CLAIMS

1. A non-metallic flexible pipe, sequentially comprising, from the inside to the outside, an inner liner, a pressure-bearing layer, an isolation layer, a tensile layer, a functional layer, and a protective layer, with non-rigid bonding being between two adjacent layers,

wherein the material of the inner liner is a thermoplastic polymer, the material of the pressure-bearing layer is a fiber-reinforced resin-based composite, the material of the isolation layer is a thermoplastic polymer, the material of the tensile layer is a resin-reinforced fiber, at least one of an optical fiber, a cable, a tracing ribbon, a pipe for conveying a heat transfer medium, a pressure sensor, and a temperature sensor is provided in the functional layer, and the material of the protective layer is a thermoplastic polymer.

2. The non-metallic flexible pipe according to claim 1, wherein the thermoplastic polymer used for the inner liner is an engineering thermoplastic, and the inner liner has a thickness of 1-20 mm.

3. The non-metallic flexible pipe according to claim 1, wherein the pressure-bearing layer is formed by at least one pair of pressure-bearing belts being wrapped on the inner liner successively and extending along the axial direction of the inner liner,

wherein in each pair of pressure-bearing belts, the inner surface of the later wrapped pressure-bearing belt covers the outer surface of the first wrapped pressure-bearing belt, and an interlocking structure is formed between the two surfaces, so that relative displacements do not occur between the two bearing belts in the axial direction.

4. The non-metallic flexible pipe according to claim 3, wherein in each pair of pressure-bearing belts, the pressure-bearing belts wrapped successively are staggered, with inlaid connection being between the two surfaces that contact each other.

5. The non-metallic flexible pipe according to claim 3 or 4, wherein the pressure-bearing belt is obtained by twisting fibers into bundles, extruding and impregnating with a resin, and curing the impregnating resin,

wherein the pressure-bearing layer has a width of 10-200 mm and a thickness of 1-20 mm.

6. The non-metallic flexible pipe according to claim 1, wherein the tensile layer is a single-layer structure, or a multi-layer structure with non-rigid bonding between the layers,

wherein the tensile layer has a thickness of 1-25 mm.

7. The non-metallic flexible pipe according to claim 6, wherein each layer of the tensile layer is formed by coating a fiber cloth woven from fibers on the surface of the isolation layer, impregnating the fiber cloth with a resin, and curing the resin.

8. The non-metallic flexible pipe according to any one of claims 1, 6 and 7, wherein the pressure-bearing layer and the functional layer disposed adjacent to each other are set as a group, and 1-3 groups of the pressure-bearing layer and the functional layer are disposed between the pressure-bearing layer and the functional layer.

9. A manufacturing method for the non-metallic flexible pipe of any one of claims 1-8, comprising the following steps:

(1) a thermoplastic polymer is melt-extruded, and shaped and cooled to obtain an inner lining pipe with a preset size, namely, the inner liner;

(2) two pressure-bearing belts made of a fiber-reinforced resin-based composite are wrapped on the surface of the inner lining pipe successively and extend along the axial direction of the inner lining pipe to form the pressure-bearing layer;

(3) a thermoplastic polymer is melt-extruded and wrapped on the surface of the pressure-bearing layer, and then shaped and cooled to form the isolation layer;

(4) fibers are woven onto the surface of the isolation layer, so that the woven fiber cloth is coated on the surface of the isolation layer; the fiber cloth is impregnated with or coated with a resin, and the resin is cured to form the tensile layer;

(5) at least one of an optical fiber, a cable, a tracing ribbon, a pipe for conveying a heat transfer medium, a pressure sensor, and a temperature sensor is wrapped on the surface of the tensile layer to obtain the functional layer; and

(6) a thermoplastic polymer is extruded outside the functional layer, and shaped and cooled to complete the coating of the protective layer.

10. The manufacturing method according to claim 9, wherein step (2) is carried out for 1-5 times, wherein the pressure-bearing belt is obtained by twisting fibers into bundles, extruding and impregnating with a resin, and curing the impregnating resin.

CLAIMS

1. A non-metallic flexible pipe, sequentially comprising, from the inside to the outside, an inner liner, a pressure-bearing layer, an isolation layer, a tensile layer, a functional layer, and a protective layer, with non-rigid bonding being between two adjacent layers,

wherein the material of the inner liner is a thermoplastic polymer, the material of the pressure-bearing layer is a fiber-reinforced resin-based composite, the material of the isolation layer is a thermoplastic polymer, the material of the tensile layer is a resin-reinforced fiber, at least one of an optical fiber, a cable, a tracing ribbon, a pipe for conveying a heat transfer medium, a pressure sensor, and a temperature sensor is provided in the functional layer, and the material of the protective layer is a thermoplastic polymer;

the pressure-bearing layer is formed by at least one pair of pressure-bearing belts being wrapped on the inner liner successively and extending along the axial direction of the inner liner,

in each pair of pressure-bearing belts, the inner surface of the later wrapped pressure-bearing belt covers the outer surface of the first wrapped pressure-bearing belt, and an interlocking structure is formed between the two surfaces, so that relative displacements do not occur between the two bearing belts in the axial direction;

in each pair of pressure-bearing belts, the pressure-bearing belts wrapped successively are staggered, with inlaid connection being between the two surfaces that contact each other;

the pressure-bearing belt is obtained by twisting fibers into bundles, extruding and impregnating with a resin, and curing the impregnating resin;

the isolation layer and the tensile layer disposed adjacent to each other are set as a

group, and 1-3 groups of the isolation layer and the tensile layer are disposed between the pressure-bearing layer and the functional layer.

2. The non-metallic flexible pipe according to claim 1, wherein the thermoplastic polymer used for the inner liner is an engineering thermoplastic, and the inner liner has a thickness of 1-20 mm.

3. The non-metallic flexible pipe according to claim 1, wherein the pressure-bearing layer has a width of 10-100 mm and a thickness of 1-20 mm.

4. The non-metallic flexible pipe according to claim 1, wherein the tensile layer is a single-layer structure, or a multi-layer structure with non-rigid bonding between the layers, wherein the tensile layer has a thickness of 1-25 mm.

5. The non-metallic flexible pipe according to claim 4, wherein each layer of the tensile layer is formed by coating a fiber cloth woven from fibers on the surface of the isolation layer, impregnating the fiber cloth with a resin, and curing the resin.

6. A manufacturing method for the non-metallic flexible pipe of any one of claims 1-5, comprising the following steps:

(1) a thermoplastic polymer is melt-extruded, and shaped and cooled to obtain an inner lining pipe with a preset size, namely, the inner liner;

(2) two pressure-bearing belts made of a fiber-reinforced resin-based composite are wrapped on the surface of the inner lining pipe successively and extend along the axial direction of the inner lining pipe to form the pressure-bearing layer;

(3) a thermoplastic polymer is melt-extruded and wrapped on the surface of the pressure-bearing layer, and then shaped and cooled to form the isolation layer;

(4) fibers are woven onto the surface of the isolation layer, so that the woven fiber cloth is coated on the surface of the isolation layer; the fiber cloth is impregnated with or coated with a resin, and the resin is cured to form the tensile layer;

(5) at least one of an optical fiber, a cable, a tracing ribbon, a pipe for conveying a heat transfer medium, a pressure sensor, and a temperature sensor is wrapped on the surface of the tensile layer to obtain the functional layer; and

(6) a thermoplastic polymer is extruded outside the functional layer, and shaped and cooled to complete the coating of the protective layer;

wherein the step (2) is carried out for 1-5 times, wherein the pressure-bearing belt is obtained by twisting fibers into bundles, extruding and impregnating with a resin, and curing the impregnating resin.