

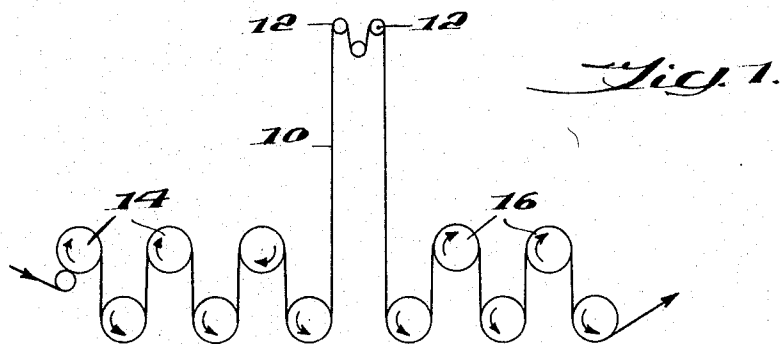
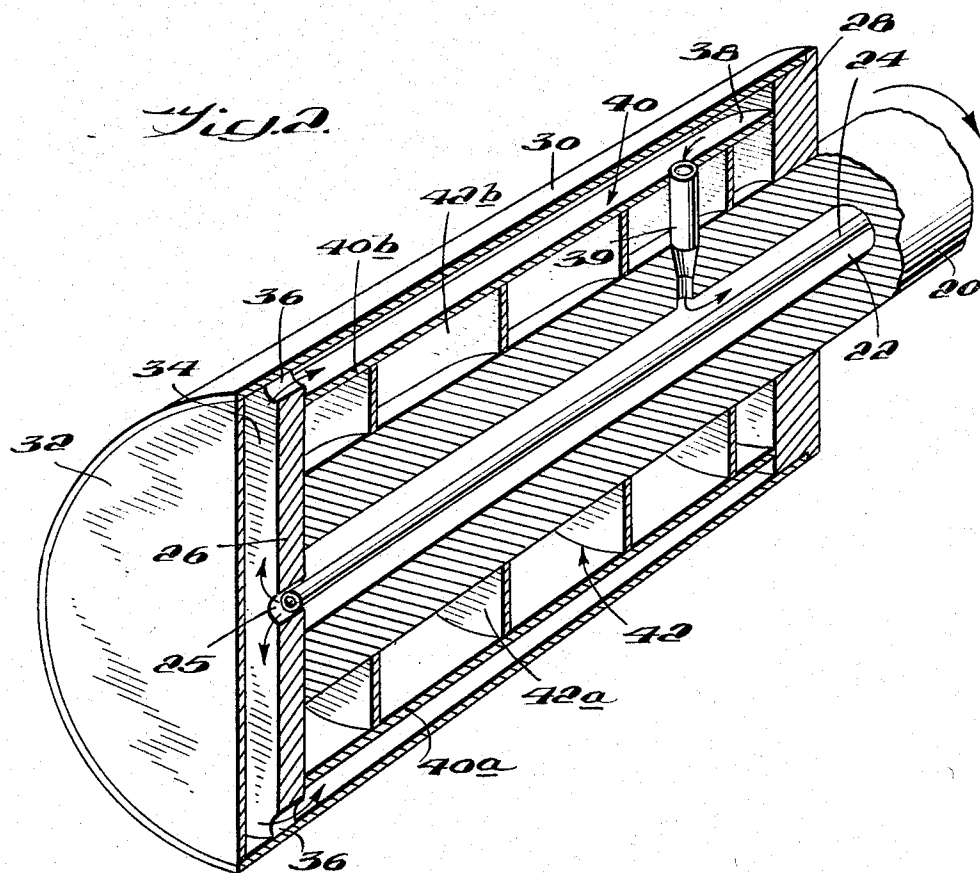
Nov. 1, 1966

C. V. BURDICK, JR  
TOW-TRANSPORTING ROLL

3,282,332

Filed Oct. 30, 1963

2 Sheets-Sheet 1



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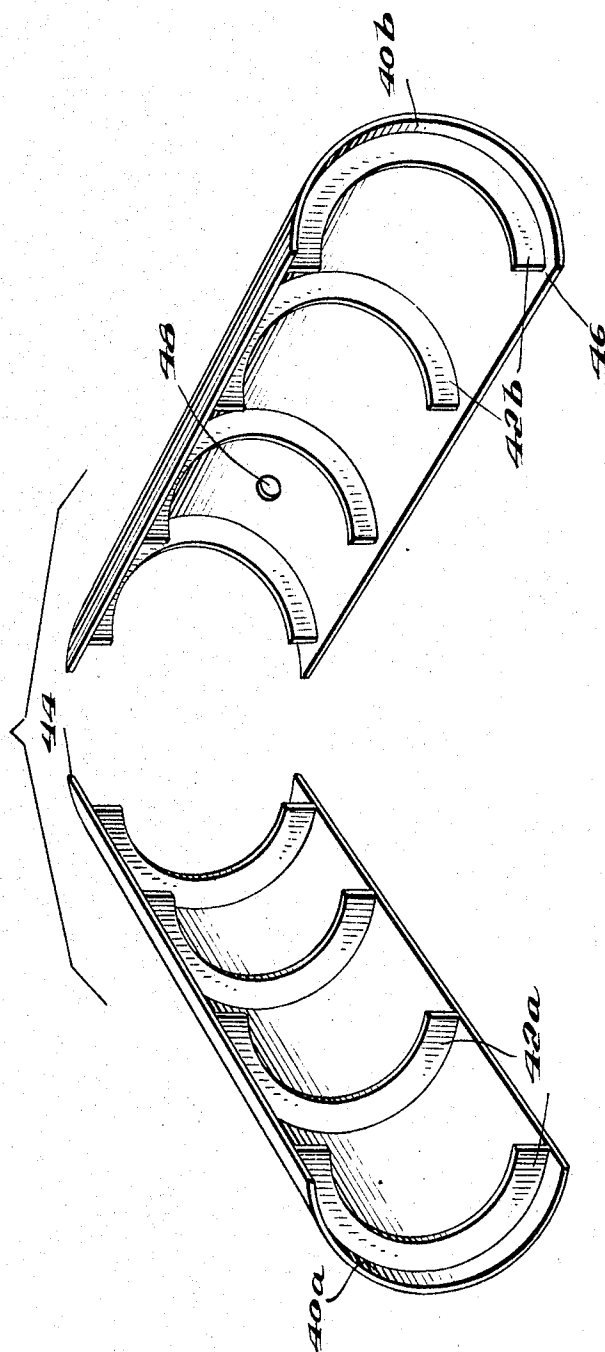


Fig. 3.

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## TOW-TRANSPORTING ROLL

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2 Claims. (Cl. 165—89)

This invention relates generally to the production of textile fibers and, more particularly, to improvements in rolls of the type used to transport textile rope or tow.

Textile rope or tow is defined as a strand of many continuous filaments which have been combined for convenience in processing and which may have a weight per unit length of many thousand denier. For simplicity, such strands are referred to herein as tow.

In the process of drawing tow, considerable heat is generated and must be dissipated as the tow advances from the draw zone. In other process steps, the tow requires heating. These heat transfers can be accomplished by circulating a suitable fluid through hollow tow-transporting rolls. Known rolls of this type have been found unsatisfactory in that they fail to properly cool (or heat) tow when the rate of tow transfer is increased beyond a certain limit or when the tow denier is increased above a critical level.

The improvements disclosed herein facilitate a significant increase in heat transfer capacity at comparatively small cost and without appreciable increase in the rotational inertia of the tow-transporting rolls. These worthwhile advantages are achieved with a hollow roll comprised of a driven shaft, a pair of spaced circular plate members fixed on the shaft, a cylindrical shell attached to the peripheries of the plate members and an interior tubular partition extending between and attached to the plate members. In addition, inlet and outlet conduit means are provided which communicate with the space between the shell and the partition for the admission and discharge of a heat exchange fluid.

Other features and advantages will be apparent from the following specification wherein reference is made to the accompanying drawings in which:

FIGURE 1 is a schematic illustration of a tow-drawing apparatus in which the hollow rolls of the present invention are adapted for use;

FIG. 2 is a perspective sectional view of a draw roll modified according to the teachings of the present invention; and

FIG. 3 is an exploded perspective view of sections from which the tubular partition shown in the roll of FIG. 2 is fabricated.

As shown in FIG. 1, tow 10 can be drawn by advancing it around snubbing pins 12 situated in a draw zone between driven feed rolls 14 and driven draw rolls 16. The extent to which the tow is drawn depends on the differential in surface speed between feed rolls 14 and draw rolls 16. To facilitate effective drawing, it is sometimes desirable to heat the tow as it advances over feed rolls 14. Additional heat is generated as the tow is drawn. Since it is also desirable to have the temperature of tow 10 reduced to a maximum level (depending on tow composition) before releasing tension, it must either be advanced over a large number of draw rolls 16 or the latter must be adapted for cooling the tow quickly.

The hollow roll chosen for purposes of illustration in FIG. 2 includes a driven shaft 20 having an axial bore 22. This shaft extends from the roll to bearings, drive means and fluid supply and outlet means (not shown).

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Within bore 22, there is an inlet conduit 24 which extends outwardly to and is fixedly attached within a central aperture 25 in a circular disk or plate 26 which is attached to the terminal end of shaft 20. Spaced inwardly from disk 26, there is a ring-shaped plate 28 which also is attached to shaft 20. On the peripheries of plates 26, 28, there is a cylindrical shell 30 which extends beyond plate 26 and has a closure 32 for space 34.

Within shell 30, a tubular partition 40 extends between plates 26, 28 and is supported on shaft 20 by a number of ring-shaped spacers 42. For ease of fabrication, partition 40 is assembled from semi-cylindrical sections 40a, 40b provided with semi-circular spacers 42a, 42b, respectively (FIG. 3). Shell sections 40a, 40b have narrow overlaps 44, 46 which facilitate fastening of the two sections after their assembly on shaft 20. Upper section 40b is provided with an aperture 48 into which a conduit 39 is fitted.

When placed in use as a draw roll, e.g., as one of the rolls 16 in FIG. 1, a fluid coolant is admitted through conduit 24 to the space 34, flows radially toward shell 30 and passes through a plurality of peripheral notches 36 to the space 38 between shell 30 and interior partition 40. Heated fluid exits space 38 through conduit 39 which also communicates with bore 22 of shaft 20. Thus, partition 30 serves to confine the coolant to the small annular space 38 within shell 30 over which the heated tow 10 is transported. By so confining and localizing the coolant, the heat exchange efficiency of draw rolls 16 has been increased substantially.

In processing a 486,000 denier nylon tow at 225 yards per minute, a draw roll system without the partitions of this invention was found to cool the tow to 61° C. in the process of tow-drawing. By using improved draw rolls, containing partitions 40, tow was cooled to 55° C. when processed at the same speed and with the same cooling fluid rate of flow.

It is apparent that structural arrangements and adaptations differing from those illustrated herein may be made without departing from the spirit of the present invention which is accordingly intended to be limited only by the scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A tow-transporting roll comprising: a driven shaft having an axial bore; a pair of spaced, circular, plate members fixed to said shaft; a cylindrical shell fixed to the peripheries of said plate members and extending outwardly beyond the end of said shaft; a closure for the open end of said shell; a tubular partition extending between and attached to said plate members in spaced relationship to said shaft, said shell and said partition defining an uninterrupted annular space extending substantially through the length of said partition; a first conduit means extending through said bore to the space within said closure, the outer plate member having radially spaced, peripheral notches communicating with said annular space; and a second conduit means extending from said partition to said bore.

2. A tow-transporting roll comprising: a driven shaft having an axial bore; a disk attached to said shaft at its terminal end; a ring-shaped plate fixed to said shaft in spaced relationship to said disk; a cylindrical shell attached to the peripheries of the disk and plate and extending beyond said disk, said shell presenting a tow-transporting surface; a closure for the open end of said shell; a tubular partition extending from the plate to said disk,

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between the shell and said shaft, said shell and said partition defining an uninterrupted annular space extending substantially through the length of said partition; a first conduit means extending through said bore and said disk, the latter being provided with radially spaced, peripheral notches to provide for the flow of fluid from said first conduit means to said annular space; and second conduit means extending from said partition to said bore for the discharge of fluid.

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