(19) Europäisches Patentamt
European Patent Office
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(11) **EP 4 335 554 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.03.2024 Bulletin 2024/11

(21) Application number: **22195098.3**

(22) Date of filing: **12.09.2022**

(51) International Patent Classification (IPC):
B05D 1/28 *(2006.01)* ***B05D 5/02*** *(2006.01)*
B05D 7/06 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B05D 7/06; B05D 1/28; B05D 5/02

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) **METHOD FOR COATING A BOARD**

(57) According to an example aspect of the present invention, there is provided a method for producing a board (3) comprising wood material and a coating of hot melt glue, wherein the hot-melt glue is spread on the surface the of the board (3) by a rotating applicator roller (2) so that the film layer applied on the surface of the board (3) is split between the rotating applicator roller (2) and the surface of the board (3) to form random protrusion on the coating..

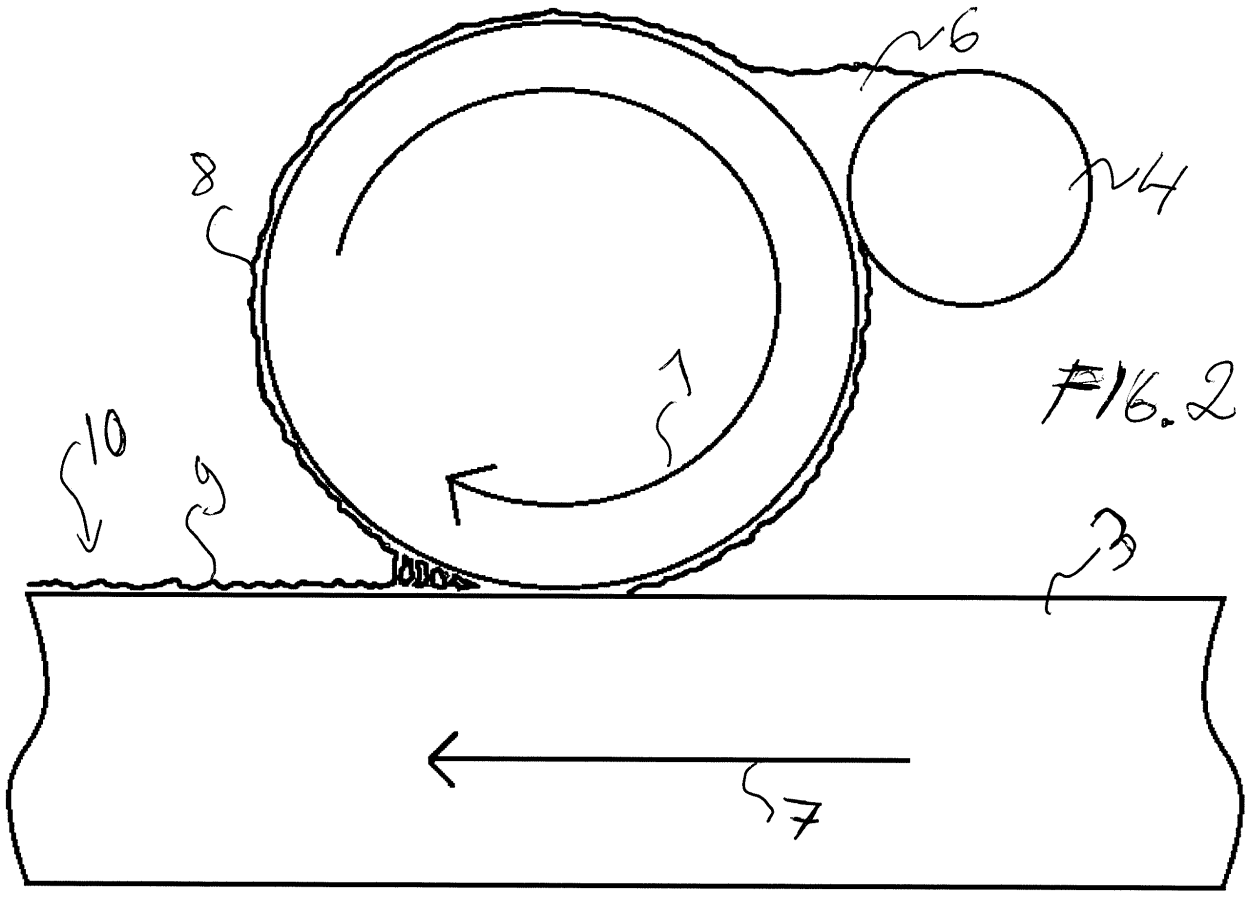

Fig. 2

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Description

FIELD

[0001] The invention relates to coating boards comprising wood materials. More particularly, the invention relates to coating boards made of using wood as base material, typically veneer boards, chipboards and blockboards. Specifically the invention relates to forming an anti-slip and wear resistance coating on such boards.

BACKGROUND

[0002] Different kinds of wood based boards provide a wide variety of properties for constructional purposes. The surface of the board may be used to give a desired visual appearance or a functional surface. Coating of the surface of the board is used to give the board desired properties, the most common surface coating being simple painting or varnishing of the surface. However, if high wear resistance, specific frictional properties, hardness, resistance to chemicals or moisture or other properties not inherent for wood boards are needed, specific coating materials and methods have to be used. The coating usually also improves the visual appearance of the board surface. There are several methods for applying a coating. Spray application may be the simplest one. However, film coatings usually provide wider variety of uses and applications. One traditional film coating type is an impregnated paper that is fixed on the surface of the board by applying heat and pressure. A wide range of polymer and composite sheets or even metal sheets or films may be applied on the surface. These are often adhered to the surface by gluing.

[0003] Coating of a wooden board is a widely used practice. Therefore there are many combinations of coating materials, production methods and base boards. Some of these are described in following publications: US 2018/0320388 discloses a multilayer covering panel, US 2018/0111360 discloses a PVC composite flooring panel, US 2017/0121982 discloses a laminated fire resistant panel, US 2014/1238593 describes a shaped body covered with a film-shaped substrate, JP2002210710 discloses a wood material coated with a hydrophilic adhesive agent and CN 202969824U discloses a bamboo veneer coated with a PUR hot melt adhesive.

SUMMARY OF THE INVENTION

[0004] The invention is defined by the features of the independent claims. Some specific embodiments are defined in the dependent claims.

[0005] According to a first aspect of the present invention, there is provided a method for producing a board comprising wood material and a coating of hot melt glue wherein the hot melt glue is spread on the surface the of the board by a rotating roller so that the film layer applied on the surface of the board is split between the rotating roller and the surface of the board to form protrusion on the coating.

[0006] According to a second aspect of the present invention, there is provided a board comprising wood material and a coating of hot melt glue having random protrusions on the surface.

[0007] According to the third aspect of the invention, the hot melt glue is spread using a roller having a rubber surface.

[0008] According to a fourth aspect of the invention, the hot melt glue is PUR hot melt glue.

[0009] According to a fifth aspect of the invention, the splitting action of the film layer is controlled by altering one of the variables of: a gap between the applicator roll and the surface of the board, the relative speed between the applicator roll and the board, the viscosity of the applied hot melt glue.

[0010] According to a sixth aspect of the invention, the splitting action of the film layer is controlled by adjusting the gap between the applicator roll and the heating roll and/or the speed difference between surfaces of said rolls.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIGURE 1 illustrates schematically a method for coating board in accordance with at least some embodiments of the present invention;

FIGURE 2 illustrates schematically a detail of the process performed with the apparatus of FIGURE 1;

FIGURE 3 shows schematically further details of the apparatus of FIGURE 1;

FIGURE 4 shows a coated board in cross section.

EMBODIMENTS

DEFINITIONS

[0012] In the present context, the term "wood" comprises material from stems of trees and wood-stemmed plants. Usually wood is referred to be made of cellulosic fibers embedded in lignin.

[0013] The board of wood material in this context refers to solid boards for constructional purposes such as plywood boards, chipboards and blockboards.

[0014] The method uses a substance usually intended for gluing pieces for preparing a coating. One example of such materials is PUR-hot melt glue. The surface of a wood board is coated in order to protect it against water, chemicals and wear. The coating may also enhance the visual properties of the wood board. According to the method, the board is coated with a hot melt type glue so

that a required amount of glue is melted on the board. This coating forms a protecting layer against moisture, chemicals and wear. The method enables production of coated wood board for floor structures where good friction and grip is required, for example in vehicles. The method provides a special surface structure having high friction and thus a good grip on the surface.

[0015] FIGURE 1 illustrates schematically a method in accordance with at least some embodiments of the present invention. The board 3 to be coated is passed through a nip formed between a counter roll 1 or similar support system and an applicator roll 2. A heating roll 4 is arranged to form a measuring nip with the applicator roll 2. A feed pipe 5 or pipes (see FIGURE 2) is arranged to feed glue to a slot formed by the applicator roll 2 and the heating roll 4 on top of the nip formed by said rolls. The heating roll 4 is used to keep the glue fluid. The pumping and feed pipes 5 are heated for same purpose. The board 3 to be coated is supported on the incoming side and exit side of the nip of a counter roll 1 and the applicator roll 2. Rolls, roll bars, bearing rolls, a transporter or any support structure the manufacturer of the apparatus desires to use, may accomplish the support. This kind of glue application apparatuses are readily available commercially.

[0016] In order to form a coating on the board, the board is fed into the nip between the counter roll 1 or similar support system and the applicator roll 2. The support structures on opposite side of the applicator roll 2 carry the board 3. A gap is formed between the applicator roll 2 and the surface of the board 3 (FIGURE 2). The width of this gap is one of the variables used to adjust the coat weight of the applied glue on the surface of the board and the formation of the top surface of the coating. The amount of the glue applied on the applicator roll 2 is adjusted by setting the gap (the nip) between the applicator roll 2 and the heating roll 4. Further factors affecting the spreading of the coating on the surface of the board are the rotation direction of the applicator roll in relation to the travel direction of the board, speed difference between the travel speed of the board and the rotation speed (i.e. surface speed caused by rotation) of the applicator roll 2 and the amount on glue applied on the applicator roll 2. The relative rotation directions of the applicator roll and the heating roll 4 affect the spreading of the glue on the applicator roll 2 and thus may have a role on the type of surface achieved on the final coating on the board. The viscosity of the glue relates the spreading action and application closely. The viscosity can be effected by adjusting the temperature of the applied glue by using the heating capability of the heating roll 4 and heating elements related to the feeding pipe 5.

[0017] As can be seen from above, several factors affect the coating process and the type of coating. Usually, the apparatuses described above are used for application of glue for fixing layers of material together. Thus, only adjustment of the coat weight to a desired level is necessary. Of course, the glue has to be spread evenly or as a desired pattern between the layers. In this method, the aim is to obtain a coating surface of a desired type. The purpose is to provide protrusions on the surface of the coating. In order to achieve this, the spreading action has to be adjusted so that the applied glue film splits between the applicator roll 2 and the surface of the board as seen in FIGURE 2. The splitting leaves peaks on the surface of the coating that is spread on the board. Since there are quite several factors affecting how the glue coating is spread on the board surface, it is difficult to set definite limits for each factor needed to obtain the splitting. However, the desired type of coating can be obtained by setting the process to run using one initial setting and thereafter adjusting one or more variables until splitting of the applied film and final surface having protrusions on the coating is obtained. The random splitting action of the glue film provides random protrusions on the top surface of the coating. A hot-melt glue sets rather rapidly. This maintains the rough structure of the surface of the coating as the glue doesn't have sufficient time to flow to a smooth even layer.

[0018] The setting up of the process can be started, for example, by choosing the glue that is applied and production speed for the coated board. The choice of glue gives a recommended temperature range and viscosity and the operation instructions of the apparatus used sets limits for production speed. Now, the gap between the applicator roll 2 and the board can be changed or the relative speed between the board and the surface of the applicator roll 2 can be changed until splitting occurs. This can be done by changing speed of the board 3, rotation speed of the applicator roll or even the rotation direction of the applicator roll 3. One setting providing the splitting includes rotating the applicator roll 2 (arrow 1) in the same direction as the board travels (arrow 7). In this way the surfaces of the roll 2 and the board 3 form an opening gap where the surfaces move away from each other and stretch the coating layer therebetween. One part 8 of the coating attached to the surface of the board and remaining part 9 follows the surface of the applicator roll 2 back to the glue puddle 6. The stretching action and uneven surface 10 is illustrated in FIGURE 2.

[0019] Another factor that can be altered is the temperature of the applied glue. The final adjustment of the temperature is made by changing the heating power of the heating roll 4.

[0020] One suitable material for the surface of the applicator roll is rubber. The surface of the roll is preferably smooth. The heating roll 4 is preferably a chromed steel roll.

[0021] Instead of the abovementioned variables, or in addition to, the gap between the applicator roll 2 and the heating roll 4 may be adjusted and/or the speed difference between said rolls. When suitable process parameters have been found, the process can be repeated for following batches directly. This enables producing even small batches rapidly as settings can be rapidly changes once they have been established by using the above

guidelines.

[0022] Suitable materials for coating are hot-melt glues. The glue is chosen according to the requirements of the intended purpose of the coated board. The glue may be polyamide (PA), ethylene-vinyl asetate (EVA), polyurethane (PUR), polyethylene (PE), polycarbonate (PC). Particularly suitable glues are reactive hot-melt glues, for example PUR-hot-melt glues. One example of such glue is TECHNOMELT PUR 9622-02 UV from HENKEL AG & KGaA. This TECHNOMELT glue is applied in melted state and it sets when exposed to moisture. The required moisture can be provided from ambient moisture, moisture of the substance to be coated or by adding water as mist, vapour or spray.

[0023] FIGURE 3 shows a glue feeding system for the apparatus of FIGURE 1. The apparatus includes a hot-melt drum 12 for hotmelt glue. A pump and heating system 11 is mounted on the hotmelt drum 12 and connected to feed pipes 5 that lead to spreading roller system 2, 4, the applicator roll 2 and the heating roll 4 of FIGURES 1 and 2. The purpose of the glue feeding system is to fluidize the hot-melt glue, maintain a desired temperature and feed a desired measured amount of glue to the spreading roller system 2, 4.

[0024] FIGURE 4 illustrates an example of a coated veneer board. The board is coated with a PUR-hot-melt glue by using above described method. The uneven surface 10 comprising the protrusions according to the invention can be seen on the surface. FIGURE 4 shows the board in cross section. The coating can be seen as the top layer 13 of the cross section. The protrusions can be observed on the top of the layer. FIGURE 4 shows a gap between the board 3 and the top layer 13. This gap is for illustrative purposes only, actually the top layer 13 is attached to the board 3. However, one can contemplate that a precoat layer is applied on the board before application of the top layer. Such precoat increases cost of manufacture and may effect adversely on formation of the slitting phenomenon. Therefore, the precoat must be carefully chosen and used only if needed for obtaining specific functional properties for the product.

[0025] This method is not limited to boards having certain length as the coating process is continuous. The width of the board is limited only by the largest width of the production apparatus that is used. The method can be easily reproduced. Some beneficial properties of the products made by the method are, for example: good grip and high friction, good wear resistance, good durability under moisture, pleasant appearance. The method is easy to implement and enables producing various sizes of wooden boards even in small batches. One can contemplate that both sides of the board are coated.

[0026] The board to be coated should have a sufficient thickness so that it maintains its rigidity during coating without continuous support. The support provided is usually a set of rolls and the counter roll 1. As the product is intended to be used as structural or other applications requiring sufficient rigidity, a minimum of 4 mm thickness is needed. The random splitting action requires sufficient amount of material to be spread on the surface of the board. The amount of coating on the board should be 100 g/m^2 or higher, for example within a range of 100 g/m^2 - 800 g/m^2, preferably 200 g/m^2 - 600 g/m^2 and most preferably 400 g/m^2 - 600 g/m^2. The surface of the board should be evenly covered with a uniform layer without any gaps or holes. However, one can contemplate that a patterned applicator roll is used to obtain patterned coating providing partial exposure to the surface of the board. Such products may have use in special limited applications.

[0027] It is to be understood that the embodiments of the invention disclosed are not limited to the particular structures, process steps, or materials disclosed herein, but are extended to equivalents thereof as would be recognized by those ordinarily skilled in the relevant arts. It should also be understood that terminology employed herein is used for the purpose of describing particular embodiments only and is not intended to be limiting.

[0028] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment.

[0029] As used herein, a plurality of items, structural elements, compositional elements, and/or materials may be presented in a common list for convenience. However, these lists should be construed as though each member of the list is individually identified as a separate and unique member. Thus, no individual member of such list should be construed as a de facto equivalent of any other member of the same list solely based on their presentation in a common group without indications to the contrary. In addition, various embodiments and example of the present invention may be referred to herein along with alternatives for the various components thereof. It is understood that such embodiments, examples, and alternatives are not to be construed as de facto equivalents of one another, but are to be considered as separate and autonomous representations of the present invention.

[0030] Furthermore, the described features, structures, or characteristics may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of lengths, widths, shapes, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, materials, etc. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

[0031] While the forgoing examples are illustrative of the principles of the present invention in one or more particular applications, it will be apparent to those of ordinary skill in the art that numerous modifications in form, usage and details of implementation can be made without the exercise of inventive faculty, and without departing from the principles and concepts of the invention. Accordingly, it is not intended that the invention be limited, except as by the claims set forth below.

[0032] The verbs "to comprise" and "to include" are used in this document as open limitations that neither exclude nor require the existence of also un-recited features. The features recited in depending claims are mutually freely combinable unless otherwise explicitly stated. Furthermore, it is to be understood that the use of "a" or "an", i.e. a singular form, throughout this document does not exclude a plurality.

INDUSTRIAL APPLICABILITY

[0033] The invention can be used for manufacture of coated wooden boards.

ACRONYMS LIST

[0034]

ABC Definition

REFERENCE SIGNS LIST

[0035]

1	counter roll
2	applicator roll
3	board
4	heating roll
5	feed pipe
6	glue puddle
7	arrow (board)
8	one part
9	remaining part
10	uneven surface
11	pump and heating system
12	hotmelt drum
13	top layer

CITATION LIST

Patent Literature:

[0036]

US 2018/0320388
US 2018/0111360
US 2017/0121982
US 2014/1238593
JP2002210710
CN 202969824U

Claims

1. A method for producing a board (3) comprising wood material and a coating of hot melt glue wherein the hot-melt glue is spread on the surface the of the board (3) by a rotating applicator roller (2) so that the film layer applied on the surface of the board (3) is split between the rotating applicator roller (2) and the surface of the board (3) to form random protrusion on the coating.

2. A method according to the claim 1, wherein the hot-melt glue is chosen from the group of: polyamide (PA), ethylene-vinyl asetate (EVA), polyurethane (PUR), polyethylene (PE), polycarbonate (PC).

3. A method according to one of the claims 1 - 2, wherein the hot-melt glue is reactive hot melt glue.

4. A method according to one of the claims 1 - 3, wherein the hot melt glue is PUR hot melt glue.

5. A method according to the claim 1, wherein the hot melt glue is spread using a roller having a rubber surface.

6. A method according to one of the claims 1 - 5, wherein the application amount of the glue on the board is 100 g/m^2 or higher, preferred within a range of 100 g/m^2 - 800 g/m^2, preferably 200 g/m^2 - 600 g/m^2 and most preferably 400 g/m^2 - 600 g/m^2.

7. A method according to any of the previous claims, wherein the splitting action of the film layer is controlled by altering one of the variables of: a gap between the applicator roll (2) and the surface of the board (3), the relative speed between the applicator roll (2) and the board (3), the viscosity of the applied hot melt glue.

8. A method according to any of the previous claims, wherein the splitting action of the film layer is controlled by adjusting the gap between the applicator roll (2) and the heating roll (4) and/or the speed difference between surfaces of said rolls (2, 4).

9. A board comprising wood material and a coating of hot-melt glue having random protrusions on the surface.

10. A board according to the claim 9, wherein the hot-melt glue is chosen from the group of: polyamide (PA), ethylene-vinyl asetate (EVA), polyurethane (PUR), polyethylene (PE), polycarbonate (PC).

11. A board according to one of the claims 9 - 10, wherein the hot-melt glue is reactive hot melt glue.

12. A board according to one of the claims 9 - 11, wherein the hot melt glue is PUR hot melt glue.

13. A board according to one of the claims 9 - 12, wherein the amount of coating on the board is 100 g/m^2 or higher, preferred within a range of 100 g/m^2 - 800 g/m^2, preferably 200 g/m^2 - 600 g/m^2 and most preferably 400 g/m^2 - 600 g/m^2.

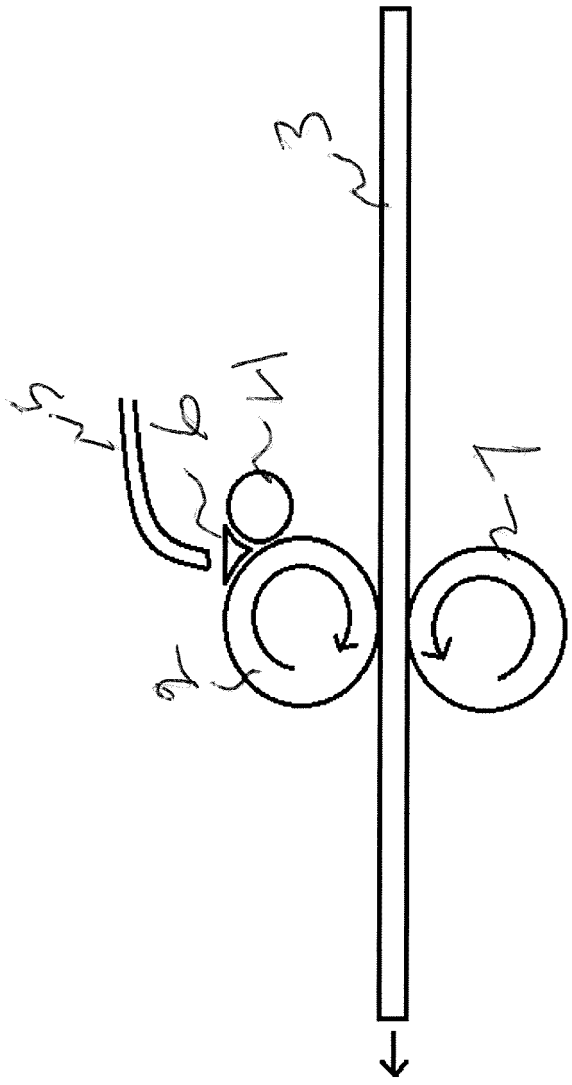
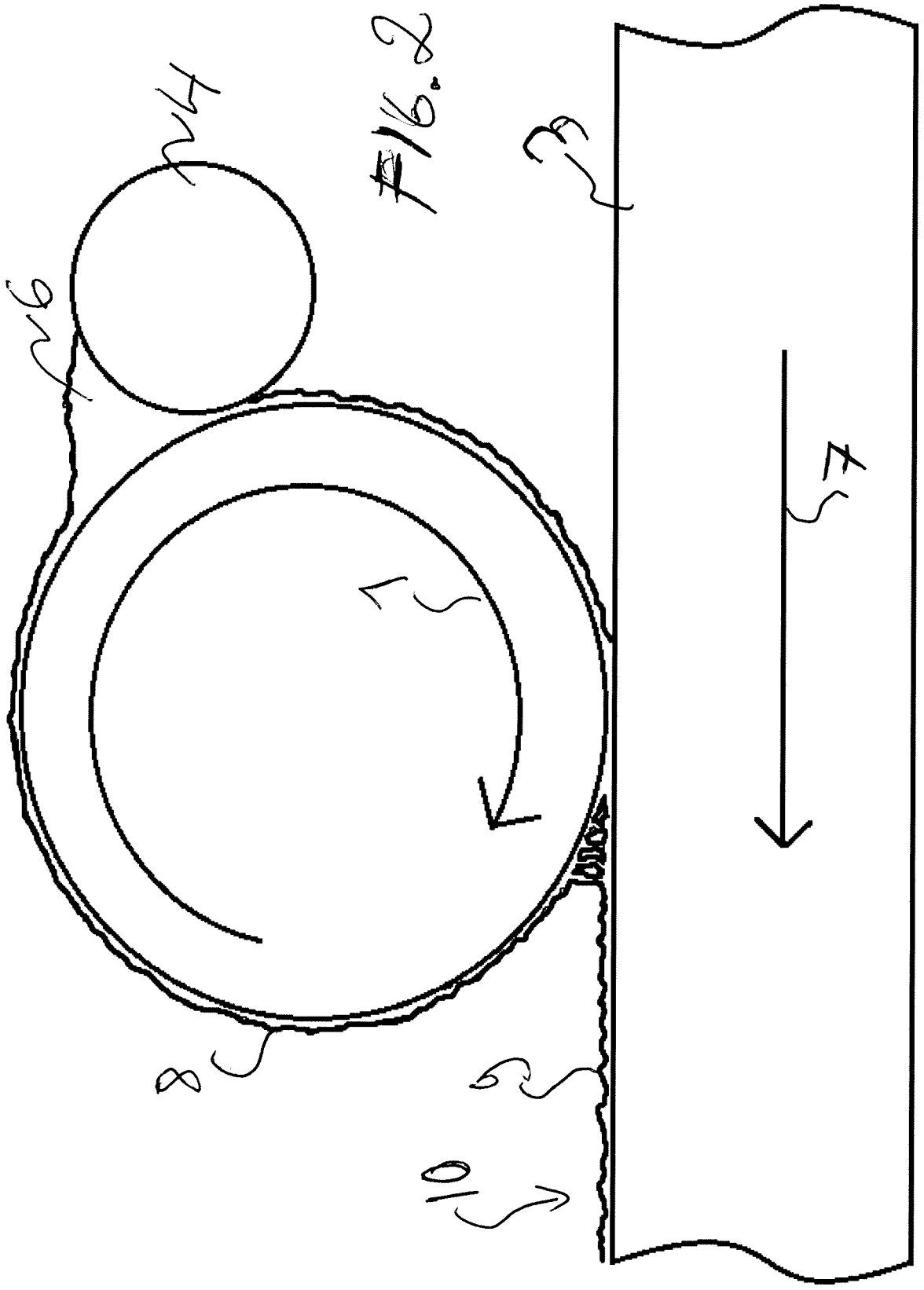


FIG. 1

FIG. 2



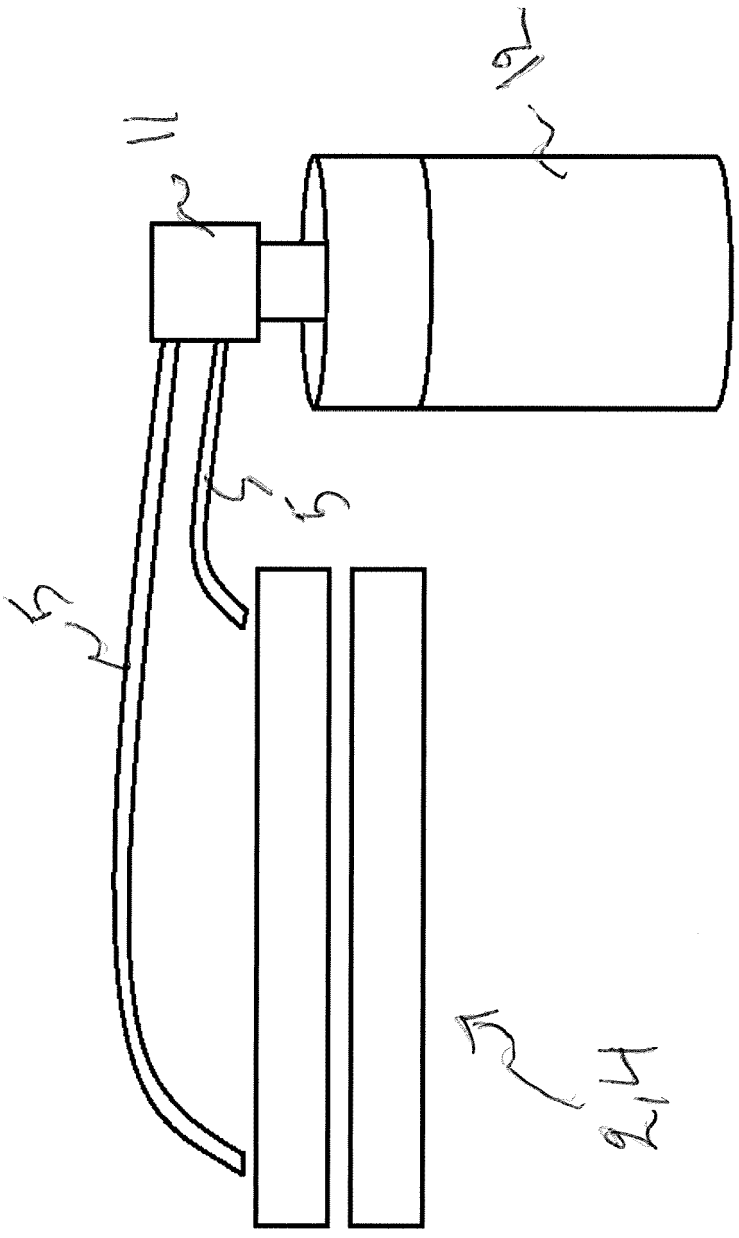


Fig. 3

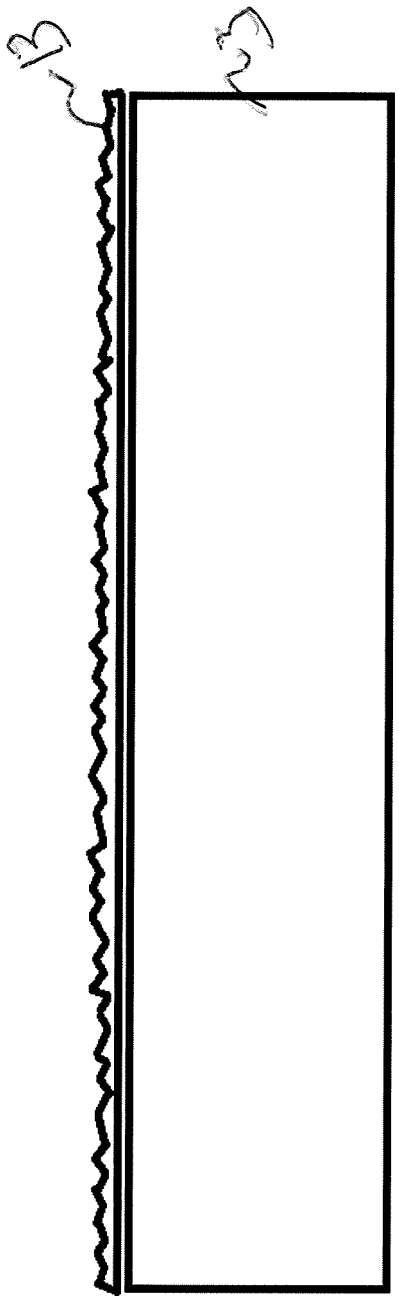


FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 22 19 5098

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2006/087085 A2 (KARL W NIEMANN GMBH & CO KG [DE]; SCHUMACHER REINHARD [DE]) 24 August 2006 (2006-08-24) * page 4, line 21 - line 23 * * page 6, line 26 - page 7, line 11 * * page 7, line 22 - line 24 * * claims 1, 6, 8, 10; figure 1 * -----	1-13	INV. B05D1/28 B05D5/02 B05D7/06
			TECHNICAL FIELDS SEARCHED (IPC)
			B05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 February 2023	Slembrouck, Igor

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 19 5098

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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07-02-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006087085 A2	24-08-2006	DE 102005035860 A1	24-08-2006
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- US 20141238593 A **[0003] [0036]**
- JP 2002210710 B **[0003] [0036]**
- CN 202969824 U **[0003] [0036]**