

DESCRIPTION

LIQUID REDUCING AGENT INJECTION HOSE

TECHNICAL FIELD

[0001]

The present invention relates to an exhaust emission purifying apparatus for reductively purifying nitrogen oxides (NO_x) in an exhaust gas using a liquid reducing agent, and in particular, to an injection hose to be used not exclusively but preferably for replenishing the liquid reducing agent from outside into a container provided in the exhaust emission purifying apparatus for storing therein the liquid reducing agent upon request.

BACKGROUND ART

[0002]

As a catalytic purification system for removing NO_x contained in the exhaust gas emitted from an engine, there has been proposed an exhaust emission purifying apparatus for subjecting NO_x in the exhaust gas and a liquid reducing agent to the catalytic-reduction reaction, to thereby purify NO_x into harmless components. This exhaust emission purifying apparatus is configured such that a reducing agent supply device controlled by a control unit is used so that the liquid reducing agent of necessary amount according to engine operating conditions is injection-supplied to a position on the upstream side of a reduction

catalytic converter disposed in an engine exhaust system.

[0003]

In this catalytic reduction reaction, ammonia having excellent reactivity to NO_x is mainly used, and as the liquid reducing agent, there is mainly used the urea aqueous solution which is hydrolyzed with the exhaust heat and water vapor in the exhaust gas to generate ammonia. The liquid reducing agent, such as the urea aqueous solution and the like, is reserved in an on-vehicle dedicated storage container.

Naturally, the liquid reducing agent reserved in the on-vehicle container must be reduced with the vehicle running, and therefore, needs to be appropriately replenished. When performing the replenishment, a new liquid reducing agent which is offered while being contained in a handheld tank of predetermined volume (for example, a tank similar to a kerosene plastic container, a cardboard box of which interior is lined with a resin bag, or the like) is manually transferred and supplied into the on-vehicle container.

[0004]

In such a liquid reducing agent tank storing the liquid reducing agent to be replenished, to an outlet port thereof, a flexible injection hose is attached, and the injection hose is inserted into an inlet port of the container to be transferred and supplied with the liquid reducing agent so that the liquid reducing agent can be filled in the container by injection. After the replenishment of the liquid reducing agent is finished, the injection hose is detached, and the detached injection hose can be again

used for the liquid reducing agent tank at the next replenishment.

[0005]

The injection hose detached from the liquid reducing agent tank needs to be kept in a state where neither the injection hose becomes dirty nor dust enters into the injection hose. As disclosed in Patent literature 1, for a bellows type hose of which one end is still attached to a tank, there has been considered a keeping method of covering entirety of the hose with a cover. However, there has not yet been proposed a keeping method suitable for the hose completely detached from the tank.

Patent literature 1: Japanese Laid-open (Kokai) Patent Application Publication No. 8-156928

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0006]

As described in the above, for replenishing the liquid reducing agent, normally, one injection hose is repetitively used, and therefore, if the injection hose detached from the liquid reducing agent tank is left without protection by an appropriate keeping method, foreign matters easily enter into the injection hose via an opening of the injection hose. Since the foreign matters entered into the injection hose are hard to be found out by a person at the time when a replenishing working is carried out by the person, there is a high possibility that the foreign matters are mixed with the liquid reducing agent. The liquid reducing agent to be

used for the exhaust emission purifying apparatus needs to be in compliance with administrative or public restrictions such as the property specification defined by, for example, Japanese Industrial Standards (JASOE502), and therefore, the mixing-in of the foreign matters, such as dirt, dust, oil and the like must be strictly inhibited.

[0007]

Therefore, it is necessary to perform the keeping method of blocking end openings of the detached injection hose to an extent such that at least the foreign matters such as dust and the like do not enter into the injection hose, so that the inside of the injection hose is blocked from the outside, that is to say, the hose interior is kept in a state of closed clean space to the extent that at least the foreign matters do not enter into the injection hose. However, in the case where the keeping method of covering the entirety of the injection hose as disclosed in patent literature 1 is applied, the cover is produced separately from the injection hose, and therefore, is not worth the cost. Consequently, such a keeping method is hard to be applied.

[0008]

Therefore, in view of the problems in the conventional technology as described above, the present invention has an object to enable the appropriate and simple keeping of an injection hose even detached from a liquid reducing agent tank without the necessity of additional cost.

MEANS FOR SOLVING THE PROBLEMS

[0009]

In order to achieve the above object, the present invention proposes a liquid reducing agent injection hose comprising: one end portion having a shape capable to be attached to an outlet port of a liquid reducing agent tank; a different end portion having a shape capable to be inserted into an inlet port disposed to a container to which the liquid reducing agent is transferred and supplied from the tank; and an intermediate portion having the flexibility which connects between the one and different two end portions, wherein at least one convex thread (or concave thread) is formed on an outer peripheral surface of one of the two end portions, and also, at least one concave thread (or convex thread) is formed on an inner peripheral surface of the other end portion, and the two end portions are connected to each other by the engagement of the convex thread and the concave thread through bending of the injection hose, so that the intermediate portion is eventually kept in a state of an annular shape.

EFFECTS OF THE INVENTION

[0010]

In the injection hose according to the present invention, after the injection hose is detached from the tank, the convex thread and the concave thread are engaged with each other so that the two end portions can be connected to each other to be in the state of annular shape (no-end state), and therefore, the hollow intermediate portion can be kept in a

closed space state to the extent that at least foreign matters such as dust and the like do not enter into the intermediate portion.

Namely, according to the present invention, since the concave thread and the convex thread are merely formed on the two end portions positioned on opposite sides of the intermediate portion, such formation can be achieved only by a slight modification in the mold for use in molding of the injection hose. Accordingly, new parts, such as an opening cover and the like, do not need to be used, and an additional cost is not required. Then, the injection hose detached from the tank after the use can be made to be in an appropriate keeping state easily preventing any foreign matters from entering in the interior of the injection hose, by merely engaging the concave and convex threads on the two end portions with each other in the sense of so-called snap fitting. Consequently, there is provided the injection hose which solves the conventional problems and also is optimum for the liquid reducing agent for an exhaust emission purifying apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 is an external view of an injection hose according to one embodiment of the present invention in a linear state including a partial cross section; and

Fig. 2 is an external view of the injection hose in Fig. 1 in an annular state.

EXPLANATION OF REFERENCE SYMBOLS

[0012]

1 ... injection hose, 2 ... end portion (outlet port attaching side), 2c ... concave thread, 3 ... end portion (inlet port inserting side), 3a ... convex thread, 4 ... intermediate portion, 5 ... hook

BEST MODE FOR CARRYING OUT THE INVENTION

[0013]

A preferred embodiment of the present invention will be described hereunder, referring to the appended drawings. Fig. 1 schematically shows an injection hose according to the present embodiment in a linear state, and Fig. 2 schematically shows the injection hose in an annular state in which two end portions are engaged with each other.

An injection hose 1 includes: an end portion 2 having a shape capable to be attached to an outlet port (not shown in the figure) of a handheld tank which stores a liquid reducing agent; an end portion 3 having a shape capable to be inserted into an inlet port (not shown in the figure) of a storage container of an exhaust emission purifying apparatus for transferring the liquid reducing agent; and an intermediate portion 4 having the flexibility which connects between the end portion 2 and the end portion 3. The intermediate portion 4 in the present embodiment is in a bellows type, and therefore, can be freely bent. The intermediate portion 4 may be formed out of an elastic body such as rubber or the like,

or thin resin, to thereby have the flexibility. However, since it is necessary to use a material which does not affect the liquid reducing agent, such a structure is suitable in which the intermediate portion 4 is formed in bellows type using the material which does not affect the liquid reducing agent, to obtain the thickness and the strength.

[0014]

The end portion 2 includes: a large diameter portion 2a of which external diameter is fitted into an internal diameter of the tank outlet port; and a funnel portion 2b of which diameter gradually tapers from the large diameter portion 2a, and a concave thread 2c is formed on an inner peripheral surface at an end of the funnel portion 2b. However, the position on which the concave thread 2c is formed is not limited to the position shown in the figure, that is, a boundary position between the end portion 2 and the intermediate portion 4. Further, in the present embodiment, an internal diameter of the concave thread 2c is made larger than an internal diameter of the intermediate portion 4, so that the end portion 3 is prevented from entering behind the concave thread 2c of the end portion 2 when the two end portions 2 and 3 are connected to each other. However, according to circumstances, the internal diameter of the concave thread 2c may be equal to or smaller than the internal diameter of the intermediate portion 4.

[0015]

A locking step 2d is formed on an outer peripheral surface of the large diameter portion 2a of the end portion 2, and when the end portion 2

is fitted into the tank outlet port, the locking step 2d is locked in a step formed on an inner peripheral surface of the tank outlet port so that the hose 1 is not readily detached during an injecting operation. Further, a flange 2e is formed on the outer peripheral surface of the end portion 2 so as to provide a partition between the large diameter portion 2a and the funnel portion 2b, and when the large diameter portion 2a is fitted into the tank outlet port, the flange 2e is in contact with an edge of the tank outlet port to serve as a stopper for preventing the end portion 2 from further entering behind the tank outlet port and also as a lid covering a gap.

[0016]

The end portion 3 is not necessary to have the flexibility, and is rather than preferable to be rigid, and therefore, is formed in a cylindrical shape thicker than the intermediate portion 4. Then, a convex thread 3a to be engaged with the concave thread 2c of the end portion 2 is formed on an outer peripheral surface at a tip end of the end portion 3. However, the position of the convex thread 3a is not limited thereto, and may be an intermediate site of the end portion 3 or the like.

Incidentally, in the present embodiment, there is shown the example in which the concave thread 2c is formed on the inner peripheral surface of the end portion 2 and the convex thread 3a is formed on the outer peripheral surface of the end portion 3. Contrary to this, the configuration may be such that a convex thread is formed on the inner peripheral surface of the end portion 2 and a concave thread is formed in the outer peripheral surface of the end portion 3. Further, two or more

convex threads and two or more concave threads may be formed, so that an engagement force between the threads can be strengthened. Further, a diameter of the end portion 2 may be smaller than a diameter of the end portion 3. In this case, the convex thread or the concave thread is formed on the inner peripheral surface of the end portion 3 of which diameter is larger than the diameter of the end portion 2, whereas the concave thread or the convex thread is formed on the outer peripheral surface of the end portion 2 of which diameter is smaller than the diameter of the end portion 3.

[0017]

The injection hose 1 in the present embodiment is used in a linear state as shown in Fig. 1, when it is attached to the liquid reducing agent tank to be used. On the other hand, the injection hose 1 is kept in an annular state as shown in Fig. 2, when it is kept after being detached from the liquid reducing agent tank after the use. Namely, the end portion 3 is inserted into the end portion 2 by bending the intermediate portion 4, and the convex thread 3a and the concave thread 2c are engaged with each other in the sense of snap fitting to be connected to each other, so that the intermediate portion 4 is made to be in the state of an annular shape (an endless state in which the end portions 2 and 3 are continually connected to each other), and thereafter, the injection hose 1 is accommodated in a predetermined storage location. As a result, the interior of the intermediate portion 4 becomes a closed space to the extent that foreign matters such as dust and the like do not enter into the intermediate portion

4, so that any contamination of the interior of the intermediate portion 4 may be prevented. Further, for example, if rubber packing or the like is applied on an inner surface of the concave thread 2c to thereby enhance the tightness, it is also possible to achieve a liquid-tight state or a gas-tight state.

[0018]

As the storage location of the injection hose 1, there may be considered an example in which the intermediate portion 4 is allowed to be bent after passing through an inner spacing defined below a handle of an unused tank, so that the injection hose 1 is held on the unused tank. However, as shown in Fig. 2, a hook 5 is attached to predetermined site on the outer peripheral surface of the intermediate portion 4, and the hook 5 is hooked on a predetermined storage location to thereby hang the injection hose 1. The hook 5 is attached so as not to move from the predetermined site of the intermediate portion 4 by means of an elastic ring such as a rubber code or the like. Therefore, when the injection hose 1 in the annular state in which the convex thread 3a and the concave thread 2c are engaged with each other is hung by the hook 5, the injection hose 1 can be kept in a state where an opening of the end portion 2 of which inner peripheral surface the concave thread 2c is formed (that is, the end portion having the larger diameter) faces downward as shown in the figure. Since the opening of the end portion 2 faces downward (toward a floor), it is possible to suppress the attachment of foreign matters such as dust and the like as much as possible.

[0019]

Incidentally, as an application example, at the using time shown in Fig. 1, it is also possible that the end portion 2 is cut out of the hose 1 while leaving the concave thread 2c, and a convex thread 3a of another injection hose 1 is engaged with the left concave thread 2c, so that a plurality of injection hoses 1 is connected to each other to form a desired length of extended injection hose having like opposite end portions, to thereby be used for the liquid reducing agent injection.

CLAIMS:

[1] A liquid reducing agent injection hose comprising:

one end portion having a shape capable of being attached to an outlet port of a liquid reducing agent tank;

a different end portion having a shape capable of being inserted into an inlet port disposed to a container into which the liquid reducing agent is transferred and supplied from the tank; and

an intermediate portion having a flexible property and extended to connect between the one and different two end portions, wherein

at least one convex thread is formed on an outer peripheral surface of one of the two end portions, and also, at least one concave thread is formed on an inner peripheral surface of the other of the two end portions, said two end portions being connected to each other by an engagement of the convex thread and the concave thread, thereby permitting the intermediate portion to be kept in a state of annular shape.

[2] The liquid reducing agent injection hose according to claim 1, wherein there is provided a hook, which is attached to a predetermined position on an outer peripheral surface of the intermediate portion in such a manner that when the hook is hooked on a preselected location in a state where the one and different two end portions are connected to each other and the intermediate portion is brought to be in the state of annular shape, one of the two end portions, which has an inner peripheral surface on which the concave thread is formed, has an opening thereof directing vertically downward.

[3] A liquid reducing agent injection hose comprising:

one end portion having a shape capable of being attached to an outlet port of a liquid reducing agent tank;

a different end portion having a shape capable of being inserted into an inlet port provided for a container to which the liquid reducing agent is transferred and supplied from the tank; and

an intermediate portion having a flexible property and arranged to connect between the one and different two end portions, wherein

at least one concave thread is formed on an outer peripheral surface of one of the two end portions, and also, at least one convex thread is formed on an inner peripheral surface of the other of the two end portions, the two end portions being connected to each other by an engagement of the concave thread and the convex thread thereby allowing the intermediate portion to be kept in a state of annular shape.

[4] The liquid reducing agent injection hose according to claim 3, wherein there is provided a hook, which is attached to a predetermined position on an outer peripheral surface of the intermediate portion in such a manner that when the hook is hooked on a preselected location in a state where the one and different two end portions are connected to each other thereby allowing the intermediate portion to be formed in the state of annular shape, one of the two end portions, which has an inner peripheral surface on which the concave thread is formed, has an opening thereof directing vertically downward.