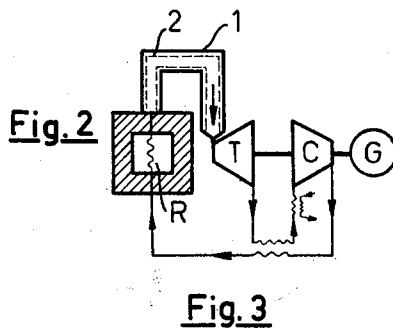
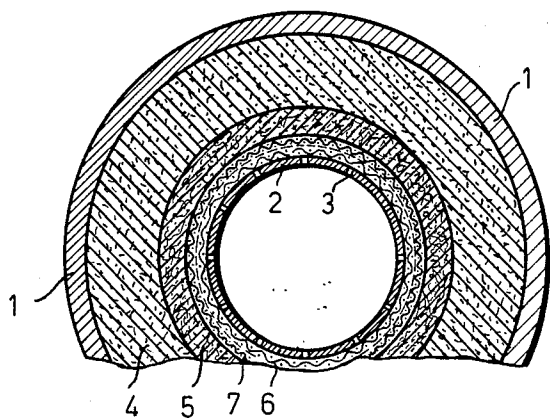
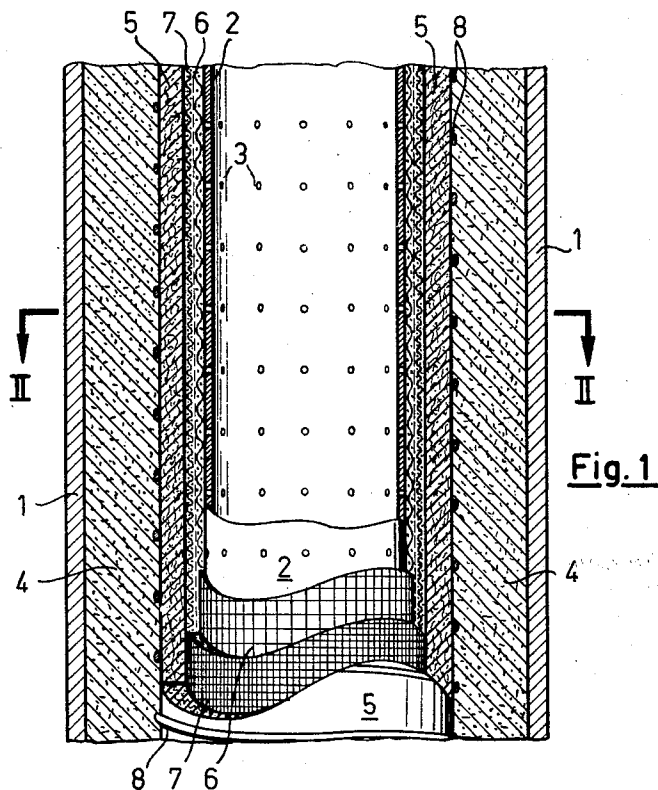


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DOUBLE-WALLED HOLLOW BODY FOR THE RECEPTION OF
A HOT GASEOUS MEDIUM UNDER PRESSURE
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DOUBLE-WALLED HOLLOW BODY FOR THE RECEPTION OF A HOT GASEOUS MEDIUM UNDER PRESSURE

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1 Claim. (Cl. 138-149)

This invention relates to a double-walled hollow body for the reception of a hot gaseous medium under pressure, the said hollow body containing a thermal insulating material in the space between the inner and outer walls, while its inner wall is formed with apertures to effect pressure equalisation between the space containing the insulating material and the interior of the hollow body.

Such hollow bodies are preferably employed as housings for apparatus and machines and as pipelines in thermal power plants, in which a gaseous working medium describes a circuit. In such cases, the outer wall has to take up the pressure of the working medium, but remains relatively cool owing to the insulating material introduced between the inner and outer walls, even when highly heated working medium flows within the hollow body. Since the pressure between the space containing the insulating material and the interior of the hollow body is balanced, the inside tube is only exposed to the high temperature of the working medium, but is not loaded in regard to strength.

On variation of the pressure of the working medium in such hollow bodies, a gas exchange takes place between the space filled with insulating material and the interior, so that the danger exists that particles of insulating material may be carried into the space containing the working medium and become mixed with the working medium of the circuit. A known step for counteracting this disadvantage resides in establishing the pressure equalisation by means of tubes of relatively small diameter, which extend from a point of the inside tube and pass through the space containing the insulating material in the longitudinal direction. These tubes are formed with a plurality of small apertures along their entire length. A further known step consists in providing on the outside of the inner wall of the hollow body a cavity defined directly by the said inner wall and in addition by a perforated jacket bearing closely against the insulating material, which cavity communicates also with the interior of the hollow body through a pressure equalising hole in the inside wall.

Such parts formed with a plurality of small holes are capable of preventing entrainment of insulating material into the space containing the working medium to such an extent that no deposits interfering with operation are produced in the working medium circuit. However, such means cannot meet the requirements arising when the gaseous working medium is heated in a nuclear reactor, because it is then difficult to prevent even small quantities of neutron-absorbing material from passing through the reactor.

In accordance with the invention, in a double-walled hollow body of the type described at the beginning, there is disposed between the insulating material and the inner wall of the hollow body a filtering layer which prevents insulating material from passing through the apertures in the inside wall into the interior of the hollow body. As a result of this step, even extremely small particles of insulating material are retained and are unable to reach the apertures in the inside wall and to pass therethrough.

The invention also concerns the use of such a hollow

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body as a gas-carrying part in a thermal power plant operating with a circulating gaseous medium which is heated in an atomic nuclear reactor.

A constructional example of the subject of the invention is illustrated in simplified form in the drawings, in which:

FIGURE 1 illustrates a gas-carrying double-walled tube, and

FIG. 2 is a section along the line II—II of FIGURE 1. FIG. 3 shows the use of the double-walled tube as a gas carrying part in a nuclear power plant.

The outer wall of the hollow body consists of a tube 1, which may be made, for example, of ferritic material. An inside tube 2 disposed coaxially with the tube 1 forms the inner wall of the hollow body and serves to guide a hot gas under pressure. The inside tube 2 is formed with apertures 3 serving to establish pressure equalisation between the interior and the annular space between the outside tube 1 and the inside tube 2.

Provided in the said annular intermediate space is a layer 4 consisting of insulating material, which bears against the outside tube 1. However, this layer 4 of insulating material does not completely fill the entire intermediate space toward the inside, but a filtering layer 5 consisting of long-fibred material is disposed between the insulating material 4 and the inside tube 2. This filtering layer 5 prevents insulating material of the layer 4 from passing through the apertures 3 in the inside tube 2 into the interior of the double tube and thus becoming admixed with the gas flowing therein. For example, there may be employed for the insulating layer 4 a packing insulation consisting of mineral wool. The filtering layer 5, on the other hand, preferably consists of a compact long-fibred mineral meshwork or woven fabric which, in addition to its filtering property, also has good insulating capacity. As a means for supporting the filtering layer 5, there are further provided between the latter and the inside tube 2 wire meshworks 6 and 7 disposed one upon the other. The wire meshwork 7 lying closer to the filtering layer has a smaller mesh width than the wire meshwork 6 lying on the side of the inside tube 2. One or more further layers of wire meshworks may also be provided between the wire meshworks 6 and 7. A band 8 wound around the filtering layer 5 serves to hold fast the said filtering layer with the interposed wire meshworks 6 and 7 on the inside tube. The inside tube exposed to high gas temperatures is preferably made of austenitic steel. Austenitic material is also preferably employed for the wire meshworks 6 and 7. The wire meshworks with the interstices between the meshes form an insulating layer which produces a certain temperature gradient as far as the filtering layer 5, so that the latter requires lower temperature resistance than the inside tube 2.

In addition, the wire meshwork 6 having the larger mesh width, with any further layers provided between the wire meshworks 6 and 7 permits a circulation of gas in the longitudinal direction of the tube. A certain pressure equalisation is established in the region of the wire meshworks even in the event of a pressure gradient being set up in the internal space in the longitudinal direction of the tube owing to frictional losses, and a gas flow in the filtering layer 5 and in the packing insulation 4 is substantially avoided. The free spaces between the meshes of the wire meshworks 6 and 7 and any further layers of wire meshworks further make it possible for the gas flowing through the apertures 3 into the space between the inside tube 2 and the outside tube 1 in the event of a pressure increase within the tube 2 to spread out over the entire surface of the filtering layer 5, so that it flows through the latter only at very low velocity. Conversely, in the event of a pressure drop in the internal

space, the gas discharged from the insulating layer 4 flows through the filtering layer 5 at a low uniform velocity and concentrates only within the layers of wire meshwork 7 to 6 among the outlet apertures 3 of the inside tube. By reason of this fact also, entrainment of insulating material into the interior of the tube 2 is avoided.

A number of layers of wire meshworks having graduated mesh widths may also be provided between the inside tube 2 and the filtering layer 5.

According to FIGURE 3, the compressed gaseous working medium of a thermal power plant is heated in a reactor R, then expanded in a turbine T and finally recompressed in a compressor C. Useful work is given up to a generator G. The double-walled tube 1,2 serves to guide the hot gas under pressure from the reactor R to the turbine T.

What is claimed is:

A double-walled conduit for use in conveying a high temperature, high pressure working medium from a nuclear reactor heat source to the inlet of a turbine comprising

- (a) an inner conduit for the reception of the working medium, said inner conduit designed to withstand high temperatures;
- (b) an outer conduit spaced from the inner conduit and defining therewith an intervening space, said outer conduit being designed to withstand high pressure;
- (c) said inner conduit containing a plurality of perforations formed therein for connecting said intervening space with the interior of the inner conduit, said perforations providing the sole means of ingress and egress for said intervening space;
- (d) a layer of gas permeable heat insulating material disposed in the intervening space adjacent the outer conduit;
- (e) a filtering layer consisting of woven long-fibered mineral material disposed between the insulating material and the inner conduit;
- (f) a first metallic wire meshwork disposed in the intervening space between the filtering layer and the inner conduit, said meshwork being coextensive with and adjacent to the inner conduit and having rela-

tively large mesh width with regard to the perforations in the inner conduit;

- (g) a second metallic wire meshwork disposed between said first meshwork and the filtering layer; the mesh width of said second meshwork being smaller than the mesh width of the first meshwork;
- (h) the first meshwork permitting a circulation of the medium in the longitudinal direction of the conduit and thereby serving to distribute evenly the flow passing from the inner conduit through the perforations and therefore avoiding localized areas of high velocity flow; and
- (i) said metallic meshworks producing a temperature gradient between the inner conduit and the filtering layer.

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