July 26, 1932. R. D. CLEVELAND 1,868,791

VULCANIZING SYSTEM

Filed Nov. 20, 1931 2 Sheets-Sheet 1

Fig. 1

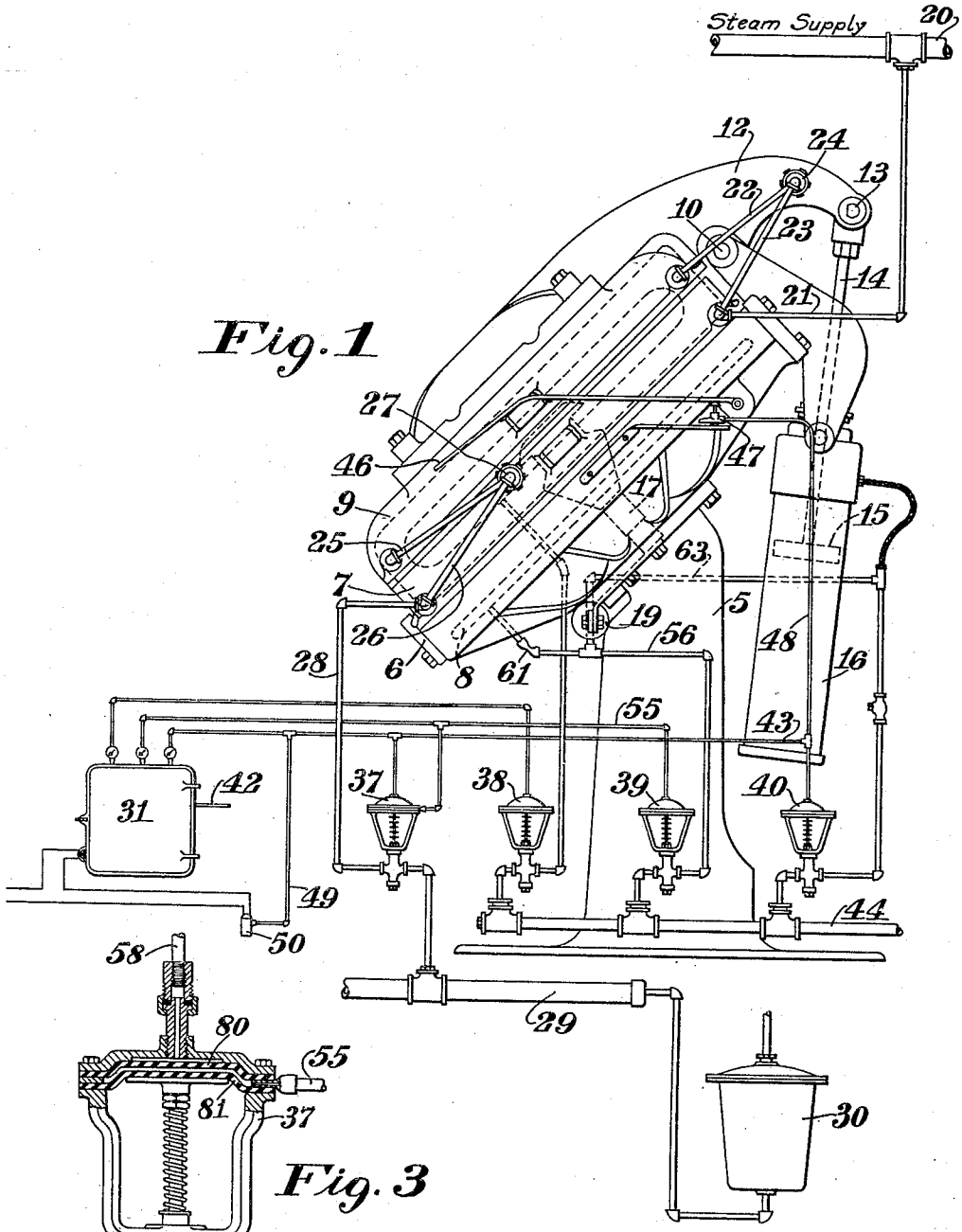


Fig. 3

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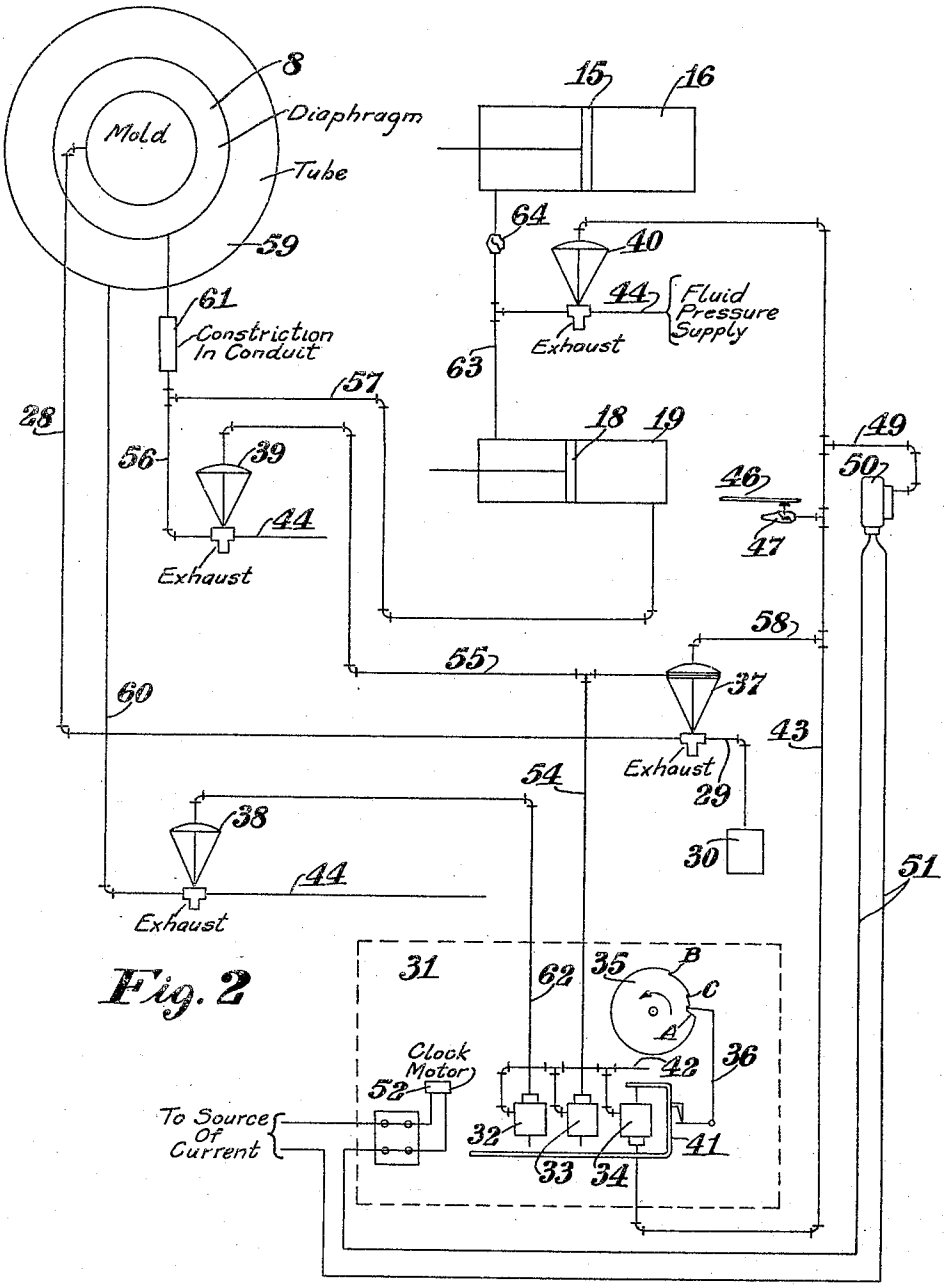


Fig. 2

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UNITED STATES PATENT OFFICE

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VULCANIZING SYSTEM

Application filed November 20, 1931. Serial No. 576,312.

This invention relates to a vulcanizing system and more particularly to an arrangement for expelling condensate automatically from the mold sections of a vulcanizing device.

At the present time individual tire and tube vulcanizers are arranged in a group or battery with a common header for supplying the heating medium such as steam for the mold sections of the several vulcanizers and with a common manifold through which the condensate formed in these sections by the cooling of the steam, passes to a single steam trap. If for any reason such a steam trap fails to function, the condensate will accumulate in the manifold and will back up into the several vulcanizers, thereby reducing the temperature of the sections thereof to a point where imperfect cures are effected resulting in defective tubes. Since there are usually a large number of vulcanizers in a battery, the defective operation of the steam trap common thereto, frequently results in the production of a large number of defective tires or tubes before such faulty operation is discovered.

In accordance with the present invention, it is proposed automatically to exhaust the condensate from each vulcanizer into the open air at some period during its cycle of operation in forming a tube or tire.

Other features of the invention will appear from the detailed description and claims when taken with the drawings in which Fig. 1 is a side elevation of a typical vulcanizer with its controlling apparatus; Fig. 2 is a diagrammatic showing of this controlling apparatus and certain portions of the vulcanizer; and Fig. 3 is a vertical section of a motor valve suitable for use in the arrangement of the present invention.

Referring especially to Fig. 1, 5 designates a base or pedestal of an individual tube vulcanizer, although the invention is applicable to various types of vulcanizers including tire vulcanizers. The structure of the present vulcanizer is more fully disclosed in the copending application of Stricklen and Fraine, Ser. #556,508, filed Aug. 12, 1931, and therefore the details of construction and operation will be only generally referred to.

On the upper end of the pedestal 5 there is mounted a diaphragm casing 6, on which there is supported the loosely mounted or floating lower mold section 7. This mold section rests on an expansible annular diaphragm 8 which may be inflated in a manner to be described so that the lower mold section may be elevated to register tightly with the upper mold section 9. The upper mold section, which is pivotally mounted on an extension of the base, is provided with an arm 12. This arm is pivotally connected at 13 with a piston rod 14 carrying piston 15 which is adapted for movement within the cylinder 16 under control, of fluid pressure and gravity. There is also indicated a breech lock 17, the structure and operation of which are more clearly disclosed in the mentioned copending application. For purposes of this description, it is sufficient to state that a piston 18 (Fig. 2) operates within the cylinder 19 to rotate the breech lock 17 in one direction to lock the mold sections 7 and 9 in engagement and in the reverse direction to unlock them.

The mold sections 7 and 9 are hollow to receive a heating medium such as steam, furnished through a common steam supply line or header 20, conduit 21 leading to a port opening into the lower mold section 7 and thence through pivoted pipe section 23 and pivoted joint 24 to the pipe 22 pivoted in a port in the upper mold section 9 and communicating with the interior thereof. The steam condensate collecting in the hollow mold sections during the operation of the vulcanizer flows through the ports of the respective sections in which the pipes 25 and 26 are pivotally mounted. The port in the lower mold section and pipe 26 communicate with pipe 28, while the free end of movable pipe 26 communicates through pivoted joint 27 with the free end of pipe 25 which pipe leads to the interior of the upper mold section. The pipes 22, 23 and 25, 26 are so pivoted in this manner that steam may enter the mold sections from steam supply line 20 and condensate may collect in pipe 28 without interfer-

ing with the opening and the closing of the upper mold section. It will be understood that a three-way motor valve 37 (Fig. 3) having two independent operating diaphragms 80 and 81 in its top, connects pipe 28 to its exhaust port or to manifold 29 which lead to a steam trap 30 of any well-known design.

In connection with the vulcanizer, there is provided a timing device including pilot valves 32, 33 and 34 (Fig. 2) which are actuated in accordance with a predetermined schedule by a time-controlled cam 35 and cam follower 36. These pilot valves cooperate in the control of motor valves 37, 38, 39 and 40 to control the various operations of the vulcanizer. It will be understood that at the conclusion of each vulcanizing cycle, the free end of the follower arm 36 engages the deepest cutting of the cam 35, as shown, so that the frame 41 operated thereby, is in a position to hold pilot valve 34 open, while the pilot valves 32 and 33 are closed. At this time, therefore, fluid pressure passes from the supply conduit 42 through pilot valve 34, thence through conduit 43 to the top of the motor valve 40. This motor valve is thus operated and supplies fluid pressure from the supply conduit 44 to the upper side of the piston 15, (Fig. 1), causing it to move downward to its lowermost position in the cylinder 16. As the piston 15 moves downward, the piston rod 14 linked to the arm 12 of the upper mold section swings this section on the pivot 10 to its open position where it remains until the beginning of the next cycle, since motor valve 40 continues to supply fluid pressure to the upper surface of piston 15. Simultaneously conduit 43 and branch conduit 58 supply fluid pressure to the upper diaphragm of motor valve 37 so that this valve holds its exhaust port closed, while conduit 43 and branch conduit 49 supply fluid pressure to hold electropneumatic switch 50 open.

However, when it is desired to start the press, after an uncured tube 59 has been inserted in the lower mold section and has been properly connected to the conduit 60 for subsequent inflation, the operator then depresses the starting handle 46. The starting handle thus actuates exhaust valve 47 permitting the fluid pressure in conduit 43 and branch conduits 58 and 49 to escape. This causes the motor valve 40 to release which, in turn, cuts off the fluid pressure supply from the upper part of the cylinder 16 above piston 15. Piston 15 thereupon rises as the mold section 9 drops downward under the action of gravity. Likewise when the fluid pressure is relieved in conduit 43 and its branch conduit 58, motor valve 37 opens its exhaust port so that any condensate that has collected in pipe 28 is blown into the atmosphere.

As is more fully disclosed in the mentioned copending application, when fluid pressure is relieved from the conduit 43 and branch conduit 49, the electro-pneumatic switch 50 completes a circuit through the conductors 51 and the clock motor 52, to the source of current. Under the control of this circuit, clock motor 52 drives the cam 35 in accordance with a predetermined schedule and as the follower arm 36 engages the inclined portion A of the cam 35, the frame 41 closes the pilot valve 34 and then opens the pilot valve 33. When the pilot valve 33 is opened, it supplies fluid pressure from the fluid supply conduit 42 through conduits 54 and 55 to the tops of the motor valves 37 and 39. This actuates the lower diaphragm in the motor valve 37 thereby causing it to close its exhaust port and to connect the pipe 28 through manifold 29 to the steam trap 30. Motor valve 39 is also actuated at this time and supplies fluid pressure from common supply conduit 44 through conduit 56 and then through branch conduit 57 to the right-hand end of the breech lock cylinder 19 (Fig. 2), causing the piston 18 to move toward the left (Fig. 2) for the purpose of operating breech lock 17 to lock the mold sections 7 and 9 closed. Similarly fluid pressure supplied to conduit 56 passes through the constriction 61 to the annular diaphragm 8 which diaphragm, it will be recalled, serves to bring the upper and lower mold sections tightly into registration.

In the course of the rotation of the cam 35, its follower 36 in progressing up cam incline A, elevates the frame 41 still farther so that the pilot valve 32 is now opened, together with pilot valve 33 which has previously been opened. The opening of the pilot valve 32 supplies fluid pressure from the common source 42, through conduit 62, to the top of the motor valve 38. This valve is thus operated and supplies fluid pressure from conduit 44, through conduit 60 to inflate the tube 59 to which it has been previously connected. The free end of the cam follower 36 now engages the circular contour of the cam 35 thereby operating frame 41 to hold the pilot valves 32 and 33 opened and pilot valve 34 closed until the end of the curing or vulcanizing period. Then when the follower 36 engages the first cutting B in the cam, following the circular portion, the frame 41 drops sufficiently so that the pilot valve 32 releases to cut off fluid pressure from conduit 62. This causes the motor valve 38 to close whereupon the tube 59 is deflated through conduit 60 and the exhaust port of motor valve 38. Subsequently, as the cam 35 advances farther the follower 36 drops into the second cam cutting C which closes pilot valve 33. This, in turn, closes motor valve 39 and permits the diaphragm 8 and the right-hand portion of the cylinder 19 to exhaust. Also when the pilot valve 33 closes, the fluid pressure which has been applied through conduit 54 to the lower diaphragm of motor valve 37 during the cur-

ing period, is relieved and this motor valve disconnects the pipe 28 from the manifold 29 leading to steam trap 30 and connects it to the motor valve exhaust port so that any condensate that has formed in the mold sections, is blown into the open air. The cam 35 continues to rotate until the follower 36 advances into the lowermost cam cutting corresponding to the normal position, then frame 41 drops to a position to open the valve 34 whereupon fluid pressure is supplied from the source 42 through conduit 43 to the top of the motor valve 40. This motor valve supplies pressure from the source 44 through conduit 63 to the left-hand side of cylinder 19, whereupon the piston 18 moves the breech lock 17 to a position to unlock the mold sections. Fluid pressure in conduit 63 is also supplied through the constriction 64 to the top side of piston 15 moving it downward with a consequent opening of the upper mold section. It should be stated that the constriction 64 serves to delay the action of the piston 15 until the breech lock has been moved to a position to unlock the sections. Fluid pressure in branch conduit 49 keeps the electropneumatic switch 50 open which fluid pressure in branch conduit 58, keeps the motor valve 37 operated so that its exhaust port is closed.

From the foregoing it will be seen that the motor valve 37 functions to exhaust condensate accumulating in the pipe 28 and the mold sections 7 and 9, both at the beginning and at the end of the curing cycle. In the first instance, this condensate is blown out of the pipe 28 during the time that the upper mold section is closing and until the pilot valve 33 opens to operate the breech block and to inflate the diaphragm. Pipe 28 is also blown out at the conclusion of the curing cycle in the interval while the breech lock 17 is being unlocked. By this arrangement the interiors of the mold sections are maintained substantially free from condensate and these sections are therefore at the proper temperature for curing, thereby obviating an important cause of defective tubes.

While the invention has been disclosed in connection with a tube vulcanizer, it will be readily appreciated that it may be applied to any other vulcanizing device operating according to a predetermined time cycle.

I claim:

1. In a vulcanizing system, a vulcanizer including hollow mold sections arranged to be heated by hot vapor, means including a fluid pressure operated motor valve for exhausting condensate from said mold sections, means including a second fluid pressure operated motor valve for controlling the opening and closing of said mold sections, conduits normally applying fluid pressure to said motor valves, and a manual device for relieving the fluid pressure in said conduits.

2. In a vulcanizing system, a vulcanizer including hollow mold sections arranged to be heated by hot vapor, means including a motor valve for exhausting condensate from said mold sections, operating mechanism for said vulcanizer, means including a regulating device for controlling said operating mechanism in accordance with time, and means including said regulating device for controlling the operation of said motor valve.

3. In a system of the class described, a vulcanizer including hollow mold sections arranged to be heated by hot vapor, an outlet for each mold section, means including a motor valve for opening and closing a connection from said outlets to the atmosphere, operating mechanism for said vulcanizer, means including a regulating device for controlling said operating mechanism according to a predetermined schedule, and means including said regulating device for controlling the operation of said motor valve.

4. In a system of the class described, a vulcanizer including hollow mold sections arranged to be heated by hot vapor, an outlet for each mold section, operating mechanism for said vulcanizer, a conduit common to said outlets, a motor valve controlling the opening of said conduit, means including a time cycle device for controlling said operating mechanism in accordance with time to determine a vulcanizing cycle, and means including said device for operating said motor valve during a portion of a vulcanizing cycle.

5. In a system of the class described, a vulcanizer including hollow mold sections arranged to be heated by hot vapor, operating mechanism for said vulcanizer, means including a motor valve controlling the exhausting of condensate from said sections, means including a time cycle device for controlling said operating mechanism in accordance with time to determine a vulcanizing cycle, and means including said device for controlling said motor valve during a portion of a vulcanizing cycle.

6. In a vulcanizing system, a vulcanizer including hollow mold sections arranged to be heated by hot vapor, each mold section being provided with an outlet, operating mechanism for said vulcanizer, a manifold, means including a motor valve for connecting said outlets alternately to said manifold and to the atmosphere, means including a regulating device for controlling said operating mechanism in accordance with time, and means including said regulating device for controlling the operation of said motor valve.

7. In a system of the class described, a vulcanizer including hollow mold sections arranged to be heated by steam, an outlet for each mold section, a conduit common to said outlets, and a valve controlling the opening of said conduit to the atmosphere, mecha-

nism for controlling the closing of said mold sections, mechanism for locking said sections in closed condition, a time cycle device controlling the operation of said mechanisms, and means responsive to said device for opening said valve to the atmosphere.

8. In a system of the class described, a vulcanizer including hollow mold sections arranged to be heated by steam, an outlet for each mold section, a conduit common to said outlets, and a valve controlling the opening of said conduit to the atmosphere, mechanism for controlling the closing of said mold sections, mechanism for locking said sections in closed position, a time cycle device controlling the operations of said mechanisms, and means responsive to said device for opening said valve to the atmosphere during the period between the initiation of the closing operation of the mold sections and the locking of the same.

9. In a system of the class described, a vulcanizer including hollow mold sections arranged to be heated by hot vapor, an outlet for each mold section, operating mechanism for said vulcanizer, means including a motor valve controlling the connection of said outlets to the atmosphere, means including a time cycle device for controlling said operating mechanism in accordance with time to determine a vulcanizing cycle, and means including said device for operating said motor valve at the beginning and at the end of each vulcanizing cycle.

10. In a system of the class described, a vulcanizer including hollow mold sections arranged to be heated by steam, means including a motor valve for exhausting condensate from said mold sections, mechanism for controlling the closing of said mold sections, mechanism for locking said sections in closed condition, a time cycle device controlling the operation of said mechanisms, and means responsive to said device for operating said valve.

11. In a system of the class described, a vulcanizer including hollow mold sections arranged to be heated by steam, means including a motor valve for exhausting condensate from said mold sections, mechanism for controlling the opening and the closing of said mold sections, mechanism for locking said sections in closed condition, a time cycle device controlling the operations of said mechanisms and means responsive to said device for opening said valve to the atmosphere during a portion of the interval between the operation of said mechanisms.

12. In a system of the class described, a vulcanizer including hollow mold sections arranged to be heated by steam, an outlet for each mold section, a conduit common to said outlets, a steam trap connectible to said conduit, a motor valve in one of its positions serving to connect said conduit to the atmosphere and in another of its positions to said steam trap, said valve being provided with two actuating diaphragms, a fluid-pressure controlled device for normally holding the mold sections in open relation, one of said diaphragms being supplied with fluid pressure in common with said device, a fluid pressure controlled device for locking said sections closed, said second diaphragm being supplied with fluid pressure in common with said locking device, the application of fluid pressure to either of said diaphragms serving to close said conduit to the atmosphere, and means for controlling the application of fluid pressure to said devices and to said diaphragms.

In testimony whereof I affix my signature.

ROBERT D. CLEVELAND.