

DEHYDRATED CELLULOSE NANOFIBRIL REDISPERSION DEVICE AND

METHOD

FIELD

[0001] The subject matter relates to redispersion devices, and more particularly, to a

5 dehydrated cellulose nanofibril (CNF) redispersion device and a dehydrated CNF redispersion method.

BACKGROUND

[0002] CNFs are a kind of biomass material based on natural fibers of nanometric

10 size. Despite the small size, the CNFs also have excellent properties such as high 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

15 dried powders or subarid slurry. Agglomeration, self-assembly, and keratinization may 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. Thus, a redispersion device is needed to redisperse the dehydrated CNF powders or slurry in a liquid medium when in use, which allows the CNFs to retain the dispersion ability.

However, the existing redispersion device may require a high power or longer dispersion duration for the redispersion due to the high viscosity of the CNF slurry, which increases the cost.

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SUMMARY

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

[0005] The present application provides a dehydrated CNF redispersion device for redispersing dehydrated CNFs in a liquid medium. The device includes a feeding mechanism, a liquid container for containing the liquid medium, a separation mechanism, and a first redispersion mechanism. The feeding mechanism is configured to feed a raw material. The raw material includes two protective layers and a slurry sandwiched between the protective layers, and the slurry has the dehydrated CNFs. The separation mechanism is mounted to the liquid container, adapted to at least partially be immersed in the liquid medium, and configured to connect to the protective layers and separate the protective layers from each other. The first redispersion mechanism is mounted to the liquid container, adapted to at least partially be immersed in the liquid medium and face a first section of at least one of the protective layers between the feeding mechanism and the separation mechanism. The first redispersion mechanism is configured to remove

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the slurry from the first section and disperse the dehydrated CNFs of the removed slurry in the liquid container.

[0006] The present application further provides a dehydrated CNF redispersion method for redispersing dehydrated CNFs in a liquid medium. The method includes providing a liquid container with a separation mechanism and a first redispersion mechanism mounted therein. A raw material is fed from a feeding mechanism to the separation mechanism, wherein the raw material includes two protective layers and a slurry sandwiched between the protective layers, and the slurry has the dehydrated CNFs, causing the first redispersion mechanism to face a first section of at least one of the protective layers between the feeding mechanism and the separation mechanism. A liquid medium is added into the liquid container, causing each of the separation mechanism and the first redispersion mechanism to at least partially be immersed in the liquid medium. The separation mechanism is operated to separate the protective layers from each other. The first redispersion mechanism is operated to remove the slurry from the first section, and to disperse the dehydrated CNFs of the removed slurry in the liquid container.

[0007] According to the present application, compared to dehydrating the CNFs into dried powders or subarid slurry in the related arts, the feeding mechanism feeds the raw material including two protective layers and the slurry sandwiched between the protective

layers. The slurry of the raw material can have a smaller thickness and also a high concentration of dehydrated CNFs. Thus, after the separation mechanism separates the protective layers from each other and the first redispersion mechanism removes the slurry from the protective layers, the dehydrated CNFs of the removed slurry can be easily
5 dispersed in the liquid medium to retain the dispersion ability. Thus, the power and the time duration required by the first redispersion mechanism for dispersing the dehydrated CNFs can be reduced, thereby reducing the cost. Furthermore, it is not needed to perform surface modification on CNFs for removing the hydroxyl groups to inhibit agglomeration or keratinization. Thus, the consumption or residue of chemical agents
10 can be reduced while preserving the original surface properties of the dehydrated CNFs.

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.

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

[0010] FIG. 2 is a diagrammatic view showing portions of the dehydrated CNF redispersion device shown in FIG. 1.

[0011] FIG. 3 is a flowchart of a dehydrated CNF redispersion method according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

5 **[0012]** 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
10 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
15 better illustrate details and features of the present disclosure.

[0013] 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.

[0014] Referring to FIG. 1, a CNF redispersion device 1 is provided according to an embodiment of the present application. The device 1 is used for redispersing dehydrated CNFs in a liquid medium. In at least one embodiment, the liquid medium may be water or other solvents suitable for redispersing the dehydrated CNFs.

5 **[0015]** The device 1 includes a feeding mechanism 10, a liquid container 20, a separation mechanism 30, and a first redispersion mechanism 40.

[0016] The liquid container 20 contains the liquid medium. The liquid container 20 may be a container suitable for containing the liquid medium. For example, the liquid container 20 may be a liquid tank. The liquid container 20 includes a bottom wall 21
10 and a sidewall 22 surrounding the edge of the bottom wall 21. The bottom wall 21 and the sidewall 22 cooperatively define a receiving space 23 for containing the liquid medium. The liquid container 20 also has an opening 24 communicating with the receiving space 23, and the opening 24 is defined by the edge of the sidewall 22 away from the bottom wall 21. The liquid medium may be added into the receiving space 23
15 through the opening 24.

[0017] The feeding mechanism 10 may be located outside the liquid container 20. The feeding mechanism 10 feeds a raw material 100 to the separation mechanism 30. The raw material 100 includes two protective layers 101 and a slurry 102 sandwiched between the protective layers 101, and the slurry 102 has the dehydrated CNFs. Each of

the protective layers 101 includes an outer surface 1011 and an inner surface 1012 opposite to the outer surface 1011, and the slurry 102 is located on at least a portion of the inner surface 1012. In at least one embodiment, the feeding mechanism 10 includes a feeding roller 11 and a storage container 12. The storage container 12 stores the raw material 100 therein. The feeding roller 11 feeds the raw material 100 from the storage mechanism toward the separation mechanism 30. In at least one embodiment, the protective layers 101 may be mesh fabrics.

[0018] The separation mechanism 30 is mounted to the liquid container 20 and at least partially immersed in the liquid medium. The separation mechanism 30 is connected to the protective layers 101 and separates the protective layers 101 from each other. In at least one embodiment, the separation mechanism 30 includes two first rollers 31 mounted in the liquid container 20 and two recycling rollers 32 located outside the liquid container 20. The first rollers 31 are spaced from each other, and the protective layers 101 of the raw material 100 traverses through a space between the first rollers 31. A distance between the protective layers 101 gradually increases from the feeding roller 11 to the first rollers 31. Each of the protective layers 101 is guided by one of the first rollers 31 toward one of the recycling rollers 32, respectively. Specifically, the outer surface 1011 of the protective layer 101 is movably attached to the first roller 31, and the inner surface 1012 of the protective layer 101 is movably attached

to the recycling roller 32. As such, the protective layer 101 can be divided into a first section 101A and a second section 101B connected to the first section 101A. The first section 101A of the protective layer 101 extends between the feeding mechanism 10 and the corresponding first roller 31, and the second section 101B of the protective layer 101 extends between the corresponding first roller 31 and the corresponding recycling roller 32. Each recycling roller 32 can rotate about its own axis, such that each of the protective layers 101 can be further fed toward the corresponding first roller 31 and the recycling roller 32 and finally coiled around the recycling roller 32. During the feeding process of the protective layers 101, the protective layers 101 are separated from each other.

[0019] In at least one embodiment, the separation mechanism 30 may further include two second rollers 33 mounted at the edge of the sidewall 22 away from the bottom wall 21. In this case, each of the protective layers 101 is guided by one of the first rollers 31 toward one of the second rollers 33. The second rollers 33 can guide the protective layers 101 from the first rollers 31 toward the recycling rollers 32, and reduce or prevent any friction between the protective layers 101 and the sidewall 22 of the liquid container 20.

[0020] Referring to FIGS. 1 and 2, the first redispersion mechanism 40 is mounted to the liquid container 20 and at least partially immersed in the liquid medium. The first

redispersion mechanism 40 faces the first section 101A of at least one of the protective layers 101. For example, the first redispersion mechanism 40 may face the outer surface 1011 of the first section 101A of one protective layer 101, and may also face the outer surface 1011 of the first section 101A of each of the protective layers 101. The first
5 redispersion mechanism 40 removes the slurry 102 from the first section 101A, such that the removed slurry 102 can disperse in the liquid medium in the liquid container 20. At this time, when the recycling roller 32 rotates, the first section 101A without the slurry 102 is further fed toward the recycling roller 32 to become the second section 101B, and then the second section 101B is coiled around the recycling roller 32. Thus, the
10 recycling rollers 32 can retain the protective layers 101 without the slurry 102 for recycling purposes. The first redispersion mechanism 40 further disperses the dehydrated CNFs of the removed slurry 102 in the liquid container 20.

[0021] In at least one embodiment, the first redispersion mechanism 40 includes two redispersion units 41 located at two opposite sides of the raw material 100. Each of the
15 redispersion units 41 may face the outer surface 1011 of the first section 101A of one of the protective layers 101. Each of the redispersion units 41 may include an ultrasonic device, a mechanical vibration device, or a liquid injection device, which is in contact with or spaced from the protective layers 101. In this embodiment, the redispersion unit 41 may be an ultrasonic device spaced from the protective layer 101, which can apply

ultrasonic waves toward the first section 101A, such that the slurry 102 is removed from the first sections 101A under the ultrasonic waves. Each of the redispersion units 41 may be strip-shaped with a width equal to or greater than that of the raw material 100. Therefore, the redispersion unit 41 may apply ultrasonic waves, mechanical vibration, or
5 liquid injection onto the entire width of the protective layer 101, thereby fully remove the slurry 102 from the protective layers 101.

[0022] Referring to FIG. 1, to further allow the dehydrated CNFs to disperse in the liquid medium more uniformly, the device 1 may further include a stirring mechanism 50 mounted in the liquid container 20. For example, the stirring mechanism 50 may be
10 mounted on the bottom wall 21. The stirring mechanism 50 stirs the liquid medium in the liquid container 20, thereby accelerating the flow of the liquid medium in the liquid container 20. In at least one embodiment, the stirring mechanism 50 includes a stirring paddle.

[0023] According to the device 1 of the present application, compared to dehydrating
15 the CNFs into dried powders or subarid slurry 102 in the related arts, the feeding mechanism 10 feeds the raw material 100 including two protective layers 101 and the slurry 102 sandwiched between the protective layers 101. The slurry 102 of the raw material 100 can have a smaller thickness and also a high concentration of dehydrated CNFs. Thus, after the separation mechanism 30 separates the protective layers 101

from each other and the first redispersion mechanism 40 removes the slurry 102 from the protective layers 101, the dehydrated CNFs of the removed slurry 102 can be easily dispersed in the liquid medium to retain the dispersion ability. Thus, the power and the time duration required by the first redispersion mechanism 40 for dispersing the dehydrated CNFs can be reduced, thereby reducing the cost. Furthermore, it is not needed to perform surface modification on 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.

10 **[0024]** Referring to FIGS. 1 and 2, in at least one embodiment, the device 1 may further include a scraper 51 mounted in the liquid container 20. Along a feeding direction (shown by arrows in FIG. 1) of the protective layers 101, the scraper 51 may be located between one of the first rollers 31 and one of the second rollers 33. The scraper 51 faces and is in contact with the second sections 101B of the protective layers 101.

15 For example, the scraper 51 may face the inner surface 1012 of the second section 101B of each of the protective layers 101, that is, the number of the scraper(s) 51 is two. When some of the slurry 102 remains on the second section 101B, the scraper 51 scrapes the slurry 102 off the second section 101B. Thus, the scraped slurry 102 can disperse in the liquid medium. In at least one embodiment, the scraper 51 may be made of a hard

material, such as polytetrafluoroethylene (PTFE). The scraper 51 may also be made of a soft material, such as silicone rubber. That will cause less damage to the protective layer 101. The scraper 51 may be strip-shaped with a width equal to or greater than that of the raw material 100.

5 **[0025]** Referring to FIG. 1, the device 1 may further include a second redispersion mechanism 52 mounted in the liquid container 20. Along the feeding direction of the protective layers 101, the second redispersion mechanism 52 may be located between one of the scrapers 51 and one of the second rollers 33. The second redispersion mechanism 52 faces the second section 101B of at least one of the protective layers 101. For
10 example, the second redispersion mechanism 52 may face the inner surface 1012 of the second section 101B of one protective layer 101. The second redispersion mechanism 52 may also face the inner surface 1012 of the second section 101B of each of the protective layers 101, that is, the number of the second redispersion mechanism(s) 52 is two. When some of the slurry 102 remains on the second section 101B, the second
15 redispersion mechanism 52 removes the slurry 102 from the second section 101B and disperses the dehydrated CNFs of the removed slurry 102 in the liquid medium. In at least one embodiment, the second redispersion mechanism 52 may include an ultrasonic device, a mechanical vibration device, or a liquid injection device.

[0026] The device 1 may further include a tension adjustment mechanism 53

connected to at least one of the recycling rollers 32. The tension adjustment mechanism 53 adjusts a tension of at least one of the protective layers 101 coiled around the at least one of the recycling rollers 32. For example, the tension adjustment mechanism 53 adjusts the tension of each protective layer 101 coiled around the corresponding recycling roller 32. Thus, the tension of the protective layer 101 can be maintained within a preset range when the protective layer 101 is coiled around the recycling roller 32. In at least one embodiment, the tension adjustment mechanism 53 may include a magnetic damper.

[0027] The device 1 may further include a washing mechanism 54 located outside the liquid container 20. Along the feeding direction of the protective layers 101, the washing mechanism 54 may be located between one of the second rollers 33 and one of the recycling rollers 32. The washing mechanism 54 faces the second section 101B of at least one of the protective layers 101. For example, the washing mechanism 54 may face the outer surface 1011 of the second section 101B of one protective layer 101. The washing mechanism 54 may also face the outer surface 1011 of the second section 101B of each of the protective layers 101, that is, the number of the washing mechanism(s) 54 is two. When some of the slurry 102 remains on the second section 101B, the washing mechanism 54 washes the slurry 102 from the second section 101B, such that the washed protective layers 101 can be coiled around the recycling rollers 32 and reused when needed. In at least one embodiment, the washing mechanism 54 may include a liquid

injection device for injecting liquid onto the second section 101B, thereby removing the slurry 102 from the second section 101B.

[0028] The device 1 may further include a sensor 55 mounted in the liquid container 20. The sensor 55 senses characteristic data which includes at least of a temperature, a pH value, and a viscosity of the liquid medium. The characteristic data can be compared with preset data, and the comparison result is for indicating that whether it is needed to replace the liquid medium in the liquid container 20, thereby improving the redispersing effect. For example, when the viscosity of the liquid medium is larger than a preset viscosity, it is needed to replace the liquid medium in the liquid container 20. Thus, an operator needs to discharge the liquid medium from the liquid container 20 and add a new liquid medium into the liquid container 20.

[0029] FIG. 3 illustrates a flowchart of a CNF surface modification method for applying a surface modification on 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. 3 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.

[0030] At step S1, a liquid container 20 is provided, which has a separation

mechanism 30 and a first redispersion mechanism 40 mounted therein.

[0031] In at least one embodiment, the separation mechanism 30 includes two first rollers 31 mounted in the liquid container 20 and two recycling rollers 32 located outside the liquid container 20. The first rollers 31 are spaced from each other.

5 **[0032]** At step S2, a raw material 100 is fed from a feeding mechanism 10 to the separation mechanism 30.

[0033] The raw material 100 includes two protective layers 101 and a slurry 102 sandwiched between the protective layers 101, and the slurry 102 has the dehydrated CNFs. The first redispersion mechanism 40 faces a first section 101A of at least one of
10 the protective layers 101 between the feeding mechanism 10 and the separation mechanism 30.

[0034] In at least one embodiment, the step S2 may be carried out by making the protective layers 101 to traverse through a space between the first rollers 31 of the separation mechanism 30. Then, each of the protective layers 101 is fed through a
15 designated first roller 31. Then, the fed protective layer 101 is coiled onto the recycling roller 32 coupled to the designated first roller 31.

[0035] At step S3, a liquid medium is added into the liquid container 20, causing each of the separation mechanism 30 and the first redispersion mechanism 40 to at least partially be immersed in the liquid medium.

[0036] In at least one embodiment, the liquid medium may be water or other solvents suitable for redispersing the dehydrated CNFs.

[0037] At step S4, the separation mechanism 30 is operated to separate the protective layers 101 from each other.

5 **[0038]** In at least one embodiment, when the separation mechanism 30 includes the recycling rollers 32, the step S4 may be carried out by rotating the first rollers 31 and the recycling rollers 32, such that each of the protective layers 101 can be further fed toward the corresponding first roller 31 and the recycling roller 32 and finally coiled around the recycling roller 32. During the feeding process of the protective layers 101, the
10 protective layers 101 are separated from each other. The protective layers 101 without the slurry 102 are coiled and retained on the recycling rollers 32.

[0039] In at least one embodiment, the liquid container 20 is further provided with a scraper 51 mounted therein. Each of the protective layers 101 includes a second section 101B extending between one of the first rollers 31 and one of the recycling rollers 32.
15 After feeding the raw material 100 to the separation mechanism 30, the scraper 51 faces the second sections 101B of the protective layers 101. The method may further include operating the scraper 51 to scrape the slurry 102 off the second sections 101B of the protective layers 101.

[0040] The liquid container 20 is further provided with a second redispersion

mechanism 52 mounted therein. After feeding the raw material 100 to the separation mechanism 30, the second redispersion mechanism 52 faces a second section 101B of at least one of the protective layers 101 between a corresponding one of the first rollers 31 and a corresponding one of the recycling rollers 32. The method may further include
5 operating the second redispersion mechanism 52 to remove the slurry 102 from the second section 101B and to disperse the dehydrated CNFs of the removed slurry 102 in the liquid container 20.

[0041] A washing mechanism 54 is further provided outside the liquid container 20. After feeding the raw material 100 to the separation mechanism 30, the washing
10 mechanism 54 faces a second section 101B of at least one of the protective layers 101 between a corresponding one of the first rollers 31 and a corresponding one of the recycling rollers 32. The method may further include operating the washing mechanism 54 to wash the slurry 102 from the second section 101B.

[0042] At step S5, the first redispersion mechanism 40 is operated to remove the
15 slurry 102 from the first section 101A, and to disperse the dehydrated CNFs of the removed slurry 102 in the liquid container 20.

[0043] In at least one embodiment, the recycling rollers 32 can retain the protective layers 101 without the slurry 102 for recycling purposes.

[0044] In at least one embodiment, when dispersing the dehydrated CNFs of the

removed slurry 102 in the liquid container 20, the method further includes sensing characteristic data which includes at least of a temperature, a pH value, and a viscosity of the liquid medium, comparing the characteristic data with preset data, and turning off the separation mechanism 30 and the first redispersion mechanism 40 based on a comparison
 5 result. For example, when the viscosity of the liquid medium is larger than a preset viscosity, it is needed to replace the liquid medium in the liquid container 20. Thus, an operator needs to turn off the separation mechanism 30 and the first redispersion mechanism 40, discharge the liquid medium from the liquid container 20, and add a new liquid medium into the liquid container 20. Then, the separation mechanism 30 and the
 10 first redispersion mechanism 40 are operated again.

[0045] According to the method of the present application, compared to dehydrating the CNFs into dried powders or subarid slurry 102 in the related arts, the feeding mechanism 10 feeds the raw material 100 including two protective layers 101 and the slurry 102 sandwiched between the protective layers 101. The slurry 102 of the raw
 15 material 100 can have a smaller thickness and also a high concentration of dehydrated CNFs. Thus, after the separation mechanism 30 separates the protective layers 101 from each other and the first redispersion mechanism 40 removes the slurry 102 from the protective layers 101, the dehydrated CNFs of the removed slurry 102 can be easily dispersed in the liquid medium to retain the dispersion ability. Thus, the power and the

time duration required by the first redispersion mechanism 40 for dispersing the dehydrated CNFs can be reduced, thereby reducing the cost. Furthermore, it is not needed to perform surface modification on CNFs for removing the hydroxyl groups to inhibit agglomeration or keratinization. Thus, the consumption or residue of chemical
5 agents can be reduced while preserving the original surface properties of the dehydrated CNFs.

[0046] 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
10 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) redispersion device for redispersing dehydrated CNFs in a liquid medium, the device comprising:
 - 5 a feeding mechanism configured to feed a raw material, the raw material comprising two protective layers and a slurry sandwiched between the protective layers, the slurry having the dehydrated CNFs;
 - a liquid container for containing the liquid medium;
 - a separation mechanism mounted to the liquid container, adapted to at least partially
 - 10 be immersed in the liquid medium, and configured to connect to the protective layers and separate the protective layers from each other; and
 - a first redispersion mechanism mounted to the liquid container, adapted to at least partially be immersed in the liquid medium and face a first section of at least one of the protective layers between the feeding mechanism and the separation mechanism, and
 - 15 configured to remove the slurry from the first section and disperse the dehydrated CNFs of the removed slurry in the liquid container.
 2. The dehydrated CNF redispersion device according to claim 1, wherein the separation mechanism comprises two first rollers mounted in the liquid container and two recycling

rollers located outside the liquid container, the first rollers are spaced from each other to allow the protective layers to traverse therebetween, each of the first rollers is configured to guide a corresponding one of the protective layers toward a corresponding one of the recycling rollers, thereby allowing the protective layers to coil around the recycling rollers, and the recycling rollers are configured to retain the protective layers without the slurry.

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

a scraper mounted in the liquid container, wherein each of the protective layers comprises a second section extending between one of the first rollers and one of the recycling rollers, and the scraper is configured to scrape the slurry off the second sections of the protective layers.

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

a second redispersion mechanism mounted in the liquid container, adapted to face a second section of at least one of the protective layers between a corresponding one of the first rollers and a corresponding one of the recycling rollers, and configured to remove the slurry from the second section and disperse the dehydrated CNFs of the removed slurry in the liquid container.

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

a tension adjustment mechanism connected to at least one of the recycling rollers

and configured to adjust a tension of at least one of the protective layers coiled around the at least one of the recycling rollers.

6. The dehydrated CNF redispersion device according to claim 2, further comprising:

5 a washing mechanism located outside the liquid container, adapted to face a second section of at least one of the protective layers between a corresponding one of the first rollers and a corresponding one of the recycling rollers, and configured to wash the slurry from the second section.

7. The dehydrated CNF redispersion device according to claim 1, further comprising:

10 a stirring mechanism mounted in the liquid container and configured to stir the liquid medium in the liquid container.

8. The dehydrated CNF redispersion device according to claim 1, further comprising:

15 a sensor mounted in the liquid container, wherein the sensor is configured to sense characteristic data which comprises at least of a temperature, a pH value, and a viscosity of the liquid medium.

9. The dehydrated CNF redispersion device according to claim 1, wherein the first redispersion mechanism comprises two redispersion units located at two opposite sides of the raw material, and each of the redispersion units is strip-shaped with a width equal to or greater than that of the raw material.

10. The dehydrated CNF redispersion device according to claim 9, wherein each of the redispersion units comprises an ultrasonic device, a mechanical vibration device, or a liquid injection device.

11. The dehydrated CNF redispersion device according to claim 1, wherein the feeding
5 mechanism comprises a feeding roller and a storage container each located outside the liquid container, the storage container is configured to store the raw material, and the feeding roller is configured to feed the raw material from the storage container toward the separation mechanism.

12. A dehydrated cellulose nanofibril (CNF) redispersion method for redispersing
10 dehydrated CNFs in a liquid medium, the method comprising:

providing a liquid container with a separation mechanism and a first redispersion mechanism mounted therein;

feeding a raw material from a feeding mechanism to the separation mechanism, the raw material comprising two protective layers and a slurry sandwiched between the
15 protective layers, the slurry having the dehydrated CNFs, causing the first redispersion mechanism to face a first section of at least one of the protective layers between the feeding mechanism and the separation mechanism;

adding a liquid medium into the liquid container, causing each of the separation mechanism and the first redispersion mechanism to at least partially be immersed in the

liquid medium;

operating the separation mechanism to separate the protective layers from each other;

and

operating the first redispersion mechanism to remove the slurry from the first section,

5 and to disperse the dehydrated CNFs of the removed slurry in the liquid container.

13. The dehydrated CNF redispersion method according to claim 12, wherein the separation mechanism comprises two first rollers mounted in the liquid container and two recycling rollers located outside the liquid container, wherein feeding the raw material to the separation mechanism comprises:

10 extending the protective layers to traverse between the first rollers, feeding each of the protective layers through a designated first roller, and coiling the fed protective layer onto a recycling roller coupled to the designated first roller;

wherein operating the separation mechanism to separate the protective layers from each other comprises:

15 rotating the first rollers and the recycling rollers, thereby separating the protective layers from each other and coiling the protective layers without the slurry around the recycling rollers.

14. The dehydrated CNF redispersion method according to claim 13, wherein the liquid container is further provided with a scraper mounted therein, each of the protective layers

comprises a second section extending between one of the first rollers and one of the recycling rollers, after feeding the raw material to the separation mechanism, the method further comprises:

operating the scraper to scrape the slurry off the second sections of the protective
5 layers.

15. The dehydrated CNF redispersion method according to claim 13, wherein the liquid container is further provided with a second redispersion mechanism mounted therein, after feeding the raw material to the separation mechanism, the second redispersion mechanism faces a second section of at least one of the protective layers between a
10 corresponding one of the first rollers and a corresponding one of the recycling rollers, and the method further comprises:

operating the second redispersion mechanism to remove the slurry from the second section and to disperse the dehydrated CNFs of the removed slurry in the liquid container.

16. The dehydrated CNF redispersion method according to claim 13, wherein a washing
15 mechanism is further provided outside the liquid container, after feeding the raw material to the separation mechanism, the washing mechanism faces a second section of at least one of the protective layers between a corresponding one of the first rollers and a corresponding one of the recycling rollers, and the method further comprises:

operating the washing mechanism to wash the slurry from the second section.

17. The dehydrated CNF redispersion method according to claim 12, further comprising:

sensing characteristic data which comprises at least of a temperature, a pH value,
and a viscosity of the liquid medium;

comparing the characteristic data with preset data; and

5 turning off the separation mechanism and the first redispersion mechanism based on
a comparison result;

discharging the liquid medium out of the liquid container and adding a new liquid
medium into the liquid container; and

operating the separation mechanism and the first redispersion mechanism again.

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