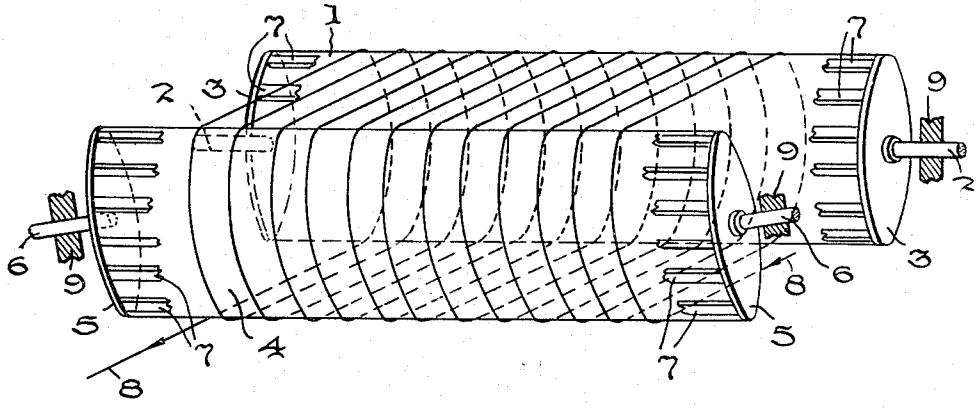
June 29, 1948. W. SEVER 2,444,315

THREAD ADVANCING APPARATUS

Filed March 14, 1946 4 Sheets-Sheet 1

Fig. 1.



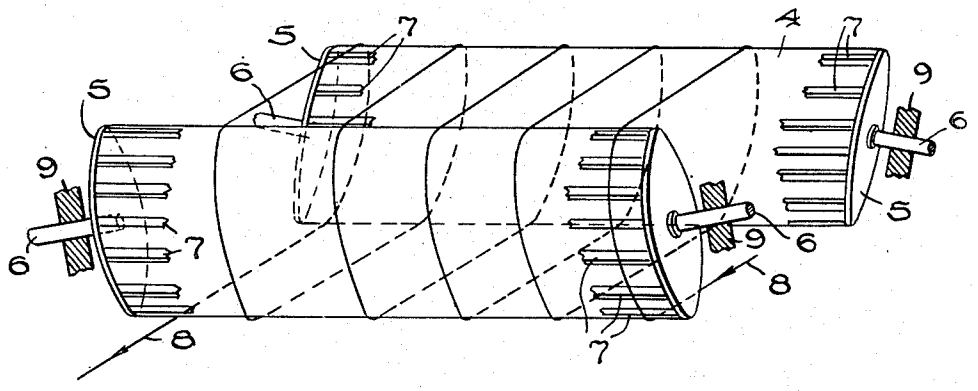


Fig. 2.

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June 29, 1948. W. SEVER 2,444,315

THREAD ADVANCING APPARATUS

Filed March 14, 1946 4 Sheets-Sheet 2

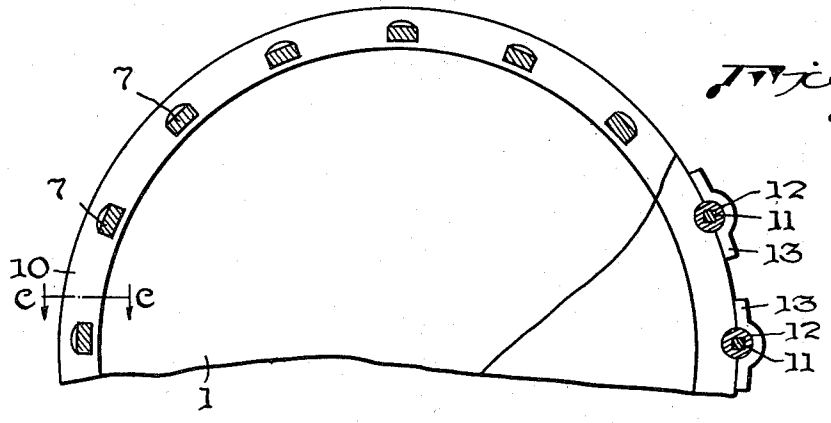

Fig. 3.

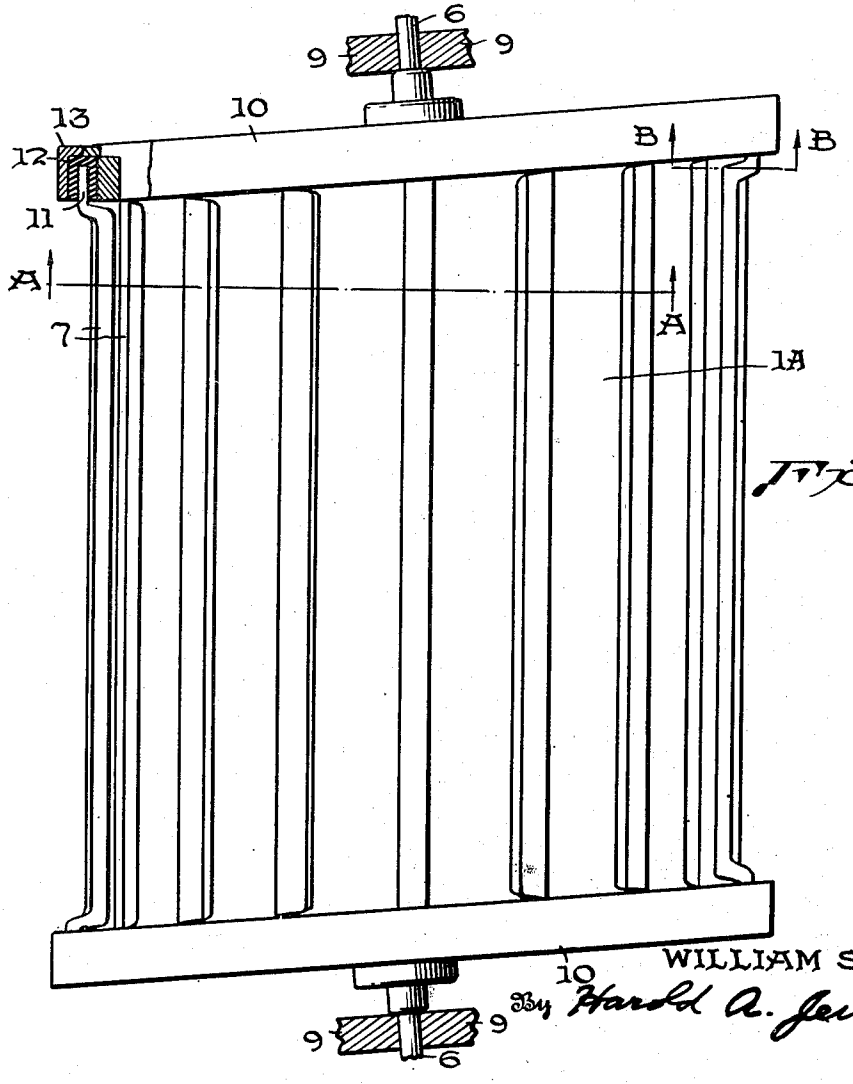

Fig. 4.

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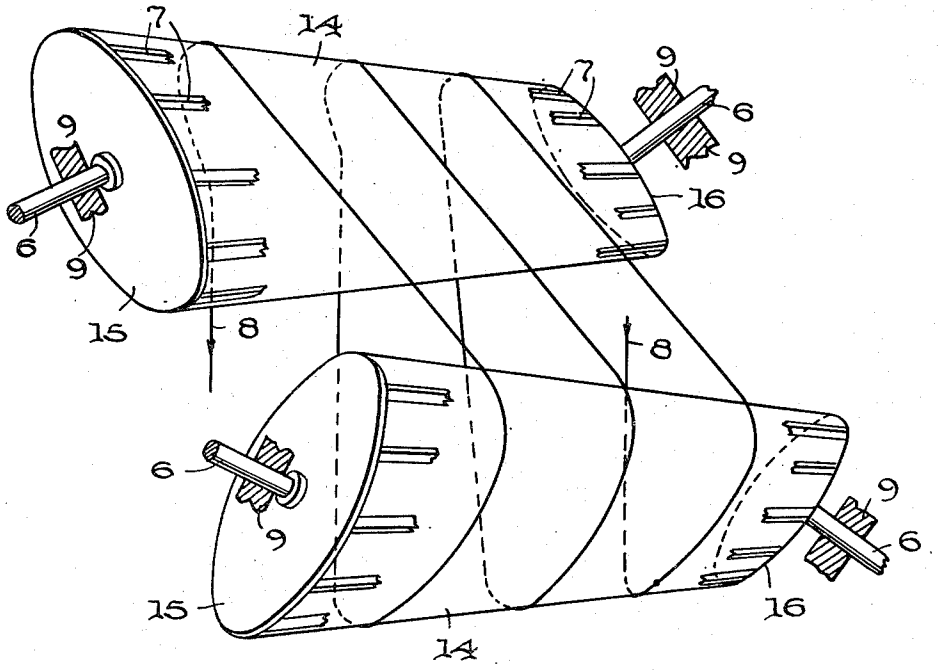
June 29, 1948. W. SEVER 2,444,315

THREAD ADVANCING APPARATUS

Filed March 14, 1946 4 Sheets-Sheet 3

Fig. 5.



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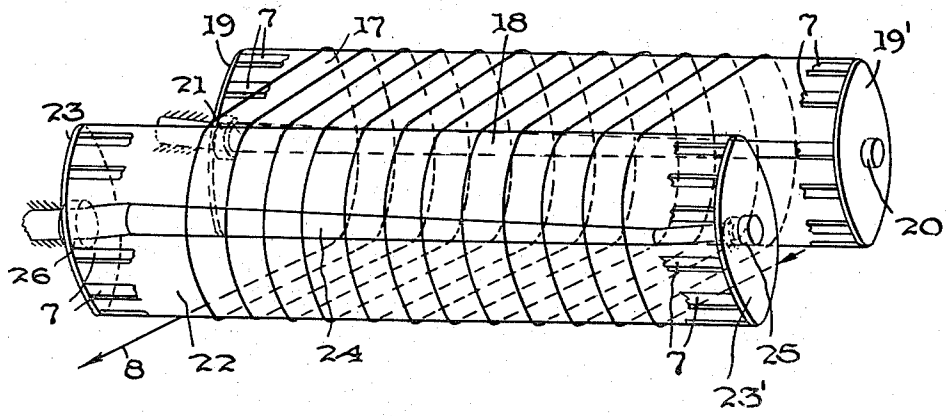
June 29, 1948. W. SEVER 2,444,315

THREAD ADVANCING APPARATUS

Filed March 14, 1946 4 Sheets-Sheet 4

FIG. 6.



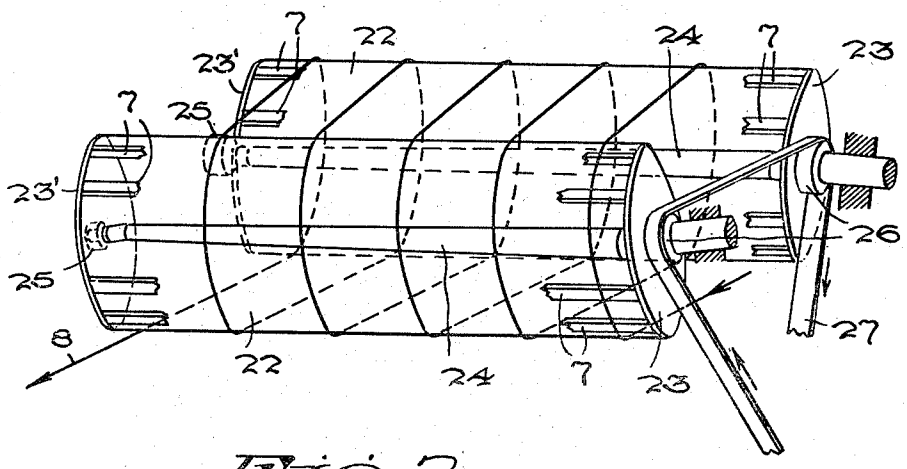


FIG. 7.

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2,444,315

UNITED STATES PATENT OFFICE

2,444,315

THREAD ADVANCING APPARATUS

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Application March 14, 1946, Serial No. 654,392
In Great Britain March 26, 1945

7 Claims. (Cl. 28—71.6)

1

The present invention relates to improvements in an apparatus for advancing and spacing of artificial filaments or threads in a limited space during the application of treatments to them, and to an improved method for advancing and spacing artificial filaments or threads during application of treatments to them.

In the manufacture of artificial filaments or threads it frequently happens that the filaments or threads have to be submitted for an appreciable period of time to one or more operations of wet or dry processing. It is desirable to carry out the manufacture of said artificial filaments or threads in as continuous a manner as possible, but as the different operations included in the manufacture may take differing periods of time to complete, some of them appreciable periods, much space and large quantities of reagents may be required if they are to be carried out on a continuously advancing filament or thread.

A number of proposals have already been made having as their main object the elimination of these difficulties and involving the provision or use of rotating apparatus for advancing and spacing the filaments or threads in a limited space.

The object of the present invention is to provide an improved method and apparatus for producing uniform and controllable spacing between adjacent turns of the filaments or threads when advancing and spacing them in a limited space and facilitating the application of wet or dry processing treatments to them.

Apparatus according to the invention adapted for the advancement and spacing of artificial filaments and threads during treatments in a limited space comprises as one component thereof a rotatable cage comprising two end plates or the like connected by a number of rods or bars of equal length disposed around them and flexibly attached thereto, each of the end plates being adapted, during rotation of the cage about its pseudo axis, synchronously to rotate around an axis perpendicular to the plate and intersecting the pseudo axis of the cage at an angle, said two end plate axes being in the same plane and parallel or nearly parallel to each other but not collinear, and as another component thereof one or more filament or thread supporting members so positioned with respect to the first component that the external tangential planes common to both components are perpendicular or substantially perpendicular to the aforesaid plane containing the axes of the two end plates of the first component.

2

By "flexibly attached" we mean that the two attachments leave the rod or bar capable of conical motion relative to each end plate about apices at the respective points of attachment. They may also if desired allow the rod or bar a slight longitudinal movement in a direction parallel to the pseudo axis of the cage.

According to the present invention the method for the continuous advancement and spacing of artificial filaments or threads during the application of treatments to them comprises passing the artificial filaments or threads several times around the filament or thread supporting member and the rotating cage as hereinbefore described in such a manner that any particular portion of the advancing filament or thread on the cage remains for substantially half a turn of the cage on a point on a rod or bar that moves towards one end of the cage during that half turn before it is taken off and led on to the said filament or thread supporting member.

The said filament or thread supporting member may be one or more rods, rollers, or rotating cages of the kind constituting the first mentioned component of the apparatus according to the invention, or one or more rotating cages wherein the axes of the two end plates of each cage are collinear and coincident with the axis of the cage.

The flexible mountings of the rods or bars may take the form of bushes or tie pieces of rubber or other resilient or flexible material.

Furthermore, the rotating cage may be either generally conical or generally cylindrical in shape. When the rotating cage is conical the filament or thread supporting member may be a similar conical rotating cage, both cages rotating with substantially equal angular velocities, so that the filament or thread can be gradually stretched.

If the cage is generally cylindrical the end plates and their respective axes are desirably parallel, but if it is generally conical the axis of the smaller end plate is preferably at a greater angle to the pseudo axis of the cage than is the axis of the larger end plate.

The resulting spacing of the continuously advancing filaments or threads can be understood when it is recognized that in either form of cage the bars or rods have reciprocating mitions in differing phases in a direction parallel to the pseudo axis, so that there is a maximum displacement towards one end of the cage when the cage has made half a turn, of any particular point on these bars or rods which lie in the plane of the

axes of the end plates, and that in carrying out the method of the present invention any particular portion of an advancing thread or filament remains on a particular point along such a bar or rod for substantially the half turn of the cage adapted to give it the displacement before it is taken off and led on to the filament or thread supporting member. The smaller the angle between the pseudo axis and the end plate axis the less the displacement and the greater the number of turns that can be accommodated on the cage.

Several forms of apparatus according to the invention are illustrated in the accompanying diagrammatic drawings in which Figure 1 is a perspective view in part section of a pair of rotational cages, one cage having end plates with non-collinear axes and the other cage having end plates with collinear axes, Figure 2 is a perspective view in part section of a pair of rotational cages both cages having end plates with non-collinear axes, Figure 3 is a part sectional end elevation of Figure 4 looking in the direction of AA and part sectioned in the direction of BB on Figure 4. Figure 4 is a front elevation of a rotating cage having end plates with non-collinear axes and part sectioned in the direction of CC on Figure 3 and Figure 5 is a perspective view in part section of two generally conical cages having end plates with non-collinear axes. Figure 6 is a perspective view showing two generally cylindrical cages both supported externally at one end with one of the cages having end plates with non-collinear axes and the other cage having end plates with collinear axes, while Figure 7 is a perspective view partly in section of a pair of rotational cages both supported externally at one end and both having end plates with non-collinear axes.

Referring to Figure 1, 1 is a cylindrical cage rotating on two collinear axles 2 of the two end plates 3, 4 is a cylindrical cage rotating in the same direction having two end plates 5 rotating on two non-collinear axles 6. The bars 7 connecting the end plates on both cages are shown in part only, for convenience. The advancing filament 8 is shown spaced on the two cages 1 and 4. 9 are journals.

Referring to Figure 2, 4 are two similar cylindrical cages rotating in the same direction about pseudo axes which are parallel to one another, each cage having two end plates 5 rotating on two non-collinear axles 6. The respective axles 6 of the two cages are equally and oppositely inclined to the plane containing the pseudo axes of the cages. The bars 7 connecting the end plates of each cage are shown in part only, for convenience. 9 are journals. The advancing filament 8 is shown spaced on the two cages 4.

In the form of apparatus illustrated in Fig. 2 the spacing distance between the turns of the advancing filament is greater than in the form illustrated in Fig. 1 because each cage in Fig. 2 is an active spacing cage.

Referring to Fig. 3, 10 is the rim of a wheel serving as an end plate of the cage 1A illustrated in Fig. 4, 7 are cross sections of the connecting bars, 11 are the flattened key-ends of the connecting bars 7, 12 are rubber seatings in flange covers 13.

Referring to Fig. 4, 10 are the rims of the wheels serving as end plates of the cage 1A, 6 are axles of the wheels 10, 9 are journals for the axles 6, 7 are bars connecting the wheels 10. Each end of a bar is cut as at 11, and the flat key-end 11 is

fixed in a flexible seat 12, held in the flange cover 13.

Referring to Fig. 5, 14 are two similar generally conical cages rotating in the same direction about pseudo axes which are parallel to one another, each cage having an end plate 15 larger than the end plate 16. 6 are the axles of the plates, 9 are journals, and 7 are bars. The axles 6 of the end plates of one cage lie in a plane parallel to that containing the axles 6 of the end plates of the other cage, and the respective axles of the corresponding plates of the two cages are equally and oppositely inclined to the plane containing the pseudo axes of the two cages. The attachments of the bars 7 to the end plates 15 and 16 are such as to permit conical movement of the bars 7, but they do not provide for any appreciable longitudinal movement of the bars in a direction parallel to the pseudo axis. Since the bars 7 are of equal length, the end plates 15 must not be exactly parallel to the end plates 16, and the axes of the plates 16 are inclined at a greater angle to the pseudo axes than are the axes 6 of the larger end plates 15. 8 is an advancing filament looped around the two rotating cages. As it progresses from the smaller end of the cages to the larger ends it is gradually stretched.

While in Figures 1 to 5 of the accompanying diagrammatic drawings the journals of the end plate axle bearings are illustrated in position external to each cage at both ends it is frequently convenient that the axle bearing for one end plate of the cage should be within the cage itself so that the cage is supported from only one end in order to facilitate the looping of the filament or thread over the cage and the supporting member.

Referring to Figure 6, 17 is a cylindrical cage rotating on a stationary cantilever shaft 18. The axes of the two end plates 19, 19 are collinear so the said shaft 18 is a plain straight shaft fitting into the internal bearing socket 20 of the plate 19 so that plate 19 is rotatable around said shaft and passing through the centre of the plate 19 so that said plate 19 can rotate around said shaft. 21 is an external collar attached to the plate 19. 22 is a cylindrical cage rotating in the same direction having two end plates 23, 23' rotating on a stationary cantilever shaft 24. The axes of the two end plates 23, 23' are non-collinear so that the said shaft 24 is bent near the plates 23, 23' so that the shaft 24 meets the plates 23, 23' at right angles. The shaft 24 at one end fits into the internal bearing socket 25 on the plate 23' so that plate 23' is rotatable around the shaft 24 and at the other end passes through the centre of the plate 23 so that said plate 23 can rotate around said shaft. 26 is an external collar attached to the plate 23. The bars 7 connecting the end plates of each cage are shown in part only, for convenience. The advancing filament 8 is shown spaced on the two cages 17 and 22.

Referring to Fig. 7, 22 are two similar cylindrical cages rotating in the same direction about pseudo axes which are parallel to one another, each cage having two end plates 23, 23' rotating on two non-collinear axes. The two end plates 23, 23' rotate on a stationary cantilever shaft 24 the shaft being so bent near the plates 23, 23' as to meet the said plates 23, 23' at right angles. At one end the shaft fits into an internal bearing socket 25 on the plate 23' so that 23' is rotatable around the shaft 24 and at the other end passes through the centre of the plate 23 so that the plate 23 can rotate around said shaft. 26 is an external collar attached to the plate 23. 27 is a driv-

ing belt passing over the said collars 26. The bars 7 connecting the end plate of each cage are shown in part only for convenience. The advancing filament 8 is shown spaced on the two cages 22.

I claim:

1. Apparatus adapted for the advancement and spacing of artificial filaments and threads which comprises a pair of rotating cages each comprising two end plate members connected by a plurality of rods or bars of equal length disposed around the members and flexibly attached thereto each plate member being supported for rotation about an axis which is substantially perpendicular to the plate member and which is substantially parallel and non-collinear to the axis of the other plate member, said axes intersecting the pseudo-axis of rotation of the cage at an angle, one of said cages being positioned relative to the other cage so that the external tangential planes common to both the cages are substantially perpendicular to the plane containing said axes of the end plate members of the cages.

2. Apparatus adapted for the advancement and spacing of artificial filaments and threads which comprises a rotating cage comprising two end plate members connected by a plurality of rods or bars of equal length disposed around the members and flexibly attached thereto, each plate member being supported for rotation about an axis which is substantially perpendicular to the plate member and which is substantially parallel and non-collinear to the axis of the other plate member, said axes intersecting the pseudo-axis of rotation of the cage at an angle, one of said end plate members having a larger radius than the other so that the cage is conical in shape, and means comprising an arcuate surface separate from said cage for guiding filaments or threads to or from said cage positioned relative to said cage so that the external tangential planes common to both the cage and said means are substantially perpendicular to the plane containing said axes of the end plate member of the cage.

3. The apparatus of claim 2, wherein the smaller end plate of the conical cage is at a greater angle to the pseudo-axis of the cage than is the axis of the larger end plate.

4. Apparatus for the continuous winding of filamentous textile material which comprises a plurality of rotatable cages separated from one another and positioned relative to one another so that filamentous textile material may pass back and forth between the cages on the external surfaces thereof, each cage comprising two end plate members, a plurality of bars or rods of equal length flexibly attached to said members, and an axle substantially perpendicular to each end member rotatably supporting the member, the axles of individual cages being separated from the axles of the other cages, the axles of at least one of said cages being non-collinear and disposed at an angle to the pseudo-axis of rotation of that cage, at least one of said cages being conical in shape.

5. Apparatus for the continuous winding of filamentous textile material which comprises a plurality of rotatable cages separated from one another and positioned relative to one another so that filamentous textile material may pass back and forth between the cages on the external surfaces thereof, each cage comprising two end plate members, a plurality of bars or rods of equal length flexibly attached to said members, and an axle substantially perpendicular to each end member rotatably supporting the member, the axles of individual cages being separated from the axles of the other cages, the axles of at least one of said cages being non-collinear and disposed at an angle to the pseudo-axis of rotation of that cage, the axle of an end plate member of a cage connecting externally of the cage with its respective end member and the axle of the opposite end plate member of the cage connecting internally of the cage with its respective end plate member.

6. Apparatus adapted for the advancement and spacing of artificial filaments and threads which comprises a rotating cage comprising two end plate members connected by a plurality of rods or bars of equal length disposed around the members and flexibly attached thereto, each plate member being supported for rotation about an axis which is substantially perpendicular to the plate member and which is substantially parallel and non-collinear to the axis of the other plate member, said axes intersecting the pseudo-axis of rotation of the cage at an angle and a second rotatable member comprising an arcuate surface separate from said cage for guiding filaments or threads to and from said cage positioned relative to the cage so that the external tangential planes common to both the cage and the rotatable member are substantially perpendicular to the plane containing said axes of the end plate members of the cage, the radius of the arcuate surface of said rotatable member being substantially equal to the radius of said cage at corresponding points along the axis of rotation.

7. Apparatus for the continuous winding of filamentous textile material which comprises a pair of rotatable cages separated from one another and positioned relative to one another so that filamentous textile material may pass back and forth between the cages on the external surfaces thereof, each cage comprising two end plate members, a plurality of bars or rods of equal length attached to said members, and an axle substantially perpendicular to each end member rotatably supporting the member, the axles of individual cages being separated from the axles of the other cages, the axles of at least one of said cages being non-collinear and disposed at an angle to the pseudo-axis of rotation of that cage with the plurality of bars or rods thereof being flexibly attached to the two end plate members of said cage, the end plates of one cage being substantially equal in radius to the corresponding end plates of the other cage, whereby the two cages have correspondingly equal radii throughout.

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