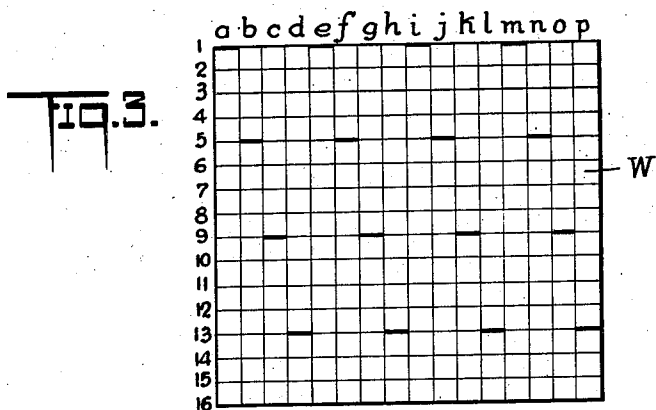
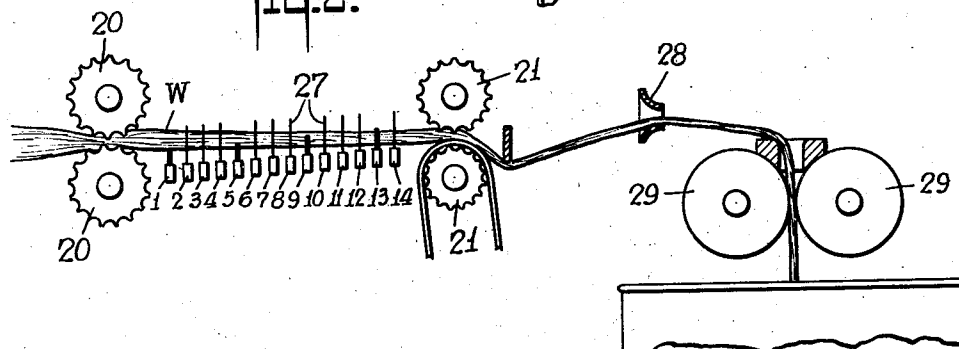
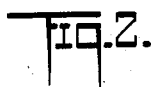


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YARN PRODUCTION

3 Sheets-Sheet 1



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2,406,642

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3 Sheets-Sheet 2

FIG. 5.

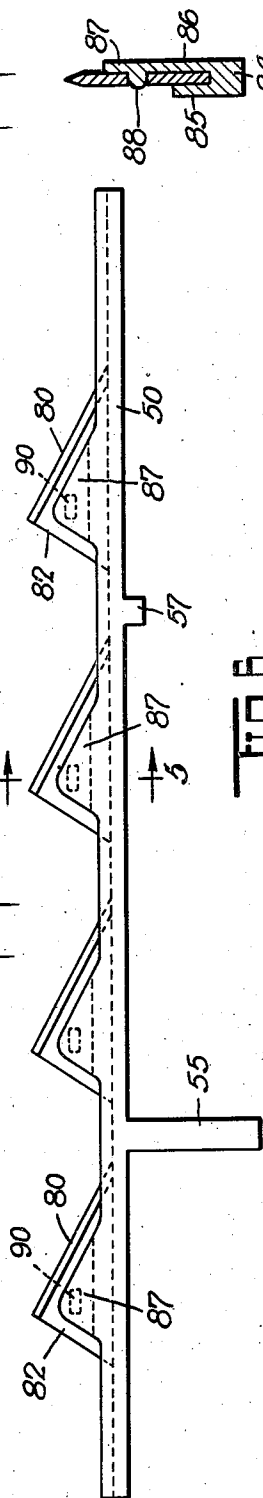


FIG. 6.

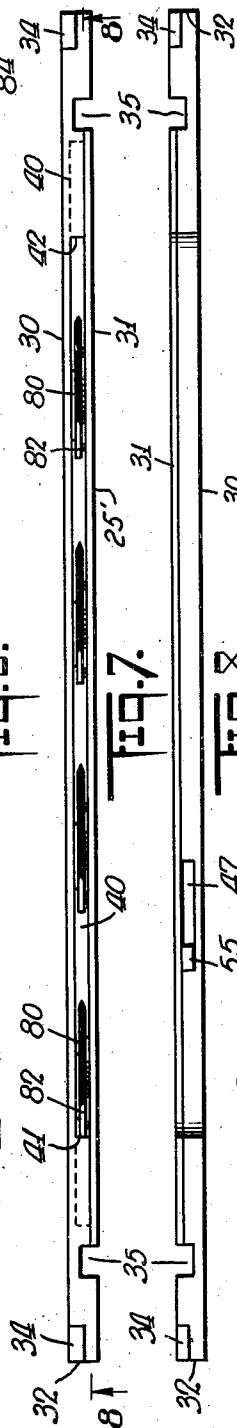


FIG. 7.

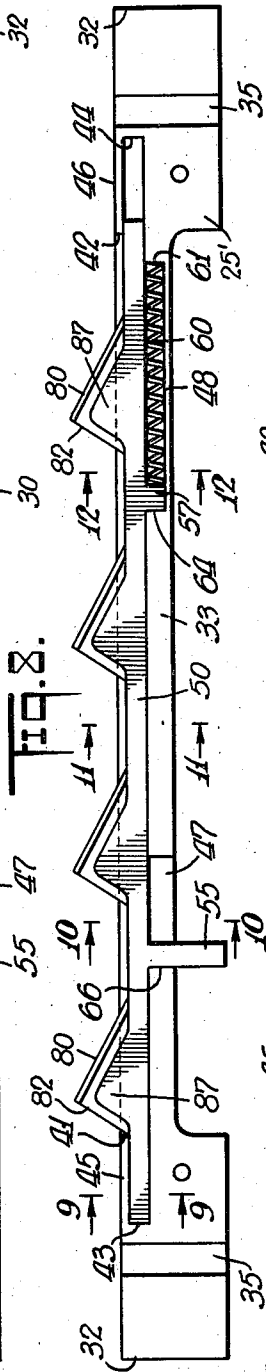
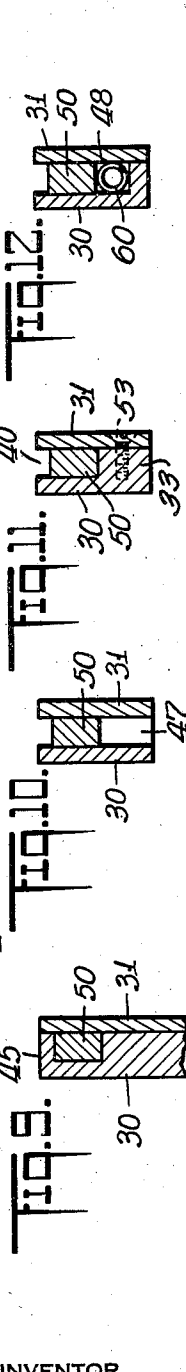


FIG. 8.



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FIG. 13.

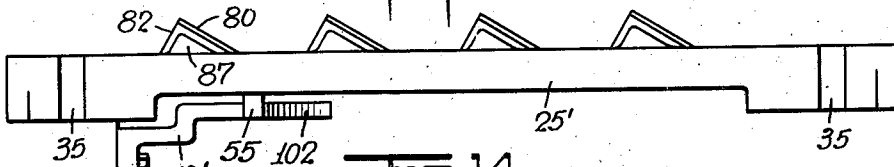


FIG. 14.

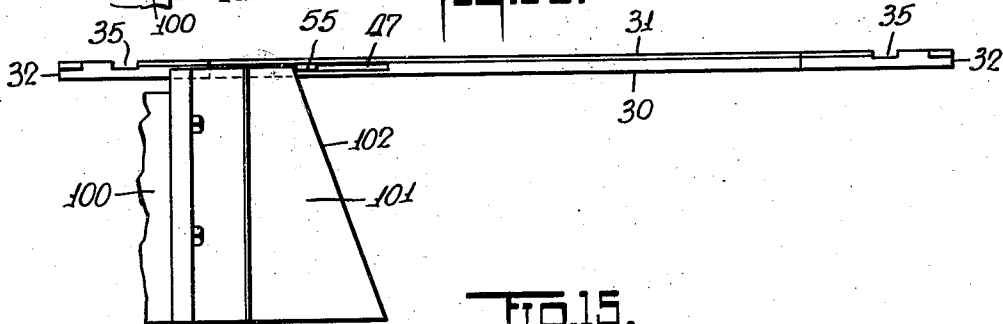


FIG. 15.

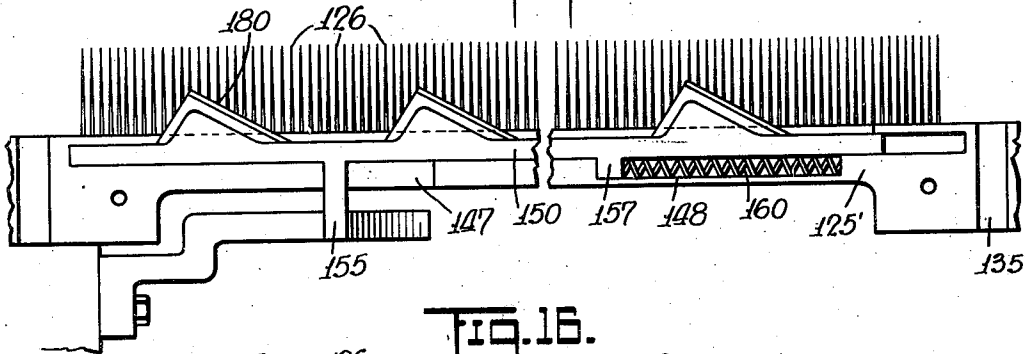


FIG. 16.

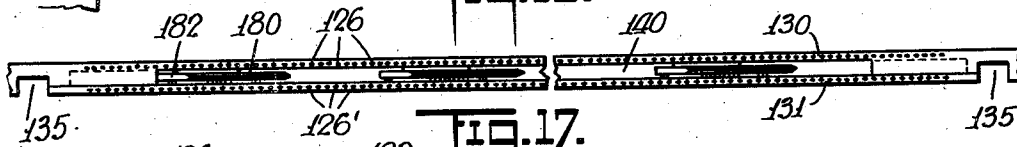
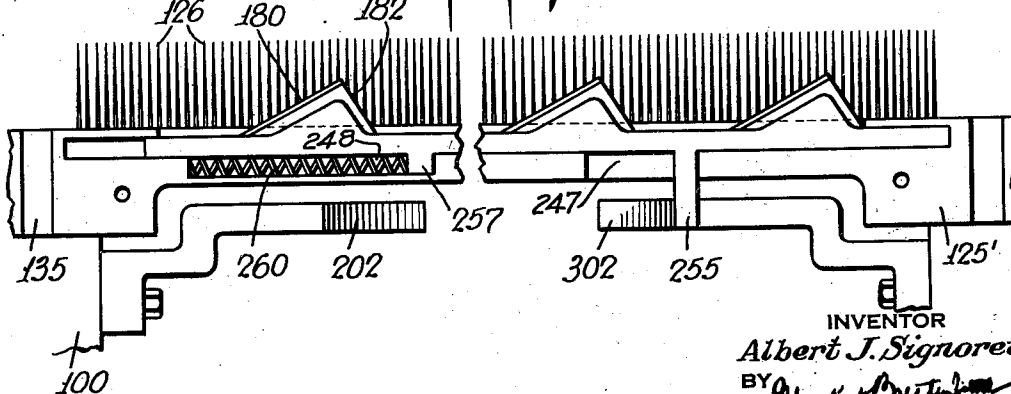


FIG. 17.



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Application February 12, 1943, Serial No. 475,617

8 Claims. (Cl. 19—129)

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My present invention relates to the production of yarn comprised of short filamentary lengths and more particularly its production from filaments which are of relatively extended or continuous length.

My invention has been developed specifically for the production of yarn from artificially produced filaments of which rayon is an example and therefore will be disclosed in that connection. Features of my invention however have a practical application in the production of yarns from natural fibers or filaments and are therefore not to be construed as limited by the manner of disclosure of my invention unless called for by express language of the claims or by the prior art.

Broadly stated, the general objects of my invention are: (a) the simplification in the process; (b) simplification of and reduction in the apparatus required; and (c) the production of a superior yarn.

Synthetically produced filaments are formed by extruding into fixing baths and the like a viscous mass through the small openings or spinnerettes, the filaments when formed being generally disposed of by being wound on bobbins. A number of the filaments are then brought together to form a thick rope-like continuous length, generally termed a sliver and comprised of filaments of extended or continuous length. In the general practice this sliver is subjected to a guillotining operation which chops the group of filaments of which it is comprised into a conglomerate mass of short staples of a length suitable for subsequent processing, and appropriate apparatus thereafter reconstitutes the short lengths of which this mass is comprised into a sliver of extended or continuous length with the short staples parallel and multiplied in cross section to give the desired thickness for example of the order of 1" and multiplied lengthwise to give the desired extended length. These reconstituted slivers are then subjected to preliminary attenuation in an apparatus termed a gill box wherein a number of slivers in lateral relation may be united into a relatively wide web which is attenuated and combed. The attenuated web is then fed through the restricted passageway of a trumpet to reconstitute and compact the web into a sliver. The compacted sliver is then subject to an apparatus wherein it is combed. The combed slivers are then subjected to a further gilling operation in what may be termed an "intermediate" gill box wherein a number of the compacted slivers again in lateral relation may be united into a web which is

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combed, attenuated and compacted as in the preliminary gill box to reconstitute this web as a sliver. These gilling operations may be repeated as often as desired or required.

For purposes of convenience of reference the term "sliver" will be applied to the extended untwisted length comprised of a plurality of continuous or extended filaments and the expression "reconstituted slivers" will be applied to the untwisted extended lengths comprised of short staple lengths effected by a guillotining operation and the subsequent reconstitution of these short staple lengths into sliver form.

I will here premise that: I have attained the first object of my invention by reducing the continuous filaments of which a sliver is comprised to short staple lengths during and as part of and simultaneously with a gilling operation and preferably that referred to as the intermediate one. I thus eliminate the guillotining operation and the subsequent operations whereby the continuous short staple lengths are reconstituted into slivers and in my preferred process, the subsequent procedures of preliminary gilling and of then combing; this simplified procedure dispenses with such portions of the apparatus as are now employed to perform operations which are eliminated thereby; the resulting re-orientation in the procedure and the apparatus employed by me herein attains improved results other than mere simplification in the process, including an improved product thus attaining the third objective of my invention.

Among the more important provisions for the attainment of the first three objects of my invention are: the reduction of continuous filaments into short staple lengths wherein a large number of continuous filaments are assembled into parallelism and temporarily segregated into a plurality of smaller groups at progressive points where severance is to be effected; the simultaneous reduction of a plurality of slivers to short staple length by first uniting a group of slivers into a web of extended width and then progressively reducing the continuous filaments of which the web is comprised into short staple lengths, and more particularly its effectuation by increments for relatively narrow widths of the web which are so distributed lengthwise and widthwise of the web that all the filaments of the web are reduced without destroying the continuity thereof; the reduction and attenuation of the sliver by progressively reducing the continuous filaments of which it is comprised, to short staple lengths and advancing these short staple lengths

relatively to the continuous filaments as they are reduced therefrom, and more particularly the simultaneous reduction and attenuation of a group of slivers in this manner by first uniting the group into a relatively wide web; the employment of cutting edges for effecting the reduction in each of the above provisions; and an arrangement for holding segregated groups of filaments for the performance of the severing or reduction operation.

It is a further and a coordinate object of my invention that the aforementioned objectives, i. e., simplification of the process, reduction of equipment, and improved product, be attained by the use of such instrumentalities now employed as are retained for the practice of my process and that this be effected without impairing the normal performance thereof so that existing apparatus for the conventional practice can be converted quickly, simply and inexpensively to perform the added functions and give the benefits and advantages which are the objects of my invention.

I attain the fourth objective of my invention by the selection of a gill box preferably the intermediate gill box for effecting the reduction of the continuous filaments which comprise the slivers, to short staple lengths in that I am enabled to avail myself of mechanisms already comprised in the conventional gill box for effecting this added operation without substantial impairment of the functioning of this mechanism in its conventional performance. I also attain thereby these further benefits: the elastic limit of a rayon filament is relatively low and any force acting to stretch the filament tends to give it a set which weakens it and by the use of the mechanisms which are comprised in the conventional gill box, I am enabled to effect the reduction of the continuous filaments to staple lengths in a manner which does not stretch the filaments; the reduction operation gives a complete control of the length of the short staples to thereby attain a uniformity in the lengths thereof.

The conventional gill box mechanism to which I have made reference comprises faller bars, needles carried thereby and mechanism for moving the faller bars along a path to cause the needles to comb the web. The preferred arrangement which I associate therewith to effect a reduction of the continuous filaments to short staple lengths, comprises cutting edges which move across the length of the continuous filaments; the functional coordination of the two is preferably such that as the faller bars perform their usual function, the cutting edges will be caused to perform their added function; the structural coordination of the two is also preferably such that the mechanism for effecting the gilling operation also effects the cutting operation.

For the attainment of these objects and such other objects as may hereinafter appear or be pointed out, I have illustrated an embodiment of my invention in the accompanying drawings, wherein:

Figure 1 is a perspective view of a gilling apparatus wherein my invention has been embodied;

Figure 2 is a longitudinal section through the apparatus of Figure 1;

Figure 3 is a diagrammatic showing of the spatial relation of the cutters embodied in the gill box;

Figure 4 is a front elevational view of the cutter with the cutter carrying bar;

Figure 5 is a section taken on line 5—5 of Figure 4;

Figure 6 is a top plan view of a faller bar modified to receive the cutter bar of Figure 4;

Figure 7 is a bottom plan view of Figure 6;

Figure 8 is a cross section taken on line 8—8 of Figure 6;

Figures 9, 10, 11 and 12 are respectively vertical sections taken on lines 9—9, 10—10, 11—11 and 12—12 of Figure 8;

Figure 13 is a view of an arrangement for shifting the cutting edges longitudinally of the faller bar;

Figure 14 is a view of Figure 13 as seen from below;

Figure 15 is a view similar to Figure 8 of a modified embodiment;

Figure 16 is a view similar to Figure 6 of the embodiment of Figure 15; and

Figure 17 shows a further embodiment of my invention.

Before proceeding to describe my invention, I will premise that gill boxes are generally characterized as follows: they function to attenuate the slivers reconstituted from the short staple lengths into which the continuous filaments are guillotined (in a typical practice the short staples are of a length of the order of 4" to 6"); they are comprised at one end of a set of feed rollers between which the slivers are fed to be formed thereby into a web and at the other end of a set of delivery rollers spaced a distance from the feed rollers which may be of the order of 12"; both sets of rollers are positively driven but at different peripheral velocities and in the practice I have in mind the difference in the peripheral velocities is of the order of five to one.

The length of the web engaged between the two sets of rollers at any movement, will therefore also be of the order of 12" whereas the length of the short staples of which it is comprised, will be of the order of 4" to 6". The short staples which comprise the sliver length engaged between the two sets of rollers, will therefore group themselves as follows: one group of these short staples will be gripped and controlled by feeding rollers; a second group will be gripped and controlled by the delivery rollers; and the remaining short lengths will form a third group which are free of both sets of rollers. Because of the accelerated peripheral velocity of the delivery rollers the second mentioned group of short staple lengths will be advanced at an accelerated speed relatively to those of the first mentioned group and the short staples which comprise the third mentioned group will respond and more or less casually to the control of factors such as adhesion imposed upon them by the movements of the other two groups and by other gill box mechanism to be referred to later. This action attenuates the web.

Gill boxes are further characterized conventionally by a mechanism positioned between the feed and delivery rollers and generally referred to as the faller bar mechanism in that it is comprised of a series of what are known as faller bars, each constituted of a bar positioned parallel to the rollers and provided with pointed needles across its length. The width of the row of needles is at least equal to that of the web formed from the sliver or slivers as they are passed through the feeding rollers.

These faller bars travel between the set of feeding rollers and the set of delivery rollers in a path that can best be described as an extremely flat oval whose long dimension is in the direction

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of the feed of the web and whose short dimension is approximately vertical. The faller bars in a typical apparatus travel in their elevated position from a point adjacent the feed rollers to a point adjacent the delivery rollers where they are dropped in succession by mechanism (not shown) to a lower level and their direction of movement reversed until they again arrive in the vicinity of the feeding rollers where they are suddenly projected upwardly one after another into their starting position in the upper level. This comprises a cycle of travel of each faller bar along a path which has been referred to as a flat oval. This path is located generally below the plane through the peripheral lines of contact of the two sets of rollers. This cycle is repeated continuously for the gilling operation. The faller bars follow each other in this path in timed relation and in a uniform manner. As each faller bar is projected into the upper level its needles are caused to penetrate the web formed from the slivers by the feeding rollers, so that as the faller bar advances toward the delivery rollers, the needles comb the short staple lengths into parallelism.

What I have just described is one type of faller bar mechanism of a typical gill box. There are other types which vary somewhat from that which has just been described. For example a second type is that known as the intersection faller bar mechanism wherein a second set of faller bars substantially a duplicate of that already described, operates above the plane between the rollers, the faller bars thereof being moved as described above and also in timed relation to the movement of the first mentioned set, the needles of both sets of faller bars being projected through the web in timed relation; a third type differs from the first type described in that each faller bar is provided with two parallel rows of spaced apart needles across the length of the faller bar; a fourth type is like the third type just described, except that the double row of needles are interrupted for a substantial distance at their middle to provide a relatively wide space to provide two spaced apart sets of double rows of needles and in this type of device the slivers are fed to the feeding rollers so as to form two webs, one to be operated upon by one set of needles and the other by the other set of needles.

In the illustrated embodiments, I effect the reduction of the continuous filaments to short lengths by cutting edges incorporated into the gill box. The action of these cutting edges can be considered broadly from each of these three aspects: (1) they effect cutting by an upward projection thereof against the filaments from below and in the embodiment herein illustrated some of the objects of my invention are attained by associating the cutting edges with the faller bars so that the latter will be projected upwardly by and with the former; (2) they effect cutting by a movement transversely of the web, and here again I attain many of the objects of my invention by the association of the cutting edges with the faller bars, however, by such an arrangement that the former are moved longitudinally of the latter by and during the initial advance of the faller bars in the upper level; and (3) the association of the cutting edges with the faller bars is such that the former cut upwardly upon the upward projection of the faller bars and thereafter cut laterally by a cutting stroke in the direction of the length of the faller bars on the initial advance thereof in the upper level. For convenience of disclosure I have illustrated my invention in this third aspect

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where the cutting edges are given two successive cutting strokes in different directions, it being understood that these two cutting strokes can be considered as alternative practical applications of the broader aspects of my invention and I can employ the practice of either one or the other of the aforementioned two cutting strokes by itself, as suggested in the first two of the three aforementioned aspects.

Another object of my invention is the provision of an arrangement whereby the cutting operation is so performed as to effect the integrity and continuity of the web to a minimum degree and this object I attain by employing cutting edges whose length is relatively small as compared to the width of the web and predeterminedly positioning these cutting edges longitudinally and transversely of each other.

Another object of my invention is a provision whereby the cutting edges can be renewed or replaced inexpensively and quickly.

This disclosure by reference to details of construction is intended merely as illustrative of the exemplary arrangements whereby my invention may be practiced.

Figures 1 and 2 illustrate a typical intermediate gill box of the first mentioned type wherein is incorporated one arrangement for effecting the purposes of my invention. The feeding rollers are shown at 20 and the delivery rollers at 21 and 22 and those faller bars moving along the upper level of the oval path are shown for purposes of exemplification as comprised of a group of fourteen bars which number may be increased or decreased as desired. For convenience of description I have numbered these faller bars respectively 1 to 14. In a conventional apparatus these faller bars as well as those in the lower level are all alike and may comprise a base 25 from which projects upwardly the single row of needles 26 which extend uninterruptedly across the major length of the bar 25, the needles tapering at their upper ends to point 27.

Upon reference to Figures 1 and 2 it will be observed however that a number of the faller bars are not of this conventional character in that they are devoid of the needles 26 and have associated therewith cutting edges as will be more fully set forth in the description of Figures 4 to 12. It will be observed that the four faller bars numbered 1, 5, 9 and 13 are illustrated as so modified and I here wish to point out that this is entirely for purposes of exemplification, because as will shortly appear, the faller bars being modified may be varied at will both as to their number and as to their relative positions.

The modified faller bars are illustrated in Figure 6. It comprises a bar 25' which is defined by sides 30 and 31, ends 32 and a bottom 33 all dimensioned, contoured and related precisely as are the corresponding parts of bar 25 of the aforementioned conventional faller bar numbered "2" for example in Figure 1. The modified faller bar numbered "1" for example, is provided with the conventional inclined surfaces 34 adjacent its opposite end walls 32 and with the conventional guiding grooves 35 whereby the movement of the faller bars is effected by the conventional mechanism in the conventional manner. The significance of this is that this modified faller bar is entirely conventional also as to those characteristics whereby it also may be moved in a conventional manner and in conventional timed and spaced relation to all the other faller bars and as if it were conventional in all other respects.

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It differs from the conventional faller bar in that it does not carry any needles 26 as does the conventional faller bars and it has associated therewith one or more cutting edges which can be said to have replaced the needles.

I will now describe one structural arrangement whereby a cutting edge may be associated with the faller bar for effecting the purposes of my invention. Upon reference to Figure 8 it will be observed that the bar 25' is slotted longitudinally thereof at 40. This slot is cut through the top of the bar from 41 to 42 as shown in Figure 6 and is extended at each end to end walls 43 and 44 as undercuts beneath the overhanging top portions 45 and 46 as shown in Figures 8 and 9. The slot 40 opens through the bottom of the bar 25' as shown at 47 in Figures 7 and 8 and is also cut to an increased depth as shown at 48 in Figure 8 without, however, opening through the bottom wall.

The slot 40 is intended to receive the blade carrying bar 50 shown in Figures 4 and 5 to which reference will now be made for details thereof. This blade carrying bar 50 is of a length less than the full length of the slot longitudinally of the bar 25' as measured from end wall 43 to end wall 44, but its length is greater than the distance between end wall 43 and point 42 or between end wall 44 and point 41 so that once inserted in the slot the cutter carrying bar 50 cannot be removed therefrom. To permit of the installation of the cutter carrying bar into slot 40 and its removal therefrom, I show an exemplary arrangement in Figures 9 and 11 wherein the side wall 31 of the bar 25' is made of a separate piece and secured in position in any preferred or desired way such as by countersunk screws 53 shown in these figures.

The cutter carrying bar 50 has a downwardly projecting relatively long finger 55 and at a distance therefrom a downwardly projecting relatively short finger 57, the dimensions and positions of these two fingers being such that when the cutter carrying bar 50 is in the slot 40 in its position of Figure 8, the relatively long finger 55 will be received through the slot extension 47 cut through the bottom of the bar 25' and the relatively short finger 57 will be received in the slot enlargement 48, these fingers taking the relative positions shown in Figure 8.

The slot 47 is much longer than the thickness of finger 55 as is also true of slot enlargement 48 relatively to finger 57. It has already been pointed out that the carrier bar 50 is shorter than the all-over length of slot 40. As a result of this arrangement the cutter carrier bar 50 can have a limited reciprocation lengthwise of slot 40. By reference to Figure 8 of the drawings it will be noted that a spring 60 is positioned in the slot enlargement 48 with one end of the spring in abutting relation to the end wall 61 of that slot enlargement and with its other end in abutting relation to the aforementioned finger 57 so that the cutter carrier bar 50 is normally maintained at an extreme position to the left as in Figure 8. This position may be fixed by the engagement of finger 57 with end wall 64 of slot enlargement 48 or of finger 55 with end wall 66 of slot extension 47 or of the left end of cutter carrier bar 50 with end wall 43 of slot 40 or in any other preferred or desired manner.

The cutter carrying bar 50 is shown in cross section in Figure 5. It comprises a base 84 from which extends upwardly spaced apart side walls 85 and 86 which define a slot shown in Figure 4

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as extending for the full width thereof and opening at both ends. Extending upwardly from the upper edge of wall 86 are a number of flanges 87 and extending inwardly from each flange is a projection or finger 88. It is contemplated that a blade be associated with each flange and in the exemplifying embodiment four blades 82 are provided for the four flanges. These blades are illustrated as triangular in shape, the cutting edge 80 being formed on one of the edges. Each blade is provided with an opening 90 contoured and positioned to receive a projection 88. The opening 90 and projection 88 are preferably non-circular and similarly dimensioned and contoured so that when the two engage, the blade will be held in fixed relation. The blades may be assembled with the holder 50 in any preferred or desired manner and I will now suggest one way by which this can be effected. The bottom or base 20 of the blade is entered from one side into the slot or space between walls 85 and 86 and moved therealong, the engagement between a blade and a flange being effected by a relatively lateral flexure of the upper end of either the blade or the flange or of both so that projection 88 can enter opening 90. The flanges 87 are preferably made triangular to give ample backing to the blade. It is contemplated in this arrangement that the parts be so dimensioned that with the projection 88 received in the opening 90 the blade will be seated on the bottom of the slot between walls 85 and 86.

The construction thus far disclosed is exemplary of one manner whereby cutting edges may be associated with a faller bar.

I will at this point emphasize that the movement of all of the faller bars including those numbered 1, 5, 9 and 13 in Figure 1 is effected in the conventional way and by the conventional mechanism and that to this end those structural characteristics of the faller bar devised to effect such movement are retained in the modified faller bars 1, 5, 9 and 13, that the path along which the faller bars move remains unchanged and that therefore to this extent the mechanism now present in such conventional gill box for effecting the movement may be retained without change. It is in this manner that I attain some of the objects of my invention.

I will now set forth briefly the manner in which the apparatus thus far described operates and the extent to which it attains other objects of my invention. The reference character S in Figure 1 is applied to the slivers. These differentiate from the reconstituted slivers hitherto fed to the gill box, in that the slivers S' which I feed to the gill box are comprised of filaments of continuous length. In Figure 1 I show for exemplification, five of these slivers being fed simultaneously in lateral relation to the feed rollers 20 so that the web W formed thereby is relatively wide. This web is therefore constituted entirely of continuous filaments all arranged in the direction of movement of the web. The feeding rollers 20 are preferably corrugated as shown, to prevent slippage and function to flatten the slivers and unite them into the relatively wide web W.

As each faller bar arrives at the end of its travel in the lower level, it is projected upwardly into the upper level and into a position adjacent the feed rollers 20 and in this operation a conventional faller bar projects its needles through the web for its full width so that as it advances in the upper level, it will comb the web. However, when one of the modified faller bars is projected

vertically at the end of its travel in the lower level it projects its cutting edges 80 upwardly to cause them to cut through a narrow section along the width of the fabric and thus sever the filaments comprised in that section. In the exemplified showing of Figure 4, the modified faller bar will cut along four narrow sections in the direction of the width of the fabric but each of such restricted lengths that the continuity of the web is not materially affected.

The pattern of Figure 3 is intended to represent the cutting action effected by the vertical projection of the faller bars through a complete cycle of movement of all the faller bars upon that length of the web which is engaged at any moment between the two sets of rollers 29 and 24 and which length may be of the order approximately 12". The pattern width shown in Figure 3 is intended to represent the width of the web W and its length as measured vertically in that figure, is intended to represent the length of the web engaged between the two sets of rollers. The numbers at the left represent the successive cutting engagement during a complete cycle of operation of all sixteen faller bars, it being understood that the numbers 15 and 16 refer to two faller bars travelling reversely in the lower level and therefore not shown in Figure 1.

For convenience of reference the web section of Figure 3 is shown as divided into sixteen sections across its width each of a width corresponding to the width of the cut effected by one of the cutting edges upon its vertical projection. The sixteen sections are lettered for convenience of identification. This pattern shows that the modified faller bar 1 cuts through sections a, e, i and m of the web and that faller bar 5 cuts through sections b, f, j and n and that faller bar 9 cuts through sections c, g, k, o and faller bar 13 cuts through sections d, h, l and p so that all sixteen sections are cut. The cuts effected by the edges 80 are shown in this pattern as distributed laterally and longitudinally of the web so that the projection of all the cuts on a single line gives the resultant of a cut for the full width of a web without substantial overlap and without destroying the continuity of the web. The cycle shown in Figure 3 is repeated as the web is fed through the gill box. Since the cutting operation is performed upon the web at a point adjacent the feeding rollers and where all the filaments of which the web is comprised are under control of and are fed at the peripheral velocity of the feed rollers, the pattern of Figure 3 correctly presents the cycle of cutting even though the short staple lengths may thereafter be fed at varying speeds.

My process presents these additional advantages: the filaments before being cut are in parallelism by the fact that they are of extended length. Therefore when these filaments are cut, the short staple lengths will already be in an ordered position of parallelism and the movement of the mass which comprises the web as a whole will tend to maintain that relation; the reduction to short staple lengths is effected at one time upon the multiplied number of continuous filaments comprised in a plurality of slivers.

The pattern of Figure 3 is illustrative merely of one arrangement of cutting edges. It can be varied as to the number of cutting edges carried by a faller bar or by a change in their distribution among the faller bars or in the number or the order of the faller bars which are modi-

fied, it being contemplated by my invention that the cuts effected be for relatively narrow widths and be distributed laterally and longitudinally of the web length to effect cutting across the full width of the web without breaking the continuity of the web.

The cutting action has been thus far described as effected by an upward movement of the cutting edges. I will now describe an arrangement whereby the cutting action may be effected by moving the cutting edges laterally, i. e., longitudinally of the faller bars.

Reference has already been made to the fact that the cutter carrier bar 50 is mounted for a lateral movement to the right from its position of Figure 8 and I will now describe an arrangement for effecting this lateral movement automatically by reference to Figures 13 and 14 wherein modified faller bar "1" is assumed as in its position of Figure 1 immediately adjacent the feed rollers and at the moment when it has finished its projection into the upper level. Mounted from the frame element 100 adjacent the feed rollers 20 is a platform or bracket 101 which presents an inclined surface 102 in the path of the finger 55 which projects downwardly through the bottom of the faller bar so that when faller bar 1 starts its advance from that position finger 55 will be cammed to the right by inclined surface 102. This movement will effect a lateral throw of cutting edges 80. The speed of this throw will be appreciated from the fact that a complete cycle of movement of the faller bars is completed generally in less than four seconds.

In its broadest aspect a vertical cut and a lateral cut are alternatives. I have illustrated and described them as effected in succession by a single set of mechanism which effects the first upon the upward movement of the faller bar and the second immediately thereafter and during the initial advance thereof. This will explain the angle of the cutting edge shown in the drawings. For the first type of cutting this angle may diverge relatively little from the horizontal and for the second type of cutting it may diverge very little from the vertical. The angle shown is such as to effect both characters of cutting and any decrease in effectiveness that may result therefrom will be more than compensated for by the increased effectiveness of the lateral cutting as will now be pointed out.

Upon viewing Figure 1 it will be observed that small groups of filaments are segregated and closely compacted and held at spaced points between adjacent needles longitudinally of the web. This action is an important factor particularly in the lateral cut in that the cut will be effected in a length of the filaments engaged between the needles longitudinally of the web.

Where the two cuts are combined as aforementioned the lateral cutting which follows the vertical cutting can be considered as supplemental thereto and as an arrangement whereby the cutting action is completed so that any filaments that may have escaped cutting on the upper projection of the faller bars is eventually cut on the lateral projection thereof.

The combination of these two cutting actions in the manner set forth modifies the cutting action of the pattern of Figure 3 in this respect. On its upward stroke of modified faller bar 1 for example, a cutter will be projected upwardly to cut in the section a as shown by the heavy line at the extreme left. On its lateral stroke which follows immediately that cutter will be projected

laterally part way into section b. This will modify the pattern in that it will show an overlap between adjacent cuts but not to a sufficient extent to materially affect the continuity of the web.

In Figures 15 and 16 I show cutting edges associated with a faller bar wherein the needles have been retained and I have chosen for this disclosure that type of faller bar which has one row of needles 126 along one edge of the faller bar and a second parallel row of needles 126' along the other edge with the needles on one side shown as alternating laterally with and shorter than those on the other side.

One of the side walls 131 is made separable along with its needles and may be secured in its position of Figure 16 in any preferred or desired manner as by countersunk screws (not shown). While cutting edges may be associated with this type of faller bar in many ways, I have illustrated in Figures 15 and 16 an arrangement for that purpose such as is shown in Figures 6 and 8 wherein the central part of the faller bar is slotted through the top to receive a cutter carrying bar such as is shown in Figure 4 for upward projection therewith as well as for lateral movement thereabove effected by the mechanism and in the manner shown in Figures 13 and 14.

I have numbered these corresponding parts in Figures 15 and 16 as they have been numbered in Figures 6 and 8 except that the numbers have been increased by 100. It will therefore be understood that the description given of the details of the cutter carrying bar and of the cutters, the manner of the association of the two and the manner of association of the cutter carrying bar with the faller bar and the manner whereby the cutters are moved laterally as described in connection with Figures 4 to 12 is referred to for the description of these corresponding features in Figures 15 and 16.

The location of the cutting edges in the embodiment of Figures 15 and 16 as closely adjacent to and in between two sets of needles 126 and 126' provides a support for the cutters and their cutting edges and increases the holding action upon a group of filaments by adjacent needles between which they are passed for a more effective cutting operation and without imposing a stretching force upon the filaments and particularly so where the needles of the two rows are in lateral alternation.

In Figure 17 I show an embodiment similar to Figures 15 and 16 except that the cutter carrying bar has been reversed so that the finger 255 and the slot 247 are at the right and the finger 257, slot 248 and spring 260 are at the left and the cutting edges 180 face toward the left. I have therefore retained for these parts those reference characters which are used therefore in Figures 15 and 16.

It will be understood that the faller bars of the faller bar mechanism can be comprised entirely of the type shown in Figures 15 and 16 or can be partly of the type shown in Figures 15 and 16 and partly of the conventional type as shown in Figure 1 and that the cutting edges employed can be multiplied in number as desired.

It is desirable that there be a balance to the cutting action of the various cutters. This I may effect as follows: The faller bars which do the cutting alternate between the types shown in Figures 15 and 17 so that one cutting bar will cut laterally in one direction and the adjacent cutter bar will cut laterally in the opposite direction. To indicate how such alternation will

function I have illustrated the faller bar of Figure 17 in the position of faller bar 1 in Figure 1 and in connection therewith have illustrated an inclined camming surface 202 as positioned at the left as in Figure 13 and the inclined camming surface 302 positioned at the right so that the inclined surface 202 at the left will cam to the right those faller bars positioned as in Figure 15 and the inclined camming surface 302 will cam those faller bars positioned as in Figure 17 to the left. Figure 17 therefore will be understood as representing one faller bar of that alternation.

The disclosure made in Figures 15, 16 and 17 applies equally as well to that type of faller bar wherein there are two groups of two rows of needles one at the left end of the faller bar and the other at the right with a substantially large space in between and for such disclosure the break through Figures 15, 16 and 17 can be considered as representing that space.

It will also be understood that cutting edges can be associated to coact with a faller bar having a single row of needles and wherein the needles are retained.

The broad features of my invention can be considered from these aspects: merely as a manner of reducing continuous filaments to short staple lengths in which aspect the disclosure herein of the gill box apparatus must be considered merely as exemplary of one type of mechanism whereby this aspect of my invention may be practiced; as a manner of effecting the reduction simultaneously with and as part of the gilling operation in which aspect the details of construction of the gill box herein disclosed must be considered as exemplary mechanism whereby the gilling operation may be performed regardless of whether such mechanism is conventional or not; as a manner whereby my invention may be practiced in either or both aspects by existing apparatus converted for that purpose, in which third aspect the gill box mechanism disclosed is exemplary of one manner whereby such presently used conventional apparatus may be converted.

When the web is fed through the delivery rollers it is comprised of a mass of short lengths and is attenuated in the manner set forth. This mass is then fed to the trumpet 28 where it is compacted as shown in Figure 1 and then fed between rollers 29 which feed as well as compact the already compacted sliver into a receptacle. This is shown in Figure 2.

In selecting the gill box mechanism wherewith to effect the reduction of the filaments of continuous length to short staple lengths I am also enabled to accomplish the following: the attenuation, combing or both may be effected with and as part of the reduction procedure and progressively as the short staple lengths are cut; the effectuation of the reduction by a cutting operation is facilitated by the presence of needles in the gill box which segregate the large group of filaments into smaller groups and hold these smaller groups for that cutting operation.

An apparatus which will cut each and every filament is the ideal. It is believed that the process and apparatus herein disclosed will approximate that ideal. However, even though the performance falls slightly short of the ideal in that filaments may occasionally escape being cut that action will not effect the efficiency of the process or the effectiveness of the apparatus if filaments that have escaped cutting are not proportionately large.

Having thus described my invention and illus-

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trated its use, what I claim as new and desire to secure by Letters Patent is:

1. In combination with a gill box employed in the production of yarn from continuous filaments and comprising faller bars and mechanisms for moving the faller bars in a continuous path in one portion of which the faller bars are projected successively into an upper level, of a cutting edge associated with a faller bar for projection upwardly therewith in the aforementioned upward projection thereof to cause the cutting edge to cut through a group of the continuous filaments being treated in the gill box to thereby reduce the continuous filaments to short staple lengths simultaneously with the gilling operation and means for moving said cutting edges laterally to effect a second cutting operation immediately after said upward projection of the faller bar.

2. In combination with a gill box employed in the production of yarn from continuous filaments and comprising faller bars and mechanism for moving the faller bars in a continuous path in one portion of which the faller bars are projected successively into an upper level, of a cutting edge associated to move with a faller bar therewith in such portion of its movement to effect a cutting operation through the web being treated in the gill box, and means for giving said cutting edge a lateral movement immediately after said faller bar has been projected into the upper level to cut through a group of filaments.

3. The process of subjecting a web comprised of many laterally related filaments of continuous length to a treatment which reduces the filaments to courses of short staple length simultaneously with and as part of that portion of the gilling operation wherein the faller bar needles are projected to penetrate the web at spaced apart points along a line transverse of the web, said process comprising severing adjacent filaments comprised in a width of the web for a distance which encompasses a group of needles and simultaneously with the penetration of the web by that group, the severing cut being extended and continuous for at least the full width of said group of needles and being substantially along said transverse line of such penetration, the severing cut being effect-

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ed first in one direction and thereafter in a direction at an angle thereto.

4. The combination with a faller bar of a gilling operation, means for securing thereto a plurality of blades spaced longitudinally of the faller bar, said blades each presenting a cutting edge which spans a plurality of needles, and means for automatically moving said blades lengthwise of the faller bar as the faller bar is projected to cause its needles to penetrate the web.

5. The combination with a faller bar of a gilling operation, means for securing thereto a plurality of blades spaced longitudinally of the faller bar, said blades each presenting a cutting edge which spans a plurality of needles, and means for automatically moving said blades lengthwise of the faller bar as the faller bar is projected to cause its needles to penetrate the web, and each said cutting edge spanning a plurality of needles.

6. In a gill box apparatus the combination with a faller bar thereof, of means for detachably securing a plurality of blades to the faller bar with their cutting edges extending lengthwise of the faller bar and in laterally spaced relation, and means for shifting said blades laterally as the faller bar is projected toward a web, the cutting edges of the blades being presented at such angle to the horizontal that cutting will be effected thereby both on the vertical projection of the faller bar and the lateral shifting of the blades.

7. In combination with a faller bar of a faller bar mechanism contained in the gill box employed in the production of yarn from continuous filaments, a cutting edge mounted on said faller bar to effect cutting of the continuous filaments into short staple lengths simultaneously with the movement of the faller bar, and means for giving said cutting edge an additional cutting movement relatively to the faller bar to cause the cut to be of greater length than that of the cutting edge.

8. In a gilling apparatus the combination with a gill box faller bar having conventional needles of a blade holding member and means for detachably affixing the member to the faller bar, to reciprocate vertically with the faller bar and means to move said member longitudinally of the faller bar as the faller bar is reciprocated vertically.

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