United States Patent

Neuber

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[54] CLAMP WITH SURGE PROTECTION

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[52] **U.S. Cl.**.....**317/16,** 317/31, 317/61.5, 339/14 R

[51] **Int. Cl.**.....**H02h 9/06**

[58] **Field of Search**.....317/16, 31, 61.5, 99, 118; 339/14 R, 14 L, 14 T

[56] **References Cited**

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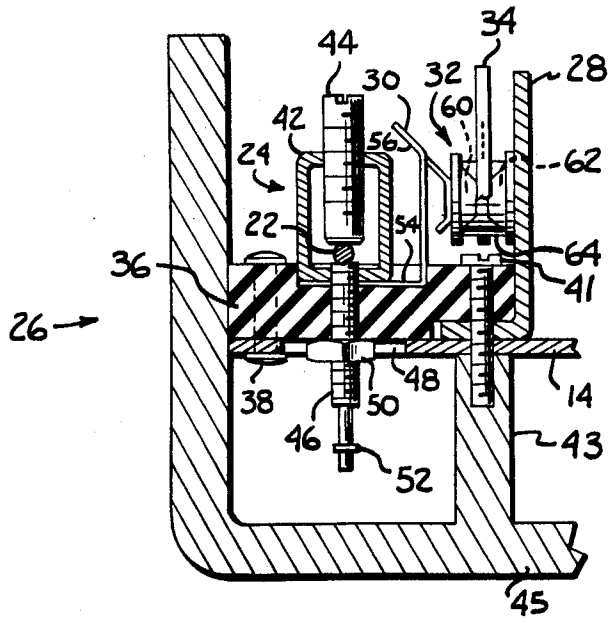
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[57] **ABSTRACT**

A clamping device for seizing a wire is disclosed wherein the clamping device includes a provision for resiliently retaining a surge protection device for protecting against voltage surges on the wire.

9 Claims, 4 Drawing Figures



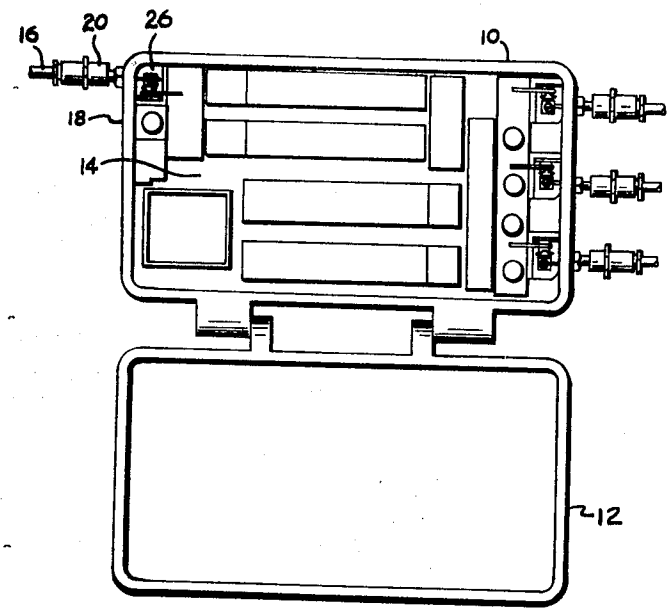


Fig. 1

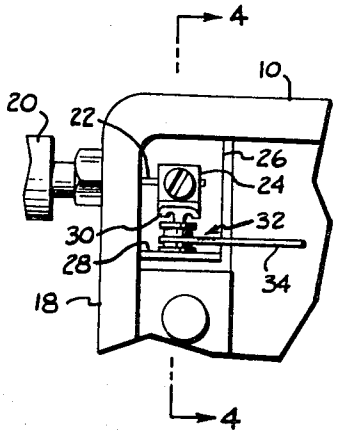


Fig. 2

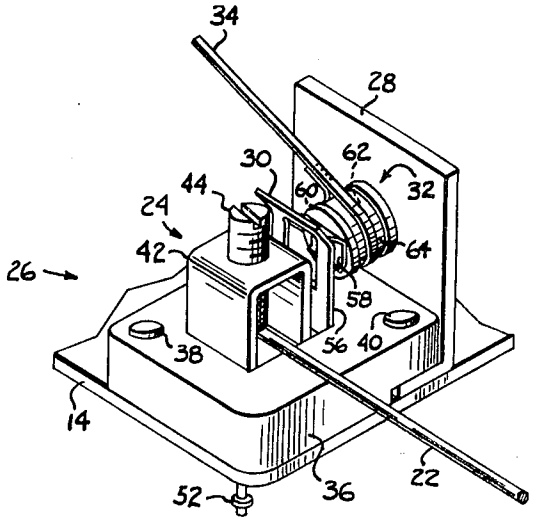


Fig. 3

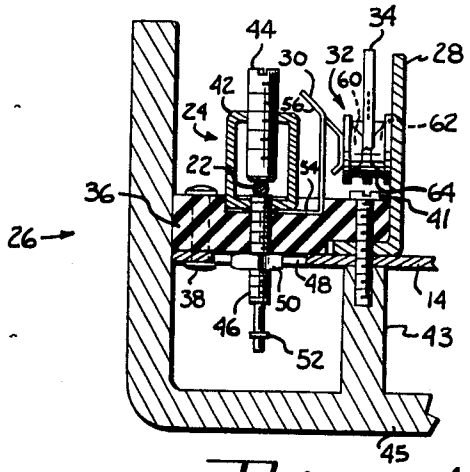


Fig. 4

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CLAMP WITH SURGE PROTECTION

BACKGROUND OF THE INVENTION

In situations where a conductor is clamped and surge protection against voltage surges on the conductor must be provided, the prior art has provided no satisfactory unitary structure for providing both the clamping and surge protection functions. For example, in cable transmission systems, such as are used for transmitting television signals, equipment housings are distributed along the cable. In such systems the cable is usually a coaxial cable where the outer sheath is secured to the housing by a connector and the center conductor protrudes through the connector and a wall of the housing where it is coupled to a terminal. This terminal is electrically coupled to electronic equipment, such as amplifiers, in the housing. One or more output cables are also coupled to the housing for receiving output signals from the electronic equipment. The electronic equipment in the housing must be protected from voltage and current surges such as may occur due to fluctuations of the line voltage or lightning strikes or other causes.

The prior art practice has been to provide a spark gap socket coupled between the input or output terminal of the housing and ground to provide surge protection. In most cases the spark gap socket is soldered in place or otherwise mounted beneath the terminal thereby necessitating removing the terminal or at least unclamping the center conductor of the cable to replace the spark gap socket. Since spark gap sockets normally deteriorate in operation so that they must be inspected and/or replaced periodically, inaccessible mounting and soldering are serious disadvantages both because of the time and expense of inspection and replacement and because the signals carried by the transmission system must be interrupted during inspection and replacement.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of this invention to obviate the above-noted disadvantages of the prior art.

It is a further object of this invention to provide an easily replacable surge protection device in a clamping device.

In one aspect of this invention the above objects and advantages are achieved in a clamping device having an insulating base with a wire clamp mounted thereon. A first upstanding support mounted in electrical contact with the wire clamp and a second upstanding support or ground strap are mounted for resiliently retaining a surge protection device therebetween.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of an equipment housing having the front cover open to illustrate the use of the invention;

FIG. 2 is an enlarged fragmentary view of a portion of FIG. 1 illustrating the invention in greater detail;

FIG. 3 is an isometric view of one embodiment of the invention; and

FIG. 4 is a sectional view of the embodiment of the invention illustrated in FIG. 3.

DETAILED DESCRIPTION OF THE INVENTION

For a better understanding of the present invention, together with other and further objects, advantages, and capabilities thereof, reference is made to the following disclosure and appended claims in connection with the above-described drawings.

In FIGS. 1 and 2 there is shown an equipment housing having a base 10 and a cover 12 hinged thereto. Cover 12 is shown in an open position to illustrate the invention. Base 10 contains a grounded chassis 14 therein for carrying electrical components such as amplifiers, splitters, transformers, etc. which are ordinarily used in cable transmission systems. An input coaxial cable 16 is coupled to a wall 18 of base 10 of the equipment housing by a typical coupling device 20 which sealizes the outer sheath or conductor of cable 16. The center conductor or wire 22 protrudes through coupling device 20 and wall 18.

Conductor 22 is inserted into a wire clamp of a clamping device such as clamp 24 of clamping device 26 which is mounted on chassis 14. Clamp 24 fixedly seizes wire 22 and makes electrical contact thereto. Clamp 24 must be capable of clamping wire 22 with sufficient force to prevent it from pulling out.

In cable transmission systems the signal being transmitted is ordinarily carried on the center conductor of the cable which may also carry an AC signal for powering the electrical equipment in the equipment housing. Voltage surges which would deleteriously affect the electrical components may also be present due to a variety of reasons such as fluctuations of line voltage, lightning, etc. Accordingly, it is ordinarily necessary to provide some form of surge protection. The most common type of protection is the use of a spark gap which fires when a surge occurs. In the prior art the spark gap socket was placed beneath clamp 24 or beneath clamping device 26 where it was inaccessible without removing clamping device 26 or at least clamp 24 thereby releasing wire 22. In places where temperature variations are encountered, wire 22 may be under considerable stress due to differing coefficients of expansion of the outer sheath and center conductor of cable 16. Thus, when clamp 24 is released, center conductor 22 may disappear through wall 18 or may extend into the equipment housing. Since the spark gap socket ordinarily deteriorates with each surge, it is necessary to inspect or replace the sockets periodically, which is a time consuming task when the clamp device must be removed or disassembled. Also, the prior art practice of soldering the sockets made replacement even more difficult.

To overcome these disadvantages, two upstanding supports such as a ground strap 28 and a resilient support 30 resiliently retain a surge protection device such as a spark gap socket 32 therebetween. Ground strap 28 is in electrical contact with ground such as the grounded portion of chassis 14 and support 30 is in electrical contact with clamp 24 thereby providing surge protection between conductor 22 and ground. To facilitate insertion and removal of spark gap socket 32, an insulating strap such as plastic strap 34 is provided attached to socket 32.

Ordinarily, the equipment housing will have one or more output ports, each coupled to a coaxial cable. A clamping device in accordance with the invention can also be used to seize the center conductor and provide surge protection for the output cables as is illustrated in FIG. 1.

In FIGS. 3 and 4 clamping device 26 is shown in greater detail. An insulating base such as a plastic base 36 is mounted on chassis 14 and attached thereto by suitable fasteners such as rivets 38 and 40. Ground strap 28 includes an angled portion positioned between base 36 and chassis 14 to make electrical contact with chassis 14. Rivet 40 extends through a hole in the angled portion of ground strap 28.

Strong lightning strikes can generate thousands of amperes which can cause strong electromagnetic fields and ground currents. To prevent or diminish the effect of such fields and currents, it is desirable to keep the ground path from spark gap socket 32 as short as possible. Accordingly, the preferred means for mounting clamping device 26 includes a screw 41, which is preferably a stainless steel screw, which extends through base 36, the angled portion of ground strap 28 and chassis 14 into a boss 43 on a back wall 45 of housing 10. Housing 10 is preferably grounded in the usual manner, for example, by a wire or cable to earth.

The preferred form of wire clamp 24 includes an upstanding bracket 42 with a thread clamping portion or insert screw 44 to clamp wire conductor 22. Other forms of clamps can also be used. Clamp 24 mounted on base 36 by a threaded post 46 extending through base 36 and through an opening 48 in chassis 14. A nut 50 secures post 46. An electrical contact can be made to post 46 by soldering a conductor to terminal 52 or alternatively by a detachable jack.

Support **30** includes a base portion **54** and an upstanding resilient portion **56**. Base portion **54** is positioned between bracket **42** and base **36** to make electrical contact with clamp **24**. Resilient portion **56** exerts a spring-like action to hold socket **32** preferably by an outward extending tab **58**.

Spark gap socket **32** includes two buttons **60** and **62** separated by a gap. Preferably the gap is enclosed by a transparent cylinder **64**, which may be constructed of ceramic or glass or other suitable insulative material, to keep the gap clean while permitting visual observation of the condition of buttons **60** and **62**. Insulating strap **34** is wrapped about cylinder **64** for inserting and removing socket **32** without danger of electrical shock.

While there has been shown and described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the invention as defined by the appended claims.

I claim:

1. A clamping device with surge protection comprising:

an insulating base;

a wire clamp, having a bracket and threaded clamping portion for seizing a wire therebetween, mounted on said insulating base;

an upstanding ground strap having a first portion fixedly attached to said insulating base and adapted to be fixedly attached to a ground connection and an upstanding second portion, said ground strap being insulated from said wire clamp by said insulating base; and

an upstanding support having a first portion fixedly clamped between said bracket and said insulating base for making electrical contact with said wire clamp and a resilient upstanding second portion mounted in a spaced relationship with said ground strap for resiliently retaining a surge protection device between said second portions of said ground strap and said support.

2. A clamping device with surge protection as defined in claim **1** wherein said surge protection device is a spark gap socket.

3. A clamping device with surge protection as defined in claim **1** wherein said wire clamp includes a threaded post attached to said bracket and extending through said insulating base for fixedly securing said wire clamp to said insulating base.

4. In an equipment housing having a grounded chassis therein for carrying electrical components thereon and a port in a wall of said housing for coupling a coaxial cable thereto with a signal carrying conductor of said coaxial cable protruding through said wall, a clamping device comprising:

an insulating base for mounting in said housing adjacent said wall;

a clamp fixedly attached to said insulating base for fixedly clamping said conductor; and

first and second upstanding metallic supports mounted in spaced relationship for resiliently retaining a surge protection device therebetween, said first support having a base portion fixedly clamped between said clamp and said insulating base for making an electrical connection to said clamp and an upstanding resilient portion, and said second support having a first portion for fixedly attaching to said insulating base and for making an electrical connection to said chassis and an upstanding second position comprising a ground strap whereby voltage surges on said conductor are electrically shunted to ground by said surge protection device.

5. A clamping device as defined in claim **4** wherein said clamp includes a bracket and a threaded insert for clamping said conductor therebetween, and further includes a post attached to said bracket and extending through said insulating base for fixedly securing said bracket to said insulating base.

6. A clamping device as defined in claim **5** wherein said base portion of said first support is clamped between said bracket and said insulating base.

7. A clamping device as defined in claim **6** additionally including a socket resiliently retained between said upstanding resilient portion of said first support and said second support, said socket including first and second metallic buttons with a spark gap therebetween, each of said first and second metallic buttons being in electrical contact with one of said first and second supports.

8. A clamping device as defined in claim **5** wherein said post includes a terminal portion for extending through an opening in said chassis for making a signal connection thereto.

9. A clamping device as defined in claim **7** additionally including an insulating strap attached to said socket whereby said socket can be inserted or removed from between said first and second supports by said insulating strap.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,659,153 Dated April 25, 1972

Inventor(s) Ralph E. Neuber

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the title page - No Assignee listed - should be

"Sylvania Electric Products Inc."

Col. 4, line 19 (Claim 4) "position" should read

"portion"

Signed and sealed this 1st day of August 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

PO-1050
(5/69)

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