Nov. 20, 1945. H. BLOUNT ET AL 2,389,178

APPARATUS FOR VULCANIZING ARTICLES

Filed Dec. 27, 1943 2 Sheets-Sheet 1

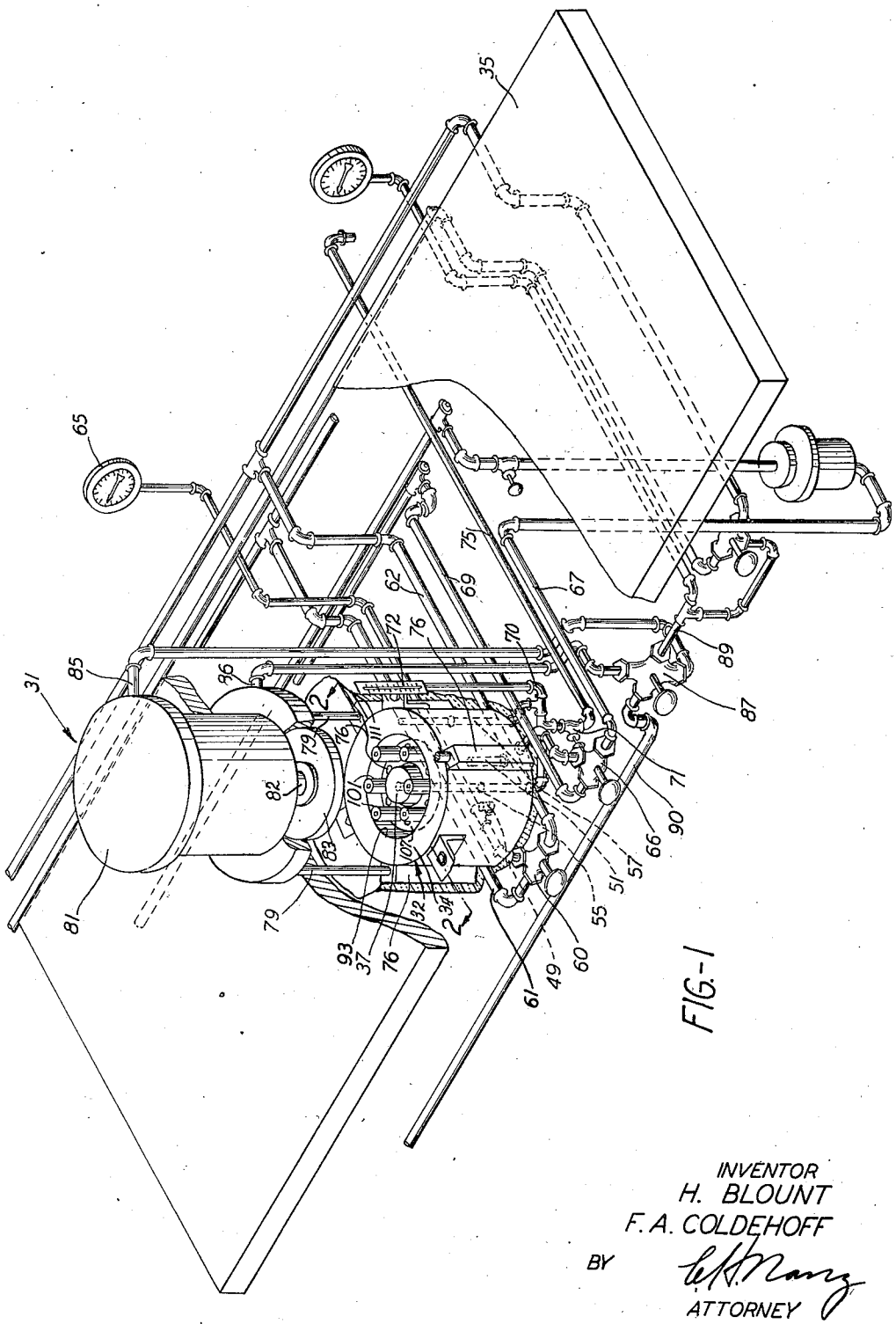


FIG-1

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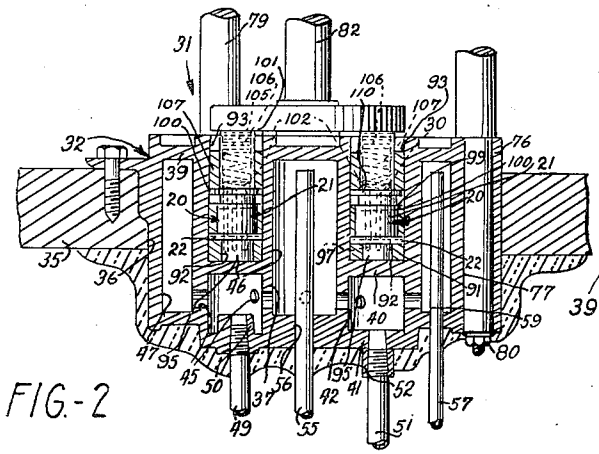


FIG.-2

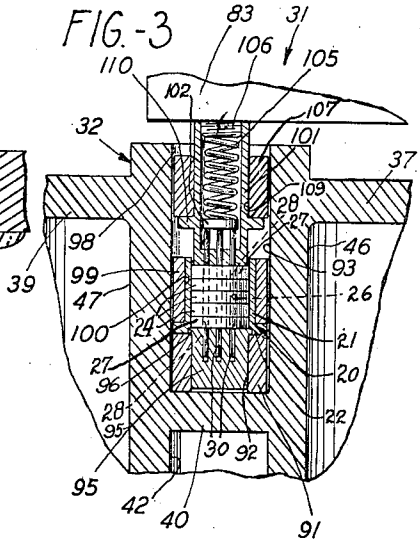


FIG.-3

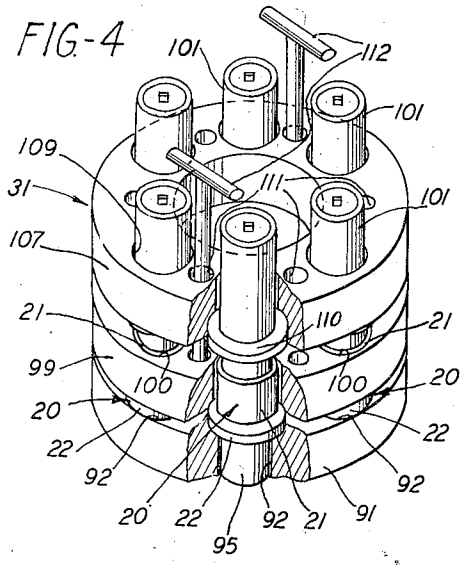


FIG.-4

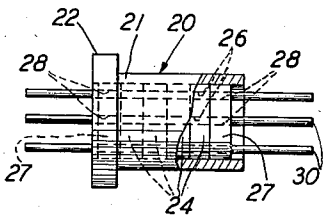


FIG.-5

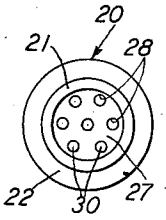


FIG.-6

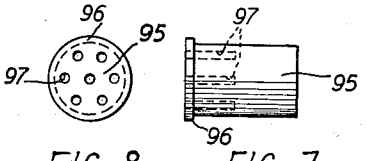


FIG.-8 FIG.-7

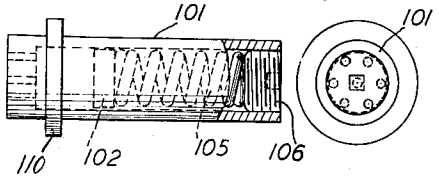


FIG.-11 FIG.-10

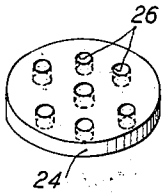


FIG.-9

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UNITED STATES PATENT OFFICE

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APPARATUS FOR VULCANIZING ARTICLES

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Application December 27, 1943, Serial No. 515,750

3 Claims. (Cl. 18—5)

This invention relates to apparatus for vulcanizing articles, and more particularly to apparatus for vulcanizing a seal about one or more conductors within a metallic tube.

In the manufacture of certain types of connectors it is necessary to seal in the connectors one or more conductors passing therethrough. In such operations, a plurality of unvulcanized, vulcanizable discs may be fitted into a tube forming a portion of a connector about the conductor or conductors positioned therein, pressed tightly against the tube and vulcanized to the tube and the conductors. With apparatus heretofore known, the above mentioned procedure has been time-consuming and costly.

An object of the invention is to provide new and improved vulcanizing apparatus.

One device embodying the invention comprises an annular member having a plurality of sockets therein for receiving metallic tubes and for positioning conductors within the tubes, a chamber surrounding the outer and inner sides and bottom of the annular member, means for selectively introducing steam and water into the chamber, a plurality of plungers for engaging masses of rubber positioned within the tubes, a resiliently mounted plate carried by each of the plungers for engaging and positioning the conductors within the tubes, and either an hydraulically or a pneumatically actuated member for exerting pressure upon the plungers.

The above outlined and other objects and features of the invention will be apparent from the following detailed description of a specific embodiment of the invention, when read in conjunction with the appended drawings, in which

Fig. 1 is a perspective view of an apparatus embodying the invention, with portions thereof broken away;

Fig. 2 is an enlarged fragmentary sectional view of the apparatus taken along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary sectional view of a portion of the apparatus;

Fig. 4 is an enlarged perspective view of a portion of the apparatus with portions thereof broken away;

Fig. 5 is an enlarged side elevation of an article formed by the apparatus;

Fig. 6 is an enlarged end elevation of the article shown in Fig. 5;

Fig. 7 is an enlarged side elevation of a portion of the apparatus;

Fig. 8 is an enlarged end elevation of the portion of the apparatus shown in Fig. 7;

Fig. 9 is an enlarged perspective view of a portion of the article shown in Fig. 5;

Fig. 10 is an enlarged end elevation of a portion of the apparatus, and

Fig. 11 is an enlarged side elevation of the portion of the apparatus shown in Fig. 10.

Referring now to the drawings, in which like parts are designated by like numerals throughout the several views, each of a plurality of connectors 20—20 (Figs. 4, 5 and 6) comprises a brass or brass-plated tube 21 having a flange 22 formed thereon. The tube 21 may be of any material upon which a suitable finish which is adherent to rubber has been applied. In an early state in the manufacture of the completed connectors, a plurality of unvulcanized discs 24—24 (Figs. 5 and 9) having apertures 26—26 formed therein, a plurality of partially vulcanized discs 27—27 having apertures 28—28 formed therein, and a plurality of brass or brass-plated electrical conductors 30—30 extending through the apertures 26—26 and 28—28 are introduced into each tube 21. The conductors 30—30 may be plated with any suitable rubber adherent finish. To render the connector fluid and gas tight, the discs 24—24 are pressed tightly against the tube 21 and around the electrical conductors 30—30 and vulcanized.

A vulcanizing press 31 (Fig. 1) for sealing the discs 24—24 to the tubes 21—21 and the electrical conductors 30—30 includes an annular block 32 (Figs. 1 and 2) secured to a work table 35 and extending through an aperture 36 formed in the work table. The block 32 is provided with a hollow cylindrical core 37 and a hollow annular ring 39 connected concentrically with the core by webs 40 and 41.

A chamber 42 (Fig. 2), formed by the webs 40 and 41, the hollow cylindrical core 37 and the hollow annular ring 39, is connected by apertures 45—45 formed in the walls of the core and the ring to chambers 46 and 47 formed in the core and the ring, respectively. An inlet pipe 49 is threaded into a nipple 50 formed on the web 41 and the end of a drain pipe 51 is threaded into a nipple 52 formed in the web 41. A blowoff pipe 55 extends through an aperture 56 formed in the bottom of the core 37 with the upper end thereof projecting into the chamber 46 and a second blowoff pipe 57 extends through an opening 59 formed in the ring 39. The open upper ends of the blowoff pipes 55 and 57 are positioned in the uppermost portions of the chambers 46 and 47.

The inlet pipe 49 is connected to a conventional three-way, two-port valve 60 (Fig. 1) which is

connected to a suitable source of steam (not shown) by a pipe 61 and to a source of cold water (not shown) by a pipe 62. The valve 60 may be operated to supply steam to the inlet pipe 59, to supply cold water thereto, or to shut off the inlet pipe 49 from either the steam or the water supply. The inlet pipe 49 is also connected to a conventional pressure gauge 65 for indicating the pressure of the steam passing therethrough.

The drain pipe 51 is connected to a three-way, two-port valve 66 of a well known type, which valve is connected to a steam exhaust pipe 67 and a water exhaust pipe 69. The valve 66 may be operated to connect the outlet pipe 51 with only the steam exhaust pipe 67, with only the water exhaust pipe 69, or with neither, as desired.

The blowoff pipes 55 and 57 are connected to a pipe 70, which is connected to a standard valve 71, and to a thermometer 72 of a well known type. The valve 71 may be actuated to connect the pipe 70 with an exhaust pipe 75 when either steam or water is supplied to the chambers 42, 46 and 47 so that any air or steam contained in the chambers 42, 46 and 47 may be forced out of those chambers through the blowoff pipes 55 and 57. Since the upper ends of blowoff pipes 55 and 57 are positioned in the upper portions of the chambers 46 and 47, the air or steam in the chambers which is forced upwardly by the steam or the water will pass through the blowoff pipes and will not be entrapped in the upper portions of the chambers. After the air or steam has been forced from the chambers by the incoming steam or water, respectively, the valve 71 is turned off to stop any flow of the water or the steam from the pipe 70 to the exhaust pipe 75.

A plurality of blocks 76—76 (Figs. 1 and 2) having bores such as a bore 77 (Fig. 2) formed therethrough are welded to the annular block 32 at spaced points around the periphery thereof. A plurality of standards 78—78 extending through the bores and secured therein by nuts such as a nut 80 (Fig. 2) threaded thereon serve to support an hydraulic or a pneumatic cylinder 81 of a conventional design. A ram 82 is secured to a piston (not shown) enclosed in the cylinder 81 and has a platen 83 secured to the lower end thereof. A pair of pipes 85 and 86 connect the upper and the lower portions, respectively, of the cylinder 81 with a four-way valve 87 of a conventional design. A supply pipe 89 from a suitable pressure source (not shown) of hydraulic fluid connects the valve 87 with the outlet of that source and an exhaust pipe 90 is also connected to the valve 87. The valve 87 may be actuated to connect the supply pipe 89 with the pipe 85 to supply the hydraulic fluid under pressure to the upper portion of the cylinder 81, and, simultaneously, to connect the pipe 86 with the exhaust pipe 90 to permit the hydraulic fluid contained in the lower portion of the cylinder 81 to be forced therefrom. Thus, the piston, the ram and the platen 83 may be forced toward the annular block 32. To return the platen 83 to its raised position, as shown in Fig. 1, the valve 87 is actuated in such a manner that the supply pipe 89 is connected with the pipe 86 and the exhaust pipe 90 is connected with the pipe 85. After the platen 83 has been raised, the valve 87 may then be turned to its neutral position in which the supply pipe 89, the exhaust pipe 90 and the pipes 85 and 86 are each closed off from any of the other pipes whereby the platen 83 will be retained in its upper position by the hydraulic fluid contained in the lower portion of the cylinder 81.

A bottom ring 91 (Figs. 2, 3 and 4) has a plurality of spaced apertures 92—92 formed therethrough and is adapted to fit into an annular cavity 93 formed by the core 37 and the ring 39. A plurality of metallic inserts 95—95 having flanges 96—96 formed thereon, and also provided with a plurality of bores 97—97 formed therein, fit into the apertures 92—92. The flanges 96—96 are of such a size that each fits into the tube 21 of one of the connectors 20—20 in which the unvulcanized discs 24—24, the partially vulcanized discs 27—27 and the conductors 30—30 have been assembled when the connectors are positioned thereover and the bores 97—97 are so spaced that the conductors 30—30 enter those bores when the connectors 20—20 are positioned over the metallic inserts 95—95. After the inserts and the connectors are thus positioned, an intermediate copper ring 99, which fits into the cavity 93 with a minimum of clearance and has a plurality of apertures 100—100 formed therethrough, may be placed over the connectors 20—20, which fit into the apertures 100—100 with a minimum of clearance, and rests upon the flanges 22—22 of the tubes 21—21. A plurality of hollow plungers 101—101 having external diameters of a slightly smaller size than the internal diameters of the tubes 21—21 are then placed over the upper ends of the conductors 30—30 and extend slightly into the tubes 21—21. A plurality of discs 102—102 rest on the upper ends of conductors 30—30 and are pressed thereby against a plurality of compression springs 105—105. The compression springs 105—105 are engaged by a plurality of plugs 106—106 threaded into the upper ends of the hollow plungers 101—101. To complete the assembling step just described a top ring 107 of the same size as the bottom ring 91 is placed over the upper portions of the hollow plungers 101—101 which extend through a plurality of apertures 109—109 formed in the ring 107. The top ring 107 rests upon a plurality of flanges 110—110 which are formed on the hollow plungers 101—101 near the central portions thereof. The ring 99 is composed of copper or similar metal having a high coefficient of conductivity of heat and surrounds the connectors 20—20 with a minimum of clearance and is surrounded closely by the walls of the cavity 93 with a minimum of clearance therebetween.

When the rings 91, 99 and 107 are positioned as just described, a plurality of apertures 111—111 formed in the intermediate and top rings 99 and 107 are aligned with a plurality of threaded bores (not shown) formed in the bottom ring 91. A pair of T-shaped handles 112—112 (Fig. 4) whose ends are threaded are adapted to be screwed into the threaded bores formed in the bottom ring and thus may serve to carry the assembly just described when desired.

In the operation of the above-described apparatus, the rings 91, 99 and 107, the inserts 95—95, the hollow-plungers 101—101 and the preassembled connectors 20—20 are assembled as described hereinabove and the T-shaped handles 112—112 are screwed into the threaded bores formed in the bottom ring 91. The T-shaped handles are then grasped and the entire assembly is placed on the cavity 93. The T-shaped handles are then unscrewed and removed from the threaded bores and the apertures 111—111.

The valve 87 is then actuated to connect the supply pipe 89 with the pipe 85 and the exhaust

pipe 90 with the pipe 86. This permits the hydraulic fluid under pressure to flow into the upper portion of the cylinder 81, thereby forcing the piston therein downwardly, and forcing the platen 83 against the upper ends of the hollow plungers 101—101 to force the plungers against the partially vulcanized discs 27—27.

The partially vulcanized discs 27—27 are thereby pressed against the unvulcanized discs 24—24 and compress these discs against the sides of the tubes 21—21, closely around the conductors 30—30, and against the partially vulcanized discs 27—27 which are supported by the inserts 95—95. The compression springs 105—105 are compressed by the conductors 30—30 against which the discs 102—102 abut, and the conductors are urged thereby into the bottoms of the bores 97—97.

The valve 60 is then actuated in such a manner that steam may flow into the chamber 42, through the apertures 45—45, into the chambers 46 and 47 and into the drain pipe 51. The steam at this time also enters the blowoff pipes 55 and 57 and its temperature is registered by the thermometer 72. After a short period of time the valve 71 is actuated to close the pipe 70 from the exhaust pipe 75. The steam passing into the chambers 42, 46 and 47 heats the walls of the core 37 and the ring 39 and the heat is conducted through the copper ring 99, to heat the tubes 21—21 and thereby heat the unvulcanized discs 24—24 positioned therein. The heat applied to the discs, together with the pressure placed upon the unvulcanized discs, serves to vulcanize the unvulcanized discs and to seal them to the brass or brass-plated tubes 21—21 and the brass or brass-plated conductors 30—30. The connectors 20—20 fit quite closely into the apertures 100—100 and the copper ring 99 very effectively conducts heat from the walls of the cavity 93.

After the unvulcanized discs 24—24 have been vulcanized sufficiently and bonded to the brass or brass-plated tubes 21—21 and the brass or brass-plated electrical conductors 30—30, the valve 60 is actuated to cut off the inlet pipe 49 from the pipe 61 and connect the inlet pipe 49 with the pipe 62 to supply cold water to the chambers 42, 46 and 47 and to the drain pipe 51. The valve 71 is actuated at this time to open the pipe 70 to the pipe 75 to permit the steam in the chambers to be forced therefrom. The cold water flowing through the chambers 42, 46 and 47 rapidly cools the apparatus and the connectors, and after a sufficient period of time, the valve 87 is actuated to raise the platen 83 to the position shown in Fig. 1 and the valve 60 is then actuated to stop the flow of both the cold water and the steam.

The T-shaped handles 112—112 are then inserted through the apertures 111—111 and are threaded into the threaded bores formed in the bottom ring 91, and the rings 91, 99 and 107 and the elements contained thereby are lifted from the annular block 32 and are placed upon the work table 35 where they may be disassembled. After the disassembling has been completed, the operation just described may be repeated to seal another set of connectors similar to the connectors 20—20.

During the operation of the apparatus described hereinabove, the connectors 20—20 are closely contained in the ring 99, which is highly conductive of heat and is heated by the walls of the cavity 93 into which the ring 99 fits with a minimum of clearance, and thus the connectors are heated rapidly, and uniformly. Consequently, all of the unvulcanized discs 24—24 may be very rapidly and efficiently vulcanized. Likewise, when cold water is supplied to the chambers 42, 46 and 47, the water rapidly cools the apparatus and the connectors 20—20. Thus, the apparatus vulcanizes and cools the connectors in very short periods of time.

What is claimed is:

1. In a press for forming pressure-tight, rubber seals about conductors positioned in metal tubes, an annular member having a plurality of sockets formed therein for receiving a plurality of such tubes, means for positioning a plurality of conductors within a plurality of tubes retained in said sockets, a block having a cavity formed therein for receiving the annular member and also being provided with a chamber formed therein, and means for supplying a vulcanizing medium to said chamber.

2. In a vulcanizing press, a block having a core portion and an annular portion positioned in concentric relationship and also provided with a bottom portion forming with the core and the annular portions an open, annular cavity, each of said portions having a chamber formed therein and connected with the chambers formed in other portions, a supply pipe leading to one of said chambers, means for selectively supplying hot steam to the supply pipe, means for selectively supplying cold water to the supply pipe, an exhaust pipe, means for exhausting stem or water from the exhaust pipe, a plurality of annular rings having a plurality of aligned sockets formed therein, a plurality of inserts fitting into the sockets formed in one of the rings, a plurality of tubes adapted to fit into the sockets in another of said rings, another of said rings being formed of copper and adapted to closely retain in the sockets formed therein a plurality of metallic tubes containing a plurality of unvulcanized rubber discs and a plurality of conductors extending through the discs, a plurality of discs positioned in said first mentioned tubes, a plurality of springs for urging the discs against the ends of said conductors, a ram, a platen attached to said ram, and hydraulic means for forcing said platen against the upper ends of said first mentioned tubes to force said tubes against a plurality of unvulcanized rubber discs contained in a plurality of metallic tubes held in the sockets formed in said second mentioned ring to compress said unvulcanized rubber discs.

3. In a vulcanizing press, a block having an open, annular cavity formed therein and also provided with a chamber surrounding the annular cavity, means for supplying a vulcanizing medium to the chamber, a plurality of annular rings having a plurality of aligned sockets for retaining a plurality of tubes containing masses of vulcanizable material and fitting into the cavity with a minimum of clearance, a plurality of plungers for engaging the masses of vulcanizable material of tubes retained by the rings, and means for pressing the plungers to apply pressure to the masses of vulcanizable material.

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