

[54] **DEVICE FOR THE CONTINUOUS DRYING AND FINISHING OF WEB MATERIALS, PARTICULARLY TEXTILES**

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[58] Field of Search 34/155, 161, 156, 160

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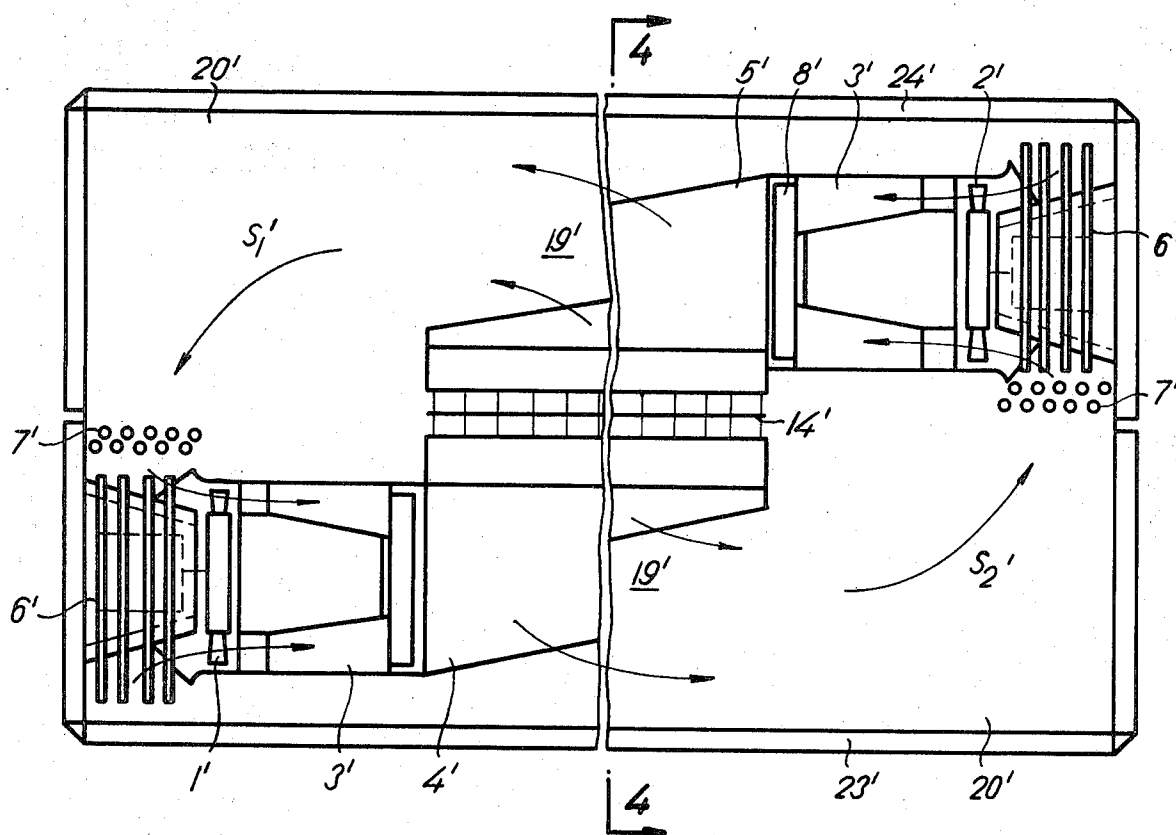
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[57] **ABSTRACT**

Device for the continuous drying and finishing of web materials, particularly textiles, by gaseous processing medium. The device consists of one or more independent sections in each section there being two fans mounted oppositely above each other, each fan being connected at its outlet part through a bypassing line with a nozzle case or a system of nozzle cases and being provided with heaters in front of its inlet part. The bypassing line may be provided with a control flap or a system thereof. The nozzle case or the system of nozzle cases may be separated by walls into supply channels and withdrawing channels.

5 Claims, 4 Drawing Figures



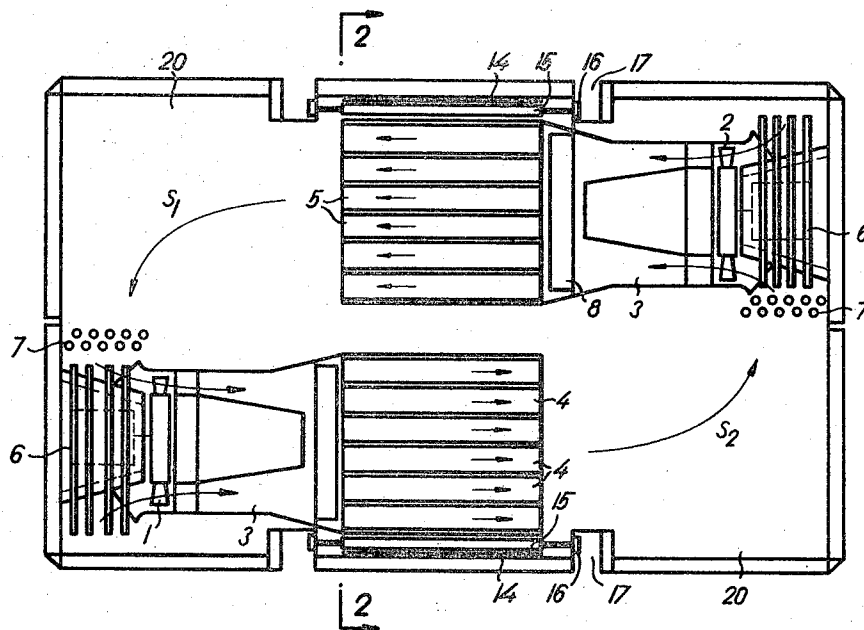


Fig. 1.

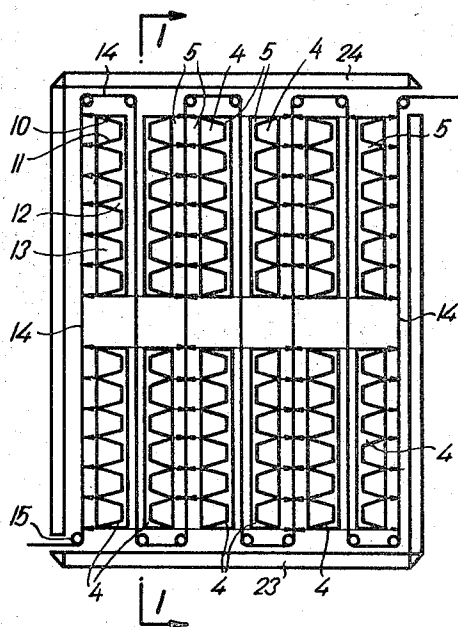


Fig. 2.

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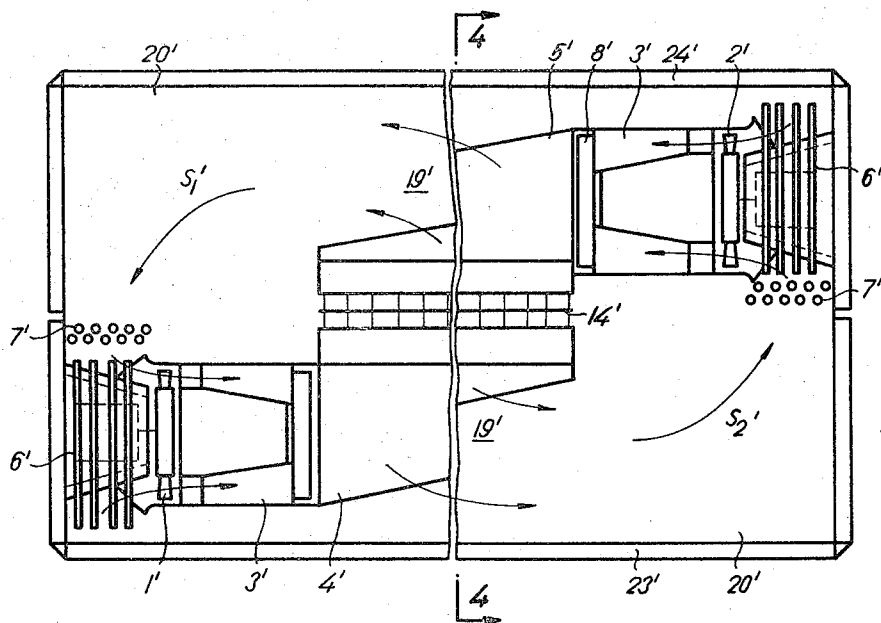


Fig. 3.

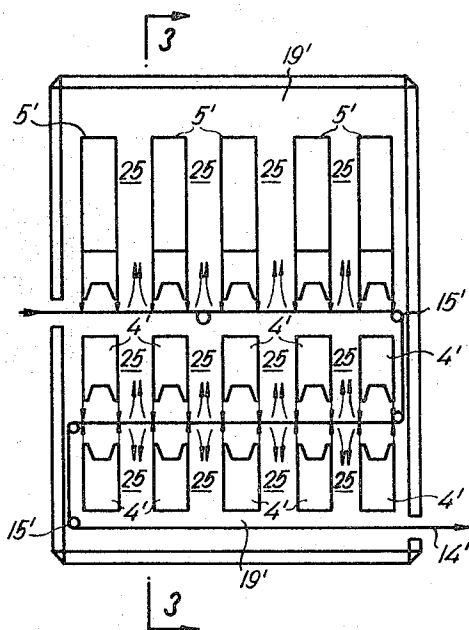


Fig. 4.

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DEVICE FOR THE CONTINUOUS DRYING AND FINISHING OF WEB MATERIALS, PARTICULARLY TEXTILES

The present invention relates to a device for the continuous drying and finishing of web materials, in particular, textiles.

For this purpose, a device has been hitherto used in which the web material, particularly textiles, pass through a processing space in which gaseous processing medium is circulated, the web material being usually guided by a system of guiding cylinders or other web carrying means, e.g. rods, or the web is carried by a gaseous flow created by a suitable arrangement of nozzle cases from the orifices of which the processing medium flows.

The gaseous processing medium circulates in circulation circuits inside the device in which fans, heaters and the actual distribution means, which are usually of the nozzle type, are situated.

The devices hitherto used, as mentioned above, usually consist of a plurality of basic units, so-called sections, mounted one behind another.

A plurality of devices for drying and finishing web materials, particularly textile webs, by means of a gaseous medium are known, said devices being arranged in such manner that a single fan is mounted in each section and the circulation circuits are constituted by interconnecting the horizontally arranged neighboring sections.

The said arrangements have a disadvantage in that the circulation path is long and the distribution of the working medium flow is asymmetrical particularly with respect to the longitudinal axis of the device. This excludes any application of that device for processing web materials, particularly textile webs, of larger widths and requires a large built-over surface.

Other devices are also known for drying and finishing web materials, particularly textile webs, by means of gaseous media, said devices having two fans arranged oppositely to each other in one section, said fans being arranged coaxially, in mirror-image arrangement, either vertically or horizontally. The arrangement of the said devices has a disadvantage consisting in that such changes in cross-section are required in the distribution manifold of the circulation circuit in its suction, as well as in its extrusion parts, that the working conditions are considerably disturbed thereupon. This shows itself in low efficiency of circulation and in transversal as well as longitudinal asymmetrical separation of the processing medium flow, as a result of which the efficiency of the machine is considerably limited.

Also other devices are known which are used for drying web materials, particularly textile webs printed with pigment dyes, in which it is necessary to perform condensation of the binding agent of the said dyes for the purpose of their stabilization on the surface of said web. This second phase, i.e., the condensation of the binding agent of said dyes, is presently performed discontinuously, i.e. separate from the drying process. This, however, is a considerable disadvantage, which shows itself particularly in the necessity of excessive material handling, low processing productivity, and the possibility of obtaining printed goods of considerably low quality.

The common disadvantage of all devices hitherto known as above-mentioned consists in the inaccessibility

of their inner space which necessitates excessively expensive designs enabling access to the machine.

The purpose of the present invention consists particularly in removing the above-mentioned disadvantages of the devices hitherto known, i.e. above all, the uneven action of the processing medium upon the web material to be processed, and further in securing maximum effect of the processing medium by a highly effective circulation circuit, particularly for machines of large working width.

The subject matter of the device according to the present invention consists particularly in that in each section there are mounted two fans directed oppositely to and one above the other, each fan being connected by means of a bypassing pipeline to a nozzle case or a nozzle case system and provided with at least one heater in front of its inlet part.

By the arrangement as mentioned it is achieved that each of said fans presses the processing medium into an independent nozzle case or a nozzle case system constituting one closed circulation circuit of the processing medium.

The advantage of the device according to the present invention consists in that the processing medium circulates about short paths, and said circulation is substantially accelerated. Thereby, a high efficiency of the circulation circuit is achieved relative to the devices hitherto known.

A further important advantage of the device according to the present invention consists in the possibility of modifying individually the arrangement of the nozzle cases for various technological operations from the viewpoint of embracement of the web material in the section and its extent, and thus also the time for which the material is acted upon by the processing medium. This circumstance is particularly important upon using the device according to the present invention for drying and condensation of binding agents on webs printed with pigment dyes, where by connecting two or more sections with horizontally arranged nozzle cases with single embracement of web material and two or more sections with vertically arranged nozzle cases with multiple embracement of web material, drying and condensing the binding agent after printing the web by pigment dyes can be continuously performed in one step in the device according to the present invention.

In the same arrangement of the circulation circuit enables the device according to the present invention also drying of web materials, particularly textile webs, of large widths, where each fan supplies independently one nozzle case with processing medium.

A further advantage of the device according to the present invention consists in perfect accessibility of its inner space.

Further features of the device according to the present invention and a more detailed specification are comprised in the following description and shown in the form of an embodiment in the form of an example in the accompanying drawings, of which

FIG. 1 is a view in vertical cross-section through one section of a first illustrative embodiment of the device according to the present invention, said device being provided with vertically arranged nozzle cases, the section being taken along line 1—1 in FIG. 2;

FIG. 2 is a view in section along line 2—2 in FIG. 1 of the whole arrangement of the device;

FIG. 3 is a view in vertical cross-section through one section of a second illustrative embodiment of the device according to the present invention, said device being provided with horizontally arranged nozzle cases, said embodiment being intended for web materials of large width, the section being taken along line 3—3 in FIG. 4;

FIG. 4 is a view in section along line 4—4 in FIG. 3 of the overall arrangement of the device having a double system of nozzle cases in its lower part.

The device according to the present invention in the first embodiment thereof, shown in FIGS. 1 and 2, consists of separate sections mounted alternately one behind another symmetrically to the left and to the right of the longitudinal axis of the device. In each section are mounted two axial flow fans, a lower fan 1 and an upper fan 2 being mounted oppositely above each other, by means of which the circulation of the processing medium is secured. The fans 1 and 2 are mutually independently adjustable and controllable. A further part of the circulation circuit is constituted by a distributing and bypassing pipeline 3 and nozzle cases or nozzle case systems 4, 5 of which one is attached to the lower fan 1 and the other to the upper fan 2.

The nozzle cases or their systems 4, 5 can be arranged either for single embracement or multiple embracement of the processed web material 14.

The nozzle cases or their systems 4, 5 have the same rectangular cross-section along their whole working width. This rectangular cross-section is divided by means of walls 10 and 11 (FIG. 2) into separate channels, i.e. supply channel 12 and withdrawing channels 13, the cross-section of said supply channels 12 becoming narrower in the direction of the processing medium flow, while the cross-section of the withdrawing channels 13 is widened in the direction of flow of the processing medium.

The processing medium is guided from the orifices of nozzles 4, 5 to the web material 14 either vertically, or inclined to the plane of advancement of web material 14. This can be secured either by the appurtenant arrangement of the nozzles 4, 5 or by providing them with extensions directed accordingly.

The circulating processing medium is heated by means of heaters 6, 7 mounted at the inlet side of fans 1, 2 and covering said inlet part from three sides in such manner that two heaters 6 are mounted vertically from the lateral sides to the axis of fan 1 or 2 and constitute an interconnection of the circulation circuit to the neighboring sections, while one heater 7 is arranged horizontally, either from above at the lower fan 1 or from below at the upper fan 2, thus securing the closing of the circulation circuit of the processing medium in each section, said circuit being represented by arrows S_1 , S_2 . The said heaters 6, 7 are independently controllable and adjustable for each fan 1, 2.

The distributing and bypassing pipeline 3 is provided with a control flap or a system of control flaps 8, enabling the distribution and changing of the quantity of the processing medium to be supplied and thus its velocity of flowing into the separate nozzle cases or nozzle case systems 4, 5. The control flaps or their systems 8 are individually and separately adjustable in each of the distributing and bypassing pipelines 3.

This individual adjustability and controllability of the temperature of the heaters 6, 7 as well as of the position of the control flap or a system 8 thereof enable the pro-

cessing to be modified to the material to be processed in its velocity and intensity, as well as to change the effect of the processing medium to the face side or reverse side of the web material 14, and also as well as compensation of the effect of weight of the processed material. It will be understood that the temperature may be increased or decreased, and that the withdrawing velocity and the quantity of processing medium either in or against the direction of advancement of the web material to be processed may be altered.

The web material 14 is guided between the nozzle cases or their systems 4, 5 by guiding cylinders 15 mounted near the floor 23 and the ceiling 24 of the device according to the present invention.

Moreover, it is possible to guide the web material 14 through the device on another carrying means, e.g. a mesh, or to guide the processed web material by means of a pin chain or a clip chain, or by similar means, all this depending on the method of processing the web material and of the kind of processed web material.

The guiding cylinders 15 are driven either by a driving mechanism (not shown) in the case that the web material 14 is guided without tension, or are mounted freely rotatably without positive driving in the case, that the web material 14 is guided through the device according to the present invention by traction. The bearings 16 of cylinders 15 are mounted in the spaces 17, thermally insulated against the inner space of the sections.

A second embodiment of the device according to the present invention is shown in FIGS. 3 and 4. This embodiment has the same basic arrangement of the section as the embodiment of FIG. 1 with the difference that the nozzle cases or their systems 4', 5' are mounted horizontally above each other, either for single or multiple embracement of web material 14. This embodiment is particularly suitable for processing material webs of large width. Parts in FIGS. 3 and 4 which are similar to those in FIGS. 1 and 2 are designated by the same reference characters with an added prime.

In FIG. 4 a section through the embodiment as shown in FIG. 3 is represented in which the nozzle cases or their systems 4', 5' of the separate sections are made in such manner, that their overall rectangular cross-section is divided into a system of mutually separately mounted partial nozzles 4', 5', the cross-section of which is narrowed in the direction of processing medium flow. Between the separate nozzles 4, 5 are open passage channels 25, through which the used processing medium is withdrawn into the intermediate space 19' which is reversed from the orifices of nozzles 4', 5', whereupon again a circulation circuit is constituted for the processing medium. In the lower part of FIG. 4, a modification of that embodiment with a double system of nozzle cases is shown.

The whole arrangement of fans 1', 2', heaters 6', 7', control flaps or their systems 8' is the same in the embodiment as shown in FIGS. 3 and 4 as in the embodiment as shown in FIGS. 1 and 2 and enables in the same extent changes in the method of processing the web material, adjustability of the said separate parts of the device and control of the conditions of processing the web material.

In the embodiment according to FIGS. 1 and 2, the nozzle cases or their systems 4, 5 can be made similarly to the embodiment as shown in FIG. 4 in such manner, that the overall rectangular cross-section changes

about their width and is separated into several separate nozzles 4', 5' situated mutually separately. Between said nozzles, open channels 25 are situated as in FIGS. 3 and 4, such channels 25 connecting the processing space, i.e. the adjacent space of the orifices of nozzles 4', 5' with the reversed space and the interposed space 20' of the device.

Although the invention is illustrated and described with reference to a plurality of preferred embodiments thereof, it is to be expressly understood that it is in no way limited to the disclosure of such a plurality of embodiments, but is capable of numerous modifications within the scope of the appended claims.

What is claimed is:

1. A device for drying webs of textile materials, comprising a housing forming a closed chamber, means in the chamber for supporting a web to be dried as the web travels horizontally within the chamber, nozzle cases inside the chamber mounted along its whole width both above and below the horizontal path of the web to be dried, said nozzle cases blowing a drying medium at the web, and axial flow fans with heaters, said fans being arranged with their axes horizontal, in pairs directed oppositely to each other, and on opposite sides and spaced from the vertical central plane of the hori-

zontal web path, one of said two fans being mounted below the horizontal web path, the other said fans being mounted above said horizontal web path, the nozzle cases having delivery nozzles, the fans having feeding apertures, and the delivery nozzles of each of said nozzle cases being connected to the feeding aperture of the fan of the other nozzle case, each pair of fans and nozzle cases forming parts of a closed drying medium circuit in which the two fans are connected in series, whereby the drying medium flow consists entirely of recirculated drying medium.

2. A device as claimed in claim 1, comprising walls separating each nozzle case into supply channels and withdrawing channels.

3. A device as claimed in claim 1, wherein the nozzle cases have separate, individually arranged nozzles with open channels arranged therebetween.

4. A device as claimed in claim 1, wherein the orifices of the nozzles are arranged at right angles to said horizontal plane of travel of the web material in the chamber.

5. A device as claimed in claim 1, comprising a control flap disposed between the nozzles of each respective nozzle box and the fan associated therewith.

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