[0007] However, effective odorization of a cryogenic fluid requires the dissolution of a generally very small and controlled amount of the odorizing ingredient in said cryogenic fluid, so that the odorant is present homogeneously in the cryogenic fluid and that, when vapors of said cryogenic fluid (for example in case of leakage, when it is at ambient temperature), an effective amount of odorant is definitely present in said vapors and that the olfactory detection threshold in the air is reached so as to allow the required alert.

[0008] Document DE102004050419 describes, for its part, a process for odorizing a cryogenic liquid fuel, the odorization operation being performed on the fluid in the gaseous state, after evaporation of said cryogenic fluid.

[0009] The odorization of liquefied natural gas has been the subject of a patent application published under No. FR2201424. This patent application in fact discloses an odorization process comprising the preparation of a solution of a diluent with an odorizing product, the cooling of this solution, then the introduction of this cooled solution into the liquefied natural gas in odorization amounts that are effective for odorizing the liquefied natural gas. The technique presented in this patent application, suffers, however, from numerous drawbacks, including that of requiring the preparation of a solution of a diluent of the odorizing ingredient, which must be cooled before use. In addition, the diluent used must comply with imperative conditions in terms of crystallization point, relative to the odorant and with respect to the natural gas to be odorized, such that the diluent mainly mentioned, not to say only mentioned, is propane. Thus another drawback linked to the abovementioned technique is the contamination of the fluid to be odorized by the appropriate diluent (propane), which can be troublesome, depending on the nature of the cryogenic fluid to be odorized and the use that is made of it later.

[0010] The object of the present disclosure is to propose a process that is simple to implement, most particularly at the industrial level, that is to say for the odorization of very large amounts of cryogenic fluids, without having the known drawbacks of the prior art techniques, in particular those using a diluent that can pollute said cryogenic fluid to be odorized, and thus potentially be a hindrance to the use that is made of said cryogenic fluid.

[0011] Another objective of the disclosure is to propose a process that is simple to implement, most particularly at the industrial level, while at the same time allowing a controlled addition without restrictions with respect to the conditions of flow rate and pressure of an odorizing agent to be introduced. Other objects and advantages will further emerge in the following description of the present disclosure.

[0011a] In one aspect, the present disclosure refers to a device for introducing an odorizing agent into a cryogenic fluid, said device comprising:

1) a feed zone, which is fed with odorizing agent in liquid or gaseous form, preferably liquid form,

2) a buffer zone in which the liquid or gaseous odorizing agent is brought to a temperature of about the temperature of the cryogenic fluid, and

3) a contact zone, wherein said odorizing agent comes into contact with said cryogenic fluid to be odorized.

CLAIMS

1. A device for introducing an odorizing agent into a cryogenic fluid, said device comprising:

1) a feed zone, which is fed with odorizing agent in liquid or gaseous form, preferably liquid form,

2) a buffer zone in which the liquid or gaseous odorizing agent is brought to a temperature of about the temperature of the cryogenic fluid, and

3) a contact zone, wherein said odorizing agent comes into contact with said cryogenic fluid to be odorized.

2. The device according to claim 1, wherein in the contact zone, the odorizing agent is in the form of droplets of solidified odorizing agent or else in the form of a solidified spray.

3. The device according to claim 1, wherein the odorizing agent arrives in the buffer zone by means of at least one or more elements chosen from a cannula, a nozzle, an injector or any other means for drip or spray feeding.

4. The device according to claim 1, wherein the odorizing agent arrives in the buffer zone, by entrainment of said odorizing agent with a carrier gas, or a portion of the cryogenic fluid to be odorized, said fluid having been previously vaporized.

5. The device according to claim 1, wherein the feed zone is equipped with a means for maintaining the temperature of the odorizing agent above its crystallization temperature.

6. The device according to any of the previous claims, wherein the odorizing agent is selected from methyl ethyl sulfide, dimethyl sulfide, diethyl sulfide, dimethyl disulfide, diethyl disulfide, methyl mercaptan, ethyl mercaptan, *tert*-butyl mercaptan, *sec*-butyl mercaptan, *iso*-propyl mercaptan, n-propyl mercaptan, cyclohexyl mercaptan, tetrahydrothiophene, methyl acrylate, ethyl acrylate, methyl methacrylate, ethyl methacrylate, methylethylpyrazine, dimethyl selenide and dimethyl diselenide.

7. The device according to any of the previous claims, wherein the odorizing agent is used pure, mixed or diluted with other compounds compatible with the cryogenic fluid.

8. The device according to any of the previous claims, wherein the cryogenic fluid is liquefied natural gas.

9. The device according to any of the previous claims, wherein the odorizing agent, in a liquid or gaseous form, is fed continuously in the feed zone.

10. The device according to claim 1, wherein the flow rate of odorizing agent in the contact zone is proportional to the flow rate of the cryogenic fluid.