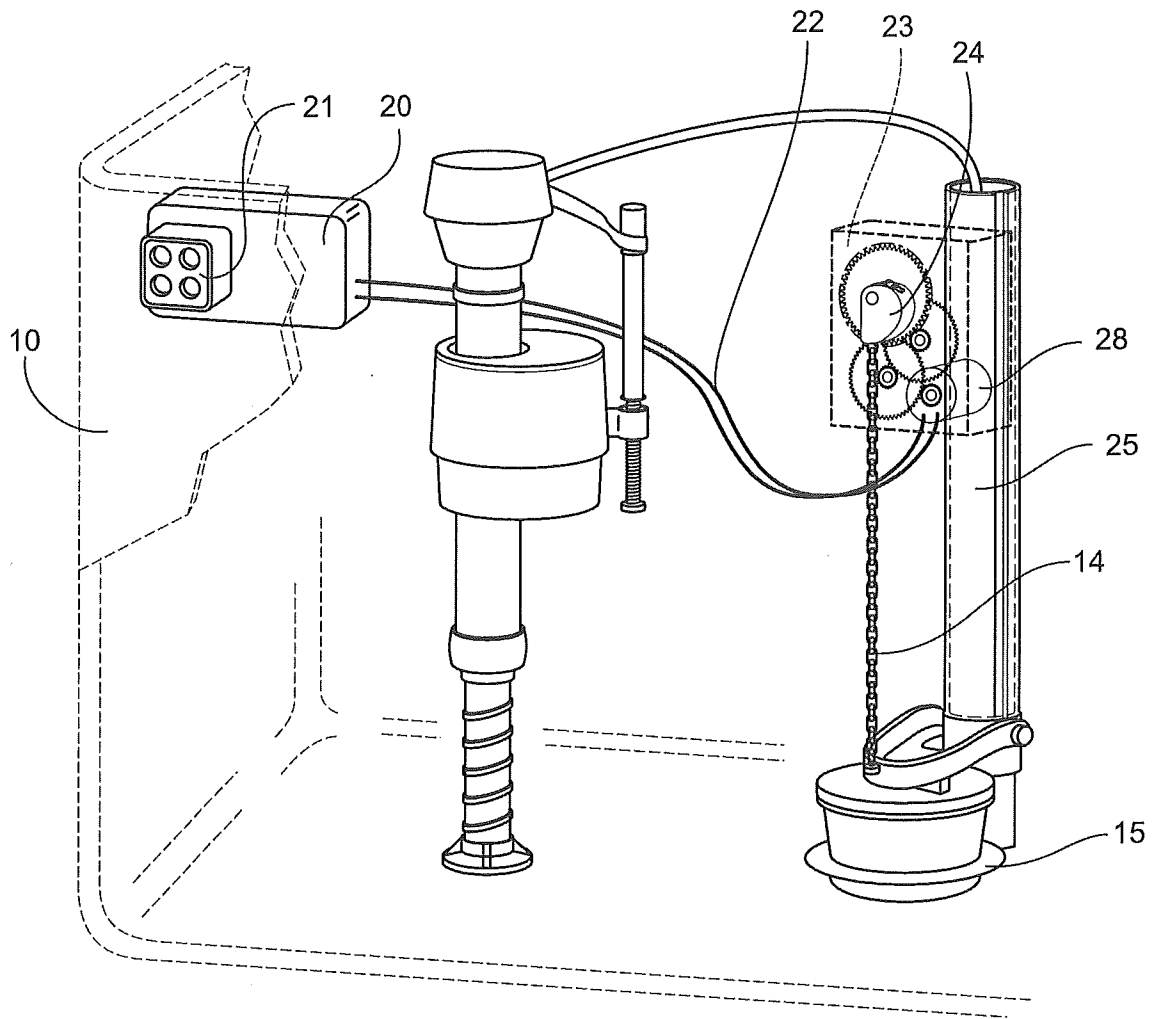


Fig. 3

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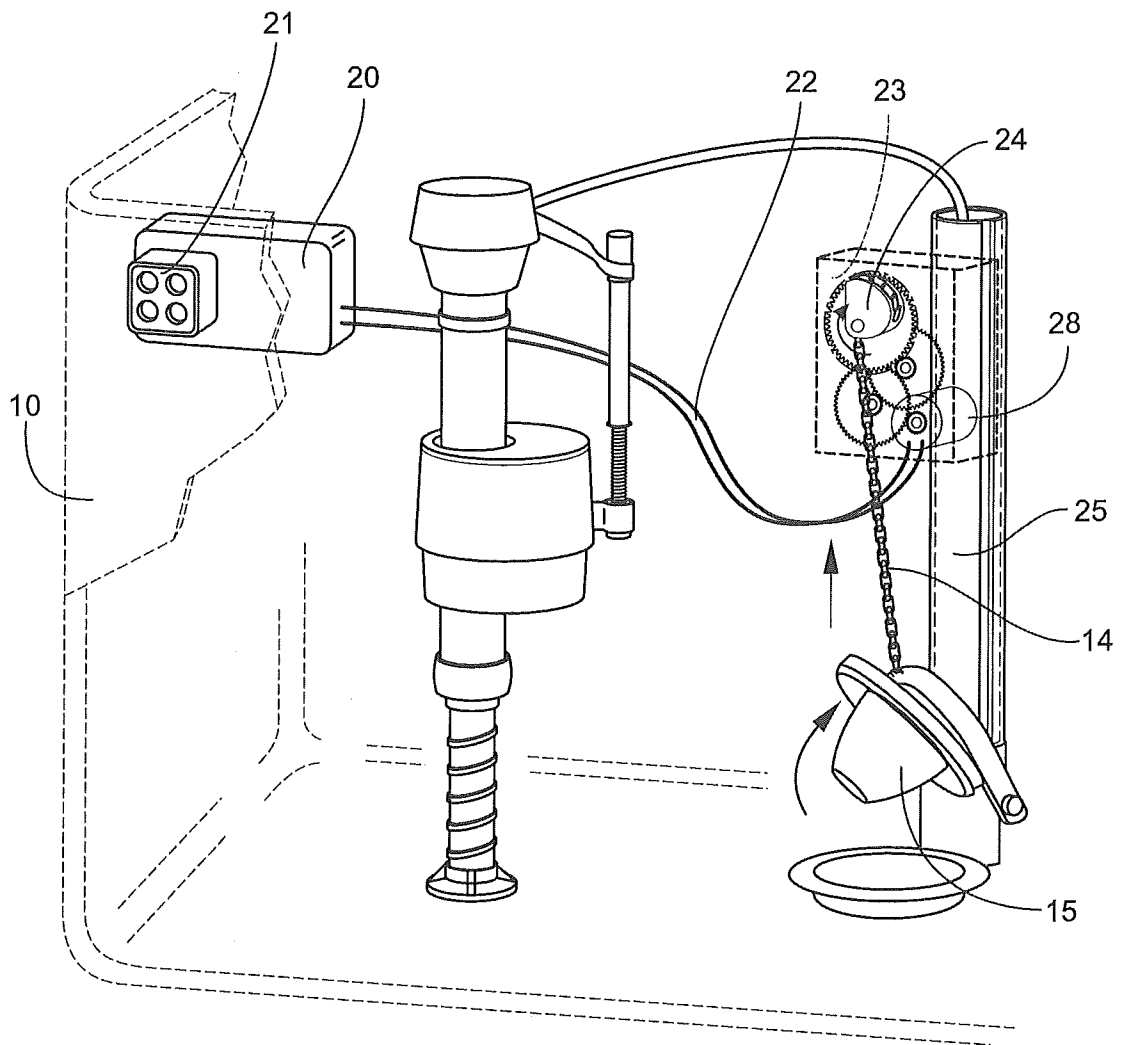


Fig. 4

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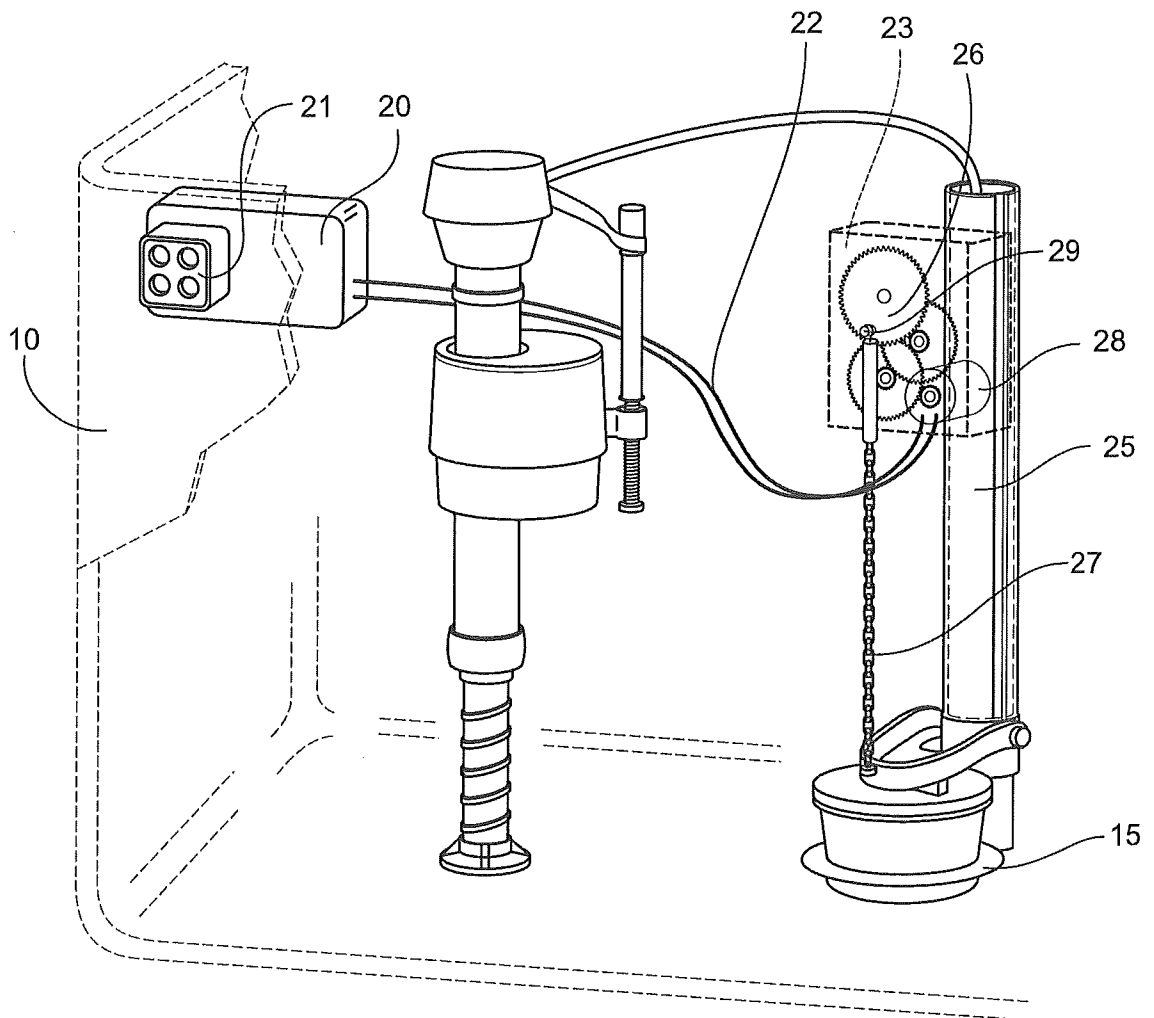


Fig. 5

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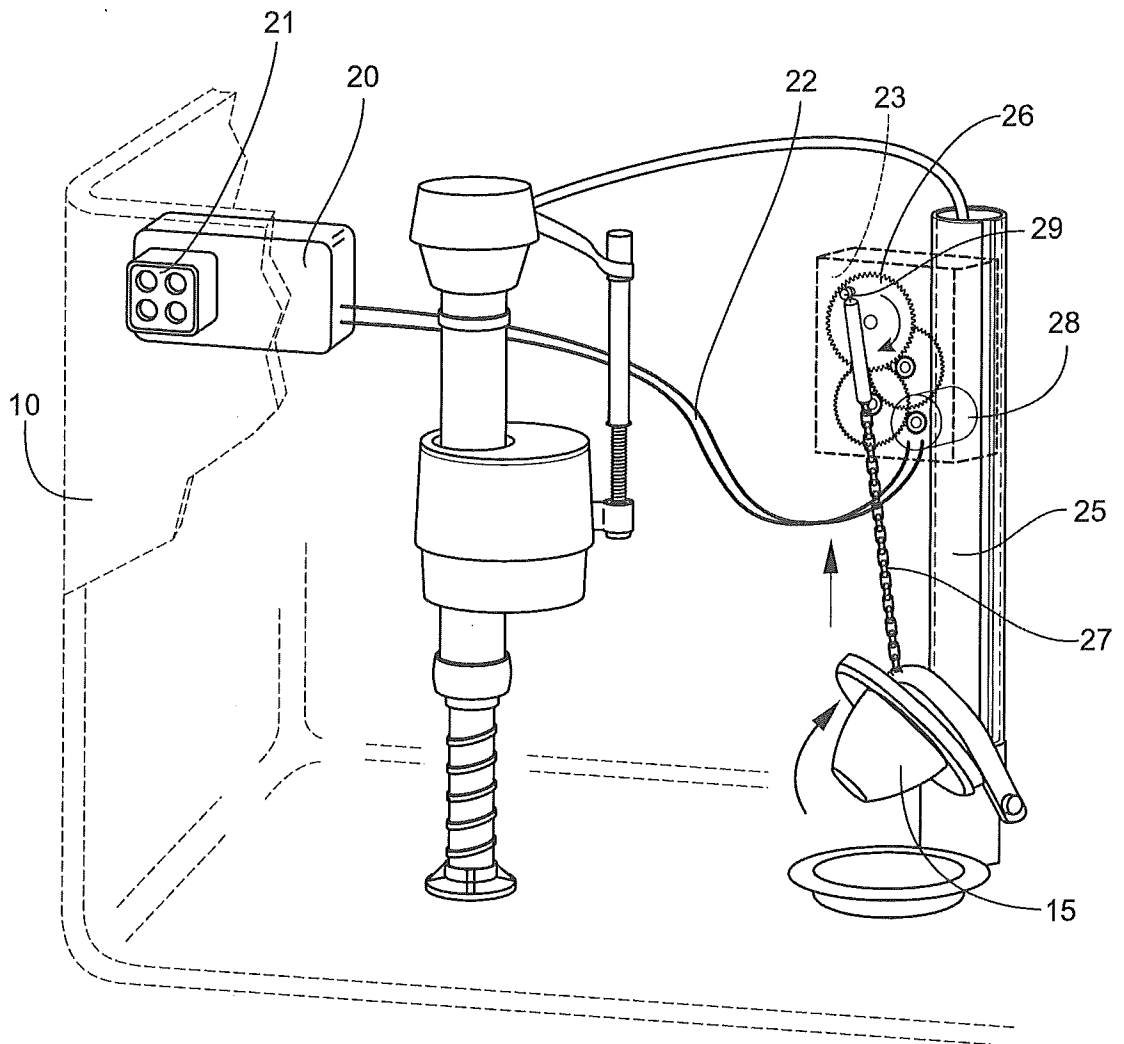


Fig. 6

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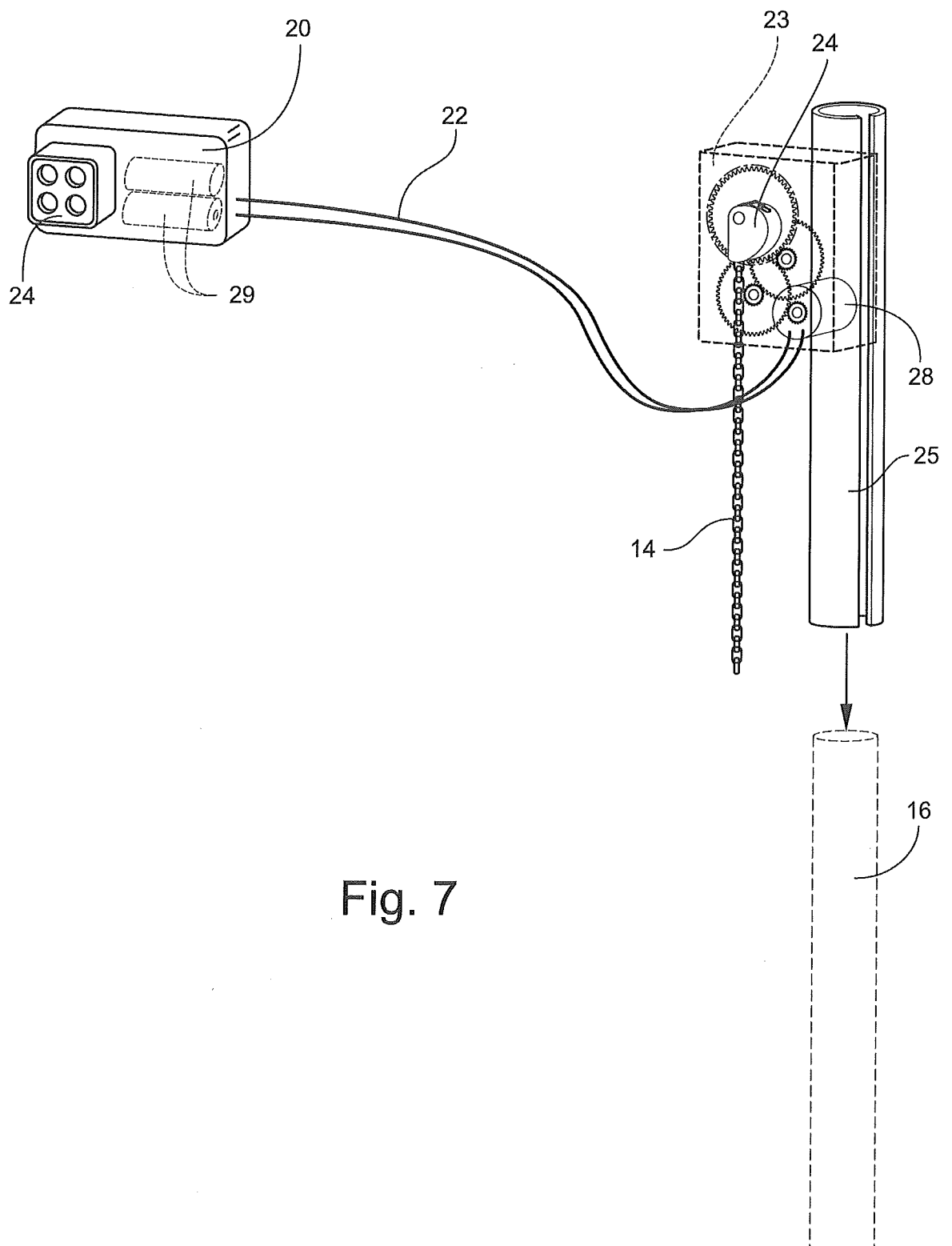


Fig. 7