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(54) Printing roller or sleeve with outer microcell cladding having open cells at the surface and closed cells internally, and method for its production

(57) A printing roller or sleeve (1) for use with flexographic printing systems or offset printing systems comprises a tubular body (2) provided with an internal cavity (3) and formed of polymer material, such as polyurethane, glass fibre reinforced plastic, kevlar, carbon, nickel or copper. This body (2) comprises two layered portions (4, 5), a first portion (4) being internal and defining the cavity of said tubular sleeve or roller (1) and a second portion (5) being external to the first and defining an outer surface of the sleeve (1), said second portion presenting a microcell structure with open cells at the surface and closed cells internally.

The method for producing the sleeve or roller is also claimed.

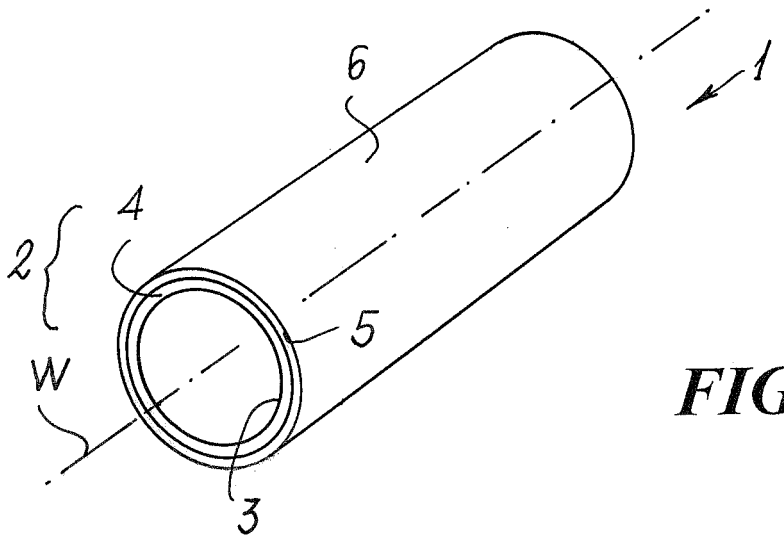

FIG. 1

EP 1 717 056 A1

Description

[0001] The present invention relates to a printing sleeve or roller in accordance with the introduction to the main claim. The invention also relates to a method for producing the sleeve or roller.

[0002] Printing sleeves and rollers having different shapes and having a single body (of metal or completely constructed of polymer material, such as polyurethane) or comprising two or more cylindrical layer which are superimposed each other and which are made of the same material or different materials, such as glass-fibre, polyurethane or rubber, have been known for some time. These sleeves are used both in flexographic printing and in offset printing.

[0003] With reference to flexographic printing, the sleeve is drawn over a suitable mandrel and supports the printing plates by interposing between these and the free surface of the sleeve a suitable known adhesive element having the double purpose of fixing the plate to the surface and providing a sort of damping element between the sleeve and plate. This adhesive element usually has a thickness not less than 0.38 mm.

[0004] The use of adhesive elements to fix the plate to the sleeve or roller results in high sleeve formation costs. In addition, the presence of these adhesive elements affects the printing quality by making the point of contact between the plate and the sleeve or roller surface non-uniform and linear.

[0005] In offset printing, for the known problems of wetting the printing plate in the non-printing regions which can hence not accept oil-based ink, a wetting unit is currently used comprising a dispensing roller and a wetting unit for a roller carrying printing parts. This roller and wetting roller unit transport water containing percentages of additives, such as isopropyl alcohol, able to reduce the surface tension of the water.

[0006] Even in this solution problems have been encountered, mainly related to the high cost of the alcohol or active substance in general, and to its disposal: the said additive is highly pollutant and toxic and must therefore be treated after use in a special manner to avoid environmental problems. For some time research has been carried out aimed at wetting the said plate using only water without any additive, but so far this research has not borne fruit.

[0007] An object of the present invention is to provide a printing sleeve or printing roller, usable either for flexographic printing or for offset printing, which is able to solve the aforesaid problems related to the use of known solutions in such printing systems.

[0008] Another object is to provide a sleeve of the stated type which enables the costs of printing machines and of the printing operation itself to be reduced.

[0009] A further object is to provide a sleeve or roller of the stated type which is able to avoid the use of environmentally harmful additives in offset printing, hence reducing the cost thereof.

[0010] Another object is to provide a method by which a sleeve or roller of the stated type can be produced at low cost.

[0011] These and other objects which will be apparent to the expert of the art are attained by a sleeve or roller and by a method in accordance with the accompanying claims.

[0012] The present invention will be more apparent from the accompanying drawings, which are provided by way of non-limiting example and in which:

Figure 1 is a perspective view of a sleeve or roller formed in accordance with the invention;

Figure 2 is a schematic block diagram showing the implementation of the method according to the invention.

[0013] With reference to said figures, A sleeve or roller according to the invention is indicated overall by 1 and comprises a body 2. The latter can be formed completely of polymer material such as polyurethane, or can have an inner portion (made of glass, resin, kevlar, carbon, nickel or copper) on which are located one or more layers made of polymeric material, rubber or other similar materials. The inner portion and the layer are torsionally connected so as the body 2 acts as a single body.

[0014] In the embodiment of figure 1, the body 2 is completely made of polymeric material; it is tubular and presents a cavity 3 disposed along its axis W. This body has a layered structure and, in particular, comprises a first portion 4 communicating with the cavity 3 and bounding this latter and at least one second portion having a surface 6 defining the free surface of the sleeve. This latter can support printing plates if the sleeve or roller 1 is used for flexographic printing; alternatively it can be used to wet a plate if the sleeve or roller is used for offset printing.

[0015] According to the invention, the second portion 5 has a microcell structure with open cells at the surface, whereas the first portion 4 has a closed cell structure on the inside of the layer. By virtue of this characteristic, the structure 6 of the sleeve or roller 1 has high elastic return (for example between 5 and 40 lbs/inch) which, when used in a flexographic printing machine, enables very thin adhesive elements (for example from 0.07 to 0.10 mm) to be used for the printing plates, which adhesive elements can be rigid. This enables production costs of a sleeve or roller for flexographic printing to be reduced and ensures a uniform linear point of contact between the printing plates positioned over the entire surface of the sleeve or roller and the element on which the printing is carried out. This improves print quality.

[0016] The open cell microcell structure of the second portion 5 has a high capacity for absorbing and distributing water uniformly in its rotary movement; this is particularly important when the sleeve or roller 1 is used for offset printing. In this manner the printing plate can be adequately wetted while limiting or possibly avoiding the

use of additives in the wetting liquid. This enables the use of a material harmful to the environment to be totally or at least largely avoided, and the disposal of which would be costly, as in fact is the case with currently known methods.

[0017] The structure of the portion 5 has a density between 0.600 g/ml and 0.800 g/ml, and preferably a thickness between 0.200 mm and 20.00 mm.

[0018] The sleeve or roller 1 is produced as shown schematically in Figure 2. The method for producing the sleeve or roller comprises adding an isocyanate present in a tank 20 to a polyol present in a tank 21. This addition can be in variable percentages, for example from 100 parts of polyol and 20 parts of isocyanate to 100:100 depending on the hardness to be obtained. Dry, substantially moisture-free air (i.e. having a lower relative humidity between 30% and 80%) is fed into the tank 21 from a tank 22. The air quantity fed into the tank 21 is suitably metered by a metering pump and is for example one litre for each 10-15 kg of second component.

[0019] The isocyanate and polyol are mixed together in a mixing machine and from there the material obtained is distributed over a rotary roller or sleeve 23 so as to coat it and define the sleeve or roller 1 in crude form. The coating obtained in this manner on the roller or sleeve 23 will contain perfectly regular air microbubbles dispersed uniformly within the entire layer of the roller or sleeve.

[0020] After the material has stabilized by chemical reaction between the two components, the coating on the roller, mandrel or sleeve 1 is surface-ground at 24, by which the air-containing cells are opened at the surface 5 to create, on the perfectly uniform and regular coating, microfissures offering the aforesaid advantages.

[0021] A preferred embodiment of the invention has been described. Others are however possible in the light of the aforegoing description: for example known hollow bodies (microspheres) can be dispersed within the polymer material which become dispersed uniformly throughout the (overall) sleeve layer, said hollow bodies forming microcavities within the body 2 of the sleeve. These microcavities are then opened at the surface 6 of the layer 5 by subjecting the sleeve or roller to a suitable mechanical surface machining operation (grinding). Alternatively, water droplets can be dispersed within the polymer material, these defining the aforesaid cavities when evaporated by heating the body 2.

[0022] Furthermore, according to a different embodiment of the invention, at least layer 5 (or both layers 4 and 5 of polymeric material) are provided over a cylindrical body made of metal, glass-fiber, carbon fiber or any other rigid material but suitable for allowing a limited radial expansion of cylindrical body to be obtained when mounted on a mandrel of a printing machine.

[0023] Even in this embodiment, layer 5 has an open-cell microcell structure in order to obtain the advantages above cited.

[0024] In this embodiment, the sleeve is obtained by coating the cylindrical body, located on a rotating mandrel, with manufacturing steps which can be easily understood by the skilled man on the basis of the description of fig. 2. Hence, these steps are not described.

Claims

1. A printing sleeve or roller (1) for use with flexographic printing systems or with offset printing systems, comprising a tubular body (2) having at least two layered portions, a first inner portion being made of polymer material such as polyurethane, or glass fibre reinforced plastic, or kevlar, or carbon, or nickel or copper, said body being provided with an internal cavity (3) defined by said first portion (4), the outer second portion (5) being external to the first and defining an outer surface of the sleeve or roller (1), **characterised in that** said second portion has a microcell structure with open cells.

2. A sleeve or roller as claimed in claim 1, **characterised in that** at least the second portion (5) contains microcavities.

3. A sleeve or roller as claimed in claim 2, **characterised in that** the microcavities are air bubbles.

4. A sleeve or roller as claimed in claim 2, **characterised in that** the microcavities are defined by hollow microspheres.

5. A sleeve or roller as claimed in claim 2, **characterised in that** the microcavities are defined by evaporated water droplets.

6. A sleeve or roller as claimed in claim 2, **characterised in that** the microcavities are bounded by solid bodies.

7. A sleeve or roller as claimed in claim 1, **characterised in that** the second portion (5) presents an elastic deformation between 5 and 40 lbs/inch.

8. A sleeve or roller as claimed in claim 1, **characterised in that** the second portion (5) has a density between 0.600 g/m and 0.800 g/ml.

9. A sleeve or roller as claimed in claim 1, **characterised in that** the second portion (5) has a thickness between 0.20 mm and 20.00 mm.

10. A method for producing a printing sleeve or roller for use with flexographic printing systems or offset systems, said sleeve or roller (1) comprising a tubolar body (2) having at least two layered portions, the second outer portion being external to the first portion and defining an outer surface of the sleeve or

roller (1), at least the outer second portion (5) being made of polymer material, said method comprising the following steps:

a) providing a first component of a polymer material in a respective tank (20);
b) providing a second component of said polymer material in a second tank (21);
c) mixing said first and second component together to obtain a mixture thereof;
d) feeding this mixture over a rotating cylindrical element to form a polymeric cylindrical body of determined thickness;
e) stabilizing said obtained polymeric body by chemical reaction between the two components;
f) surface machining the hence stabilized polymeric body;
characterised in that a further third component is added to at least the second component of this polymer material prior to its mixing with the first component, this third component creating microcavities within the polymeric cylindrical body after its stabilization, the cavities present on the free surface (6) of this polymeric cylindrical body being opened by the surface machining of said body, the body (2) so having an outer portion having a microcell structure with open cells superimposed to a portion having different structure.

11. A method as claimed in claim 10, **characterised in that** the third component is air.

12. A method as claimed in claim 10, **characterised in that** said third component is defined by microspheres.

13. A method as claimed in claim 10, **characterised in that** the third component is water.

14. A method as claimed in claim 11, **characterised by** adding 1 litre of air for each 10 kg-15 kg of second component.

15. A method as claimed in claim 11, **characterised in that** the air is dry and has a lower relative humidity between 30% and 80%.

16. A method as claimed in claim 12, **characterised in that** said hollow microspheres are added in a quantity of 1 litre for each 25 kg-30 kg of third component.

17. A method as claimed in claim 10, **characterised in that** the surface machined layer of the polymeric body is located over an inner layer of polymer material, the two layers defining the layered portions of the printing sleeve which is completely of polimer material.

18. A method as claimed in claim 10, **characterised in that** the polymer body is obtained over a cylindrical body of glass fiber reinforced plastic, kevlar, carbon, nickel or copper, the latter so having an outer layer having a microcell structure with open cells, the different portions of the sleeve been torsionally joined.

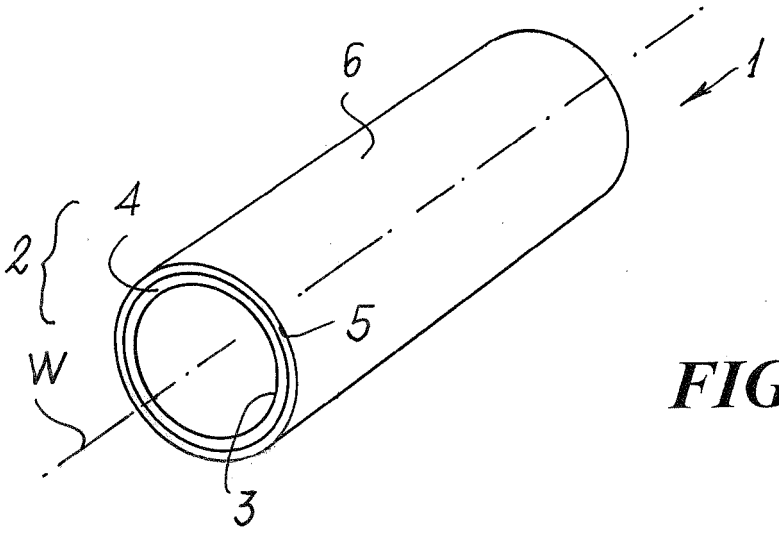

FIG. 1

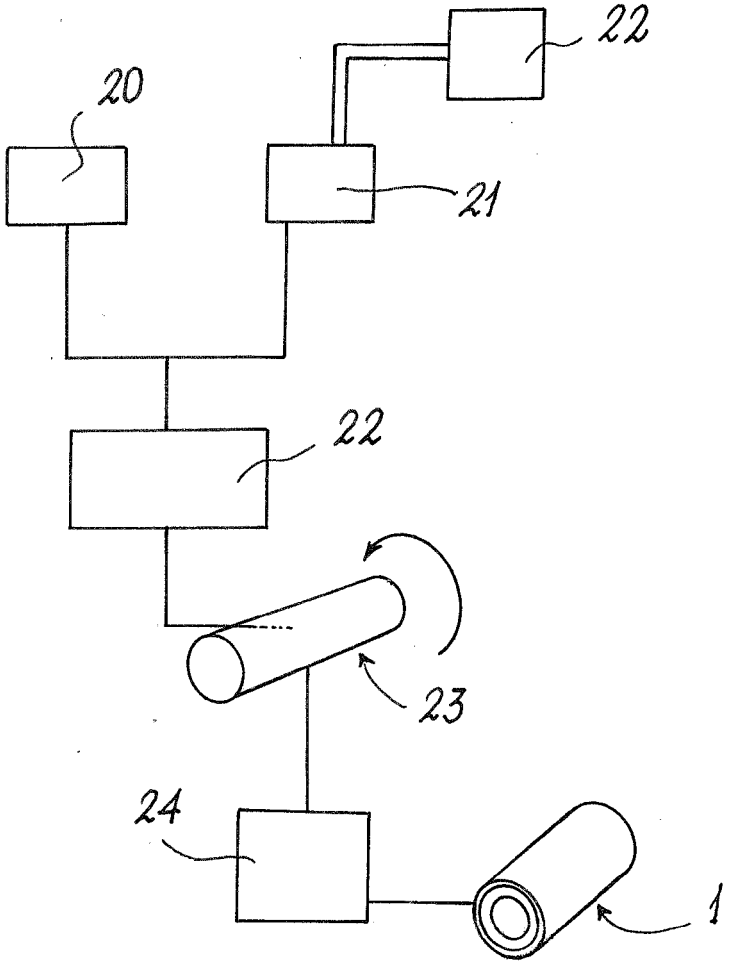

FIG. 2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 10 3430

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	EP 1 164 011 A (ERMINIO ROSSINI S.P.A; ROSSINI S.P.A) 19 December 2001 (2001-12-19) * paragraphs [0011], [0015], [0035], [0045], [0050] *	1-18	B41N7/04 B41N7/00 B41N10/00
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 November 2005	Giannitsopoulos, G

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 05 10 3430

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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