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(11) **EP 1 533 417 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.05.2005 Bulletin 2005/21

(51) Int Cl.7: **D21H 19/08**

(21) Application number: **04105659.9**

(22) Date of filing: **10.11.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL HR LT LV MK YU

(72) Inventor: **Munaro, Gilio**
33100, UDINE (IT)

(74) Representative: **Petraz, Gilberto Luigi**
GLP S.r.l.
Piazzale Cavedalis 6/2
33100 Udine (IT)

(30) Priority: **11.11.2003 IT UD20030221**

(71) Applicant: **METALPACK Srl**
34170 GORIZIA (IT)

(54) **Method to produce metallic paper and metallic paper produced by said method**

(57) Method to produce metallic paper (10) comprising, in sequence, a first step during which a first layer (33) of an impregnating material is applied on a cellulose-based sheet or strip (21); a second step during

which a second layer (47) of a water paint is deposited on the first layer (33); and a third step wherein a third layer of metal (70), which anchors stably to the water paint, is deposited on the second layer (47).

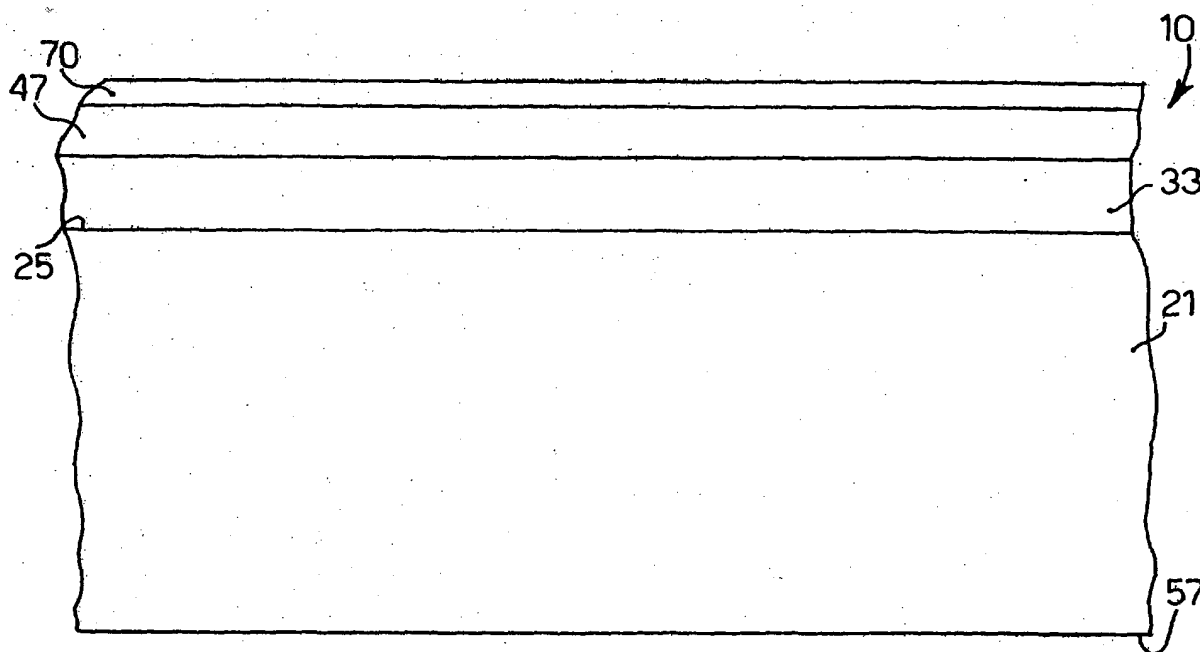


fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a method to produce metallic paper, and the metallic paper produced using said method.

[0002] The metallic paper according to the present invention can be used to make sheets, envelopes, wrappers, bags, containers, paper cornets, wrappings, packages or other, preferably but not exclusively suitable to contain and preserve foodstuffs.

BACKGROUND OF THE INVENTION

[0003] A method is known for the production of an aluminum or aluminized paper for envelopes for use for foodstuffs, by means of which a coat of metal oxides, kaolin and earth is applied on a cellulose strip, possibly smoothed and polished on one side, in order to form a first layer that closes the pores of the cellulose. Subsequently, on the coated cellulose strip a solvent paint is applied, that is, a paint containing chemical solvent, on which the aluminum is then applied.

[0004] To be more exact, the aluminum is applied directly onto the layer of solvent paint by means of vacuum sublimation and a sufficiently high quantity thereof is deposited to ensure that the layer of solvent paint is fixed and completely covered.

[0005] Another layer of solvent paint is finally deposited on the layer of aluminum, which protects the metal layer and prevents it from oxidizing in the air. On the last layer of solvent paint logos and writings are printed, by means of inks and paints, also containing solvent, in order to decorate or personalize the paper.

[0006] This known method has the disadvantage, however, that it produces a metallic paper in which some of the toxic products used to produce it (e.g. solvents, metal oxides ...) remain in any case.

[0007] Moreover, according to current legislation, in order to apply the solvent paint, the strip of paper has to be transferred to a working site that is separate from that where the paper is produced, in order to prevent the solvent from dispersing and polluting the paper.

[0008] Another disadvantage of the known method is that using a coat greatly conditions the basic characteristics of the paper used for metalization.

[0009] Purpose of the present invention is to perfect a method that does not require the use of toxic products, such as solvents or metal oxides, so that there is no risk of them remaining in the finished product, and so that it is not necessary to transfer the cellulose sheet to an autonomous working site other than where the basic paper is produced, as happens, on the contrary, when toxic products are used.

[0010] Another purpose of the present invention is to perfect a method that allows to obtain a metallic paper which has a very limited metal content, so that the inci-

dence of the latter is as low as possible, so that the metallic paper itself can be completely burnt and then disposed of together with ordinary paper.

[0011] Another purpose of the present invention is to perfect a method to produce metallic paper which, apart from having a great resistance to load, is also light, that is, it has a weight in grams little more than that of the cellulose strip, and that it is easily crumpled.

[0012] Applicant has devised, tested and embodied the present invention to obtain these and other purposes, to overcome the shortcomings of the state of the art and to obtain significant advantages.

SUMMARY OF THE INVENTION

[0013] The present invention is set forth and characterized in the main claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0014] In accordance with said purposes, a method according to the present invention to produce metallic paper comprises in sequence: a first step during which a first layer of an impregnating material is applied on a cellulose-based sheet or strip; a second step during which a second layer of a water paint is deposited on the first layer; and a third step during which a third layer of metal is deposited on the second layer and anchors stably on the water paint.

[0015] The metal that forms the third layer interacts with the water paint and is stably integrated therewith in the zone of contact, so that it is not necessary that the layer of metal be protected and covered by any other layer of additional protection.

[0016] The water paint that constitutes the second layer is advantageously an acrylic paint, soluble in water.

[0017] Water inks and paints, which are without solvents or toxic products, can then be printed directly on the layer of metal in order to make logos or writings.

[0018] In a preferential embodiment, the impregnating material too is a water-soluble acrylic paint.

[0019] By means of the method according to the invention we thus obtain a metallic paper which is completely without toxic products.

[0020] Using a water paint also has the advantage that it prevents the dispersion of toxic solvents into the working environment, and does not necessarily require, during the processing, that the metallic paper be transferred to an autonomous site for the application of the paint onto the first layer, although this can always be done for reasons connected to production.

[0021] Another advantage of using water paint is that the layer of metal applied can have a very limited thickness, in the range of about 150-200Å (1.5-2.0 nanometers), while still ensuring a complete cover of the water paint below.

[0022] In this way we obtain a metallic paper with a high load resistance, wherein the quantity of metal

present is less than 0.05 g/m², so that, in a paper of 48 g/m², the ratio of weight between the metal and the paper is about 0.9 kg of metal for 1,000 kg of metallic paper in all.

[0023] Thanks to this limited quantity of metal, the metallic paper according to the present invention can therefore be completely burned. Moreover, thanks to the fact that no coat is applied, the paper can have different weights from several tens of g/m² to more than one hundred g/m², for example from about 20 to about 150 g/m².

[0024] Since we are not limited by the presence of a coat in the second layer, it is possible to use a cellulose sheet or strip with very different characteristics, according to the type of metallic paper that is to be obtained.

[0025] Moreover, thanks to the use of the impregnating substance instead of the coat, the second step to apply the water paint can advantageously be carried out immediately after the first step.

[0026] In the event that the metallic paper made with the method according to the invention has to be used to make up fatty or oily elements, such as butter, margarine, fresh cheese, or other, a processing step is also advantageously provided at the end of the aforesaid third step, to process at least the third layer of metal with a substance able to make the paper proof against fatty and oily substances.

[0027] According to a variant, it is provided that, on one and/or the other external surface of the metallic paper according to the invention, other layers of plastic material such as polyethylene are arranged, for example with anti-adhering and/or reinforcing functions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein:

- fig. 1 is a lateral view, on an enlarged scale, of a portion of a sheet of metallic paper obtained by means of the method according to the present invention;
- fig. 2 shows schematically a first part of a plant for the production of the sheet of metallic paper shown in fig. 1;
- fig. 3 shows a second part of the plant in fig. 2, consecutive to the first part shown in fig. 2;
- fig. 4 shows a third part of the plant in fig. 2, consecutive to the second part shown in fig. 3.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT OF THE INVENTION

[0029] With reference to fig. 1, a metallic paper 10 according to the present invention is produced in a processing plant 12 (figs. 2 to 4) which comprises a plu-

ality of stations, substantially of a known type, which are arranged sequentially to each other.

[0030] A first station 14 of the processing plant 12 (fig. 2) comprises a container 16, containing a wet cellulose mix, a conveyor belt 17 onto which the cellulose mix is poured, and a contrasting roller 19.

[0031] In this way we obtain, in a known manner, a cellulose-based strip 21, of the desired thickness.

[0032] The strip 21 defines the base layer of the metallic paper 10 (fig. 1).

[0033] From the first station 14 (fig. 2), the strip 21 is wound onto a drying and polishing roller 23 of a known type, which makes the strip 21 smoother and shinier on a first side 25, or front side (fig. 1). The polishing is controlled, downstream of the roller 23, by means of control members 27, such as for example optical type detectors.

[0034] Subsequently, the strip 21 is made to transit in a second station 29, comprising a first calender 31, by means of which a layer of impregnating material 33 is applied (fig. 1) on the first side 25 of the strip 21. The impregnating material 33 advantageously consists of a water-soluble acrylic paint, such as for example product 1334 marketed by the Company SUN CHEMICALS. The impregnating material 33 forms a first layer of the metallic paper 10.

[0035] In a third station 35 (fig. 3), the strip 21, already provided with the impregnating material 33, is made to transit first in a circuit of compressed air 37 and then in a drier 39 with infrared rays where, apart from drying, the humidity of the strip 21 is also continuously controlled.

[0036] Subsequently, by means of a guide roller 41, the strip 21 is made to transit in a fourth station 43, comprising a second calender 45 by means of which a second layer is applied, consisting of a paint 47 (fig. 1). According to the invention, the paint used is a water paint, such as for example product 1034 marketed by the Company SUN CHEMICALS.

[0037] As a consequence of using the water paint 47 instead of a paint with solvents as in the state of the art, the whole processing plant 12 can be installed in the same site, and without particular problems, since the working environment is in no way polluted by organic solvents.

[0038] Subsequently, the strip 21, already provided with the two layers 33 and 47, is inspected along its travel by other control members 49 in order to verify the humidity, structure and possible imperfections thereof, and is again dried on a drier roller 51.

[0039] The strip 21 is then transferred to a fifth station 53, optionally comprising a third calender 55, by means of which it is conditioned on its second side 57, or back (fig. 1) by applying water and starch so as to prevent the metallic paper 10 from subsequently curling.

[0040] After conditioning, the strip 21 is further dried in a sixth station 59 and then transferred to a seventh station 61 (fig. 4), where it is pressed with a pressure of

about 300-400 kg/cm² by means of a pair of calendars 63, at a temperature of about 70-80°C. The strip 21 with the two layers of impregnating material 33 and respectively of water paint 47 is thus flattened and homogenized, so that it is ready for metalization.

[0041] Subsequently, after a final control by means of a relative member 65, the strip 21 is wound onto a roller 67. The latter is transferred to an eighth station 69 where metalization is carried out by applying a layer of metal 70 onto the layer of paint 47 (fig. 1).

[0042] For example, a layer of aluminium, copper or other material is applied.

[0043] The station 69 is of a substantially known type and comprises a chamber kept under vacuum, inside which a sublimation unit 72 is arranged, provided with one or more rolls 73 of wires of aluminium or of the metal that is to be used.

[0044] The strip 21 is guided inside the vacuum chamber so that the layer of paint 47 is facing towards the sublimation unit 72. The latter heats the wire of aluminium, or of other metal, to high temperatures, so as to vaporize it directly on the layer of water paint 47. Thanks to the characteristics of the layer of water paint 47, the aluminium or other metal is fixed to the water paint itself, interacting and stably integrating therewith in the zone of contact.

[0045] After metalization, the strip of metallic paper 10 is rewound onto a roller 75 and is ready to be printed directly on the metal layer 70 without having to apply any additional protective layer provided with anti-oxidant substances.

[0046] Subsequently, the metal layer 70 is printed by means of water printing, in a relative printing station not shown in the drawings.

[0047] It is clear, however, that modifications and/or additions of steps may be made to the method to produce metallic paper 10 as described heretofore, without departing from the field and scope of the present invention.

[0048] It is also clear that, although the present invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of method to produce metallic paper 10, all of which shall come within the field and scope of the present invention.

Claims

1. Method to produce metallic paper, **characterized in that** it comprises, in sequence, a first step during which a first layer (33) of an impregnating material is applied on a cellulose-based sheet or strip (21); a second step during which a second layer (47) of a water paint is deposited on said first layer (33); and a third step wherein a third layer of metal (70), which anchors stably to said water paint, is deposited on said second layer (47).

2. Method as in claim 1, **characterized in that** a water-soluble acrylic paint is used as the water paint.

3. Method as in claim 1, **characterized in that** said second step is carried out immediately after said first step.

4. Method as in any claim hereinbefore, **characterized in that** during said third step said metal is fixed on said second layer (47) by means of vacuum sublimation.

5. Method as in any claim hereinbefore, **characterized in that** during said third step a layer of about 150-200Å (1.5-2.0 nanometers) of said metal (70) is deposited.

6. Method as in any claim hereinbefore, **characterized in that** aluminum or copper is used as the metal.

7. Method as in any claim hereinbefore, **characterized in that** a water paint is used as the impregnating material.

8. Method as in claim 7, **characterized in that** said water paint is a water-soluble acrylic paint.

9. Method as in any claim hereinbefore, **characterized in that** after said first step and before said water paint is applied, said strip (21) is dried by means of compressed air and/or infrared rays.

10. Method as in any claim hereinbefore, wherein said first layer (33) of impregnating material is applied on a first side (25) of said cellulose-based strip (21), **characterized in that** it comprises a fourth step, between said second step and said third step, during which said cellulose-based strip (21) is conditioned on its second side (57) by means of an application of water or starch.

11. Method as in claim 9, **characterized in that** it comprises a fifth step between said fourth step and said third step, during which said strip (21) with said first (33) and said second layer (47) is pressed and homogenized.

12. Method as in any claim hereinbefore, **characterized in that** it comprises a sixth step subsequent to said third step during which a water ink or a water paint is directly printed on said third layer of metal (70).

13. Method as in any claim hereinbefore, **characterized in that** it comprises, at the end of said third step, a processing step to process at least said third layer of metal (70) with a substance able to make

said metallic paper proof against fatty and oily substances.

or the other external surface thereof, it comprises at least another layer of plastic material.

14. Method as in any claim hereinbefore, **characterized in that** it also comprises a coating step wherein on one and/or the other external surface of said metallic paper at least another layer of plastic material is arranged. 5
15. Metallic paper comprising a cellulose-based sheet or strip (21), **characterized in that** it comprises: a first layer (33) of impregnating material arranged on a first side of said strip (21); a second layer of water paint (47), which is applied on said first layer (33), and a third layer of metal (70), which is stably anchored to said second layer (47). 10 15
16. Metallic paper as in claim 15, **characterized in that** said water paint comprises a water-soluble acrylic paint. 20
17. Metallic paper as in claim 15 or 16, **characterized in that** a water paint is used as the impregnating material. 25
18. Metallic paper as in claim 17, **characterized in that** said water paint is a water-soluble acrylic paint.
19. Metallic paper as in any claim from 15 to 18 inclusive, **characterized in that** said metal is either aluminum or copper. 30
20. Metallic paper as in any claim from 15 to 19 inclusive, **characterized in that** said third layer of metal (70) has a thickness of about 150-200Å (1.5-2.0 nanometers). 35
21. Metallic paper as in any claim from 15 to 20 inclusive, **characterized in that** the quantity of metal present is less than 0.05 g/m². 40
22. Metallic paper as in any claim from 15 to 21 inclusive, **characterized in that** it has a weight that varies from about 20 g/m² to about 150 g/m². 45
23. Metallic paper as in any claim from 15 to 22 inclusive, **characterized in that** it comprises a water print of a logo or a writing, arranged directly on said layer of metal (70). 50
24. Metallic paper as in any claim hereinbefore from 15 to 23 inclusive, **characterized in that**, at least on said third layer of metal (70), it comprises a substance able to make it proof against fatty and oily substances. 55
25. Metallic paper as in any claim hereinbefore from 15 to 24 inclusive, **characterized in that**, on one and/

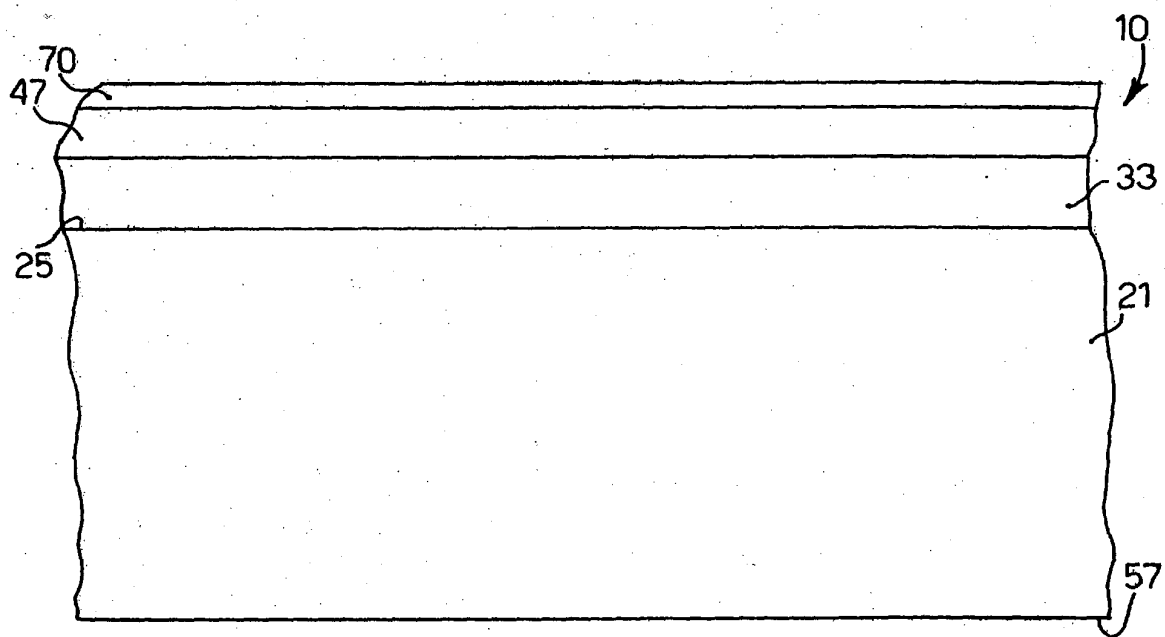
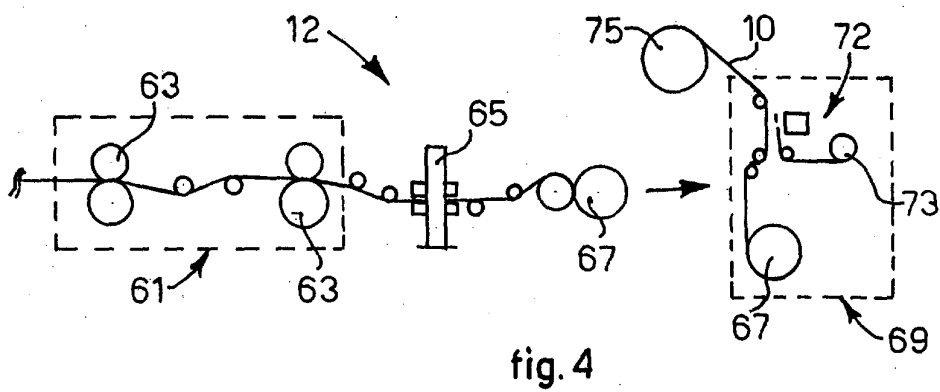
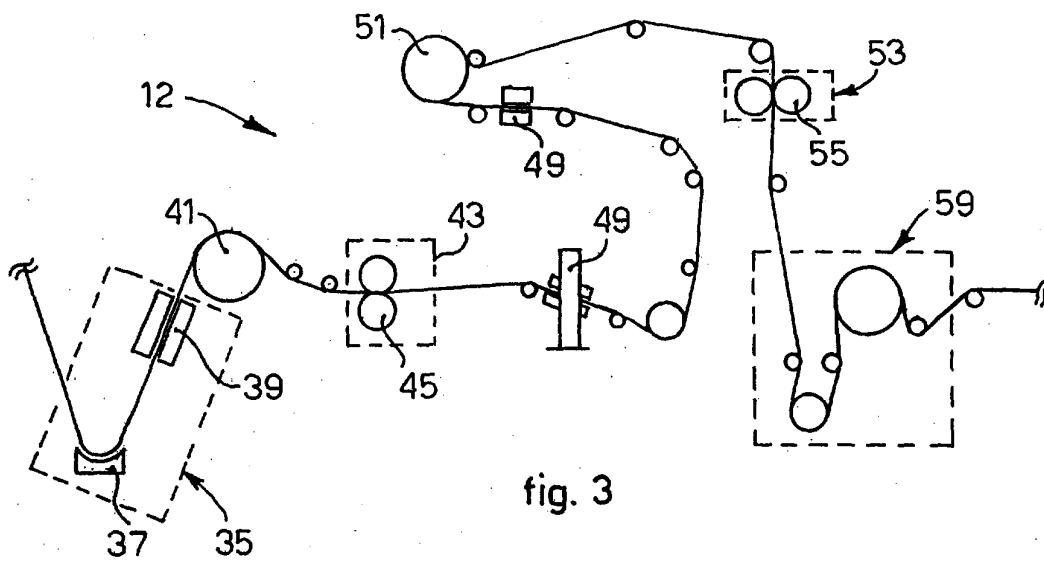
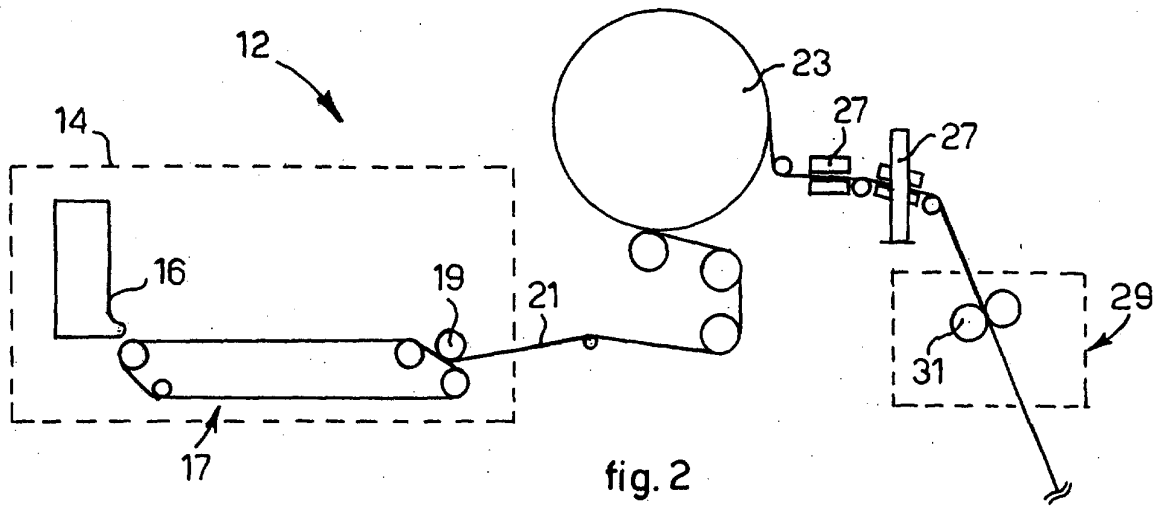


fig. 1





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Application Number
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Place of search Munich		Date of completion of the search 25 February 2005	Examiner Karlsson, L
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