

## **Description**

**Title of Invention:** SUBMERGIBLE PUMP

### **Technical Field**

[0001]

The present invention relates to a submersible pump.

### **Background Art**

[0002]

A submersible pump has been used for such a purpose as drainage of spring water in a construction site. The submersible pump sucks up and drains water accumulated in a sump (water tank) by driving a motor, and includes: an impeller which sucks water; a pump casing which forms a pump chamber in which the impeller is stored; and a strainer which covers a suction port in the pump chamber so that foreign substances do not block the suction port when the water is sucked up.

[0003]

In Patent Literature 1, for example, the pump casing is divided into an intermediate casing and a lower casing, and the intermediate casing is installed to the motor with a bolt. The strainer is installed so as to fit snugly against the outer circumference of the lower casing, surrounding the entire side surface of the lower casing. The bolt penetrates a hole of the lower casing from a lower portion of a base plate which supports the strainer and the lower casing from the bottom, and is screwed into the intermediate casing. Thereby the lower casing, the strainer and the base plate are installed as a single unit.

### **Citation List**

## **Patent Literature**

[0004]

Patent Literature 1: Patent Publication JP-A-7-208383

## **Summary of Invention**

### **Technical Problem**

[0005]

In the case of the submersible pump disclosed in Patent Literature 1, however, the base plate is removed by removing the bolt, then the strainer and the lower casing are removed, to expose the pump chamber and the impeller. Therefore it takes time to perform maintenance to check, clean and replace the pump chamber and the impeller.

[0006]

With the foregoing in view, it is an object of the present invention to provide a submersible pump with which the time required for maintenance of the impeller and the pump chamber can be reduced.

### **Solution to Problem**

[0007]

A submersible pump according to an aspect of the present invention includes: a pump casing which includes a suction port, and forms a pump chamber in which an impeller to suck water from the suction port is disposed; a strainer which includes a bottom portion on which at least two openings are formed, and which is disposed to cover the suction port; and a suction cover which is disposed between the strainer

and the pump casing, so as to cover the pump casing, and which includes at least two protruded portions protruding from at least the two openings respectively.

[0008]

In this aspect, the bottom portion of the strainer may include a first bottom face, and a second bottom face which is in a portion from the openings to an outer peripheral portion, and is recessed from the first bottom face.

[0009]

In this aspect, the bottom portion of the strainer may further include a side face which is formed at a step difference of the first bottom face and the second bottom face, so as to oppose a center portion.

[0010]

In this aspect, the protruded portions of the suction cover may be protruded from the openings along the side face of the strainer.

[0011]

In this aspect, at least the two protruded portions of the suction cover may be formed to oppose the center portion of the bottom portion of the strainer.

[0012]

In this aspect, at least the two protruded portions of the suction cover may be formed to oppose each other.

[0013]

In this aspect, a thickness of the protruded portions of the suction cover may be thicker than a thickness of the other portions of the suction cover.

[0014]

In this aspect, the protruded portion of the suction cover may include a recessed portion which is recessed toward a center portion of the bottom portion of the strainer.

[0015]

In this aspect, each of the suction cover and the pump casing may have a cup shape, and an inner side face of the suction cover and an outer side face of the pump casing are in contact.

[0016]

In this aspect, a part of the outer side face of the pump casing may extend in a direction intersecting orthogonally to a bottom portion of the suction cover, and the inner side face of the suction cover may be tapered off in a direction toward the bottom portion of the suction cover.

[0017]

In this aspect, each of the suction cover and the pump casing may have a cup shape, and a recessed and protruded portion is disposed on an inner side face of the suction cover and an outer side face of the pump casing, so as to fit together respectively.

[0018]

In this aspect, the strainer, the pump casing and the suction cover may be separable from each other, and the strainer and the suction cover may be fixed to a pump main body using two screws, which are disposed on each side of a center

portion of the bottom portion of the strainer, in a state where the pump casing is covered by the suction cover.

### **Advantageous Effect of Invention**

[0019]

According to the present invention, a submersible pump, with which time required for maintenance of the impeller and the pump chamber can be reduced, can be provided.

### **Brief Description of Drawings**

[0020]

[Figure 1] Figure 1 is a schematic diagram depicting an external appearance of a submersible pump 10 according to one embodiment of the present invention.

[Figure 2] Figure 2 is a schematic cross-sectional view depicting an internal structure of the submersible pump 10 according to one embodiment of the present invention.

[Figure 3] Figure 3 is a perspective view of a casing unit 140 and a strainer 200, viewed from the lower side, in an assembled state according to one embodiment of the present invention.

[Figure 4] Figure 4 is a perspective view of the casing unit 140 and the strainer 200, viewed from the lower side, in a separated state according to one embodiment of the present invention.

[Figure 5] Figure 5 is a perspective view of the casing unit 140 and the strainer 200, viewed from the upper side, in a separated state according to one embodiment of the present invention.

[Figure 6] Figure 6 is an enlarged cross-sectional view of a portion where the pump casing 310 and the suction cover 330 are in contact according to one embodiment of the present invention.

## **Description of Embodiments**

[0021]

Embodiments of the present invention will be described in concrete terms, with respect to the accompanying drawings. The embodiments to be described below are merely examples for carrying out the invention, and are not intended to limit the interpretation of the invention. To assist in understanding the description, same composing elements are denoted with same reference signs in each drawing as much as possible, and redundant description thereof may be omitted in some cases.

[0022]

<One embodiment>

[Configuration of submersible pump]

Figure 1 is a schematic diagram depicting an external appearance of a submersible pump 10 according to one embodiment of the present invention. In each drawing, an x axis, a y axis and a Z axis may be indicated. The x axis, y axis and the z axis form right handed three-dimensional rectangular coordinates. Hereinbelow, an arrow direction of the x axis may be referred to as the “x axis + side”, and a direction the opposite of the arrow direction may be referred to as the “x axis - side”, which is the same for the other axes. The Z axis + side and the Z axis - side may be referred to as the “upper side” and the “lower side” respectively. The z axis direction may be referred to as the “vertical direction”. Surfaces intersecting

orthogonally to the x axis, the y axis and the z axis may be referred to as the “yz face”, “zx face”, and “xy face” respectively.

[0023]

As illustrated in Figure 1, the submersible pump 10 includes a pump main body 100, a casing unit 140 and a strainer 200 which are disposed on the lower side of the pump main body 100.

[0024]

Figure 2 is a schematic cross-sectional view depicting an internal structure of the submersible pump 10 according to one embodiment of the present invention. As illustrated in Figures 1 and 2, the pump main body 100 has an approximate columnar shape. A discharge port 170 is disposed on the upper side of the pump main body 100. A suction port 160 is disposed on the lower side of the casing unit 140.

[0025]

The strainer 200 and the casing unit 140 are assembled and disposed on the lower side of the pump main body 100 in the assembled state. The casing unit 140 forms a pump chamber 150.

[0026]

The pump main body 100 includes a rotation shaft 110, a motor 120, an impeller 130, and an oil casing 180.

[0027]

The oil casing 180 is disposed on the upper side of the casing unit 140. The motor 120 is disposed on the upper side of the oil casing 180. The impeller 130 is disposed in the pump chamber 150.

[0028]

The submergible pump 10 is a vertical submergible electric pump, of which rotation center shaft of the rotation shaft 110 extends in the vertical direction. The rotation shaft 110 has a columnar shape extending in the vertical direction, and is rotatably fixed to the pump main body 100.

[0029]

The impeller 130 is fixed to the lower end of the rotation shaft 110. A rotor of the motor 120 is fixed to the upper side of the rotation shaft 110. The rotation shaft 110 is rotated by the electromagnetic force between a stator, included in the motor 120, and the rotor. The rotation shaft 110 transfers the rotating force, generated by the motor 120, to the impeller 130.

[0030]

The suction port 160 is located on the lower side of the rotation shaft 110. Water to be drained is guided to the pump chamber 150 from a space 220g on the lower side of the casing unit 140, through the suction port 160.

[0031]

When the impeller 130 is rotated by driving of the motor 120, the water guided into the pump chamber 150 is moved by the impeller 130 along a flow passage FP, and is discharged from the discharge port 170. By discharging the water guided into the pump chamber 150, new water flows into the pump chamber 150 from the space 220g on the lower side of the casing unit 140 through the suction port 160. Thereby in the pump main body 100, a ceaseless water flow is generate along the flow passage FP, which guides the water sucked from the suction port 160 to the

discharge port 170 through the pump chamber 150, and the water is drained by the submersible pump 10.

[0032]

Figure 3 is a perspective view of the casing unit 140 and the strainer 200, viewed from the lower side, in an assembled state according to one embodiment of the present invention. Figures 4 and 5 are perspective views of the casing unit 140 and the strainer 200, viewed from the lower side and the upper side respectively, in a disassembled state according to one embodiment of the present invention.

[0033]

As illustrated in Figures 2 to 5, the casing unit 140 includes a pump casing 310, a wear ring 320 and a suction cover 330.

[0034]

The strainer 200, the pump casing 310, the suction cover 330 and the wear ring 320 are separable from each other (see Figures 4 and 5). For example, these [components] are separated during maintenance, such as during cleaning and component replacement.

[0035]

When the submersible pump 10 supplies/drains water, the strainer 200, the pump casing 310, the suction cover 330 and the wear ring 320, which are in the assembled state, are installed on the lower side of the oil casing 180 in the pump main body 100 using two screws 400. The configuration of fixing the strainer 200 and the casing unit 140 to the pump main body 100 using the two screws 400 like

this allows reduction of man hours required for fastening or loosening the screws 400.

[0036]

[Configuration of strainer 200]

The strainer 200 is formed of aluminum, for example, and has a cup shape which is opened upward in a general view. The strainer 200 is disposed so as to cover the suction port 160. To be more precise, the strainer 200 includes three protruded portions 210 and a bottom portion 220.

[0037]

Two openings 221 are formed on the bottom portion 220. Three or more openings 221 may be formed on the bottom portion 220.

[0038]

The bottom portion 220 includes: a first bottom face 220b which is visible from the lower side; and a second bottom face 220c which is located in a portion from the opening 221 to an outer peripheral portion 220ae of the bottom portion 220, and is recessed upward from the first bottom face 220b. Each of the first bottom face 220b and the second bottom face 220c extends along an xy plane which intersects with the z axis.

[0039]

The bottom portion 220 further includes a side face 220d which is formed at a step difference of the first bottom face 220b and the second bottom face 220c, so as to oppose a center portion 220ac of the bottom portion 220. The portion which is

recessed upward from the first bottom face 220b by this step difference may be referred to as the “recessed portion 222”.

[0040]

The submersible pump 10 is placed in a sump such that the first bottom face 220b contacts the bottom of water in the sump, hence the submersible pump 10 rests on the bottom of the water body independently in a state where the strainer 200 and the pump main body 100 are positioned on the lower side and the upper side respectively.

[0041]

In the recessed portion 222, two notches 220f, which are cut toward the center portion 220ac of the bottom portion 220, are formed respectively in the two openings 221 on the outer peripheral portion 220ae side. The screw 400 passes through each notch 220f. Because of this configuration where the notch 220f is formed in the recessed portion 222, which is recessed upward by one level from the second bottom face 220c, it can be prevented that the head of the screw 400 protrudes downward from the first bottom face 220b, hence the independent standing of the submersible pump 10 becomes more stable.

[0042]

An opposing face 220a, which is visible from the upper side, opposes the suction port 160. The bottom portion 220 includes three mounting portions 220ap having a mounting face located above the opposing face 220a. Out of the three mounting portions 220ap, the recessed portion 222 is formed on the lower side of the two mounting portions 220ap, which oppose each other across the center portion

220ac. The mounting portion 220ap is formed along the outer peripheral portion 220ae of the bottom portion 220.

[0043]

The protruded portion 210 has a shape of protruding upward from the outer peripheral portion 220ae of the bottom portion 220. Three protruded portions 210 are disposed along the circumferential direction of the bottom portion 220 at intervals from each other. The mounting portion 220ap is located between two protruded portions 210.

[0044]

A plurality of slits 211 are formed in a portion from the side face of the strainer 200 to the first bottom face 220b. Each slit 211 has a rectangular opening of which major axis is in the vertical direction. The slits 211 constitute a part of the flow passage FP.

[0045]

[Configuration of wear ring 320]

The wear ring 320 is an approximately disc-shaped member which extends along the xy plane. Three openings 320a constituting a part of the flow passage FP are formed on the wear ring 320. The impeller 130 (not illustrated in Figures 3 to 5) is disposed on the lower side of the wear ring 320. The rotation shaft 110 (not illustrated in Figures 3 to 5), fixed to the impeller 130, penetrates through a hole 320e formed at the center portion of the wear ring 320.

[0046]

Therefore when the two screws 400 are removed and the movement of the wear ring 320 becomes free, the wear ring 320 can be separated from the oil casing 180, but the presence of the impeller 130 limits this movement to a portion between the oil casing 180 and the impeller 130. The movement of the wear ring 320 may be limited by fitting with the oil casing 180.

[0047]

In the wear ring 320, two through holes 320f are formed. The through holes 320f are formed facing each other across the hole 320e, and extend in the vertical direction. The two screws 400 are inserted into the two through holes 320f respectively.

[0048]

[Configuration of suction cover 330]

The suction cover 330 is disposed between the strainer 200 and the pump casing 310, so as to cover the pump casing 310, and includes two protruded portions 331. The suction cover 330 may include three or more protruded portions 331.

[0049] To be more precise, the suction cover 330 is formed of aluminum, for example, and has a cup shape which is opened upward. On a bottom face 330b of the suction cover 330 which is visible from the lower side, an opening 330e, which functions as the suction port 160, is formed approximately at the center.

[0050] The two protruded portions 331 protrude from the two openings 221 in the strainer 200 respectively. The two protruded portions 331 protrude from the openings 221 along the side face 220d of the strainer 200. Because of this configuration, each recessed portion 222 is disposed on the outer peripheral portion 220ae side of the protruded portion 331, hence the two protruded portions 331 can

be exposed in a state of being easily picked by fingers. This makes it easier to pick up the suction cover 330 and the strainer 200 together as a single unit.

[0051]

The two protruded portions 331 are formed to oppose the center portion 220ac of the bottom portion 220 of the strainer 200. Because of this configuration, a force directed to the center portion 220ac can be applied to the suction cover 330 when the protruded portions 331 are pressed with fingers, hence when the suction cover 330 is detached together with the strainer 200 by hooking a finger on each protruded portion 331, the strainer 200 and the suction cover 330 can be detached without rotating.

[0052]

The two protruded portions 331 are formed so as to protrude downward from the bottom face 330b and are positioned opposite to each other. Because of this configuration, each protruded portion 331 can be disposed at a position where force can be easily applied when the protruded portions are picked up by a thumb and at least one of the index finger, middle finger and ring finger, for example. Therefore operability to hold the suction cover 330 can be improved.

[0053]

In the suction cover 330, two through holes 330f are formed. The through holes 330f are located between an inner side face 330c and an outer side face 330d, and are formed to oppose each other across the opening 330e, and extend in the vertical direction. The two screws 400 are inserted into the two through holes 330f respectively.

[0054]

A mounting face 330a of the suction cover 330, which is visible from the upper side, oppose the wear ring 320 across the pump casing 310.

[0055]

When the wear ring 320 and the suction cover 330 are connected, an inner space surrounded by the wear ring 320 and the suction cover 330 is formed.

[0056]

The inner side face 330c of the suction cover 330 is tapered off in a direction toward the mounting face 330a (example of “bottom portion”) of the suction cover 330.

[0057]

[Configuration of pump casing 310]

The pump casing 310 includes a suction port 160, and forms a pump chamber 150 in which the impeller 130 is positioned to suck water in from the suction port 160.

[0058]

The pump casing 310 is formed of an elastic member (e.g. rubber), for example, and has a cup shape which is opened upward. An opening, which is the suction port 160, is formed on a bottom face 310b of the pump casing 310.

[0059]

The pump casing 310 is housed in an internal space surrounded by the wear ring 320 and the suction cover 330. The pump chamber 150 is formed by the pump casing 310 and the wear ring 320. The impeller 130 (see Figure 2) is housed in the pump chamber 150, although not illustrated in Figure 5.

[0060]

An outer side face 310d of the pump casing 310 includes: three straight faces 310s which extend in a direction intersecting orthogonally to the mounting face 330a (example of “bottom portion”) of the suction cover 330; and three tapered faces 310t which are tapered off in a direction toward the mounting face 330a of the suction cover 330. The straight face 310s and the tapered face 310t are alternately disposed along the circumferential direction of the pump casing 310.

[0061]

[Assembly]

A pump casing 310 is inserted into the suction cover from the upper side so that the bottom face 310b of the pump casing 310 and the mounting face 330a of the suction cover 330 contact with each other.

[0062]

As illustrated in Figure 6, the inner side face 330c of the suction cover 330 is tapered off in a direction toward the mounting face 330a of the suction cover 330. Because of this configuration, the size of the opening of the suction cover 330 can be larger than the size of the bottom face 310b of the pump casing 310. Whereby the pump casing 310 can be more easily inserted into the opening of the suction cover 330. Further, the inner side face 330c of the suction cover 330 and the outer side face 310d of the pump casing 310 can be contacted more easily.

[0063]

Furthermore, the straight faces 310s included in the outer side face 310d of the pump casing 310 extend in a direction intersecting orthogonally to the mounting

face 330a of the suction cover 330. Because of this configuration, the pump casing 310 and the suction cover 330 can be tightly inter-fitted at the lower side of the straight faces 310s. This prevents the separation of the pump casing 310 from the suction cover 330 after assembly.

Further, the pump casing 310 and the suction cover 330 can be inter-fitted more loosely at the upper side of the straight faces 310s. This reduces the frictional resistance generated when the pump casing 310 is inserted into the suction cover 330 from the upper side, making assembly thereof easier.

[0064]

As mentioned above, the tapered faces 310t included in the outer side face 310d of the pump casing 310 are tapered off in the direction toward the mounting face 330a of the suction cover 330. In the present embodiment, tolerance is designed such that a slight gap is generated between the inner side face 330c of the suction cover 330 and the tapered faces 310t. Thereby the size of the bottom face 310b of the pump casing 310 can be smaller than the size of the opening of the suction cover 330. Hence the pump casing 310 can be easily inserted into the opening of the suction cover 330.

[0065]

By forming a straight surface 310s on only a portion, rather than on the entire circumference, of the outer side face 310d of the pump casing 310, the pump casing 310 can be assembled by pushing down on only a portion (three locations in this embodiment) of the pump casing 310 when fitting it into the suction cover 330. This simplifies assembly. Further, only the three straight faces 310s are the faces of

which fitting dimensions need be adjusted, hence the workload to correct dies can be reduced when the pump casing 310 is mass produced.

[0066]

In the state where the bottom face 310b of the pump casing 310 and the mounting face 330a of the suction cover 330 are in contact, the inner side face 330c of the suction cover 330 and the outer side face 310d of the pump casing 310 are in contact. Because of this configuration, when the pump casing 310, which is formed of an easily deformable elastic member (e.g. rubber), is fitted with the suction cover 330, which is formed of undeformable aluminum, the pump casing 310 is elastically deformed, and the restoring force of the pump casing 310 increases the adhesion of the inner side face 330c of the suction cover 330 and the outer side face 310d of the pump casing 310. Hence the pump casing 310 can be fixed to the suction cover 330 at least firmly enough not to be separated by gravity.

[0067]

Then the suction cover 330 is connected with the wear ring 320. The pump casing 310, the wear ring 320 and the suction cover 330, that is, the casing unit 140 as a whole, has a columnar shape. On the outer periphery of the casing unit 140, three protruded portions which protrude in the diameter direction, and three recessed portions which are located between the protruded portions, are formed.

[0068]

The two protruded portions 331 in the suction cover 330 are inserted into the two openings 221 in the strainer 200 respectively, and the suction cover 330 is mounted on the mounting portion 220ap so that the three protruded portions are located on the upper side of the three mounting portions 220ap in the strainer 200.

[0069]

At this time, the bottom face 330b of the suction cover 330 and the mounting face of the mounting portion 220ap are in contact. The two protruded portions 331 protrude downward from the two openings 221, and because of the configuration where the second bottom face 220c is recessed from the first bottom face 220b in a portion from the opening 221 to the outer peripheral portion 220ae, the vertical positions of the lower end of the protruded portions 331 can be located on the upper side of the vertical position of the first bottom face 220b of the strainer 200. Thereby the protruded portions 331 can be protruded from the opening 221 without protruding downward from the first bottom face 220b, and can be exposed from the strainer 200. Further, the submersible pump 10 can stably stand independently by the first bottom face being fixed at the bottom of the water body, for example.

[0070]

The strainer 200 and the casing unit 140 are integrated (see Figure 3). The strainer 200 and the casing unit 140 are fixed to the pump main body 100 by screwing the two screws 400 into the pump main body 100 via a notch 220f, the through hole 330f, and the through hole 320f respectively.

[0071]

[Separation]

First each of the two screws 400 is loosened, so as to separate the screws 400 from the pump main body 100.

[0072]

For example, the two protruded portions 331 of the suction cover 330 are held using the thumb and at least one of the index finger, middle finger and ring finger, so as to hold the suction cover 330.

[0073]

Then the suction cover 330 is pulled in the - direction of the z axis. The bottom face 330b of the suction cover 330 and the mounting face of the mounting portion 220ap are in contact, hence the strainer 200, along with the suction cover 330, can be separated from the pump main body 100 with certainty. This makes it easy to remove the strainer 200 and the suction cover 330 covering the pump casing 310.

[0074]

Further, the inner side face 330c of the suction cover 330 and the outer side face 310d of the pump casing 310 are in contact, hence the pump casing 310, along with the suction cover 330, can also be separated from the pump main body 100. Since the impeller 130 and the pump chamber 150 can be exposed thereby, the time required for maintenance of the impeller 130 and the pump chamber 150 can be reduced.

[0075]

For example, while holding the strainer 200 with one hand, the protruded portions 331 are pushed in the + direction of the z axis using the thumb of the other hand, whereby the suction cover 330 can be separated from the strainer 200.

[0076]

For example, while holding the suction cover 330 with one hand, the pump casing 310 is pulled in the + direction of the z axis using the other hand, whereby the pump casing 310 can be separated from the suction cover 330.

[0077]

[Modification example]

The thickness of the protruded portion 331 of the suction cover 330 is thicker than the thickness of the other portions of the suction cover 330. Because of this configuration, an end of the protruded portion 331 at the lower side can be easily pushed up. This make it easy to separate the suction cover 330 and the strainer 200.

[0078]

The protruded portion 331 of the suction cover 330 includes a recessed portion, which is recessed toward the center portion 220ac of the bottom portion 220 of the strainer 200. Because of this configuration, when the two protruded portions 331 of the suction cover 330 are held using the thumb and at least one of the index finger, middle finger and ring finger, for example, the inner sides of the fingers can be hooked in the recessed portions. This makes it easy to hold the suction cover 330, and prevent the slipping of the fingers when the two protruded portions 331 are held with the fingers and force is applied in the - direction of the z axis.

[0079]

On the inner side face 330c of the suction cover 330 and the outer side face 310d of the pump casing 310, the recessed and protruded portion is disposed respectively so as to inter-fit with each other. Because of this configuration, when the strainer 200, along with the suction cover 330, is separated from the pump main

body 100 by holding the protruded portions 331 with fingers and applying force in the - direction of the z axis, the pump casing 310 can also be separated from the pump main body 100 with certainty.

[0080]

The embodiments described above are for assisting in the understanding of the present invention, and are not intended to limit interpretation of the present invention. Each element of the embodiments, and the arrangements, materials, conditions, shapes, sizes and the like thereof are not limited to those described in the examples, and may be changed appropriately. Configurations described in different embodiments may be partially replaced or combined.

### **Reference Signs List**

[0081]

- 10 Submersible pump
- 100 Pump main body
- 110 Rotation shaft
- 120 Motor
- 130 Impeller
- 140 Casing unit
- 150 Pump chamber
- 160 Suction port
- 170 Discharge port
- 180 Oil casing

200 Strainer

210 Protruded portion

211 Slit

220 Bottom portion

220a Opposing face

220ac Center portion

220ae Outer peripheral portion

220ap Mounting portion

220b First bottom face

220c Second bottom face

220d Side face

220f Notch

220g Space

221 Opening

222 Recessed portion

310 Pump casing

310b Bottom face

310d Outer side face

310s Straight face

310t Tapered face

320 Wear ring

320a Opening

320e Hole

320f Through hole

330 Suction cover

330a Mounting face

330b Bottom face

330c Inner side face

330d Outer side face

330e Opening

330f Through hole

331 Protruded portion

400 Screw

FP Flow passage

## Claims

[Claim 1] A submergible pump, comprising:

a pump casing which includes a suction port, and forms a pump chamber in which an impeller to suck water from the suction port is disposed;

a strainer which includes a bottom portion on which at least two openings are formed, and which is disposed to cover the suction port; and

a suction cover which is disposed between the strainer and the pump casing, so as to cover the pump casing, and which includes at least two protruded portions protruding from at least the two openings respectively.

[Claim 2] The submergible pump according to claim 1, wherein

the bottom portion of the strainer includes a first bottom face, and a second bottom face, which is located in a portion from the openings to an outer peripheral portion and is recessed from the first bottom face.

[Claim 3] The submergible pump according to claim 2, wherein

the bottom portion of the strainer further includes a side face which is formed at a step difference of the first bottom face and the second bottom face, so as to oppose a center portion.

[Claim 4] The submergible pump according to claim 3, wherein

the protruded portions of the suction cover are protruding from the openings along the side face of the strainer.

[Claim 5] The submergible pump according to claim 1, wherein

at least the two protruded portions of the suction cover are formed to oppose the center portion of the bottom portion of the strainer.

[Claim 6] The submergible pump according to claim 1, wherein

at least two of the protruded portions of the suction cover are formed to oppose each other.

[Claim 7] The submergible pump according to claim 1, wherein

a thickness of the protruded portions of the suction cover is thicker than a thickness of the other portions of the suction cover.

[Claim 8] The submergible pump according to claim 1, wherein

the protruded portion of the suction cover includes a recessed portion which is recessed toward a center portion of the bottom portion of the strainer.

[Claim 9] The submergible pump according to claim 1, wherein

each of the suction cover and the pump casing has a cup shape, and

an inner side face of the suction cover and an outer side face of the pump casing are in contact.

[Claim 10] The submergible pump according to claim 9, wherein

a part of the outer side face of the pump casing extends in a direction intersecting orthogonally to a bottom portion of the suction cover, and

the inner side face of the suction cover is tapered off in a direction toward the bottom portion of the suction cover.

[Claim 11] The submergible pump according to claim 1, wherein

each of the suction cover and the pump casing has a cup shape, and

a recessed and protruded portion is disposed on an inner side face of the suction cover and an outer side face of the pump casing, so as to fit together respectively.

[Claim 12] The submergible pump according to claim 1, wherein

the strainer, the pump casing and the suction cover are separable from each other, and

the strainer and the suction cover are fixed to a pump main body using two screws, which are disposed on each side of a center portion of the bottom portion of the strainer, in a state where the pump casing is covered by the suction cover.