

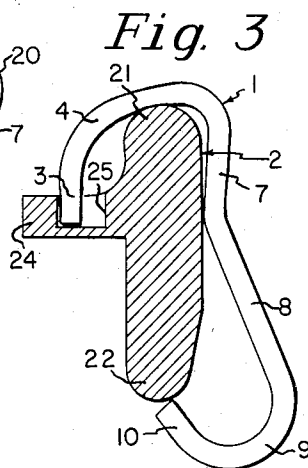
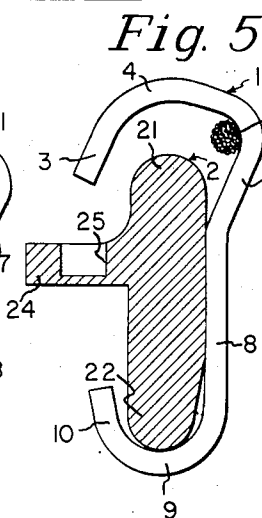
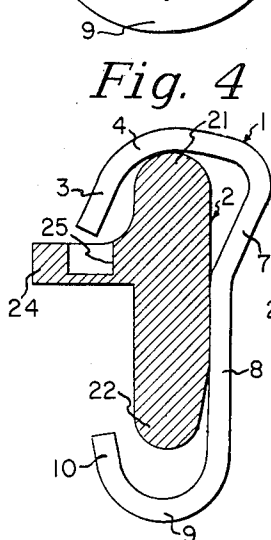
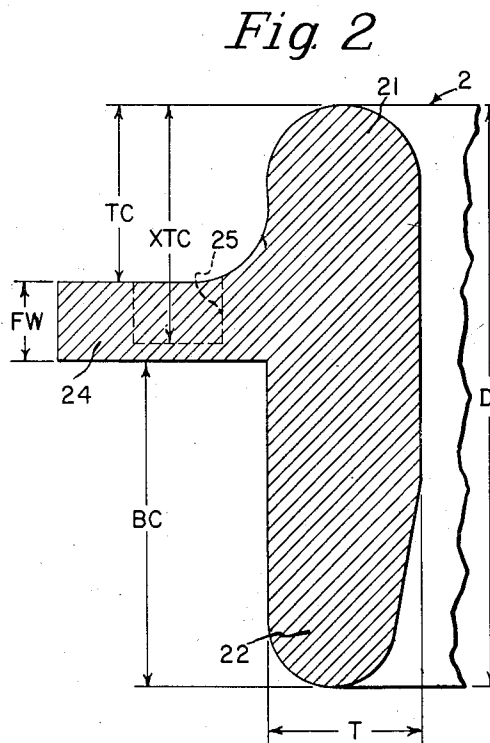
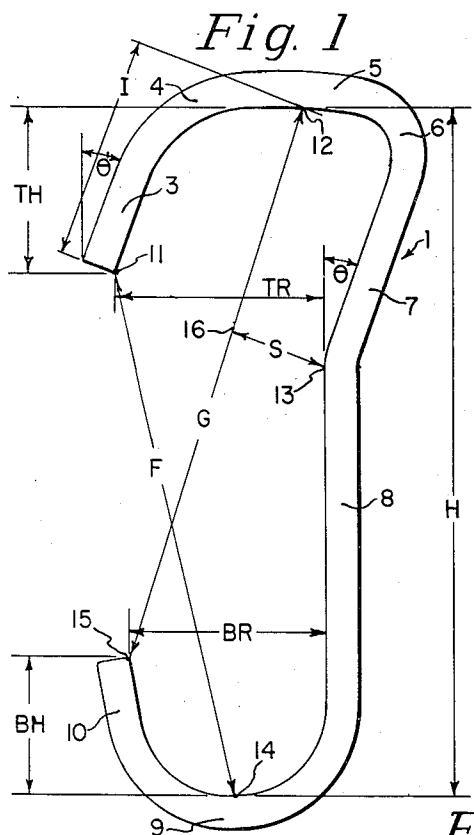
April 22, 1958

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2,831,313

RING TRAVELER

Filed Jan. 10, 1955



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2,831,313

RING TRAVELER

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Application January 10, 1955, Serial No. 480,987

5 Claims. (Cl. 57-119)

This invention relates to winding of yarns and the like, concerning especially ring-spinning and arrangement of traveler and ring therein.

In one form of spinning and twisting apparatus, a yarn guide or "traveler" passes rapidly about a supporting annulus or "ring"; extended sliding contact between ring and traveler leads to wear of at least one of those elements. Ingenious lubricating methods have been devised to counteract the problem of wear, but these have given rise to additional difficulties. Recently, use of a strongly abrasion-resistant polymeric material known as "nylon" for the ring component has met with considerable success, largely eliminating necessity for lubrication; however, another kind of drawback is presented by this combination. As it is apparent that a traveler should present little risk of flying off the ring on which it is used, the ends of the usual metal traveler are sufficiently close together that the traveler must be sprung open for installation on the ring. Although resistant to abrasion, nylon is soft enough to be deformed permanently by the force exerted upon it during such installation of the traveler, and resulting nicks or other non-uniformities in the ring lead to erratic performance of the traveler and consequent deleterious effect upon the yarn passing therethrough.

A primary object of this invention is installation of a traveler upon a ring by use of negligible or only nominal force. A further object is provision of a traveler capable of coacting in unique manner with the ring upon which it travels. Other objects will be apparent from the following description of the invention and the accompanying diagrams.

Figure 1 is a side elevation of a form of traveler according to this invention. Figure 2 is a cross-sectional elevation of a ring adapted for use with the traveler of Figure 1. Figure 3 is an elevation, partly in section, showing the traveler of Figure 1 being installed on the ring of Figure 2. Figure 4 is a view similar to that of Figure 3 but showing the traveler at rest on the ring. Figure 5 is another similar view but showing the traveler in operating position on the ring.

In general, the objects of the present invention are accomplished by use of a modified C-shaped traveler having an arched back upon an annular ring having an exterior flange. The traveler is installed on the ring by rotating it slightly from the vertical (tilting it forward) so as to place the mouth of the traveler down over the top of the ring and then reversing the rotation (tilting it backward) to permit the traveler to hang freely thereon. During operation, drag of the yarn passing within the space provided by the arched back of the traveler raises it into contact with the bottom of the ring, while centrifugal force presses the vertical part of the back of the traveler against the inner edge of the ring. The coaction of traveler and ring is described in more detail below with reference to the diagrams.

Figure 1 shows traveler 1 from the side and oriented in normal vertical position. In transverse section, which

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is not shown, the traveler is a simple elliptical shape throughout. The longest straight part of the traveler is the lower back 8, which is vertical; at the lower end the back terminates in a hooked portion consisting of substantially arcuate bottom part 9 ending in somewhat straighter terminus 10. At arch-point 13 the back bends backward in a substantially straight upper portion 7 forming angle θ with the vertical. At the top end the back merges into curved corner 6, which is followed by a relatively straight top part 5, a less sharply curved corner 4, and terminus 3. This top termination forms angle θ' with the vertical. For convenience, points 11, 12, 14, and 15 in Figure 1 designate respectively the lowermost extent of the top terminus, the inside edge of the top, the inside edge of the bottom, and the inner top edge of the bottom terminus.

Figure 2 shows a vertical section through ring 2 consisting of an annulus having integrally formed top 21 and bottom 22 portions and flange 24 extending at the side. The vertical extent from top to bottom of the ring is called herein the "depth," while the side-to-side dimension is the "thickness." Top and bottom clearances with respect to the flange are apparent. Hollow 25 shown by dashed lines in the flange defines an extended top clearance from the bottom of the hollow to the top of the ring. Reference characters symbolizing dimensional characteristics of the ring and traveler are named in Table I, end-points (for the traveler) being at the numbered locations or projections therefrom, as shown in Figure 1.

Table I

For the Traveler			For the Ring	
Symbol	Name	End-points	Symbol	Name
BH-----	Bottom Hook-----	14, 15	D-----	Depth.
BR-----	Bottom Reach-----	13, 15	FW-----	Flange Width.
F-----	Fit-----	11, 14	T-----	Thickness.
G-----	Gap-----	12, 15	TC-----	Top Clearance.
H-----	Height-----	12, 14	XTC-----	Extended Top Clearance.
I-----	Insertion-----	11, 12	BC-----	Bottom Clearance.
S-----	Set-----	13, 16		
TH-----	Top Hook-----	11, 12		
TR-----	Top Reach-----	11, 13		

Of course, as for an ordinary C-shaped traveler, the inside vertical and horizontal dimensions must exceed the corresponding outside dimensions of the ring in order for the traveler to move freely with respect to the ring, regardless of any problem of installation of the traveler on the ring; thus, in the present terminology, $H > D$, $TR > T$, and $BR > T$. According to the present invention, installation of the traveler over the ring can occur without deformation of either (shown in Figure 3) because gap G between the inside top of the traveler and the top edge of the bottom terminus of the traveler exceeds ring depth D. Despite this feature, unintentional removal of the traveler from the ring is prevented; however, removal by hand is easily accomplished. The forward tilting shown in this figure normally occurs only during installation. Furthermore, the present design prevents removal by any tilting in the opposite direction, as may occur during start-up, when drag of yarn inside top corner 6 of the traveler may raise it from the rest position shown in Figure 4 and tilt it backward momentarily before centrifugal force associated with movement of the traveler about the ring becomes sufficient to force the traveler outward into normal operating position, in which contact between bottom 9 of the traveler and bottom 22 of the ring replaces normal resting contact of their respective tops 5 and 21. Accordingly, fit F from lowermost point 14 inside the traveler to the top terminus 11 is less than

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depth D of the ring; in a sense, F and G here are converse requirements.

It is clear from the view of the operating position in Figure 5 that bottom hook BH of the traveler, the distance between the levels of points 14 and 15 of the lower part, should be less than bottom clearance BC, the distance from the underside of the supporting flange to the bottom of the ring. This is necessary to prevent the ring from catching or chattering against the flange of the ring during winding. Because the traveler settles onto the ring as in Figure 4 upon cessation of operation, it is similarly desirable that top hook TH, the distance between the levels of points 12 and 11 of the top part of the traveler should be less than top clearance TC, the distance from the top side of the ring flange to the top of the ring. It will be apparent also that when the traveler is tilted forward onto the ring, the top terminus of the traveler should not contact the ring flange; thus, insertion I, the distance parallel to the sides of the straight top terminus between points 12 and 11, should be less than top clearance TC. Alternatively, a depression or hollow (dashed lines) can be provided in the flange at the desired installation point to constitute extended top clearance XTC, which will accommodate enough of the top terminus temporarily without distortion of either element. Optionally, extended clearance may be provided by eliminating the flange completely at one or more sectors on the ring. Flange width FW normally is considerably less than either thickness T or depth D of the ring, the flange being present primarily to stiffen the structure and to provide a fastening location for a ring-supporting member, which usually also "traverses" the ring up and down the length of the spindle (or bobbin supported thereon).

In Figure 5, yarn 20 is visible passing within the top internal corner of the traveler, which appears in the normal operating position. Set S is the length of a perpendicular from arch point 13 of the back to the gap line connecting points 12 and 15; it conveniently approximates half the ring-thickness to facilitate installation, as shown in Figure 3. Angle θ' made by the hooked top end of the traveler with the vertical usually does not differ greatly from the angle of arch θ , but it may vary therefrom by as much as a factor of ten in either direction (comparison in degrees).

When a steel traveler having a maximum cross-sectional dimension within the range of 0.014 to 0.125 inch is used with a nylon ring having a diameter of 3 to 8 inches, relative dimensions appearing in the following table are preferred for smoothness of operation and reduction in wear.

Table II

1.1D<H<1.2D (D+0.001")<G<(D+0.003") 0.85D<F<0.95D 1.15T<TR<1.60T 1.15T<BR<1.60T BR<TR<1.25BR	0.85TC<TH<TC 0.35BC<BH<0.40BC 12°<θ<30° θ/θ'<(3θ-0.001θ) 0.45T<S<0.65T
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The described traveler does not separate from the ring during string-up, winding, or in the quiescent or resting state. The attitude of the traveler with respect to the ring during installation is not duplicated in normal operation or at rest or during transition from one state to the other, whether starting or stopping. The advantages of such an arrangement are obvious. In particular, this enables hardened travelers to be used satisfactorily on rings made of softer materials. Instead of steel, the traveler may be made of other metal or of ceramic; brittleness of the traveler is not a handicap because the traveler need not be sprung to place it on the ring. As a constituent of the ring, nylon may be replaced by polytetrafluoroethylene

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or a polyester, as well as other resinous polymeric substances. Either traveler or ring may incorporate graphite or other lubricant or finely divided metal, such as copper or lead, for modification of surface characteristics or other purposes; in general, no lubrication is necessary with the described traveler-ring combinations. Not only are maintenance and replacement costs lessened greatly but winding tensions become much more uniform throughout the useful lives of both ring and traveler, greatly reducing the incidence of broken filaments, barre, and other defects in the yarn processed thereby.

The claimed invention:

1. In a ring-spinning machine including a horizontal annular ring having an exterior flange defining top and bottom clearances thereon, the improvement comprising a modified C-shaped traveler having a back arched through an appreciable angle, and having a gap from inside the top to the terminus of the hooked bottom thereof greater than the vertical depth of the ring and a fit from the inside bottom to the terminus of the hooked top thereof less than said depth.

2. In apparatus according to claim 1 in which the ring is composed of a resinous polymeric substance, the improvement comprising a traveler made of material harder than the ring composition and characterized further by horizontal reach of the hooked top greater than the horizontal thickness of the ring exclusive of the flange and by horizontal reach of the hooked bottom greater than said thickness, the top reach exceeding the bottom reach, and by having a top hook less in extent than the top clearance of the ring and a bottom hook less in extent than the bottom clearance of the ring.

3. In combination, a nylon spinning and twisting ring and a metallic traveler having the relative dimensions appearing in Table II wherein the reference characters have the meanings ascribed to them in Table I hereof.

4. Apparatus comprising, in combination, an annular ring of substantially uniform axial depth and radial thickness having an exterior flange defining separate clearances thereon, each clearance being the axial distance depthwise along the ring from a substantially perpendicular surface of the flange, and a generally C-shaped traveler opening from one terminus to the furthestmost opposite inside surface of the traveler to an extent greater than the ring depth and opening from the other terminus to the furthestmost inside surface of the traveler opposite that terminus to an extent less than the ring depth, whereby the traveler fits without distortion onto the ring upon location of the greater of the two openings in depthwise alignment with the ring, each of the respective clearances being sufficient to accommodate the corresponding terminus of the traveler.

5. The ring-spinning machine of claim 1 in which the modified C-shaped traveler has the relative dimensions appearing in Table II wherein the reference characters have the means ascribed to them in Table I hereof.

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