ELECTRICALLY CONDUCTIVE SEALING GASKET AND METHOD OF MAKING SAME
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ELECTRICALLY CONDUCTIVE SEALING GASKET AND METHOD OF MAKING SAME

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This invention relates to sheet materials and more particularly to electrically conductive sheet materials which are suitable for use in making sealing gaskets.

In order to prevent interference with radio reception caused by electrical and magnetic emissions from the ignition circuits of internal combustion engines, or the like, it has long been common practice to enclose these circuits in metallic casings. It is necessary in most instances to construct these casings of separable parts and to provide gaskets between the connected parts to prevent the entrance of air, moisture, and the like. The inclusion of gaskets constructed of known materials suitable for this purpose has been detrimental to the shielding ability of the casing, particularly where high frequency currents are involved, because the electrical conductivity and the metallic continuity of the casing are interrupted. Much difficulty has been experienced in endeavoring to solve this shielding problem.

It is accordingly an object of the present invention to provide a novel gasket material which will serve as an electrically conductive link between two metallic surfaces and also serve to prevent the passage of air and moisture between said surfaces.

Another object of the invention is to provide an oil and heat resistant gasket material which is electrically conductive, particularly in the direction of the thickness thereof.

A further object is to provide a metal reinforced rubber-like sheet material which is electrically conductive between opposite surfaces thereof.

Still another object is to provide a novel method of making material of the above character.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention, reference for this latter purpose being had primarily to the appended claims.

In the accompanying drawings, wherein like reference characters refer to like parts throughout the several views;

Fig. 1 is a plan view showing a gasket made from one form of material embodying the present invention;

Fig. 2 is a similar view with parts broken away and on an enlarged scale;

Fig. 3 is a detail sectional view on a still larger scale showing said material before completion thereof, the section being taken substantially on line 3—3 of Fig. 2; and

Fig. 4 is a view similar to Fig. 3 showing the material of the invention after completion, the section being taken substantially on line 4—4 of Fig. 2.

The single embodiment of the invention illustrated in the drawings, by way of example, consists of a wire mesh screen or cloth impregnated with a suitable elastomer, such as rubber or like material. The synthetic rubber commercially known as "Neoprene" has been found suitable for this purpose and other products, such as suitably processed polymerized cashew-nutshell oil, may also be used as the filling or impregnating material.

The wire mesh screen or cloth, in the form shown, comprises a plurality of relatively small, transversely extending metallic wires and a plurality of longitudinally extending wires, said wires being wavy or sinuous in the longitudinal direction and interwoven with each other in a familiar well-known manner to form a relatively flat network. The wire mesh structure thus formed will be of such a nature as to yield slightly in the direction of the thickness thereof. This yieldability results primarily from the curvature imparted to the individual wires during the weaving process and to the flexibility of the wires.

The rubber or rubber-like filling material completely fills the spaces between the interwoven wires and preferably adheres to the latter so as to provide a solid, yieldable sheet material which is non-porous, or substantially so.

In order to render said structure electrically conductive, however, in the direction of the thickness thereof, the outermost surfaces or high points of the bends or humps in the waved wires and are exposed and, if desired, said surfaces may be flattened somewhat as best shown at 10 in Fig. 3. The flattening of the high points 9 which are exposed through the filling material increases the metallic surface which may be exposed in the same plane with the surface of the filling material and also provides a smooth, even surface on the material, thereby enhancing the sealing ability as well as the electrical conductivity of the material when the same is used as a gasket between metallic surfaces.

The above described material may be fabricated by merely placing the wire mesh screen 1, 8 or an equivalent conductive network between two sheets of suitable impregnating material, such as "Neoprene" or an equivalent elastomer.
These sheets and the screen are then subjected to pressure and heat simultaneously for pressing the filling or impregnating material of the sheets into the interfingering of the wires, network or screen, and for vulcanizing the material of the sheets together and around the interwoven wires and the screen. The surfaces of the resulting incompletely produced product, which is illustrated in Fig. 3, are then abraded in some suitable manner, such as by sanding or brushing, until the high points or bends of the wires are exposed and preferably somewhat flattened, as at 10, by a grinding away of a portion of the metal. If desired, the filling material might be applied to the sheet by dipping or by running the screen through calender rolls with the filling material in the same manner that textile fabrics are coated with rubber and like materials.

In one satisfactory material employed for making gaskets for use in connection with the present invention, a mesh aluminum wire cloth made of .015 inch diameter wire was impregnated with synthetic rubber. In choosing the wire used in making the wire screen or cloth, consideration should preferably be had for the metal of the parts between which the gasket is to be used. The metal of the parts in the present invention, and the metal of the wire mesh cloth should be as close together as possible in the table of E. M. F. series of metals to thereby avoid galvanic action which would accelerate corrosion of the metal. Where the connected parts are made of magnesium alloys such as are used in building modern ignition devices and shielding thereof, an aluminum alloy screen in the gasket material is satisfactory, although a screen or cloth of the same metal is preferable from the standpoint of possible corrosion.

There is thus provided a novel sheet material which is pliable, flexible and resilient and yet durable, even when subjected to high temperatures and wide changes in temperature, and to attack by oil, gasoline, moisture and the like. The novel material provided may be readily and inexpensively manufactured with existing machinery at relatively low cost. The invention comprehends a wire reinforced gasket material which is rendered electrically conductive by the reinforcing wire without appreciably detracting from the sealing ability thereof when used as a gasket.

Although only a single embodiment of the invention is illustrated and described in detail, it is to be expressly understood that the same is not limited thereto. For example, hardware cloth wherein the engaging portions of the cross or interwoven wires are soldered or otherwise secured together to prevent lateral collapse may be used instead of ordinary wire cloth or screen. Other variations in the specific structure illustrated and in the component materials mentioned, by way of example, will now be apparent to those skilled in the art and may be made without departing from the spirit and scope of the invention. For a definition of the limits of the invention, reference is had primarily to the appended claims.

What is claimed is:

1. An electrically conductive sealing gasket comprising a network of interwoven sinusoidal wires, and a flexible solid material filling the spaces between said wires, longitudinally spaced portions of each of said wires being exposed at opposite surfaces of said filling material.
2. An electrically conductive sealing gasket comprising a network of electrically conductive strands, and a solid unitary mass of flexible material filling the space between said strands, portions of each of said wires being exposed at the opposed flat surfaces of said filling material to render said sheet material adaptable to conduct electrical current between metallic parts engaging opposite surfaces thereof.
3. An electrically conductive sealing gasket comprising a sheet of rubber-like material, and a plurality of metallic wires embedded in said sheet, each of said wires having only longitudinally spaced portions thereof flattened and exposed at opposite surfaces of said sheet of material.
4. An electrically conductive sealing gasket comprising a sheet of material adapted for use as a gasket, and a plurality of metallic strands embedded in said sheet of material, portions of each of said strands being exposed at opposite surfaces of said sheet of material and exposed portions at one surface being electrically connected to exposed portions at the other of said surfaces.
5. A flexible gasket electrically conductive in a direction normal to its plane comprising a sheet of yieldable solid material and a wire mesh screen embedded in said sheet, portions of each of the wires of said screen being exposed at both surfaces of said sheet.
6. A flexible disk-like electrically conductive gasket comprising a plurality of sinusoidally shaped and yieldable solid material filling the spaces between said wires, the crests of the bends in said wires having flat areas in the plane of the opposite surfaces of said filling material.
7. A flexible electrically conductive gasket comprising a sheet of vulcanizable material, and a wire mesh screen embedded in said sheet of material, the wires of said screen having flattened surfaces in the planes of both surfaces of said sheet of material.
8. A flexible electrically conductive sealing gasket comprising a sheet of rubber-like composition, and a plurality of electrically conductive strands embedded in said sheet of material, said strands having only spaced relatively flat electrically conductive surfaces in the planes of the surfaces of said sheet of material.
9. The method of making electrically conductive gaskets which comprises the steps of placing a wire mesh screen between sheets of vulcanizable material, simultaneously heating and pressing said sheets against said screen to press said sheets between the wires of said screen and vulcanize the same together, and abrading the surfaces of the resulting sheet until portions of the wires of said screen are exposed and flattened.
10. The method of making a gasket which comprises embedding a wire mesh screen in yieldable solid material, and abrading opposite surfaces of said material until portions of the wires of said screen are exposed and flattened.
11. The method of making an electrically conductive gasket which comprisesEmbedding a plurality of electrically conductive strands in a sheet of yieldable solid material, and abrading the surfaces of said material until spaced portion only of each of said strands are exposed and flattened at both said surfaces.
12. A resilient connector adapted to seal a joint between electrically conductive bodies comprising a relatively flat net of metallic wires enclosed in a flat body of flexible dielectric material, each of said wires being exposed on opposite surfaces of the flat body to render said connector elec-
trically conductive between the surfaces having the exposed wires.

13. An electrically conductive gasket for use between adjacent surfaces of electrically conductive parts comprising a plurality of sinuous strands of electrically conductive material embedded in a resilient dielectric sheet, the crests of alternate bends in each of said strands being exposed at opposite surfaces of said sheet of material.

14. The method of making a flexible sheet of material having electric conductance which includes making a network of sinuous wires, impregnating and covering said network with resilient dielectric material and reducing opposite surfaces of said material until crests of the bends of said wires are exposed in both said opposite faces of said sheet and flattened.

15. A gasket comprising a block of resilient dielectric material and enclosing an interconnected network of wires, each of said wires having flattened projections exposed in those surfaces of the sheet adapted to be contacted by electrically conductive surfaces of the body in which the gasket is adapted to be used, said projections being of a nature sufficiently resilient not to interfere with the sealing characteristics of the gasket.

16. A combined sealing gasket and electrically shielding member comprising a woven metallic screen impregnated with rubber to form a disk-like member, and portions of said screen being substantially flush with opposite surfaces of the rubber filling to make electrical contact with abutting surfaces.

17. A combined sealing gasket and electrically shielding member comprising a series of crossed electrical conducting members, the spaces between said members being filled with a compressible sealing material which covers portions of said members and leaves other portions thereof exposed at the opposite surfaces of the sealing material.

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