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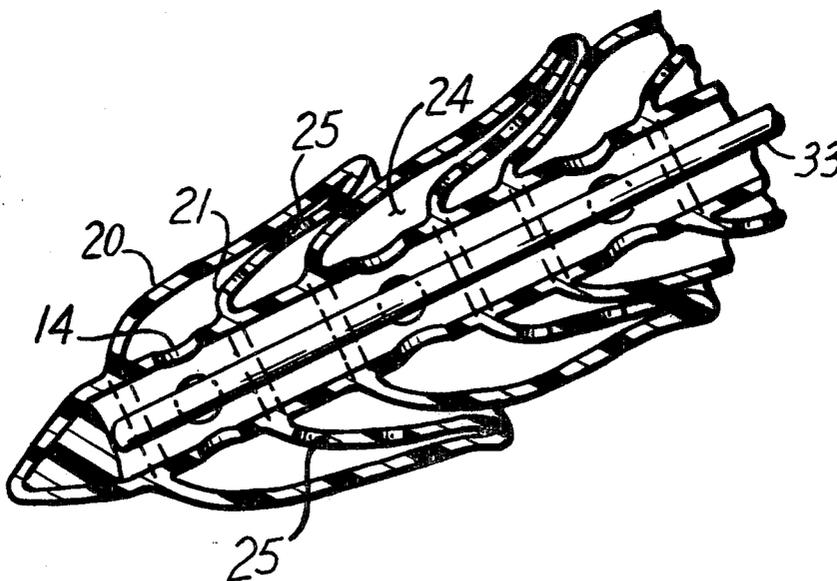
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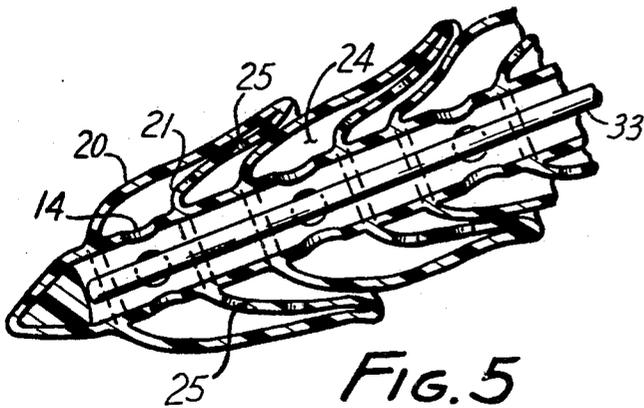
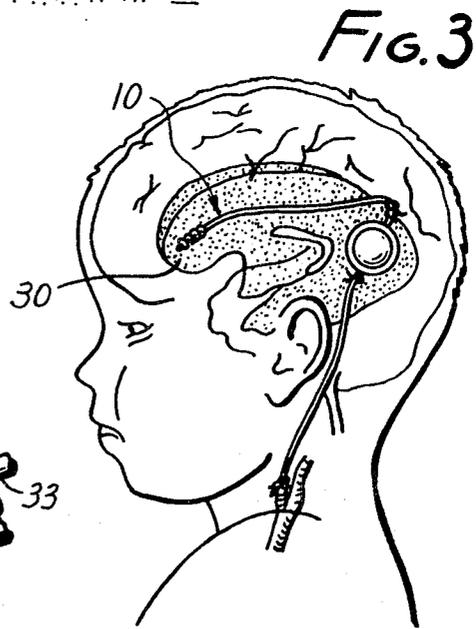
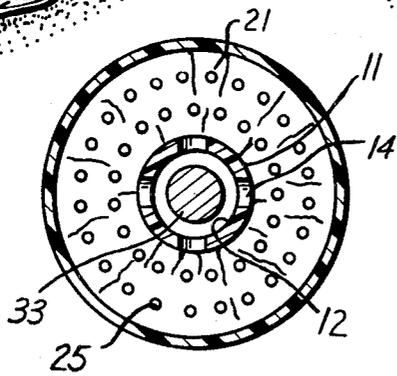
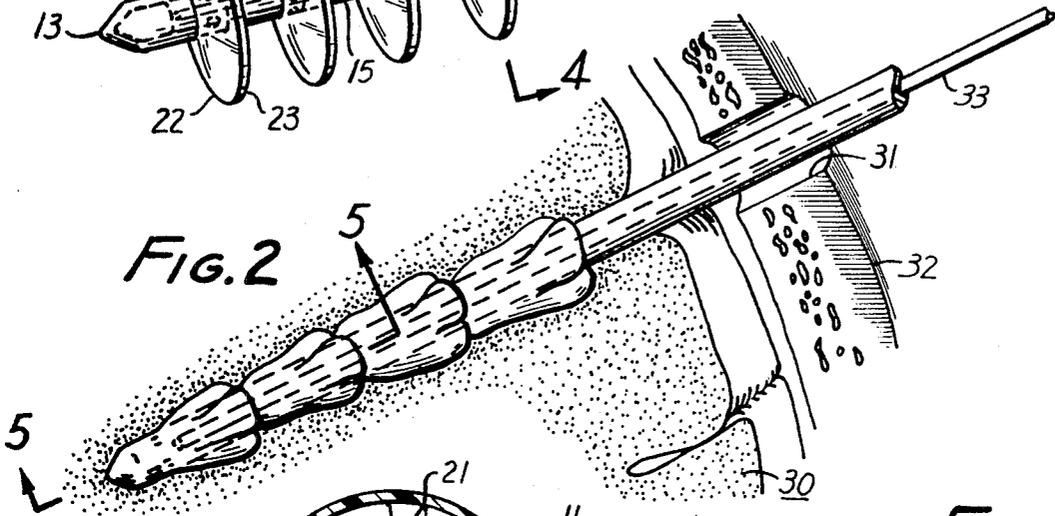
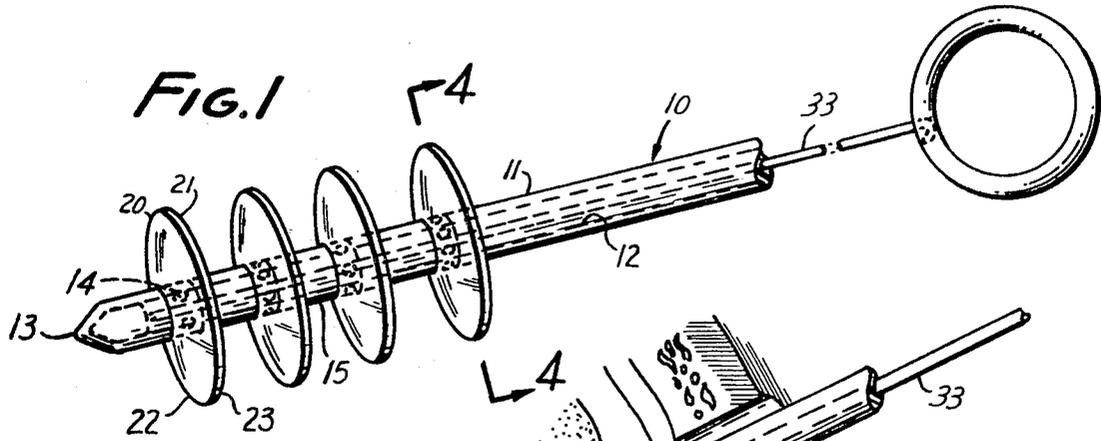
[54] **CATHETER WITH AUGMENTED DRAINAGE MEANS**  
 5 Claims, 5 Drawing Figs.

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 128/245  
 [51] Int. Cl. .... **A61m**  
 27/00  
 [50] Field of Search ..... 128/348,  
 349 R, 349 B, 350 R, 350 V, 351, 245

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**ABSTRACT:** A catheter for the drainage of a region of the human body into which region one end of the catheter is inserted, usually by means of an axial force. Means is provided for augmenting the drainage area of the catheter whereby to minimize clogging by such particulate matter as may be present in the region to be drained. In addition, means may be provided to shroud at least some of the drainage means while the catheter is being thrust into the region. The catheter comprises a pair of flexible fins which surround a catheter tube on each side of a passage through its wall. The passage is an inlet means to the lumen of the tube. These fins are joined to each other at a peripheral junction so as to form a chamber in communication with the passage. A plurality of perforations through at least one of the fins augments the inlet means in the sense of providing an increased total flow channel to the lumen of the tube without requiring enlargement of the passage, which could risk the passage of particulate matter of excessive size.





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## CATHETER WITH AUGMENTED DRAINAGE MEANS

## CROSS-REFERENCE TO OTHER PATENT APPLICATION

This is a continuation-in-part of applicant's copending U.S. Pat. application, Ser. No. 844,559, filed July 24, 1969, entitled "Non-Clogging Catheter."

This invention relates to a catheter for the drainage of fluids from within the human body.

A conventional catheter is a tube with an axially extending lumen which, near one end thereof has a passage in the nature of an inlet port extending between the lumen and the outer wall. After the catheter is thrust in to a region holding unwanted fluids, the fluid may enter the inlet port and flow through the lumen to be disposed of either outside the body or in some region within the body where a further disposal process takes place.

A well-known application for such a catheter is in the alleviation of the symptoms of hydrocephalus. In such cases, a catheter is thrust into the ventricles of the brain in order to drain unwanted fluid therefrom, and is then led through the jugular vein into the heart so that the fluid from the ventricles enters the blood stream and is disposed of in the process of purification of the blood.

A problem encountered with conventional catheters is that the debris created by its insertion may clog the inlet port during the insertion process. Furthermore, in applications such as in drainage of the brain, the matter of the brain is thrust aside upon insertion and when the brain is decompressed by drainage of the fluid, it tends to bear against the wall of the catheter, thereby potentially clogging the inlet port. Also, the fluids to be drained are frequently burdened with particulate matter which can clog up single openings as so often are provided in conventional catheters. It is an object of this invention to provide means whereby the catheter may be rendered substantially nonclogging and nonoccludable both during the process of insertion and during the time that it remains inside the region to be drained, and also having augmented means whereby to increase the number of drainage ports without weakening the tube and without requiring enlargement of the port itself.

A catheter according to this invention comprises a tube having an internal longitudinal lumen with an inlet port or passage passing through its wall to the lumen. A pair of circumferential flexible fins are attached to the outer wall of the tube on each side of the opening and are connected to each other's peripheries so as to form a chamber between them in fluid communication with the inlet port. A plurality of perforations is provided in at least one of the fins and may be provided in both. Advantages are obtained when only that one of the fins of each pair which is the farther from the tip is perforated.

The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawings in which:

FIG. 1 is a perspective drawing showing the presently preferred embodiment of this invention together with a tool for its insertion;

FIG. 2 is a perspective drawing partly in cutaway cross section showing the catheter of the invention in the process of being inserted into the brain;

FIG. 3 shows the device of FIGS. 1 and 2 in the brain;

FIG. 4 is a cross section taken at 4—4 of FIG. 1; and

FIG. 5 is a axial cross section taken at line 5—5 of FIG. 2.

The presently preferred embodiment of the invention is shown in FIG. 1 wherein a catheter 10 is shown which includes an elongated tube 11 having a central lumen 12 comprising a cylindrical interior bore ending at a closed tip 13.

Drainage means 14 comprising a laterally extending hole extending between the lumen 12 and outer wall 15 of the tube is provided to permit fluid from outside the tube to be drained to the internal lumen and thus to be removed from the body. In the prior art, such drainage means (hereinafter frequently referred to as drain ports) have been all the openings which

exist, and these have been subject to clogging by particulate matter contained in the fluid to be drained and also by contact with the surrounding tissue which has been pushed aside upon insertion of the catheter itself.

It is an object of this invention to increase the drainage cross section of the drainage means without, however, permitting passage of very large particulate matter which downstream in the heart or in the jugular vein might cause distress or damage to the person. For example, were ports 14 to be made quite large and large particulate matter to be discharged into the heart, then damage to the heart valves, or occlusion of various ones of the veins and arteries might occur which could cause a stroke. In the instant device, an augmented drainage cross section is provided without increasing the risk of passage of particulate solid material.

Furthermore, this is accomplished while still providing, if desired, means for shrouding the ports 14 during the time when the catheter is forced into the region which it is to drain.

According to this invention, a pair of circumferential fins 20, 21 are bonded to, or otherwise formed integrally with, outer wall 15. These include annular dislike surfaces which are joined at their outer peripheral edges 22, 23 respectively by cementing or fusion so as to form inside chambers 24, which chambers are in fluid communication with respective ones of ports 14.

Either one or both of each pair of fins is provided with perforations 25 to provide for admission of fluids from the surrounding region into the chamber. According to a preferred but optional feature of the invention, and as best shown in FIG. 5, these perforations are provided only in the fins which are on the opposite side of the tip from the other member of the respective pair of fins.

Accordingly, with reference to FIGS. 2 and 5, when the catheter is thrust into brain 30 through a hole 31 formed in the skull 32 by axial force exerted on the end of a thrust rod 33, the fins will be deflected rearwardly, and those which are exposed to the material of the brain will shroud the perforations. Thereafter when pressure is relieved, and as best shown in FIG. 3 the material of the catheter will spring back and the fins will restore themselves to their generally annular shape, thereby exposing their perforations to fluid in the brain.

It will thereby be understood that this device provides a means optionally for shrouding the perforations of the catheter upon insertion into the brain or the region to be drained, and thereafter when the means for insertion is removed, to provide an augmented inlet means such that a particle of material might clog up one perforation, but not the inlet passage, so that the device is not disabled. The perforations in the fins would preferably be smaller than the diameter of port 14. The entire structure is preferably made of medical grade silicone rubber, and joined as appropriate by a similar type of cement.

This invention is not to be limited by the embodiment shown in the drawings and described in this description which is given by way of example and not of limitation but only in accordance with the appended claims.

I claim:

1. A catheter for the drainage of fluid such as hydrocephalus fluid from the region of the human body into which the catheter is inserted by an axial force exerted at its tip end, which region contains substances likely to close or to clog the catheter such as by dislodged debris or by occlusion occasioned by abutment of matter in said region, said catheter comprising: a tube having an internal longitudinal lumen, an outer peripheral wall, a closed tip end, an inlet port space from the tip end and passing through said outer wall to said lumen, a first and a second flexible fin each making a full peripheral sealing contact with the outer peripheral wall and extending entirely around the tube, the first fin being disposed on the side of the inlet port closer to the tip end, and the second fin being disposed on the opposite side thereof, the fins being joined peripherally to form a chamber between them and the said outer wall, said chamber structure formed by the

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fins being springly flexible so as to exert springback force against a surrounding environment, thereby to maintain the fins in their general shape of a double ended frustoconical member, said chamber being in fluid communication with the said inlet port, one of the fins having a plurality of perforations therethrough to admit fluid into said chamber, said tube being further provided with a plurality of such chambers and inlet ports, identical to that defined above, spaced-apart axially along said tube.

2. A catheter according to claim 1 in which the said perforations are formed in the said second fin, whereby when the

catheter is thrust into said region by an endwise force, the fin folds and shrouds the perforations in the said second fin.

3. A catheter according to claim 1 in which said perforations are formed in both the said fins.

4. A catheter according to claim 1 in which the fins and the tube are made of silicone rubber.

5. A catheter according to claim 4 in which the fins and the tube are connected together with the silicone adhesive so as to form a substantially continuous body.

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