Feb. 3, 1959 J. K. WHISNANT 2,871,502

VACUUM WHEEL FOR EXTRACTING LIQUID FROM TOW

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Fig. 1.

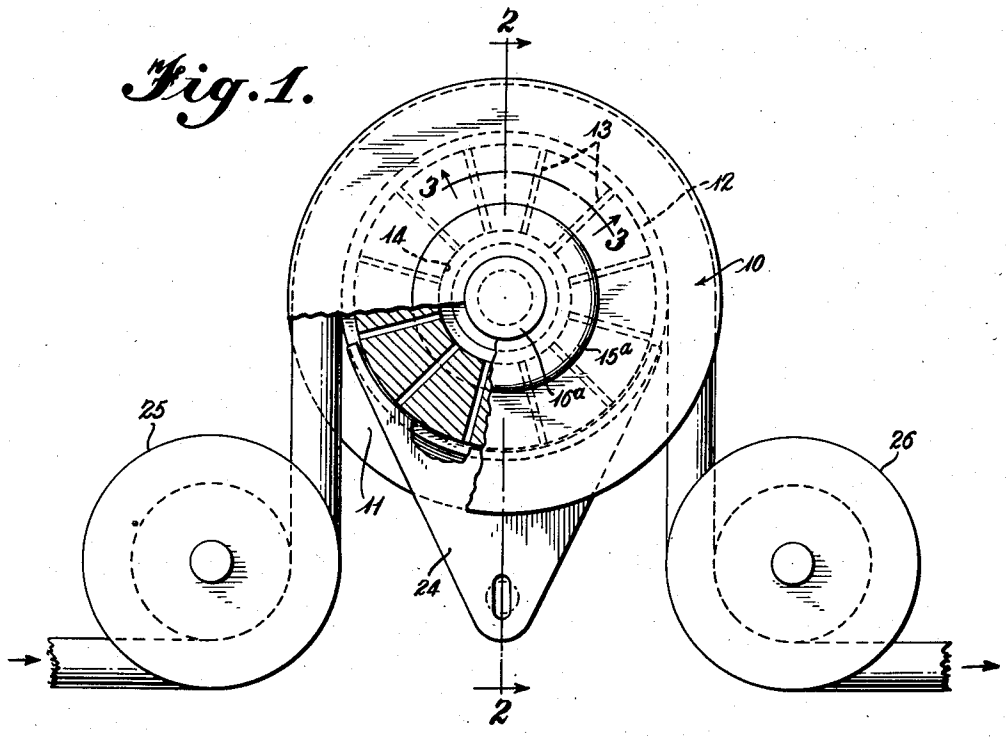

Fig. 2.

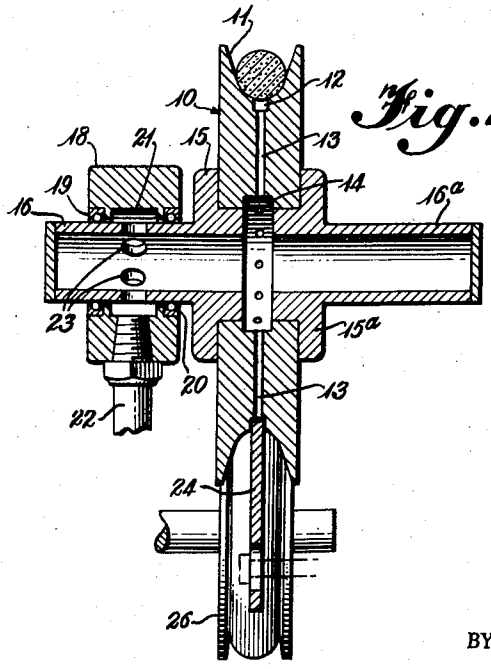

Fig. 3.

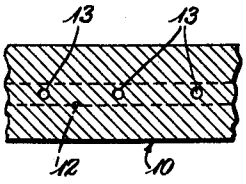

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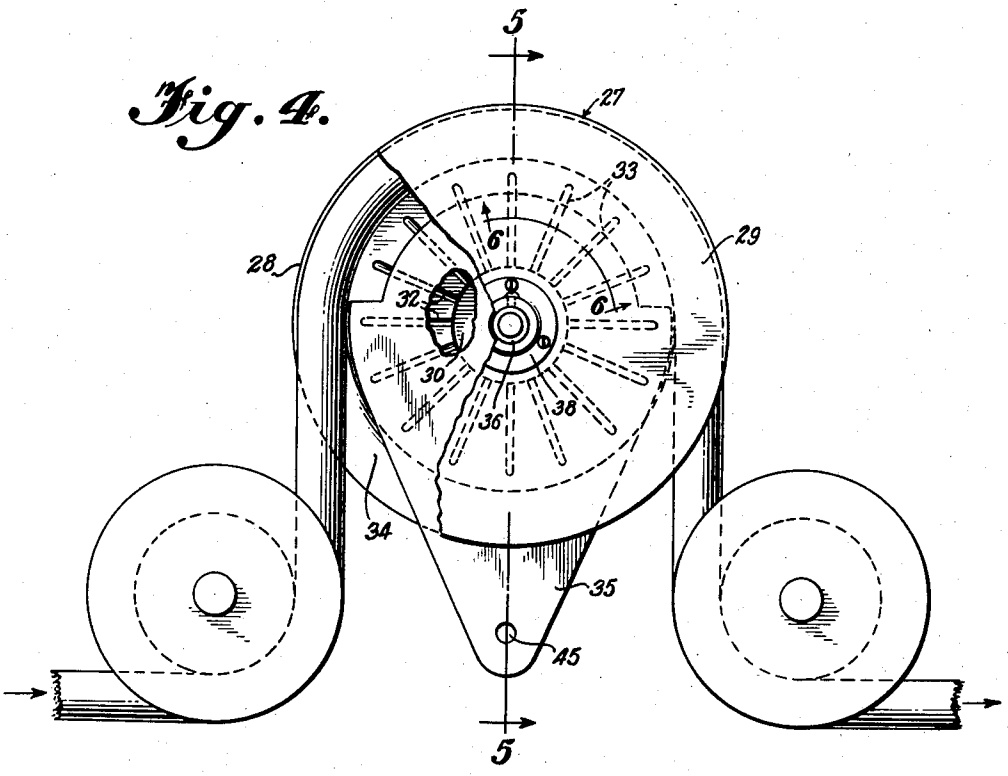
Fig. 4.



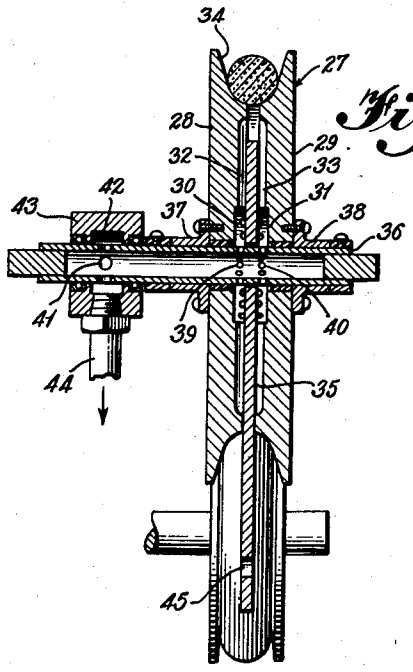
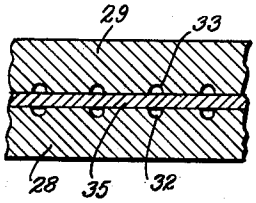


Fig. 5.

Fig. 6.



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VACUUM WHEEL FOR EXTRACTING LIQUID FROM TOW

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5 Claims. (Cl. 15—306)

This invention relates to the manipulation of multiple yarns or tows and more particularly to the propulsion of and liquid recovery from a running tow of viscose rayon.

In the manufacture of staple fibers and the like, it is customary to spin a large number of parallel yarns and to effect the aftertreatment of these yarns in a group which is called a tow. Because the aggregate denier of the tow is very high, the forces required to move it are high and the loads imposed on driving equipment are high enough to render the control of slippage a problem.

In the liquid treatment of tow, the entrained treating liquid is considerable in volume and the waste incident to its removal from the system is relatively great.

Heretofore, attempts to meet the slippage problem have involved various expedients tending to increase friction between driving sheaves and the tow. Some of these schemes cause yarn damage and none of them is related to liquid recovery.

It is therefore an object of this invention to provide a tow propulsion device which will maintain good driving contact with the tow not only in a manner to avoid damage thereto but whereby simultaneous liquid recovery is effected.

Another object of this invention is to provide a sheave having suction means for withdrawing liquid from the tow groove which is characterized by a high degree of pumping economy in the maintenance of the desired suction.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of a preferred embodiment thereof wherein:

Figure 1 is a view in elevation of a tow propulsion wheel according to the present invention in a typical position of use;

Figure 2 is a view in section of the tow wheel of Figure 1 taken on the line 2—2 of that figure;

Figure 3 is a fragmentary view in section taken on the line 3—3 of Figure 1;

Figure 4 is a view in elevation of a modified type of tow propulsion wheel according to the present invention;

Figure 5 is a view in section taken on the line 5—5 of Figure 4; and

Figure 6 is a view in section taken on the line 6—6 of Figure 4.

If more detailed reference is made to Figures 1, 2 and 3 of the drawings, it will be noted that the feed or transfer wheel **10** of the present invention is a sheave or pulley having a peripheral groove **11** of arcuate cross section for tow and a narrow annular groove **12** at the bottom of the tow groove **11**. A series of radial passageways **13** extend inwardly from the groove **12** to a common inner annular space or manifold **14** located in the hub of the wheel **10**. The wheel **10** is fixed on hollow hub portions **15** and **15***a* which define between them an annular space registering with the inner manifold **14** of the wheel **10** and placing that manifold in communication with the hollow interior of the hub portions. The hub portion **15***a* is a part of a hollow stub shaft **16***a* closed at one end. The hub **15** is a part of hollow shaft **16** the interior of

which is served by a vacuum connection **18** which comprises a box sealed against leakage at **19** and **20** to the shaft **16** and providing an interior annulus **21** served by a conduit **22**. The shaft **16** is provided with ports at **23** which register with the annulus **21**.

Since it is intended that the groove **12** shall be maintained under negative pressure, a suitable vacuum pump, not shown, is connected to conduit **22**, which together with ports **23**, shaft **16** and manifold **14**, provides conduit means for permitting application of suction to passageways **13**. The load on this pump would be very high indeed for a tow extending for as short an arc as is indicated in Figure 1 were it not for the sealing of the groove **12** in the portions of the arc of movement where there is no contact with the tow. To do this, a sealing shoe **24** is provided to bear on the bottom of the groove **12** in the portion of the arc of movement where there is no tow. In order that the sealing shoe may have its arcuate sealing surface properly centered, the shoe is provided with a slot through which it may be adjustably bolted to a stationary part of the machine.

The guide wheels **25** and **26** may be ordinary pulleys or may be of the type of the present invention. In any event, a typical tow path is shown in Figure 1 and the effect of it, due to the suction created, is to make a good positive drive for the tow at the same time to extract considerable residual treating liquid or other moisture therefrom. Shaft **16**—**16***a* is, of course, provided with ordinary bearings, not shown. It is to be understood that the sheave **10** and the shaft **16**—**16***a* turn as a unit. The propulsion of the shaft **16**—**16***a* is accomplished by any convenient means, not shown.

In the modification of the invention shown in Figures 4, 5 and 6, the sheave bears reference numeral **27**. Instead of being a unitary body with drilled radial ports, it is an assembly which is made up of two cast elements or sides **28** and **29** which are mutually complementary. The elements **28** and **29** each include a central space or manifold **30**, **31**. Grooves or channels **32** and **33** extend radially outwardly from the manifolds **30** and **31**. These grooves are cast or cut on the inner faces of the sheave elements **28** and **29** and they extend for less than the full radius of the half sheave. Marginal complementary peripheral grooves define a tow groove **34** having an arcuate cross section. When the sheave elements **28** and **29** are assembled, a sealing plate **35** is located between them. This plate is so shaped that its upper half does not cover the ends of the grooves **32** and **33** while its lower half does, see Figure 4. Thus, suction applied to the grooves through the center manifolds **30** and **31** will be effective through that part of the groove **34** in the path which the tow contacts but will not be effective in the remaining part of the groove **34**.

Aside from the foregoing differences, the structure of the embodiment of Figures 4, 5 and 6 is not very different from that of Figures 1, 2 and 3. The sheave elements are mounted on a hollow shaft **36** by hub members **37** and **38** so that the shaft **36**, the hubs **37** and **38** and the sheave elements **28** and **29** turn as a unit. Shaft **36** has a series of ports **39** leading to manifold **30** and another series of ports **40** leading to manifold **31**. Still a third series of ports **41** lead to the annular interior **42** of a suction box **43** provided with a suction conduit at **44**.

From the foregoing, it is apparent that when suction is applied at **44**, the reduced pressure within the shaft **36** will be communicated to the manifolds **30** and **31** and from them to the grooves **32** and **33**. Because the sealing plate **35** does not extend to the outer ends of the grooves in the arc through which the tow passes, sheave elements **28** and **29** are spaced apart so that the suction is communicated to the groove **34**.

The path of the tow to, from and over the sheave 27 may be the same as is shown in Figure 1. The shaft 36 and the sheave 27 turn as a unit, but the plate 35 is held stationary as for example by a bolt passing through the aperture at 45.

Although in Figure 6 the ports 32 and 33 are indicated as being in circumferential registry on opposite sides of the plate 35, this registry is unimportant to the operation of the device.

Among the more important aspects of this invention is the provision of a sheave having a tow groove, a suction groove at the bottom of the tow groove and means to seal the suction groove during those parts of the annular movement in which the groove is not in radial registry with tow.

In using the device of this invention in the aftertreatment of tow, it will be appreciated that the conduits 22 and 44 may be used to withdraw treating liquids which may then be delivered to suitable recovery apparatus. Should the particular liquids recovered be corrosive, suitable precautions are taken.

What is claimed is:

1. A rotatable wheel for the propulsion of tow, said wheel having a marginal groove of arcuate cross section for the reception of the tow, a narrower groove at the bottom of said marginal groove, circumferentially spaced ports extending radially within said wheel and communicating with said narrower groove, means to apply suction to said ports and stationary sealing means occupying said narrower groove in a part of its path of rotation, said sealing means extending beyond the periphery of the wheel.

2. A rotatable wheel for the propulsion of tow, said wheel having a marginal groove of arcuate cross section for the reception of the tow, a narrower groove at the bottom of said marginal groove, a hollow shaft supporting said wheel for rotation, means to apply suction to the hollow interior of said shaft, means establishing passageways interconnecting the hollow interior of said shaft with said narrower groove at circumferentially spaced points thereabout and stationary sealing means occupying said narrower groove in a part of its path of rotation, said sealing means extending beyond the periphery of said wheel.

3. A rotatable wheel for the propulsion of tow, said wheel having a marginal groove of arcuate cross section for the reception of the tow, a narrower groove at the bottom of said marginal groove, circumferentially spaced ports extending radially within said wheel and communicating with said narrower groove, means to apply suction to said ports, a plate having an arcuate edge complementary to said narrower groove, means located beyond the periphery of said wheel to hold said plate stationary with the arcuate edge in said narrower groove to seal the same in a part of its arc of movement.

4. A rotatable wheel for the propulsion of tow, said wheel having complementary sides mounted for rotation about an intermediate stationary spacer plate and defining therebetween a marginal tow receiving groove of arcuate cross section, at least one of said sides having radial grooves therein extending short of said tow groove, said sides being spaced apart so that said grooves communicate with said tow groove, and means to apply suction to the radially inner end of said grooves, said plate being radially shorter than said grooves in one sector thereof and radially longer than said grooves for the remaining sector thereof whereby in said radially longer sector said radial grooves are closed.

5. A rotatable wheel for the propulsion of tow, said wheel having complementary sides mounted for unitary rotation about an intermediate spacer plate and defining therebetween a marginal tow receiving groove of arcuate cross section, each of said sides having radial grooves therein on the side facing said plate, said grooves terminating short of said tow receiving groove, said sides being spaced apart so that said grooves communicate with said tow groove, means to apply suction to the radially inner ends of said grooves, said plate being radially shorter than said grooves in one sector and in the other being radially longer than the grooves, a portion of the radially longer sector extending beyond the margins of the wheel to constitute a support.

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