

BLOOD OXYGENATION DEVICE

BACKGROUND OF INVENTION

1. FIELD OF INVENTION

[0001] The present invention relates to an oxygenation device, and more
5 particularly, to a blood oxygenation device capable of oxygenating blood
during blood transfusion.

2. RELATED ART

[0002] With ever-increasing requirements for mobile phone screens, full-
screen display mobile phones have become an inevitable trend. According to
10 the study, once a human body loses too much blood, blood transfusion is
needed to supplement the lost components in the blood. Therefore, the blood
transfusion is crucial in maintaining lives in the medical care field. Generally
speaking, the blood transfused to patients or people who need blood
transfusion is hypoxic blood. Once it is transfused into the body, it takes about
15 10 to 15 minutes before the transfused blood can effectively function. In other
words, when the blood is just transfused into the human body, because
hypoxia is yet unable to react with cells, the transfusion recipient may feel
uncomfortable during treatment or surgery. When there is a dire need for
blood transfusion, the aforementioned response time can seriously hinder the
20 rescuing acts. Furthermore, due to the widespread of the current outbreak of
COVID 19, many patients' lungs function may have been damaged by the
virus and is therefore degraded or lead to fibrosis, and eventually lose its
functions. Since the patients themselves have difficulty breathing and are
severely hypoxic, if blood transfusion is required for surgery during the
25 quarantine, the time for the transfused blood to normally function could be
even longer, which undoubtedly increases the difficulty in rescuing the

patients.

SUMMARY OF INVENTION

[0003] An objective of the present invention is to provide a blood
30 oxygenation device capable of increasing oxygen content of blood, so that the
blood can reach a functioning state relatively quickly. This improves the
hypoxia of blood during the blood transfusion process, and the carried oxygen
amount and oxygenation efficiency enable blood to directly react with cells
after being transfused into the human body, thus effectively reducing the
35 discomfort of the transfused patient during the blood transfusion process of
treatment or surgery, so as to eliminate problems in blood transfusion.

[0004] To reach the above objective, the present invention provides a blood
oxygenation device that comprises a first exchanging layer, a second
exchanging layer laminated and assembled with the first exchange layer, an
40 input mechanism, and an output mechanism, in which:

a first exchanging layer comprises a first pedestal, a first oxygenation
seat body assembled with the first pedestal, and a first air-permeable film
arranged on the first oxygenation seat body, wherein a blood inlet, a first
guiding channel, and a plurality of first channels connected to the first
45 guiding channel are provided on the first oxygenation seat body;

a second exchanging layer is laminated and assembled with the first
exchange layer, and comprises a second pedestal, second oxygenation seat
body assembled with the second pedestal, and second air-permeable film

arranged on the second oxygenation seat body; wherein a blood outlet,

50 second guiding channel, and a plurality of second channels connected to the second guiding channel are provided on the second oxygenation seat body;

an input mechanism comprises a first tube and first connector, wherein the first connector is assembled on the blood inlet of the first oxygenation seat body, and the first tube is connected to the blood inlet via the first

55 connector, so as to guide the hypoxic blood into the laminated first exchanging layer and second exchanging layer; and

the output mechanism comprises a second tube, a second connector, and a blood oxygen concentration detector, wherein the second connector is assembled on the blood outlet of the second oxygenation seat body, the

60 second tube is connected to the blood outlet via the second connector, and the blood oxygen concentration detector is assembled on the tube, so as to whether the blood oxygen concentration of the oxygenated blood conforms to a standard.

[0005] According to a preferred embodiment of the present invention, a
65 plurality of oxygenation tanks are provided on each channel of the plurality of first channels and second channels, to allow hypoxic blood to be fully oxygenated in the oxygenation tank.

[0006] According to a preferred embodiment of the present invention, a

70 film compression frame is further arranged between the first air-permeable
film of the first exchanging layer and the second air-permeable film of the
second exchanging layer, battens are provided on the film compression frame
corresponding to each channel of the plurality of first channels and second
channels, in order to fix by pressing the first air-permeable film with the
second air-permeable film to allow for stable circulation of oxygenated blood
75 in said each channel.

[0007] According to a preferred embodiment of the present invention, an
irradiation machine is further provided under the second pedestal. The
irradiation machine comprises a pedestal and a plurality of red LED lamps.
The pedestal is provided with a plurality of locating seats that correspond to
80 each channel on the second pedestal. The red LED lamp is assembled on the
locating seat. With the irradiation machine irradiating the oxygenated blood
flowing through each channel, the carried oxygen amount and oxygenation
efficiency of the oxygenated blood can be improved.

[0008] According to a preferred embodiment of the present invention, the
85 wavelength of the light emitted by the red LED lamp may be 632. 5nm, and
the power thereof may be 3-5W.

BRIEF DESCRIPTION OF DRAWINGS

[0009] To better illustrate embodiments or technical solutions in the prior
90 art, a brief description of the drawings used in the embodiments or the prior
art description will be given below. Obviously, the accompanying drawings
in the following description merely show some embodiments of the present
invention, and a person skilled in the art may still derive other drawings from
these accompanying drawings without creative efforts.

95 [0010] FIG. 1 is a diagram illustrating a 3-dimensional exploded view of a blood oxygenation device according to a first embodiment of the present invention.

[0011] FIG. 2 is a diagram illustrating a step-by-step assembling according to FIG. 1.

100 [0012] FIG. 3 is a diagram illustrating a blood oxygenation device used for blood transfusion according to a first embodiment of the present invention.

[0013] FIG. 4 is a 2-dimensional diagram illustrating a blood oxygenation device according to a second embodiment of the present invention.

[0014] FIGs. 5-6 are diagrams illustrating a cross-sectional view and top
105 view of the blood oxygenation device according to a second embodiment of the present invention.

[0015] FIG. 7 is a diagram illustrating a blood oxygenation device used for blood transfusion according to a second embodiment of the present invention.

110 DESCRIPTION OF PREFERRED EMBODIMENTS

[0016] Please refer to FIG. 1 to FIG. 3, which illustrate a first embodiment of the present invention blood oxygenation device. As shown in FIG. 1 of the present invention, the blood oxygenation device 1 comprises: a first exchanging layer 2, a second exchanging layer 3, and an input mechanism 4
115 arranged on the first exchanging layer 2, an output mechanism 5 arranged on the second exchanging layer 3, and a film compression frame 6 arranged between the first exchanging layer 2 and second exchanging layer 3, wherein the first exchanging layer 2 comprises a first pedestal 21, a first oxygenation seat body 22 assembled with the first pedestal 21, and a first air-permeable

120 film 23 arranged on the first oxygenation seat body 22, wherein the first
pedestal 21 is of a square shape and is provided with assembly holes 211 on
its four sides for assembling with the first oxygenation seat body 22. The first
oxygenation seat body 22 is of a square shape that matches the first pedestal
21, and a blood inlet 221 is provided on the first oxygenation seat body 22, to
125 allow the hypoxic blood to enter the first oxygenation seat body 22. In
addition, a first guiding channel 222 is provided on one side of the first
oxygenation seat body 22, a plurality of first channel 223 connected to the
first guiding channel 222 is provided at the center part of the first oxygenation
seat body 22, and a plurality of oxygenation tanks 224 are provided on each
130 channel 223 to accommodate blood so that the blood can be fully oxygenated
in the oxygenation tanks 224. Furthermore, the four sides of the first
oxygenation seat body 22 correspond to the assembly holes 211 of the first
pedestal 21 respectively, and are provided with assembly holes 225, so that
after the first oxygenation seat body 22 is laminated with the second
135 exchanging layer 3 (which is described later), with the second exchanging
layer 3, the first oxygenation seat body 22 can be latched with the second
exchanging layer 3 via bolts 81 and nuts 82.

[0017] The second exchanging layer 3 comprises a second pedestal 31, a
second combined seat body 32 assembled with the second pedestal 31, and a
140 second air-permeable film 33 arranged on the second oxygenation seat body
32, wherein the second pedestal 31 is of square shape, a plurality of assembly
holes 311 are provided on its four sides, which are used to connect with the
second oxygenation seat body 32. The second oxygenation seat body 32 is a
square that matches the second pedestal 31, and is provided with a blood
145 outlet 321 to allow hypoxic blood to enter the second oxygenation seat body
32. In addition, a second guiding channel 322 is provided on one side of the
second oxygenation seat body 32, a plurality of second channels 323

connected to the second guiding channel 322 are provided in the part of the second oxygenation seat body 32, and an oxygenation tank 324 is provided on each channel 323 to accommodate blood, so that the blood can be fully oxygenated in the oxygenation tank 324. Furthermore, each of the four sides of the second oxygenation seat body 32 corresponds to the assembly holes 311 of the second pedestal 31, and are provided with assembly holes 325, which can be latched with the first exchanging layer 2 via the bolts 81 and nuts 82.

[0018] The input mechanism 4 is assembled on the blood inlet 221 of the first oxygenation seat body 22, and comprises: a first tube 41 and first connector 42, wherein the first connector 42 is a tee connector and is assembled on the blood inlet 221 of the first oxygenation seat body 22, which allows for blood transfusion and air circulation to perform blood oxygenation. The first tube 41 connects to the blood inlet 221 via the first connector 42, so that the hypoxic blood can be guided into the laminated first exchanging layer 2 and second exchanging layer 3.

[0019] The output mechanism 5 is assembled on the blood outlet 321 of the second oxygenation seat body 32, and comprises: a second tube 51, a second connector 52, and blood oxygen concentration detector 53, wherein the second connector 52 is a tee connector, and is assembled on the blood outlet 321 of the second oxygenation seat body 32, to allow the transfusion of oxygenated blood. The second tube 51 is connected to the blood outlet 321 via the second connector 52. The blood oxygen concentration detector 5 is assembled on the second tube 51, to detect whether the blood oxygen concentration of the oxygenated blood conforms to a standard.

[0020] The film compression frame 6 is arranged between the first air-permeable film 23 of the first exchanging layer 2 and the second air-

175 permeable film 33 of the second exchanging layer 3. The film compression
frame 6 is provided with battens 61 corresponding to the channels 223 of the
first oxygenation seat body 22 and the channels 323 of the second
oxygenation seat body 32, in order to fix by pressing the first air-permeable
film 23 with the second air-permeable film 33 to allow for stable circulation
180 of the oxygenated blood on each of the channels 223 and 323.

[0021] Please also refer to FIG. 2, when assembling the present invention
blood oxygenation device 1, the second pedestal 31 serves as the bottom part,
and then the second oxygenation seat body 32 is stacked on the second
pedestal 31. Next, the second air-permeable film 33 is stacked onto the second
185 oxygenation seat body 32 at a plurality of second channels 323. Next, the film
compression frame 6 is stacked onto the second air-permeable film 33, and
then the first air-permeable film 23 is stacked onto the film compression frame
6. Next, the first oxygenation seat body 22 is aligned and stacked on the
second oxygenation seat body 32, and then the first pedestal 21 is aligned and
190 latched the first oxygenation seat body 22 using bolts 81 and nuts 82 (as
shown in FIG. 1). According to the above steps of the present invention, the
assembly of the first exchange layer 2, the second exchange layer 3 and the
membrane pressure frame 6 of the blood oxygen device 1 is completed. After
the assembly is completed, as shown in FIG. 3, the input mechanism 4 and
195 output mechanism 5 are respectively assembled on the blood inlet 221 of the
first oxygenation seat body 22 and the blood outlet 321 of the second
oxygenation seat body 32, and then the overall assembly of the present
invention blood oxygenation device 1 is completed.

[0022] Please refer to FIG. 3 and FIG. 1, after the assembly of the present
200 invention blood oxygenation device 1 is completed, when oxygenation of the
blood is to be performed, the first tube 41 is connected to the human blood
vessel or blood bag, and the oxygen is input to the first oxygenation seat body

22, and then diverted to each of the first channels 223 and the oxygenation tanks 224 via the first guiding channel 222. The outside air is also let in, and the diffusion of the first air-permeable film 23 is performed to add oxygen to the blood flowing on the first channel 223 and oxygen tank 224, and so as to perform the blood oxygen exchange of the first layer. After that, the oxygen is further transmitted to the second oxygenation seat body 32, and then diverted to each of the second channels 323 and oxygenation tanks 324 via the second guiding channel 322. The outside air is also let in, and the diffusion of the second air-permeable film 33 is performed to add oxygen to the blood flowing on the second channel 323 and the oxygen tank 324, and so as to perform the blood oxygen exchange of the second layer. If this way, the hypoxic blood can be oxygenated. The oxygenated blood is transmitted to the human body via the blood outlet 321 or collected by blood bags. Therefore, through the blood oxygenation device 1 of the present invention, the blood can directly react with cells right after being input to the human body after being input into the human body, to effectively reduce the discomfort of the transfusion recipient during the blood transfusion process of the treatment or surgery, so as to improve the existing problems of blood transfusion.

[0023] Please refer to FIG. 4 to FIG. 7, which illustrate the second embodiment of the present invention blood oxygenation device. As shown in FIG. 5 and FIG. 6, the difference between this embodiment and the first embodiment is that the second embodiment further comprises an irradiation machine 7, while the rest of the elements are the same as those depicted in the first embodiment. As shown in FIG. 4, the irradiation machine 7 comprises a pedestal 71 and a plurality of red LED lamps 72. The pedestal 71 is provided with a plurality of locating seats 711 corresponding to each channel 323 on the second pedestal 31 for containing the red LED lamps 72. A plurality of assembling holes 311 is provided on the four sides of the pedestal 71 that

correspond to the second pedestal 31. The pedestal 71 is also provided with a locating grooves 712 so that when the second pedestal 31 is stacked thereon, the nuts 82 can be snapped into the locating grooves 712 and therefore is fixed. The wavelength of the light emitted by the red LED lamp 72 may be 632.5mm, and the power thereof may be 3-5Mw. The red LED lamp 72 is assembled on the locating seat 711. By using the red LED lamp 72 to irradiate the oxygenated blood flowing through the each of the channels 323 and the oxygen tanks 324, the carried oxygen amount and oxygenation efficiency of the oxygenated blood can be improved. Please refer to FIG. 7 along with FIG. 5 and FIG. 6. When performing the oxygenation of the blood, the first tube 41 is connected to the human blood vessel or blood bag, and the blood oxygen exchange is reached by the oxygenation described in the first embodiment. Meanwhile, with the red LED lamp 72 irradiating the oxygenated blood flowing through each channel 323, the carried oxygen amount and oxygen efficiency of oxygenated blood can be improved. In this way, the oxygenated blood can directly react with cells after being input into the human body, thus effectively reducing the discomfort of the transfusion recipient during the blood transfusion process of the treatment or surgery, and improving the existing problems of blood transfusion. One thing to be noted is that the blood oxygenation device 1 and the irradiation machine 7 of the present invention are combined in a cross-positioning manner. That is, when replacing the blood oxygenation device 1, the old blood oxygenation device 1 can be drawn out and dumped, while the irradiation machine 7 can still be used.

[0024] In view of the above, the blood oxygenation device provided by the present disclosure can indeed achieve the purpose of creation and therefore meet the requirements of the Patent Act. However, what is illustrated above is merely preferred embodiments of the present disclosure. Various modifications and changes made according to the present disclosure shall fall

within the claimed scope of the present application.

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What is claimed is:

1. A blood oxygenation device comprising:

a first exchanging layer comprising a first pedestal, a first oxygenation seat body assembled with the first pedestal, and a first air-permeable film arranged on the first oxygenation seat body, wherein a blood inlet, a first guiding channel, and a plurality of first channels connected to the first guiding channel are provided on the first oxygenation seat body;

a second exchanging layer laminated and assembled with the first exchanging layer, and comprising a second pedestal, second oxygenation seat body assembled with the second pedestal, and second air-permeable film arranged on the second oxygenation seat body; wherein a blood outlet, second guiding channel, and a plurality of second channels connected to the second guiding channel are provided on the second oxygenation seat body; wherein a film compression frame is arranged between the first air-permeable film of the first exchanging layer and the second air-permeable film of the second exchanging layer, battens are provided on the film compression frame corresponding to each channel of the plurality of first channels and second channels, in order to fix by pressing the first air-permeable film

with the second air-permeable film to allow for stable circulation of oxygenated blood in said each channel and

an output mechanism comprising a second tube, a second connector, and a blood oxygen concentration detector, wherein the second connector is assembled on the blood outlet of the second oxygenation seat body, the second tube is connected to the blood outlet via the second connector, and the blood oxygen concentration detector is assembled on the tube.

2. The blood oxygenation device of claim 1, wherein a plurality of oxygenation tanks are provided on each channel of the plurality of first channels and second channels, to allow hypoxic blood to be fully oxygenated in the oxygenation tank.
3. The blood oxygenation device of claim 1, wherein the first pedestal and the second pedestal are assembled by providing a plurality of assembling holes at corresponding locations of the first pedestal and the second pedestal, and latching the first pedestal with the second pedestal via bolts and nuts.
4. The blood oxygenation device of claim 1, wherein the first connector and second connector are tee connectors.
5. A blood oxygenation device comprising:

a first exchanging layer comprising a first pedestal, a first oxygenation seat body assembled with the first pedestal, and a first air-permeable film arranged on the first oxygenation seat body, wherein a blood inlet, a first guiding channel, and a plurality of first channels connected to the first guiding channel are provided on the first oxygenation seat body;

a second exchanging layer laminated and assembled with the first exchanging layer, and comprising a second pedestal, second oxygenation seat body assembled with the second pedestal, and second air-permeable film arranged on the second oxygenation seat body; wherein a blood outlet, second guiding channel, and a plurality of second channels connected to the second guiding channel are provided on the second oxygenation seat body; wherein a film compression frame is further arranged between the first air-permeable film of the first exchanging layer and the second air-permeable film of the second exchanging layer, battens are provided on the film compression frame corresponding to each channel of the plurality of first channels and second channels, in order to fix by pressing the first air-permeable film with the second air-permeable film to allow for stable circulation of oxygenated blood in said each channel and an output mechanism comprising a second tube, a second connector, and a blood oxygen concentration detector, wherein the second connector is assembled

on the blood outlet of the second oxygenation seat body, the second tube is connected to the blood outlet via the second connector, and the blood oxygen concentration detector is assembled on the tube ; and

an irradiation machine assembling on the second pedestal which comprises a pedestal and a plurality of red LED lamps, in which the pedestal is provided with a plurality of locating seats that correspond to each channel on the second pedestal, and the red LED lamp which is assembled on the locating seat, so as to the irradiation machine irradiating the oxygenated blood flowing through each channel, the carried oxygen amount and oxygenation efficiency of the oxygenated blood can be improved.

6. The blood oxygenation device of claim 5, wherein a plurality of oxygenation tanks are provided on each channel of the plurality of first channels and second channels, to allow hypoxic blood to be fully oxygenated in the oxygenation tank.

7. The blood oxygenation device of claim 5, wherein the first connector and second connector are tee connectors.

8. The blood oxygenation device of claim 5, wherein the first pedestal and the second pedestal are assembled by providing a plurality of assembling holes at corresponding locations of the first pedestal and the second pedestal, and latching the first pedestal with the second pedestal via bolts and nuts.

9. The blood oxygenation device of claim 5, wherein the wavelength of the light emitted by the red LED lamp may be 632. 5nm, and the power thereof may be 3-5W.

10. The blood oxygenation device of claim 8, wherein a plurality of assembling holes is provided on the four sides of the pedestal that correspond to the second pedestal, and the pedestal which is also provided with a locating grooves so that when the second pedestal is stacked thereon, a nuts can be snapped into the locating grooves and therefore is fixed.

11. A blood oxygenation device comprising a exchanging layer and an irradiation mechanism; and an input mechanism and an output mechanism arranged on the exchanging layer, wherein:

the exchanging layer comprises a pedestal, a oxygenation seat body assembled with the pedestal, and an air-permeable film arranged on the oxygenation seat body, wherein a blood inlet, a guiding channel, and a plurality of the channels connected to the guiding channel are provided on the oxygenation seat body; wherein a film compression frame is further arranged between the air-permeable film of the exchanging layer and the air-permeable film of the exchanging layer, battens are provided on the film compression frame corresponding to each channel of the plurality channels, in order to fix by pressing the air-permeable film to allow for stable

circulation of oxygenated blood in said each channel and

an irradiation machine assembling on the pedestal which comprises a pedestal and a plurality of red LED lamps, in which the pedestal is provided with a plurality of locating seats that correspond to each channel on the second pedestal, and the red LED lamp which is assembled on the locating seat, so as to the irradiation machine irradiating the oxygenated blood flowing through each channel, the carried oxygen amount and oxygenation efficiency of the oxygenated blood can be improved.

12. The blood oxygenation device of claim 11, wherein a plurality of assembling holes are located corresponding to the pedestal and the oxygenation seat body, and latched together via bolts and nuts.

13. The blood oxygenation device of claim 12, wherein a plurality of assembling holes is provided on the four sides of the pedestal that correspond to the irradiation machine, and the pedestal which is also provided with a locating grooves so that when the pedestal is stacked thereon, a nuts can be snapped into the locating grooves and therefore is fixed.

14. The blood oxygenation device of claim 11, wherein a plurality of oxygenation tanks are provided on each channel of the plurality of channels, to allow hypoxic blood to be fully oxygenated in the oxygenation tank.

15. The blood oxygenation device of claim 11, wherein the wavelength of the light emitted by the red LED lamp may be 632. 5nm, and the power thereof may be 3-5W.