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DEVICE FOR CUTTING STAPLE FIBER

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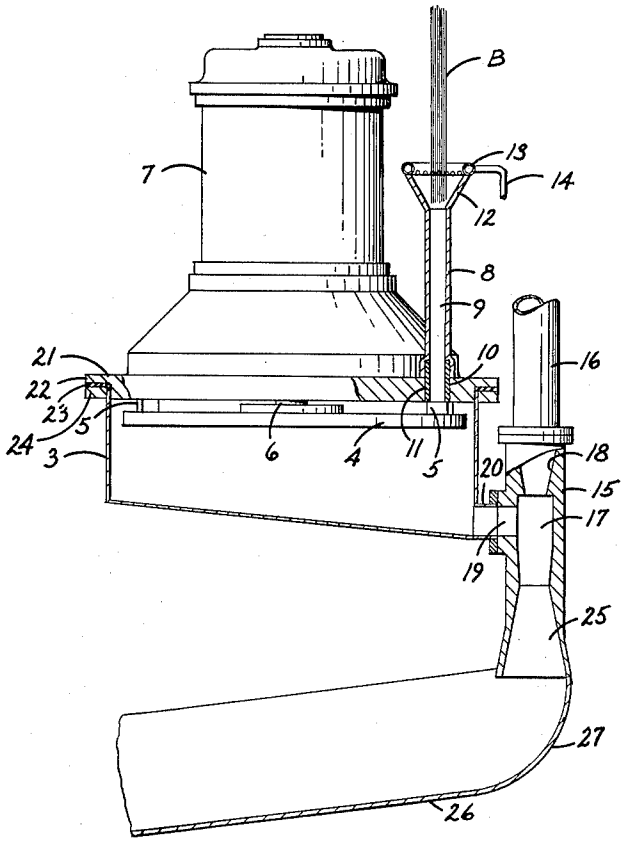


Fig. 1

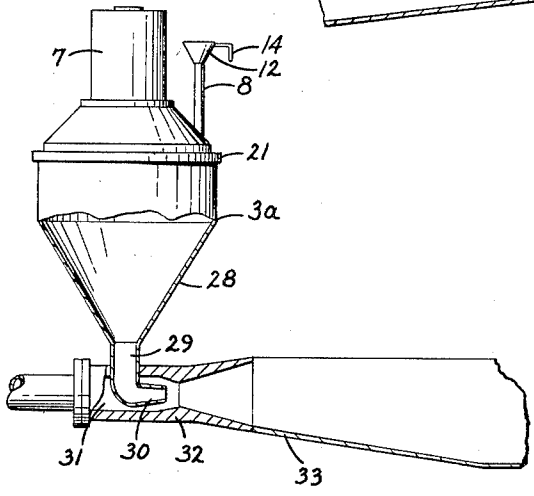


Fig. 2

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DEVICE FOR CUTTING STAPLE FIBER

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4 Claims. (Cl. 164—61)

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Th's invention relates to a device for cutting continuous filamentary bundles into short lengths and it is particularly concerned with a device which is adaptable to the cutting of extremely short lengths of fibers commonly known as "flock" as well as conventional lengths known as staple fiber.

It is a particular object of the invention to provide an improved cutting device which comprises a conduit having a considerable length of uniform internal diameter somewhat larger than that of the bundle for leading the bundle into a housing containing the cutting means, means for applying suction to induce a reduced pressure in the housing, and means for supplying a fluid to the housing to suspend the cutting fibers therein to facilitate the opening thereof and at the same time the conveying of the fibers from the housing.

Other objects and advantages, general as well as more specific, will be apparent from the drawing and the description thereof hereinafter.

In the drawing, which is illustrative of the invention,

Figure 1 is a side elevation, partially in section, of a preferred embodiment, and

Figure 2 is a side elevation of a modification of the invention.

As shown in Figure 1, a housing 3 is provided which contains the cutting means which comprises the rotary member 4 carrying one or more blades or knives 5. This cutter member may be driven by a shaft 6 driven by a motor which may be enclosed in a casing 7 projecting outside of the housing 3. The filamentary bundle B passes through a conduit 8 having an internal passage 9 which terminates in an opening 10 in a wall of the housing 3. As shown, the passage 9 is of substantially uniform diameter for a considerable length back from the opening 10. Preferably, an insert 11 in the form of a bushing of hardened material, such as a specially hardened cutting steel, may be fitted within the opening 10 so that it is flush with the inside wall of the housing and is adapted to co-operate as a cutter element with the cutting blades 5. The bushing 11 and the conduit 8 are fitted together in fluid-tight relationship and the assembly is secured in the wall of the housing in fluid-tight relationship. The upper end of the conduit 8 may be flared as at 12 to form a funnel-like entrance.

A fluid, preferably a liquid is supplied to the housing to suspend the fibers therein to facilitate opening the clump of fibers and the removal

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of the fibers from the housing. Advantageously, the fluid supply may be water and it may be introduced into the housing by way of the annular distributor 13 connected with a supply conduit 14. The annular distributor is disposed either detachably or fixedly to the upper end of the bundle-feeding system, such as to the top of the flared entrance 12. In such position, the liquid supplied to the housing serves also to partially seal the space within the passage 9 which is unoccupied by the bundle B and thereby it serves to increase the degree of vacuum obtainable within the housing.

Means is provided for reducing the pressure within the housing and in its preferred embodiment, that means may take the form of an aspirator-type of suction device, such as an injector or ejector jet 15 which is supplied with a fluid, preferably water, under pressure by means of a conduit 16. The injector jet induces a reduced pressure in the zone 17 around the narrow portion of the jet produced by the converging inlet 18. The reduced pressure zone communicates through an opening 19 with a conduit 20 connected to the housing 3. Preferably, the bottom wall of the housing slopes downwardly to the conduit 20 so that the fiber suspension flows by gravity into the injector. In the specific embodiment shown, the top wall 21 of the housing may be in the form of a disc having an annular shoulder at 22 which is adapted to receive a gasket 23 and an annular flange 24 secured to a cylindrical side wall of the housing 3. By means of the gasket 23 and the flange 24, the side wall of the housing can be secured to the top wall in fluid-tight relationship.

The discharge port 25 of the injector jet may be disposed to deliver the fibers into any suitable receptacle or to a conveyor and in the specific embodiment shown, it discharges into the upper end of a sluice trough 26, the upper end 27 thereof being curved to gradually merge with the taper of the discharge port 25.

The embodiment of Figure 2 illustrates a modification in which the housing 3a has a sloped bottom wall in the form of a frusto-conical surface 28 and a conduit 29 from the bottom thereof has a right-angle bend 30 which projects into a substantially concentric alignment with the inlet end 31 of the injector jet 32. The discharge opening of the conduit 30 is positioned in a narrow portion of the jet so that suction is induced within the housing. As in the embodiment of Figure 1, the fiber suspension withdrawn

from the housing may be discharged into a trough 33.

The cross-sectional area of the passage 9 should be somewhat larger than the total cross-sectional area of the bundle B to be cut, regardless of whether the passage has a circular or an elongated slit-like cross-sectional shape. Thus, it is preferred that the cross-sectional area of the passage 9 should not exceed the cross-sectional area of the compacted filamentary bundle by more than 100%. Thus, the cross-sectional area of the passage 9 may be from 10% to 100% greater than the cross-sectional area of the compacted bundle to be cut. By so correlating the size of the passage to the size of the bundle, the amount of liquid needed to be supplied to the passage may be minimized without greatly reducing the amount of vacuum obtainable within the housing. Of course, operation can be performed with a larger ratio between the cross-sectional area of the passage 9 to the cross-sectional area of the compacted bundle but in this case, it is generally necessary to increase the amount of liquid supplied to the passage in order to maintain any given amount of vacuum within the housing.

In operation, the suction induced within the housing serves to pull the filamentary bundle into the housing and this suction is exerted in such a way as to maintain the filaments projecting into the housing in a substantially parallelized condition. The liquid flowing into the funnel 12 serves to fill up the space between the bundle and the internal wall of the passage 9 so that it tends to seal off the housing and thereby increases the degree of vacuum obtainable therein, by other conditions being the same. By this parallelizing the filaments, the cutter is capable of producing substantially uniform length fibers, the length of which depends upon the number of blades carried by disc 4 as well as upon the speed of rotation of such rotary member. When the fibers leave the cutting position, they are thoroughly wet and upon striking the bottom wall of the housing or the fiber suspension flowing thereover, thorough opening of the fibers is effected. The injector jet serves to develop suction within the housing 3 and to convey the fiber suspension therefrom without the use of relatively moving mechanical parts. The fluid stream within the injector which is preferably liquid, such as water, serves to further open any remaining clumps of fibers because of the violent agitation they undergo as the two streams intermingle in the low pressure zone 17 and the discharge port 25 of the injector jet.

The improved cutter of the present invention can be used to cut fiber to any particular length. Thus, it may be used to produce staple fiber having a length of ½ inch to eight inches or more from artificial filamentary materials spun either by wet or dry or melt spinning procedures, such as rayon from cellulose acetate or other esters; regenerated cellulose rayon from cuprammonium cellulose or from viscose; nylon, casein; or synthetic resin fibers, such as those produced from the vinyl resins, polyvinyl chloride, copolymers of vinyl chloride with vinyl acetate or with acrylonitrile, polyvinylidene chloride, etc. The

cutter may be used for the cutting of continuous filamentary bundles to produce extremely short length fibers such as those of $\frac{1}{32}$ to $\frac{3}{16}$ inch or from $\frac{3}{16}$ inch to ½ inch, either of which may be used as flock or in paper of felt-making procedures. The individual filaments in the continuous filamentary bundle may be of continuous nature or they may already be short fibers, such as in the form of a spun rayon yarn or in the form of a yarn spun from natural fibers, such as cotton, wool, glass, mineral wool, asbestos, and the like. The system of the present invention which involves liquid suspension within the housing is particularly important when cutting yarns comprising twisted fibers or filaments which are more difficult to separate and open because of the presence of the twist.

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

We claim:

1. A device for cutting a continuous filamentary bundle to fibers comprising a housing having a top wall and a sloped bottom wall, a conduit connected to the housing adjacent the lowest part of the bottom wall, an aspirator-type of suction device having a lateral suction port connected to the conduit and having a discharge port for removing cut material from the housing, an opening in the top wall of the housing, an upper conduit above the housing terminating in fluid-tight relationship with the opening for guiding the bundle downwardly into the housing, means for supplying liquid to the upper conduit, and means inside the housing for repeatedly cutting the bundle as it is fed into the housing.

2. A cutting device in accordance with claim 1 in which the cutting means comprises a cutting element fitting in the opening, and a rotary cutter having at least one blade cooperating with the cutting element fitted in the opening.

3. A cutting device in accordance with claim 2 in which the rotary cutter comprises a disc driven by a shaft extending into the housing, means is provided outside the housing for driving the shaft, and each blade is carried adjacent the outer periphery of the disc.

4. A cutting device in accordance with claim 2 in which the shaft is mounted on a vertical axis and extends through the top wall of the housing, and the upper conduit is substantially parallel to the shaft.

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