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Quichaud et al.

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[54] **DEVICE FOR SUSPENDING MEASURING INSTRUMENTS IN A DRILL STRING**

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Related U.S. Application Data

[63] Continuation of Ser. No. 141,722, May 10, 1971, abandoned.

[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **166/224,** 175/65

[51] **Int. Cl.** **E21b 33/00**

[58] **Field of Search** 166/250, 224; 175/65, 232, 234; 73/151; 251/356; 137/798

[56] **References Cited**

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[57] **ABSTRACT**

A collar for holding an instrument in a drill string is provided with a housing for attachment to the instrument, and elastomeric suspension means connecting the housing to the collar. Both housing and suspension means are pierced to pass drilling mud. A passage in the housing is controlled by a first valve responsive to the instrument. A second valve controls the passage defined between the housing and drill collar and containing the suspension means. The second valve is pressure responsive and closes whenever the first valve is closed. The object is to provide a sharper change in volume of drilling mud flow when the first valve is operated and consequently to transmit a clearer signal along the column of drilling mud.

5 Claims, 3 Drawing Figures

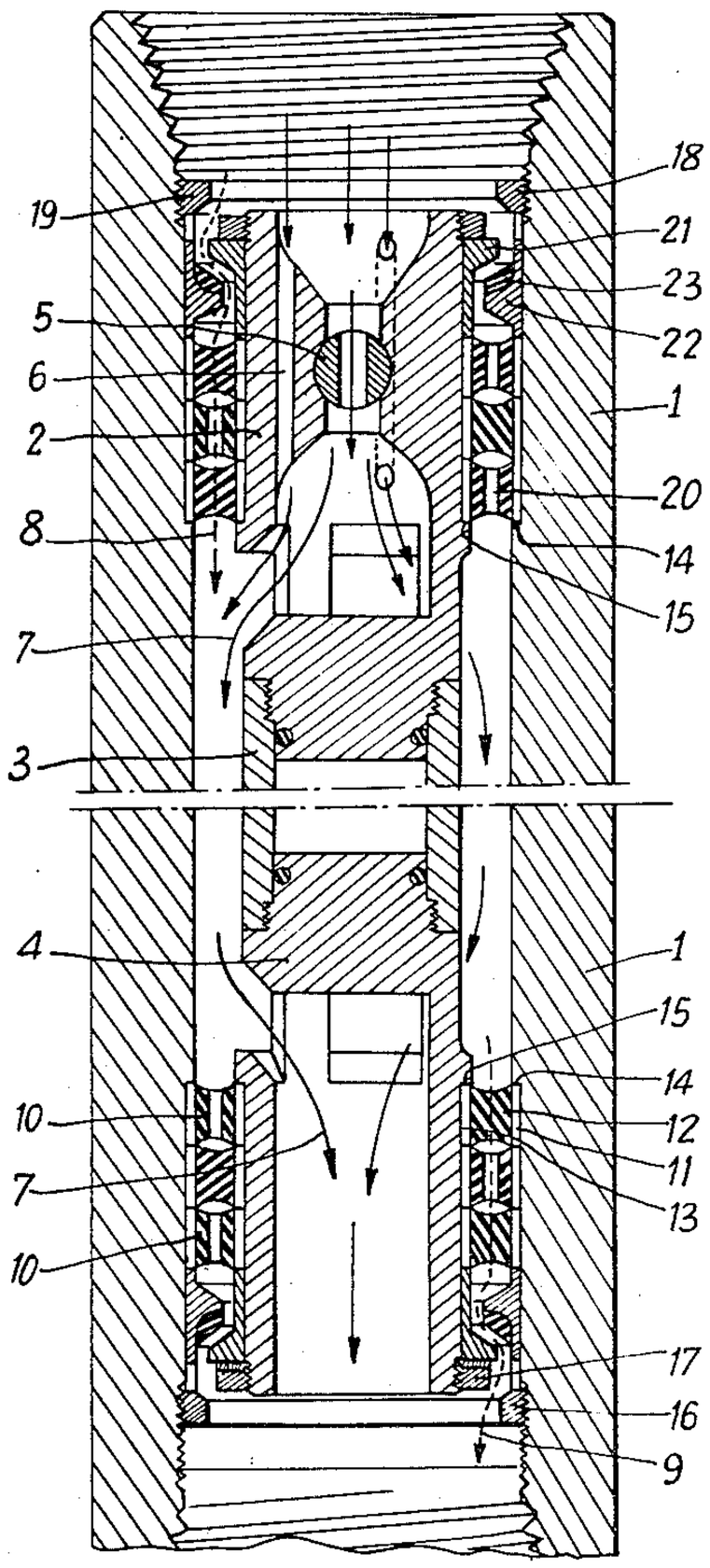


Fig. 1

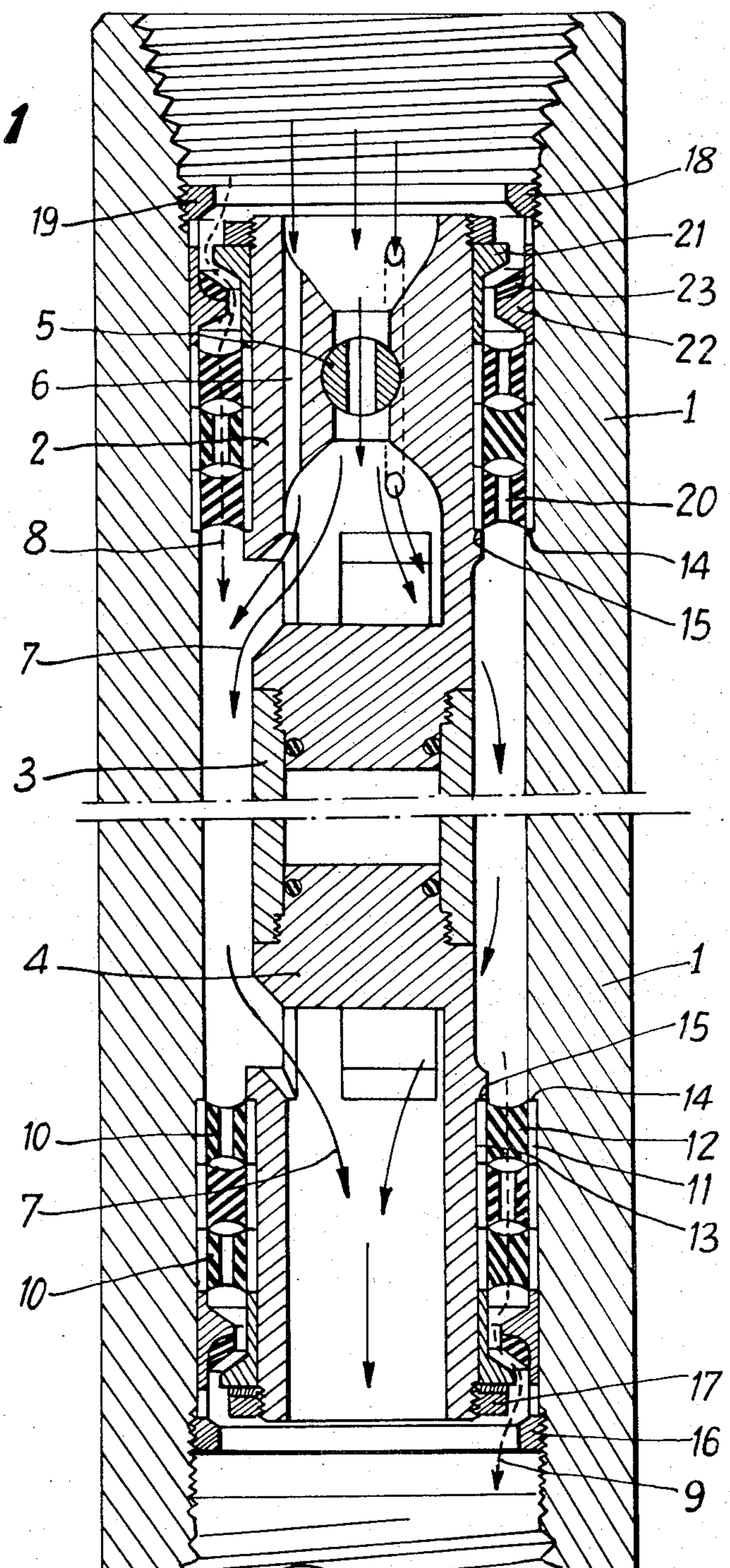


Fig: 2

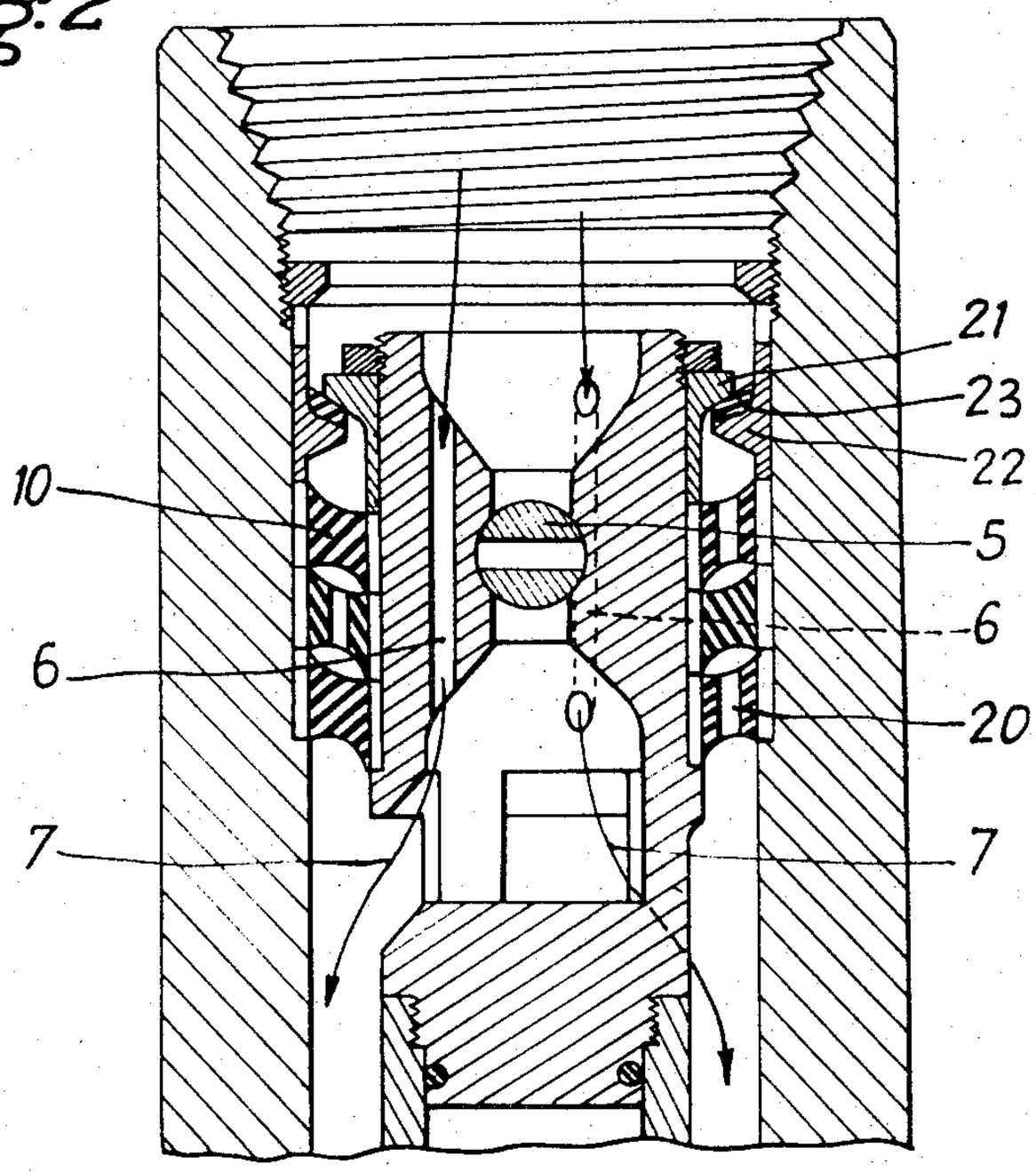
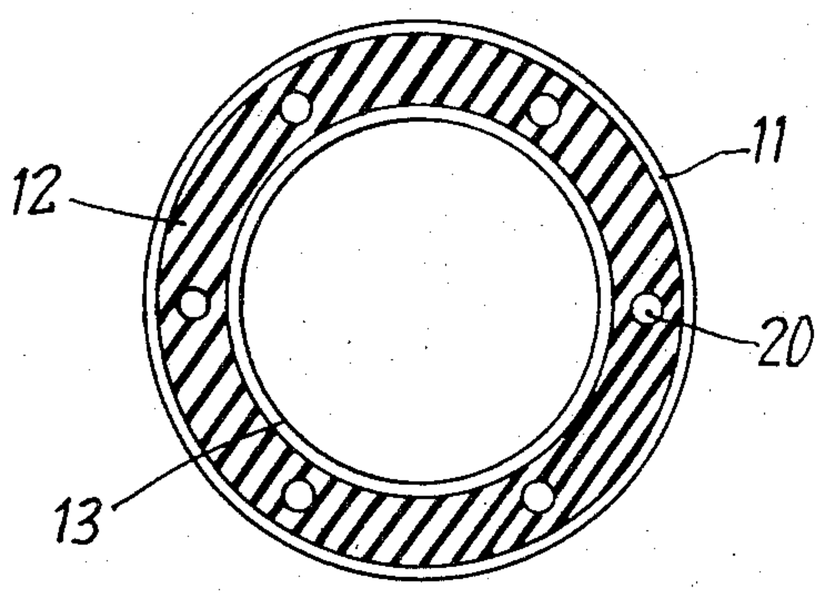


Fig: 3



DEVICE FOR SUSPENDING MEASURING INSTRUMENTS IN A DRILL STRING

This is a continuation of application Ser. No. 141,722, filed May 10, 1971 now abandoned.

The present invention concerns a device for suspending a measuring instrument in a drill string.

A transmitting appliance, controlled by the measuring instrument, is frequently placed immediately next to it. Information is transmitted either along the line of rods, or along the mud column, using a valve controlled by the measuring instrument. The closure of this valve produces pressure variations in the mud column, which may be noted at the surface. By coding the closure of this valve, information can be transmitted from the bottom of the well to the surface. But such closure interrupts momentarily the circulation of the drilling mud, and the transmitting appliance is subjected to a strain equal to the product of the cross-sectional area of the measuring instrument by the pressure-difference created by the valve.

Also, in the case of such an arrangement, mud continues to circulate through the suspension linings, and could damage them. In addition, the total pressure-drop is reduced by the flow of fluid through the linings, and the signal received on the surface is consequently blurred and more difficult to interpret. It is in order to avoid these drawbacks that the originator of the present invention has provided means of halting the circulation of drilling fluid through the linings while the valve is shut.

The suspension device according to the present invention contains a number of suspension rings, each consisting of two concentric ring-shaped frames, linked by an elastomer ring fixed to them by vulcanization, the outer frame of each suspension ring resting on a drill collar incorporated in the string, and their inner frames being connected to the measuring instrument, and is characterized by the fact that the upper end of the said suspension device is equipped with a ring-shaped valve member which can close on a valve-seat attached rigidly to the collar, closing of this valve taking place as the result of the force applied to the suspension device by the closure of a valve blocking off the passage inside the said device, and this valve being closed intermittently by a component operated by the measuring instrument.

It will be easier to understand the invention from reading the following description, illustrated by the accompanying figures.

FIG. 1 shows a suspension device corresponding to the invention.

FIG. 2 shows the upper end of the same device.

FIG. 3 shows a suspension ring.

In FIG. 1, a collar 1, incorporated in the string, preferably at a point near the drilling tool, contains shoulders 14. The housing is inserted into this collar in two stages. First, the upper end 2, which will be connected with the lower end 4 by a coupling 3, inside which the measuring instrument is placed, is placed in position. This coupling 3 allows the lower end 4 to be screwed to the upper end 2, when this upper end is already inside the collar. The upper end 2 contains a valve 5, the movement of which is controlled by the measuring instrument. This valve, which may be open or shut, is shown here open. The body of the upper end of the housing contains passages 6, allowing fluid to continue

to circulate when the valve is closed. This continued circulation merely results in additional loss of head. The mud flow circulates in the direction shown by the arrows 7. A subsidiary flow is set up through the suspension components, as shown by the arrows 8 and 9. This in particular ensures that the suspension components are kept clean and will function properly.

The suspension components 10 consist of three concentric rings 11, 12 and 13. The inner and outer rings 11 and 13 are metal, and the intermediate ring 12, which contains cavities, is of elastomer, vulcanized to the two metal rings. The rings 11 of these suspension elements rest on the projection 14, which forms part of the collar 1, and they are also held in place by the threaded ring 16. The rings 13 rest on the shoulder 15, which forms part of the housing, and they are held in place by a ring 17, which screws on to the component 4. A ring 21, which carries an outer bearing surface, is held in place by the ring 18, which is screwed on to the upper part of the housing 2. Facing this ring and carried by the collar, there is a ring-shaped seat 22, held in place on the collar by the threaded ring 19. This seat carries an elastomer lining 23, which provides a seal between the components 21 and 22 when the valve 5 is shut, as explained below.

FIG. 2 shows the upper end of the device shown in FIG. 1, with the valve 5 closed. The references are the same as for FIG. 1. When the valve 5 is closed, the drilling fluid passes through the passages 6 and round the measuring instrument, in the directions shown by the arrows 7. The additional pressure drop resulting from closing of the valve 5 produces a force which pushes the ring-shaped valve member on the housing against the seat 22 on the collar.

Closure of the valve 21–22 prevents the drilling fluid from circulating through the suspension components 10, thus preventing a jet of drilling fluid under pressure from passing through the cavities 20. In addition, this closure ensures a much greater pressure drop through the passages 6, meaning that the signal emitted is much more sharply defined. FIG. 2 also shows the distortion of the suspension rings, which creates a release couple that tends to open the valve 21–22 once the valve 5 is open again.

FIG. 3 shows a suspension ring, showing the outer frame 11 and inner frame 13, both metal, and the elastomer ring 12, vulcanized to the metal rings on each side of it. This elastomer lining 12 contains cavities 20, through which the drilling fluid circulates when the valve 21–22 is open.

What is claimed is:

1. A device for suspending measuring instruments inside a line of drilling pipes, consisting of a cylindrical housing having an inner annular shoulder and at least one coupling which is fixed to the measuring instrument and which contains a shoulder, a number of suspension rings each made up of two concentric ring-shaped frames linked by an elastomer ring fixed to them by vulcanization, the inner frame resting on the shoulder of the corresponding coupling, and the outer frame on said shoulder of said housing incorporated in the line of drilling pipes in order to hold the measuring instrument, said coupling at its upper end carrying a ring-shaped valve adapted to cooperate with a valve-seat attached rigidly to said cylindrical housing, closing of this valve taking place as the result of the force applied to the suspension device by the closure of a shut-

ter blocking off the passage inside the said device, and this shutter being closed intermittently by a component operated by the measuring instrument.

2. In a device for suspending a measuring instrument in a drilling string,

said device comprising a housing for said instrument, a collar having an upper and a lower end and a plurality of suspension rings connecting said coupling to said collar,

each suspension ring comprising two concentric annular frames connected by a resilient elastomeric ring, with one frame connected to the housing and the other to the collar,

said housing and said suspension rings being both pierced by at least one passageway permitting the flow of drilling mud therethrough,

and a valve member positioned to open and close a passageway in said housing in response to indications by said instrument, the improvement which comprises

an annular valve member encircling said housing and

a cooperating annular valve seat so positioned on the inside of said collar between said suspension rings and the upper end of said collar but beneath said annular valve member that the increased pressure exerted by said drilling mud against said housing upon closing of a passageway in said housing forces said annular valve member against said annular seat, thus closing said at least one passageway in said suspension ring.

3. Device as claimed in claim **2** in which there are a plurality of passageways in siad housing, only one of which is closed by the valve member responsive to the indications of said instrument.

4. Device as claimed in claim **2** in which said annular valve seat is provided with an elastomeric lining.

5. Device as claimed in claim **2** in which the resilience of said elastomeric rings separates said annular valve member and valve seat when the valve responsive to the indications of said instrument is opened.

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