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HIGH PRESSURE DEFORMABLE SEAL

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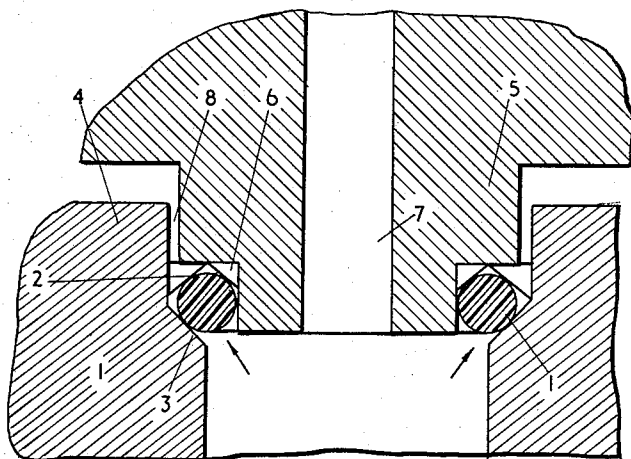


FIG. 1

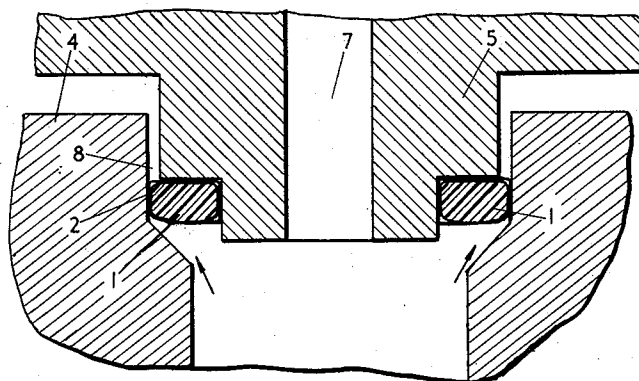


FIG. 2

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HIGH PRESSURE DEFORMABLE SEAL

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3 Claims. (Cl. 277-170)

This invention relates to a high pressure liquid seal and in particular to high pressure liquid seals operating at high temperatures.

In the manufacture of thermoplastic articles from polymers such as polyamides or polyesters the polymer, usually in the form of small cubes or granules is fed to a heating zone where it is melted and the molten polymer is drawn off by means of a pump and forced through a filter pack to an extrusion die.

The filter pack through which the molten polymer is pumped usually consists of a thick walled cylindrical metal container with the extrusion die at its face and located above the die the filtration medium, usually a thickness of fine sand supported on a perforated plate and contained within fine mesh stainless steel gauzes. The pack is completed by a top plate provided with an inlet port for the molten polymer. In use the pack is held tightly against the outlet port from the pump and the molten polymer is forced through the filtration medium to the extrusion die.

The temperatures and pressures involved when extruding thermoplastic polymers are very high, for example, when extruding molten polyethylene terephthalate to form continuous fine filament yarns the temperature of the molten polymer is about 285° C. and the pressure within the pack may be as high as 10,000 pounds per square inch.

It will be easily appreciated that under the conditions specified above, a high degree of engineering precision is required to ensure that the joints between the components of the filter pack remain proof against leakage of the polymer during extrusion.

In the processes of the prior art, filter packs for the production of melt spun filaments of polyethylene terephthalate have been designed with various types of joints and one of the most successful is exemplified in British patent specification 780,743 in which is claimed a melt spinning apparatus comprising a spinning pack wherein at least one deformable sealing ring seals a joint in the spinning pack assembly as a result of the melt pressure, the surface area of said ring in contact with the melt being greater than the surface area of the ring in contact with the spinning pack.

In the drawings attached to British patent specification 780,743 there are illustrated numerous types of deformable sealing rings for ensuring a liquid tight seal between the various components of a melt spinning pack. The most difficult joint to make is that between the top plate of the pack and the pack body and in the various illustrations these joints are either screwed or bolted together with the deformable sealing ring taken up between the top plate and a shoulder on the pack body.

With a pack of this type the construction has to be such that the clearances between the top plate and the pack body are very close in order that the sealing rings may be accurately positioned and this entails costly engineering practice resulting in components which may be easily damaged and are also difficult to dismantle after use, this latter process having to be done whilst the pack is hot enough for the polymer to be molten.

It is an object of our present invention to provide a novel means of sealing high pressure liquid joints between components that may be assembled with a relatively loose joint between them.

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According to our invention we provide an improved means of sealing joints between conduits carrying liquids under conditions of high temperature and pressure of the type wherein the pressure of the liquid within the conduit causes a deformable sealing ring to be pressed into the joint, characterised in that the sealing ring comprises two separate components namely an inert outer thin metal deformable ring and an inner inert deformable plastic ring and that the metal ring is of such cross sectional form that it is pressed outwards by the action of the fluid being sealed pressing on the inert plastic ring.

We have found that our invention is particularly suitable for sealing the joint of a melt spinning pack of the type used in the manufacture of, for example, melt spun filaments of polyethylene terephthalate or high molecular weight polypropylene where temperatures up to 320° C. and pressures up to 10,000 pounds per square inch may be encountered within the filter pack. The cross sectional form of the metal ring may for example be that of a V or a U. In a preferred version of our invention the outer metal ring is made of aluminum and the inner deformable plastic ring is made of polytetrafluoroethylene (P.T.F.E.).

The deformable metal ring can adapt itself to slightly varying recess clearances so that these are no longer critical, and by doing so such clearances need no longer be small. The metal covers such clearances and prevents the plastic ring extruding through them under pressure and the plastic ring itself, contained by the metal ring shroud makes the liquid seal.

When the process of our invention is used at lower temperatures, the deformable plastic sealing ring may be made of rubber or other suitable material.

The attached drawings illustrate but do not limit our invention.

FIG. 1 represents a section through the inlet port of a melt spinning pack before the melt pressure has been applied and FIG. 2 represents the same section with the melt pressure applied.

A P.T.F.E. ring 1 shrouded on top by an aluminum ring 2 sits on a shoulder 3 of the pack body 4. The pump discharge outlet 5 is loosely located within the rings 1 and 2 and the shoulder 6 rests on ring 2.

In operation the molten polymer enters under pressure through the port 7 and exerts a fluid pressure, indicated by the arrows, against the P.T.F.E. ring 1 which in turn acts on the aluminum ring 2 to seal the gap 8 between the pack body 4 and inlet manifold 5.

What I claim is:

1. High pressure joint, comprising a first hollow cylindrical member having an open end, the interior surface of said member adjacent the open end including a portion of a major diameter extending longitudinally inwardly from said open end, an outwardly flaring tapered shoulder merging with the inner extent of said major diameter portion, the inner extent of said shoulder thence merging with a minor diameter portion; a second member having a major exterior diameter less than the major diameter of said first member for loose reception within the end of said first member, the inner extent of said second member having a minor diameter and a transverse shoulder there between, the minor diameter of said second member being positioned in opposed relationship to at least a substantial part of the major diameter of said first member to define an annular space bounded by the outwardly flaring shoulder and the major diameter of said first member, the transverse shoulder and the minor diameter of said second member; an outer ring of deformable metal or the like carried about the minor diameter of said second member adjacent said transverse shoulder, said outer ring being of a size to bridge the said annular space between said members, and an inner ring of plastic material carried within

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said annular space adjacent the outer ring, said outer ring including two angularly extending legs which are respectively of a length sufficient to be deformed into substantial coextensive sealing engagement with the major diameter of said first member and the opposed minor diameter of said second member in response to an increased pressure within said first member, said inner ring being carried within said outer ring between said outer ring legs.

2. High pressure joint defined in claim 1 wherein second member has a longitudinal bore wherein first and second members constitute conduits.

3. High pressure joint defined in claim 1 wherein said outer ring is composed of aluminum and said inner ring is composed of polytetrafluoroethylene.

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