

DEHYDRATED CELLULOSE NANOFIBRIL STORAGE DEVICE AND METHOD

FIELD

[0001] The subject matter relates to storage devices, and more particularly, to a dehydrated cellulose nanofibril (CNF) storage device and a dehydrated CNF storage
5 method.

BACKGROUND

[0002] CNFs are a kind of biomass material based on natural fibers of nanometric size. Despite the small size, the CNFs also have excellent properties such as high
10 strength, making them suitable for reinforcing composite materials. When incorporated into a polymer matrix, the CNFs add strength and stiffness to the polymer material, making them an attractive choice for a variety of structural applications.

[0003] To facilitate storage and transportation, the CNFs are dehydrated to form dried powders or subarid slurry. Agglomeration, self-assembly, and keratinization may
15 happen to the CNF powders or slurry due to a large amount of hydroxyl groups on the surface, making it impossible for the CNFs to retain the high dispersion ability. Even when the dehydrated CNF powders or slurry is redispersed in a liquid medium when in use, a high power or longer dispersion duration may be required to allow the CNFs to retain the dispersion ability due to the high viscosity of the CNF slurry, which increases

the cost.

SUMMARY

[0004] To overcome the above shortcomings, a dehydrated CNF storage device and
5 method are needed.

[0005] The present application provides a dehydrated CNF storage device for storing
dehydrated CNFs. The dehydrated CNF storage device includes a storage chamber, a
first fixing mechanism, a sensing mechanism, and a pressure relief mechanism. The
storage chamber is for storing a liquid medium and a multilayer material immersed in the
10 liquid medium, the multilayer material includes two porous layers and a slurry
sandwiched between the porous layers, the slurry has the dehydrated CNFs. The storage
chamber includes a main body and a cover connected to the main body. The cover
defines a first opening for adding the liquid medium into the storage chamber or taking a
sample of the liquid medium from the storage chamber. The first fixing mechanism is
15 received in the storage chamber and configured to fix the multilayer material in the
storage chamber. The sensing mechanism is mounted in the storage chamber and
configured to sense characteristic data of the liquid medium in the storage chamber.
The pressure relief mechanism is mounted to the cover and configured to adjust a
pressure in the storage chamber.

[0006] The present application further provides a dehydrated CNF storage method for storing dehydrated CNFs. The dehydrated CNF storage method includes providing a storage chamber with a liquid medium stored therein. A multilayer material is fixed in the storage chamber, thereby causing the multilayer material to be immersed in the liquid medium, wherein the multilayer material includes two porous layers and a slurry sandwiched between the porous layers, the slurry has the dehydrated CNFs. Characteristic data of the liquid medium in the storage chamber is sensed and compared with preset data to obtain a comparison result. According to the comparison result, the characteristic data of the liquid medium in the storage chamber is adjusted, or the liquid medium is replaced from the storage chamber. A pressure in the storage chamber is adjusted when the pressure is greater than a preset pressure.

[0007] According to the present application, compared to dehydrating the CNFs into dried powders or subarid slurry in the related arts, the storage chamber stores the multilayer material including two porous layers and the slurry sandwiched between the porous layers in the liquid medium, thereby facilitating the storage and transportation of the dehydrated CNFs. The slurry of the multilayer material can have a smaller thickness and also a high concentration of dehydrated CNFs. The liquid medium in the storage chamber may be supplemented to the slurry through the pores of the porous layers, and therefore, damages to the dehydrated CNFs due to excessive drying and dehydration may

be reduced or avoided during the storage or transportation of the multilayer material. Also, after the slurry is separated from the porous layers, the dehydrated CNFs of the slurry can be easily dispersed in the liquid medium to retain the dispersion ability. Furthermore, it is not needed to perform surface modification on the dehydrated CNFs for
5 removing the hydroxyl groups to inhibit agglomeration or keratinization. Thus, the consumption or residue of chemical agents can be reduced while preserving the original surface properties of the dehydrated CNFs. Moreover, the present application can maintain a suitable storage environment for the dehydrated CNFs in the storage chamber to reduce damages to the dehydrated CNFs.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Implementations of the present technology will now be described, by way of example only, with reference to the attached figures.

[0009] FIG. 1 is a diagrammatic view of a dehydrated CNF storage device according
15 to an embodiment of the present application.

[0010] FIG. 2 is a diagrammatic view showing a multilayer material fixed in the dehydrated CNF storage device in FIG. 1.

[0011] FIG. 3 is a top view of the dehydrated CNF storage device of FIG. 1.

[0012] FIG. 4 is diagrammatic view of a dehydrated CNF storage device according to another embodiment of the present application.

[0013] FIG. 5 is a diagrammatic view showing a cover of the dehydrated CNF storage device in FIG. 4 being opened.

[0014] FIG. 6 is a top view of the dehydrated CNF storage device of FIG. 5.

[0015] FIG. 7 is flowchart of a dehydrated CNF storage method according to an embodiment of the present application.

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DETAILED DESCRIPTION

[0016] It will be appreciated that for simplicity and clarity of illustration, where appropriate, reference numerals have been repeated among the different figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the embodiments described herein. However, it will be understood by those of ordinary skill in the art that the embodiments described herein can be practiced without these specific details. In other instances, methods, procedures, and members have not been described in detail so as not

to obscure the related relevant feature being described. Also, the description is not to be considered as limiting the scope of the embodiments described herein. The drawings are not necessarily to scale and the proportions of certain parts may be exaggerated to better illustrate details and features of the present disclosure.

5 **[0017]** The term “comprising,” when utilized, means “including, but not necessarily limited to”; it specifically indicates open-ended inclusion or membership in the so-described combination, group, series, and the like.

[0018] Referring to FIGS. 1 to 3, a dehydrated CNF storage device is provided according to an embodiment of the present application. The device 1 is used for storing
10 dehydrated CNFs.

[0019] The device 1 includes a storage chamber 10, a first fixing mechanism 30, a sensing mechanism 40, and a pressure relief mechanism 50.

[0020] Referring to FIG. 2, which shows a multilayer material 100 has been placed into the storage chamber 10. The storage chamber 10 can store a liquid medium 20 and
15 the multilayer material 100 immersed in the liquid medium 20. The multilayer material 100 includes two porous layers 101 and a slurry 102 sandwiched between the porous layers 101, the slurry 102 has a solvent and the dehydrated CNFs. The storage chamber 10 may be a container suitable for storing the multilayer material 100. The storage chamber 10 includes a main body 11 and a cover 12 connected to the main body 11.

The main body 11 may be rectangular or other suitable shapes facilitating the storage and transportation. The cover 12 covers the main body 11 to reduce the leakage of the liquid medium 20 from the storage chamber 10. Referring to FIG. 3, the cover 12 defines a first opening 121, and the first opening 121 may penetrate through the cover 12. The cover 12 may further include a plug (not shown) for sealing the first opening 121 to further reduce the leakage of the liquid medium 20 from the storage chamber 10. In at least one embodiment, the porous layers 101 may be mesh fabrics for protecting the dehydrated CNFs sandwiched therebetween.

[0021] The liquid medium 20 may be added into the storage chamber 10 through the first opening 121 of the cover 12. A sample of the liquid medium 20 in the storage chamber 10 may also be taken through the first opening 121 of the cover 12 when needed. The liquid medium 20 may be water or other solvents suitable for immersing the multilayer material 100. Thus, the liquid medium 20 may be supplemented to the slurry 102 through the pores of the porous layers 101, and therefore, damages to the dehydrated CNFs due to excessive drying and dehydration may be reduced or avoided during the storage or transportation of the multilayer material 100.

[0022] In at least one embodiment, the liquid medium 20 includes a first liquid, and the first liquid may be the same as the solvent of the slurry 102. Thus, when the multilayer material 100 is immersed in the liquid medium 20, the first liquid may be

supplemented to the slurry 102 through the pores of the porous layers 101. Since the first liquid may be the same as the solvent of the slurry 102, the first liquid supplemented to the slurry 102 may cause little negative impact on the dehydrated CNFs. The liquid medium 20 may further include a second liquid, and the second liquid includes at least one of a preserving agent, a stabilizing agent, and a modifying agent. The specific type of the second liquid may be selected according to actual needs, thereby achieving the functions of preserving, stabilizing, and surface modifying.

[0023] Referring to FIGS. 1 to 3, the first fixing mechanism 30 is at least partially received in the storage chamber 10 and can fix the multilayer material 100 in the storage chamber 10. Thus, the position of the multilayer material 100 stored in the storage chamber 10 is maintained, which reduces the damages to the multilayer material 100 during storage or transportation.

[0024] The sensing mechanism 40 is at least partially mounted in the storage chamber 10 and can sense characteristic data of the liquid medium 20 in the storage chamber 10. The characteristic data may include at least of a height, a temperature, a pH value, and a viscosity of the liquid medium 20. The characteristic data can be compared with preset data and a comparison result is obtained. The comparison result is for indicating that whether it is needed to adjust the characteristic data of the liquid medium 20 in the storage chamber 10 or replace the liquid medium 20 from the storage

chamber 10, thereby maintaining a suitable storage environment for the dehydrated CNFs. For example, when the height of the liquid medium 20 is less than a preset height, it may be needed to add the liquid medium 20 into the storage chamber 10. For example, when the viscosity of the liquid medium 20 is larger than a preset viscosity, it may be needed to
5 replace the liquid medium 20 in the storage chamber 10 with a new liquid medium 20. When the viscosity of the liquid medium 20 is larger than the preset viscosity, it may also be needed to add some liquid medium 20 into the storage chamber 10 or dilute the liquid medium 20 in the storage chamber 10, thereby adjusting the viscosity of the liquid medium 20 in the storage chamber 10. In at least one embodiment, the sensing
10 mechanism 40 may be a liquid level sensor, a temperature sensor, a pH value, or a viscosity sensor.

[0025] The pressure relief mechanism 50 is mounted to the cover 12 and can adjust a pressure in the storage chamber 10. Thus, when the pressure in the storage chamber 10 is higher than a preset pressure, the pressure relief mechanism 50 can release the pressure
15 in the storage chamber 10, thereby maintaining a suitable storage environment for the dehydrated CNFs and reducing damages to the dehydrated CNFs due to excessive pressure in the storage chamber 10. In at least one embodiment, the pressure relief mechanism 50 may be a pressure relief valve.

[0026] According to the device 1 of the present application, compared to dehydrating

the CNFs into dried powders or subarid slurry in the related arts, the storage chamber 10 stores the multilayer material 100 including two porous layers 101 and the slurry 102 sandwiched between the porous layers 101 in the liquid medium 20, thereby facilitating the storage and transportation of the dehydrated CNFs. The slurry 102 of the multilayer material 100 can have a smaller thickness and also a high concentration of dehydrated CNFs. The liquid medium 20 in the storage chamber 10 may be supplemented to the slurry 102 through the pores of the porous layers 101, and therefore, damages to the dehydrated CNFs due to excessive drying and dehydration may be reduced or avoided during the storage or transportation of the multilayer material 100. Also, after the slurry 102 is separated from the porous layers 101, the dehydrated CNFs of the slurry 102 can be easily dispersed in the liquid medium 20 to retain the dispersion ability. Furthermore, it is not needed to perform surface modification on the dehydrated CNFs for removing the hydroxyl groups to inhibit agglomeration or keratinization. Thus, the consumption or residue of chemical agents can be reduced while preserving the original surface properties of the dehydrated CNFs. Moreover, the setting of the sensing mechanism 40 and the pressure relief mechanism 50 can maintain a suitable storage environment for the dehydrated CNFs in the storage chamber 10 to reduce damages to the dehydrated CNFs.

[0027] Referring to FIGS. 4 to 6, in another embodiment, the device 1 may have different structures for storing different shapes of the multilayer material 100. For

example, the multilayer material 100 may be coil-shaped as shown in FIG. 2, and may also be stack-shaped as shown in FIG. 4. The specific structure of the device 1 is described, by way of embodiment, with reference to the multilayer material 100.

Embodiment 1

5 **[0028]** Referring to FIGS. 1 to 3, in the embodiment, the first fixing mechanism 30 includes a rotation shaft 31 and a traction layer 32 secured to the rotation shaft 31. The rotation shaft 31 is rotatably mounted in the storage chamber 10. The storage chamber 10 further defines a second opening 122, and the second opening 122 may be located at the main body 11 or the cover 12. When the second opening 122 is located at the cover 12, the first opening 121 and the second opening 122 are spaced from each other at the cover 12. The traction layer 32 is partially exposed from the second opening 122, and the exposed traction layer 32 can connect to an end of the multilayer material 100. Thus, when the rotation shaft 31 rotates, the multilayer material 100 is introduced into the storage chamber 10 and then coiled on the rotation shaft 31. That is, the first fixing mechanism 30 can fix the multilayer material 100 of coil-shaped in the storage chamber 10. In at least one embodiment, the second opening 122 may be a rectangular opening extending along a direction parallel to the rotation shaft 31. The traction layer 32 may be, but not limited to a mesh fabric similar to the porous layers 101.

[0029] Referring to FIG. 3, in at least one embodiment, each of two opposite

sidewalls 110 of the main body 11 defines a through hole 111. Two ends of the rotation shaft 31 movably extend through the two through holes 111 and protrude from the main body 11. The device 1 may further include a driving mechanism 310 located outside the storage chamber 10 and connected to one end of the rotation shaft 31. The driving
5 mechanism 310 can drive the rotation shaft 31 to rotate, and can stop driving the rotation shaft 31 when a desired length of the multilayer material 100 has been coiled on the rotation shaft 31. The driving mechanism 310 may be a motor.

[0030] Referring to FIGS. 1 and 2, the device 1 may further include a second fixing mechanism 60 mounted to the storage chamber 10 and adjacent to the second opening

10 122. The second fixing mechanism 60 can fix to another end of the multilayer material 100 away from the traction layer 32. As such, the multilayer material 100 in the storage chamber 10 can be extracted out of the storage chamber 10 as needed, by pulling the end of the multilayer material 100 fixed to the second fixing mechanism 60. After all of the multilayer material 100 has been extracted out of the storage chamber 10, the multilayer
15 material 100 can be separated from an end of traction layer 32, and the second fixing mechanism 60 can also fix the end of traction layer 32. Thus, another multilayer material 100 can be fixed to the end of traction layer 32 in the future. In at least one embodiment, the second fixing mechanism 60 may include, but not limited to a clamping jig suitable for fixing the end of the multilayer material 100.

[0031] Referring to FIG. 3, the device 1 may further include a tension adjustment mechanism 311 connected to the rotation shaft 31. The tension adjustment mechanism 311 may be connected to one end of the rotation shaft 31 protruding from the main body 11. The tension adjustment mechanism 311 can adjust a tension of the multilayer material 100 coiled on the rotation shaft 31. Thus, the tension of the multilayer material 100 can be maintained within a preset range when the multilayer material 100 is coiled on the rotation shaft 31. In at least one embodiment, the tension adjustment mechanism 311 may include a magnetic damper.

Embodiment 2

10 **[0032]** Referring to FIGS. 4 to 6, in the embodiment, the cover 12 is movably connected to the main body 11. For example, the cover 12 may be rotatably connected to the main body 11 through a hinge 123. The cover 12 may also be detachably connected to the main body 11.

[0033] The first fixing mechanism 30 includes two clamping plates 33, and each of the clamping plates 33 defines a plurality of holes 330. The clamping plates 33 can clamp a plurality of stacked multilayer materials 100 therebetween. That is, the first fixing mechanism 30 can fix the multilayer materials 100 of stack-shaped in the storage chamber 10. The first fixing mechanism 30 can also prevent the multilayer materials 100 from separating from each other during the storage and transportation. The holes

330 allow the liquid medium 20 in the storage chamber 10 to penetrate to fully immerse the multilayer materials 100. In use, referring to FIGS. 4 and 5, the cover 12 can be opened relative to the main body 11, and the first fixing mechanism 30 with the multilayer materials 100 can be placed into the storage chamber 10.

5 **[0034]** At least one of the clamping plates 33 may have a width equal to that of the main body 11. For example, one of the clamping plates 33 may be resisted against two opposite sidewalls 110 of the main body 11, such that the clamping plates 33 can fix the multilayer materials 100 in the storage chamber 10, thereby reducing the moving or shaking of the multilayer materials 100 in the storage chamber 10. In another
10 embodiment, the device 1 may also include a third fixing mechanism 70 secured in the storage chamber 10. The third fixing mechanism 70 can fix the clamping plates 33 in the storage chamber 10, thereby reducing the moving or shaking of the multilayer materials 100 in the storage chamber 10. The third fixing mechanism 70 may include, but not limited to a clamping jig suitable for fixing the clamping plates 33.

15 **[0035]** FIG. 7 illustrates a flowchart of a dehydrated CNF storage method for storing the dehydrated CNFs in accordance with an embodiment. The method is provided by way of embodiments, as there are a variety of ways to carry out the method. Each step shown in FIG. 7 represents one or more processes, methods, or subroutines carried out in the method. Furthermore, the illustrated order of steps may be changed. Additional

steps may be added or fewer steps may be utilized, without departing from this disclosure.

The method begins at step S1.

[0036] At step S1, a storage chamber 10 with a liquid medium 20 stored therein is provided.

5 **[0037]** The storage chamber 10 includes a main body 11 and a cover 12 connected to the main body 11. For example, the main body 11 may be rectangular or other suitable shapes facilitating the storage and transportation. For example, as shown in FIGS. 4 to 6, the cover 12 may be rotatably connected to the main body 11 through a hinge 123, and may also be detachably connected to the main body 11. The cover 12 can reduce the
10 leakage of the liquid medium 20 from the storage chamber 10. The cover 12 defines a first opening 121, and the first opening 121 may penetrate through the cover 12. In at least one embodiment, the porous layers 101 may be mesh fabrics for protecting the dehydrated CNFs sandwiched therebetween.

[0038] At step S2, a multilayer material 100 is fixed in the storage chamber 10,
15 thereby causing the multilayer material 100 to be immersed in the liquid medium 20. The multilayer material 100 includes two porous layers 101 and a slurry 102 sandwiched between the porous layers 101, the slurry 102 has the dehydrated CNFs.

[0039] In at least one embodiment, the first fixing mechanism 30 includes a rotation shaft 31 and a traction layer 32 secured to the rotation shaft 31. The rotation shaft 31 is

rotatably mounted in the storage chamber 10. The storage chamber 10 further defines a second opening 122, and the second opening 122 may be located at the main body 11 or the cover 12. In this case, fixing the multilayer material 100 in the storage chamber 10 may be carried out by securing a traction layer 32 to the rotation shaft 31 rotatably mounted in the storage chamber 10, allowing the traction layer 32 to be partially exposed from the storage chamber 10. Then, an end of the multilayer material 100 is connected to the exposed traction layer 32. Then, the rotation shaft 31 is rotated to introduce the multilayer material 100 into the storage chamber 10 and coil the multilayer material 100 on the rotation shaft 31. Furthermore, the rotation shaft 31 may be driven by a driving mechanism 310, which is connected to the rotation shaft 31, to rotate.

[0040] Furthermore, after the multilayer material 100 is coiled on the rotation shaft 31, the method further includes fixing another end of the multilayer material 100 away from the traction layer 32 to the storage chamber 10. As such, the multilayer material 100 in the storage chamber 10 can be extracted out of the storage chamber 10 as needed, by pulling the end of the multilayer material 100 fixed to the second fixing mechanism 60.

[0041] In at least one embodiment, the method further includes adjusting a tension of the multilayer body coiled on the rotation shaft 31. Thus, the tension of the multilayer material 100 can be maintained within a preset range when the multilayer material 100 is

coiled on the rotation shaft 31.

[0042] In other embodiment, the first fixing mechanism 30 includes two clamping plates 33, and each of the clamping plates 33 defines a plurality of holes 330. In this case, fixing the multilayer material 100 in the storage chamber 10 may be carried out by
5 clamping a plurality of stacked multilayer materials 100 between the clamping plates 33. Then, the clamping plates 33 with the stacked multilayer materials 100 therebetween are placed into the storage chamber 10. The holes 330 allow the liquid medium 20 in the storage chamber 10 to penetrate to fully immerse the multilayer materials 100.

[0043] Furthermore, the method may include fixing the clamping plates 33 in the
10 storage chamber 10, thereby reducing the moving or shaking of the multilayer materials 100 in the storage chamber 10.

[0044] At step S3, characteristic data of the liquid medium 20 in the storage chamber 10 is sensed. The sensed characteristic data is compared with preset data and a comparison result is obtained. According to the comparison result, the characteristic
15 data of the liquid medium 20 in the storage chamber 10 is adjusted, or the liquid medium 20 is replaced from the storage chamber 10.

[0045] In at least one embodiment, the characteristic data may include at least of a height, a temperature, a pH value, and a viscosity of the liquid medium 20. The comparison result is for indicating that whether it is needed to adjust the characteristic

data of the liquid medium 20 in the storage chamber 10 or replace the liquid medium 20 from the storage chamber 10, thereby maintaining a suitable storage environment for the dehydrated CNFs. For example, when the height of the liquid medium 20 is less than a preset height, it may be needed to add the liquid medium 20 into the storage chamber 10.

5 For example, when the viscosity of the liquid medium 20 is larger than a preset viscosity, it may be needed to replace the liquid medium 20 in the storage chamber 10 with a new liquid medium 20. When the viscosity of the liquid medium 20 is larger than the preset viscosity, it may also be needed to add some liquid medium 20 into the storage chamber 10 or dilute the liquid medium 20 in the storage chamber 10, thereby adjusting the
10 viscosity of the liquid medium 20 in the storage chamber 10.

[0046] At step S4, a pressure in the storage chamber 10 is adjusted when the pressure is greater than a preset pressure.

[0047] Thus, a suitable storage environment for the dehydrated CNFs can be maintained, which reduces damages to the dehydrated CNFs due to excessive pressure in
15 the storage chamber 10.

[0048] According to the method of the present application, compared to dehydrating the CNFs into dried powders or subarid slurry in the related arts, the storage chamber 10 stores the multilayer material 100 including two porous layers 101 and the slurry 102 sandwiched between the porous layers 101 in the liquid medium 20, thereby facilitating

the storage and transportation of the dehydrated CNFs. The slurry 102 of the multilayer material 100 can have a smaller thickness and also a high concentration of dehydrated CNFs. The liquid medium 20 in the storage chamber 10 may be supplemented to the slurry 102 through the pores of the porous layers 101, and therefore, damages to the dehydrated CNFs due to excessive drying and dehydration may be reduced or avoided during the storage or transportation of the multilayer material 100. Also, after the slurry 102 is separated from the porous layers 101, the dehydrated CNFs of the slurry 102 can be easily dispersed in the liquid medium 20 to retain the dispersion ability. Furthermore, it is not needed to perform surface modification on the dehydrated CNFs for removing the hydroxyl groups to inhibit agglomeration or keratinization. Thus, the consumption or residue of chemical agents can be reduced while preserving the original surface properties of the dehydrated CNFs. Moreover, the method can maintain a suitable storage environment for the dehydrated CNFs in the storage chamber 10 to reduce damages to the dehydrated CNFs.

[0049] Even though information and advantages of the present embodiments have been set forth in the foregoing description, together with details of the structures and functions of the present embodiments, the disclosure is illustrative only. Changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the present exemplary embodiments, to the full extent indicated by the plain

meaning of the terms in which the appended claims are expressed.

CLAIMS

What is claimed is:

1. A dehydrated cellulose nanofibril (CNF) storage device for storing dehydrated CNFs and comprising:

- 5 a storage chamber for storing a liquid medium and a multilayer material immersed in the liquid medium, the multilayer material comprising two porous layers and a slurry sandwiched between the porous layers, the slurry having the dehydrated CNFs, the storage chamber comprising a main body and a cover connected to the main body, the cover defining a first opening for adding the liquid medium into the storage chamber or
- 10 taking a sample of the liquid medium from the storage chamber;
- a first fixing mechanism received in the storage chamber and configured to fix the multilayer material in the storage chamber;
- a sensing mechanism mounted in the storage chamber and configured to sense characteristic data of the liquid medium in the storage chamber; and
- 15 a pressure relief mechanism mounted to the cover and configured to adjust a pressure in the storage chamber.

2. The CNF storage device according to claim 1, wherein the first fixing mechanism comprises:

a rotation shaft rotatably mounted in the storage chamber, and the storage chamber defining a second opening; and

a traction layer secured to the rotation shaft and partially exposed from the second opening, and the exposed traction layer configured to connect to an end of the multilayer material;

wherein the rotation shaft is configured to rotate to introduce the multilayer material into the storage chamber and coil the multilayer material on the rotation shaft.

3. The dehydrated CNF storage device according to claim 2, further comprising:

a driving mechanism located outside the storage chamber and connected to the rotation shaft, and configured to drive the rotation shaft to rotate.

4. The dehydrated CNF storage device according to claim 2, further comprising:

a second fixing mechanism mounted to the storage chamber and adjacent to the second opening, and configured to fix to another end of the multilayer material away from the traction layer.

5. The dehydrated CNF storage device according to claim 2, further comprising:

a tension adjustment mechanism connected to the rotation shaft and configured to adjust a tension of the multilayer material coiled on the rotation shaft.

6. The dehydrated CNF storage device according to claim 2, wherein the first fixing mechanism comprises:

two clamping plates each defining a plurality of holes, and the clamping plates configured to clamp a plurality of stacked multilayer materials therebetween.

7. The dehydrated CNF storage device according to claim 6, further comprising:

5 a third fixing mechanism secured in the storage chamber and configured to fix the clamping plates in the storage chamber.

8. The dehydrated CNF storage device according to claim 2, wherein the second opening is rectangular and extends along a direction parallel to the rotation shaft.

9. A dehydrated cellulose nanofibril (CNF) storage method for storing dehydrated CNFs and comprising:

10 providing a storage chamber with a liquid medium stored therein;

fixing a multilayer material in the storage chamber, thereby causing the multilayer material to be immersed in the liquid medium, wherein the multilayer material comprises two porous layers and a slurry sandwiched between the porous layers, the slurry has the dehydrated CNFs;

15 sensing characteristic data of the liquid medium in the storage chamber, comparing the sensed characteristic data with preset data thereby obtaining a comparison result, and adjusting the characteristic data of the liquid medium in the storage chamber or replacing the liquid medium from the storage chamber according to the comparison result; and

adjusting a pressure in the storage chamber when the pressure is greater than a preset

pressure.

10. The CNF storage method according to claim 9, wherein fixing the multilayer material in the storage chamber comprises:

- securing a traction layer to a rotation shaft rotatably mounted in the storage chamber,
- 5 allowing the traction layer to be partially exposed from the storage chamber;
- connecting an end of the multilayer material to the exposed traction layer; and
- rotating the rotation shaft to introduce the multilayer material into the storage chamber and coil the multilayer material on the rotation shaft.

11. The dehydrated CNF storage method according to claim 10, wherein rotating the rotation shaft comprises:

controlling a driving mechanism, which is connected to the rotation shaft, to rotate the rotation shaft.

12. The dehydrated CNF storage method according to claim 10, further comprising:

fixing another end of the multilayer material away from the traction layer to the storage chamber.

13. The dehydrated CNF storage method according to claim 10, further comprising:

adjusting a tension of the multilayer body coiled on the rotation shaft.

14. The dehydrated CNF storage method according to claim 9, wherein fixing the multilayer material in the storage chamber comprises:

- providing two clamping plates each defining a plurality of holes; and
- clamping a plurality of stacked multilayer materials between the clamping plates;
- and
- placing the clamping plates with the stacked multilayer materials therebetween into
- 5 the storage chamber.
15. The dehydrated CNF storage method according to claim 14, further comprising:
- fixing the clamping plates in the storage chamber.