Surgical Irrigating Device

Frederick L. McConnell, Saskatoon, Saskatchewan, Canada

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This invention relates to a device for mechanically
controlling the emptying and filling of the bladder of a
patient whose normal bladder function has been rendered
inoperative by illness.

In the case of numerous diseases and injuries, par-
ticularly those affecting the spinal cord, it is common for the
patient to lose voluntary bladder control. In such
cases the bladder may become either atomic or spastic
and will cease to function in the normal manner.

Heretofore it has been usual in cases where the patient
has lost voluntary control to resort to the use of a
catheter. In using the latter instrument, its application
is necessarily intermittent, and in the intervals between
voiding the bladder becomes distended. Over long
periods of such treatment, infection has been common,
and has been a frequent cause of death in patients so
affected.

It is a principal object of this invention to remove the
disadvantages of the treatment heretofore used by pro-
viding an appliance which proceeds on an entirely dif-
ferent principle from that involved in the ordinary
catheter.

It is a further object of this invention to provide an
appliance for the aforesaid purpose which in its function
causes the bladder to go through operations closely
approximating those of a normal bladder, and which will
accordingly assist the bladder in regaining its normal
function.

An accompanying object is to provide a device for the
aforesaid purpose which is simple and economical to
manufacture and which involves only the use in com-
bination of components which are readily available.

It is also an object to provide such a device which will
reduce the risk of infection, which is easily sterilized and
which can be readily operated by hospital personnel with-
out extensive supervision.

Another object is to remove the difficulty found with
the conventional treatment in that it is almost impossible
with prior art devices to prevent the beds from becoming
wet, and the present invention is therefore a boon to
nurses and hospital ordnaries.

A still further object is to eliminate the odor associated
with chronic urinary cases where a catheter is used.

In addition to the objects stated above, other objects
will be apparent from the specification as a whole, both
from direct reference to the device, and by implication.

A preferred embodiment of the invention will now be
described with the assistance of the accompanying
drawings wherein,

Figure 1 illustrates an oblique three-quarters view of
the device;

Figure 2 shows a cross-sectional view corresponding to
Figure 1 and cross-sectioned by a plane parallel to the
part denoted by reference numeral 2, and passing medially
through the parts denoted by reference numerals 4, 6,
11 and 14;

Figure 3 shows an enlarged, fragmentary cross-sectional
view of the parts denoted by reference numerals 11, 12
and 13, and,

Figure 4 shows an enlarged, fragmentary cross-sectional
view, as cross-sectioned at lines 4—4 in Figure 2.

While a particular embodiment has been illustrated
and will be hereinafter described, it will be appreciated
by one skilled in the art that this is given by way of
example only and that considerable modification may be
made without departing from the spirit of the invention.

With reference to the drawings, wherein the same refer-
ence numerals denote like parts in all figures, the device
is shown generally at 1, and will be referred to as irrigator
1. A number of tubes, preferable of glass or plastic are
required in the construction of this device, and it is
desirable that they should be rigidly mounted; for this
purpose a base such as mounting board 2 is provided.
Mounting board 2 may be supported in any convenient
manner, such as on a side table or attached to a wall
of the room.

A bladder tube, shown at 3, connects with the patient's
bladder by any suitable means, such as an indwelling
catheter, and the outlet tube of irrigator 1 is shown at 4
through which urine mixed with water (as will be
described below) is discharged to a drainage bottle or
other suitable disposal means.

Bladder tube 3 connects to a manifold tube shown at
5, which is preferably disposed in a horizontal position,
and rigidly attached to mounting board 5. Manifold tube
5 has connected thereto, and preferably integral therewith,
three substantially vertical tubes denoted as water tube
6, manometer tube 11 and siphon tube 14, all three of
which are also attached to mounting board 2, and will
be more fully described below.

Water tube 6 has at its upper end an enlarged portion
shown at 7 with a nozzle indicated at 8 inserted therein.
A valve shown at 9, which may be of the standard glass
tubing variety, controls the flow of water through nozzle
8 as will be described below. A supply tube shown at 10
makes suitable connection with a supply of water under
an appropriate pressure or head, so that continuous flow
of from twenty to thirty drops of water per minute may
be discharged through nozzle 8.

AnManometer tube 11 is not essential to the operation of
this device, but it is convenient since it is desirable to
know the pressure in the tube system in millimeters of
water or other units in reference to cysto-metograms.

At the upper end of manometer tube 11 it is desirable
to provide a small opening so that the pressure of the
air above the water column in manometer tube 11 may
be atmospheric and at the same time substantially closing
the tube so that dust and the like cannot enter. For
this purpose it has been found satisfactory if the upper end
is closed by a stopper shown at 12, and stopper 12 is
pierced by a hollow needle shown at 13 which may be
a hypodermic needle of a suitable size such as No. 20—
No. 24 gauge, with its bevelled point protruding down into
manometer tube 11. Changes in the liquid level in
manometer tube 11 do not occur rapidly except when the
liquid is discharging through outlet tube 4, as will be
described below, and the lumen of needle 13 is adequate
to admit the amount of air required to maintain substan-
tially atmospheric air pressure inside manometer tube 11.

For further convenience in setting up the irrigator 1
so that the manometer readings are of significance, a
bladder level line shown at 19 is preferably marked on
mounting board 2, and a vertical scale shown at 20 is
also provided, calibrated for instance in millimeters of
water.

Siphon tube 14, also disposed vertically on mounting
board 2 is connected to a U-tube shown at 15 by means
of a length of flexible tubing shown at 16. The opposite
end of U-tube 15 connects with outlet tube 4, and in the present embodiment the latter is preferably flexible. It is desirable that the vertical position of U-tube 15 be capable of being varied, and to allow this to be done a vertical rod shown at 17 is provided rigidly attached to mounting board 2, and the U-tube 15 is held in a predetermined vertical position in relation to rod 17 by means of a stop shown at 18 of any suitable design. It will be appreciated that instead of mounting board 2 and rod 17 for supporting the various tubular components, a framework of rods suitably connected together may be provided, after the manner of the racks used for mounting laboratory equipment, and if such a framework is used, a part corresponding to rod 17 would be merely one of the elements of such framework.

The operation of the device described above will be apparent from the foregoing description, but for greater certainty will now be outlined. The device is first set up so that the bladder level line is on a level with the pubic symphysis of the patient. Bladder tube 3 is then connected to the patient’s bladder by conventional means. Valve 9 is next opened to an extent sufficient to allow a discharge of from twenty to thirty drops per minute into the enlarged portion 7 of water tube 6. After this discharge has taken place, the frequency of function of the device will become apparent, and valve 9 may be re-adjusted in accordance with the patient’s bladder capacity and rate of urine secretion, so that discharge through outlet 4 takes place at whatever intervals are desired, for example every half hour.

As the water from nozzle 8 flows into tube 6, the water level rises in the latter, and the level also rises in manometer tube 11 and syphon tube 14. Simultaneously, water will flow through bladder tube 3 into the patient’s bladder, which, together with the urine collecting therein, builds up pressure in the bladder which will be in accordance with the connecting tubes of irrigator 1.

After a period depending on the aforesaid factors, the water level in siphon tube 14 will rise as far as the horizontal portion of U-tube 15, and finally some liquid flows over into discharge tube 4. The descending liquid in discharge tube 4 causes siphon action to occur, and thereafter liquid commences to flow downwardly through outlet tube 4 at a rapid rate, and such rapid flow will continue until the liquid is substantially emptied from irrigator 1 and from the patient’s bladder.

The principles of siphons are well understood, and need not be reiterated as applied to this invention. It will only be mentioned that in order to have the siphon operate properly, the discharge end of outlet tube 4 must be kept a substantial distance (of the order of thirty inches) below the lowest point from which it is desired that liquid will be withdrawn, i.e., manifold tube 5.

After siphon action has caused a discharge of liquid as referred to above, the cycle begins over again. Water continues to flow from nozzle 8 into water tube 6 and the water is forced into the patient’s bladder again, and also up through manometer tube 11 and siphon tube 14 until the discharge level has been reached in the latter, when there is again a rapid discharge.

While the embodiment of the invention just described is capable of considerable modification, it has been found by the inventor to operate very successfully in the form shown. One such device was still continuing to function without any difficulty after five months of continuous use, and several like devices have operated entirely successfully for lesser periods.

While water has been referred to as the fluid supplied to irrigator 1, this has been used by way of example, and it is thought preferable to use an irrigating fluid of normal (isotonic) saline solution.

As in common with surgical appliances, cleaning must be effected at regular intervals, and with the present apparatus it is satisfactory if it is cleaned and sterilized every five days. For sterilizing, any suitable urological disinfectants can be used, and sterilization proceeds in a manner similar to that used with cystoscopes and other urological apparatus.

When the irrigator 1 is first placed in use with a patient who has lost voluntary control, it is usual to find that considerable sediment has collected in the patient’s bladder, and the discharge from discharge tube 4 will thus contain considerable sediment. When this condition is present, the irrigator 1 should be disconnected and the bladder properly irrigated until the return is clear. After this is done, the irrigator 1 will prevent any further accumulation of urinary sediment.

It will be seen that the invention described herein represents a considerable improvement over conventional apparatus, prevents infection in treatment of the kind referred to, is simple and economical to produce and operate and is advantageous to both patients and those administering treatment.

1. A surgical irrigating device comprising a mounting frame, a horizontally-disposed manifold tube attached to said frame, said manifold tube being open at one end for connection to the bladder of a patient, a vertical tube connected at its lower extremity to said manifold tube, means at the end of said vertical tube opposite said manifold tube for admitting liquid at a predetermined rate, a second vertical tube substantially parallel to said first vertical tube and also connected at its lower extremity to said manifold tube, a U-tube flexually integral with and flexibly connected to said second vertical tube, and a level line on said mounting frame substantially perpendicular to said vertical tubes for guidance in the operation of the device.

2. A surgical irrigating device comprising a substantially rectangular mounting frame, a vertical tube attached to said frame and substantially parallel to a long side of said mounting frame, means attached to said vertical tube for admitting liquid to said vertical tube at a predetermined rate, a second vertical tube attached to said frame and substantially parallel to said first vertical tube, a horizontal tube connecting the lower extremities of said two vertical tubes, said horizontal tube being open at one end for connection to the bladder of a patient, a U-tube attached to said frame substantially parallel and flexibly attached to said second vertical tube, said U-tube being inverted with relation to said horizontal tube.

3. A surgical irrigating device comprising two vertical tubes, means at the upper end of one of said vertical tubes for admitting liquid at a predetermined rate, an inverted U-tube having one leg connected to the upper end of the other of said vertical tubes, the other leg of said U-tube being adapted for connection to a syphon tube, a manifold connecting the lower extremities of said vertical tubes, said manifold having an outlet adapted to receive a connection from the bladder of a patient, and said patient being positioned below the lower extremities of said vertical tubes and at the lowest extremity of said manifold.

References Cited in the file of this patent

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Copies in Division 55.