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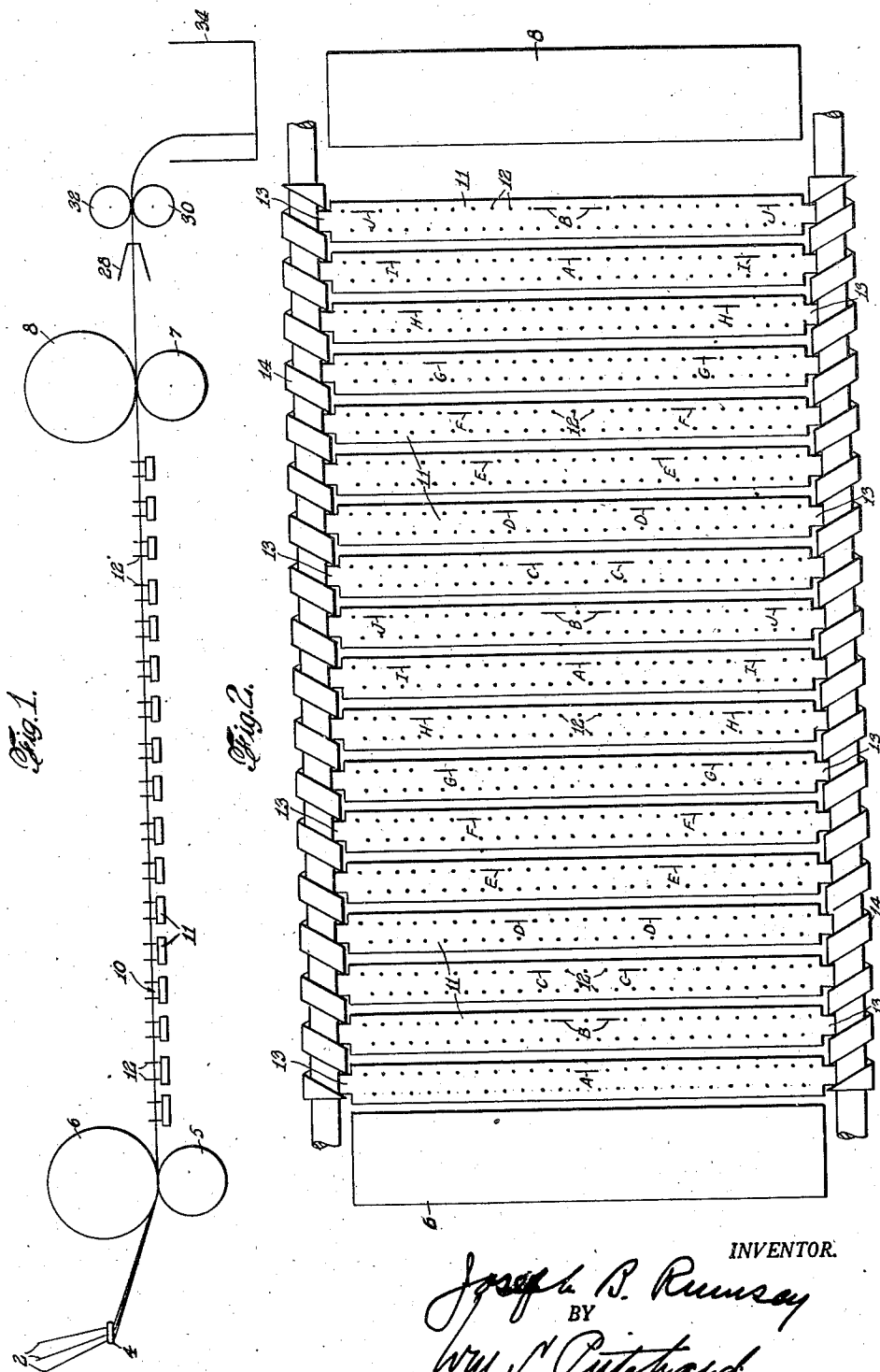
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2,410,307

APPARATUS FOR CONVERTING TOW TO TOP

Filed March 18, 1943

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

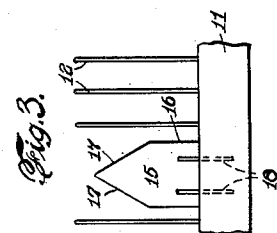
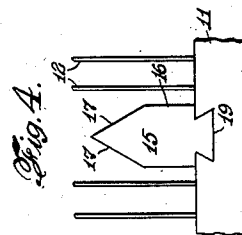
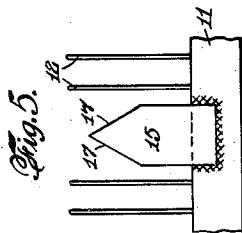
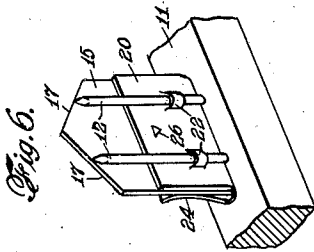
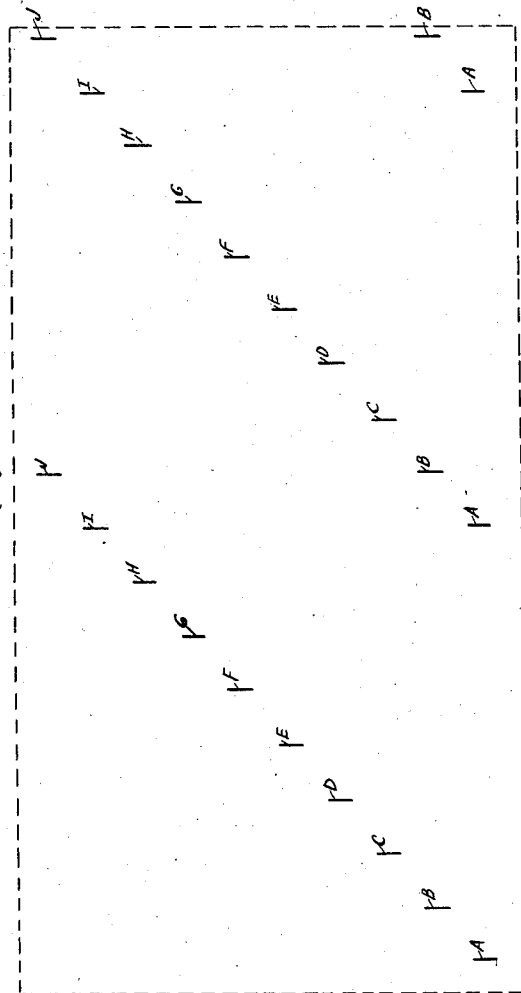


Fig. 7.



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APPARATUS FOR CONVERTING TOW TO TOP

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3 Claims. (Cl. 19-1)

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This invention relates to an apparatus for converting a tow to a top without destroying the continuity of the tow and sliver and the substantial parallelism of the fibers.

Herein the expression "tow" is intended to cover a bundle of continuous filaments in substantially parallel relationship. Also, herein, the expression "sliver" is intended to cover the structure formed when the continuous filaments of the tow are severed into fibers of predetermined lengths. Also, herein, the expression "top" is intended to cover the product resulting from drawing the sliver.

Prior to this invention, a tow was passed through a drafting frame wherein the speed of the drafting rollers was such as to haphazardly break the filaments into relatively short, irregular lengths to form a sliver continuous with the tow and without destroying the substantial parallelism of the fibers. In this procedure, frequently many of the continuous filaments were not broken and it was impossible to convert the filaments into fibers of predetermined lengths.

An object of this invention is to provide an apparatus for directly and continuously converting a tow to a top formed of fibers of predetermined lengths without destroying the continuity of the sliver and tow and the substantial parallelism of the fibers.

Another object of this invention is to provide an apparatus for directly and continuously converting a tow to a top by cutting the tow, according to a predetermined pattern, to form a sliver of fibers of predetermined lengths and in staggered relationship, without destroying the continuity of the sliver and tow and the substantial parallelism of the fibers.

In general, the objects of this invention are obtained by providing knives, arranged according to a predetermined pattern, on the gill or faller bars of a standard gill drafting frame so that when the tow is fed to the gill drafting frame (provided with the knife arrangement as hereinbefore mentioned) the knives will, in accordance with the pattern of the arrangement of the knives, sever the filaments throughout the length of the tow to produce a sliver composed of fibers of predetermined lengths, without destroying the continuity of the tow and the sliver and the substantial parallelism of the fibers. Simultaneously with the cutting of the filaments into fibers of predetermined lengths, the sliver is drafted (elongated or drawn) down to a predetermined size in which the substantial continuity of the

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sliver and parallelism of the fibers are maintained.

In general, the knives are arranged on the gill bars to effect a staggered cutting so that the fibers are in staggered relationship. The knives may be arranged in a diagonal, broken diagonal, triangular, broken triangular, etc., pattern as desired. The knives are also disposed at predetermined positions in the selected pattern in accordance with the length of fiber desired.

The drawing frame is preferably also provided with a condenser or trumpet of either the rotary or stationary type to receive the top from the drawing rolls and direct said top to a pair of condensing rolls. The condensing rolls compact and flatten the top and deliver it to a suitable receptacle, such as a fiberboard can, which is given an oscillatory movement to permit packing of the top therein. Alternatively, the can may be stationary, and the top delivered thereto from the drafting frame may be compressed by appropriate means, such as an intermittently acting reciprocating plunger. Optionally, a guide, such as a trough, may be provided intermediate the condensing rolls and receiving receptacle. In some instances it may be desirable to dispense with the receiving can and to impart a false twist to the top, for instance by a rotating trumpet, and directly wind it up as a ball warp.

In order to more fully explain the invention, reference will now be had to the accompanying drawings forming a part of this specification and wherein an illustrative embodiment of the invention is shown, and wherein:

Figure 1 is a side elevation of a gill drafting frame (with the gill bar conveyer screws and driving mechanisms omitted for clarity) embodying the features of this invention;

Figure 2 is an enlarged top plan view of the apparatus shown in Figure 1, particularly showing the knives arranged in a triangular pattern;

Figures 3, 4 and 5 are partial front elevations showing different means of securing the knives to the gill bars;

Figure 6 is a partial perspective of another means of securing the knives to the gill bars; and

Figure 7 is a diagrammatic arrangement of the knives on the gill bars.

Though the invention is not restricted to any specific tow, for convenience it will be described in connection with rayon tow.

Referring now to the drawings, wherein like reference numerals designate like parts, the reference numeral 2 designates a plurality of ends of rayon tow supplied from any suitable source

(not shown) and which pass through a converging guide 4 in their passage to the gill drafting frame. The gill drafting frame comprises the usual retaining rolls which, in the form shown, comprise a driven roll 5 and a heavy or weighted floating roll 6 cooperating therewith. The drawing rolls comprise a driven roll 7 and a heavy or weighted floating roll 8 cooperating therewith. The drawing rolls 7 and 8 are driven so that the peripheral speed thereof is higher than the peripheral speed of the retaining rolls 5 and 6, whereby the desired draft may be obtained. In the instant invention, satisfactory results have been obtained when the ratio of the peripheral speed of the retaining rolls to the peripheral speed of the drawing rolls is 1:3.5 or 1:4, although it is understood that any desired degree of draft may be obtained by adjusting the ratio of the peripheral speed of the retaining rolls to the drawing rolls.

In the space intermediate the retaining rolls 5 and 6 and the drawing rolls 7 and 8, there is provided a gill bed, generally designated by the reference numeral 10. The gill bed comprises a plurality of gill bars 11, each of the gill bars being provided with a plurality of gill pins 12. In the form shown, each gill bar 11 is provided with two rows of gill pins 12 arranged in staggered relationship. It is to be understood that the invention is not restricted to this precise arrangement and number of gill pins, since it is apparent that a greater or lesser number of gill pins, arranged in either a single or plurality of rows and either in parallel or staggered relationship, may be used. Each gill bar, at each end thereof, is provided with a boss 13 which is designed to engage a groove of a high pitch spiral screw conveyor 14, which is driven in the usual manner (not shown). It is to be understood that there is also provided a pair of high pitch screws, similar to screws 14, in a plane beneath the plane occupied by the screws 14. Normally, the lower pair of screws are of a higher pitch than the pitch of the screws 14, so that the gill bars may be transferred and elevated quickly to operative position. The screws 14 are driven so that the gill bars during operative position will travel at a speed slightly in excess of the peripheral speed of the retaining rolls. Usually, the speed of travel of the gill bars is approximately 10% higher than the speed of the retaining rolls.

The retaining rolls 5 and 6, the drawing rolls 7 and 8, and the gill bed 10, as well as the appurtenant driving mechanisms, are all of the standard types common in gill drafting frames.

The gill bars 11, as shown in Figure 2, are provided with a plurality of knives A to J inclusive, which are arranged in a triangular pattern. The spacing of the knives A to J inclusive relative to each other determines the extent of the staggered relationship of the staple fibers. The spacing of the correspondingly positioned knives A and A, B and B, etc., determines the length of the staple. Thus, for example, if a staple fiber of 4" in length is desired, the distance between the correspondingly positioned knives A and A, B and B, etc., is each 4", and the extent to which the fibers are staggered is the distance between the knives A and B, B and C, etc. Thus, for example, if this overlap is desired to be 1/2", the distance between the knives A and B, B and C, etc., is made 1/2". Obviously, the length of the staple fibers and the degree of staggering also depend on the relative speeds of the rolls 5, 6, 7 and 8, and the gill bed 10, which can be adjusted

to produce the desired results. Since the distance between the correspondingly positioned knives determines the length of the staple, it is clear that any length staple may be obtained. Likewise, any degree of staggering can be obtained.

Though in Figure 2 the knives are shown as arranged in a pattern of a triangle and will produce staple of substantially uniform lengths arranged in staggered (triangular) relationship, the invention is not restricted to such a precise pattern. In Figure 7, the knives are arranged in a diagonal pattern. It is to be understood that the patterns of the knives on the gill bars are not restricted to the two illustrative embodiments shown in Figures 2 and 7, since it is obvious that the knives may be arranged to produce staple fibers of any predetermined lengths and in accordance with any pattern desired.

Each knife 15 comprises a body portion 16 and a triangular portion which is provided with the cutting edge 17. The knives may be supported on the gill bars in various manners. As shown in Figure 3, each knife may be provided with a plurality of pins 18 which may be inserted in the holes which normally receive the gill pins 12. Alternatively, each knife 15 may be provided with a tongue 19 which is inserted in a corresponding groove formed in one of the faces of the gill bar. When the knives are made of heavy steel, for example that used in the manufacture of hacksaw blades, they may be secured, as by soldering, to the face of the gill bar, as shown in Figure 5.

Another modification of providing the gill bars with the knives in accordance with the instant invention is shown in Figure 6. In this embodiment, each knife 15 is positioned in a clip 20 which is provided with rings 22 on the rear face thereof and which are designed to slip over the gill pins 12. The front portion 24 of the clip 20 serves as a compression spring and thereby securely holds each knife in position. A depression or tongue 26 formed in the clip 20 cooperates with a hole (not shown) in the knife to more securely hold the knife in position.

The height of the knives 15 is such that when a faller bar is elevated from inoperative position to operative position, the knife will engage and transversely cut the tow engaged thereby. The shape of the knives and the effective width and position of the cutting edge or edges thereof relative to the gill pins is in part dependent on the size of the tow, the degree of drafting, and the material constituting the tow. Thus, the top edge of the knives may be in alignment with or above or below the tops of the gill pins. In one embodiment, satisfactory results are obtained when, in the triangular knife shown, the angle between the knife edges 17 is approximately not less than 60°, such as, for example, 90°, and the tip of the knife at the apex thereof is in alignment with or slightly below the tips of the gill pins, as in Figures 3, 4 and 5, or slightly above the tips of the gill pins, as shown in Figure 6.

In operation, a plurality of ends 2 of rayon tow are fed to the gill drafting frame. As the tow is fed from the retaining rolls 5 and 6, each of the knives on the faller bar, which is elevated into operative position, engages and severs the portion of the tow contacting therewith. In many instances, if the section of the tow is not severed upon the elevation of the gill bars into operative position, it will be severed at some time during the passage to the drawing rolls. Simultaneously with the cutting, the drawing rolls draw or elongate the sliver, the gill pins aiding in this opera-

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tion by imposing a retaining or holding action on the fibers. It is to be noted that during the operations of producing and drawing the sliver the latter is continuous with the tow and the parallel arrangement of the fibers is not destroyed. From the drawing rolls 7 and 8, the resulting rayon top passes through a condenser or trumpet 28, wherein the top is laterally compressed or condensed particularly to remove the feather edge obtained in the preceding operation. The laterally compressed top, upon leaving the trumpet, passes between a driving roll 30 and a pressure roll 32 constituting condensing or compacting rolls which, after compacting and condensing the top, delivers it into the fiberboard can 34, which is given an oscillatory movement in order to uniformly lay the top in the can.

Although the invention has been described with reference to an open gill drafting frame, it is equally applicable to intersecting gill frames, in which case the knives may be affixed to either the lower or upper faller bars or to both.

Since it is obvious that various changes and modifications may be made in the above description without departing from the nature or spirit thereof, this invention is not restricted thereto except as set forth in the appended claims.

I claim:

1. An apparatus for directly converting tow to top while maintaining the substantial parallelism of the fibers and the continuity of the tow and sliver, which comprises a gill drafting frame having a plurality of gill bars, each of said gill bars being provided with a plurality of gill pins,

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a plurality of knife holders removably disposed on said gill pins in accordance with a predetermined pattern, and a knife positioned in and carried by each of said knife holders.

2. An apparatus for directly converting tow to top while maintaining the substantial parallelism of the fibers and the continuity of the tow and sliver, which comprises a gill drafting frame having a plurality of gill bars, each of said gill bars being provided with a plurality of gill pins, a plurality of knife holders, each of said knife holders having ears on the rear thereof to cooperate with the gill pins whereby said knife holders are removably disposed on said gill pins, each of said knife holders having a clip and a knife positioned in each of said clips, said knife holders being arranged in accordance with a predetermined pattern.

3. An apparatus for directly converting tow to top while maintaining the substantial parallelism of the fibers and the continuity of the tow and sliver, which comprises a gill drafting frame having a plurality of gill bars, each of said gill bars being provided with a plurality of gill pins, a plurality of knife holders, each of said knife holders having ears on the rear thereof to cooperate with the gill pins whereby said knife holders are removably disposed on said gill pins, each of said knife holders having a spring clip and a knife positioned in each of said clips, said knife holders being arranged in accordance with a predetermined pattern.

JOSEPH B. RUMSEY.