

June 8, 1971

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3,583,048

JET DEVICE

Filed Sept. 18, 1969

FIG. 1

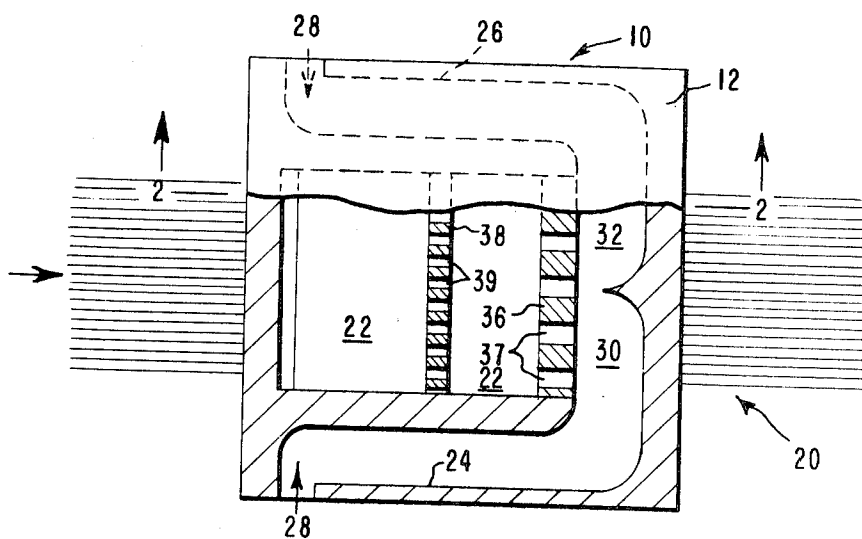
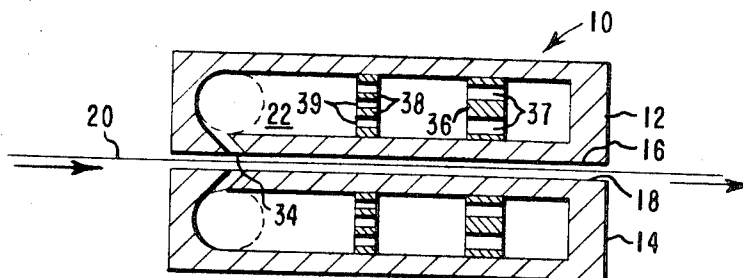


FIG. 2



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JET DEVICE

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Filed Sept. 18, 1969, Ser. No. 858,921

Int. Cl. D02g 1/16

U.S. Cl. 28—1.4

2 Claims

ABSTRACT OF THE DISCLOSURE

A jet device for the fluid treatment of filamentary material with a hot gas which travels back and forth through the jet before exiting through a slot orifice at one end of the jet. Two parallel internal channels located beyond the edges of the material advancing past the jet combine with a central passage in the jet which leads to the jet orifice for directing hot gas on the material. Two distributor plates are positioned in the central passage for evenly distributing the velocity of the hot gas moving through the passage to the orifice.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates to an apparatus for the fluid treatment of filamentary material. More particularly, it relates to a jet device for providing uniform treatment across a ribbon-like band of filaments.

(2) Description of the prior art

In Burns et al. U.S. Pat. No. 3,324,526, plural fluid passages are employed in a jet apparatus to deliver fluid unidirectionally to multiple orifices for treatment of filamentary material. In Claussen et al. U.S. Pat. No. 3,055,080, a single perforated plate is employed to distribute the fluid flowing from a pipe into a plenum on each side of a filament array.

SUMMARY OF THE INVENTION

It has been found that the uniformity of the temperature and pressure of a heated gaseous stream issuing from a jet and impinging on a ribbon-like array of filaments or tow band may be improved by a combination of several features. Heated gas is introduced into two heat balance passages in the jet beyond the edges of the tow band and then flows parallel to the tow band to one end of the jet device. The gas then turns inward and flows toward the center of the tow band where the two streams meet and turn again to flow through a central cavity in the jet parallel to the tow band but in the opposite direction to the flow in the heat balance passages. The fluid flow velocity is distributed uniformly across the central cavity by two distributor plates, each having evenly spaced holes of which the length is at least twice the diameter. The second plate has smaller diameter holes than the first but has a larger total open area. The gas leaving the second plate enters a uniform height slot whose width is greater than the width of the tow to be treated, the length of the slot being that dimension parallel to the gas flow, the width being the large transverse dimension perpendicular to the flow and the height being the small dimension perpendicular to the flow. For further improving the uniformity of the treatment, a second similar device may be positioned on the opposite side of the tow band.

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BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of an apparatus of this invention partially cut away to show the interior arrangement.

FIG. 2 is a cross-section of the apparatus of FIG. 1 at the line W—W.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, jet device 10 comprises two plates 12, 14 having spaced opposed surfaces 16, 18. The plates are spaced to allow the passage of tow band 20 for treatment. Since plates 12 and 14 are substantially duplicates of each other only plate 12 will be described in detail. As best shown in FIG. 1, plate 12 has a central cavity 22 aligned with the path of the tow 20 and a pair of passages 24, 26 coextensive with the cavity and leading from a source of fluid supply to turning sections 30, 32 in the plate which direct fluid from passages 24, 26 back through cavity 22 toward slot 34 in surface 16. There are two distributor plates 36, 38 positioned in cavity 22. The first diffuser plate 36 having holes 37 straightens the gas flow, and the pressure drop through the holes tends to equalize the flow to each hole. Second diffuser plate 38 having holes 39 is spaced at least 3 times the thickness of plate 36 away from plate 36, to diffuse the individual jets of gas issuing from the first plate before the gas arrives at exit slot 34 which impinges it on tow band 20.

In the preferred embodiment, the hot gas is introduced into the side passages 24, 26 at the same end as the exit orifice slot 34 so that heat will flow toward the center to compensate for heat losses through the metal near the slot. This feature provides improved temperature uniformity from one end of the jet to the other along the surface which is in close proximity to the tow. The use of radii at turns reduces turbulence. The first diffuser plate 36 has relatively large holes spaced relatively widely apart. In one embodiment, the diffuser plate 36 is 10.2 by 1.25 inches and has 83 holes each $\frac{3}{16}$ inch diameter evenly spaced. The plate is $\frac{3}{8}$ inch thick, making the length of each hole 37 twice the diameter. The second plate 38 has the same overall dimensions but has 263 holes each $\frac{1}{4}$ inch diameter, giving a larger total open area than the first plate. The second plate is $\frac{1}{4}$ inch thick, again making the length of each hole 39 twice the diameter. The holes in each plate are small enough to diffuse the flow satisfactorily and yet are large enough so that they are not clogged by occasional foreign matter entering the jet device from the gas supply piping.

The apparatus of this invention may be used to open tow, to heat it for stabilizing it against shrinkage, to heat undrawn tow to make it draw at a lower tension or to stabilize the draw point. Improved temperature uniformity is necessary to provide uniform shrinkage, dyeability, and denier in each filament of the materials being processed.

In some cases, a single jet apparatus 12 will be sufficient for treating a tow band. In other cases, a second similar apparatus 14 may be provided on the opposite side of the tow band. In still other cases, an insulated plate may be provided on the opposite side of the tow from jet apparatus 12 instead of jet apparatus 14.

What is claimed is:

1. A jet device for fluid treating filamentary material comprising: a plate having a flat surface past which said

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material is advanced in a path for treatment, said plate having a central cavity aligned with said path and a pair of passages positioned on opposite sides of and co-extensive with said cavity, said passages being axially aligned with and located in close proximity to the edges of said path, said passages being connected to a source of fluid supply at their one end and to a means for directing said fluid into one end of said central passage at their other ends, said plate having an elongated orifice transverse of said path in said bottom surface, said orifice being in communication with said cavity; and a plurality of distributor plates positioned in said cavity, the free area of said plates being successively increased from said one end of the chamber toward said orifice.

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2. The apparatus as defined in claim 1 each of said distributor plates having a plurality of holes therethrough each of said holes having a length which is at least twice its diameter.

References Cited

UNITED STATES PATENTS

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3,458,905	8/1969	Dobson et al.	28—1.4X

LOUIS K. RIMRODT, Primary Examiner

U.S. Cl. X.R.

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