

Nov. 24, 1942.

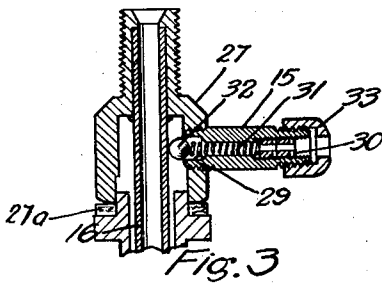
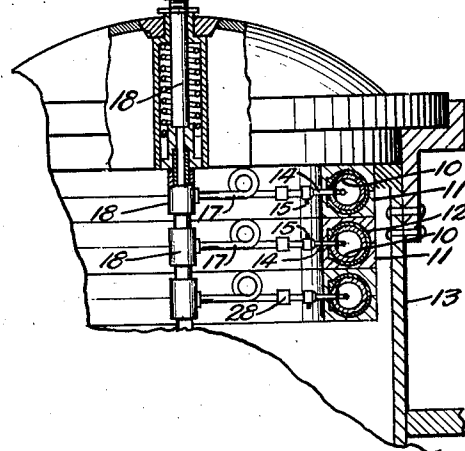
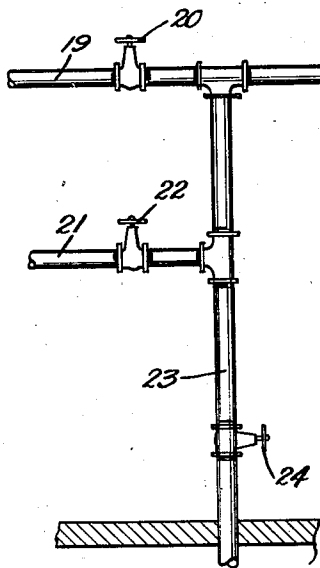
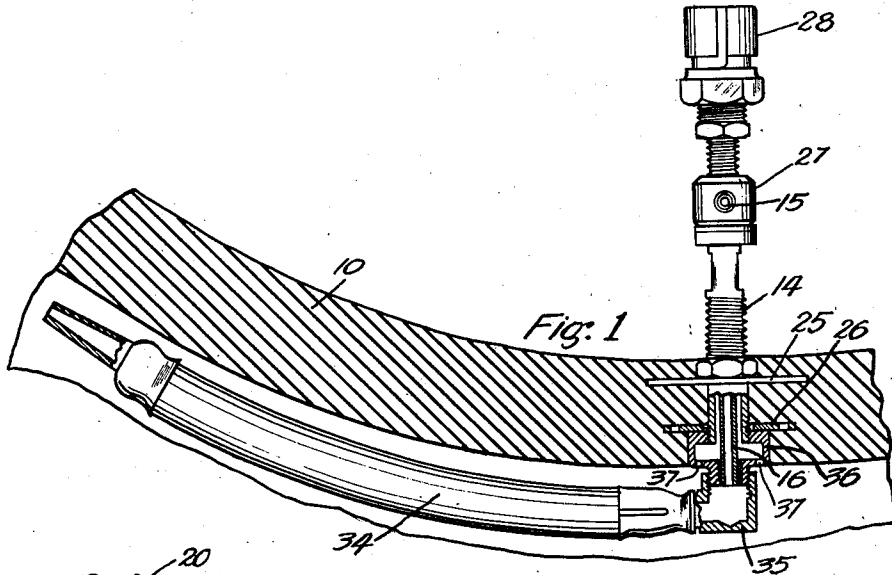
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2,302,754

TIRE-VULCANIZING APPARATUS

Filed Dec. 23, 1938

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

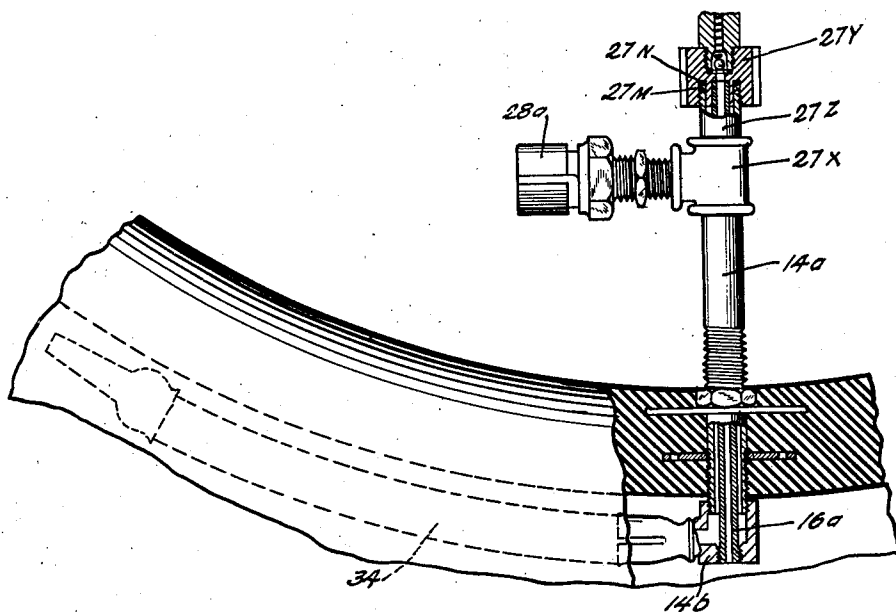


Fig. 4

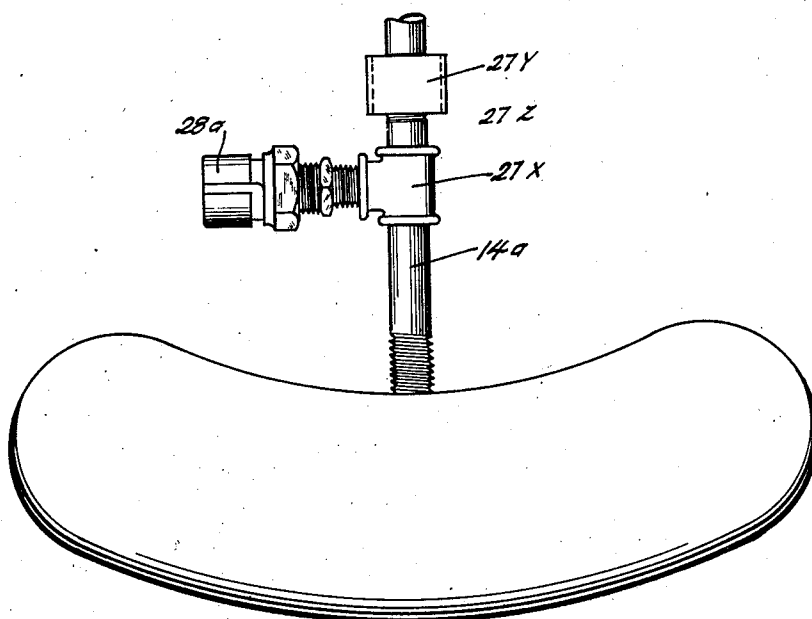


Fig. 5

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UNITED STATES PATENT OFFICE

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TIRE-VULCANIZING APPARATUS

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1 Claim. (Cl. 18—45)

This invention relates to apparatus for vulcanizing hollow articles such as pneumatic tires.

Heretofore a fluid-expansible core composed of or comprising rubber, usually called a water bag, for distending the tire in a mold, has been provided with two inlet and outlet pipes, one within the other, one of them being in communication with the manifold of a chamber type vulcanizer or pot heater and the other having communication with the chamber of the heater, except when the valve is closed, through a valve which opens toward the interior of the bag and is urged toward its open position by a spring, the arrangement being such that when pressure fluid such as steam or water is conducted into the bag from the manifold the air contained in the bag, and steam mixed with it, are driven out through the valve to the interior mold-containing chamber of the vulcanizer until the pressure within the bag is enough greater than that in the vulcanizer chamber to cause the valve to close against the force of the spring.

This arrangement has been employed for riding the bag of its contained air in order to avoid excessive oxidation of the inner face of the bag in successive vulcanizing operations and in order to avoid the heat-insulating effect of air pocketed in the bag.

In all apparatus of this general type that has been employed prior to my invention, however, so far as I am aware, either two bag-stems have been employed, at opposite sides of the tire, as in McLeod 1,118,503, with a filler ring closing the opening between the beads of the tire but permitting the pressure fluid to contact the inner face of the tire, which is impracticable because of the ply-separation that occurs in the tire during its vulcanization; or, as in Batcheller 1,175,681, no automatically-closing valve has been employed; or the inlet and outlet openings of the two pipes, in the bag, have been at an elevation half-way up the height of the cavity in the bag, as in Bucy et al. 2,100,627 or Bucy et al. Re. 20,561, which has prevented the complete emptying of the bag of curing water or of water of condensation by conducting air or steam into the bag; or, as in a later modification of the Bucy apparatus, a flexible pipe adapted to have its open end at a low position in the bag, for venting all of the water down to that low level, has been attached to and in communication with the inlet passage that leads from the interior of the vulcanizer through the spring valve, and with the pipe from the manifold opening at a position within the passage just referred to, or within the

extension thereof afforded by the flexible pipe, with the result that when the pressure in the manifold is released to the exterior of the vulcanizer to permit the valve-spring and the pressure within the vulcanizer chamber to open the valve and thus cause steam from that chamber to enter the bag through the valve-controlled conduit and drive the water out through the manifold the steam has had an open channel for short-cutting directly from the valve-controlled passage into the manifold passage without ever reaching the free end of the flexible tube, and with the steam jet within the flexible-tube conduit opposing the entrance of water into the flexible tube.

Also, the jet of steam flowing into the bag, from either the vulcanizer chamber or from the manifold, has been so close to the mouth of the water-receiving or air-receiving outlet from the bag, when the flexible pipe has been omitted, that the jet effect of the incoming steam has caused a suction or fluid-piston effect which, especially when very high velocity has been involved because of carelessness on the part of the personnel, apparently has interfered to a substantial extent with the desired outflow of air, into the heater chamber, at the beginning of the operation, and with the desired outflow of water, through the manifold, at the end of the operation.

The chief objects of my invention are to provide improved apparatus of this general type adapted to provide for positive forcing of substantially all of the water from the core at the end of the vulcanizing operation; to avoid the undesirable suction or fluid-piston action of the fluid jetting into the bag as above mentioned; to provide a more effective and uniformly dependable washing out of the air from the bag by steam conducted into the bag at the beginning of the operation even though the incoming jet is very strong and the spring-backed valve is quickly closed by reason of the operator letting steam into the cores more rapidly than is contemplated in the setting of the spring-backed valve for closing at a predetermined difference of pressures on its two sides; and to provide an assembly in which the valve passage and other passages are less subject to being clogged by particles of the bag material than in assemblies heretofore employed.

Of the accompanying drawings:

Fig. 1 is a fragmentary horizontal section of a vulcanizing core embodying my invention in its preferred form, parts being shown in elevation.

Fig. 2 is a fragmentary vertical section of a pot heater assembly embodying the invention.

Fig. 3 is a longitudinal middle section of a valve assembly, heretofore known, which is preferred for employment with other parts of my apparatus.

Fig. 4 is a horizontal middle section of a modification adapted for avoidance of clogging of the passages by crumbs of the bag material.

Fig. 5 is a plan view of a sectional repair core embodying my invention in its preferred form.

Referring to the drawings, the apparatus comprises a fluid-expansible core 10 of which a plurality may be assembled in the usual relationship to tire molds 11, 11 and tires 12, 12 therein in a pot heater 13.

Each core is provided with a fluid-conducting pipe or stem 14 through which the interior of the bag or core is in communication with the interior of the vulcanizer through a lateral spring-backed-valve stem 15 and, within the stem 14, a pipe 16 through which the interior of the bag is in communication with a flexible pipe 17 leading from the jointed manifold 18 of the vulcanizer, which in turn is adapted to be put in communication, selectively, with a steam-supply or gas-supply pipe 19 controlled by a valve 20, a water-supply or gas-supply pipe 21 controlled by a valve 22, or a vent pipe 23 leading to a drain and controlled by a valve 24.

The stem 14 is vulcanized in and thereby sealed to the base wall of the core 10, is provided with the usual plates 25, 26 for anchoring it in the rubber of the core, and at its outer end is fitted into a head 27 and sealed thereto by a fiber washer 27^a. Into a side face of the head 27 is threaded the lateral stem 15, and at its outer end the head 27 is threaded for mating with a bayonet-slot coupling member 28 for attachment to the flexible manifold branch pipe 17.

The spring-backed-valve assembly comprises the lateral stem member 15, formed with a valve seat 29 (Fig. 3) near the inner end of a through passage in which is threaded an apertured spring-adjusting plug 30 which forms a seat for a compression spring 31 which bears at its inner end against a ball valve 32 to urge the latter away from its seat 29 and toward the inner pipe 16, which latter serves as a stop for the ball. An apertured end cap 33 may be provided for the lateral stem 15.

The inner pipe 16 is permanently mounted in and sealed to the wall of a countersink within the head 27, as shown clearly in Fig. 3, and it is desirable that from time to time the head 27 be unscrewed from the stem 14, permanently anchored in the wall of the bag, for cleaning out of the inner pipe 16 and of the annular space between it and the outer pipe 14.

The necessity of thus removing the head 27 and inner pipe 16 from the stem 14 presented a problem in the matter of having the inner pipe in service communicate directly and positively with a flexible tube 34 within the bag, because the flexible tube 34 has to be placed in the bag before its manufacture is completed and remain permanently in the bag and also because the inner pipe 16 cannot well be made of such size and strength as alone to serve as a mounting for the flexible tube 34.

Having conceived the thought of mounting the flexible tube 34 with its fluid passage as a continuation of the fluid passage of the inner pipe 16, so as to provide a desirable tangential flow of the incoming jet of steam at the beginning of the op-

eration, for washing the air out of the bag at a position sufficiently remote from the jet to be substantially out of the region of the suction or fluid-piston effect of the jet, and so as to provide a positive driving out of the water at the end of the operation, I have also solved the above-mentioned further problem by mounting the flexible tube 34 upon an elbow 35 which is rigid with and, for convenience of manufacture is screwed upon, a hollow head member 36 which is rigid with and, for convenience of manufacture is screwed upon, the outer pipe or stem 14, and in its end wall adjacent the elbow 35 is formed with an aperture in which the inner end of the inner pipe 16 is screwed, so that it may be removed for cleaning while leaving the head 36, elbow 35 and flexible tube 34 in place, and yet when in service provides positive fluid connection from the manifold 18 to the interior of the bag through the flexible tube 34, the latter thus being provided with the rugged support of the relatively large pipe 14 and its head 36, which have their support in the wall of the bag, close to the elbow 35, and not at the remote position of the other end of the weak inner pipe 16. Also, the small inner pipe, having its only other support at the remote position of its other end, is supported and centered by the engagement of its inner end in the threaded aperture of the head 36.

To provide for flow of fluid through the annular space between the two pipes 16, 14 and through the spring-backed valve assembly, outward from the bag for the washing out of air at the beginning of the operation and into the bag for driving water out through the flexible tube 34 and through the manifold 18 at the end of the operation, the head 36 is formed with apertures 37, 37.

The stem 14 may be provided with the usual anchorage plates 25, 26 and the flexible tube 34 may be provided with the usual metal nozzle 40 at its free end for directing incoming fluid tangentially in the bag and to serve as a weight for assuring that its mouth will be at the lowermost part of the bag cavity for conducting out substantially all of the water.

In the operation of the apparatus as adapted for use with a pot heater as here shown, steam is let into the bags, through the manifold 18 and the flexible tube 34 and mixes with and washes out air from the core, through the holes 37 and then through the lateral stem 15 and into the heater chamber until the pressure within the bag is sufficiently greater than that within the chamber to close the valves 32 against the force of the springs 31, the pressures preferably being so controlled that the valves close only after substantially all of the air has been washed out of the bags.

The vulcanization of the tires is then carried out in the usual way, with either high pressure steam or high pressure water, conducted in through the manifold 18, holding the tires distended in their molds.

At the end of the cure the interiors of the bags are vented through the flexible tubes 34 and the manifold 18, some of the water in the bags flashing into steam and exerting an expelling force upon the remaining water, and when the pressure within the bags is sufficiently lower than that within the heater chamber the valves 32 are opened by the force of the springs 31 acting in addition to the chamber pressure and steam from the chamber enters the bags through the opened valves and by positive static pressure drives substantially all of the water from the bags through

the flexible pipes 34 and the manifold 18, the free end of the flexible tube 34 of course lying upon the bottom wall or floor of the bag, as shown clearly in Fig. 2.

In the modification shown in Fig. 4 the outer stem, 14^a, has the flexible pipe 34 mounted upon and sealed to a head 14^b which is mounted upon the inner end of the stem 14^a, with no direct communication between the flexible tube and the small inner pipe, 16^a, and at its outer end the outer stem, 14^a, is threaded into a pipe-T, 27^x, which has the bayonet-slot coupling, 28^a, threaded into its laterally-extending arm, for communication of the manifold with the annular outer passage instead of with the inner passage of the small inner pipe as in Fig. 1.

The small inner pipe 16^a is at its inner end threaded through a wall of the head 14^b, thus leading directly into the interior of the water bag, and not through the flexible pipe 34 as in the prior art.

At its outer end the small inner pipe 16^a is fitted and welded in an annular recess formed in a head 27^y and the latter, having in axial extension thereof a valve assembly such as is shown in Fig. 1, is adapted to be drawn onto and sealed to a pipe 27^z, which is screwed into the adjacent arm of the pipe-T 27^x, by rotating the head 27^y to screw the inner end of the small inner pipe 16^a into the wall of the head 14^b, a fiber washer 27^m and a metal washer 27ⁿ being interposed between the pipe 27^z and the head 27^y.

This construction segregates, and thus renders less subject to clogging, the "bottle-neck" factors represented by the narrow annular passage through the valve-seat, past the ball, and the narrow annular passage between the small inner pipe 16^a and the outer stem 14^a.

Also, by reason of the fact that the valve assembly is an axial extension of the passage in the small inner pipe, with a substantially straight flow of fluid through them, this construction avoids the centrifugal-separator, clogging effect, or eddies incident to the right-angle turn, close to the valve-seat, in Fig. 1.

The annular passage between the two pipes gets an effective reverse-flow cleaning effect in each vulcanizing cycle, without hindrance to or hindrance by the narrowness of the annular valve passage, and in each vulcanizing cycle the valve passage gets an effective reverse-flow cleaning effect without hindrance to or hindrance by the narrowness of the annular passage between the pipes, and the right-angle turn of the current, in the pipe-T, in crumb-carrying outflow, is into the branch pipe from the manifold, which is of course much less subject to clogging than the narrow annular valve-passage is, so that the centrifugal-separator effect of the eddies is harmless.

Various other modifications are possible within the scope of the appended claim and the invention is not wholly limited to use in an assembly including a vulcanizer of the pot heater type.

I claim:

Tire-vulcanizing apparatus comprising an expansible core, a single core-stem therefor having two inlet-outlet passages one within the other, and, within the core, a tube having an open end at substantially the lowest part of the core cavity, the said tube at its other end having fluid connection substantially with only the outer one of the said passages, and a spring-opened, inwardly-opening valve having its passage as substantially an axial extension of the inner passage.

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