C. MEHLUM.

COLLAPSIBLE MANDREL.

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1,093,284.

Patented Apr. 14, 1914.

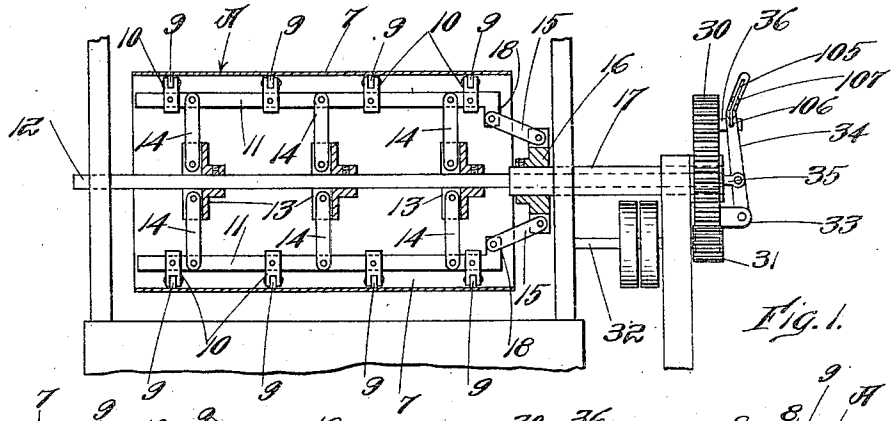


Fig. 1.

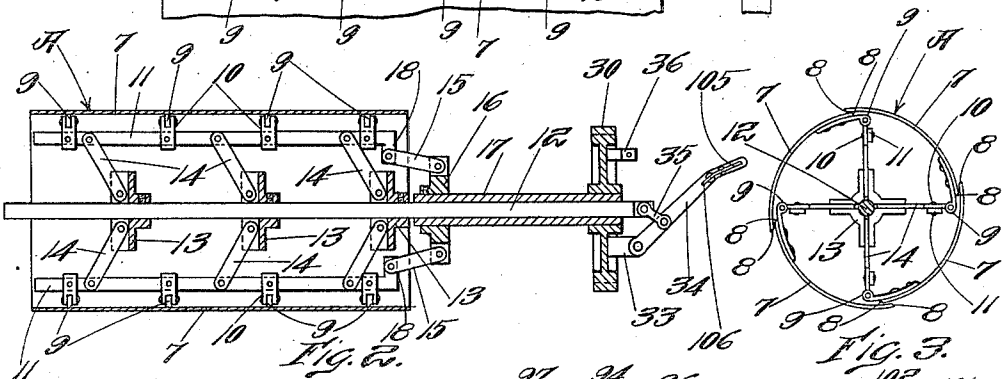


Fig. 2.

Fig. 3.

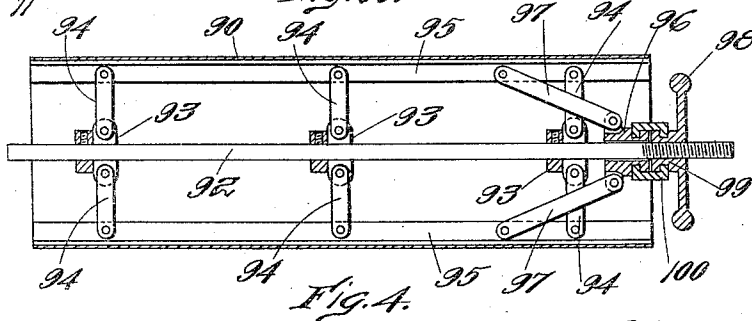


Fig. 4.

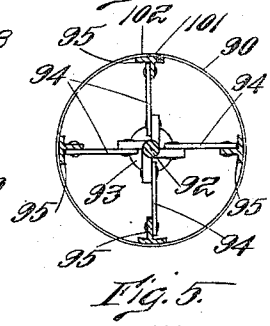


Fig. 5.

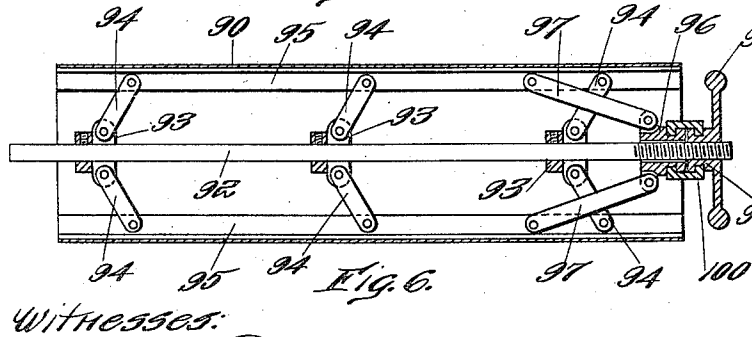


Fig. 6.

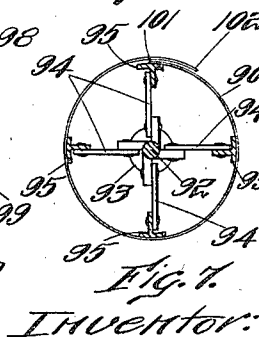


Fig. 7.

Witnesses:

John H. Parker

Helen M. Purcell

Inventor:

Casper Mehlum

by Macleod, Calver, Copeland & Dike

Attorneys.

UNITED STATES PATENT OFFICE.

CASPER MEHLUM, OF CAMBRIDGE, MASSACHUSETTS.

COLLAPSIBLE MANDREL.

1,093,284. Specification of Letters Patent. Patented Apr. 14, 1914.

Original application filed December 26, 1912, Serial No. 738,573. Divided and this application filed March 3, 1913. Serial No. 751,792.

To all whom it may concern:

Be it known that I, CASPER MEHLUM, a subject of the King of Norway, residing at Cambridge, county of Middlesex, State of Massachusetts, have invented a certain new and useful Improvement in Collapsible Mandrels, of which the following is a specification, reference being had therein to the accompanying drawings.

This is a division of my application for machine for making fiber tubes, filed December 26, 1912, Serial No. 738,573.

In the manufacture of fiber tubes as sometimes practised, the material from which the tube is formed is prepared in a sheet or web wound into a roll from which it is rewound on a mandrel for a sufficient number of layers or windings to make a tube of the requisite thickness. When the tube has been built up to the requisite thickness the web is cut so as to free the unwound portion of the web from the portion on the mandrel, and the tube thus formed is removed from the mandrel. Various means have been adopted for separating the tube and mandrel from each other. As the tube hugs the mandrel very tightly it is preferable to make the mandrel collapsible.

My invention relates to a collapsible mandrel both as to its construction and as to the means for operating it.

The invention will be fully understood from the following description taken in connection with the accompanying drawings, and the novel features will be pointed out and clearly defined in the claims at the close of the specification.

In the drawings: Figure 1 is a longitudinal section of the mandrel and operative parts viewed when the mandrel is expanded. Fig. 2 is a longitudinal section of the mandrel and its operative parts viewed when the mandrel is collapsed. Fig. 3 is an end view of the collapsed mandrel, partly in section. Fig. 4 is a longitudinal section of a mandrel provided with a modified form of mechanism for collapsing the mandrel and showing the mandrel in its un-collapsed form. Fig. 5 is an end view partly in section of Fig. 4. Figs. 6 and 7 are respectively longitudinal sectional and end views of the modified form of Fig. 4, showing the mandrel collapsed.

Referring now to the drawings,—in the preferred form of construction the mandrel A is composed of a plurality, preferably four in number, of segmental plates 7, each of which is a quarter cylinder of the same radius, so that when matched together the four plates together will form a cylinder. Preferably the edges 8 of each one of the segmental plates is beveled, as shown in Fig. 3, so that the plates may more readily slide over each other to collapse the mandrel. Each segmental plate has secured to its inner face a series of ears 9, to which is pivotally connected a series of hangers 10 which form supports for a bar or rod 11. A shaft 12 passes lengthwise through the center of the mandrel, and has fixedly mounted thereon a series of boxes 13 which are pivotally connected with the several longitudinal bars 11 by means of the links 14 which are pivoted both to the bars 11 and the boxes 13. The front end of each of the bars 11 is pivotally connected by links 15 with a hub or collar 16 mounted fast on a sleeve 17 in which the shaft 12 is slidable. Means are provided to cause the shaft 12 and sleeve 17 to rotate together, as will be hereinafter described. Preferably the front ends of the bars 11 are formed with a bent portion 18 for convenience of connecting with the links 15.

Mounted fast on the forward end of the sleeve 17 is a gear wheel 30 which engages with suitable driving mechanism. The form shown is pinion 31 on shaft 32. Projecting from the face of the gear 30 is an arm 33 to which is pivotally connected a handle 34 which has a link connection 35 with the forward end of the shaft 12, so that by means of said handle 34 the shaft 12 can be moved longitudinally in its bearings. By reason of the connection of the handle 34 both with the gear 30 and with the shaft 12, said shaft 12 will rotate with said gear and with the sleeve 17. Means are provided for locking the handle to the gear 30 when the mandrel is in expanded form so that it will not be accidentally moved to collapse the mandrel. Pivoted to the side of the handle 34 is a lever 105 carrying a stud 106 which extends through a hole in the handle and is adapted to engage in a hole in an arm 36 which projects from the side of the gear 30. A spring 107 normally holds the stud 106 in engagement with said hole in the arm 36, as shown in Fig. 1, to lock the handle so that the shaft 12 will not be moved longitudinally but will be free to rotate with the gear 30

and sleeve 17. By pressing on one arm of said lever, the lever will be turned to disengage the pin from the socket in the arm 36 so that the handle may be pulled back, as shown in Fig. 2, thereby pulling the links 14 into the angular position shown in said Fig. 2 and drawing the bars 11 inward toward the shaft and thereby drawing the segmental plates 7 inward into the position shown in Fig. 3 nearer to the shaft. The pivoted side of each segmental plate 7 will slide partially under the free side of the adjacent segment.

After the tube has been built up on the mandrel and it is desired to collapse the mandrel so that the tube can be removed, the operator will by hand release the lever 34 from its locked engagement with the gear wheel and turn it over to the right from the position shown in Fig. 1 to that shown in Fig. 2 pulling the shaft 12 longitudinally to the right and thereby pulling the links 14 from their vertical position shown in Fig. 1 to the angular position shown in Fig. 2, and pulling the links 15 more nearly parallel with the shaft, and thereby drawing the pivoted sides of the segments 7 inwardly, as shown in Fig. 3, which will be allowed by reason of the beveled edges of said segment plates, thus partially collapsing the mandrel so that the built up tube will be loose on the mandrel and can be withdrawn therefrom.

When it is desired to start the machine again the lever 34 will be turned up into vertical position and locked so as to expand the mandrel and retain the shaft against endwise movement.

In the modified form of collapsible mandrel shown in Figs. 4 to 7 inclusive the mandrel instead of being made of segments is preferably made of a single plate 90 rolled into cylindrical form, with the edges brought together as shown in Fig. 5, the plate being sufficiently elastic so that by a drawing in of one edge of the plate it may be turned under the other edge and then by a general drawing in the plate will be coiled into a cylinder of smaller diameter, as shown in Fig. 7. In producing this result the mandrel instead of the shaft is moved lengthwise. The means by which this is accomplished is as follows: Mounted fast on the shaft 92 is a plurality of blocks 93 to which links 94 are pivoted at one end, the other end of said links 94 being pivoted to ribs 95 which extend lengthwise of the inner periphery of the mandrel 90. One of these ribs 95 is secured to the cylinder near one edge thereof. The other ribs 95 are unattached to the cylinder so that they can slip thereon, but are held in engagement with the cylinder by the links 94. Mounted loose on said shaft 92 is a block 96 to which are pivotally connected at one end links 97, the other ends of said links being pivotally connected with said ribs 95. The outer end of said shaft 92 is screw threaded and is engaged by an internally screw threaded hub 99 having an operating wheel 98 to rotate said hub. Said hub is formed with an annular recess in its periphery to receive one flange of a coupling sleeve 100, the other flange of said coupling sleeve engaging with an annular groove in the block 96 which, as stated, is loose on the shaft 92. By turning said wheel the hub 99 will as it turns move lengthwise on the threaded end of said shaft, and thereby move the block 96 longitudinally of said shaft. When it is moved in a direction to move the hub and wheel toward the right hand end of the shaft 92, as viewed in Figs. 5 and 6, it will pull the links 97 a little more nearly parallel with the shaft and the mandrel itself will also be moved lengthwise toward the right a short distance, thereby turning the links 94 from the right angle position shown in Fig. 5 to the inclined position shown in Fig. 6 and pulling the edge 101 of the mandrel plate down under the edge 102 and causing the edges to slide past each other so that they will overlap, as shown in Fig. 7, and reducing the diameter of the mandrel so that the fiber tube will then become loose on the mandrel and enable it to be removed in the manner previously described with reference to the mandrel shown in Fig. 2.

What I claim is:

1. In a mandrel, a hollow cylinder slitted lengthwise thereof, a shaft whose axis is concentric with said cylinder, a plurality of boxes fixedly mounted on said shaft, a plurality of rods within the periphery of said cylinder extending lengthwise thereof parallel with said shaft, link connections between said rods and said boxes of the shaft, connections between the inner periphery of the cylinder and said rods, and means for moving said shaft or cylinder one with relation to the other in an endwise direction whereby the cylinder is contracted in diameter.

2. In a mandrel, a collapsible cylinder, a shaft whose axis is concentric with said cylinder, bearings for said shaft in which said shaft is movable longitudinally, link connections between said shaft and said cylinder, and means for causing a longitudinal movement of the shaft with relation to the cylinder whereby through the said link connections the cylinder is collapsed.

3. In a machine for making fiber tubes, a collapsible mandrel comprising a plurality of segmental plates which when set up form a cylinder, a shaft extending centrally through said cylinder, a plurality of rods extending lengthwise within said cylinder parallel with said shaft, there being at least one of said rods for each of said segmental plates, a flexible connection between each of

said segmental plates and one of said rods, a plurality of boxes fixedly mounted on said central shaft, link connections between said boxes and said rods, bearings for said shaft within which said shaft is movable longitudinally, and means for moving said shaft longitudinally in its bearings with relation to said segmental plates whereby said segmental plates are drawn inwardly toward said central shaft.

4. In a mandrel, a hollow cylinder slitted lengthwise thereof, a shaft whose axis is concentric with said cylinder, a plurality of boxes fixedly mounted on said shaft, a plurality of rods within the periphery of said cylinder extending lengthwise thereof parallel with said shaft, a plurality of link connections between said rods and said boxes whereby said rods are supported and are adapted to hold the mandrel in expanded form, a sleeve loose on said shaft and link connections between said sleeve and said rods, said sleeve and shaft being longitudinally movable one with relation to the other whereby the said link connections are adapted to move the said parallel rods toward and from said shaft and thereby allow the contraction and expansion of the mandrel.

5. In a machine for making fiber tubes, a collapsible mandrel comprising a plurality of segmental plates which when set up form a cylinder, a shaft extending centrally through said cylinder, each of said plates having on its inner periphery a plurality of ears secured thereto and disposed at intervals lengthwise thereof, a hanger pivoted to each of said ears, a rod supported by said hangers extending lengthwise of said segment plate, a plurality of boxes fixedly mounted on said shaft, link connections between said boxes and said longitudinal rods, bearings for said shaft, and means for moving said shaft longitudinally in its bearings and with relation to said mandrel plates whereby through said link connections said mandrel plates are drawn inwardly toward the axis and also drawn into overlapping relation with each other.

6. In a machine for making tubes, a mandrel consisting of a cylinder slitted lengthwise thereof having the edges normally meeting along the line of the slit, a shaft whose axis is concentric with said cylinder, a plurality of links connecting said shaft with said cylinder, and means for causing a lengthwise movement of said shaft with relation to the cylinder, whereby the said meeting edges are caused to overlap each other and contract the cylinder.

7. In a machine for making tubes, a mandrel consisting of a cylinder slitted lengthwise thereof, a shaft extending centrally through said cylinder, a plurality of bars extending through the cylinder and attached to the inner periphery thereof, link connections between said shaft and said bars, and means for moving the shaft or cylinder, one with relation to the other, in an endwise direction whereby the edges of the cylinder along the slit are drawn into overlapping relation with each other and thereby to contract the cylinder.

8. A mandrel composed of a plurality of segmental plates which when placed concentrically form a cylinder, a shaft whose axis is central with said cylinder, link connections between said shaft and each of said segments, bearings for said shaft permitting endwise movement of the shaft with relation to the cylinder, and means for moving said shaft endwise whereby the links draw the segment plates nearer to the axis of the shaft so that they partially overlap each other.

9. A mandrel composed of four segmental plates making when placed concentrically a cylinder, a shaft central with said cylinder and movable longitudinally, link connections between the shaft and one side of each of said segments, and means for moving the shaft longitudinally with relation to the cylinder whereby through the links the side edges of the segmental plates to which the links are connected are drawn nearer to the axis of the cylinder, causing the drawn in edges to under-lap the adjacent sides of the adjacent segments.

10. In a machine for making tubes, a mandrel composed of a plurality of segmental plates which when placed concentrically form a cylinder, a shaft which extends centrally through said cylinder, link connections between said shaft and each of said segments, bearings for said shaft permitting endwise movement of the shaft with relation to the cylinder, means for moving said shaft endwise whereby the links draw the segment plates nearer to the axis of the shaft, and means for rotating said shaft, said link connections causing the cylinder to rotate when the shaft rotates.

11. In a machine for making tubes, a mandrel composed of a plurality of segmental plates which when placed concentrically form a cylinder, a shaft which extends centrally through said cylinder, link connections between said shaft and each of said segments, bearings for said shaft permitting endwise movement of the shaft with relation to the cylinder, means for moving said shaft endwise whereby the links draw the segment plates nearer to the axis of the shaft, means for rotating said shaft, said link connections causing the cylinder to rotate when the shaft rotates, and means for locking the mechanism which operates the shaft endwise.

12. In a machine for making tubes, a mandrel composed of a plurality of segmental plates which when placed concen-

trically form a cylinder, a shaft which extends centrally through said cylinder, link connections between said shaft and each of said segments, bearings for said shaft permitting endwise movement of the shaft with relation to the cylinder, thereby drawing the segment plates nearer to the axis, means for moving said shaft longitudinally, a rotating driving wheel having a hub through which the said shaft passes and in which it is longitudinally slidable, connections between said wheel and said shaft whereby the rotation of the said wheel rotates the shaft and mandrel.

13. In a machine for making tubes, a mandrel composed of a plurality of segmental plates which when placed concentrically form a cylinder, a shaft which extends centrally through said cylinder, link connections between said shaft and each of said segments, bearings for said shaft permitting endwise movement of the shaft, a rotating driving wheel having a hub through which the said shaft passes and in which it is longitudinally slidable, a lever pivoted at one end to said wheel and pivoted intermediate its ends to said shaft whereby the shaft may be moved endwise with relation to the cylinder and wheel and the shaft and cylinder may be rotated by the wheel.

In testimony whereof I affix my signature, in presence of two witnesses.

CASPER MEHLUM.

Witnesses:
WILLIAM A. COPELAND,
ALICE H. MORRISON.