

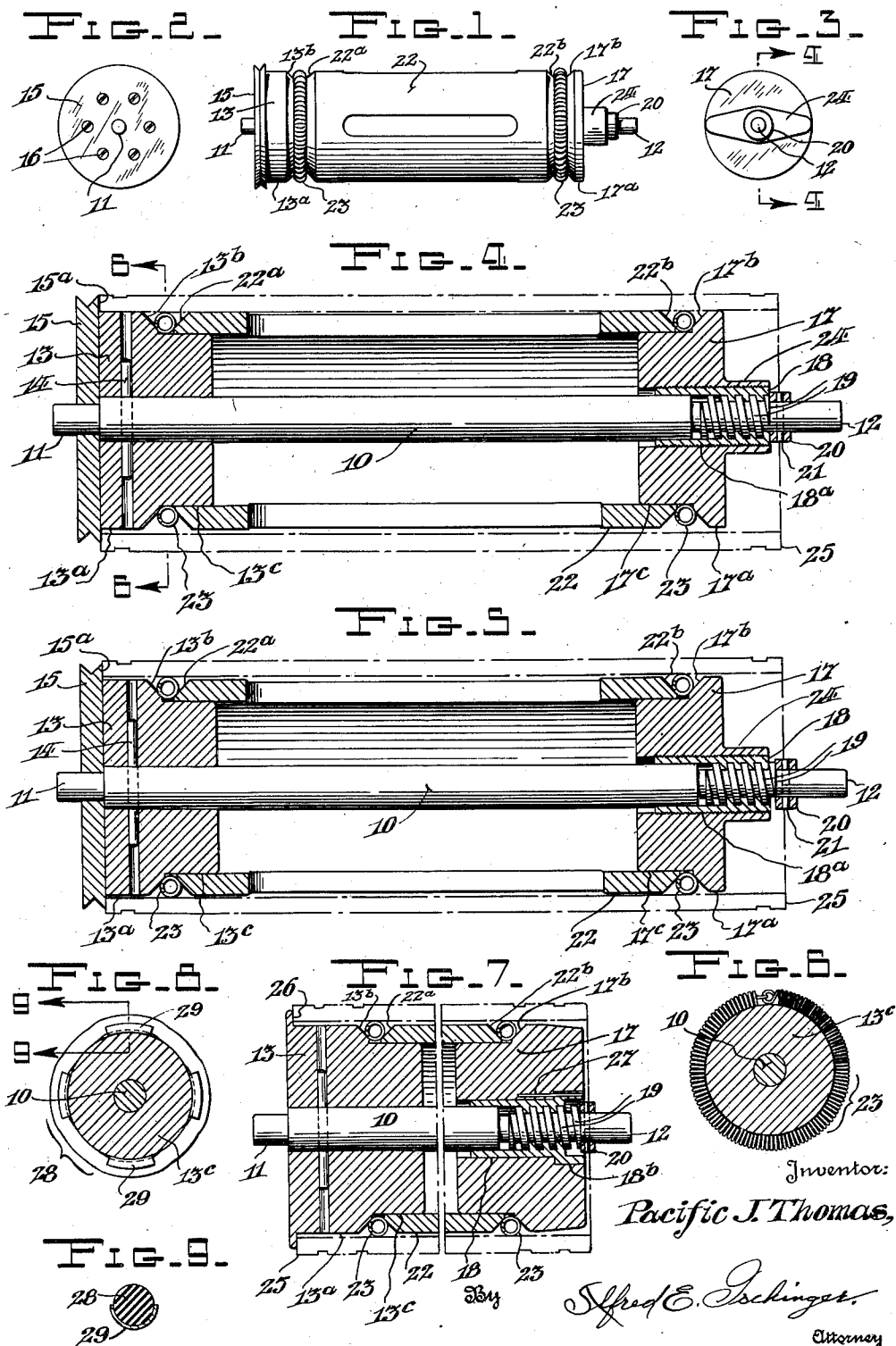
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MANDREL

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MANDREL

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This invention relates to mandrels, and more particularly to the type provided with movable means adapted to engage and releasably hold the devices mounted on the mandrel.

Modern yarn winding and twisting machines are equipped with mandrels on which are releasably mounted the devices adapted to receive the yarn. Such devices are usually in the form of tubes, or cylinders of paper, cardboard, or other material. The tubes have wound thereon a measured quantity of yarn, thereby to form yarn packages of standard size and configuration. In order that the yarn may be wound uniformly and in even layers, it is essential that the mandrels firmly hold the devices in precise relation to the yarn feeding means during the operation of the machine. Difficulties of a more or less serious nature have heretofore been experienced in consistently attaining this result, because the general run of the yarn receiving devices, and particularly the paper tubes, sometimes vary somewhat in size, are slightly out of round, or have a non-uniform interior mandrel engaging surface, which conditions have a tendency to cause slippage of the tubes relative to the mandrels in use and prevent proper axial alignment therewith.

One object of my invention is to provide a novel mandrel adapted for association with machines, such as yarn winding and twisting machines, to overcome difficulties of the general type indicated.

Another object is to provide a novel mandrel which embodies structural and functional features of advantage over similar devices of the prior art.

A further object is to provide such a mandrel having novel means for releasably holding the devices mounted on the mandrel.

Another object is to provide such a mandrel which embodies unique means for firmly gripping and accurately positioning the devices mounted on the mandrel.

An additional object is to provide such a mandrel which embodies one or more novel resilient or elastic elements adapted to function as self-adjusting or compensating means in conjunction with the holding and positioning action exerted by the mandrel relative to the devices mounted thereon.

An additional object is to provide such a mandrel in which the said elements have associated therewith interrupted, or spacedly arranged means, adapted to engage the devices mounted on the mandrel.

Another object is to provide such a mandrel in which the said elements are in the form of rings, or endless straps, having an edge portion adapted to directly engage and hold the devices mounted on the mandrel.

A still further object is to provide such a mandrel in which the said elements are formed from spirally wound spring wire, or elastic material such as rubber.

It is also an object to provide such a mandrel which embodies novel means for effecting quick holding and releasing action of the mandrel.

Another object resides in the provision of such a mandrel which embodies novel relatively adjustable coextensive surface members having juxtaposed edge sections arranged to form one or more variable cam grooves therebetween which are adapted to function as actuating means for the said resilient or elastic elements.

With these and other objects in view, which will become more apparent from the following detailed description of certain practical and illustrative embodiments of my novel mandrel, shown in the accompanying drawing, the invention comprises the new elements, features of construction and arrangement of parts in cooperative relationship, as hereinafter more particularly pointed out in the claims.

Referring to the drawing:

Figure 1 is an elevational view, on a reduced scale, of a mandrel embodying my invention.

Fig. 2 is an end elevational view of the mandrel shown in Fig. 1, as seen by looking at the latter from the left.

Fig. 3 is an end elevational view of the mandrel shown in Fig. 1, as seen by looking at the latter from the right.

Fig. 4 is a central cross-sectional view taken substantially as indicated by the arrows 4—4 on Fig. 3, and shows the mandrel parts approximately to actual size.

Fig. 5 is a view similar to Fig. 4, but with certain parts in another position.

Fig. 6 is a cross-sectional view, on a reduced scale, taken as indicated by the arrows 6—6 on Fig. 4, and more particularly shows one of the resilient ring elements forming a part of the mandrel of my invention.

Fig. 7 is a partial central cross-sectional view, similar to Fig. 5, but of a modified form of my mandrel invention.

Fig. 8 is a cross-sectional view, similar to Fig. 6, and shows another, or modified form of ring, or strap element, and

Fig. 9 is a cross-sectional view, taken substan-

tially as indicated by the arrows 9—9 on Fig. 8.

To exemplify a practical embodiment of the mandrel construction of my invention, the latter is herein disclosed in the form of a mandrel adapted for association with yarn winding and twisting machines of the type manufactured and sold by the U. S. Textile Machine Company of Scranton, Pa. For information concerning such machines, reference may be had to the various catalogs and other printed matter published and distributed by the said company from time to time. The mandrel of my invention can be incorporated in such machines for the purpose of releasably holding the usual yarn receiving devices or tubes made of paper, cardboard, fibrous, or other materials.

The construction illustrated in Figs. 1 to 6 inclusive generally comprises, a spindle 10 having reduced ends 11 and 12 which function as trunnions to fit suitable machine bearings in which the mandrel is rotatably mounted; a gudgeon head 13 fixed to the spindle 10 by a pin 14 which passes through the latter; a magazine sheave 15 attached to the outer surface of the gudgeon head 13 by bobbin screws 16 which latter pass through the sheave 15 and are secured in the head 13; an endwise movable head 17 having centrally secured thereto a sleeve 18, which is internally threaded and has a knurled outer surface 18^a; threads 19 on the spindle end 12, adapted and arranged for cooperative association with the internal threads of sleeve 18; a movement limiting collar 20 fixed to the spindle end 12 by a pin 21; a cylindrical member, or sleeve 22; and two tensioned resilient or elastic ring elements 23.

The heads 13 and 17 are arranged in opposed relation to each other on the spindle 10, are of circular cross-sectional configuration and are provided with aligned or coextensive outer surfaces 13^a and 17^a, similarly opposed inwardly inclined tapered edge portions 13^b and 17^b, and extensions, or ledge sections 13^c and 17^c. The said ledge sections form supports for the outer ends of the cylinder 22, permitting free floating movement thereof relative to heads 13 and 17, i. e., free rotation and limited longitudinal sliding movement of the cylinder in either direction, relative to the heads 13 and 17.

The outer surface of the cylinder 22 is also aligned or coextensive with the surfaces 13^a and 17^a. At its ends, the cylinder 22 has tapered edge portions 22^a and 22^b which are inclined in the opposite direction to the adjacent tapered edge portions 13^b and 17^b of the heads 13 and 17. The juxtaposed edge portions 13^b—22^a and 17^b—22^b form two similar annular V-shaped cam grooves in each of which is seated one of the tensioned resilient ring elements 23.

The outer end of the head 17 has integrally formed thereon a transverse member 24 arranged to serve as finger engaging or grasping means to facilitate rotation of the head when it is desired to effect longitudinal movement thereof in either direction, along the spindle threads 19.

As illustrated in Fig. 6, each of the resilient ring elements 23 comprises a body formed from a spirally wound spring wire the ends of which are connected or interlocked with each other. The wire convolutions of this ring form an outer interrupted, or spacedly arranged edge section consisting of a multiplicity of arcuate wire portions adapted to engage the inner surface of a yarn receiving device, or tube 25, indicated in dot-and-dash lines in Figs. 4 and 5. The ring ele-

ments 23, when completely relaxed or contracted, are of a considerably smaller diameter than the ledge sections 13^c and 17^c, so that when seated in the cam grooves of the mandrel these elements are partly tensioned and expanded. Fig. 6 shows one of the elements 23 tensioned and expanded so that its inside diameter equals that of the diameter of the ledge section 13^c on which the element rests.

The edge of the magazine sheave 15 extends beyond the surface 13^a of head 13, and its projecting side surface 15^a adjacent the head 13 functions as a positioning stop for the tube 25.

To operate the mandrel, a yarn receiving tube 25 is slidably moved over the mandrel from right to left until the left edge of the tube abuts the side surface 15^a of the magazine sheave 15, as shown in Fig. 4. The head 17 is then rotated so that it moves longitudinally along the spindle 10 toward the head 13, as determined by coaction of the internal threads of sleeve 18 and threads 19 on the spindle end 12. Due to the tensioned condition of the ring element 23 between the edge portions 17^b and 22^b, such axial movement of head 17 is partly or entirely transmitted to the free floating sleeve 22 as determined by the speed of such movement and the rate of expansion of the ring element 23 between the edge portions 17^b and 22^b. Since the tension, or contracting force of the ring elements 23 is substantially equal, the centralizing or positioning force exerted on each end of sleeve 22 is substantially the same. Therefore, continued movement of the head 17 toward the head 13 will result in uniformly reducing the width of the two V-shaped cam grooves formed by the juxtaposed edges 13^b—22^a and 17^b—22^b, thereby radially moving, or further expanding the resilient ring elements 23 in parallel planes, transversely of the mandrel body, until their outer edges engage the inner cylindrical surface of the tube 25 with sufficient pressure to effect firm holding or gripping of the tube, as illustrated in Fig. 5. Since the ring elements 23 are resilient, or lengthwise elastic, and their outer edges consist of a multiplicity of individual relatively spaced arcuate wire portions, which are also yieldable, the outer contacting edges of the elements will adjust themselves relative to any existent slight variations or irregularities of the inner cylindrical surface of the tube at the point of contact, and, in conjunction with the yielding action afforded by such means, establish substantially precise concentricity of the outer surface of the tube 25 relative to the axis of the spindle 10.

To release the tube 25, so as to permit its removal from the mandrel, it is merely necessary to rotate head 17 in reverse direction to effect longitudinal movement thereof toward the spindle end 12. The contracting force of the resilient elements 23 will then be exerted on the cam groove edges 13^b—22^a and 17^b—22^b, and the latter will be uniformly separated or spread apart, until the elements 23 have contracted sufficiently to again occupy the position shown in Fig. 4.

The movement limiting collar 20 is provided to act as an abutment stop for the sleeve 18 so as to prevent the head 17 from being moved outwardly along the spindle 10 beyond the point where rotation of the head would fail to promptly effect holding or releasing action of the mandrel.

From the foregoing description of the operation of the mandrel shown in Figs. 1 to 6 inclusive, it will be noted that the heads 13 and 17 and the cylinder 22, constitute three separate

members of the mandrel having aligned coextensive outer surface portions which are adjustably moved longitudinally of the mandrel as explained, so as to vary the width of the V-shaped cam grooves formed by their respective tapered edges, and that such adjustment of the cam grooves results in expansion or contraction of the ring elements 23, effecting the holding or release action of the mandrel.

The magazine sheave 15 has an annular groove in which a few turns of the yarn may be initially wound and anchored to facilitate continued winding of the yarn unto the tube 25, in accordance with the usual and well known practice.

As previously explained, the sheave 15 also functions as a positioning stop for the edge of the tube 25. If desired, the sheave 15 may be omitted and a tube positioning stop, or flange 26, may be integrally formed on the head 13, as disclosed by the modified mandrel construction of Fig. 7. Also, instead of providing a knurled outer surface on the sleeve 18 to effect fixed engagement with the head 17 when formed of molded or other material, a flange 18^b may be provided on the sleeve 18, and a securing pin 27 passed therethrough and into the head 17, as disclosed in the modified construction of Fig. 7. Except for these two changes, the modified mandrel of Fig. 7 is substantially the same in construction and operation as that previously described. To avoid repetition of the description of the parts of the mandrel shown in Fig. 8, which correspond with the parts of the mandrel of Figs. 1 to 6 inclusive, such parts are designated by similar reference characters in each of these two forms of the mandrel construction.

Fig. 8 illustrates a modified form of ring element 28 which can be substituted for the resilient ring elements 23 in the mandrel constructions already described. The ring element 28 is elastic and may be formed of rubber or the like. In order that such an elastic element may freely expand and contract when the width of the cam groove of the mandrel, in which it is seated, is changed, a plurality of substantially rigid surface members or shields 29, of suitable spring metal or the like, may be clampingly applied thereto, or otherwise attached, in spaced relation along the inner edge of the ring, as clearly shown. The members 29 prevent the elastic element 28 from being squeezed or pinched, at the points of location of said members, and provide for free radial sliding action of the element 28 in its respective cam groove when the width of the latter is varied.

The elastic ring elements 28 when completely relaxed or contracted, are also of a smaller diameter than the ledge sections 13^c and 17^c, so that when seated in the cam grooves of the mandrel they are tensioned and partly expanded. When a ring element 28 occupies its intended position in one of the V-shaped cam grooves of the mandrel, the outer edge portions of the element opposite to the members 29 will be slightly advanced or projected, as clearly shown in Fig. 8, and these advanced edge sections are adapted to engage the inner surface of the tube 25 to effect a holding and positioning action in substantially the same manner as explained in connection with the resilient ring elements 23.

For practical and efficient results, the mandrel of my invention may be partly constructed of wood, and partly of metal. For example, the heads 13 and 17, and the cylinder 22 may be formed of suitable wood, and the spindle 10, sleeve 18, collar 20, pins 14, 27 and 21 of metal. How-

ever, it will be understood that certain of these parts may also be made of other materials, such as plastic materials, to impart to the mandrel construction the characteristics and benefits to be derived from such substitution.

Of course, the mandrel construction specifically shown and described can be changed and modified in various ways without departing from the invention herein disclosed and more particularly pointed out in the appended claims.

I claim:

1. A mandrel comprising, a spindle, two relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section, a cylindrical member mounted for free floating movement intermediate said heads and having outwardly tapered edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a resilient ring element seated in each of said cam grooves, means securing one of said heads to the spindle, and means arranged to effect axial movement of the other head along said spindle.

2. A mandrel comprising, a spindle, two relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section, a cylindrical member mounted for free floating movement intermediate said heads and having outwardly tapered edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a resilient ring element seated in each of said cam grooves, means securing one of said heads to the spindle, means arranged to effect axial movement of the other head along said spindle, and means arranged to limit the movement of said movable head in one direction.

3. A mandrel comprising, a spindle, a pair of relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section and a contiguous annular extension, a cylindrical member mounted on said extensions for free rotary and axial movement intermediate said heads and having outwardly tapered edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a resilient ring element seated in each of said cam grooves, means securing one of said heads to the spindle, and means arranged to effect axial movement of the other head along said spindle.

4. A mandrel comprising, a spindle, two relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section, a cylindrical member mounted for free floating movement intermediate said heads and having outwardly tapered edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a resilient ring element seated in each of said cam grooves, means securing one of said heads to the spindle, means on the head secured to the spindle for limiting the axial movement of the object to be mounted on the mandrel, and means arranged to effect axial movement of the other head along said spindle.

5. A mandrel comprising, a spindle, two relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section, a cylindrical member mounted for free floating movement intermediate said heads and having outwardly tapered edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves

therebetween, a resilient ring element seated in each of said cam grooves, means securing one of said heads to the spindle, a magazine sheave associated with the head which is secured to the spindle, and means arranged to effect axial movement of the other head along said spindle.

6. A mandrel comprising, a spindle, two relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section, a cylindrical member mounted for free floating movement intermediate said heads and having outwardly tapered edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a resilient ring element seated in each of said cam grooves, means securing one of said heads to the spindle, a magazine sheave unitedly associated with the head secured to the spindle and arranged to extend beyond the perimeter of said head, means arranged to effect axial movement of the other head along the spindle when the head is rotated, and means arranged to limit the movement of the movable head in one direction.

7. A mandrel comprising, a spindle, two relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section, a cylindrical member mounted for free floating movement intermediate said heads and having outwardly tapered edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a slip preventing resilient ring seated in each of said grooves and arranged to be engaged with the object mounted on the mandrel, means securing one of said heads to the spindle, and means arranged to effect gradual axial movement of the other head along said spindle.

8. A mandrel comprising, a spindle, two relatively opposed heads on said spindle each provided with an inwardly tapered edge section, a cylindrical member mounted for free floating movement intermediate said heads and having outwardly tapered edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a resilient ring element seated in each of said grooves, means securing one of said heads to the spindle, means arranged to effect axial movement of the other head along said spindle, and abutment means on the head which is secured to the spindle arranged to determine the position of one edge of the devices cooperatively associated with the mandrel.

9. A mandrel comprising, a spindle, two relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section, means mounted for free floating movement intermediate said heads and having edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a spiral spring wire element seated in each of said cam grooves, means securing one of said heads to the spindle, and

means arranged to effect axial movement of the other head along said spindle.

10. A mandrel comprising, a spindle, two relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section, means mounted for free floating movement intermediate said heads and having edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a rubber ring element seated in each of said grooves, means securing one of said heads to the spindle, and means arranged to effect axial movement of the other head along said spindle.

11. A mandrel comprising, a spindle two relatively opposed annular heads on said spindle each provided with an inwardly tapered edge section, means mounted for free floating movement intermediate said heads and having edge sections arranged in juxtaposed relation with the inwardly tapered edge sections of the heads so as to form cam grooves therebetween, a rubber ring element seated in said groove, a plurality of rigid devices spacedly attached to said ring along its inner perimeter, means securing one of said heads to the spindle, and means arranged to effect axial movement of the other head along said spindle.

12. A mandrel comprising separate relatively adjustable surface members having juxtaposed edge portions spacedly arranged to form a cam groove with oppositely inclined side surfaces, a resilient element seated in said groove, and means for effecting relative adjustment of said members so as to move the element along said side surfaces of the groove between a position effecting holding engagement of the element with an object mounted on the mandrel, and a position effecting release of said object.

13. A mandrel comprising separate relatively adjustable surface members having juxtaposed edge portions spacedly arranged to form a plurality of cam grooves, each having oppositely inclined side surfaces, a separate resilient element seated in each of said grooves, and means for simultaneously effecting relative adjustment of said members so as to equally move all the elements along said side surfaces of the grooves between a position effecting holding engagement of the elements with an object mounted on the mandrel, and a position effecting release of said object.

14. A mandrel comprising separate relatively adjustable annular surface members having juxtaposed edge portions spacedly arranged to form an annular cam groove with oppositely inclined side surfaces, a resilient annular slip preventing element seated in said groove, and means for effecting relative adjustment of said members so as to move the element along said side surfaces of the groove between a position effecting holding engagement of the element with an object mounted on the mandrel, and a position effecting release of said object.

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