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(12) # EUROPEAN PATENT APPLICATION

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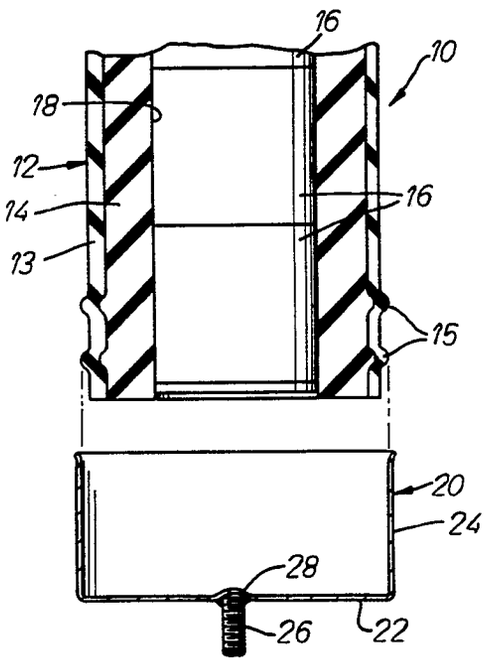
(54) **A capped resilient electrical housing and arrester comprising such a housing.**

(57) One such capped resilient electrical housing is a gapless arrestor having an elastomeric housing (12) and a number of surge arrestor blocks (16) positioned within a passage (18) within the housing (12). An electrically conductive terminating cap (20) is provided at one end of the housing (12) to close the passage. The cap (20) is compressed by magnetic pulse forming against the outer surface (13) of the housing (12) to hermetically seal the passage (18). The cap also includes an electrically conductive contact (26, 28) engaging the end of a surge arrestor block (16). Ridges (15) can be molded around the outer surface (13) of the housing (12) to interlock with the flange (24) of the terminating cap (20) to act as "O" ring seals and to hold the cap (20) on the housing (12). A rigid ring (30) can be placed in a groove (32) provided at the end of the passage (18) adjacent to the cap (20) which co-operates with the flange (24) to provide an even compression of the elastomeric housing (12).



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TITLE: A CAPPED RESILIENT ELECTRICAL HOUSING

This invention relates to a capped resilient electrical housing, and more especially, a gapless arrestor with a cap.

A prior art gapless arrestor has surge arrestor blocks housed within a passage in an elastomeric or rubber housing to cushion and protect the ceramic parts which form the arrestor blocks from damage. However, the inherent resiliency of the elastomeric housing required that the terminal connector be provided on the internal part of the housing because of the insufficient compressive strength of the housing to secure the terminal to the exterior surface.

Magnetic pulse forming has been used to secure metallic members to non-metallic members made of relatively rigid materials such as bakelight and/or ceramics which are relatively brittle. This method is described in U.S. Patent 4,063,208 granted on December 13, 1977 and entitled "Fuse Housing End Caps Secured by Magnetic Pulse Forming". The cylindrical housing of the type disclosed in this patent has sufficient compressive strength to resist the forces of the magnetic pulses in forming the flange of the end cap to the exterior surface of the end of the housing.

According to one aspect of the present invention there is provided a capped resilient electrical housing, comprising a cylindrical electrically insulating elastomeric housing (12)

having a passage (18) open at one end, an electrically conductive metallic cap (20) mounted on said housing (12) and enclosing the open end of said passage (18), said cap (20) having an annular flange (24) encircling the outer surface of the housing at the open end, characterised in that said flange (24) is compressed by magnetic pulse forming against the outer surface (13) of said elastomeric housing (12) to form a hermetic seal therewith and means (26, 28) for electrically connecting said cap (20) within the housing (12).

According to a further aspect of the present invention there is provided a gapless arrestor comprising an elastomeric housing (12) having a passage (18) therein, voltage sensitive surge means (16) in said passage (18) and an electrically conductive terminating cap (20) mounted on said housing (12) at one end of said passage (18), said cap (20) including a flange (24) encircling the outer surface (13) of said housing (20), characterised in that said flange (24) is compressed by magnetic pulse forming against the outer surface (13) of said housing (12) to form a hermetic seal therewith.

In embodiments of the present invention a hermetic seal is achieved by the even distribution of the compressive force of the magnetic pulses to the flange of the cap around the entire perimeter of the end of the housing. The hermetic seal has been further improved by providing ridges around the end of the elastomeric housing which engage the internal surface of the flange of the terminal cap. When the magnetic pulses necessary to form the flange against the housing are applied to the flange, the ridges form "O"-rings which bear against the flange to produce the seal. It has been further found that by providing a rigid ring on the inside surface of the housing, the compressive strength of the housing can be increased whereby magnetic pulse forming of the flange will compress the housing between the ring and the flange to produce the hermetic seal.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which :-

Figure 1 is a cross sectional view of a portion of the open end of a gapless arrestor showing the terminal cap in a position to be pushed onto the end of the elastomeric housing;

Figure 2 is a cross sectional view of a portion of the gapless arrestor showing the terminal cap in position for magnetically pulse forming to the housing;

Figure 3 is a cross sectional view of a portion of the arrestor similar to Figure 2 showing the terminal cap after being magnetically pulse formed to the housing; and,

Figure 4 is a cross sectional view of a second embodiment of gapless arrestor having a rigid ring positioned in a groove on the inside surface of the open end of the arrestor housing.

Referring to Figure 1, a portion of a gapless elbow arrestor 10 is shown. The arrestor includes an elastomeric housing 12 molded from a material such as rubber which is shown in a generally cylindrical form having an inner insulating portion 14 and an outer semi-conductive portion 13. A central passage 18 is provided within the insulating portion 14 and a number of annular ridges 15 are molded around the outside surface of the semi-conductive portion 13 at the open end of the housing 12. Surge arrestor means in the form of a number of surge arrestor blocks 16 are shown positioned within the passage 18.

The open end of the passage 18 is closed by means of a terminal cap 20 whichincludes a generally, flat end-plate 22 and an annular flange 24. The flange 24 has a diameter substantially equal to the diameter of the ridges 15 provided on the outside surface of the housing.

Means can be provided in the terminal cap for electrically engaging the surge arrestor blocks 16. Such means is shown in the form of a threaded stud 26 which is welded to an indent 28

provided in the end wall 22. Indent 28 projecting inward sufficiently to engage the end of the surge arrestor block at the end of the passage 18.

Figure 2 shows the terminal cap 20 positioned on the end of the housing 12 prior to magnetic pulse forming. It should be noted that the annular ridges 15 are shown in contact with the inside surface of the flange 24. However, if ridges 15 are not provided the flange diameter should be made slightly greater than the diameter of the housing 12.

Figure 3 shows the terminal cap 20 after being pulse formed into engagement with the outside surface of the elastomeric housing. The ridges 15 which have a greater diameter than the outside surface of the housing resist the compressor force imposed by magnetic pulse forming the flange in the end cap against the housing causing the flange to form around the rings and interlock therewith. The rings form an annular pressure line against the inside surface of the flange 24 providing a means for securing the end cap into the housing. These pressure lines also form seal rings and thus act as O-ring seals to seal the terminal cap to the elastomeric housing.

In a second embodiment of the invention shown in Figure 4 means are provided to increase the compressive strength of the housing. Such means is in the form of a rigid ring 30 positioned in a groove 32 provided on the inner surface of the insulating portion 14 at the open end of the passage 18 in the housing. The ring provides sufficient compressive restraint to the housing to prevent distortion of the housing due to the magnetic pulse force applied to the flange 24 of the terminal cap. The portion of the elastomeric housing between the rigid ring 32 and the flange 24 is compressed evenly to form the hermetic seal and to lock the flange to the ridges on the end of the housing.

In Figure 4 it should be further noted that the surge arrestor block 16 is biased by means of a spring 34 provided

between the cap 20 and the last block 16. The ability of the end cap 20 to interlock with the ridges 15 when magnetically pulse formed to the house makes this possible. The flange 24 will form around the ridges 15 as shown in Figures 3 and 4 to securely hold the cap 20 in position.

RESUME

Magnetic pulse forming of a deformable member to an elastomeric housing is believed to be one of the unique features of this application. Attachment of end caps to flexible tubular housings has always been difficult if not impossible by conventional rolling methods. The ability to provide a moisture seal between the end cap and the elastomeric housing is also a feature which is unique in this application. The moisture seal being improved by the adaption of annular ridges on the outside surface of housing which engage the inside surface of flange of the end cap.

CLAIMS:

1. A capped resilient electrical housing, comprising a cylindrical electrically insulating elastomeric housing (12) having a passage (18) open at one end, an electrically conductive metallic cap (20) mounted on said housing (12) and enclosing the open end of said passage (18), said cap (20) having an annular flange (24) encircling the outer surface of the housing at the open end, characterised in that said flange (24) is compressed by magnetic pulse forming against the outer surface (13) of said elastomeric housing (12) to form a hermetic seal therewith and means (26, 28) for electrically connecting said cap (20) within the housing (12).

2. A housing as claimed in Claim 1, wherein said housing (12) includes an annular ridge (15) molded around the outside surface (13) of said housing (12), said flange (24) being compressed against said ridge (15) whereby said ridge (15) forms a sealing ring between said housing (12) and said flange(24).

3. A housing as claimed in Claim 1, wherein said housing (12) includes a groove (32) around the inner surface of the housing (12) at the open end of said passage (18), and a rigid ring (30) positioned in said groove (32) to provide sufficient compressive strength around the inner surface of the opening in said housing (12) to provide an even compression of said housing (12) on magnetic pulse forming of said flange (24) to said housing (12).

4. A gapless arrestor comprising an elastomeric housing (12) having a passage (18) therein, voltage sensitive surge means (16) in said passage (18) and an electrically conductive terminating cap (20) mounted on said housing (12) at one end of said passage (18), said cap (20) including a flange (24) encircling the outer surface (13) of said housing (20), characterised in that said flange (24) is compressed by magnetic pulse forming against the outer surface (13) of said housing (12) to form a hermetic seal therewith.

5. An arrestor as claimed in Claim 4, wherein said cap (20) includes means (26, 28) for electrically engaging said voltage sensitive means (16) and is held in electrical contact therewith by the elastic force of said housing (12).

6. An arrestor as claimed in either one of Claim 4 or Claim 5. wherein said housing (12) includes a groove (32) around the inner surface of the passage (18) adjacent to said terminal cap (20), a metallic ring (30) positioned in said groove (32) to increase the compressive strength of the housing (12) around the passage (16) whereby said ring (30) co-operates with said flange (24) on forming to provide an even compression of said housing (12).

7. An arrestor as claimed in any one of Claims 4 to 6, wherein said housing (12) includes at least one annular ridge (15) molded on the outside surface (13) of said housing (12) and said flange (24) is formed around said ridge (15) whereby said ridge (15) forms a sealing ring between said flange (24) and said housing (12).

8. An arrestor as claimed in any one of Claims 4 to 7, comprising a number of surge arrestor blocks (16) in said passage (18), wherein a spring (34) is positioned in said passage (18) between the surge arrestor blocks (16) and the end cap (20).

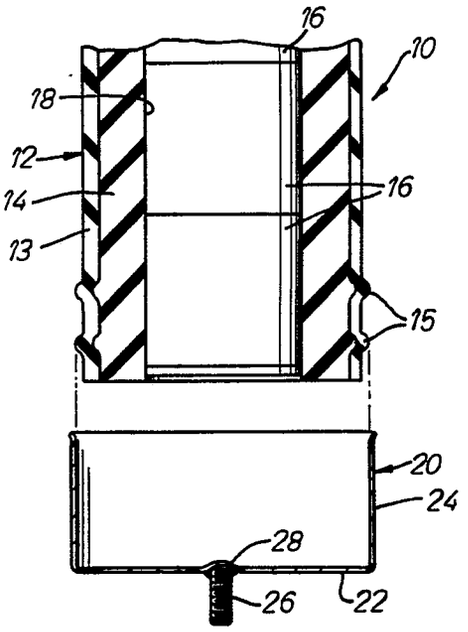

FIG. 1

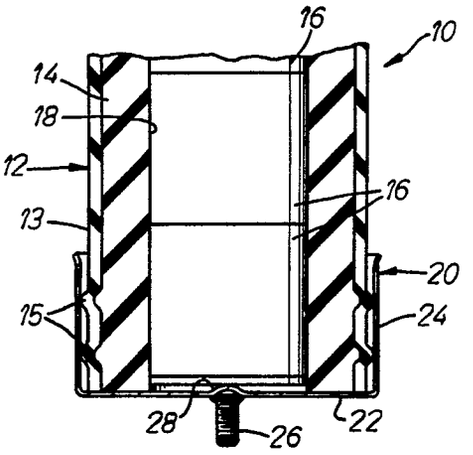

FIG. 2

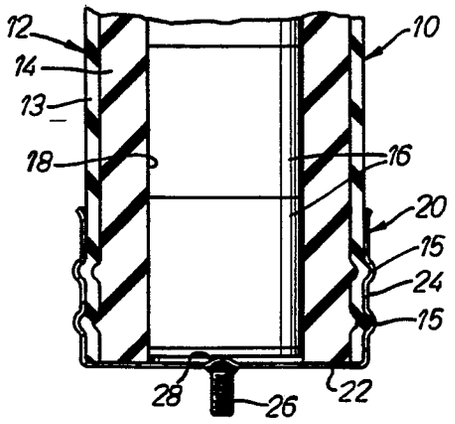

FIG. 3

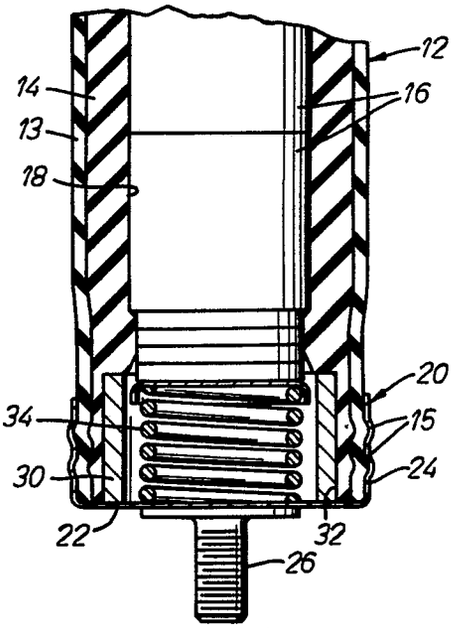

FIG. 4

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EUROPEAN SEARCH REPORT

Application number
EP 80 30 1283

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
D,X	US - A - 4 063 208 (S. & C. ELECTRIC COMPANY) * Column 1, line 17 to column 5, line 45; figures * --	1,2,7	H 01 C 7/12 H 01 H 69/02 H 01 C 1/024
X	US - A - 4 028 656 (S. & C. ELECTRIC COMPANY) * Column 2, line 57 to column 4, line 16; figures * --	1,2,7	
	US - A - 4 035 753 (S. & C. ELECTRIC COMPANY) * Column 3, line 10 to column 5, line 57; figures * --	1,2,7	TECHNICAL FIELDS SEARCHED (Int.Cl. 3) H 01 C 7/12 7/10 H 01 H 69/02 85/16 H 01 C 1/024 1/02 H 01 T 1/00
	US - A - 3 727 108 (KEARNEY NATIONAL) * Column 2, line 13 to column 5, line 10; claims; figure 1 * --	1,4,8	
	GB - A - 867 901 (WESTINGHOUSE ELECTRIC) * Claims; figures * --	1,4	CATEGORY OF CITED DOCUMENTS
	US - A - 3 631 323 (RALPH R. PITTMAN, U.S.A.) * Claims; figures * ----	1,4	X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12.08.1980	GORUN

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