Feb. 27, 1934. A. L. WALLACE 1,949,226

CONTINUOUS VULCANIZER

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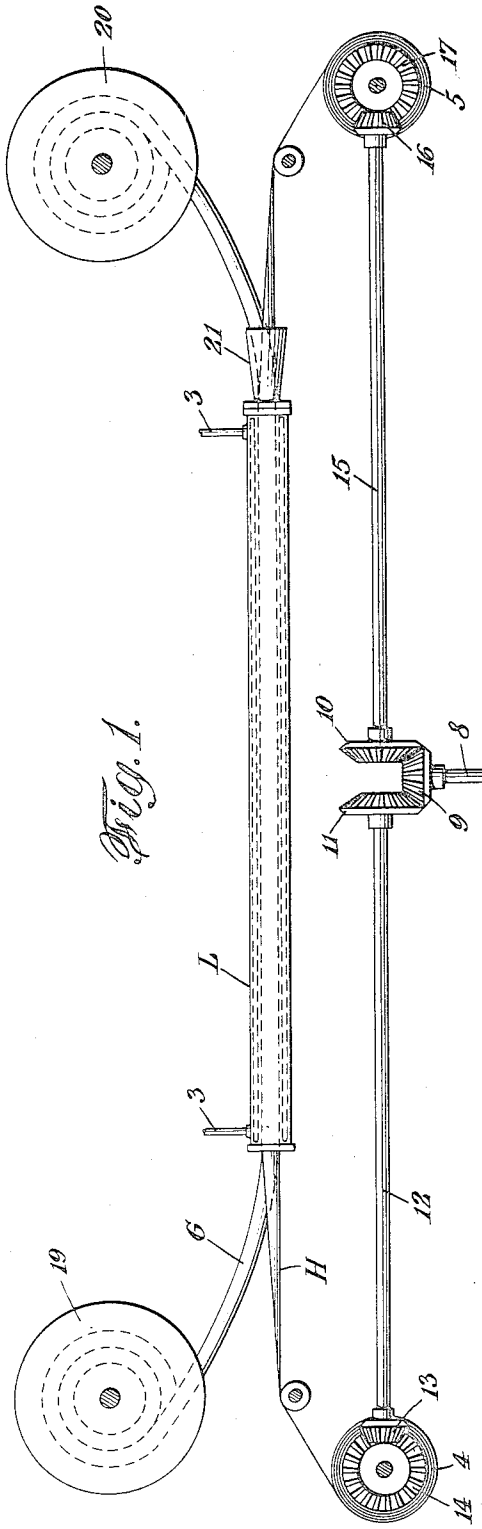


Fig. 1.

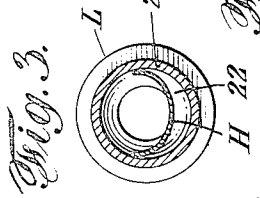


Fig. 3.

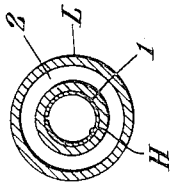


Fig. 5.

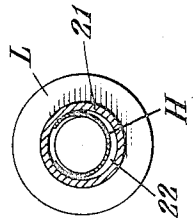


Fig. 4.

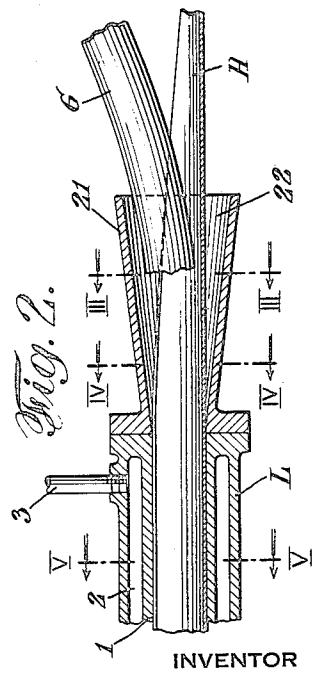


Fig. 2.

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CONTINUOUS VULCANIZER

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Fig. 8.

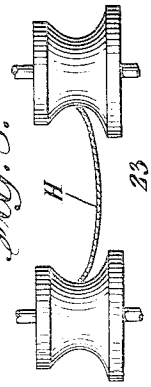


Fig. 9.

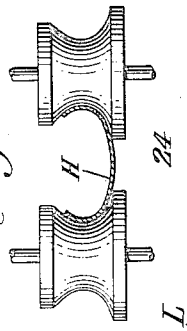


Fig. 10.

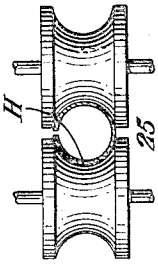


Fig. 6.

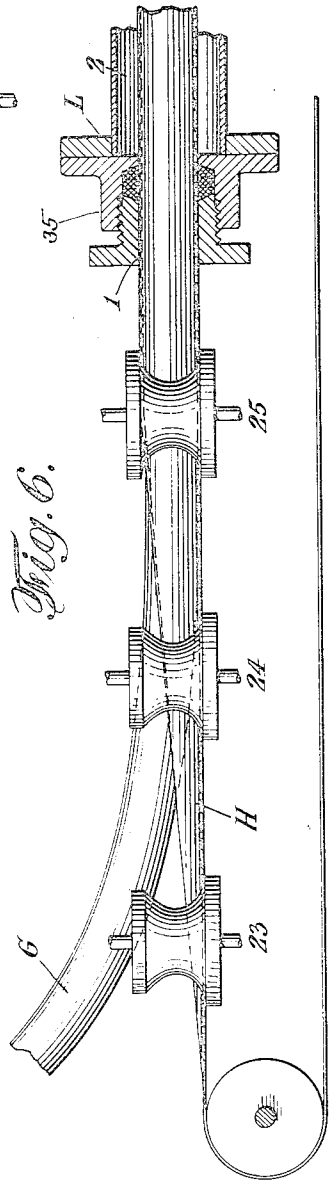
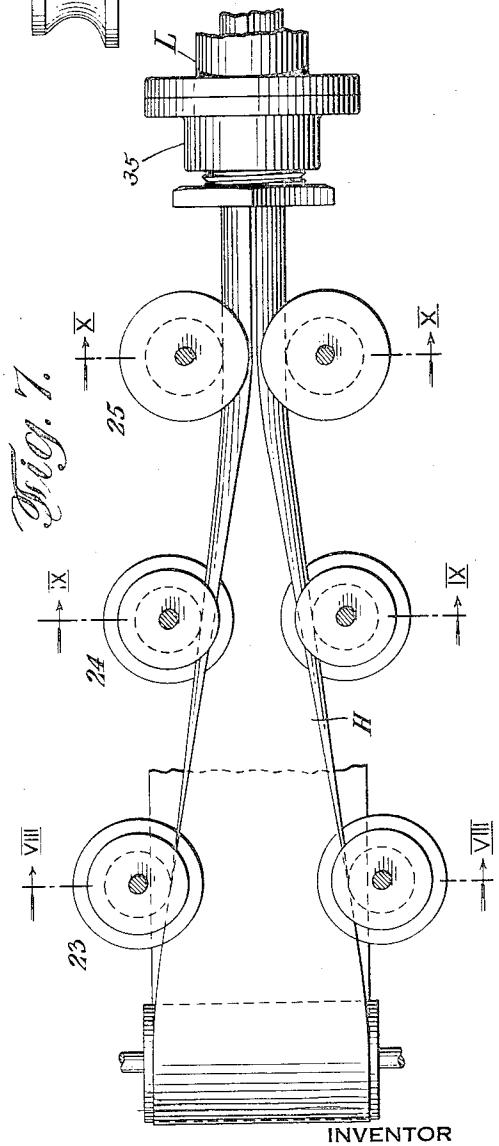


Fig. 7.



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CONTINUOUS VULCANIZER

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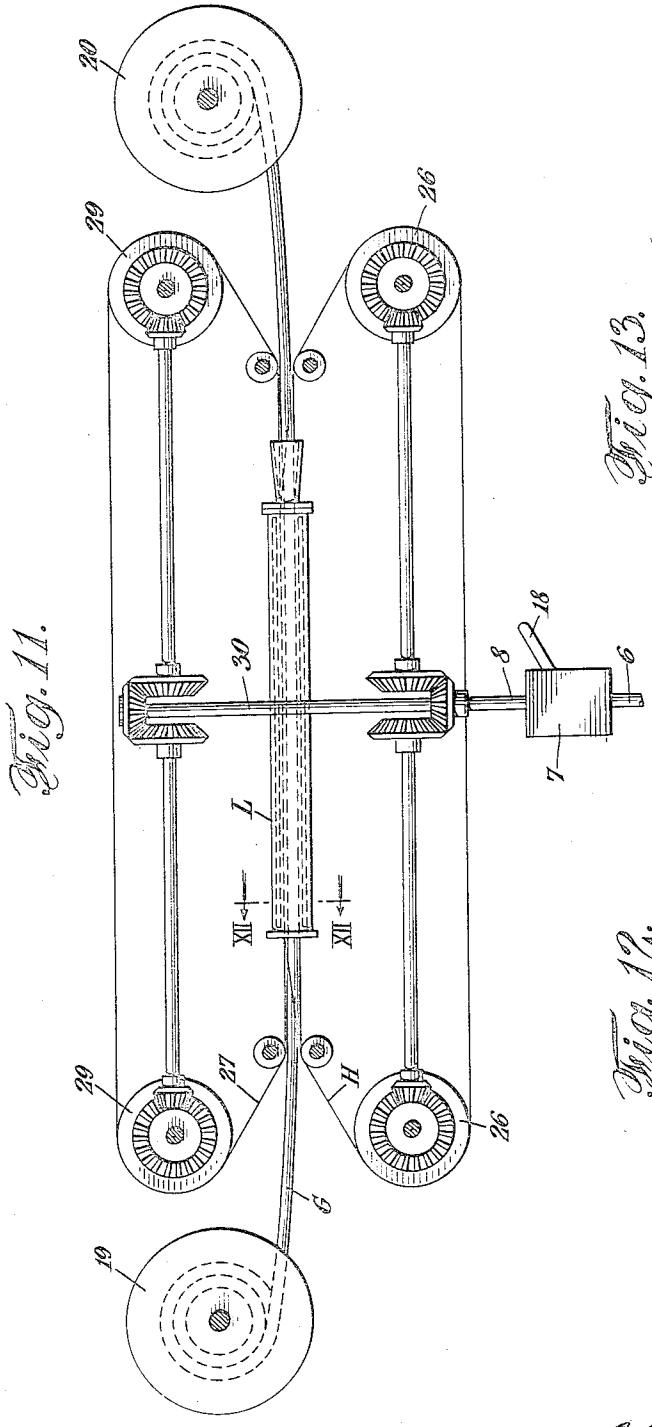


Fig. 11.

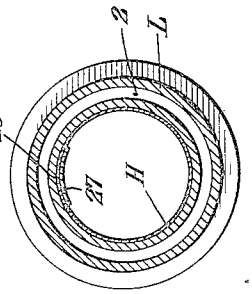


Fig. 13.

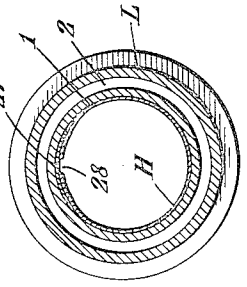


Fig. 12.

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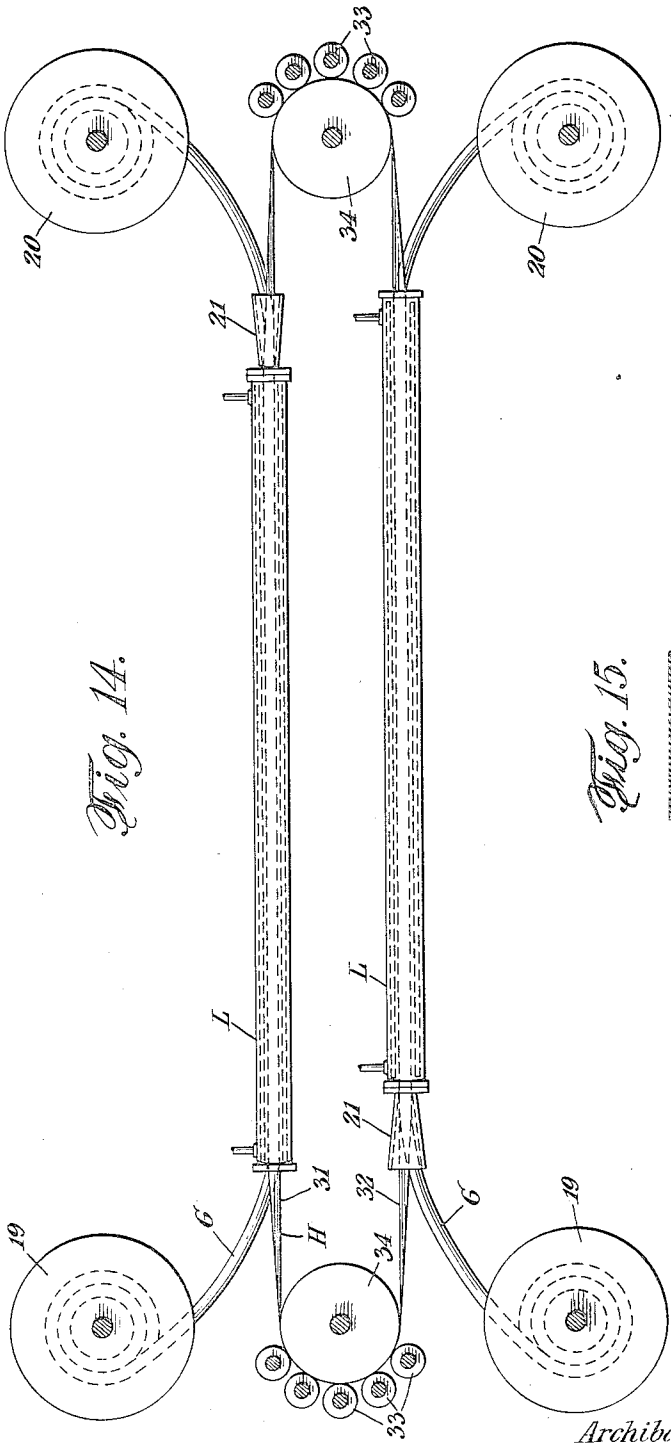


Fig. 14.

Fig. 15.

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UNITED STATES PATENT OFFICE

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CONTINUOUS VULCANIZER

Archibald L. Wallace, Brooklyn, N. Y.

Application March 5, 1932. Serial No. 596,961

18 Claims. (Cl. 18—6)

This invention relates to a continuous vulcanizer for use in the production of rubber hose, belting, and the like.

An object of the invention is to provide a vulcanizer of this type operable to provide an unusually and atractive smooth surface upon the vulcanized article.

A further object is to provide simple means by which any desired configuration may be easily and attractively formed upon the surface of the vulcanized article.

A further and more detailed object is to provide a vulcanizer including one or more ribbons of thin flexible material arranged so as to form a travelling cover for the material being vulcanized.

A further detailed object is to provide suitable means for controlling the movement of the ribbon or ribbons and for causing the ribbon or ribbons to properly engage about the material being vulcanized so as to not only cover said material but so as to cause the material to travel with said ribbon or ribbons through the vulcanizing chamber.

A further detailed object is to so devise and arrange the ribbons employed that one or more thereof may carry ornamental or otherwise attractive and desirable features in such relation as to be caused to appear in predetermined relation upon the finished vulcanized article.

Other objects and aims of the invention, more or less specific than those referred to above, will be in part obvious and in part pointed out in the course of the following description of the elements, combinations, arrangements of parts, and applications of principles constituting the invention; and the scope of protection contemplated will be indicated in the appended claims.

In the accompanying drawings which are to be taken as a part of this specification, and in which I have shown merely a preferred form of embodiment of the invention:—

Fig. 1 is a diagrammatic view illustrating a vulcanizer as it appears in operation, constructed in accordance with this invention.

Fig. 2 is an enlarged fragmentary sectional view illustrating one end of the vulcanizing chamber and associated parts as they appear in Fig. 1.

Figs. 3, 4 and 5 are transverse sectional views upon the planes respectively of lines III—III, IV—IV and V—V of Fig. 2.

Fig. 6 is an enlarged elevational view, partly in section, showing a modified means for guiding the ribbon about the article to be vulcanized.

Fig. 7 is a top plan view of the structure seen in Fig. 6.

Figs. 8, 9 and 10 are transverse sectional views upon the planes respectively of lines VIII—VIII, IX—IX and X—X of Fig. 7.

Fig. 11 is a view similar to that seen in Fig. 1 but illustrating a modification showing the use of more than a single ribbon.

Fig. 12 is an enlarged transverse sectional view upon the plane of line XII—XII of Fig. 11.

Fig. 13 is a similar sectional view but showing a slightly modified relationship of the two ribbons present.

Fig. 14 is a view similar to that seen in Fig. 1 but illustrating a further modification in which two separate vulcanizing chambers are employed enveloping portions of the two legs of an endless ribbon, and

Fig. 15 is a transverse sectional view through the ribbon employed.

Referring to the drawings for describing in detail the structures therein illustrated, and referring first to the structure as illustrated in Figs. 1 to 5, the reference character L indicates the vulcanizing chamber. This is shown to be an elongated cylindrical member having a smooth central bore 1 through which the hose G or other material may be passed. Heat may be applied in any suitable manner as for instance into a jacket as 2 through pipes as 3.

Extending also through the bore 1 of the vulcanizing chamber, and surrounding the hose or the like G, is a thin metallic ribbon H which is of a width sufficient to entirely surround the hose as a lining squeezed firmly between the outer surface of the hose and the interior surface of the bore 1. Suitable reels as 4 and 5 are provided at opposite ends of the vulcanizing chamber, and these are preferably driven so that they may cause the ribbon H to move first in one direction through the chamber L and then in the opposite direction through said chamber. The movement in one direction may continue until nearly the entire length of ribbon has been transferred for instance from the reel 4 to the reel 5, and then the movement may be reversed and continued until the ribbon has been nearly all returned onto the reel 4, etc.

Any suitable drive means may be provided for the reels 4 and 5 but for illustrative purposes the drawings herewith show a drive shaft as 6 operating through a manually operable reversing mechanism 7 and shaft 8 to rotate a bevel-pinion 9 which is in constant mesh with a pair of bevel-gears as 10 and 11. The gear 11 is fixed to a shaft.

12 at the opposite end of which is carried a bevel-pinion 13 meshing with a bevel-gear 14 fixed to the shaft of the reel 4. The gear 10 is fixed to a shaft 15 at the opposite end of which is carried a bevel-pinion 16 meshing with a bevel-gear 17 fixed to the shaft of the reel 5.

By these connections the continuous rotation of drive shaft 6 may be made to operate the reels 4 and 5 so as to cause the ribbon H to travel in either direction selectively according to the will of the operator, the reversing mechanism 7 having a suitable handle as 18 associated therewith by which to change the direction of rotation of the reels at any time.

Obviously if desired the mechanism 7 may be understood to be an automatically operating reversing mechanism timed to reverse the direction of rotation of the reels at predetermined intervals.

The reference characters 19 and 20 indicate a pair of reels positioned one adjacent each end of the chamber L and adapted to support the hose, belting, or like material being operated upon.

When the ribbon H is moving from its reel 4 toward its reel 5 the reel 19 is considered as a supply reel from which the work G moves into the left hand end of the chamber L with the ribbon, while the reel 20 is considered as a take-up reel upon which the work is received as it emerges from the right hand end of the chamber L.

When the ribbon H is moving from its reel 5 toward its reel 4 the reel 20 is considered as a supply reel from which the work G moves into the right hand end of the chamber L with the ribbon, while the reel 19 is considered as a take-up reel upon which the work is received as it emerges from the left hand end of the chamber L.

The reels 19 and 20 may be supplied with any desired driving mechanism as for instance such as that just referred to for driving the reels 4 and 5.

It will be understood that as the work G moves from its supply reel into the adjacent end of the vulcanizing chamber the work is in a relatively unvulcanized condition, and that the vulcanizing of the work takes place within the period of time while the work is travelling through said chamber, so that the vulcanizing operation is completed by the time the work emerges from the opposite end of the chamber.

The speed of travel of the work through the vulcanizing chamber is the same as the speed of travel of the ribbon through the chamber, and although the work holding reels 19 and 20 may be power driven, as above mentioned, it is preferable however that the actual propulsion of the work through the vulcanizing chamber shall at all times be performed by the ribbon and the ribbon drive mechanism, rather than by any power applied to the work holding reels.

By reference to the illustration Figs. 2 to 5 it will be understood that as the ribbon moves into the end of the vulcanizing chamber, along with the work it is automatically curved transversely from its normal flat condition into a tubular condition surrounding the work as a lining between the work and the smooth interior surface of the bore 1 of the vulcanizing chamber. It is intended that the transverse dimension of the work, as compared with the transverse dimension of the bore 1, is such that the material constituting the work will be somewhat condensed by its forced entrance within the ribbon as it moves with the ribbon into and through the vulcanizing chamber.

The material of the work G has no engagement with any part of the vulcanizing chamber. It has engagement only with the moving ribbon. The ribbon will take a grip upon the work as the ribbon curls around the work and moves with it into the vulcanizing chamber, and hence the work will be positively drawn along by the ribbon.

Obviously any surface configuration, such as trade-name, identifying numbers, or ornamental figures, etc., which may be present upon the inner surface of the ribbon will, under these conditions, be transferred or impressed upon or into the work, and likewise the degree of smoothness or roughness of the interior surface of the ribbon will be imparted as surface texture into the vulcanized work.

Also, if the ribbon be very smooth upon its inner surface the outer surface of the finished work will likewise be very smooth and attractive.

In order to insure a desirable transverse curving or folding of the ribbon about the work as the two move together into the end of the vulcanizing chamber, said chamber may if desired be provided with suitable means to engage, or to be engaged by, the passing ribbon to cause the ribbon to bend at appropriate stages of its progress into the vulcanizing chamber.

In the illustration Figs. 1 to 5 such a means is shown as consisting of a funnel-like extension 21 which may be fixed at the end of the chamber so that the ribbon and work may move therethrough. In such a structure the flaring or conical interior wall surface as 22 is disposed so that the edge portion of the advancing ribbon will engage against it and be curled around, as clearly indicated in the drawings.

The cone or funnel 21 may be duplicated at opposite ends of the vulcanizing chamber.

In the illustration Figs. 6 to 10 a means is shown which in some respects is an improvement upon the cone 21. In these figures a plurality of pairs of idler rollers are used instead of the cone 21. These pairs are designated 23, 24 and 25. The two rollers comprising the pair 23 are placed in a position corresponding with the outer or larger end of the cone 21. The two rollers comprising the pair 25 are placed in a position corresponding with the inner or small end of the cone 21, while the two rollers comprising the pair 24 are placed in a position intermediate the pairs 23 and 25. The rollers of these pairs have their peripheral surfaces appropriately curved, each pair being differently curved with respect to the others, so as to provide a proper directing influence upon the ribbon and afford a frictionless means by which to cause the ribbon to bend or fold into cylindrical form as the ribbon advances with the work, into the end of the vulcanizing chamber.

The modification illustrated in Figs. 11 and 12 is the same in all respects to the structure already described, except, first, that it suggests that if desired the ribbon H may be a continuous or endless ribbon moving about spaced drive rolls 26—26, corresponding in general position with the reels 4 and 5 of the previous figures, and second, that it suggests the use of a second ribbon as 27 in association with the ribbon H adapted to move with said ribbon H through the vulcanizing chamber.

Where the second ribbon as 27 is employed such additional ribbon may be used to bridge a gap as 28 which may be of greater or less width between the adjacent opposite edges of the first ribbon and it may be placed either exteriorly

of the tube formed by the first ribbon, as indicated in Fig. 12, or interiorly of the tube formed by the first ribbon, as indicated in Fig. 13.

The use of the additional ribbon 27 has certain advantages amongst which may be mentioned that it avoids necessity for a close fit of the opposite edges of the first ribbon against each other, that it prevents any portion of the material constituting the work from reaching into engagement with the relatively stationary wall of the bore 1 of the vulcanizing chamber, and that it provides a convenient medium upon which ornamental, identifying or other desirable configuration, may be present for transference to the work.

The second ribbon as 27 may be mounted and driven in the same manner as already described with respect to the ribbon H, and it may be either an endless ribbon as indicated in Fig. 11 or it may be of single length carried upon supporting reels as described with respect to the ribbon H in Fig. 1. It may be driven by independent drive mechanism, if desired, or it may be connected to be driven directly from the drive shaft 6, in the same manner as are the reels 4 and 5 and rollers 26—26, above described.

Suitable guide rollers as shown may be provided for guiding the ribbons into their appointed marginal overlapping relationships.

In the illustration Fig. 11 the additional ribbon 27 is shown to be of endless form engaging about spaced rollers 29—29 and the driving connections for said rollers are shown to include an extension as 30 from the shaft 8 and connected with the rollers 29—29 in the manner already described with respect to Fig. 1, but this is merely for illustrative purposes and may be modified at will.

In the modification Fig. 14 the structure is again the same in principle as has already been described, except that it suggests that if desired the ribbon H may be so mounted as to provide two leads as 31 and 32 each passing through a separate vulcanizing chamber L—L. Each of these vulcanizing chambers is adapted independently to receive work carried by the work holding reels 19 and 20.

The arrangement illustrated in Fig. 14 is particularly advantageous in instances where the ribbon H is of the endless type suggested in Fig. 11 since it enables work to be performed by both leads of such an endless ribbon, thereby doubling the output without proportional increase in costs and in time consumed.

The additional ribbons, as 27, illustrated in Fig. 11, may be employed in connection with each of the vulcanizing chambers of Fig. 14 if desired.

In Fig. 14 there is also illustrated a modified form of driving device for the ribbon H. This consists of a series of drive rollers as 33 mounted to frictionally engage the ribbon H where said ribbon rests about its opposite carrying rollers 34. The rollers 34 may be idlers, and the power for moving the ribbon may be imparted solely from the rollers 33, or the rollers 34 may be power driven and the rollers 33 operate either as auxiliary driving means or simply as means to hold the ribbon H in desirable frictional engagement with the rollers 34. The driving means for the rollers 34 and 33 may be of any appropriate type such for instance as that already herein described. In any event the rollers 33 will always operate to smooth or iron out the surface of the ribbon H and thus constitute means for keeping the surface of the ribbon always in a proper condition for performing the desired result set forth herein.

The material used for the ribbon may be of any suitable kind, but preferably consists of sheet metal, usually sheet steel, of almost paper thinness, and it is possessed of suitable flexibility and resiliency to enable it to promptly perform as herein shown and described.

The ribbon may be of only single thickness material or, if desired, it may be of multiple thickness as suggested in the illustration Fig. 15 so that it may be more easily bendable in the performance of its office.

The vulcanizing chamber L in all instances may, if desired, be provided with stuffing boxes at its opposite ends, in the manner as indicated at 35 in Figs. 6 and 7 and the vulcanizing chamber may be formed so that its inner wall in the space between the opposite stuffing boxes is spaced away from the ribbon so as to provide a live steam compartment as 36 surrounding the ribbon and work.

It will be observed that the ribbon in passing through the stuffing box, with the work enclosed within it, constitutes in effect a solid rod, or "piston-like", element moving through said stuffing boxes and preventing the escape of any appreciable amount of steam from within the compartment 36. Due to the fact that the wall of the vulcanizing chamber intermediate the opposite stuffing boxes is spaced away from the ribbon, while passing through the compartment 36, moves somewhat away from direct contact with the work and thereby enables the live steam in the compartment 36 to come into direct contact with the work, this result being sometimes very desirable in the production of certain kinds of belting and hose.

As many changes could be made in tihs construction without departing from the scope of the invention as defined in the following claims, it is intended that all matter contained in the above description, or shown in the accompanying drawings, shall be interpreted as illustrative only and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A vulcanizing machine comprising means forming a vulcanizing chamber having a smooth tubular bore therethrough, and a lining movable longitudinally through said bore and adapted to contain the work therein, said lining comprising a member positioned to be curved about the work in engagement therewith and held in said position by engagement with the interior surface of said bore, together with means having engagement with said lining selectively operable to move said lining and the work therein in either selected direction longitudinally through said bore.

2. A vulcanizing machine comprising means forming a vulcanizing chamber having a smooth tubular bore therethrough, and a lining movable longitudinally through said bore and adapted to contain the work therein, said lining comprising a flexible ribbon of sheet material extending lengthwise through said bore and being curved transversely by engagement with the walls of the bore so as to be curved about the work, together with means for moving the lining longitudinally through the bore.

3. A vulcanizing machine comprising means forming a vulcanizing chamber having a smooth tubular bore therethrough, and a lining movable longitudinally through said bore and adapted to

contain the work therein, said lining comprising a flexible ribbon of sheet material extending lengthwise through said bore and being curved transversely by engagement with the walls of the bore so as to be curved about the work, together with means operable to move the lining in either direction longitudinally through said bore selectively at will.

4. A vulcanizing machine comprising means forming a vulcanizing chamber having a smooth tubular bore therethrough, and a lining movable longitudinally through said bore and adapted to contain the work therein, said lining comprising a flexible ribbon of sheet material extending lengthwise through said bore and being curved transversely by engagement with the walls of the bore so as to be curved about the work, together with means for moving the lining in one direction through the bore and means by which to reverse the direction of movement of the lining through the bore.

5. A vulcanizing machine comprising means forming a vulcanizing chamber having a smooth tubular bore therethrough, and a lining movable longitudinally through said bore and adapted to contain the work therein, said lining comprising a flexible ribbon of sheet material extending lengthwise through said bore and being curved transversely by engagement with the walls of the bore so as to be curved about the work, together with automatically operating means for reversing the direction of movement of the lining through the bore.

6. A vulcanizing machine comprising means forming a vulcanizing chamber having a smooth tubular bore therethrough, a ribbon of flexible material movable through said bore as a tight tubular cover for work and as a lining for said bore, propelling means for moving the ribbon and work through said bore, and a plurality of pairs of rollers arranged at the entrance end of the bore providing annular surfaces of a contour to be engaged by the ribbon and to guide the ribbon into tubular form about the work as a result of said engagement.

7. A vulcanizing machine comprising means forming a vulcanizing chamber having a smooth tubular bore therethrough, a plurality of radially overlapping ribbons movable through said bore serving collectively to constitute a tight tubular cover for the work and as a lining for said bore effective to completely hold the work out of engagement with the surface of the bore, and propelling means for moving said ribbons and said work in unison through the bore.

8. A vulcanizing machine comprising means forming a vulcanizing chamber having a smooth tubular bore therethrough, a ribbon of flexible sheet material movable through said bore constituting a lining for at least a portion of the circumference of said bore, a second ribbon also of flexible sheet material movable through said bore constituting a lining for the remaining portion of the circumference of said bore, said two ribbons collectively completing a cover for the work effective to completely hold the work out of engagement with the surface of the bore, and propelling means for moving said ribbons and said work in unison through the bore.

9. A vulcanizing machine comprising means forming a vulcanizing chamber having a smooth tubular bore therethrough, an endless ribbon of flexible sheet material having one of its leads extending through said bore, said ribbon being transversely resiliently flexible and being bent transversely by engagement with the walls of the bore into tubular form within said bore adapted to constitute a lining for at least a portion of the circumference of the bore, a second ribbon of flexible material extending through said bore constituting a lining for the remaining portion of the circumference of the bore, said two ribbons collectively completing a cover for the work effective to completely hold the work out of engagement with the surface of the bore, and propelling means for moving said ribbons and said work in unison through the bore.

10. A vulcanizing machine comprising means forming two spaced vulcanizing chambers each having a smooth tubular bore therethrough, an endless ribbon of flexible material mounted upon a pair of spaced rollers so that said ribbon provides two spaced leads movable in opposite directions longitudinally through said bores respectively, said ribbon being resiliently flexible and being bent transversely by engagement with the walls of the bores into tubular form within said bores adapted to constitute linings for said bores and covers for work, and driving means for said ribbon.

11. The combination with means comprising a vulcanizing chamber, of a work carrier movable longitudinally through said chamber, said work carrier consisting of a plurality of separate ribbons extending lengthwise of the chamber each being normally flat transversely and of substantially uniform cross section, and each being independently transversely resiliently flexible and being held by the chamber walls flexed transversely so as to be curved about the work, said transversely curved ribbons being arranged with respect to each other to complete a substantially cylindrical cover for the work and so as to have longitudinal marginal portions overlapping and thereby constituting double thickness portions of said cover, and means to propel said ribbons with the work carried thereby longitudinally through said chamber.

12. The combination with means comprising a substantially cylindrical vulcanizing chamber, of a work carrier movable longitudinally through said chamber, said work carrier comprising a ribbon extending lengthwise of the chamber being normally flat transversely and being of substantially uniform cross section, said ribbon being made up of a plurality of independently transversely resiliently flexible layers of ribbon material so that said ribbon is highly flexible transversely, and said ribbon being held by the chamber walls flexed transversely so as to be curved about the work, and means to propel said ribbon with the work carried thereby longitudinally through said chamber.

13. The combination with means comprising a vulcanizing chamber, of a work carrier movable longitudinally through said chamber, said work carrier consisting of a plurality of separate ribbons extending lengthwise of the chamber arranged with respect to each other to complete a cover for the work and so as to have longitudinal marginal portions overlapping and thereby constituting double thickness portions of said cover, and means to propel said ribbons with the work carried thereby longitudinally through said chamber.

14. A vulcanizing machine comprising means forming a vulcanizing chamber having a tubular bore therethrough within which work is to be vulcanized and through which the work is to be moved, a plurality of ribbons of flexible mate-

rial movable through said bore as a lining therefor between the work and the surface of the bore, a guiding device arranged at the entering end of said vulcanizing chamber by which said ribbons are guided into longitudinal marginal over-lapping relation with each other as they enter the vulcanizing chamber, and propelling means for said ribbons arranged beyond said vulcanizing chamber of a character to draw the ribbons through said guiding device and through said vulcanizing chamber.

15. A vulcanizing machine comprising means forming a vulcanizing chamber having a tubular bore therethrough within which work is to be vulcanized and through which the work is to be moved, a plurality of ribbons of flexible material movable through said bore as a lining therefor between the work and the surface of the bore, propelling means for said ribbons, and guide means for the ribbons of a character to guide said ribbons in longitudinal marginal over-lapping relationship with each other.

16. A vulcanizing machine comprising means forming a vulcanizing chamber having a tubular bore therethrough within which work is to be vulcanized and through which the work is to be moved, a plurality of ribbons of flexible material movable through said bore as a lining therefor between the work and the surface of the bore, means to guide said ribbons into longitudinal marginal overlapping relation with each other, and means to propel the ribbons in unison through the vulcanizing chamber.

17. A vulcanizing machine comprising means forming a vulcanizing chamber having a tubular bore therethrough within which work is to be vulcanized and through which the work is to be moved, a plurality of ribbons of flexible material movable through said bore as a lining therefor between the work and the surface of the bore, means to guide said ribbons into longitudinal marginal overlapping relation with each other while within the vulcanizing chamber, and propelling means arranged beyond the vulcanizing chamber having parts holding the ribbons in non-overlapping relation beyond said chamber and propelling them through the vulcanizing chamber.

18. The combination with means comprising a vulcanizing chamber, of a work carrier movable longitudinally through said chamber, said work carrier consisting of a plurality of separate ribbons extending lengthwise of the chamber arranged with respect to each other to complete a cover for the work and so as to have longitudinal marginal portions overlapping and thereby constituting double thickness portions of said cover, at least one of said ribbons being disposed with its opposite longitudinal marginal portions constituting the inner thickness of two of said double thickness portions, and means to propel said ribbons with the work carried thereby longitudinally through said chamber.

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