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(54) Apparatus for polymerisation of inks and paints on supports

(57) Apparatus for polymerisation of inks and paints on supports (2) comprises radiation emitting means (5), containing ultraviolet radiations, and reflecting means (6) arranged to direct said radiations towards said supports (2), said reflecting means (6) comprising profiled element means (16); the apparatus furthermore comprises heat dissipating means (23) associated with said reflecting means (6) and suitable for fostering the cooling of said emitting means (5) and of said reflecting means (6).

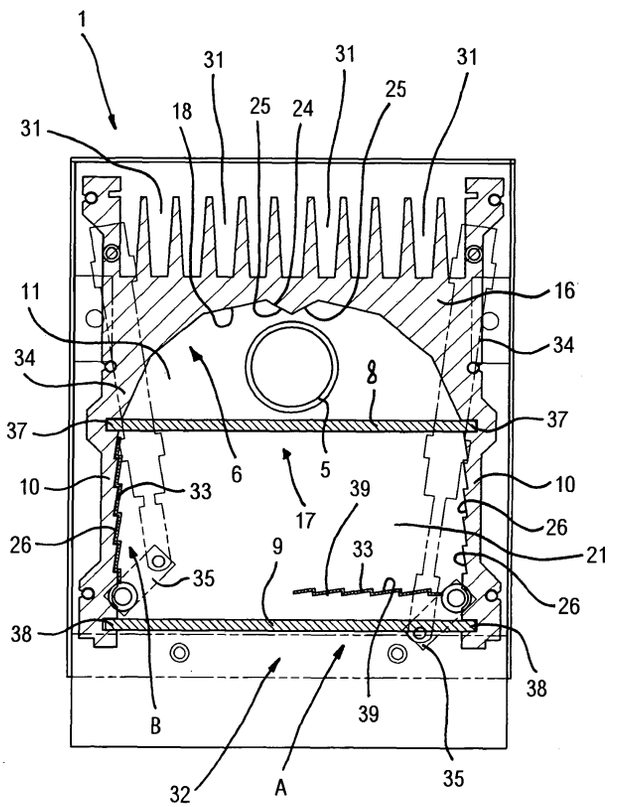

Fig. 2

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Description

[0001] The invention relates to an apparatus for polymerisation of inks and paints on supports.

[0002] In the graphics industry inks or paints are used that, after application to a support material, must be exposed to the action of ultraviolet rays that cause their reticulation and fixing to the support.

[0003] To achieve this object, drying devices, or ovens, are used that are equipped with emitting units equipped with lamps that generate ultraviolet radiations that are suitably directed towards the support to be treated. Such lamps are intrinsically also emitters of infrared radiations which, when they reach excessively high intensity levels, cause occurrence of deformations on the support, the aforementioned deformations being such as to impair subsequent processing, particularly in the case of colour prints distributed over a plurality of phases.

[0004] The Italian patent for industrial invention no. 1297639 discloses an apparatus for polymerisation of inks and paints comprising ultraviolet radiation emitter means.

[0005] Emitter means comprises a lamp that is partially surrounded by a concave reflector that directs the reflected radiations towards the material to be dried.

[0006] A filter suitable for substantially stopping the infrared radiations emitted by the lamp is associated with the bottom edge of the reflector.

[0007] The filter comprises a top wall and a bottom wall that are parallel to each other and interconnected by lateral walls diverging towards the material to be dried.

[0008] The top wall of the filter cooperates with the reflector to delimit a substantially insulated chamber wherein the lamp is contained.

[0009] The reflector is externally surrounded by a manifold that communicates with a suction conduit wherein a fan is inserted.

[0010] A temperature sensor is located near the manifold and sends signals relating to the temperature that is detected inside the chamber. When the temperature detected by the sensor exceeds a preset limit the actuation of the fan causes the passage of a cooling fluid through openings provided in the chamber.

[0011] The apparatus disclosed above, although it operates in quite a satisfactory manner, is nevertheless rather complicated to manufacture.

[0012] In particular, assembly of the lamp and of the walls of the filter requires rather a long time and requires highly qualified labour.

[0013] A further problem that besets the aforementioned apparatus consists of the fact that the reflector, being subjected to high temperatures, tends to be dimensionally unstable and to be subject to deformations.

[0014] To overcome this disadvantage, lamps have been devised that are provided with a screen associated with them, which lamps operate intermittently.

[0015] These lamps are shaped in such a way as to be able to subsequently assume two different configurations: an operating configuration wherein they direct the radiation towards the material to be dried, and a rest configuration, wherein the aforementioned screen, which is made of a material that is impervious to radiation, is interposed between the lamp and the material to be dried.

[0016] In this rest configuration, an airflow is directed towards the lamp to cool it.

[0017] This means that the lamp, once it has been returned in the operating configuration, has to overcome a certain thermal inertia to return to operating temperature.

[0018] One object of the invention is to improve the apparatuses for polymerisation of inks and paints on supports.

[0019] Another object is to obtain an apparatus for polymerisation of inks and paints on supports, the manufacture and assembly of which are rather simple.

[0020] A further object is to obtain an apparatus equipped with an effective cooling system of the radiation emitting lamp and of the reflector.

[0021] A further object is to obtain an apparatus provided with a reflector equipped with high dimensional stability.

[0022] In a first aspect of the invention, an apparatus is provided for polymerisation of inks and paints on supports, comprising radiation emitting means, containing ultraviolet radiations, and reflecting means arranged to direct said radiations towards said supports, characterised in that said reflecting means comprises profiled element means.

[0023] In one embodiment, profiled section means is made of aluminium alloy.

[0024] In another embodiment, profiled element means comprises an internal cavity delimited by a curved wall defining a surface of reflecting means suitable for reflecting radiation.

[0025] In a further embodiment, profiled element means is subjected to surface polishing that increases its reflecting power.

[0026] In a yet further embodiment, profiled element means is provided with a cladding layer in metallic material, for example chrome.

[0027] Owing to this aspect of the invention it is possible to obtain an apparatus for polymerisation of inks and paints on supports that is particularly simple to manufacture inasmuch as a base body thereof, comprising reflecting means, is made from a profiled element, obtained for example by extrusion.

[0028] The use of the aforementioned profiled element furthermore enables apparatuses to be obtained with great simplicity that have a cross-sectional dimension in relation to the supply direction of the material to be dried, having a wide range of dimensions.

[0029] Furthermore, the use of a profiled element in aluminium alloy gives an apparatus manufactured

therewith high dimensional stability.

[0030] In the manufacture of such apparatuses it is in fact sufficient to obtain lengths of profiled element having a desired length, which can be simply achieved by cutting to the required size a semifinished product consisting of a profiled element of significant length.

[0031] In a further embodiment, shield means is associated with emitting means that is arranged to hold back infrared radiation.

[0032] Such screen means comprises a first wall and a second wall arranged at a certain distance from each other in such a way that a chamber is defined between them.

[0033] In such a case, profiled element means furthermore comprises a first pair of grooves and a second pair of grooves, each pair of grooves being suitable for receiving an end portion of the first wall and of the second wall respectively, which makes the assembly of the first wall and of the second wall rather simple, the ends of which can be simply inserted into the respective pair of grooves.

[0034] In another embodiment, the apparatus comprises generating means of a flow of coolant fluid, which means is arranged to direct such a fluid inside the chamber.

[0035] In a second aspect of the invention, an apparatus for polymerisation of inks and paints on supports is provided, comprising radiation emitting means, containing ultraviolet radiations, and reflecting means arranged to direct the radiations towards said supports, and furthermore comprising heat dissipating means associated with said reflecting means and suitable for fostering the cooling of said emitting means and of said reflecting means.

[0036] In one embodiment, heat dissipating means comprises fin means suitable for interacting with a cooling fluid.

[0037] In another embodiment, the apparatus comprises profiled element means provided with an internal cavity delimited by a curved wall defining a surface of reflecting means suitable for reflecting radiation and appendage means defining the aforementioned dissipating means.

[0038] Owing to this aspect of the invention, it is possible to obtain an apparatus for polymerisation of inks and paints on supports that is equipped with an efficient cooling system of emitting means and of reflecting means.

[0039] In particular, in such an apparatus, the cooling fluid does not directly touch emitting means, which can be contained in a chamber insulated from the operating zone wherein the aforementioned radiations interact with the supports.

[0040] This enables performance to be improved and the operating life of emitting means to be prolonged inasmuch as powder or solvent vapours are not deposited on the surface of the latter.

[0041] The invention may be better understood and implemented with reference to the attached drawings, which illustrate a nonlimiting embodiment of the invention, wherein:

Figure 1 is a partially sectioned schematic view of an apparatus according to the invention;
Figure 2 is an enlarged detail of Figure 1;
Figure 3 is a schematic longitudinal section of the detail in Figure 2;
Figure 4 is a schematic front view of the detail in Figure 2;
Figure 5 is a crass-section of a profiled section defining reflecting means and dissipating means of the apparatus in Figure 1.

[0042] Figure 1 shows an apparatus 1 for polymerisation of inks and paints on a support 2 comprising a conveyor 3 whereupon the support 2 rests. The conveyor 3 is movable through an operating zone 4 wherein drying of the support 2 occurs through the action of a beam of radiations emitted by a lamp 5 generating radiations, in particular ultraviolet radiations. The lamp 5 is partially surrounded by a concave reflector 6 that directs the reflected radiations towards the operating zone 4 underneath. With the bottom edge of the reflector 6 a filter 7 is coupled that is suitable for substantially withholding the infrared radiations emitted by the lamp 5. The filter 7 comprises a top wall 8 and a bottom wall 9 that are parallel to one another and arranged at a preset distance from one another.

[0043] The reflector 6 and the top wall 8 cooperate to define a chamber 11 within which the lamp 5 is contained.

[0044] The top wall 8 and the bottom wall 9 similarly delimit a chamber 21 within which coolant fluid is made to circulate, as will be disclosed in greater detail below.

[0045] The aforementioned coolant fluid is suitable for removing heat generated by the portion of infrared radiation emitted by the lamp 5.

[0046] The operating zone 4 is defined by a plane 12 whereupon a net 36 slides that is part of the conveyor 3, which has an end actuated by an electronically controlled motor 13. The plane 12 delimits at the top a seat 14 that is kept in a vacuum by suction means 15 that sucks the air contained therein by means of elbow-shaped suction conduits 16 communicating with the seat 14. The plane 12 is furthermore equipped with through holes that are not shown through which air is drawn inside the seat 14. This has two consequences: adhesion of the support 2 to the net 36 by means of a vacuum and cooling of the plane 12 through expansion of the air during passage through the aforementioned holes with consequent lowering of the temperature of the support 2 being processed.

[0047] Figures 2 to 5 show an apparatus 1 wherein the reflector 6 is defined by a profiled element 16, for example obtained through extrusion of an aluminium alloy.

[0048] The profiled element 16 comprises a cavity 17 equipped with a concave wall 18 that identifies the reflecting surface 17 of the reflector 6.

[0049] The profiled element 6 may be subjected to a polishing treatment, or be clad with a metallic layer, for example chrome, in order to improve the reflection of the radiation acting thereupon.

[0050] The profiled element 16 comprises, inside the cavity 17, a first pair of grooves 19 and a second pair of grooves 20.

[0051] The first pair of grooves 19 is suitable for receiving end 37 portions of the top wall 8 of the filter 7, whilst the second pair of grooves 20 is suitable for receiving end 38 portions of the bottom wall 9 of the filter 7.

[0052] In this way, the top wall 8 and the bottom wall 9 can be assembled, or replaced, very easily by positioning the top wall 8 and the bottom wall 9 at one of the sides of the apparatus 1 and exerting thereupon sufficient pressure to enable sliding of the aforementioned end portions within the respective grooves.

[0053] The profiled element 16 comprises a plurality of appendages 22 protruding from a zone of the profiled element 16 adjacent to the concave wall 18, the appendage 22 constituting dissipating means 23 suitable for dissipating part of the heat generated by the lamp 5.

[0054] Between the appendages 22 a plurality of conduits 31 is defined that are substantially parallel to one another, inside which a cooling fluid is made to flow.

[0055] In this way, the appendages 22 act as heat exchangers enabling effective cooling of the lamp 5 and of the reflector 6.

[0056] The concave wall 18 comprises a projection 24 obtained in the top part thereof, the projection 24 being defined by a pair of faces 25 converging towards the zone of the cavity 17 wherein the lamp 5 is housed.

[0057] The projection 24 acts as a deflecting element of the radiation inasmuch as the faces 25 are arranged in such a way that a beam of radiation produced by the lamp 5 and hitting the faces 25 is reflected towards a support 2 and not towards the lamp 5 itself, thus optimising the performance of the apparatus 1.

[0058] The faces 25 thus constitute a pair of reflecting surfaces that prevent radiations from being again directed towards the lamp 5 by which they were produced, in such a way as to prevent overheating of the lamp itself.

[0059] The portions of the profiled element 16 connected with the concave surface 18 and again comprised between the first pair of grooves 19 and the second pair of grooves 20 define side walls 10 of the chamber 21.

[0060] Such side walls 10 comprise a plurality of lengths 26 diverging towards the operating zone 4 in such a way as to reflect the radiation towards the supports 2.

[0061] The lengths 26 are mutually arranged in such a way as to give a saw-tooth profile to the side walls 10.

[0062] Providing a plurality of lengths 26 furthermore enables the surface extension of the side walls 10 to be increased in relation to walls extending substantially along a plane, which improves heat exchange between the side walls 10 and the coolant fluid circulating within the chamber 21.

[0063] The apparatus 1 furthermore comprises first fan means, not shown, arranged to induce the aforementioned coolant fluid to cross the chamber 21 in the direction shown by the arrow F in such a way as to create a flow of the aforementioned coolant fluid between a first delivery manifold 27 and a first collection manifold 28.

[0064] The apparatus 1 furthermore comprises second fan means, which is also not shown, arranged to induce the aforementioned cooling fluid to go along the conduits 31 in the direction shown by the arrow F1 in such a way as to create a flow of the aforementioned cooling fluid between a second delivery manifold 29 and a second collection manifold 30.

[0065] Owing to the invention, it is therefore possible to obtain an apparatus 1 equipped with un efficient cooling system, which enables lamps of considerable power to be used.

[0066] The apparatus 1 furthermore comprises suction means, which is not shown, arranged to take ozone from the chamber 11, this ozone acting as a shielding element against ultraviolet radiation and thus penalising the efficiency of the lamp 5.

[0067] Suction means generates a slight vacuum inside the chamber 11 that enables ozone to be extracted without, however, cooling the lamp 5.

[0068] The apparatus 1 furthermore comprises shutter means 32 arranged to permit intermittent operation of the apparatus 1.

[0069] Shutter means 32 comprises a pair of movable walls 33 that are arranged inside the chamber 21 and are movable between a closed position, indicated by A in Figure 2, wherein they intercept the radiation, and an open position, indicated by B in Figure 2, wherein they allow the radiation to reach the operating zone 4.

[0070] The movable walls 33, similarly to the side walls 10, have a saw-tooth profile formed by further lengths 39 mutually arranged in such a way as to direct the radiation reflected thereby towards the operating zone 4, when the movable walls are in the open position B.

[0071] The movable walls are transferred from the closed position A to the open position B, and vice versa, by means of a pair of actuators 34, each one of which is arranged to rotatingly actuate a lever 35 that is integral with a respective movable wall 33.

[0072] Shutter means 32 enable intermittent operation of the apparatus without this making it necessary to switch off and subsequently switch on again the lamp 5.

[0073] In this way, the lamp 5 is less subject to thermal stress caused by frequent switching off and switching on occurring within a short space of time of each other, which reduce the operating life of the lamp.

Claims

1. Apparatus for polymerisation of inks and paints on supports (2), comprising radiation emitting means (5), containing ultraviolet radiations and reflecting means (6) arranged to direct said radiations towards said supports (2), **characterised in that** said reflecting means (6) comprises profiled element means (16).

2. Apparatus according to claim 1, wherein said profiled element means (16) comprises cavity means (17) delimited by curved wall means (18) defining reflecting surface means of said reflecting means (6).

3. Apparatus according to claim 2, wherein said curved wall means (18) comprises deflecting means (24) arranged to direct the radiation reflected by said reflecting surface far from said emitting means (5).

4. Apparatus according to claim 3, wherein said deflecting means comprises projection means (24) protruding from said curved wall means towards the interior of said cavity means (17).

5. Apparatus according to claim 4, wherein said projection means (24) comprises a pair of faces (25) converging towards said emitting means (5).

6. Apparatus according to any one of the preceding claims, wherein said profiled element means (16) comprises surface zones that have been subjected to polishing treatment.

7. Apparatus according to any one of the preceding claims, wherein said profiled element means comprises a metal profiled section (16).

8. Apparatus according to claim 7, wherein said metal profiled section (16) is made of aluminium alloy.

9. Apparatus according to claim 7, or 8, wherein said metal profiled section (16) is provided with surface cladding.

10. Apparatus according to claim 9, wherein said cladding is of chrome.

11. Apparatus according to any one of the preceding claims, and furthermore comprising heat dissipating means (23) associated with said reflecting means (6) and suitable for fostering the cooling of said emitting means (5) and of said reflecting means (6).

12. Apparatus according to claim 11, wherein said heat dissipating means (23) comprises appendage means (22) of said profiled element means (6).

13. Apparatus according to claim 12, wherein between said appendage means (22) conduit means (31) is obtained arranged to allow the passage of cooling fluid means.

14. Apparatus according to any one of the previous claims, and furthermore comprising filter means (7) arranged to allow the passage through it of ultraviolet radiations and to oppose the passage through it of infrared radiations.

15. Apparatus according to claim 14, wherein said filter means (7) comprises a first wall (8) and a second wall (9) interposed between said emitting means (5) and said objects (2), said first wall (8) and said second wall (9) being separated from each other by a preset distance.

16. Apparatus according to claim 15, wherein said first wall (8) and said second wall (9) cooperate with said profiled element means (16) to define chamber means (21) arranged to receive coolant fluid means.

17. Apparatus according to claim 15, or 16, wherein said profiled element means (16) comprises first groove means (19) arranged to receive end zones (37) of said first wall (8) and second groove means (20) arranged to receive end zones (38) of said second wall (9).

18. Apparatus according to any one of claims 15 to 17, wherein said first wall (8) cooperates with said reflecting means (6) to define chamber means (11) inside which said emitting means (5) is housed.

19. Apparatus according to claim 18, and furthermore comprising suction means arranged to create a vacuum inside said chamber means (11).

20. Apparatus according to any one of claims 2 to 5, or according to any one of claims 6 to 19 when appended to any one of claims 2 to 5, wherein said profiled element means (16) comprises lateral wall means (10) laterally delimiting said cavity means (17).

21. Apparatus according to claim 20, wherein said lateral wall means (10) comprises a plurality of lengths (26) mutually arranged in such a way as to give said lateral wall means (26) a saw-tooth profile.

22. Apparatus according to claim 21, wherein said lengths (26) are shaped in such a way as to reflect said radiations towards said supports (2).

23. Apparatus according to any one of the previous claims, and furthermore comprising shutter means (32) movable between a closed position (A) wherein it intercepts said radiations, and an open position (B), wherein it enables said radiations to reach said supports (2).

24. Apparatus according to claim 23, and furthermore comprising actuating means (34) arranged to transfer said shutter means (32) from said closed position (A) to said open position (B), and vice versa.

25. Apparatus according to claim 23, or 24, wherein said shutter means (32) comprises movable wall means (33) having a saw-tooth profile.

26. Apparatus according to claim 25, wherein said movable wall means (33) comprises a plurality of faces (39) arranged in such a way as to reflect said radiations towards said supports (2).

27. Apparatus for polymerisation of inks and paints on supports (2), comprising radiation emitting means (5), containing ultraviolet radiations, and reflecting means (6) arranged to direct said radiations towards said supports (2), and furthermore comprising heat dissipating means (23) associated with said reflecting means (6) and suitable for fostering the cooling of said emitting means (5) and of said reflecting means (6).

28. Apparatus according to claim 27, wherein said dissipating means (32) comprises appendage means (22) of profiled element means (16).

29. Apparatus according to claim 28, wherein said profiled element means (16) defines said reflecting means (6).

30. Apparatus according to claim 28, or 29, wherein between said appendage means (22) conduit means (31) is obtained arranged to enable the passage of cooling fluid means.

31. Apparatus according to any one of claims 28 to 30, wherein said profiled element means (16) comprises cavity means (17) delimited by curved wall means (18) defining reflecting surface means of said reflecting means (6).

32. Apparatus according to claim 31, wherein said curved wall means (18) comprises deflecting means (24) arranged to direct the radiation reflected by said reflecting surface far from said emitting means (5).

33. Apparatus according to claim 32, wherein said deflecting means comprises projection means (24) protruding from said curved wall means towards the interior of said cavity means (17).

34. Apparatus according to claim 33, wherein said projection means (24) comprises a pair of faces (25) converging towards said emitting means (5).

35. Apparatus according to any one of claims 28 to 34, wherein said profiled element means (16) comprises surface zones that have been subjected to polishing treatment.

36. Apparatus according to any one of claims 28 to 35, wherein said profiled element means comprises a metal profiled section (16).

37. Apparatus according to claim 36, wherein said metal profiled element (16) is made of aluminium alloy.

38. Apparatus according to claim 36, or 37, wherein said metal profiled section (16) is provided with surface cladding.

39. Apparatus according to claim 37, wherein said cladding is of chrome.

40. Apparatus according to any one of claims 27 to 39, and furthermore comprising filter means (7) arranged to allow the passage through it of ultraviolet radiations and to oppose the passage through it of infrared radiations.

41. Apparatus according to claim 40, wherein said filter means (7) comprises a first wall (8) and a second wall (9) interposed between said emitting means (5) and said objects (2), said first wall (8) and said second wall (9) being separated by a preset distance.

42. Apparatus according to claim 41 when claim 40 is appended to any one of claims 28 to 39, wherein said first wall (8) and said second wall (9) cooperate with said profiled element means (16) to define chamber means (21) arranged to receive coolant fluid means.

43. Apparatus according to claim 41 when claim 40 is appended to any one of claims 28 to 39, or according to claim 42, wherein said profiled element means (16) comprises first groove means (19) arranged to receive end zones (37) of said first wall (8) and second groove means (20) arranged to receive end zones (38) of said second wall (9).

44. Apparatus according to any one of claims 41 to 43, wherein said first wall (8) cooperates with said reflecting means (6) to define chamber means (11) inside which said emitting means (5) is housed.

45. Apparatus according to claim 44, and furthermore comprising suction means arranged to create a vacuum inside said chamber means (11).

46. Apparatus according to any one of claims 31 to 34, or according to any one of claims 35 to 45 when appended to any one of claims 31 to 34, wherein said profiled element means (16) comprises lateral wall means (10) laterally delimiting said cavity means (17).

47. Apparatus according to claim 46, wherein said lateral wall means (10) comprises a plurality of lengths (26) mutually arranged in such a way as to give said lateral wall means (26) a saw-tooth profile.

48. Apparatus according to claim 47, wherein said lengths (26) are shaped in such a way as to reflect said radiations towards said supports (2).

49. Apparatus according to any one of the preceding claims, and furthermore comprising shutter means (32) movable between a closed position (A) wherein it intercepts said radiations, and an open position (B), wherein it allows said radiations to reach said supports (2).

50. Apparatus according to claim 49, and furthermore comprising actuating means (34) arranged to transfer said shutter means (32) from said closed position (A) to said open position (B), and vice versa.

51. Apparatus according to claim 49, or 50, wherein said shutter means (32) comprises movable wall means (33) having a saw-tooth profile.

52. Apparatus according to claim 51, wherein said movable wall means comprises a plurality of faces (39) arranged in such a way as to reflect said radiations towards said supports (2).

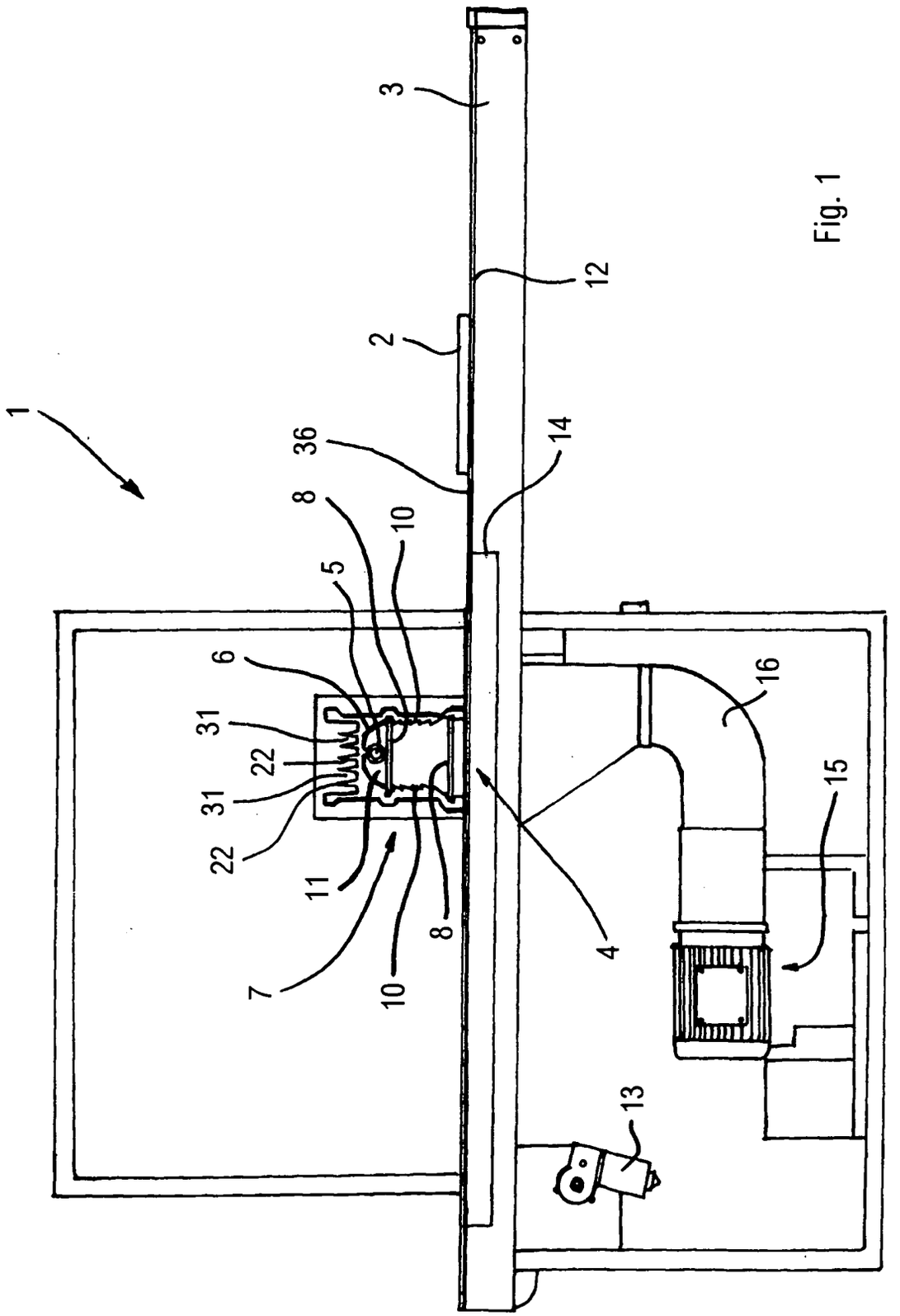

Fig. 1

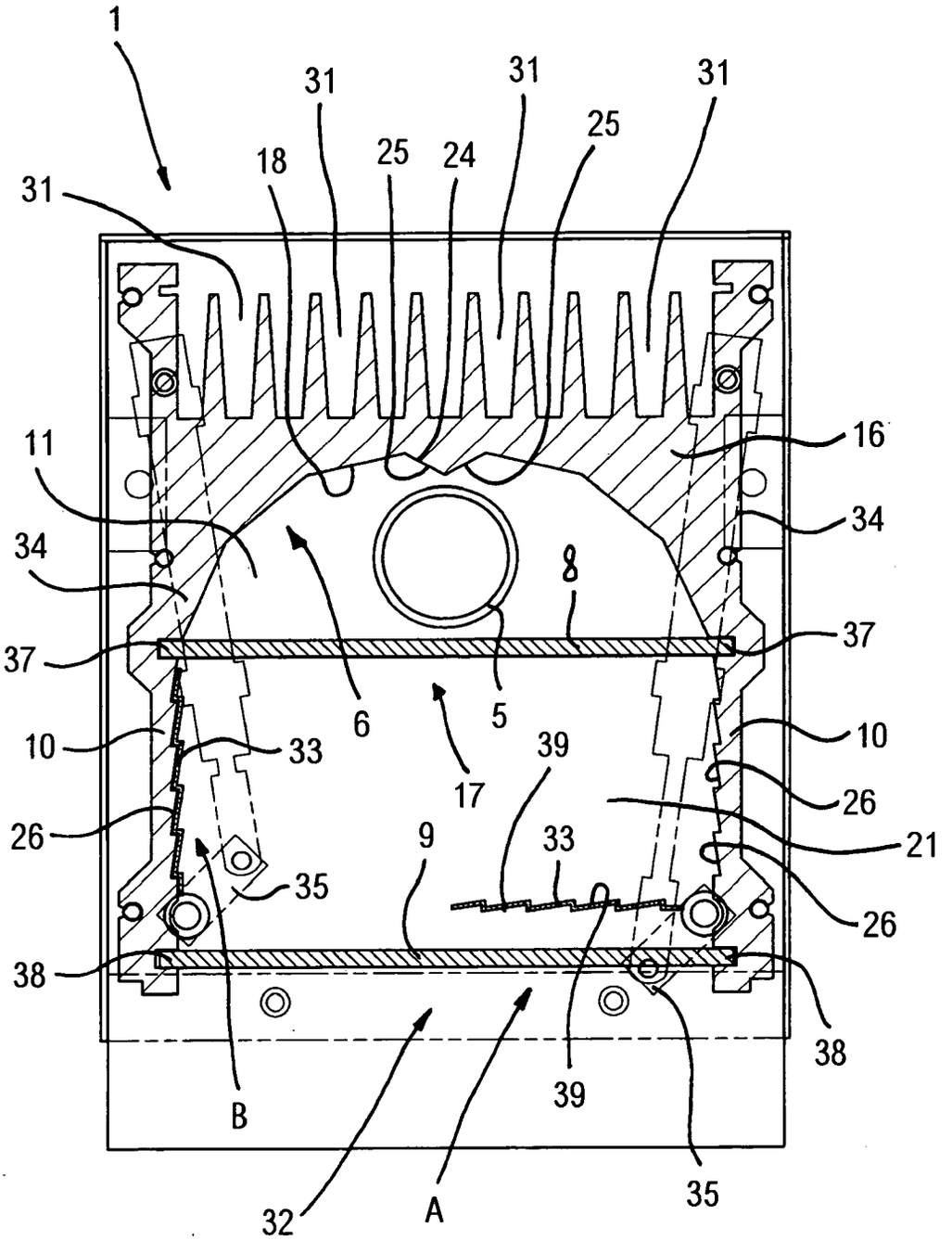
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Fig. 2

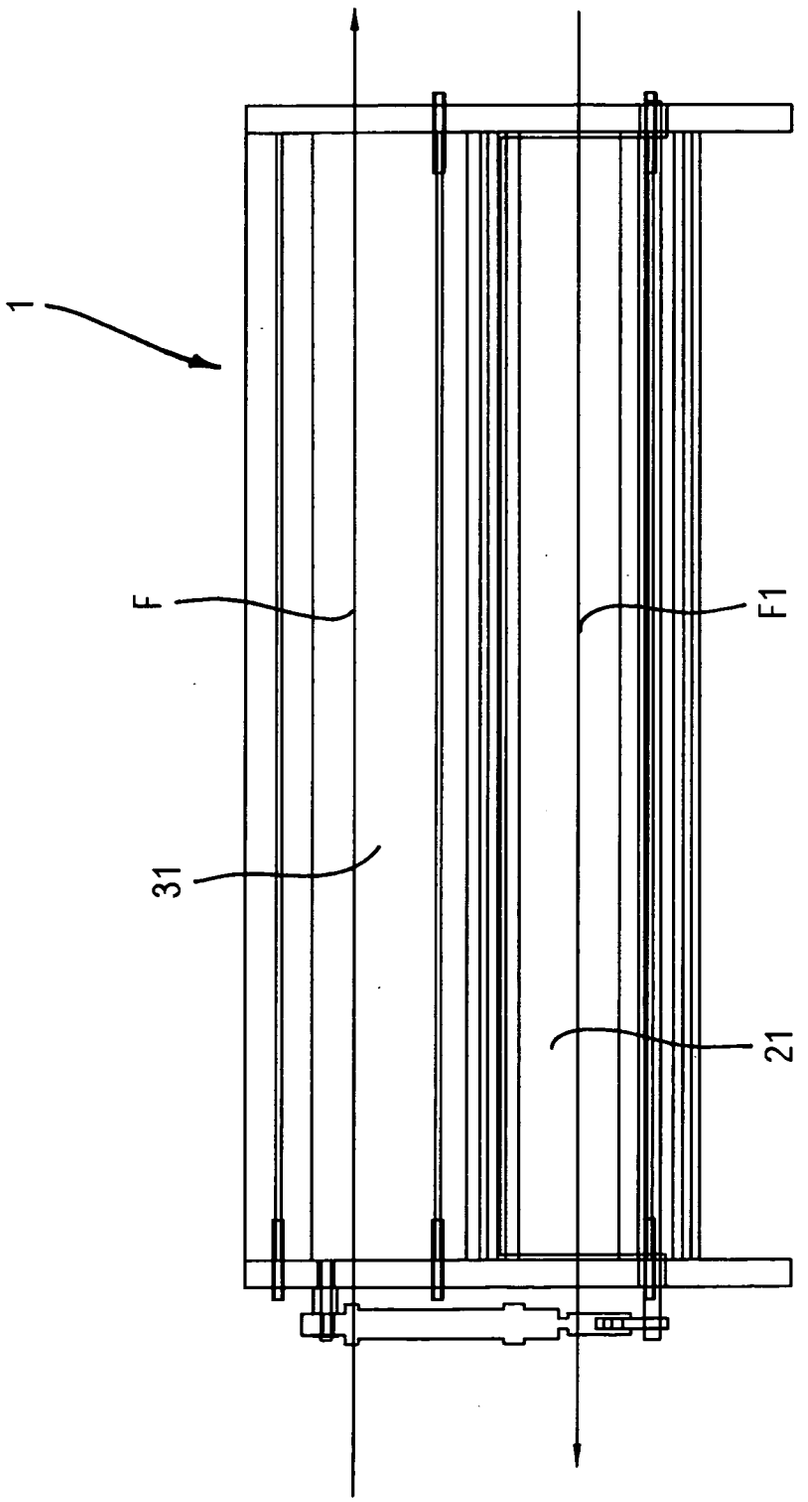

Fig. 3

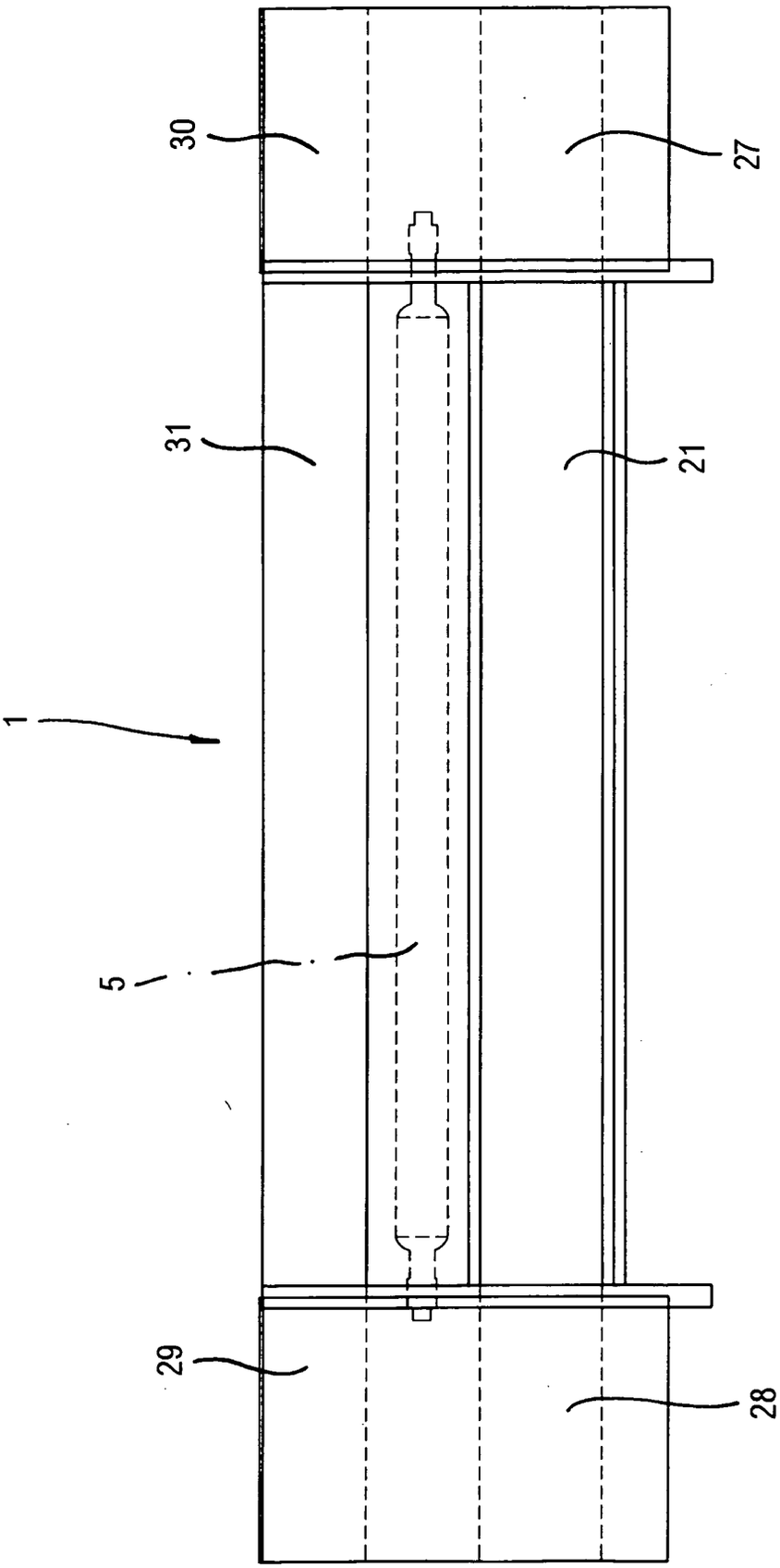

Fig. 4

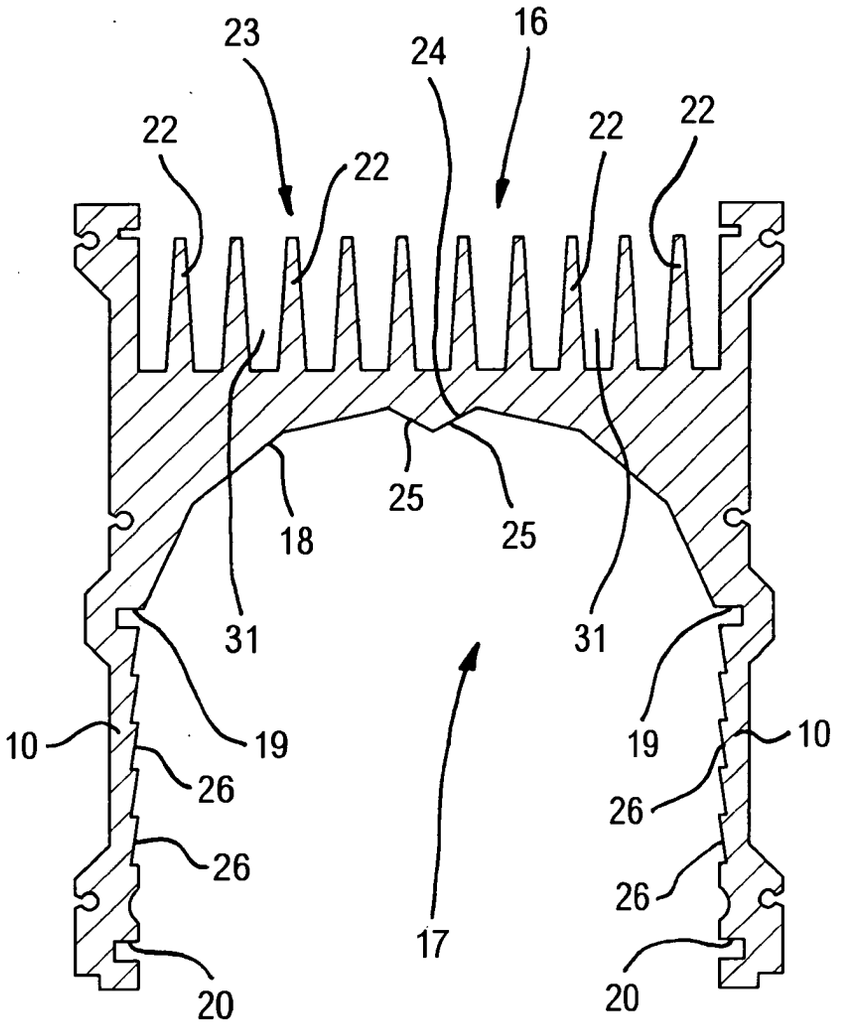

Fig. 5