

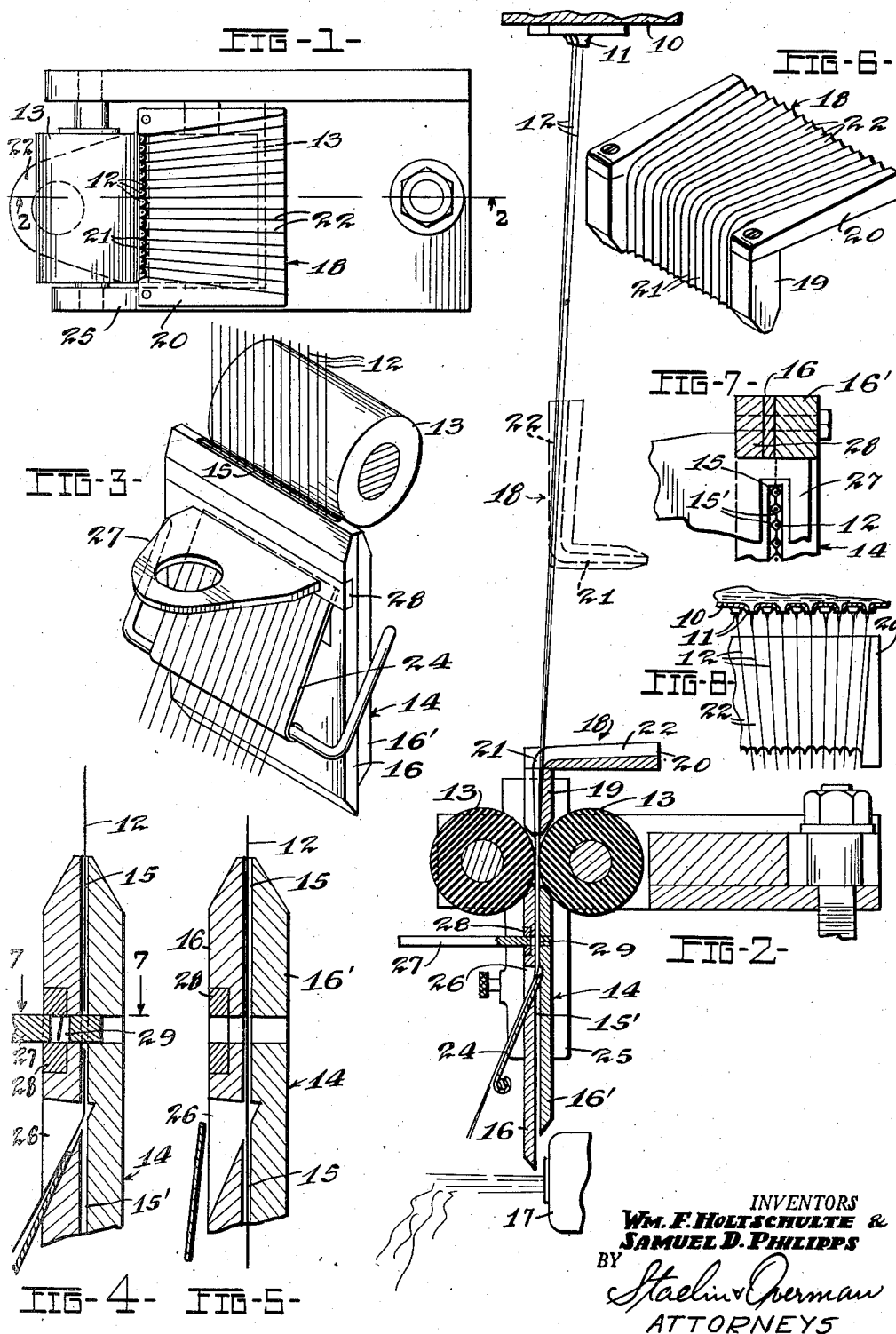
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APPARATUS FOR GUIDING AND THREADING FIBERS

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APPARATUS FOR GUIDING AND
THREADING FIBERS

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This invention relates generally to apparatus for producing and continuously attenuating fibers of thermoplastic material and refers more particularly to an improved threading and guide mechanism for the fibers.

The present invention is readily adaptable to operations requiring the alignment or spacing of a multiplicity of single fibers or strands of fibers and particularly in instances where the fineness of the fibers and spacing is such as to make the handling of individual fibers a tedious operation.

The forming of fine continuous type glass fibers has been chosen as an example of the use which a device of the present construction is well adapted. In one such method it is the practice to flow a plurality of streams of molten glass from a container or melter and attenuate the streams to filaments and feed the filaments continuously into a high velocity flame of a burner to form very fine fibers. With this type of fiber forming operation it is necessary to introduce the primary fibers singly into the flame and spaced apart so that they do not weld together when softened by the high degree of heat within the flame.

In order to achieve maximum production of fibers and burner efficiency the fibers are normally spaced as close as practicable by means of a guide which supports the fibers as they are attenuated by the gaseous blast. The primary glass fibers or filaments are pulled from the container orifice at a uniform rate by continuously rotating friction rolls or the like to assure a substantially uniform fiber diameter. Heretofore, it has been the practice to thread each fiber separately by hand into the guide when the operation was started. This operation was not only tedious but required a great length of time when a multiplicity of primary fibers was employed. Also this hand feeding resulted in a loss of material due to the time interval between the introduction of the first and last fibers into the flame.

There are, of course, many other fiber fabricating processes in which individual fibers are guided and to which the present invention may be readily adapted.

It is one of the principal objects of this invention to reduce the time required to thread the guide with the fibers by providing for simultaneously threading all the fibers into the guide in only a fraction of the time previously required to separately thread each fiber in the guide.

A further object of this invention is to provide a threading device capable of being used in connection with equipment for producing glass fibers

wherein the latter are formed by flowing streams of the thermoplastic material through feeder orifices arranged in a row and which are spaced laterally from each other greater distances than the spacing between the guide channels for the fibers. As a result, the fibers travel in converging paths from the feeder to the guide channels forming a "fan." This arrangement of the fibers tends to complicate threading of the fibers in the guide channels.

In accordance with this invention, a removable guide part is provided having a guiding portion in which there is a plurality of grooves which correspond in number to the number of fibers and also correspond in lateral spacing to the lateral spacing of the guide channels. The guide has a comb portion extending at substantially right angles to the guide portion and formed with a like number of grooves which flare or fan outwardly sufficiently to correspond to the spacing of the fibers adjacent the delivery side of the feeder. Thus, at initiation of the operation of the process, the fan of fibers are gathered in a flattened bundle by hand and introduced between the moving feeder rolls, the action of which tends to spread out the fibers due to their tendency to assume a right angle relation with their source at the orifice. The fibers thus acquire substantially their final operating arrangement while still non-uniformly spaced.

The moving fibers adjacent the feeder orifices are simultaneously engaged in the grooves in the comb and while in this position the threading device is lowered from the feeder and swung through approximately 90° to engage the fibers in the grooves of the guide portion of the device. The device is then positioned over the pulling rolls with the grooves in the guide portion thereof in alignment with the channels in the stationary fiber guide so as to enable the fibers to enter the latter channels. This arrangement greatly facilitates threading the fibers into the feeding and guiding mechanism and thereby reduces the idle time of the equipment to a minimum.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawing, wherein:

Figure 1 is a fragmentary plan view of a device constructed in accordance with this invention;

Figure 2 is a sectional view taken substantially on the plane indicated by the line 2—2 of Figure 1 and also diagrammatically showing a feeder in combination with the device;

Figure 3 is a fragmentary perspective view of the device shown in Figures 1 and 2;

Figures 4 and 5 are fragmentary sectional views showing parts of the apparatus in different positions;

Figure 6 is a perspective view of the combined guide and comb construction;

Figure 7 is a sectional view taken substantially on the plane indicated by the line 7-7 of Figure 4; and

Figure 8 is a fragmentary view of the device shown in Figure 6 when placed in fiber engaging position below a feeder bushing.

For the purpose of illustrating this invention, the combined threading and guiding device is shown in connection with the production of glass fibers. However, it will be understood as this description proceeds that the device may be advantageously employed in practically any instance where the spacing of fibers or filaments, regardless of their composition, is determined by a guide interposed between the fiber supplying means and the fiber processing equipment.

With the above in view, reference is made to Figure 2 of the drawings, wherein it will be noted that the reference character 10 indicates a feeder adapted to contain a body of molten glass and having a multiplicity of laterally spaced orifices 11 through which molten glass flows in the form of streams. As the glass streams are drawn downwardly they harden upon leaving the feeder 10 to form filaments or fibers 12 and the filaments are then directed between a pair of driving rolls 13. The driving rolls, which may be of rubber or other resilient material are, respectively, rotatably supported at opposite sides of the path of the fibers and cooperate with one another to frictionally engage the fibers and attenuate them as they are fed into succeeding mechanism.

The fibers pass between the rolls 13 in lateral spaced relationship and enter a stationary guide 14 supported directly beneath the rollers 13 and provided at its upper end with a slot 15 communicating with a series of channels 15'. The lateral spacing of the channels 15' is usually somewhat less than the corresponding spacing of the orifices 11, so that the fibers travel along converging paths from the feeder to the guide 14 and are thereby confined into a more compact space.

As shown in Figures 2, 4 and 5, the guide 14 comprises a pair of plates 16 and 16' having registering grooves in adjacent faces forming the channels 15'. The primary fibers 12 are delivered by the guide to a position opposite a burner diagrammatically illustrated in Figure 2 of the drawings and indicated by the reference character 17. The burner 17 is preferably of the type capable of producing an intensely hot blast of extremely high velocity, so that the primary fibers are softened by the heat of the blast and are attenuated by the high velocity of the blast into extremely fine staple-like fibers.

Although the apparatus briefly described above enables forming glass or thermoplastic filaments in substantially continuous operation, nevertheless, there are instances when the process must be discontinued. For example, the operation of the apparatus must be discontinued periodically to make the necessary replacements or repairs and there are times when the apparatus must be shut down, because of breakage of one or more of the filaments. Regardless of the cause of the shut down, it is necessary to thread the filaments into the guide 14 before operation of the equip-

ment is initiated. As previously stated, it has been the practice to handle each fiber separately during threading of the fibers into the guide. This requirement delayed initiating the process and materially reduced the production rate of the apparatus.

In accordance with the present invention, the time required to thread the filaments into the guide is substantially reduced by the device designated in the several figures of the drawings by the reference character 18. The device 18 comprises a guiding portion 19 and a comb portion 20 extending at right angles from the guiding portion 19. The guiding portion 19 is formed with a plurality of grooves 21 corresponding in number and spacing to the channels 15' in the guide 14. The comb portion 20 is formed with a corresponding number of grooves 22 having the free ends spaced laterally from each other distances corresponding substantially to the lateral spacing of the orifices 11 in the feeder 10 and having the opposite ends registering with the entrant ends of the grooves 21. The guiding portion 19 is adapted to be removably secured to the frame structure 25 above the rolls 13 with the grooves 21 respectively vertically aligned with the channels 15' so that the filaments 12 are guided by the portion 19 between the rolls 13 into the channels 15' of the guide 14.

With the construction thus far described, it will be noted that when it is desired to initially start the operation of the apparatus, the device 18 is removed from its position in operative relation to the rolls 13. The operator then first grasps the fibers or filaments adjacent the orifices 11 in one hand and pulls them downwardly, breaking off the excess length of the fibers to even the ends of the resulting bundle which is then introduced between the rolls 13. As the fibers are pulled by the rolls 13 they tend to spread out between the rolls into approximately their operative relation and enter the slot 15 of the guide 14. The device 18 is then placed against the fibers in the region of the orifices with the comb portion 20 facing them so that the fibers enter the grooves 22. The comb 20 is then moved downwardly with the fibers or filaments in the grooves 22 and at the same time rotated through 90° of travel to transfer the filaments into the grooves 21 of the guiding portion 19 of the threading device. In this position the device is replaced in the frame 25 and the fibers are held in the grooves by reason of the proximity of the end guide to the rolls as shown in Figure 2. In this latter position of the guide 19, the grooves 21 are aligned with the channels 15' so that the rolls 13 may advance the filaments into their respective channels.

As the filaments are advanced downwardly they pass through the slot 15 and are deflected laterally outwardly from the guide 14 by a deflector 24. The deflector 24 is supported for sliding movement in a generally vertical direction on the guide supporting structure 25 and in its retracted position shown in Figure 2 projects across all of the channels 15'. In this connection, it will be noted that the plates forming the guide 14 are formed with a recess 26 to not only enable retracting the deflector 24 across the channels 15' but to also permit the filaments to pass out of the guide.

The deflector is primarily employed to prevent any of the fibers from prematurely entering the channels 15'. When all of the fibers are passing uniformly through the slot 15 the deflector may be removed to the position shown in Figure 4 and the filaments severed at a point directly above

the deflector. For accomplishing this, a knife 27 is supported for sliding movement transversely of the guide 14 between the deflector 24 and the rolls 13. The knife is placed in the Figure 2 position prior to initially starting the fibers. As shown in Figures 2, 4, 5 and 7, the knife 27 is guided by a member 28 secured in the plate 16 and is provided with an elongated slot 29 there-through to enable uninterrupted passage of the filaments through the slot 15 when the knife 10 is in severing position. Thus it will be noted that the length of filaments deflected from the guide 14 may be instantly uniformly severed and removed from the guide upon retraction of the knife from the guide.

The fibers even though flexible in greater lengths are sufficiently rigid when under the influence of the guide 19 and rolls 13 to hold their relative spacing and pass directly into their respective channels 15' in the lower part of the guide 14. The bottom edge of the guide terminates adjacent the flame of the burner 17 into which the fibers are fed.

Various modifications may be resorted to within the spirit and scope of the appended claims.

We claim:

1. Fiber producing apparatus comprising a guide for positioning a plurality of fibers in lateral spaced relationship, a source for supplying fibers to the guide with the spacing between adjacent fibers somewhat greater than the spacing of the fibers in the guide, and a fiber threading device having angularly positioned comb and guide portions, said comb portion engageable with the fibers during threading and said guide portion engageable with the fibers during guiding, said guide portion having fiber receiving grooves spaced laterally from each other distances corresponding to the fiber spacing effected by said guide, said comb also having grooves diverging from the grooves in the guide portion of the device and spaced from each other at the outer ends distances substantially corresponding to the spacing of the fibers at the source.

2. In a fiber producing apparatus including a guide for positioning a plurality of fibers in lateral spaced relationship, a source for supplying fibers to the guide with the spacing between adjacent fibers somewhat different than the spacing of the fibers in said guide, and a fiber threading device comprising a member associated with said guide and having angularly related grooved portions, one of said portions adapted at times to engage the fibers adjacent the source and co-operating with said other portion to alter the spacing between the fibers to correspond with the fiber spacing in said guide when said device is positioned adjacent the guide.

3. Fiber producing apparatus comprising a guide having a plurality of laterally spaced channels for respectively receiving a corresponding number of fibers, means for supplying fibers to the guide with the spacing between adjacent fibers somewhat greater than the spacing of the channels in the guide, means for threading the fibers into the channels including a device having angularly extending first and second portions, one of said portions engageable at times with the fibers in advance of the guide and grooved to alter the lateral spacing of the fibers passing from the source of supply to the lateral spacing of the guide channels and said other portion having grooves for aligning the fibers with said channels, and means for continuously feeding said fibers.

4. In a fiber producing apparatus including means for supplying fibers with adjacent fibers spaced laterally from each other, guide means for positioning the fibers in predetermined lateral spaced relationship, said guide having channels for respectively receiving the fibers, a threading device removably arranged between the supply and fiber positioning means comprising a guide portion provided with grooves registerable with the guide channels and having an angularly extending portion provided with grooves diverging from the entrant ends of the grooves in said guide portion and operable at times to position said fibers in said guide grooves, and means for continuously feeding said fibers.

5. In a fiber producing apparatus including a feeder having a plurality of laterally spaced orifices for flowing a corresponding number of streams of glass to form filaments, means for continuously drawing said filaments, a guide spaced from the feeder having a plurality of channels spaced laterally from each other distances somewhat less than the distance between the orifices and respectively engageable with the filaments, a filament threading device comprising a removable member positioned between the feeder and guide for aligning fibers therein, said device having angularly extending guide and comb portions, said guide portion having filament receiving grooves spaced from each other distances corresponding to the lateral spacing of said channels, and said comb portion having filament receiving grooves diverging from the receiving ends of the grooves in the first named portion and having the free ends of said diverging grooves spaced laterally from each other distances corresponding substantially to the spacing between said orifices.

6. Fiber producing apparatus comprising a feeder having a plurality of laterally spaced orifices for flowing a corresponding number of streams of glass to form filaments, means for continuously drawing the filaments, a guide having channels therein associated with said drawing means including a removable device having angularly extending grooved guide and comb portions, said guide portion having filament receiving grooves spaced laterally from each other distances which are somewhat less than the spacing between the orifices and in alignment with said channels, and said comb portion having filament receiving grooves which diverge from the receiving ends of the grooves in the first portion and are spaced from each other at the free ends distances which correspond to the spacing between the orifices.

7. Fiber producing apparatus comprising a guide having laterally spaced channels for guiding fibers along a predetermined path of travel, a selectively operable plate supported externally of the guide and movable into and out of the path of travel of the fibers for deflecting the fibers from the guide, and means for severing the fibers in the guide directly above the plate.

8. Fiber producing apparatus comprising a guide having laterally spaced channels for guiding fibers along a predetermined path of travel, a plate supported for sliding movement in a plane inclined with respect to said path of travel and movable across the guide channels to deflect the fibers from the guide, and a knife supported for sliding movement transversely of the guide between the entrant end of the latter and deflector for severing the fibers in the guide.

9. Fiber producing apparatus comprising a

pair of driving rolls, means for directing a plurality of laterally spaced filaments between the rolls, a guide at the delivery side of the rolls having laterally spaced channels for receiving the filaments, a plate movable across the channels to deflect the filaments out of the guide, and a knife supported for sliding movement transversely of the guide between the rolls and deflector plate for severing the filaments in the guide channels.

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The following references are of record in the file of this patent:

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