This invention relates to a spacer for joining two metal bodies in spaced relation and more particularly to an insulating spacer having surfaces for sealing contact with the carburetor and intake manifold of an internal combustion engine.

The carburetors of automobile engines are usually made of a brass casting with a lower flange which is intended for fastening to the intake manifold of the engine proper. The manifold is ordinarily a metal casting of iron with an upwardly facing flange having proper openings matching those in the lower flange of the carburetor. It is desired that an insulation be provided between the manifold and the carburetor to avoid excessive heat transfer from the engine to the carburetor body. In the past this insulation has been provided by a spacer placed between the flanges on the manifold and carburetor respectively.

Difficulty has been experienced in the past in obtaining an accurate seal between the spacer and the flanges on the manifold and carburetor. Various expedients have been used including the use of soft gaskets on either side of the spacer and also a coating of varnish on the surfaces of the spacer. These attempts to seal the surface were necessary in that the flange surfaces could not be ground to sufficient accuracy in production methods. These flanges were often .005" to .008" concave so that air leakage occurred without the use of a separate sealing medium.

In fastening the carburetor to the intake manifold, the spacer has to resist a considerable compressive force and to maintain this resistive quality throughout the life of the engine. For this reason, a completely resilient spacer having cold flow properties cannot be used.

The principal object of this invention is to provide a one piece spacer of the character described which has compressive resistance combined with compressible sealing surfaces for engaging the flanges of the carburetor and intake manifold of an engine.

A further object is to provide a spacer of the character described which is a chemically bonded sandwich type spacer. A further object is to provide a bonded spacer having a core capable of permanently resisting compression placed on the spacer.

A further object is to provide a new and novel method for producing a spacer of the character described.

Further advantages, features and objects of the invention will be ascertained from the description to follow and the accompanying drawings, in which:

Fig. 1 is a diagrammatic broken side elevation view of a spacer of this invention installed between the flanges of an engine carburetor and intake manifold;

Fig. 2 is a perspective view of the spacer of this invention;

Fig. 3 is an exploded side elevation view of the mold plates used to form the spacer of Fig. 2;

Fig. 4 is a side elevation view of the mold of Fig. 3 shown in assembled relation;

Fig. 5 is a vertical sectional view through the mold showing a spacer formed therein and taken through the mold so as to illustrate the aligning means, the pins for forming openings through the spacer and the sprue plugs for admitting material within the cavity of the mold;

Fig. 6 is a top plan view of the sprue plate of the mold taken substantially along line 6—6 in Fig. 3; and

Fig. 7 is a top plan view of the cavity plate of the mold taken substantially along line 7—7 in Fig. 3.

While this invention is susceptible of many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

The spacer is diagrammatically illustrated in Fig. 2 and is shown to have four relatively large air and gas vapor passages 10 for permitting the passage of the fuel from the carburetor into the intake manifold of the engine. This spacer is about 1/4" thick so as to provide adequate heat insulation between the intake manifold and the carburetor. The bolts 11 shown in Fig. 1 pass through corner openings 12 in the spacer to secure the parts together. In appearance, the spacer appears to be a single unit of homogeneous material and only upon close examination can it be ascertained that the core might have been separate from the facing surfaces. In the upper face of the spacer as illustrated, there are five openings 13 which extend only a portion of the depth into the core of the spacer. These openings are left in the spacer as a result of placing the molding material in the mold to form the spacer. This procedure will be defined in detail below.

The fragmentary view of Fig. 1 illustrates the barrel 14 of a carburetor having a lower flange 15 opposed to a flange 16 on the intake manifold 17. The spacer, generally indicated 20, is sandwiched between these flanges. The bolts 11 are pulled tight against the flanges to compress them into the surfaces of the spacer therebetween providing an airtight seal. Any slight irregularities in the surfaces of these flanges are accommodated in the compressible surfaces of the spacer and thus avoid air leakage.

The core of the spacer is preferably made of a mineral filled phenolic bonded molding composition. This composition is injected into a closed mold internally of the surface sheets of asbestos paper impregnated with thermo-setting resins. These sheets appear to have the character of gaskets prior to being bonded to the core. The resin used in the surface sheets is different from the resin of the core in order to obtain a composite spacer of the sandwich type in which the surface may have a Rockwell hardness of 10 while the core may have a hardness of 100, both using the L-scale. The thickness of the core should be a minimum in excess of the combined thickness of the surface layers. The surface layers should not be more than 1/8" thick. The core provides a permanent compression resistant body while the surfaces provide the necessary compressibility to seal against slightly irregular surfaces of carburetor or intake manifold.

As stated above, the spacer is formed in a closed mold. This mold includes a sprue plate 21 illustrated in Figs. 3—7. The sprue plate 21 carries four lugs 22 of the shape of the gas and air passages 10 in the finished spacer. These lugs have a depth to fit into the cavity 32 of the cavity plate 31 and to rest upon the bottom of the cavity. The plates are brought into proper alignment by four corner aligning pins 23 which fit into corresponding bores 33 in the cavity plate. The plates are held together by twelve cap screws 34 extending upwardly through the cavity plate and into the sprue plate 21.

When the plates are assembled as in Figs. 4 and 5, align-
ing pins 25 meet within the cavity with similar pins 35 in the cavity plate. These pins form the corner openings 12 through the spacer. When assembled, five sprue plugs 26 extend through the sprue plate and into the cavity formed between the plates. These plugs are ordinarily exposed about 1/4 to the cavity and are used for the purpose of introducing the core material into the mold.

Before the mold plates are assembled in closed relation, a surface sheet 18 having four openings therein corresponding to the gas passages 10, is fitted into the sprue plate and frictionally held in place by fitting over the lugs 22. A similar surface sheet 19, having the same openings is fitted into the cavity of the cavity plate 31 and is held in position by frictionally grasping the guide pins 35. These two surface sheets have other openings as required and sheet 18 has five openings to fit about the sprue plugs 26 so that the plugs may extend through the sheet 18 into the space between the two sheets.

The forming of the spacer is done under hydraulic pressure of about 2000 p.s.i. and at an elevated temperature of about 300°F., this temperature being that at which the thermosteet resins will chemically react and bond together. A reservoir containing the core material is supported above the assembled mold on a plurality of posts 27 secured in the top surface of the sprue plate 21. The material flows from the reservoir through the sprue plugs 26 into the space ordinarily exposed 19 and the pressure and temperature employed cause the sheets and core to chemically react and bond together. The sheets and core in the finished product lose substantially all visible identity and the finished spacer appears to be made of homogeneous material. The compressible qualities of the surface sheets are retained while the core material sets up to a considerably greater hardness. In the finished product, the core provides sufficient strength and resistance to compression while the surface sheets, although bonded to the core, provide sealing contact with the flanges described.

Ordinarily it is preferred that the asbestos paper which is used for the sheets 18 and 19 be from 3/4" to 5/8" thick. The molding material as it is forced into the mold is a plastic clay-like mass. The holes formed in the sheets are located with considerable accuracy and generally are on centers within a tolerance of ±.003. The spacers are generally required to pass a test according to automotive standards which require the material to withstand a considerable compression for a period of two hundred hours. By combining the surface compressibility with the hard core in a single unit, considerable expense has been avoided in the handling of separate parts. Manufacturing assembly of motors has been speeded up in this operation without appreciable increase in the cost of the parts involved. The use of the spacer of this invention has resulted in a considerable savings in the manufacture of the automobile engines.

A specific example of a spacer made in accordance with the present invention used surface sheets of .020" thick and a core material of sufficient thickness to make a combined thickness of 1/4". The surface comprised an asbestos filled Neoprene bonded sheet and the core was an asbestos filled phenolic bonded composition. The materials were chemically bonded together at about 300°F. and under a pressure of 2000 p.s.i. The finished spacer had a permanent compressive resistance and surface portions which were deformable to seal against slight irregular surfaces. Ordinarily the spacers are made in a range from 3/8" to 1/2" thick and the surface sheets may be of a thickness range between .020 to .030" with the core being between fifteen to thirty times as thick as the surface sheet.

I claim:

1. A method of making a sandwich type spacer for use between opposed metallic flanges comprising, placing a resilient sheet of material an ingredient of which is Neoprene, one on each face of a closed mold so that the sheets are parallel and spaced apart, introducing a thermosteeting phenolic core material having an asbestos filler, under about 2000 p.s.i. molding pressure through openings in one of the sheets and into the space between said sheets, elevating the temperature of the mold and contents to about 300°F. to chemically react and bond together the sheets and core, and then removing the completed spacer from the mold.

2. A method of making a sandwich type spacer for use between opposed metallic flanges comprising, placing a resilient sheet of material an ingredient of which is Neoprene, one on each face of a closed mold so that the sheets are spaced apart, introducing a thermo-setting phenolic core material having a mineral filler under an elevated molding pressure through openings in one of the sheets and into the space between said sheets, elevating the temperature of the mold and contents to a temperature sufficient to chemically react and bond together the sheets and core, and then removing the completed spacer from the mold.

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