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SPINNERET COUPLING ASSEMBLY

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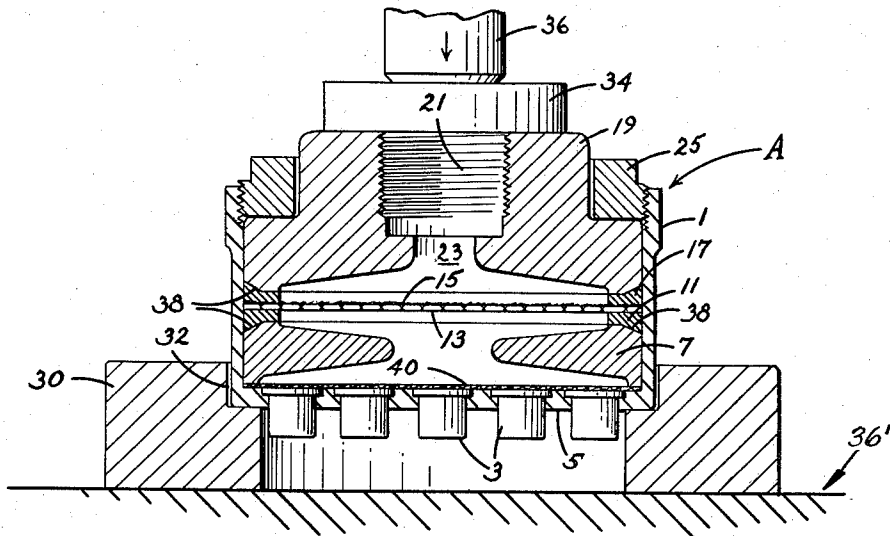


Fig. 1

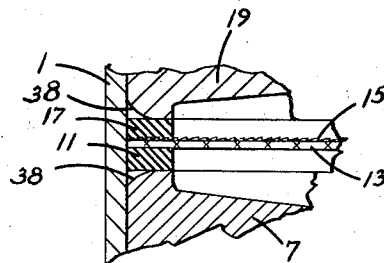


Fig. 2

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SPINNERET COUPLING ASSEMBLY

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The present invention relates to a new and novel spinneret assembly for use in producing artificial yarns. In particular, my invention relates to a multi-jet or spinneret assembly for use in producing staple yarn of an artificial nature.

With respect to producing man-made staple fibers such as viscose rayon staple by the wet-spinning process, a single extruding device has been developed heretofore which simultaneously extrudes into a suitable coagulating bath a plurality of small separate bundles of filaments that are gathered together immediately after extrusion into one large bundle. After the large bundle of filaments has been processed, it is then cut into staple length fibers.

This single extruding device is in the form of a coupling assembly which is connected with a supply line through which the spinning solution such as viscose is fed to the coupling. A plurality of spinnerets are fitted into and extend through the face of a female coupling member which is immersed in the coagulating solution during the actual yarn spinning. Each spinneret extrudes a small bundle of filaments and the spinnerets are so positioned within the coupling face that adequate space is provided between each spinneret whereby suitable coagulating liquid for the yarn spinning solution may easily flow across the entire face of the spinneret and through the filaments. The female coupling or cap houses suitable filter media such as a filter screen and filter cloth.

Several disadvantages are prevalent with this single extruding device which render the device extremely unsatisfactory in mass production processing. With this device, the filter media, gaskets, etc. which are housed within the female coupling are all compressed together by means of an ordinary cooperating male coupling member which is threaded into the female coupling. To accommodate the large number of spinnerets, the coupling assembly has rather a large diameter of approximately four inches. With such a large diameter coupling assembly, it is extremely difficult to assemble the coupling members when they consist of screw-type coupling members. Such difficulty arises from the fact that the female coupling or cap usually houses, in addition to the filter media and gaskets, a flow-directing or distribution member for directing the spinning fluid to the spinnerets as well as a rounder union for connecting the assembly to a supply line for the spinning solution. These additional members are generally formed of hard rubber. As pressure is exerted upon these members housed within the female coupling by the male coupling during assembly, an opposing pressure is also exerted against the male member by the hard rubber elements being compressed together within the female coupling. This opposing pressure against the male threaded member produces a galling of the threads on the male member. Such a deleterious reaction upon the threads of the male and female members requires that these threaded components be frequently replaced.

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In addition, it has been found that the filter media, usually a cloth and a supporting screen, positioned within the female coupling becomes distorted (wrinkles inwardly toward the cloth center) as the elements within the female coupling are compressed together by the male member. When the filter cloth becomes distorted, it is of course moved out of its original set position and leaks occur therethrough. This means that a portion of the spinning solution flowing to the spinnerets is not filtered as required whereby the spinneret orifices become clogged.

It is therefore one object of my invention to provide a novel and improved multi-jet spinneret assembly which corrects the above-mentioned disadvantages of the prior type extruding devices.

A further object of my invention is to provide a novel and improved multi-jet spinneret assembly wherein the filtering members, the flow-directing member, etc., which are housed within the coupling, are compressed against the inner surface of the female coupling face without a threading or screwing action after which these members are locked into position by suitable locking means.

A still further object of my invention is to provide a novel and improved multi-jet spinneret assembly wherein the filter media is maintained in correct operating position as the members within the coupling are compressed against the inner surface of the face of the female coupling or cap.

Other objects and advantages of my invention will become more apparent from a study of the following description and drawing wherein:

Figure 1 is a section of my novel and improved multi-jet spinneret coupling assembly; and

Figure 2 is a detail of a portion of the coupling assembly shown in Figure 1.

As seen in Figure 1, my multi-jet spinneret assembly A comprises a round cap 1 or female coupling member formed of a suitable hard metal and which preferably has a diameter of approximately four inches. A plurality of extruding devices or spinnerets 3, 3 extend through the face 5 of the cap 1 and are supported by their flanges on counter-bored sections cut into the inner surface of the face 5 of the cap 1. These spinnerets 3, 3 extend over the full face 5 in spaced-apart relationship whereby channels are provided between the spinnerets to permit adequate flow of acid, or other coagulating medium, across the cap face and through the separate bundles of extruded filaments.

Housed within the cap interior adjacent the inner surface of the face 5 is a flow-directing or distributing member 7, preferably formed of hard rubber, which provides for equal and uniform distribution of the flowing yarn spinning solution to the spinneret units 3, 3. With the use of the flow-directing member 7, stagnant areas or traps wherein the spinning solution might collect and stagnate are eliminated. As seen in the drawing, the flow-directing member 7 is ring-shaped. The flow-directing member or ring 7 extends inwardly from the side wall of the cap toward the center of the cap interior and tapers inwardly from both its sides or surfaces to its point of termination adjacent the center of the cap interior to provide a central restricted passageway for the flowing spinning solution. Since the surfaces of the distributing ring 7 are smooth, the solution cannot be trapped as it travels both through the central opening of the distributing ring 7 and along the surfaces of the ring 7 toward the spinneret units 3, 3. With the particular design of the distributing ring 7, as shown in the drawing, equal distribution of the spinning solution is provided to the individual spinnerets 3, 3.

Lying immediately adjacent the flow-directing or dis-

tributing member 7 is a filter media clamping ring gasket 11, preferably formed of soft rubber. Next to the clamping gasket 11 is positioned a filter cloth supporting screen 13. In contact with the filter screen 13 is a filter cloth 15 such as typewriter ribbon cloth. A second filter media clamping ring gasket 17 similar to gasket 11 is positioned immediately adjacent the filter cloth 15.

A cylindrical-shaped rounder union or centrally apertured head 19 of hard rubber is inserted within the interior of the female coupling or cap 1 to lie next to the filter clamping gasket 17. As seen in Figure 1, the rounder union or head 19 has a threaded bore portion 21 into which is threaded a spinning solution supply conduit (not shown). The threaded bore portion 21 of the rounder union 19 narrows to form a nonthreaded passageway 23 which gradually widens or tapers outwardly as it approaches the filter cloth 15.

To hold the above-described members in position within the cap 1, a ring nut or male coupling 25 is positioned around a neck portion of the rounder union or head 19 and cooperates with a threaded inner rim on the wall of the cap 1 at the end of the cap opposite the cap face 5.

To assemble, the above-described members are positioned within the cap interior in the manner and position described. The cap is then positioned in a support block 30, preferably formed of hard rubber. The block 30 has a ring-shaped shoulder 32 which receives the face 5 of the female coupling or cap 1. A plate 34 is then positioned atop the rounder union or head 19 after which the entire assembly is placed between the pressure applying units of an arbor press (not completely shown). The upper pressing unit or spindle 36 of the press is positioned atop the plate 34 while the lower support of the press 36 supports the block 30. Pressure is then applied to the rounder union 19 through the press spindle 36 and plate 34 whereby the rounder union 19, the clamping gaskets 11 and 17, the filter media 13, 15, and the flow-directing member 7 are compressed together against the cap face 5. While these elements are still under compression within the cap 1, the ring nut 25 is easily tightened against the rounder union 19 after which the pressure upon the plate 34 may be removed. Since most of the elements within the cap are formed of soft or hard rubber, they will tend to expand against the male coupling ring nut 25 as the press pressure is removed. Through this expansion, a tight seal is formed by the ring nut 25 and the rounder union 19 whereby any leakage through these members is prevented.

To disassemble, the entire assembly is again placed between the pressure applying members of the arbor press. Pressure is exerted upon the rounder connector 19 whereby the elements within the cap are further compressed together to relieve the pressure upon the ring nut 25. The nut 25 is then easily loosened after which the press is removed.

An important feature of my invention, which has not yet been mentioned, lies in the manner and means whereby the filter cloth 15 and filter screen support 13 are actually stretched radially and maintained in correct position as the coupling A is being assembled. As seen in Figure 1 and more clearly in Figure 2, the peripheral portions of the rounder union or head 19 and the flow-directing or distributing member 7 adjacent their surfaces which lie adjacent the filter clamping gaskets 17 and 11 respectively are cut back at an angle or rounded so that when the elements are in operating position, expanded annular channels or recesses 38, 38 (seen more clearly in Figure 2) are provided immediately above and below the soft rubber gaskets 17 and 11. These channels are defined by surface portions of the head, the inner wall of the side wall of the cap or female coupling and the filter media. As seen in Figure 2, the filter clamping gaskets 11 and 17 are normally rectangular in cross section before the elements within the female coupling or cap 1 are compressed together against the inner surface of the

face 5 of the cap 1. As the members within the cap are compressed through pressure applied by the press spindle 36, the gaskets 11 and 17 are compressed and thus creep and expand into the annular recesses 38, 38 as shown more clearly in Figure 1. As the gaskets 11 and 17 expand, they draw with them the filter cloth 15 and filter screen 13 causing them to stretch or expand radially along with the gaskets 11 and 17. With this arrangement, the filter media is drawn taut across the interior of the female coupling or cap 1 to provide thorough filtering of the spinning solution passing through the filter media. Distortion of the screen 13 and cloth 15 is thus eliminated during the assembling of the spinneret assembly.

If desired, a second filter cloth 40 may be positioned over the inner surface of the cap face 5 immediately adjacent the spinnerets to provide additional final filtering of the spinning fluid.

It should be pointed out that the spinneret units 3, 3 are press-fitted within the face of the cap face 5 to provide a tight seal between the spinnerets and the cap face. A suitable sealant such as that sold commercially as Epon Cement (Epoxy resin) is then applied to the inner face of the cap face 5 to seal any possible openings existing between the spinnerets and the inner surface of the cap face 5 to prevent leakage of the coagulating liquid through the cap face 5. The spinnerets may be cleaned by normal cleaning procedures without removing them from the cap face which is an important advantage of my invention.

With the above-described coupling, the distinctive parts thereof may be easily assembled without damaging any of the threaded elements as mentioned heretofore, thus eliminating the need for frequent replacement of the coupling components. In addition, the filter media is properly positioned during the assembling of the coupling member, thus eliminating frequent leakage of the spinning solution past the filter media as has occurred heretofore. With the inclusion of my divider plate or flow-directing member 7, stagnant areas or traps are eliminated from the spinneret coupling and a uniform and equal flow of the spinning solution is provided to the series of spinnerets mounted in the coupling face.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the present invention as defined in the appended claims. I claim:

1. A spinneret coupling assembly comprising a female coupling, at least one spinneret mounted in and extending through the coupling face, a spinning solution distributing member within the female coupling which lies adjacent the coupling face, a centrally apertured head positioned within and substantially filling the remaining portion of the female coupling interior, a filter medium positioned between the head and the distributing member which extends across the coupling interior, a resilient filter medium stretching member positioned on one side of the filter medium, a second resilient filter medium stretching member positioned on the opposite side of the filter medium, said head and distributing member having receding rounded peripheral surfaces on their opposing surfaces whereby expansion chambers are provided adjacent the female coupling wall into which the filter medium stretching members expand to stretch the filter medium upon compression of the above elements, all of said elements and members set forth above, except the spinneret, being supported within the female coupling in sliding relationship with respect to the inner surface of the coupling wall, and a male coupling which fits around the head and which cooperates with the female coupling to retain in fixed and compressed position the above members supported within the female coupling.

2. A spinneret coupling assembly according to claim 1 comprising a plurality of spinnerets mounted in and extending through the cap face.

3. A spinneret coupling assembly according to claim 1

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wherein the inner wall surface of the female coupling has a threaded portion adjacent the end of the coupling opposite the coupling face, and the male coupling comprises a ring nut which cooperates with said threaded portion.

4. A spinneret coupling assembly according to claim 1 wherein the filter medium comprises a screen support and a filter cloth positioned immediately adjacent the screen.

5. A spinneret coupling assembly comprising a female coupling of cylindrical shape, a plurality of spinnerets mounted in and extending through the coupling face, a spinning solution flow-distributing ring positioned within the coupling which lies adjacent the coupling face, a resilient centrally apertured head of cylindrical shape positioned within the coupling adjacent the flow-distributing ring and contacting the inner surface of the coupling wall, a round screen support positioned between the head and the flow-distributing ring, a filter cloth of circular shape positioned immediately adjacent the screen, said screen and cloth extending substantially the diameter of the coupling interior, a resilient filter media stretching ring gasket positioned on one side of and in contact with the filtering media, a second resilient filter media stretching gasket positioned on the opposite side and in contact with the filter media, the peripheries of said gaskets being in contact with the inner surface of the coupling wall, said head and distributing member having receding rounded peripheral surfaces on their opposing surfaces whereby expansion chambers are provided adjacent the female coupling wall into which the filter media stretching members expand to stretch the filter media upon compression of the above elements, all of said elements and members set forth above, except the spinnerets, being supported within the female coupling in sliding relationship with respect to the inner surface of the coupling wall, and a ring nut fitting around a portion of the head which nut cooperates with a threaded section on the inner surface of the coupling wall at the end opposite the coupling face to retain in a fixed and compressed position the above members supported within the female coupling interior.

6. A spinneret coupling assembly according to claim 5 comprising an additional round-shaped filter cloth positioned between the inner surface of the female coupling face and the adjacent flow-distributing ring.

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7. A spinneret coupling assembly according to claim 5 wherein the flow-distributing ring gradually decreases in thickness as it extends inwardly from the inner periphery of the female coupling toward the center of the female coupling to a point of termination adjacent the coupling center to form a restricted passageway.

8. A spinneret coupling assembly comprising a female coupling, at least one spinneret mounted in and extending through the coupling face, a spinning solution distributing member within the female coupling which lies adjacent the coupling face, a centrally apertured head positioned within and substantially filling the remaining portion of the female coupling interior, a filter medium positioned between the head and the distributing member which extends across the coupling interior, resilient filter medium stretching means positioned on one side of the filter medium, resilient filter medium stretching means positioned on the opposite side of the filter medium, said head and distributing member having receding rounded peripheral surfaces on their opposing surfaces whereby expansion chambers are provided adjacent the female coupling wall into which the resilient filter medium stretching means expand to stretch the filter medium upon compression of the above elements, and a male coupling which fits around the head and which cooperates with the female coupling to retain the above members in a fixed and compressed condition.

9. A spinneret coupling assembly according to claim 8 wherein the filter medium stretching means comprise resilient gaskets.

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