May 29, 1945. S. C. NELSON 2,377,173

TOW GUIDE

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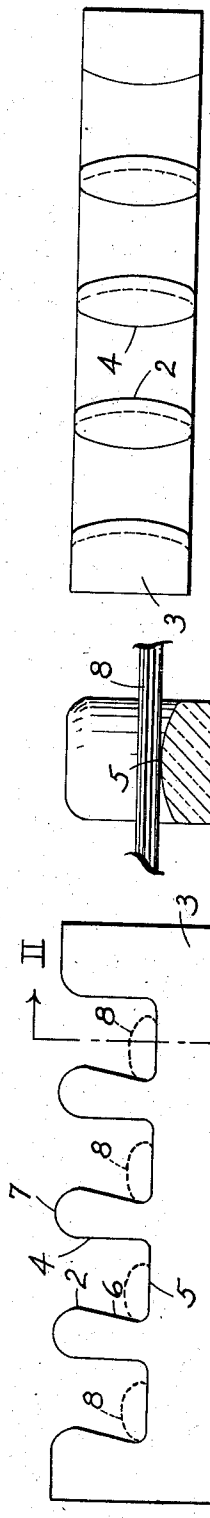


Fig. 1

Fig. 2

Fig. 3

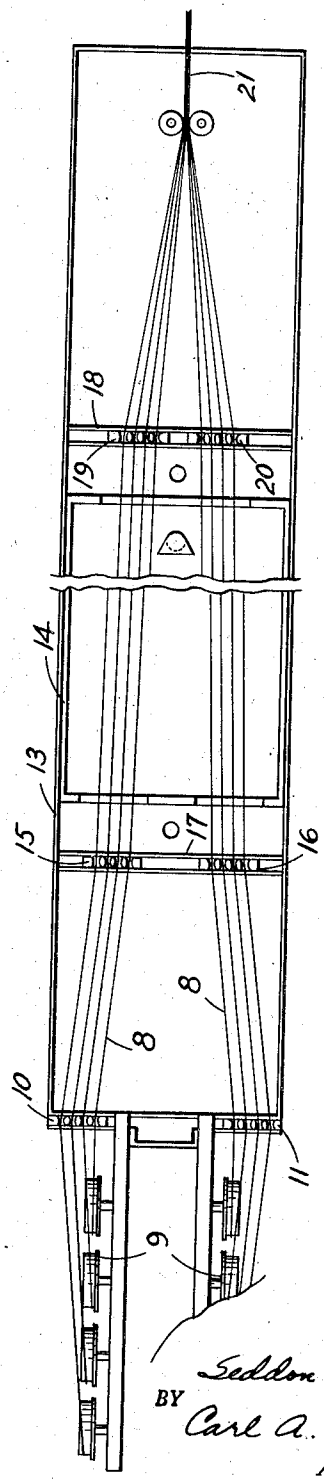


Fig. 4

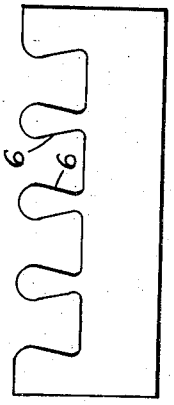


Fig. 5

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TOW GUIDE

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12 Claims. (Cl. 242—157)

This invention relates to guides for filamentary material and more particularly to guides for controlling the movement and shape of bundles of filamentary material during liquid treatment thereof.

It is difficult to insure equal and uniform liquid treatment of filamentary material in the form of tows, yarns, or other bundles, especially when the bundles comprise a large number of individual filaments, because the filaments tend to adhere together in the form of a round rope or cable, under the impact of the treating liquid thereagainst, so that all parts of the bundle, and all parts of each filament comprising the same, are not accessible to the liquid and, therefore, the filaments and bundles are variously conditioned thereby.

It is an object of the present invention to provide a special guide by means of which a plurality of filamentary bundles are passed into or through a liquid treating zone, in substantially flattened or spread out condition, and in side-by-side relationship, so that all of the bundles, and all parts thereof, are equally available to the treating liquid and uniformly conditioned by the same. Further objects and advantages of the invention will be apparent from the drawing and the description thereof given hereinafter.

In the drawing illustrative of the invention:

Figure 1 is an elevation view of a guide constructed in accordance with the invention;

Figure 2 is a section taken on line II—II of Figure 1;

Figure 3 is a top plan view of the guide shown in Figure 1,

Figure 4 is a plan view showing an application of the guide in the treatment of a plurality of filamentary bundles, and

Figure 5 is a modification of the guide shown in Figure 1.

As shown in Figures 1 to 3, the guide comprises a plurality of guiding members 2 which are formed integrally with and project from a common support 3. Each guiding member has two side walls constituted by arcuate guiding surfaces 4 and 6 which are separated at their bases but which smoothly and gradually merge together through convex surface 7, at their ends opposite their bases. Adjacent pairs of guiding members are joined by an arcuate surface 5 on the support which gradually merges with and joins the guiding surface 4 of one guiding member with guiding surface 6 of an adjacent guiding member. In the preferred embodiment of the invention at least one of the two guiding surfaces extending from surface 5 is inclined with respect to that surface and partially overhangs the same, as shown in Figure 1. The other guiding surface may also partially overhang the joining surface 5, or it may extend substantially perpendicularly therefrom. Arcuate guiding surfaces 4, 6 and 5 are convex facing the channel which is defined thereby. The channel is open at the top and diverges in both directions from an intermediate transverse plane through the channels of the guide, and the depth of the guide is at least as great and preferably greater than the width of the channel at its narrowest portion to provide a long bearing surface along the path of travel for the filamentary bundles through the guide to minimize frictional wear on the filaments and facilitate passage thereof. Surface 5 curves into or merges smoothly with the arcuate surfaces 4 and 6 of adjoining pairs of guide members, and is convex in the direction of travel of the filamentary material as seen more particularly in Figure 2. As seen in Figs. 1 and 5, transversely of the direction of travel of the material, surface 5 comprises a plurality of substantially horizontal approximately straight-line intercepts with parallel planes which are generally perpendicular to the direction of travel of the material, so that as the bundles of filaments pass thereover, the bundles tend to spread out on both sides of surface 5 in the direction of the guiding surfaces 4 and 6. It will be observed that any section taken transversely of the direction of travel of the filamentary bundles through the guide produces three straight lines connected by curves at their points of junction so that there are no sharp corners in the guiding surfaces which would tear or otherwise damage the filaments. In practice, the filamentary bundles slip easily between the two arcuate side walls and travel over the convex bottom of the channel in substantially flattened or spread out shaped and in free, unimpeded, and stream-lined condition. In Figure 4 there is shown a practical adaptation of the guide of our invention to the liquid treatment of a plurality of bundles of filamentary material. The filamentary bundles 8 are shown advancing from a plurality of feed rollers 9. The filamentary bundles may be coming from another treating device or may be freshly spun artificial filaments coming from a coagulating medium. Two guides 10 and 11 constructed in accordance with the invention are vertically mounted at spaced points on one end of a chamber 13 which supports at least one trough 14

wherein the filamentary bundles are subjected to liquid treatment. Chamber 13 may support a plurality of troughs for treating the filamentary bundles successively with different treating liquids. Another pair of guides 15 and 16 constructed according to the invention, are mounted vertically on cross-bar 17 positioned in chamber 13.

As shown, the guides serve to deflect the bundles from their normal course of travel and direct them into trough 14 through which they move while maintaining their substantially flattened shape and in side-by-side relationship. After passing through trough 14 or other liquid treating zone, the various filamentary bundles may be passed through another set of guides 19 and 20 mounted on cross-bar 18, and if desired, may then be united into a single thick tow, as at 21, and forwarded for further processing as, for example, to a staple fiber cutter for cutting into discontinuous fibers of any desired length.

Guiding surface 6 of each guiding member, which preferably partially overhangs convex surface 5 in the direction in which the filamentary material is deflected also serves to maintain each bundle within the confines of the respective channels at all times even when the tension on the bundle is relaxed and whether such relaxation occurs while the bundle is traveling over surface 5 or is at rest thereon for any reason.

As shown in Figure 5, the guide may be modified so that each of the guiding surfaces comprising each guiding member 2 partially overhangs the respective convex surfaces 5 as shown at 6, which construction may be preferable in some cases as when the guide is so mounted or positioned that the tendency for the filamentary bundles to escape from or over-ride the channels is more pronounced.

The guides may comprise any number of open channels defined by convex surfaces 4, 6 and 5 for handling or manipulating any number of bundles of filamentary material to insure simultaneous liquid treatment of all of the bundles while the bundles are in substantially flattened or spread out condition, and the side walls 4 and 6 may be of any length to provide channels of any desired depth.

By the use of my improved guide for manipulating a plurality of filamentary bundles and controlling the movement and shape thereof during liquid treatment, it is possible to separately but simultaneously liquid-treat all of the filaments to be subsequently formed into a thick tow, in comparatively small, substantially flattened subdivisions, and thus insure that all of the portions of the final tow are equally treated and conditioned, and in short runs through the treating liquid, and hence are characterized by uniform physical properties.

The guides may be used as shown in Figure 4 for controlling the movement and shape of the filamentary bundles at a point removed from the liquid treating zone, or they may be submerged completely or partially in the liquid for supporting the bundles therein. Obviously, also, the arrangement shown in Figure 4 may be modified to include additional guides positioned within trough 14 for controlling the movement and shape of the filamentary bundles therein and such an arrangement may be desirable when the filaments being treated are heavier than the density of the bath so as to ensure that the bundles do not sink therein. The guides have the advantage that when positioned in the liquid bath or the liquid treating zone, the rounded contours of the channels thereof permit free and smooth passage therethrough of both the filamentary material and the treating liquid. The new guide may be used, also, for controlling the movement and shape of filamentary bundles traveling in or through gaseous media.

The guides are preferably constructed of aluminum oxide, especially where the treating liquid comprises hot water, but they may be constructed of any other suitable material such as glass, porcelain, Bakelite, Durez, Alsimag, agate, stainless steel, and the like.

While preferred embodiments of the invention have been disclosed, it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. A guide for filamentary material comprising at least two spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each of said guiding members having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the arcuate guiding surface of an adjacent member facing that of the former surface, said latter two arcuate guiding surfaces and the joining surface being convex facing a channel defined thereby and open at the top for the reception and passage therethrough of filamentary material, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

2. A guide for filamentary material comprising a plurality of spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each guiding member having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the arcuate guiding surface of an adjacent member facing that of the former member, at least one of said latter guiding surfaces partially overhanging said joining surface, said latter two guiding surfaces and the joining surface being convex facing a channel defined thereby and open at the top for the reception and passage therethrough of filamentary material, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

3. A guide for filamentary material comprising a plurality of spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each guiding member having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the guiding surface of an adjacent member facing that of the former member, one of said latter two arcuate guiding surfaces partially overhanging said joining surface, and the other of said latter two guiding surfaces extending substantially perpendicularly from said joining surface, said latter two arcuate guiding surfaces and said joining surface being convex facing a chan-

nel defined thereby, for the reception and passage therethrough of filamentary material, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

4. A guide for filamentary material comprising a plurality of spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each guiding member having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the arcuate guiding surface of an adjacent member facing that of the former member, both of said latter two arcuate guiding surfaces partially overhanging said joining surface, said latter two arcuate guiding surfaces and said joining surface being convex facing a channel defined thereby, and open at the top for the reception and passage therethrough of filamentary material, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

5. A guide for filamentary material comprising at least two spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each of said guiding members having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the arcuate guiding surface of an adjacent member facing that of the former member, said latter two arcuate guiding surfaces and the joining surface being convex facing a channel defined thereby, which channel is open at the top and diverges in both directions from an intermediate transverse plane through the channels of the guide, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

6. A guide for filamentary material comprising a plurality of spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each guiding member having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the arcuate guiding surface of an adjacent member facing that of the former member, at least one of said latter guiding surfaces partially overhanging said joining surface, said latter two guiding surfaces and the joining surface being convex facing a channel defined thereby, which channel is open at the top and diverges in both directions from an intermediate transverse plane through the channels of the guide, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

7. A guide for filamentary material comprising a plurality of spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each guiding member having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the guiding surface of an adjacent member facing that of the former member, one of said latter two arcuate guiding surfaces partially overhanging said joining surface, and the other of said latter two guiding surfaces extending substantially perpendicularly from said joining surface, said latter two arcuate guiding surfaces and said joining surface being convex facing a channel defined thereby, which channel is open at the top and diverges in both directions from an intermediate transverse plane through the channels of the guide, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

8. A guide for filamentary material comprising a plurality of spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each guiding member having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the arcuate guiding surface of an adjacent member facing that of the former member, both of said latter two arcuate guiding surfaces partially overhanging said joining surface, said latter two arcuate guiding surfaces and said joining surface being convex facing a channel defined thereby, which channel is open at the top and diverges in both directions from an intermediate transverse plane through the channels of the guide, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

9. A guide for filamentary material comprising at least two spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each of said guiding members having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the arcuate guiding surface of an adjacent member facing that of the former surface, said latter two arcuate guiding surfaces and the joining surface being convex facing a channel defined thereby, which channel is open at the top and diverges in both directions from an intermediate transverse plane through the channels of the guide, the depth of the guide in the direction of travel of the filamentary material being at least as great as and preferably greater than the width of the channel at its narrowest point, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

10. A guide for filamentary material comprising a plurality of spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each guiding member having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the arcuate guiding surface of an adjacent member facing that of the former member, at least one

of said latter guiding surfaces partially overhanging said joining surface, said latter two guiding surfaces and the joining surface being convex facing a channel defined thereby, which channel is open at the top and diverges in both directions from an intermediate transverse plane through the channels of the guide, the depth of the guide in the direction of travel of the filamentary material being at least as great as and preferably greater than the width of the channel at its narrowest point, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

11. A guide for filamentary material comprising a plurality of spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each guiding member having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the guiding surface of an adjacent member facing that of the former member, one of said latter two arcuate guiding surfaces partially overhanging said joining surface, and the other of said latter two arcuate guiding surfaces extending substantially perpendicularly from said joining surface, said latter two arcuate guiding surfaces and said joining surface being convex facing a channel defined thereby, which channel is open at the top and diverges in both directions from an intermediate transverse plane through the channels of the guide, the depth of the guide in the direction of travel of the filamentary material being at least as great as and preferably greater than the width of the channel at its narrowest point, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

12. A guide for filamentary material comprising a plurality of spaced guiding members formed integrally with and projecting laterally from spaced points along a common support, each guiding member having two side walls constituted by arcuate guiding surfaces, an arcuate surface on the support gradually merging with and joining the arcuate guiding surface of one member with the arcuate guiding surface of an adjacent member facing that of the former member, both of said latter two arcuate guiding surfaces partially overhanging said joining surface, said latter two arcuate guiding surfaces and said joining surface being convex facing a channel defined thereby, which channel is open at the top and diverges in both directions from an intermedaite transverse plane through the channels of the guide, the depth of the guide in the direction of travel of the filamentary material being at least as great as and preferably greater than the width of the channel at its narrowest point, said joining surface comprising a plurality of parallel substantially horizontal, approximately straight lines lying therein transversely to the direction of travel of the filamentary material over said surface.

SEDDON C. NELSON.