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PROTECTIVE SEAL FOR VULCANIZING APPARATUS

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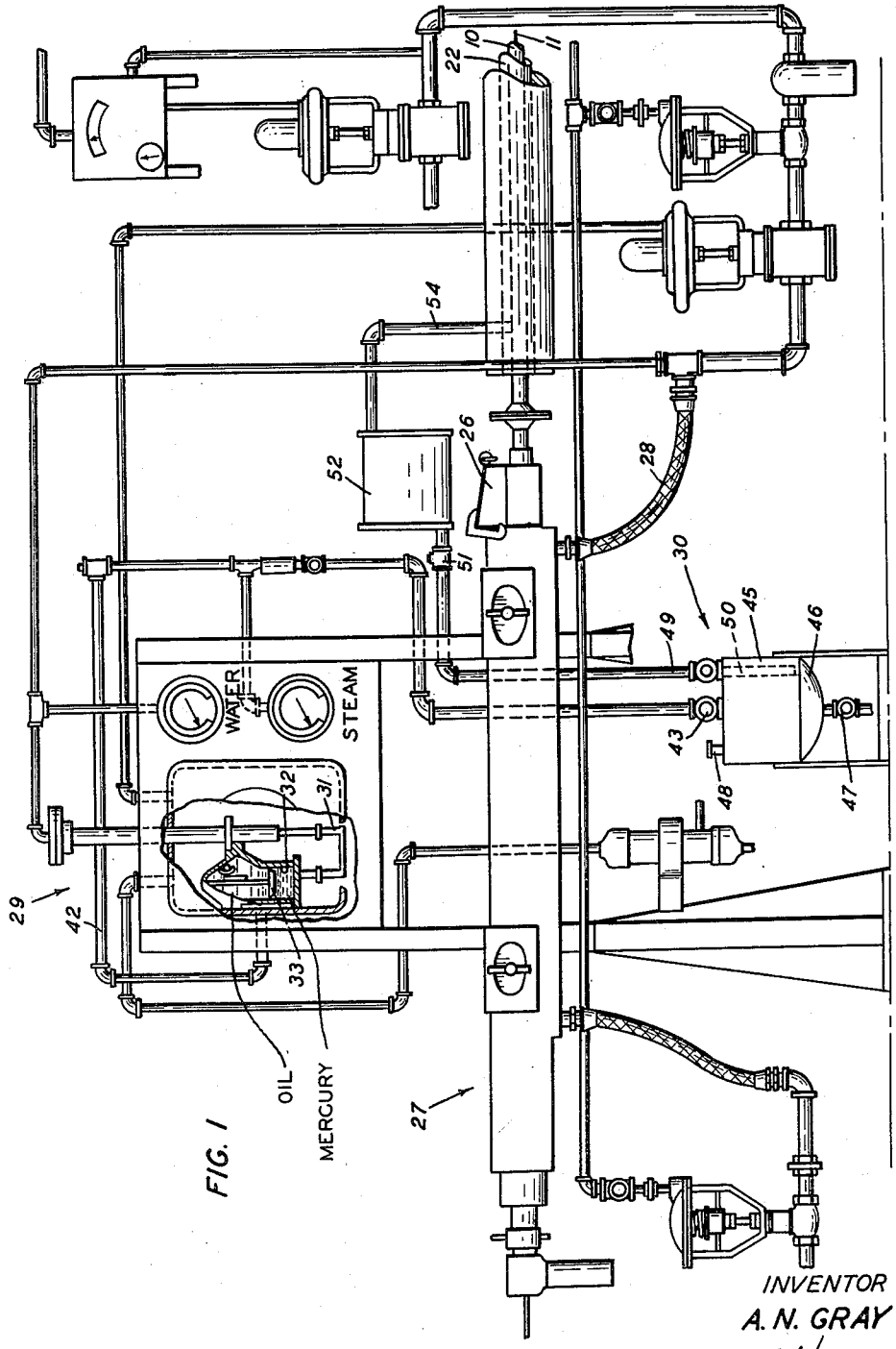


FIG. 1

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PROTECTIVE SEAL FOR VULCANIZING APPARATUS

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11 Claims. (Cl. 18—6)

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This invention relates to protective seals, and more particularly to protective seals for preventing contact between hydrogen sulphide in steam lines connecting vulcanizing tubes to float chambers containing mercury and the mercury.

In the manufacture of the filamentary articles, such as insulated and jacketed conductors and cables, having outer coverings of vulcanized compounds over suitable cores, the cores sometimes include elements of hygroscopic material, such as textile materials. Such a core usually is advanced through an extruder, which extrudes a covering of vulcanizable compound including sulphur as an agent therein, and then the covered core is advanced through an elongated vulcanizing tube to vulcanize the covering. In a vulcanizing tube having steam at a high temperature and under high pressure therein, the heat of the steam vaporizes latent moisture in the hygroscpic elements of the core. The steam in the vulcanizing tube picks up hydrogen sulphide derived from the sulphur used as a vulcanizing agent in the vulcanizable compound extruded upon the core.

A seal has sometimes been positioned at the end of such a vaulcanizing tube, and cold water has been introduced into the seal. The seal serves the dual purpose of preventing the escape of steam from the vulcanizing tube into the atmosphere, and of cooling the covered core to condense the vaporized moisture originally contained in the hygroscopic elements of the core and thereby prevent bursting of the covering of vulcanized compound thereover. The pressure of the water has sometimes been controlled by apparatus such as that disclosed and claimed in copending application Serial No. 702,601, filed October 11, 1945 by A. Stiegler for "Continuous Extruding and Vulcanizing Apparatus." Such a pressure controlling apparatus includes a U-tube including a float chamber containing mercury and a float resting on the mercury in the float chamber for actuating suitable water-pressure-changing elements. Steam pressure is transmitted directly by steam to the float chamber, and water pressure is transmitted to the other end of the U-tube. In the past, the steam or condensate carrying hydrogen sulphide therewith has come into direct contact with the mercury in the float chamber and mercuric sulphide, and due to the reaction between the hydrogen sulphide and the mercury a solid is formed, which cakes up the float and the mercury chamber. This has a deleterious action on the operation of the pressure controlling apparatus.

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An object of the invention is to provide new and improved protective seals.

A further object of the invention is to provide new and improved protective seals for preventing contact between hydrogen sulphide in steam lines connecting vulcanizing tubes of continuous extruding and vulcanizing apparatus and mercury in float chambers of pressure regulating systems associated with such apparatus.

A protective seal illustrative of certain features of the invention includes a precipitating chamber positioned between a float chamber containing mercury and a steam line having hydrogen sulphide laden steam therein, and a precipitating agent positioned in the precipitating chamber for precipitating the sulphide to prevent contact between the sulphide and the mercury.

A complete understanding of the invention may be obtained from the following detailed description of a protective seal forming a specific embodiment thereof, when read in conjunction with the appended drawing, in which the only figure is an enlarged, fragmentary, partially sectional, side elevation of a portion of a continuous insulating and vulcanizing apparatus and a protective seal embodying the invention.

Referring now in detail to the drawing, there is shown therein a portion of a continuous extruding and vulcanizing apparatus for forming and vulcanizing a protective covering 10 (Fig. 1) over a core 11 to form a covered conductor. The core 11 also includes a textile covering (not shown), such as cotton, or the like, which is hygroscopic in the manner described in the above-mentioned copending application. The covering 10 is composed of a vulcanizable compound, such as a jacketing compound containing rubber or a synthetic rubber-like material and sulphur as a vulcanizing agent. The covered core is advanced through an elongated steam-jacketed vulcanizing tube 22 into which steam under high pressure is supplied by suitable means (not shown). The steam vulcanizes the vulcanizable compound, and, in so doing, becomes laden with hydrogen sulphide. The covered core is advanced from the vulcanizing tube into and through a splice box 26 and through a cooling and sealing device 27 arranged in tandem with the splice box.

As the covered core 11 is advanced through the elongated vulcanizing tube 22, the steam under a high but fluctuating pressure heats the covering 10 to a high temperature. This heat and pressure vulcanize the covering 10, but the

heat of the covering 10 heats any moisture contained in the textile covering to temperatures at which the moisture would be volatilized under atmospheric pressure. As long as a pressure substantially above that of atmosphere is kept on the covering 10, the moisture thereunder does not volatilize. But if the pressure thereon is reduced to that of atmosphere before the moisture is cooled, the moisture under the covering 10 volatilizes and ruptures or blisters the covering 10. Cold water under a high pressure is supplied through a pipe 28 to the seal and cools the moisture in the covered core 11 sufficiently to prevent such damage.

The cold water is kept at a pressure substantially the same as that of the steam by a differential pressure controlling device 29, which, except for a protective seal 30, is identical with that disclosed and claimed in the above-mentioned copending application of A. Stiegler. The differential pressure controlling device includes a U-tube 31 and a float chamber 32. Mercury positioned in the U-tube 31 serves to support a float 33 in the float chamber 32, and the float serves to actuate the controller. A pipe 42 filled with oil connects the upper portion of the float chamber, the upper portion of which also is filled with oil, to a manually operable valve 43 leading to the interior of a precipitating tank 45. The precipitating tank is filled with a hydrogen sulphide precipitating solution such as, for example, a solution of copper chloride, of greater density than water and oil, and has a collecting portion 46, a drain 47 and a refill spout 48. The precipitating solution is heavier than the oil in the pipe 42 and is positioned at a lower level than the float chamber 32 so that the oil prevents contact between the mercury and the precipitating solution but transmits pressure therebetween.

A pipe 49 having a spout 50 and filled with water connects the precipitating tank to a check valve 51, which is connected to a steam condenser 52. The check valve 51 does not normally affect the rest of the apparatus, but when a high vacuum is formed in a pipe 54 connecting the condenser to the vulcanizing tube 22, as when steam is initially supplied to the vulcanizing tube and shoots past the pipe 54 at a high velocity, the check valve lets atmospheric air into the pipe 49 and the condenser to prevent the contents of the protective seal 30 from being drawn therefrom.

In the operation of the protective seal 30, the pressure of the steam in the vulcanizing tube 22 is transmitted to the float chamber 32 by steam through the pipe 54, by water in the condenser 52 and the pipe 49, by the precipitating solution in the precipitating tank 45 and by oil in the valve 43 and the pipe 42.

The water in the condenser 52 and the pipe 49 is the condensate from steam entering the condenser, and hence is laden with the hydrogen sulphide carried by the steam. Any hydrogen sulphide which enters the spout 50 of the pipe 49 is immediately precipitated by reaction with the metallic salt in the precipitating solution in the spout, and the precipitate, copper sulphide, if a copper chloride solution is used, settles into the collecting portion 46 of the precipitating tank. The oil between the precipitating solution and the mercury prevents contact therebetween by gravity. Thus, hydrogen sulphide is kept from contacting the mercury so that the mercury is kept clean.

Whenever the precipitating solution becomes weak, the valve 43 is closed and the drain 47 is opened whereby the solution flushes the collected precipitate out of the collecting portion 46 of the tank as it is drained from the tank. The drain 47 then is reclosed, the refill spout 48 is opened, and a fresh quantity of the precipitating solution is poured into the tank 45 through the refill spout to fill the tank 45. The refill spout is closed again and the valve 43 is reopened.

The above-described apparatus serves to keep mercury in the float chamber 32 from being contaminated by hydrogen sulphide, so the pressure controller is kept in operative condition even though the steam in the vulcanizing tube 22 is laden with hydrogen sulphide. Also, there is no solid obstruction between the vulcanizing tube and the float chamber so that transmission of pressure from the steam in the tube to the mercury is not prevented.

The precipitating tank is made sufficiently large to prevent the necessity of draining and refilling it frequently. The precipitating solution effectively prevents contact between the hydrogen sulphide and the oil, since the spout 50 extends so far into the tank that hydrogen sulphide does not filter through the oil and come into contact with the mercury.

What is claimed is:

1. In an apparatus including a U-tube for holding mercury and a conduit for fluid laden with a chemical element capable of forming a salt with mercury, the improvement which comprises a chamber communicating with both the conduit and the U-tube, a solution positioned in the chamber for removing the chemical element in such a fluid in the conduit and for transmitting pressure from the fluid toward mercury held in the U-tube, and a pressure-transmitting fluid immiscible with the solution and the mercury positioned therebetween.

2. In an apparatus including a U-tube for holding mercury and a conduit for fluid laden with hydrogen sulphide, the improvement which comprises a chamber positioned between and communicating with both the conduit the U-tube, and a sulphide-precipitating solution positioned in the chamber for reacting with the hydrogen sulphide in the fluid in the conduit to form an insoluble sulphide and for transmitting pressure from the fluid toward mercury held in the U-tube, and a pressure-transmitting fluid immiscible with the solution and the mercury positioned between the solution and the mercury.

3. In an apparatus including a mercury filled U-tube and a conduit for fluid laden with hydrogen sulphide, the improvement which comprises a chamber positioned between and communicating with both the conduit and one end of the U-tube, a copper chloride solution positioned in the chamber for reacting with the hydrogen sulphide in the fluid in the conduit to form an insoluble sulphide and for transmitting pressure from the fluid toward the mercury in the U-tube, and a pressure-transmitting fluid immiscible with the solution and the mercury positioned between the solution and the mercury.

4. In an apparatus including a chamber for holding a fluid and a second chamber for holding a second fluid which includes a material chemically reactive with the first-mentioned fluid, the improved seal which comprises means including a third chamber for connecting the first-mentioned chambers and being in communication therewith, a precipitating fluid contained in the third chamber for precipitating the element of

the second fluid to prevent contact between it and the first-mentioned fluid and for transmitting pressure from the second fluid toward the first-mentioned fluid, and a pressure-transmitting sealing fluid positioned between the precipitating fluid and one of the other fluids and immiscible therewith.

5. In an apparatus including a chamber for holding mercury and a second chamber for holding a fluid having hydrogen sulphide therein, the improvement which comprises means including a third chamber for connecting the first-mentioned chambers and being in communication therewith, a sulphide-precipitating fluid contained in the third chamber for reacting with the hydrogen sulphide of the second fluid to form an insoluble sulphide to prevent contact between it and mercury in the first chamber and for transmitting pressure from the second fluid to the mercury, and a pressure-transmitting sealing fluid immiscible with mercury and the sulphide-precipitating fluid and positioned therebetween.

6. In an apparatus including two containers filled with fluids including chemically reactive elements, a device for connecting the two containers together in communication with each other and for preventing contact between the two fluids, which comprises a chamber positioned between the two containers and connected thereto, a precipitating fluid for precipitating the reactive elements of one of the fluids in the containers to prevent contact between the reactive elements of the last-mentioned fluids, a pressure-transmitting, sealing fluid immiscible with the precipitating fluid and one of the other fluids positioned therebetween, means for draining the chamber to remove the precipitate therefrom, and means for refilling the chamber.

7. In an apparatus including a container, a container having mercury therein and a second container having therein a fluid laden with an element capable of forming a salt with the mercury when in contact therewith, a device for connecting the two containers in communication with each other and for preventing contact between the mercury and the fluid, which comprises a chamber positioned between the two containers and connected thereto, a precipitating fluid for precipitating the salt-forming element of the fluid in the second container to prevent contact between that element and the mercury, a pressure-transmitting, sealing fluid immiscible with the mercury and the precipitating fluid positioned between and in communication with the mercury and the precipitating fluid, means for draining the chamber to remove the precipitate therefrom, and means for refilling the chamber.

8. In an apparatus including a container having mercury therein and a second container having therein a fluid including hydrogen sulphide a device for connecting the two containers together in communication with each other and for preventing contact between the mercury and the hydrogen sulphide, which comprises a chamber positioned between the two containers and connected to the second container, a copper chloride solution for precipitating the hydrogen sulphide in the fluid in the second container, a conduit for connecting the chamber to the first-mentioned container, and a sealing fluid in the conduit immiscible with the mercury and the copper chloride solution for preventing contact between the mercury and the precipitating chamber.

9. In a continuous vulcanization apparatus including an elongated vulcanizing tube, a cooling and sealing unit positioned at the exit of the vulcanizing tube, means for supplying steam under a high pressure to the vulcanizing tube, means for supplying water under high pressure to the cooling and sealing unit and means for controlling one of the steam-supplying means and the water-supplying means to maintain a predetermined ratio between the pressures of the steam and the water, said controlling means including a mercury U-tube for retaining mercury therein, the improvement which comprises a device for protecting the mercury from contact with the steam and for transmitting pressure therebetween, which comprises a generally U-shaped precipitating passage, a hydrogen sulphide precipitating fluid in the precipitating passage, a conduit for connecting one arm of the precipitating passage to one arm of mercury U-tube, a sealing fluid non-reactive with and immiscible with the mercury and the precipitating fluid positioned in the conduit, said sealing fluid having a density lower than that of the precipitating solution, and a second conduit for connecting the other arm of the precipitating passage to one of the cooling and sealing unit, the water-supplying means and the vulcanizing tube.

10. In a continuous vulcanization apparatus including an elongated vulcanizing tube, a cooling and sealing unit positioned at the exit of the vulcanizing tube, means for supplying steam under a high pressure to the vulcanizing tube, means for supplying water under high pressure to the cooling and sealing unit and means for controlling one of the steam-supplying means and water-supplying means to maintain a predetermined ratio between the pressures of the steam and the water, said controlling means including a mercury U-tube for retaining mercury therein, the improvement which comprises a device for protecting the mercury from contact with one of the steam and the water and for transmitting pressure therebetween, which comprises a generally U-shaped precipitating passage, a hydrogen sulphide-precipitating fluid including copper chloride and having a predetermined density in the precipitating passage, a conduit for connecting one arm of the precipitating passage to one arm of the mercury U-tube, oil having a density less than that of the precipitating fluid and positioned in the conduit, and a second conduit for connecting the other arm of the precipitating passage to one of the cooling and sealing unit and the vulcanizing tube.

11. In a continuous vulcanization apparatus including an elongated vulcanizing tube, a cooling and sealing unit positioned at the exit of the vulcanizing tube, means for supplying steam under a high pressure to the vulcanizing tube, means for supplying water under high pressure to the cooling and sealing unit and means for controlling one of the steam-supplying means and the water-supplying means to maintain a predetermined ratio between the pressures of the steam and the water, said controlling means including a mercury U-tube for retaining mercury therein, the improvement which comprises a device for protecting the mercury from contact with one of the steam and the water and for transmitting pressure therebetween, which comprises a vertically disposed U-shaped precipitating trap, a sulphur and hydrogen sulphide precipitating fluid of a predetermined density positioned in the precipitating

trap, a conduit including a manually operable valve for connecting one arm of the precipitating trap to one arm of the mercury U-tube, a sealing fluid non-reactive with and immiscible with the mercury and the precipitating fluid positioned in the conduit, and having a density less than that of the precipitating fluid, a second conduit for connecting the other arm of the precipitating trap to one of the cooling and sealing unit, the water-supplying means and the vulcanizing tube, means for draining the precipitating trap, and means for refilling the precipitating U-tube.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,105,127	Petroe	Jan. 11, 1938
2,307,575	Davis	Jan. 5, 1943
2,418,166	Dinmore, Jr., et al.	Apr. 1, 1947
2,426,341	Canfield	Aug. 26, 1947