

April 16, 1935.

M. F. DOW

1,998,225

CATHETER

Filed May 9, 1932

FIG. 1

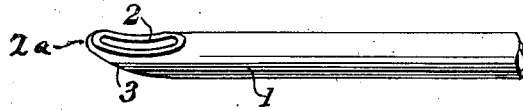


FIG. 2.

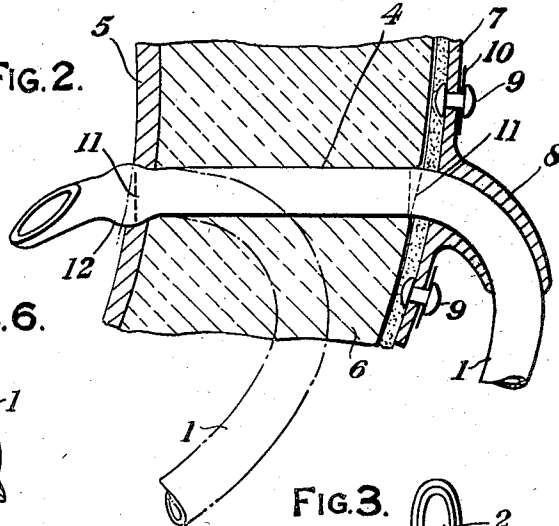


FIG. 6.

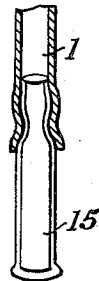


FIG. 3.

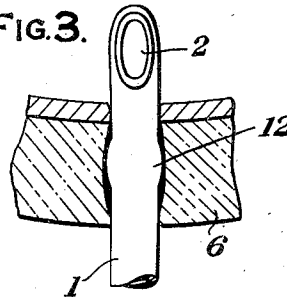


FIG. 4.

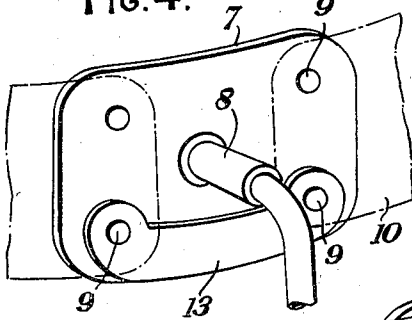
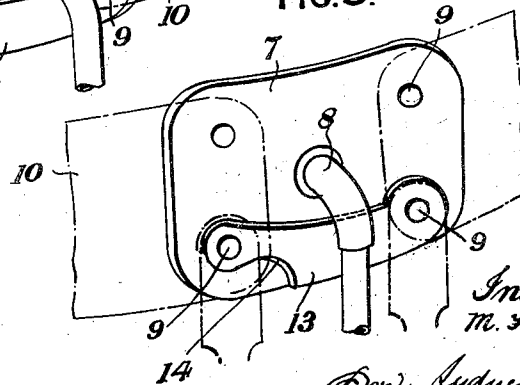


FIG. 5.



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UNITED STATES PATENT OFFICE

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CATHETER

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5 Claims. (Cl. 128—349)

This invention relates to catheters of the kind used in certain diseases of the body where it becomes necessary to evacuate the bladder artificially. The catheter usually of flexible rubber is inserted into an artificial canal extending from the wall of the bladder and through the abdominal wall and epidermis to evacuate the contents of the bladder by a syphon action, for which a receptacle is secured at the other end of the catheter. The catheter is held in position by a pad including a canula through which the catheter is passed before entering the canal and the pad is secured to the body against the abdominal wall by a belt, a dressing being interposed between said pad and wall.

Main objects of the present invention are to construct a catheter which will give the maximum comfort to the user, and to construct a catheter which seals the artificial canal and prevents leakage between the canal and the catheter. Another object is to provide apparatus including a catheter of the kind referred to which is comfortable to wear and which is supported in such a manner as not easily to move the catheter and cause discomfort or leakage. Another object is to provide such a construction of apparatus in which a visible indicator is provided showing internal pressures are occurring which must be eliminated to avoid leakage.

Further and other objects will be understood from the following description and appended claims.

The catheters which form the subject of the present invention are of the kind comprising relatively pliable material and accordingly to be distinguished from catheters of perfectly rigid form or those usually employed for irrigation purposes.

In a surgical apparatus according to the present invention the catheter is of pliable nature, and is formed with an aperture reaching the head, the underside of which is shaped away as a spoon. By making the aperture reach the head and by shaping away the underside of the head, the least possible amount of material of the catheter is entered into the bladder.

Conveniently the catheter is curved from the head, the advantages of which will be hereafter more fully explained, but briefly the curvature disposes the catheter obliquely at the junction of the bladder and abdominal walls, and accordingly this inner junction of the canal is disposed on a major axis of an elliptical section of the catheter, hence a distension of the junction occurs producing a seal thereat between the catheter and canal.

If the curved form is extended sufficiently a similar seal may obtain at the outer junction of the canal, though it is preferred to depend on the internal seal and leave the outer entrance to the canal free for the injection of cleansing fluids. Moreover, the intermediate curvature tends to cause the wall of the canal itself to cling to the catheter in such a manner as to oppose the passage of liquid between the catheter and canal walls.

A catheter according to the invention may be bulged immediately behind that part intended to lie at the inner junction of the canal and thereby form an ancillary device opposing leakage, or a bulge may be formed so as to be disposed in the canal itself and cause a local distension producing a drawing up of the canal wall on to the catheter, and thereby form a seal against leakage.

A catheter curved from the head rearwardly according to the invention may be made by first forming a tube of rubber, and then coiling the tube from the head outwardly on a former (conveniently of metal) adapted to retain the coiled shape, particularly forming the first bend so that the head of the catheter is compressed axially and bulged rearwardly thereof at the predetermined point, thereafter the coiled catheter is treated, e. g. by boiling, to retain the "set" at the head.

A catheter in accordance with the invention is preferably used in combination with a pad including a canula through which the catheter passes and studs to each side thereof for attachment to a belt; this combination with a catheter and pad is, in accordance with the invention, characterized by a removable rigid member bridging the canula and connecting the studs, whereby the catheter is retained against lateral displacement. The rigid member has the effect of limiting movements of extension to the belt and eliminating them from the pad so that the catheter is not rocked or moved laterally with regard to the canula, which movement, if permitted, tends to cause a leakage between the catheter and the wall of the canal.

In order that the invention may be more clearly understood reference will now be made to the accompanying diagrammatic sketches which show by way of example some embodiments of the present invention.

Referring to the drawing:

Fig. 1 is a pictorial view of the head of a catheter constructed according to the invention;

Fig. 2 is a diagrammatic drawing showing in elevation the employment of a curved catheter

with a bulge at the inner junction of the canal;

Fig. 3 shows a modified form of the catheter;

Fig. 4 is a pictorial view showing a support for use in combination with a catheter according to the invention;

Fig. 5 shows a modified form of rigid member; and

Fig. 6 shows in elevation a transparent stopper which may be used with the apparatus.

Fig. 7 is a pictorial view illustrating a method of forming the catheter head.

As shown in Fig. 1 a catheter according to the invention includes at the head 1 an aperture 2 leading to the bore thereof, which bore extends to the tip of the head, the underside of the head being shaped away beneath the aperture as indicated at 3, thereby giving a spoon-like configuration to the head of the catheter. By such a formation of the head of the instrument the minimum discomfort obtains because the minimum amount of catheter is entered into the organ being evacuated. It will be noted that there is only a narrow rim of material 2a between the aperture 2 and the extremity of the tube. From such construction a larger aperture than has been hitherto obtained may result. For example, for all numbers of catheters up to and including gauge 21, the length measurement of the aperture may be $\frac{5}{8}$ in., and for gauge 22 and larger sizes, the length may be $\frac{3}{4}$ in.; in each case the width of the aperture will be as much as the gauge permits.

It is found in practice that in spite of the employment of a dressing between the pad and the outer end of the canal a considerable leakage occurs. It appears that there are two reasons for the leakage, one is that the canal hardens up to a diameter substantially equivalent to that of the catheter, and accordingly when the bladder is full, liquid exudes between the two. The other reason for leakage consists in the fact that the movement of the person causes distension of the rubber belt, and consequential movements of the pad relatively to the canal; hence the catheter is rocked, that is, moved laterally, and any liquid between the canal and the catheter is released; alternatively the movement of the catheter enlarges the wall of the canal and occasions a leakage between the catheter and the canal.

To prevent leakage between the canal and the catheter, the latter may, according to the present invention, be curved rearwardly from the head in a spiral. The employment of a curved catheter according to the invention for the purpose of evacuating the bladder of a person is diagrammatically illustrated in Fig. 2, in which the artificial canal 4, formed between the bladder 5 and the epidermis of the abdominal wall 6, has inserted in it a catheter of curved form. The shape of the catheter before insertion in the canal is shown by the dot and dash lines, and, as will be seen, that part of the catheter in the canal is caused to assume an approximately straight line, but owing to its curvature it presses against the bottom of the canal at each end, and also against the top of the canal towards the center.

Further, owing to the curved form of the catheter, the ends of the canal are required to engage over the catheter on an elliptical section, that is, engage over the major axis 11 of the elliptical section, hence there is a distension of the inner end of the canal and a seal formed between the canal and the catheter. The outlet end of the catheter is carried in a pad 7 having a relatively rigid short canula 8 extending therefrom,

and which forms a bearing for the catheter. These pads carry studs 9 to which the ends of a belt indicated by chain lines 10 are secured.

It should be noticed that the inner end of the canal, that is, at the junction of the canal with the bladder wall is not so elastic as the wall of the canal itself, hence the seal formed is more or less of a permanent nature, and by curving the catheter the canal is strained longitudinally in straightening that part of the catheter in the canal, thereby causing the canal to bind on to the catheter by reason of the radial contraction enforced throughout its length. The same contraction occurs at the outer end, that is, at the junction of the canal with the abdominal wall.

A catheter according to the invention may be bulged as indicated at 12 in Figs. 2 or 3. By making a bulge for a part only of the catheter within the canal and juxtaposed to the inner junction as shown in Fig. 2, the canal wall is not unduly strained, the expansion being taken up throughout the length of the wall. By such manner an ancillary seal is obtained by the catheter. The bulge may be towards the middle of the canal, and then a deformation of the longitudinal wall at once occurs locally as indicated in Fig. 3. The bulge 12 may be included in the catheter of curved form according to the invention, and in such case an additional assurance against leakage is provided.

Considering now the means for preventing lateral or rocking movement of the catheter, the pad 7 (Fig. 4) through which projects the canula 8, is provided with a demountable or detachable rigid member 13 which may be of bone, and which engages the studs 9 on either side thereof. Such a member may be used above as well as below the canula 8. By preventing the distension of the pad 7 all expansions of the abdomen during breathing or respiratory movements are taken up by the belt and prevented from being communicated to the pad, hence lateral movements are eliminated and any tendency for the catheter to distend the canal radially is eliminated.

The rigid members may be of the form shown in Fig. 4, or the rigid members may be shaped, as indicated in Fig. 5, where the inconvenience of rubbing action from surgical appliances may be avoided. For instance as shown in Fig. 5, the lower part of the rigid member 13 may be cut away as indicated at 14 to avoid a support where the patient is suffering from the effect of rupture.

In forming the catheter with a curved portion from the head rearwards and with a bulge in the curved portion, the catheter may be first made in the form of a tube from rubber, and inside the tube may be inserted a length of wire which comes out at the aperture to it. The tube and wire are then doubled back and then coiled around the doubled back portion, thereby making the bends in strict conformity to the ultimate requirements which have to be predetermined, and the head of the catheter is compressed axially and bulged. In order to obtain a permanent set with the bulged head of the catheter the same may be boiled for a prolonged period with the former in situ, and when the treatment is finished the tube may be uncoiled and the former removed.

By the present invention a surgical apparatus is provided for treatment of cases in which the normal organs do not effect evacuation of the bladder, which is effective in use, and more com-

portable than has heretofore been constructed, and in which the discomforts of leakages are entirely eliminated.

When the usual receptacle is removed it is usual to temporarily plug the free end of the catheter. In practice it is shown that an internal pressure is soon set up engendering conditions culminating in initiating a leakage.

According to a further part of this invention a transparent receptacle, preferably of glass, is employed at the free end of the catheter; the receptacle may be in the form of a hollow stopper 15 as shown in Fig. 6. The patient has then a visible indication when the catheter is full, and can immediately take the necessary measures to prevent an internal pressure being set up.

Instead of a glass stopper as shown in Fig. 6, a light, transparent rubber envelope (preferably of elongated form) may be attached to the catheter by a connecting tube of light material, e. g. vulcanite, so that practically only the weight of the liquid in the envelope is pulling on the catheter during relatively long periods when the patient may be relieved of the usual receptacle secured to the leg. The connecting tube may be formed with a ridge at each end, and the envelope with a neck which can be pushed over the rib and obtain a secure connection, the other end of the tube being inserted in the free end of the catheter to an extent such that the ridge is located therein.

What I claim is:

1. In combination a tubular catheter closed at one end to form the head of the catheter of the same diameter as the tube from which head the catheter is made and formed with the aperture to the bore disposed on the side of the catheter and reaching to the head, the underside of which head is shaped away as a spoon, a pad including a canula through which the catheter passes, and studs to each side thereof for attachment of a belt, characterized by a removable rigid member straddling the canula and connecting the studs, whereby the catheter is retained against lateral displacement.

2. In combination a tubular catheter closed at one end to form the head of the catheter of the same diameter as the tube from which head the catheter is made and formed with the aperture to the bore disposed on the side of the catheter and reaching to the head, the underside of which

head is shaped away as a spoon, a pad including a canula through which the catheter passes, studs to each side thereof for attachment of a belt, characterized by a removable rigid member straddling the canula and connecting the studs, whereby the catheter is retained against lateral displacement, and a transparent receptacle whereby visible indication is provided when internal pressures exist for the purpose set forth.

3. Apparatus according to claim 2 wherein the transparent receptacle is in the form of a hollow glass stopper.

4. In combination a tubular catheter of the kind referred to closed at one end to form a head the same diameter as the tube from which the catheter is made and formed with the aperture to the bore disposed on the side of said tube and reaching to the head, the underside of which head is shaped away as a spoon, the catheter being curved, immediately behind the said aperture, from the head rearwards with the aperture outwards, and including an integral bulge immediately behind the aperture, thereby forming an ancillary device opposing leakage all round the catheter, a pad including a canula through which the catheter passes, and studs to each side thereof for attachment of a belt, characterized by a removable rigid member straddling the canula and connecting the studs, whereby the catheter is retained against lateral displacement.

5. In combination a tubular catheter of the kind referred to closed at one end to form a head the same diameter as the tube from which the catheter is made and formed with the aperture to the bore disposed on the side of said tube and reaching to the head, the underside of which head is shaped away as a spoon, the catheter being curved, immediately behind the said aperture, from the head rearwards with the aperture outwards, and including an integral bulge immediately behind the aperture, thereby forming an ancillary device opposing leakage all round the catheter, a pad including a canula through which the catheter passes, studs to each side thereof for attachment of a belt, characterized by a removable rigid member straddling the canula and connecting the studs, whereby the catheter is retained against lateral displacement, and a transparent hollow glass stopper removably attached at the free end of said tubular catheter.

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