

SPECIFICATION

TITLE OF THE INVENTION

HELICAL REINFORCING HOSE

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates to a helical reinforcing hose such as a suction hose or a duct hose and the like, for example, in which a superior anti-pressure characteristic is attained under its application of low pressure or negative pressure.

More particularly, the present invention relates to a helical reinforcing hose in which the reinforcing member of hard synthetic resin is buried in the hose main body of soft synthetic resin in a helical form.

DESCRIPTION OF THE RELATED ART

In the related art, as this kind of helical reinforcing hose, a reinforcing member 2' having a circular section is buried in an outer circumferential surface 1a' of a hose main body 1' as shown in Fig. 3, for example, while being projected outwardly to cause a hose outer wall surface A2' to be protruded in a corrugated shape.

In addition, as shown in Fig. 4, a size of wall thickness of the hose main body 1' is made uniform under a state in which

the reinforcing member 2' having a circular section is buried in the hose main body 1', thereby there is provided a hose in which a hose outer wall surface A2' is smooth.

However, such a related art helical reinforcing hose shows a problem that the hose shows a poor sliding action when the hose is contacted with the ground to make a inferior convenience in use and the hose is easily worn out to cause its life time to be short due to the fact that the hose outer wall surface contacted with the ground or a floor surface during its use is molded by soft synthetic resin having a high frictional resistance.

In addition, although the related art hose in which the hose outer wall surface is protruded in a corrugated shape has a thin wall thickness at a wall section where the reinforcing member is not buried is easily bent and light in its weight, if the hose is fastened with a normal flat band, for example, to cause the entire inner circumferential surface of the hose main body to be closely contacted with a hose nipple, the helical section in which the reinforcing member protruded in a corrugated shape is buried can be partially compressed. However, since the wall section where no reinforcing member is buried cannot be compressed, there occurs a problem that fluid is leaked or the hose is removed

when the inferior air-tightness is produced and the inner pressure of fluid flowing in the hose is increased.

In order to prevent this phenomenon, it was necessary to use an expensive exclusive hose band.

In addition, in the case of the related art hose in which the outer wall surface of the hose is flat and smooth, although the entire hose can be compressed uniformly by fastening the normal flat band such as a belt band or the like, for example, and has a superior air-tightness, the wall thickness size of the wall section where no reinforcing member is buried becomes thick, so that there occurs a problem that the hose is hardly bent and becomes heavy.

First and second aspects of the present inventions aim at attaining a thin wall thickness of the entire hose and performing a uniform compression of the entire hose even with the normal flat band while the hose main body cannot be contacted with the ground.

Third aspect of the present invention aims at attaining a rigid connection of the reinforcing member with the hose main body in addition to the objects of the first and second aspects of the present inventions.

SUMMARY OF THE INVENTION

In order to accomplish the aforesaid objects, the first aspect of the present invention is characterized in that a sectional shape of the reinforcing member is molded flat in an axial direction of the hose main body in such a way that its outer circumferential surface may become flat, almost of the member except the flat outer circumferential surface is buried in the outer circumferential surface of the hose main body and the flat smooth ground contact section slightly projected and exposed from the outer circumferential surface of the hose main body is molded at the outer circumferential surface of the reinforcing member.

Second aspect of the present invention is characterized in that the constitution of the first aspect of the present invention is added with a constitution in which when the aforesaid entire hose is fastened to the constitution of the first aspect of the present invention, the hose main body made of soft synthetic resin is resiliently remolded to cause the reinforcing member made of hard synthetic resin to be completely embedded.

Third aspect of the present invention is characterized in that the constitution of the first and second aspects of the present inventions is added with a constitution in which either a protrusion or an indentation projected toward the

center of the hose main body is molded only at the inner circumferential surface of the reinforcing member to increase a contact area with the hose main body.

First and second aspects of the present inventions are constructed such that the reinforcing member is flat in its shape, the ground contact section having a smooth outer circumference is protruded slightly from the outer circumferential surface of the hose main body and exposed, thereby the wall thickness size of the hose main body can be molded thin and at the same time when used, the ground contact section made of hard synthetic resin is contacted with the ground and further in the case that the entire hose is fastened with the normal flat band, the hose main body made of soft synthetic resin is resiliently remolded to cause the reinforcing member made of hard synthetic resin to be completely buried and then these ground contact sections and the outer circumferential surface of the hose main body are substantially in flush with each other.

Third aspect of the present invention is constructed such that the constitution according to first aspect of the present invention is added with a constitution in which either the protrusion or the indentation protruding toward the center of the hose main body is molded only at the inner

circumferential surface of the aforesaid reinforcing member to cause a contact area with the hose main body to be increased, resulting in that an adhering strength between the reinforcing member and the hose main body is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front elevational view with a part being broken away to a helical reinforcing hose of one preferred embodiment of the present invention.

Fig. 2 is an enlarged side elevational view in longitudinal section taken along line (II) - (II) of Fig. 1.

Fig. 3 is a front elevational view in longitudinal section to show one example of the related art helical reinforcing hose.

Fig. 4 is a front elevational view in longitudinal section to show one example of the related art helical reinforcing hose.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, one preferred embodiment of the present invention will be described as follows.

As shown in Figs. 1 and 2, this preferred embodiment is constituted such that a hose nipple B is inserted into one

end inner circumferential surface A1 of a helical reinforcing hose A and a normal flat band C such as a belt band, for example, is wound around and fastened to its outer circumferential surface A2, thereby one end inner circumferential surface A1 of the helical reinforcing hose A is press contacted with the hose nipple B.

The aforesaid helical reinforcing hose A is made such that soft synthetic resin such as soft vinyl chloride, for example, is heated and softened, and a belt-like hose main body 1 is extruded from a first extruder (not shown), hard synthetic resin such as hard vinyl chloride, for example, is heated and softened and a liner reinforcing member 2 is extruded from a second extruder (not shown), after these both members are merged from each other, they are wound in a helical manner in an axial direction of the hose and melted there, thereby the hose main body 1 having the reinforcing member 2 embedded therein is manufactured in a continuous manner.

In the case of the illustrated example, as the soft synthetic resin, transparent soft vinyl chloride is applied and as the hard synthetic resin, colored hard vinyl chloride is applied.

The aforesaid reinforcing member 2 is made such that its sectional shape is molded into a flat shape in an axial

direction of the hose main body 1 as shown in Fig. 1, almost of all the portions except at least the outer circumferential surface are embedded into the outer circumferential surface 1a of the hose main body 1 and then a flat ground contacted section 2a projected slightly from and exposed from the outer circumferential surface 1a of the hose main body 1 as shown in Fig. 2 is molded at the outer circumferential surface of the reinforcing member 2.

Further, the inner circumferential surface of the aforesaid reinforcing member 2 is molded with either a protrusion 2b or an indentation protruded toward the center of the hose main body 1 in order to make contact area wide a little with the hose main body 1.

In the case of the preferred embodiment of the present invention, there is molded the protrusion 2b having a substantial semi-oval section protruded gradually toward the center of the hose main body 1 as it faces axial central direction of the hose main body 1. However, this shape is not limited to the protrusion 2b of substantial semi-oval section and if it is possible to make the contact area with the hose main body 1 wide a little, other protrusions or indentations of other shapes not shown may also be available.

In addition, the aforesaid hose nipple B is made of hard

synthetic resin or metal, and in the case of the illustrated example, a telescopic hose connecting cylinder B1 is molded at one axial end, a cylindrical connecting cylinder B2 is protruded at the other end in order to be connected to another machine and its outer circumferential surface is molded with a connecting section B3 such as a screw or the like.

Then, a method for fixing such a helical reinforcing hose A as above will be described as follows.

At first, a hose connecting cylinder B1 of the hose nipple B is inserted into one end inner circumferential surface A1 of the helical reinforcing hose A as shown in Fig. 1, and a normal flat band C molded like a belt shape is wound around one end outer circumferential surface A2 of the helical reinforcing hose A under this state and this is gradually fastened.

With such an arrangement as above, at first only the reinforcing member 2 made of hard resin abutted against the flat band C is pushed inwardly, the hose main body 1 made of soft resin which is arranged near it is resiliently demolded to cause the reinforcing member 2 to be completely embedded, resulting in that these ground contact sections 2a and the outer circumferential surface 1a of the hose main body 1 are substantially in flush with each other.

As a result, the aforesaid ground contact section 2a and the outer circumferential surface 1a of the hose main body 1 are compressed uniformly and the one end inner circumferential surface A1 of the helical reinforcing hose A is demolded along the hose connecting cylinder section B1 of the hose nipple B and closely contacted with it.

Accordingly, even in the case that an inner pressure of fluid flowing in the helical reinforcing hose A is made to be high, neither leakage of fluid nor removal of hose is produced.

In addition, since the aforesaid helical reinforcing hose A is made such that the reinforcing member 2 is flat in its shape and the outer circumferential ground contact section 2a is slightly protruded and exposed from the outer circumferential surface 1a of the hose main body 1, the wall thickness size of the hose main body 1 can be molded thin, resulting in that its weight is light and it has a superior flexibility.

Further, when used, since the ground contact section 2a made of hard resin is contacted with either the ground or the floor surface, it may easily be slid and hardly worn out as compared with that the outer circumferential surface 1a of the hose main body 1 made of soft resin with a high

frictional resistance.

Further, since the inner circumferential surface of the reinforcing member 2 is molded with protrusions 2b protruded toward the center of the hose main body 1, a contact area between the reinforcing member 2 and the hose main body 1 is increased to cause adhering strengths of both members to be improved.

As a result, the reinforcing member 2 can be rigidly connected to the hose main body 1 and then the reinforcing member 2 is not removed from the hose main body 1.

In addition, although the aforesaid preferred embodiment has illustrated the case in which the normal flat band C is wound around and fastened to the outer circumferential surface A2 of the helical reinforcing hose A to press contact the one end inner circumferential surface A1 of the helical reinforcing hose A against the hose nipple B, the preferred embodiment is not limited to this state and it may also be applicable that in place of the aforesaid normal flat band C, a pipe which can be pressurized and demolded is applied to cover the outer circumferential surface A2 of the helical reinforcing hose A and press fitted, thereby the one end inner circumferential surface A1 of the helical reinforcing hose A may be press contacted with the hose nipple

B and connected there.

Further, although the cylindrical connecting cylinder B2 is integrally protruded and arranged at an axial one end direction of the hose nipple B to be connected to another machine, the present invention is not limited to this preferred embodiment, and it may also be applicable that the connecting cylinder B2 is not integrally protruded.

As described above, first and second aspects of the present inventions are constituted such that the reinforcing member is flat, the ground contact section having a smooth and flat outer circumference is slightly protruded from the outer circumferential surface of the hose main body and exposed, thereby the wall thickness size of the hose main body is made thin to enable the hose main body to be molded and at the same, when used, the ground contact section made of synthetic resin is contacted with the ground and in the case that the entire hose is fastened with the normal flat band, the hose main body made of soft synthetic resin is resiliently deformed to cause the reinforcing member made of hard synthetic resin to be completely embedded and these ground contact section and outer circumferential surface of the hose main body are made substantially in flush to each other, so that the wall thickness of the entire hose is made thin and

the entire hose can be compressed uniformly with the normal flat band while the hose main body cannot be contacted with the ground.

Accordingly, as compared with the related art hose in which the outer wall surface of the hose is protruded in a corrugated shape or the outer wall surface of the hose is flat and smooth, the hose of the present invention is light in its weight, has a superior flexibility and at the same time the hose may easily be slid and conveniently applied in its use when the hose is contacted with the ground, it is hardly worn out, it has a long life and it can be used for a long period of time.

Further, even if the normal flat band is applied, this band can be closely contacted with the hose nipple and even if an inner pressure of fluid flowing in the hose is increased to be become high, no leakage of fluid or no removal of hose occurs to make a safe state in operation and further it is not necessary to use any expensive and exclusive hose band, resulting in that a quite economic state can be attained.

In addition to the effects of the first aspect of the present invention, third aspect of the present invention has an effect that the reinforcing member can be rigidly connected to the hose main body because the contact area between the

reinforcing member and the hose main body is increased and adhering strengths of both members are improved.

Accordingly, the reinforcing member is not peeled off from the hose main body.

Having described specific preferred embodiments of the invention with reference to the accompanying drawings, it will be appreciated that the present invention is not limited to those precise embodiments, and that various changes and modifications can be effected therein by one of ordinary skill in the art without departing from the scope of the invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A helical reinforcing hose in which the reinforcing member (2) made of hard synthetic resin is embedded helically in the hose main body (1) made of soft synthetic resin, wherein a sectional shape of said reinforcing member (2) is formed flat in an axial direction of the hose main body (1) to cause its outer circumferential surface to be flat and smooth, almost of all the member except the flat and smooth outer circumferential surface section are embedded into the outer circumferential surface (1a) of the hose main body (1) and the outer circumferential surface of said reinforcing member (2) is formed with a flat and smooth ground contact section (2a) slightly protruded and exposed from the outer circumferential surface (1a) of the hose main body (1).

2. A helical reinforcing hose according to Claim 1, wherein when said hose is entirely fastened, the hose main body (1) made of soft synthetic resin is resiliently deformed to cause the reinforcing member (2) made of hard synthetic resin to be completely embedded.

3. A helical reinforcing hose according to Claim 1 or Claim 2, wherein only the inner circumferential surface of said reinforcing member (2) is formed with either a



protrusion (2b) projecting toward the center of the hose main body (1) or an indentation and a contact area with the hose main body (1) is increased.

