Oct. 30, 1962 A. MEIER-WINDHORST 3,060,594

APPARATUS FOR THE DRYING OF WEBS OF MATERIAL WITH A HEATED GASEOUS MEDIUM

Filed July 17, 1959 2 Sheets-Sheet 1

FIG. 1.

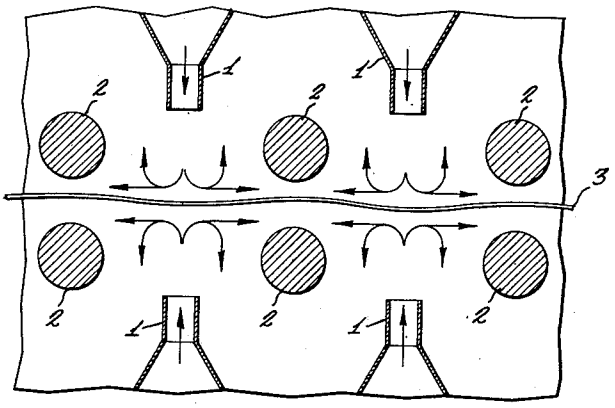


FIG. 2.

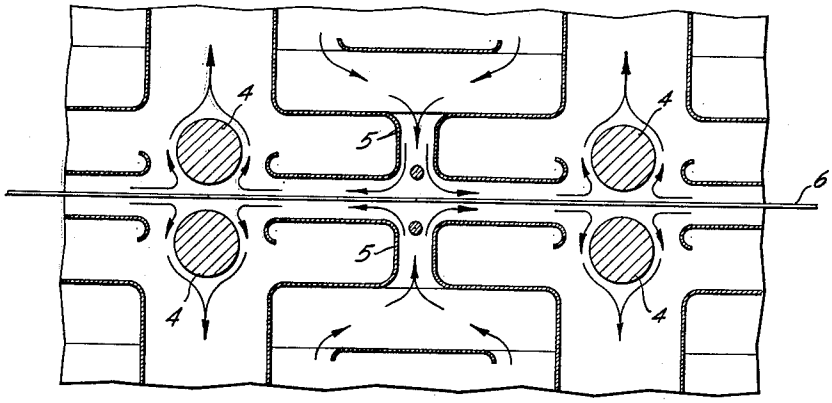
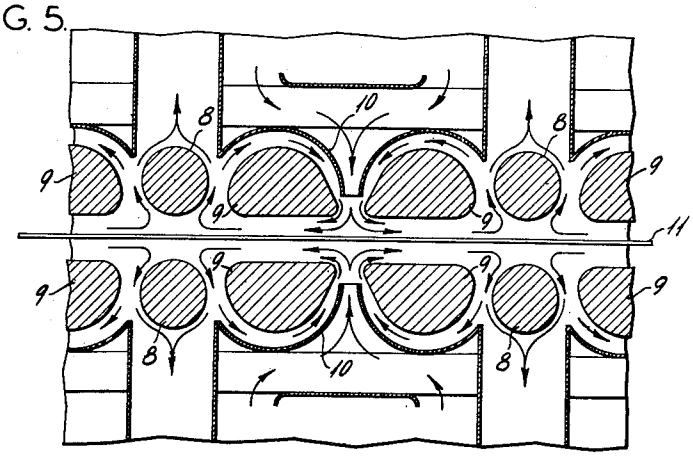


FIG. 5.



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Filed July 17, 1959 2 Sheets-Sheet 2

FIG.3.

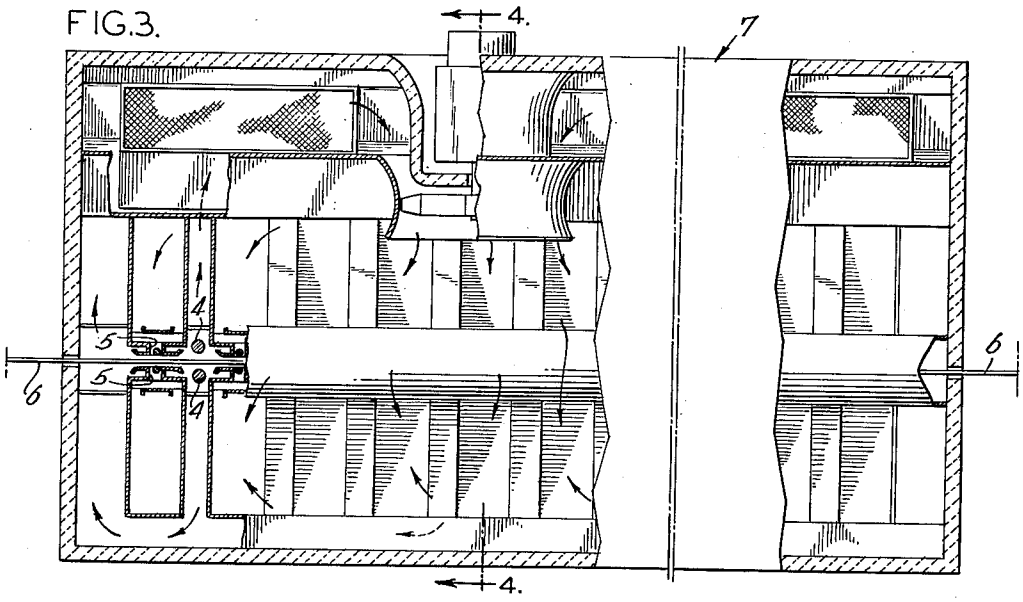
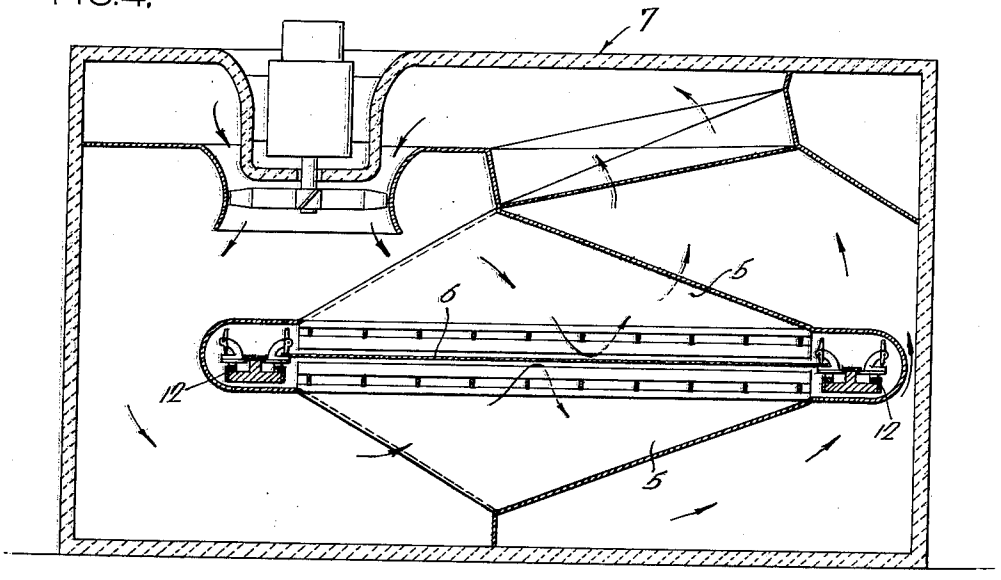


FIG.4.



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APPARATUS FOR THE DRYING OF WEBS OF MATERIAL WITH A HEATED GASEOUS MEDIUM

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Claims priority, application Germany July 19, 1958
2 Claims. (Cl. 34—156)

The invention relates to an apparatus for the treatment and especially the drying of webs of material in particular webs of fabric by means of a heated gaseous medium which is blown on to the web by nozzle slots or rows of separate nozzles arranged on both sides of the web symmetrically thereto over the entire width thereof and conducted off substantially perpendicularly to the web by passages provided between the nozzles.

With the object of attaining absolutely contact-free, tension-free and nevertheless highly effective guiding of webs freely suspended or floating within the treatment chamber, it was proposed in the application for patent, Ser. No. 676,792, now Patent No. 3,041,739, to arrange symmetrically on the two sides of the web at a distance from the nozzles, profiled elements having preferably curved surfaces facing the web, these elements being at a distance from the central position of the web which is equal to or less than the distance of the nozzle outlets from the central position of the web. In the regions where the streams of each two successive nozzles extending parallel to the web meet, the profiled elements are arranged as baffles with wedge-shaped surfaces in the inlet opening in the opposite direction to the flow of the medium so as to produce stable pressure cushions. Laterally of the nozzles and near the web the profiled elements can be arranged as guides and have curved surfaces facing the nozzle jet and the web of material, which surfaces assist the off-flow of the treatment medium from the nozzle to the outlet passage so that currents are produced between the air guiding elements and the web for carrying the web. At the same time the nozzle wall and the boundary surfaces of the elements facing it preferably form a passage which connects the region where the jet passes out from the nozzle with the outlet passage. Instead of combining the baffles with guide elements located laterally of the nozzles, they can also be combined in alternating succession with nozzles which form stable pressure cushions in the vicinity thereof also between these nozzles and the web. These nozzles may be constructed as double nozzles operating in and counter to the feed direction of the web.

It has now been found that this method of guiding in absolutely free suspension in a perfect manner can also be introduced with great advantage in tentering frame driers in which the web in passing through the machine is guided between stretching chains of a tentering frame but is held loosely between these chains. In view of the high-grade finish required of modern fabrics, there is an ever-increasing demand that the material be shrunk not only in the direction of the weft but also in the direction of the warp while on the tentering frame during the drying process. Consequently the fabric web is guided through the greater portion of the tentering frame drier in a very slack or sagging state so that it can shrink also in the warp direction during the drying process, while in the last phase of the drying process a certain equalization in width takes the place of the stretching.

On the other hand excessive sagging on the tentering frame has a detrimental effect on account of the very unequal spacing of the blast nozzles arranged outside the range of the tentering chains. This serious objection is now overcome by employing the apparatus described in

application Ser. No. 676,792 by which the webs of fabric held loosely between the tentering chains are guided in central position in a floating state free from contact.

The method of guiding in free suspension in central position between the upper and lower nozzles guarantees that the web is brought into a position in which it is relieved of weight and stressing. Consequently the ideal conditions are present for the shrinkage in the warp direction. At the same time by the uniform spacing of the nozzles an absolutely uniform heating and perfect drying of the material is ensured. The standard blast nozzles used in the tentering frame drier are identical with the conventional nozzles used in the apparatus described in the application for patent Ser. No. 676,792 for guiding the web in free suspension or floating state. The spacing of these nozzles from the fabric web is maintained in such a manner that the chains of the tentering frame in their different positions across the width can pass freely between the nozzles, when these are located between the tentering chains. Being of rod-shape enables them to be advantageously made telescopic so that they can be adapted in a simple manner to the actual width setting of the tentering machine.

Thus it is clearly shown that considerable advantages are obtained by the introduction of the nozzle system according to application Ser. No. 676,792 for guiding the web of fabric carried in the tentering frame so that it is maintained in suspended state, and by the special construction for their use on this frame.

An embodiment of the invention is illustrated diagrammatically by way of example in the accompanying drawing which shows in

FIG. 1 the arrangement of the baffle elements in the off-flow region.

FIG. 2 shows this arrangement in combination with double suspension nozzles.

FIG. 3 is a longitudinal section of the drying chamber with the nozzle arrangement of FIG. 2.

Fig. 4 shows in cross-section a drying chamber.

FIG. 5 is a nozzle arrangement with baffle elements in the inflow and off-flow regions. FIGURES 1, 2, 3 and 5 are the same as those in patent application Ser. No. 676,792. FIGURES 3 and 4 show a drying chamber **7** through which the web **6** to be treated is guided with its lateral edges in tentering chains **12** between which it preferably hangs loosely. The web **6** is treated with the aid of nozzles **1**, **5** and **10** shown in FIGS. 1, 2 and 5. The guiding elements and baffles **2**, **4**, **8** and **9** are also shown in FIG. 1, 2 or 5 so that the web carried in the tentering chains **12** and hanging more or less loosely between these chains can nevertheless float or flow through the treatment chamber **7** in suspended state free from contact.

In the arrangement shown in FIG. 1, the apparatus include nozzles **1**, each having a tip portion disposed above and below the web **3** and baffle elements of generally cylindrical shape disposed in the off-flow region which is the discharge opening intermediate adjacent nozzles. In the present instance, the nozzle tip portions are arranged in confronting pairs on opposite sides of the web **3** and the baffle element are likewise arranged in confronting pairs between adjacent nozzles in the discharge openings.

In the form of construction shown in FIGS. 2–4, baffle elements **4** are provided in the off-flow region arranged in the same manner as that shown in FIG. 1. The nozzles, however, are constructed as special nozzles in the form of double supporting nozzles **5**, each having an extension projecting from the tip portion thereof substantially parallel to the direction of the web so that stable pressure zones are produced also in the in-flow region in the form of supporting cushions as indicated by the arrows.

In the form of construction illustrated in FIG. 5, baffle elements **8** are arranged in the off-flow region and guide or baffle elements **9** are provided in the in-flow region on each side of the nozzles **10**. The guide elements **9** are spaced from the nozzle tip portions and the web **6** to provide a continuous passageway between the nozzle tip portions and the discharge openings affording flow of the treating medium therebetween. In the present instance, the guide elements **9** extend the entire width of the web **6** and each guide element includes a surface parallel to the web and spaced closer thereto than the nozzle tip portions.

The drying medium flows from the nozzles **10** and impinges on the web **11** to be treated, in a vertical direction. The baffle elements **9** arrest the tangential off-flow directly in the region of the nozzle so that a stable pressure zone forms between the opposite baffle elements **9**. These baffle elements **9** are so constructed and arranged in relation to the nozzle **10** that a free space forms between the border surfaces of the elements **9** and the nozzle wall. This space is preferably so shaped by suitably constructing the nozzle mouth that a circular current forms around the element **9** and influences in an extremely positive manner the structure of the flow in the region of the nozzle so as to constitute a favorable heat transfer to the web to be treated.

The guide or baffle element **9** can extend so far horizontally in the region of the nozzle stream that it forms a common exhaust passage with the corresponding element of the neighbouring nozzle. As, however, unstable pressure conditions would form in the region of the off-flow for the drying medium from the web to be treated, on both sides thereof, the baffle elements **8** according to the invention are arranged at this point and divide the off-flow current and also produce a stable pressure distribution in the region of this off-flow zone on both sides of the web to be treated so that it is smoothly guided without contact and in a suspended state.

While particular embodiments of the present invention have been illustrated and described herein, it is to be understood that changes and modifications may be incorporated within the scope of the following claims.

I claim:

1. In apparatus for treating elongated web material, spaced tentering chains in said apparatus operably engaging the web material along opposite side edges thereof, a plurality of nozzles each having a tip portion terminating adjacent to and spaced from the web material, said tip portions being arranged in a row of confronting pairs on opposite sides of said web material, means supplying gaseous treating medium to said nozzles, means defining discharge openings between adjacent nozzles on each side of the web material, a series of baffle elements arranged in a row of confronting pairs in said discharge openings, said baffle elements being spaced from said web material and being closer to said web material than said nozzle tip portions, said nozzle tip portions, baffle elements and discharge openings providing flow of said treating medium operable to support the web in a suspended state and effect substantially uniform treatment of said web material, said tentering chains being operable subsequent to a predetermined amount of lateral shrinkage of the web material during treatment to prevent further such shrinkage thereof.

2. Apparatus as claimed in claim 1 including guide elements at respectively opposite sides of the web material disposed adjacent said nozzle tip portions and spaced from said nozzle tip portions and said web material to provide a continuous passageway between the nozzle tip portions and the discharge openings affording flow of said treating medium therebetween, said guide elements extending the entire width of the web material between adjacent nozzles and each including a surface parallel to the web material closer thereto than said nozzle tip portions whereby said guide elements cooperate with said nozzle tip portions, baffle elements and discharge openings to provide flow of said treating medium operable to support the web material in a suspended state and effect substantially uniform treating of said web material.

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