United States Patent

Rassieur

[15] **3,640,354**

[45] **Feb. 8, 1972**

[54] **HOLLOW-STEM AUGER HEAD WITH SEAL**

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[73] Assignee: **Central Mine Equipment Company,** St. Louis, Mo.

[22] Filed: **Nov. 24, 1969**

[21] Appl. No.: **879,239**

[52] **U.S. Cl.** **175/243,** 166/224

[51] **Int. Cl.** **E21b 27/00**

[58] **Field of Search** 175/243, 226, 318; 166/187, 166/224, 84; 251/5; 137/320, 525.1, 525.3

[56] **References Cited**

UNITED STATES PATENTS

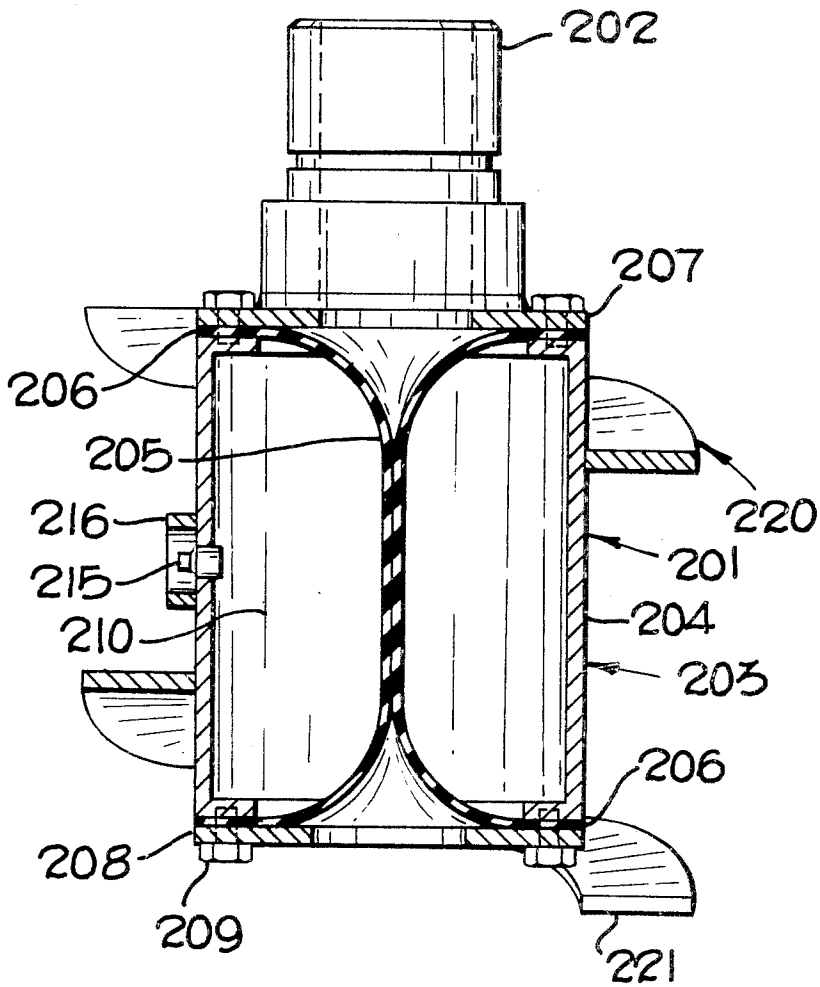
2,897,835	8/1959	Philippe	137/525.1 X
3,074,493	1/1963	Bennett	175/107
3,370,659	2/1968	Gatien	175/318
3,490,551	1/1970	Gatien	175/318

Primary Examiner—Stephen J. Novosad
Attorney—Polster and Polster

[57] **ABSTRACT**

In a hollow-stem auger, wherein sampling tools are to be used through the hollow auger passage, a flexible seal is provided in the head which prevents or inhibits sand and the like from moving into the auger passage, but which permits a sampling tool to pass through.

5 Claims, 11 Drawing Figures



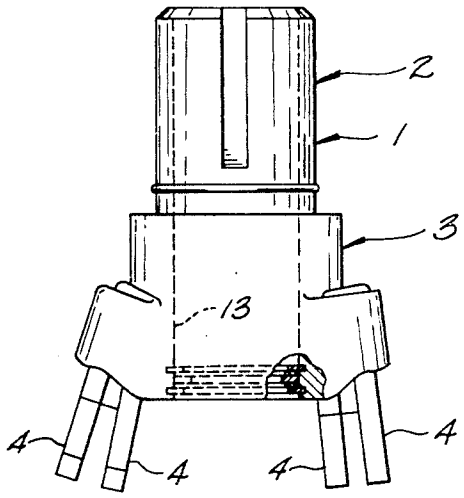


Fig 1

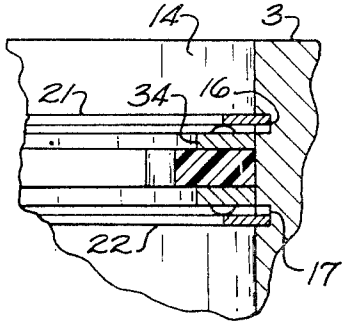


Fig 3

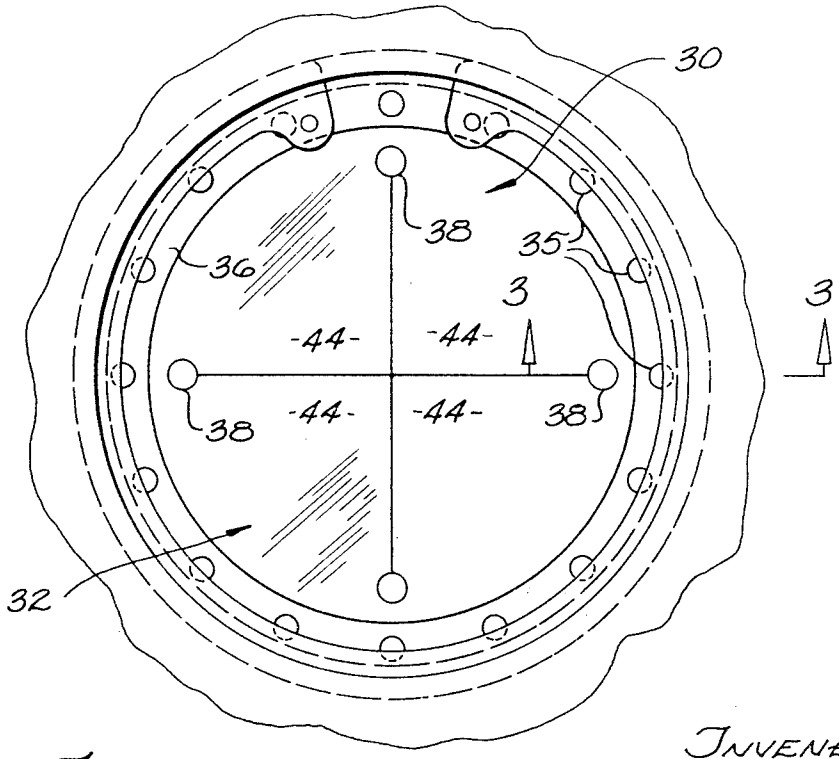


Fig 2

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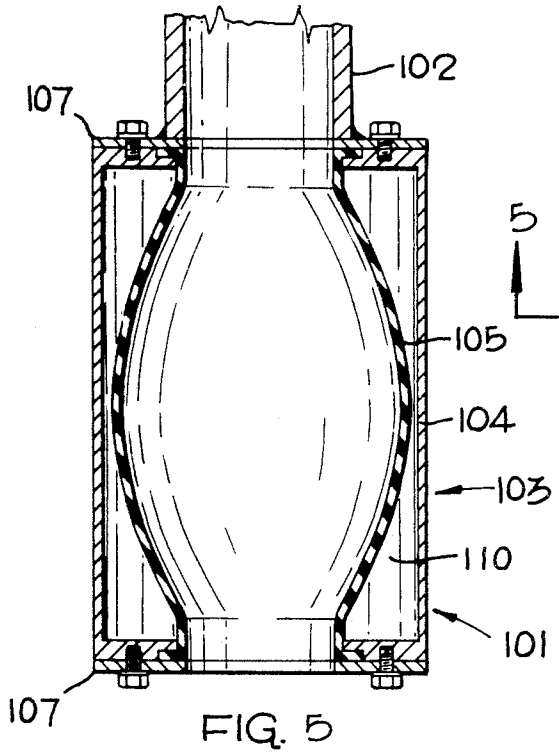


FIG. 5

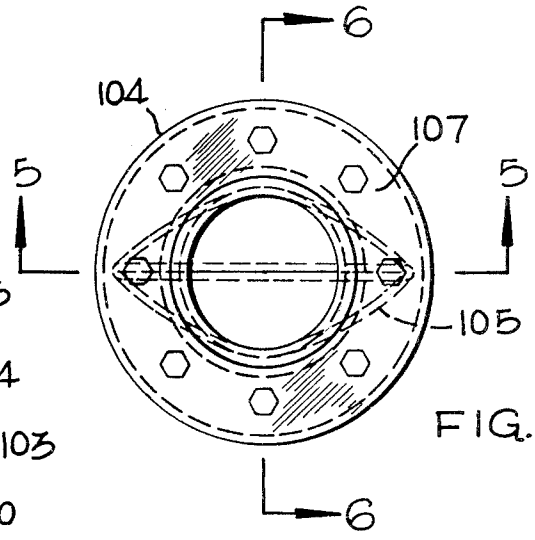


FIG. 4

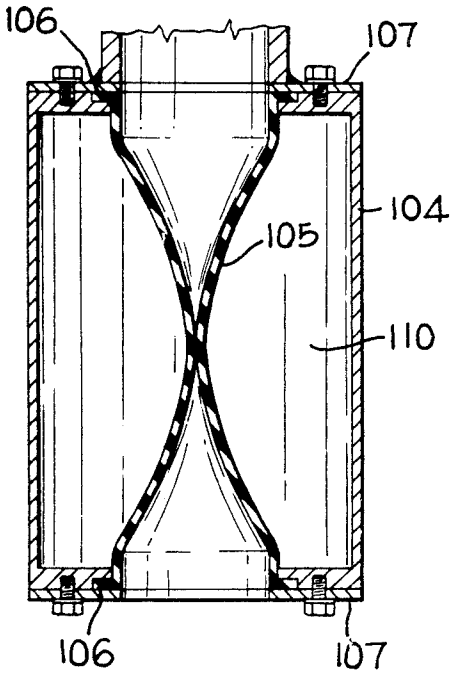


FIG. 6

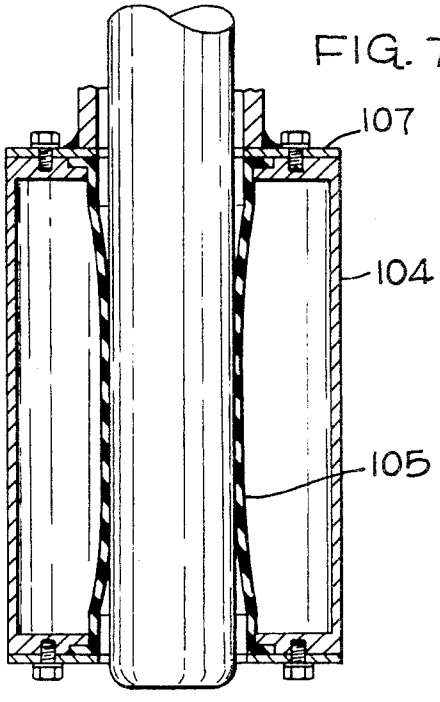


FIG. 7

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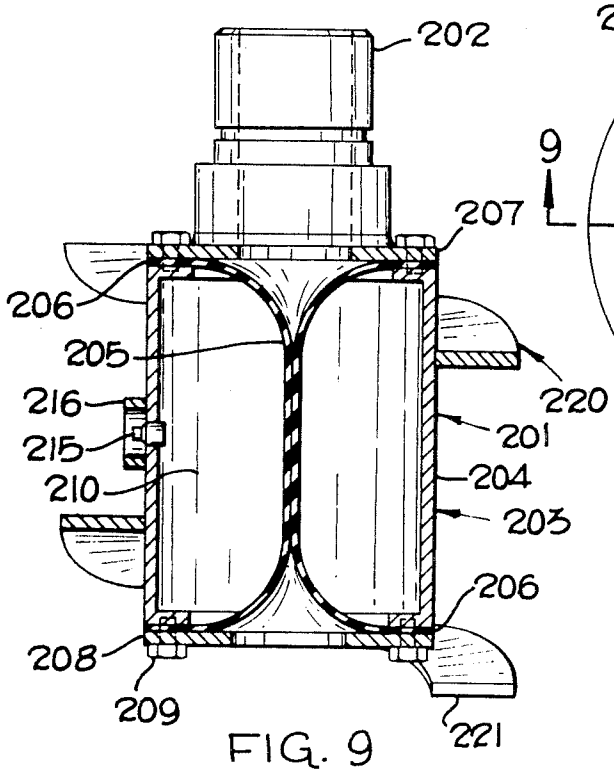


FIG. 9

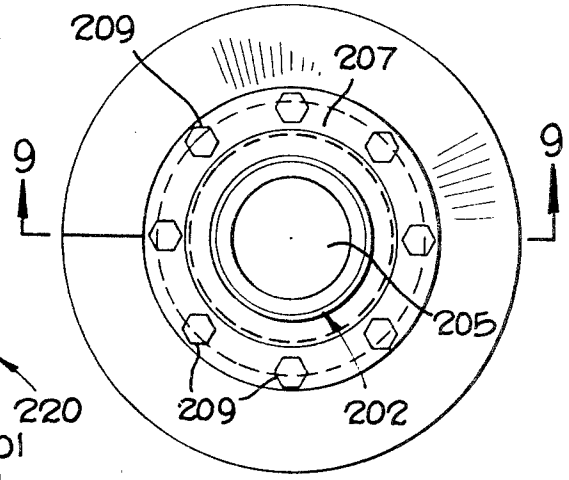


FIG. 8

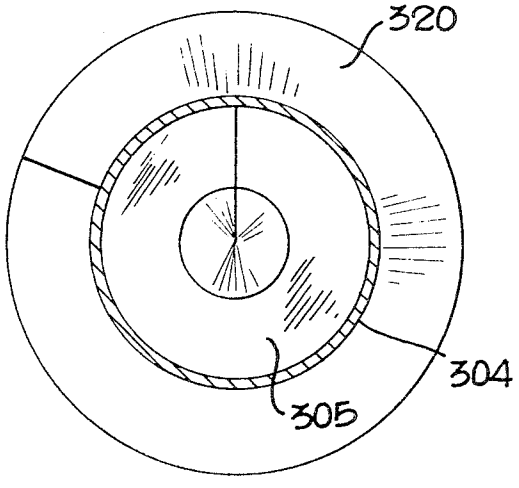


FIG. 11

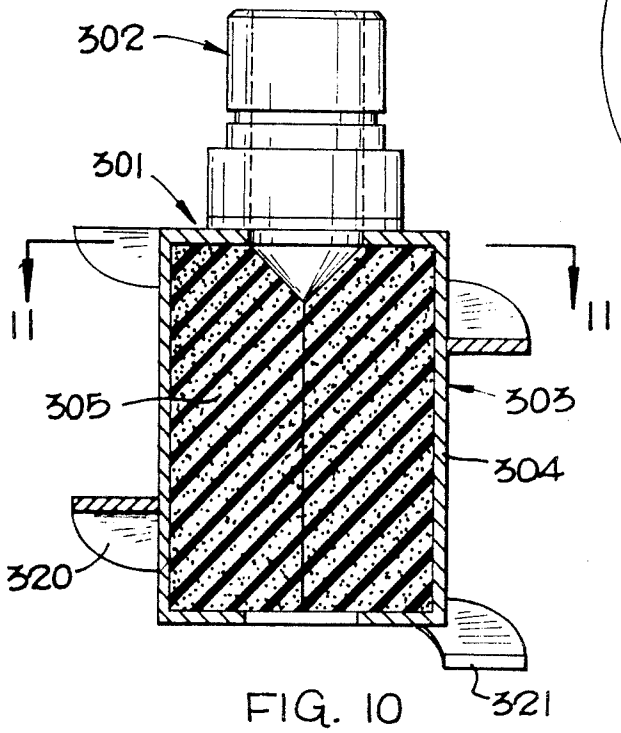


FIG. 10

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HOLLOW-STEM AUGER HEAD WITH SEAL

BACKGROUND OF THE INVENTION

When drilling with hollow-stem augers, a center plug is normally used to prevent foreign material from coming into the bottom of the auger string. When a sample is to be taken, the center plug is removed and sampling tools are lowered through the hollow auger passage and beyond the head of the auger, and then withdrawn. However, when drilling in flowing sand, the sand will move into the auger string passage several feet when the center plug is removed. It is necessary to wash out this sand before a sample can be taken. If the center plug is not used, sand also enters the auger string, and has to be washed out. Since the purpose of the center plug is frustrated by the inflow of sand under these circumstances, the general practice in drilling in flowing sand is not to use the center plug.

One of the objects of this invention is to provide a drill head with a simple, inexpensive but effective valve which will prevent or inhibit the entrance of sand to the hollow auger string.

Other objects will become apparent to those skilled in the art in the light of the following description and accompanying drawing.

SUMMARY OF THE INVENTION

In accordance with this invention, generally stated, a hollow-stem auger head is provided with a seal of resilient material so formed as to serve normally to close the auger string passage, but to admit a sampling tool. In its simplest form the valve is in the form of a disc of stiff, cord-reinforced rubber, slit quadrantly from its center to a point near but spaced inwardly from the periphery of the disc.

Another embodiment utilizes an elongated, flexible, open-ended tube the wall of which is adapted to be collapsed, through at least a part of its length, by external force to form a seal and to move outwardly radially under the thrust of a sampling tool to permit the tool to be pushed axially through the length of a passage defined by the continuous interior surface of the wall.

In still another embodiment, an elongated, normally closed tube is formed of sponge, the intercommunicating pores of which, filled with liquid, serve to maintain the integrity of the seal, but the resilience of which permits the passage of a sampling tool.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawing:

FIG. 1 is a view in side elevation partly broken away, of one embodiment of hollow-stem auger head of this invention;

FIG. 2 is a fragmentary bottom plan view of the auger head of FIG. 1;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a top plan view of another embodiment of hollow stem auger head of this invention;

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 4;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 4;

FIG. 7 is a sectional view corresponding to the view shown in FIG. 6 but with a tool stem extending through a valve part of said auger head;

FIG. 8 is a top plan view of still another embodiment of hollow-stem auger head of this invention;

FIG. 9 is a sectional view taken along the line 9—9 of FIG. 8;

FIG. 10 is a sectional view, corresponding to the section shown in FIG. 9, of still another embodiment of this invention; and

FIG. 11 is a sectional view taken along the line 11—11 of FIG. 10.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1–3 of the drawing for one illustrative embodiment of hollow-stem auger head of this invention, reference numeral 1 indicates a hollow-stem auger head with a coupling part 2 of the type shown in FIG. 2 of Rassieur U.S. Pat. No. 3,357,724, and bits 4.

The auger head 1 has a passage 13 through it, defined by an inner wall 14. An upper annular snapring channel 16 is formed in the inner wall 14, and, spaced axially below it, a lower snapring channel 17. An upper snapring 21 is seated in the upper snapring channel 16. A lower snapring 22 is seated in the lower snapring channel 17. A valve 30 is mounted within the passage 13, between the snaprings 21 and 22. The valve 30 consists of a stiffly resilient rubber disc 32, reinforced with upper and lower steel reinforcing rings 34 and 36, the outer edges of which are flush with the outer edge of the disc, and which are secured on opposite sides of the disc by means of rivets 35.

Terminal holes 38, 90° from one another, are spaced radially inwardly from the reinforcing rings, and extend through the disc 32. Diametrically directed cuts extend between diametrically opposite holes 38, as shown in FIG. 2. The cuts produce four flaps 44.

In assembling the auger head, the upper snapring 21 is seated in the upper snapring channel 16, the valve 30 is slid into the mouth of the auger passage 13 until the rivets or upper ring engages the underside of the upper snapring 21, and the lower snapring 22 is then snapped into the lower snapring channel 17, caging the valve between the snaprings.

In use, during the drilling operation, a head of water or other drilling fluid is maintained within the drill string passage to assist the valve in keeping out sand and other foreign material. When a sampling tool is to be used, it is pushed through the valve, the flexibility of the leaves 44 permitting its passage. When the sampling tool is withdrawn, the resilience of the leaves 44 causes them to return to the condition shown in the figures.

Referring now to FIGS. 4–7 for another embodiment of this invention, reference numeral 101 indicates a hollow stem auger head with a coupling part 102 and an intermediate valve part 103.

The valve part 103 of this embodiment includes a casing 104, a resilient-walled tube 105 with flanges 106 integral with it at both ends, and closures 107. The coupling part 102 is connected to top closure 107. A bit section like that of the embodiment shown in FIGS. 1–3 can be connected to the bottom closure 107, or the head can be equipped with flights terminating in cutting edges as in the embodiments illustrated in FIGS. 8–11. The closures 107 have central, circular openings of a diameter substantially the same as the diameter of the bore of the coupling part 102.

The tube 105 is elliptical in top plan, as shown in FIG. 4 and with the casing and closures forms a hollow gastight chamber 110. The chamber 110 is charged with gas under pressure which collapses the tube to a condition shown in FIG. 6 forming a seal intermediate its ends. The extent of the seal depends upon the length and configuration of the tube and the amount of pressure.

Referring now to FIG. 8 and 9 for another embodiment of this invention, reference numeral 201 indicates a hollow-stem auger head with a coupling part 202, an intermediate valve part 203 and flights 220, terminating in cutting edges 221.

The valve part 203 includes a casing 204, a resilient walled tube 205 with flanges 206 integral with it at both ends, and upper and lower closures 207 and 208 respectively mounted to the casing 204 by means of studs 209. The upper and lower closures 207 and 208 have a central, circular opening of a diameter substantially the same as that of the bore of the coupling member. The coupling part 202 is secured, as by welding, to the upper closure 207. The flights 220 are welded to the outside surface of the casing 204.

A gas valve **215** is mounted in the wall of the casing **204**, communicating with a hollow gastight chamber **210** defined by the casing, closures and tube. A guard ring **216** is welded around the outside end of the valve. In this embodiment, the tube **205** is circular in cross section, but oval in longitudinal section with a narrow intermediate neck as shown in FIG. **9**.

Referring now to FIGS. **10** and **11** for still another embodiment of this invention, reference numeral **301** indicates a hollow stem auger head with a coupling part **302**, an intermediate valve part **303** and flights **320**, terminating in cutting edges **321**.

The valve part **303** includes a casing **304**, the ends of which have a central, circular opening of a diameter substantially the same as the diameter of the bore of the coupling part **302**, and a sponge filler **305**. The sponge filler **305** is, in the embodiment shown, in the form of a thick, flat, rectangular block, chamfered on one edge and rolled into a cylinder with the chamfered edge on the inside, at the top. The thickness of the sponge is such as to close the passage defined by the inner sidewall. The sponge **305** is of the natural type, with intercommunicating pores.

In the illustrative embodiment shown, the sponge block has been rolled tightly and compressed, to insert it through the hole in the bottom wall of the casing **304**, and permitted to expand to assume the form shown in FIG. **10**, but the casing and bottom wall can also be constructed like the casing and closures of the valve shown in FIG. **9**.

In use, the drill string to which the head is coupled is preferably filled with liquid so as to reduce the pressure gradient across the valve. When a sample is to be taken the sampler is simply lowered through the stem, pushed through the valve, forcing the wall of the tube or sponge aside, and used in the usual manner. When the sampler or tool is withdrawn, the wall of the tube again converges to reform the seal.

Numerous variations in the construction of the auger head of this invention will occur to those skilled in the art in the light of the foregoing disclosure. For example, other flexible materials beside rubber can be employed in the flap or tube types. Other configurations of flaps may be used, by making more or fewer cuts, e.g., three cuts at 120° to the center, or six cuts at 60°, or the leaves can be formed in an overlapping pattern, giving somewhat the appearance of a camera diaphragm and adding stiffness to the closure. If the overlap is produced by using two superposed discs each with two mirror-image triangular leaves spanning more than 90° the two discs being offset 90° from one another, the orientation of the leaves with respect to the head makes no difference.

In the embodiment shown in FIGS. **4–7**, a spring or other mechanical biasing means can be used either in aid of or in lieu of the compressed gas. A mixture of gas and low-boiling liquid can also be used. The configuration of the tube can be varied, for example, by making it rectangular in plan.

In the embodiment shown in FIGS. **10** and **11**, an artificial sponge may be used if its pores are intercommunicated.

Combinations of two or more of the types may also be used, e.g., a flap-type valve at the bottom with a sponge or tube-type valve about it or vice versa, or a tube may be backed with sponge, either communicating with the well drilling fluid without added pressure or, sealed, serving as a resilient filler with gas pressure.

These variations are merely illustrative.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. In a hollow auger system, wherein a sampling tool is to be used through a passage in an auger drill string, a seal at the end of said auger drill string comprising flexible closure means normally biased to a position at which said passage is closed by said means, said means being adapted and positioned to move, in response to the application of force thereto by a sampling tool, to a position to admit the passage of said tool, and to move upon withdrawal of said tool, to close said passage, said flexible closure means comprising a tube, and said seal including a hollow casing in which said tube is mounted and a closure, said tube, casing and closure forming a fluidtight chamber and compressed gas within said chamber biasing the wall of said tube into sealing engagement normally to close said passage.

2. The seal of claim **1** wherein the tube is noncircular in cross section.

3. In a hollow auger system, wherein a sampling tool is to be used through a passage in an auger drill string, a seal at the end of said auger drill string comprising flexible closure means normally biased to a position at which said passage is closed by said means, said means being adapted and positioned to move, in response to the application of force thereto by a sampling tool, to a position to admit the passage of said tool, and to move upon withdrawal of said tool, to close said passage, said flexible closure means comprising a tube of sponge having intercommunicating pores, said tube being normally closed by the compressive force of the walls of the tube itself.

4. In a hollow auger system, wherein a sampling tool is to be used through a passage in an auger drill string, a seal at the end of said auger drill string comprising flexible closure means normally biased to a position at which said passage is closed by said means, said means being adapted and positioned to move, in response to the application of force thereto by a sampling tool, to a position to admit the passage of said tool, and to move upon withdrawal of said tool, to close said passage, said flexible closure means comprising a plurality of flexible leaves projecting inwardly to form a closure for said passage when the leaves are free from external axially directed forces and of sufficient flexibility to permit their being bent resiliently axially in at least one direction to define the sampling tool-admitting passage.

5. The seal of claim **4** wherein the said leaves are mounted within the head of the auger.

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