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(54) **PRINT**

(57) The present invention relates to a printing machine comprising a rotary impression drum (4) cooled by water supporting a substrate (S), printing groups (5) and drying groups (6); a water distribution device (7); a first air circulation device (8) associated with said drying groups (6); a drying tunnel (10) for drying the printed substrate (S) and a second air circulation device (11) associated with said drying tunnel (10), said water distribution device (7), said first and second air circulation devices (8, 11) and said drying tunnel (10) being arranged in an upper platform with respect to said print unit (3), and distributed such that a passageway (19) enabling an operator to access said devices is defined between same, access means having been provided for accessing said upper passageway (19).

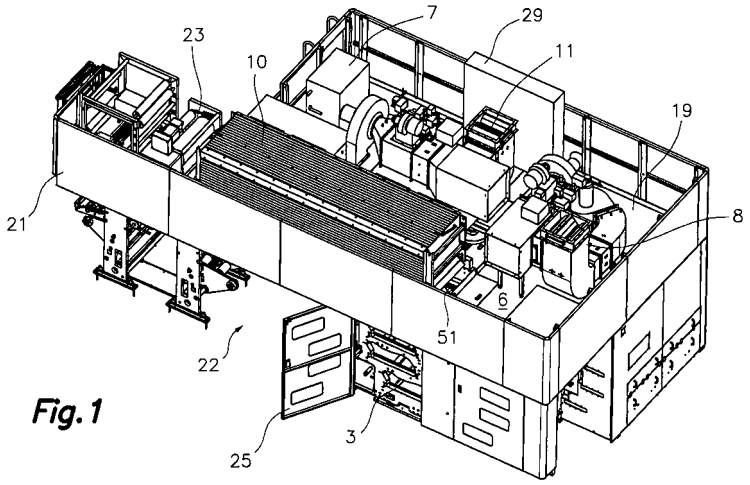

Fig. 1

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Description

Technical Field

[0001] The present invention relates to a printing machine and more specifically to a flexographic printing machine which comprises, according to a standard layout, the following units or devices: a central rotary impression drum cooled by water supporting a laminar substrate; printing groups and drying groups; a water distribution device; a first air circulation device (associated with said drying groups); a drying tunnel for drying the printed laminar substrate and a second air circulation device associated with said drying tunnel.

[0002] The invention provides a characteristic distribution of the mentioned units or devices in the machine assembly facilitating their access particularly for maintenance, also providing a particular layout for the drying tunnel.

Background of the Invention

[0003] In known flexographic printing machines, the mentioned built-in units and particularly the air circulation devices and drying tunnel are generally placed in an upper part in relation to the central impression drum, associated with one or more supporting structures basically provided for supporting them. Therefore, accessing said elements or devices both for maintenance and for acting in the event of a breakdown becomes complicated and generally requires auxiliary means such as stairways or elevators to access specific elements.

[0004] In some cases, a platform having a small dimension has been defined above the upper level of the central impression drum, but the platform was not envisaged to allow suitable access to the mentioned units or devices.

[0005] The invention offers an alternative to this problem by means of a particular distribution of the mentioned units and devices in an upper platform of the machine.

[0006] Furthermore, a special structure of the drying tunnel which also favors laminar substrate arrangement tasks and any necessary intervention thereon is provided.

Disclosure of the Invention

[0007] For that purpose, the invention proposes a flexographic printing machine of the type integrating:

- a print unit which comprises a rotary impression drum cooled by water (to ensure its diametrical stability) and arranged for supporting a laminar substrate, a plurality of printing groups provided for printing inks successively on said substrate, the substrate being supported in said impression drum, and a plurality of drying groups arranged for drying the ink printed by each printing group;
- a water distribution device for cooling the impression drum;
- a first temperature-regulated air circulation device associated with said drying groups;
- a drying tunnel for drying the substrate printed; and
- a second air circulation device with heating means associated with said drying tunnel.

[0008] In accordance with the proposal of this invention, the mentioned water distribution device, the first and second air circulation devices and the drying tunnel are arranged in an upper level with respect to said print unit, distributed on a wide platform and spread out such that an upper passageway which enables operators to access any of said units or devices optimally is defined between same, access means, for example a stairway, having been provided for accessing said upper passageway from the ground area or lower level of the machine.

[0009] It has further been provided that the mentioned cooling unit is also located in said upper level and accessible from the mentioned upper passageway, said cooling unit including a cooling roller arranged for cooling the printed substrate once it has been dried by the drying tunnel.

[0010] In one embodiment, a quality control unit which comprises an image capturing device for controlling the quality of the printed substrate has been provided also located in said platform or upper level of the machine. Said quality control unit is intended for verifying the quality of the printed substrate once it is cooled by said cooling unit, said quality control unit being readily accessible from the mentioned upper passageway.

[0011] In the same lower level as the print unit there is provided an unwinding unit for unwinding the substrate from a first reel and a winding unit for winding the printed substrate on a second reel.

[0012] The drying tunnel is arranged longitudinally next to one of the sides of the machine and separated by said passageway, one of its ends being next to a passage opening for the passage of the assessing material or the material coming from the drum.

[0013] The drying tunnel comprises a plurality of support rollers defining an elongated arched floor suitable for supporting and guiding the substrate into the drying tunnel. There is a drying screen above each of said rollers. The drying screens are assembled in cantilever and bound by one of their ends to a wall of the tunnel which is articulated to swivel together with a lid portion perpendicular to said wall.

[0014] This arrangement allows a very easy access to the laminar band to be dried, since the ends of the drying screens are free for any necessary intervention thereon during the machine operating cycle.

[0015] In a preferred embodiment, the mentioned upper level defines a platform demarcated by a railing with at least one opening for access from a stairway.

[0016] The machine is also characterized in that it defines an enclosure adjacent to a first side of the central

impression drum of the machine wherein all the drive motors both of the drum and of the rollers of the printing groups are arranged, a part of the mentioned upper platform extending above said enclosure.

[0017] A second side of the impression drum where a protective fairing defines a vertical wall of the machine thus remains completely smooth, for removing, for example, the sleeves of the printing rollers through suitable openings of a bedplate of the machine, and all the motors including the traction motor fixed to the shaft of the central impression drum are arranged on the other side and inside the mentioned enclosure.

[0018] Another feature of the machine proposed is that the drive motor of the drum and the brake are placed in a coaxial arrangement, projecting towards said first side of the machine, inside the mentioned enclosure below the upper platform.

[0019] Other features of the invention will be shown more clearly in the detailed description of an embodiment illustrated in the attached drawings in which:

Brief Description of the Drawings

[0020]

Fig. 1 is a perspective view of a printing machine according to one embodiment of the present invention;
Fig. 2 is another perspective view of the printing machine;
Fig. 3 is a top view of the printing machine;
Fig. 4 is a side view of the printing machine; and
Fig. 5 is a perspective view of a drying tunnel pertaining to the printing machine.

Detailed Description of an Exemplary Embodiment

[0021] The printing machine of this invention comprises the following known units or devices in combination:

- a flexographic print unit 3 including a central rotary impression drum 4, advantageously cooled by water and suitable for supporting a substrate S, a plurality of printing groups 5 arranged for printing inks successively on said substrate S, the substrate being supported on said impression drum 4, and a plurality of drying groups arranged for drying the printed ink, with one drying group for each printing group 5;
- a water distribution device 7 for cooling the central impression drum 4;
- a first air circulation device 8 associated with said drying groups 6 of the printing groups 5, and provided, in a preferred embodiment, with air temperature regulating means;
- a drying tunnel 10 for drying the printed substrate S; and
- a second air circulation device 11 associated with said drying tunnel 10, also advantageously provided with air temperature regulating means.

[0022] In a first main aspect, the invention proposes that the mentioned water distribution device 7, said first and second air circulation devices 8, 11, an electrical cabinet 29 for the air circulation devices, said drying tunnel 10, and several other devices supporting the print unit, are arranged in an upper level with respect to said print unit 3, and distributed on an raised platform 6 accessed through a stairway 24, such that there is defined between same an upper passageway 19 opening up a generally wide passage so that an operator can easily and/or conveniently access said devices (7, 8, 10, 11, 29) for inspection and/or for performing any maintenance task, access means having been provided for accessing said upper passageway 19 from the lower level of the machine.

[0023] The mentioned platform 6 located in said upper level is demarcated by a railing or panel 21 with at least one opening for accessing from the stairway 24.

[0024] It can be seen in Figures 1 to 3 that the drying tunnel 10 is arranged longitudinally next to one of the sides of the machine and separated by said passageway 19, one of its ends being next to a passage opening 51 for the passage of the material coming from the impression drum 4. It is also possible to access the upper part of the drum 10 through said passage opening 51 for any maintenance task.

[0025] The flexographic printing machine proposed further comprises a plurality of support rollers 17 for supporting and guiding the substrate S from one unit to another, some of said support rollers 17 raising the substrate S until a position close to the upper level to provide a passage for said operator below the substrate S between the unwinding unit 1 and the mentioned print unit 3.

[0026] The printing machine further comprises a cooling unit 23 located in said upper level and accessible from the upper passageway 19, said cooling unit 23 including a cooling roller 13 which is intended for cooling the printed substrate S once it is dried by the drying tunnel 10.

[0027] An embodiment of this printing machine also provides the inclusion of a quality control unit 14 applied for inspecting the quality of the printed substrate S once it is cooled by said cooling unit 23, said quality control unit being located in said upper level and accessible from the upper passageway 19. In one embodiment, said quality control unit 14 comprises an image capturing device on top of the printed substrate S for controlling the quality of the printed substrate S.

[0028] It can be seen in Figure 4 that the proposed printing machine further comprises an unwinding unit 1 for unwinding the substrate S from a first reel 2 and a winding unit 15 for winding the printed substrate S on a second reel 16, said winding and unwinding units 1, 15 being arranged in the same lower level as the print unit 3.

[0029] As can be seen in said Figure 4, the machine further integrates a plurality of support rollers 17 for sup-

porting and guiding the substrate from one unit to another, some of said support rollers 17 raising the substrate S until a position close to the upper level to provide a passage 22 for operators below the substrate S between the unwinding unit 1 and the print unit 3.

[0030] Figure 5 shows the open drying tunnel, where it can be seen that the tunnel comprises a plurality of support rollers 41 for supporting and guiding the substrate into the drying tunnel 6 and a plurality of drying screens 40, with a screen 40 on top of a respective roller 41, both said support and guide rollers 41 and the drying screens 40 being assembled in cantilever and bound by one of their ends to a wall of the tunnel to which there is attached in an articulated manner a swiveling cover 42 together with a front lid portion 43 perpendicular to said cover, wherein there is at least one gripping element 44.

[0031] In another aspect of the invention, it has been provided that an enclosure adjacent to a first side of the impression drum 4 of the machine accessed through door 50 and where all the drive motors both of the drum 4 and of the rollers 5 of the printing groups are arranged, is defined below the platform 6. Therefore, there are no protruding parts on the other side of the printing machine 3 and the side of the machine and particularly the printing groups can be accessed for maintenance tasks (replacement of printing sleeves, adjustments, etc.) through door 25.

[0032] In yet another aspect of this invention, it has been provided that the drive motor of the drum and the brake are located in a coaxial arrangement on said first side of the central drum of the machine, inside the mentioned enclosure above which the platform 6 extends.

Claims

1. A printing machine of the type comprising:

a print unit (3) including a rotary impression drum (4) cooled by water and arranged for supporting a substrate (S), a plurality of printing groups (5) arranged for printing inks successively on said substrate (S) supported on said impression drum (4), and a plurality of drying groups (6) arranged for drying the ink printed by each printing group (5);
a water distribution device (7) for cooling the impression drum (4);
a first air circulation device (8) associated with said drying groups (6);
a drying tunnel (10) for drying the printed substrate (S); and
a second air circulation device (11) associated with said drying tunnel (10);
characterized in that said water distribution device (7), said first and second air circulation devices (8, 11) and said drying tunnel (10) are arranged in an upper level with respect to said print unit (3) and distributed such that an upper passageway (19) enabling an operator to access said devices is defined between same, access means being provided for accessing said upper passageway (19).

2. The printing machine according to claim 1, **characterized in that** it further comprises a cooling unit (23) located in said upper level and accessible from the upper passageway (19), said cooling unit (23) including a cooling roller (13) arranged for cooling the printed substrate (S) once it is dried by the drying tunnel (10).

3. The printing machine according to claim 2, **characterized in that** it further comprises a quality control unit (14) for controlling the quality of the printed substrate (S) once it is cooled by said cooling unit (23), said quality control unit being located in said upper level and accessible from the upper passageway (19).

4. The printing machine according to claim 3, **characterized in that** said quality control unit (14) comprises an image capturing device for controlling the quality of the printed substrate (S).

5. The printing machine according to claim 3, **characterized in that** it further comprises an unwinding unit (1) for unwinding the substrate (S) from a first reel (2) and a winding unit (15) for winding the printed substrate (S) on a second reel (16), said winding and unwinding units (1, 15) being arranged in the same lower level as the print unit (3).

6. The printing machine according to claim 5, **characterized in that** it further comprises a plurality of support rollers (17) for supporting and guiding the substrate from one unit to another, some of said support rollers (17) raising the substrate (S) until a position close to the upper level to provide a passage for said operator below the substrate (S) between the unwinding unit (1) and the print unit (3).

7. The printing machine according to claim 5, **characterized in that** it further comprises a plurality of support rollers (41) for supporting and guiding the substrate into the drying tunnel (6).

8. The printing machine according to claim 7, **characterized in that** said drying tunnel (10) comprises a plurality of drying screens (40) assembled in cantilever and bound by one of their ends to a wall of the tunnel, from which derives a swiveling cover (42) together with a lid portion (43) perpendicular to said cover.

9. The printing machine according to claim 8, **charac-**

terized in that said drying tunnel (10) is arranged longitudinally next to one of the sides of the machine and separated therefrom by said passageway (19), one of its ends being next to a passage opening (51) for the passage of the material coming from the impression drum (4).

10. The printing machine according to any one of the preceding claims, **characterized in that** said upper level defines a platform (6) demarcated by a railing (21), with at least one opening for access from a stairway (24).

11. The printing machine according to claim 10, **characterized in that** it includes an enclosure adjacent to a first side of the impression drum of the machine, wherein all the drive motors both of the drum (4) and of the rollers of the printing groups (5) are arranged, a part of the mentioned platform extending above said enclosure.

12. The printing machine according to claim 11, **characterized in that** the drive motor of the drum (4) and the brake are placed in a coaxial arrangement on said first side of the central drum of the machine.

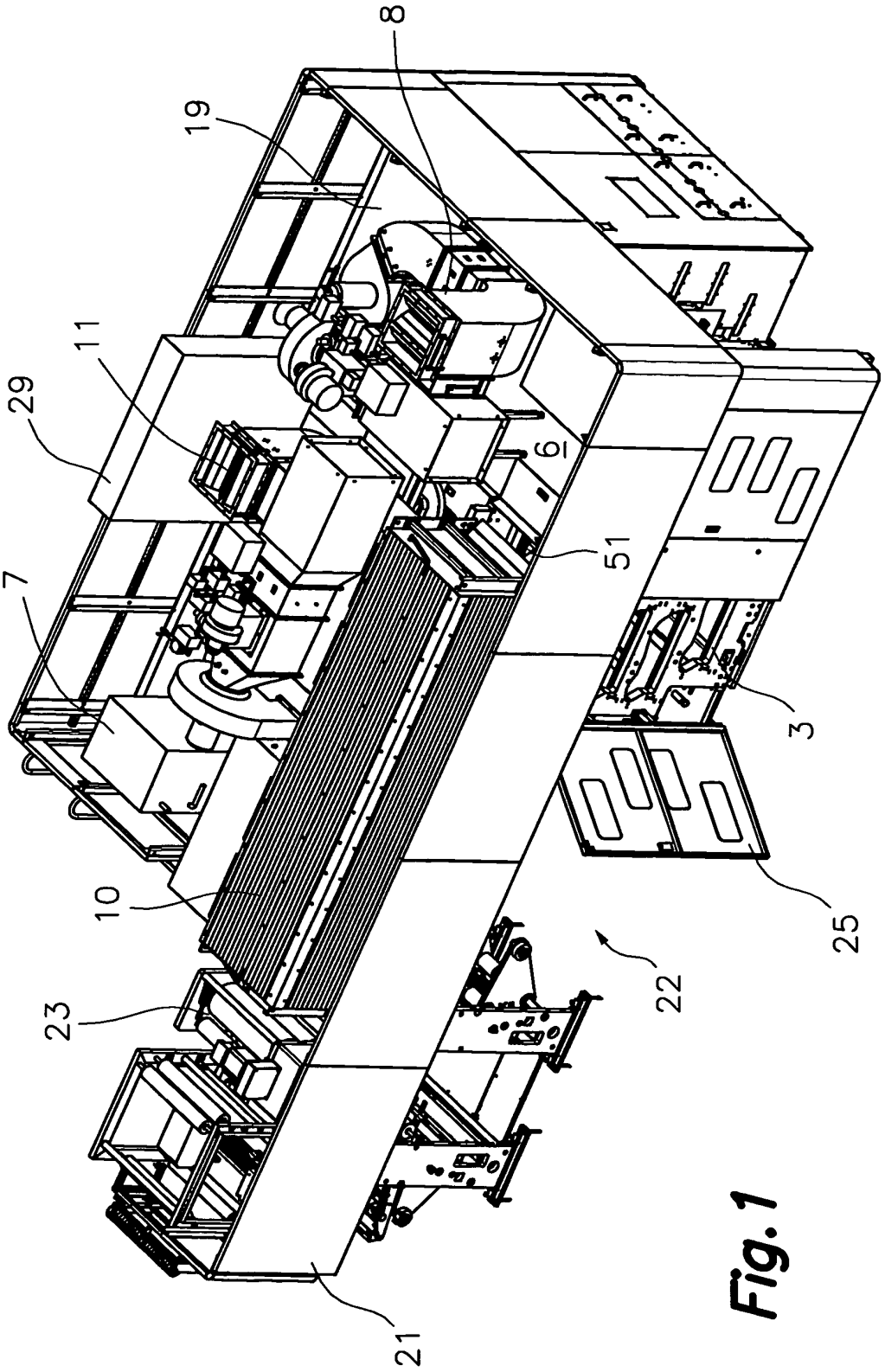
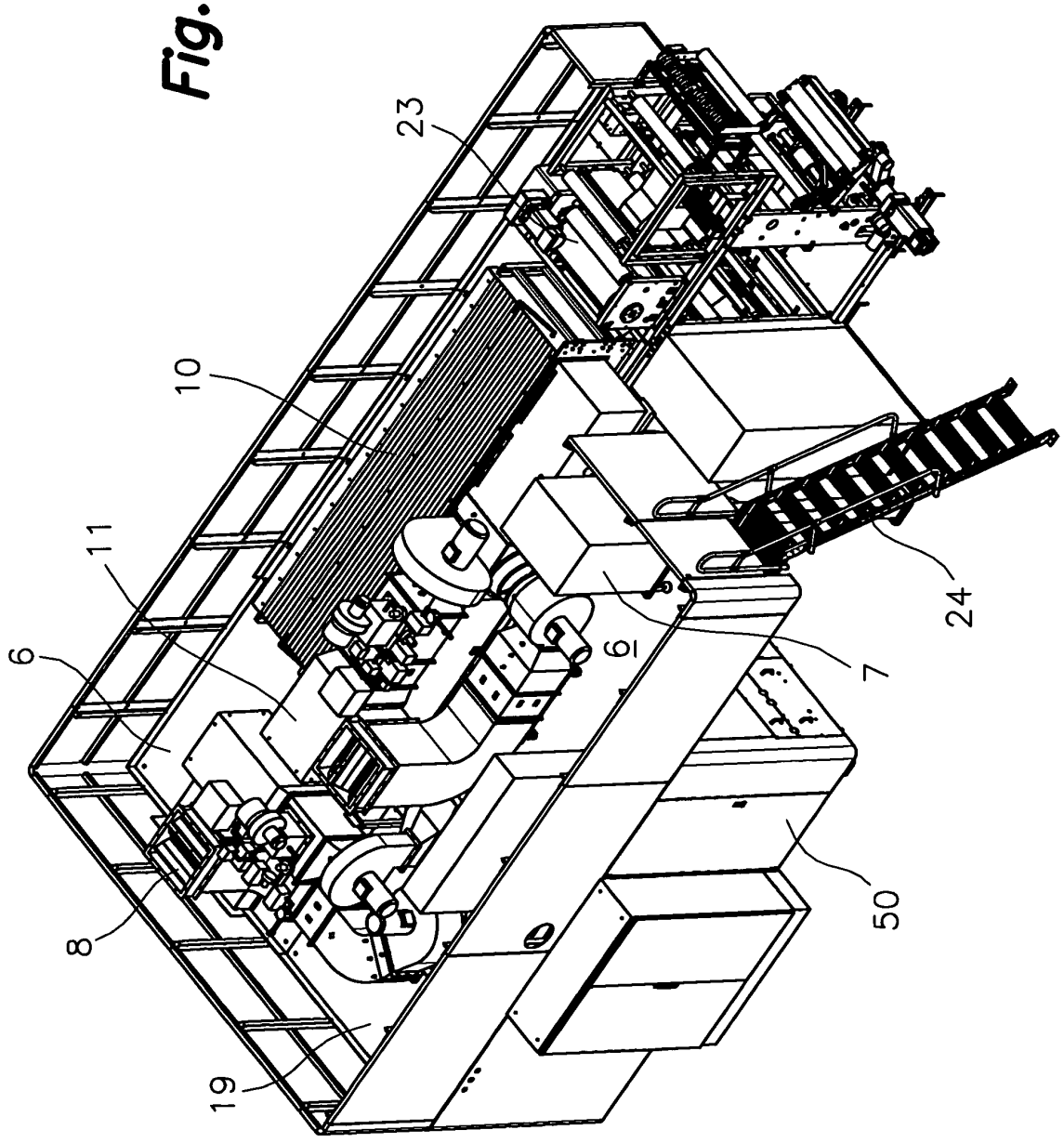


Fig. 1

Fig.2



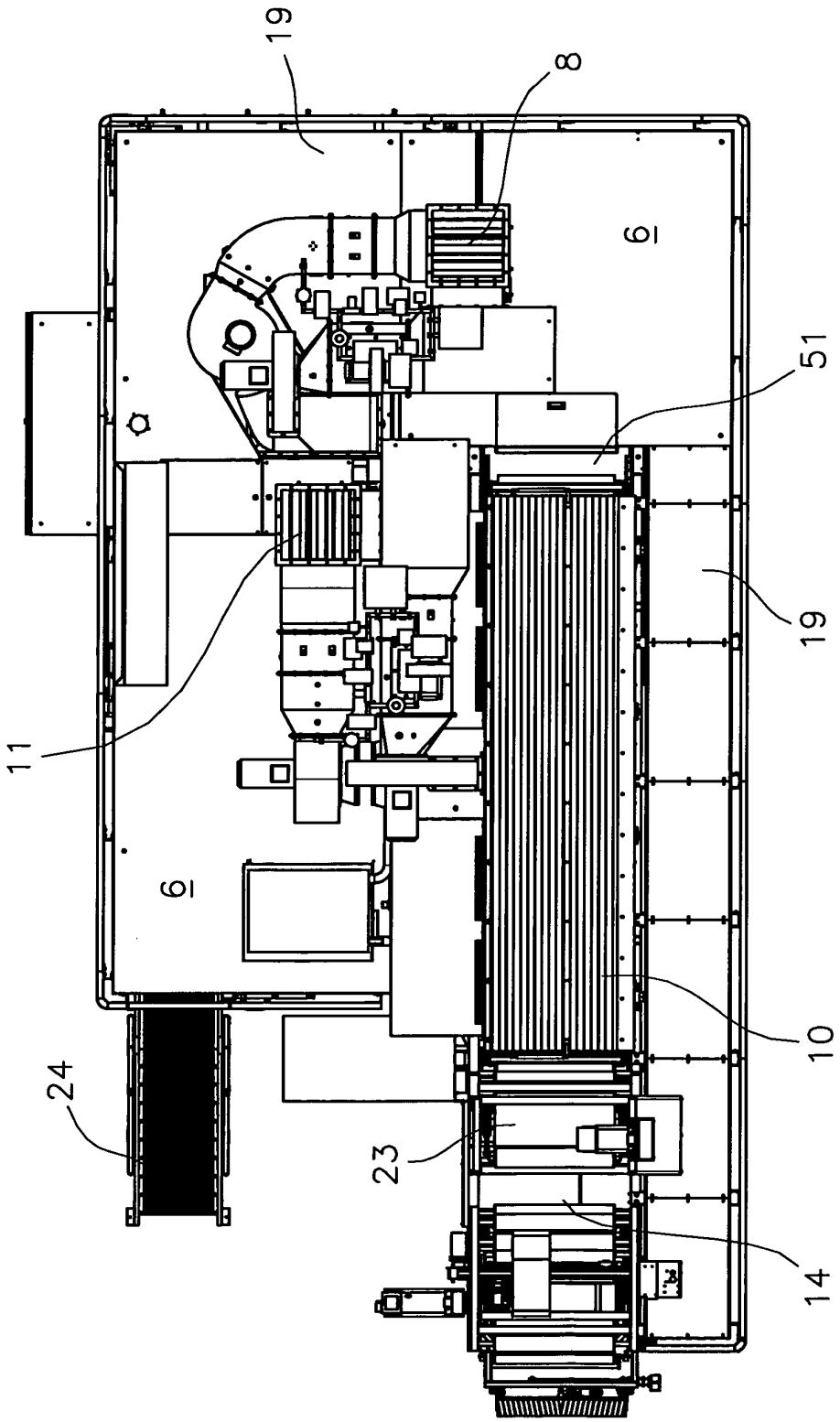


Fig.3

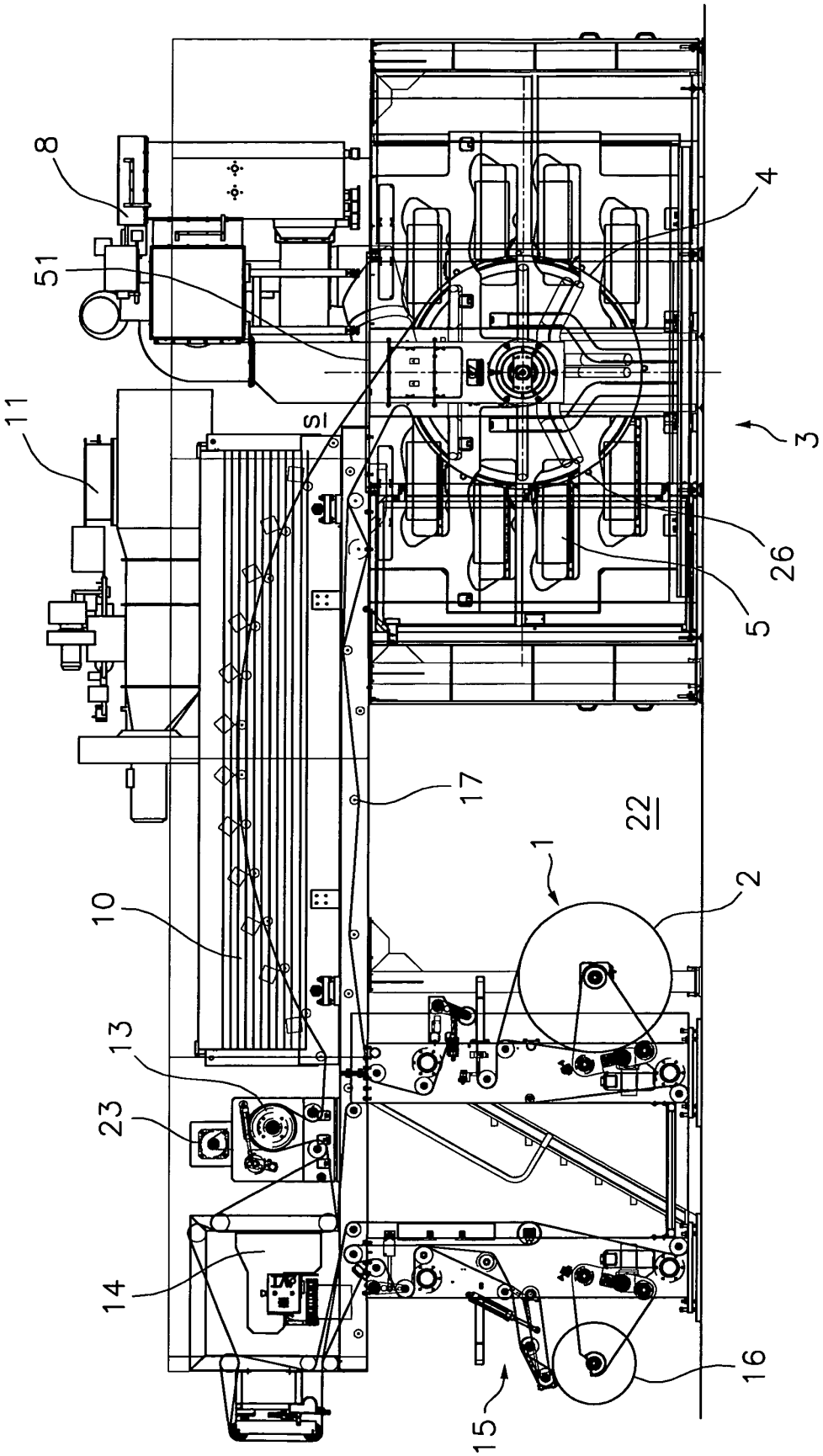


Fig.4

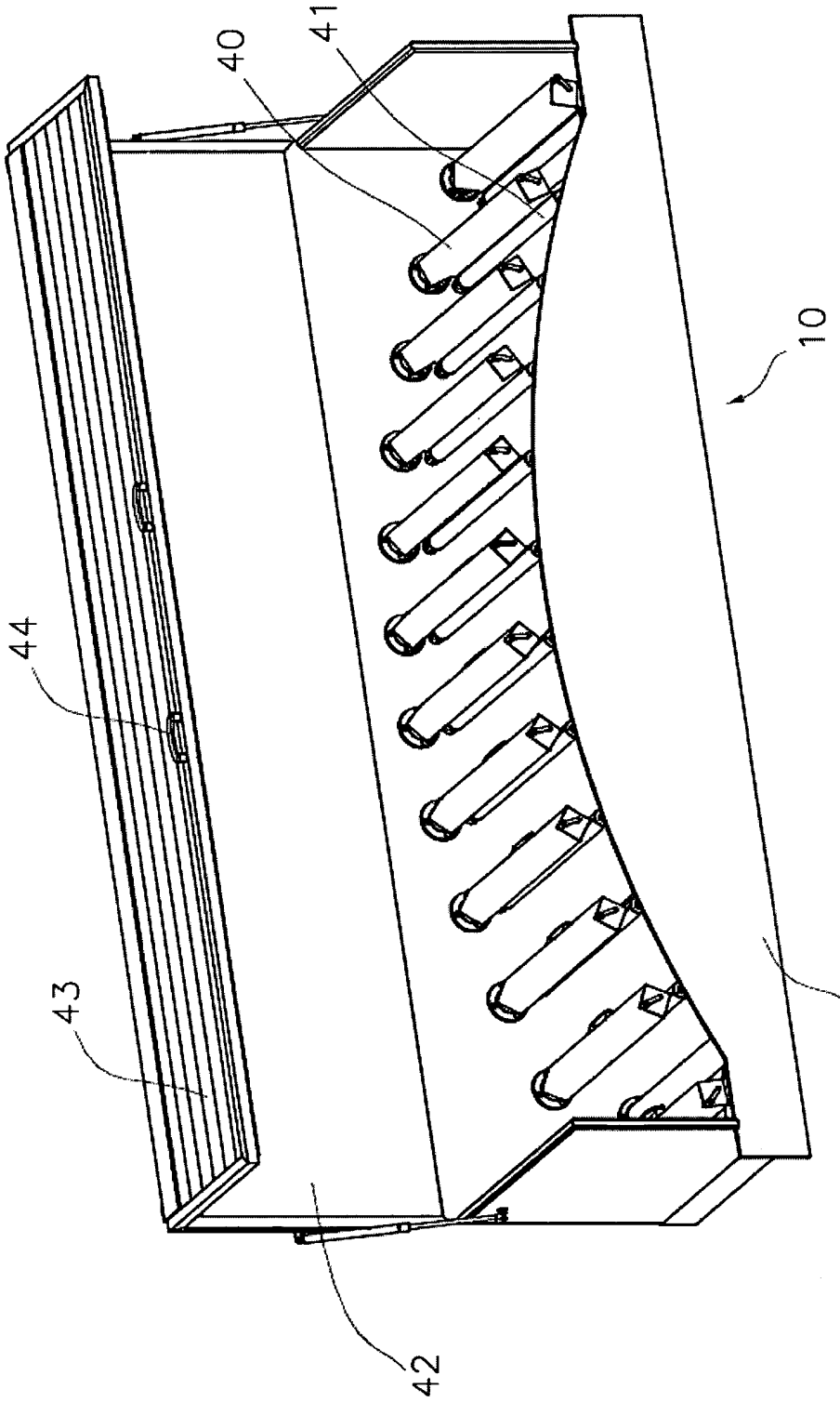


Fig.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2011/000175

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 0393336 A1 (GRAPHIC MACHINE SERVICE SRL) 24/10/1990, Abstract from DataBase EPODOC. Retrieved from EPOQUE. Figure 1.	1-12
A	EP 1318015 A2 (OF E M SRL) 11/06/2003, figure 1.	1, 5-7
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A	EP 0150047 A2 (FISCHER & KRECKE KG) 31/07/1985, Abstract from DataBase EPODOC. Retrieved of EPOQUE. Figure 3.	1

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
04/11/2011	**(08/11/2011)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer G. Villarroel Álvaro Telephone No. 91 3498571

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International application No.

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CLASSIFICATION OF SUBJECT MATTER

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B41F23/04 (2006.01)
B41F13/22 (2006.01)

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