(54) Title: METHOD FOR THE PRODUCTION OF A COLLECTING LINE FOR DETECTING AND LOCATING AN AGENT DISCHARGING INTO THE ENVIRONMENT OF THE COLLECTING LINE IN CASE OF LEAKAGE, AND COLLECTING LINE PRODUCED BY MEANS OF THIS METHOD

(57) Abstract:
The invention relates to a method for the production of a collecting line, and to a collecting line produced according to this method for detecting and locating an agent discharging into the environment of the collecting line in case of leakage. Such a collecting line comprises a carrier pipe (18), the wall of which is equipped with openings (16) that are sealed by means of an elastic material that is permeable for the agent. According to the invention, a hose (4) made of the permeable elastic material, the inside diameter of which is smaller than the outside diameter of the carrier pipe (18), is elastically expanded by creating a pressure difference between the interior and the exterior of the hose (4), the carrier pipe (18) being inserted into the radially expanded hose (4), and the radially expanded hose (4) being attached to the outside surface of the carrier pipe (18) by reducing the pressure difference.
Abstract

The invention relates to a method for the production of a collecting line, and to a collecting line produced according to this method for detecting and locating an agent discharging into the environment of the collecting line in case of leakage. Such a collecting line comprises a carrier pipe (18), the wall of which is equipped with openings (16) that are sealed by means of an elastic material that is permeable for the agent. According to the invention, a hose (4) made of the permeable elastic material, the inside diameter of which is smaller than the outside diameter of the carrier pipe (18), is elastically expanded by creating a pressure difference between the interior and the exterior of the hose (4), the carrier pipe (18) being inserted into the radially expanded hose (4), and the radially expanded hose (4) being attached to the outside surface of the carrier pipe (18) by reducing the pressure difference.
Description

METHOD FOR THE PRODUCTION OF A COLLECTING LINE FOR
DETECTING AND LOCATING AN AGENT DISCHARGING INTO THE
ENVIRONMENT OF THE COLLECTING LINE IN CASE OF LEAKAGE,
AND COLLECTING LINE PRODUCED BY MEANS OF THIS METHOD

The invention relates to a method for the production of
a collecting line for detecting and locating an agent
discharging into the environment of the collecting line
from a plant component, for example a pipeline, in the
case of leakage, such as is known for example from EP 0
175 219 B1. The invention also relates to a collecting
line produced by means of this method.

The collecting line known from EP 0 175 219 B1 consists
of a carrier pipe which is provided on its outer
surface with a permeable layer or sheath through which
an agent, which discharges from a leak in the plant,
for example a pipeline, into the environment of the
collecting line and is to be detected, can diffuse. The
carrier pipe is impermeable for this agent. Its wall is
provided with openings, so that the agent passing
through the permeable layer can enter the interior of
the collecting line through these openings. A method
known from DE 24 31 907 C3 is then used to determine
the location at which the agent has infiltrated the
collecting line. This location corresponds to the point
at which the agent was discharged from the monitored
plant component. For this purpose, a pump connected to
the collecting line is used to feed the agent which has
infiltrated the collecting line, together with a
carrier gas located in the collecting line, to a sensor
which is also connected to the collecting line. If the
flow speed is known, it is possible to determine from
the time span between the switching-on of the pump and
the arrival of the agent at the sensor the location at
which the agent infiltrates the collecting line, and thus the location of the leak on the plant component.

In this case, in a large number of applications, ethylene vinyl acetate (EVA), which is for example applied in an extrusion process to the carrier pipe made of PVC, has proven particularly suitable as the material for the permeable layer. However, in practice, applications occur, for example extreme ambient conditions or the detection of specific agents, necessitating the use, for the permeable layer, of materials which cannot easily be thermoplastically processed and attached to a carrier pipe. Thus, for example, the use of EVA as the permeable layer is problematic under ambient conditions in which very low temperatures can occur, such as is the case for example in the detection of oil pipelines laid above ground in arctic or subarctic regions. That is to say, it has been found that the rate of diffusion of the agents to be detected through an EVA wall falls significantly with temperature and in practice limits the range of use of EVA as the permeable layer of a collecting line of this type at temperatures above 0 °C. Under these ambient conditions and for the agents to be detected in this case, silicone rubber has in particular been found to be suitable as the material for the permeable layer. However, the application of silicone rubber to a long carrier pipe made of a thermoplastic having a relatively low melting or softening temperature, for example PVC, is a considerable problem in terms of production.

A device for applying resilient hose portions to cylindrical lines is known from DE 100 09 528 C2. For this purpose, hose portions are first placed into a tool. Afterwards, compressed air is applied to a double-walled pipe and this pipe is passed through the hose portions located in the tool. Subsequently, the
line to be sheathed is inserted through this pipe and the pipe then re-extracted from the tool. The hose portions are thus attached to the line at the correct position. However, as a result of the use of the tool and the additional pipe to which compressed air is applied, this method is complex and requires a large number of operations.

The invention is therefore based on the object of disclosing a method for the production of a collecting line for detecting and locating an agent discharging into the environment of the collecting line in the case of leakage, with which it is possible in a particularly efficient manner to sheath or to coat a carrier pipe even with materials which cannot be thermoplastically processed easily and at low temperatures. The invention is also based on the object of disclosing a collecting pipe produced by means of this method.

With regard to the method, the aforementioned object according to the invention is achieved by the features of patent claim 1. In the case of the method for the production of a collecting line for detecting and locating an agent discharging into the environment of the collecting line in the case of leakage, comprising a carrier pipe, the wall of which is provided with openings which are sealed by a resilient material which is permeable for the agent, according to the invention, the following method steps are provided:

1) a hose, which is made of the permeable resilient material and the inside diameter of which is the same size as or smaller than the outside diameter of the carrier pipe, is resiliently expanded, at least over a portion of its length, by generating a difference in pressure between the interior and the exterior of the hose, in that
a2) the hose is introduced into a mounting device which is double-walled at least over a portion of its length and has a hollow cylindrical mounting pipe,

a3) the mounting pipe

a3.1) is surrounded by an outer pipe set radially apart therefrom,

a3.2) has an inside diameter which is larger than the outside diameter of the hose when relaxed,

a3.3) communicates via a plurality of openings arranged on its circumference with a chamber which is located between the mounting pipe and the outer pipe, surrounds the mounting pipe and extends in the longitudinal direction,

a4) at least one vacuum pump is connected to the chamber,

b) the hose is placed tightly at its ends against the mounting device in such a way that the hollow space, which is located between the hose and the mounting pipe and communicates with the chamber, is outwardly tightly sealed,

c) the chamber is evacuated to generate the reduced pressure,

d) the carrier pipe is introduced into the radially expanded hose, and

e) the radially expanded hose is placed against the outer surface of the carrier pipe by reducing the difference in pressure.
As a result of this measure, the hose adheres to the outer surface of the carrier pipe with frictional engagement. This frictional engagement is additionally increased if the inside diameter of the relaxed, force-free hose is smaller than the outside diameter of the carrier pipe. In this case, the hose is additionally resiliently braced to the carrier pipe.

The number of required openings depends on the length of the mounting device and the resilience properties of the hose and must be configured so as to allow the hollow space to be evacuated uniformly over its entire length in order to avoid the production of non-evacuated, bag-like zones. As a result, this configuration of the method is particularly suitable for long mounting devices.

In order to facilitate the introduction of the carrier pipe, the inside diameter of the hose when expanded is larger than the outside diameter of the carrier pipe. In addition, it is possible to apply a lubricant, for example talc, which is used to reduce the friction between the hose and carrier pipe.

With regard to the collecting line, the object according to the invention is achieved by a collecting line having the features of patent claim 3, according to which the carrier pipe is surrounded by a hose which tightly seals the openings, is made of a resilient semipermeable material, rests with frictional engagement against the outer surface of the carrier pipe, in particular is braced resiliently therewith in the circumferential direction and is made preferably of a silicone rubber.

In order further to describe the invention, reference will be made to the exemplary embodiment of the drawings, in which:
Figures 1 to 4 show the sequence of the method according to the invention, in each case in a schematic diagram with a double-walled mounting device.

According to Figure 1, a hose 4, which is made of a resilient material, in particular silicone rubber, and provided as the sheath or coating of a carrier pipe, is introduced into a double-walled mounting device 2 consisting of a hollow cylindrical mounting pipe 2a and an outer pipe 2b and connected in a vacuum-tight manner to the mounting device 2 at the ends thereof. The outside diameter of the hose 4 when relaxed, i.e. when no axial or radial forces are exerted thereon, is smaller than the inside diameter of the mounting pipe 2a. In the exemplary embodiment, the hose 4 is for this purpose turned inside-out at the ends of the mounting device 2 and, as is indicated by the arrows 6, fixed to the overhanging mounting pipe 2a by means of a hose clamp. The mounting pipe 2a is provided, at least over a portion of its length, with a plurality of openings or perforations 8 which are distributed uniformly over its circumference and via which it communicates with a chamber 10 which is formed between the inner pipe 2a and the outer pipe 2b and surrounds the mounting pipe 2a in the region of the openings 8. In the exemplary embodiment, the outer pipe 2b is connected in a vacuum-tight manner at its end sides to the mounting pipe 2a. However, a vacuum-tight connection of this type is not required if the outer pipe 2b is guided up to the end side of the mounting pipe 2a and the hose 4 is placed around the outer pipe 2b in a vacuum-tight manner.

The outer pipe 2b is preferably hollow cylindrical in order to generate a distribution of pressure which is as uniform as possible over the circumference of the inner pipe 2a. However, in principle, the geometric
shape of the outer pipe is not restricted to a cylindrical geometry.

A plurality of vacuum pumps 12, via which it is possible uniformly to evacuate the hollow space 14 formed between the outer pipe 2b and hose 4, are connected to the chamber 10.

Fig. 2 illustrates the situation which occurs during evacuation of the hollow space 14. As a result of the difference in pressure, which is formed when the vacuum pumps 12 are switched on ('on'), between the interior of the hose 4, in which the ambient pressure generally prevails, and the exterior, formed by the chamber 10 or the hollow space 14, of the hose 4, the hose 4 is radially expanded and rests against the inner surface of the mounting pipe 2a. The distance between the openings 8 and also their width have in this case dimensions such that the hose 4 rests uniformly against the inner surface of the mounting pipe 2a, without being drawn into the openings 8.

Once the hose 4 has been resiliently expanded, a carrier pipe 18, which is to be provided with the sheath or coating and is provided on its wall with a large number of openings 16, is now introduced into the hose 4. Subsequently, according to Figure 4, the chamber 10 is ventilated (vacuum pumps 12 'off') and the hose 4, which in the relaxed, force-free state has an inside diameter which is the same size as or smaller than the outside diameter of the carrier pipe 18, is placed against the outer surface of the carrier pipe 18. The hose 14 is fixed axially and with frictional engagement in the circumferential direction to the outer surface of the carrier pipe 18, braced resiliently thereto in the circumferential direction, if its inside diameter in the relaxed, force-free state is smaller than the outside diameter of the carrier
pipe 18, and seals in this case the openings 16 located in the carrier pipe 18 according to Fig. 3.

The sheath is manufactured in this case, in a correspondingly long mounting device 2, in a single production step. However, in principle, it is also possible to provide a very long carrier pipe 18 with the sheath in a stepwise manner in that said carrier pipe is completely extracted from the mounting device 2 after a coating process. Subsequently, a new hose 4 is inserted into the mounting device 2 and expanded. In a subsequent step, the carrier pipe 18 is slid through the mounting device 2 until the portion which adjoins the previously sheathed portion and has not yet been provided with the sheath is located within the mounting device 2, so that certain portions of the sheaths either overlap or abut one another.
Patent claims

1. A method for the production of a collecting line for detecting and locating an agent discharging into the environment of the collecting line in the case of leakage, comprising a carrier pipe (18), the wall of which is provided with openings (16) which are sealed by a resilient material which is permeable for the agent, including the following method steps:

a1) a hose (4), which is made of the permeable resilient material and the inside diameter of which is the same size as or smaller than the outside diameter of the carrier pipe (18), is resiliently expanded, at least over a portion of its length, by generating a difference in pressure between the interior and the exterior of the hose (4), in that

a2) the hose (4) is introduced into a mounting device (2) which is double-walled at least over a portion of its length and has a hollow cylindrical mounting pipe (2a),

a3) the mounting pipe (2a)

a3.1) is surrounded by an outer pipe (2b) set radially apart therefrom,

a3.2) has an inside diameter which is larger than the outside diameter of the hose (4) when relaxed,

a3.3) communicates via a plurality of openings (8) arranged on its circumference with a chamber (10) which is located between the mounting pipe (2a) and the outer pipe (2b), surrounds the mounting pipe (2a) and extends in the longitudinal direction,
a4) at least one vacuum pump (12) is connected to the chamber (10),

b) the hose (4) is placed tightly at its ends against the mounting device (2) in such a way that the hollow space (14), which is located between the hose (4) and the mounting pipe (2a) and communicates with the chamber (10), is outwardly tightly sealed,

c) the chamber (10) is evacuated to generate the reduced pressure,

d) the carrier pipe (18) is introduced into the radially expanded hose (4), and

e) the radially expanded hose (4) is placed against the outer surface of the carrier pipe (18) by reducing the difference in pressure.

2. The method as claimed in claim 1, wherein the inside diameter of the hose (4) when expanded is larger than the outside diameter of the carrier pipe (18).

3. A collecting line for detecting and locating an agent discharging into the environment of the collecting line in the case of leakage, comprising a carrier pipe (18), the wall of which is provided with openings (16) which are surrounded by a hose (4) which tightly seals the openings, is made of a resilient semipermeable material and rests with frictional engagement against the outer surface of the carrier pipe (18).

4. The collecting line as claimed in claim 3, wherein the hose (4) is resiliently braced to the carrier pipe (18) in the circumferential direction.
5. The collecting line as claimed in claim 3 or 4, wherein the hose (4) is made of a silicone rubber.