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(54) IMPROVEMENTS IN GASKETS

(71) We, KLINGER AG, of 10 Baarerstrasse, Zug, Switzerland, a Swiss Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a gasket for sealing joints between two parts for the purpose of preventing the escape at the joints of gases or liquids passing to one or more cavities or through passages in at least one of the parts. More particularly, the invention is concerned with a gasket for the making of a seal between components that are subject to heat and vibration and high or irregular and non-uniform distortion which seal thus requires a gasket which is of high strength and which at the same time affords single torque properties, such as in cylinder head gaskets for diesel or petrol engines.

The use of metal laminate construction material for gaskets is well established for diesel engine cylinder head gasket applications where high clamping loads are available. However, this type of gasket cannot be used satisfactorily in petrol engines where the clamping loads are relatively low and the gaskets lack compliance (ie ease of conformability on distortion); even when relatively high loads are applied the gasket material is very stiff and has difficulty in conforming to the distorted parts to be sealed. Furthermore, considerable work has to be carried out on the material to form it into a gasket, such as reducing the area of material under load by cutting out areas of at least some of the metal layers. Also, in order to attempt to match the general distortions of the parts, the material thickness is adjusted by surrounding those inner peripheral regions of the gasket which define respective apertures therein through which fluid can flow with ferrules or bindings and adjusting the thickness of the ferrules or bindings in dependence on the distance of the apertures from the centre of the gasket (the nearer the aperture to the centre the thicker the binding). Because of the construction of a metal laminate material the apertures through which gases or liquids pass require to be sealed in some manner, usually by using a metal binding, to avoid the penetration of the medium in between the laminate forming the material.

A gasket embodying the invention is provided with suitable compressive properties to allow it to accommodate the distortion of the parts to be sealed under the conditions of temperature and pressure typically encountered in a petrol or diesel engine, and at the same time has a low relaxation to eliminate the need of a torque follow-up procedure.

According to the present invention there is provided a gasket comprising a laminate of at least three metal sheet layers and a layer of cellulose fibre based sheet material between each respective pair of adjacent metal sheet layers.

The laminate has at least three and more preferably three metal sheet layers and as at least two (more preferably two) layers of cellulose fibre based sheet material, one between each pair of adjacent metal sheet layers.

By "cellulose fibre based material", we mean a material which has, by weight, a majority of or only cellulose fibre content.

There is thus provided a means of adding a controlled compliance or compression to an otherwise relatively stiff incompressible material while at the same time sealing the space between the metal layers against the penetration of relatively low pressure and temperature mediums as typically found within the passages surrounding the combustion aperture in a cylinder head gasket.

The application of a cellulose fibre based material in sheet form in between the metal layers allows a very close control to be maintained on the allowable compression of

the gasket material, which can be adjusted to suit the requirements of individual applications. In addition, gasket constructions embodying the invention retain the single torque properties of conventional laminate gaskets of metal alone.

Where a gasket embodying the invention has an aperture therethrough in a region to be subjected to conditions of extreme temperature and pressure it may be provided with a metal 'U' sectioned binding member lining the aperture in such a way that the arms of the U-shaped member embrace the regions of the gasket surrounding the aperture. In such cases one or more metal layers or layers of cellulose fibre based sheet material may be cut back in an area within the 'U' sectioned binding member to adjust the pressure applied to the binding member to the desired level for attaining maximum fluid sealing efficiency.

One or more of the metal or interposed layers of cellulose fibre based sheet material may be cut back in unsupported or unclamped areas where the material is used as a fluid or gas flow controller to minimize erosion of the cellulose material by high velocity fluid.

The cellulose fibre based sheet material may be treated to improve its resistance to fluid penetration or its swelling properties.

The present invention will now be described in greater detail by way of example with reference to the accompanying drawing, wherein:—

Fig. 1 is a part cross-sectional view of one preferred form of gasket;

Fig. 2 is a part cross-sectional view of a modified form of gasket including interposed layers of cellulosic fibre based sheet material cut back in the vicinity of one aperture therein; and

Figs. 3 to 5 are part cross-sectional views of further modified forms in which one or both of the interposed layers of cellulosic fibre based sheet material are cut back at the inner peripheral edges of the gasket surrounding respective apertures.

Referring firstly to Fig. 1, the gasket comprises three layers 10 of sheet metal and two interposed layers 12 of cellulose fibre based material sheet material. A first aperture 14 and a second aperture 15 are provided for the flow of gas or liquid through the gasket. The second aperture 15 is disposed at or towards the centre of the gasket. In this central region distortive forces tend to be greater and, for protection against this distortion, the inner peripheral region of the gasket defining the second aperture is surrounded by a binding member 16 whose cross-section is U-shaped, the arms of the U-shaped binding member 16 making contact with outermost sheet metal laminates 10 at the inner peripheral region of the gasket.

In the modified form shown in Fig. 2, the interposed layers 12 of cellulose fibre based sheet material are cut back in the vicinity of the first aperture 14 so that they are only present in the clamping zone 18 thus minimizing erosion of the cellulosic material by flowing fluid. This form is particularly useful where the gasket is used as a means of restriction in a gas or as a liquid flow controller.

Referring now to Fig. 3, in a further modified form the uppermost layer 12 of cellulose fibre based sheet material is cut back in the vicinity of the binding member 16.

In the form shown in Fig. 4 both cellulose fibre based layers 12 are cut back in the vicinity of the binding member 16. The pressure applied to the binding member 16 by the material which it surrounds depends upon the number and choice of layers which are cut away and this pressure can thus be adjusted to a desired level for attaining maximum sealing efficiency.

Finally, in the modified form shown in Fig. 5 a C-shaped resilient member 18 is provided with the U-shaped binging member 16.

In all embodiments the cellulose fibre based sheet material can be treated to improve its resistance to gas or liquid penetration or its swelling properties.

In the above embodiments the cellulose fibre based sheet material constitutes between 5% and 60% of the gasket body material assembly thickness when compressed in its working enviroment.

The above described gaskets are particularly applicable to diesel and petrol engines, although they may also be used on turbomachinery, compressor casings and pipe joints.

WHAT WE CLAIM IS:—

1. A gasket comprising a laminate of at least three metal sheet layers and a layer of cellulose fibre based sheet material between each respective pair of adjacent metal sheet layers.

2. A gasket according to claim 1, wherein the laminate has three metal sheet layers and two layers of cellulose fibre based sheet material.

3. A gasket according to any one of the preceding claims, wherein the or each layer of cellulose fibre based sheet material has been treated to improve resistance thereof to fluid penetration and/or the swell characteristics thereof.

4. A gasket according to any one of the preceding claims, wherein the metal sheet layers and respective adjacent layers of cellulose fibre based sheet material are adhered to one another.

5. A gasket according to any one of the

preceding claims having at least one aperture therein defined by an internal peripheral region of the gasket which said aperture enables fluid flow through the gasket.

6. A gasket according to claim 5, wherein the said internal peripheral region thereof can come into contact with fluid flowing through the aperture.

7. A gasket according to claim 6, wherein the or each layer of cellulose fibre based sheet material terminates short of the said inner peripheral region of the gasket defining the or a said aperture through which fluid can flow.

8. A gasket according to claim 5, which is provided with a U-shaped binding member surrounding the said internal peripheral region.

9. A gasket according to claim 8, wherein the or each layer of cellulose fibre based sheet material terminates short of the or each respective said peripheral region of the gasket surrounded by a said U-section binding member.

10. A gasket according to claim 8 or claim 9 wherein at least one of the said metal sheet layers terminates short of the or at least one said peripheral region of the gasket surrounded by a or a respective said U-section binding member.

11. A gasket according to any one of the preceding claims which when fitted to form a seal has a total thickness of the said layers of cellulose fibre based sheet material constituting from 5 to 60% inclusively of the total thickness of the gasket material.

12. A gasket constructed and arranged substantially as herein described with reference to and as illustrated in Figure 1 of the accompanying drawings.

13. A gasket constructed and arranged substantially as herein described with reference to and as illustrated in Figure 2 of the accompanying drawings.

14. A gasket constructed and arranged substantially as herein described with reference to and as illustrated in Figure 3 of the accompanying drawings.

15. A gasket constructed and arranged substantially as herein described with reference to and as illustrated in Figure 4 of the accompanying drawings.

16. A gasket constructed and arranged substantially as herein described with reference to and as illustrated in Figure 5 of the accompanying drawings.

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1604434 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig.1.

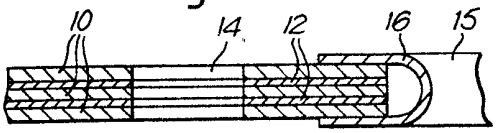

Fig.2.

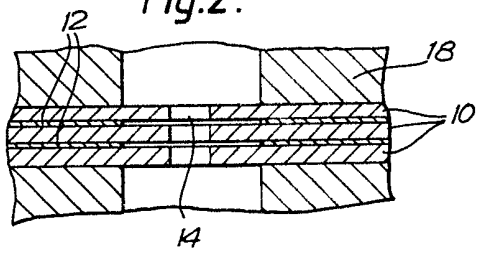

Fig.3.

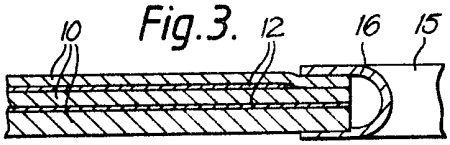

Fig.4.

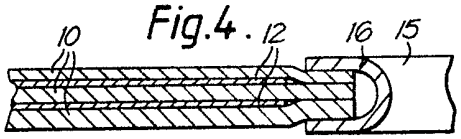

Fig.5.