United States Patent [19]

Berman

[11] **3,901,576**

[45] **Aug. 26, 1975**

[54] **ARRESTER HOLDER**

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[22] Filed: **Feb. 1, 1974**

[21] Appl. No.: **438,745**

[52] **U.S. Cl.** ..... **339/258 F**; 337/29; 337/34; 339/262 F

[51] **Int. Cl.** **H01r 11/22**

[58] **Field of Search** ..... 337/28, 29, 30, 31, 32, 337/33, 34; 339/150 F, 252 F, 253 F, 258 F, 262 F, 270 F

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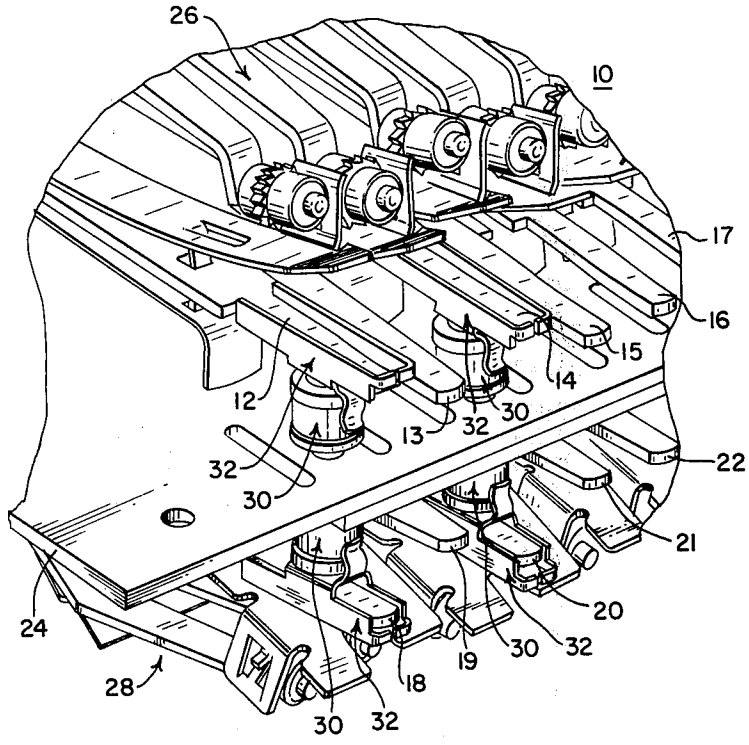
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[57] **ABSTRACT**

A gas tube arrester holder for use in telephone central office protection systems includes a pair of spaced apart, generally rectangular, elongated legs, each of which has a transversely extending end portion. The legs are maintained in the spaced apart relationship, but resiliently deflectable, by a clip assembly having a generally U-shaped ledge portion extending from an elongated edge of each of the legs. A gas tube arrester having an insulating tube with an electrode at each end is mounted on the ledge portion by a pair of opposing clips extending from the ledge portion so that one of the electrodes of the gas tube arrester extends through a hole in the ledge portion enabling the electrodes to be placed in direct electrical and thermal contact with the protection system.

11 Claims, 4 Drawing Figures



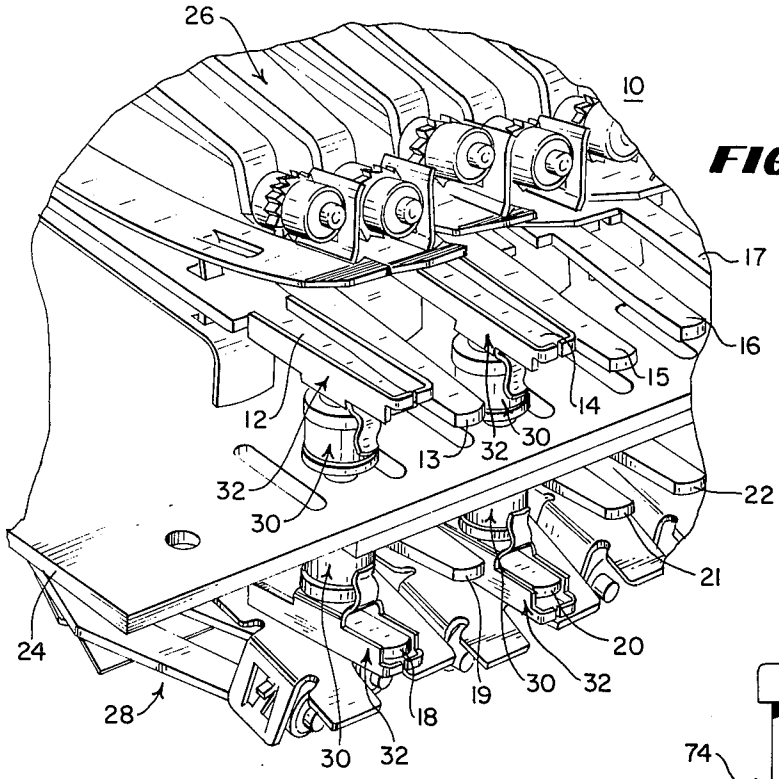


FIG. 1

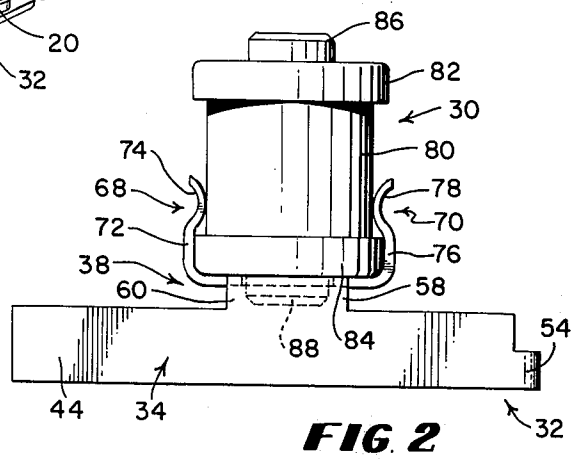
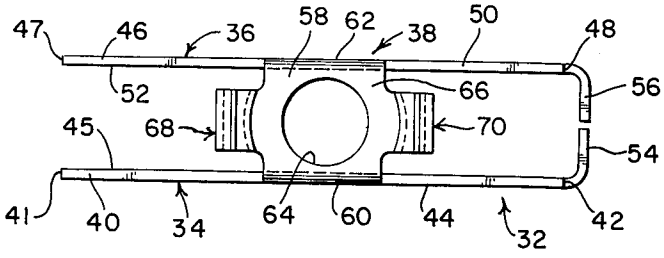


FIG. 2

FIG. 3



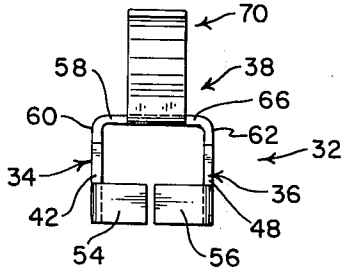


FIG. 4

ARRESTER HOLDER

This invention relates to protection systems in a telephone central office and, more particularly, to a new and improved gas tube arrester holder for mounting relatively small gas tube arresters in the telephone central office protection systems.

In a telephone central office, it is necessary to provide a protection system against high voltages and sneak currents that might occur on outside cables or that might be injurious to personnel and switching equipment. One such type or protection system has a plurality of line or terminal contact bars that are normally maintained in a spaced relationship to a ground plate. Each of the terminal contact bars is connected to a cable and/or equipment that must be protected from such high voltages and sneak currents. To so protect these cables and/or equipment, a gas tube arrester is normally placed in a holder and inserted between the terminal contact bar and the ground plate. Since the terminal contact bars are resiliently biased toward the ground plate, the arresters are secured between the terminal contact bar and the ground plate due to the force exerted on the holder and/or arrester by the terminal contact bar.

The holder used for so securing the gas tube arrester between the terminal contact bar and the ground plate must conform to certain design criteria. First, the holder should allow standard forms of gas tube arresters to be rather easily inserted between the terminal contact bar and the ground plate in the telephone central office protection equipment. Second, the holder should not contain and low temperature flammable materials that could ignite or deform at temperature under approximately 1300° F., this temperature being attained in certain instances when power crosses occur through the arrester due to high voltages or sneak currents. Third, the holder should position the arrester between the terminal contact bar and the ground plate in such a manner that adequate heat or thermal transfer paths are provided between the arrester and the heat sinks formed by the terminal contact bar and the ground plate. Fourth, the holder must not interfere with or prevent the fail safe use of the gas tube arrester in the telephone central office protection system so that lines connected to the terminal contact bar are never totally unprotected. Finally, the holder should be rather inexpensive.

One such type of gas tube arrester and holder utilized in such protection systems includes a pair of metal electrodes sealed in a glass enclosure filled with an inert gas. The electrodes extend into the glass enclosure so as to form a spark gap that breaks down during a power cross whenever a high voltage or sneak current of sufficient magnitude strikes one of the electrodes. The glass enclosure is permanently mounted in a generally rectangular, elongated housing made of plastic or the like. Along one elongated edge of the housing is disposed a relatively thin cross-sectional metallic, generally U-shaped guide track, the legs of which are resiliently deflectable away from the bight portion of the guide track. The guide track is coupled to one of the electrodes and is designed to fit about the terminal contact bars in the protection system so that the one electrode is coupled to the terminal contact bar. The other electrode is coupled to a relatively thin, cross-sectional, resilient metal contact disposed along the other elongated edge of the housing. When the guide track is positioned about the terminal contact bar, the biased terminal contact bar forces the metal contact against the ground plate and the housing together with the spark gap formed by the electrodes is properly positioned between the ground plate and the terminal contact bar.

Although this particular type of gas tube arrester and housing has advantageous physical and electrical properties, the mounting of the glass enclosure into the housing is both expensive and relatively difficult and standard forms of gas tube arresters cannot be readily used in such a housing. In addition, the heat generated in many power cross situations is not properly dissipated because the thin metallic guide track and contact do not provide an adequate heat transfer path between the arrester and the heat sink formed by the terminal contact bar and ground plate. Moreover, the heat generated in these power cross situations tends to deform the plastic housing of the holder. Because of such deforming and the lack of good heat transfer paths for the generated heat, this type of arrester and holder tends to explode during a power cross so that it prevents the fail safe use of the arrester in the telephone central office. Finally, this type of arrester and holder is relatively costly to manufacture.

Accordingly, objects of the present invention are to provide a new and improved gas tube arrester holder; to provide a new and improved gas tube arrester holder on which can be readily mounted a gas tube arrester for telephone central office protection systems; to provide a new and improved gas tube arrester holder that is relatively inexpensive and simple to produce; to provide a new and improved gas tube arrester holder that facilitates the mounting of standard gas tube arresters in existing telephone central office protection systems; to provide a new and improved gas tube arrester holder that is not deformed as a result of the heat generated during power crosses from high voltage or sneak currents on telephone lines; to provide a new and improved gas tube arrester holder that provides a good heat transfer path between the arrester and a heat sink consisting of the telephone office equipment on which the arrester is mounted; and to provide a new and improved gas tube arrester holder that enables the fail safe usage of the arrester in telephone central office protection systems.

In accordance with these and many other objects, an embodiment of the present invention comprises a holder for gas tubes arresters, each of which arresters includes an insulating spacer tube having an electrode at each end consisting of a cup-shaped end cap with a stem or rod projecting therethrough. The gas tube arrester is mounted in a clip assembly that bridges a pair of spaced apart, generally elongated and flat legs, both of which have transversely extending end portions. The clip assembly maintains the legs in the spaced apart relationship and allows the legs to be resiliently deflected for installing the legs about a terminal contact bar in a telephone central office protection system so as to position the gas tube arrester between the terminal contact bar and a ground plate. The clip assembly is formed of a generally U-shaped ledge or bridge portion that extends from a top elongated edge of each of the legs near the middle of the elongated axis of the legs. Extending away from the top edge of the legs and disposed on opposite edges of the ledge is a pair of clips. Each of the clips has an outwardly bending portion adjacent the

ledge and adapted to engage one of the end caps of the gas tube arrester and an inwardly bending portion which is adapted to engage the spacer tube of the gas tube arrester.

The clips ensure that the arrester does not move along the elongated axis of the legs of the holder as the holder is mounted on the terminal contact bar. In addition, the clips maintain one of the rods in a clip hole in the ledge portion so that the one rod makes contact with the terminal contact bar when the holder is positioned between the terminal contact bar and the ground plate. In this manner, the rod portion of each electrode is in contact with the heat sink formed by either the terminal contact bar or ground plate so that heat generated during a power cross can be properly without damage to the holder or arrester.

Many other objects and advantages of the present invention will become apparent from considering the following detailed description in conjunction with the drawings in which:

FIG. **1** is a partially cut away, perspective view disclosing a portion of a telephone central office protection system and illustrating the use of a gas tube arrester holder embodying the present invention;

FIG. **2** is a side elevation view of a gas tube arrester holder made in accordance with the present invention with a gas tube arrester mounted on the holder;

FIG. **3** is a top view of the gas tube arrester holder of FIG. **2** with the gas tube arrester removed; and

FIG. **4** is an end view of the gas tube arrester holder of FIG. **3.**

Referring now to FIG. **1,** therein is illustrated a portion of a telephone central office protection system for telephone cables, equipment or the like, which system is indicated generally as **10.** The protection system **10** includes a number of terminal contact bars **12–22** positioned on either side of a ground plate **24.** The terminal contact bars **12–17** positioned adjacent one side of the ground plate **24** are resiliently biased toward the ground plate **24** by bias mechanisms generally indicated as **26.** In a similar manner, the contact bars **18–22** positioned adjacent the other side of the ground plate **24** are resiliently biased toward the ground plate **24** by biasing mechanism generally indicated as **28.** Each of the terminal contact bars **12–22** is coupled to individual cables or equipment that are to be protected by the telephone central office protection system **10.**

In order to so protect the cables or equipment, an arrester, like a gas tube arrester **30** (FIG. **2**), is positioned between any one of the terminal contact bars **12–22** and the ground plate **24.** In the illustrative embodiment of FIG. **1,** gas tube arresters identical to the gas tube arrester **30** are positioned between the ground plate **24** and the terminal contact bars **12, 14, 18** and **20.** Each of the arresters **30** is maintained in its proper position and electrically coupled to the terminal contact bars **12, 14, 18** and **20** by an arrester holder **32,** which holder **32** embodies the present invention.

More specifically and as best seen in FIGS. **2–4,** the arrester holder **32** has a pair of generally flat, rectangularly shaped, elongated legs **34** and **36** and a clip or holder assembly **38** interconnecting the legs **34** and **36.** The leg **34** has a top elongated edge **40,** side edges **41** and **42,** an outside side surface **44,** and an inside side surface **45** whereas the leg **36** has a top elongated edge **46,** side edges **47** and **48,** an outside side surface **50,** and an inside side surface **52.** Extending from the side edge **42** of the leg **34** is an L-shaped end portion **54,** the longer or top leg of which extends transversely or generally perpendicular to the elongated axis of the leg **34** and toward the other leg **36.** Likewise, the leg **36** has an L-shaped end portion **56** extending from the side edge **48,** the longer or top leg of which extends generally perpendicular or transversely to the leg **36** and toward the other end portion **54.** As best seen in FIGS. **2** and **4,** the end portions **54** and **56** only extend approximately half way toward the top edges **40** and **46,** respectively.

The clip or holder assembly **38** maintains the legs **34** and **36** in generally parallel, spaced apart relationship to each other and enables the legs **34** and **36** to be resiliently deflectable toward and away from each other. In order to accomplish this, the clip assembly **38** has a generally U-shaped ledge or bridging portion **58,** the legs of which **60** and **62** extend from the top edges **40** and **46,** respectively. The clip assembly **38** also has a clip hole **64** in a bight portion **66** of the ledge portion **58.** In the disclosed embodiment, the leg **60** of the clip assembly **38** is positioned on the top edge **40** in a centrally located position between the side edges **41** and **42** and the leg **62** is positioned on the top edge **46** in a centrally located position between the side edges **47** and **48.**

Extending upward from the bight portion **66** is a pair of opposing clips **68** and **70.** The clip **68** has a lower, outwardly bending portion **72** adjacent the bight portion **66** of the ledge **58** and an upper, inwardly bending portion **74.** Similarly, the clip **70** has a lower, outwardly bending portion **76** adjacent the bight portion **66** on an opposite edge from the clip **68** and an inwardly bending, upper portion **78.** As best seen in FIG. **2,** the clips **68** and **70** are designed to secure the arrester **30** in a proper position relative to the legs **34** and **36** so that the arrester **30** can be readily and properly inserted between one of the contact bars **12–22** and the ground plate **24** of the telephone central office protection system **10.**

More specifically, the arrester **30** is formed of an insulating spacer tube **80,** made of ceramic or the like, at the ends of which are electrodes consisting of cup-shaped, relatively thin cross-sectional metal end caps **82** and **84** and solid metal stem or rod portions **86** and **88.** The stem portions **86** and **88** extend out from the open portions of the end caps **82** and **84,** respectively, and are connected to the bottom closed portion of the end caps **82** and **84** within the spacer tube **80** by welding or the like. The end caps **82** and **84** seal the end portions of the spacer tube **80** by brazing or the like. The portions of the electrodes formed by the end caps **82** and **84** and the stem portions **86** and **88** extending into the spacer tube **80** form a spark gap within the spacer tube **80** such that when a high voltage or sneak current of sufficient magnitude appears on the line protected by the arrester **30,** the spark gap breaks down and a power cross occurs.

To mount the arrester **30** on the clip assembly **38,** the arrester **30** is disposed between the clips **68** and **70** such that the outwardly bending portions **72** and **76** abut against the end cap **84** and the inwardly bending portions **74** and **78** abut against the insulating spacer tube **80.** When the arrester **30** is positioned between the clips **68** and **70** in this manner, the stem **88** extends through the hole **64** in the bight portion **66** of the ledge portion **58.** By having the arrester **30** so mounted in the

arrester holder **32,** the arrester holder **32** not only provides a relatively inexpensive holder for the arrester **30,** but also enables the arrester **30** to be readily installed between any of the terminal contact bars **12–22** and the ground plate **24.**

As previously indicated, the terminal contact bars **12–17** are normally maintained adjacent the ground plate **24** by the mechanism **26** (see, for example, the terminal contact bar **13** in FIG. **1**). In a similar manner, the terminal contact bars **18–22** are normally biased toward the ground plate **24** by the mechanism **28** (see, for example, the terminal contact bar **19** in FIG. **1**). As illustrated in connection with the terminal contact bar **12,** the terminal contact bar **12** is moved away from the ground plate **24** when the arrester **30** in the holder **32** is installed therebetween. To so install the arrester **30,** the inside surfaces **45** and **52** adjacent the side edges **41** and **47,** respectively, are positioned on either side of the contact bar **12** and the holder **32** with the arrester **30** mounted thereon is moved along the contact bar **12** toward the mechanism **26.** As the inside surfaces **45** and **52** of the legs **34** and **36,** respectively, slide along the terminal contact bar **12,** the terminal contact bar **12** is moved away from the ground plate **24** so that the arrester **30** is lodged between the terminal contact bar **12** and the ground plate **24** as shown in FIG. **1.** Advantageously, the end portions **54** and **56** enable one to so slide the holder **32** along the terminal contact bar **12** and the positioning of the clips **68** and **70** does not allow the arrester **30** to move relative to the legs **34** and **36** during this process.

When the arrester **30** is in the position shown in FIG. **1,** the inside surfaces **45** and **52** abut against the contact bar **12** and the stem **88** extends through the hole **64** and makes contact with the terminal contact bar **12.** Also, as is apparent from FIG. **1,** with the arrester **30** so positioned, the stem **86** is forced against the ground plate **24** and thereby makes electrical contact with the ground plate **24.** Thus, the spark gap formed in the spacer tube **80** is inserted between the terminal contact bar **12** and the ground plate **24.** If a high voltage or sneak current occurs on the cable or equipment associated with the terminal contact bar **12,** the spark gap will spark over shorting the terminal contact bar **12** to the ground plate **24** and thereby the arrester **30** protects the cable or equipment connected to the terminal contact bar **12** by grounding the terminal contact bar **12.**

During a power cross when the spark gap sparks over, a considerable amount of heat energy is produced within the arrester **30.** In many instances, the heat generated in such a power cross condition raises the temperature of the arrester **30** to approximately 1300° F. If such generated heat is not allowed to dissipate to the heat sink formed by the telephone central office protection system **10,** and particularly the terminal contact bar **12** and the ground plate **24,** the arrester **30** could be damaged and might even explode preventing the use of the arrester **30** as a fail safe protection for the lines connected to the terminal contact bar **12.**

As previously indicated, the holder **32** provides for the positioning of the arrester **30** between the terminal contact bar **12** and the ground plate **24** in a manner that the stem portion **88** is in direct intimate contact with the contact bar **12** and the stem portion **86** is in direct contact with the ground plate **24.** Thus, the holder **32** positions the arrester **30** between the terminal contact bar **12** and the ground plate **24** in such a manner that an appropriate and adequate heat transfer path is provided for between the stem portions **86** and **88** and the heat sinks formed by the ground plate **24** and the terminal contact **12,** respectively. Since the heat is allowed to so dissipate through the stem portions **86** and **88,** the heat generated during a power cross situation does not damage the arrester **30,** and particularly, the seal between the end caps **82** and **84** and the spacer tube **80,** so that the arrester **30** can be used as a fail safe protection device. Advantageously, the holder **32** being made of a rather thin cross-sectional metallic material is not deformed or damaged during a power cross even though excessive heat might be generated.

Although the present invention is described with reference to a single illustrative embodiment thereof it should be understood that numerous other modifications and embodiments of the invention can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. An arrester holder for mounting onto a terminal contact bar an arrester having an electrode at one end, said arrester holder comprising:

leg means having first and second leg portions and

a clip assembly interconnecting said first and second leg portions and mounting said first leg portion in spaced apart relationship to said second leg portion so as to enable said first leg portion to be resiliently deflectable relative to said second leg portion for positioning of said first and second leg portions about said terminal contact bar, said clip assembly having holding means for said electrode to electrically connect said electrode to said terminal contact bar.

2. The arrester holder as set forth in claim **1** wherein said first and second leg portions are generally flat and elongated, and said first and second leg portions have transversely extending end portions which extend toward each other.

3. The arrester holder as set forth in claim **1** wherein said clip assembly includes a ledge portion extending from said first and second leg portions and a pair of opposing clips forming at least a part of said holding means between which clips said electrode of said arrester is mountable.

4. The arrester holder as set forth in claim **3** wherein said clips are positioned on said ledge portion so as to oppose movement of said arrester along the elongated axis of said first and second leg portions.

5. The arrester holder as set forth in claim **1** wherein said clip assembly is centrally located relative to said first and second leg portions.

6. In combination with a gas tube arrester having a spacer tube and an electrode at each end of said spacer tube, each of which electrodoes has a stem portion and an end cap, a gas tube arrester holder comprising:

a pair of spaced apart, opposing leg means and

a clip means on to which is mountable said gas tube arrester, said clip means bridging said leg means so as to maintain at least a portion of each of said leg means in said spaced apart relationship and allowing said portions of said leg means to be resiliently deflectable relative to each other.

7. The gas tube arrester holder as set forth in claim 6 wherein said clip means includes arrester holding means, a portion of which arrester holding means engages one of said end caps and another portion of which holding means engages said spacer tube.

8. The arrester holder as set forth in claim 6 wherein said clip means includes a bridging portion, said bridge portion extending from each of said leg means.

9. The arrester holder as set forth in claim 8 wherein said bridging portion has a hole therethrough into which is extendable one of said stem portions.

10. An arrester holder on to which is mountable an arrester having a pair of electrodes and which is to be disposed on terminal contact bars located adjacent a ground plate in a telephone central office protection system, said arrester holder comprising:

resiliently deflectable leg means disposed in abutting relationship on either side of said terminal contact bar, and

an arrester holding means connected to said leg means enabling said leg means to be resiliently deflectable, said arrester holding means having clip means into which is insertable said arrester such that when said leg means is in said abutting relationship to said terminal contact bar said electrodes of said arrester are in electrical and thermal contact with said terminal contact bar and said ground plate.

11. The arrester holder as set forth in claim 10 wherein said holder is made of a relatively nonflammable material.

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