Title: A CONDUIT SYSTEM FOR TRANSPORTING A GASEOUS MEDIUM, SUITABLE FOR INTRAMURAL INSTALLATION

Abstract: A conduit system for transporting a gaseous medium, suitable for intramural installation, including conduits, connector fittings, distributor fittings. The elements of the conduit system are arranged within a protective housing (9), delimiting a gas-tight space containing a gaseous filling of a pressure higher than the working pressure of the medium transported in the conduit system, and that the space of the protective housing (9) is connected with an actuator (10) of a pneumatically operated cut-off valve (3) inserted into the conduit system prior to the point of the latter's entry point into a solid structural element, such as a wall (1, 7) or a ceiling of a building. In case of any failure of the elements of the conduit system, whether the breakdown or damage is of internal or external origin, the alteration of the pressure conditions in the conduit system and within the protective housing (9) results in the immediate activation of the cut-off valve (3) positioned prior to the entry point of the conduit system, which disconnects safely the entire conduit system from the supply network, preventing thereby that the gaseous medium, most frequently gas, supplied from the network should cause accident, damage or injury of any kind.
Description

A CONDUIT SYSTEM FOR TRANSPORTING A GASEOUS MEDIUM, SUITABLE FOR INTRAMURAL INSTALLATION

Technical Field

[1] The invention relates to a conduit system for transporting a gaseous medium, suitable for intramural installation, including elements as pipes, connector fittings and distributor fittings.

Background Art

[2] In the area of public utility networks, the concealed installation of water conduit systems in walls, ceilings etc. has been well-known and common for a long time. Conduit systems transporting gaseous medium, especially gas conduits, on the other hand, represent a hazard to the environment due to incidental damage at threaded connections or gas escape from damaged conduits, and hence neither e.g. the Hungarian standards, nor those in effect in most other known countries, allow to install gas conduit systems in walls, ceilings etc. Damage to the gas conduit may result from the movement/cleft of elements/walls of the building, and especially from external penetration into the gas conduit-line, invisible to the naked eye, in the course of accidental drilling, hitting/driving a nail in, or demolition. In order to prevent that, the relevant Hungarian regulations provide for conduits to be installed in an open wall chase or arranged under a special cover lath. The design and construction of a conduit system of this kind is described in detail e.g. in: I. Cséki, R. Glósz: SZAKMAI ISMERET - A gázvezeték- és készülékszerelő szakma számára (PROFESSIONAL SKILLS - for the plumber and fitter trade) (Műszaki Könyvkiadó /Technical Press, Budapest, 2003).

Disclosure of Invention

Technical Problem

[3] In order to eliminate extramural gas conduits, no doubt an unaesthetic solution, zinc-plated steel conduits with a thicker wall or equipped with anti-drill armor plating, or combined metal and plastic conduits, i.e., mechanically resistant ones, have been applied recently in Western Europe in order to enhance the protection of the gas conduit. However, a gas conduit system built rigidly into the wall cannot withstand with high safety forces originating from the movement of the building itself even under such measures, and coupling errors during or subsequent to the installation of the conduit will still impose an environmental hazard. On the basis of the above, it is easily understood that so far no option has been available to deploy a gas conduit system characterized by no coupling error and guaranteed resistance to external
mechanical impacts or to shearing force occurring in case of fire or wall cleft, that is, one that is foolproof and hence suitable for intramural installation with passive protection.

Technical Solution

The objective of the present invention is to create a conduit system suitable for intramural installation, constructed decisively of elements of the current, but also of future, gas conduit systems, or using the same, that is suitable to prevent hazards and errors associated with the known conduit systems, and also to safely cut off the conduit system within the building, in case of inevitable error or damage, from the supply network, and hence to eliminate thereby any danger, damage or accident due to malfunction.

The proposed solution to the objective set above is based on a conduit system for transporting a gaseous medium, suitable for intramural installation, including elements as conduits, connector fittings, distributor fittings, improved by arranging the elements of the conduit system within a protective housing, delimiting a gas-tight space including a gaseous filling of a pressure higher than the working pressure of the medium transported in the conduit system, so that the space of the protective housing is connected with the actuator of a pneumatically operated cut-off valve inserted into the conduit system prior to the point of the latter's entry point into a solid structural element, such as a wall or a ceiling, of the building.

According to one advantageous implementation of the proposed conduit system, the protective housing consists of protective tubes surrounding the elements of the conduit system and connector fittings joining these in a gas-tight manner.

It is furthermore advantageous according to the present proposal to join the protective tubes to the connector fittings by plugging.

In the latter case, it is advantageous to use the feasible implementation whereas the protective tubes are fixed to the connector fittings by tubing clamps.

According to another advantageous implementation of the proposed conduit system, the cut-off valve is realized as a spring-loaded valve that is closed in standby position.

It is also advantageous according to the present proposal to connect an optical display element to the cut-off valve to indicate working status.

It is furthermore advantageous to design the said display element as a pressure gauge, but the possible implementation whereas the display element is designed so as to indicate the working statuses of the cut-off valve by different colors is also advantageous.

Advantageous Effects
The main advantage of the proposed solution is that, in case of any failure of the elements of the conduit system, whether the breakdown or damage is of internal or external origin, the alteration of the pressure conditions in the conduit system and within the protective housing results in the immediate activation of the cut-off valve positioned prior to the entry point of the conduit system, which disconnects safely the entire conduit system from the supply network, preventing thereby that the gaseous medium, most frequently gas, supplied from the network should cause accident, damage or injury of any kind.

**Description of Drawings**

In the following, the proposed solution will be described in more detail with reference to the enclosed drawings showing a possible implementation of the pipe system, whereas

- Figure 1 outlines the operating principle of the conduit system according to the present invention;
- Figure 2 shows an example of a possible connection of the protective tube of the protective housing of the conduit system and the connector fitting;
- Figure 3 shows the arrangement of a T-shaped joint, within the protective tube, in sectional overview, and
- Figure 4 shows a sketch of a possible implementation of the cut-off valve inserted in the proposed conduit system, and its operating principle.

**Best Mode**

Figure 1 shows a possible implementation of the conduit system according to the present invention, suitable for intramural installation. Outside the frontal wall 1 of the building sketched in sectional view, a cut-off valve 3 is arranged, connected to entry conduit 4, in the present example, of a gas supplying network transporting a gaseous medium, through a pit 2, and to an exit conduit 5 forming part of the conduit system of the building. Since this solution was created in order to allow the concealed installation of a conduit system within a building, in the present example, conduit 5 is led to an appliance 8, which may be a gas-cooker, oven, boiler, heater etc., in base 6 of the building and in its internal partition wall 7. According to the present proposal, the conduit 5 is not directly installed in the base 6 and the walls 1,7, but it is located within a protective housing 9, whereas one end of the said housing, the one on the side of appliance 8, has a sealed closure, while the other, external, end is connected to actuator 10 of cut-off valve 3 operated pneumatically. In the case presented here, an actuator 10 of the cut-off valve 3 is also connected to a display element 11.

Figure 2 shows a broken sectional view of an example of a possible advantageous layout of the connector fitting used for the purpose of joining the conduits forwarding
the gaseous medium in the conduit system and the protective tubes surrounding them according to the present invention. In the case shown here, the connector fitting 12 is designed as a cylindrical body, including a co-axially arranged bush 13. Bush 13 is positioned, for example, by distance pieces 14 immovably inside the connector fitting 12, so as to form, between the latter's external cylindrical body and internal bush 13 a free space 15 belonging to the internal space of protective housing 9, but the connector fittings 12 can also be designed so that space-dividing bore-holes 15 be made in its solid cylindrical body. While the external cylindrical part of connector fitting 12 serves the purpose of connecting the protective tubes of protective housing 9, bush 13 located inside it serves the purpose of connecting the conduits 17 of the conduit system, which actually transport the gaseous material, inside the protective tube 16. Hence the bush 13 also has, as a matter of course, a channel 18 preferably designed with a concentric layout, ensuring connection between conduits 17 of the conduit system.

In the given case, the end of conduit 17 is led over projection 20 of bush 13 through flexible double sealing 19, and the protective tube 16 is, in the present case, led over the circumferential edge 22 of the connector fitting 12 through also flexible double sealing 21, upon which it is fixed by tubing clamps 23. Given the fact that, as will be shown in more detail later on, the working pressure inside the internal space of protective tube 16 is higher than in conduit 17 transporting the gaseous medium in the conduit system, conduit 17 is additionally pressed by this higher pressure to the projection 20 of the bush 13, and hence the gaseous medium transported in conduit 17 cannot, in standby position, exit conduit 17 and enter the space of protective tube 16.

Figure 3, partly related to the previous figure, shows in broken sectional view a possible implementation of a distribution section 24 frequently used in conduit systems. Some elements of connector fitting 12 and of the connection in Figure 2 are used in this distributor fitting 24, too, namely: protective tube 16, conduit 17, sealings 19, 21, tubing clamps 23, channel 18 and clearance 15. In order to realize the branching, however, the internal bush 13 is not a simple cylindrical body, positioned concentrically in distribution section 24, but a T-shaped fitting 25 in the traditional sense, with an projection 20 designed at each end, connected, through sealings 19, to conduits 17. This T-shaped fitting 25 is placed within the external body 26 of distributor fitting 24 surrounding it so that, for every connection from distributor fitting 24, clearance 15 be accessible for the medium inside the internal space of protective housing 9.

Figure 4 shows a possible arrangement of the cut-off valve 3. Cut-off valve 3 is operated pneumatically, whereas the operating medium may be not only air, but, theoretically, any other gaseous material. Closing means of the cut-off valve 3 is a spring-loaded plate valve realized and operating according to the manner known to those
skilled in the art. The gaseous medium, e.g. natural gas, to be transported in the conduit system enters the cut-off valve 3 from conduit 4 in Figure 1 through a filling connection 27 of the cut-off valve 3. Given the fact that, in standby position, the cut-off valve 3 is closed under the impact of the force of its plate valve 28 transferred via spring 29 and valve stem 30, the cut-off valve 3 sits on seat 31, and hence it blocks the way of the gas entering through the filling connection 27. If the plate valve 28 is open, the gas flows freely past the seat 31 to the filling connection 32 exiting the cut-off valve 3. The actuator of the cut-off valve 3 includes a flexible membrane 33, dividing the actuator of the cut-off valve 3 into a gas space 34 and a control chamber 35. Spring 29 sits at one end on the surface of gas space 32 of cut-off valve 3, and at the other end on membrane 33. Under working conditions, control chamber 35 of the cut-off valve 3 is connected to the internal space of protective tube 9. In the case of the implementation shown in Figure 4, the control chamber 35 is attached, through valve 37, to a pressure gauge 38 used as optical display element.

The operation of the proposed conduit system suitable for intramural installation is based on a very simple principle: the internal space of protective housing 9 is filled, through the filling connection formed on protective housing 9, in the known way, not shown in the drawing, by a gaseous medium, preferably neutral gas, to a pressure exceeding the working pressure of the gaseous material, e.g. natural gas, transported by or present in conduit 5 of the conduit system. The pneumatic actuator of cut-off valve 3 is calibrated so that, if pressure within protective housing 9 attains a certain, pre-defined, limit value, the membrane 33 opens the plate valve 28 against the spring 29, and the transported gas flows unobstructed from the conduit 4, through the cut-off valve 3, to the conduit 5 and to the appliance 8. If the pressure of the neutral gas filled into the essentially annular space of protective housing 9 decreases, the actuator of cut-off valve 3 closes the flow-path of the gas, as pressure decrease in control chamber 35 causes the spring 29 to alter the position of the membrane 33, and together with the membrane 33, the plate valve 29 connected thereto via valve stem 30 also sits on seat 31 of the cut-off valve 3. This will occur in case of any malfunction of either conduit 5 or protective housing 9. Hence, as demonstrated, the proposed active protection makes it impossible in case of any damage to either the gas conduit or the protective housing, for the gas transported in conduit 5 to flow into the environment.

The material of protective housing 9 is preferably identical with the materials used for the conduits transporting the gaseous material, and connector fittings 12 and distributor fittings 24 will preferably be made of metal. In function of the technology ever, conduit 5 and protective housing 9 can also be made of a single integrated conduit, whereas channel-like passages formed in the material of the protective housing 9 shall form the internal space of the protective housing 9 and trigger the
closure of the cut-off valve 3 in case of a violent external intrusion. In the implement-
mentation presented here, the pressure of the neutral gas filled into the protective
housing 9 is in the range of 4-6 bars. This ensures, at gas pressures according to the
provisions applicable to gas distribution, the immediate activation without any delay of
the active protection system and the prevention of occasional damage, injury or
accident.
Claims

1. A conduit system for transporting a gaseous medium, suitable for intramural installation, consisting of elements including conduits, connector or distributor fittings, characterized in that the elements of the conduit system are arranged within a protective housing (9) delimiting a gas-tight space containing a gaseous filling of a pressure higher than the working pressure of the medium transported in the conduit system, and that the space of the protective housing (9) is connected with an actuator (10) of a pneumatically operated cut-off valve (3) inserted into the conduit system prior to the point of the latter's entry point into a solid structural element, such as a wall (1, 7) or a ceiling of a building.

2. A conduit system according to claim 1, characterized in that the protective housing (9) consists of protective tubes (16) surrounding the elements of the conduit system and connector fittings (12) joining these in a gas-tight manner.

3. A conduit system according to claim 2, characterized in that the protective tubes (16) are connected to the connector fittings (12) by plugging.

4. A conduit system according to claim 2, characterized in that the protective tubes (16) are fixed to the connector fittings (12) by tubing clamps (23).

5. A conduit system according to claim 4, characterized in that the cut-off valve (3) is realized as a spring (29) biased valve that is closed in standby position.

6. A conduit system according to claim 1, characterized in that an optical display element (11) is connected to the cut-off valve (3) for indicating the actual working status.

7. A conduit system according to claim 6, characterized in that said display element (11) is a pressure gauge (38).

8. A conduit system according to claim 6, characterized in that the said display element (11) is designed so as to indicate the working statuses of the cut-off valve (3) by different colours.
A. CLASSIFICATION OF SUBJECT MATTER

IPC 7  F16L5/14  F16L55/10  F17D5/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7  F16L  F16K  F17D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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