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(71) Applicant: **Gesek, Bogdan**
London SE16 3DX (GB)

(72) Inventor: **Gesek, Bogdan**
London SE16 3DX (GB)

(74) Representative:
Hughes, Brian Patrick
Brian Hughes & Co.
Letterbox Cottage
Friezley Lane
Cranbrook, Kent TN17 2LL (GB)

(54) Improvements in and relating to cisterns

(57) A cistern for use with a water closet has a conventional flushing lever 26 which when depressed initiates the siphonic action which empties the cistern. The siphon 16 is an inverted U-tube and at the top of the first limb 20 of the U-tube is a rotary valve which allows a controlled flow of air to enter the limb 20 during flushing and thereby destroy the vacuum in the U-tube to terminate the flushing cycle. The rotary valve has a number of settings to allow the duration of the flushing cycle to be varied.

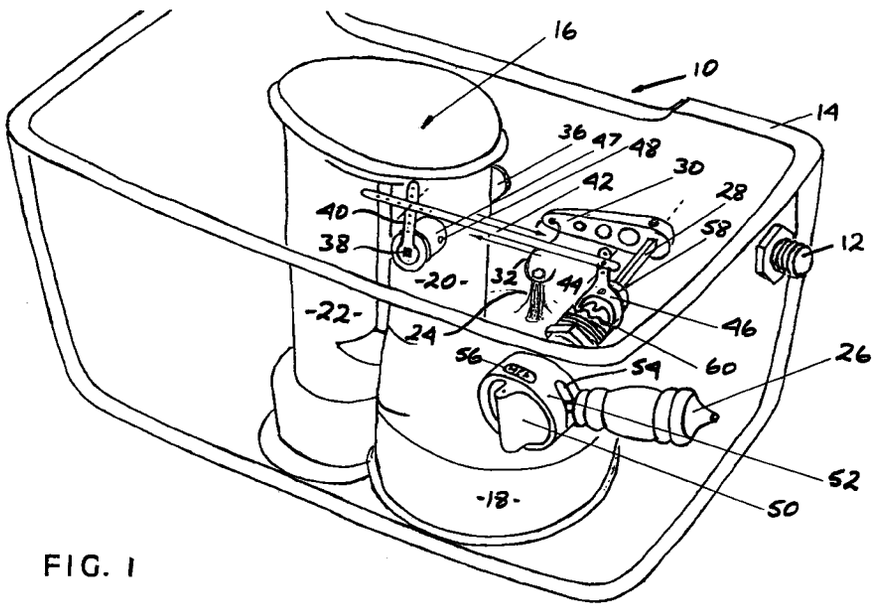

FIG. 1

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Description

[0001] This invention is concerned with improvements in and relating to cisterns for use with water closets.

[0002] It is well known that very large quantities of water are used in flushing water closets and, as the pressure on water supplies has increased in recent years, it has become increasingly desirable to effect some saving in the amount of water used in this way. Simple measures to effect this saving have included placing a brick in the cistern to reduce the volume of water used in each flush, but generally these simple measures have proved to be either unsatisfactory in use or unpopular with the users.

[0003] It is an object of the present invention to provide an improved cistern for a water closet.

[0004] The present invention is a cistern for a water closet, the cistern containing an inlet valve, means for opening and closing the inlet valve when the level of water in the tank reaches predetermined levels, an outlet valve connected with an actuator outside the cistern, a siphon associated with the outlet valve for delivering water to the outlet from the cistern, and a control valve for allowing air to enter the siphon thereby controlling the duration of the siphon effect.

[0005] Preferably external control means are provided for adjusting the control valve and thereby the duration of the siphon effect.

[0006] Indexing means may be provided between the external control means and the control valve.

[0007] The external control means may be a rotatable knob linked with the control valve.

[0008] Preferably the control valve is a rotary valve having a plurality of settings.

[0009] The actuator may be a lever.

[0010] The means for opening and closing the inlet valve may be a float.

[0011] An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig.1 is a perspective view of a part of a cistern according to the present invention;

Fig.2 is a plan view of part of the cistern of Fig. 1; and

Fig.3 is a perspective view of a modified cistern according to the present invention.

[0012] Referring now to Figs.1 and 2, a cistern 10 has an inlet pipe 12 in its enclosing wall 14 for supplying water to the cistern through an inlet valve which is opened and closed by a float when the water in the cistern reaches predetermined levels. As the details of the inlet valve and float are well known the inlet valve and float are not shown in the drawings in the interests of clarity.

[0013] The cistern 10 is provided with a siphon 16 for delivering water from the cistern to an outlet pipe when an outlet valve is actuated. The siphon 16 consists of a large diameter chamber 18 at the bottom of which is located the outlet valve (not illustrated), the bottom of the chamber 18 communicating with the interior of the cistern 10 and the top of the chamber 18 connecting with an inverted U-tube having first and second limbs 20 and 22, the limb 22 leading to the outlet from the cistern.

[0014] The outlet valve consists of a piston extending across the chamber 18 and in which is provided a one way flap valve allowing water to flow from the body of the cistern through the disc into chamber 18 and the first limb 20 of the U-tube. A piston rod 24 extends upwardly from the piston through the top of the chamber 18 and is connected through a lever system to an external actuator in the form of a handle 26.

[0015] The lever system between the handle 26 and the piston rod 24 consists of an actuator shaft 28 which rotates with the handle 26, a lever arm 30 keyed on the end of the shaft 28, and a link 32 between the free end of the lever arm 30 and the top of the piston rod 24. Thus, as the handle 26 is depressed the actuator shaft 28 and the lever arm 30 rotate clockwise as seen in Fig.1 and the piston is lifted in the chamber 18.

[0016] When the piston is raised in the chamber 18 the flap valve is held shut and the piston carries with it the water in the chamber 18 and the first limb 20 of the U-tube until the water spills over into the second limb 22 of the U-tube. The water passing down the second limb 22 reduces the pressure in the first limb 20 while the water in the chamber 18 below the piston is at atmospheric pressure, with the result that the flap valve opens to allow the water in the body of the cistern to pass through the piston and U-tube to the cistern outlet. This continues until the water level in the cistern drops below the bottom of the chamber 18 allowing air into the siphon to destroy the vacuum in the U-tube and the siphonic effect.

[0017] The construction and operation of the cistern as so far described is well known.

[0018] In this embodiment of the present invention the siphon is modified by having a rotary control valve 36 inserted into the top of the first limb 20 of the U-tube to allow air to enter the siphon at a controlled rate. The control valve 36 has a spindle 38 to which is keyed a lever 40 which is connected through a link 42 to an arm 44 projecting from a collar 46.

[0019] The control valve 36 has a plurality of settings, in this embodiment three settings corresponding to three different rates of air flow into the siphon. The control valve 36 has an outer casing 47 in which is provided a hole 48, and the rotary spindle 38 has two holes which communicate through the spindle 38 with the interior of the limb 20 of the U-tube. The two holes are of different sizes and the cooperation of each of the holes 49 with the casing hole 48 provides two settings of the control valve, the third setting being when no hole is cooperating with the casing hole 48.

[0020] The mechanism for controlling the setting of

the control valve 36 is shown best in Fig.2. A control knob 50 is exposed at the end of a cover 52 which, as best seen in Fig.1, has an opening 54 in its side wall to enable the handle 26 to be depressed to empty the cistern. A second opening 56 is provided in the cover 52 to expose markings, such as MIN, MED and MAX, on the control knob 50 indicative of the setting of the control valve 36.

[0021] Extending inwardly from the control knob 50 is a control shaft 58 which surrounds the actuator shaft 28 and mounts the collar 46. An index ring 60 is secured to the wall 10 of the cistern and surrounds the control shaft 58 and is on a common axis therewith, the index ring 60 having three notches 62 facing the collar 46 and the collar 46 having a tooth 64 facing the index ring 60 for cooperating with the notches 62. The index ring 60 and the toothed collar 46 constitute an indexing mechanism.

[0022] The index ring 60 in this embodiment is provided by the end of a threaded boss which is integral with the cover 52 and extends through the wall of the cistern, and by which the cover is secured to the wall of the cistern.

[0023] The control knob 50, control shaft 58 and collar 46 are biassed outwardly by a spring 66 so that the tooth 64 is in engagement with one of the notches 62 in the index ring 60 thus accurately establishing the setting of the control valve 36. To change the setting of the control valve, and thus the rate at which air is allowed to enter the siphon, the control knob 50 is pushed inwardly against the bias of the spring 66 to move the collar axially relative to the ring and disengage the tooth 64 from the notch 62 with which it is engaged, is then rotated to a position indicated by one of the markings exposed at the window 56 and released to allow the tooth 64 to engage the new notch 62 with which it is now aligned and thus ensure accurate indexing of the collar 46 and an accurate setting of the control valve 36.

[0024] In use, operation of the handle 26 initiates the flushing cycle in the normal way. However, the control valve 36 is allowing air to enter the siphon and eventually the vacuum in the siphon is insufficient to maintain the siphon effect and the flushing cycle is terminated. Clearly the time at which the cycle is terminated is determined by the rate at which air is allowed to enter the siphon, i.e. the setting of the control valve 36, and the earlier the cycle is terminated the less water is used in that cycle.

[0025] While the invention has been described in relation to a cistern in which the handle 26 is on the front face of the cistern it is easily adapted to other configurations of cistern, the important point being only that a suitable linkage be provided between the control knob 50 and the control valve 36.

[0026] The cistern shown in Fig.3 illustrates the embodiment of Fig.1 modified to suit a cistern having its flushing handle 26 at the side of the cistern, the same reference numerals being used in all the Figs. to denote the same or equivalent parts.

[0027] In another modified cistern the control valve is located externally of the siphon on a mounting block. The block has a first passage extending across the block and a second passage extending at right angles to the first and connecting the first passage to the interior of the siphon through a projection on the block which passes through a hole in the wall of the siphon.

[0028] The use of this block simplifies the fitting of the control valve to a cistern as it is only necessary to drill the hole in the side of the siphon, insert the projection into the hole and secure the block in position by an adhesive, place the valve at one end of the first passage and blank off the other end, and then connect the valve to the handle through a lever system.

[0029] In a further modification of the present invention the control valve is mounted remote from the siphon and the air passing through the valve is connected into the siphon by a flexible tube. In a particularly preferred form of this modification the control valve is formed integrally with the setting control mechanism and is connected to the index ring by, for example, gears.

Claims

1. A cistern for a water closet, the cistern containing an inlet valve, means for opening and closing the inlet valve when the level of water in the tank reaches predetermined levels, an outlet valve connected with an actuator outside the cistern, a siphon associated with the outlet valve for delivering water to the outlet from the cistern, and a control valve for allowing air to enter the siphon thereby controlling the duration of the siphon effect.

2. A cistern as claimed in claim 1, in which external control means are provided for adjusting the control valve and thereby the duration of the siphon effect.

3. A cistern as claimed in claim 2, in which the external control means is a rotatable knob linked with the control valve.

4. A cistern as claimed in claim 3, in which indexing means are provided between the external control means and the control valve.

5. A cistern as claimed in claim 4, in which the indexing means comprises a ring and a collar which are mounted on a common axis, are relatively movable axially and of which one is connected with the control valve and the other with the control knob, the ring and knob being movable axially apart for relative rotary adjustment.

6. A cistern as claimed in claim 5, in which the rotatable knob is coaxial with the ring and collar, is spring biased in a first axial direction and is movable against the spring bias to move the ring and collar

apart.

7. A cistern as claimed in any preceding claim, in which the control valve is a rotary valve having a plurality of settings.

8. A cistern as claimed in any preceding claim, in which the actuator is a lever.

9. A cistern as claimed in claim 8, in which the lever is connected to a shaft coaxial with the ring and collar.

10. A cistern as claimed in any preceding claim, in which the means for opening and closing the inlet valve is a float.

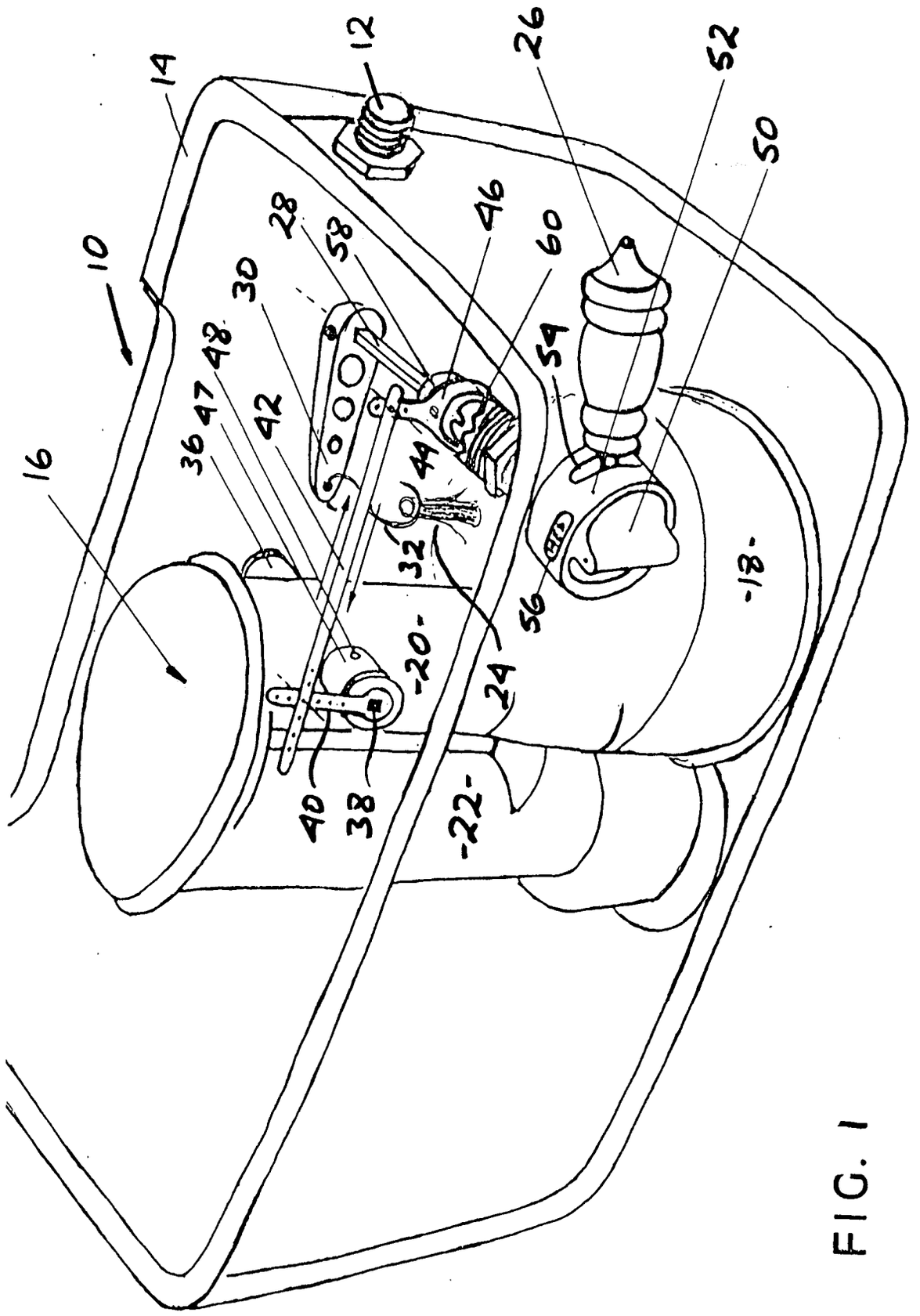
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FIG. 1

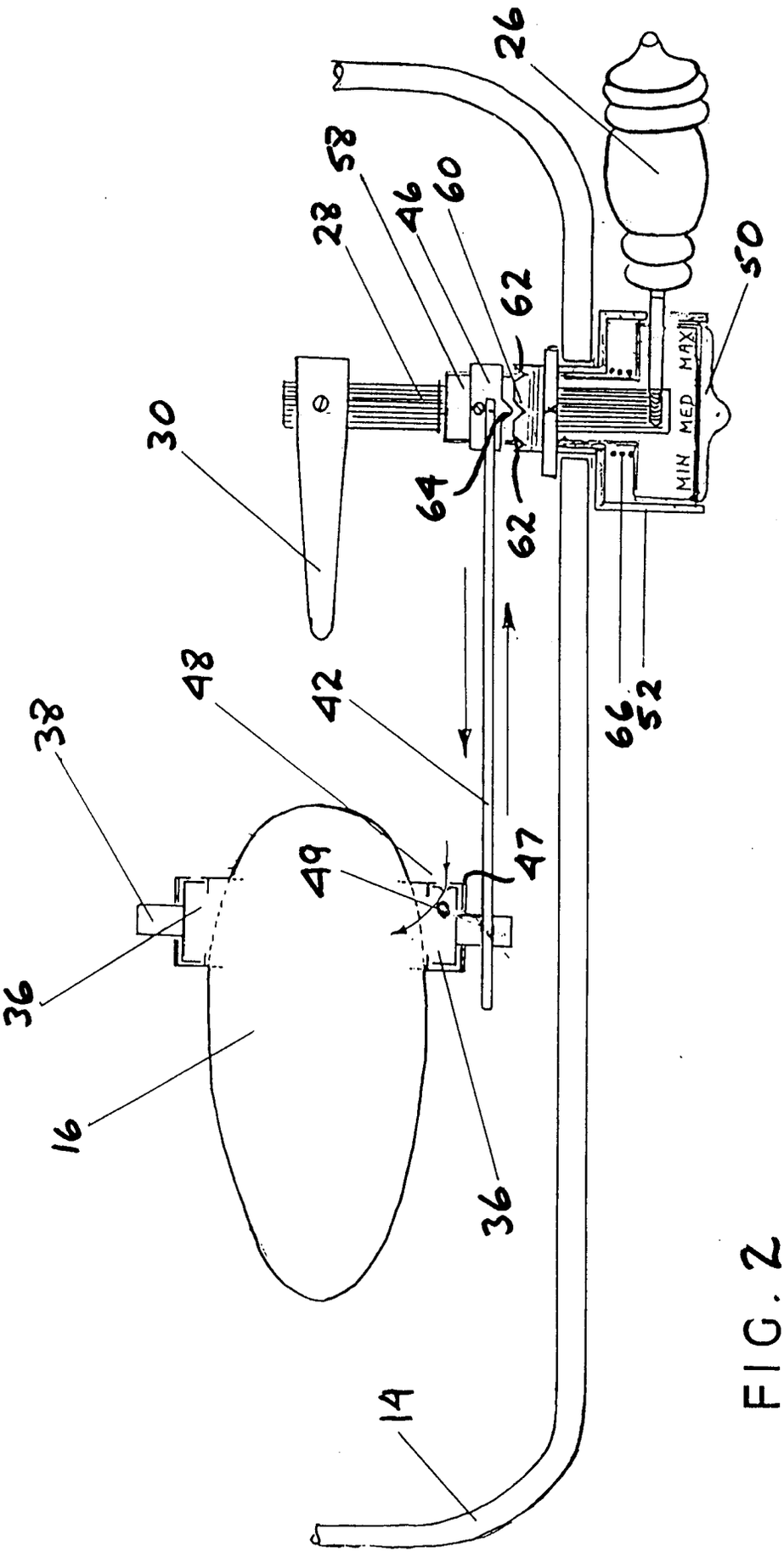
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FIG. 2

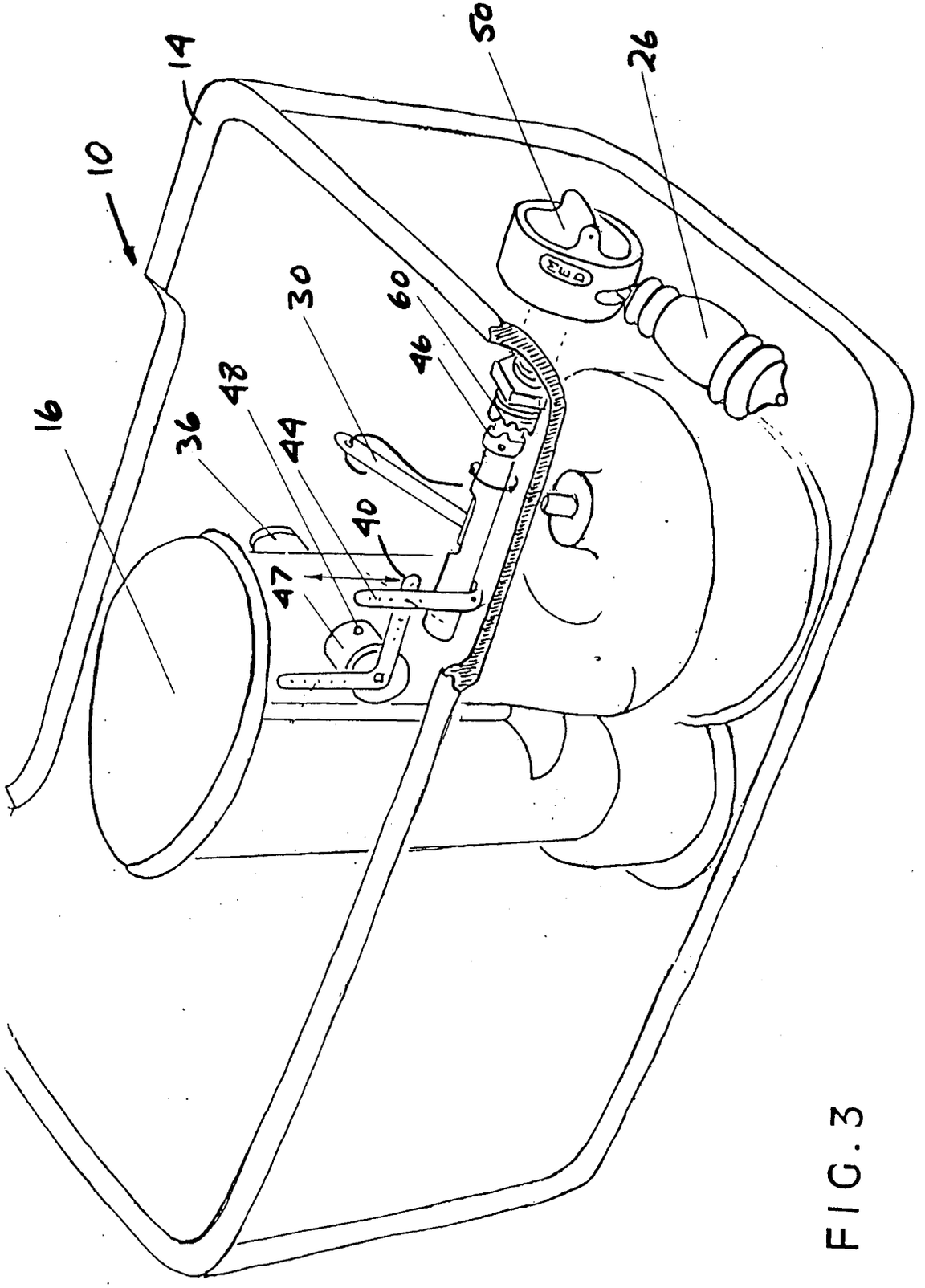

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 0497

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.6)
X Y	GB 2 162 214 A (BELL) 29 January 1986 * the whole document * ---	1-5,8,10 6,7	E03D1/14
X A	DE 34 10 140 A (ZÖLLER) 4 April 1985 * abstract * ---	1,2 3,8,10	
Y A	US 2 869 141 A (KOCH ET AL) 20 January 1959 * figures * ---	6,7 1,3-5	
A	US 4 296 505 A (CHIEN-SHENG) 27 October 1981 * figures * ---	9	
A	GB 2 235 708 A (PRICE) 13 March 1991 * page 4, last paragraph * -----	1-5	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
E03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 June 1998	Van Beurden, J

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