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(71) Applicant: OMET S.R.L. [IT/IT]; Via Caduti Lecchesi a Fossoli 22, 23900 Lecco (IT).

(72) Inventors: MANZINI, Amerigo; Via Valsecchi 17/A, 23900 Lecco (IT). GADDI, Marco; Via Ciserino 11, 23827 Lierna (Lecco) (IT). CIOFFI, Carmine; Via Don Ambrogio Buzzi 14, 23844 Sirone (Lecco) (IT).

(74) Agent: FIORAVANTI, Corrado et al.; c/o Jacobacci & Partners S.p.A., Corso Emilia 8, 10152 Torino (IT).

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(54) Title: A SLEEVE FOR SUPPORTING A PRINTING PLATE

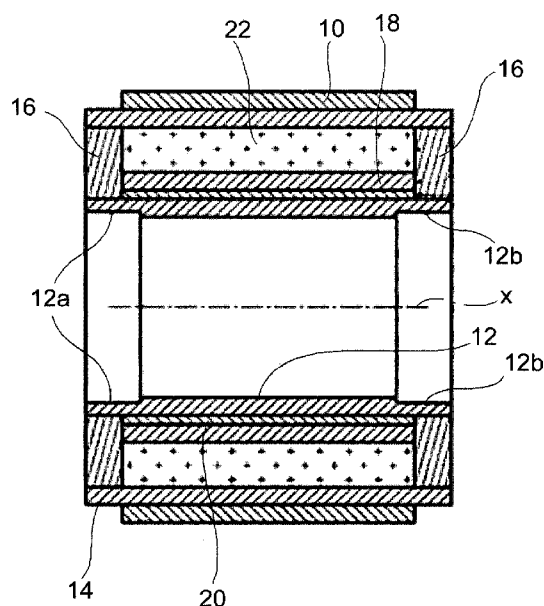


FIG. 4B

(57) Abstract: A sleeve (1) for a printing plate (10) comprises an inner jacket (12) of annular shape, an outer jacket (14) coaxial with respect to this inner jacket (12), and at least one connecting element (16), extending radially between the two jackets (12, 14) and configured so as to connect them rigidly.



A sleeve for supporting a printing plateTechnical sector

The present invention is generally in the field of printing machines; in particular, the invention refers to a printing plate support sleeve.

Prior art

Support sleeves for printing plates, in the form of composite cylindrical elements that are fitted, by means of a pneumatic thrust, on rotating mandrels of a printing machine (as will be better appreciated in the following description) are known.

The plate is a matrix that is mounted on a radially outer jacket of the sleeve (as shown in Figures 1A and 1B); such sleeve comprises a radially inner jacket that is forced onto the mandrel of the printing machine. The two jackets are connected by several layers of materials having different elasticity and flexibility with respect to the jackets themselves.

A traditional mandrel comprises a number of radial holes, from which pressurized air is expelled during operations of assembly and disassembly of the sleeve, creating a pneumatic bearing that causes the radial expansion of the inner jacket of the sleeve and allows the operator to bring the sleeve axially and angularly into the printing position (as shown in Figures 2A and 2B).

The expansion of the inner jacket of the sleeve is permitted by its flexibility, as well as by the elasticity and compressibility of the damping and filling layers that wrap the inner jacket. Once the air is no longer expelled from the mandrel shaft, the inner diameter of the sleeve returns to its original size, tightening the sleeve on the shaft.

Due to the layered composition of materials with different elastic characteristics, the outer jacket is not rigidly bonded to the inner jacket. Indeed, the intervention of external forces may cause unwanted deformation of the intermediate layers, causing angular and radial

displacements between the two jackets, depending on the reaction force of the elastic damping part and the stresses on the sleeve.

During the printing stage (the stage wherein the mandrel rotates the sleeve and consequently the plate), forces are generated due to the printing pressure, which cause possible angular and radial misalignments between the inner jacket and the outer jacket.

In this regard, Figures 3A and 3B schematically show a sleeve according to the prior art during the printing stage; such sleeve carries a plate rotating between an inking roller (bottom left in the figures) and a contrast roller for printing (bottom right), in a manner known per se. Figures 3A and 3B show, respectively, a condition wherein the inner and outer jackets undergo an angular misalignment, and a condition wherein the two jackets undergo a radial misalignment (but it is also possible for the two conditions to occur simultaneously).

These conditions do not make the rotation movement between the two jackets of the sleeve perfectly rigid and synchronous, creating resonance phenomena in the system, which are manifested in defects in the print. These limitations understandably affect or impair the qualitative yield of the printing process.

Solutions are also known to allow sleeves of different diameters to be mounted on the mandrel, such as the devices described in documents US 2004/0139872 A1 and EP 2 202 073 A1.

However, these are not true sleeves adapted to support the printing plate, but rather adapters, which are placed between the mandrel and the inner jacket of the sleeve, with the aim of making sleeves with different inner diameters usable on the same mandrel.

These adapters in turn consist of a radially innermost jacket and a radially outermost jacket, radially expandable by means of a pressurizable fluid, which is blown into the interface between said jackets. This is made possible by the presence of holes and channels passing through the thickness of at least one of the jackets (mainly the radially inner jacket), so that the fluid may be blown from the outside of the adapter into the cavity between said jackets, so

that the radially outer jacket expands and comes into contact with the inner jacket of the sleeve, which is then locked on the mandrel.

However, such a solution does not solve the problem of making the rotational movement between the two jackets of the sleeve rigid and synchronous, since the adapter according to the prior art performs the sole function of allowing the sleeve to be mounted on the mandrel, without affecting its functional or structural characteristics. In other words, the adapter may be seen as a radial extension of the mandrel, on which the actual sleeve is fitted.

In addition, in the operating condition, the fluid inside the adapter must be kept under pressure to preserve the radial expansion of the outer jacket of the adapter, and the consequent engagement of the sleeve. For this purpose, valves and seals must be provided in the adapter, which make its construction complex.

Summary of the invention

One purpose of the present invention is to eliminate the angular and radial misalignments between the outer jacket and the inner jacket of the sleeve, while maintaining the pneumatic mounting of the sleeve on the mandrel, by means of radial expansion of the inner jacket.

To obtain this result, according to the invention, the inner and outer jackets of the sleeve are rigidly joined together by means of radial connecting elements, which are preferably placed at the axial ends of the sleeve and are firmly joined to the two jackets, so that the transmission of the rotation from the inner jacket to the outer jacket is conveyed by the rigid connecting element, and not by the elastic layers that may be placed between these jackets. Moreover, there are no through holes in the two jackets or in the radial connecting elements adapted to allow the introduction of a fluid between these jackets (to cause the radial expansion of the radially outer jacket with respect to the radially inner jacket) and/or to accommodate pressurizing means (such as valves, screws, etc.), adapted to pressurize and/or maintain under pressure a fluid between these jackets.

Preferably, the sleeve is monolithic, so that the inner and outer jackets and the radial connecting elements are made in one piece.

Preferably, the radial thickness of the inner jacket is reduced in the segments near the connecting elements. In effect, in the segments wherein these connecting elements are present, the radial expansion of the inner jacket would be hindered.

By adopting an uneven section, wherein the segments of the inner jacket near the connecting elements are thinner than the rest of the jacket, the operation of inserting and removing the sleeve from the mandrel would not entail the need to use pneumatic pressure to deform these segments stiffened by the connecting elements, since in that segment the inner diameter of the jacket is greater than the corresponding outer diameter of the mandrel. In this way, the mandrel may be inserted or removed from the inner jacket, without the latter having to be deformed to accommodate it.

In the remaining segments, wherein there are no connecting elements (conveniently, the axially central segment of the inner jacket), the inner jacket is free to expand radially under the effect of pneumatic pressure, so that it may be fitted on, and removed from, the rotating mandrel of the printing machine, according to methods known to the person skilled in the art.

The aforesaid and other purposes and advantages are achieved, according to an aspect of the invention, by a sleeve having the characteristics defined in Claim 1. Preferred embodiments of the invention are defined in the dependent claims.

Brief description of the drawings

The functional and structural characteristics of some preferred embodiments of a sleeve according to the invention will now be described. Reference is made to the accompanying drawings, wherein:

- Figures 1A and 1B are respectively a schematic frontal view and a longitudinal sectional view of a sleeve on which a printing plate is mounted, according to the prior art;

- Figures 2A and 2B are schematic views of two stages of the process of mounting a sleeve on the mandrel shaft of a printing machine, according to the known technique, wherein is visible the stage of radial expansion of the inner jacket under the pneumatic thrust generated by the mandrel, and this inner jacket's subsequent return to its original diameter, with the resulting locking on the mandrel;
- Figures 3A and 3B are schematic views of two undesirable conditions that may be found in a sleeve according to the prior art and illustrate respectively a condition of angular misalignment and a condition of radial misalignment between the inner and outer jackets;
- Figures 4A and 4B are respectively a schematic frontal view and a longitudinal sectional view of a sleeve on which a printing plate is mounted, according to an embodiment of the present invention; and
- Figure 5 is a schematic longitudinal sectional view of a sleeve on which is mounted a printing plate, according to an embodiment of the present invention wherein the sleeve is made monolithic, i.e. having the inner and outer jackets and connecting elements made in one piece.

Detailed description

Before explaining in detail a plurality of embodiments of the invention, it should be clarified that the invention is not limited in its application to the constructive details and to the configuration of the components presented in the following description or illustrated in the drawings. The invention may assume other embodiments and may in practice be implemented or achieved in different ways. It should also be understood that the phraseology and terminology have descriptive purposes and should not be construed as restrictive.

Making reference by way of example to Figures 4A and 4B, a sleeve 1, adapted to support a printing plate 10, comprises an inner jacket 12, annular or cylindrical in shape and extending axially between a first end portion 12a and a second end portion 12b. The inner jacket 12 is adapted to be mounted on a mandrel shaft 11 of a printing machine and is at least partly elastically deformable in a radial direction under the action of a pneumatic thrust exerted by such mandrel shaft 11.

The sleeve 1 further comprises an outer jacket 14 of an annular shape, coaxial with respect to the inner jacket 12 and radially outermost with respect to the latter.

The sleeve 1 comprises at least one connecting element 16, extending radially between the inner jacket 12 and the outer jacket 14 and configured in such a way as to rigidly connect said inner and outer jackets 12, 14. Preferably, the connecting element 16 is located near an end portion 12a, 12b of the inner jacket 12.

Furthermore, in said inner and outer jackets 12, 14 and in said at least one connecting element 16 there are no through holes adapted to allow the introduction of a fluid to the interface between said jackets 12, 14 (to cause the radial expansion of the radially outer jacket 14 with respect to the radially inner jacket 12) and/or to accommodate pressurizing means, adapted to pressurize and/or to maintain under pressure a fluid between these jackets 12, 14.

Preferably, the sleeve 1 is monolithic, i.e. the inner and outer jackets 12, 14 and connecting elements 16 are made in one piece (as shown in figure 5). In other words, there is a mechanical and structural continuity between the inner and outer jackets 12, 14 and the connecting elements 16.

Due to the connecting elements 16, which are rigid, the outer jacket 14 rotates integrally with the inner jacket 12, and no undesired misalignments are possible.

Conveniently, there are at least two connecting elements 16, located near the opposite end portions 12a, 12b of the inner jacket 12 (as shown by way of example in Figure 4B).

According to an embodiment not shown, the connecting element 16 is configured as rays of elements spaced circumferentially.

According to an alternative embodiment, the connecting element 16 is configured as a ring extending circumferentially for at least part of the cross-section of the inner jacket 12 (as illustrated by way of example in Figure 4A).

In the entire present description and in the claims, the terms and expressions indicating positions and orientations, such as “longitudinal”, “radial” or “circumferential”, refer to the longitudinal axis x of the sleeve 1.

According to a preferred embodiment, the inner diameter of the inner jacket 12 at the connecting element 16 is greater than the diameter of the sections of such inner jacket 12 where there is no connecting element 16. The inner diameter of the inner jacket 12 at the connecting element 16 is configured to prevent contact between the inner jacket 12 and the mandrel 11. In this way, the mandrel 11 may be inserted into, or removed from, the sleeve 1 without resistance, and without the need to deform the inner jacket 12 (the deformation of which would be hindered by the connecting element 16). On the other hand, at the segments of the inner jacket 12 wherein the connecting elements 16 are not present (conveniently, the axially central segment of the inner jacket 12, i.e. the segment between the end portions 12a, 12b), this inner jacket 12 will be free to expand radially under the thrust of air jets coming out of the mandrel 11, so as to accommodate the latter and, once the pneumatic thrust has ceased, return elastically to the original diameter, remaining locked on the mandrel 11. It follows that, when the connecting element 16 is placed near an end portion 12a, 12b, the inner diameter of the inner jacket 12 near that end portion 12a, 12b would be greater than the diameter of the other sections of the inner jacket 12, as for example illustrated in the embodiment in Figure 4B.

According to an embodiment, the sleeve comprises an intermediate jacket 18, in a radially interposed position between the inner jacket 12 and the outer jacket 14.

Preferably, between the inner jacket 12 and the intermediate jacket 18, there is a layer of damping material 20, made for example of rubber or other material having greater elasticity and flexibility than those of the inner and outer jackets 12, 14.

According to one embodiment, between the intermediate jacket 18 and the outer jacket 14 there is a filling layer 22, which has different elasticity and flexibility with respect to the layer of damping material 20.

Different aspects and embodiments of a printing plate support sleeve according to the invention have been described. It is understood that each embodiment may be combined with any other embodiment. The invention, moreover, is not limited to the described embodiments, but may be varied within the scope defined by the accompanying claims.

CLAIMS

1. A sleeve (1) adapted to support a printing plate (10), comprising:
 - an inner jacket (12), of an annular shape and extending axially between a first end portion (12a) and a second end portion (12b), said inner jacket (12) being adapted to be mounted on a mandrel shaft (11) of a printing machine, and being at least partially elastically deformable in a radial direction under the action of a pneumatic thrust exerted by the mandrel shaft (11); and
 - an outer jacket (14) of an annular shape, coaxial with respect to the inner jacket (12) and radially outermost with respect to the latter;characterized in that it comprises at least one connecting element (16), radially extending between the inner jacket (12) and the outer jacket (14) and configured in such a way as to rigidly connect said inner and outer jackets (12, 14).
and in that said inner and outer jackets (12, 14) and in said at least one connecting element (16) there are no through holes, adapted to allow the introduction of a fluid between said inner and outer jackets (12, 14) and/or to house pressurizing means, adapted to pressurize and/or to maintain under pressure a fluid between said inner and outer jackets (12, 14).
2. Sleeve according to claim 1, wherein the sleeve (1) is monolithic, so that the inner and outer jackets (12, 14) and the connecting elements (16) are made in one piece.
3. A sleeve according to claim 1 or 2, wherein the connecting element (16) is located near an end portion (12a, 12b) of the inner jacket (12).
4. A sleeve according to claim 3, comprising at least two connecting elements (16), located near the opposite end portions (12a, 12b) of the inner jacket (12).
5. A sleeve according to any one of the preceding claims, wherein the connecting element (16) is configured as rays of elements spaced circumferentially.
6. A sleeve according to any one of claims 1 to 4, wherein the connecting element (16) is configured as a ring extending circumferentially for at least part of the cross-section of the inner jacket (12).

7. A sleeve according to any of the preceding claims, wherein the inner diameter of the inner jacket (12) at the connecting element (16) is greater than the diameter of the sections of such inner jacket (12) at which there is not a connecting element (16), said inner diameter of the inner jacket (12) being configured in such a way as to avoid contact between the inner jacket (12) and the mandrel (11).
8. A sleeve according to any one of the preceding claims, comprising an intermediate jacket (18), in a radially interposed position between the inner jacket (12) and the outer jacket (14).
9. A sleeve according to claim 8, comprising a layer of damping material (20), interposed between the inner jacket (12) and the intermediate jacket (18).
10. A sleeve according to any one of the preceding claims, comprising a filling layer (22), interposed between the intermediate jacket (18) and the outer jacket (14).

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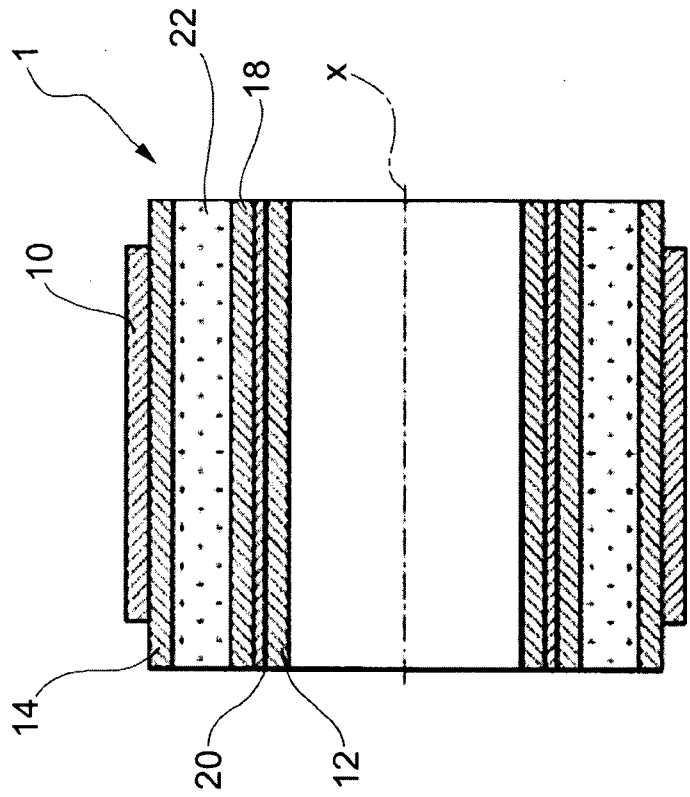


FIG. 1B
(PRIOR ART)

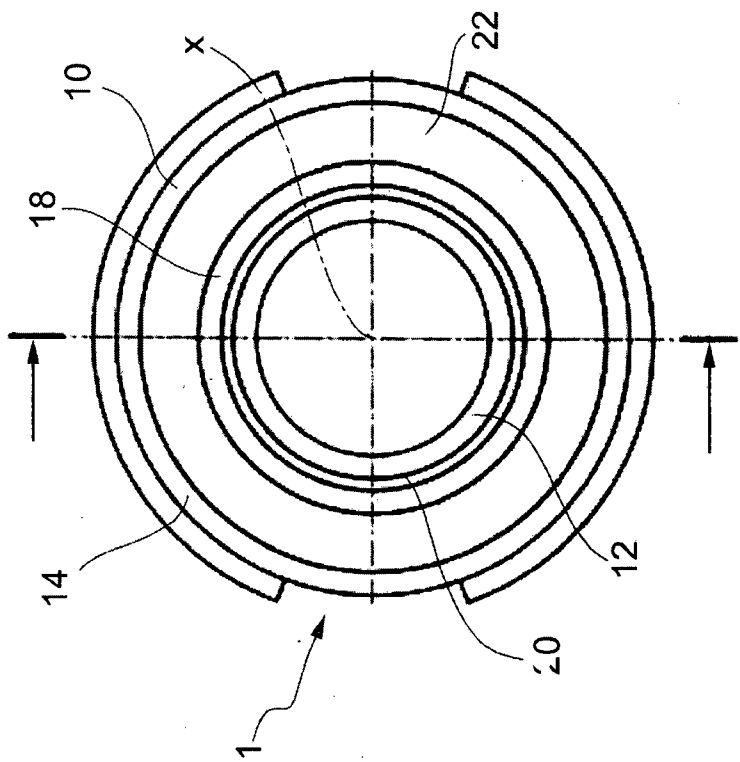


FIG. 1A
(PRIOR ART)

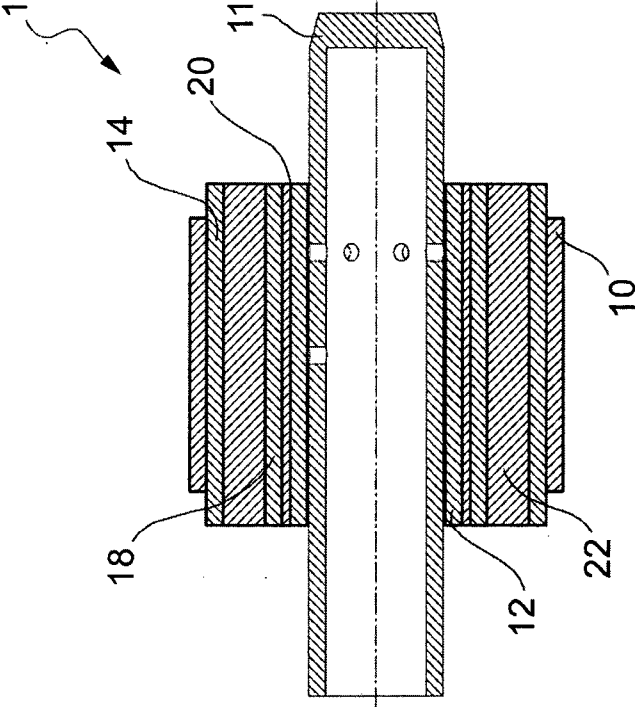


FIG. 2B
(PRIOR ART)

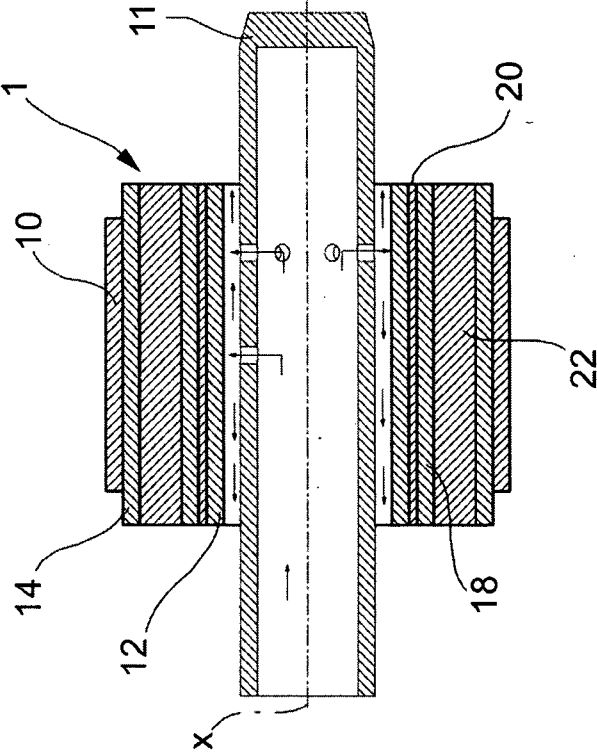


FIG. 2A
(PRIOR ART)

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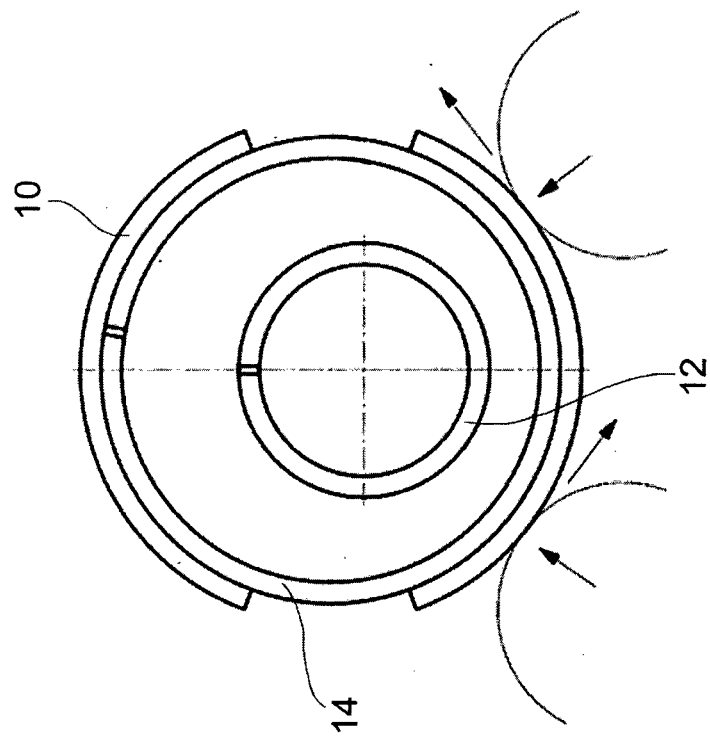


FIG. 3A
(PRIOR ART)

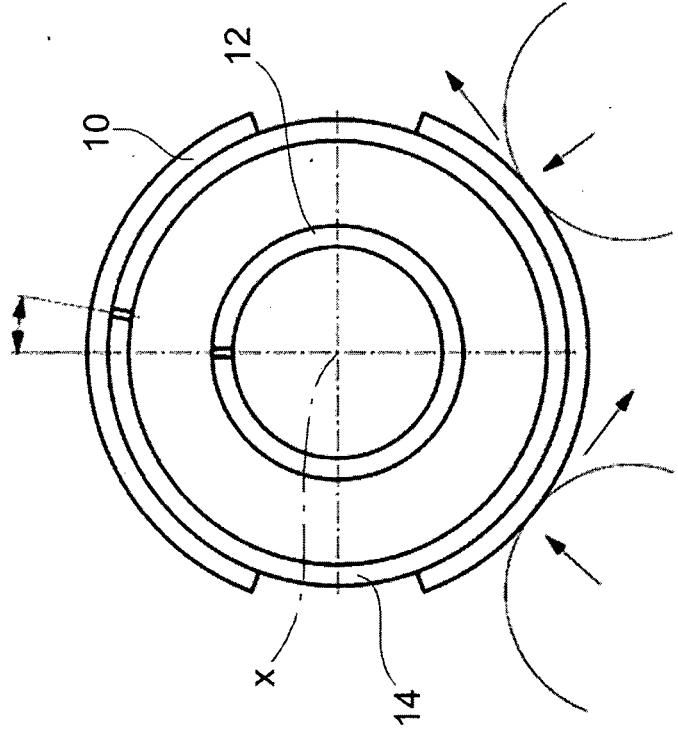


FIG. 3B
(PRIOR ART)

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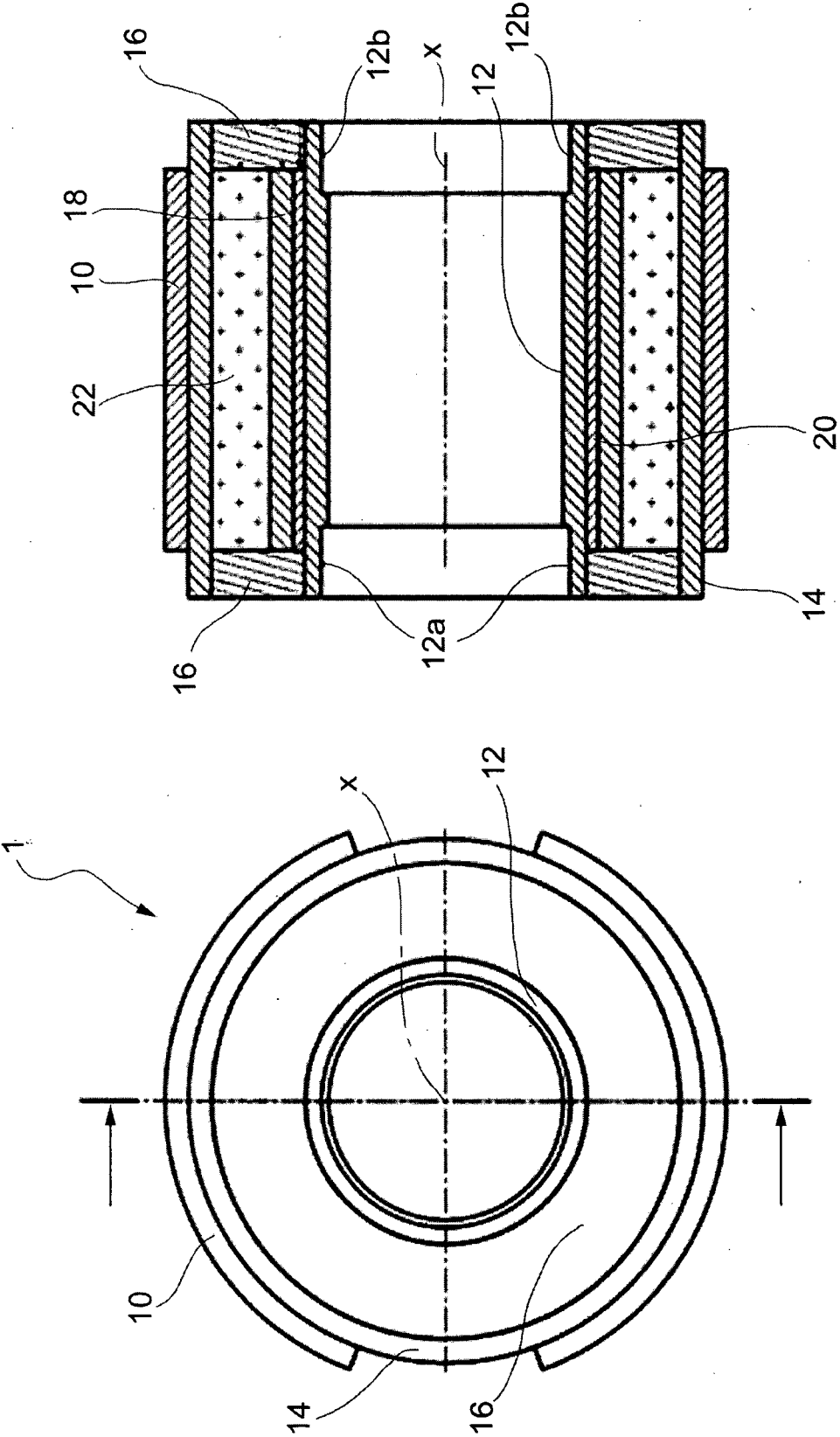


FIG.4B

FIG.4A

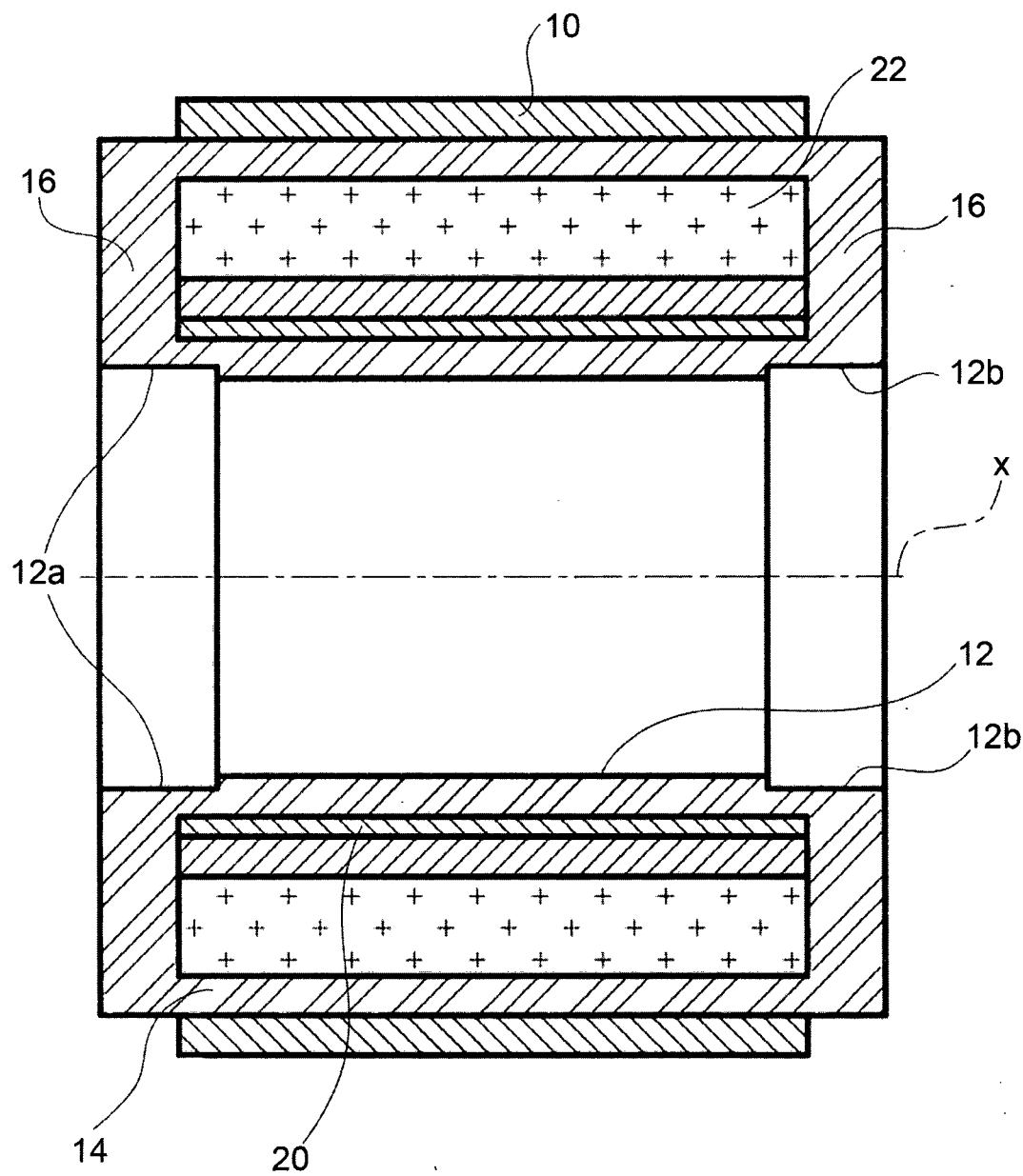


FIG.5

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. B41F27/06 B41F27/14 B41N6/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B41F B41N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 327 522 A1 (XYMID LLC [US]) 16 July 2003 (2003-07-16) abstract paragraphs [0001] - [0002], [0004] - [0010], [0012] - [0013], [0018], [0023] - [0031] figures 10-12	1-10
A	DE 200 12 929 U1 (POLYWEST KUNSTSTOFFTECHNIK [DE]) 28 December 2000 (2000-12-28) abstract pages 1,8-11 figure * ----- -/-	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

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Date of mailing of the international search report

08/10/2019

Name and mailing address of the ISA/

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NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Bellofiore, Vincenzo

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2019/056685

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2004/139872 A1 (MELOTTI RENZO [IT]) 22 July 2004 (2004-07-22) cited in the application abstract paragraphs [0001], [0003] - [0011], [0017], [0019] - [0028] figure *	1-10
A	----- EP 2 202 073 A1 (ROSSINI S P A [IT]) 30 June 2010 (2010-06-30) cited in the application abstract paragraphs [0001], [0005] - [0006], [0008] - [0009], [0012] - [0015], [0018] - [0019], [0021] - [0026] figures 1-3	1-10
A	----- US 5 819 657 A (ROSSINI FELICE [IT]) 13 October 1998 (1998-10-13) abstract column 1, lines 9-11 column 3, lines 45-55 column 4, lines 1-20 column 6, line 7 - column 10, line 18 examples 1-2 figures 2, 10	1-10
A	----- DE 200 19 625 U1 (POLYWEST KUNSTSTOFFTECHNIK [DE]) 10 May 2001 (2001-05-10) the whole document -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2019/056685

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1327522	A1	16-07-2003	EP 1327522 A1	16-07-2003
			US 2003131746 A1	17-07-2003

DE 20012929	U1	28-12-2000	AU 8971501 A	05-02-2002
			DE 10192912 D2	13-03-2003
			DE 20012929 U1	23-11-2000
			US 2004079250 A1	29-04-2004
			WO 0207978 A1	31-01-2002

US 2004139872	A1	22-07-2004	NONE	

EP 2202073	A1	30-06-2010	AT 514556 T	15-07-2011
			BR PI0905301 A2	22-03-2011
			EP 2202073 A1	30-06-2010
			EP 2202074 A2	30-06-2010
			ES 2368677 T3	21-11-2011
			US 2010147171 A1	17-06-2010
			US 2014311368 A1	23-10-2014

US 5819657	A	13-10-1998	NONE	

DE 20019625	U1	10-05-2001	DE 10152547 A1	23-05-2002
			DE 20019625 U1	05-04-2001
