

Nov. 4, 1952

R. TWELLS ET AL

2,616,481

DEVICE FOR MOUNTING CONCENTRIC BODIES

Filed Dec. 30, 1946

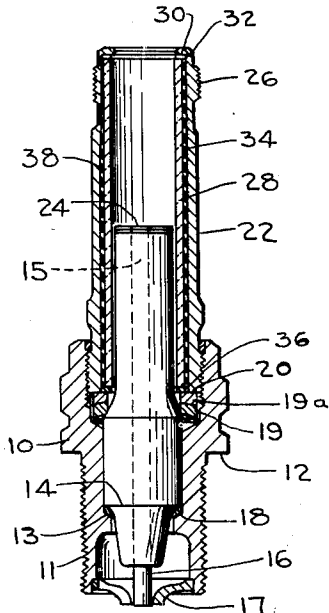


FIG-1

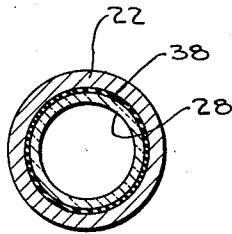


FIG-3

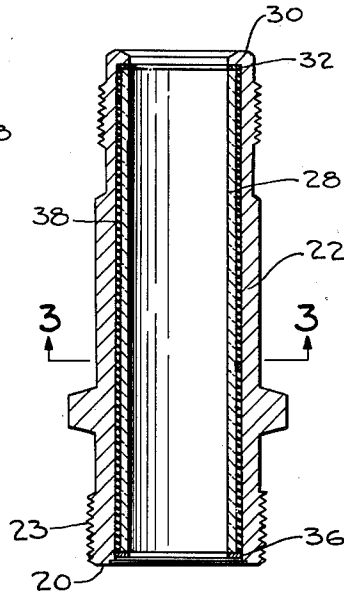


FIG-2

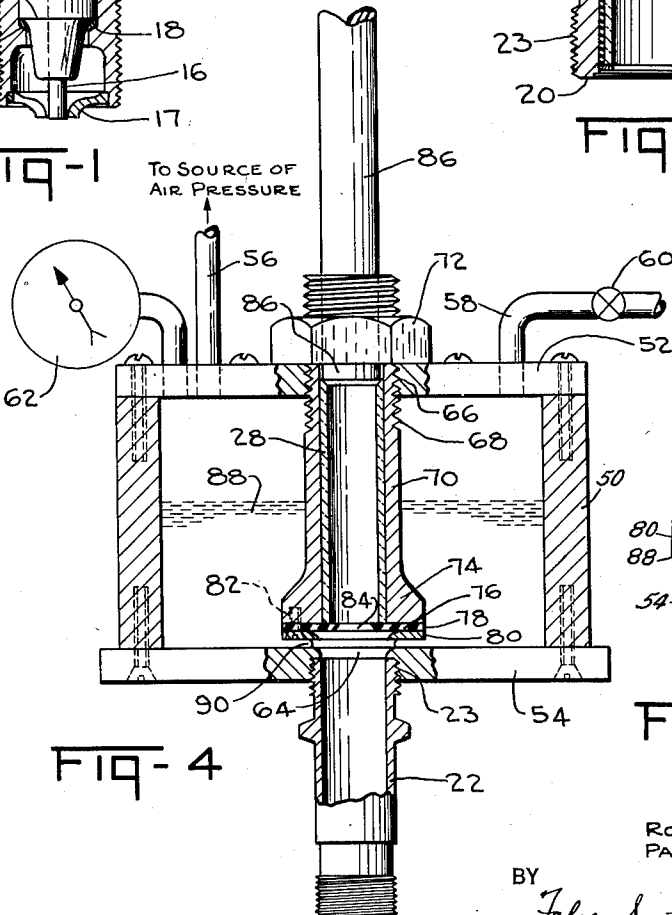


FIG-4

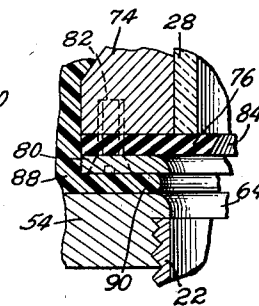


FIG-4A

INVENTORS
ROBERT TWELLS
PAUL E. BUCKLES

BY
Felby, Souther & Stollenberg
ATTORNEYS

UNITED STATES PATENT OFFICE

2,616,481

DEVICE FOR MOUNTING CONCENTRIC BODIES

Robert Twells and Paul E. Buckles,
Fostoria, Ohio

Application December 30, 1946, Serial No. 719,304

5 Claims. (Cl. 154-1)

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This invention relates to a method of and a machine for positioning a body of viscous material between a pair of cooperating tubular elements having a relatively long dimension longitudinally compared to a transverse dimension.

This invention contemplates the provision of a method which facilitates the positioning of a body of viscous material, such as organo-silicon oxide polymers, commonly known in the trade as silicones, between the closely cooperating walls of a pair of tubes and in the narrow annular space between, for the purpose of resiliently mounting the tubes with reference to each other.

The invention further contemplates providing a device, whereby a resilient body of material, such as organo-silicon oxide polymers, may be expeditiously positioned between a metal tube and a ceramic tube, whereby the relatively frangible ceramic tube is held resiliently in position without stresses or strains which are likely to cause breakage therein.

It is, therefore, a principal object of this invention to provide a method of and a device to expeditiously extrude a viscous body in a narrow space between two closely cooperating members.

It is a further object of this invention to provide a method which will facilitate the resilient mounting of a frangible ceramic member within a non-frangible member by extruding a body of resilient material therebetween.

Other objects and advantages of this invention relating to the arrangement, operation and function of the related elements of the structure, to various details of construction, to combinations of parts and to economies of manufacture, will be apparent to those skilled in the art upon consideration of the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Referring to the drawings:

Fig. 1 is an elevational view, partly in section, of a spark plug incorporating the invention;

Fig. 2 is an enlarged elevational view, in section, of the shielding tube of the spark plug;

Fig. 3 is a plan view, in section, taken along the line 3-3 of Fig. 2;

Fig. 4 is an elevational view, in section, of a device for carrying out the invention;

Fig. 4A is a cross-sectional view of a detail.

The invention is disclosed having reference to a specific application thereof, particularly to a spark plug. Referring to the drawings, particularly to Fig. 1, a spark plug is shown having a body member 10, with a threaded portion 11 to

fit into an engine, and an external shoulder 12 adapted to cooperate with a sealing gasket (not shown). An internal shoulder 13 is shown, against which is seated an enlarged portion of an insulator 14 carrying a center electrode 15 provided with a firing tip 16 cooperating with a ground electrode 17 fitted into the body member 10. A gasket 18 is provided for sealing the insulator 14 in the shell 10 as shown.

To maintain a sealing pressure on the gasket 18, a spring member 19 is provided in the nature of a ring which bears on the upper shoulder of the enlarged portion of the insulator 14. Tension is maintained on the spring member 19, by a washer 19a thrust downwardly by the bottom end 20 of a shielding tube 22 threaded into the upper end of the body member 10 by a threaded section 23. The terminal end 24 of the center electrode 15 projects into the shielding tube 22 and terminates adjacent a central position thereof where contact is made with a conductor (not shown) adapted to project into the shielding tube from the opposite end and held in position by an attaching means (not shown) cooperating in threaded relation with threads 26 on the outside of the shielding tube 22.

To insulate the connection between terminal end 24 of the center electrode and the conductor from the metallic shielding tube 22, a ceramic tube 28 is provided which is fitted into the interior of the shielding tube from the bottom end thereof and abuts against an inwardly extending flange 30 with a gasket 32, made preferably of asbestos therebetween at the upper end of the shielding tube. The dimension of the cooperating tubes are such that an annular space 34 is provided between them as shown. At the lower end of the ceramic tube 28 a second gasket 36 is provided to rest upon the washer 19a. A device for positioning this ceramic tube within the metallic shielding tube is the locus of the invention to be described in detail hereinafter.

It is clear from the already described structure that the ceramic tube 28 must be placed in position in the metallic shielding tube 22 before the shielding tube is threaded into operative relation with the shell 10. Preferably the assembly is made as a separate sub-assembly for the spark plug as is clearly shown in Fig. 2. In order to hold the ceramic tube 28 resiliently in the metallic shielding tube 22, the space 34 therebetween is filled with a rubber-like body 38 of organo-silicon oxide polymers, known in the trade as silicones. These polymers are very stable to moisture and temperatures found in the spark plug when in use and form an excellent resilient body to protect the relatively frangible ceramic

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tube from breakage. This is accomplished by creating a cushioning effect for blows inflicted by rough usage and also allows positioning of the ceramic tube without stress and strain in the tube itself. It is highly desirable to position the body of these polymers as compactly as possible and without vesiculation, for which purpose a novel machine is provided, as shown in Fig. 4 and described in detail hereinafter. The details of this article and method are also described and particularly claimed in application, Serial No. 719,303 filed December 30, 1945.

The organo-silicon oxide polymers most satisfactory for the aforementioned purpose are relatively heavy viscous fluids at room temperature, and can be obtained commercially under the trade-name of Silastic SC-69-3 (K392) made by Dow Corning Corporation of Midland, Michigan. These polymers are in the form of a soft, dense, white paste which will spread easily and will adhere tenaciously to clean, smooth surface. It is particularly advantageous to use a ceramic surface such as found on a ceramic article as it comes from the vitrifying furnace. Clean surfaces on the articles to which these polymers are to adhere are essential.

Referring now to Fig. 4, a device is shown which is designed to facilitate the positioning of a body of the aforementioned polymers between the ceramic tube 28 and the metallic shielding tube 22. For this purpose, a container 50 is provided, preferably made of brass having a cylindrical form with a cover 52 and a bottom 54 in parallel arrangement. The container is made air-tight for purposes to be described hereinafter, being in communication with a source of air pressure through conduit 56 positioned in the cover 52. A bleeder conduit 58 is provided, controlled by a valve 60, also in communication with the container 50 through the cover 52. The valve 60 allows an operator to control the air pressure in the chamber as measured by a gauge 62.

The floor 54 of the container 50 is provided with a centrally-located aperture 64, which is counter-bored and may be threaded to allow a metal shielding tube 22 to be fitted therein by the threads positioned on its lower end as shown in Fig. 2. The tube is inverted for this, so that the flanged end thereof depends from the floor, substantially as shown with the aperture 64 coinciding with the internal diameter of the tube. An unthreaded counterbore may also be used and the inverted tube held manually in position.

The cover 52 is provided with an aligning threaded aperture 66, into which is fitted the threaded end 68 of a cylinder 70, which depends from the cover and terminates a short distance above the floor 54 as shown. The cylinder 70 is locked in adjusted position in the cover 52 by lock nut 72, and is provided at its lower terminus by an enlargement 74 to form a lower face 76, to which is attached a rubber packing 78 by means of a ring plate 80 held to the face by screws 82 which pierce the face. The rubber packing 78 is provided with a central aperture 84 in alignment with the bore of the cylinder 70 and the aperture in the ring plate 80, which is chamfered to provide a sharp wiping edge adjacent its upper surface somewhat smaller in diameter than the diameter of the bore of the cylinder 70. The aperture in the ring plate 80 is rounded downwardly to give a smooth surface to allow flexing of the gasket member downwardly when in use as described hereinafter.

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The bore of the cylinder 70 is of a diameter to allow the ceramic tube 28 to fit loosely therein to allow ready longitudinal movement through the bore to hold the tube 28 in alignment with spaced longitudinal juxtaposition to the tube 22. When positioned in the bore, the tube 28 rests upon the upper surface of the gasket 78, while its upper end is adapted to cooperate with a plunger 86 adapted to be moved manually in the bore of the cylinder to thrust the ceramic tube 28 downwardly into partial engagement or telescoping relation with the metallic shielding tube 22, thereby deflecting the gasket 78 downwardly to form a seal with the exterior of the tube 28. The operator begins a cycle of operation in this manner with the parts in position in the device as shown in Fig. 4.

A body 88 of the organo-silicon oxide polymers is positioned in the container 50 as shown with an air space above. Inasmuch as the polymer is a soft, dense, white paste of relatively high viscosity, it does not flow readily without the application of substantial air or fluid pressure on its upper surface. It, therefore, does not flow of its own volition through a narrow gap or circumambient orifice 90 formed between the ring plate 80 and the bottom 54 of the container but must be extruded or forced to do so by the air pressure aforesaid.

To position a ceramic tube within a metallic shielding tube, an operator proceeds as follows: With the parts of the device in the position shown in Fig. 4, the plunger 86 is thrust downwardly to move the ceramic tube through the aperture in the gasket 78 which distends the flexible material thereof downwardly to form a seal with the outside of the tube and seals the gap or orifice 90 until the tube enters a slight distance the metallic shielding tube 22 into the bottom. At this point, the valve 60 in the bleeder conduit 58 is closed to build up an air pressure over the body 88 of the polymers in the container until a pressure of 70 pounds per square inch is attained. Then simultaneously, the plunger 86 is slowly moved downwardly to advance and telescope the ceramic tube 28 into the metallic tube 22, and the air pressure in the container opens the seal formed in the gap or orifice 90 to a sufficient extent to deposit a thin layer of the polymers on the outer surface of the ceramic tube, which carries the polymers into the metallic tube to fill completely the space 38 therebetween. This continues until the ceramic tube is completely telescoped with the metallic tube and is in cooperative relation with the gasket 32 adjacent the flange 30 of the metallic tube 22. The air pressure is then released, the plunger retracted, and the completed tube assembly removed from the aperture 64. The second gasket 36 is then positioned in the assembly as shown and thrust toward flange 30 to seat both gaskets 32 and 36. The whole assembly is then heat-treated at a temperature of 600° F. for one hour, which brings the polymers to a soft, rubbery condition, adhering to both members.

To begin a new cycle of operation, a second metallic tube is positioned in the aperture 64, and a second ceramic tube is dropped into the bore of the cylinder 70 and the plunger replaced to the starting position as shown in Fig. 4.

The soft, rubbery condition of the layer of polymers, after heat-treatment between the ceramic tube 28 and the metallic tube 22, protects the ceramic tube from lateral stresses and holds the tube resiliently in position. There is

substantially no stress or strain in the ceramic tube, either during assembly or after complete assembly and in use as a spark plug. This substantially obviates breakage arising from this source.

It is to be understood that the above detailed description of the present invention is intended to disclose an embodiment thereof to those skilled in the art, but that the invention is not to be construed as limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of being practiced and carried out in various ways without departing from the spirit of the invention. The language used in the specification relating to the operation and function of the elements of the invention is employed for purposes of description and not of limitation, and it is not intended to limit the scope of the following claims beyond the requirements of the prior art.

What is claimed and it is desired to secure by United States Letters Patent:

1. In a device of the class described, a sealed casing containing a body of viscous material, a source of fluid pressure in communication with the casing, valve means to control the fluid pressure on the free surface of said viscous material, holding means to position a pair of concentric interfitting tubular members in longitudinally-spaced aligned relation, a circumambient orifice for one of said members communicating with said casing to allow extrusion of said material through said orifice by an increase in the fluid pressure on said free surface, resilient sealing means adjacent the orifice cooperating with the exterior of the inner member by tightly gripping the member and means to cause relative movement between said members to telescope said members while simultaneously positioning a body of said material between said members

2. In a device of the class described, a sealed casing containing a body of viscous extrudable material, a source of fluid pressure in communication with the casing, valve means to control the fluid pressure on the free surface of said material, holding means cooperating with the base of the casing to hold the outer of a pair of tubular cooperating members, an inner holding means cooperating with the casing to hold an inner of said pair of tubular cooperating members in concentric aligned longitudinally-disposed relation with an overlap with reference to the first member, a circumambient orifice including a resilient sealing means cooperating with the exterior of the inner member adjacent the first holding means to allow extrusion of said material under influence of the fluid pressure in one longitudinal direction, and means to move said second member into telescoping relation with said first member to position a body of the extruded material between said members.

3. In a device of the class described, a sealed casing containing a body of viscous material, a source of fluid pressure in communication with the casing, valve means to control the fluid pressure on the free surface of said material to cause movement thereof, holding means to position a pair of interfitting tubular members in longitudinally-spaced aligned overlapping relation, a circumambient orifice including a resilient sealing means cooperating tightly with the exterior of the inner one of said members said orifice communicating with said casing to allow extrusion of said material therethrough in one longi-

tudinal direction by change in fluid pressure on said free surface, means to cause relative movement between said members to telescope said members, and control means for said orifice to vary the size of said orifice to allow the positioning by the fluid pressure of a sufficient body of said material to fill the space between said interfitting members while said members are being telescoped.

4. In a device of the class described, means to hold the first of a pair of interfitting tubular members in stationary position, means to hold the second members of said pair of tubular members in longitudinally-movable relation being positioned initially in concentric aligned longitudinally-spaced over-lapping relation to said first member, a circumambient orifice including a resilient sealing means tightly cooperating with the exterior of the inner member of said pair of interfitting tubular members adjacent their point of initial cooperation, means to control the size of said orifice, pressure means to extrude a viscous material through said orifice to apply a coating to said inner member, said orifice being controlled to limit the pressure of said pressure means, and means for telescoping said members whereby the viscous material is uniformly positioned between the members.

5. In a device of the class described, means to hold the outer of a pair of interfitting tubular members in stationary position, means to hold the inner of said pair of tubular members in concentric longitudinally-movable relation, being positioned initially in aligned longitudinally-spaced over-lapping relation with the outer member, resilient gasket means on the means holding the inner of said pair of members cooperating with the exterior of the inner member to form a seal and with the outer member to define an annular zone, adjustable means for the means holding the inner of said pair of members to control the relation between the gasket means and the outer member to vary the size of the annular zone, means including a pressure storage chamber to extrude a viscous material through the annular zone to coat the inner member, and means for telescoping said members, whereby the viscous material is uniformly positioned between the interfitting members.

ROBERT TWELLS.
PAUL E. BUCKLES.

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