DESCRIPTION

TITLE OF THE INVENTION:

COATING FILM REMOVING DEVICE AND COATING FILM REMOVING METHOD

Field

[0001] The present invention relates to a coating film removing device and a coating film removing method capable of efficiently removing a coating film on a surface of a base film.

Background

[0002] While a plastic is used in various fields, a plastic such as a microplastic is considered to be a cause of marine pollutions, and reduction of environmental load by a plastic is urgently needed.

In recent years, with evolution of Internet of Things (IoT), the number of electronic devices mounted on computers and smartphones, such as CPU, has increased, and as a result, the number of multilayer ceramic capacitors (MLCCs) required to drive the electronic devices has also rapidly increased. A general method for manufacturing this MLCC includes a step of forming a ceramic green sheet layer on a release film obtained by forming a release layer on a plastic base film using the release film as a carrier sheet, and a step of removing the ceramic green sheet layer to form a ceramic green sheet. In these steps, the release film from which the ceramic sheet has been removed is discarded as an unnecessary material.

[0003] That is, an increase in the number of release films as a waste due to a rapid increase in the number of manufactured MLCCs in recent years is an environmental problem, and efforts for reuse of a base film have been activated. A component of a release layer contained in the release film generally has a different composition from a component constituting the base film from a viewpoint of

releasability. Therefore, when the release film with the release layer is remelted as it is to form a regenerated film, the component of the release layer is present as a foreign substance, and therefore stable film formation cannot be performed.

Patent Literature 1 discloses, as a method for removing a release layer containing a water-soluble resin from a release film, a method in which a cleaning liquid in a form of droplets is applied to the release layer, the cleaning liquid is held in the form of droplets on a surface of the release layer, and then the release layer containing the cleaning liquid is removed.

Citation List

Patent Literature

[0004] Patent Literature 1: WO 2022/190713 A

Summary

Technical Problem

[0005] The removing method of Patent Literature 1 has a problem that when a surface roughness of a base film is large or when there is a scratch, a coating film, particularly a water-soluble resin layer formed in contact with the base film remains, and the quality of the base film as a recycled chip is deteriorated.

Therefore, embodiments of the present invention provide a coating film removing device and a coating film removing method capable of reducing a coating film remaining on a base film.

Solution to Problem

[0006] According to a first aspect of the present invention, there is provided a coating film removing device that removes a coating film from a coated film including

the coating film on at least one surface of a base film, the device including: a conveyance mechanism configured to convey the coated film; a mechanism configured to remove the coating film from the coated film; a first cleaning liquid applying mechanism that is disposed on a downstream side of the mechanism configured to remove the coating film from the coated film in a conveyance direction, the first cleaning liquid applying mechanism being configured to apply a cleaning liquid to a surface of the coating film remaining on the base film; and a suction mechanism that is disposed on a downstream side of the first cleaning liquid applying mechanism in the conveyance direction, the suction mechanism being configured to suck residues of the coating film remaining on the base film together with the cleaning liquid, wherein the suction mechanism is a suction roll including a tubular main body portion including a hollow portion therein and having a plurality of holes, and a roll layer made of a nonwoven fabric and formed on an outer peripheral portion of the main body portion.

[0007] The coating film removing device of the above aspect of present invention comprises the following embodiments.

[0007a] In an embodiment, the suction mechanism includes a speed control mechanism configured to control a rotation speed of the suction roll.

[0007b] In an embodiment, the suction mechanism includes: a back roll disposed at a position facing the suction roll with the coated film interposed therebetween; and a nip mechanism configured to presses the suction roll and/or the back roll against the coated film.

[0007c] In an embodiment, the mechanism configured to remove the coating film from the coated film includes: a second cleaning liquid applying mechanism that is different from the first cleaning liquid applying mechanism, the second cleaning liquid applying mechanism being configured to apply the cleaning liquid to the surface of the coating

film; a coating film removing mechanism that is disposed on a downstream side of the second cleaning liquid applying mechanism in a conveyance direction, the cleaning liquid applying mechanism being configured to remove the coating film containing the cleaning liquid from the coated film in which the cleaning liquid is applied to the surface of the coating film.

[0008] According to a second aspect of the present invention, there is provided a coating film removing method for removing a coating film from a coated film including the coating film on at least one surface of a base film using the above coating film removing device, the method including: while conveying the coated film, after removing the coating film from the coated film, applying a cleaning liquid to a surface of the coating film remaining on the base film to suck and remove residues of the coating film remaining on the base film together with the cleaning liquid.

[0008a] According to a third aspect of the present invention, there is provided a coating film removing method for removing a coating film from a coated film including the coating film on at least one surface of a base film using the above coating film removing device, the method including: while conveying the coated film, applying a cleaning liquid to a surface of the coating film and bringing the coating film removing mechanism into contact with the surface of the coating film to remove the coating film containing the cleaning liquid; and thereafter, applying the cleaning liquid to the surface of the coating film remaining on the base film to suck and remove residues of the coating film remaining on the base film together with the cleaning liquid.

Advantageous Effects of Invention

[0009] According to embodiments of the coating film removing device and the coating film removing method of the

present invention, it is possible to reduce a coating film remaining on a base film and to obtain a recycled chip having excellent quality.

Brief Description of Drawings

[0010] FIG. 1 is a schematic view of a coating film removing device according to an embodiment of the present invention.

FIG. 2 is a cross-sectional view of a suction mechanism used in FIG. 1 parallel to a film width direction.

FIG. 3 is a schematic view of a coating film removing device according to Modification 1 of the embodiment of the present invention.

FIG. 4 is a schematic view of a coating film removing device according to Modification 2 of the embodiment of the present invention.

Description of Embodiments

[0011] Hereinafter, an embodiment of the present invention will be described with reference to the drawings. Note that the following description exemplifies the embodiment according to the present invention, the present invention is not limited thereto, and various modifications and combinations can be made without departing from the gist of the present invention.

[0012] (Embodiment)

FIG. 1 is a schematic view of a coating film removing device 100 of the present invention. The coating film removing device 100 includes: an unwinding device 10 that unwinds a film 1 (hereinafter, also referred to as a coated film) including a coating film 3 on one surface of a base film 2; a winding device 20 that winds the base film 2 from which the coating film 3 on a surface of the coated film 1 has been removed; and driving devices 30-1 and 30-2 for

particularly preferable to use a curable silicone resin compound having dimethylsiloxane having high water permeability as a main skeleton, which can be suitably used as a cleaning liquid.

[0015] [Coating film removing device]

In order to stably convey the coated film 1 and the base film 2 from which the coating film 3 has been removed, each of the driving devices 30-1 and 30-2 preferably has a configuration capable of performing tension cut. When the tension cut is performed with a suction roll, a part of the coating film of the coated film 1 may be sucked, which may cause a trouble. Therefore, a configuration in which the coated film 1 is nipped with a metallic drive roll and a rubber roll is more suitably used. For the driving devices 30-1 and 30-2, stainless steel or one that has been surface-treated as a rust prevention measure is suitably used.

[0016] The cleaning liquid applying mechanism 40 includes a discharge nozzle that discharges the cleaning liquid 41, a liquid feeding pump that feeds the cleaning liquid 41 to the discharge nozzle, and a tank that stores the cleaning liquid 41.

The amount of the cleaning liquid to be applied to a coating film surface of the coated film 1 can be preferably 1 cm^3/m^2 or more such that at least some components of the coating film can be sufficiently dissolved, and it is preferable to control the liquid feeding pump according to a conveyance speed of the coated film 1 to determine specifications of the discharge nozzle and the liquid feeding pump such that a necessary amount of the cleaning liquid 41 can be applied to the coating film surface of the coated film 1. The discharge nozzle only needs to be able to apply the cleaning liquid 41 to the coating film surface of

the coated film 1, and examples thereof include a spray, a shower head nozzle, and a jet nozzle for high-pressure water.

The cleaning liquid applying mechanism 40 only needs to be able to apply the cleaning liquid 41 to the coating film surface of the coated film 1, and may include a liquid tank storing the cleaning liquid 41 to immerse the coated film 1 in the liquid tank to apply the cleaning liquid 41 to the coating film surface.

[0017] The cleaning liquid 41 used in the coating film removing device 100 exhibits its effect with any solvent as long as the solvent can dissolve at least some components of the coating film, but water is preferably used in order to reduce environmental load. In addition, a surfactant or the like may be added to the cleaning liquid 41 in order to improve wettability with the coated film to make the cleaning liquid 41 easily spread over the coating film surface.

In order to dissolve at least some components of the coating film quickly, it is preferable to apply the heated cleaning liquid 41 to the coating film surface of the coated film 1. When a discharge nozzle is used, the discharge nozzle may include a heat source such as a cartridge heater, or a tank that stores the cleaning liquid 41 may be heated. When the liquid tank is used, the liquid tank may be heated, or a throw-in heater may be disposed inside the liquid tank. Any means that can heat the cleaning liquid 41 may be used, and the present invention is not limited thereto.

[0018] The coating film removing mechanism 50 has an edge 51 that extends in a ridge line shape in the film width direction and comes into contact with a surface of the coating film 3 of the coated film 1 to remove the

CLAIMS

1. A coating film removing device that removes a coating film from a coated film including the coating film on at least one surface of a base film, the device comprising:

a conveyance mechanism configured to convey the coated film;

a mechanism configured to remove the coating film from the coated film;

a first cleaning liquid applying mechanism that is disposed on a downstream side of the mechanism configured to remove the coating film from the coated film in a conveyance direction, the first cleaning liquid applying mechanism being configured to apply a cleaning liquid to a surface of the coating film remaining on the base film; and

a suction mechanism that is disposed on a downstream side of the first cleaning liquid applying mechanism in the conveyance direction, the suction mechanism being configured to suck residues of the coating film remaining on the base film together with the cleaning liquid, wherein

the suction mechanism is a suction roll including a tubular main body portion including a hollow portion therein and having a plurality of holes, and a roll layer made of a nonwoven fabric and formed on an outer peripheral portion of the main body portion.

2. The coating film removing device according to claim 1, wherein the suction mechanism includes a speed control mechanism configured to control a rotation speed of the suction roll.

3. The coating film removing device according to claim 1, wherein

the suction mechanism includes:

a back roll disposed at a position facing the suction roll with the coated film interposed therebetween; and

a nip mechanism configured to presses the suction roll and/or the back roll against the coated film.

4. The coating film removing device according to claim 1, wherein

the mechanism configured to remove the coating film from the coated film includes:

a second cleaning liquid applying mechanism that is different from the first cleaning liquid applying mechanism, the second cleaning liquid applying mechanism being configured to apply the cleaning liquid to the surface of the coating film;

a coating film removing mechanism that is disposed on a downstream side of the second cleaning liquid applying mechanism in a conveyance direction, the cleaning liquid applying mechanism being configured to remove the coating film containing the cleaning liquid from the coated film in which the cleaning liquid is applied to the surface of the coating film.

5. A coating film removing method for removing a coating film from a coated film including the coating film on at least one surface of a base film using the coating film removing device according to any one of claims 1 to 3, the method comprising:

while conveying the coated film,

after removing the coating film from the coated film, applying a cleaning liquid to a surface of the coating film remaining on the base film to suck and remove residues of the coating film remaining on the base film together with

the cleaning liquid.

6. A coating film removing method for removing a coating film from a coated film including the coating film on at least one surface of a base film using the coating film removing device according to claim 4, the method comprising:

while conveying the coated film,

applying a cleaning liquid to a surface of the coating film and bringing the coating film removing mechanism into contact with the surface of the coating film to remove the coating film containing the cleaning liquid; and

thereafter, applying the cleaning liquid to the surface of the coating film remaining on the base film to suck and remove residues of the coating film remaining on the base film together with the cleaning liquid.