Nov. 10, 1936. W. W. SPOONER 2,060,430

TREATMENT OF WEBS OF MATERIAL

Filed Jan. 6, 1932 3 Sheets-Sheet 1

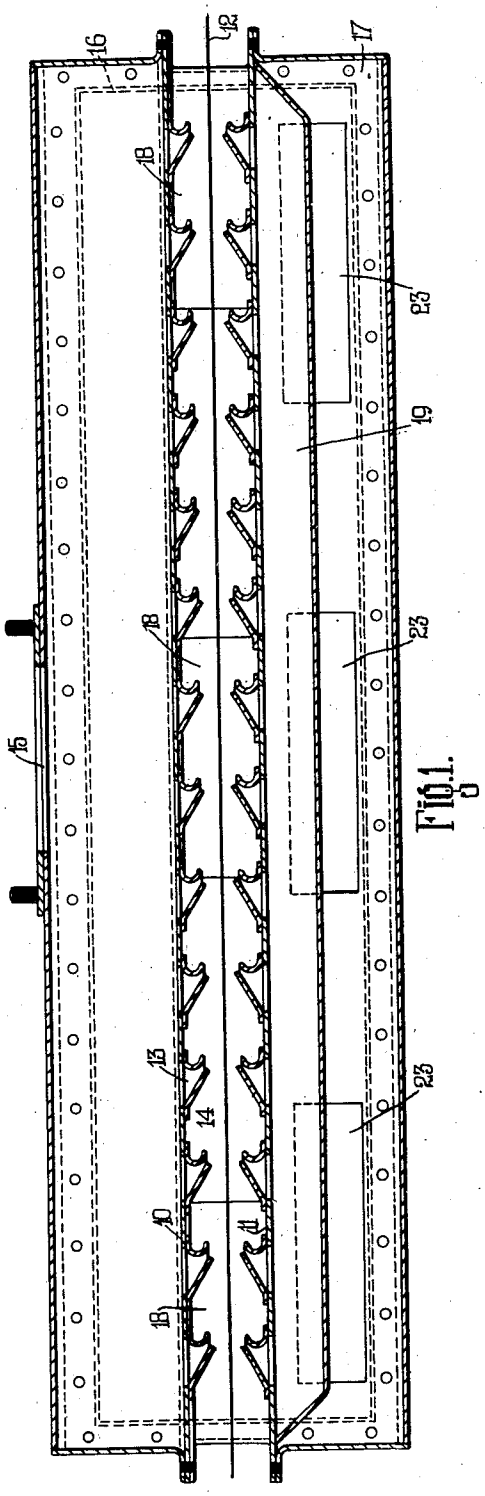


Fig. 1.

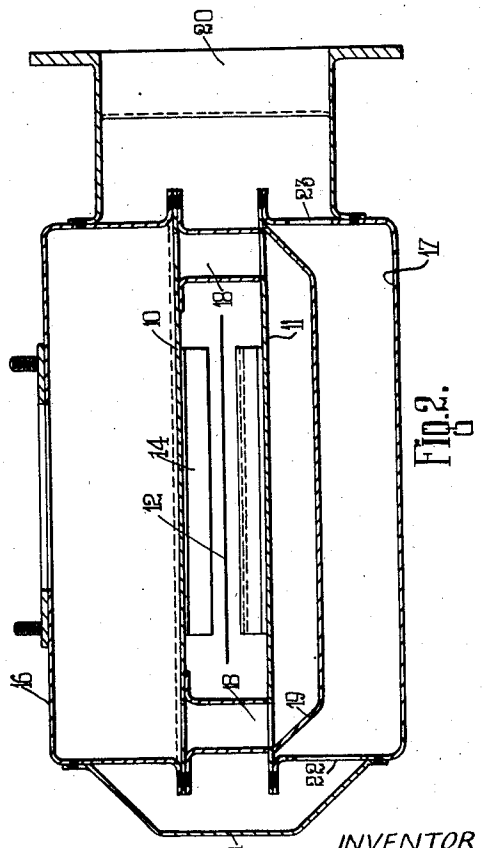


Fig. 2.

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TREATMENT OF WEBS OF MATERIAL

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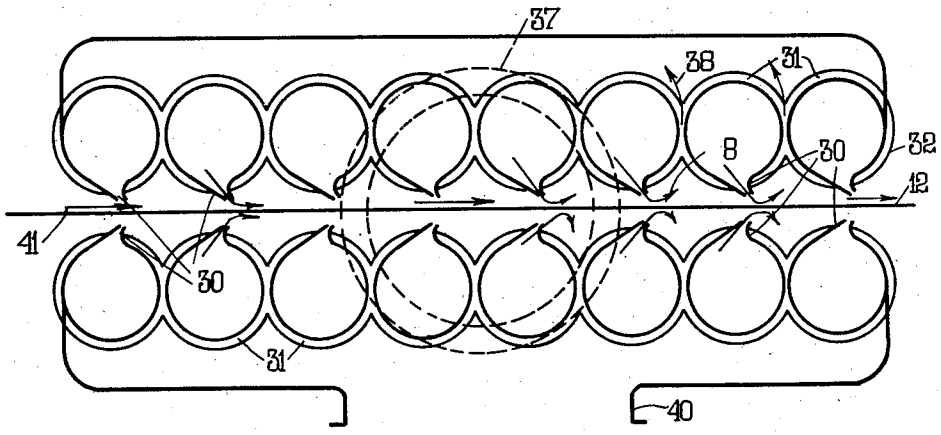


Fig. 3.

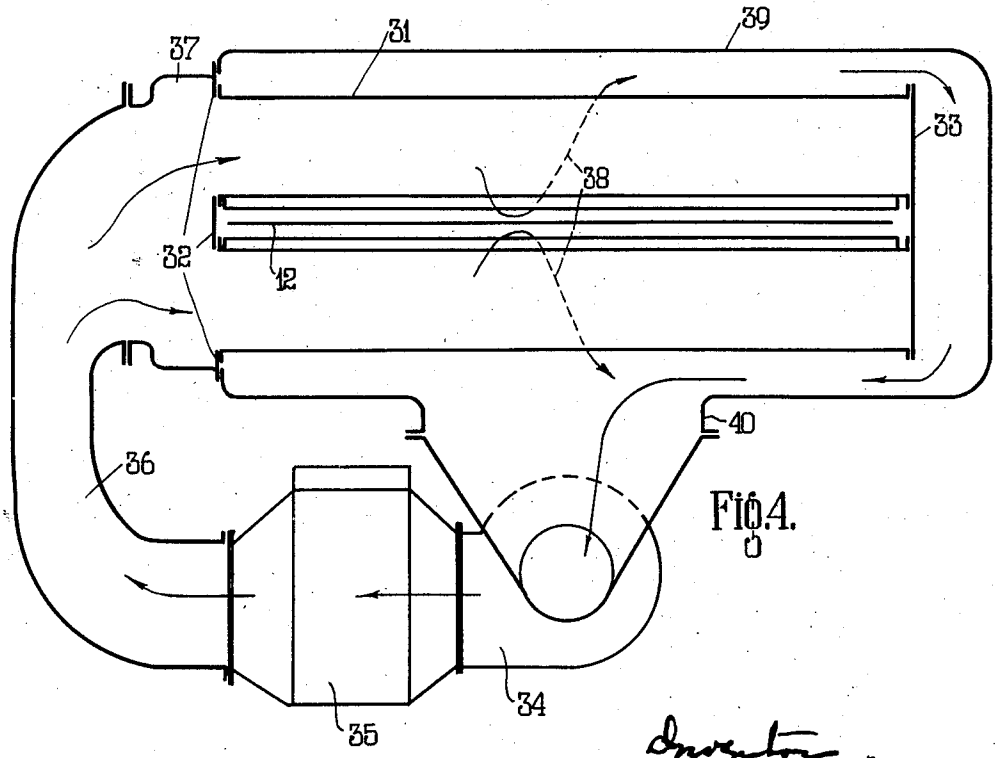


Fig. 4.

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TREATMENT OF WEBS OF MATERIAL

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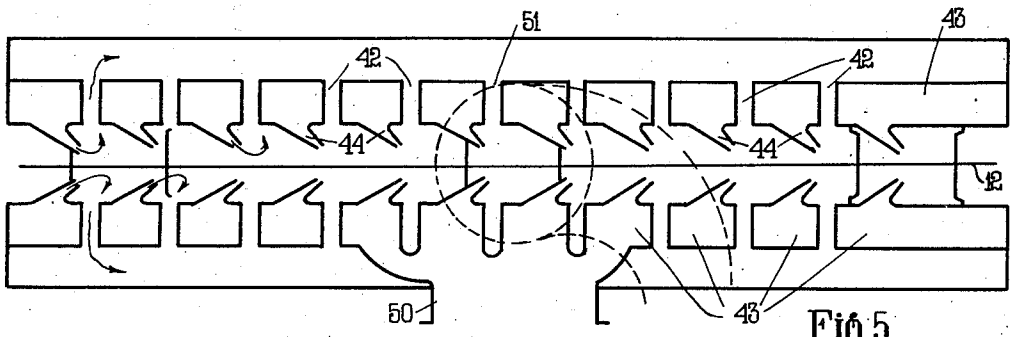


Fig. 5.

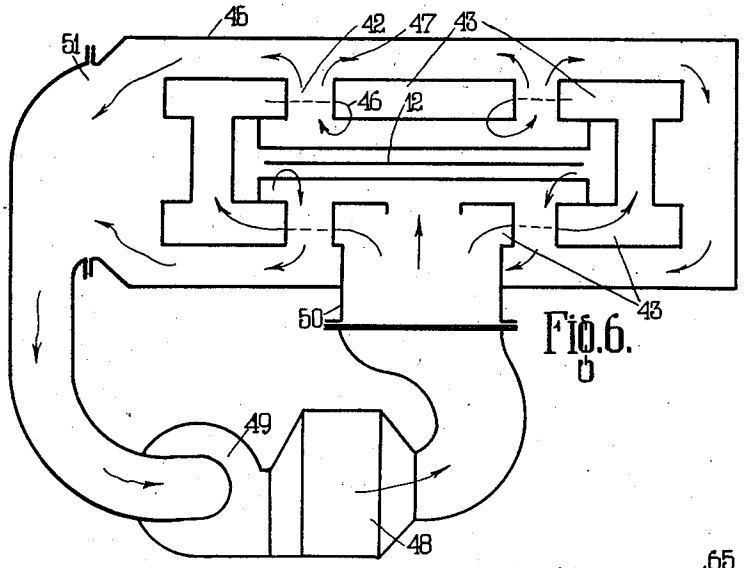


Fig. 6.

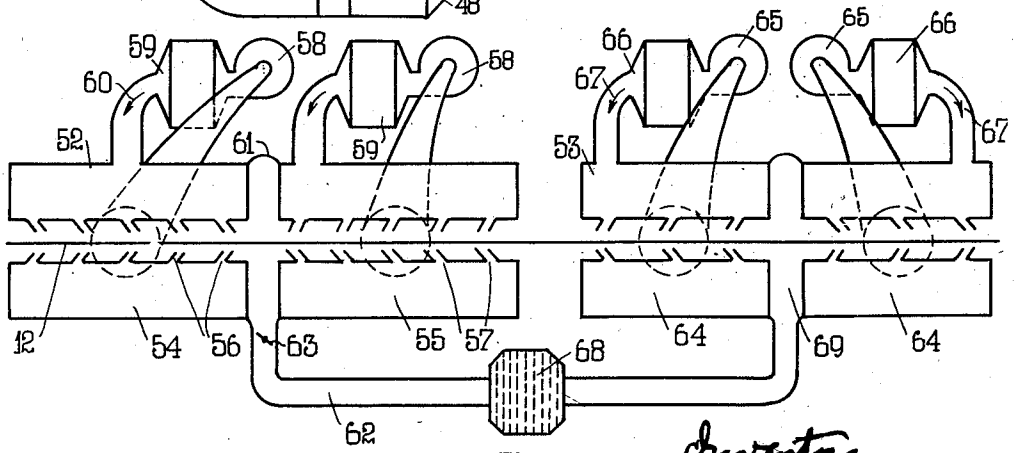


Fig. 7.

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Patented Nov. 10, 1936 2,060,430

UNITED STATES PATENT OFFICE

2,060,430

TREATMENT OF WEBS OF MATERIAL

William Wycliffe Spooner, Ilkley, England

Application January 6, 1932, Serial No. 585,110
In Great Britain January 5, 1931

7 Claims. (Cl. 34—48)

The present invention relates to the treatment of webs of material, for instance textile material such as cloth or warp, with a gaseous fluid such as air.

The invention is particularly applicable to the drying and conditioning of textile materials.

According to the present invention a web of material is traversed along a given path and is subjected to the action of streams or jets of a gaseous fluid which impinge on the web at a relatively high velocity.

The velocity of the fluid may be advantageously in the region of 10 to 20 feet per second. Preferably, the jets are projected on to both sides of a web of material.

In certain processes in the treatment of textile materials the gaseous fluid may be passed in a closed cycle which includes an impeller such as a fan for moving the air at high velocity, a device for treating the air such as a heater, cooler or humidifier and a set of nozzles for directing streams of air to a moving web of material.

If desired, means may be provided for permitting a given proportion of the gaseous fluid which is passing in the cycle to escape.

An apparatus according to the present invention for projecting streams of fluid on to a moving web of material essentially comprises a hollow casing having a longitudinal passage therein to permit the traversing of a web of material therethrough, the opposite walls of the casing bounding said longitudinal passage, having nozzles thereon for the projection of gaseous fluid from the casing on to a web travelling through said longitudinal passage.

The invention is more particularly described with reference to the accompanying drawings, in which:—

Figure 1 is a longitudinal sectional elevation of one form of apparatus.

Figure 2 is a corresponding transverse sectional view.

Figure 3 is a diagrammatic longitudinal sectional view of another form of apparatus according to the invention.

Figure 4 is a diagrammatic transverse sectional view corresponding to Figure 3.

Figures 5 and 6 are diagrammatic longitudinal and transverse sectional views respectively of a still further form of apparatus.

Figure 7 shows diagrammatically the general arrangement of a drying and conditioning apparatus according to the present invention.

As shown in Figures 1 and 2, diaphragms 10 and 11 are oppositely disposed on either side of the path of travel of a web 12 to be dried. Oblong ducts 13 of relatively short length and great width are formed transversely in the diaphragms each duct consisting of an oblong opening in the diaphragm and a nozzle member 14 coincident with the opening.

Hot air or any other suitable drying fluid is passed through an opening 15 in a supply casing 16 mounted on the back of the diaphragm 10. A discharge casing 17 is mounted on the back of the diaphragm 11.

Part of the drying fluid passes through the nozzles 13 of the diaphragm 10 and the remainder of the fluid is passed through ducts 18 to a chamber 19 on the back of the diaphragm 11 and within the casing 17, and thence through the nozzles of the diaphragm 11.

The drying fluid is discharged at the sides of the diaphragms, some of the fluid passing directly into a discharge main 20 and the remainder of the fluid passing through an auxiliary casing 21 secured to the sides of the casing 16 and 17, and through openings 22 and 23 in the discharge casing 17 to the discharge main 20.

In Figures 3 and 4 the travelling band is again indicated by the reference numeral 12. In this form of construction nozzles 30 extending transversely to the path of travel of the material, are formed in tubes 31 secured between a pair of tube plates 32, 33. The tubes 30 are arranged in two rows which are spaced apart to form a chamber through which the web 12 is traversed, the nozzles 30 being directed into the chamber and inclined relatively to the web.

Air is fed from a fan 34 through a heater 35 and inlet duct 36 to an inlet casing 37 which is connected to the tube plate 32 which has openings therein coincident with the tubes 31. The air, after passing into the tubes 31 and through the nozzles 30 escapes between the tubes as shown by the arrows 38, into an exhaust casing 39 which encloses the tubes 31. The air is withdrawn from an exhaust duct 40 in the casing 39 by the fan 34.

The apparatus according to Figures 3 and 4 is suitable for use as a drier. The heated air is passed in a substantially closed cycle, a proportion of the air however, being permitted to escape at the right hand end of the apparatus as viewed in Figure 3, a corresponding amount of make up air being automatically admitted at the left hand end of the apparatus.

The direction of movement of the cloth is shown by the arrow 41.

The tubes shown in Figures 3 and 4 need not of

course be of circular form, but may be of any other suitable shape in cross sectional view.

The construction shown in Figures 5 and 6 is similar to that of Figures 1 and 2 with the exception that ducts **42** extend through the hollow casings **43** between the nozzles **44** at points displaced from the edges of the nozzles.

The provision of the ducts **42** enables air projected for instance from the centre portion of a nozzle to escape to the exhaust casing **45** when traversing over the full width of the web. The path of travel of air projected from the centre part of a nozzle is shown for instance by the arrows **46, 47**.

In this apparatus which may be used for instance as a drier, a heater being shown at **48** and a fan at **49**, the inlet duct is indicated at **50** and the exhaust duct at **51**.

Figure 7 shows diagrammatically the general arrangement of a drying and conditioning plant. A web of material **12** is passed through a drier **52** and a conditioner or humidifier **53**.

The drier consists of a pair of drier elements **54, 55**, the respective nozzles **56, 57** of which are inclined in opposite directions and towards one another. Air is circulated through each of the drier elements separately by a fan **58** and through a heater **59**, the air moving in the direction of the arrow **60**.

A casing **61** extends between the adjacent ends of the drier elements and is connected by a duct **62** controlled by a valve **63** with the conditioner **53**. A cooler is inserted between the drier and the conditioner.

The conditioner similarly consists of two conditioner elements **64**, the respective nozzles of which are again oppositely inclined but in this case they are inclined away from one another. Air is passed in closed circuit through each conditioner by a fan **65** and through a cooler **66** the air circulating in the direction indicated by the arrow **67**.

In operation, air is circulated through both driers and part of the air tends to escape into the common housing **61**. The amount of air which is permitted to escape from the respective closed cycles, each of which includes a fan, heater and drier element, is governed by the position of the valve **63**.

A corresponding amount of fresh air is admitted through the extreme ends of the drier element according to the amount of air escaping through the valve **63**. The air escaping through the valve **63** into the duct **62** will be warmed and humidified and on being passed through the cooler **68**, the humidity will be increased so that the air will be relatively wet on arriving at the conditioner **53**.

The air is admitted to the conditioner through a common housing **69** and is circulated in a substantially closed circuit by the fans and through the coolers. A portion of this damp air will, however, continuously escape through the extreme ends of the conditioner.

The invention also includes an improved method of drying which consists in heating air, projecting the heated air on to a travelling web of material at one point thereof, re-heating the air and again projecting it on to the travelling web at a point in advance of said first point and where the web is wetter.

It will be appreciated that by this process the capacity of the air for taking up moisture is increased in steps by re-heating, the air of course, becoming increasingly moist. Further it will be seen that the driest part of the web will be treated by the driest air.

An apparatus for carrying out this process may consist, for instance, of two or more drier units similar to that shown in Figure 7 arranged in series, the air from one drier unit being taken through the valve **63** and through the duct **62** to a second drier unit in series therewith.

If desired, the heater or conditioner may be incorporated within the casings of the drier elements or in the inlet passages of the same or alternatively the necessary heat for warming air or other gaseous fluid may be derived from any suitable waste heat source such as a flue.

It will be seen that in general, if it is desired to definitely retain a quantity of air or other gaseous fluid in a closed circuit or to positively control the rate of escape of fluid from an apparatus according to the present invention, it is necessary to employ the arrangement shown in the drier in Figure 7 wherein the nozzles of a pair of drier elements connected by a common housing are inclined towards one another.

If it is desired that a proportion of the fluid flowing in a closed cycle should continuously escape then the nozzles should be inclined away from one another as shown in the conditioner apparatus in Figure 7, or again a single drier or conditioner element with inclined nozzles may be used.

I declare that what I claim is:—

1. Apparatus for treating a web of material with a gaseous fluid comprising a pair of hollow casings each having a passage formed therein to enable the web to be traversed therethrough, the said passages being in alignment, nozzles formed on said casings inclined to the path of travel of the web, the nozzles of one casing being inclined oppositely to the nozzles of the other casing and a common housing extending between the adjacent ends of said casings.

2. Apparatus for treating a web of material with a gaseous fluid comprising a pair of hollow casings each having a passage formed therein to enable the web to be traversed therethrough, the said passages being in alignment, nozzles formed on said casings inclined to the path of travel of the web, the nozzles of each casing being directed towards the other casing, an impeller for each casing adapted to drive the gaseous fluid, inlet ducts and exhaust ducts connecting said impellers with said casings, a common housing extending between the adjacent ends of said casings and a leak-off duct extending from said housing.

3. Apparatus for the treatment of a web of material with a gaseous fluid comprising a pair of tube-supporting plates, one of which has openings formed therein, two rows of tubes or ducts extending between said plates and coinciding with said openings, said rows of tubes being spaced apart to form a chamber for the passage of said web and each tube having an opening or nozzle formed therein directed into the chamber so formed, an inlet duct connected to the tube plate having said openings formed therein and an exhaust casing enclosing the tubes.

4. A process for treating a web of material with a gaseous fluid which consists in traversing the material along a given path, and projecting said fluid on to the material in the form of a number of high velocity jets, said jets on at least one side of the web being arranged in groups, the jets of one group being oppositely inclined to the jets of an adjacent group.

5. A process for treating a web of material with a gaseous fluid which consists in traversing the material along a given path, projecting said fluid in a series of high velocity jets, said jets on one side of the web being arranged in four groups, two of said groups being inclined towards each other and two inclined away from each other, and leading a portion of said fluid from between said first two groups to between said second two groups.

6. A process of treating a web of material with a gaseous fluid which consists in traversing the web along a given path, projecting the fluid in the form of a number of individual transversely extending high velocity jets simultaneously on to both sides of the web over a given region in its path of travel, withdrawing at least some of the fluid at points spaced from the ends of said region and at points spaced from the edges of said web, to prevent the whole of the fluid from traversing said region and then re-projecting at least a portion of said fluid on to the web in a closed cycle.

7. An apparatus for treating webs of material comprising means for causing the material to traverse a given path; transversely extending nozzles on either side of said path said nozzles being arranged in two pairs of groups, means for circulating the fluid to and from each of said groups in a closed cycle, means for leading fluid from between cne pair of groups to between the other pair and means for cooling said fluid en route.

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