Apparatus and method for peeling and removing a coated film from a resin product

Vorrichtung und Verfahren zum Abschälen und Entfernen von einer Beschichtung eines Kunststofferzeugnisses

Procédé et appareil pour peler et enlever d'un revêtement d'un produit à base de résine

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Description

[0001] The present invention relates to a coated film peeling/removing apparatus for coated resin products, e.g., bumpers, side lacings for a vehicle, CD-ROM or the like used electronic appliances. Further, the present invention relates to a peeling/removing method of the coated film.

[0002] In recent years, many serious considerations are largely placed on recycling of resin products due to mounting interest in environmental problems and reutilization of sources (materials, natural resources). An attention is paid to recycling of resin products removed from wasted vehicles and discarded products. The problems are particularly intense for used products such as bumpers, side lacings or similar resin products produced by a vehicle industry.

[0003] The surface of this kind of resin products such as bumpers, side lacings or the like is usually coated with surface treatment materials for improving appearance and quality improvement. In general, a film is coated on the surface of the bumpers made from thermoplastic resin materials such as polypropylene based resin or the like after applying a primer later composed of thermoplastic resin such as polypropylene based resin or the like. The material of this coated film is a thermosetting resin, e.g., an amino polyester based resin, an amino acrylic based resin, an amino polyester urethane based resin or an acrylic urethane based resin. And, these resins are liquid before hardening reaction but a bridge structure is given to the film by a baking finish. Since the structure is strong and dense, the coated resin bumper has excellent chemical resistance, heat resistance, scratching resistance, weather resistance and excellent surface brightness.

[0004] When the coated bumper is crushed in this condition for pelletizing, coated film pieces are mixed in the raw material of the resin product composed of polypropylene based resin. Mold in polypropylene based resin, the coated film pieces obstruct flowability of the molten resin, causing "burn", "weld mark", "bubbles" or a similar failed molding to occur. Another drawback is that the coated film pieces floated up on the surface of the resin product degrades the appearance of the resin product.

[0005] The coated film pieces are thermosetting resin and a polypropylene based resin serving as a base resin so that little mutual interference occurs between the coated film pieces and the base resin, and the coated film pieces which can not finely be dispersed in the base resin prevents the recycled resins from being integrally kneaded, resulting in remarkably deteriorated mechanical properties of the recycled resin product. Consequently, the usable range of the recycled resin product is largely restricted.

[0006] For this reason, removing of the coated film is absolutely necessary required in the case that the resin products are recycled with the coated resin products. As disclosed at page 3 to 9, NO. 5, Vol. 46, in Technical Booklet "Automobile Technology" edited and published in 1992 by Incorporated Body "Automobile Technology Association", Japan, there are many mechanical, physical and chemical methods for peeling and removing the coated films from the coated resin product.

[0007] As the mechanical coated film removing method, there is a shot blasting method of blowing fine granular abrasive material toward the coated surface of the resin product to break thereof and then removing the broken coated resin, and a screen mesh method of removing coated film pieces mixed but not disssolved in the molten resin after finely crushing the resin product, melting the finer crushed and filtering coarse resin products by extruding through a screen mesh.

[0008] The shot blasting method is acceptable from the viewpoint that poisonous substances are not scattered and environmental safety is secured. On the contrary, a large shot blast equipment is required and coated film removing efficiency is not satisfactorily high. Especially, it is very difficult to apply this method for concaved, recessed or irregularly protruded part. And, the screen mesh method is acceptable from the viewpoints as mentioned above, however, there arises a malfunction of cloggedness because the screen mesh is clogged with undissolved coated pieces, causing extrusion force to be remarkably increased, resulting in extrusion quantity and productivity being degraded. Thus, the coated film can not be removed at a sufficiently high efficiency. Another drawback is that there often arises a necessity for replacing the screen mesh with a new one when the screen mesh is clogged with the coated film pieces, resulting in a low production efficiency.

[0009] The physical removing method of the coated film uses a halogen based solvent or various kinds of organic solvents. So that a phenomenon of penetration of solvent into the boundary between the coated film and raw material or a phenomenon of expansion of the coated film is utilized for removing the coated film. However, this method is unacceptable from the viewpoint as mentioned above, and the coated film removing efficiency and the treatment capacity are comparative low, and moreover, there is a defect that the characteristics of the raw material may change.

[0010] As the chemical coated film removing method, there is known an organic acid salt method of chemically dissolving and removing the coated film by cutting an ether bonding in the proximity of a bridge point of the resin to be peeled in an ethanol aqueous solution containing, e.g., an organic salt.

[0011] This coated film removing method has a problem which requires a secondary treatment such as wasted water treatment or the like, and moreover, a treatment efficiency is low and inefficient.

[0012] In addition, as an apparatus for removing coated film of a resin product, there is shown a prior art apparatus for peeling the surface of a synthetic resin as shown in Fig. 22 that is an illustrative front view and dis-

[0013] The peeling apparatus is such that a resin product, e.g., a side lacing 102 is conveyed between rotary members 103 and 104 each composed of a foamed synthetic resin in contact with the resin product, the rotary members 103 and 104 are broken due to the brittleness while generating powder dust. For this reason, the peeling apparatus is not preferable from the viewpoint of working environment. Another drawback is that this peeling apparatus is not suitable for a bent or curved resin product.

[0015] WO92/00152 discloses a method and apparatus for separating paper laminate from gypsum wallboard comprising a roller and a plate spatially disposed from the roller.

[0016] DE-A-4322298 discloses a method of removing a first coating from a resin product by giving a shearing stress between the first coating and the resin product through a pair of first removing rollers rotated at different speeds with respect to each other in accordance with the preamble of claim 8 and an apparatus therefor in accordance with the preamble of claim 1.

[0017] GB-A-2240067 discloses an apparatus for removing melamine, facing from chipboard comprising a treatment member, for example a toothed roller, and feed means for feeding the board past the treatment member.

[0018] EP-A-551655 discloses a method for crushing scrap plastics or organic natural polymers whereby the scrap plastics or organic natural polymers are communicated between preferably fixedly-mounted rolls which rotate in the same or opposite directions.

[0019] The present invention has been made in consideration of the aforementioned background.

[0020] An object of the present invention is to provide an apparatus for peeling and removing coated films from coated resin products which has an excellent coated film removing efficiency, excellent environment safety and excellent treatment capability and which can obtain a high quality of recycled resin product.

[0021] Another object of the present invention is to provide a method of peeling and removing coated films from coated resin products which assures that a hot resin to be crushed and pelletized is effectively cooled for improving productivity at the intermediate part of the whole steps.

[0022] According to one aspect of the present invention, there is provided an apparatus for removing a first coating (Wc) from a resin material (Wb) of a resin product (Wa), having a first coating removing device including a pair of first removing rollers arranged opposite each other and provided to roll the resin product (Wa), said pair of first removing rollers being rotatable at different rotational speeds, thereby in use to apply a shearing stress between the coating (Wc) and the resin material (Wb) to remove the coating (Wc) from the resin material (Wb), characterised in that: a shape forming device is provided prior to said first coating removing device said shape-forming device being arranged to roll and form the resin product (Wb) into a trapezoidal cross-sectional shape and to convey the shape-formed product to the first coating removing device, said shape forming device including a pair of a coated film side roller and a resin material side roller which are opposed to each other to define a rolling gap therebetween, said coated film side roller having first spiral grooves forming a first spiral projected part disposed on one side of a plane perpendicular to the axis of said coated film side roller, and second spiral grooves forming a second spiral projected part disposed on the other side of said plane, said first spiral projected part and said second spiral projected part having mutually opposite spiral directions and said resin material side roller being a smooth cylindrical roller, so that when the coated film side roller is rotated, said first and second spiral projected parts exert on the coating (Wc) forces resisting free extension of the coating (Wc) in the axial directions of the coated film side roller while the smooth resin material side roller allows free extension of the resin material (Wb) in the axial directions of the resin material side roller, to enable the resin product (Wb) to be formed into a trapezoidal shape in cross section in which the side of the resin product having the coating (Wc) thereon has a smaller width than the side of the resin material (Wb).

[0023] In addition, according to another aspect of the present invention, there is provided a method of removing a first coating (Wc) from a resin product (Wa) by giving a shearing stress between the first coating (Wc) and the resin product (Wa) through a pair of first removing rollers rotated at different speeds with respect to each other, characterised by the steps of: forming the resin product (Wa) between a pair of rollers into a trapezoidal shape in cross section in which a side of the resin product having the first coating (Wa) thereon has a smaller width than an opposite side of the resin product; and conveying the formed resin product between said first removing rollers to remove the first coating (Wa).

**BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is a schematic perspective view illustrating a recycling process of resin coated products;
[0025] The present invention will now be described in details hereinafter with reference to the accompanying drawings which illustrate preferred embodiments thereof.

[0026] In Fig. 1, description is made with respect to the case that a resin bumper, i.e., a comparatively larger part of a vehicle is recovered and recycled.

[0027] Fig. 1 is an illustrative view which shows the outline of a method of recycling coated resin products for which a coated film peeling/removing apparatus constructed in accordance with an embodiment of the present invention is used.

[0028] The outline of the recycling method will be described with reference to Fig. 1. A bumper W derived from a production or assembling line as a defected article in a production line or taken from a used and wasted vehicle is recovered in a resin product recovering step a at which metallic parts are removed, and thereafter, a resin member Wa having a predetermined width is cut from out of the bumper W at a next resin product cutting step b.

[0029] The resin member Wa is treated in a next coated film peeling step c so that a coated film Wc is peeled and removed from the resin member Wb through a coated film peeling/removing apparatus 1 to be described later.

[0030] After the coated film Wc is peeled and removed from the resin material at the coated film peeling step c, the resin member Wb is crushed at a next crushing treatment step d by operating a shredder or a similar machine to provide a crushed material Wd.

[0031] Then, the crushed material Wd is fed to, e.g., an extruder at a subsequent pelletizing step e at which the crushed material Wd is displaced by rotation of a screw in a barrel of the extruder while it is heated by a band heater.

As the crushed material Wd is displaced outwardly in the barrel, it is molten and extruded through a die to provide pellets We each having a predetermined contour. At this time, remaining coated film pieces are removed from the molten resin through of a screen mesh disposed at the foremost end of the barrel. It should be added that a treating capacity can be elevated by automatically changing the screen mesh with another one so as to improve a productivity.

[0032] The pellet We obtained at the pelletizing step is added with pellets produced from virgin (new) polypropylene based resin or the like so that a resin product such as a bumper W or a similar product is again molded.

[0033] The crushed material Wd is pelletized at the pelletizing step, but if the crushed material Wd is finely crushed, the pelletizing step e may be eliminated de-
pending on the crushed state of the pellet We.

[0034] Next, the coated film peeling/removing apparatus 1 for peeling and removing the coated film Wc from the resin material Wb at the coated film peeling step c will be described below.

[0035] Fig. 2 is the whole side view of the coated film peeling/removing apparatus 1. The coated film peeling/removing apparatus 1 includes a preliminary treatment step A comprising a projected part shearing step B of cutting projected parts Wf such as ribs or the like protruding from the resin member Wa cut to have a predetermined width at the resin product cutting step b to provide a flat plate-like resin a and an end part treating step C of treating the end part shape of the resin member Wa modified to a flat plate-shaped resin at the projected part shearing step B. In addition, the coated film peeling/removing apparatus 1 includes a coated film peeling step D comprising an upper surface coated film peeling step E of peeling from the resin material Wb the coated film Wc coated on the upper surface of the resin member Wa of which shape is regulated at the preliminary treatment step A and a lower surface coated film peeling step F of peeling from the resin material Wb a coated film formed on the lower surface of the resin member Wa.

[0036] The coated film peeling/removing apparatus 1 includes a protruded part shearing device 10 and an end part treating device 20 adapted to function corresponding to the protruded part shearing step B and the end part treatment step C, a coated film peeling device provided corresponding to the coated film peeling step D, and the coated film peeling device includes an upper surface coated film peeling device 30 and a lower surface coated film peeling device 40 corresponding to the upper surface coated film peeling step E and the lower surface peeling step F. And, conveying apparatuses 50, 60 and 70 are provided between the respective devices 10, 20, 30 and 40.

[0037] Next, the foregoing devices will successively be described below. The projected part shearing device 10 includes a guide portion 12 for conducting to the conveying device 50 the resin member Wa fed from an inlet port 12a and includes an opposing pair of support roller 13 and a shear roller 14 located opposite to each other at the intermediate position of the guide portion 12.

[0038] As shown in Fig. 3, the support roller 13 is rotatably supported between a pair of support roller supporting members 19a vertically displaceably supported on a support frame 11 of the protruded part shearing device 10, and support roller 13 is rotationally driven by a rotational driving device 15 such as a motor equipped with a speed reduction unit jointed thereto via a universal joint 15a. In addition, by raising or lowering a support roller supporting member 19a by raising/lowering means 19, the support roller 13 is vertically displaced to adjust a gap between the support roller 13 and the shear roller 14 corresponding to a thickness of the coated resin member Wa.

[0039] The shear roller 14 is rotatably supported relative to the frame 11 by a pair of shear roller supporting members a while it is located on the opposite side to the support roller 13, and it is rotationally driven by a rotational driving device 16 such as a motor equipped with a speed reduction unit.

[0040] The shear roller 14 is shown by a perspective view of Fig. 4, and as shown in Fig. 5a by a sectional view through the shear roller in Fig. 5b by a sectional view of the shear roller and a development view of the roller surface of the shear roller 14 in Fig. 5c, a plurality of shearing blades 14a each comprising an annular projection smoothly extending in a sinusoidal pattern on a column-like roller surface are formed in the direction of a roller rotational shaft in the equally spaced relationship via a plurality of annular grooves 14b each extending in a sinusoidal pattern.

[0041] The support roller 13 and the shear roller 14 are rotationally driven by the rotational driving devices 15 and 16 in such a manner that the devices 15 and 16 are rotated in the opposite direction relative to each other so as to allow the resin member Wa fed in the inlet port 12a while clamped therebetween in cooperation with each other to be conveyed to the side of the conveying device 50, and moreover, the rotational circumferential speed of the shear roller 14 is larger than that of the support roller 13.

[0042] With this construction, as shown in Fig. 6 that is an illustrative view of operation, as the resin member Wa including a protruded part Wf such as a rib or the like fed between the support roller 13 and the shear roller 14 each having a different rotational circumferential speed is conveyed in cooperation of the support roller 13 with the shear roller 14, the protruded part Wf is inserted in a groove portion 14b of the shear roller 14 and so that the protruded part Wf is sheared by a shear blade 14a formed along the surface of a roller and smoothly extending in the sinusoidal pattern to exhibit a flat plate-like contour.

[0043] Since the shearing blade 14a is formed to smoothly extend in the sinusoidal pattern, the protruded part Wf is smoothly cut not only without any collision of the protruded part Wf with the shearing blade 14a but also without any plucking of the protruded part Wf due to the shearing blade 14a as represented by Fig. 6A.

[0044] There is a fear that removal of a protruded part can not be achieved attributable to adhesion of chips, dust or the like appearing on removal of the protruded part Wf by shearing to the groove portion 14b between the shearing blades 14a of the shear roller 14. To deal with the foregoing malfunction, the protruded part shearing device 10 is provided with a shear roller adhered material removing mechanism 18 for removing adhered material adhering to the groove portion 14b of the shear roller 14.

[0045] As shown in Fig. 7 the shear roller adhered material removing mechanism 18 includes a base 18a having a substantially U-shaped base 18a and secured to the frame 11 in parallel with the rotational shaft line of
the shear roller 14, a slider 18b having a substantially T-shaped sectional shape and a pair of slide receivers 18c adapted to hold the base end of the slider 18b in the clamped state and allowing reciprocable movement of the slider 18b in the direction of the rotational axis line of the shear roller 14.

A pair of guide pins 18d adapted to hold side surfaces 14c of the shearing blade 14a and including guide rollers 18e rolling on the side surfaces 14c are disposed on the opposite sides of the top end of the slider 18b, and the slider 18b is constructed to reciprocably displace in the direction of the rotational axis line of the shear roller 14. In addition, a plurality of scraper pins 18f adapted to be fitted in respective grooves 14b formed in the shear roller 14 are disposed at the top portion of the slider 18b so as to allow the top portion to be resiliently biased toward the protruding direction by springs 18g fitted in guide holes 18h formed in the slider 18.

Thus, the adhering material adhering to the groove portion 14b formed on the rotating shearing roller 14 is displaced toward the direction of the rotational axis line of the shearing roller 14 as the shearing roller 14 rotates so that it is normally scraped by the head portions of the scraper pins 18f normally fitted in the respective grooves 14b.

The adhering material scraped down by the top portions of the scraper pins 18f drop in a receiving portion 18i disposed below the shearing roller 14, and it is conveyed out of the protruded part shearing device 10 by a conveyer (not shown) or the like.

The resin member Wa treated to exhibit a flat plate-like contour with the protruded portion Wf sheared and removed therefrom by the protruded part shearing device 10 is fed to conveying device 50, and it then is conveyed to an end part treating device 20 adapted to function as a next end part treating step C by the conveying device 50.

As shown in Fig. 2 and Fig. 8, the conveying device 50 is such that five pairs of rollers 55 each comprising a coated film side conveying roller 56 and a resin material side conveying roller 57 rotationally driven via a power transmission means 53 and a pulley 54 of the like such as a chain and a belt or the like in this embodiment by a rotational driving device 52 such as a motor including a speed reduction unit or the like via a universal joint 55a. By raising and lowering a coated film side rolling roller support member 29 by raising and lowering means 29, the coated film side rolling roller 23 is vertically displaced whereby a gap between the coated film side rolling roller 23 and a resin material side rolling roller 24 is adjusted.

On the other hand, the resin material side rolling roller 24 is supported on a support frame 21 in the opposing relationship relative to the coated film side rolling roller 23 by a pair of supporting members 21a such that its opposite ends can be rotated by a rotational driving device 25 such as a motor including a speed reduction unit or the like. The coated film side rolling roller 23 and the resin material side rolling roller 24 are rotationally driven in the opposite direction so as to allow the resin member Wa fed between the coated film side rolling roller 23 and the resin material side rolling roller 24 to be rolled and be transferred to the side of a conveying device 60.

In addition, as shown in Fig. 10, a plurality of spiral grooves 23a each extending in the different spiral direction from the central side of the roller surface of the coated film side rolling roll toward the end side of the roller surface are formed on the roller surface of the coated film side rolling roller 23. Each spirally extending surface 23a has an arched-sectional contour and it is formed such that as the coated film side rolling roller 23 is rotated, the pressure contact position between the coated film side rolling roller 23 and the resin member Wa is successively dislocated from the end side of the coated film side rolling roller to the central side of the coated film side rolling roller 23.

Thus, the resin member Wa fed between the coated film side rolling roller 23 and the resin material side rolling roller 24 each rotationally driven is subjected to rolling by the rolling rollers 23 and 24 and expands also in the rotational axis line direction of rolling rollers.
23 and 24. When the resin member Wa is subjected to rolling, the end part of the spirally extending groove 23a formed on the roll surface of the coated film side rolling roller 23b, i.e., the spiral projected part 23b plunges in the surface of the coated film Wc so that extension of the resin member Wa to the coated film Wc in the direction of the rotational axis line of the rollers 23 and 24 caused by the rolling is suppressed and the contact portion of the resin raw material side rolling roller 24 of the resin raw material Wb is more expanded. For example, shown by the sectional plane of the resin member Wa in Fig. 11(a), the resin member Wa formed by represented by a substantially sectional rectangle is modified such that the resin material Wb side is largely expanded than the coated film Wc side so that the resin member Wa having a substantially trapezoidal shape with the coated film Wc side as short side is formed.

[0057] The resin member Wa which is shape-corrected during the end part treatment step C to exhibit a substantially rectangular shape or a trapezoidal shape having the resin material Wb enlarged is successively nipped between a conveyance coated film side roller 66 and a conveyance resin raw material side roller 67 by a conveyance device 60 including plural roller pair 65 comprising a conveyance coated film side roller 66 and a conveyance resin material side roller 67 rotationally driven by a rotational driving unit 62 such as a motor or the like via power transmission means 63, and thereafter it is conveyed and fed to an upper surface coated film peeling device 30 which serves as an upper surface coated film peeling step E.

[0058] The upper coated film peeling device 30 conducts the resin member Wa conveyed by the conveyance device 60 between the coated film side roller 33 and the resin material side roller 34. A guide portion 32 for conducting the resin raw material Wb having the coated film Wc peeled therefrom by the rollers 33 and 34 is provided and a pair of coated film side roller 33 and resin material side roller 34 for peeling the coated film Wc are arranged at the intermediate part of the guide portion 32 in the opposing relationship.

[0059] The coated film side roller 33 and the resin material side roller 34 are made of a metallic material and each roller surface is mirror-finished or plated with chromium. As shown in Fig. 12, the coated film side roller 33 is rotatably supported between a pair of coated film side roller supporting member 39a vertically displaceably supported on a support frame 31 of the upper surface coated film peeling device 30, and it is rotationally driven by a rotational driving device 35 such as a motor including a speed reduction unit connected via a universal joint 35a. By raising or lowering the coated film side supporting member 39a by raising/lowering means 39, the coated film side roller 33 is vertically displaced to adjust a gap between the coated film side roller 33 and the resin material side roller 34.

[0060] On the other hand, the opposite ends of the resin material side roller 34 are rotatably supported opposite to the coated film side roller 33 on the support frame 31 via a supporting member 31a, and the resin material side roller 34 is rotationally driven by a rotational driving device 36 such as a motor including a speed reduction unit or the like.

[0061] To assure that the coated film side roller 33 and the resin material side roller 34 have a different rotational circumferential speed, e.g., the rotational circumferential speed of the resin material side roller 34 coming in pressure contact with the surface of the resin material Wb has a larger rotational circumferential speed of the coated film side roller 33 coming in pressure contact with the surface of the coated film Wc, and to impart a certain intensity of squeezing force to the resin material fed to the both rollers 33 and 34, the latter are rotationally driven in the opposite direction.

[0062] Therefore, the resin member Wa fed from the conveyance device 60 is subjected to rolling in the presence of the squeezing force given by the coated film side roller 33 and the resin material side roller 34, and a shear slipping stress is exerted on the coated film Wc and resin member Wb due to difference of relative rotational circumferential speed between both the rollers 33 and 34, whereby the coated film Wc is peeled from the resin material Wb.

[0063] In the case that a sectional shape of the resin member Wa fed between the coated film side roller 33 and the resin material side roller 34 is a rectangle as shown in Fig. 13a, the coated film Wc side coming in pressure contact with the coated film side roller 33 and the surface side of the resin material Wb coming in pressure contact with the resin material side roller 34 are deformed as if pushed out outwardly by the squeezing force given by the coated film side roller 33 and the resin material side roller 34 as shown in Fig. 13b. However, especially, at the end parts of the resin material Wb and the coated film Wc, the thrusting force given by the coated film side roller 33 and the resin material side roller 34 are not maintained so that a sufficient shear slipping stress does not arise between the resin material Wb and the coated film Wc, whereby the coated film Wc is incompletely peeled and there is a fear that the coated film Wc remains in the vicinity of the resin material Wb.

[0064] However, when the sectional shape of the resin member Wa is modified in the form of trapezoidal configuration having a short side identified by Wc during the end part treatment step C as shown in Fig. 13c, the surface sides of the coated film Wc side and the resin material Wb are deformed as if pushed out outwardly by the squeezing forces given by the coated film side roller 33 and the resin material side roller 34. At this time, since the squeezing force given by the coated side roller 33 and the resin material side roller 34 is applied to the end part and a sufficient shear slipping stress arises between the upper surface of the resin material Wb and the coated film Wb, sufficient peeling of the coated film Wc is achieved in the vicinity of the resin material Wa, resulting in the remaining of the coated film Wc being
The scraper 37 is set to about 126° and the tangential line of the roller surface 33a of the coated film side roller 33 in the vicinity of the roller surface 33a of the coated film side roller 33. The coated film Wc scraped from the roller surface 33a of the coated film side roller 33 is conveyed and recovered from the upper surface coated film peeling device 30 by conveying device, e.g., a belt conveyer 37b.

The scraper 37 is made of a high carbon steel, e.g., S45C (JIS Standard), and as shown in Fig. 14 that is an enlarged view of essential components, a foremost end 37a of the scraper 37 exhibits an acute angle of about 45°, an angle α between the upper surface of the scraper 37 and the tangential line of the roller surface 33a is set to about 126°, and a gap β between the roller surface 33a and the foremost end 37a of the scraper 37 is set to about 0.03 mm.

In addition, to assure that scraping and recovering of the coated film by the scraper 37 by reducing the adhering force of coated film Wc to the coated film side roller 33, cooling means for cooling the coated film side roller 33 is provided.

An embodiment of the roll cooling means will be described below with reference to Fig. 15 to Fig. 17. Fig. 15 is a schematic view which shows an outline of the roll cooling means. Reference numeral 34 denotes a resin material side roll rotationally driven by a rotational driving device 35 or a rotational driving device 36 or a coated film side roller rotationally driven by a rotational driving device 35 or both rollers 33 and 34. In this embodiment, reference numeral 38 denotes cooling means for cooling the coated film side roller 33.

The cooling means 38 includes an inflow pipe 38a and an outflow pipe 38b for connecting a cooling liquid storing tank 38c to a connecting member 38i connected to the side which is not jointed to the rotational driving device 35 for the coated film side roll 33 for supplying and discharging cooling liquid to the coated film side roll 33, a pump 38d for pumping the cooling liquid in the coated film side roller 33 from the cooling liquid storing tank 38c via the connecting member 38i is disposed in the inflow pipe 38a, and a temperature sensor 38f for detecting the temperature of the cooling liquid recovered from the coated film side roll 33 and a radiator 38h for cooling the cooling liquid are disposed on the outflow pipe 38a.

In addition, the cooling means 38 includes a pump driving/controlling circuit 38g for controlling the rotation of a rotational driving device 38e such as a motor or the like for rotationally driving the pump 38d in conformance with a temperature detecting signal outputted from a temperature sensor 38f.

On the other hand, as shown in Fig. 16a that is a sectional view, Fig. 16b that is a cross-sectional view taken line XVib-XVib and Fig. 17 that is a sectional exploded perspective view, the coated film side roll 33 includes a roll main body 33A, a joint member 33B and an annular member 33C, the roll main body 33A is constructed such that its one end side is rotatably supported by a coated film side roll supporting member 39a, and a rotational shaft 33b rotationally driven by the rotational driving device 35, an annular member fitting groove 33c surrounding the rotational shaft 33b and a joint member fitting recess 33d are formed on the other side. In addition, a plurality of cooling liquid piping passages 33e are formed in the vicinity of a roll surface 33a of the roll main body 33A for making communication between the annular member fitting groove 33c and the joint member fitting groove 33d.

The joint member 33B includes a main body portion 33f fitted into a joint member fitting groove 33d and a rotational shaft 33g projecting from the main body portion 33f to rotatably support in a coated film side roll support member 39a, and a cooling liquid discharge piping passage 33h having a bottom and extending from the rotational shaft 33g to the main body portion 33f along the rotational axis line, an auxiliary cooling liquid pipe 33i of which one end is communicating with a cooling liquid piping passage 33e formed in the roll main body 33A, a supply side joint pipe passage 33j for making communication between the auxiliary cooling liquid pipe passage 33i and the cooling liquid discharge pipe passage 33h, a discharge side communicating pipe passage 33k and an annular member fitting groove 33c of which other end is opened to the auxiliary cooling liquid pipe passage 33i are formed.

The annular member 33C has an annular contour, and by fitting the annular member 33C in the annular member fitting groove 33c of the roll main body 33A, a communication pipe passage 33s for making communication between the ends of adjacent cooling liquid pipe passage 33e is closed and forms a recirculation passage of the cooling liquid in the roller main body 33A.

On the other hand, the connecting member 38i includes an inlet connected to the inflow pipe 38a and a discharge port 38m connected to the delivery pipe 38k. The other end of the discharge port 38m is connected to the joint pipe 38p so as to allow the discharge port 38m to be rotated relative to the joint pipe 38p threadedly connected to one end of the rotational shaft 33g. An inner pipe 38g is disposed in the joint pipe 38p of which foremost end is inserted into the supply side connecting pipe passage 33j with an annular gap kept between the inner pipe 38g and the casing 38j. The casing 38j is disposed at a supporting member 39a located on the opposite side to the coating film side roller.

The temperature sensor 38f detects the temperature of the cooling liquid in the discharge pipe 38b, and as the temperature is elevated, an output value from the pump driving/controlling circuit 38g, e.g., an electric current is increased, a flow rate of cooling liquid by a pump 38d driven by a driving device 38e is increased and a quantity of pumped cooling liquid delivered from
the coated film side roller 33 at a temperature of 40 °C, especially, when the cooling liquid discharged from the coated film side roller 33 and the resin material side roller 34 and a temperature relationship between a coated film peeling rate when the coated film side roller 33 is scraped by the scraper 37 from the roller surface of the coated film side roller 33, Fig. 18b is a diagram which shows the relationship between the temperature of cooling liquid detected by the temperature sensor and an adhesion remaining charged from the coated film side roller 33 and detected with the result that the temperature of the coated film side roller is controlled to assume a constant level.

[0078] The cooling liquid which has cooled the cooling liquid side roller 33 flows from the discharge side connection pipe passage 33k to the discharge pipe passage 33h and further through the joint pipe 38p so that it is pumped in a radiator 38h via the discharge port 38m of the joint member 38l and the discharge pipe 38b, and subsequently, after heat radiating and cooling in the radiator 38h, the cooling liquid is recovered in the cooling liquid pipe passage 33e, causing it to flow the respective cooling liquid pipe passages 33e, the auxiliary cooling liquid pipe passage 33i and the communication passage 33s. Subsequently, the cooling liquid is recirculated in the vicinity of the roll surface 33a to cool the coated film side roll 33, especially, the roll surface 33a, whereby elevation of the temperature of the roll 33 is suppressed.

[0079] When the coated film side roller 33 is cooled and the temperature of cooling liquid detected by the temperature sensor 38i is lowered, output from the pump driving/controlling circuit 38g is reduced and a quantity of cooling liquid to be fed to the roller is reduced with the result that the temperature of the coated film side roller is controlled to assume a constant level.

[0080] Fig. 18a is a diagram which shows the relationship between the temperature of cooling liquid discharged from the coated film side roller 33 and detected by the temperature sensor and an adhesion remaining rate of the coated film Wc on the roll surface 33a of the coated film side roller 33 after the coated film Wc adhering to the coated film side roller 33 is scraped by the scraper 37 from the roller surface of the coated film side roller 33, Fig. 18b is a diagram which shows the relationship between a coated film peeling rate when the coated film Wc is peeled by the coated film side roller 33 and the resin material side roller 34 and a temperature of cooling liquid detected by the temperature sensor. As is apparent from Fig. 18a and Fig. 18b, under the condition that the coated film side roller 33 is maintained at a temperature higher than a predetermined temperature, essentially, when the cooling liquid discharged from the coated film side roller 33 at a temperature of 40 °C or less, reduction of a coated film adhesion remaining rate to the coated film side roller 33 is remarkable, and it is possible that the coated film peeling rate is maintained at a high level.

[0081] The resin material Wb having the coated film Wc on the resin material upper surface peeled from the upper coated film peeling device 30 is conveyed as a next lower surface coated film peeling step F by a conveying device 70.

[0082] A conveying device 70 includes plural pairs of rollers 75, i.e., in this embodiment, five pair of rollers composed of upper rollers 76 and the lower rollers 77 each rotationally driven by a rotational driving device 72 via power transmitting means 73, and the rollers 75 and 77 are placed on a frame 71.

[0083] The conveying device 70 arranged between the upper surface coated film peeling device 30 and the lower surface coated film peeling device 40 is rotationally driven by a rotational driving device 72 such as a motor or the like via power transmitting means 73 such as a chain, a belt or the-like, and in this embodiment, five pairs of rollers 75 including an upper roller 76 disposed on the coated film side roller 33 side arranged on the upstream side and a lower roller 77 disposed on the resin material side roll 34 side are arranged in the frame 71.

[0084] The upper roller 76 and the lower roller 77 disposed in the opposing relationship in the pair of rollers 75 cooperate with each other to hold in the clamped state the resin material Wb fed from the upper side coated film peeling device 30, subsequently, they are rotationally driven in the opposite direction so as to transfer the resin material Wb to the lower surface coated film peeling apparatus 40 side. Since the coated film side roller 33 is rotationally driven at a rotational circumferential speed larger than that of the roller side roller 34 when the resin material Wb is squeezed between the coated film roller side 33 and the resin material side roller 34 each having a different circumferential speed and then peeled therefrom, to correct the resin material curv edly deformed in the downward arched contour to a flat plate-like contour, the rotational speed each of the upper roller 76 and the lower roller 77 is determined such that the circumferential speed of the lower roller 77 becomes larger than the circumferential speed of the upper roller 76.

[0085] A lower surface coated film peeling device 40 includes a guide portion 42 for conducting the conveyed resin material Wb to a recovering portion such as a next hopper 80 or the like, and a pair of resin material side roller 43 and coated film side roller 44 for peeling a coated layer (not shown) applied to the resin material are arranged at the intermediate part of the guide portion 42 in the opposing relationship.

[0086] As shown in Fig. 19 that is a perspective view of essential components, the resin side roller 43 is supported by resin side roll supporting members 49a at its both ends on a support frame 41 of the lower coated film peeling device 40. The resin side roller 43 is vertically displaceably supported by raising/lowering means 49 and rotationally driven by a rotational driving device 45 via a universal joint 45a.

[0087] The resin side roller 43 and the coated roller 44 have a different rotational circumferential speed, and the coated film side roller 44 is rotationally driven at a rotational circumferential speed larger than that of the...
Thus, the resin material Wb is rolled by the squeezing force given by the resin raw material side roller 43 and the coated film side roller 44, and the coated film is peeled away from the resin material Wb based on the difference between the rotational circumferential speeds of both the rollers 43 and 44 due to the shear slipping stress appearing between the resin material Wb and the coated film applied to the lower surface of the coated film.

A scraper 47 for scraping the coated film adhering to the surface of the coated film side roller 44 is disposed in the vicinity of the roll surface 44a of the coated film side roller 44, and moreover, a belt conveyor 47b for conveying the coated film scraped by the scraper 47 is arranged in the vicinity of the roll surface 44a of the coated film side roller 44. In addition, to reduce the adhering force of the coated film to the coated film side roller 44 and facilitate the scraping of the coated film by the scraper 47, roller cooling means is provided in the same manner as the upper surface coated film peeling device 30.

In connection with the aforementioned embodiment, another embodiment of roll cooling means usable for an upper coated film peeling device 30, a lower coated film peeling device 40 and so forth will be described below with reference to Fig. 20.

Same components shown in Fig. 20 as those shown in Fig. 2 are represented by the same reference numbers, and therefore, repeated description on them is eliminated. Cooling means 38 is such that a feed pipe 38a and a discharge pipe 38b for feeding to and discharging from a cooling liquid pipe a cooling liquid are connected to the end part which is not connected to a rotational device 35 of the coated film side roller 33 via a connecting member 38c.

A pump 38d for pumping a cooling liquid to a coated film side roller 33 is disposed at the other end of the feed pipe 38a, and a temperature sensor 38f for detecting the temperature of the cooling liquid discharged from the coated film side roller 33 and a radiator 38h for cooling the cooled liquid are disposed on the delivery pipe 38b. Since the radiator 38h is connected to the pump 38d the cooling liquid pumped by the pumps 38d is fed to the coated film side roller 33 via the feed pipe 38a and the connecting member 38j, and the cooling liquid discharged from the coated film side roller 33 via the connecting member 38i is conducted to the pump 38d via the delivery pipe 38b, the temperature sensor 38f and the radiator 38h to thereby form a closed circuit for recirculation.

In addition, the cooling means includes a pump driving/controlling device 38g controlling the rotational speed of a rotational/driving device 38e such as a motor or the like in response to a temperature detecting signal from the temperature sensor 38f, and moreover, controlling the rotational speed of a cooling fan for cooling the radiator 38h.

The temperature sensor 38f detects the temperature of the cooling liquid discharged from the coated film side roller 33, increases/decreases an output value from the pump driving/controlling circuit 38g, e.g., an electric current corresponding to the detected temperature, and moreover, increases or decreases the flow rate of the cooling liquid by the pump 38d to be driven by the driving device 38e so as to regulate a quantity of feeding of the cooling liquid to the coated film side roller 33 from the connecting member 38i. Further, the temperature sensor 38f controls the rotation of the cooling fan for cooling the radiator 38h based on an output from the pump driving/controlling circuit 38g corresponding to the cooled liquid temperature detected by the temperature sensor 38f, e.g., increase or decrease of an electric current or ON or OFF.

Therefore, the temperature of the cooling liquid discharged from the coated film side roller 33 is detected by the temperature sensor 38f and a quantity of feeding of the cooling liquid to the coated film side roller 33 by the pump 38d and a quantity of radiated heat from the radiator 38h by the cooling fan are regulated in conformance with the detected value so that it is possible to maintain the temperature of the coated film side roller 33 constant or lower than a predetermined value, enabling a coated film scraping efficiency from the roll surface 33a by the scraper to keep normal, and moreover, it is possible to reduce an adhesion remaining rate of the coated film Ec to the roller surface 33a.

In the above description, the coated film roller is cooled, but it is possible to cool the resin material side roll and both of the coated film side roll and the resin material side roll.

In the foregoing embodiment, description has been made with respect to the lower surface coated film peeling step F and the coated film peeling apparatus including the lower surface coated film peeling device 40 for executing the lower surface coated film peeling step F and in the case that no coated film is applied to the lower surface of the resin member Wa, it is possible to eliminate the lower surface coated film peeling device 40. Further, coated film peeling is more reliably achieved by sequentially arrange a plurality of devices such as the upper surface coated film peeling device and the lower surface peeling device 40 or the like.

Fig. 21 shows another embodiment of shearing roller and an adhered article removing mechanism including the shearing roller for a projected part shearing device. In this embodiment, a spirally extending shearing blade 14a' extending in a different spiral direction is substantially symmetrical at the central part of the shearing roll 14', and a shearing roll adhered article removing mechanism is constructed such that a shearing roll 18' including a scraper blade 18f meshes with the shearing roll 14' in the opposing relationship while a spi-
the shape-formed product to the first coating removing device (30,40), said shape forming device (20) including a pair of a coated film side roller (23) and a resin material side roller (24) which are opposed to each other to define a rolling gap therebetween, said coated film side roller (23) having first spiral grooves (23a) forming a first spiral projected part (23b) disposed on one side of a plane perpendicular to the axis of said coated film side roller, and second spiral grooves (23a) forming a second spiral projected part (23b) disposed on the other side of said plane, said first spiral projected part (23b) and said second spiral projected part (23b) having mutually opposite spiral directions and said resin material side roller (24) being a smooth cylindrical roller, so that when the coated film side roller (23) is rotated, said first and second spiral projected parts (23b) exert on the coating (Wc) forces resisting free extension of the coating (Wc) in the axial directions of the coated film side roller (23) while the smooth resin material side roller (24) allows free extension of the resin material (Wb) in the axial directions of the resin material side roller (24), to enable the resin product (Wa) to be formed into a trapezoidal shape in cross section in which the side of the resin product having the coating (Wc) thereon has a smaller width than the side of the resin material (Wb).
of scraper pins (18f), each of the scraper pins (18f) being adapted to be inserted in said groove (14b).

5. The apparatus according to claim 2 or 3, wherein:

said shearing blades (14a) are formed to extend spirally and symmetrically on the surface of one of the rollers (13,14) of said shearing means (10).

6. The apparatus according to claim 2, further comprising:

first conveying means (50) provided between said shearing means (10) and said shape forming means (20) to convey the resin product, said first conveying means (50) having a plurality of pairs of rollers (56,57) arranged in a row, each pair of rollers (56,57) including an upper roller (56) rotatable at a different rotational speed from a lower roller (57) in order to flatten the resin product (Wa) in a curved shape therebetween.

7. The apparatus according to claim 7, further comprising:

second conveying means (70) provided to receive the resin product (Wa) from said first coating removing means (30), said conveying means (70) having a plurality of pairs of rollers (76,77) arranged in a row, each pair of rollers (76,77) having an upper roller (76) and a lower roller (77) rotatable at different rotational speeds from each other in order to deform the resin product (Wa) therebetween; and second coating removing means (40) provided to receive the resin product (Wa) from said second conveying means (70), said second coating removing means (40) having a pair of second removing rollers (43,44 or 33,34) arranged opposite each other and provided to roll the resin product (Wa), said second removing rollers (43,44) being rotatable at different rotational speeds from each other in order to remove a second coating (Wc) from the resin product (Wa) by applying a shearing stress between the second coating (Wa) and the resin product (Wa).

8. A method of removing a first coating (Wc) from a resin product (Wa) by giving a shearing stress between the first coating (Wc) and the resin product (Wa) through a pair of first removing rollers (23,24) into a trapezoidal shape in cross section in which a side of the resin product having the first coating (Wa) thereon has a smaller width than an opposite side of the resin product; and conveying the formed resin product between said first removing rollers (33,34) to remove the first coating (Wa).

9. The method according to claim 8, further comprising the step of:

shearing a protruding portion (Wf) from the resin product (Wa) by rolling the resin product (Wa) between a pair of rollers (13,14), before said step of forming the resin product (Wa).

10. The method according to claim 8, further comprising the steps of:

deforming the resin product (Wa) into a curved shape; and flattening the curved shape of the resin product (Wa) by insertion thereof between pairs of rollers (56,57) rotated at different speeds with respect to each other, after said step of shearing the protruding portion (Wf).

11. The method according to claim 8, further comprising the step of:

forming a flat shape of the resin product (Wa) by rolling the resin product (Wa) through a pair of rollers (66,67), after said step of forming the resin product.

12. The method according to claim 11, further comprising the steps of:

after removing a first coating (Wc) from one surface of the resin product (Wa), flattening the resin product (Wa) in a further conveying device (70) by rolling the resin product (Wa) through pairs of upper and lower rollers (76,77) rotated at different speeds with respect to each other in order to flatten said product (Wa); and

then removing a second coating (Wa) from the opposite surface of the resin product (Wa) by giving a shearing stress therebetween through a pair of second upper and lower removing rollers (43,44) rotated at different speeds with respect to each other.

13. The method according to claim 12, wherein

a first removing roller of the pair of first removing rollers (33,34) contacting said first coating (Wa) to remove the first coating (Wa) rotates with a great-
er rotational speed than the other of the first removing roller of the pair of first removing rollers (33,34), and a first of said upper and lower rollers (76,77) of the further conveying device (70) provided on the same side as said first removing roller of the pair of first removing rollers (33,34) rotates with a lower rotational speed than the other of the upper and lower rollers (76,77) of the conveying device (70).

Revendications

1. Appareil pour enlever un premier revêtement (Wc) depuis un matériau en résine (Wb) d’un produit à base de résine (Wa), comportant un dispositif d’enlèvement du premier revêtement (30, 40) comprenant une paire de premiers rouleaux d’enlèvement (33, 34 ou 43, 44) disposés mutuellement en regard et agencés pour effectuer un roulage du produit à base de résine (Wa), la paire de premiers rouleaux d’enlèvement (33, 34 ou 43, 44) pouvant tourner à des vitesses de rotation différentes, pour ainsi, en fonctionnement, appliquer une force de cisaillement entre le revêtement (Wc) et le matériau en résine (Wb) pour enlever le revêtement (Wc) depuis le matériau en résine (Wb), caractérisé par le fait que :

un dispositif de mise en forme (20) est prévu en amont du premier dispositif d’enlèvement de revêtement (30, 40), le dispositif de formage étant agencé pour effectuer un roulage et une mise en forme du produit à base de résine (Wb) selon une forme à section transversale trapézoïdale et transporter le produit mis en forme jusqu’au dispositif d’enlèvement du premier revêtement (30, 40), le dispositif de mise en forme (20) comprenant une paire constituée par un rouleau latéral de film revêtu (23) et un rouleau latéral de matériau en résine (24) qui se font face pour définir entre eux un interstice de roulage, le rouleau de côté de film de revêtement (23) présentant des premières rainures en spirale (23a) formant une première partie saillante en spirale (23b) placée d’un côté d’un plan perpendiculaire à l’axe du rouleau de côté de film de revêtement, et des secondes rainures en spirale (23a) formant une seconde partie saillante en spirale (23b) placée de l’autre côté dudit plan, la première partie saillante en spirale (23b) et la seconde partie saillante en spirale (23b) ayant des directions de spirale mutuellement opposées et le rouleau latéral de matériau en résine (24) étant un rouleau cylindrique lisse, de sorte que, lorsque le rouleau de côté de film de revêtement (23) est mis en rotation, les première et seconde parties saillantes en spirale (23b) exercent sur le revêtement (Wc) des forces de résistance à une extension libre du revêtement (Wc) selon les directions axiales du rouleau de côté de film de revêtement (23) tandis que le rouleau lisse de côté de matériau, en résine (24) permet une extension libre du matériau en résine (Wb) dans les directions axiales du rouleau latéral de matériau en résine (24), pour permettre que le produit à base de résine (Wa) soit formé selon une section transversale de forme trapézoïdale dans laquelle le côté du produit à base de résine portant le revêtement (Wc) présente une largeur moindre que celle du côté du matériau en résine (Wb).

2. Appareil selon la revendication 1, comprenant en outre :

... des moyens de cisaillement (10) placés en amont des moyens de mise en forme (20) de sorte que le produit à base de résine (Wa) traité dans les moyens de cisaillement (10) est transporté jusqu’aux moyens de mise en forme (20), les moyens de mise en forme (10) comprenant une paire de rouleaux (13, 14) mutualment en regard et agencés pour effectuer un roulage du produit à base de résine (Wa), au moins l’un des rouleaux (13, 14) ayant des lames de cisaillement (14a) pour cisaillement une partie en saillie (Wf) du produit à base de résine (Wa) pendant le roulage.

3. Appareil selon la revendication 2, dans lequel :

... les lames de cisaillement (14a) sont disposées sur une surface de l’un des rouleaux (13, 14) selon un motif sinusoidal, une rainure (14b) étant formée entre lames de cisaillement adjacentes (14a).

4. Appareil selon la revendication 3, dans lequel :

... un mécanisme d’enlèvement (18) est prévu pour enlever un élément de résine (Wb), collé à la dite surface, par grattage par une pluralité de broches de grattage (18f), chacune des broches de grattage (18f) étant agencée pour être insérée dans la dite rainure (14b).

5. Appareil selon l’une des revendications 2 et 3, dans lequel :

... les lames de cisaillement (14a) sont de forme telle qu’elles s’étendent en spirale et de façon symétrique sur la surface de l’un des rouleaux (13, 14) des moyens de cisaillement (10).

6. Appareil selon la revendication 2, comprenant en
outre :

des premiers moyens de transport (50) placés entre les moyens de cisaillement (10) et les moyens de mise en forme (20) pour transporter le produit à base de résine, les premiers moyens de transport (50) comportant une pluralité de paires de rouleaux (56, 57) disposés selon une colonne, chaque paire de rouleaux (56, 57) comprenant un rouleau supérieur (56) pouvant tourner à une vitesse de rotation différente de celle d'un rouleau inférieur (57) afin d'aplanir entre eux le produit à base de résine (Wa) selon une forme arrondie.

7. Appareil selon la revendication 7, comprenant en outre :

des seconds moyens de transport (70) agencés pour recevoir le produit à base de résine (Wa) depuis les premiers moyens d'enlèvement de revêtement (30), les moyens de transport (70) comportant une pluralité de paires de rouleaux (76, 77) disposées selon une rangée, chaque paire de rouleaux (76, 77) comprenant un rouleau supérieur (76) et un rouleau inférieur (77) pouvant tourner à des vitesses de rotation mutuellement différentes pour déformer entre eux le produit à base de résine (Wa), et des seconds moyens d'enlèvement de revêtement (40) agencés pour recevoir le produit à base de résine (Wa) à partir des seconds moyens de transport (70), les seconds moyens d'enlèvement de revêtement (40) comportant une paire de seconds rouleaux d'enlèvement (43, 44 ou 33, 34) mutuellement en regard et agencés pour effectuer un roulage du produit à base de résine (Wa), les seconds rouleaux d'enlèvement (43, 44) pouvant tourner à des vitesses de rotation mutuellement différentes pour enlever un second revêtement (Wc) à partir du produit à base de résine (Wa) en appliquant une contrainte de cisaillement entre le second revêtement (Wa) et le produit à base de résine (Wa).

8. Procédé d'enlèvement d'un premier revêtement (Wc) d'un produit à base de résine (Wa) en appliquant une force de cisaillement entre le premier revêtement (Wc) et le produit à base de résine (Wa) au moyen d'une paire de premiers rouleaux d'enlèvement (33, 34 ou 43, 44) mis en rotation à des vitesses mutuellement différentes, caractérisé par les étapes suivantes :

mise en forme du produit à base de résine (Wa) entre une paire de rouleaux (23, 24) en une forme à section trapézoïdale dans laquelle un côté du produit à base de résine portant le premier revêtement (Wa) présente une largeur inférieure à celle d'un côté opposé du produit à base de résine, et transport du produit à base de résine mis en forme entre les premiers rouleaux d'enlèvement (33, 34) pour enlever le premier revêtement (Wa).

9. Procédé selon la revendication 8, comprenant en outre l'étape de :

cisaillement d'une partie saillante (Wf) à partir du produit à base de résine (Wa) par roulage du produit à base de résine (Wa) entre une paire de rouleaux (13, 14), avant l'étape de mise en forme du produit à base de résine (Wa).

10. Procédé selon la revendication 8, comprenant en outre les étapes de :

déformation du produit à base de résine (Wa) en une forme courbe, et aplanissement de la forme courbe du produit à base de résine (Wa) en l'insérant entre des paires de rouleaux (56, 57) mis en rotation à des vitesses mutuellement différentes, après l'étape de cisaillement de la partie saillante (Wf).

11. Procédé selon la revendication 8, comprenant en outre l'étape de :

mise en forme du produit à base de résine (Wa) selon une forme plate par roulage du produit à base de résine (Wa) à travers une paire de rouleaux (66, 67), après l'étape de mise en forme du produit à base de résine.

12. Procédé selon la revendication 11, comprenant en outre les étapes suivantes :

après enlèvement d'un premier revêtement (Wc) depuis une surface du produit à base de résine (Wa), aplanissement du produit à base de résine (Wa) dans un autre dispositif de transport (70) par roulage du produit à base de résine (Wa) à travers des paires de rouleaux inférieur et supérieur (76, 77) mis en rotation à des vitesses mutuellement différentes afin d'aplanir le dit produit (Wa), et ensuite enlèvement d'un second revêtement (Wa) depuis la surface opposée du produit à base de résine (Wa) en appliquant une contrainte de cisaillement entre eux au moyen d'une paire de seconds rouleaux supérieur et inférieur d'enlèvement (43, 44) mis en rotation à des vitesses mutuellement différentes.
13. Procédé selon la revendication 12, dans lequel :

un premier rouleau d'enlèvement de la paire de premiers rouleaux d'enlèvement (33, 34), en contact avec les premier revêtement (Wa) pour enlever le premier revêtement (Wa), tourne à une vitesse de rotation supérieure à celle de l'autre rouleau de la paire de premiers rouleaux d'enlèvement (33, 34), et un premier des rouleaux supérieur et inférieur (76, 77) de l'autre dispositif de transport (70), disposé du même côté que le premier rouleau d'enlèvement de la paire de premiers rouleaux d'enlèvement (33, 34), tourne à une vitesse de rotation inférieure à celle de l'autre parmi les rouleaux supérieur et inférieur (76, 77) du dispositif de transport (70).

**Patentansprüche**

1. Vorrichtung zum Entfernen eines ersten Überzugs (Wc) von dem Material (Wb) eines Kunststoffproduktes (Wa), aufweisend eine erste Einrichtung zum Entfernen eines Überzuges (30,40) mit einem Paar von ersten Schälwalzen (33,34) oder (43,44), die einander gegenüber angeordnet und dazu vorgesehen sind, das Kunststoffprodukt (Wa) zu walzen, wobei das Paar erste Schälwalzen (33,34) oder (43,44) mit unterschiedlichen Drehgeschwindigkeiten drehbar ist, um in Einsatz eine Scherspannung zwischen dem Überzug (Wc) und dem Kunststoffmaterial (Wb) zu erzeugen und den Überzug (Wc) von dem Kunststoffmaterial (Wb) abzuschälen, dadurch gekennzeichnet, daß vor der ersten Einrichtung zum Entfernen eines Überzugs (30,40) eine Gestaltformungseinrichtung (20) vorgesehen ist, welche derart angeordnet ist, daß sie das Kunststoffprodukt (Wb) walzt und in einer Gestalt von trapezförmigem Querschnitt bringt und das verformte Produkt in die erste Einrichtung zum Entfernen eines Überzugs (30,40) überführt, wobei die Gestaltformungseinrichtung (20) ein Paar Walzen aus einer Walze (23) auf der Seite des Überzugs und einer Walze (24) auf der Seite des Kunststoffmaterials umfaßt, welche einander gegenüber angeordnet sind und zwischen sich einen Walzspalt definieren, wobei die Walze (23) auf der Überzugseite erste spiralförmige Rillen (23a) aufweist, welche ein erstes spiralförmiges, hervortretendes Teil (23b) bilden, welches auf einer Seite einer senkrechten zur Achse der überzugsseitigen Walze stehenden Ebene angeordnet ist, sowie zweite spiralförmige Rillen (23a) aufweist, welche ein zweites spiralförmiges, hervortretendes Teil (23b) bilden, welches auf der anderen Seite der Ebene angeordnet ist, wobei das erste spiralförmige, hervortretende Teil (23b) und das zweite spiralförmige, hervortretende Teil (23b) einander entgegengesetzte Spiralrichtungen aufweisen und die Walze (24) auf der Seite des Kunststoffmaterials eine glatte, zylindrische Walze ist, so daß dann, wenn die Walze (23) auf der Überzugseite in Drehung ver setzt wird, das erste und das zweite spiralförmige, hervortretende Teil (23b) auf den Überzug (Wc) Kräfte ausüben, welche die freie Ausdehnung des Überzugs (Wc) in die axialen Richtungen der Walze (23) auf der Überzugseite beschränken, während die glatte Walze (24) auf der Seite des Kunststoffmaterials eine freie Ausdehnung des Kunststoffmaterials (Wb) in die axialen Richtungen der Walze (24) auf der Seite des Kunststoffmaterials gestattet, um zu ermöglichen, daß das Kunststoffprodukt (Wa) in eine Gestalt mit trapezförmigem Querschnitt gebracht wird, wobei die Seite des Kunststoffproduktes, die den Überzug (Wc) trägt, eine geringere Breite aufweist als die Seite des Kunststoffmaterials (Wb).

2. Vorrichtung nach Anspruch 1, die außerdem eine Schereinrichtung (10) enthält, welche vor der Gestaltformungseinrichtung (20) vorgesehen ist, so daß das in der Schereinrichtung (10) behandelte Kunststoffprodukt (Wa) in die Formgebungseinrichtung (20) gefördert wird, wobei die Schereinrichtung (10) ein Paar Walzen (13,14) aufweist, die einander gegenüberliegend angeordnet und dazu vorgesehen sind, das Kunststoffprodukt (Wa) zu walzen, und mindestens eine der Walzen (13 oder 14) Scherklingen (14a) aufweist, um einen hervorstehenden Teil (Wf) des Kunststoffproduktes (Wa) beim Walzen abzuschälen.

3. Vorrichtung nach Anspruch 2, wobei die Scherklingen (14a) auf der Oberfläche einer der Walzen (13 oder 14) in Form einer Sinusurve angeordnet sind und zwischen benachbarten Scherklingen (14a) eine Rille (14b) ausgebildet ist.

4. Vorrichtung nach Anspruch 3, wobei ein Abstreifmechanismus (18) vorgesehen ist, um ein Kunststoffteil (Wb), das an der Oberfläche anhaftet, durch Abschaben mittels mehrerer Kratzstifte (18f) davon zu entfernen, und jeder der Kratzstifte (18f) dazu ausgelegt ist, in die Rille (14b) eingesetzt zu werden.

5. Vorrichtung nach Anspruch 2 oder 3, wobei die Scherklingen (14a) angelegt sind, sich spiralförmig und symmetrisch auf der Oberfläche einer der Walzen (13,14) der Schereinrichtung (10) zu erstrecken.

6. Vorrichtung nach Anspruch 2, außerdem aufweisend erste Fördereinrichtungen (50), die zwischen
der Schereinrichtung (10) und der Gestaltformungseinrichtung (20) vorgesehen, zum Zuführen des Kunststoffproduktes, wobei die ersten Fördereinrichtungen (50) mehrere in einer Reihe angeordnete Paare von Walzen (56,57) aufweisen und jedes Paar Walzen (56,57) eine obere Walze (56) umfaßt, die mit einer unterschiedlichen Drehgeschwindigkeit gegenüber einer unteren Walze (57) drehbar ist, um das Kunststoffprodukt (Wa) dazwischen in einer gekrümmten Form flach zu walzen.

7. Vorrichtung nach Anspruch 6, außerdem außerdem aufweisend die ersten Schälwalzen (33,34) zum Entfernen des verformten Kunststoffproduktes aufweist; und

die gegenüberliegende Seite des Kunststoffprodukts (Wa) trägt, eine geringere Breite als wobei eine Seite des Kunststoffproduktes, die den ersten Überzug (Wc) trägt, eine geringere Breite als die gegenüberliegende Seite des Kunststoffproduktes (Wa) von der ersten Einrichtung zum Entfernen eines Überzugs (30) aufzunehmen, wobei die Fördereinrichtungen (70) mehrere in einer Reihe angeordnete Paare von Walzen (76,77) umfassen und jedes Paar Walzen (76,77) eine obere Walze (76) und eine untere Walze (77) umfaßt, die mit unterschiedlichen Drehgeschwindigkeiten drehbar sind, um das Kunststoffprodukt (Wa) dazwischen zu verformen; und

die zweiten Einrichtungen zum Entfernen eines Überzugs (40), die dazu vorgesehen sind, das Kunststoffprodukt (Wa) von der zweiten Fördereinrichtung (70) aufzunehmen, wobei die zweiten Einrichtungen (40) zum Entfernen eines Überzugs ein Paar von zweiten Schälwalzen (43,44 oder 33,34) aufweisen, die einander gegenüber angeordnet und dazu vorgesehen sind, das Kunststoffprodukt (Wa) zu walzen, wobei die zweiten Schälwalzen (43,44) mit untereinander unterschiedlichen Drehgeschwindigkeiten drehbar sind, um den zweiten Überzug von dem Kunststoffprodukt (Wa) durch Anwendung einer Scherspannung zwischen dem ersten Überzug und dem Kunststoffmaterial (Wa) zu entfernen.

8. Verfahren zum Entfernen eines ersten Überzugs (Wc) von einem Kunststoffprodukt (Wa) durch Anwendung einer Scherspannung zwischen dem ersten Überzug (Wc) und dem Kunststoffprodukt (Wa) mittels eines Paares von ersten Schälwalzen (33,34 oder 43,44), die mit untereinander unterschiedlichen Drehgeschwindigkeiten gedreht werden, gekennzeichnet durch

die Schritte des Verformens des Kunststoffproduktes (Wa) zwischen einem Paar von Walzen(23,24) zu einer Gestalt mit trapezförmigem Querschnitt, wobei eine Seite des Kunststoffproduktes, die den ersten Überzug (Wc) trägt, eine geringere Breite als die gegenüberliegende Seite des Kunststoffproduktes aufweist; und

des Förderns des verformten Kunststoffproduktes zwischen die ersten Schälwalzen (33,34) zum Ent-

9. Verfahren gemäß Anspruch 8, außerdem einschließlich des Schritts des Abscherens eines hervorstehenden Teils (Wf) von dem Kunststoffprodukt (Wa) durch Walzen des Kunststoffprodukts (Wa) zwischen einem Paar Walzen (13,14) vor dem Schritt des Verformens des Kunststoffproduktes (Wa).

10. Verfahren gemäß Anspruch 8, außerdem einschließlich den Schritt des Verformens des Kunststoffproduktes (Wa) in eine gekrümmte Form und des Flachwalzens der gekrümmten Form des Kunststoffproduktes (Wa) durch Hindurchführen derselben zwischen Paaren von Walzen (56,57), die mit untereinander unterschiedlichen Geschwindigkeiten gedreht werden, nach dem Schritt des Abscherens des hervorstehenden Teils (Wf).


12. Verfahren gemäß Anspruch 11, außerdem einschließlich den Schritt des nachfolgend auf das Entfernen des ersten Überzugs (Wc) von einer Oberfläche des Kunststoffproduktes (Wa) erfolgenden Flachwalzens des Kunststoffproduktes (Wa) in einer wie teren Fördereinrichtung (70) durch Walzen des Kunststoffproduktes (Wa) zwischen Paaren von oberen und unteren Walzen (76,77), die mit untereinander unterschiedlichen Geschwindigkeiten in Drehung versetzt werden, um das Kunststoffprodukt (Wa) flach zu walzen; und anschließenden Entfernens eines zweiten Überzugs (Wc) von der gegenüberliegenden Oberfläche des Kunststoffproduktes (Wa) durch Anwendung einer Scherspannung zwischen beiden mittels eines Paares von zweiten oberen und unteren Schälwalzen (43,44), die mit untereinander unterschiedlichen Geschwindigkeiten gedreht werden.

13. Verfahren gemäß Anspruch 12, worin eine erste Schälwalze des Paares der ersten Schälwalzen (33,34), die zu den Entfernens des ersten Überzugs (Wc) mit dem ersten Überzug (Wc) in Kontakt steht, mit einer größeren Drehgeschwindigkeit rotiert als die andere erste Schälwalze des Paares der ersten Schälwalzen (33,34) und eine erste der oberen und unteren Walzen (76,77) der weiteren Fördereinrichtung (70), die auf derselben Seite angeordnet ist wie die erste Schälwalze des Paares der ersten Schälwalzen (33,34) mit kleinerer Drehgeschwindigkeit rotiert als die andere der oberen und unteren
Walzen (76,77) der FörderEinrichtung (70).
FIG. 7
**FIG. 18a**

**FIG. 18b**