

[Description]

[Title of Invention]

CLEANING BRUSH FOR HULL

[Technical Field]

The present invention relates to a cleaning brush for a hull, and more specifically, to a cleaning brush for a hull in which a base material is rotated to remove a contaminant on a surface of a hull, the contaminant including marine organisms such as slime, marine plants, barnacles, or mussels, by using pressure and friction generated due to the rotation of the base material.

[Background Art]

Even newly built ships have various marine organisms adhering to lower surfaces of hulls (hereafter referred to as hull surfaces) from the moment the ships touch seawater. Various marine organisms such as slime to marine plants, barnacles, or mussels adhere to the hull surfaces, and depending on the amount of adhering, a movement speed of a ship decreases to increase the fuel expenditure by 10% to 30%. Hence, the hull surfaces need to be cleaned.

In order to prevent marine organisms from adhering to the hull surfaces, the hull surfaces are coated with antifouling paint, but this coating merely delays the time for marine organisms to adhere thereto. After about one year, organisms such as barnacles or mussels, which significantly increase the resistance of water, form a colony and adhere to the hull surfaces.

In order to remove marine organisms adhering to the hull surfaces, divers or ship cleaning robots have been cleaning the hull surfaces using cleaning brushes that

rotate automatically by motors.

In the related art, cleaning brushes for a hull are broadly divided into disk-shaped cleaning brushes having a filament-shaped base material installed on one side of a rotating disk, and roller-shaped cleaning brushes having a filament-shaped base material installed on a surface of a long rotating cylinder.

In addition, biofouling levels of hull surfaces can be arbitrarily categorized into four levels as follows (here, a higher level includes biofouling in a lower level).

Level 1: Slime or moss

Level 2: Marine plants

Level 3: Small colonies of hard-shelled creatures

Level 4: Large colonies of hard-shelled creatures

In order to minimize a degree of biofouling and damage to antifouling paint of hull surfaces, soft cleaning brushes to which only plastic base materials are applied, middle cleaning brushes to which a mixture of a metal base material and a plastic base material is applied, and hard cleaning brushes to which only a metal base material is applied have been used selectively.

For example, the hard cleaning brushes are used in a case where there is little antifouling paint in level 4 biofouling, the middle cleaning brushes are used in a case where no problem arises even if antifouling paint is severely damaged in level 3 biofouling, and the soft cleaning brushes are used in levels 1 and 2 biofouling and cause very little damage to antifouling paint during cleaning.

Repainting of antifouling paint takes much time and money, so it is important to use the antifouling paint for as long as possible. In order to use the antifouling

paint for a long time, it is especially necessary to provide a cleaning brush that can minimize damage to the antifouling paint during cleaning a surface of a ship in levels 1 to 3 biofouling.

It is possible to easily remove organisms by applying a weak impact to upper parts of the shells instead of lower parts of the shells in order to easily remove the organisms having hard shells in level 3 biofouling. In order to apply a weak impact, a stiff base material needs to be used, but existing filament-shaped base materials have a problem in that tips of the base materials come into point contact with the antifouling paint and scratch it, thereby causing damage thereto.

In addition, cleaning brushes have been manufactured in a manner of implanting the existing filament-shaped base materials into a surface of a rotating disk or rotating cylinder, and if the base materials wear out and need to be replaced, a problem arises in that the worn-out base materials need to be removed and new base materials need to be implanted again using specialized equipment.

Hence, there is a demand for a cleaning brush for a hull, which can be used in various biofouling situations of surfaces of ships, minimizes damage to antifouling paint during cleaning, and enables easy replacement of a base material.

[Citation List]

[Patent Literature]

[Patent Literature 1]

Korean Patent Registration No. 2204694

[Summary of Invention]

[Technical Problem]

Hence, in order to solve such a problem in the related art, an object of the present invention is to provide a cleaning brush for a hull in which a base material can be mounted in a rotation body part by inserting a fixing part coupled to the base material into a fixing groove of the rotation body part such that the base material can be easily replaced and used, damage to antifouling paint is minimized during cleaning by using a block-shaped base material rather than a filament-shaped base material, and base materials having various shapes and qualities can be mixed and easily mounted.

Objects to be achieved by the present invention are not limited to the objects mentioned above, and the following description enables those skilled in the art to clearly understand additional unmentioned objects.

[Solution to Problem]

According to the present invention, the above object can be achieved by a cleaning brush for a hull for removing a contaminant on a surface of a hull, the cleaning brush comprising: a base material; a fixing part coupled to a lower end part of the base material and having a fixing protrusion which is formed therein and protrudes to the outside of the base material; and a rotation body part that rotating and having one or more fixing grooves into which the fixing part coupled to the base material is inserted, in which the base material is replaceable.

Here, the rotation body part may be formed in a shape of a disk, and the fixing grooves may be formed in a shape open at a side surface part and an upper surface of the rotation body part such that the fixing part coupled to the base material is inserted inward in a radial direction from a side surface of the disk to allow

the base material to protrude from an upper surface of the disk.

Here, the rotation body part may be formed in a shape of a cylinder, and the fixing grooves may be formed in a shape open at an outer surface and an edge of at least one surface of upper and lower surfaces of the cylinder of the rotation body part such that the fixing part coupled to the base material is inserted in a height direction of the cylinder from any one surface of the upper and lower surfaces of the cylinder to allow the base material to protrude from an outer surface of the cylinder.

Here, the fixing grooves may be a fixing protrusion inserting groove into which the fixing protrusion is inserted in a direction in which the fixing part coupled to the base material is inserted and a base material inserting groove into which the lower end part of the base material is inserted and may be formed in a cross shape.

Here, the base material may be formed in a shape of a block or formed by overlapping a plurality of plates.

Here, the lower end part of the base material may have at least one penetration hole, and the fixing part may have a fixing protrusion which is inserted into the hole and protrudes toward both sides from the hole.

Here, the fixing part may have a bar-shaped first frame, and at least one bar-shaped second frame which extends in a direction orthogonal to the first frame, is inserted into the hole, and protrudes to an outer side from the base material.

Here, the base material may be made of either a polyurethane class or a nylon class.

Here, the cleaning brush for a hull may further comprise a strip brush including a base material having a

symmetrically bent shape, a holding frame surrounding a bent lower end part of the base material, and a core pressurizing a bent inner side of the base material, and the fixing part may be coupled to a lower end part of the strip brush.

Here, the fixing part may have an accommodation part that surrounds an outer side of the holding frame and has an upper end part bent above the holding frame, and the fixing protrusion may protrude toward both sides from an outer surface of the accommodation part.

Here, the strip brush may be either a filament-shaped strip brush or a sponge-like strip brush.

Here, the fixing part may be separated into right and left parts.

Here, base materials having shapes different from each other and including materials different from each other may be inserted into a plurality of fixing grooves, respectively.

Here, base materials having shapes different from each other and including materials different from each other may be inserted into the fixing grooves, respectively, along on insertion directions of the fixing grooves.

Here, a surface of the base material may be coated with powder having a high hardness.

Here, the base material may be formed to contain powder having a high hardness.

Here, the powder may be made of carbon or metal.

#### [Advantageous Effects of Invention]

The cleaning brush for a hull according to the present invention as described above has an advantage in that a base material can be easily replaced and mounted.

The cleaning brush has another advantage in that

damage to antifouling paint can be minimized during cleaning of a hull surface by using a base material made of a flexible material having a high hardness in a shape of a block or overlapped plates.

The cleaning brush has still another advantage in that various combinations of base materials that are made of various materials and have various shapes, such as a block-shaped base material and a strip brush-shaped base material, can be replaced and installed, and thus it is possible to clean a hull surface without replacing the base materials regardless of biofouling levels.

[Brief Description of Drawings]

FIG. 1 is a perspective view of a cleaning brush for a hull according to a first embodiment of the present invention.

FIG. 2 is an exploded perspective view illustrating a state where a base material is separated in FIG. 1.

FIG. 3 is a perspective view illustrating coupling relationships between a fixing part and a block-shaped base material and a plate-shaped base material, respectively.

FIG. 4 is a perspective view of a cleaning brush for a hull according to a second embodiment of the present invention.

FIG. 5 is an exploded perspective view illustrating a state where a base material is separated in FIG. 4.

FIG. 6 is a perspective view of a cleaning brush for a hull according to a third embodiment of the present invention.

FIG. 7 is an exploded perspective view illustrating a state where a strip brush is separated in FIG. 6.

FIG. 8 illustrates a perspective view and a side view of a coupling state between a filament-shaped strip

brush and a fixing part.

FIG. 9 illustrates a perspective view and a side view of a separation state between the filament-shaped strip brush and the fixing part in FIG. 8.

FIG. 10 illustrates a perspective view and a side view of a coupling state between a fixing part and a sponge-like strip brush as a modification example of the filament-shaped strip brush in FIG. 8.

FIG. 11 illustrates an exploded perspective view and a coupling view of a cleaning brush for a hull according to a fourth embodiment of the present invention.

FIG. 12 illustrates an exploded perspective view and a coupling view of a modification example of FIG. 11.

#### [Description of Embodiments]

The specific details of embodiments are included in the detailed descriptions and drawings.

Advantages, features, and methods of achieving the advantages and the features are to be more clearly described with reference to embodiments to be described below in detail together with the accompanying drawings. However, the present invention is not limited to the embodiments to be described hereinafter, but can be realized as various embodiments different from each other. The embodiments are only provided to complete the disclosure of the present invention and completely inform those with ordinary skill in the art to which the present invention pertains of the scope of the present invention, and the present invention is only defined by the scope of the claims. Through the entire specification, the same reference numerals denote the same configurational elements, respectively.

Hereinafter, the present invention will be described with reference to the drawings for describing a cleaning

brush for a hull on the basis of the embodiments of the present invention.

FIG. 1 is a perspective view of a cleaning brush for a hull according to a first embodiment of the present invention, FIG. 2 is an exploded perspective view illustrating a state where a base material is separated in FIG. 1, and FIG. 3 is a perspective view illustrating coupling relationships between a fixing part and a block-shaped base material and a plate-shaped base material, respectively.

The cleaning brush for a hull according to the first embodiment of the present invention may include a base material 120, a fixing part 130, and a rotation body part 110.

The rotation body part 110 receives power from a motor (not illustrated) and rotates, and at least one base material 120 is fixed thereto. In the present embodiment, the rotation body part 110 is formed in a circular disk shape having a predetermined thickness, and the base material 120 may be coupled to the rotation body part to protrude from an upper surface of the disk-shaped rotation body part 110.

As illustrated in the drawings, the rotation body part 110 has, at a center thereof, a coupling hole 112 to which a motor shaft or a rotary shaft that receives power from a motor and rotates is inserted and coupled.

The rotation body part 110 may have one or more fixing grooves 116 to which the base material 120 is coupled. More specifically, as will be described below, the base material 120 is coupled to the fixing part 130, and the fixing part 130 to which the base material 120 is coupled may be inserted into the fixing groove 116 to be coupled to the rotation body part 110.

In the present embodiment, the fixing groove 116 can

be formed in a shape open at an upper end part of a side surface and an upper surface of the rotation body part 110 such that the fixing part 130 coupled to the base material 120 is inserted into the fixing groove 116 from the upper end part of the side surface of the rotation body part 110 to enable the base material 120 to protrude from the upper surface of the rotation body part 110. At this time, as will be described below, the base material 120 may be formed in a shape of a long block having a predetermined thickness, so that the fixing groove 116 may extend deep inward in a radial direction of the rotation body part 110.

The base material 120 is coupled to the rotation body part 110 and removes contaminants on a hull surface by applying pressure or friction through rotation of the rotation body part 110. As illustrated in (a) of FIG. 3, in the present embodiment, the base material 120 may be formed in a shape of a block. The base material can be formed in a block having a rectangular parallelepiped shape which has a predetermined height and a predetermined thickness and is long in one direction, and the shape of the block is not limited thereto. Alternatively, the base material may be formed to have a block shape as illustrated in (a) of FIG. 3 by overlapping a plurality of plate-shaped base materials 120a as illustrated in (b) of FIG. 3.

In the case of an existing filament-shaped base material, a stiff base material 120 needs to be used in order to easily remove contaminants having hard shells of level 3 or higher biofouling. In this case, a problem arises in that an end part of the base material 120 comes into point contact with antifouling paint and scratches and easily damages the antifouling paint. Accordingly, in the present invention, the base material 120 is formed in

the shape of a block as illustrated in FIG. 3 to come into line contact or surface contact with the antifouling paint, so that damage to the antifouling paint during cleaning can be minimized even when the stiff base material 120 is used.

In the present embodiment, it is desirable that the base material 120 be made including a material which has a high hardness and can be flexibly bent when force is applied. For example, the base material may be made of a polyurethane class or a nylon class, but is not necessarily limited thereto. The base material may be made by mixing metal or may be made of a metal material to be used in cleaning level 4 biofouling.

The fixing part 130 may have a fixing protrusion that is coupled to a lower end part of the base material 120 and protrudes to the outside of the base material 120. The fixing part 130 coupled to the base material 120 may be inserted into the fixing groove 116 and fixed to the aforementioned rotation body part 110.

The base material 120 may have at least one through-holes 122 at a lower end part thereof, and the fixing part 130 may have fixing protrusions which are inserted into the through-holes 122 to be coupled to the base material 120 and to protrude toward both sides from the through-holes 122.

In the present embodiment, the fixing part 130 may include a bar-shaped first frame 131 and at least one bar-shaped second frames 132 extending in a bar shape in a direction orthogonal to the first frame 131. A plurality of second frames 132 may be formed separately at regular intervals, and the at least one through-holes 122 into which the second frame 132 is inserted and which the second frame penetrate can be formed in the lower end part of the base material 120. At this time, the number

of the second frames 132 may be greater than the number of the through-holes 122 formed in the base material 120. In this case, the base material 120 may be coupled to the fixing part 130 by selecting any position of the fixing part 130, or a plurality of the base materials 120 may be coupled to a single fixing part 130.

When the second frame 132 of the fixing part 130 is inserted into the through-hole 122 of the base material 120 and coupled thereto, an end part of the second frame 132 protrudes to the outside of the base material 120, and the protruding end part of the second frame 132 may form a fixing protrusion. In addition, when the fixing part 130 is coupled to the base material 120, the first frame 131 protrudes to the outside of the base material 120, and the first frame 131 may form fixing protrusions on opposite sides.

At this time, the fixing groove 116 formed in the rotation body part 110 may include fixing protrusion inserting grooves 114 into which the fixing protrusions on both sides are inserted, as illustrated in the enlarged view of FIG. 2, in a direction in which the fixing part 130 coupled to the base material 120 is inserted, and a base material inserting groove 115 into which the lower end part of the base material 120 is inserted. At this time, a plurality of fixing grooves 116 are formed in a circumferential direction of the disk-shaped rotation body part 110 so that a plurality of base materials 120 can be coupled thereto.

Although not illustrated, a locking part (not illustrated) blocking side surfaces of the fixing grooves 116 can be formed to prevent the fixing part 130 coupled to the base material 120 from escaping in a direction opposite to the insertion after the fixing part 130 is inserted into the fixing groove 116. The locking part can

be formed in a shape of a cap covering an outer surface of the rotation body part 110 to block the side surfaces of the plurality of fixing grooves 116 in the circumferential direction.

As described above, in the cleaning brush for a hull according to the present invention, the fixing parts 130 coupled to the base materials 120 are inserted into and coupled to the fixing grooves 116, so that the base material 120 can be easily replaced and installed when the base material 120 is worn out during use and needs to be replaced with a new base material 120.

FIG. 4 is a perspective view of a cleaning brush for a hull according to a second embodiment of the present invention, and FIG. 5 is an exploded perspective view illustrating a state where a base material is separated in FIG. 4.

In the present embodiment, the following description focuses on differences from the first embodiment described above.

In the present embodiment, the rotation body part 110 is formed in a shape of a cylinder, and the base material 120 may be formed to protrude from the outer surface of the cylinder. In this respect, regarding the fixing grooves 116 in the present embodiment, the fixing groove 116 may be formed in a shape open at an outer surface of the cylinder and an edge of at least one surface of upper and lower surfaces of the cylinder of the rotation body part 110 such that the fixing part 130 coupled to the base material 120 can be inserted in a height direction of the cylinder from any one surface of the upper and lower surfaces of the cylinder to allow the base material 120 to protrude from an outer surface of the cylinder of the rotation body part 110. In the drawings, the fixing grooves 116 are formed in a shape

open at both the upper and lower surfaces of the cylinder, but can be formed in a shape blocked at one surface.

A plurality of fixing grooves 116 are formed separately in the circumferential direction, and a plurality of base materials 120 can be coupled to the outer surface of the cylinder of the rotation body part 110 in the circumferential direction.

FIG. 6 is a perspective view of a cleaning brush for a hull according to a third embodiment of the present invention, FIG. 7 is an exploded perspective view illustrating a state where a strip brush is separated in FIG. 6, FIG. 8 illustrates a perspective view and a side view of a coupling state between a filament-shaped strip brush and a fixing part, FIG. 9 illustrates a perspective view and a side view of a separation state between the filament-shaped strip brush and the fixing part in FIG. 8, and FIG. 10 illustrates a perspective view and a side view of a coupling state between a fixing part and a sponge-like strip brush as a modification example of the filament-shaped strip brush in FIG. 8.

In the present embodiment, the following description focuses on differences from the embodiments described above.

In the present embodiment, the base material 120 is not solely coupled to the fixing part 130, but forms a strip brush 125 together with a holding frame 123 and a core 124. As illustrated in the side views of FIGS. 7 and 8, the strip brush 125 may be formed with the base materials 120 bent symmetrically, and the holding frame 123 surrounding a bent lower end part of the base material 120, and the core 124 pressurizing a bent inner side of the base material 120 downward. At this time, as illustrated in the drawings, it is possible to overlap and bend a plurality of base materials 120.

The base material 120 can be cut up and down into a plurality of base materials in a width direction on both sides of a bent portion to form a filament-shaped strip brush 125. In addition, the base material 120 can also form an uncut sponge-like strip brush 125, as illustrated in FIG. 10. At this time, it is desirable that both sides of the base material 120 of the sponge-like strip brush 125 be formed to become thicker towards an opposite side of the bent portion.

The base material 120 constituting the strip brush 125 includes preferably a softer material than the aforementioned block-shaped base material 120. Hence, In the present embodiment, the strip brush can be effectively used in cleaning for levels 1 and 2 biofouling.

The fixing part 130 can be coupled to a lower end part of the strip brush 125. Preferably, as illustrated in the drawings, an accommodation part 133 having a shape surrounding an outer side of the holding frame 123 and bent toward the base material above the holding frame 123 can be coupled to a lower end part of the strip brush 125. Fixing protrusions 134 can be formed to protrude on both right and sides of the accommodation part 133. In the drawings, fixing protrusions 134 are formed at lowest ends of the left and right sides, but the present invention is not necessarily limited thereto, and the fixing protrusions 134 can be formed to protrude in the middle part.

At this time, the fixing part 130 can be separated into right and left parts as illustrated in the drawings. In a case where the fixing part 130 is formed integrally, it is not possible to easily insert the lower end part of the strip brush 125 into the accommodation part 133 of the fixing part 130. However, by forming the fixing part

130 to have right and left parts separated, the lower end part of the strip brush 125 can be easily inserted into the accommodation part 133.

The rotation body part 110 has the fixing grooves 116 formed as described above, and the fixing parts 130 coupled to the respective strip brushes 125 can be inserted into the fixing grooves 116 so that the strip brushes 125 can be easily replaced and installed.

The drawings illustrate an example in which the strip brushes 125 are coupled to the side surface of the cylinder, but a structure can be formed in which the strip brush 125 is coupled to the rotation body part 110 having a circular disk shape as illustrated in FIGS. 1 and 2.

FIG. 11 illustrates an exploded perspective view and a coupling view of a cleaning brush for a hull according to a fourth embodiment of the present invention, and FIG. 12 illustrates an exploded perspective view and a coupling view of a modification example of FIG. 11.

In the present embodiment, as illustrated in FIG. 11, the base materials 120 having shapes different from each other or including materials different from each other described with reference to FIGS. 1 to 10 can be individually inserted into the plurality of fixing grooves 116. The block-shaped base materials 120 illustrated with reference to FIGS. 1 to 5 or the base materials 120 having a shape of the strip brush 125 described with reference to FIGS. 6 to 10 can be arranged individually in each of the plurality of grooves arranged in the circumferential direction. Alternatively, as illustrated in FIG. 12, the base materials 120 having shapes different from each other or including materials different from each other can be individually inserted into one fixing groove 116 along an insertion direction.

In this case, for level 1 biofouling, it is possible to remove the contaminants without damages to the antifouling paint by using the base material 120 having the shape of the strip brush 125 made of soft material, and for levels 2 and 3 biofouling, it is possible to remove contaminants without damages to the antifouling paint by using the block-shaped base material 120 made of hard material. Further, for level 4 biofouling, it is possible to remove contaminants while damages to the antifouling paint is minimized by using a block-shaped base material 120 in which metal is mixed or which includes a metal material. Hence, in the present embodiment, various types of base materials 120 are mounted on the rotation body part 110 so that contaminants can be removed by a single cleaning brush without using an additional cleaning brush according to the degree of fouling.

In addition, in the present invention, in order to improve cleaning performance for level 1 biofouling, the surface of the base material 120 can be coated with powder of carbon or a metal material having a high hardness. Alternatively, the base material 120 can be produced by mixing powder of carbon or metal material having a high hardness. Mixing with or coating with powder described above for a soft material having a hard and smooth surface, such as urethane or filament used for the block-shaped base material 120 or a tender and soft material such as sponge can make the surface rough, so the cleaning performance for level 1 biofouling such as slime can be improved.

The scope of rights of the present invention is not limited to the above-described embodiments, and the present invention can be implemented in various embodiments within the accompanying claims. The scope of

the claims of the present invention is construed to include various ranges in which any person with ordinary skill in the art to which the invention pertains can modify the present invention without departing from the gist of the present invention claimed in the claims.

[Reference Signs List]

- 110: Rotation body part
- 112: Coupling hole
- 114: Fixing protrusion inserting groove
- 115: Base material inserting groove
- 116: Fixing groove
- 120: Base material
- 122: Through-hole
- 123: Holding frame
- 124: Core
- 125: Strip brush
- 130: Fixing part
- 131: First frame
- 132: Second frame
- 133: Accommodation part
- 134: Fixing protrusion

[Claims]

[Claim 1]

A cleaning brush for a hull for removing contaminants on a surface of a hull, comprising:

a base material;

a fixing part coupled to a lower end part of the base material and having a fixing protrusion which is formed therein and protrudes to the outside of the base material; and

a rotation body part rotating and having at least one fixing groove into which the fixing part coupled to the base material is inserted, wherein the base material is replaceable.

[Claim 2]

The cleaning brush for a hull according to claim 1, wherein the rotation body part is formed in a shape of a disk, and the fixing grooves are formed in a shape open at a side surface part and an upper surface of the rotation body part such that the fixing part coupled to the base material is inserted inward in a radial direction from a side surface of the disk to allow the base material to protrude from an upper surface of the disk.

[Claim 3]

The cleaning brush for a hull according to claim 1, wherein the rotation body part is formed in a shape of a cylinder, and the fixing grooves are formed in a shape open at an outer surface and an edge of at least one surface of upper and lower surfaces of the cylinder of the rotation body part such that the fixing part coupled to the base material is inserted in a height

direction of the cylinder from any one surface of the upper and lower surfaces of the cylinder to allow the base material to protrude from an outer surface of the cylinder.

[Claim 4]

The cleaning brush for a hull according to claim 1, wherein the fixing grooves are a fixing protrusion inserting groove into which the fixing protrusion is inserted in a direction in which the fixing part coupled to the base material is inserted and a base material inserting groove into which the lower end part of the base material is inserted and is formed in a cross shape.

[Claim 5]

The cleaning brush for a hull according to claim 1, wherein the base material is formed in a shape of a block or formed by overlapping a plurality of plates.

[Claim 6]

The cleaning brush for a hull according to claim 5, wherein the lower end part of the base material has at least one penetration hole, and the fixing part has a fixing protrusion which is inserted into the hole and protrudes toward both sides from the hole.

[Claim 7]

The cleaning brush for a hull according to claim 6, wherein the fixing part has a bar-shaped first frame, and at least one bar-shaped second frame which extends in a direction orthogonal to the first frame, is inserted into the hole, and protrudes to an outer side from the base material.

[Claim 8]

The cleaning brush for a hull according to claim 5,  
wherein the base material is made of either a  
polyurethane class or a nylon class.

[Claim 9]

The cleaning brush for a hull according to claim 1,  
further comprising

a strip brush including a base material having a  
symmetrically bent shape, a holding frame surrounding a  
bent lower end part of the base material, and a core  
pressurizing a bent inner side of the base material,

wherein the fixing part is coupled to a lower end  
part of the strip brush.

[Claim 10]

The cleaning brush for a hull according to claim 9,  
wherein the fixing part has an accommodation part  
that surrounds an outer side of the holding frame and has  
an upper end part bent above the holding frame, and

the fixing protrusion protrudes toward both sides  
from an outer surface of the accommodation part.

[Claim 11]

The cleaning brush for a hull according to claim 9,  
wherein the strip brush is either a filament-shaped  
strip brush or a sponge-like strip brush.

[Claim 12]

The cleaning brush for a hull according to claim 10,  
wherein the fixing part is separated into right and  
left parts.

[Claim 13]

The cleaning brush for a hull according to claim 1,  
wherein base materials having shapes different from  
each other and including materials different from each  
other are inserted into a plurality of fixing grooves,  
respectively.

[Claim 14]

The cleaning brush for a hull according to claim 1,  
wherein base materials having shapes different from  
each other and including materials different from each  
other are inserted into the fixing grooves, respectively,  
along on insertion directions of the fixing grooves.

[Claim 15]

The cleaning brush for a hull according to claim 1,  
wherein a surface of the base material is coated  
with powder having a high hardness.

[Claim 16]

The cleaning brush for a hull according to claim 1,  
wherein the base material is formed to contain  
powder having a high hardness.

[Claim 17]

The cleaning brush for a hull according to claim 15  
or 16,  
wherein the powder is made of carbon or metal.