(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
1 September 2016 (01.09.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/135552 A1

(51) International Patent Classification:
B41F 31/26 (2006.01) *B41F 27/10* (2006.01)
B41F 5/24 (2006.01)

(21) International Application Number:
PCT/IB2016/000186

(22) International Filing Date:
24 February 2016 (24.02.2016)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
PI2015A000009 24 February 2015 (24.02.2015) IT

(71) Applicant: **ZENIT S.p.A.** [IT/—]; Via I° Maggio, 26, I-29012, Caorso (PC) (IT).

(72) Inventor: **GASPARINI, Antonino**; Via Romanini, 6, I-29122, Piacenza (PC) (IT).

(74) Agent: **PALAGINI, Giulia**; Via P. Landi, 13, 56124, Pisa (PI) (IT).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) Title: ROLLER OF A FLEXOGRAPHIC PRINTING MACHINE AND FLEXOGRAPHIC PRINTING MACHINE THEREOF

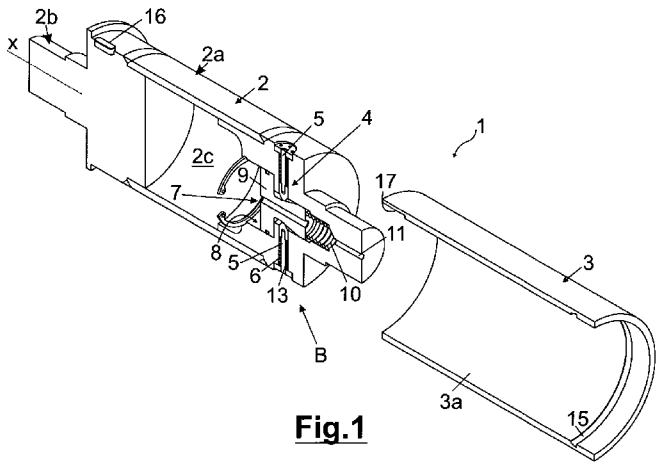


Fig.1

(57) Abstract: It is described a roller (1) of a flexographic printing machine, such as an inking roller, which comprises a cylindrical support (2), a sleeve (3) arranged in an exchangeable way on the cylindrical support (2) and locking means (4) adapted to lock the sleeve (3) on the cylindrical support (2). The sleeve (3) has a stiff structure in a radial direction and achieves with the cylindrical support (2) a matching form. The locking means (4) comprises at least one locking pin (5) arranged within a respective housing (6) obtained in the cylindrical support (2) in a radial position, and actuating means (7) of the locking pin (5) that is adapted to cause pass selectively the locking pin (5) between a first configuration, wherein the locking pin (5) protrudes to contrast with the sleeve (3) put on the cylindrical support (2) to block it, and a second configuration, wherein said locking pin (5) is completely contained into said housing (6) and said sleeve (3) can be engaged/disengaged on/from said cylindrical support (2).

WO 2016/135552 A1

Title

ROLLER OF A FLEXOGRAPHIC PRINTING MACHINE AND FLEXOGRAPHIC PRINTING MACHINE THEREOF

Field of the invention

The present invention concerns the flexographic printing and, in particular, it relates to a roller, for example an inking or printing roller, of a printing machine with flexographic technology. Furthermore, the invention relates to a flexographic printing machine that comprises said roller.

State of the art

The flexography is a rotary printing method wherein a printing roller, having matrix boards - called cliché - arranged on an external surface, prints a plastic film or paper sheet which slides, in a continuously way, in contact with this. This is a printing technology used for example for flexible packaging or a daily.

In particular, a flexographic printing machine comprises an ink container and a feeding roller of ink, commonly in a rubber material, that draws ink in mentioned ink container. Furthermore, the flexographic printing machine comprises an inking roller arranged to contact with feeding roller; a doctor blade is associated to the inking roller, wherein the doctor blade is adapted to eliminate surplus ink. A printing roller is arranged in contact with said inking roller. A pressure roller is provided, that is adapted to keep film in contact with said printing roller.

The inking roller, known with the term of "anilox" has, on an external surface, a plurality of microcells that

is adapted to contain ink, which in the rotary contact between inking roller and printing roller, is deposited on matrix applied to printing roller.

Are known the inking rollers with "a jacket" or "sleeve" structure, which replace old technology with matrices directly carved on external surface of the same; reason such that was necessary to use more rollers to make different printed matter. The latter aspect produces passive times in production, operations less efficient and costs more high, in addition that a large number of inking rollers is required.

Printing rollers with a sleeve structure are known.

The sleeve is substantially a tubular element put on a cylindrical support; the sleeve can be selectively interchanged by cylindrical support. On outer surface of sleeve a matrix, in case of inking roller, is provided.

Structurally the sleeve comprises more layers: an outer metal layer, commonly aluminum, on which an incised surface is obtained, an intermediate layer of deformable material, and a third layer of composite material - for example fiber glass - in contact with cylindrical support. An example is disclosed in the document EP0791477.

A layered structure of the sleeve provides a locking means function on the cylindrical support, as described below. The sleeve uses an "air pillow" at high pressure, which is apt to insert or extract the sleeve on the cylindrical support. The installation is carried out by expanding the deformable layer by an airflow that flows in a radial direction, through holes made on the surface of the cylindrical support, to generate the air pillow for

coupling the sleeve on the cylindrical support. Once airflow is discontinued, the deformable layer expands again in the original position in order to block the sleeve on the cylindrical support.

The sleeve can be easily extracted, in reverse steps, by generating again the air pillow.

At the light of above, however some drawbacks are observed. The structure of the sleeve with more layers, in addition to be structurally complicated and expensive, is subject with the time to wear and/or loss of the original resilient features. This causes drawback to lock the sleeve on the cylindrical support and, therefore, a low printing quality.

The deformable layer, furthermore, causes a lower rotation quality (eccentricity) with further problems of printing quality.

The cylindrical support is also subject to drawback such as a possible blocking of holes on the outer surface that perform air pillow. In this case, maintenance and cleaning with subsequent increasing of passive time production are necessary.

Furthermore, in the sleeve the metal layer is engaged with the sandwich layer in composite material, with a pressing tool and glued to it with special glue with more components. The sandwich layer end has to be protected by the hits by seal plastic rings to avoid ink infiltration; aspects these that show relevant complications of the structure.

Still, at the light of above, the disposal of the sleeve is laborious, in a difficult way recyclable and

expensive.

In FR2789626 with reference to Fig. 1, is described a support cylinder 10 that comprises a sleeve 14 mounted in a exchanged way on the support cylinder 10.

The support cylinder 10 is closed to the two ends forming a closed chamber 16. A feeding compressed air is supplied in one of the end of the support cylinder.

The support cylinder 10 comprises a side surface 18 and nozzles 20 that define ducts, which allow the flow of compressed air.

The sleeve 14 comprises an inner surface 22 of diameter identical or slightly less than the diameter of the outer surface 18 of the support cylinder. Each nozzle 20 comprises a stopper device 24 that operates or blocks the flows of the compressed air by the inner outwards of the support cylinder. Such stopper device comprises a slide 26 that is movable in translating in a direction substantially perpendicular to the nozzle in a chamber 28 that divide the nozzle 20 in two parts, a first part called inlet that connects the closed chamber 16 in the chamber 28, and a second part called outlet that connects the chamber 28 with the outside of the support cylinder offset.

In FR2789626 the obturators arranged in nozzles is adapted to allow or to block air flow during assembly operations. The structure of the sleeve is flexible such that it can be radially expanded pushed by the air pillow generated.

FR2789626 describes, furthermore, the prearranging a bolt that has a prevent function to block a relative rotation between the sleeve and the support, but it has not

the function to block the same sleeve, which is carried out in a classic way with the aid of the air pillow.

Summary of the invention

It is an object of the present invention provides a roller of a flexographic printing machine, which is adapted to overcome the inconveniences of the prior art by simplifying the structure and the costs of the structure of the same.

Another object of the present invention provides a flexographic printing machine that achieves the same objects.

These and other objects are achieved by a roller of a flexographic printing machine, in particular an inking or printing roller, comprising:

- a cylindrical support having a longitudinal axis x;
- a sleeve that is adapted to be engaged in an exchanged way on said cylindrical support, coaxially to said longitudinal axis x;
- locking means of said sleeve on said cylindrical support;

wherein said sleeve has a stiff configuration, in a radial direction with respect to said longitudinal axis (x), said sleeve having a tolerance size in order to make a clearance fit with said cylindrical support, and wherein said locking means comprises:

- at least a locking pin housed within a respective housing obtained in said cylindrical support, said locking pin being oriented radially with respect to said longitudinal axis (x);
- actuating means of said locking pin adapted to cause

pass selectively said locking pin among:

- a first configuration, wherein said locking pin protrudes from said housing, in order to capturing the sleeve put on the cylindrical support and to block stably it, and
- a second configuration, wherein said locking pin is completely contained into said housing and said sleeve can be engaged/disengaged on/from said cylindrical support.

The roller, according to the present invention, its therefore structurally much easier and provide a tubular sleeve with a single rigid layer or thickness, without a sandwich structure, and at least one mechanical locking pin, with dedicated actuating means, which ensures an higher stability to the sleeve when its engaged on the cylindrical support; this configuration solves eccentricity inconveniences. The locking pin is able to overcome a wear drawback of the deformable layer in the sleeve, according to the prior art. Furthermore, its able to improves the engagement stability and therefore a printing quality.

Moreover, it's adapted to provide a simplified engaged/disengaged operations on/from the cylindrical support.

In particular, the sleeve has a stiff structure, which is not deformable in a radial direction, contrary to a sandwich structure of sleeve according to the prior art. It's simply obtained by machine tools and has an inner diameter - defined by an inner side face of the same - with a tolerance dimension adapted to be engaged with the cylindrical support, without a pillow air.

In particular, said tolerance size defined among an inner diameter of the sleeve and outer diameter of the support cylinder has a value Δset between 0.02 and 0.09 mm, more in particular, set between 0.02 and 0.05 mm.

Advantageously, the actuating means of the locking pin are pneumatic means.

In a preferred exemplary embodiment the pneumatic means operation united comprises:

- a cylinder obtained in said cylindrical support;
- a piston functionally coupled in the cylinder,
- a resilient element associated with said piston;
- a feeding duct adapted to feed a pneumatic fluid in the cylinder.

In particular, the piston comprises a frustoconical shaped neck defined among a maximum cross section and a minimum cross section, on the frustoconical shaped neck being functionally rests in contact at least a locking pin. The locking pin is normally kept by the resilient element in the first configuration, in order to intercept the frustoconical shaped neck at the maximum cross section. The locking pin passes through instead in the second configuration when is fed pneumatic fluid in the cylinder by the feeding duct, such that the overpressure obtained in the cylinder moves the piston contrasting the resilient element and the locking pin, sliding on the frustoconical neck among the maximum cross section towards the minimum cross section, arranging completely in the housing.

Preferably a plurality of locking pin is provided, the locking pin being radially arranged with respect to said longitudinal axis and angularly spaced to each other.

In particular, a spring functionally coupled to each locking pin is provided. The spring has a function to keep in contact an end portion of said pin with said frustoconical shaped neck.

In particular, each locking pin comprises a contact portion, which has a frustoconical profile. The contact portion defines a fluid tight engagement with the housing; the spring is engaged to the locking pin. Opposite to the contact portion a plug is provided, the plug has a central opening from which protrudes a locking pin portion. The plug works as an upper abutment for the spring and in the meantime allows, once removed, of approach the housing the pin and the ability to carry out maintenance/changing operations of components.

Advantageously, the sleeve comprises an inner side surface, which in use faces towards said cylindrical support, and at least one circular groove adapted to engage with said locking pins.

Advantageously, said groove has a bottom wall with an inclined profile, which defines a beveled portion in order to assist the locking of the sleeve on the cylindrical support.

In addition, in an advantageous way, a spline arranged at opposite part with respect to the locking pins is provided; the spline allows to avoid a relative rotation of the sleeve with respect to the cylindrical support.

The spline is fixed. Said sleeve has in turn a recess - obtained on the inner side face - in which engages, in a abutment way, with the spline once the sleeve is put completely on the cylindrical support.

A end stop reference by introducing the sleeve on the cylindrical support is defined by the abutment with the recess at an end portion of the support.

Advantageously, said sleeve is made of a metal material or an alloy or composite material.

In a preferred exemplary embodiment said cylindrical support comprises a first and a second portion engaged to each other. The first portion comprises a chamber that define said cylinder. The second portion engages at least partially in said chamber. The first and the second portion comprise respective rotating shanks of the roller according to said longitudinal axis.

Advantageously, said cylinder is obtained in a cross section of said chamber. The chamber has a cross section greater than to said cylinder.

The cylinder substantially is obtained in a chamber portion and it is therefore open on the chamber. Such configuration allows approach the cylinder through the chamber.

In particular, the piston is adapted to slide among a head wall of the cylinder and a abutment ring arranged in a opposite side, from a side of said chamber.

Advantageously, the piston comprises at least one tightness seal housed peripherally on the outer surface of the piston.

According to another aspect of the invention is described a flexographic printing machine that comprises at least one roller, in particular an inking roller, said roller comprising:

- a cylindrical support having a longitudinal axis;

- a sleeve that is adapted to be put in a exchanged way on said cylindrical support, coaxially to said longitudinal axis;
- locking means of said sleeve on said cylindrical support;

wherein the sleeve has a stiff structure in a radial direction with respect to the longitudinal axis and has a tolerance size adapted to make a clearance fit with said cylindrical support, and

wherein the locking means comprises:

- at least one locking pin housed within a respective housing obtained cylindrical support, said locking pin being radial arranged with respect to said longitudinal axis x;
- actuating means of the locking pin that is adapted to cause pass selectively the locking pin among:
- a first configuration, wherein said locking pin protrudes from said housing, in order to capturing the sleeve put on the cylindrical support and to block stably it, and
- a second configuration, wherein said locking pin is completely contained into said housing and said sleeve can be engaged/disengaged on/from said cylindrical support.

According to another aspect of the invention is described a sleeve of a roller of a flexographic printing machine, wherein said roller comprises a cylindrical support having a longitudinal axis, and wherein said sleeve is adapted to be put in a exchanged way on said cylindrical support, coaxially to said longitudinal axis, wherein said

sleeve is stiff in a radial direction with respect to said longitudinal axis and has a tolerance size adapted to provide a clearance fit with said cylindrical support.

Description of figures of the invention

Further characteristic and advantages of the invention are better shown by examining the following detailed description of a preferred embodiment, but not exclusive, shown for example and not limitative, with the support of the attached drawings, wherein:

- Fig. 1 shows a perspective cross sectional view of a roller of a flexographic printing machine such as an inking roller, according to the present invention, in a configuration, where the cylindrical support and the sleeve are disengaged to each other;
- Fig. 2 shows an elevational side view of the cylindrical support and of the sleeve of Fig. 1;
- Fig. 3 shows a sectional elevation side view of the cylindrical support and of the sleeve partially coupled to each other;
- Fig. 4 shows a perspective view of the same configuration of Fig. 3;
- Fig. 5 shows a perspective view where the cylindrical support and the sleeve are completely coupled to each other.

Detailed description of the invention

With reference to Fig. 1, a roller **1** of a flexographic printing machine is shown, in particular an inking roller, according to the present invention. The roller **1** comprises a cylindrical support **2** with a longitudinal axis **x**, a sleeve **3** conformed to be coupled - in a exchanged way -

with the cylindrical support **2**, coaxially to the longitudinal axis **x**. Moreover the roller **1** comprise locking means **4** adapted to lock the sleeve **3** on the cylindrical support **2**.

More in particular, the sleeve **3** has a stiff structure in a radial direction with respect to the longitudinal axis **x** and has an inner side face that achieves with the cylindrical support **2** a matching form, substantially a clearance fit, with a predetermined tolerance size. Advantageously, the sleeve **3** is made of a metal material or an alloy or composite material. In particular, the tolerance size between inner diameter of the sleeve **3** and outer diameter of the support cylinder has a value **Δ** set between 0.02 and 0.05 mm.

The locking means **4** comprise at least one locking pin **5** housed in a respective housing **6** obtained on the cylindrical support **2**. Preferably a plurality of locking pins **5** is provided. The locking pins are radially arranged with respect to the longitudinal axis **x** and rotationally spaced to each other, with fixed pitch.

Furthermore, actuating means **7** is provided that allow to move selectively the locking pins **5** among a first configuration **A** to a second configuration **B**. In the first configuration **A** (Fig. 5) each locking pin **5** protrudes from the housing **6** and by the outer surface of the cylindrical support **2**. In this way, when the sleeve **3** is engaged with the cylindrical support **2** each pin **5** intercepts and stably blocks the sleeve **3**, avoiding the extraction of the same in a longitudinal direction and the relative rotation about the cylindrical support **2**.

In the second configuration **B** (Fig. 1) each locking pin **5** is completely contained in the housing **6** and not protrudes with respect to the external surface of the cylindrical support **2**. This way, the sleeve **3** can be engaged/disengaged on/from the cylindrical support **2**.

In a preferred exemplary embodiment, the locking pins **5** are operated by a pneumatic mechanism **7** that comprises a cylinder **8** that extends along the longitudinal axis **x** and a piston **9** functionally coupled in the cylinder **8**. Furthermore, a resilient element **10** is provided, preferably a spring, which is in contrast with one side of the piston **9**, and a feeding duct **11** of a pneumatic fluid - compressed air - in the cylinder **8**.

In detail, the piston **9** comprises a frustoconical shaped neck **9a** with cross section variable among a minimum cross section **9a"** and a maximum cross section **9a'** (Fig.4). On the frustoconical neck **9a** are functionally arranged in contact the locking pins **5**, which are disposed in a radially position. The locking pins **5** are, therefore, normally kept in the first configuration to - i.e. the configuration protruding - by the spring **10** that is in contrast with the piston **9** such that the frustoconical neck **9a** rests the locking pins **5** at the maximum cross section **9a'** pushing the same towards the above (Fig.4).

The locking pins pass instead in the second configuration **B** when air is supplied compressed cylinder **8** (Fig.2) by the feeding duct **11**. The overpressure obtained in the cylinder **8** pushes the piston **9** in an opposite direction contrasting the resilient action of the spring **10**. Therefore the locking pins **5** moves along the

frustoconical neck **9a** between the maximum cross section **9a'** towards the minimum cross section **9a"** completely arranged in the housing **6**.

This technical solution overcomes the difficulties of the prior art concerning to the obstruction inconvenience of the holes that create the air pillow. In the meantime, the stability of the connection between the sleeve **3** and the cylindrical support **2** is better, reducing the relative movement between the elements and therefore the quality and precision of the printing.

More in detail, with reference to Fig. 5, the cylindrical support **2** comprises a first **2a** and a second **2b** portion adapted to be engaged to each other. The first portion **2a** is substantially slot and defines an inner chamber **2c** in which the cylinder **8** is obtained. The second portion **2b** engages at least partially in the chamber **2c** in order to close it in a fluid tight way.

Structurally the cylinder **8** is obtained in a portion of the chamber **2c;** the chamber **2c** has a larger cross section with respect to the cylinder **8**. The piston **9** slides between a head wall of the cylinder **8** and a abutment ring **18** arranged in the edge that faces the chamber. The piston **9**, furthermore, has a tightness seal **19**.

The feeding duct **11** is obtained coaxially to the longitudinal axis **x** starting from the end of the first portion **2a**. Such extends, furthermore, through the piston up to be connected to the cylinder **8**. This solution allows to feed a flow air by a end portion of the printing roller, exploiting the same configuration with respect to the prior art flexographic printing machines.

According to other structural aspects, as shown in detail in Figs. 4 and 5, each locking pin **5** is associated with a respective resilient element **13** adapted to keep the sliding contact - of each end portion - with the frustoconical neck **9a**.

Structurally each locking pin **5** comprises a contact portion **5a** with a frustoconical profile in a respective end. The contact portion **5a** defines a matching shape with the housing **6**. The spring **13** is inserted on the locking pin **5**; opposite to the contact portion **5a** a plug **5b** is provided, the lug comprise an opening from which protrudes part of the locking pin **5**. The plug **5b** integral to the cylinder works as abutment for the spring **13** that pushes the locking pin **5** towards the frustoconical neck **9a**.

To assist a locking function, in an advantageous way, the sleeve **3** comprises, on the inner side face that faces the cylindrical support **2**, a circular groove **15** which engage with the locking pins **5**. The groove **15** has a bottom wall **15'** (Fig.5) with an inclined profile, which defines a beveled portion to assist the disengagement of the locking pins **5** when the sleeve **3** is extracted from the cylindrical support **2**, according to the longitudinal axis **x**.

Furthermore, a spline **16** is advantageously provided, that works as a reference when the sleeve **3** is assembled on the cylindrical support **2**. The spline **16** allows to avoid the relative rotating of the sleeve **3** with respect to the cylindrical support **2**. The sleeve **3** has in turn a recess **17** in which the spline **16** engages. The technical effect combined of the locking pins **5** and of the spline **16** allows to keep the sleeve **3** steadily on the support **2**; said

solution is adapted to improve a printing quality.

The structure of roller above described realize different advantages. The sleeve is much cheaper, not providing a structure with more layers. Furthermore, is structurally much easier; does not require assembly operations i.e. of a pressure tool machine to press the aluminum coating, moreover does not require glues with more components, and protection rings to the end of the roller. The sleeve therefore does not subject to infiltration inconveniences.

Moreover, the roller coupled to the sleeve is much steadier and precise in rotation; is reduced remarkably the eccentricity error between support and sleeve, in order to eliminate the sandwich with a deformable middle layer.

CLAIMS

1. A roller (1) of a flexographic printing machine (1), in particular an inking roller, comprising:
   - a cylindrical support (2) having to longitudinal axis (x);
   - a sleeve (3) that is adapted to be put in a exchanged way on said cylindrical support (2), coaxially to said longitudinal axis (x);
   - locking means (4) adapted to lock said sleeve (3) on said cylindrical support (2);

wherein said sleeve (3) has a stiff structure adapted to be stiff in a radial direction with respect to said longitudinal axis (x), said sleeve (3) having a tolerance size in order to make a clearance fit with said cylindrical support (2), and wherein said locking means (4) comprises:

- at least a locking pin (5) housed within a respective housing (6) obtained in said cylindrical support (2), said locking pin (5) being radially arranged with respect to said longitudinal axis (x);
- actuating means (7) of said locking pin (5) adapted to cause pass selectively said locking pin (5) between:
- a first configuration (A), wherein said locking pin (5) protrudes from said housing (6), in order to capturing the sleeve (3) put on the cylindrical support (2) and to block stably it, and
- a second configuration (B), wherein said locking pin (5) is completely contained into said housing (6) and said sleeve (3) can be engaged/disengaged on/from said cylindrical support (2).

2. Roller (1) according to claim 1, wherein said tolerance size defined among an inner diameter of the sleeve and outer diameter of the support cylinder has a value Δ set between 0.02 and 0.09 mm, more in particular, set between 0.02 and 0.05 mm

3. Roller (1) according to claim 1, wherein said actuating means (7) of the locking pin (5) are pneumatic means, said actuating pneumatic means (7) comprising:
   - a cylinder (8) obtained in said cylindrical support (2);
   - a piston (9) functionally coupled in said cylinder (8),
   - a resilient element (10) associated with said piston; (9)
   - a feeding duct (11) adapted to feed a pneumatic fluid in said cylinder (8),

   wherein said piston (9) comprises a frustoconical shaped neck (9a) defined among a maximum cross section (9a') and a minimum cross section (9a"), on said frustoconical shaped neck (9a) being functionally arranged in contact at least a locking pin (5),
   and wherein said locking pin (5) is normally kept by said resilient element (10) in said first configuration (A) capturing the frustoconical shaped neck at said maximum cross section (9a'), and wherein said locking pin (5) passes through in said second configuration (B) when is fed pneumatic fluid in said cylinder (8) by said feeding duct (11), such that the over pressure generated in said cylinder (8) moves said piston (9) contrasting said resilient element

(10) and said at least locking pin (5), sliding on said frustoconical shaped neck (9a) between said maximum cross section (9a') towards said minimum cross section (9a"), in order to completely get in said housing (6) such that it allows the assembly/ disassembly of said sleeve (3).

4. Roller (1) according to any one of claims 1-3, wherein a plurality of locking pin is provided (5), being radially arranged with respect to said longitudinal axis (x) and rotationally spaced to each other.
5. Roller (1) according to any one of claims 3-4, wherein a spring (13) functionally coupled to each locking pin (5) is provided, said spring adapted to keep in contact an end pin portion with said frustoconical shaped neck (9a).
6. Roller (1) according to claims 5, wherein said locking pin (5) comprises a contact portion (5a) with frustoconical shaped, said contact portion (5a) defines a fluid tight engagement with said housing (6), said spring (13) is put on the locking pin (5), and opposite on contact portion (5a) is provided to plug (5b) with an opening from which protrudes part of said locking pin (5).
7. Roller (1) according to any of claims 1-6, wherein said sleeve (3) comprises an inner side surface, which in use faces towards said cylindrical support (2), at least one circular groove (15) which engage with said locking pins (5), in particular said groove (15) has a bottom wall (15') with an at an angle profile, which defines a beveled portion, in order to assist a locking of said

sleeve (3) on said cylindrical support (2).

8. Roller (1) according to any one of claims 1-7, wherein a spline (16) is provided, which are arranged at opposite part with respect to said locking pins (5), said spline that is adapted to avoid the relative rotating of said sleeve (3) with respect to said cylindrical support (2), wherein said spline (16) is fixed and said sleeve (3) has in turn a recess (17) obtained on the inner side face of said cylindrical support (2) in which said spline (16) is engages once the sleeve (3) is put completely on the cylindrical support (2).

9. Roller (1) according to desired of claims 1-8, wherein said cylindrical support (2) comprises a first (2a) and a second (2b) portion engaged with each other, wherein said first portion (2a) comprises a chamber (2c) where said cylinder (8) is obtained, and wherein said second portion (2b) engages at least partially in said chamber (2c) in a fluid tight way.

10. A flexographic printing machine that comprises at least to roller (1) according to claims 1-8.

11. A sleeve (3) of a roller (1) of a flexographic printing machine, wherein said roller (3) comprises a cylindrical support (2) having a longitudinal axis (x), and wherein said sleeve (3) is adapted to be arranged in a exchanged way on said cylindrical support (2), coaxially to said longitudinal axis (x), wherein said sleeve (3) is stiff in a radial direction with respect to said longitudinal axis (x) and has a tolerance size (Δ) adapted to provide a clearance fit with said cylindrical support (2).

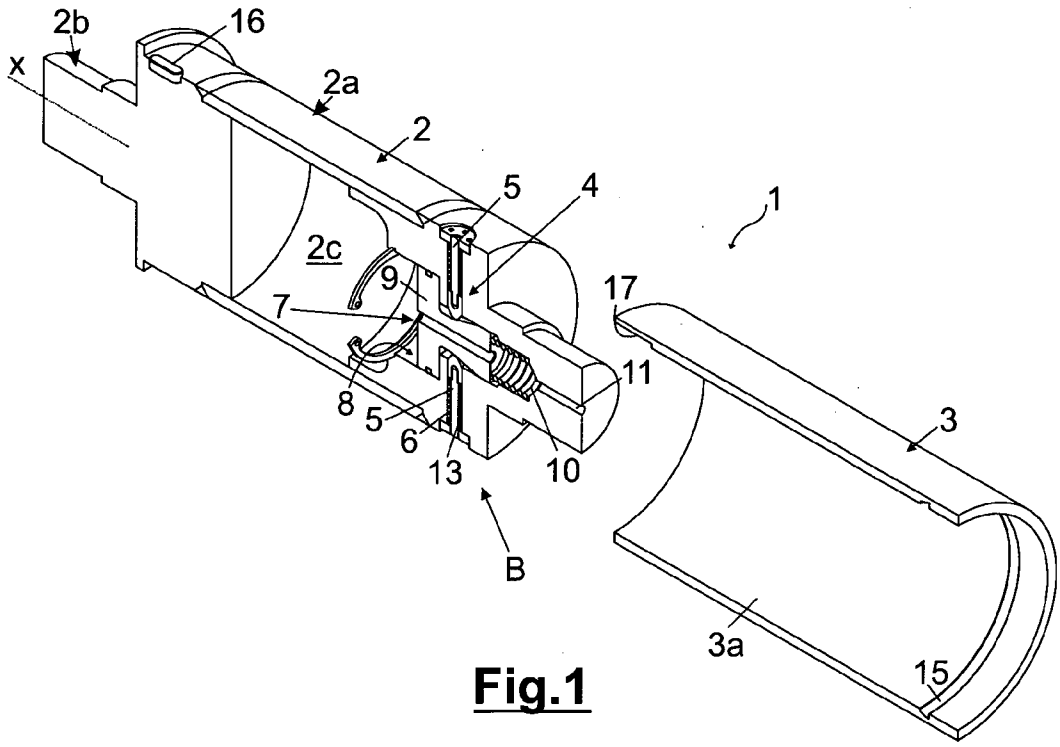


Fig.1

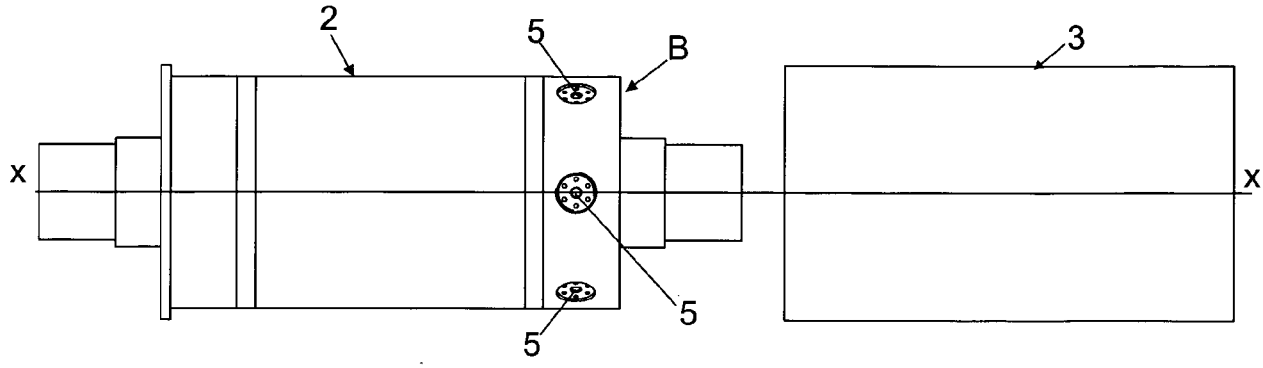


Fig.2

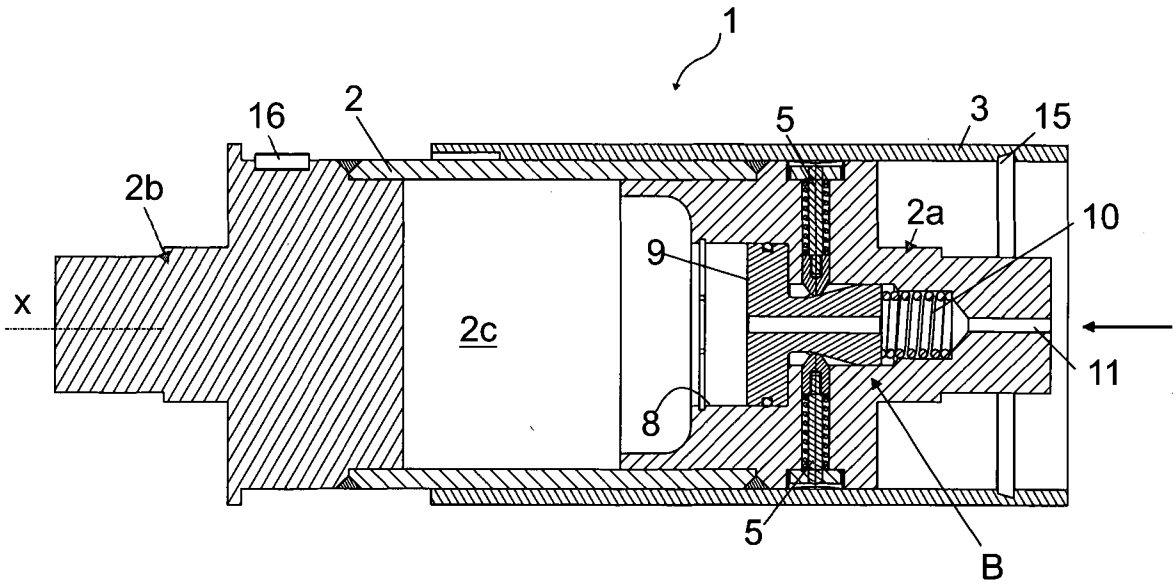

1
16
2
5
3
15
2b
2a
10
9
x
2c
11
8
5
B

Fig.3

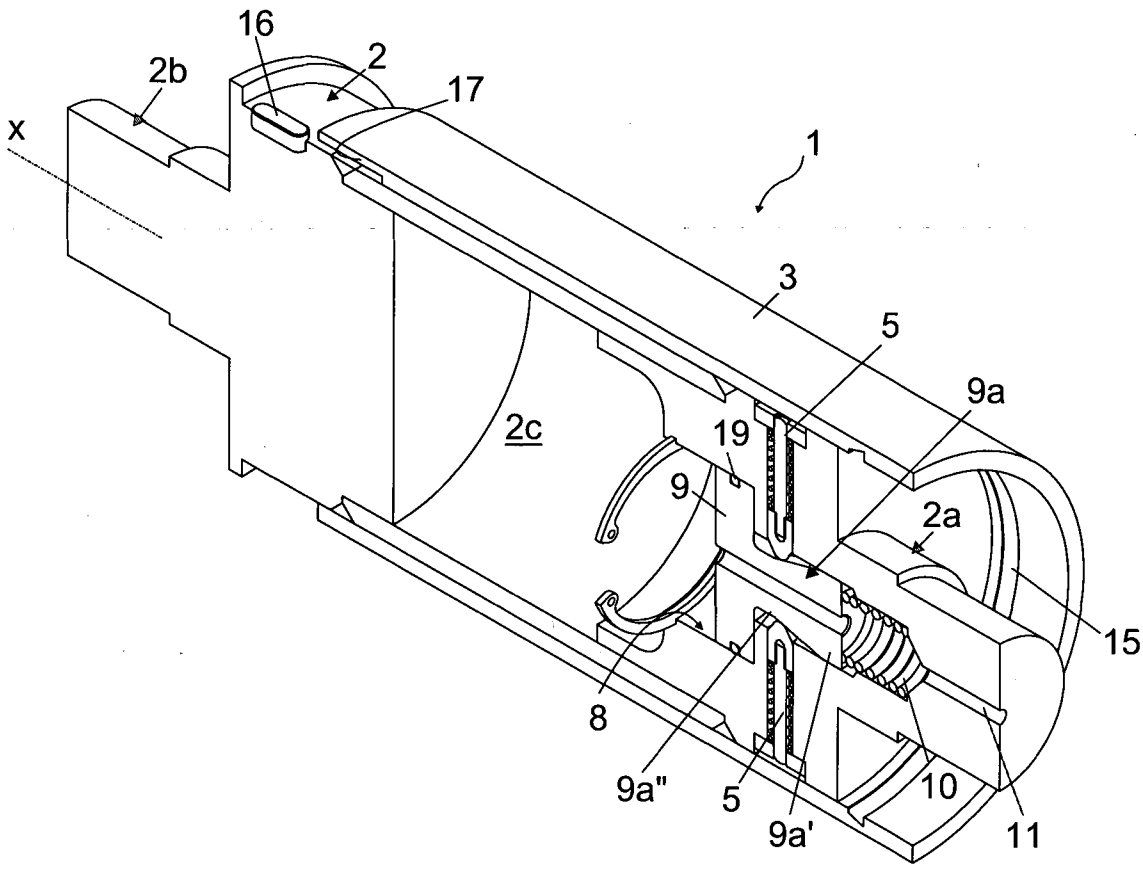

16
2b
2
17
x
1
3
5
9a
2c
19
9
2a
15
8
9a"
5
10
9a'
11

Fig.4

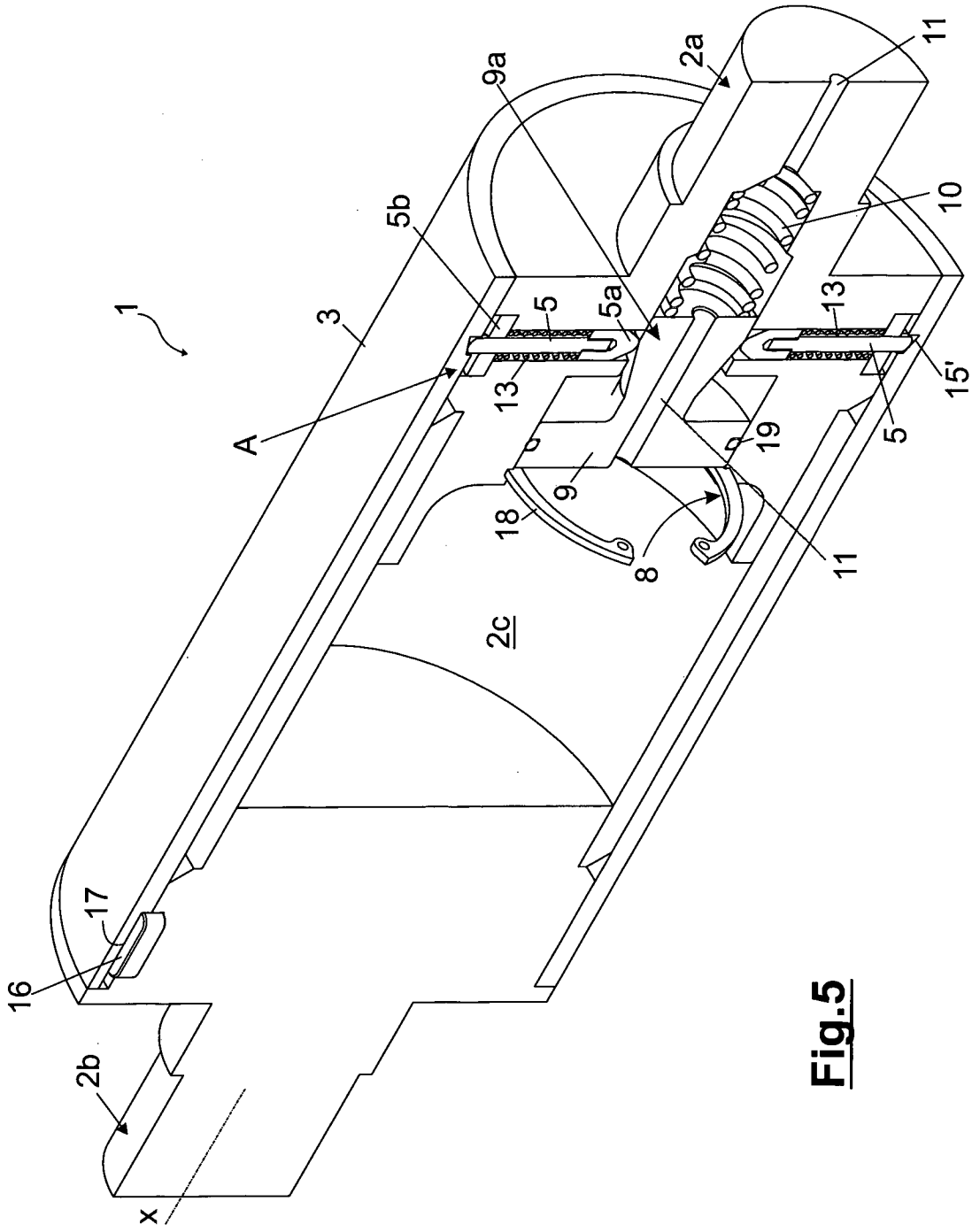


Fig.5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/000186

A. CLASSIFICATION OF SUBJECT MATTER
INV. B41F31/26 B41F5/24 B41F27/10
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

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	FR 2 789 626 A1 (FRANCILLE JEAN [FR]) 18 August 2000 (2000-08-18) cited in the application abstract pages 1-2, 6-7 figures 6A-6B	1-11
A	DE 27 40 634 A1 (ROTOFLEX ENGRAVING LTD) 23 March 1978 (1978-03-23) pages 6-7 pages 12-16 figures 7-10	1-11

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 June 2016	10/06/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bellofiore, Vincenzo

1

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/000186

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 727 729 A1 (MIYAKOSHI PRINTING MACH [JP]) 7 May 2014 (2014-05-07) abstract paragraphs [0001], [0005] - [0008], [0021] - [0026], [0051] - [0064] figures 1-3, 9-10	1-11
A	EP 0 782 919 A1 (HEIDELBERGER DRUCKMASCH AG [DE]) 9 July 1997 (1997-07-09) the whole document	1-11

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2016/000186

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2789626 A1	18-08-2000	NONE	
DE 2740634 A1	23-03-1978	DE 2740634 A1	23-03-1978
		DK 391077 A	14-03-1978
		GB 1587956 A	15-04-1981
EP 2727729 A1	07-05-2014	CA 2831498 A1	06-05-2014
		CN 103802448 A	21-05-2014
		EP 2727729 A1	07-05-2014
		JP 2014091301 A	19-05-2014
		US 2014123864 A1	08-05-2014
EP 0782919 A1	09-07-1997	EP 0782919 A1	09-07-1997
		JP H09207307 A	12-08-1997
		US 5778779 A	14-07-1998