Aug. 1, 1967 C. G. GILMORE ET AL 3,333,313

FILAMENT INTERLACING APPARATUS

Filed Dec. 6, 1965

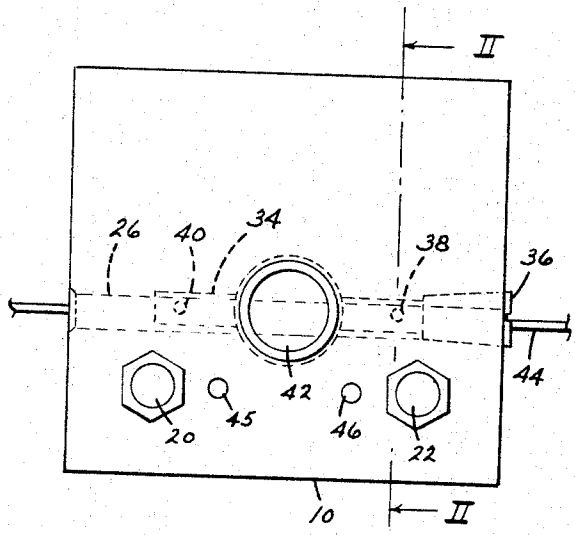


Fig - 1

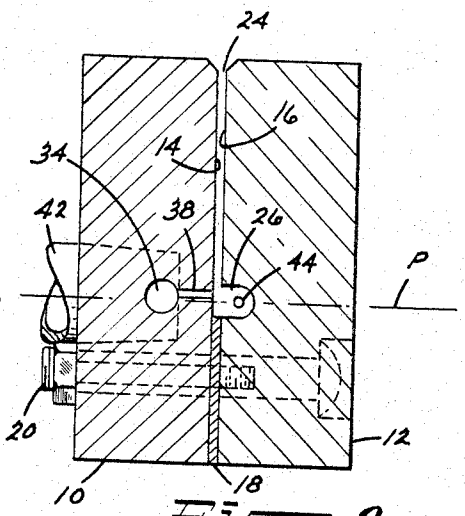


Fig - 2

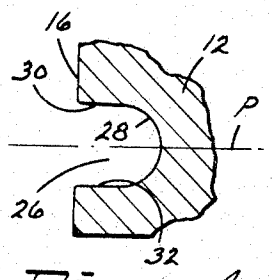


Fig - 4

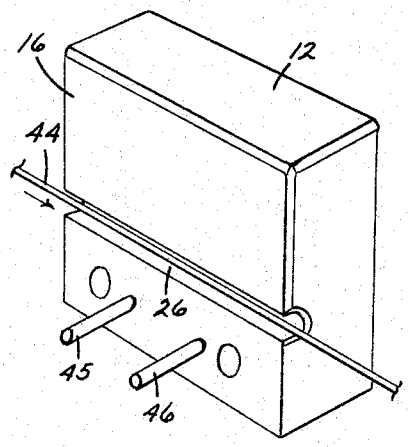


Fig - 3

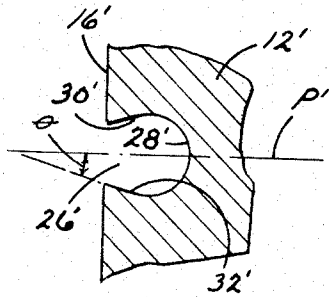


Fig - 5

United States Patent Office 3,333,313
Patented Aug. 1, 1967

3,333,313

FILAMENT INTERLACING APPARATUS

Charles G. Gilmore and Raman A. Patel, Meadville, Pa., assignors to FMC Corporation, Philadelphia, Pa., a corporation of Delaware

Filed Dec. 6, 1965, Ser. No. 511,679
7 Claims. (Cl. 28—1)

The present invention relates to an improved apparatus for making a continuous filament interlaced or tangled yarn.

Continuous filament synthetic yarn as initially manufactured has little or no twist and when such yarn is processed into a fabric there is a tendency for the individual filaments to wander away from the main bundle and become snagged on the processing equipment. In order to provide a compact unitary bundle of filaments it has long been customary to subject the initially manufactured yarn to a twisting operation. Continuous filament yarn needs only a slight twist (about one turn per inch) to make it perform satisfactorily in weaving and knitting machinery but nevertheless the twisting is a separate operation requiring special handling and is a noticeable item of expense. Also the twisting sometimes damages the yarn, as by causing broken filaments. It is known that continuous filament yarns may be processed into a fabric without twisting if the filaments, instead of being maintained in parallelism, are caused to interlace or tangle with one another so that the friction between the filaments holds them together. These untwisted yarns have running and processing characteristics similar to a low twist yarn and are known in the trade by such terms as "interlaced," "tangled" and "intertwined" and it is toward an apparatus for producing such yarns that the present invention is directed. These yarns are distinguished from bulked yarns in that the filaments are compactly arranged so that the denier of the yarn is about the same as the denier of a twisted yarn having the same number and size of filaments.

Therefore it is the primary object of this invention to provide an improved apparatus for producing continuous filament interlaced yarn.

More specific objects of the invention and the means for attaining the same will become apparent as the description of certain preferred embodiments thereof proceeds.

Referring now to the drawing:

FIG. 1 is a side elevational view of the apparatus;

FIG. 2 is a sectional view taken along the line II—II of FIG. 1;

FIG. 3 is a perspective view of one of the elements of the apparatus;

FIG. 4 is an enlarged fragmentary section taken transversely of the yarn passageway through the apparatus; and

FIG. 5 is a view similar to FIG. 4 but showing a modified form of yarn passageway.

The apparatus comprises two main members **10** and **12** having flat faces or flat faced areas **14** and **16** respectively which are spaced a slight distance apart by a shim **18** or the like which is interposed therebetween. Bolts **20** and **22** and tapered or straight dowel locating pins **45** and **46** may be employed to hold the parts in the assembled condition shown in FIG. 2. Instead of the shim **18**, one or the other of members **10** and **12** may have a corresponding step or extension formed integrally therewith, but in either case a passageway or open-ended slot **24** is provided between the upper portions of said members.

Member **12** has an open sided channel **26** extending through the flat face **16** thereof. The channel or the means defining the channel comprises a semicircular bottom **28** and straight side walls **30** and **32** extending from the bottom to the open side of the channel. In that form of the invention shown in FIGS. 1 through 4 side walls **30** and **32** extend perpendicular to the flat face **16** of member **12** and also perpendicular to face **14** of member **10**, faces **14** and **16** being parallel to one another. Since the bottom **28** of the channel is a true semicircle, the channel is symmetrical about a plane extending longitudinally thereof and perpendicular to the flat face **16**, said plane being indicated in FIGS. 2 and 4 by chain-dotted line P.

Member **10** has bored therein from one of the side edges a passageway **34** the open end of which is plugged by a plug **36**. Extending from passageway **34** and opening through the flat face **14** of member **10** are a pair of smaller tubular conduits **38** and **40** constituting fluid discharge means. The fluid discharge conduits **38** and **40** are directed toward the semicircular bottom of channel **26** and are spaced a small distance from the centerline of the channel. Preferably, passages **38** and **40** are located at equal distances from the opposite ends of channel **26** and preferably also are located on the same side of plane P. A fluid pressure line **42** is screwed into or otherwise connected to member **10** so as to discharge a fluid, preferably air, into passageway **34** from whence it issues in the form of jet streams through the two smaller conduits **38** and **40**.

The yarn **44** to be interlaced is drawn through the channel **26** under a slight tension and is maintained generally in alignment with the longitudinal centerline of the channel by a suitable guide or guides, not shown, located outside the confines of the above described apparatus. The open-sided slot **24** between members **10** and **12** enables the yarn to be laced through channel **26** with facility. The jets of fluid issuing from conduits **38** and **40** extend parallel to plane P until striking the running yarn or the bottom of channel **26** at which time swirling currents are created which swing some of the filaments forming the yarn out of line and these filaments become interlaced or intertwined with other filaments making up the yarn whereby when the yarn leaves the apparatus the filaments are no longer readily separatable but cling together in a manner characteristic of a low twist yarn. The yarn is not actually twisted or even false twisted but due to the interlacing of the filaments has handling characteristics similar to a twisted yarn. The actual amount of interlacing depends upon a number of factors such as the tension on the yarn as it passes through the apparatus, the denier of the yarn and the denier and number of individual filaments forming the yarn, the air pressure and the size of passages **38** and **40** and also upon the size of channel **26** and the spacing between members **10** and **12**. However, by maintaining the yarn under a slight tension, looping of filaments and bulking of the yarn are avoided and the thus treated yarn has a denier about the same as a low twist yarn formed of the same number and size of filaments.

In FIG. 5 is shown a modification and parts corresponding to parts of the previously described embodiment are indicated by prime numbers. The only difference between this embodiment and that previously described is that the straight walls **30'** and **32'** converge in the direction away from the semi-circular bottom **38'** of the channel **26'**. It has been found that, other factors being equal, substantially greater tangling of the yarn results when the angle θ between centerline plane P' and each of the walls **30'** and **32'** is about 10° to 20°, that is to say the angle of convergence between the walls is about 20° to 40°. As shown in the drawing, channel **26'** is symmetrical about plane P' which extends longitudinally of the channel and perpendicular to the flat face **16'**. It will be understood that member **12'** may be used as a replacement for member **12** so that in the assembled apparatus

the jet openings 38 and 40 will be properly placed with respect to channel 26' for obtaining more effective tangling in the yarn. The principal advantage of the FIG. 5 modification is that a greater degree of filament interlacing may be obtained than with the other form with the same amount of air.

Having thus described certain preferred embodiments of the invention, what is claimed is:

1. Yarn filament interlacing apparatus comprising a member having a flat face, means defining an open sided channel extending through the flat face of said member, said means defining the channel comprising a semi-circular bottom and straight walls extending from the bottom to the open side of the channel, said channel being symmetrical about a plane extending longitudinally thereof and perpendicular to said flat face of said member, and fluid discharge means for directing a jet of fluid toward said semi-circular bottom in a stream parallel to and spaced from the defined plane.

2. The apparatus set forth in claim 1 wherein said straight walls converge in the direction away from said semi-circular bottom.

3. The apparatus set forth in claim 2 wherein the angle of convergence of said straight walls is approximately 20° to 40°.

4. The apparatus set forth in claim 1 comprising a second member having a flat face extending parallel to the flat face of the first mentioned member and spaced a small distance therefrom, and said fluid discharge means comprising a conduit having a discharge end in the flat face of said second member.

5. The apparatus set forth in claim 4 wherein said straight walls converge in the direction away from said semi-circular bottom at an angle of approximately 20° to 40°.

6. The apparatus set forth in claim 1 comprising a second fluid discharge means for directing a jet of fluid toward said semi-circular bottom in a stream parallel to and spaced from the defined plane, said two fluid discharge means being located at equal distances from opposite ends of said channel.

7. The apparatus set forth in claim 6 wherein the two fluid discharge means are located on the same side of the defined plane.

References Cited

UNITED STATES PATENTS

2,990,671	7/1961	Bunting et al.	57—34
2,995,801	8/1961	Cormier et al.	28—1
3,022,566	2/1962	Daniels et al.	28—72
3,237,269	1/1966	Hawkins	28—1
3,261,071	7/1966	Clendening et al.	28—1
3,296,679	1/1967	Jobson	28—1

MERVIN STEIN, *Primary Examiner.*

L. K. RIMRODT, *Assistant Examiner.*