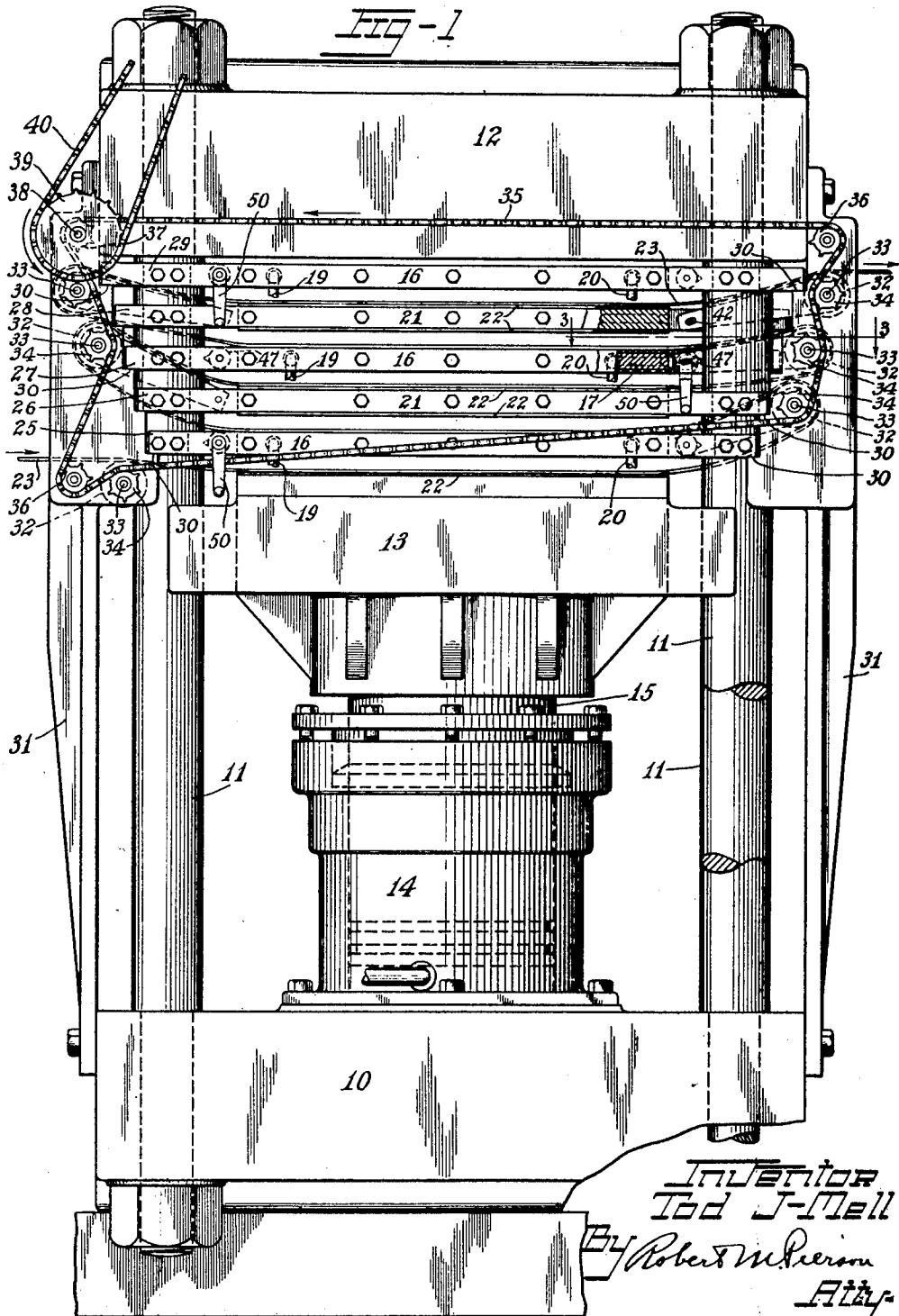


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2 Sheets-Sheet 1



April 26, 1927.

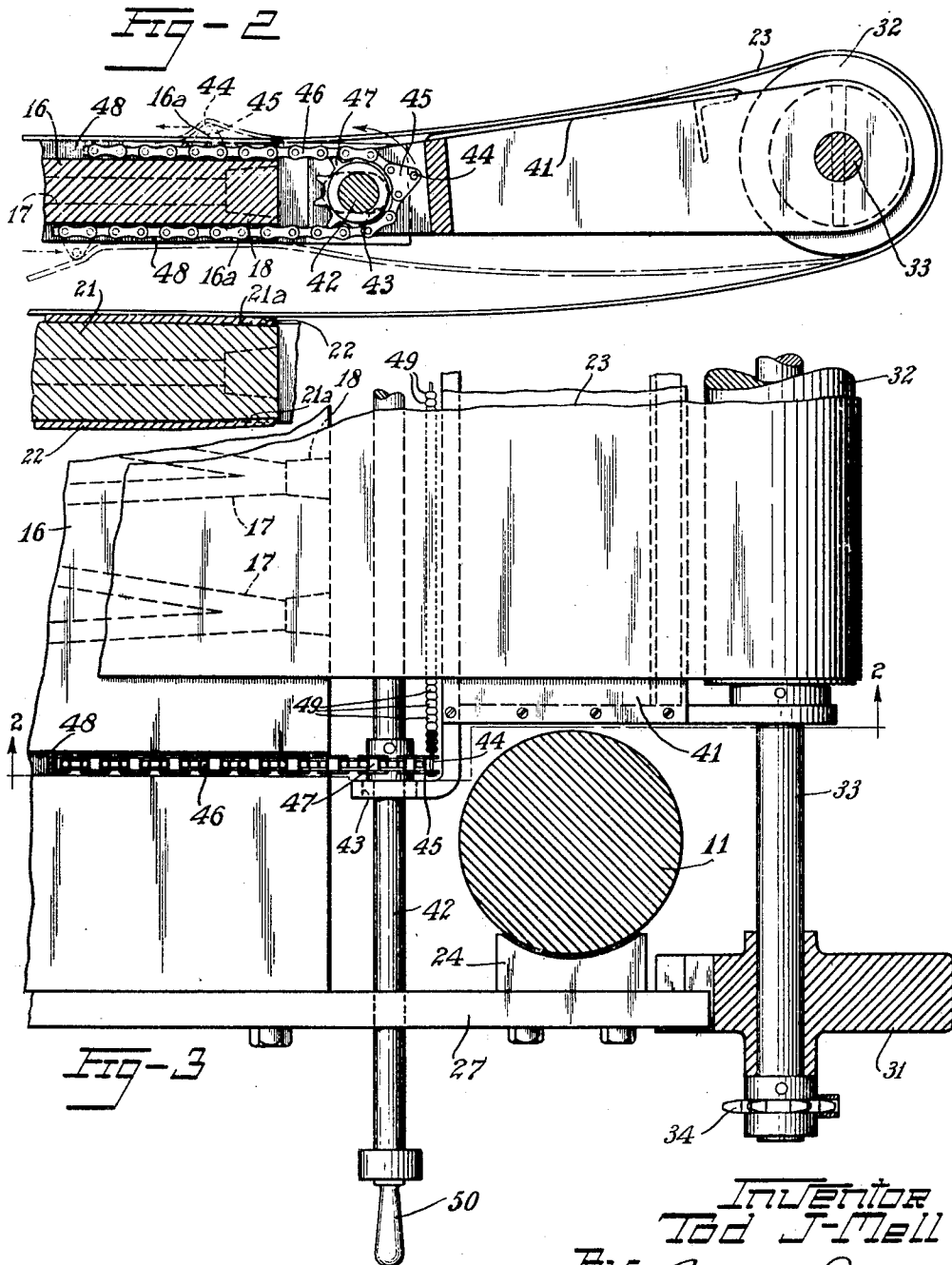
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STRIP VULCANIZING APPARATUS AND METHOD

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2 Sheets-Sheet 2



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STRIP-VULCANIZING APPARATUS AND METHOD.

Application filed March 24, 1925. Serial No. 17,930.

This invention relates to methods and apparatus for vulcanizing continuous strip material and its chief objects are to provide large production capacity for a given equipment outlay, to provide for convenient and economical handling of the material to give the same a uniform press cure, and especially to vulcanize the material in molding means through which the material is fed or stepped forward between cures to bring successive reaches thereof into the molding means. Further objects are to provide such advantages with especial reference to quick surface-curing of sheet rubber to impart a smooth finish thereto, as in the case of previously vulcanized rubber produced in sheet form by slicing relative thin sheets from a thicker sheet of vulcanized rubber, as described in my copending application Serial No. 679,532, filed December 10, 1923. More specific and detailed objects will be manifest from the following description.

Of the accompanying drawings:

Fig. 1 is a side elevation, with parts broken away and in section, of preferred apparatus embodying and adapted to carry out my invention.

Fig. 2 is a section on line 2—2 of Fig. 3.

Fig. 3 is a section on line 3—3 of Fig. 1.

Referring to the drawings, the preferred apparatus here shown comprises a platen press which includes the usual base 10, corner guide posts 11, 11 rising therefrom and connected at their tops by an upper, stationary, press-head 12, a lower, vertically slidable press-head 13 guided upon the corner posts 11, a ram cylinder 14 mounted centrally upon the base 10, and a ram 15 mounted therein and secured to the head 13 for raising and lowering the latter.

Slidably mounted upon the corner posts 11, between the two press-heads, are a plurality of steam-platens or hot-plates 16, 16, each formed with zig-zag steam passages 17, 17 bored therein from the edge of the plate, the bores being closed at the edges of the plates by plugs 18, 18, and each platen being provided with suitable steam-supply and discharge pipes 19, 19, 20, 20, for circulating steam therethrough. Cold-plates 21, 21 are similarly mounted, in alternate relation to the hot-plates, and may be bored as shown for the circulation of a cooling fluid therethrough, or for the circulation of a heating fluid, in case it is desired to em-

ploy them as hot-plates, as may be done on occasion, although in the particular work for which the apparatus here shown is primarily intended these alternate plates 21 do not require the circulation of either a heating or a cooling fluid therethrough.

Each hot-plate 16 is provided both on its upper and on its lower side with a smooth metal face adapted to impart a smooth finish to a sheet of rubber pressed thereagainst, and each cold-plate 21 is provided both on its upper and on its lower face with a resilient pad 22, which may be of rubber, rubberized fabric or the like, adapted to engage the reverse side or back of the work, which here consists of a continuous strip of rubber or rubberized sheet material 23 so looped back and forth as to extend between each hot-plate and the adjacent cold-plate and to form loops beyond the ends of the plates, said loops each containing a reach of material approximately equal to one of the reaches lying between the plates. The pads 22 are adapted to hold the work against the adjacent hot-plates with substantially equal pressure throughout the extent of the plates, without requiring substantial flow of the rubber, notwithstanding slight variations in the thickness of the work, the plates thus being adapted to give a quick, smoothing surface-cure without requiring plasticising or substantial vulcanization of the main body of the sheet. A pad 22 corresponding to those on the cold-plates is provided upon the upper face of the lower press-head 13.

Both the hot-plates 16 and the cold-plates 21 are guided upon the corner posts 11 by guide shoes such as is shown at 24 in Fig. 3, said guide shoes being secured to respective bars such as are shown at 25, 26, 27, 28 and 29, and a pair of such bars being secured to and extending along the side edges of each plate and projecting from the ends thereof past the adjacent corner posts.

The bars of each successive plate from the bottom to the top of the series extend farther from the ends of the plate than do those of the plate next below, as is shown clearly in Fig. 1, so that the end portions of the several pairs of bars are adapted to come to rest, when the press is opened by descent of the lower press-head, upon respective steps, 30, 30, formed on stationary brackets 31, 31, secured to the base 10 and the upper press-head 12 at the respective ends of the

press, to support the plates in open or spaced-apart relation.

For feeding the looped strip of sheet material 23, to step it forward between cures, feed rolls 32, 32 are secured upon respective shafts 33, 33 journaled in the brackets 31 and each provided with a sprocket 34, each roll being adapted to lie within a loop of the strip material 23 which is threaded back and forth through the series of rolls and plates, except the initial roll and the terminal roll of the series, which simply underlie the incoming and outgoing portions respectively of the work.

A sprocket chain 35 is so mounted upon said sprockets as to drive each one in the proper direction to feed the stock forward through the succession of loops as indicated by the arrows in Fig. 1. Said chain runs over guide sprockets 36, 36 mounted upon certain of the brackets 31 and over a drive sprocket 37, secured upon a shaft 38 journaled in one pair of the brackets 31 and provided with a sprocket 39 having a chain 40 thereon running from a suitable source of power.

To support the upper reach of each loop of material beyond the ends of the plates and guide it to the plates a table structure 41 is pivotally supported at one end upon one of the shafts 33 and at the other upon a shaft 42 journaled in the bars, such as the bar 27, Fig. 3, of the respective plate, the table structure being formed with slots, such as the slot 43, accommodating the shaft, so as to permit angular movement of the table structure as an incident of vertical, reciprocal movement of the plate. The table structure is thus adapted so to prevent the work from catching or dragging with excessive friction on the edge of the underlying plate and being unduly stretched as it is fed thereover.

To dislodge the cured reaches of stock from the hot-plates after each cure, strippers are adapted to be passed longitudinally of the work between the latter and the hot-plate surface against which it is vulcanized. Each stripper comprises a rod or shaft 44 mounted at each of its ends in a bracket link 45 of a sprocket chain 46 mounted upon sprockets such as the sprockets 47, 47 secured upon shafts such as the shafts 42, said sprocket chains being slidably received in grooves such as is shown at 48, Fig. 3, in the hot-plates 16. Upon each of the rods 44 is strung in axially abutted relation a set of rollers 49, 49, for which purpose glass beads may be employed. One of the shafts 42 of each stripper assembly is provided with a hand crank 50 for driving the sprocket chains 46 and thus passing the stripper 44, 49 along the face of the hot-plate and progressively separating the work therefrom as shown in broken lines in Fig. 2, the bracket-links 45 of

the sprocket chains being adapted to support the shafts 44 and rollers 49 spaced at a distance from the face of the hot plate so that the rollers 49 may freely rotate under frictional contact of the work, to reduce forward drag of the stripper upon the work. Two strippers, oppositely positioned, are preferably employed upon each pair of sprocket chains 46, so that the driving of the chains through half of their orbit will cause one stripper to dislodge the work from one face of the hot-plate while the other operates similarly at the other face of the plate, the strippers being adapted to assume inoperative, non-obstructive positions, adjacent the shafts 42, as shown in Figs. 2 and 3, between stripping operations.

The hot-plates 16 and the cold-plates 21 are preferably of gradually reduced thickness at their anterior and posterior margins, as shown respectively at 16^a and 21^a, Fig. 2, so as to avoid an abrupt termination of the surface cured zones and to provide for substantially uniform cure of successive, overlapped zones of vulcanization.

In operation, the press being opened, by lowering of the head 13, as shown in Fig. 1, the strip 23, which may be a strip of vulcanized sheet rubber sliced from a thicker strip, is threaded through the apparatus as there shown, which may be facilitated by driving the rolls 32. The head 13 is then raised, causing the several plates in succession to be lifted from the steps 30 of the brackets 31 and the series of plates to be pressed together, with reaches of the strip 23 between them, against the upper head 12. The hot-plates, continually heated by the circulation of steam therein, contact the finish face of the work in certain reaches thereof which alternate with and are each of approximately the same length as the length of the adjacent unembraced reach of the strip, and as the pads 22 of the cold-plates press the work with substantially uniform pressure against the hot-plates the latter impart a quick surface vulcanization and a smooth finish to the adjacent face of the work throughout the embraced reaches thereof.

The press is then opened, the strippers actuated to dislodge the work from the hot-plates, and the rolls 32 are driven to step the work forward a distance approximately equal to the length of a surface-vulcanized reach of the material, which brings the intervening, unfinished reaches into position between the plates, the proportions of the parts preferably being such as to provide a slight overlap of the zones of surface vulcanization and thus avoid unfinished gaps between such zones. The press is again closed and these intervening zones are vulcanized, after which the press is reopened and the rolls 32 are driven through a suffi-

cient number of revolutions to feed from the press all of the strip which has been vulcanized in the two cures just described, except that a slight overlap of the zones of vulcanization is preferably permitted at the delivery end of the last or uppermost hot-plate.

The cycle of operations just described is then repeated successively to advance the strip through the press and deliver it therefrom as a continuous strip having a mold-finished face.

As the surface cure may be quickly effected and is applied to a large area of the strip, in the aggregate, at each closing of the press, alternate movements of the strip-feeding rolls being of correspondingly great length, the production capacity of the apparatus is very high as compared with single unit platen presses adapted to occupy the same floor space and requiring nearly the same capital investment and labor costs, and conservation of heat also is effected. Other general and specific advantages, including those set forth in the above statement of objects, will be manifest.

Modifications may be resorted to without departing from the scope of my invention, and I do not wholly limit my claims to the specific construction or the exact procedure described.

I claim:

1. The method of vulcanizing strip material which comprises looping the material back and forth to bring zones thereof into close proximity, simultaneously vulcanizing said zones without vulcanizing intermediate zones, and then vulcanizing said intermediate zones while holding them in close proximity.

2. The method of vulcanizing strip material which comprises looping the material back and forth to bring zones thereof into close proximity, simultaneously vulcanizing said zones without vulcanizing intermediate zones, feeding the intermediate zones into close proximity, and vulcanizing said intermediate zones while so holding them.

3. Strip-vulcanizing apparatus comprising a series of pressing members in excess of two adapted to press a plurality of

juxtaposed zones of continuous strip material so looped back and forth as to provide the juxtaposed zones in closely spaced, overlapping relation to each other, means for heating material held between said members, and means for feeding the material through said series of pressing members in interlooped relation thereto.

4. Strip-vulcanizing apparatus comprising a series of pressing members in excess of two overlying each other and adapted to be closed as a series to press zones of continuous strip material looped back and forth between them, means for heating alternate members of the series without directly heating the intervening members, and means for supporting looped portions of the material exterior to the pressing members.

5. Strip-vulcanizing apparatus comprising a series of pressing members in excess of two overlying each other and adapted to be closed as a series to press zones of continuous strip material looped back and forth between them, means for heating members of the series, work-supporting and guiding rollers mounted at opposite sides of the series of pressing members at determinate distances therefrom such as to support, exterior to the pressing members, zones of the work of approximately the same length as zones lying between the pressing members, and means for concurrently driving said rollers at such relative speeds and in such directions as to feed the work through the series of pressing members in interlooped relation thereto.

6. Strip-vulcanizing apparatus comprising a stationary upper press-head, a vertically reciprocable lower press-head, a vertically aligned series of horizontal press-platens interposed between the two, means for stopping and supporting the several press-platens in spaced apart positions as the lower press-head descends, and means for guiding strip material through the series of press-platens in interlooped relation thereto.

In witness whereof I have hereunto set my hand this 20th day of March, 1925.

TOD J. MELL.