Dec. 15, 1964 T. D. WILLIAMSON 3,160,941

CRIMPING APPARATUS

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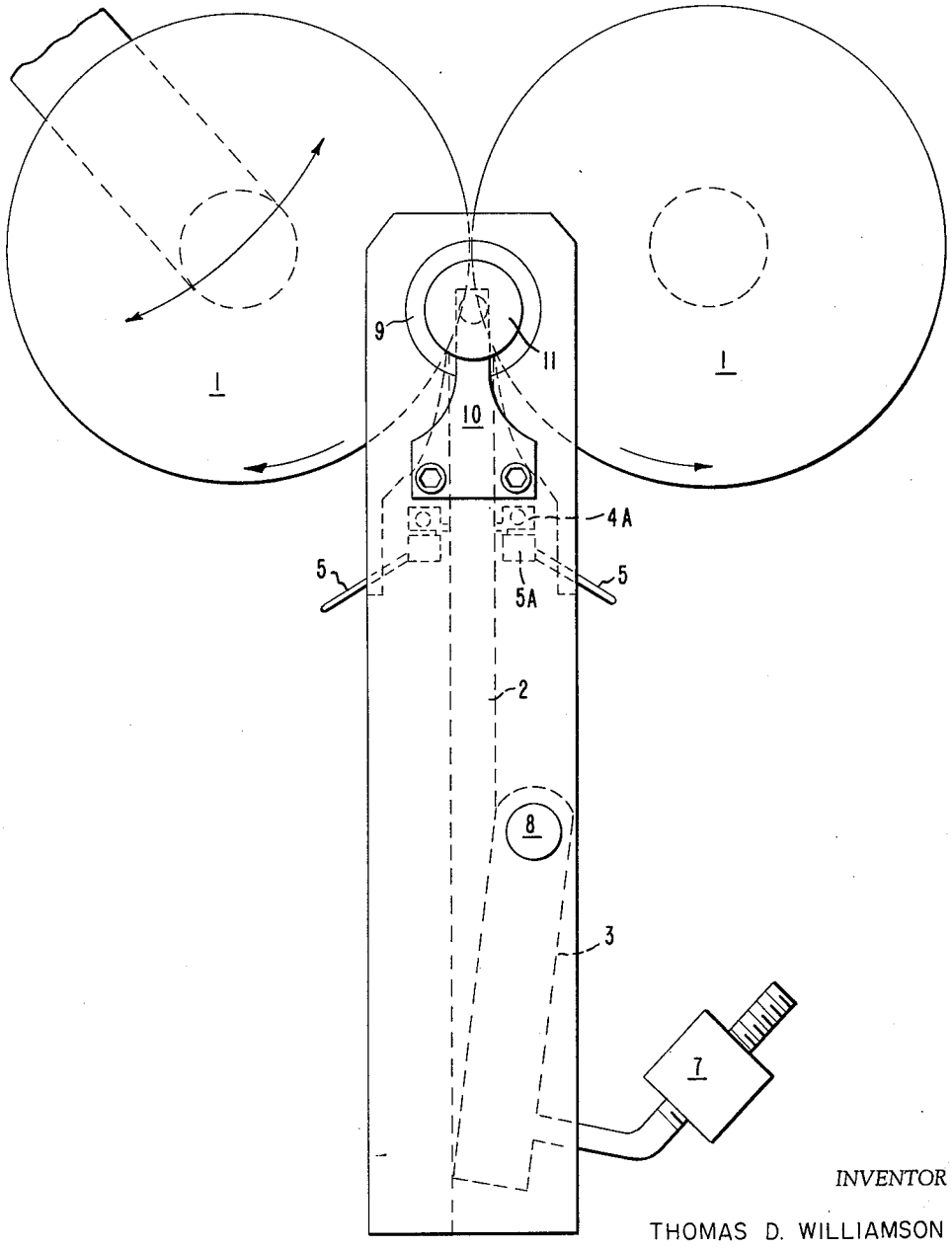
FIG. 1



INVENTOR

THOMAS D. WILLIAMSON

BY David Katz.

ATTORNEY

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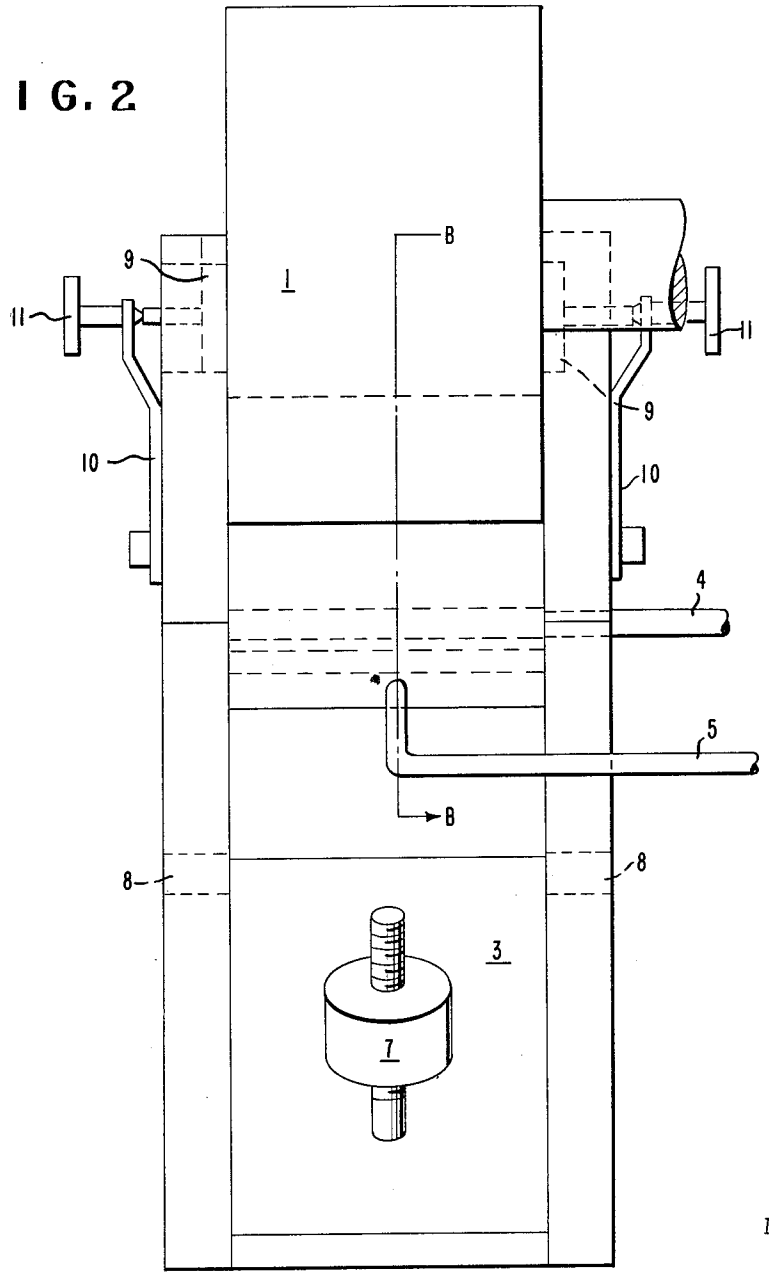
FIG. 2



INVENTOR

THOMAS D. WILLIAMSON

BY David Katz.

ATTORNEY

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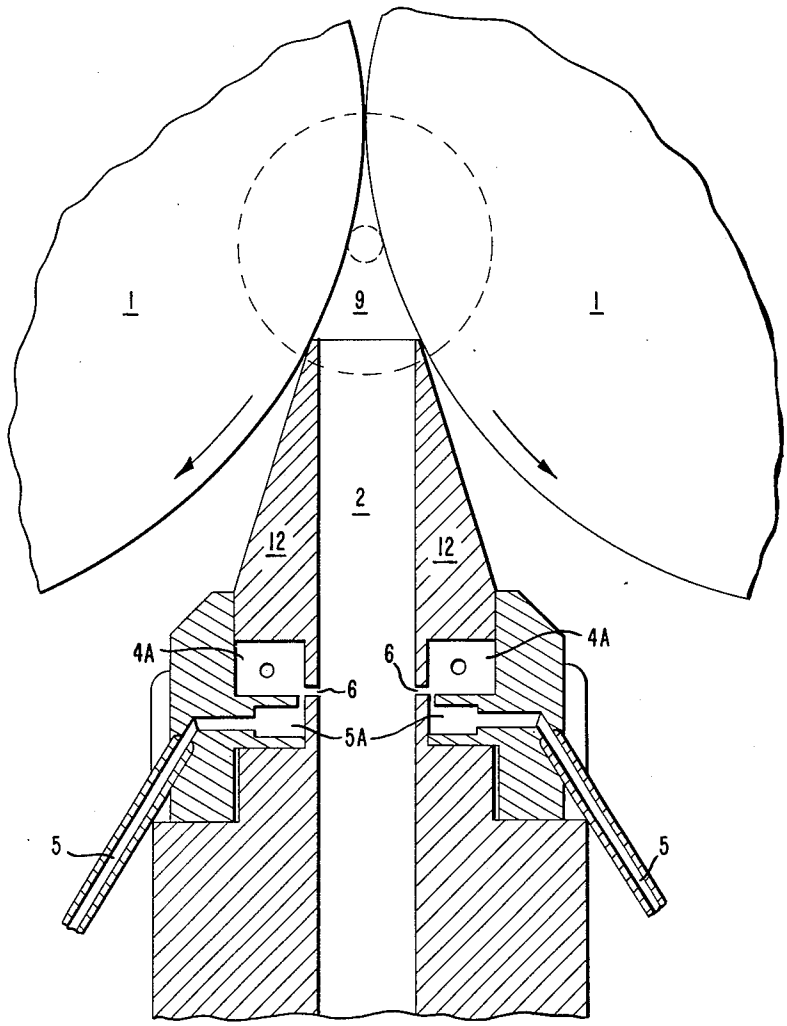
FIG. 3



INVENTOR

THOMAS D. WILLIAMSON

BY David Katz

ATTORNEY

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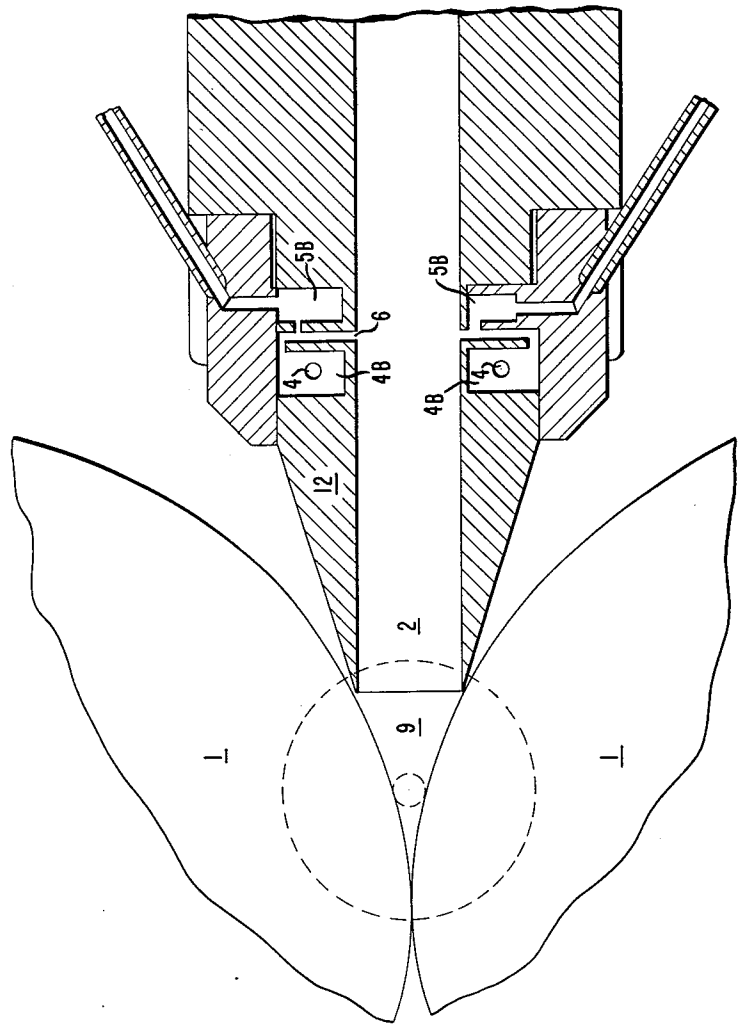
FIG. 4



INVENTOR
THOMAS D. WILLIAMSON

BY David Katz.

ATTORNEY

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3,160,941

CRIMPING APPARATUS

Thomas D. Williamson, Lugoff, S.C., assignor to E. I. du Pont de Nemours and Company, Wilmington, Del., a corporation of Delaware

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This invention relates to apparatus and process for application of finish to synthetic fiber tows which are being crimped.

It is well known in the art to crimp synthetic fibers which are to be processed either as broken tow or cut staple on textile processing equipment to yield yarns having cotton-like or wool-like structures. The proper crimp and a suitable textile finish, usually comprising both a lubricant and an antistat, are mandatory to uniform textile processing and satisfactory properties in the final yarn. It is frequently necessary also to add other materials (e.g., durable antistatic agents, slickeners, etc.) so as to develop properties required in the trade. In most instances, good uniformity of application is essential to satisfactory processing and to development of the desired properties. In the discussion which follows, the term "textile finish" is used to describe all classes of fiber conditioning agents whether employed to facilitate textile processing or to develop other functional or aesthetic properties desired. The textile finish is usually applied in the form of a dilute aqueous solution or dispersion, both states being embraced below by the expression "aqueous suspension."

The "stuffing-box" type crinkler or crimper, one form of which is described in U.S. Patent 2,747,233, is generally satisfactory for processing the heavy-denier tows which can either be cut to the desired staple length and then processed on one of the available staple textile systems (e.g., the cotton system) or utilized directly without prior cutting in one of the systems involving a tow breaker, such as the Turbo Stapler or the Pacific Converter.

Hitherto, however, the entire finish eventually desired in the fiber has been applied to the tow at a point before it enters the crimper. Indeed, because the fiber is normally heavily laden with moisture, it is necessary to apply a considerable excess of the finish at said point, to compensate for partial loss of the same with the water which is normally squeezed out of the fibers by the feed rolls just prior to entry into the crimping chamber.

The mentioned procedure is considered as not entirely satisfactory for two reasons. Firstly, as is obvious, it wastes finishing liquid. Secondly, and much more importantly, the aforegoing procedure does not assure a tow in which the finish is uniformly distributed.

Uniformity of finish is, however, a very important factor. The consumer (in this case a textile mill which converts the tow into yarn and fabric) must have the assurance that each yard of fiber is of the same quality as the next one.

Accordingly, it is an object of this invention to provide an improved apparatus for uniform application of finish to a tow while it is under crimping compression in a stuffing box crimper. Other objects will appear hereinafter.

These objects are accomplished in this invention by modifying the crimping apparatus with a view to a novel procedure for applying the finish, said proceduce involving:

(*a*) Treating the tow prior to entry into the crimper with the minimum of finish that will enable proper movement of the tow through the rollers and pulling devices.

(*b*) Supplying the remainder of the quantity of finish

desired in the final product directly into the crimping chamber, at a point close to the point of entry of the tow.

(*c*) Supplying the aforementioned portion (*b*) in such a manner (i.e. in such a geometrical pattern) that uniform distribution throughout the cross section of the fiber mass in the crimper is practically instantaneous and certain.

Conditions (*b*) and (*c*) are satisfied in this invention by resort to a unique stuffing box design which incorporates horizontally disposed, elongated, rectangular orifices in the two opposing major faces of the usually rectangular stuffing box, said orifices being substantially as long as the width of said faces. Each of these orifices communicates with two adjacent, horizontally elongated reservoirs within the respective wall of the crimper, of which one is supplied with the desired finish and is positioned on one side of the horizontal orifice, while the other one supplies a second fluid under pressure and is positioned on the other side of the orifice, so that the aqueous suspension of the finish, which is metered into its reservoir at a constant rate, is delivered into the fiber mass in a uniform manner along the entire width of the crimping chamber and is propelled into the compact bundle of fibers by the second fluid. Conveniently, the second fluid is steam or hot air as normally employed to heat-condition the fibers for crimping.

The invention will readily be understood from the following description and by reference to the drawings, in which FIGURE 1 is a front elevation of a preferred embodiment; FIGURE 2 is a side elevation of the same, and FIGURE 3 is an enlarged detail representing cross section B—B of FIGURE 2. FIGURE 4 is a cross section of a modified form of appaartus, showing an adaptation of this invention to a horizontal type stuffing box.

Taking up now FIGS. 1, 2 and 3 in detail, the horizontally elongated reservoirs are shown at 5A and 4A in each wall, each of said reservoirs communicating with orifice 6, and each of them, including said orifice, extending horizontally for the full width of the wall in which they are lodged (see dotted lines in FIG. 2). In operation, tow is forcibly packed into crimper chamber 2 by crimper rolls 1 which are driven by a mechanism not shown. One of the crimper rolls 1 is flexibly mounted, as indicated in FIG. 1 of said U.S. Patent 2,747,233, to permit controlled loading of the tow at the nip of rolls 1. As the compact tow passes orifices 6 (FIG. 3), an aqueous suspension of textile finish, metered through lines 5 by constant delivery pumps (not shown), is projected into the bundle of fiber by a gaseous fluid under pressure admitted through lines 4. The bottom of crimping chamber 2 is closed by clapper 3 which pivots about shaft 8 and is under a controlled degree of loading schematically represented by cantilevered weight 7. When sufficient pressure has developed in crimper chamber 2 to overcome the closing force on clapper 3, it is forced open by the emerging tow. Control of the tow at the entrance to crimping chamber 2 is maintained by inserts 9 which are urged into contact with crimper chamber walls 12 and rolls 1 by a mechanism schematically represented by screws 11 and springs 10.

In FIG. 4, the crimping apparatus is disposed horizontally and the reservoirs, shown at 5B and 4B, respectively, run transversely of the "horizontal walls" (roof and floor) of the rectangular chamber and extend for the full width of said walls. Otherwise, the construction and operation are essentially the same as described with reference to the vertical modification shown in FIGS. 1, 2 and 3.

Experience with the apparatus and process of this invention has confirmed that no measurable amount of the injected finish is lost with the aqueous exudate expressed

from the tow as it approaches the nip of rolls 1. By means not shown, this exudate is directed away from contact with the emerging crimped tow.

Analysis of the crimped and finished tow has confirmed that substantially every filament has about the same amount of finished when averaged over a reasonably short length and that uniformity inch-by-inch along the filament improves to a completely satisfactory level by migration of the finish along the damp filaments as the tow is processed further. Thus substantial savings in finish application costs are realized while producing a product of highly uniform distribution of the finish desired therein.

I claim:

1. In a crimping device for synthetic fibers which comprises walls of substantial thickness defining an oblong, essentially rectangular crimping chamber through which the fiber to be crimped moves under compression, means for treating said fiber with a textile finish while it is contained in said chamber, said means comprising a horizontally disposed, elongated, straight edged orifice in the inner face of each of two oppositely facing walls of said chamber, the two orifices facing each other at the same distance from and relatively close to the point at which the fiber enters said crimping chamber, and two adjacent, horizontally elongated reservoir chambers communicating with said orifice within each of said two walls, each of said chambers and said orifice extending for the full

width of the wall in which they are lodged, one of said chambers being positioned on one side of said orifice and being provided with means for feeding textile finish thereinto, and the other of said chambers being positioned on the other side of the orifice and being adapted to receive and pass into the crimping chamber through said orifice a gaseous fluid under pressure, whereby to drag along with said gaseous fluid, at a uniform rate, some of the finish contained in the first mentioned chamber, all to the effect that said finish enters the rectangular fiber mass within said chamber simultaneously from two opposite walls and penetrates quickly and uniformly throughout the mass of fibers contiguous to said pair of said oppositely facing orifices.

2. A crimping device as in claim 1, the walls of said rectangular chamber being disposed in vertical planes, defining a vertical passage for said compressed fiber mass, and said orifices and reservoir chambers being located in each of the two wider walls of said rectangular chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

1,283,768	Hillmann	Nov. 5, 1918
2,854,728	Rainard et al.	Oct. 7, 1958
2,865,080	Hentschel	Dec. 23, 1958
3,019,993	Hoover	Feb. 6, 1962