Nov. 6, 1928. 1,690,625

P. DE MATTIA

COUNTERBALANCING DEVICE FOR VULCANIZING MOLDS

Filed Sept. 27, 1926 2 Sheets-Sheet 1

Fig. 1.

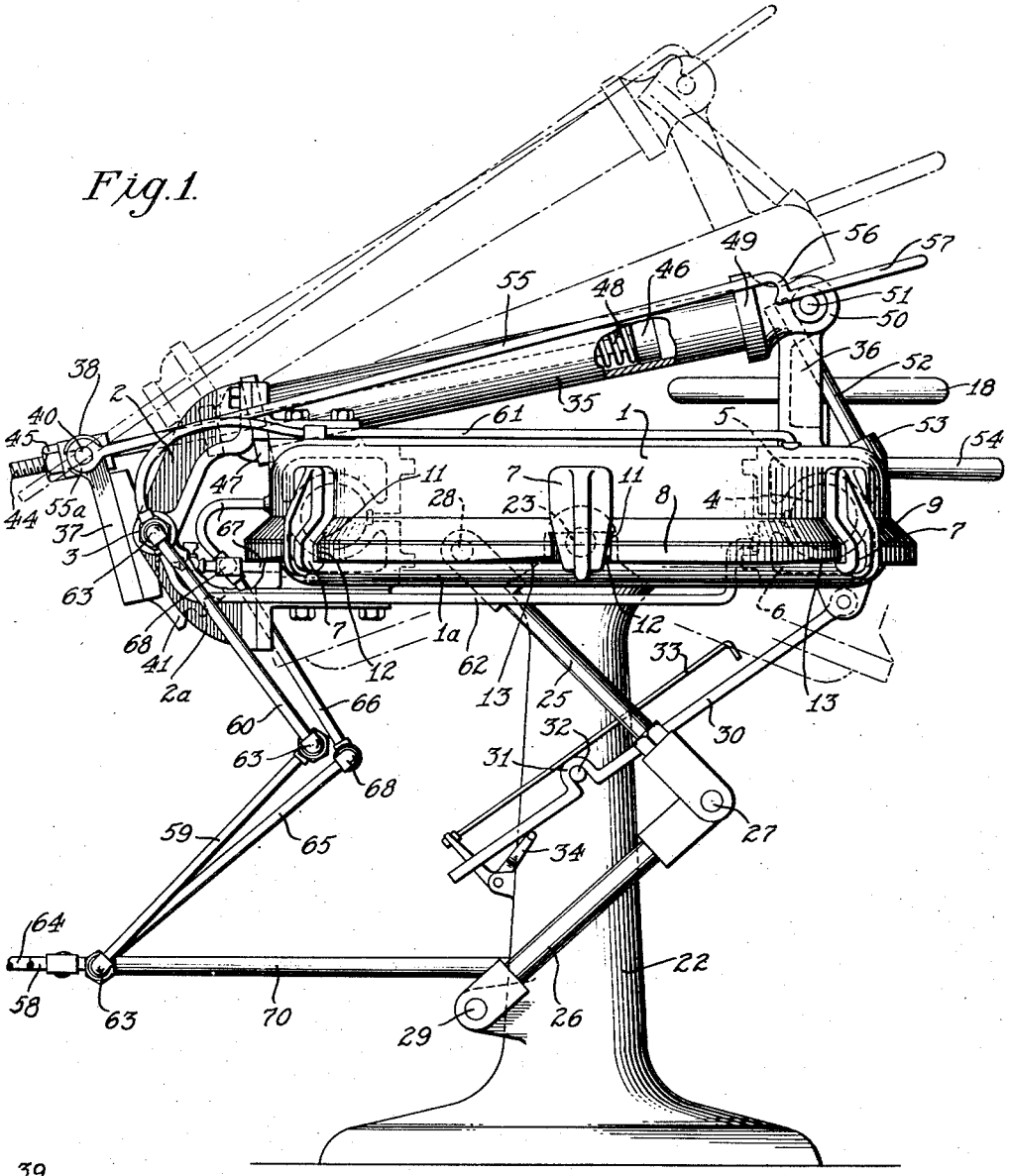
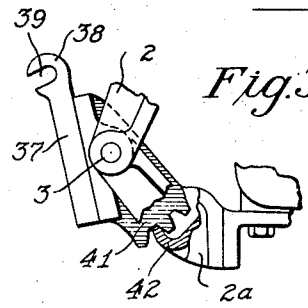


Fig. 3.



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Fig. 2.

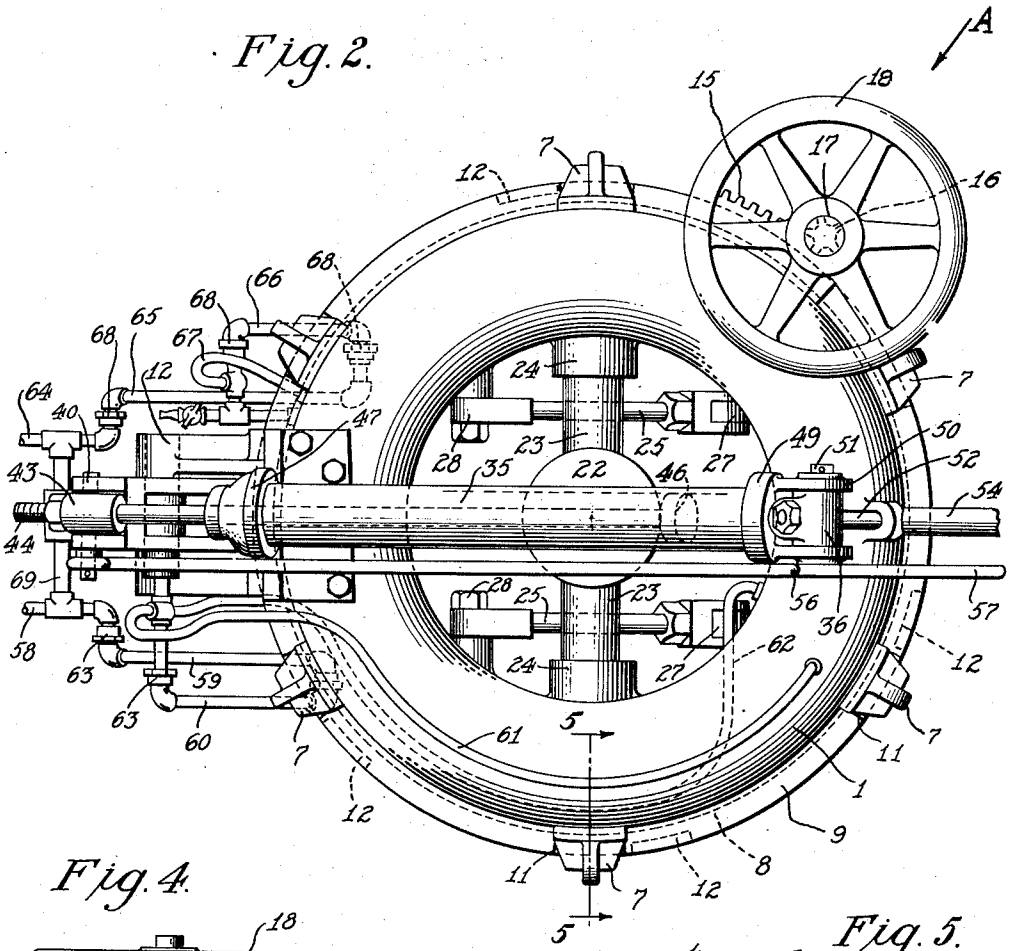


Fig. 4.

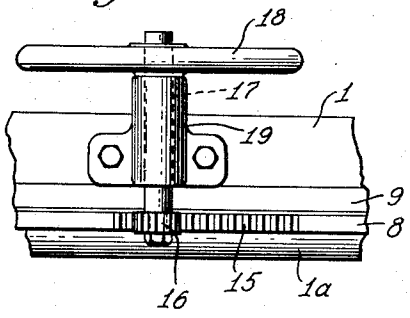
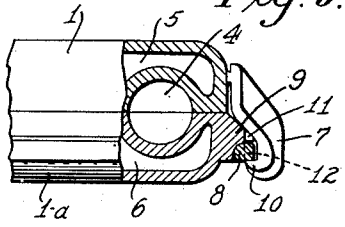


Fig. 5.



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UNITED STATES PATENT OFFICE.

PETER DE MATTIA, OF PASSAIC, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO NATIONAL RUBBER MACHINERY COMPANY, OF AKRON, OHIO, A CORPORATION OF OHIO.

COUNTERBALANCING DEVICE FOR VULCANIZING MOLDS.

Application filed September 27, 1926. Serial No. 137,845.

This invention relates to improvements in molds such as are used in the vulcanization of automobile tires, inner tubes, and the like, and has particular reference to molds of the type having hinged sections, one of which may be swung relative to the other to open the mold.

For reasons well understood in the art, it is desirable that the mold may be quickly opened and closed for insertion and removal of the work. The movable section or cover member of such a mold is quite heavy, and in order to ease the work of the operator and to speed up the operation, various types of counterbalance weights, overhead hoists, and the like have been used. Such prior art devices have not been satisfactory, however, for several reasons. Usually the molds are designed with a view to economy in occupied floor space, and therefore counterbalance weights must be suspended on a short leverage to position them close to the base of the mold. Because of this limitation in leverage, the weight must be much heavier than the movable mold section, in some instances a thousand pounds, which is excessively bulky. Such bulky and heavy counterbalance weights are particularly undesirable in horizontal rocking molds, which require periodic tilting, such as for draining condensation from the heating chambers because they render the tilting difficult and necessitate more complicated steam and drain pipe connection. Hoists have been used in some instances, suspended above the molds, but they have been expensive to install and maintain, and not so conducive to rapid operation.

These and other objectionable features of the prior art are overcome by the present invention which contemplates the use of counterbalancing means for assisting the movement of the swinging section of the mold, as well as novel means for effecting locking engagement of the mold sections to resist internal pressure while in use.

An important feature of the invention in its broader aspects is the provision of a counterbalancing mechanism which will partially overlie one of the mold sections in such a manner as to exert an opening force in a line oblique to the axis of the mold.

Another feature is the provision of a mold formed of hinged sections, with a spring member having one of its ends anchored to the swinging section and its other end acting against a stationary portion of the machine in such a manner as to substantially counterbalance said swinging section.

Another feature is the provision of such a counterbalancing spring with means for varying the tension as desired.

Another feature is the provision of such a counterbalancing device for sectional molds wherein the spring is normally under compression and enclosed within a protective casing on top of the movable section.

Another feature is the provision of such a counterbalanced mold section with a novel and simplified lock for holding it in its open position.

Other features and advantages will be apparent from the following description when taken in connection with the accompanying drawings, wherein a preferred embodiment of the invention is shown by way of illustration.

In the drawings:

Figure 1 is a side elevation of a mold equipped with a counterbalance mechanism in accordance with this invention, the locking ring being shown in unlocked position;

Figure 2 is a top plan view thereof, with the locking ring in locked position;

Figure 3 is a fragmentary detail view of the mold hinge and its connecting means for one end of the counterbalance spring;

Figure 4 is a fragmentary elevation of the mold looking toward the lock operating means in the direction of arrow "A" in Figure 2; and

Figure 5 is a detail sectional view on the line 5—5 of Figure 2.

The invention has been shown in the drawings as applied to a tube vulcanizing mold of the horizontal rocking type, but it is equally applicable to molds of the stationary type, as well as to molds for vulcanizing tire casings and articles other than inner tubes. Such a tube curing mold may comprise a pair of opposed mold sections 1 and 1^a having hinge members 2 and 2^a respectively, connected together as at 3 by a suitable pintle. The mold sections 1 and 1^a are suitably grooved on their mating faces

to form an annular vulcanizing chamber 4 into which the article to be treated is placed, said vulcanizing chamber being surrounded by heating chambers or steam jackets 5 and 6. In the broader aspects of the invention, any ordinary means may be employed for locking the two mold sections together to resist internal pressure during the vulcanizing process, but I prefer to make use of the improved form of locking means herein illustrated and forming the subject matter of my co-pending application Serial No. 146,324 filed Nov. 5, 1926.

To this end, the upper or swinging section 1 may be provided with a plurality of downwardly extending hook members or lugs 7 adapted to engage a slotted ring 8 which is rotatably supported in any suitable manner against a guide flange 9 on the lower or fixed section 1^a. The hook members 7 are suitably spaced around the circumference of the mold section 1, as shown, and their lower ends 10 extend inwardly in such manner as to straddle portions of the flange 9 and ring 8, and to bear against the lower surface of said ring (see particularly Fig. 5). The flange 9 is formed with slots or recesses 11 in radial alignment with the hook members 7, and the ring 8 is similarly provided with recesses 12 which, when aligned with the recesses 11, as shown in Fig. 1, permit passage of the ends 10 of the hook members during swinging movement of the mold section 1. At one side of the recesses 11, the lower surface of the ring 8 is beveled or inclined, as at 13, to form wedging surfaces for engagement with the ends 10 of the hook members (which may or may not be oppositely beveled, as desired) to positively draw the two sections together when the ring is partially rotated to a position as shown in Fig. 2. Such rotation is effected through a gear segment or rack 15, secured to the ring 8, and meshing with a pinion 16 on the lower end of a shaft 17, which latter is provided at its upper end with a hand wheel 18 (Fig. 4). In the illustrated embodiment of the invention, the shaft 17 is shown as journalled at 19 to the movable mold section 1, but it may be mounted on the section 1^a if desired.

The lower mold section 1^a is supported by a pedestal 22, which, in the case of a rocking mold, is fitted with trunnions 23 having pivotal connection at 24 with said lower mold section. To assist in the support of the section 1^a, pairs of links 25 and 26 are mounted at opposite sides of the pedestal, said links being pivoted together as at 27, with the upper ends of links 25 attached at 28 to the mold section 1^a, and the lower ends of links 26 attached at 29 to the pedestal 22. Also pivoted to the mold section 1^a at its underside is a locking rod 30 having an upwardly extending loop portion 31 forming a recess for engagement with a pin 32 which extends outwardly from the pedestal 22. When the pin 32 is within the loop 31, as shown in Figure 1, the mold is firmly held in its horizontal position, and may be unlocked by means of a push-rod 33 which actuates a bell-crank lever having one of its arms 34 engaging the locking rod 30.

The mechanism thus far described is illustrative of one type of mold to which the counterbalance mechanism, which is an important feature of this invention, may be applied. Said counterbalance mechanism is preferably mounted above and rearwardly of the mold, and includes a spring housing or guide sleeve 35 which is supported between a standard or post 36 secured to the swinging mold section 1 adjacent the front edge thereof, and a bracket member 37 attached to the lower mold section 1^a at the side of the hinge connection 3 opposite the post 36.

The bracket member 37 may be in the form of a flat plate having an enlarged upper end 38 which is preferably bifurcated and provided with rearwardly disposed and inclined notches 39 for reception of oppositely disposed pins or bolts 40. As best shown in Figure 3, the bracket 37 carries a segmental gear 41, the teeth of which are selectively engageable by a detent 42 carried by the hinge member 2^a. Thus the bracket 37 may be adjusted about the axis of the hinge pintle at 3 for the purpose of setting it approximately for the tension desired in the counterbalance.

The pins or bolts 40 are transversely disposed in a cylindrical sleeve 43 which is mounted in the bifurcated upper end 38 of the bracket 37, and extending longitudinally through said sleeve 43 is one end of a tension rod 44, having a threaded extremity to receive an adjusting nut 45.

The opposite end of the tension rod 44 extends into the spring housing 35 through a closure cap 47 and is fitted with a collar or head portion 46. Compressed between the cap 47 and the collar 46 is a coiled spring 48, the force of which may be finely adjusted by turning the nut 45. The other end of the spring housing 35 is closed by a cap 49 having a yoke portion 50 for connection to the post 36 by a clevis pin or bolt 51. The proportions and disposition of the parts are such that the spring and its cooperating parts are inclined with respect to the upper surface of the mold, whereby said spring exerts its lifting force in a line oblique to the axis of the mold.

From this it will be apparent that the spring 48, being under compression, effectively counterbalances the weight of the swinging mold section, and in view of the fact that the spring housing 35 is pivoted to the post 36, and with its other end slid-

able relative to the tension rod 44, the counterbalancing action will be effective in all positions of said swinging mold section.

For the purpose of reinforcing the post 36, an angularly disposed brace 52 has its upper end secured to the post, while its lower end is anchored in a boss 53 in the mold section 1. Also secured to the mold section 1, preferably at the front thereof is a handle 54 by means of which said section may be swung away from the lower section 1ª to open the mold, and to facilitate tilting of the closed mold on its pedestal.

In order to lock the movable mold section 1 in its open position, a rod 55 is pivoted by means of an eye 55ª to one of the pins 40, and extends forwardly beside the spring housing 35. Adjacent to its forward end the rod 55 is formed with a double offset to provide a latch member 56 and terminates in a straight handle portion 57. The offset forming the latch member 56 is at an acute angle to the rod 55, and the parts are so proportioned that the handle portion 57 rests upon the projecting end of the pin 51 when the mold is closed. Because of the fact that the rod 55 and the cover member 1 are pivoted eccentrically with respect to each other, the distance between the pins 40 and 51 becomes shorter as the cover member is moved upwardly, as shown in Fig. 1, until it reaches the maximum required opening, when the latch member 56 drops down and engages the projecting end of the pin 51. The inclination of the latch member provides a positive grip whereby the mold section may be maintained in its raised position.

Live steam or other suitable heating medium may be supplied to the heating chambers 5 and 6 from an inlet pipe 58 and through conduits 59, 60, 61, and 62. some of said conduits having swivel connections 63, as shown in the drawings. Similarly a drain pipe 64 communicates with the chambers 5 and 6 through conduits 65, 66, and 67, having swivel connections 68. The pipes 58 and 64 are firmly supported by a cross-bar 69 which is carried at the extremity of a horizontal arm 70 attached to the pedestal 22.

In using the device, the tube or other article to be vulcanized is placed within the mold chamber 4 in the usual manner and the movable mold section 1 is swung down against the fixed section 1ª. In such movement the ends 10 of the locking lugs 7 pass through their respective recesses 11 and 12, and after said movable mold section has come to rest against the relatively fixed section, the locking ring 8 is partially rotated by means of the hand wheel 18. Thus the inclined bearing surfaces 13 are caused to engage with the ends 10 of the locking lugs to positively draw the two mold sections together and to lock them in such relationship. The article may then be subjected to the vulcanizing process, as usual, at the completion of which the mold may be quickly opened by operation of the hand wheel 18 to unlock the hook members 7. The operator then grasps the handle 54 and swings the top mold section 1 upwardly about its hinge connection 3. The weight of the cover member is substantially counterbalanced by the spring 48 and its associated parts as has been already described, thus reducing the effort required of the operator, and thereby quickening said operation. When the swinging mold section 1 reaches a position slightly beyond that indicated by dotted lines in Fig. 1, the latch member 56 engages the end of pin 51 and holds said mold section in raised position, leaving the operator the use of both hands for removing the cured article and inserting another uncured article in the mold. In reclosing the mold, the operator again grasps the handle 57, relowers the mold section, and locks it in place for the next operation. If it is desired to vary the lifting force of the mechanism, this may be easily accomplished by means of the adjusting nut 45 or the segmental gear 41.

When it is desired to tilt or rock the mold, such as for draining condensation from the heating chambers 15 and 16, the loops 31 of the locking rod 30 may be disengaged from the pin 32 through the instrumentality of bell-crank lever 34 and push-rod 33. The entire mold may then be moved about the axis of the trunnions 23. Since the weight of the counterbalancing mechanism is applied to the mold on opposite sides of the trunnions 23, the tilting or rocking referred to can be conveniently carried out with little or no extra effort. Furthermore since there is no bulky weight depending from the mold, as in certain prior art molds, the steam and drain pipe connections may be made more easily.

From the foregoing it will be obvious that a substantial advance has been made in the art by the provision of my simplified locking means and effective counterbalance mechanism. The invention is, of course, susceptible of numerous modifications and the right is herein reserved to make such changes as fall within the scope of the appended claims without departing from the spirit of the invention.

Having thus described my invention, what I claim is:

1. In a vulcanizing mold, a normally horizontal fixed mold section, a movable mold section hinged with reference thereto, counterbalancing means overlying the movable mold section and movable therewith, and means for tilting the mold sections as a unit.

2. In a vulcanizing mold, a normally horizontal fixed mold section, a movable mold

section hinged with reference thereto, counterbalancing means in the form of a coiled spring carried by the movable section and acting to exert a lifting force thereon, a pedestal for supporting the fixed mold section, and means to permit tilting of said fixed mold section with reference to the pedestal.

3. A rockable vulcanizing mold, comprising a normally horizontal fixed mold section, a movable mold section hinged with reference thereto, counterbalancing means in the form of a compression spring carried by the movable section and overlying the same, said spring acting to exert a lifting force on the movable mold section, and means for tilting the mold sections as a unit.

4. A rockable vulcanizing mold, comprising a normally horizontal fixed mold section, a movable mold section hinged with reference thereto, a bracket secured to said fixed mold section, a post carried by the movable mold section, said bracket and post being relatively disposed at opposite sides of the axis of the hinge pintle, and yielding counterbalancing means connecting the bracket and said post and exerting a lifting force on said movable mold section.

5. In a vulcanizing mold, a relatively fixed mold section, a movable mold section hinged with reference thereto, a bracket mounted on the fixed mold section, a compression spring extending longitudinally over the movable section, means for connecting one end of the spring in fixed relation to said bracket, and means for connecting the other end of the spring to the movable mold section in such a manner as to exert a lifting force thereon.

6 In a vulcanizing mold, a relatively fixed mold section, a movable mold section hinged with reference thereto, a bracket mounted on the fixed mold section, a compression spring, a tension rod pivoted to the bracket and extending through the spring, said tension rod having a collar at its outer end to form an abutment for one end of the spring, and means for yieldingly connecting the opposite end of the spring to the movable mold section to exert a lifting force thereon.

7. In a vulcanizing mold, a relatively fixed mold section, a movable mold section hinged with reference thereto, a bracket mounted on the fixed mold section adjacent the hinged side of the mold, a tension rod pivoted to said bracket and extending over the movable mold section, said tension rod being provided at its outer end with a collar to form an abutment, a spring encircling a portion of the tension rod and having one end engaging against said abutment, and means for connecting the other end of the spring to the movable section, and to compress the spring to exert a lifting force on said movable section.

8. In a vulcanizing mold, a relatively fixed mold section, a movable section hinged with reference thereto, a bracket mounted on said fixed mold section adjacent its hinged edge, a post carried by the movable mold section, a guide sleeve having one of its ends pivoted to said post, and its free end disposed toward said bracket, a tension rod pivoted to the bracket eccentrically with respect to the axis of the mold hinge, the other end of said tension rod being in the form of a collar and having sliding engagement within the guide sleeve, and a compression spring disposed between said collar and the free end of the guide sleeve whereby to exert a lifting force to assist opening movement of the movable mold section.

9. In a vulcanizing mold having a pair of opposed mold sections hinged with reference to each other, means for holding the mold sections in separated position, said means comprising a rod pivoted to one of the mold sections eccentrically with respect to their hinged connection, a latch member carried by the rod, and means on the other mold section for engaging with the latch member when the mold sections are separated.

10. A vulcanizing mold having a pair of opposed mold sections hinged with reference to each other, said mold sections having steam jackets and being normally horizontal when closed and in use, means for adjustably supporting the mold sections whereby to permit them to be tilted to drain, and a counterbalancing spring to assist in opening the mold, said counterbalancing spring being carried by the tiltable mold sections and having its weight distributed on opposite sides of the axis on which the mold sections are tilted.

In testimony whereof, I have affixed my signature hereto.

PETER DE MATTIA.