separately, depending on a worker, there is a risk of forgetting any one of the work to clamp the hose by the ground member and the work to clamp the hose using the clamping band, and thus there is a problem of poor safety. Further, in the hose, a conductive wire is wound on the surface of a hose main body and a reinforcing member made of hard resin is spirally wound outside the conductive wire. However, since the conductive wire is disposed to be exposed on the outer circumference surface of the hose main body, if the tension of the conductive wire increases, for example, due to foreign matters being caught, then the conductive wire gets cut easily, and some of cut and separated conductive wires fall on the conductive wire or float in air. Therefore, since there is also a rare possibility that some of the separated conductive wires may be mixed in with other things such as a product being manufactured, in the industry such as a food factory or a pharmaceutical factory, in particular, where the handling with mixing of foreign matters into a product is difficult, a hose in which a conductive wire is exposed on the outer circumference surface of a hose main body cannot be used and static electricity prevention measures are troublesome.

[0005]

The present invention has a task to handle with such a problem and has an object to perform ground connection of a tube body while reliably connecting the tube body by a tube joint, to simultaneously perform the connection of the tube body to the tube joint and the ground of the tube body, or the like.

SOLUTION TO PROBLEM

[0006]

In order to achieve such an object, according to an aspect of the present invention, there is provided a tube connection structure including: a tube body with a conductive part provided on an outer surface in an axial direction; a tube joint to which one end portion of the tube body is detachably connected; and a ground member which makes the conductive part and the tube joint electrically communicate with each other, in which the tube joint has a nipple which is provided so as to oppose an inner surface of the tube body, a clamp member which is provided to compress an inserting space of the tube body put therebetween in a radial direction with respect to an outer circumference surface of the nipple, and a connecting part which is made of a conductive material and mounted so as to electrically communicate with other equipment, the clamp member is supported so as to be movable in an insertion direction of the tube body with respect to the

nipple, a sleeve which is opposed to the outer surface of the tube body is provided, as the ground member, between the clamp member and the nipple~~and the ground member is disposed over the conductive part and the connecting part~~ so as to electrically communicate with ~~each of the conductive part and~~ the connecting part, the sleeve is formed of a conductive material so as to be elastically deformed in the radial direction according to movement of the clamp member with respect to the nipple, and at the time of diameter contraction deformation thereof, an inner circumference surface of the sleeve comes into contact with and electrically communicates with the conductive part.

ADVANTAGEOUS EFFECT

[0007]

According to the present invention having the above-described features, since the ground member is disposed over the connecting part of the tube joint made of a conductive material and the conductive part of the tube body so as to electrically communicate with each of the connecting part and the conductive part, whereby static electricity generated in the tube body flows from the conductive part to the connecting part through the ground member and is grounded from the connecting part to other equipment. Therefore, ~~thus~~ it is possible to perform ground connection of the tube body while reliably connecting the tube body using the tube joint. As a result, in comparison with the related art in which the pulling-out of the hose with respect to the metal pipe is restricted by the clamping force of the ground member, even if an external force acts on the tube body in a direction to be extracted from the tube joint in a tube body connection state or the pressure (internal pressure) of a fluid or the like passing through the inside of the tube body rises, there is no concern that the tube body may be pulled out from the tube joint, and thus leakage of a fluid or the like can be reliably prevented. In addition, the sleeve serving as the ground member is deformed so as to be contracted in diameter due to the movement of the clamp member with respect to the nipple and the inner circumference surface thereof is brought into contact with the conductive part of the tube body, whereby static electricity generated in the tube body flows to the connecting part through the conductive part and the sleeve serving as the ground member and is grounded. Therefore, it is possible to simultaneously perform the connection of the tube body to the tube joint and the ground of the tube body. As a result, in comparison with the related art in which clamping work of a hose by a ground member and clamping work of a hose using a clamping band are separately

ground performance can be expected regardless of a person's connection work experience, to improve the safety.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figs. 1A and 1B are explanatory diagrams showing the overall configuration of a tube connection structure according to an embodiment of the present invention, wherein Fig. 1A is a longitudinal cross-sectional front view showing a state before connection of a tube body, and Fig. 1B is a longitudinal cross-sectional front view showing a state after connection of the tube body with a tube joint.

Fig. 2 is an exploded perspective view.

Fig. 3 is an explanatory diagram (a partially cut-away front view) showing the overall configuration of a tube connection structure according to another embodiment of the present invention and shows a state after connection of the tube body with the tube joint.

Fig. 4 is an explanatory diagram (a longitudinal cross-sectional front view) showing the overall configuration of a tube connection structure according to another embodiment of the present invention and shows a state after connection of the tube body with the tube joint.

Figs. 5A and 5B are explanatory diagrams showing the overall configuration of a tube connection structure according to another embodiment of the present invention, wherein Fig. 5A is a longitudinal cross-sectional front view showing a state after connection of the tube body with the tube joint, and Fig. 5B is a perspective view of a ground member (a clip).

DETAILED DESCRIPTION OF EMBODIMENTS

[0009]

Hereinafter, an embodiment of the present invention will be described in detail based on the drawings. A tube connection structure A according to the embodiment of the present invention includes, as main constituent elements, a tube body 10 with a conductive part 11 provided on an outer surface 10a in an axial direction, a tube joint 20 to which one end portion of the tube body 10 is detachably connected, and a ground member 30 which makes the conductive part 11 and the tube joint 20 electrically

Claims

[Claim 1]

A tube connection structure comprising:

a tube body with a conductive part provided on an outer surface in an axial direction;

a tube joint to which one end portion of the tube body is detachably connected; and

a ground member which makes the conductive part and the tube joint electrically communicate with each other,

wherein the tube joint has a nipple which is provided so as to oppose an inner surface of the tube body, a clamp member which is provided to compress an inserting space of the tube body put therebetween in a radial direction with respect to an outer circumference surface of the nipple, and a connecting part which is made of a conductive material and mounted so as to electrically communicate with other equipment, ~~and~~

~~the ground member is disposed over the conductive part and the connecting part so as to electrically communicate with each of the conductive part and the connecting part.~~

~~[Claim 2]~~

~~The tube connection structure according to Claim 1, wherein~~ the clamp member is supported so as to be movable in an insertion direction of the tube body with respect to the nipple, a sleeve which is opposed to the outer surface of the tube body is provided, as the ground member, between the clamp member and the nipple so as to electrically communicate with the connecting part, and

the sleeve is formed of a conductive material so as to be elastically deformed in a radial direction according to movement of the clamp member with respect to the nipple, and at the time of diameter contraction deformation thereof, an inner circumference surface of the sleeve comes into contact with and electrically communicates with the conductive part.

[Claim 2~~3~~]

The tube connection structure according to Claim 1 ~~or 2~~, wherein as the conductive part, a band shape body made of a conductive material is fixed to and integrated with the outer surface of the tube body in the axial direction of the tube body.