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SURGE CUT-OFF DEVICE FOR PRESSURE SENSING UNITS

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FIG. 1

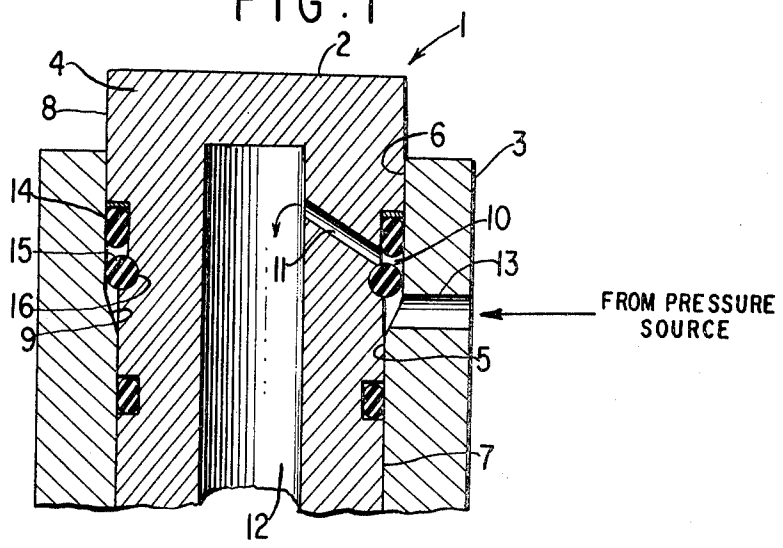


FIG. 2

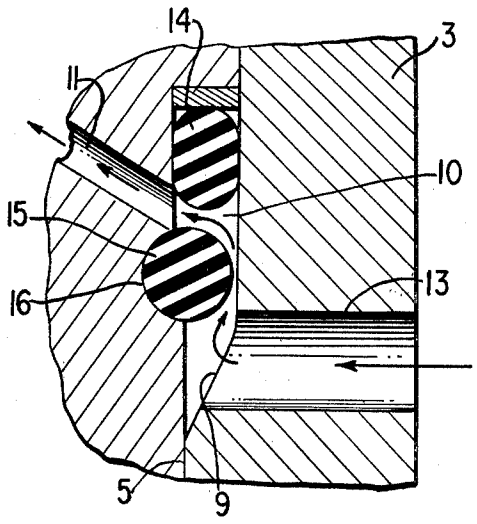
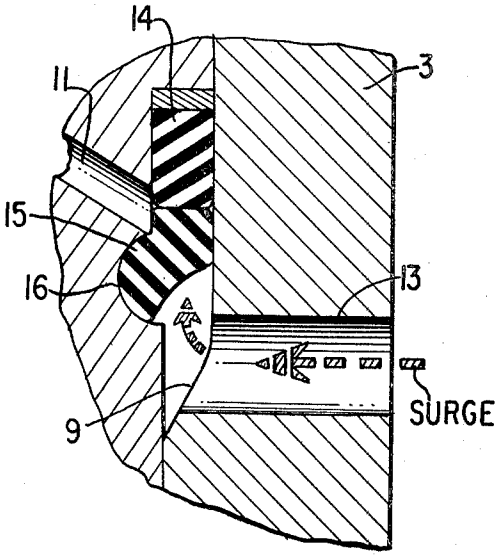


FIG. 3



INVENTOR
JOHN J. RYAN

BY Smythe & Moore
ATTORNEYS

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SURGE CUT-OFF DEVICE FOR PRESSURE SENSING UNITS

John J. Ryan, Glen Cove, N.Y., assignor to H. & R. Development Company, Inc., Nutley, N.J., a corporation of Delaware

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4 Claims

ABSTRACT OF THE DISCLOSURE

A surge cut-off device having a resilient O-ring positioned in an annular chamber communicating with a source of pressure and with a pressure chamber within the device and a predetermined clearance past the resilient O-ring so that a surge of fluid pressure will move the O-ring to block the passage communicating with the pressure chamber within the device.

The present invention relates to a surge cut-off device for fluid pressure sensing units and more particularly to such a device employing a resilient O-ring which is distorted by surges in pressure to block the passage of the fluid under pressure.

The measurement of pressure in fluid systems has been carried out by many forms of gauges, regulators, differential indicators, and the like. These devices have been so highly developed that they can indicate accurately the pressure in the systems at all times. However, in many instances when the pressure changes in a system, the change is not gradual but is accompanied by a surge in pressure. Thus, for a brief instant the pressure surges to an extremely high value and just as rapidly decreases to the level of the pressure change. In many applications it is not necessary to determine the surge in pressure and, indeed, in some applications the pressure surges are undesirable and may adversely affect the pressure indication. While various forms of surge cut-off devices have been incorporated in pressure measuring devices, the cut-off devices generally are complex in structure and cumbersome in operation. Furthermore, these cut-off devices may add considerably to the cost of the pressure indicating device because of their complicated structures.

It is therefore an object of the present invention to provide an improved surge cut-off device for pressure sensing units.

Another object of the invention is to provide a surge cut-off device for fluid pressure systems wherein surges in pressure are blocked and kept from the pressure sensing unit while gradual increases in pressure are measured.

In one aspect of the invention, the surge cut-off device comprises a housing having a pressure chamber and an annular space surrounding the pressure chamber. One end of the annular space is provided with a conical surface and there are passage means between the pressure chamber and the annular space, and further passage means between the conical end of the annular space and the exterior of the housing for connection to a source of pressure. A resilient O-ring is positioned within the annular space between the two passage means. There is a predetermined clearance between the O-ring and a surface of the annular space so as to permit a predetermined flow rate of fluid between the first and second passages. The O-ring is of sufficient resiliency so as to be movable or distortable to block the passage between the annular space and the pressure chamber when a surge of fluid pressure is received in the annular chamber from the pressure source.

The housing may be made of two concentric tubular

members formed to define the annular space therebetween. The O-ring may be positioned in a shallow groove formed in the inner surface of the annular space.

Other objects, advantages and features of the invention will become apparent from the following description when taken in conjunction with the accompanying drawings, which are merely exemplary.

In the drawings:

FIG. 1 is a longitudinal sectional view of the surge cut-off device of the present invention;

FIG. 2 is a portion of the view in FIG. 1 in enlarged scale and showing the position of the O-ring within the annular space between the two passages; and

FIG. 3 is a view similar to FIG. 2 but showing the O-ring in distorted position in response to a surge of pressure into the annular space.

Referring to the drawings wherein like reference symbols indicate the same parts throughout the various views, a specific embodiment of the invention will be described in detail.

As may be seen in FIG. 1, the surge cut-off device is indicated generally at **1** and comprises a housing **2** formed of an outer tubular member **3** and an inner tubular member **4** which are fixed with respect to each other in the position shown in FIG. 1.

Outer tubular member **3** has a smaller internal diameter portion **5** and a larger internal diameter portion **6**, the inner tubular member **4** having corresponding smaller diameter portion **7** and larger diameter portion **8**. The two diameter portions **5** and **6** of the outer tubular member are interconnected by a conical surface **9**. When the tubular members are positioned as shown in FIG. 1, there is defined therebetween an annular space **10**.

An inclined passage **11** is formed in the inner tubular member to provide communication between the annular space **10** and a pressure chamber **12** located within the inner tubular member. A second passage **13** is provided in the outer tubular member to communicate between the conical portion of the annular space and the exterior of the cut-off device. The passage **13** is adapted for connection to a source of fluid pressure.

Positioned in annular space **10** are two resilient O-rings **14** and **15** made of natural or synthetic rubber or a suitable plastic material. The O-ring **14** is positioned at the upper end of the annular space as viewed in FIG. 1 and is above the opening to passage **11**. O-ring **15** is positioned in a shallow groove **16** formed in the inner tubular member **4**. When O-ring **15** is seated in the groove **16**, a clearance is provided between the outer edge of O-ring **15** and the adjacent wall defining annular space **10**. In this manner, the fluid under pressure entering annular space **10** to passage **13** passes around O-ring **15** and enters passage **11** to flow into the pressure chamber **12**. A specific clearance is maintained around O-ring **15** so as to permit a predetermined flow rate to the pressure chamber **12**.

When a surge of fluid pressure enters through passage **13**, the O-ring **15** is immediately distorted or moved upwardly against O-ring **15** so as to close the entrance to passage **11** in the inner tubular member as shown in FIG. 3. Upon decay of this surge in pressure, the O-ring will revert to its original position as shown in FIG. 2 and will permit the flow of fluid into the passage **11**.

When the O-ring **16** is in the closed or blocking position, it becomes a self-energizing seal for the duration of this surge in pressure. Most surges in pressure are relatively short in nature so that the O-ring will almost immediately revert to its original position.

Thus, it can be seen that the present invention discloses a surge cut-off device which prevents actuation of pressure sensing units by momentary surges or pressure

waves in fluid pressure systems while permitting actuation of pressure sensing units by normal changes in pressure. An outstanding advantage of the present invention is its simplicity of structure and, as a result, its low cost due to ease of manufacture. Furthermore, the structure of this device has a considerable flexibility so as to adapt this device for a large number of different applications. Also, the device is insensitive to minor system contamination.

What is claimed is:

1. A surge cut-off device for fluid pressure sensing units comprising a housing having a pressure chamber therein and an annular space surrounding said pressure chamber, there being a conical surface at one end of said annular space, first passage means between said pressure chamber and said annular space and second passage means between said conical end of said annular space and the exterior of the housing for connection to a source of pressure, a resilient O-ring within said annular space between said first and second passage means, there being a predetermined clearance between the outer surface of said O-ring and the adjacent surface of said annular space to permit a predetermined flow rate of fluid between said first and second passage means, at least a portion of said O-ring being movable to block said first passage means upon a surge of fluid pressure in said second passage means, said housing comprising an outer tubular member having larger and smaller internal diameter portions with said conical surface interconnecting said two diameter portions, and an inner tubular member closed at one end and defining a pressure chamber having a first outer diameter portion corresponding to said smaller internal diameter portion and a second outer diameter portion corresponding to said larger diameter portion, said annular space being defined between said inner and outer tubular members.

2. A surge cut-off device as claimed in claim 1 additionally including a groove in the first outer diameter portion of said inner tubular member, said O-ring being seated therein.

3. A surge cut-off device as claimed in claim 1, further comprising a second resilient O-ring at the other end of said annular space and on the other side of said first passage means.

4. A surge cut-off device as claimed in claim 1 wherein said first passage means is inclined away from said second passage means.

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WILLIAM F. O'DEA, Primary Examiner

DAVID J. ZOBKIW, Assistant Examiner

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73—392; 37—525; 138—26