

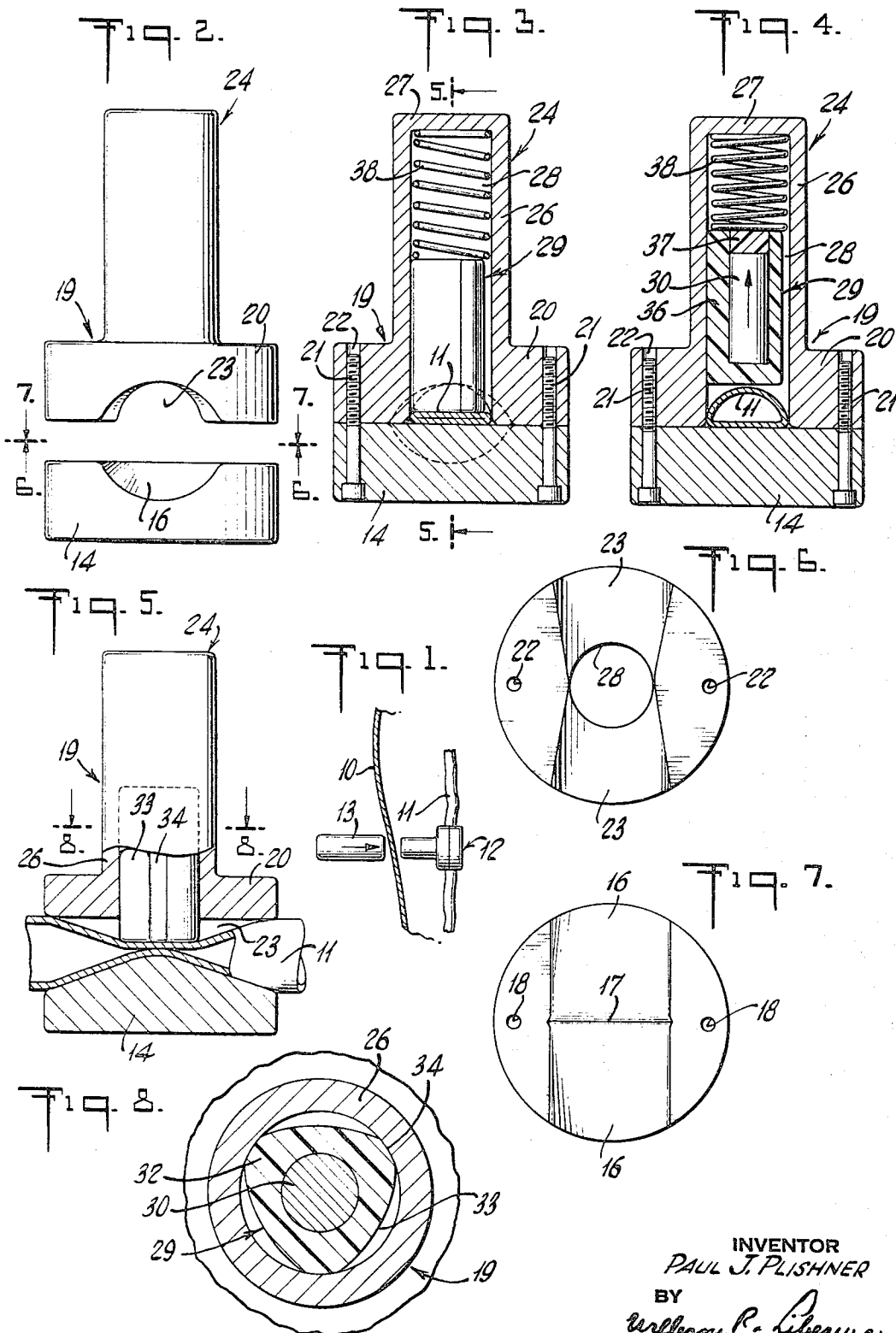
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MAGNETICALLY ACTUATED VALVE CLAMP FOR URETHRA CONTROL

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3,419,008 MAGNETICALLY ACTUATED VALVE CLAMP FOR URETHRA CONTROL

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ABSTRACT OF THE DISCLOSURE

An urethra control device comprises a base and a cylinder mounted on and confronting the base, the device being positioned with the base and cylinder on opposite sides of the urethra. A plunger having an elongated permanent magnet slideably engages the cylinder and is spring-urged toward the base normally to pinch or clamp the urethra to a closed position. A hand manipulated permanent magnet brought toward the cylinder attracts the plunger selectively to open the urethra.

The present invention relates generally to improvements in fluid control mechanisms and it relates in particular to an improved valving system for liquid carrying body tubes which may be externally controlled.

There are in the human and animal body many liquid carrying tubes which are of a voluntary and involuntary nature. Thus waste water is discharged from the body through the urethra which leads from the bladder and is controlled by the schincter associated with the urethra in the area of its junction with the bladder. The sphincter is commonly disabled or incapacitated due to damage thereto or to its control system as a result of surgery, disease or other damaging influence. As a consequence, there is incontinence and a loss of control of the passage of waste liquids, a circumstance which is common but quite embarrassing, awkward, uncomfortable and inconvenient and leads to many other undesirable conditions. While many methods and expedients have been employed and proposed to control and alleviate the incontinency in the passage of waste fluids, these have possessed numerous drawbacks and disadvantages and have done little to solve this problem. A satisfactory urethra control should not permit the storage or continued presence of urine therein since this leads to infection and deterioration of the urethra wall and should not permit the build-up of excess pressure in the bladder which is a serious hazard.

It is, therefore, a principal object of the present invention to provide an improved liquid flow control mechanism.

Another object of the present invention is to provide an improved mechanism for controlling the flow of liquids through liquid carrying body tubes.

Still another object of the present invention is to provide an improved mechanism for externally controlling the passage of waste liquid through the urethra.

A further object of the present invention is to provide an improved externally controlled urethra control mechanism wherein the urethra is normally free of waste liquids and wherein any build-up of excessive fluid pressure therein is obviated.

Still a further object of the present invention is to provide an improved mechanism of the above nature which is relatively easy to apply, simple to control, highly compact, rugged and reliable.

The above and other objects of the present invention

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will become apparent from a reading of the following description taken in conjunction with the accompanying drawing, wherein:

FIGURE 1 is a diagrammatic view of an embodiment of the present invention illustrated as applied to the urethra;

FIGURE 1 is an enlarged front elevational view of the valve sections in an assembled condition;

FIGURE 3 is a longitudinal sectional view of the valve assembled about the urethra and shown in its closed position;

FIGURE 4 is a view similar to FIGURE 3 with the valve shown in its open position;

FIGURE 5 is a sectional view taken along line 5—5 in FIGURE 3;

FIGURE 6 is a sectional view taken along line 6—6 in FIGURE 2;

FIGURE 7 is a sectional view taken along line 7—7 in FIGURE 2; and

FIGURE 8 is a sectional view taken along line 8—8 in FIGURE 5.

In a sense the present invention contemplates the provision, in combination with a fluid-carrying tubular organ disposed within a body, of a valve located within said body and comprising a pair of first and second clamp means positioned on opposite sides of said tubular organ and movable toward and away from each other to effect a contracting closure and release opening respectively of said tubular organ, resilient means normally urging said valve means toward each other, said first valve means including a first permanent magnet, and a second magnet disposed externally of said body and selectively actuable to attract and release said first permanent magnet to respectively open said valve against the action of said resilient means and to release said valve to a closed position under the influence of said resilient means. The improved valving system is employed to great advantage to the urethra at its entrance in the area of the inoperative or defective sphincter. The valve is implanted within the body and includes a base member positioned in the rear side of the urethra and a cylinder carried by the base member and positioned on the other side of the urethra. A valve defining plunger including an encapsulated permanent magnet slideably registers with the cylinder and is urged toward the base by a compression spring housed in the cylinder to releasably close the urethra. A hand manipulated permanent magnet controls the valve member. The spring closes the valve member with a force sufficient to maintain the urethra in a closed position at a liquid pressure therein of about 90 millimeters of mercury and is of such strength as to be urged to an open position by a liquid pressure in the urethra which may be dangerous to exceed.

Referring now to the drawing which illustrates a preferred embodiment of the present invention as applied to the control of the urethra, reference numeral 10 generally designates the body of the subject in which the upper part of the urethra 11 is located leading from the bladder. The improved urethra control valve 12 is positioned in body 10 and surrounds the trailing end of urethra 11 and is embedded or implanted in the body 10 by known and conventional surgical procedures. Valve 12 is controlled from a point external of the body 11 by a hand manipulatable high strength permanent magnet 13 in the manner which will be hereinafter described.

Valve 12 includes a base member or block 14 of circular configuration and disposed along the rear surface

of urethra 11. The front face of base 14, confronting the urethra, has a pair of curved radially extending channels 16 formed therein which extend longitudinally along the urethra 11 and are forwardly inclined from the periphery of the base member 14 and converge to a rounded diametric apex 17 extending transversely across the rear surface of the urethra. A pair of transversely spaced countersunk bores 18 are formed in base 14.

A guide member 19 is positioned at the front surface of the urethra 11 and is secured to base 14. Guide 19 comprises a circular base section 20 engaging the front face of base member 14 and secured thereto by a pair of bolts 21 engaging bores 18 in base member 14 and aligned tapped bores 22 formed in the guide member base section 20. The rear face of base 20 has a diametrically extending arcuate channel 23 formed therein in alignment with channels 16, the side faces of channel 23 converging somewhat approaching the transverse medial axis thereof. The channels 16 and 23 define a passageway when the valve 12 is assembled along which the urethra 11 extends.

Projecting forwardly from and coaxial with base section 20 is a hollow guide cylinder 24 including a circular peripheral wall 26 and a front end wall 27, bore 28 extending through base section 20 and communicating with channel 23. A valve-defining piston or plunger 29 longitudinally slideably registers with bore 28 and includes a longitudinally extending strong permanent magnet element 30 having opposite poles at opposite ends thereof. Magnet 30 is encapsulated in or coated by an inert corrosion resistant housing 32 of approximately prismatic configuration having curved side faces 33 spaced from the inside face of cylinder wall 26 and arcuate corners 34 mating and slideably engaging the inside face of cylinder wall 26. Housing 32 may be formed of a hollow section 36 in which magnet element 30 nests and is closed by a circular disc 37 suitably cemented in registry with the open end of section 36.

A helical compression spring 38 is housed in cylinder 24 and is entrapped between the cylinder end wall 27 and the confronting end of plunger 29 to urge the latter resiliently toward base member 14 to close the urethra 14. It should be noted that spring 38 should be of a strength sufficient to close the urethra under the normal fluid pressure therein, that is, at a urethra fluid pressure of about 90 millimeters of mercury, and should advantageously be of such a strength as to permit the retraction of the plunger 29 against the urging of the spring 38 and under the influence of the urethra 11 when the fluid pressure in the latter exceeds a dangerous level, which varies among individuals. The externally manipulable control magnet 13 is provided with a suitable indication designating which end thereof is of a polarity opposite that of the forward end of the magnet element 30 and which must be brought to the vicinity thereof to effect its attraction and the retraction of the plunger 29 and the opening of valve 12 and urethra 11. The valve sections, except for magnet element 30, should be formed of an inert, non-allergic, advantageously non-magnetic material not affected by the body fluids, and may advantageously be formed of a suitable ceramic or inert organic polymer such as the halogenated polyolefins, for example, polytetrafluoroethylene. Magnet elements 13 and 30 may be formed of any high strength permanent magnet material, for example, Alnico VIII.

In application, the valve 12 is implanted in the body 10 by conventional surgical procedures and is assembled about the trailing end of urethra 11 and locked in assembled condition by screws 21, with the cylinder 24 directed forwardly. The urethra 11 is normally maintained in a closed condition by plunger 29 which, under the influence of spring 28, effects the transverse contraction or pinching of the urethra. In order to open the urethra and permit the discharge of liquid therethrough, the subject merely brings the control magnet 13 to the area of the forward end of the cylinder 24 with the pole opposite to

that of the forward end of the magnet element 30 being directed thereto, thereby to attract the magnet 30 and retract the plunger 29 against the influence of the spring 28. The retraction of plunger 29 permits the opening of the urethra 11 by the liquid pressure therein, and following the excretion of liquid through the urethra it is returned to its closed position by the spring urged plunger 29 upon the withdrawal of the magnet 13. It should be noted that by dimensioning the spring 38 to the strength earlier set forth, the valve 12 functions as a safety release to prevent the excessive build up of pressure behind the urethra.

While there has been described and illustrated a preferred embodiment of the present invention, it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof. For example, the control permanent magnet 13 may be substituted by an externally positioned electromagnet and other fastening means than the screws 21 may be employed for locking the valve 12 in its assembled position.

What is claimed is:

1. A valve for controlling the flow of urine through the longitudinally extending urethra comprising a clamping device having an unimpeded longitudinal passageway adapted to receive said urethra whereby urine flow therethrough can be checked until release of the valve by bringing a control magnet thereto is accomplished, said clamping means including a first clamp member having a transversely extending first clamp face adapted to confront one side of said urethra, a second clamp member including a permanent magnet movable therewith and supported by said first clamp member for movement toward and away from said first clamp member along a path across said longitudinal passageway and including a second clamp face confronting said first clamp face and movable toward engagement there with along an area extending transversely of said passageway, and resilient means normally urging said second clamp member toward said first clamp member whereby a second magnet disposed externally of the body may be selectively actuatable alternatively to attract and release said first permanent magnet respectively to open said clamping means against the action of said resilient means and to release said clamping means to a closed position under the influence of said resilient means whereby respectively to open and close said urethra.

2. The combination of claim 1, wherein said second clamp means comprises a base member and said first clamp means comprises a plunger including said first permanent magnet and including guide means carried by said base member and slideably engaging and supporting said plunger in alignment with said base member.

3. The combination of claim 2, wherein said guide means comprises a cylinder extending transversely and having an outer end wall, said resilient means comprising a helical spring entrapped between said end wall and the opposing face of said plunger.

4. The combination of claim 2, wherein said permanent magnet is encapsulated in a non-corrosive material.

5. The combination of claim 1 wherein said resilient means is of a strength to urge said valve to a closed position with a force sufficient to maintain said urethra closed at a fluid pressure therein of 90 millimeters of mercury and to permit the opening of said urethra at fluid pressures exceeding 90 millimeters of mercury by a predetermined amount.

6. A valve for controlling the flow of urine through the urethra comprising clamping means adapted to be placed around the urethra whereby urine flow therethrough can be checked until release of the valve by bringing a control magnet thereto is accomplished, said clamping means including a first clamp member having a transversely extending first clamp face adapted to confront one side of said urethra, a cylinder mounted on said base member, a plunger slideably registering with

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said cylinder and including a permanent magnet having an axis extending along the length of said cylinder, said plunger having a transversely extending second clamp face confronting said first clamp face and being of lesser transverse cross-section than said cylinder to delineate a longitudinal passageway therewith, spring means positioned in said cylinder normally urging said plunger toward said first clamp member, whereby a second magnet disposed externally of the body may be selectively actuatable to attract and release said first permanent magnet respectively to open said clamping means against the action of said spring means and to release said clamping means against the action of said spring means to a closed position under the influence of said spring means whereby respectively to open and close said urethra.

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