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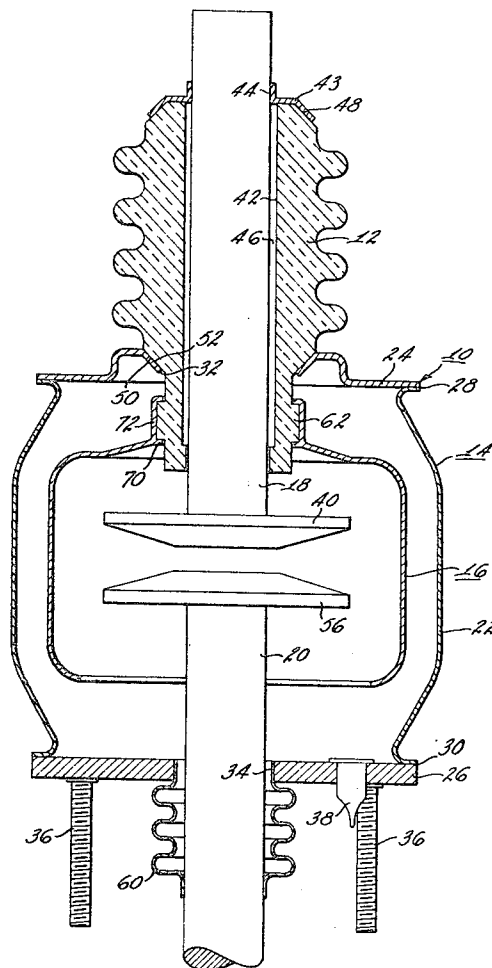
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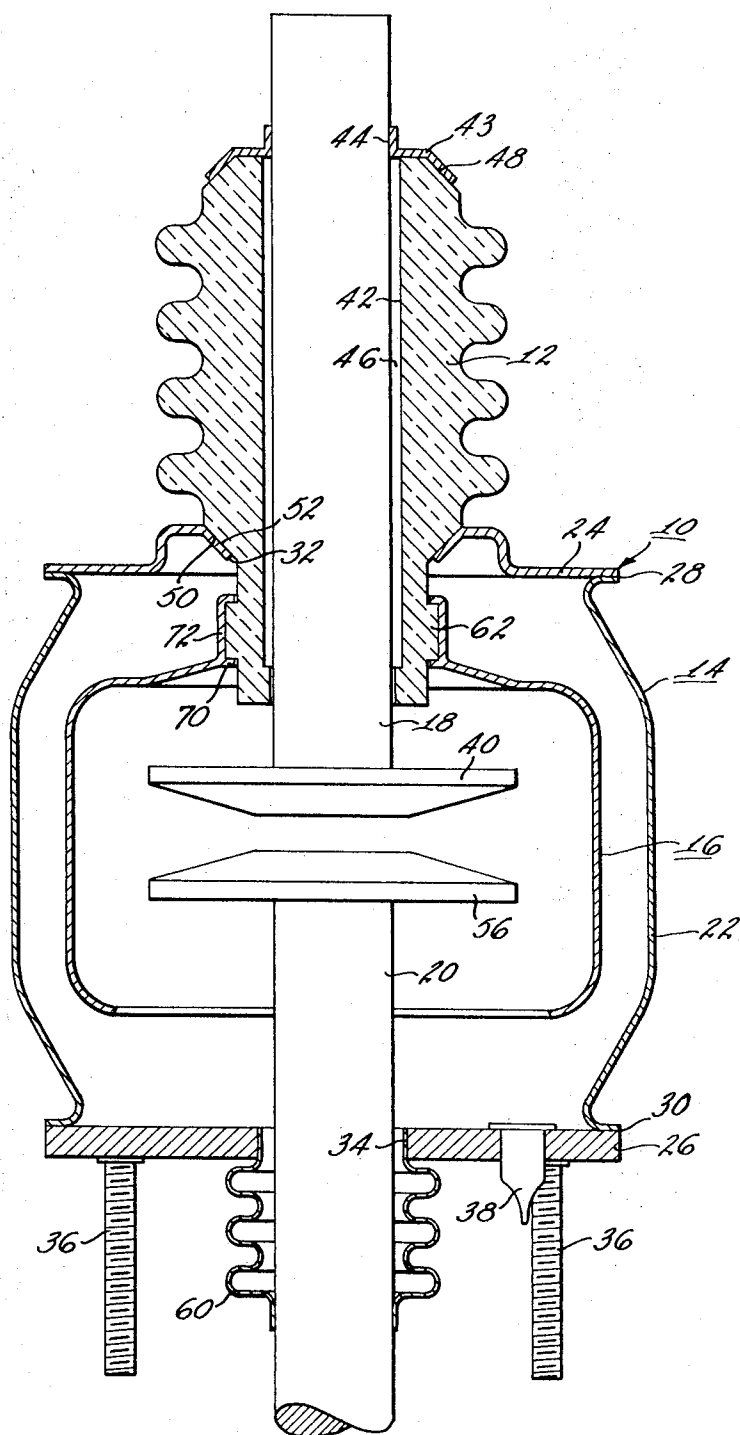
[54] **VACUUM INTERRUPTER WITH SINGLE INSULATING MEMBER HAVING CONICAL EXTERIOR ATTACHING SURFACES AND SUPPORTING A FLOATING SHIELD**
 2 Claims, 1 Drawing Fig.

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ABSTRACT: A vacuum interrupter comprises an insulating member through which a stationary contact rod extends. A metallic housing is mounted on the insulating member and surrounds the stationary contact rod and a movable contact rod which extends into the housing through flexible sealing means. A metallic floating shield is supported on the insulating member within the housing and surrounds portions of the stationary and movable contact rods and the contacts thereon.





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VACUUM INTERRUPTER WITH SINGLE INSULATING MEMBER HAVING CONICAL EXTERIOR ATTACHING SURFACES AND SUPPORTING A FLOATING SHIELD

SUMMARY OF THE INVENTION

This invention relates generally to electric vacuum interrupters or switches, particularly those employing floating shields therein.

Many types of vacuum interrupters and vacuum switches are known in the electrical art. For example, in one type, a pair of relatively movable contacts are enclosed within a cylindrical envelope made of glass or ceramic. In another type, the contacts are enclosed within an envelope comprising a generally spherical hollow body which has hollow cylindrical bushings on opposite sides thereof. In both types, metallic shields, either floating or electrically connected to one of the contacts, are sometimes employed inside the envelopes along the walls thereof to trap and condense arc discharge products and to achieve desired electrical effects. Interrupters of the aforesaid type employ insulating bodies in or as part of their envelopes which are necessarily large and relatively costly. For example, the cost of a generally cylindrical ceramic insulating body is proportional to its diameter squared times its length. Thus, any reduction of diameter reduces costs drastically. Furthermore, these insulating bodies usually have large surface areas exposed within the envelope and such surfaces can hold quantities of absorbed gases sufficient to destroy the vacuum interrupter when the gases are released during arcing. Therefore, size reduction of such exposed surfaces reduces the quantity of releasable gas. Accordingly, it is desirable to provide improved vacuum interrupters which overcome the aforesaid difficulties and have other advantages.

In accordance with the present invention, there is provided a vacuum interrupter having an insulating body on which a metallic envelope is mounted. A pair of relatively movable contact members are located within the envelope. One contact member extends through the insulating body and the other extends through an opening in the envelope. An electrically conductive floating shield is mounted on the insulating body within the envelope and surrounds portions of both contact members and the contacts thereon.

OBJECTS

It is an object of the present invention to provide improved vacuum interrupters and switches.

Another object is to provide such interrupters which use a minimum amount of insulating material and have a minimum amount of the surface area thereof exposed in the interior of the envelope.

Another object is to provide such interrupters having improved means for mounting shields therein, particularly floating shields.

Another object is to provide such interrupters wherein the envelope, and conductive shield and at least one electrode are mounted on an insulating body.

Another object is to provide such interrupters which are economical to produce and relatively easy to fabricate and assemble.

Other objects and advantages of the invention will hereinafter appear.

DRAWINGS

The accompanying drawing illustrates a preferred embodiment of the invention, but it is to be understood that the embodiment illustrated is susceptible of modification with respect to details thereof without departing from the scope of the appended claims.

In the drawing, the single FIGURE depicts a cross-sectional view of a vacuum interrupter in accordance with the present invention.

DESCRIPTION OF THE INVENTION

Referring to the drawing, the numeral 10 designates a vacuum interrupter in accordance with the present invention. It is to be understood that interrupter 10 is intended to be used in a suitable electrical circuit to perform a switching or interrupting function. Interrupter 10 comprises an insulating body or bushing 12 on which an envelope or housing 14, a shield 16 and one of a pair of relatively movable contact members 18 and 20 are supported. Envelope 14 is understood to be vacuumized and comprises a tubular or cylindrical portion 22 and a pair of end plates 24 and 26 which are understood to be welded to portion 22 at the joints 28 and 30, respectively. The end plates 24 and 26 are provided with holes 32 and 34, respectively. End plate 26 serves as a base plate and is provided with suitable mounting means such as a plurality of studs 36. Sealed to raised tooled end plate 26 is a vacuum pinch-off tube 38 through which gases are evacuated from the interrupter during manufacture and which is subsequently pinched closed.

Contact member 18, which is provided with a suitable contact 40, is stationary and takes the form of a cylindrical electrically conductive rod which extends through an opening 42 in insulating body 12.

Means are provided to form a seal between stationary contact member 18 and insulating body 12 and such means take the form of a metallic member 43 which is brazed to contact member 18 at 44 and is suitably sealed to insulating body 12. Since contact member 18 and body 12 are made of different materials and have different thermal expansion characteristics, it is desirable that a clearance space 46 be provided between contact member 18 and the wall of opening 42 in insulating body 12. The clearance space allows advantage to be taken of the creep path along the inside wall of insulating body 12. Furthermore, it is desirable that insulating body 12 be provided with a sloped surface or shoulder 48 against which a sloped portion of member 43 is disposed and sealed.

Means are provided to form a seal between end plate 24 of envelope 14 and insulating body 12. Thus, insulating body 12 is provided with another sloped surface 50 which is sealed to a sloped surface 52 provided on end plate 24 around hole 32.

Contact member 20 is axially movable and extends through hole 34 in end plate 26. Contact member 20 is provided with a suitable contact 56. Flexible sealing means, such as a bellows 60, is connected between contact member 20 and end plate 26 in sealed relationship around opening 34. Contact member 20 and end plate 26 are electrically connected through bellows 60, and contact member 20 and envelope 22 are adapted to be at substantially the same electrical potential. Preferably, bellows 60 is located on the exterior of envelope 14 and hole 34 in end plate 26 is as small as practical to prevent arcing products within envelope 14 from being deposited on or damaging the bellows.

Insulating body 12 is provided on the end thereof which extends into envelope 14 with means such as a flange 62 by which shield 16 is supported on the insulating body. Shield 16 is generally cylindrical in form and is adapted to surround the contacts 40 and 56 and to extend therebeyond to surround portions of the contact members 18 and 20. Shield 16 limits the dispersion of arc products formed during arcing when contacts 40 and 56 separate while carrying current. Shield 16 is a floating shield because it is mounted on insulating body 12 and is not electrically connected to either of the contact members and is at a different electrical potential than those members. Shield 16 is provided with means such as the tab means or members 70 and 72 which are adapted to cooperate with flange 62 on insulating body 12 to support the shield on the insulating body.

The general configuration of interrupter 10 is such that only a very small portion of the surface area of insulating body 12 is exposed inside envelope 14. Therefore, during arcing which occurs when contacts 40 and 56 separate under load, only a

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minimum amount of ceramic surface is available from which gas can be released. No insulating ceramic surface is exposed to line of sight bombardment by metallic vapor released from the contacts during arcing. Furthermore, the total amount of ceramic material in insulating body 12 is relatively small considering the fact that insulating body 12 serves to support contact member 18, envelope 14 and shield 16. Thus, the overall cost of interrupter 10 is reduced despite the fact that superior insulating properties are obtained. Vacuum interrupter 10 is also constructed so that such vacuumtight seals that are required are easily provided during manufacture.

The embodiments of the invention in which an exclusive property or privilege I claim are defined as follows:

1. In a vacuum interrupter,
 - a hollow insulating member,
 - said insulating member having first and second spaced-apart conic exterior surfaces and having an external and an internal flange,
 - an electrically conductive envelope having first and second openings therein,
 - the portion of said envelope surrounding said first opening having a conic surface adapted to mate with said second conic surface of said insulating member to provide an expandable sealed joint,
 - a stationary contact member extending through said insulating member into said envelope,
 - the relative sizes of said insulating member and said stationary contact member being such as to provide internal clearance space therebetween which is substantially smaller than the diameter of said stationary contact

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- member,
- said internal flange on said insulating member further reducing said clearance space to allow only for thermal expansion clearance in the region where said stationary contact member emerges from said insulating member into said envelope,
- sealing means connected between said stationary contact member and said insulating member to support said stationary contact member and to seal off said internal clearance space,
- said sealing means having a conic surface adapted to mate with said first conic surface of said insulating member to provide an expandable sealed joint,
- a movable contact member extending through said second opening in said envelope,
- flexible electrically conductive sealing means connected between said movable contact member and said envelope and located exteriorly of said envelope,
- and an electrically conductive floating shield surrounding portions of said stationary and movable contact members, said shield being supported by said external flange on said insulating member.
2. A vacuum interrupter according to claim 1 wherein said envelope comprises a tubular portion and a pair of end plates, a plate being located at each end of said tubular portion, one plate having an opening which corresponds to said one opening in said envelope, and the other plate having an opening which corresponds to said second opening in said envelope.

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