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(54) **An automatic flushing device for a flush toilet.**

(57) An automatic flushing device for a flush toilet comprising an infrared sensor (231) and an electronic circuit connected with the infrared sensor (231), which is possible to sense the length of time the toilet has been used and to actuate the electronic circuit to energize a coil (24) to move magnetically up a round block (31) connected with a rhomboidal (3 ball (35) normally blocking an outlet (4) of a tank for three different lengths of time and accordingly for flushing water in three different volumes out of the outlet (4)

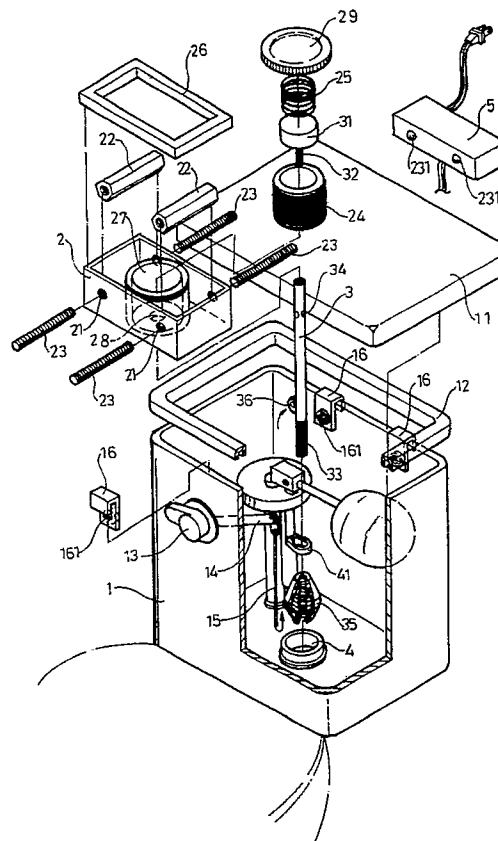


FIG. 1

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BACKGROUND OF THE INVENTION

Conventional flush toilets commonly require manual pushing of the flush handle for flushing away waste each time they are used. Should it be neglected to be flushed, the next person may feel unpleasant to use it.

SUMMARY OF THE INVENTION

The automatic flushing device for a flush toilet in the present invention comprising a water tank, a case for fixing a coil in the water tank and under a tank lid, a round iron block set inside the coil, and a shaft tube connected at its upper end with a round block and at the lower end with a rhomboidal ball, an infrared sensor, and an electronic circuit as the main components.

The water tank has a rubber gasket placed on its upper edge and then a tank lid covers the tank. Four hangers having a threaded hole hang inwardly on the upper edge of the tank for supporting the case for fixing a coil in the tank.

The case for fixing the coil is shaped rectangular, having two threaded holes in both length-wise opposite side walls for two pairs of threaded rods to screw through to screw with a female-threaded tube placed between each pair of the opposite holes in the side walls. The two female-threaded tubes respectively have an opposite-direction thread at the right and the left section such that rotation of the female-threaded tubes can make two pairs of the two threaded rods screw in or out. And those threaded rods have their outer end screw with holes in the four hangers so that the case can be supported firmly in its place by the four threaded rods and the four hangers.

The case is also provided with a cylindrical base in its interior for fixing the coil therein, a spring and the round iron block inside the coil. The round block placed under the spring has a threaded rod extending through a hole in the bottom wall of the case, possible to move up magnetically when the coil is energized by the electronic circuit. The spring urges the bottom surface of a cap covering the case and thus can be shrink up when the round block is pulled up by the coil while energized and can push elastically down the round block when coil is de-energized.

The shaft tube has at the upper end a female thread to screw with the bottom end of the threaded rod of the round block and at the bottom end a male thread to screw with a rhomboidal ball normally blocking an outlet of the tank. Therefore, the rhomboidal ball can be moved up together with the round block, leaving the outlet, through which the water in the tank can be flushed in the toilet, when the coil is energized.

The infrared sensor can sense if a person uses the toilet and the electronic circuit can count the period of time it is used and judging according to three periods of time, less than 10 seconds, 10-120 seconds, and more than 120 seconds, to energize the coil 24 respectively for 1 - 2 seconds or 3 - 5 seconds or 5 - 10 seconds to pull up the rhomboidal ball, and thus to flush water for the same length of time.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an exploded perspective view of the automatic flushing device for a flush toilet in the present invention.

Figure 2 is an elevational view of the automatic flushing device for a flush toilet in the present invention.

Figure 3 is a diagram of the electronic circuit for controlling the automatic flushing device in the present invention.

Figure 4 is a first actional view of the automatic flushing device in the present invention.

Figure 5 is a second actional view of the automatic flushing device in the present invention.

DETAILED DESCRIPTION OF THE INVENTION

First, as shown in Figure 1, a tank 1 combined with this automatic flushing device has the same structure as a conventional tank for storing water and a float in controlling the level of the water therein. Thus it is not described further, while the automatic flushing device in accordance with the present invention is to be described as follows.

The automatic flushing device comprises a rubber gasket 12 on the circumferential edge of the tank 1 to enable a tank lid 11 to cover tightly the tank 1. Four hangers 16 are hooked on the upper edge of the tank 1, having a threaded hole 161 for a threaded rod 23 to horizontally screw with so that a case 2 can be supported at its place firmly by the four rods 23 in the upper interior of the tank 1 under the tank lid 11. The case 2 has two opposite threaded holes 21 in both the lengthwise side walls and two female-threaded tubes 22 having an opposite-direction female thread at the right and the left section are respectively placed between the two opposite threaded holes 21 and screwed with the four threaded rods 23 at the same time by rotating the two tubes 22, and the four rods 23 can screwingly advance in or retreat out of the said tubes 22 by the rotation of said tubes 22.

A rectangular rubber gasket 26 is fixed on the upper circumferential edge of the case 2 to tighten connection of the case 2 with the bottom surface of the tank lid 11. The case 2 is provided with a cylindrical base 27 in its interior, and the cylindrical

base 27 has a round hole 28 in its bottom wall and a cap 29 covering its top by screwing. A coil 24, a spring 25 and a round iron block 31 are placed in the cylindrical base 27, and the spring 25 is confined inside the coil 24 under the cap and on the round block elastically urging the cap 29. The round block 31 has its bottom welded with a threaded rod 32 passing through the round hole 28 downward and screwing with a shaft tube 3 having its bottom end screwed with a rhomboidal ball 35, which conforms to an outlet 4 and thereby functions to stop or let out the water in the tank 1.

The shaft tube 3 can move up and down with the round block 31, limited by a position round hole 41 it passes through, having a hollow interior and sidewise holes 34 at its upper section, through which the water in the tank 1 can flow down to the outlet 4 when the tank 1 is full of water too much. Thus the water can never overflow the upper edge of the tank 1. The shaft tube 3 is also provided with at its lower section an ear hole 36 tied with one end of a string having its other end tied with a lever 14 connected with a push handle 13 fixed at the outside wall of the tank 1 so that the push handle 13 can be manually operated to flush the water, as shown in Figs. 4 and 5.

An electronic circuit for controlling the automatic flushing device is shown in a diagram in Fig. 3, kept in a control box 5 and connected with the coil 4 so as to control the length of time for pulling up the round block 31 together with the shaft tube 3 and thus adjusting the volume of the water to be flushed in three stages. Now, the function of the electronic circuit is to be described as follows:

1. When a person comes and stands near the toilet less than 10 seconds without using it,

an infrared sensor 231 senses the person standing near the toilet, generating a signal to close a contact point to actuate a timer IC U1 to check the period of time of the presence of the person. If it does not exceed the preset time, 10 seconds, a timer IC U1 does not generate a signal to energize the coil 24.

2. When a person uses the toilet 10 - 120 seconds, probably only for urination,

the timer IC U1 checks the length of time of the user's presence, and generates a signal after 10 seconds to actuate an OR Gate U9 and a timer IC U2, which generates a signal to an OR Gate U10 to energize the coil 24. The length of time to actuate U2 is preset to be 1 - 2 seconds and the coil 24 is accordingly is to be energized for 1 - 2 seconds to actuate the flush device to flush only a little water in the toilet to moisten it. A timer IC U3 also starts checking the time synchronously with the timer IC U1, having its actional time preset for 120 seconds. Therefore, if the user leaves the toilet before

120 seconds, the timer IC U3 gives a signal to a NAND Gate U14 and a timer IC U4 orderly, which actuates the coil 24 through OR Gates U11 and U10 for 3 - 5 seconds, as the same length of time the timer IC U4 has for its preset action time. Thus the water is to be flushed in the toilet for the same length of time, 3 - 5 seconds.

3. When a person uses the toilet more than 120 seconds, probably relieving himself,

the coil 24 is to be energized for 1 - 2 seconds after 10 seconds pass, as described in paragraph 1 and 2. Then an OR Gate U13, a NAND Gate 8, and an OR Gate U12 orderly receives a signal to actuate a timer IC U7, which is to function for 5 - 10 seconds, the preset length of time, to energize the coil 24 for 5 - 10 seconds via OR Gates U11 and U10 and thus flushing a large volume of water in the toilet for the same length of time.

In general, the coil 24 cannot be energized unless a person comes near the toilet more than 10 seconds. The water is to be flushed 1 - 2 seconds in case of using the toilet more than 10 seconds, to be flushed for 3 - 5 seconds in case of 11 - 120 seconds of using the toilet, and to be flushed for 5 - 10 seconds in case of more than 120 seconds.

Claims

1. An automatic flushing device for a flush toilet comprising;

a tank being provided with a rubber gasket placed on its upper circumferential edge for supporting a tank lid and keeping the tank and the tank lid firmly combined together, and with four hangers being hung on the upper edge of the tank and having a threaded hole for screwing horizontally with a threaded rod also screwing with a threaded hole in a case to support the case in the interior of the tank under the tank lid;

a case of a rectangular shape being placed in the upper interior of the tank and under the tank lid and having two opposite threaded holes in both the lengthwise opposite side walls for the threaded rods to screw through and to screw with two female-threaded tubes to be positioned between two opposite threaded holes in the side walls, said two female-threaded tubes having an opposite-direction female thread at the right and the left section so that rotation of said female-threaded tubes can make two pairs of the threaded rods to screw inward or outward, and said two pairs of threaded rods being possible to screw in the threaded holes in the four hangers so that the case can be kept firmly in its place, a

rubber gasket being placed on the upper edge of the case for touching and supporting the bottom surface of the tank lid, a cylindrical base being provided in the interior of the case for containing a coil, a spring inside the coil and under a cap covering the case, a round iron block in the coil and under the spring, the round block having a threaded rod passing through a hole in the bottom wall of the case;

a shaft tube having at its upper end a female thread to screw with the lower end of the threaded rod of the round block in the cylindrical base, at the bottom end a male thread to screw with a rhomboidal ball, at the upper section several sidewise holes communicating with the hollow interior, and an ear hole protruding sidewise at the lower section for tying a string with a push handle fixed at the outer side of the tank for manual pushing the handle to actuate the shaft tube to move up so that the rhomboidal ball can also be moved up to leave an outlet in the bottom of the tank; and

a control box being placed up above the tank and containing an infrared sensor and an electronic circuit, said infrared sensor connected with the electronic circuit connected with the coil in the cylindrical base in the case, said infrared sensor sensing the presence of a user of the toilet and actuating the electronic circuit to check the length of the time the toilet has been used and energizing the coil by the electronic circuit for three different lengths of time to move up the round block and accordingly the shaft tube together with the rhomboidal ball so that the water in the tank can be flushed out of the outlet that the rhomboidal ball normally blocks in three different volumes of water.

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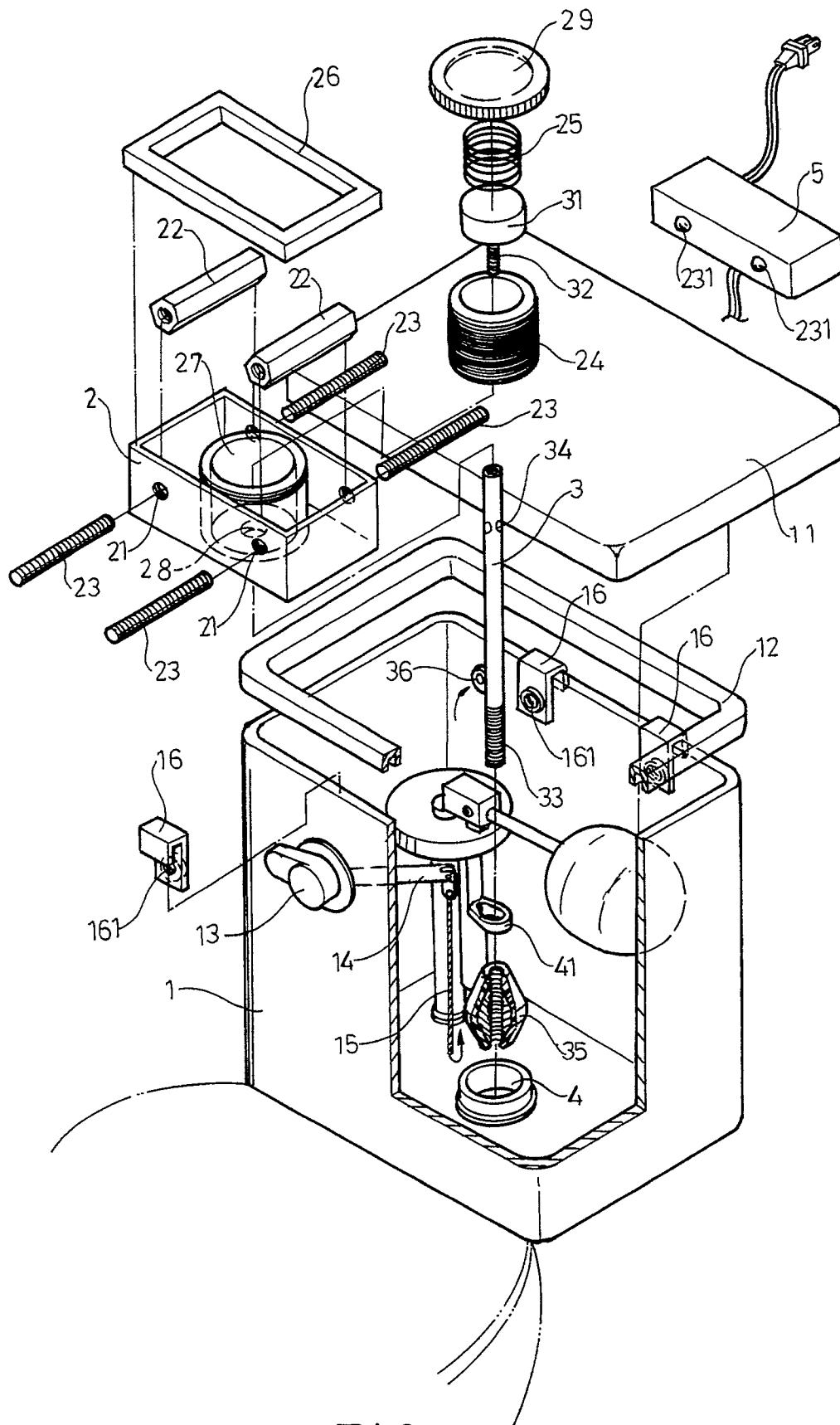


FIG. 1

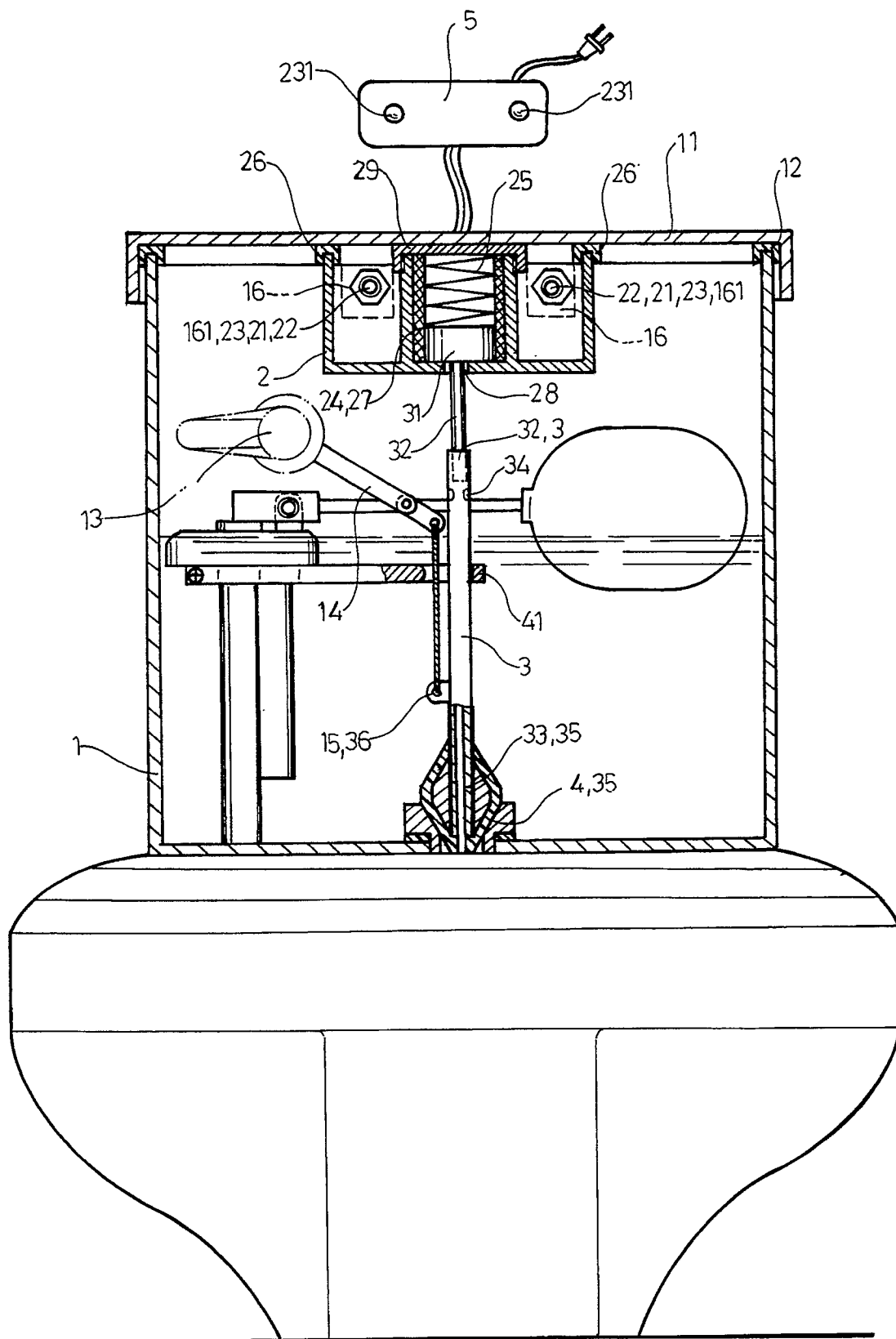


FIG. 2

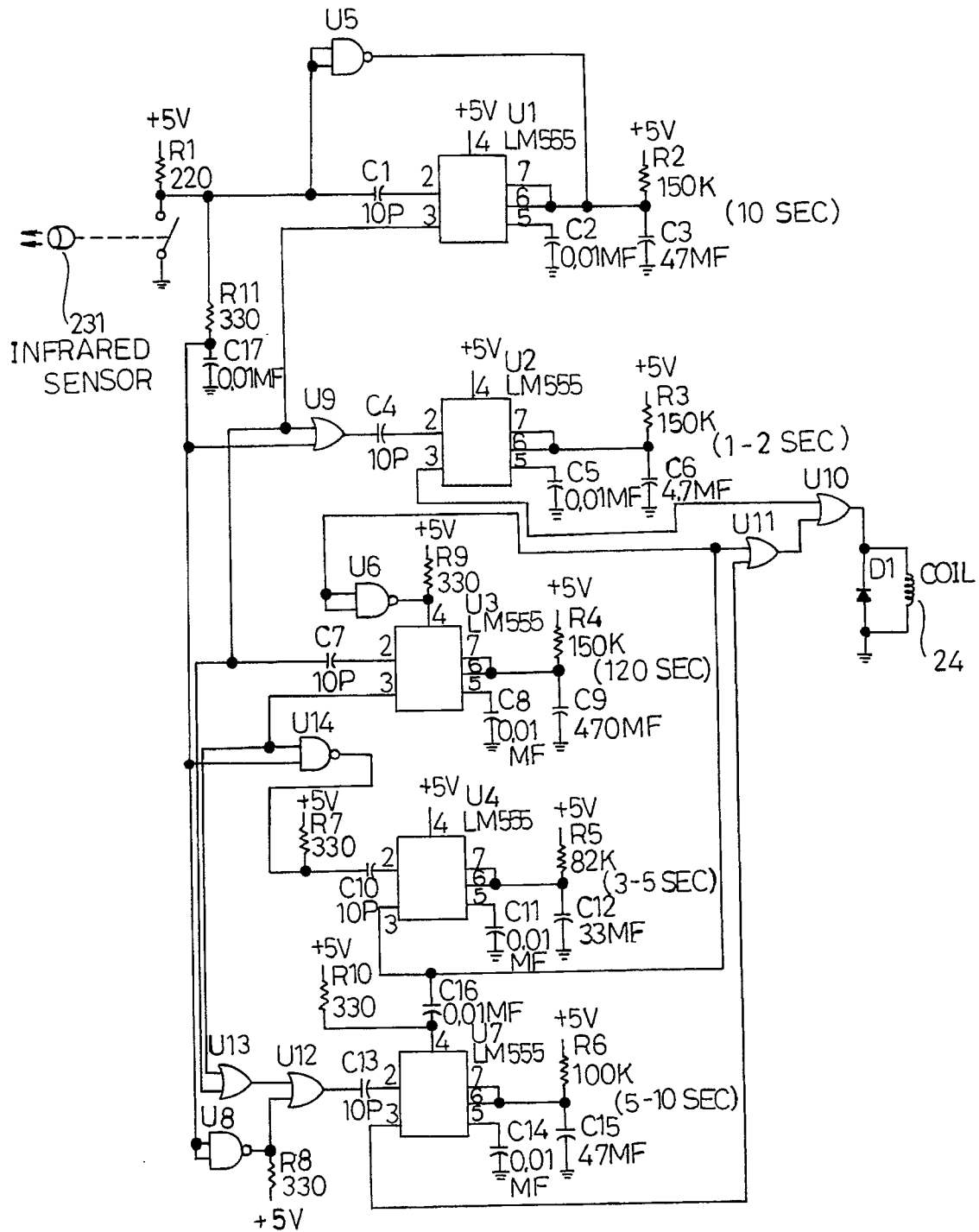


FIG. 3

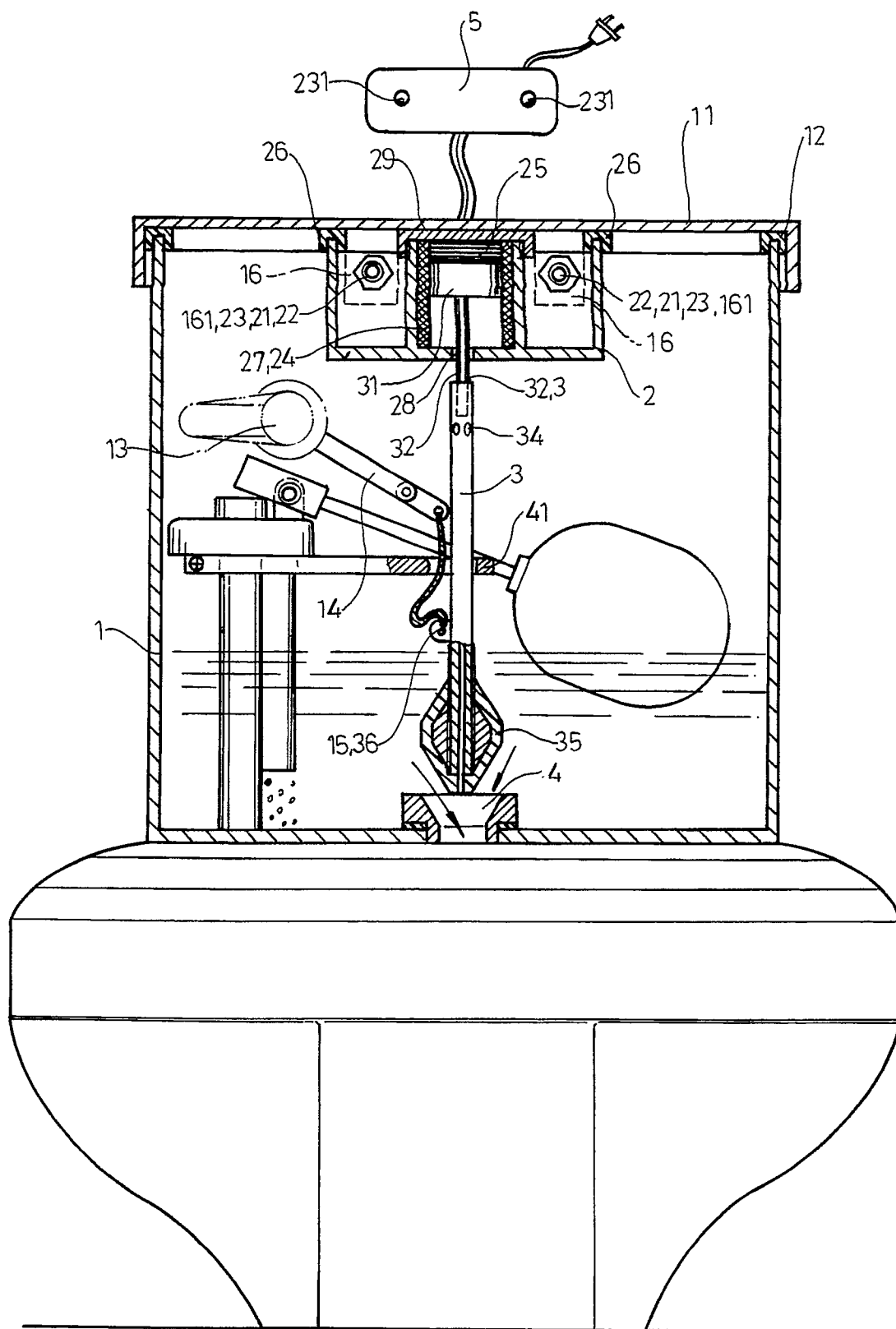
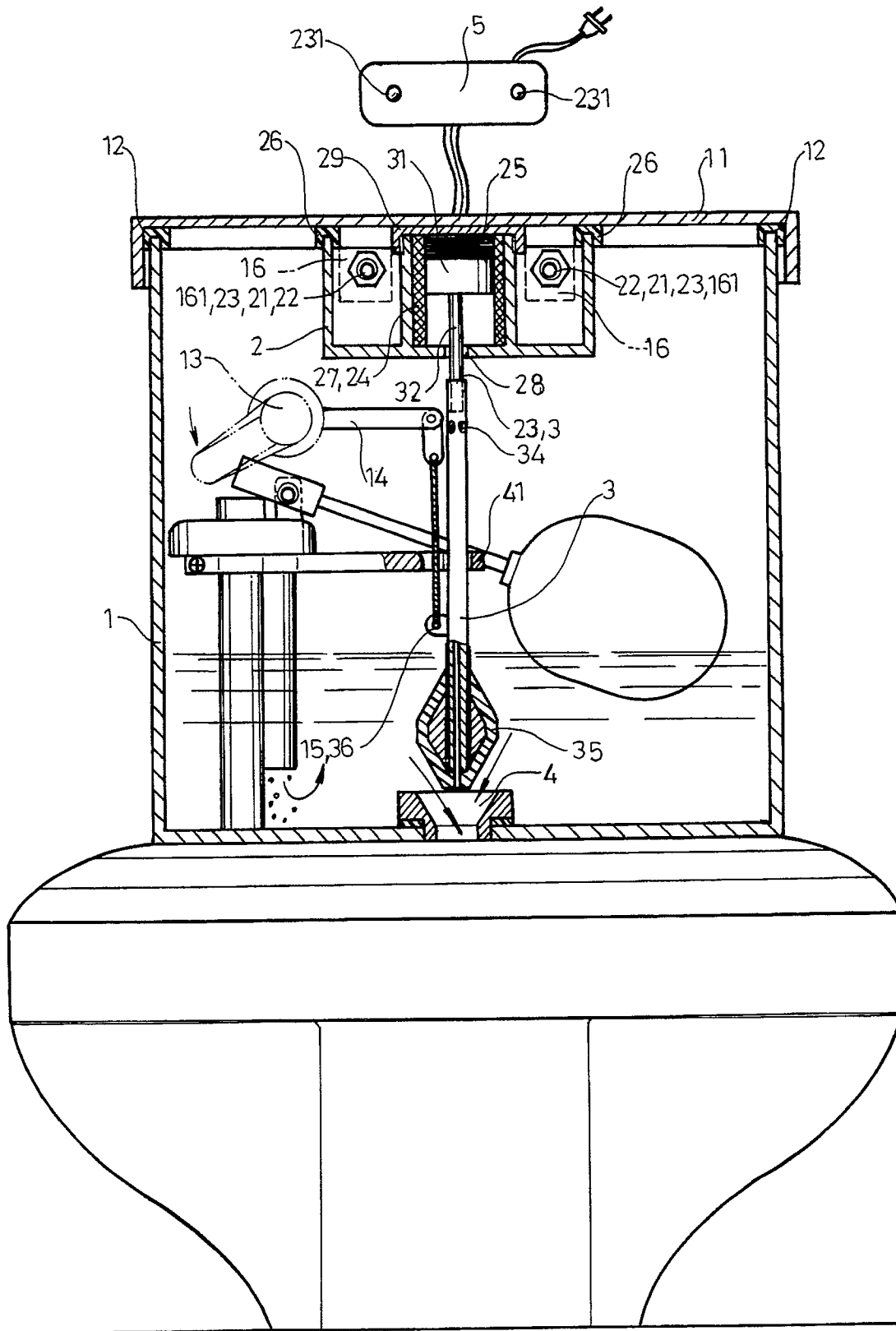


FIG. 4





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EUROPEAN SEARCH REPORT

Application Number

EP 91 10 0179

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)														
A	GB-A-1 509 600 (UN) * the whole document * -- -- --	1	E 03 D 5/10 E 03 D 1/22														
A	US-A-3 908 204 (HOPKINS) * abstract * -- -- --	1															
A	US-A-4 141 091 (PULVARI) * the whole document * -- -- --	1															
A	US-A-4 793 588 (LAVERTY JR.) * abstract * -- -- -- --	1															
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5) E 03 D														
Place of search The Hague		Date of completion of search 31 July 91	Examiner VAN BEURDEN J.J.C.A.														
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