July 14, 1964 F. S. FLICK ETAL 3,141,008

SAFETY VENTING DEVICE

Filed July 6, 1962

FIG. 1

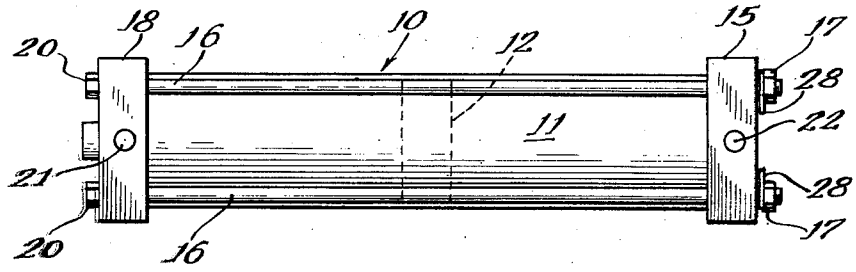


FIG. 2

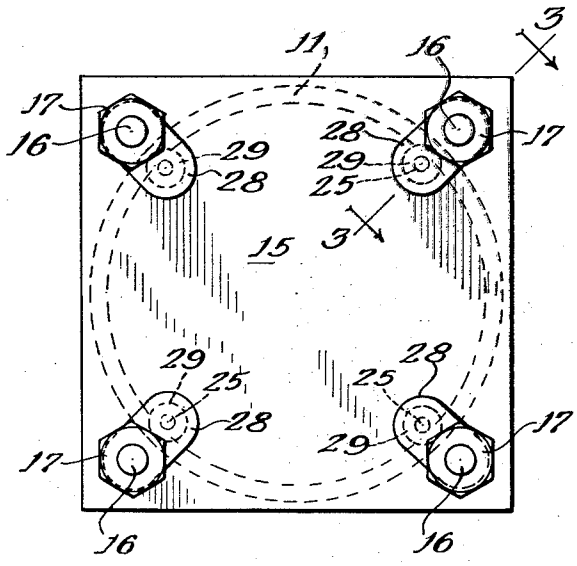


FIG. 3

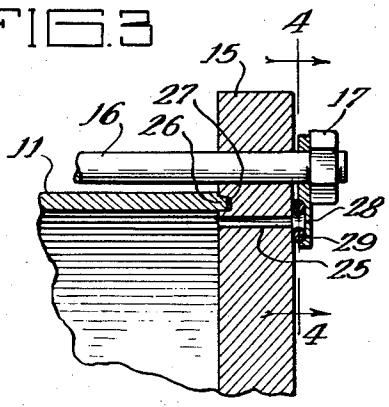
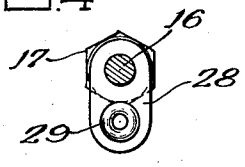


FIG. 4



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SAFETY VENTING DEVICE

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This invention relates to a safety venting device and more particularly to a safety venting device for tie rod equipped accumulators.

An accumulator is a device for storing fluid under pressure and in such a capacity stores fluid at pressures up to around 3,000 p.s.i. Since an assembled accumulator has no moving parts that are visible to a workman, it is extremely difficult to look at an accumulator and tell whether or not it has stored fluid under pressure within it. This situation produces a hazardous and risky operation when it is desired to dismantle an accumulator for maintenance or other reasons. Serious accidents may result from the innocent loosening of the tie rod nuts on a charged accumulator, thereby allowing a jet of high pressure fluid to escape. The fluid pressure is strong enough to violently force the accumulator apart or strip the tie rod threads when they are partially loosened.

The present invention eliminates the above hazards by providing a safety venting device which automatically and safely allows fluid to escape from the accumulator once a tie rod nut is loosened.

It is the primary object of this invention to provide a new and improved safety venting device for tie rod equipped accumulators.

Another object of this invention is to provide such a safety venting device which will not alter the design or hinder the operation of the accumulator.

Other objects, features and advantages of the invention will be apparent from the following description of a preferred embodiment illustrated in the accompanying drawings, in which:

FIGURE 1 is a side view of an accumulator having the safety venting device of this invention at one end thereof with the parts in position to better illustrate the invention;

FIGURE 2 is an enlarged end view of the accumulator shown in FIGURE 1 with the barrel, passage, O-ring and a portion of the closure plate shown in dotted outline;

FIGURE 3 is a view taken substantially as indicated along line 3—3 of FIGURE 2 showing the relationship between the passage, the tie rod, the cantilevered plate, and the O-ring with the nut loosened on the tie rod for clarity of illustration of the invention;

FIGURE 4 is a plan view taken substantially as indicated along line 4—4 of FIGURE 3 illustrating the relationship between the tie rod nut, the cantilevered plate, and the O-ring.

The accumulator illustrated in the drawings is one involving a free type piston reciprocating in a cylinder of single size. The accumulator generally indicated **10** has a cylinder **11** having a pair of square heads **15** and **18** joined to the cylindrical barrel **11** by a plurality of tie rods **16**, generally one in each corner, of the square heads. The construction of the cylinder barrel and heads is held in assembled relation by the tie rods following accepted good practice for the making of high pressure cylinders of machine tool grade. The tie rods, of course, are equipped at each end with nuts **17** and **20** which in assembly apply a predetermined tensile stress to the tie rods and an equal and opposite compression upon the cylindrical barrel **11**. As shown in FIGURE 1 tie rod nuts **17** on the outer ends of rods **16** hold the head **15** and the barrel **11** in assembled relation and tie rod nuts

20 on the outer ends of tie rods **19** hold the head **18** and barrel **11** in assembled relation.

Ordinarily, a hydraulic fluid from a pump circuit or other hydraulic circuit is connected with a port **21** so as to be in the upper end of the cylinder **11** beyond an internal floating piston **12**. The accumulator is loaded by introducing a gas, such as filtered air or nitrogen, through port **22** at the far end of the accumulator so that the gas will be below the internal floating piston **12** within the cylinder **11**. In operation, the pump circuit or hydraulic circuit to which the accumulator is attached will during periods when the fluid is not needed pump hydraulic fluid into the upper end of the cylinder thus causing the piston **12** to move to the right in FIGURE 1 compressing the gas in the cylinder. When the system requires a surge of high pressure oil or hydraulic fluid, the accumulator is charged to deliver that oil generally at relatively high rates of flow.

As is illustrated in FIGURE 1, the accumulator has no visible moving parts. There is thus no way in which a person can observe an accumulator to determine whether or not it is loaded or unloaded. Maintenance may require that an accumulator be dismantled and under such conditions it is obviously important that the high pressure charge within the accumulator be reduced to more nearly atmospheric pressure. In the present invention, means are provided to insure the venting of the interior of the cylinder of the accumulator upon the first movements of a maintenance man in starting to disassemble the accumulator.

Referring particularly to FIGURES 2 through 4, a device is employed to vent the interior of the charged side of the accumulator whenever one of the tie rod nuts **17** is first loosened. In order to accomplish the venting, a small drilled passage **25** extends longitudinally or diagonally toward the center and opposite end of the cylinder, through the head **15** adjacent a tie rod **16** but spaced radially inwardly therefrom a sufficient distance or with enough diagonal angle to be inside the wall of the cylinder **11** at its inner end. The passage **25** thus communicates with the interior of the cylinder and the space which would be charged with gas. It is important to vent the space before any separation of the head and cylinder wall occurs or before thread engagement of the nut on the tie rod is shortened materially. As illustrated in FIGURE 3, the cylinder **11** is provided with an extension **26** extending into a circular groove in the head **15** and this construction is made in accordance with United States Letters Patent No. 2,842,284. It includes a metal-to-metal contact between the outer surface of the extension and the outer surface of the groove in the head. Also, a resilient seal **27** is in the bottom of the groove. Until the head and cylinder wall are separated sufficiently to bring the two metal members out of contact, there may at times be no observable leakage between the cylinder and head.

In order to insure that the initial attempt to disassemble the accumulator will vent the interior, the individual passages **25** are placed through at least one head and adjacent each tie rod. The passage is closed by a plate **28** impaled on the adjacent tie rod and extending radially inwardly in superposed relation to the adjacent passage **25**. An O-ring **29** or other sealing device is mounted on the underside of the plate in a groove provided for that purpose so as to surround the outer end of the passage **25**. As shown in FIGURES 2 and 4, the inner diameter of the O-ring **29** corresponds to the circumference of the passage **25** so that the bending load on the plate **28** is reduced. When the tie rod nut **17** is tightened to place stress in the tie rod, the cantilevered plate will be brought into face-to-face contact with the head and the O-ring will fill the cavity provided for it providing a

pressure sensitive seal around the exterior of the passage 25. So long as there is one passage for each tie rod, loosening of the nut on either end of the tie rod will permit the pressure within the accumulator to lift the plate and thus escape. The loosening of one tie rod will thus vent the interior of the accumulator before there has been sufficient disassembly to allow the separation of the heads from the cylinder barrel of the accumulator.

The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom for some modifications will be obvious to those skilled in the art.

We claim:

1. A safety venting device for a high pressure pneumatic fluid accumulator and the like, comprising: a cylindrical barrel with a head at each end and a plurality of tie rods equipped with nuts for joining said heads to maintain assembled relation of said barrel and heads and hold fluid at high pressure within the barrel, fluid sealing means between each head and the barrel, a fluid escape passage through at least one head adjacent one of said tie rods and communicating with the interior of said barrel, a plate extending under the tie rod nut and over the passage, and an O-ring surrounding said passage between the head and plate whereby tightening of the tie rod nut positions the O-ring and plate in sealing relationship with the passage and attempted disassembly of the accumulator by loosening a nut on the tie rod will safely vent pneumatic fluid from the interior of the barrel through said passage.

2. A safety venting device for a high pressure pneumatic fluid accumulator and the like, comprising: a cylindrical barrel with a square head at each end and a plurality of tie rods extending through the corners of each head equipped with nuts for joining said heads to maintain assembled relation of said barrel and heads and hold fluid at high pressure within the barrel, sealing means including metal-to-metal contact between each head and the barrel for sealing the fluid within the barrel, a fluid escape passage lengthwise through each head close to the barrel wall and communicating with the interior of said barrel, a rigid plate extending under the tie rod and cantilevered over the passage, and an O-ring surrounding said passage between the head and plate whereby tightening of the tie rod nut positions the O-ring and plate in sealing relationship with the passage and attempted disassembly of the accumulator by loosening a nut on the tie rod will safely vent pneumatic fluid from the interior of the barrel through said passage.

3. A safety venting device for a high pressure pneumatic fluid accumulator and the like, comprising: a cylindrical barrel with a square head at each end and at least one tie rod extending through each corner of each head equipped with nuts for joining said heads to maintain assembled relation of said barrel and heads and hold fluid at high pressure within the barrel, sealing means including metal-to-metal contact between each head and the barrel for sealing the fluid within the barrel, a fluid escape passage lengthwise through each head close to the barrel wall and communicating with the interior of said barrel, a rigid plate extending under the tie rod cantilevered over the passage, and an O-ring surrounding said passage between the head and plate whereby tightening of the tie rod nut positions the O-ring and plate in sealing relationship with the passage and loosening a nut on a tie rod allows any high pressure pneumatic fluid in the interior of the barrel to safely vent by lifting the plate and opening the passage without breaking the metal-to-metal sealing contact between each head and the barrel.

4. A safety venting device as specified in claim 4 wherein the heads of the accumulator are provided with a venting passage adjacent each tie rod and a separate rigid plate is movable into and out of sealing position over one of said venting passages under control of tightening and loosening of nuts on said each tie rod whereby loosening of a tie rod on the accumulator will vent the same.

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