P. I. ANDREWS.

MANDREL FOR SEAMLESS TUBES OF SHRINKABLE MATERIAL.

APPLICATION FILED MAR. 16, 1911.

**999,004.** **Patented July 25, 1911.**

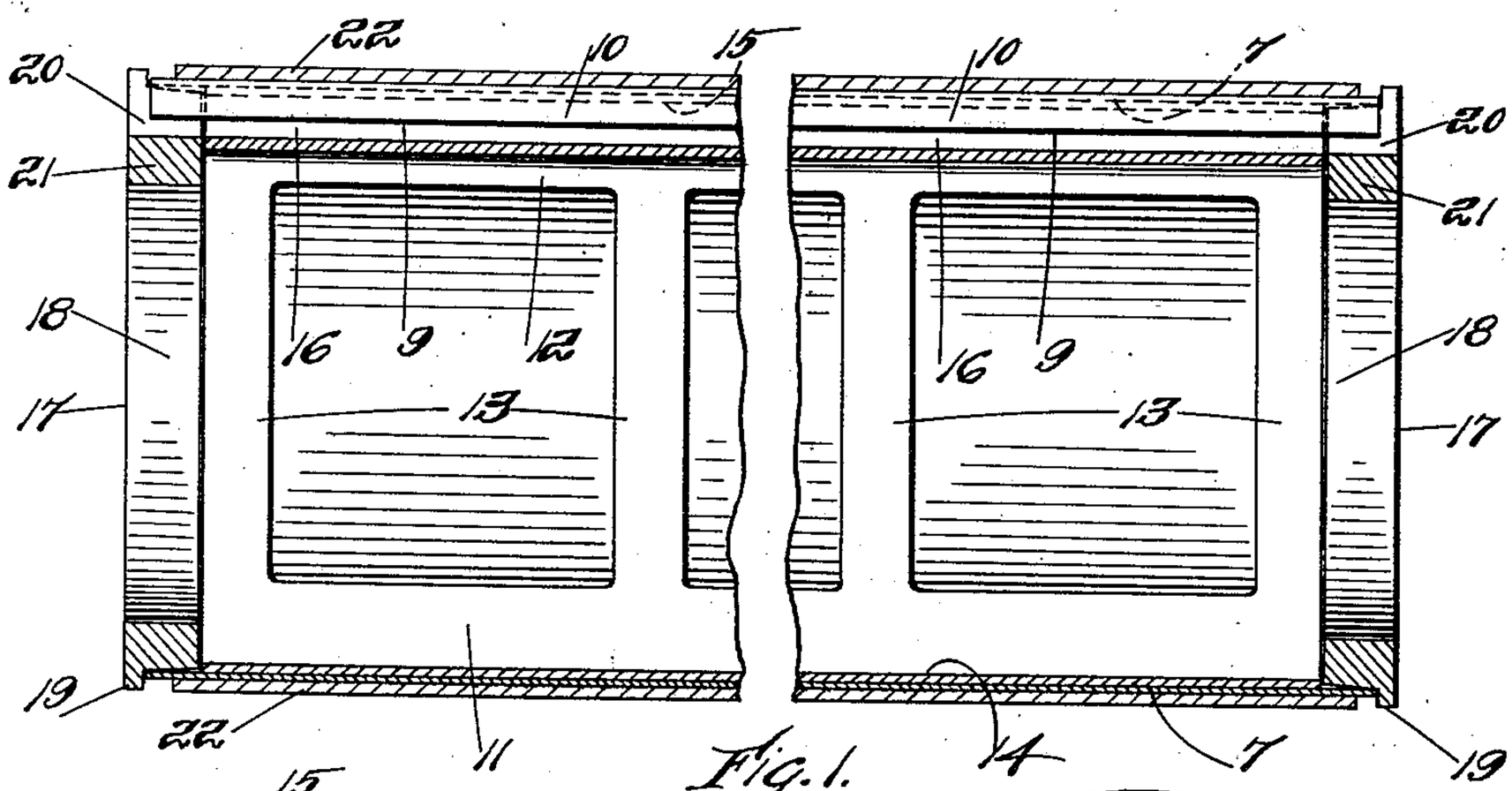


Fig. 1.

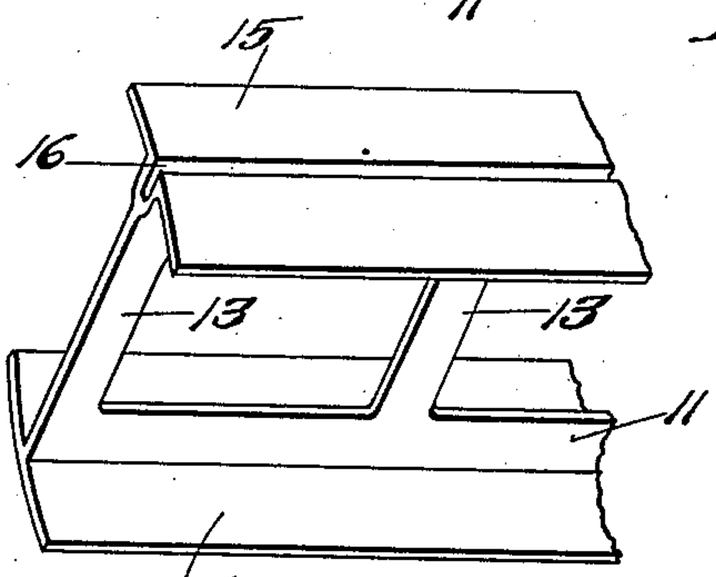


Fig. 3.

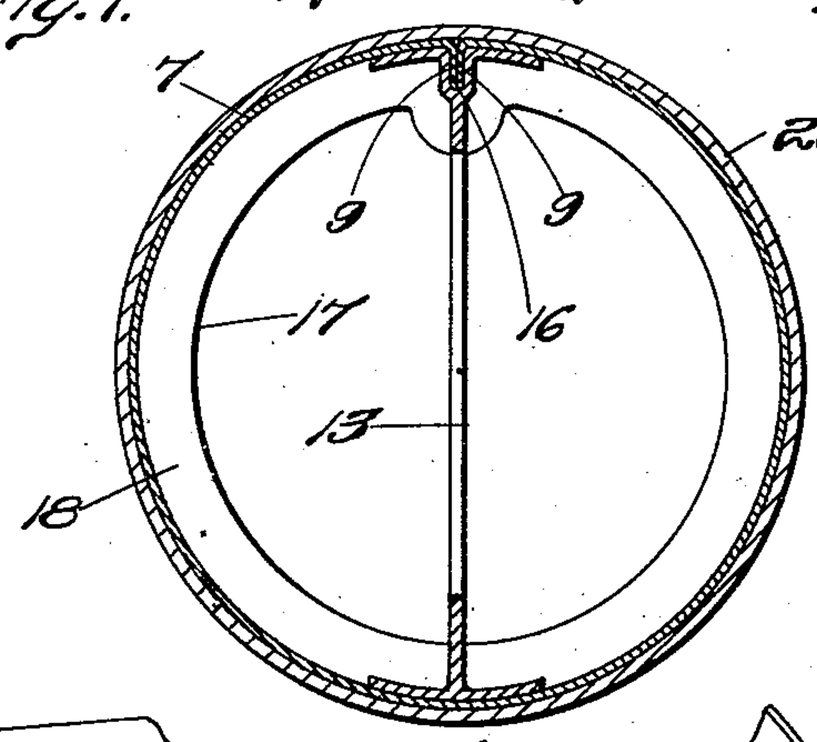


Fig. 2.

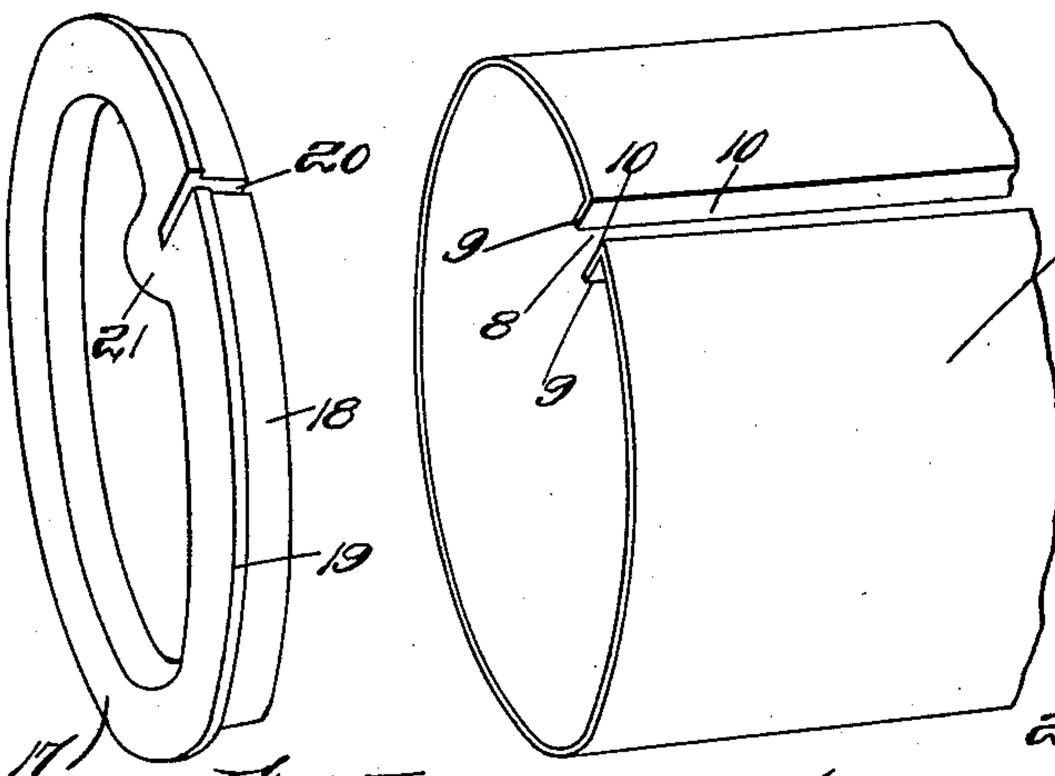


Fig. 5.

Fig. 4

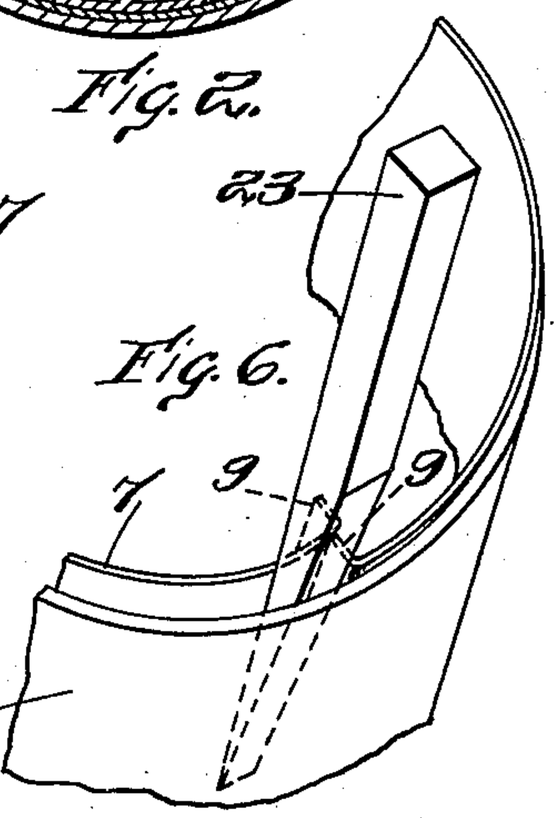


Fig. 6.

Witnesses:
John H. Parker
Jessie E. Morrison.

Inventor:
Paul I. Andrews
by Macleod, Calver, Copeland & Dike
Attorneys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

PAUL I. ANDREWS, OF KENNEBUNK, MAINE.

## MANDREL FOR SEAMLESS TUBES OF SHRINKABLE MATERIAL.

999,004. Specification of Letters Patent. Patented July 25, 1911.

Application filed March 16, 1911. Serial No. 614,823.

*To all whom it may concern:*

Be it known that I, PAUL I. ANDREWS, a citizen of the United States, residing at Kennebunk, county of York, State of Maine, have invented a certain new and useful Improvement in Mandrels for Seamless Tubes of Shrinkable Material, of which the following is a specification, reference being had therein to the accompanying drawings.

In the formation of seamless tubes of some kinds of material the tubes shrink after they have first been formed until they are set. This is especially true of tubes formed of chemical fiber or pulp and which are formed when the fiber or pulp is in a moist condition. Tubes of this character have a considerable shrinkage when the tube dries. In order to make the tube in the first place sufficiently large to allow for the shrinkage the tube is first formed on a mandrel of larger diameter than the tube is intended to be in its finished form. After it is removed from the first mandrel or drum on which the tube in its original form is produced it is important that it should be placed on another and smaller mandrel of exactly the diameter intended for the completed tube, otherwise when the tube shrinks not only will there be uncertainty as to the degree of shrinkage and therefore a variation in the diameter of the tubes, but also the tubes are liable to buckle or otherwise become distorted. If the mandrel on which the tube is dried is made solid or integral the tube in drying will shrink onto the mandrel and bind so tightly that it is difficult to remove the tube after it is dry. The same difficulty occurs if the mandrel is a non-collapsible or rigid metal tube. On the other hand if the tubular mandrel is made with such a thin shell that its walls are yielding the shrinkage of the fibrous or pulp tube in drying is liable to warp the tubular mandrel or squeeze in the sides in such a manner as to squeeze it out of cylindrical form.

The object of the present invention is to provide a tubular mandrel of thin sheet material, braced and reinforced in such manner that it will retain its cylindrical form during the drying or shrinking of the seamless tube upon the mandrel and which can be readily removed after the seamless tube has set.

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

In the drawings, Figure 1 is a longitudinal section, partly broken away of a mandrel embodying the invention and showing the seamless tube upon the mandrel. Fig. 2 is a transverse section of the mandrel with the tube mounted thereon. Fig. 3 is a perspective view partly broken away of the brace which extends longitudinally through the mandrel, and extends diametrically across the same. Fig. 4 is a perspective view partly broken away showing the split tube of the mandrel with the head removed. Fig. 5 is a perspective view of one of the annular heads of the mandrel. Fig. 6 is a perspective view partly broken away showing the method of removing the mandrel from the tube after the tube has set.

Referring now to the drawings, the body of the mandrel consists of a split tube 7 of thin sheet material, preferably of steel so that it may be strong and elastic having a split 8 longitudinally thereof, so that it may be sprung to make one edge overlap the other for the purpose of reducing its diameter in withdrawing it from the seamless tube. This tube 7 is formed of a sheet of spring metal rolled into the form of a split cylinder, its adjacent edges being bent radially inward to form the flanges 9, 9, whose proximate faces 10 will abut against each other when the mandrel is in its fully closed condition, as shown in Fig. 2.

In order to strengthen the mandrel tube to prevent inward collapsing or squeezing out of cylindrical form, a detachable strengthening rib or brace is inserted in the tube extending crosswise thereof and substantially throughout its length and having curved flanges or plates which bear against the inner walls of the tube, and so constructed as to clamp together the two flanges 9, 9, to retain the mandrel tube in its closed form. This strengthening brace as shown comprises longitudinal side rails 11, 12, connected by a series of cross-tie or web portions 13, there being one of these cross-tie or web portions at each end of the brace and preferably two or more cross ties intermediate the ends. Lateral flanges or plates 14, 15 extend longitudinally of the lengthwise rails 11, 12, respectively, said flanges extending laterally on both sides of the said rails, their outer faces being curved on the

arc of a circle of the same diameter as the inner periphery of the mandrel tube 7. The flange plate 15 is formed with a longitudinal groove 16 in its outer face which is adapted to receive the two flanges 9, 9, of the mandrel tube when the said tube flanges are brought into abutting engagement with each other. The said reinforcing brace may be slipped endwise into the mandrel tube 7 when the mandrel tube is squeezed so as to close the flanges 9, 9, into contact with each other, said flanges 9, 9, sliding along in the groove 16, thereby being clamped and held in their closed position, while the curved faces of the flanges 14, 15, bear against the inner periphery of the mandrel tube.

It is important that the mandrel tube should be still further reinforced at each end and for this purpose an annular head or collar is provided. The strengthening brace should be a little shorter than the mandrel tube so as to allow for the attachment of the heads at the opposite ends. These heads should be a little more rigid material than the mandrel tube, preferably of cast metal. The heads will be made exactly alike, and a description of one will answer for a description of the other. Each head 17 has an annular flange portion 18 whose exterior periphery just fits snugly within the end of the mandrel tube 7 when the mandrel tube is closed and is formed with a laterally projecting flange 19 which projects radially outward beyond the periphery of the mandrel tube so as to form a stop or abutment for the seamless fiber tube when the seamless tube is mounted upon the mandrel for drying. A radial groove 20 is formed in the exterior periphery of the head which may be brought into alinement with the groove 16 of the strengthening brace to receive the flanges 9, 9, of the mandrel tube at their end portions. The head is preferably formed with a thickened portion or lug 21 extending radially inwardly at that portion of the head where the groove 20 is formed so that the head will not be unduly weakened at that point.

When the seamless tube of moist fiber is about to be mounted upon the mandrel the strengthening rib will be inserted longitudinally into the mandrel tube engaging the flanges 9, 9, in the longitudinal groove 16, then one of the heads 17 will be inserted in one end of the mandrel, then the seamless fiber tube will be slipped over the mandrel from the end at which the head has not yet been inserted, then the second head will be put in place and it will be left until the fiber tube has become fully dried and set. When the fiber tube is first put on the mandrel it will normally be of very appreciably greater diameter than the mandrel.

When it is desired to remove the fiber tube after drying both heads 17 will be removed and then the strengthening rib will also be withdrawn. The shrinking of the seamless tube upon the mandrel will bind the faces of the two flanges 9, 9, very strongly against each other even after the heads and strengthening ribs are removed and now in order to withdraw the seamless tube from the mandrel tube it is necessary to spring in one of the abutting flange ends of the mandrel tube so that it may slip past the other. It is very difficult to do this without tools and to accomplish this it is best done by means of a wedge which may be forced in endwise between the seamless tube and the mandrel tube. A suitable form of wedge for this purpose is shown in Fig. 6, showing also the method of its use. Such wedge 23 may be forced in between the mandrel tube 7 and the seamless tube 22 in proximity to one of the abutting flange ends of the mandrel tube and thereby force one flanged end 9 inward until it can slip past the other flanged end 9, as shown in Fig. 6. This collapses it sufficiently to enable the dried seamless tube to be pulled off endwise.

Although in the specification the seamless tube has been referred to sometimes as a fiber tube that is done merely for convenience of designation. It is to be understood that the tube may be made of fiber or pulp or any suitable material. In other words the mandrel is adapted for use in the construction of any seamless tube in which the seamless tube shrinks after it is first molded or formed.

What I claim is;

1. A mandrel having a tube of resilient material split throughout its length in one side and having inturned flanges at the meeting edges and an annular head at each end of said tube having a portion which fits into the end of the tube, said head being formed with a groove in its periphery adapted to receive both flanges of the mandrel tube.

2. A mandrel comprising a sheet of resilient material in cylindrical form with adjacent edges turned radially inward to form parallel flanges and a removable skeleton brace for the interior of said tube, said brace having longitudinal flanges which extend lengthwise of the interior of the tube and engage the periphery thereof on opposite sides, one of said longitudinal flanges being formed with a groove which receives both of said parallel inturned flanges of the tube and cross-ties which rigidly unite said longitudinal flanges.

3. A mandrel for seamless tubes having a mandrel tube of resilient material with a longitudinal split in one side and having inturned flanges at the meeting sides, a brace extending crosswise of the interior of said mandrel tube and engaging the interior periphery of the said tube on opposite sides and being formed with a groove to receive

the abutting flanges of the mandrel tube to prevent the spreading thereof, and an annular head for each end of said tube having a flange portion which fits into the end of the tube, the head being formed with a groove in its outer periphery transversely thereof and adapted to be brought into alinement with the groove in the brace to engage the outer ends of the flanges of the mandrel tube.

4. A tubular mandrel having a removable brace for the interior thereof, said brace comprising webs which extend transversely of the interior of the mandred tube and longitudinal flanges on the opposite ends of said webs which extend lengthwise of the mandrel tube and engage the inner periphery thereof.

5. A tubular mandrel having a removable brace for the interior thereof, said brace comprising rails which extend longitudinally of the tube, cross-bars which rigidly connect together said rails and lateral flanges on said rails which extend lengthwise thereof and engage the inner periphery of the mandrel tube.

6. A mandrel having a hollow mandrel tube consisting of a sheet of resilient material in cylindrical form with adjacent edges turned radially inward to form flanges whose faces are adapted to abut against each other, means for clamping together said abutting flanges, and a brace having a web portion which extends diametrically crosswise of the interior of the said mandrel tube and has curved laterally extending flanges on the diametrically opposite sides of said web which are curved to fit the inner periphery of the mandrel tube and engage therewith.

7. A mandrel having a hollow mandrel tube consisting of a sheet of resilient material in cylindrical form with adjacent edges turned radially inward to form flanges whose faces are adapted to abut against each other, means for clamping together said abutting flanges, and a brace having a web portion which extends diametrically crosswise of the interior of the said mandrel tube and has curved laterally extending flanges on the diametrically opposite sides of said web which are curved to fit the inner periphery of the mandrel tube and engage therewith, one of said curved flanges being formed with a longitudinal groove which receives the abutting flanges of the mandrel tube.

8. A mandrel for seamless tubes having a mandrel tube of resilient material with a longitudinal split in one side and having inturned flanges at the meeting sides, and an annular head for the end of said tube having a flange portion which fits into the end of the tube, the head being formed with a groove in its outer periphery transversely thereof and adapted to engage the outer ends of the flanges of the mandrel tube.

9. A mandrel having a hollow mandrel tube consisting of a sheet of resilient material in cylindrical form with adjacent edges turned radially inward to form flanges whose faces are adapted to abut against each other, means for clamping together said abutting flanges, and a brace having a web portion which extends diametrically crosswise of the interior of the said mandrel tube, and has laterally extending flanges on the diametrically opposite sides of said web which engage the inner periphery of the tube.

10. A mandrel having a hollow mandrel tube consisting of a sheet of resilient material in cylindrical form with adjacent edges turned radially inward to form flanges whose faces are adapted to abut against each other, means for clamping together said abutting flanges, and a brace having a web portion which extends diametrically crosswise of the interior of the said mandrel tube and has laterally extending flanges on the diametrically opposite sides of said web which engage with the periphery of the mandrel, one of said flanges being formed with a longitudinal groove which receives the abutting flanges of the mandrel tube.

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

PAUL I. ANDREWS.

Witnesses:
T. S. ANDREWS,
I. M. R. THOMPSON.