Feb. 9, 1960 K. W. GUNDLACH 2,924,001

CRIMP SETTING DEVICE

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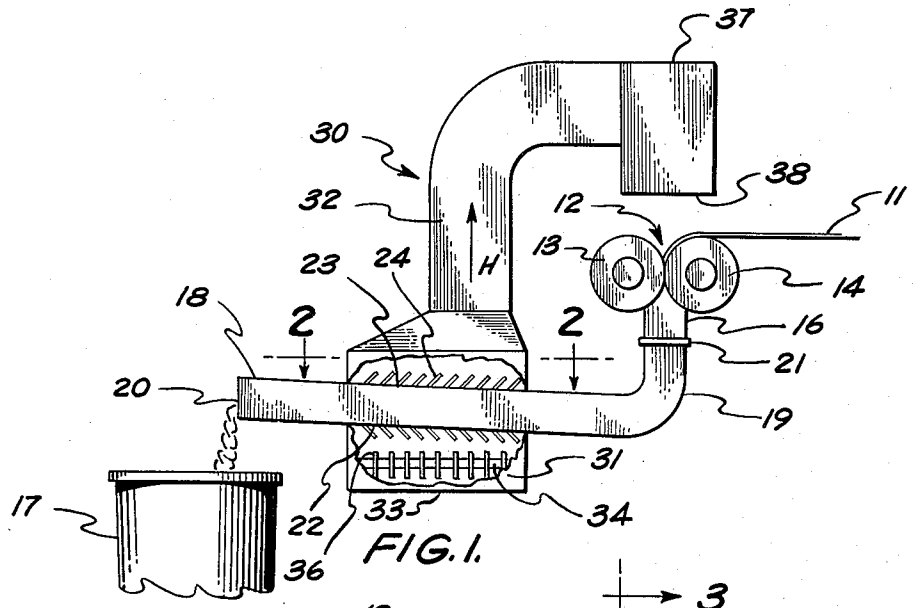


FIG. 1.

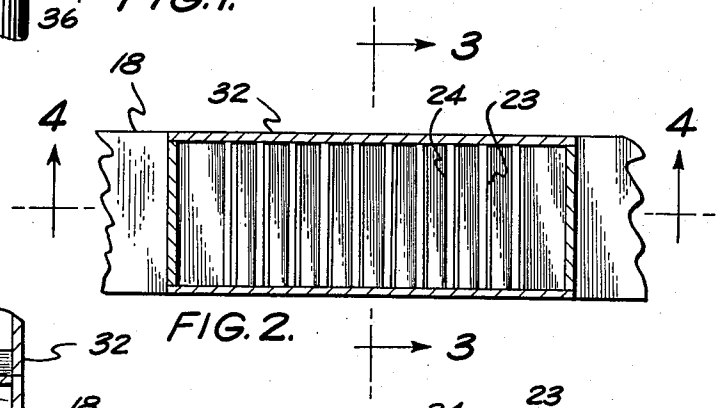


FIG. 2.

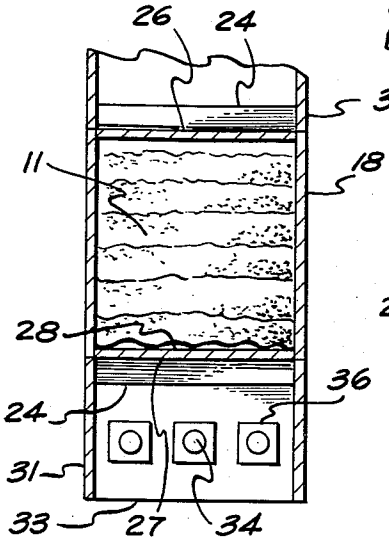


FIG. 3.

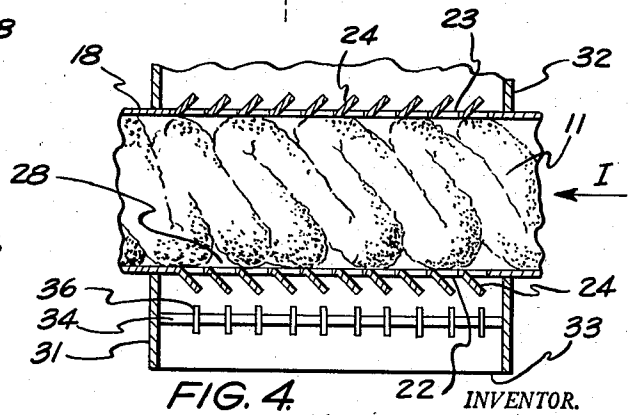


FIG. 4.

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CRIMP SETTING DEVICE

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2 Claims. (Cl. 28—1)

This invention relates to textile treating apparatus and more particularly to a textile treating device for permanently setting or fixing he waves or crimps formed by filamentary crimping apparatus in filamentary material. The filamentary material processed by the crimp setting device of this invention may be a synthetic, fiber forming composition such as a polymer of acrylonitrile and the like, and is preferably in the form of a continuous filamentary "rope" or tow.

One of the common types of textile material produced commercially in present day textile practice is continuous filament yarn which is composed of one or more continuous filaments of a synthetic material such as nylon, acrylics, and the like. As is well known, filaments of such synthetic material are normally straight and smooth surfaced, and in order to adapt the filaments for textile uses it is highly desirable to form "waves" or "crimps" of predetermined shape and spacing successively along the filaments so as to give the synthetic filaments qualities approaching that of natural fibers such as wool and the like. These crimps impart certain highly desirable qualities such as loftiness, stretchability, warmth, and the like, to fabrics formed from synthetic filaments. One class of synthetic filamentary material to which such a crimping operation is applied satisfactorily and to which this invention is well adapted are filaments composed of a synthetic composition such as acrylonitrile polymer and the like.

In one well known manner of crimping such synthetic material, a "rope" or tow of such material is initially heated and preferably moistened by means such as a steam bath or the like to bring the material to a so-called softened or "plastic" state. This conditioned tow is subsequently passed through a crimping apparatus such as a "stuffer box" type of crimper. In the "stuffer box" crimper, a pair of smooth surfaced, cooperating feed rolls are utilized for advancing and stuffing the tow into the box against a yieldingly mounted door or clapper. The tow emerges from such crimping apparatus with a series of crimps spaced successively along the longitudinal axis of the filaments. However, due to the speed at which this crimping operation is performed, the crimped tow is discharged from the crimper while still in a moist and heated condition. As is well understood, in the crimping of tow composed of such synthetic material, the crimps imposed by the crimping apparatus do not normally set permanently within the tow until the tow has cooled and dried. This means, of course, that when this moist, hot, freshly crimped tow is fed continuously into suitable receptacles or containers, the weight of the tow as it travels from the crimper to the receptacle exerts a stretching action on the tow which tends to remove or reduce the crimped configuration in the tow since sufficient time has not elapsed subsequent to crimping to permit the tow to cool and the crimps to set permanently. This undesirable result is further magnified in modern day practice as a result of the high speeds at which the tow travels from

the crimping apparatus outlet to the receptacle or can in which the tow is deposited.

Accordingly, a primary object of this invention is to provide a new and novel device for permanently fixing or setting freshly formed crimps in filamentary material such as synthetic material formed from acrylonitrile polymers and the like.

Another object of this invention is to provide a new and novel device for association with filamentary tow crimping means which efficiently produces a crimped tow end product having crimps of predetermined shape and spacing throughout substantially the entire tow.

A further object of this invention is to provide a new and novel crimp setting device which permits the immediate storing or packaging of freshly crimped filamentary tow without affecting the crimp configuration in the tow.

Still another object of this invention is to provide a new and novel crimp setting device which permanently sets freshly formed crimps in synthetic filamentary tow and which eliminates the crimp removing effect of tow weight as the tow is fed continuously from crimping apparatus to a storage receptacle.

This invention further resides in the provision of a new and novel apparatus and method for continuously cooling and drying a freshly crimped tow discharged from crimping apparatus.

Other objects and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings.

The objects stated above and other related objects in this invention are accomplished by providing means for guiding the movement of a tow of filamentary material in a path. The tow movement guiding means is arranged to be associated with tow crimping means of any suitable well known construction and receives freshly crimped tow, which has been previously heated and preferably moistened, from the crimping apparatus. The tow is thus moved guidably in the guiding means for subsequent discharge therefrom into any suitable receptacle or container for storage or the like. Means are provided for passing a fluid medium through said guidably moving tow continuously. This fluid medium which is preferably heated, carries away the entrained moisture in the tow and rapidly cools the tow so that the crimps formed therein by the crimping apparatus are permanently set.

The novel features which are believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation may be best understood by reference to the following description taken in conjunction with the accompanying drawing in which:

Figure 1 is a side view of apparatus for treating a tow of filamentary material which incorporates the invention;

Figure 2 is a sectional view taken substantially along line 2—2 of Figure 1 in the direction of the arrows;

Figure 3 is a sectional view taken substantially along line 3—3 of Figure 2 in the direction of the arrows; and

Figure 4 is a sectional view taken substantially along line 4—4 of Figure 2 in the direction of the arrows.

As generally illustrative of the invention, there is shown in Figure 1 a crimp setting device constructed in accordance with the invention. The crimp setting device of the invention is arranged to be associated with means for crimping filamentary material which is preferably fed to the crimping means in the form of a tow 11. Although the tow 11 may be composed of any desired filamentary material, in the specific embodiment illustrated, the tow 11 is composed of synthetic material formed from acrylonitrile polymer and the like.

The tow crimping means, designated generally by the nu-

meral 12, is of the well known "stuffer box" type of crimper comprising a pair of smooth surfaced feed rolls 13, 14, which are suitably driven so as to receive the tow 11 and feed it into a stuffer box or chamber 16. The chamber 16 is provided with a yieldingly mounted door or clapper (not shown) which permits the tow to build up compactly within the chamber 16 until sufficient pressure is developed by the crimped mass within the chamber to force open the clapper and discharge the tow in a crimped form. In the most commonly used construction, the clapper is pivotally mounted and is biased into chamber closing position by means such as a spring or by pneumatic means.

As is well known, the tow 11, prior to its movement into the crimper 12 is heated and preferably moistened by any suitable means such as a steam conditioner (not shown) so as to put the tow in a softened or "plastic" state wherein it will react properly to the crimp forming forces developed during the stuffing of the tow into the chamber 16.

In prior constructions, this crimped tow 11 which moved at a high rate of travel through the crimping apparatus 12, was discharged from the chamber 16 in a moist, warm condition and subsequently collected in a suitable container or receptacle 17 positioned beneath the outlet of the crimping apparatus. It can be understood that with such high tow advancing speeds, sufficient time was not allowed for drying and cooling the tow so as to set the crimps formed by the apparatus 12 and the downward movement of the tow into the receptacle 17 exerted a pulling or stretching force on the tow with an attendant destruction or reduction of the crimps in the tow.

Means, therefore, have been provided with this invention to permanently and quickly set the crimps formed in the tow by the crimping apparatus 12, and eliminate the undesirable crimp removal effect described above. More specifically, tow guiding means 18 are provided which, in the specific embodiment, comprise an elongated chute which is substantially rectangular in cross-sectional area as shown best in Figure 3.

In order to movably guide the tow 11 from the crimping apparatus 12 to the receptacle 17, the chute 18 is preferably provided with an arcuate end portion 19 which is connected in any suitable manner at 21 to the outlet of the crimper chamber 16. Thus, the preheated, moist, freshly crimped tow discharged from the crimping apparatus 12 is guidably conducted in a confined path continuously through the chute 18 and into the receptacle 17 under the feeding action of the rolls 13, 14, of the crimping apparatus 12. It should be understood that although a substantially rectangular chute 18 is provided, any suitably shaped chute may be employed for moving the tow in its confined path.

In order to permanently set the crimps in the tow 11, means have been provided for passing a fluid medium, which is preferably heated, continuously through the tow 11 so as to dry the tow and remove the heat applied to the tow prior to crimping. More specifically, port means are provided in the walls of the chute through which preheated air is moved so that the air passes throughout substantially the entire cross-sectional area of the tow as it moves along the chute 18.

In the specific embodiment, the port means comprise openings 22, 23, as shown best in Figure 4, each of which is preferably provided with louvers 24 arranged in substantially parallel relationship transverse to the longitudinal axis of the chute 18 as shown best in Figure 2. The louvers 24 are preferably cut or struck out from the wall of the chute 18 and extend obliquely outward in a direction opposite to that of the tow 11 advancing in the direction indicated by the arrow I in Figure 4. Furthermore, the openings 22, 23 are arranged in vertical alignment in the top and bottom walls 26, 27 of the chute (Figure 3). Thus, the heating medium may move vertically upward through the tow while at the same time it creates a light pressure on the under surface of the tow to form a relatively thin clearance or space 28 as shown in Figures 3, 4, and reduces the tendency for the filaments in the tow to move into the openings 23.

It should be understood that any suitable type of air openings may be provided in the chute 18 such as perforations, slots, or the like. However, louvers 24 are preferably employed so as to eliminate the presentation of sharp surfaces or edges to the tow as would be the case with the use of perforations or the like. Such sharp edges would tend to catch and pull filaments from the tow 11 during its movement through the chute 18 and with the use of louvers 24 of a construction shown best in Figure 4, only smooth curvilinear surfaces or trailing edges in said openings, formed as the louvers are bent in the illustrated manner, are presented to the tow.

In order to convey the air in a defined path through the tow 11, air passage means designated generally by the numeral 30, have been provided as shown best in Figure 1, which comprise lower and upper housings or ducts 31, 32, respectively. The lower portion 31 is provided with a bottom opening 33 (Figure 3) for admitting air to the air passage means 30. In order to supply heat to the admitted air, heating means such as a plurality of conventional space heaters 34 or the like, having fins 36, are secured in any suitable manner to the walls of the duct 31 so as to extend in heat transfer relationship with the stream of air flowing into the air inlet 33.

Means have been provided for circulating the heated air through the air passage means 30 and the tow 11 advancing along the chute 18. Preferably, the air circulating means comprise air moving means such as a rotary impeller or centrifugal fan 37 which is positioned within the duct 32 as shown in Figure 1 for inducing the flow of air through the ducts 31, 32. As is well known, the fan 37 contains an outlet 38 for continuously exhausting air from the air passage means 30.

In the operation of the invention, the tow 11, which has been previously conditioned in the usual manner by heating and moistening, is fed continuously into the crimper 12 and crimped in the well known manner in the crimping chamber 16 by the stuffing action of rolls 13, 14. The continuous rotation of the rolls 13, 14 moves the freshly crimped, still warm and moist tow into and through the chute 18 so that it is subsequently discharged from the chute outlet 20 into the receptacle 17. During this operation, the fan 37 is actuated to induce the flow of air in the direction of the arrow H through the duct inlet 33 and across the heaters 34. This heated, dry air enters the lower chute opening 22 and travels upwardly through the tow, drying and cooling the tow and permanently setting the crimps therein. The air leaving the tow subsequently flows out of the upper chute openings 23 to be carried away through the fan discharge opening 38 in the usual manner.

Thus, the pulling or stretching action exerted on the tow by its own weight as it drops into the receptacle 17 may only temporarily flatten the crimps in the tow as due to the now permanently set, resilient nature of the crimps, they will quickly assume or spring back to their normal shape with no permanent deformation as soon as the stresses are removed.

It should be understood that the chute 18 is preferably located in a slightly inclined or slanted manner as shown in Figure 1 so as to permit the tow to build up within the portion of the chute 18 adjacent its end 20 and, therefore, substantially seal the end of the chute to any leakage of the air traveling through the air passage means 30. As a result of the upwardly moving air flow, a slight clearance 28 is produced between the inner surface of the chute bottom wall, as shown in Figures 3, 4, and as described above, to further limit the likelihood of tow filaments entering the chute openings 22 during tow movement.

With the novel construction of this invention, there has been provided a novel arrangement for insuring that the crimps formed in a tow of filamentary material remain permanently therein, and rapidly advancing tow common to modern day production methods may be handled subsequently to crimping in any desired way without affecting the crimp formation in the tow. With the novel arrangement of the invention, the continuous production of crimped tow is permitted in a simple and positive manner without the need for expensive equipment or substantial modification of existing equipment. Furthermore, the invention lends itself readily to incorporation within a continuously moving production line.

While there has been described what at present is considered to be the preferred embodiment of the invention, it will be understood by those skilled in the art that various changes and modifications may be made therein without departing from the invention and, therefore, it is the aim of the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

Having thus described the invention, what is claimed is:

1. A crimp setting device comprising, in combination, means for crimping a tow of filamentary material, an elongated chute of substantal cross-sectional area arranged to communicate with the outlet of said crimping means and to guidably conduct said tow advancing from said crimping means in a confined path, said chute having an opening in the top and bottom walls thereof, said openings being arranged in vertical alignment with said tow sandwiched therebetween, said openings being provided with substantially parallel louvers formed integrally with said associated chute wall and extending transversely to the direction of tow movement through said chute so as

to present a curvilinear trailing edge to said advancing tow, air passage means communicating with said chute openings, a heater in said air passage means, air circulating means for moving said air through said air passage means and said chute openings in heat exchange relationship with said heater so as to conduct said heated air transversely through said advancing tow and permanently set the crimps formed in said tow by said crimping means.

2. A crimp setting device comprising, in combination, means for crimping a tow of filamentary material, an elongated chute, said chute being arranged to receive freshly crimped tow from said crimping means and to guidably conduct said tow in a confined path, said chute having a top wall and bottom wall with openings therein, said chute openings being arranged in vertical alignment so that said advancing tow is sandwiched therebetween, a plurality of substantially parallel louvers in said openings extending transverse to the direction of tow movement through said chute, said louvers being formed integrally with said chute wall to present a curvilinear trailing edge to said advancing tow, and means for passing a heating medium through said chute openings and transversely through said advancing tow to permanently set the crimps formed in said tow by said crimping means.

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