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2,563,986

YARN HANDLING METHOD AND APPARATUS

Filed July 30, 1946

2 Sheets-Sheet 1

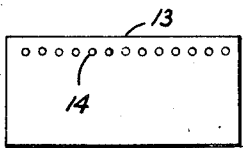
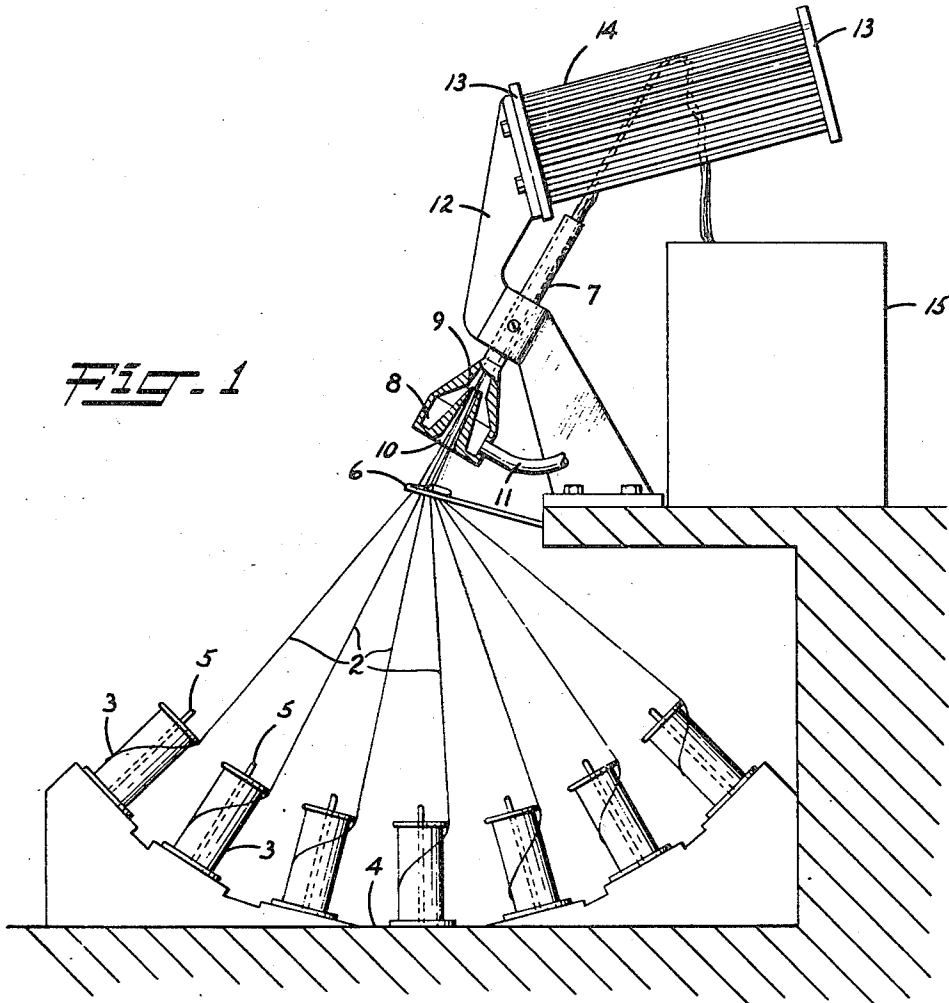


Fig. 1a

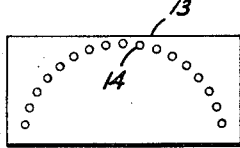


Fig. 1b

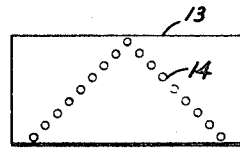


Fig. 1c

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Fig. 2

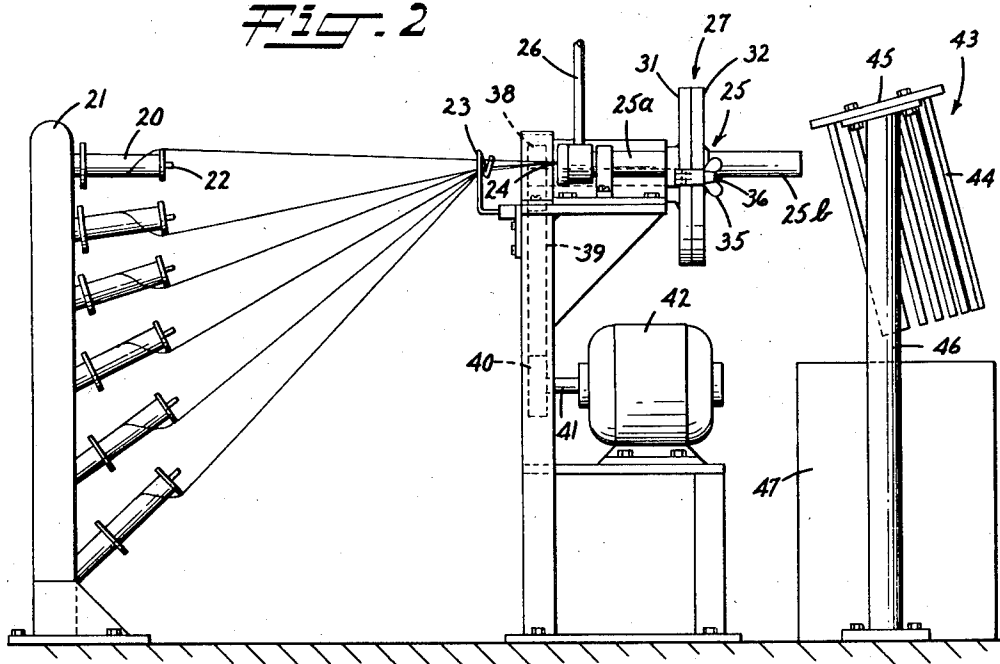


Fig. 3

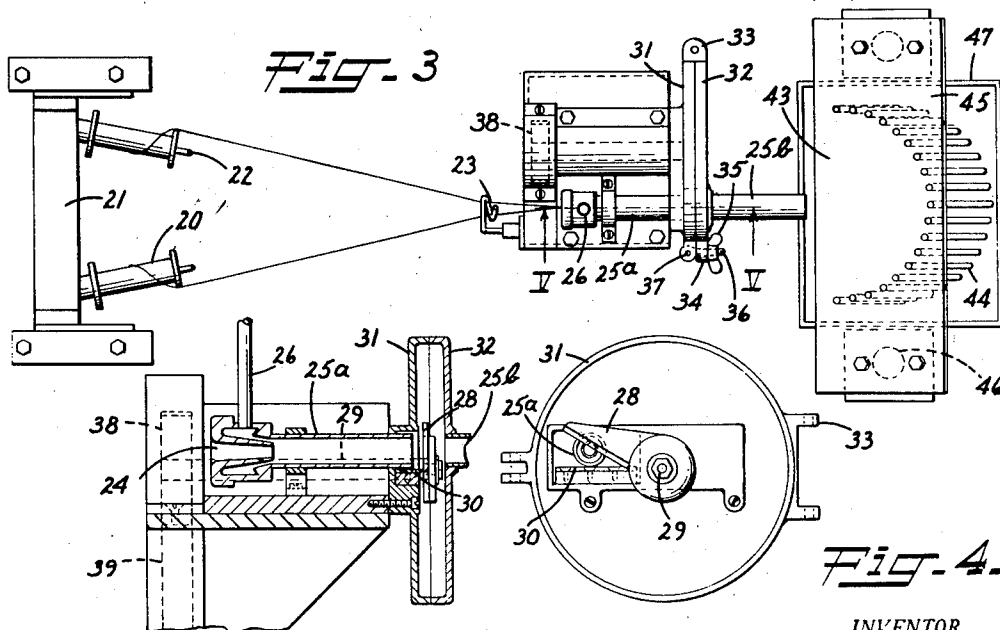


Fig. 4.

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Fig. 5.

UNITED STATES PATENT OFFICE

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YARN HANDLING METHOD AND APPARATUS

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10 Claims. (Cl. 28—71.5)

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This invention relates to improved methods and apparatus for the handling of filamentary material, such as twisted yarns or yarn-like bundles of untwisted continuous filamentary material such as may be obtained during the production of artificial filaments.

One of the objects of the invention is to provide a method and apparatus for delivering a continuous strand comprising one or more ends and involving the utilization of a fluid stream and an improved system for separating the filamentary bundle from such fluid stream adjacent the point of delivery.

Another object of the invention is to provide an improved method and apparatus for the continuous removal of strands from a plurality of packages, the combining of such strands into a common strand, the conveying of the common strand by a fluid medium and subsequently separating the common strand from the stream adjacent its point of delivery thereby.

Another object of the invention is to provide an improved method and apparatus of the character just indicated in which the continuous common strand may be cut at intervals while being conveyed by the fluid stream whereby the discharge from the cutting position and the separation from the fluid stream serve to open the fiber clumps prior to deposition in a collecting receptacle.

Further objects and advantages will be apparent from the drawing and the description thereof hereinafter.

In the drawing, which is illustrative of preferred embodiments of the invention,

Figure 1 is an elevation of one system for carrying out the invention,

Figures 1a, 1b and 1c are transverse sections through various forms of separating devices that may be used in carrying out the invention,

Figure 2 is a similar elevation of another system for carrying out the invention,

Figure 3 is a plan view of the system shown in Figure 2 omitting the bobbin-supporting racks,

Figure 4 is an end view of the cutter with the front plate of the cutter housing removed, and

Figure 5 is a section through line V—V of Figure 3.

As shown in Figure 1, one or more yarn-like strands or bundles 2 are withdrawn over-end from one or more bobbins 3 disposed upon a platform 4 and held in position thereon by the posts 5. Such strand or strands proceed through a common guide 6 through a conduit 7 which is supplied with a blast of fluid, such as compressed

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air, steam or the like through a form of injector comprising an annular channel 8 surrounding the conduit and communicating therewith through an annular port 9. Bore 10 constitutes the entrance of the conduit 7 through which the strands are sucked by virtue of the flow of the compressed air or other fluid toward the discharge end of the conduit 7. The fluid may be supplied through a conduit 11. The conduit 7 is supported in a bracket 12 which also supports a separating device comprising one or more end supporting plates 13 having a plurality of approximately parallel smooth-surfaced rods 14 projecting therefrom or therebetween. The rods 14 have long, narrow slits therebetween and form a grillwork allowing the fluid blast to pass therebetween while retaining the strand 2.

As shown, the rods of the grillwork are free of obstructions to the sliding of the filaments and are inclined from the normal to the direction of the fluid blast discharged from the conduit 7, so that the strand or strands caught by the grillwork are forced longitudinally of the rods toward the ends thereof disposed at a greater distance from the discharge opening of conduit 7. As they are thus displaced out of the direct fluid stream, they finally reach a point where they are not held against the rods by virtue of the fluid stream but instead fall into a receptacle 15 disposed under the portion of the rods away from the discharge of conduit 7.

Figures 1a, 1b, and 1c are transverse cross-sections through various forms of separators which may be used. In Figure 1a, the rods 14 are disposed in a straight row which may project from a single end-supporting plate 13. In Figure 1b, the rods 14 are arranged along an arc of a circle, whereas in Figure 1c the rods are arranged on two sides of a triangle to form a dihedral angle between the rows of rods.

In the form of device shown in Figures 2 to 5, the individual ends proceed from bobbins 20 carried on upright supporting racks 21 provided with pins 22. They pass through the common guide 23 through the mouth or entrance 24 of a conduit 25 comprising an injector jet at its entrance supplied by a fluid under pressure by means of line 26. Between the two sections 25a and 25b of the conduit 25, a housing 27 is provided to receive a cutter comprising a blade or knife 28 (see Figures 4 and 5) carried on a rotating shaft 29 and a stationary blade 30 adapted to co-operate with the knife. As the strand or strands are conveyed by the fluid stream through the portion of the conduit 25 in advance of the cutter housing, the

strands are directed over the top of stationary blade 30 where they are in a position to be cut by the rotating blade 28.

The cutter housing comprises a back plate 31 and a front plate 32 hingedly mounted at 33. The lugs 34 on the front plate or door 32 cooperate with a wing nut 35 secured on a bolt 36 swivelly mounted at 37 on the back plate. The conduit 25b is secured in the front plate 32 in alignment with the first portion 25a thereof.

The cutter shaft 29 is rotated by a pulley 38, a belt 39, a pulley 40, motor shaft 41 and motor 42.

The cut fibers discharged through the portion of conduit 25b beyond the cutter are caught by the grillwork of the separating device 43. This device comprises a complete semicircle of rods 44 secured on a single end supporting plate 45 which in turn is supported upon the uprights 46. In this arrangement, the fibers are carried at high velocity in the fluid stream in an approximately horizontal direction and the rods of the grillwork are inclined to the direction of the fluid stream so that the tendency of the fluid blast is to force the fibers toward the free ends of the rods which are disposed directly above a receptacle 47. As shown, this component of motion imparted by the fluid blast is downward and as soon as the fibers become insufficiently supported by the air blast, they fall by gravity into the receptacle.

The rods in the grillwork are preferably sufficiently long that the ends farthest from the discharge opening of the fluid-conveying conduit are substantially outside the direct air current and preferably outside adjacent eddy currents formed beyond the conduit. By such construction it is assured that the filamentary material, whether continuous or discontinuous, will fall directly from the rods into the receptacle therebelow. The space between the rods may vary widely depending upon the length of the staple fiber produced when cutting is involved. When continuous bundles, as in Figure 1, or when long staple fibers, say from about three inches up are produced, the spacing may vary from about a quarter of an inch even up to one-half an inch. When shorter fibers are produced, it is preferred to have proportionately smaller spaces. In general, a spacing from $\frac{1}{8}$ to $\frac{1}{2}$ of an inch is highly advantageous for all purposes, since such interstitial spacing allows the fluid free passage while retaining the filamentary or fibrous materials as they are forced longitudinally of the rods.

As described hereinabove, the system of the present invention is adaptable to the handling of continuous filament bundles whether twisted or untwisted, and to yarns or strands made up of continuous filaments or staple fibers. One important use is to provide an efficient system for removing waste yarns left upon used bobbins. It will be apparent that the operation is entirely continuous. When one or more of the bobbins serving as sources of supply are exhausted, it is merely necessary for the operator to replace the empty bobbin with another containing a full package of yarn or merely the remaining waste in the case of a used bobbin and take the free end therefrom to a position in proximity to the entrance of the fluid-conveying conduit where the suction immediately draws the yarn or bundle into the system. Alternatively, he may merely place the free end of the yarn from the fresh bobbin on one or more of the strands proceeding to the entrance of the fluid-conveying conduit. Likewise, it is unnecessary to interrupt the opera-

tion while replacing the collecting receptacle, such as receptacles 15 and 47. The procedure is highly advantageous in converting continuous filamentary material and especially that coming from the waste residue upon used bobbins to staple fiber as illustrated in the embodiment of Figures 2 to 5. When used for this purpose, the air blast which conveys the bundle through the portion 25b of the conduit beyond the cutting device, serves to open the clumps of cut fibers.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A method of handling continuous filamentary material comprising conveying the material longitudinally in a fluid stream, cutting the material at intervals into discontinuous lengths, then directing the material-conveying stream in a predetermined path against a grillwork consisting of a plurality of smooth-surfaced elements disposed with long slits therebetween and inclined from the normal to said path whereby said fluid forces the discontinuous lengths of filamentary material to slide freely longitudinally of said elements out of the direct path of the stream, thereby facilitating the passage of the fluid through the slits and the separation of the material from the stream.

2. Apparatus for handling filamentary material comprising a conduit, means for directing a fluid stream through the conduit for conveying filamentary material therethrough, supporting means for a supply of filamentary material, means in advance of said conduit for guiding the material thereto from the supporting means, a grill facing the discharge opening of said conduit and comprising a plurality of smooth-faced rods spaced apart to provide slits therebetween, the rods being inclined from the normal to the direction of fluid discharge from the conduit.

3. Apparatus for handling filamentary material comprising a conduit, means for directing a fluid stream through the conduit for conveying filamentary material therethrough, supporting means for a plurality of supplies of continuous filamentary material, a common guide in advance of said conduit for guiding the material from the supporting means for said plurality of supplies into said conduit, a grill facing the discharge opening of said conduit and comprising a plurality of smooth-faced rods spaced apart to provide slits therebetween, the rods being inclined from the normal to the direction of fluid discharger from the conduit.

4. Apparatus for handling filamentary material comprising a conduit, means for directing a fluid stream through the conduit for conveying filamentary material therethrough, a grill facing the discharge opening of said conduit and comprising a plurality of smooth-faced rods spaced apart to provide slits therebetween, the rods being inclined from the normal to the direction of fluid discharge from the conduit, and means in said conduit for cutting said material into discontinuous lengths.

5. Apparatus for handling filamentary material comprising a conduit, means for directing a fluid stream through the conduit for conveying filamentary material therethrough, supporting means for a supply of filamentary material, means in advance of said conduit for guiding the material thereto from the supporting means, a grill facing the discharge opening of said con-

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duit and comprising a plurality of smooth-faced rods spaced apart to provide slits therebetween, the rods being inclined from the normal to the direction of fluid discharge from the conduit, and means in said conduit for cutting said material into discontinuous lengths.

6. Apparatus for handling filamentary material comprising a conduit, means for directing a fluid stream through the conduit for conveying filamentary material therethrough, supporting means for a plurality of supplies of continuous filamentary material, a common guide in advance of said conduit for guiding the material from the supporting means for said plurality of supplies into said conduit, a grill facing the discharge opening of said conduit and comprising a plurality of smooth-faced rods spaced apart to provide slits therebetween, the rods being inclined from the normal to the direction of fluid discharge from the conduit, and means in said conduit for cutting said material into discontinuous lengths.

7. Apparatus for handling filamentary material comprising a conduit, means for directing a fluid stream through the conduit for conveying filamentary material therethrough, said means comprising an injector nozzle for inducing suction at the entrance end of said conduit, a grill facing the discharge opening of said conduit and comprising a plurality of smooth-faced rods spaced apart to provide slits therebetween, the rods being inclined from the normal in the direction of fluid discharge from the conduit.

8. Apparatus for handling filamentary material comprising a conduit, means for directing a fluid stream through the conduit for conveying filamentary material therethrough, said means comprising an injector nozzle for inducing suction at the entrance end of said conduit, means in said conduit beyond said nozzle for cutting said material into discontinuous lengths, a grill facing the discharge opening of said conduit and comprising a plurality of smooth-faced rods spaced apart to provide slits therebetween, the

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rods being inclined from the normal to the direction of fluid discharge from the conduit.

9. Apparatus for handling filamentary material comprising a conduit, means for directing a fluid stream through the conduit for conveying filamentary material therethrough, a grill facing the discharge opening of said conduit and comprising a plurality of smooth-faced rods spaced apart to provide slits therebetween, the rods being inclined from the normal to the direction of fluid discharge from the conduit, said rods being disposed in a non-linear row with its concave side facing the discharge opening of the conduit.

10. Apparatus for handling filamentary material comprising a conduit, means for directing a fluid stream through the conduit for conveying filamentary material therethrough, a grill facing the discharge opening of said conduit and comprising a plurality of smooth-faced rods spaced apart to provide slits therebetween, the rods being inclined from the normal to the direction of fluid discharge from the conduit, the rods being disposed in an arcuate row with its concave side facing the discharge opening of the conduit.

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