



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.05.2011 Bulletin 2011/20

(51) Int Cl.:
B41F 9/18 (2006.01)

(21) Application number: **09175627.0**

(22) Date of filing: **11.11.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

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(54) **System for the substitution of colour groups or lacquer groups in a rotogravure printing machine or in a lacquering machine**

(57) System for the substitution of color groups or lacquer groups (1-6; 7-12) in a machine (M) for rotogravure printing, wherein a storage device (13) is provided at the machine side, and extends in a direction parallel to longitudinal axis (L) of same machine; said storage device comprises stations (13a-13d), which are aligned along said axis and are suitable for housing the respective color

groups; are provided with a plurality of guides (41-46) for inserting/extracting said groups, which are arranged in order to allow the color groups to move directly between the storage stations and the machine operating stations; the storage device is also movable in the direction of the machine axis, for aligning color groups to respective insertion/extraction guides.

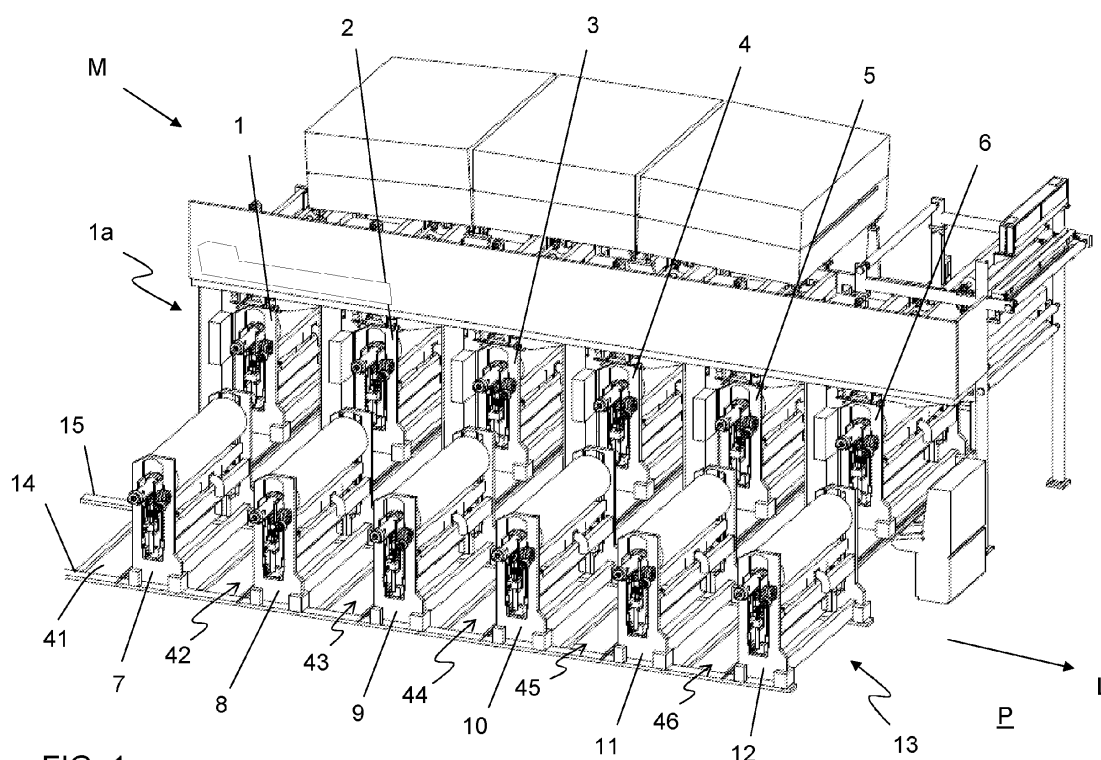


FIG. 1

DescriptionField of the invention

[0001] The invention refers to the field of rotogravure printing machines for printing on a medium such as film, paper, or fabric. In particular, the invention refers to a system for quick replacement of color or lacquer groups.

Known art

[0002] A rotogravure printing machine generally comprises a plurality of color groups. For example, six respective color groups are used for six color printing.

[0003] Each of said groups comprises an engraved cylinder of suitable diameter and length, which carries the text or graphic patterns to be printed. The group may optionally comprise an ink roller, whose task is to draw the ink from a corresponding reservoir and deposit it onto the engraved cylinder; a blade scrapes the excess ink from the cylinder. If the ink roller is absent, the aforesaid engraved cylinder draws the ink directly from the reservoir.

[0004] During operation of the machine, the engraved cylinder of the color group is contrasted by a pressure roller, which is associated with the structure of the machine. The medium to receive the print, for example film, paper or fabric, passes between the engraved cylinder and the pressure roller.

[0005] The color groups are generally aligned along a longitudinal axis of the machine, which corresponds to the main conveying direction of the printing medium. Intermediate drying stations may be provided between the color groups.

[0006] A problem of this type of machines is the need to replace the engraved cylinder at each format change or printing change. The replacement of the engraved cylinder with one of different diameter and/or width generally also entails the replacement of the ink roller.

[0007] Nowadays, the above said cylinders are replaced using a substantially manual procedure, by laterally extraction by means of conveying carriages and/or suitable lifting and handling devices.

[0008] However, this technique has a number of drawbacks. First, it is labor intensive and requires a long machine downtime, up to about one hour. Such a drawback is particularly felt when producing by small batches, with frequent format changes. In these conditions, the productivity and flexibility of the machine are severely impaired. A manual replacement is further complicated by the small space available, especially in machines for printing on extensible plastic film, in which the color groups are as close as possible to each other, for limiting stress in the plastic film during transition from one group to the other, which may deform the print.

[0009] The same drawbacks are present in the case of the replacement of the lacquer groups, which are used for finishing purposes, whose structure is substantially

the same of the above described color groups.

Summary of the invention

[0010] The aim of the invention is to overcome the above said limitations of the known art, by providing a faster and less labor intensive replacement system for substituting the cylinders of the color groups and lacquer groups.

[0011] This aim is achieved with a system for the substitution of color groups or lacquer groups in a rotogravure printing machine or lacquering machine, said machine comprising a plurality of color groups or lacquer groups housed in respective working stations of said machine and which are aligned along a longitudinal axis of the machine, each of said groups comprising at least one engraved cylinder and an optional ink roller, the system being characterized in that:

- each color or lacquer group is comprised of a mobile carriage, comprising a support frame which supports said engraved cylinder, and, if present, said ink roller;
- a storage device is provided at the machine side, and extended in a direction parallel to said longitudinal axis; said device comprises a plurality of stations, which are aligned along said axis and are suitable for housing the respective color or lacquer groups;
- a plurality of guides are provided for inserting and extracting said groups, said guides being substantially perpendicular to the axis of the machine, and are arranged to allow the groups to move directly between the stations of the storage device and the working stations of the machine;
- said storage device is movable in the direction of said longitudinal axis, for allowing alignment between said stations of the storage device and respective insertion/extraction guides of color groups or lacquer groups.

[0012] The term "printing cylinder", in the sense of the invention, refers to the engraved cylinder and/or the respective ink roller or, which is equivalent, the lacquer depositing roller. The invention is equally applicable for the replacement of color groups and for replacement of lacquer groups. Therefore, in the present description, all references to color groups have to be considered equally applicable to lacquer group.

[0013] The color group, or carriage, according to the invention, is provided with wheels or similar supports, which allow the same to move along the floor, without lifting the same.

[0014] According to a preferred embodiment of the invention, the storage device comprises a number of stations, which is twice the total number of color or lacquer groups which may be operated by the machine. In this way, the storage may hold a complete set of ready to use color groups for the machine, and may also be loaded

with the complete set of color groups to be replaced. Preferably there is a respective transversal guide for insertion and extraction dedicated to each color group.

[0015] In a preferred embodiment, the storage device is essentially represented by two supporting beams, parallel to the machine axis, which are housed at floor level at the machine side. Said supporting beams are connected to a motorized device which is able to rigidly translate, in the longitudinal direction, the set of the two beams. The insertion/extraction guides of color groups, according to further preferred aspects, are formed by respective rails, which are at least partially overlapping with the longitudinal supporting beams.

[0016] A particularly preferred embodiment of the invention comprises the following aspects: the insertion/extraction guides of color groups are comprised of transversal rails which are interrupted at the respective intersections with the supporting beams of the storage device; each carriage forming a color group comprises one or more wheels adapted to engage at least one of the rails of each insertion/extraction guide, for moving the carriage to and from the machine; moreover, the longitudinal supporting beams comprise transversal portions which, in predetermined positions of said beams along the machine axis, allow to restore the continuity of the transversal rail, at the intersection points. Said transversal portions are for example represented by slots and/or supporting areas with the same configuration of the rails of said insertion/extraction guides.

[0017] Another object of the invention is a method for substituting at least one color or lacquer group, in a machine provided with above said system.

[0018] With reference to the replacement of a color group, for example, the method comprises the steps of: preparing a new color group in a respective station of said storage device; extraction of the old color group from the machine; moving the group on a respective transversal guide, until a storage station is reached, preferably in an adjacent position with respect to that holding the new group; translation of the storage device, with alignment of the new color group to said transversal guide; insertion of the new group into the machine, along said transversal guide. A method for substituting lacquer groups essentially comprises the same steps.

[0019] A plurality of color groups, or all the color groups of the machine, may be replaced essentially simultaneously. The color groups are prepared in respective storage stations, alternating with free stations to receive the groups in use; the groups in use are extracted by letting them slide along the transversal guides and by loading them into the storage device, positioning them in said free stations; the storage device is translated in order to bring the new groups into alignment with the respective transversal guides, and the new groups are inserted into the machine, by sliding on the transversal guides.

[0020] The removal of the color groups in use may require preliminary steps, like the opening of the pressure roller, the opening of the blade and the removal of a me-

chanical block; similarly, the insertion of a new group will require in the following order: closing the block, closing the blade, and closing the pressure roller.

[0021] The advantage of the invention is the quick substitution of engraved cylinders of each color, and the drastic reduction of machine downtime. A great advantage is the possibility of easily preparing the color groups, which are aligned and ready for use along the storage device on the machine side, all this while the machine continues to operate. The substitution step is particularly fast and generally requires only a few minutes, instead of hours as in the known art. The machine downtime is in fact limited to the time strictly required for extracting the color groups from the machine, translating the storage device for positioning the new groups in alignment with the transversal guiding rails, and inserting the new groups. The groups are inserted ready to operate, without the necessity to work within the narrow spaces inside the machine. The transversal guides allow an easy movement of printing cylinders, which are already mounted on the respective groups.

[0022] A machine according to the invention is therefore much more flexible than the known machines, especially for small production batches which require frequent printing changes and therefore the substitution of cylinders of color groups. With the invention, while the machine operates with a given format, operators may ready at the machine side the color groups each with a respective engraved cylinder and ink roller, and then perform the change in a matter of a few minutes, by replacing the color groups with the above said procedure.

[0023] The invention is even more advantageous in machines for printing on plastic extensible film, wherein the color groups are typically quite close to each other, and the conventional substitution technique is rather difficult.

[0024] The advantages of the invention will be more apparent by reading the following description, which refers to a preferred embodiment.

Brief description of the figures

[0025]

Fig. 1 schematically shows a rotogravure six-color printing machine, according to a preferred embodiment of the invention.

Fig. 2 shows a front view of two color groups of machine of Fig. 1.

Fig. 3a-3c illustrate the substitution of two color groups of machine of Fig. 1.

Fig. 4 shows a preferred construction detail.

Detailed description of the invention

[0026] Fig. 1 shows a rotogravure printing machine for printing on film, which is generally indicated by M. Said machine M has a substantially longitudinal extension, ac-

cording to a longitudinal machine axis L, and comprises a plurality of color groups, in the example six color groups 1-6. The color groups 1-6, in use, are positioned inside as many working stations provided in the machine M. For example, the color group 1 is positioned in a working station 1a.

[0027] Said color groups 1-6 are readily replaceable with respective groups 7-12, which are positioned on a linear storage device, generally indicated by 13, which is positioned at the side of the machine M and is extended in a parallel direction to said longitudinal machine axis L,

[0028] The storage device 13, in this example, is essentially comprised of two supporting beams 14 and 15, which extend parallel to machine axis L at floor level. Said beams 14 and 15 may translate, for a certain path, along axis L by means of a mechanical actuator, which is not shown. The group of beams 14 and 15 moves rigidly upon operation of the mechanical actuator.

[0029] In a preferred embodiment each of the supporting beams 14 and 15 may be formed for example by a C-shaped or U-shaped profile, which is housed inside a sliding seat in the floor P of the room where the machine M is installed.

[0030] Beams 14 and 15 intersect with a plurality of transversal guides for color groups, represented in an example by a corresponding number of rails 41 - 46 which allow to move the color groups to and from the machine M.

[0031] A color group, for example the group 1, is shown in greater detail in fig. 2. It comprises an engraved cylinder 20 and an optional ink roller 21, which draws the ink from a reservoir 22. The group has a supporting frame 23, with wheels 24 and 25 on both sides. The other color groups are essentially similar, the diameter and position of engraved cylinder 20 varying according to print type.

[0032] A lacquer groups has a similar structure, with reservoir 22 containing lacquer and the lacquer depositing roller being essentially equivalent to the cylinder 20.

[0033] The wheels 24, 25 are arranged so as to allowing movement in a direction parallel to the axis of cylinder 20, which during use corresponds to direction of insertion or extraction of the same group, which is perpendicular to machine axis L. Wheels 24, 25 are also adapted for engaging the transversal rail tracks 41-46.

[0034] The same Fig. 2 shows that in use, a medium or substrate like a plastic film F is between the engraved cylinder 20 and a contrasting pressure roller 26, which is typically made of rubber. The pressure roller 26 is part of machine M and is pressed against the engraved cylinder 20 of color group 1 by means of an hydraulic or pneumatic actuator 27. The height of reservoir 22 may be adjusted inside a rail 28, for adapting to different diameters of engraved cylinder 20. In space A between color group 1 and adjacent color group 2, a device for the drying of print on film F may be provided.

[0035] The system for substituting color groups, which is an object of the invention, is now described in further detail. The storage device 13 comprises a plurality of

stations, each being able to host a color group. Each station is defined between two adjacent seats 30 or rest areas 31 of beams 14, 15. Preferably, for each station, a longitudinal locking system of color groups is provided.

5 For example, there is at least one seat 30 which is arranged for engaging at least a pair of wheels, for example the wheels 25, of each color group, in order to retain the same color group in the longitudinal direction. Preferably, the coupling between the wheels 25 of a color group and the seats 30, is substantially of a ribbed profile.

10 **[0036]** Therefore, a color group positioned on beams 14, 15 is substantially blocked in the direction of axis L due to coupling between wheels 25 and seat 30.

15 **[0037]** Fig. 3a shows empty stations 13a and 13c, and stations 13b and 13d respectively occupied by color groups 7 and 8. In the example a six-color machine M is shown, which may house six color groups 1-6, and the storage device 13 comprises twelve stations, each for receiving a respective color group. For sake of clarity, only stations 13b-13d are shown.

20 **[0038]** The tracks 41-46 are interrupted at the intersection with beams 14 and 15. For example, figure shows that rails 41a and 41b of track 41 are interrupted at the intersection points. The correct alignment of at least one of stations 13a-13d allows, however, restores the continuity of the rails 41a and 41b. In the example shown, the seats 30 and supports 31 are arranged in such a way to restore continuity of the rails 41a and 41b when, by virtue of movement along direction L of storage 13, the alignment between said seats and supports 30, 31 and rails 41a and 41b is achieved.

30 **[0039]** In the following, substitution of color groups is described.

35 **[0040]** New color groups, which have to replace the groups currently used, are prepared along storage device 13, by placing them on beams 14, 15. Figure shows groups 7 and 8 in stations 13b and 13d, which have to replace the groups in use 1 and 2; normally all color groups required for machine operation will be prepared. In the example shown it may be noted that new groups 7 and 8 have an engraved cylinder with a diameter greater and width smaller than groups in use 1 and 2.

40 **[0041]** Groups 1 and 2 are then withdrawn from machine M, by moving them along respective transversal guides and by bringing them into stations 13a and 13c (Fig. 3b). It is to be noted that the alignment condition between stations 13a, 13c and rails 41, 42 allows groups 1 and 2 to reach said stations 13a and 13c.

45 **[0042]** At this stage, the mechanical handling system draws beams 14 and 15 in a forward direction, together with color groups placed on the same, by a distance "s" (Fig. 3c), so that the stations 13b, 13d with respective new groups 7 and 8, are aligned with the tracks 41 and 42. It is now possible to push said new groups 7 and 8 in the operating positions previously occupied by groups 1 and 2.

50 **[0043]** Fig. 4 shows one of the embodiments of the storage device 13. Each supporting beam 14 or 15 for

color groups is essentially formed by an element 32, movable in the longitudinal direction, with respect to two fixed supports 33, 34, which in the example shown, are provided by two C-shaped beams. The element 32 is slidable on supports 33, 34 by means of a set of carriages 35.

[0044] The element 32 comprises a set of suitably spaced grooves 30. Rest areas 31 are shown in the figure, which may correspond to specific supports, or simply to portions of the surface of element 32. The groove 30 may be engaged by a tooth of wheels 25 (fig. 2) of each color group. In this way, one of the stations of storage device 13 is substantially defined between one of grooves 30 and the next rest area 31 of beams 14, 15, wherein the locking of the color group is actually ensured by the wheels 25 engaging said groove 30.

[0045] Each pair formed by a groove 30 and adjacent support 31 has a gauge which corresponds to track gauge of rails of tracks 41-46.

[0046] Fig. 4 shows the station 13a aligned with track 41. The groove 30 and rest area 31 are therefore aligned with rails 41a and 41b, respectively. The rail 41a forms a groove 41c, with the same transversal section of groove 30, whereas rail 41b is for example realized with a metal plate embedded in the floor of the room of machine M. In the position of Fig. 4, continuity of track 41 is restored so that one of color groups may translate from said station 13a to or from machine M, along said track 41.

Claims

1. System for the substitution of color groups or lacquer groups in a machine (M) for rotogravure printing or lacquering, said machine comprising a plurality of color groups or lacquer groups (1-6) housed in respective working stations (1a) of said machine and aligned along a longitudinal axis (L) of the machine, each of said groups comprising at least one engraved cylinder (20) and optionally an ink roller (21), the system being **characterized in that:**

- each color group or lacquer group (1-6) is formed by a movable carriage, comprising a supporting frame which supports said engraved cylinder (20) and, if present, said ink roller (21);
- a storage device (13) is provided at the machine side, and extends in a direction parallel to said longitudinal axis (L); said device comprises a plurality of stations (13a-13d) aligned along said axis and suitable for housing the respective color groups or lacquer groups;
- a plurality of guides (41-46) are provided for inserting and extracting said groups, said guides being substantially perpendicular to the axis of the machine, and being arranged to allow the groups (1-6, 7-12) to move directly between the stations of the storage device (13a-13d) and the working stations of the machine;

- said storage device (13) is movable in the direction of said longitudinal axis (L), for allowing alignment between said stations of the storage device (13a-13d) and respective guides (41-46) for inserting/extracting color or lacquer groups.

2. System according to claim 1, wherein the storage device comprises a number of stations which is twice the number of color or lacquer groups that may be used by said machine (M), being adapted to store a complete set of ready to use groups (7-8), and a respective insertion track (41-46) is provided for each group.

3. System according to claim 1 or 2, wherein said storage device comprises at least one pair of supporting beams (14, 15), which are parallel to the machine axis and are placed at floor level on the machine side.

4. System according to claim 3, wherein said supporting beams (14, 15) are connected to a mechanical system for moving the storage device (13) in the longitudinal direction.

5. System according to claim 4, wherein said guides (41-46) for inserting/extracting the groups, are formed by respective tracks, which are at least partially overlapping said storage device.

6. System according to claim 5, wherein each carriage forming a color or lacquer group comprises wheels suitable for sliding along the transversal insertion/extraction guides.

7. System according to claim 6, wherein:

- the insertion/extraction guides of color or lacquer groups (41-46) are formed by transversal rails (41a, 41b), which are interrupted at the respective intersections with the supporting beams (14, 15) of the storage device;
- each carriage forming one of said groups comprises one or more wheels (24, 25), which may engage at least one of the rails of each insertion/extraction guide, for moving the carriage to and from the machine (M);
- said supporting beams (14, 15) comprise transversal guiding portions (30, 31), which, in predetermined positions of said beams along the machine axis, allow to restore the continuity of said transversal rails (41a, 41b) at the intersections points.

8. System according to claim 7, wherein said transversal guiding portions comprise seats (30) and/or rests (31), which have the same configuration as the transversal rails (41a, 41b).

9. Machine (M) for lacquering or rotogravure printing of a substrate, in particular a plastic film, comprising a system for the substitution of color groups or lacquer groups (1-6; 7-12) according to any of the preceding claims. 5
10. Method for the substitution of at least one color group or lacquer group (1-6) in a machine (M) according to claim 8, the method comprising the steps of: 10
- preparing of a new color group in a respective station of said storage device;
 - extraction of the group from the machine, by moving the group on a respective transversal guide, until a storage station is reached, preferably in an adjacent position with respect to that holding the new group; 15
 - translation of the storage device, with alignment of the new color group to said transversal guide; 20
 - insertion of the new group into the machine, along said transversal guide.
11. Method according to claim 10, wherein: 25
- a plurality of color or lacquer groups (7-12) of machine are prepared in respective stations (13b, 13d) of storage device (13), alternated to free stations (13a, 13c) to receive the groups in use; 30
 - the groups in use (1-6) are extracted and positioned in said free stations along respective transversal guides (41-46);
 - the storage (13) is traversed in order to bring the new groups (7-12) into alignment with said transversal guides (41-46), and said new groups are inserted into the machine (M) along said guides. 35
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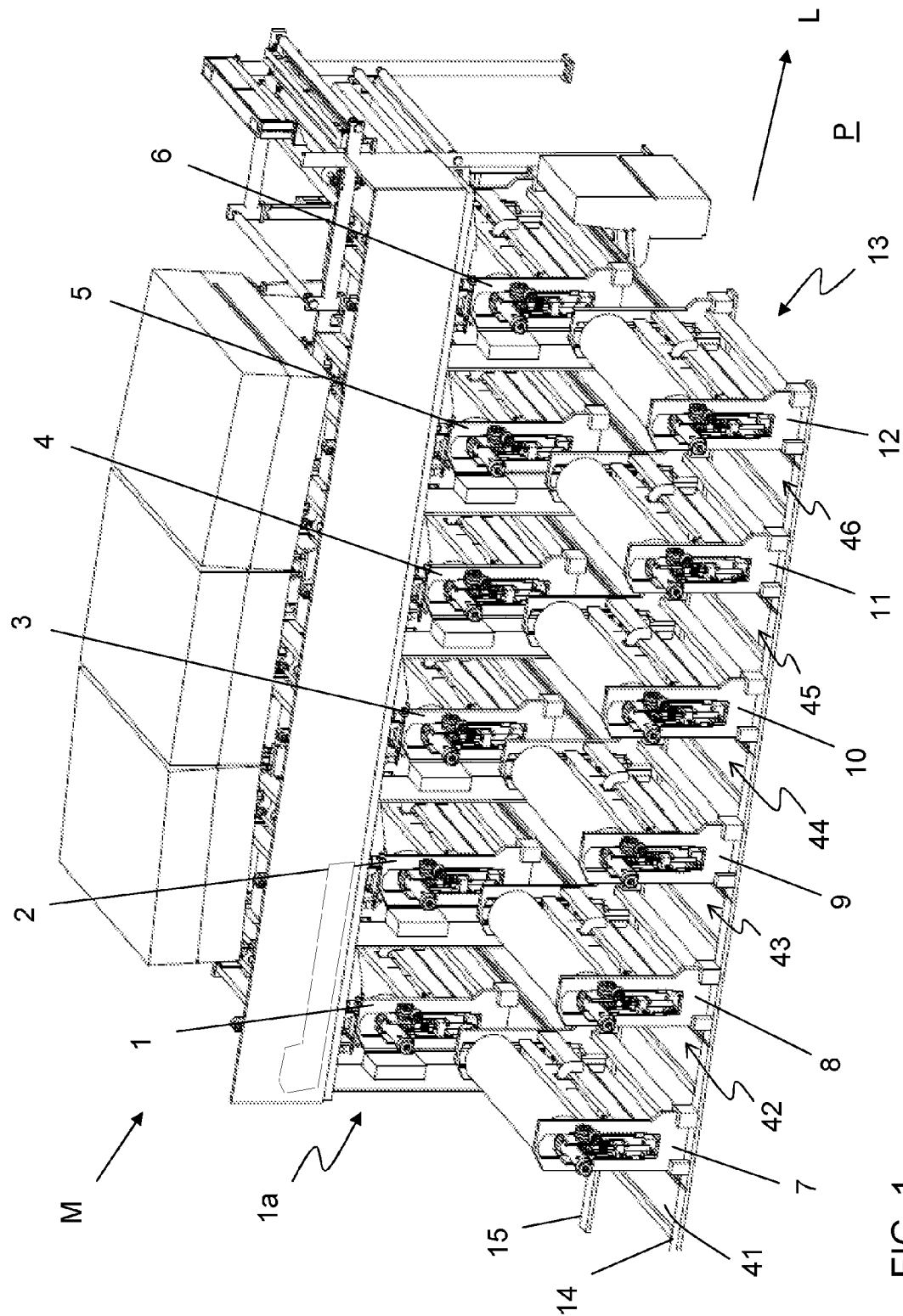
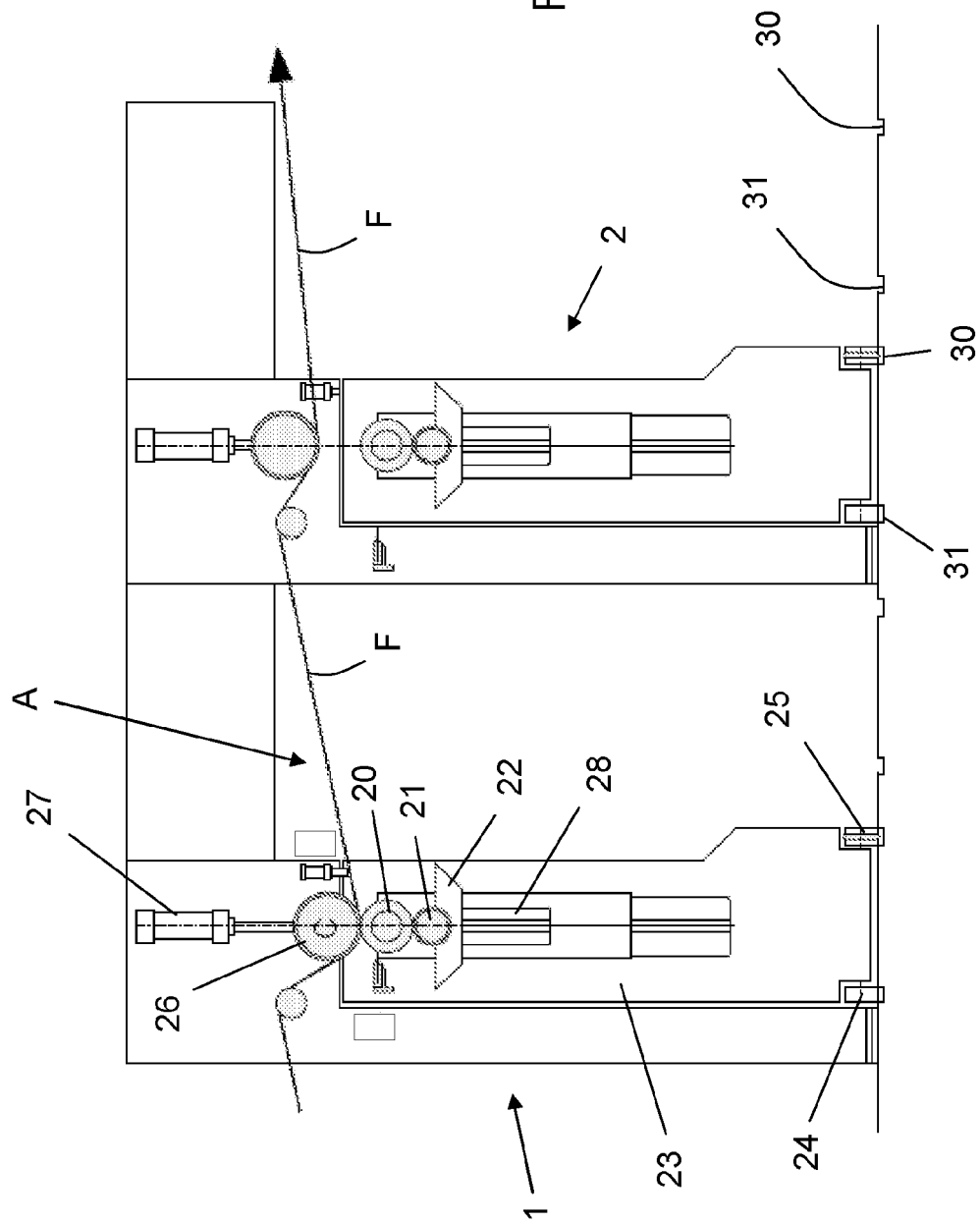
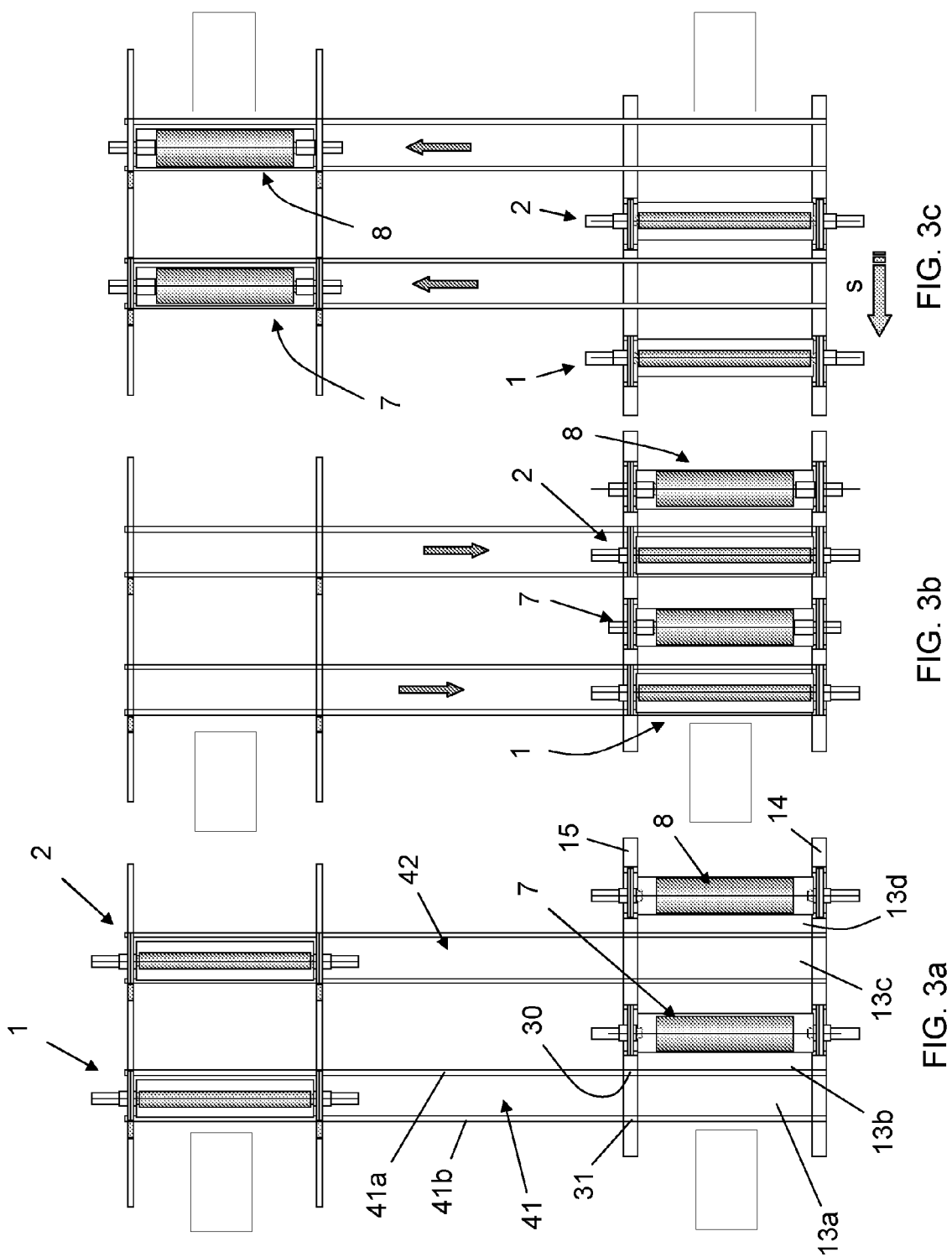


FIG. 1

FIG. 2





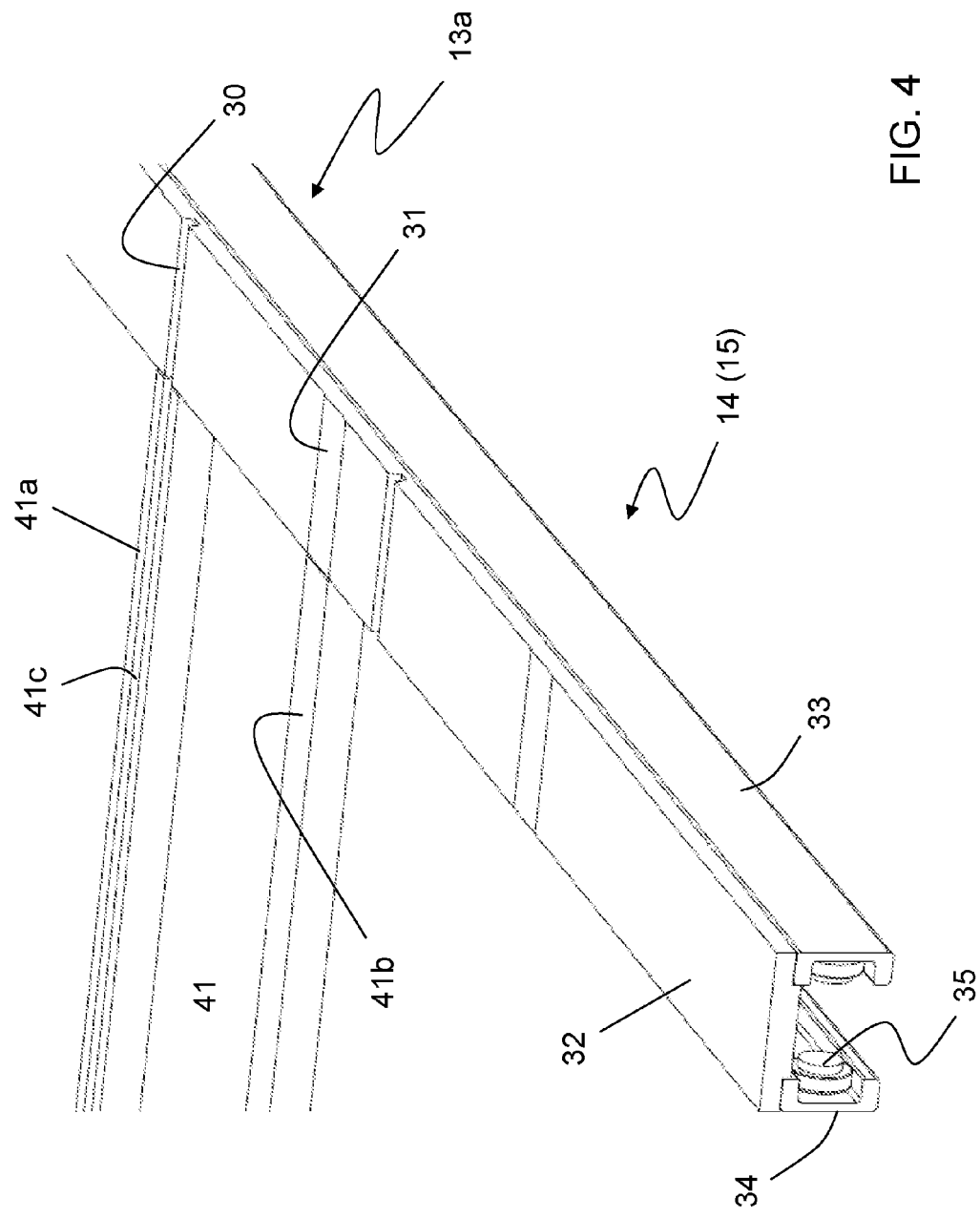


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 09 17 5627

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search Munich		Date of completion of the search 11 February 2010	Examiner Hajji, Mohamed-Karim
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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