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None

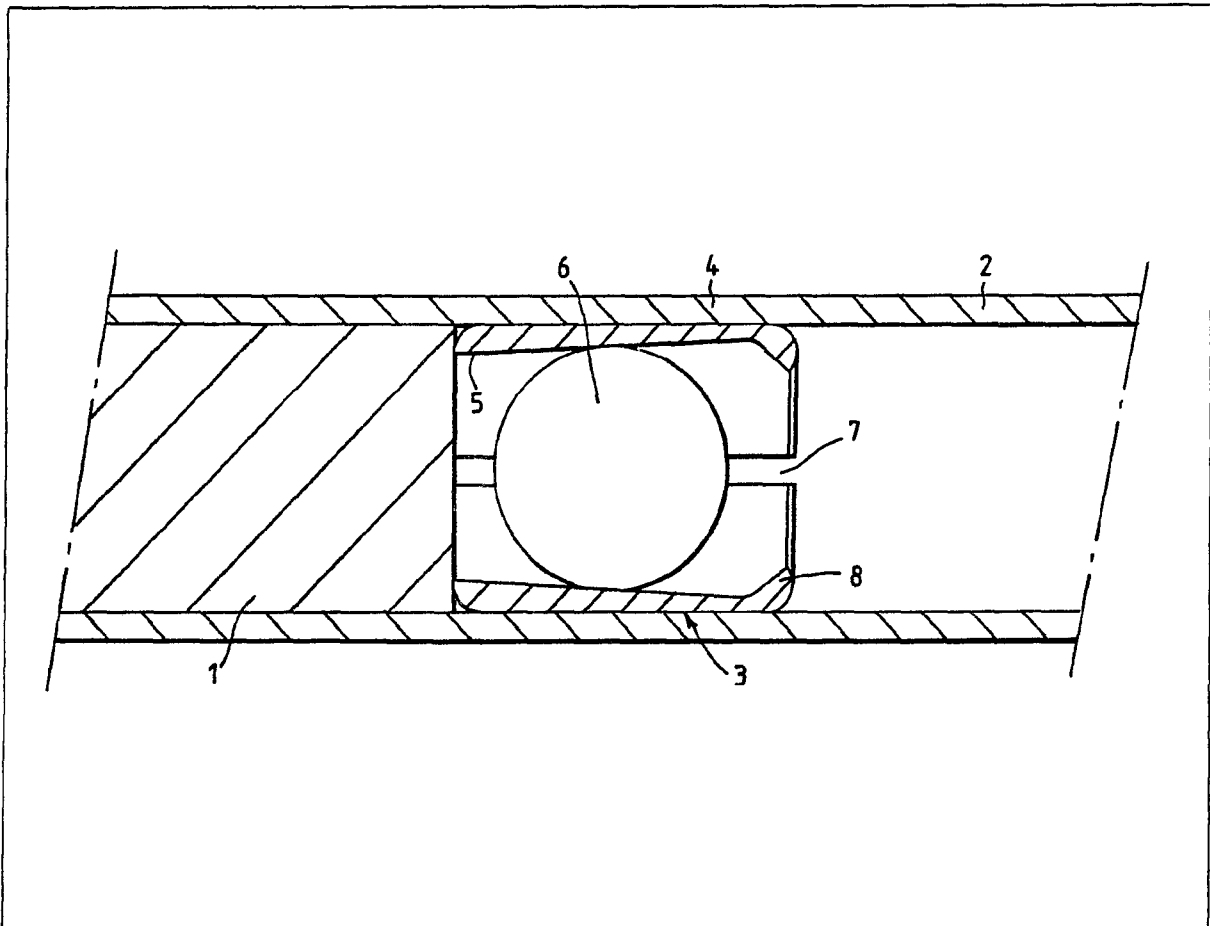
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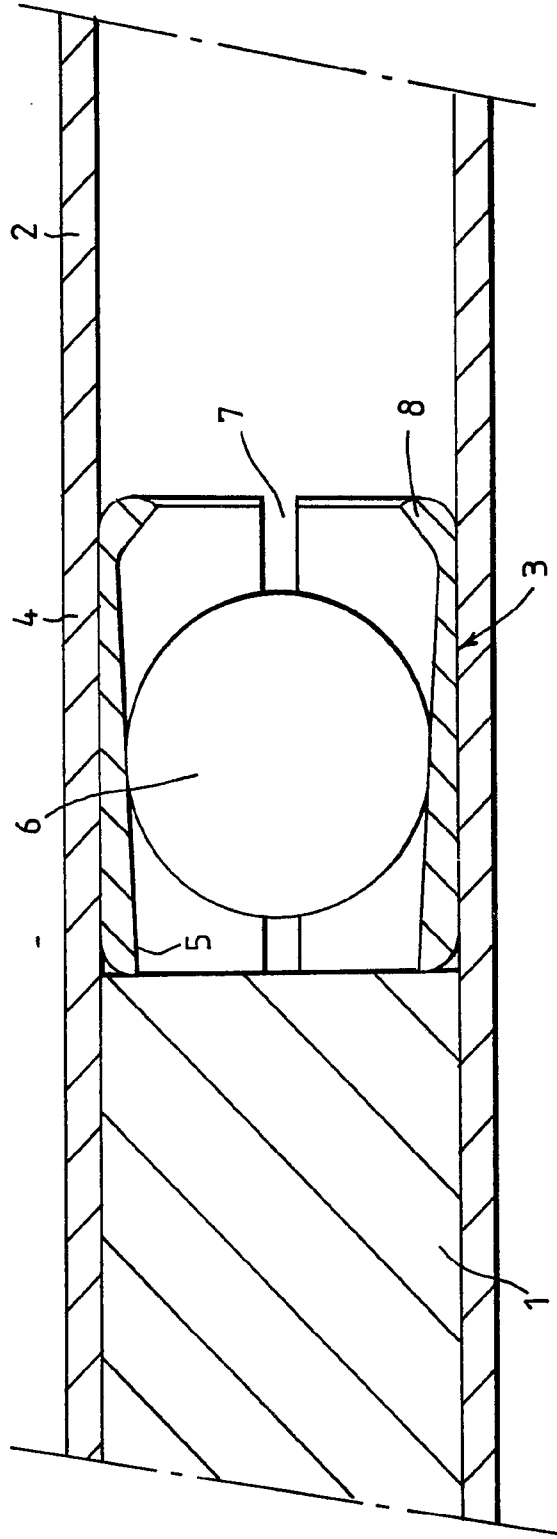
(57) A nuclear reactor fuel element wherein a stack of nuclear fuel is prevented from displacement within its sheath by a retainer comprising a tube member which is radially expanded into frictional contact with the sheath by means of a captive ball within a tapered bore.

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SPECIFICATION

Nuclear reactor fuel elements

5 This invention relates to nuclear reactor fuel elements.

One kind of nuclear reactor fuel element comprises a stack of ceramic (mixed plutonium and uranium oxide) pellets within a

10 closed tubular sheath whilst a second kind comprises a mass of large and small granules or oxides compacted by vibration within a closed tubular sheath. In order to prevent the stack of fuel pellets falling out of the sheath of
 15 the first kind of fuel element during manufacturing handling operations, it is known to insert a retaining plug comprising an expansible thimble which frictionally engages the wall of the sheath. For retaining the fuel stack of
 20 the second kind of fuel element a retainer which has more positive engagement with the wall of the sheath is required and a typical example is disclosed in our copending application no 8030919 the retainer comprising, in
 25 combination, a thimble-shaped member and a wedge member for urging the skirt of the thimble radially into engaging contact with the wall of the sheath.

According to the present invention a fuel
 30 stack retainer for a nuclear fuel element comprises a radially expansible tube member having a tapered bore and housing a captive ball whereby the tube member can be radially expanded to grip the wall of the sheath by
 35 displacement of the ball along the converging bore.

Preferably the tube member has a longitudinal slit in the wall to facilitate radial expansion.

40 A nuclear fuel element embodying the invention is described by way of example with reference to the sole accompanying drawing which is a fragmentary sectional side view.

The drawing illustrates a fuel element comprising a fuel stack 1 (which may be oxide pellets or granules of mixed sizes) retained
 45 within a sheath 2 by a retainer 3. The retainer comprises a radially expansible steel tubular member 4 having a tapered bore 5 and housing a steel ball 6. The tube member has a
 50 longitudinal slit 7 in the wall and the ball is captivated after insertion by coining the end of the tube member at 8.

On assembly of the fuel element, the fuel
 55 stack is loaded into the sheath and is urged towards a closed end by insertion of the retainer 3. With the sheath in a vertical attitude a punch is passed through the coined end of the tube member and impacted with a
 60 known force to drive the ball along the converging bore thereby to expand the tube member radially into gripping engagement with the wall of the sheath. The expanding tube member enlarges the sheath diameter
 65 and the resultant strain energy in the sheath is

applied to the tube member which grips the ball. The diameter change is totally elastic so that after displacement of the tube member along the sheath the vacated section of the
 70 sheath retracts. In use of the fuel element fission gases released from the stack of fuel can pass freely beyond the retainer by way of the slot 7.

In a typical example of retainer for use in a
 75 sheath of bore 0.2 in diameter, an impact force of 14 pounds is required to drive a 4 mm steel ball into the tube member to expand it into engagement with the tubular sheath and thereby resist a pushout force of 72
 80 pounds.

CLAIMS

1. A nuclear reactor fuel element comprising a stack of nuclear fuel contained within a
 85 sheath and a retainer for preventing displacement of the stack within the sheath, the retainer comprising a radially expansible tube member having a tapered bore and captively housing a ball whereby the tube member is
 90 radially expanded to grip the wall of the sheath.

2. A nuclear reactor fuel element according to claim 1 wherein the tube member has a longitudinal slit in the wall.

95 3. A nuclear reactor fuel element substantially as hereinbefore described with reference to the accompanying drawing.

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