(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 703 008 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.09.2006 Bulletin 2006/38

(51) Int Cl.:
D06B 23/16 *(2006.01)* ***D06B 23/18*** *(2006.01)*

(21) Application number: **06111145.6**

(22) Date of filing: **15.03.2006**

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

(30) Priority: **17.03.2005 IT UD20050040**

(71) Applicant: **LAFER SpA**
36015 Schio (Vicenza) (IT)

(72) Inventors:
- **Scortegagna, Bruno**
  36015, SCHIO (VI) (IT)
- **Panozzo, Antonio**
  36030, VILLAVERLA (VI) (IT)

(74) Representative: **Petraz, Davide Luigi et al**
GLP Srl
Piazzale Cavedalis, 6/2
33100 Udine (IT)

(54) Machine and method for treating a fabric under pressure and/or depression

(57) Machine (10) for treating a fabric (14) under pressure and/or depression, comprising a feed element (17) and a collection element (18) for the fabric (14). The machine (10) also comprises at least a closed sealed intermediate chamber (12) positioned between a first treatment chamber (11) and the outer environment, or between two adjacent treatment chambers, kept at pressures different and autonomous from each other. The feed element (17) can be located in the outer environment or in one of the treatment chambers, and the collection element (18) can be located in the outer environment or in another treatment chamber.

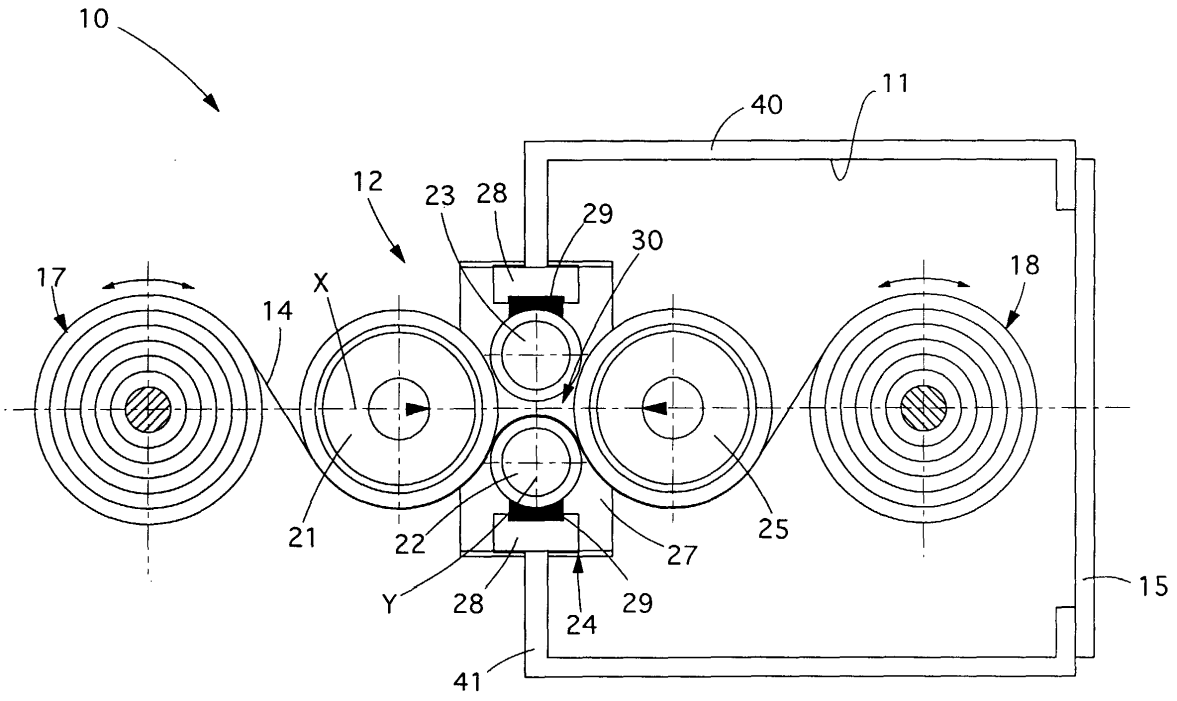

fig. 1

EP 1 703 008 A2

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a machine and the relative method for the treatment under pressure and/or depression of a fabric.

[0002] The invention is used advantageously in finishing operations for a fabric, in order to perform one or more treatments in at least a relative chamber having a desired condition of pressure and/or depression with respect to the outer environment or with respect to one or more adjacent treatment chambers working at different pressures.

BACKGROUND OF THE INVENTION

[0003] It is known that in the field of textile finishing there are numerous and various treatments that require particular and specific conditions of pressure/depression in order to optimize the result obtained. Among these, the treatments of drying, exsiccation, impregnation, *décatissage,* calendaring, etc. are particularly known.

[0004] Such treatments are generally performed in discontinuous machines, for example autoclaves or suchlike, in which it is provided to insert rolls of fabric inside the machine, to close the machine, to start the process until it is finished, to open the machine and discharge the treated fabric.

[0005] To make these processes at least partly continuous, pressurized/depressurized machines have been designed into which the fabric is inserted by means of at least a feed cylinder, located outside the pressurized/depressurized environment, and collected in at least a collection cylinder, also located outside. To be inserted into and removed from the controlled pressure environment, the fabric passes through sliding sealed systems, consisting mainly of at least partly rubberized cylinders located in reciprocal contact and cooperating with flanges associated with the heads of the cylinders and possibly with elastic compensation pads.

[0006] Examples of such sliding sealed systems are disclosed in US-A-3.807.059 and US-A-3.158.507.

[0007] However, these systems have the disadvantage that they do not guarantee a secure seal of the atmosphere of the controlled pressure environment, and, especially in treatments with toxic or pollutant substances or gases, such as ammonia, dangerous situations may arise for the workers due to leakages or seepages.

[0008] Known machines generally allow to perform a single pressure/depression treatment on the fabric, while possible pre- or post-treatments of the fabric generally occur at environmental temperature and at atmospheric pressure.

[0009] If it is necessary to subject the fabric, before or after the specific treatment in the sealed chamber, to a possible pre- or post-treatment which is also to be carried out in specific conditions of pressure or depression, it is necessary to remove the fabric and transfer it to another machine with a sealed treatment chamber suitably prepared.

[0010] One purpose of the present invention is to achieve a machine for treating a fabric under pressure/depression which will guarantee a secure sealed separation of the atmospheres of one treatment chamber with respect to the outside, or of two or more adjacent chambers, reducing the risk of contamination between the relative atmospheres, and also the risk of leakage or loss of pressure/depression in the treatment chamber.

[0011] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0012] 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.

[0013] In accordance with said purpose, a machine for treating a fabric under pressure and/or depression comprises at least an element to feed the fabric to be treated and an element to collect the treated fabric, said elements being able to invert their reciprocal function performed according to the direction in which the fabric is unwound and the step of the process under way.

[0014] According to a characteristic of the present invention, the machine comprises an intermediate closed sealed chamber, located between a first pressurized/depressurized treatment chamber and the outer environment, or between two treatment chambers working under respective conditions of pressure/depression distinctly and autonomously from each other.

[0015] The intermediate chamber allows to ensure a secure and complete separation between the treatment environments, reducing the impact and seriousness of possible leakages, also when toxic or pollutant substances or gases are used, and reducing the harmful effect of possible losses of pressure/depression from the treatment environment.

[0016] According to an advantageous embodiment of the invention, the intermediate chamber is kept in a condition of pressure/depression substantially between atmospheric pressure and the pressure of the treatment chamber, or between the working pressures of the two or more adjacent treatment chambers.

[0017] According to the invention, the intermediate chamber is defined by an empty space associated upstream and downstream with sealing means. In a first preferential embodiment, said sealing means are of the sliding type, with at least partly rubberized cylinders and lateral pads.

[0018] In another preferential embodiment, the sealing means comprise two central fixed cylinders, or rollers, sliding on a relative pad, and two peripheral movable cylinders, which can be brought close to the fixed cylinders with an adjustable level of pressure.

[0019] The element to feed the fabric is located in the outer environment, or in one of the treatment chambers, and the collection element is located in the outer environment or in another of the chambers, different from the first.

[0020] In this way, the machine according to the present invention is able to perform, in one or each of said chambers, and in succession, a relative treatment of the fabric, made under the desired conditions of pressure/depression specifically adapted for the relative treatment to be carried out.

[0021] In one embodiment of the invention, the element that feeds the fabric is outside, substantially at atmospheric pressure, the first treatment chamber is kept at a pressure higher than atmospheric pressure and inside it a specific treatment is performed, for example impregnation of the fabric with a liquid substance, while the collection element is in a second treatment chamber, kept at a pressure lower than atmospheric pressure, in order to promote the drying operation and partial exsiccation. The first and second treatment chamber are separated from each other by a respective intermediate chamber.

[0022] According to a variant, the feed element and/or collection element themselves at least partly collaborate in performing a partial sealing function between the outside and the adjacent chamber or between one chamber and the adjacent one.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] 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 longitudinal lateral view, partly in section, of a machine for treating a fabric under pressure and/or depression according to the present invention;
- fig. 2 shows a variant of the machine in fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

[0024] With reference to fig. 1, a machine 10 according to the present invention for treating a fabric 14 under pressure and/or depression comprises a containing structure 40 that defines inside itself a treatment chamber 11, insulated from the outer environment by means of an intermediate chamber 12 made on a dividing wall 41 of the containing structure 40.

[0025] The containing structure 40 also comprises an airtight door 15, which allows selective access inside the treatment chamber 11 to feed or respectively evacuate the fabric to/from the chamber 11.

[0026] The machine 10 also comprises a feed cylinder 17 located in the outer environment, and a collection cylinder 18 located in the treatment chamber 11. The fabric 14 to be treated is fed by the feed cylinder 17 and subsequently collected by the collection cylinder 18. If the treatment cycle provides two or more passes with an inverted direction of feed, the reciprocal function performed by the feed cylinder 17 and the collection cylinder 18 can also be selectively inverted.

[0027] The intermediate chamber 12 comprises a first cylinder 21, two rollers, respectively a first roller 22 and a second roller 23, and a second cylinder 25, all having respective axes of rotation substantially parallel to each other and to the axis of rotation of the feed cylinder 17, and circular outer surfaces covered by an at least partly elastic or elastomeric material, for example rubberized or suchlike.

[0028] The intermediate chamber 12 also comprises two lateral pads 27 and two horizontal pads 29 attached to a supporting structure 24, in turn attached in sealed manner to the dividing wall 41.

[0029] The first cylinder 21 is selectively movable along an axis of translation X, in this case substantially horizontal, and with which the feed cylinder 17 and collection cylinder 18 are also aligned.

[0030] The first roller 22 and the second roller 23 are attached laterally to the supporting structure 24 by means of the two lateral pads 27, of which only one is visible in fig. 1, so that the two rollers 22 and 23 are aligned with each other with respect to an axis of alignment Y, substantially perpendicular to the axis of translation X, and positioned on opposite sides with respect to the latter.

[0031] Moreover, both the first roller 22 and the second roller 23 are normally reciprocally thrust towards the axis of translation X by means of the two horizontal pads 29. The latter are attached to respective walls 28 of the supporting structure 24, which are substantially orthogonal to the lateral pads 27.

[0032] The second cylinder 25 is aligned with the first cylinder 21 with respect to the axis of translation X, on the

opposite side with respect to the axis of alignment Y of the two rollers 22 and 23. The second cylinder 25 too is selectively movable along the axis of translation X.

[0033] The reciprocal convergent movement towards the axis Y of the two cylinders 21 and 25 determines the contact of their circular surfaces with the respective circular surfaces of the two rollers 22 and 23, thus defining a security space 30, or lung, the functions of which will be explained in detail hereafter.

[0034] Moreover, the reciprocal movement of the first and second cylinder 21 and 25 after contact has occurred between the circular surfaces of the rollers 22 and 23 allows to vary the level of the seal of the security space 30.

[0035] The two lateral pads 27 are normally thrust against the respective front surfaces of the first and second roller 22 and 23 and, partly, against the respective front surfaces of the first and second cylinder 21 and 25.

[0036] In this way, the airtight seal of the security space 30 or lung is guaranteed, also laterally.

[0037] The fabric 14 is made to pass between the first cylinder 21 and the first roller 22, and between the latter and the second cylinder 25, to be then guided towards the collection cylinder 18.

[0038] Thanks to the security space 30, the intermediate chamber 12 guarantees a secure and complete separation of the treatment chamber 11 and the outer environment, reducing the impact and seriousness of possible leakages, also when toxic or pollutant substances or gases are used, and reducing the harmful effect of possible losses of pressure/depression from the treatment chamber 11.

[0039] Moreover, the pressure P_c inside the intermediate chamber 12 can be kept different and autonomous both from the atmospheric pressure P of the outer environment, and also from the pressure P_1 of the treatment chamber 11.

[0040] In one solution of the invention, the pressure P_c is kept at a substantially intermediate value between the atmospheric pressure P and the pressure P_1.

[0041] According to a variant, the intermediate chamber 12 is kept in a vacuum condition.

[0042] According to a variant shown in fig. 2, the collection cylinder 18 is also arranged in the outer environment and, associated with the treatment chamber 11, a second intermediate chamber 32 is provided, similar to the first intermediate chamber 12.

[0043] It comes within the field of protection of the present invention to arrange other treatment chambers in a cascade with the treatment chamber 11, which are separated from each other by a corresponding intermediate chamber. In this way, it is possible to perform in safety a plurality of treatments in cascade which, thanks to the respective intermediate chamber, are insulated from each other and with respect to the outer environment.

[0044] For example, if a second treatment chamber is used, arranged in cascade with the first treatment chamber 11 and similar thereto, it is provided to use a second intermediate chamber between the first and the second treatment chamber.

[0045] A relative pressure condition in the two treatment chambers provides that the pressure P_1 of the first treatment chamber is kept higher than the atmospheric pressure P, and the pressure P_2 of the second treatment chamber is kept lower than the pressure P_1 of the first treatment chamber 11.

[0046] The pressure in the second intermediate chamber is kept at an intermediate value between the pressures of the two adjacent treatment chambers.

[0047] In this case, the fabric 14 can be subjected to an impregnation treatment under pressure in the first treatment chamber without previous dehumidification, whereas in the second treatment chamber a drying or exsiccation step is performed under conditions of depression.

[0048] If a third treatment chamber is used, arranged in cascade with the second treatment chamber and similar thereto, it is provided to use a third intermediate chamber located between the second and the third treatment chamber, allowing, for example, the following two conditions of treating the fabric.

[0049] The first condition provides that the pressure P_1 in the first treatment chamber 11 is kept lower than atmospheric pressure, the pressure P_2 of the second treatment chamber substantially equal to atmospheric pressure, and the pressure P_3 of the third treatment chamber higher than atmospheric pressure P.

[0050] Similarly, the pressure P_c in each intermediate chamber is kept at an intermediate value between the pressures of the two corresponding adjacent treatment chambers.

[0051] This condition is produced if it is desired to perform a partial dehumidification of the fabric 14, in the first treatment chamber 11, and then subject it to an impregnation treatment at atmospheric pressure, for example a dyeing treatment, in the second treatment chamber, and finally a treatment, for example, of steaming or *décatissage* performed under pressure in the third treatment chamber.

[0052] The second condition provides that the pressure P_1 is kept lower than atmospheric pressure, the pressure P_2 higher than atmospheric pressure, the pressure P_3 substantially equal to atmospheric pressure. In this case, the treatment in the second treatment chamber is performed under pressure, for example for impregnation in ammonia, on a fabric 14 previously dehumidified, while in the third treatment chamber the fabric 14 is for example finished in environmental conditions of atmospheric pressure.

[0053] It is clear that modifications and/or additions of parts and/or steps may be made to the machine 10 and the treatment method as described heretofore, without departing from the field and scope of the present invention.

[0054] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of machine for the treatment under pressure and/or depression of a fabric and relative method, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Machine for treating a fabric (14) under pressure and/or depression, comprising means (17) to feed the fabric (14) and means (18) to collect the fabric (14), the machine also comprising at least a closed sealed intermediate chamber (12, 32) positioned between a first treatment chamber (11) and the outer environment, or between two adjacent treatment chambers, wherein the means (17) to feed the fabric (14) are located in said outer environment or in one of said treatment chambers, and the collection means (18) are located in said outer environment or in another of said treatment chambers different from the first, said treatment chambers being kept at pressures different and autonomous from each other, **characterized in that** said intermediate chamber (12, 32) comprises sealing means defining a security space (30), or lung, which guarantees a secure and complete separation between said first treatment chamber (11) and the outer environment, or between two adjacent treatment chambers, said sealing means comprise at least two central cylinders (22, 23), or rollers, and two peripheral cylinders (21, 25) able to be brought close to said fixed central cylinders (22, 23) with a selectively adjustable degree of pressure.

2. Machine as in claim 1, **characterized in that** said cylinders (21, 22, 23, 25) are at least partly rubberized and cooperate with pads (27, 29).

3. Machine as in claim 2, **characterized in that** said two central cylinders (22, 23), or rollers, are slideable on a relative pad (29).

4. Machine as in claim 1, **characterized in that** said degree of pressure defines at least the level of the seal of said security space (30).

5. Machine as in any claim from 1 to 4 inclusive, **characterized in that** said cylinders (21, 22, 23, 25) have respective axes of rotation substantially parallel to each other.

6. Machine as in any claim from 1 to 5 inclusive, **characterized in that** said two peripheral cylinders (21, 25) are movable along an axis of translation (X) and said two central cylinders (22, 23) are aligned with each other with respect to an axis of alignment (Y), substantially perpendicular to said axis of translation (X), and are positioned on opposite sides with respect to said axis (Y).

7. Machine as in claim 6, **characterized in that** said two peripheral cylinders (21, 25) are aligned with each other with respect to said axis of translation (X) and positioned on opposite sides with respect to said axis of alignment (Y).

8. Machine as in any claim from 1 to 7 inclusive, **characterized in that** first pads (27) are kept thrust against the respective front surfaces of said two central cylinders (22, 23) and at least partly against the respective front surfaces of said two peripheral cylinders (21, 25), in order to guarantee the lateral seal of said security space (30).

9. Machine as in any claim from 1 to 8 inclusive, **characterized in that** said two central cylinders (22, 23) are thrust reciprocally towards said axis of translation (X) by means of second pads (29).

10. Machine as in any claim hereinbefore, **characterized in that** said intermediate chamber (12, 32) is kept in a condition of pressure/depression with a substantially intermediate value between atmospheric pressure and that of said treatment chamber (11), or between the working pressures of the two or more adjacent treatment chambers.

11. Machine as in any claim from 1 to 9 inclusive, **characterized in that** said intermediate chamber (12, 32) is kept in a vacuum condition.

12. Machine as in any claim hereinbefore, **characterized in that** said means (17) to feed the fabric (14) are located in said outer environment, or in one of the treatment chambers, and said collection means (18) are located in said outer environment or in another of the chambers, different from the first.

13. Machine as in any claim hereinbefore, **characterized in that** it also comprises at least a second treatment chamber separated from said first treatment chamber (11) by at least a respective intermediate chamber, and a third treatment chamber separated from said second treatment chamber by at least another intermediate chamber.

14. Machine as in claim 13, **characterized in that** the pressure (P_1) in said first treatment chamber (11) is lower than atmospheric pressure, the pressure (P_2) in said second treatment chamber is substantially equal to atmospheric pressure, and the pressure (P_3) in said third treatment chamber is higher than atmospheric pressure.

15. Machine as in claim 13, **characterized in that** the pressure (P_1) in said first treatment chamber (11) is lower than atmospheric pressure, the pressure (P_2) in said second treatment chamber is higher than atmospheric pressure, and the pressure (p_3) in said third treatment chamber is substantially equal to atmospheric pressure.

16. Machine as in claim 13, **characterized in that** the pressure (P_1) in said first treatment chamber (11) is substantially equal to atmospheric pressure, the pressure (P_2) in said second treatment chamber is higher than atmospheric pressure, and the pressure (P_3) in said third treatment chamber is lower than atmospheric pressure.

17. Method to treat a fabric (14) under pressure/depression, wherein are included means (17) to feed the fabric (14) and means (18) to collect the fabric (14), **characterized in that** said fabric (14) is made to transit through at least a closed sealed intermediate chamber (12, 32) located between a first treatment chamber (11) and the outer environment, or between two adjacent treatment chambers, wherein the means (17) to feed the fabric (14) are located in said outer environment or in one of said treatment chambers, and the collection means (18) are located in said outer environment or in another of said treatment chambers, different from the first, and said treatment chambers are kept at pressures different and autonomous from each other so that in each of them said fabric (14) is subjected to a specific and predetermined treatment under pressure/depression irrespective of the treatment performed in the adjacent chamber.

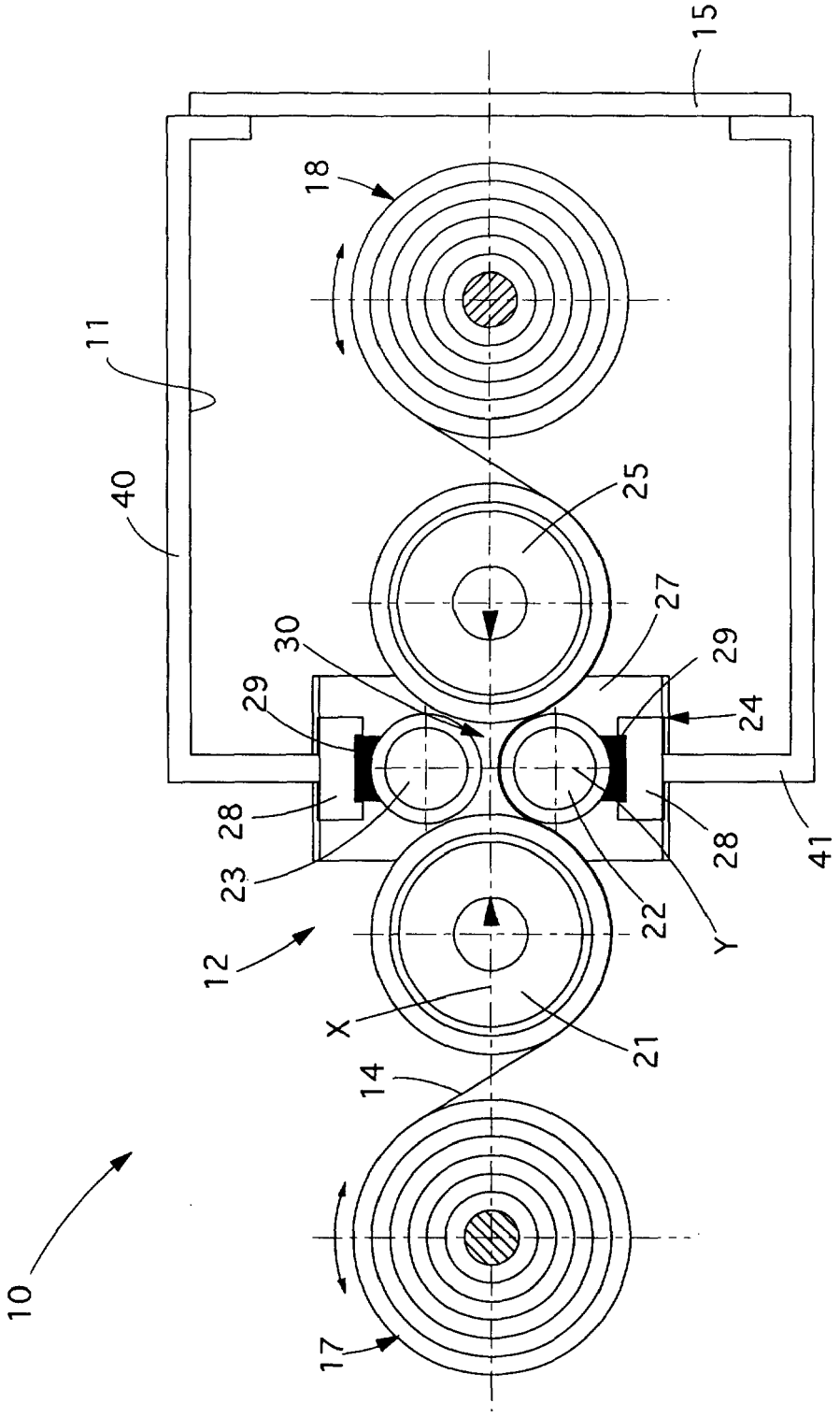

fig. 1

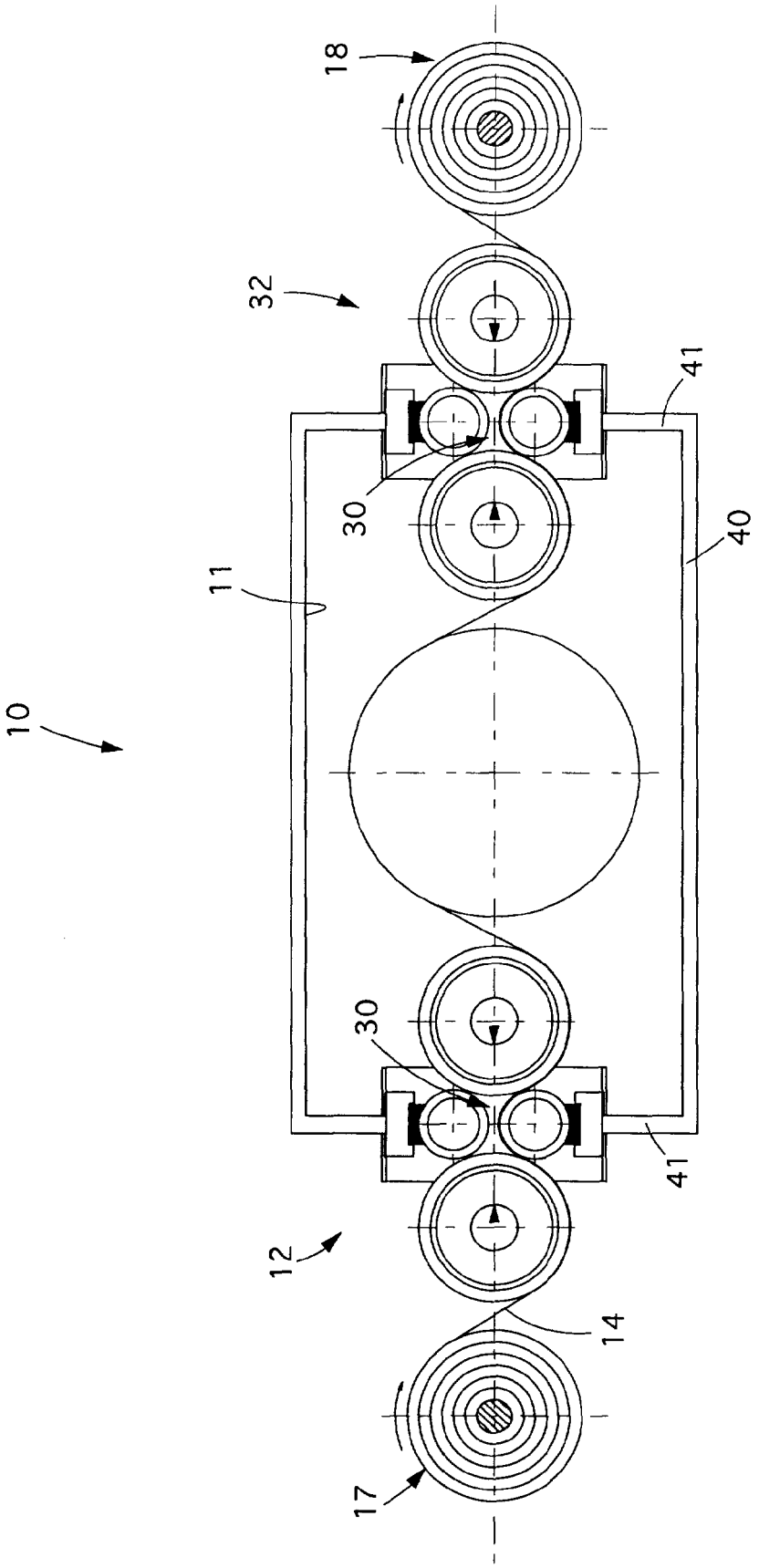

fig. 2

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 3807059 A **[0006]**
- US 3158507 A **[0006]**