April 2, 1929. E. BLAKER 1,707,794

STEAM HEATED TUBE SPLICING MANDREL

Filed Feb. 1, 1928

Fig. 1.

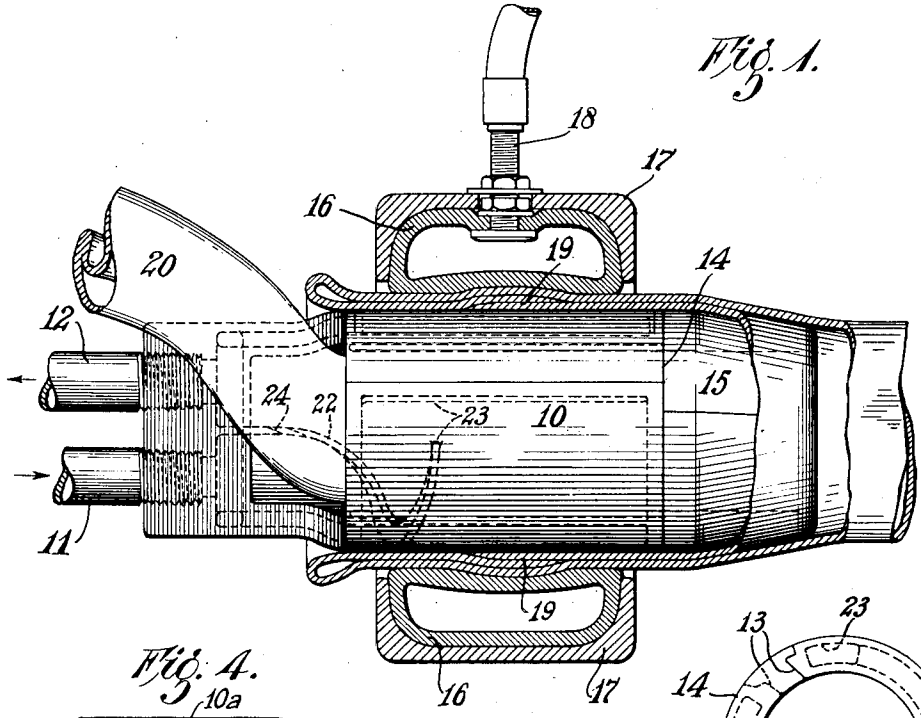
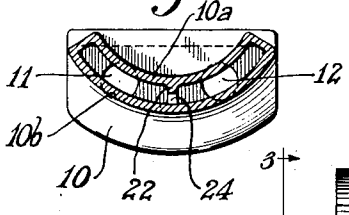


Fig. 4.



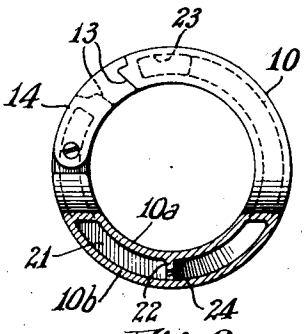


Fig. 3.

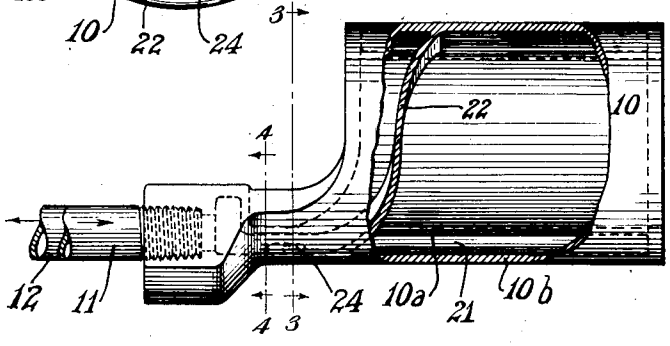


Fig. 2.

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UNITED STATES PATENT OFFICE.

ERNEST BLAKER, OF AKRON, OHIO, ASSIGNOR TO THE B. F. GOODRICH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

STEAM-HEATED TUBE-SPLICING MANDREL.

Application filed February 1, 1928. Serial No. 251,200.

This invention relates to steam-heated mandrels and especially mandrels such as are used for vulcanizing the splice by which the ends of a straight or curved length of rubber tubing are joined in the manufacture of inner tubes for pneumatic tires, the mandrel in this instance being formed as a sectional annulus adapted for the tube to be mounted within the mandrel and cuffed back on its outer surface. Such a mandrel is shown in the patent to Edward Fetter No. 1,364,362, issued January 4, 1921.

Mandrels of the character described have been open to the objection that their construction did not provide uniform distribution of heat therein, which resulted in lack of uniformity in the vulcanized tube splice. This imperfection is due to the fact that the inlet and outlet of the major section of the mandrel, through which the steam is circulated, are positioned close together in a neck formed at the margin of one end of the section, in extension thereof, the steam pipes being connected to the neck in order that the body portion of the mandrel may be supported clear of obstructions, such as the hot steam pipes, which would interfere with the operation of mounting and removing the tubes.

Because of the close proximity of the inlet and outlet of the mandrel chamber, considerable heating fluid, in the mandrels heretofore used, has passed directly from the inlet to the outlet without circulating to the remote parts of the chamber, with the result that the mandrel is hotter in some parts than in others.

The chief object of my invention is to provide a steam-heated mandrel, and especially a mandrel having an arcuate, axially elongated steam-chamber, adapted to be heated to substantially uniform temperature throughout its surface area by steam circulated therethrough by means of steam-inlet and outlet pipes mounted close together at the periphery of one end of the mandrel. Another object is to provide for removal of water of condensation from a mandrel of the character described. Another object is the reduction of time required to effect vulcanization.

Of the accompanying drawings,

Fig. 1 is a plan view of my inmproved mandrel in its preferred form in association with the other elements of a tube-splicing vulcanizer, and a tube mounted therein in splice-vulcanizing position, parts being broken away and in section.

Fig. 2 is a side elevation of the mandrel, part being broken away and in section.

Fig. 3 is a section on line 3—3 of Fig. 2.

Fig. 4 is a section on line 4—4 of Fig. 2.

Referring to the drawings, 10 is the major section of a sectional, tubular, steam-jacket mandrel having the steam-inlet pipe 11 and steam-outlet pipe 12 mounted in an extension at one end of the section, as above explained. The major mandrel section 10 is formed with a longitudinal slot 13 for convenience in applying to and removing a tube therefrom, said slot being located in the upper portion of the mandrel section and to one side of the center thereof, farther from the fluid inlet 11 than from the outlet 12. The slot is closed by a hinged gate 14. Associated with said mandrel is the usual two-part tapered leader 15, and a fluid-pressure pad 16 confined in a suitable clamp 17, said leader, pad, and clamp being of a construction well known in the rubber industry. Said pad is adapted, when distended by air or water admitted through its valve-stem 18, to compress and compact the splices 19 of an inner tube, such as the tube 20, and hold said splice against the heated mandrel 10, 14 until it is vulcanized.

The mandrel section 10 comprises (see Figs. 2, 3, and 4) the usual concentric inner and outer walls 10^a and 10^b respectively, which are sealed at their opposite ends and at each side of the slot 13 so as to define a steam-chamber 21 which communicates with the steam inlet 11 and outlet 12, and which is of such form and has such relation to the steam-inlet and outlet pipes that in this form of mandrel as heretofore used wide variations in temperature were of common occurrence due to air pockets, dead spaces, or collected condensate.

To correct these defects I provide a partition or baffle 22 in the chamber 21, the baffle extending helically from the end wall of the elongated neck of the mandrel, from a position between the inlet 11 and outlet 12 to a position at the opposite side of the mandrel circumferentially, where it terminates short of the marginal wall of the mandrel section to

define a passage 23 between said wall and the end of said baffle.

The helical pitch of the baffle is such that steam entering the chamber 21 through the inlet 11 will pass substantially half-way around the mandrel while being confined close to the adjacent end-wall of the chamber and will then impinge against the marginal wall of the mandrel section defining the slot 13 and proceed longitudinally in the upper part of the mandrel, which heretofore has been especially difficult to maintain at the proper temperature due to the fact that it is usually over-center with relation to the vertical axis of the mandrel and consequently becomes a trap wherein water of condensation accumulates. The velocity of the incoming steam causes it to pass in part to the far end-wall of the chamber and in part to pass downward from the top of the chamber in eddies which persist circumferentially of the chamber to replace air with steam in the portion of the chamber circumferentially opposite the baffle 22, air initially contained in the chamber at either side of the passage 23 being driven therefrom ahead of or in admixture with the steam. Thus water of condensation in the uppermost, over-center portion of the chamber 21 is avoided by initially directing the hot, incoming steam into that region, and any condensate in other parts of the chamber, except the portion thereof anterior to the passage 23, will be free to flow by gravity to the lowest part of said chamber and pass therefrom with the current of steam through the outlet 12.

The presence of the baffle 22, interposed between the inlet 11 and outlet 12, and the sharp rise thereof essential to effect removal of air from near the adjacent end-wall of the chamber, prevent condensate forming on the receiving side of the baffle from flowing with the main current of steam to the outlet 12, and such condensate flows downward by gravity along the baffle 22 toward its lowest point. Adjacent the inlet 11 and outlet 12 the baffle 22 is formed with an obliquely disposed aperture 24 through which the condensate may flow into the outlet 12 with the outgoing steam and the condensate from the other side of the baffle. The angularity of the aperture 24 is such that when steam is admitted initially to the cold mandrel, the velocity of the steam carries it past said aperture and little if any of the steam passes therethrough. When the mandrel is fully heated the steam therein reaches a substantially static condition, except of course when steam-traps in the steam lines are opened to remove condensate, and during said static interval some inflowing steam will pass through the aperture 24, but this is not undesirable because it serves to balance the pressures within the steam-chamber. Moreover, the normal substantially static condition of the steam permits the condensate to flow, by gravity, unimpeded through said aperture.

The construction as described is such that the hot incoming steam is compelled to pass to a region of the steam-chamber both longitudinally and circumferentially remote from the inlet before being free to return to the outlet, which region heretofore has been a trap for water of condensation, and that water of condensation and air are effectively driven from all parts of the chamber and substantially uniform heating of the mandrel is obtained notwithstanding the peculiar shape of the chamber and the positions of the baffle and the inlet and outlet pipes.

My invention is susceptible of modification within the scope of the appended claims.

I claim:

1. In combination, a mandrel member formed with an arcuate and axially elongated heating chamber having a fluid inlet at one side thereof adjacent its end and a baffle so positioned within said heating chamber as to direct incoming fluid to a region at the opposite side of the chamber circumferentially from said inlet.

2. In combination, a mandrel member formed with an arcuate and axially elongated heating chamber having a fluid inlet at one end and at one side thereof, and a baffle so positioned within said heating chamber as to direct incoming fluid to the opposite side circumferentially of the chamber while confining it to a space closely adjacent the end of the chamber nearest said inlet.

3. In combination, a generally C-shaped, axially elongated mandrel member formed with a steam-chamber having a steam inlet near its bottom, said chamber extending over-center from said inlet, and a baffle within said chamber and so disposed as to direct inflowing steam against an edge wall of the chamber in the over-center marginal portion of the mandrel member.

4. A combination as defined in claim 3 in which the inlet is at one end of the mandrel member and the baffle is so disposed as to direct inflowing steam against the edge wall of the chamber near the end thereof at which the inlet is positioned.

5. In combination, a mandrel member formed with an arcuate and axially elongated steam-chamber having a fluid inlet and outlet and a baffle so disposed within the chamber as to deflect upwardly the inflowing fluid and so formed as to permit direct flow of water of condensation from the fluid stream adjacent the inlet to the outlet of the chamber.

6. In combination, a mandrel member formed with an internal steam-chamber which is provided with a fluid inlet and a fluid outlet adjacent thereto and a baffle so positioned within said chamber as to separate the inflowing and outflowing streams,

said baffle being formed with an aperture to permit water of condensation to pass therethrough from the inflowing stream to the outflowing stream.

7. A combination as defined in claim 6 in which the aperture through the baffle is so disposed obliquely with relation to the course of the fluid passing into the mandrel-chamber as substantially to prevent steam from passing through the aperture when the current of steam is of high velocity.

In witness whereof I have hereunto set my hand this 25th day of January, 1928.

ERNEST BLAKER.