**Title:** ARRANGEMENT IN A DRAINAGE SYSTEM

In connection with an arrangement in a drainage system, especially in connection with a drainage pipe (B) of originally electrically non-conductive material, for example plastic, it is according to the invention suggested that the pipes or a part of a pipe (10A) included in the drainage system (A) are provided with an electrically conductive layer (11A) for the connection of the inner layer (C) of the drainage system to the grounding system (J1).

* See back of page
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Arrangement in a drainage system

Field of the invention

The present invention relates to an arrangement in a drainage system, especially in connection with drainage pipes of originally electrically non-conductive material, for example plastic pipes which when used in drainage environment receive an inner conductive layer.

Background of the invention

The problem which may be enfaced by the electricians, is that drainage systems made of plastic after having been used for some time, receive an inner conductive layer. This layer may in quite a number of cases constitute a better grounding potential than the existing grounding system.

This better grounding potential which is found on the inside of the plastic pipes may provide for relatively large and dangerous potential differences between for example the metal sink in a bathroom and the hand shower when a fault exists in the system.

It is in this case important to provide a balancing connection between said grounding potential in the pipe and the existing grounding system for the sake of safety requirements.

Prior art

From DE 2408517 there is known a plastic pipe system comprising a spigot pipe section and a socket section, both pipe sections comprising a conductive covering layer which is sealed by means of a sealing ring, which in turn is covered by a conductive material. The object of these covering layers of conductive material is to avoid static charging during transportation of dry material through the pipes, which in turn are made of a synthetic material, and
which due to the transportation of air or mixture of air and dust, especially in mining environments, etc., could create electrostatic charging and a danger of electrostatic discharging, which could mean a danger of explosion, especially in mining environments, etc.

The object of the prior art according to DE 2408517 is thus to provide a continuous outer grounding system, that is a continuous outer grounding layer, which would be of no or marginal benefit when used in connection with drainage pipes, in which an inner conductive layer would develop after some time of use, and wherein this inner conductive layer should be included in a grounding connection with an already existing grounding system.

From GB 2201304 there is known a fitting which in use is connected to the one end of a pipe in a fluid-tight manner, comprising a main body made of non-electrically conductive material, the main body comprising an opening to receive a pipe, the fitting providing electric continuity between the pipe and an earth conductor through a coating of conductive material applied to the main body. The main body is preferably made of polyacetal plastics, whereas the coating may be flame-sprayed zinc.

The object of this technique is to provide a grounding connection for the supply pipe itself, and this may most appropriately be provided by arranging the grounding connection on the fitting itself, which is made of non-electrically conductive material. However, according to the prior art, there are initially provided metallic fluidum conductors or pipes, which is substantially different from the originally installed plastic drainage pipes used in the present connection, the prior art also defining an outer coating of a main body made of non-metal, whereas in connection with the present invention it is a token about an originally non-conducting drainage system which after having been used for some time, will develop a conductive inner
layer, which in turn is to be connected together with an original grounding system.

According to US 4635162 there is provided a flange system of conductive material, which is used for discharging possible static electricity which may develop when the two pipe sections of non-conductive material are statically charged by transportation of fluid or gas through the system pipe in question. In such cases there may occur a discharge problem at the pipe transition, which is the problem being concentrated upon according to US patent specification 4635162. Accordingly, the prior art does not relate to any arrangement in a drainage system, in which the drainage pipes originally are of electrically non-conductive material, for example plastic, but on the contrary suggests conductors which permanently comprise a conductive lining which is located across and along the inner surface of said pipes. The prior art gives instructions for this lining to consist of an electrically conductive sleeve which is attached to the inner surface of the pipe, or may be provided as an integral part of the pipe during the manufacturing thereof. However, this type of pipe does not fall into the category of originally electrically non-conductive material, which is the case in connection with the present invention. Neither does the prior art according to US patent specification 4635162 give any instructions for a portion of a pipe being implemented in a drainage system and being originally of a non-conductive material, but which during use in a drainage environment receives an inner conductive layer, and therefore has to be provided with an electrically conductive layer for connecting the inner layer of the drainage pipe to a grounding system.

Summary of the invention

The solution suggested by the present invention in connection with the above problem, is consequently to the fact that a drainage pipe or a portion of a drainage pipe is
provided with an inner electrically conductive layer for the connection of the inner layer of said drainage pipe to a grounding system.

More specifically, the invention relates to the fact that the conductive layer of the drainage pipe is made of copper or some other electrically conductive material, and that the layer is provided with an outer connection clamp for connection to the grounding system.

An appropriate embodiment is to the fact that the drainage pipe including an inner electrically conductive layer is inserted in the existing drainage system by means of one or more appropriate fittings or sockets.

Brief description of the drawings

Fig. 1 is a sketch illustrating how the problem relating to potential differences between various grounding systems may develop due to fault in the electric system.

Fig. 2 is a cross section through a part of a drainage system, provided in accordance with the present invention.

Fig. 3 is a longitudinal section through a system according to Fig. 2.

Fig. 4 is a cross section through a variant of the arrangement according to the invention.

Fig. 5 is a longitudinal section through the arrangement according to Fig. 4.

Description of embodiments

The object of the present invention, as this is discussed in the introductory part of the present specification, is to reach for a solution for the grounding problem developing
due to a drainage system made of plastic after some time's use is covered on the inside by a conductive layer. This layer may in very many cases constitute a better grounding potential than the existing one. This better grounding potential on the inside of the plastic pipes thus constitutes a possibility for relatively large and dangerous potential differences between for example the metal sink in the bathroom and the hand shower when a fault exists in the electric system.

This case is sought illustrated in Fig. 1, in which there is illustrated a grounded water supply pipe J1 which is connected to a shower D, and which may conduct electric current if a fault exists in the electric system R, S, T.

In Fig. 1 there is also illustrated a drainage sink A at a small distance from the shower D, and this drainage sink is connected to a drainage pipe B, which originally is made of a non-conductive material, for example plastic, and as such represents an isolation.

However, the drainage pipe B will during use receive an inner layer C, which is to the fact that the originally isolating pipe will be conductive, and in many cases this will constitute a better grounding potential J2 than the existing grounding system J1.

This means that between the water pipes J1 and the discharge sink J2 there may exist potential differences, especially in bathrooms. Such potential differences, which may be in the range of 70 - 80 V may constitute a risk - and may in all cases be very uncomfortable - by simultaneous touching the discharge sink grate and a water tap.

According to the present invention, it is an object to provide a permanent, sturdy grounding electrode with a relatively large abutment surface against the conductive layer which has developed on the inside of the plastic
drainage pipe, and consequently establish a connection
between this electrode and the inner layer in the drainage
pipe, especially made of PVC. Besides, this grounding
electrode should have a good, sturdy conductive connection
to the main grounding system of the building.

In other words, the present invention aims for avoiding
dangerous contact potentials at exposed parts of the system,
namely due to the fact that the drainage system in some
cases has better grounding potential than otherwise the
grounding system of the building, and which is to be
directed to the fact that a conductive mud layer develops on
the inside of the discharge pipes.

A practical solution is illustrated in Fig. 2 and Fig. 3,
comprising a standard PVC pipe 10 of a length of for example
500 mm and diameter for example 110 mm, there being inside
this PVC pipe mounted a copper lining 11 having a thickness
of for example 1,0 mm, or some other approved conductive
material.

The connection from the inner mounted copper lining 11 is
here provided with a grounding bolt for sturdy connection to
the existing grounding system.

In Fig. 4 and 5 illustrating a variant of the arrangement
according to the invention, this will also comprise a
standard PVC pipe 10A, having a copper lining 11A, which
before being pressed into the pipe 10A has been equipped
with a channel portion 13, into which have been soldered a
connection conductor 14. When pressing the copper lining 11A
into the pipe 10A, the connection conductor 14 will be
pulled out through an appropriate opening in the pipe 10A.
Preferably, the copper lining 11A is attached to the pipe
10A by means of an adhesive, for example a layer of glue.

This "grounding fitting" 10A which originally should not be
necessary, because the drainage pipe is made from non-
conductive material, will thus in a very simple manner be installed in existing and new drainage pipes by means of two standard gliding fittings, 15A og 15B, respectively, including sealing rings 16. Consequently, it is very simple to establish contact with the inner conductive layer of the plastic drainage pipes, because the layer as such represents a good conducting connection, and it is of importance to bring this conducting mud layer to the same potential as the grounding system as such.
Patent claims

1. Arrangement in a drainage system, especially in connection with drainage pipes (B) of originally electrically non-conductive material, for example plastic pipes which when used in drainage environment (A) receive an inner layer (C), characterized in that a drainage pipe or a portion of a drainage pipe (10A) is provided with an inner electrically conductive layer (11A) for the connection of the inner layer (C) of said drainage pipe to a grounding system (J1).

2. Arrangement as claimed in claim 1, characterized in that the conductive layer (11) of the drainage pipe (10) is made of copper or other electrically conducting material, and that the layer (11) is provided with an outer connection clamp for being connected to the grounding system (J1).

3. Arrangement as claimed in claim 1 or 2, characterized in that the drainage pipe (10A) including the inner electrically conducting layer (11A) is inserted in an existing drainage system (A) by means of one or more appropriate fittings (15A, 15B).

4. Arrangement as claimed in any of the preceding claims, characterized in that the inner conducting layer (11A) is attached in the drainage pipe (10A) by means of a pressure fit and/or gluing.

5. Arrangement as claimed in claim 4, characterized in that the inner conducting layer has a longitudinally extending channel portion (13), in which there is attached a connection conductor (14) for the connection to the grounding system (J1).

6. Arrangement as claimed in claim 5,
characterized in that the connection conductor (14) extends partly through the channel portion (13) and partly outside the pipe (10A) through an appropriate opening therein.
### INTERNATIONAL SEARCH REPORT

**I. CLASSIFICATION OF SUBJECT MATTER**

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: F 16 L 11/127

### II. FIELDS SEARCHED

Minimum Documentation Searched

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Documentation Searched other than Minimum Documentation to the extent that such documents are included in Fields Searched

SE, DK, FI, NO classes as above

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### IV. CERTIFICATION

Date of the Actual Completion of the International Search: 4th September 1990

Date of Mailing of this International Search Report: 1990-09-17

International Searching Authority: SWEDISH PATENT OFFICE

Signature of Authorized Officer: Axel Lindhult

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