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[0001] The invention relates to an artificial nail preparation comprising at least one synthetic resin layer and a textile fabric cast in the synthetic resin layer. In addition, the invention relates to a method for producing an artificial nail preparation, in which at least one textile fabric, is de-aerated by means of at least one synthetic resin. Finally, the invention relates to a device for producing an artificial nail preparation comprising at least one strand pulling device.

[0002] Such nail preparations are used in particular for lengthening and/or reinforcing of human finger and toe nails by applying a model layer plastic. The artificial nail preparations are also known as nail tips and are for example known from the FR 2 846 861 A1, from German Patent DE 10 2008 039 109 B4, from German Patent Application DE 36 20 568 A1 or the German Utility Model Application 1 768 305. In order to be able to de-aerate a woven fabric with a synthetic resin, the German Unexamined Laid-Open Application DE 36 20 568 A1 suggests to stretch the fabric over an open mould to close the mould and inject the synthetic resin at one point underneath the woven fabric into the mould so that a portion of the woven fabric is penetrated by the synthetic resin and is embedded in this. The US patent no 4,860,774 also describes a method for producing an artificial nail preparation, in which a woven fiberglass fabric is sprayed with a synthetic resin suspension, dried, coated on one side with a pressure sensitive adhesive and pressed with the coated side onto a an adhesion triggering means. An apparatus for manufacturing an artificial nail preparation is known from US 7 185 660 B1. Known nail preparations which are reinforced with textile fabrics have thicknesses which make the finger or toe nails lengthened with them appear unnaturally thick. In addition, the known methods of manufacture are disadvantageously complex and therefore cost-intensive.

[0003] It is therefore the object of the invention to disclose an artificial nail preparation with which extensions produced on finger or toe nails acquire a particularly natural appearance and to disclose a method and a device with which this nail preparation can be produced particularly cost-effectively and simply.

[0004] This object is solved according to the invention by an artificial nail preparation having the features of patent claim 1, a method for producing the same having the features of patent claim 8 and a device for carrying out the method having the features of patent claim 14. Advantageous further developments of the invention are specified in the dependent claims which are each related back to these patent claims.

[0005] The artificial nail preparation is characterized in that the thickness of the textile fabric is equal to the thickness of the synthetic resin layer. In this way, the textile fabric functioning as reinforcement in the synthetic resin layer is distributed uniformly in the entire layer cross-section of the synthetic resin layer so that individual fibres of the textile fabric directly touch the surfaces of the synthetic resin layer. In the region of this touching, the textile fabric has fibre backs partially exposed to the free atmosphere. According to the physical properties of the textile fabric used for the synthetic resin layer and the synthetic resin used for the synthetic resin layer, fibre backs located on the surfaces of the synthetic resin layer can however also be wetted with the synthetic resin of the synthetic resin layer. As a result of the incorporation of the textile fabric into the near-surface edge regions of the synthetic resin layer, in particular the tearing strength of the nail preparation according to the invention is advantageously increased. The increased tearing strength ultimately enables the formation of the synthetic resin layer in particularly small thicknesses so that a toe or finger nail extended with the nail preparation according to the invention comes particularly close to a natural toe or finger nail both with regard to its flexibility and also with regard to its external appearance.

[0006] According to a first further development of the artificial nail preparation, the synthetic resin layer comprises at least one polyester resin. Polyester resins are particularly suitable for forming artificial toe and finger nails, because of their transparent and largely resistant properties with respect to acids and bases. In principle, however, it is also feasible to form the synthetic resin layer with epoxy resins, acrylates or polyurethanes.

[0007] In order to be able to cure the artificial nail preparation particularly rapidly, reliably and cost-effectively in automated production processes, it is proposed that the polyester resin is a light-curing polyester resin. A suitable alternative to light-curing polyester resins are, for example, heat-curing polyester resins.

[0008] According to a next further development of the invention the textile fabric is a woven fabric. Woven fabrics are suitable for forming particularly light and tear-resistant textiles as a result of their ordered fibre courses. At this point however the random laid nonwoven fabric should also be mentioned as a suitable alternative to the woven fabric.

[0009] In order to form particularly cost-effective and nevertheless durable nail preparations, the woven fabric preferably comprises a linen weave formed in a mesh-like manner. Furthermore, it lies within the framework of this invention to assign the physical properties of different types of woven fabric to various demand profiles which are imposed on nail preparations.

[0010] In practice, textile fabrics having a basis weight of less than 27 grams per square meter preferably have proven of less than 22 grams per square meter. It is proposed that the textile fabric is composed of silk fibers. Both natural silk and artificial silk may be employed. A notable alternative consists in forming the textile fabric from glass fibers.

[0011] The method according to the invention for producing an artificial nail preparation is characterized in that the fabric is immersed in the synthetic resin, that the immersed textile fabric is coated on both sides with at least one foil material to produce an intermediate product, that the intermediate product is formed in reproducible manner, that the synthetic resin enclosed in the formed intermediate product is cured and that the foil material is separated from the cured synthetic resin to obtain nail preparation blanks. For immersing the textile fabric in the synthetic resin, a synthetic resin tank is produced containing this through which the textile fabric is moved. Introducing the method of manufacture according to the invention, the textile fabric is flooded with the synthetic resin. In each case the textile fabric should be de-aerated completely during the immersion or flooding and, by the subsequent coating with a foil material, is prepared for being removed from the immersion or flooding region as an intermediate product without a further de-aeration. For the reproducible forming of the intermediate product the foil material and the textile fabric is in particular exposed to elastic deformations whereas in the liquid synthetic resin compensating flows are formed which reduce deformation stresses. With the subsequent curing of the liquid synthetic resin, the intermediate product held in shape solidifies as a whole so that the separation of the foil material from the cured synthetic resin finally produces the dimensionally stable nail preparation blank. The dimensional stability of the nail preparation blanks is characterized by a high tensile strength and a high elastic modulus and is in particular achieved whereby the foil material is placed directly on the immersed fabric so that the thickness of the textile fabric is equal to the thickness of the synthetic resin layer.

[0012] According to a first further development of the method according to the invention the foil material is rolled onto the immersed textile fabric. The rolling of the foil material accordingly takes place at a time at which the textile fabric is immersed in the liquid synthetic resin or is flooded by this. With the immersion or flooding the textile fabric is particularly reliably de-aerated. With the rolling a flat application of the foil material onto the textile fabric is accomplished with the formation of a plurality of individual contact points.

[0013] In order to prevent atmospheric air from being able to be drawn into the de-aerated textile fabric via the foil edges delimiting the foil material outside the immersion or flooding region, the immersed textile fabric is sealed in the foil material in an airtight manner. In principle, however the gluing-in or other type of surrounding of the textile fabric with the foil material is a feasible possibility. With the airtight incorporation of the textile fabric, a storable intermediate product is produced whose further processing to form the nail preparation blanks can advantageously be accomplished with a temporal and/or local offset.

[0014] For the curing of the synthetic resin, the foil material is flooded with an ultraviolet radiation. For this purpose, the foil material is preferably a plastic foil having transparent properties. A suitable alternative to this process step consists in curing of the synthetic resin with thermal radiation. To this end, the foil material is for example, a composite foil with an increased thermal conductivity.

[0015] According to a next further development of the invention, the intermediate product is handled exclusively on its airtight welded foil material. For handling the intermediate product is, for example, carried, guided, gripped or pushed on the airtight welded foil material.

[0016] According to a further development concluding the method according to the invention, the nail preparation blanks are divided into individual nail preparations. For the dividing preferably individual nail preparations are cut out or stamped out from the nail preparation blanks. Optionally the nail preparations can then be packed and distributed via the trade.

[0017] The device according the invention for producing an artificial nail preparation is characterized in that the strand pulling device has at least two foil web drawing devices as well as at least one textile web drawing device arranged between the foil

web drawing devices, that at least one synthetic resin immersion tank is formed between the foil web drawing devices, that the synthetic resin immersion tank has at least one outlet opening with a roller nip, with which the foil web drawing devices and the textile web drawing device are brought together to a production line and that the production line has at least one moulding tool with a continuous feed synthetic resin curing device. The foil web drawing devices as well as the textile web drawing device each have a pivot bearing arrangement for receiving a wound product. In the case of the foil web drawing device, the wound product is preferably a foil material wound onto rolls, spools or drums and in the case of the textile web drawing device, the wound product is preferably a textile fabric wound onto rolls, spools or drums. The synthetic resin immersion tank formed between the foil web drawing devices is used to provide liquid synthetic resin and for immersing into the liquid synthetic resin a textile fabric which has been transported via the textile web drawing device into the device according to the invention. The roller nip has the task of coating the immersed textile fabric with the foil material on both sides to produce an intermediate product which is transported via the foil web drawing devices into the device according to the invention. Via the outlet opening the intermediate produce produced at the roller nip is pulled over the production line to a moulding tool in which it is reproducibly formed and stabilized in the held form by curing the synthetic resin enclosed therein. With the strand pulling device the device according to the invention is particularly suitable for the continuous production of artificial nail preparations. The two foil web drawing devices here form a handling device with which the intermediate product is pulled continuously through the production line. The moulding tool preferably has a continuous operating mode where a die tracking adapted to the take-off speed of the foil web drawing devices is preferably assigned to the dies of the moulding tool. Such a die tracking is preferably produced by the formation of a circulating guide having a plurality of upper dies and a circulating guide having a plurality of lower dies. In principle, however it is also feasible to configure the moulding tool in the manner of an ingot mould known from continuously operated continuous casting devices.

[0018] According to a first further development of the device according to the inventive, the synthetic resin immersion tank has at least two tank boundaries formed from web sections of the foil web drawing devices. The immersion tank seal produced at the tank boundaries is only accomplished by means of the foil material transported into the foil web drawing device. In this way, the foil material is only contacted on one side with the synthetic resin, so that the roller nip formed at the outlet of the synthetic

resin immersion tank, the moulding tool as well as other processing stations located on the production line remain free from contamination by the liquid synthetic resin.

[0019] In order to produce an immersion tank seal formed between the foil web drawing devices, the synthetic resin immersion tank additionally has at least two connecting parts cooperating with the tank boundaries via sliding seals in a liquid-tight manner. Such connecting parts are preferably formed as fixed immersion tank walls on which the foil material transported in the foil web drawing devices runs down in a liquid-tight manner.

[0020] According to a next further development of the invention, the synthetic resin immersion tank has a tank wall which is slightly inclined with respect to one of the foil web drawing devices in the drawing direction. Inside the synthetic resin immersion tank the foil web drawing device forming the flat inclined tank wall and the textile web drawing device run directly adjacent to one another so that a textile fabric transported in the textile web drawing device dips at a particularly flat angle into the liquid synthetic resin provided in the synthetic resin immersion tank. The flat immersion angle advantageously prevents atmospheric air from the textile fabric being introduced into the liquid synthetic resin in the form of air inclusions.

[0021] According to a particularly advantageous further development of the invention, the at least one foil welding station located between the roller nip and the moulding tool foil is assigned to the foil web drawing devices, which comprises at least two longitudinal welding heads, each aligned onto one of the edge regions of the production line. The longitudinal welding heads are used for edge-side welding of the foil material coating the textile fabric on both sides. By the continuous pulling of the intermediate product through the production line, the foil material transported into the foil web drawing devices prints is welded to one another by the edge-side arrangement of the longitudinal welding heads to form a foil tube. Moreover, the foil welding station has at least one transverse welding head aligned on the production line which is used for the front-side welding of the foil material coating the textile fabric on both sides. Together with the longitudinal welding heads, the transverse welding head enables completely airtight welding of the textile fabric into the foil material.

[0022] For the continuous pulling of the intermediate product through the production line, the foil web drawing devices have at least one drive unit located upstream of the moulding tool, which has at least one pair of transport rollers aligned on the

production line. The transfer of the drive forces produced by the drive unit to the intermediate product is preferably accomplished by means of the adhesive friction forces built up between a rubber coating of the pair of transport rollers and the foil material of the intermediate product.

[0023] According to a next further development of the invention, the production line comprises a de-moulding station located downstream of the moulding tool, to which at least two foil web winding devices each operatively connected to one of the foil web drawing devices are assigned. The foil web winding devices have the task of separating the foil material from the cured synthetic resin in an ordered manner to obtain the nail preparation blanks. The separation is preferably accomplished by means of a take-off process by means of which the foil material is guided out from the production line via deflecting rollers. In order to be able to separate the nail preparation blanks from the cured synthetic resin, the de-moulding station additionally has a cutting device with which the welds located at the edges on the intermediate product are cut away.

[0024] In order to be able to cut the nail preparation blanks into individual nail preparations, at least one cutting device is located downstream of the demoulding station which comprises at least one transverse cutting edge aligned on the production line. The cutting device preferably also has a continuous operating mode, where a cutting tracking adapted to the drawing device speed of the foil web drawing devices is preferably assigned to the transverse cutting edge. Such a cutting tracking is produced, for example, by incorporating the transverse cutting edge on a rotational body on the circumference of which a plurality of transverse cutting edges are preferably then held.

[0025] An exemplary embodiment of the invention from which further inventive features are obtained is shown in the drawing. It shows:

Fig. 1: a partial perspective view of an artificial nail preparation according to the invention;

Fig. 2: a schematic view of a first part of the device according to the invention for producing the nail preparation according to Fig. 1; and

Fig. 3: a schematic view of a second part of the device according to the invention according to Fig. 2.

[0026] Fig. 1 shows a part of an artificial nail preparation according to the invention comprising a synthetic resin layer 1 and a textile fabric 2 cast into the synthetic resin layer 1. The thickness of the textile fabric 2 is equal to the thickness of the synthetic

resin layer 1, which consists of a polyester resin. The textile fabric 2 is a woven fabric having a linen weave having basis weight of 20 g per m^2. The textile fabric 2 is composed of individual silk fibers 3 4. In particular the artificial nail preparation has a curved surface 5 adapted to the nail bed of a human toe or finger nail

[0027] Figs. 2 and 3 show the device according to the invention comprising a strand pulling device comprising two the foil web drawing devices 6, 7 as well as a textile web drawing device 8 arranged between the foil web drawing devices 6, 7. A synthetic resin immersion tank 9 which has an outlet opening formed with a roller nip 10 is formed between the foil web drawing devices 6, 7. Via the roller nip 10 the foil web drawing devices 6, 7 and the textile web drawing device 8 are brought together to a production line 12 comprises a moulding tool 13 with a synthetic resin continuous curing 14. The synthetic resin immersion tank 9 has two tank boundaries formed from web sections of the foil web drawing devices 6, 7 and two connecting parts 17, 18 which cooperate via sliding seals 15, 16 in a liquid-tight manner with the tank boundaries. One of the tank boundaries formed with the foil web drawing devices 6, 7 is a tank wall configured to be flat sloping in the take-off direction according to arrow 19. A foil welding station 20 disposed between the roller nip 10 and the moulding tool 13 is assigned to the foil web drawing devices 6, 7, which comprises longitudinal welding heads 23, 24 each aligned onto one of the edge regions 21, 22 of the production line 12 and a transverse welding head 25. The foil web drawing devices 6, 7 have a drive unit 26 disposed between the foil welding station 20 and the moulding tool 13, which has a pair of transport rollers 27 aligned on the production line 12. Located downstream of the moulding tool 13, the production line 12 has a de-moulding station 28 with two foil web winding devices 29, 30 each operatively connected to one of the foil web drawing devices 6, 7. In addition, the de-moulding station 28 has a cutting device 31 located upstream of the foil web winding devices 29, 30 which has two longitudinal cutting edges 32, 33 each engaged with one of the edge regions 21, 22 of the production line 12. Located downstream of the de-moulding station 28 is another cutting device 34, which has a transverse cutting edge 35 aligned on the production line 12.

[0028] The device according to the invention operates as follows: A textile fabric 36 moved in the textile web drawing device 8 between the foil web drawing devices 6, 7 is immersed in a liquid synthetic resin 37 provided in the synthetic resin immersion tank 9. Via the roller nip 10 formed at the outlet opening 11 of the synthetic resin immersion tank 9, the immersed textile fabric 36 is coated on both sides with a foil

material 39, 40 to produce an intermediate product 38, which is supplied to the roller nip 10 via the foil web drawing devices 6, 7. Subsequently the intermediate product is supplied via the production line 12 to a foil welding station 20 located downstream of the roller nip 10, the longitudinal welding heads 23, 24 whereof are used to weld the foil material 39, 40 to one another at the edges to form a foil tube. By means of the pair of transport rollers 27 of the drive unit 26 located downstream of the longitudinal welding heads 23, 24, the intermediate product 41 welded at the edges is pulled away via the production line 12 and guided past the transverse welding head 25 by means of a deflecting roller 42. With the transverse welding head 25 the foil material 39, 40 is also welded together at the front side so that the textile fabric 36 of the intermediate product 41 which is already welded at the edges can be sealed in a completely airtight manner in its foil material 39, 40. In the moulding tool 13 located downstream of the foil welding station 20 the intermediate product 43 which has been welded at the edges and at the front is reproducibly formed between individual upper dies 44 and lower dies 45 corresponding to these, where the liquid synthetic resin 37 enclosed in the formed intermediate product 46 is cured with UV radiation in the synthetic resin continuous curing device 14 formed on the moulding tool 13. Two edge strips 48 in which the welds made with the longitudinal welding heads 23, 24 are located, are separated from the cured intermediate product 47 by means of the longitudinal cutting edges 32, 33 of the cutting device 31 located downstream of the moulding tool 13 in the de-moulding station 28. By means of the foil web winding devices 29, 30 located downstream of the cutting device 31, the foil material 39, 40 of the intermediate product 49 freed from the edge strips 48 is removed from the cured synthetic resin 37 to form nail preparation blanks 50. The nail preparation blanks 50 are finally divided into individual nail preparations 51 by means of the transverse cutting edge 35 of the cutting device 34 located downstream of the de-moulding station 28.

1. Kunstig negletip der har mindst et harpikslag og et tekstilstof, som er indstøbt i harpikslaget, **kendetegnet ved, at** tykkelsen af tekstilstoffet (2) er lig med tykkelsen af harpikslaget (1).

2. Kunstig negletip ifølge krav 1, **kendetegnet ved, at** harpikslaget (1) omfatter mindst en polyesterharpiks.

3. Kunstig negletip ifølge krav 2, **kendetegnet ved, at** polyesterharpiksen er en lyshærdende polyesterharpiks.

4. Kunstigt negletip ifølge et hvilket som helst af kravene 1 til 3, **kendetegnet ved, at** tekstilstoffet (2) er et vævet stof.

5. Kunstig negletip ifølge krav 4, **kendetegnet ved, at** det vævede stof har en almindelig vævning.

6. Kunstig negletip ifølge et hvilket som helst af kravene 1 til 5, **kendetegnet ved, at** tekstilstoffet (2) har en gramvægt, der er mindre end 27 gram pr. kvadratmeter.

7. Kunstig negletip ifølge et hvilket som helst af kravene 1 til 6, **kendetegnet ved, at** tekstilstoffet (2) er fremstillet af silkefibre (3, 4).

8. Fremgangsmåde til fremstilling af en kunstigt negletip, i hvilken mindst et tekstilstof afluftes med mindst en flydende syntetisk harpiks, **kendetegnet ved, at**

tekstilstoffet (36) nedsænkes i den flydende syntetiske harpiks (37),
det nedsænkede tekstilstof (36) overtrækkes med mindst ét foliemateriale (39, 40) på begge sider for at fremstille et mellemprodukt (38),
mellemproduktet (38) støbes på reproducerbar måde,
den flydende syntetiske harpiks (37), der er indesluttet i det støbte mellemprodukt (46), hærdes og
foliematerialet (39, 40) adskilles fra den hærdede syntetiske harpiks (37) for at opnå negletipråemner (50).

9. Fremgangsmåden ifølge krav 8,
kendetegnet ved, at foliematerialet (39, 40) rulles på det nedsænkede tekstilstof (36).

10. Fremgangsmåde ifølge krav 9 eller 10, **kendetegnet ved, at** det nedsænkede tekstilstof (36) svejses på en lufttæt måde inden i foliematerialet (39, 40).

11. Fremgangsmåde ifølge et hvilket som helst af kravene 8 til 10, **kendetegnet ved, at** foliematerialet (39, 40) bestråles med ultraviolet stråling for at hærde harpiksen (37).

12. Fremgangsmåde ifølge krav 10 eller 11, **kendetegnet ved, at** mellemproduktet (38, 41, 43) håndteres ved dets lufttætte forseglede foliemateriale (39, 40).

13. Fremgangsmåde ifølge et hvilket som helst af kravene 8 til 12, **kendetegnet ved, at** negletipræmnerne (50) opdeles i individuelle negletips (51).

14. Indretning til fremstilling af en kunstig negletip, hvilken indretning omfatter mindst en strengtrækningsindretning, især til at udføre en fremgangsmåde ifølge et hvilket som helst af kravene 8 til 13, **kendetegnet ved, at**

strengtrækningsindretningen har mindst to foliebanetrækningsindretninger (6, 7) og mindst en tekstilbanetrækningsindretning (8), der er anbragt mellem foliebanetrækningsindretningerne (6, 7),
mindst en nedsænkningstank (9) til kunstig harpiks, der er er anbragt mellem foliebanetrækningsindretningerne (6, 7),
hvilken nedsænkningstank (9) til syntetisk harpiks har mindst en udløbsåbning (11) med en indløbsrulle (10), med hvilken foliebanetrækningsindretningerne (6, 7) og tekstilbanetrækningsindretningen (8) bringes sammen til at danne en produktionslinje (12) og
hvilken produktionslinje (12) indbefatter mindst et støbeværktøj (13) med en hærdningsindretning (14) til kontinuerligt at føde syntetisk harpiks.

15. Indretning ifølge krav 14, **kendetegnet ved, at** nedsænkningstanken (9) til syntetisk harpiks indbefatter mindst to tankbegrænsende elementer, som er dannet af banesektioner fra foliebanetrækningsindretningerne (6, 7).

16. Indretning ifølge krav 15, **kendetegnet ved, at** nedsænkningstanken (9) til syntetisk harpiks indbefatter mindst to forbindelsesdele (17, 18), der samvirker på væsketæt måde med de tankbegrænsende elementer via glidende tætninger (15, 16).

17. Indretning ifølge et hvilket som helst af kravene 14 til 16, **kendetegnet ved, at** nedsænkningstanken (9) til syntetisk harpiks har en tankvæg, der er fladt skrånende i forhold til en af foliebanetrækningsindretningerne (6, 7) i trækningsretningen.

18. Indretning ifølge et hvilket som helst af kravene 14 til 17, **kendetegnet ved, at** mindst en foliesvejsningsstation (20) opstrøms for støbeværktøjet (13) er tildelt foliebanetrækningsindretningerne (6, 7), og foliesvejsestationen eller foliesvejsestationerne har mindst to langsgående svejsehoveder (23, 24), som hver især er rettet ind med en af produktionslinjens (12) kantområder (21, 22).

19. Indretning ifølge et hvilket som helst af kravene 14 til 18, **kendetegnet ved, at** foliebanetrækningsindretningerne (6, 7) har mindst en drevenhed (26), der er anbragt mellem foliesvejsningsstationen (20) og støbeværktøjet (13), hvilken drevenhed har mindst et transportrullepar (27), der er rettet ind med produktionslinjen (12).

20. Indretning ifølge et hvilket som helst af kravene 14 til 19, **kendetegnet ved, at** produktionslinjen (12) indbefatter en afformningsstation (28) nedstrøms for støbeværktøjet (13), hvilken station har mindst to foliebaneopviklingsindretninger (29, 30), som hver er operativt forbundet til en af foliebanetrækningsindretningerne (6, 7).

21. Indretning ifølge krav 20, **kendetegnet ved, at** mindst en skæreindretning (34) er anbragt nedstrøms for afformningsstationen (28) og har mindst en tværskærerindretning (35), der er rettet ind i forhold til produktionslinjen (12).