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Kreuzer

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[54] **APPARATUS FOR PROTECTING DATA PROCESSING INSTALLATIONS AND THE LIKE FROM DISTURBANCES**

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[52] **U.S. Cl.** **317/16,** 317/31, 317/50, 317/61.5

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

[58] **Field of Search** 317/16, 31, 50, 61.5, 317/20

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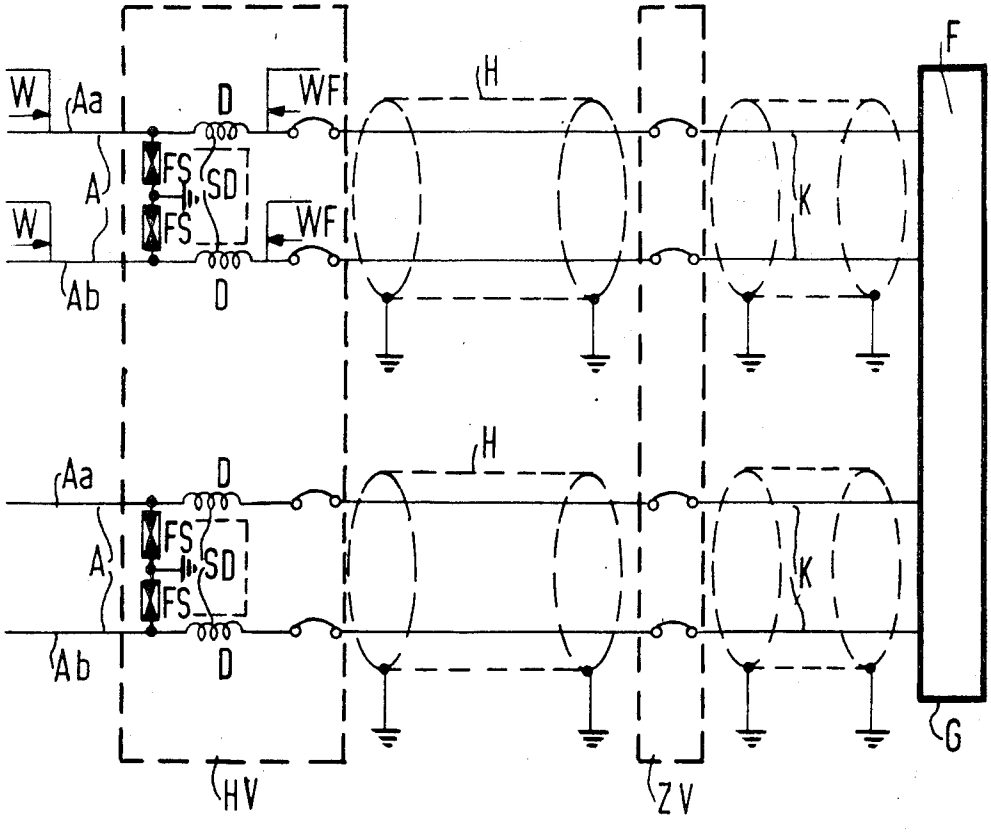
Primary Examiner—James D. Trammell

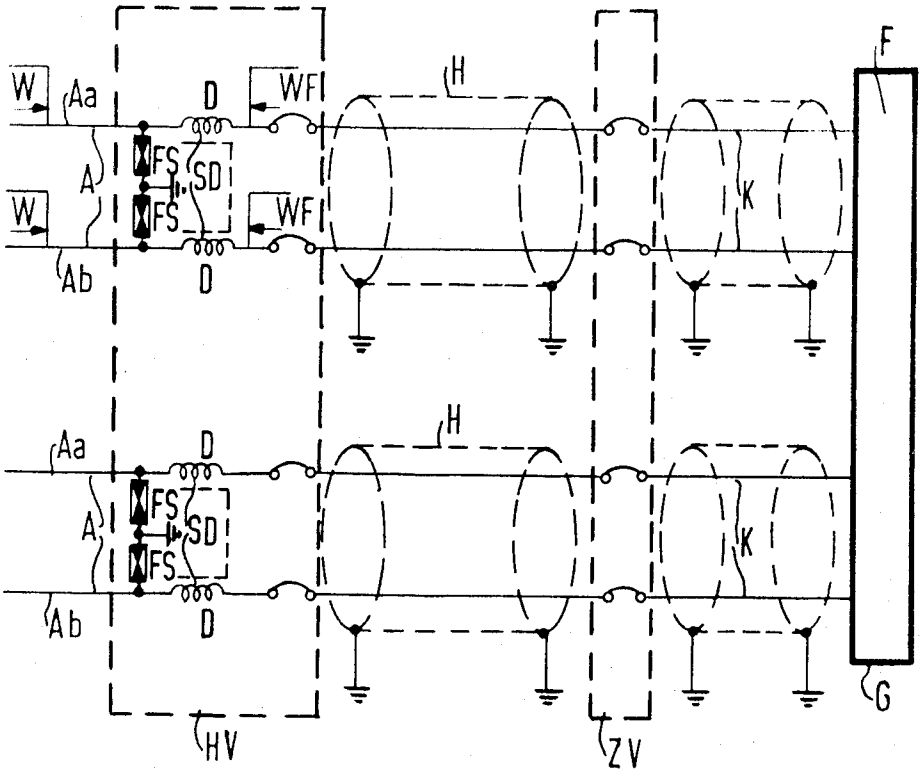
Attorney—Birch, Swindler, McKie & Beckett

[57] **ABSTRACT**

Apparatus is described for protecting data processing installations, particularly, telecommunications exchanges from voltage and current surges caused by external influences, such as lightning and from radio frequency disturbances generated from within. At the installation's main distributor to which line pairs are connected, each line of a pair has an inductance coil connected in series therewith, and the coils in a line pair are connected in opposition to each other. Each line has a voltage diverter, preferably, of the spark gap type connected to ground.

3 Claims, 1 Drawing Figure




W
Aa
D
WF
H
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A
FS
SD
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WF
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Aa
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APPARATUS FOR PROTECTING DATA PROCESSING INSTALLATIONS AND THE LIKE FROM DISTURBANCES

BACKGROUND OF THE INVENTION:

The invention relates to an arrangement for the protection of data processing installations, and particularly, those used in telecommunication exchanges against disturbance or interference caused by such things as lightning or the like and radio frequency signals or other spurious signals generated within the installation.

Modern telecommunication exchange installations, as well as data processing installations, contain semiconductor elements in their connection line circuits, and these, like the lines themselves, must be protected against disturbance influences. The most dangerous current and voltages reach the installation from outside, so that especially in the case of free lines, great dangers can arise. Particularly, important sources of disturbances are sudden atmospheric discharges in and near the lines and gradual collection of atmospheric electricity on the lines. Additional sources of danger can arise through direct contact of the line with high current lines and disturbing voltages which are created by induction from nearly high current lines in the telephone installation.

It is known in the art to protect data processing installations against invasion by excessive voltages and currents caused by the above factors by connecting voltage discharge devices to ground and by connecting melting fuses in the lines. With this type of protection, especially in connecting lines which have no galvanic separation from ground in the installation, i.e., those having a central power supply, peak currents of more than 10 amps can arise. For example, in case of a lightening strike in the surrounding area of the connecting lines, robust component parts are even endangered and the time required for a melting fuse to operate prevents the latter from offering much protection. The voltage diverting devices to ground always have a certain spark delay time, during which damage can already occur in the installation. Therefore, the protection described above is not sufficient for modern devices containing semi-conductor elements. In such devices, it has been found to be desirable to limit currents appearing on connecting lines and arising from spurious sources to peak values less than lamp, if possible.

A further difficult problem is posed by the need to eliminate radio frequency interference in large data processing installations, such as, for example, the telephone exchanges and teletypewriter exchanges. In teletypewriter exchanges, for example, the main sources of interference are telegraph relay contacts which transmit the information signals, and, until now, only these have been wired with a radio interference suppression circuit. An individual interference suppression circuit for all of the more than 100,000 switching contacts necessary for the control of such an installation has not been possible for reasons of expense. In the future, however, radio interference suppression for an entire installation will also be required in the large installations. There are known experiments which seek to totally eliminate interference in an installation by housing the installation in a room capable of functioning as a Faraday cage and by providing all connecting lines

thereto with a series-connected high frequency choke and a bypass capacitor to ground.

The invention has as an object to provide apparatus for protecting a data processing installation from voltage or current surges caused by disturbing influences and to suppress radio frequency interference within the installation, which apparatus is neither complex nor expensive.

SUMMARY OF THE INVENTION

The foregoing and other objects are realized in accordance with the invention by providing, externally of the installation to be protected, preferably in its main distributor in which the connecting double lines end, a high frequency-symmetrical choke and two excess voltage diverters for each double line. The high frequency-symmetrical choke comprises two equal symmetrical windings, which are connected opposite each other in series with the two transmission lines constituting the connecting double line.

The advantages achieved with the invention are realized by using the chokes to block transmission of the radio frequency disturbances created in the installation over the connecting double lines and thereby eliminating the otherwise usual bypass capacitors. The disturbance voltage coming in over the connecting line in case of a stroke of lightning builds itself up on the high frequency-symmetrical choke, until the voltage diverters spark and carry off the disturbance energy to ground. This cooperation of both circuit parts, i.e., high frequency-symmetrical choke (inductor coil) and of the voltage diverter, insures good suppression of radio frequency disturbances of the installation and good protection against voltage surges. In spite of their small inductances, sufficient for the suppression of radio frequency interference, the symmetrical chokes limit the interfering currents entering the installation to be protected during the spark delay time of the voltage diverter in cases of disturbance voltage peaks up to 5kV, to a non-dangerous current amplitude smaller than 300mA. The latter current value is not dangerous for the semi-conductor elements utilized with central current supply (power supply).

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be best understood by reference to a description of a preferred embodiment given hereinbelow in conjunction with the single FIGURE drawing which is a schematic diagram of the protecting apparatus along with pertinent portions of the data processing installation.

DETAILED DESCRIPTION OF THE DRAWINGS

In the FIGURE, a modern teletypewriter exchange F of known construction, equipped with electronic telegraph relays is shown. In the teletypewriter exchange F itself, no radio frequency interference suppression means are utilized, rather the exchange is only housed in a sufficiently radiation impervious housing G of known construction. The input lines constituted by cable K having grounded high frequency shields H are routed over an intermediate distributor ZV to a main distributor HV and then to the connecting double lines A.

In the main distributor HV, which is outside of the installation F to be protected, there is provided for each incoming connecting double line A a high

frequency-symmetrical choke SD and for each line A*a*, A*b* of the connecting double line A a voltage diverter FS. The voltage diverter FS is of known construction and preferably of the spark gap type. The high frequency-symmetrical choke SD comprises two equal symmetrical windings D, which are connected in opposition in the two lines A*a*, A*b* of the connecting double line A. That is, symmetrically arranged coils will have like polarities at corresponding ends of the coils, and they are connected in opposition so that the magnetic fluxes from the two coils will oppose each other. Thus, the windings D are only functional against unsymmetrical, i.e., a voltage between an individual line and ground, disturbance voltages because the magnetic fluxes from each winding oppose those of the other windings. For example, an atmospheric charge, which arrives in parallel in the form of a traveling wave or surge W on the two lines Aa and Ab of the connection double line A, is discharged through the voltage diverter FS to ground. As soon as an atmospheric discharge which has entered the line A has cleared for itself a path to ground over the spark gap FS, the resistance of the spark gap suddenly sinks nearly to zero. Thus, the current, which passes over the resistance of the spark gap, likewise, quickly assumes substantial values.

In order to prevent damage which could occur in the time interval during which the spark voltage of the voltage diverter FS has not yet been reached, the high frequency-symmetrical choke SD is provided. This choke works against the lightning voltage coming in with equal phase from outside over the lines Aa and Ab in such a way that the lightning voltage W is built up on the inductance of the choke relative to ground, until the spark voltage of the voltage diverter FS is reached. Of course, at that point, the voltage diverters FS discharge the dusturbance energy to ground. The high frequency-symmetrical choke SD works in a known way, likewise, against unsymmetrical radio frequency radiations WF of the illustrated teletypewriter exchange F. According to the principles of the invention, the otherwise usual bypass capacitors for each line to ground are eliminated.

The preferred embodiment of the invention described hereinabove is intended only to be exemplary of the principles of the invention and is not limiting. It is contemplated that a number of modifications in or changes to the preferred embodiment may be made within the scope of the appended claims.

I claim:

1. Apparatus for protecting a data processing installation or the like from externally caused voltage and current surges and from radio frequency interference comprising:

inductor coils connected in series with transmission lines, which transmission lines are connected to said installation, each said coil in a given one of said transmission lines being arranged relative to said other coils in other transmission lines so that the magnetic fluxes from said one coil will oppose the magnetic fluxes from said other coils, when current is flowing through said coils in the same direction, and

voltage diverting means connecting each said transmission line to ground, each said voltage means being rendered conductive only upon the appearance thereacross of a predetermined voltage magnitude.

2. The apparatus defined in claim **1**, wherein said coils and voltage diverting means are connected at the main distributor of said installation.

3. The apparatus defined in claim **1**, wherein said voltage diverting means comprises the spark gap means.

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