July 12, 1927.

1,635,458

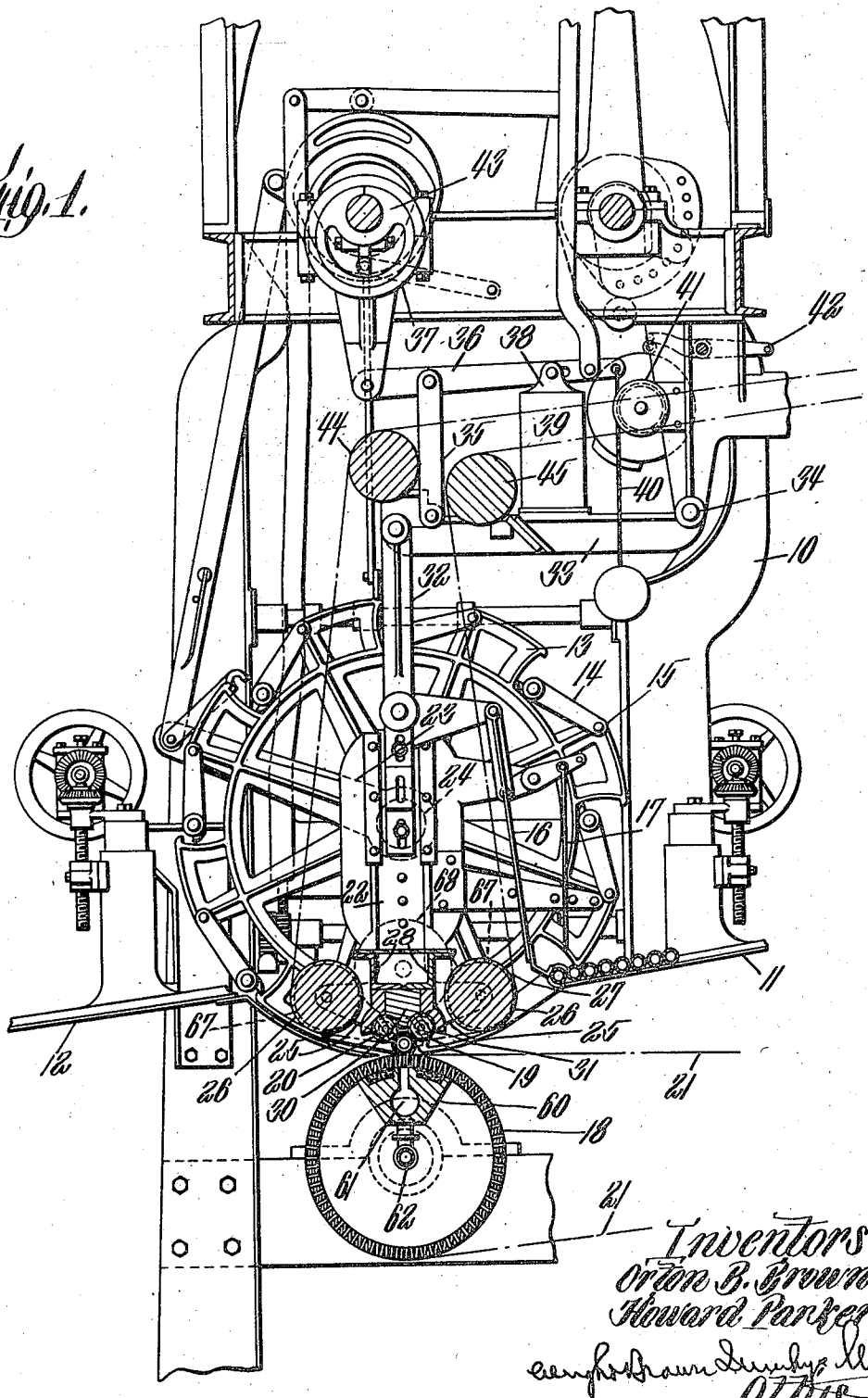
O. B. BROWN ET AL

MACHINE FOR MAKING FIBER TUBES

Original Filed July 11, 1924

2 Sheets-Sheet 1

Fig. 1.



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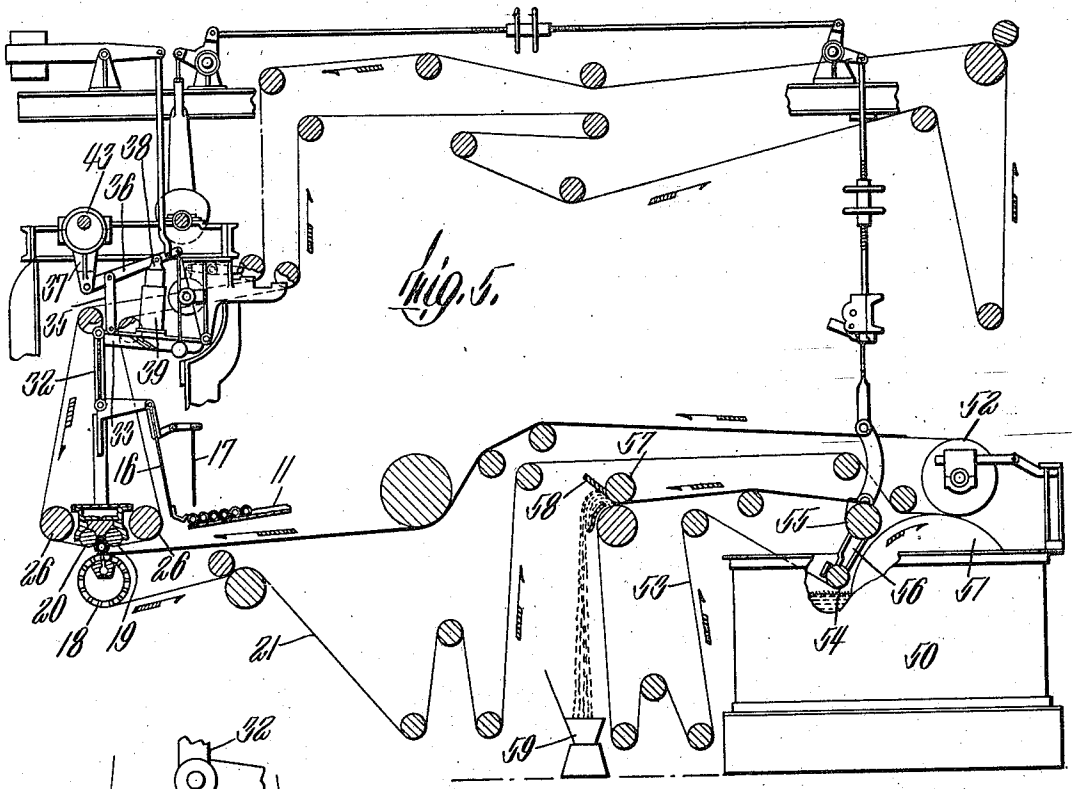


Fig. 5.

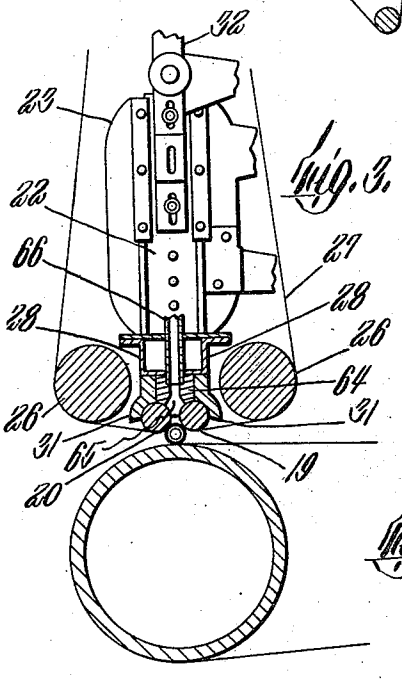


Fig. 3.

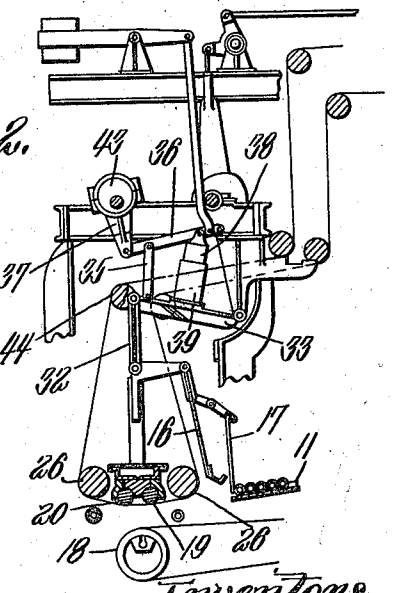


Fig. 2.

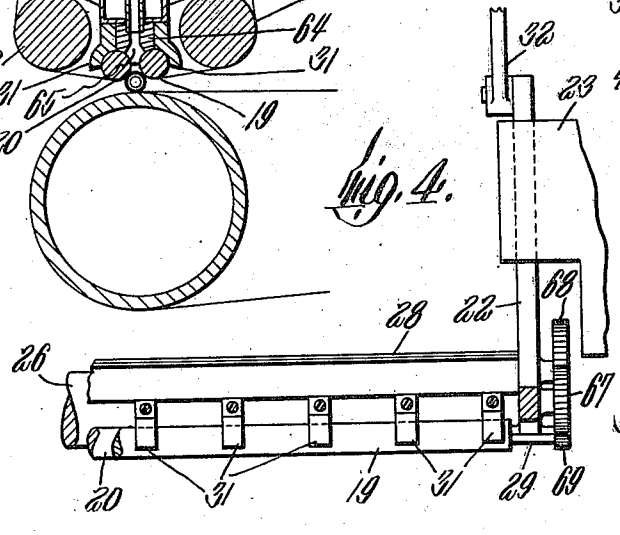


Fig. 4.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING FIBER TUBES.

Original application filed July 11, 1924, Serial No. 725,403, and in Canada July 8, 1925. Divided and this application filed September 3, 1926. Serial No. 133,392.

This invention has relation to instrumentalities for automatically making fiber tubes, such, for example, as those produced by winding about a mandrel a web of wet pulp delivered from a vat of aqueous pulp by a suitable forming and conveying mechanism.

In machines for this purpose, such as illustrated in Letters Patent No. 1,147,262, granted on the application of Howard Parker on July 20, 1915, or in an application of Howard Parker Serial No. 715,086, filed May 22, 1924, the mandrels are automatically supplied seriatim to a forming point or station in the machine at which each is located between and in parallelism with a plurality of (usually three) rolls, with which it rotates in peripheral unison, so that the web of pulp fed thereto may be wound thereon. Heretofore these rolls, which from their functions may be termed base and press rolls respectively, have been mounted in end bearings, and thus have all been necessarily of relatively large diameter to resist such bending or distortion as would occur under operating conditions due to their length. It has followed, therefore, that, while such machines are capable of producing efficiently and economically long tubes of relatively large diameter—say three inches or more, the production of long tubes of small diameter (say ½ inch to 2 inches) has been inhibited by reason of the necessarily large diameter of the forming rolls.

The object of the present invention is to provide an instrumentality by means of which long tubes of small diameter may be produced. The manner in which this is accomplished and a machine embodying the invention are described and set forth in the following portion of this specification, reference being made to the accompanying drawings, in which

Figure 1 represents in vertical section that portion of the machine which is provided with forming rolls and associated mechanism constituting one form of the invention.

Figure 2 shows a portion of the machine with the press rolls lifted from the base roll, to permit the removal of a filled mandrel and its replacement by an empty mandrel.

Figure 3 is a somewhat similar view, on a larger scale, showing the tube in the process of formation, with the forming rolls in operating position, but illustrates an alternative device for removal of water from the wet tube.

Figure 4 is a detail view, showing in side view one of the felt guide rolls, the associated forming press roll, and the abutment bearing for the last-mentioned roll.

Figure 5 illustrates more or less conventionally a portion of a complete machine in which the present invention is incorporated.

In machines such as heretofore employed, there is a suitable web-forming mechanism, by which the aqueous pulp contained in a vat is formed, conveying means by which the wet web is supplied to the forming point of the machine to be wound about a mandrel, and automatic mechanism by which the supply of the web is automatically interrupted for that length of time required to permit the complete formation of a tube, its removal from the forming point or station and the placement of a fresh or empty mandrel at the forming point to receive the oncoming end of the interrupted web. So far as the present invention is concerned, any suitable instrumentalities for attaining these results may be employed, if desired, so that it will be understood that the present invention is not limited to those which are hereinafter described. Moreover any suitable timing mechanism may be utilized for ensuring the properly timed operation of the several mechanisms of the machine. In this connection, reference may be had to the Letters Patent issued on the application of Howard Parker, No. 1,497,344, June 10, 1924, and to his application Serial No. 715,086, for those details of construction and operation of a complete machine which are not herein shown or described.

In Figure 1 a portion of the framework at the tube-forming portion of the apparatus is shown, as indicated generally at 10, which supports certain of the instrumentalities to be described. At 11 there is a feeding table upon which many empty mandrels are positioned and from which they are removed, one at a time, and located between the forming rolls; and at 12 there is a delivery table onto which the filled mandrels are successively delivered from the winding or forming point, these several tables being preferably in the form of tracks to support the ends, only, of the mandrels which project

beyond the tubes which are formed thereon. Suitable carrier wheels, of which one is indicated at 13, are employed, and are automatically and intermittently operated to feed the mandrels to and away from the forming or winding position, each wheel being provided with pivoted arms 14 and associated chucks 15 for loosely entering the ends of the mandrels. The front mandrel on the table 11 rests against a stop 16, which at the proper time is automatically raised to release it, and at the same time a stop 17 descends to engage the second mandrel, the movement of these two stops being simultaneous but in opposite directions and being properly timed in reference to the operation of the other instrumentalities of the machine. A more complete description of these several parts is given in the application last herein mentioned.

The forming rolls comprise a base roll 18 and press rolls 19, 20. These rolls are of any length that may be desired, say, six to ten feet. The base roll 18 is journaled in any suitable stationary bearings afforded by the framework, and may be of such relatively large diameter that it will not bend between its ends, by reason of its own weight or of the operating conditions. About this roll is passed the felt or apron 21 by which the wet pulp web is supplied to the mandrel which is in winding position. The two cooperating press rolls 19 and 20 are of small diameter so that, when they are brought to such position that their adjacent peripheries are equidistant from each other and the base roll, an imaginary cylinder tangential to the rolls is of very small diameter. The press rolls are supported on slides (one being shown), of which one is indicated at 22, each of these slides being vertically movable in a stationary guideway 23 firmly fixed to a stud shaft 24 on which one of the carrier wheels 13 is rotatably mounted. It will be understood that the construction of the guideways and of the slides is the same at both ends of the respective rolls so that a description of these parts at one end of the roll will suffice for both. Each slide at its lower end is provided with laterally-extending arms or brackets 25, and in these arms or brackets are journaled two relatively large guide rolls 26, 26, around which there is passed a drier felt or apron indicated conventionally at 27. The slides 22 are connected by angle beams or cross bars indicated at 28 by which they are rigidly connected. The two press rolls 19 and 20 have their axes located in a horizontal plane considerably below the horizontal plane of the axes of the guide rolls 26, and they are provided with reduced ends which are mounted in journals 29 at the lower ends of the slides 22. Inasmuch, however, as these rolls 19 and 20 are of relatively great length and of small diameter, they would tend in operation to bend intermediate their end portions, and consequently to prevent this they are also journaled in bearings intermediate their ends. These intermediate bearings may be continuous or the bearings may be formed in sections as it were. As shown, there is secured to the under side of the cross bar 28 a plurality of blocks 30 which are provided with concave portions to engage the peripheries of the two adjacent rolls 19 and 20. Associated with each block there are two bearing members 31, 31, which are also provided with concave portions to engage the peripheries of the rolls 19, 20, respectively. Thus each block 30 and its associated members 31 constitutes a lateral thrust bearing for the two press rolls. The concavity formed by the block and each associated member 31 is of course complemental to the periphery of the press roll and constitutes an arc of something more than 180° so as to support the roll against downward bending when the press rolls are lifted, as well as to resist upward or lateral thrust in either direction. The drier felt 27, as shown in Figure 1, passes beneath one of the guide rolls 26, thence under the two press rolls, and thence under the other guide roll 26. The press rolls are spaced far enough apart so as to hold a mandrel newly placed between them, as well as the mandrel while the pulp web is being wound thereon, in proper position without danger of dislocation, the drier felt being sufficiently flexible and yielding so that it will in its travel follow the contour of the mandrel and the tube being formed thereon without causing a malformation of the tube. Any suitable mechanism may be utilized for moving the slides 22 to bring the press rolls into and out of operating position. The same mechanism which is utilized in the machine illustrated in the Parker application Serial No. 715,086, may be utilized for this purpose, so that it is not necessary to describe the same in detail. It may be stated, however, that the two slides 22 are connected by links 32 to the free end of a frame 33 pivoted at 34. The frame 33 is connected at its free end by links 35 to floating levers 36,—one only of each of these being shown as they are duplicated on the machine. The floating lever 36 at one end is connected to the arm of an eccentric strap 37, and at its other end there is a piston 38 working in a dash pot 39 carried by the frame 33 intermediate its ends. If the breaking or interrupting of the web which is being supplied to the mandrel for the formation of a tube is controlled by the thickness of the tube, the end of one of the floating levers 36 extends beyond the piston 38 and has secured thereto a weighted cord 40 wrapped about the drum 41 of a thickness adjuster. The thickness

adjuster is so arranged as to trip a lever 42 when the tube has almost reached its desired ultimate thickness so as to cause the interruption of the web of pulp being supplied thereto. Suitable timing mechanism is employed so that, when the tube on the mandrel has reached a predetermined thickness and the lever 42 is tripped, the timing mechanism is set into operation by which the eccentric strap 37 is operates by an eccentric 43, after the web of pulp has been interrupted for a sufficient length of time, to operate the levers 36 and swing upwardly the frame 33 so as to raise the slides 22 and thus move the press rolls and the felt guiding rolls to an inactive position as shown in Figure 2, so as to permit the removal of the mandrel with the completed tube thereon and the introduction of an empty mandrel to the winding or forming position. Upon the frame 33 may be journaled additional guide rolls 44, 45 for the drier felt.

As shown in Figure 5, the drier felt may be passed under and over various guide rolls through squeeze rolls and otherwise treated so as to remove therefrom the water and any particles of pulp which may be absorbed thereby or adhere thereto. In this last-mentioned figure, I have illustrated conventionally a vat 50 to which the aqueous pulp is supplied and which is provided with a suitable cylinder mold or other web-forming mechanism as indicated at 51. As shown the felt or apron 21, by which the web is supplied to the mandrel and which passes about the base roll 18, is caused to pass around a couch roll 52 so as to receive the web which forms on the cylinder mold 51. Suitable whipping, washing and suction apparatuses and devices are utilized for cleaning and drying the felt 21 after it has delivered the web to the mandrel and before it again reaches the couch roll 52.

Any suitably operated mechanism located at any convenient point may be employed under the control of the thickness measurer or otherwise to interrupt the web being delivered by the conveyor or felt 21 when the tube being formed has reached a predetermined thickness, so it will be understood that we are not limited to the particular mechanism which we have illustrated for this purpose. This mechanism as illustrated is substantially the same as that illustrated in the last-mentioned application filed by Howard Parker in which the web is interrupted before being delivered by the cylinder mold to the conveying devices by which it is conveyed to the mandrel. It may be sufficient to state that the breaker felt is indicated conventionally at 53 and passes around guide rolls 54, 55, on a frame which is automatically moved into and out of engagement with the cylinder mold. Power-transmitting connections between the frame which is indicated at 56 and operating mechanism on the machine is employed for causing the actuation of the frame at the proper time, all as set forth in said Parker application. In Figure 5 the breaker web 53 has been brought into engagement with the cylinder mold 51 so as to remove the web therefrom and thus interrupt the supply of web to the mandrel on which the tube is then being formed. The breaker felt is whipped, dried and cleaned by any suitable instrumentalities and the web which is thereon is removed by a couch roll 57 from which it is scraped by a doctor 58 into a receptacle indicated at 59.

No claim is herein made for any particular form of breaking mechanism or any particular form of timing mechanism or mechanism for effecting the movements of the guides by which the press rolls are operated, apart from their association and their coordination and cooperation with the press rolls, the essential features of the present invention comprehending those incident to the accurate formation of tubes of small diameter such as cannot be accurately formed by forming rolls which are all journaled only at their ends.

It is important in the formation of the tubes that the water which is expressed from the pulp during the winding of the web upon the mandrel may be properly removed. This may be accomplished in any one of several ways. For example in Figure 1 the large base roll comprises a shell provided with numerous perforations, and within the shell there is a stationary segmental member 60 below the forming or winding point of the machine. This segmental member is provided with a slot or throat 61 connected by a conduit 62 with a vacuum pump (not shown) so that the water which is expressed from the tube may be sucked through the felt 21 and removed. If desired, however, a construction as shown in Figure 3 may be employed,—in which case the block 64, corresponding to those at 20 in Figure 1, is provided with a throat or chamber 65 connected by a conduit 66 with a vacuum pump not shown, so that the water which is expressed from the tube may be sucked through the drier felt 27. Other equivalent means may be employed for removing the excess water.

The peripheries of the press rolls and the associated bearing surfaces of the intermediate abutment bearings are preferably polished, and they are lubricated by the water which is expressed from the pulp, so that the press rolls do not need necessarily to be rotated by power. But ordinarily it is preferable to affix on each end of each of the guide rolls 26 a gear 67. The gears 67 intermesh with gears 68, with which also engage pinions 69 on the ends of the press rolls (see Figure 4). The drier felt 27 is

driven by any suitable driving mechanisms, and, by reason of its large area of contact with the guide rolls 26, effects their rotation, so that, through the intermediate gearing, the press rolls are driven at a peripheral speed equal to that of the guide rolls and to the feed of the felt 27. Similarly, by the use of proper driving mechanism, the web conveyor or make-up felt 21 is driven at a speed equal to that of the felt 27.

The bearings, which resist or prevent the springing of the press rolls, are of course located within the zones of the tube being formed on the mandrel, and are thus intermediate the ends of the rolls. The end bearings for the press rolls may be dispensed with, but ordinarily it is preferable to employ them, particularly when the intermediate gearing between the felt guide rolls 26 and said press rolls is used. The slides, in which the press rolls and the guide rolls are supported, constitute a carrier therefor, but any other suitable mechanism may be utilized by which the forming rolls are separated and brought back to operating position.

No claim is herein made for the means intermediate the ends of the press roll or rolls for preventing the springing thereof, and no claim is made for the suction chamber located between the press rolls expressed from the tube being formed, as these constitute the subject-matter of application Serial No. 725,403, filed July 11, 1924, of which this application is a division.

What is claimed is:—

1. In a machine for making fiber tubular bodies, a mandrel, a plurality of forming rolls comprising a base roll and press rolls, a felt traveling between the mandrel and the press rolls, bearings engaging the surface between the ends of each of the press rolls on more than half its circumference, and means for guiding said felt clear of said bearings.

2. In a machine for making fiber tubular bodies, a mandrel, a plurality of forming rolls comprising a stationary base roll and press rolls, a felt traveling between the mandrel and the press rolls, and guide rolls for the felt located on both sides of and adjacent to said press rolls.

3. In a machine for making fiber tubular bodies, a mandrel, a plurality of forming rolls comprising a stationary base roll and press rolls, a felt traveling between the mandrel and the press rolls, guide rolls for the felt located on both sides of and adjacent to said press rolls, and a movable carrier for said press rolls and guide rolls.

4. In a machine for making fiber tubular bodies, a mandrel, a plurality of forming rolls comprising a base roll and press rolls, a carrier for the press rolls, felt guide rolls journaled in said carrier on both sides of and adjacent to said press rolls, and a traveling felt passing around said guide rolls and between said press rolls and the mandrel.

5. In a machine for making fiber tubular bodies, a mandrel, a plurality of forming rolls comprising a base roll and press rolls, a traveling felt passing between the mandrel and the press rolls, guide rolls for the felt, and power-transmitting mechanism between the guide rolls and said press rolls.

In testimony whereof we have affixed our signatures.

ORTON B. BROWN.
HOWARD PARKER.