

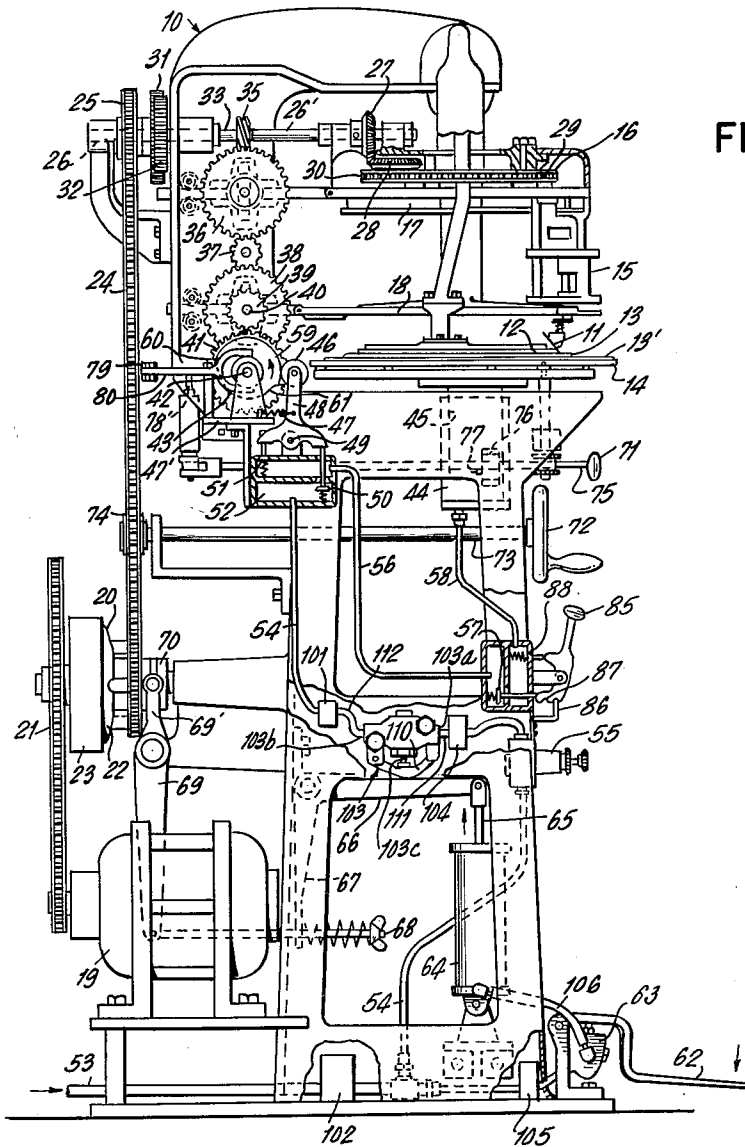
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H. R. POLLEYS
SOLE CUTTING MACHINE

3,006,006

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2 Sheets-Sheet 1



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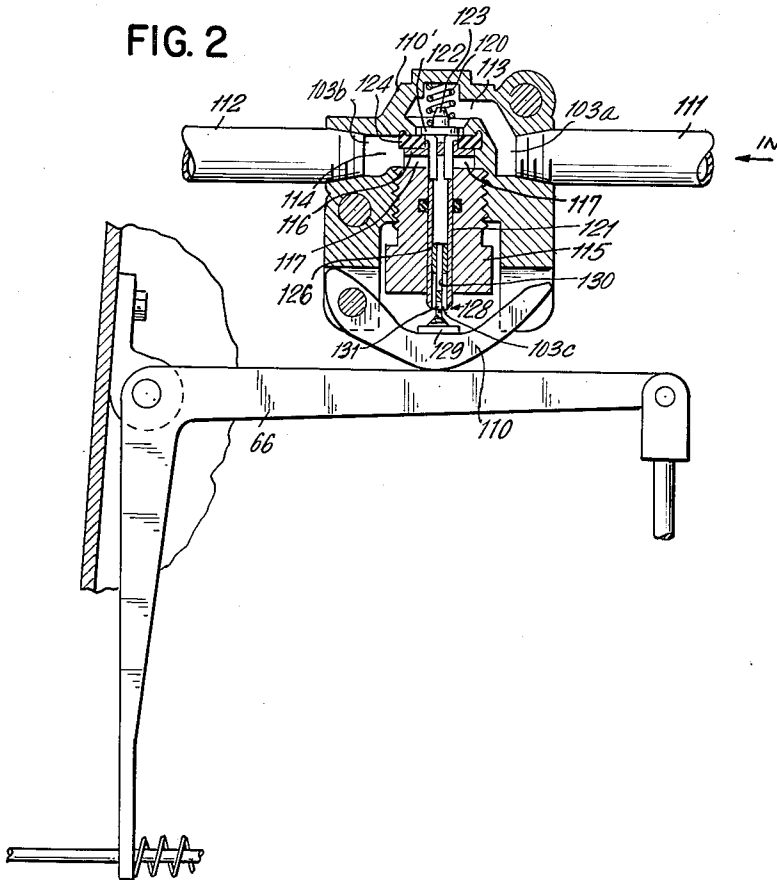
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FIG. 2



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SOLE CUTTING MACHINE

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2 Claims. (Cl. 12—86.6)

This invention relates to an improved automatic sole cutting machine and particularly provides increased safety protection to the operators who use it.

In particular this invention is an improvement over the Polleys machine, Patent No. 2,469,518. This machine generally, comprises a cutting blade adapted to speedily move about a path defined by a templet having the desired sole pattern. Sole stock in slab form is positioned on a cutting pad and is cut into outsoles to an outline of selected style and size by being lifted into and held fixed in the circuitous path that the cutting blade travels. It has an automatically timed lifting mechanism to accomplish this and after each sole is cut, the table is automatically lowered to provide time for the operator to slide an uncut portion of sole stock beneath the templet on its cutting pad after which it is subsequently relifted as set forth by the table action. This operation is repeated, one sole at a time, until all of the uncut sole stock has passed beneath the cutting blade's path, the actuation beginning when the operator presses a pedal at the beginning of the cutting of each fresh slab and continuing for the duration of the sole cutting operation.

Although the machine operates in a semi-automatic manner, there are numerous times when adjustments are necessary requiring manual operation (by turning a hand wheel) as for example, when the blade depth must be adjusted and the knife carriage is brought to the front of the machine, when the angle setting of the blade must be reset for a different sole bevel, when broken or dulled blades must be replaced, when knife blocks must be changed, when the carriage track or templets must be changed, and when lubricating or repairing parts of the machine. At such times, I have recognized that the operator may be in danger of hand injury should he neglect to manually shut off the previously provided hand valve which controls the flow of fluid to actuate the table lift and exhaust it by means of same. As will be explained in detail hereinafter, should the operator fail to take the steps just stated, it is possible for the table lift to rise at an inopportune time, and should the operator's hands be in or near the path of the cutting blade, its rotation could cause severe injury. Considering the number of machines in use, the number of different sole patterns cut in an efficient, high production factory, the number of adjustments required in one day, and the fatigue of the operator, it is apparent that the existing mechanism presents a substantial hazard, particularly should the operator fail to manually shut off the valve now provided.

An object of this invention is to eliminate this hazard so long as the operator's pedal is not depressed by providing automatic protection against sudden table liftings when adjusting and servicing the machine.

Other objects and advantages of this invention will become apparent from the following description used in conjunction with the accompanying drawings, wherein are set forth by way of illustration and example an embodiment of this invention.

FIGURE 1 is a side view of the improved sole cutting machine showing the position and interrelationship of the parts thereof and embodying the invention; and

FIGURE 2 is an enlarged partly sectional view showing the newly added means of this invention.

In order to understand this invention, the operation of the prior machine of Polleys Patent No. 2,469,518 will

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be considered. Referring now to FIGURE 1, there is shown a machine 10 comprising a cutting knife 11 which is driven around a templet 12 of the shape of the sole to be cut from a sheet of rubber stock 13, which is supported on a cutting pad 13' carried by the table 14 and is clamped between the templet 12 and the table. As used herein, the term "rubber" includes natural or synthetic rubbers, and rubber-like plastics. The means for driving the cutting knife 11 in a circuit around the templet 12 is shown by carriage 15, which is directly connected to and driven by the chain 16. The carriage 15 is guided in a circuit above the templet 12 by the upper and lower guide tracks 17 and 18 which are shown further in Patent No. 1,270,319 to E. L. Patten. The chain 21 is driven by a motor 19 through a clutch 20 which in turn drives connecting chain 24. When the engageable and disengageable parts 22 and 23 of the clutch 20 are in engagement, the knife 11 is driven from the clutch 20 through the sprocket chain 24, which meshes with the sprocket wheel 25 keyed to a shaft 26. A reciprocating shaft 26' is driven by a slidable connection with the shaft 26, and drives the chain 16 through the mitre gear 27 keyed to the shaft 26' and which meshes with the mitre gear 28. The chain 16 passes around sprockets 29 and 30 and is driven by sprocket 30 which is keyed to the shaft to which the mitre gear 28 is affixed.

The means to reciprocate the track is clearly seen in FIGURE 1. The track guides 17 and 18 are shifted horizontally by a train of gears which is driven from the shaft 26 by a gear 31 which is keyed to a shaft 33, on which a spiral gear 35 is also keyed and which drives the train of gears 36, 37 and 38. This reciprocates the track guides 17 and 18. The gear 39 fixed to gear 38 is adapted to drive gear 41 which is slidably mounted on a shaft 42.

A wide faced cam 43, also slidably mounted on shaft 42 and affixed to gear 41, controls the rise and fall movements of table 14 and synchronizes them with the travel of the knife 11 by causing fluid under pressure to be admitted to and exhausted from the lower end of the cylinder 44 to operate the piston 45 therein. This lifts and drops table 14. The mechanism for performing such functions comprises a cam roller 46 which rolls on and is held in contact with the surface of cam 43 by a spring 47 having one of its ends affixed to a stationary support 47' and its other end affixed to a lever 48. The cam roller 46 is mounted on valve operating lever 48 which is pivoted on a pin 49, and is provided with lateral arms adapted to operate an inlet valve 50 and an exhaust valve 51, respectively, which are adapted to admit and exhaust compressed fluid or air to and from the cylinder 44.

Pressurized fluid is admitted to the valve chamber 52 through a supply pipe 53, to which is connected a branch pipe 54 having a pressure regulator 55 inserted therein and leading to the chamber 52. The regulator is adapted to control the required clamping pressure between the templet 12 and the table 14. As shown in FIGURE 1, the inlet valve 50 is open and fluid is being admitted by pipe 54 through control valve 52 and out by way of pipe 56, manually operated, normally open valve 57, and pipe 58, to the lower end of the cylinder 44. FIGURE 1 also shows piston 45 in its up position, clamping stock 13 under the templet 12 and knife 11 is traveling around the templet to cut a sole from the stock. The inlet valve 50 is being held in its open position by the higher cam surface 59 acting upon the cam roller 46 against the action of the spring 47. The valve 50 was moved to its open position when the knife 11 was in the desired position on its path of travel for a previously selected entry point into the stock 13, which occurred when the rise 60 on the surface of the cam made contact with the cam roller 46. After such occurrence the knife 11 makes a complete circuit

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plus some overlap around the edge of the sole. The cam roller 45 then runs down the rise 61 on the cam surface and travels along the lower surface of the cam. As the rollers runs down the rise 61, inlet valve 50 is closed and exhaust valve 51 is opened to atmosphere which permits table 14 to be lowered by virtue of its weight and loss of sustaining pressure. The stock 13 is thus withdrawn downwardly from the knife 11 at the desired position on the edge of the sole. The table remains in its bottom position until just before the knife 11 returns to the position on its path where it previously entered the stock 13, and at which time the cam rise 60 again makes contact with roller 46. When the table is down, cutting pad 13' with stock 13 thereon is shifted on the table by the operator to a position (indexing) for cutting the next sole. Such successive cutting and stock indexing operations are continued until all of the soles have been cut from the single sheet of sole stock 13 initially placed upon cutting pad 13' at the beginning of the operation. While the several soles are being cut, the operator depresses foot pedal 62 to admit fluid from supply line 53 through valve 63 to cylinder 64. This operates a piston therein to hold the clutch 20 in engagement with the drive from the motor 19. Motion is transmitted to the movable member 22 of the clutch 20 from the piston rod 65, through a linkage comprising a bell crank lever 66 having an arm 67 which yieldably actuates a rod 68 connected to a lever 69 having a yoke 69' thereon which actuates the clutch collar 70 to connect the knife drive to the motor 19.

After the table has moved upwardly for cutting the last sole from the sheet of sole stock 13 the operator removes his foot from the foot pedal 62 which exhausts the fluid from cylinder 64 and disengages clutch 20. Knife 11 has sufficient momentum to complete the cut, and will come to a stop while table 14 is in its lower position. In such position, a new sheet of stock may be placed on the table in position to be operated upon by the knife in succession after each sole is cut therefrom. After placing the sheet of stock on the cutting pad 13' in the desired position for cutting the first sole, the operator depresses pedal 62, and while the pedal is being depressed, the machine repeats the successive operations of cutting the soles therefrom, and it is only necessary for the operator to shift the stock to a new position for cutting the next sole each time the table 14 is lowered out of the path of knife 11, since cam 43 and its allied mechanism automatically causes knife 11 to enter and be withdrawn from the stock at relatively the same place on the edge of each consecutive sole.

Table 14 is reciprocated through one cycle, moving up and down once, during part of the time the knife travels twice around its path of movement. The stock is held up slightly more than one revolution, and is held down out of the path of the knife while it completes the remaining portion of its travel, which is slightly less than one revolution.

The geared relationship between the knife 11 and the rise and fall points 60 and 61 on the cam 43 may be changed to cause the rise to make contact with the cam roller 46 while the knife 11 is at any position on its 360 degree path of travel, and thereby cause stock to enter the path of the knife 11 and be withdrawn from same at any desired position on the edge of the shoe sole being cut. Changes in such geared relationship may be made while the cam roller 46 is on the lower surface of cam 43 adjacent to the rise 60, clutch 20 normally being out of engagement, and the knife is not in motion. Under such conditions the shifter knob 71 is pulled outwardly to shift the gear 41 out of mesh with the gear 39 (as shown by the position of such gears in FIGURE 3 of the drawings as aforementioned of Patent No. 2,469,518), and slide the face of the cam 43 beneath roll 46. While the gears 39 and 41 are thus out of mesh, the knife 11 may be turned to a new position (just behind the position it should enter to cut the stock) by manually operating the hand wheel 72. The wheel 72 is affixed to a shaft 73 and turns a

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sprocket wheel 74 with which the knife drive chain 24 meshes and which is driven by a one-way clutch in the nature of a ratchet located within the hub of wheel 74 and driven by shaft 73. The knob 71 is then pushed inwardly and the gears 39 and 41 are again thrown into mesh with each other without any appreciable change in the angular movement of the cam 43 during the sliding movement of its face under roller 46. In such newly adjusted position, the knife will be caused to enter the stock just beyond the point at which it is set by virtue of the rise 61 causing the valve 50 to be opened.

The linkage which connects the knob 71 to the mechanism for shifting the gear 41 out of mesh with the gear 39 comprises a rod 75 which extends through a fixed collar 76 and is provided with a lug 77 thereon which cooperates with the collar 76 to hold the gears in or out of mesh as may be desired. The lug 77 as shown in FIGURES 1 and 2 (Patent No. 2,469,518) is in the gear meshing position. The gears 39 and 41 are disengaged by lifting the rod until the lug 77 is raised above the bottom of the interior wall of the collar 36. The lug is then pulled through the collar and dropped down on the opposite side of the collar, where it holds the gears 39 and 41 out of mesh. One end of the rod 75 is connected to a bell crank lever 78 comprising lower and upper arms which are secured to a vertical shaft 78' pivoted on the frame of the machine, and the other arm of the lever is connected to a rod 79 at the rear of the machine. The rod 78 operates a clutch shifter lever 80 on the other side of the machine. The lever 80 is pivoted on a pin and operates a collar longitudinally of the shaft 42 upon which the gear 41 and integral cam 43 are slidably mounted. The gear 41, cam 43, and shift collar 82 are secured together and rotate as a unit on the shaft 42. The movement of the lever 80 in the direction to pull the gears 39 and 41 out of mesh compresses a coiled spring surrounding shaft 42. A thrust collar is interposed between the spring and shift collar. The spring holds the gears 39 and 41 in mesh with one another, excepting when the rod 75 is pulled outwardly and is retained in such outward position by the lug 77.

Means are provided for lowering the table 14 in the event the knife 11 or carriage 15 should become jammed or broken and stop while the cam roller 46 is on the upper surface 59 of cam 43, and thereby hold the inlet valve 50 open and the table operating piston 45 in its upper position. In the event this should happen, fluid may be exhausted from cylinder 44 by pushing in the handle 85 and thereby close the inlet valve 57 and open the exhaust valve 88 to atmosphere, which would permit the table to descend by virtue of its weight and loss of sustaining pressure. Valve 57 is obviously hand operable and is not a control valve as used herein, since it does not exert a control function during the operating cycle. The handle 85 is automatically locked in either the opened or closed position of the inlet valve 57 by the fixed detent 86 falling into one of the recesses 87 on the handle 85. Stock is then removed out of its jammed position with the knife 11 or other parts of the machine. The hand wheel 72 is then turned until the low portion of the cam 43 comes in contact with the cam roller 46 which causes the inlet valve 50 to be closed and the exhaust valve 51 to be opened. With the valves 50 and 51 in such positions the handle 85 can be again moved to close the exhaust valve 88 and open inlet valve 57, and the table 14 will remain in its downward position, and the necessary repairs may be made. A more complete description may be had by referring to Polleys Patent No. 2,469,518, the disclosure of which is incorporated herein by this reference.

From the foregoing, it is apparent that the hazard to the operator from unexpected table clamping action when the knife carriage is hand rotated, can occur regardless of whether pedal 62 is depressed or not should the operator neglect to manually shut off fluid to the table lift pipe circuit 58 and exhaust same to atmosphere by

means of positioning handle 85. Should the operator neglect to shut off this fluid and then by means of hand wheel 72 rotate the knife block carriage 15, with gear shift or rod 75 in gear engaged position, the rotating wide faced cam 43 could by means of its rise (if by chance rotated to this point) open the table life valve unexpectedly by rocking lever 48 to actuate inlet valve 50. This would cause the table 14 to rise, possibly at an inopportune time as, for example, if the knife blade had not yet been removed, it could be broken or possibly cause injury to the operator's hand.

It is seen that table 14 is actuated by the extension of piston 45 of cylinder 44. Fluid is supplied to cylinder 44 through pipes 58, valve 88, pipe 56, valve 52, pipe 54, lubricator 101, three-way valve 103, tank 104, pressure regulator 55, pipe 54, strainer 102 and inlet supply pipe 53. The pressurized fluid to actuate cylinder 64 (which in turn actuates clutch 20) is supplied from pipe 53, lubricator 105, foot valve 63, and pipe 106. Valve 103 has the particular property of allowing fluid to enter the inlet 103a and pass to the outlet 103b when arm 110 is moved inward. When arm 110 is extended, inlet 103a is sealed and outlet 103b communicates with center exhaust 103c, allowing fluid to flow through and into valve 103 from 103b and to be exhausted through 103c.

When foot pedal 62 is in its up or non-operative position, clutch actuating cylinder is in its neutral position with rod 65 retracted. This position draws bell crank lever 66 to its downward setting, allowing arm 110 to be extended by its internal spring component; the inlet 103a then becomes sealed, and the outlet 103b is exhausted to atmosphere through 103c.

It is thus clear that pressurized fluid is supplied to valve chamber 52 from inlet pipe 53 through valve 103. In its neutral or normally closed position, arm 110 is extended and inlet 103a is sealed to prevent flow through the valve. Further, should any fluid under pressure remain in chamber 52 and pipe 54 back as far as normally closed valve 103 which has been shut by removing the pressure against the pedal, so as to hold table 14 in its up position, it is exhausted to atmosphere through the center of plunger 103c if pressurized fluid in cylinder 44 has not been vented to atmosphere through exhaust valve port 51 because cam valve has remained in its open position. Fluid can thus be exhausted automatically (without need to manually close valve 57 and open exhaust valve 88 by moving hand lever 85) through the hollow stem 103c of valve 103 so as to drop the table, as it flows back from cylinder 44 through pipe 58, valve 88, pipe 56, open inlet valve 50, valve chamber 52, pipe 54, and out to atmosphere through hollow valve stem 103c. It can be readily seen that with the table lift fluid shut off and exhausted by valve 103, hand wheel 72 can be rotated to move carriage 15 and its associated knife block unit 360 degrees or more with or without the templet in place and without causing the table plate 14 to rise. The reason for this is that valve chamber 52, being shut off to pressurized fluid by closed valve 103, can be opened and shut at will by rotating cam action without any force being applied to piston 45; consequently table plate 14 cannot lift should the carriage by chance be moved by hand to the position where, by means of the gear train, the cam 43 would normally have its rise actuate valve 52.

The operation of the piping circuit in conjunction with three-way valve 103 is shown in further detail in FIGURE 2. The pressurized fluid which eventually actuates cylinder 44 through valve 52 enters valve 103 through inlet pipe 111 and valve inlet 103a. The outlet pipe 112 communicates with the valve through outlet 103b. Valve 103 has an exterior casing 110' with inlet chamber 113 and outlet chamber 114. There are three communicating orifices, the aforementioned inlet 103a connecting to inlet pipe 111, outlet 103b connecting to outlet pipe 112, and central exhaust 103c which connects only to outlet pipe 112 (through outlet 103b) and atmosphere. Central

exhaust 103c is defined by a number of components and the manner by which it communicates with outlet 103b will be apparent from a discussion of the operation of this valve.

One of such components is the threaded nut 115 which is received by valve body or casing 110'. Located within nut 115, is a central hollow plug 121 which urges and is urged against by spring 120. At the other end of hollow plug 121 is a slidable sealing cap 128 which is connected to and actuated by arm 110.

At the base of threaded nut 115 is a neck 116 having a number of radial apertures 117. As shown, aperture 117 may communicate with outlet valve chamber 114. The bottom of neck 116 is hollow as is entire nut 115 and provides a seat or shoulder for packing element 124. Plug 121 is hollow and has a circular flange base 122 and projection 123 to receive closure spring 120. The surface towards neck 116 provides the other seat for packing element 124. However, flange base 122 is imperforate and when spring 120 urges plug 121 and base 122 towards the top surface of nut 115, the packing ring is compressed and the interior of the hollow wall 126 of plug 121 which communicates with central exhaust 103c is sealed from inlet valve chamber 113.

The interior of hollow wall 126 communicates with central exhaust 103c by means of sealing cap 128 which has an imperforate circular flanged head 129 which effectively seals 103c when forced inwardly by bell crank action, and a hollow exhausting shank 130 having a transverse aperture 131.

The valve is shown in the off position indicating that pedal 62 is not depressed which corresponds to the time the operator may desire to make necessary changes or to effect repair and maintenance. In this view, rod 65 is retracted and lever 66 is down. Arm 110 is extended and circular head 129 is sufficiently out beyond the sealable end of 121 to allow transverse aperture 131 to communicate with the atmosphere. Inasmuch as spring 120 is not compressed an effective seal from incoming air or fluid is provided by the neck 116, base 122 and packing element 124 (a resilient washer). Thus inlet chamber 113 is cut off or sealed from the interior of plug 121 which communicates with transverse aperture 131. At the same time, any pressurized fluid in outlet pipe 112 may flow back into outlet valve chamber 114 and into the interior of plug 121 through radial aperture 117 of threaded nut 115 and through the interior of plug 121 and out through the transverse aperture 131 to atmosphere. Therefore in the off position, fluid flows from outlet 103b to central exhaust 103c, inlet 103a being sealed. It is obvious from the foregoing, that when arm 110 is activated because of the extension of rod 65, head 129 is depressed and transverse aperture 131 no longer communicate with atmosphere, and is enclosed by cylindrical wall 126 of plug 121, the sealing cap, and associated packing 124. Simultaneously, spring 120 is compressed and the seal between neck 116, base 122 and packing element 124 is broken so that fluid in inlet chamber 113 may flow into the interior of plug 121 and into aperture 117 to outlet chamber 114 through an apertured stem not shown which couples the flange base 122 of nut 115 to the cylindrical wall 126 of plug 121.

While the foregoing description shows the advantage of the improved safety feature of this invention, it may be recognized that much production time is saved and reduced operating cost results from the elimination of the step of operating handle 85 to completely exhaust the system. Since other advantages and modifications within the spirit of the invention will be recognized by those skilled in the art, I wish to be limited only by the following claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. A machine for cutting a pattern from a slab of rubber comprising a templet having a contour defining the

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desired pattern, means mounting said templet in a horizontal plane, a cutting knife adapted to cut said stock, means for driving said knife in circuit about the periphery of the templet, a clamping table comprising a cutting pad on the top surface thereof and adapted to receive the slab of uncut stock, means to move said table upwardly and downwardly to place the uncut stock in the path of the cutting knife as it is driven about its circuit including a table lift having a cylinder and piston, said piston being actuated by fluid pressure, a first valve means to control the flow of fluid to said cylinder and having an outlet connected to said cylinder and having an inlet, second valve means having a normally closed inlet means, a normally open outlet means and normally open exhaust means, said second valve means having plunger means to open said normally closed inlet means and close said normally open exhaust means, a first conduit means coupling the inlet of said first valve means and the outlet of said second valve means, a second conduit means coupled to the inlet of said second valve means, whereby the said second conduit means may couple a source of pressurized fluid to the inlet of said second valve means, a second fluid actuated cylinder having a second piston, a third valve means having a normally open exhaust means, an outlet and normally closed inlet means, a third conduit means coupling the outlet of said third valve means to said second cylinder, a fourth conduit means coupled to the inlet means of said third valve means, whereby said fourth conduit means may couple a source of pressurized fluid to the inlet of said third valve means, movable means having an actuating element to open the inlet means and close the exhaust means of said third valve, whereby said second cylinder may be actuated to move said second piston, means responsive to the movement of said second piston to move said plunger means to open said normally closed inlet means and close said normally open exhaust means of said second valve means.

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2. A machine for cutting a pattern from a slab of rubber comprising a templet having a contour defining the desired pattern, means mounting said templet in a horizontal plane, a cutting knife adapted to cut said stock, means for driving said knife in circuit about the periphery of the templet, a clamping table comprising a cutting pad on the top surface thereof and adapted to receive the slab of uncut stock, means to move said table upwardly and downwardly to place the uncut stock in the path of the cutting knife as it is driven about its circuit including a table lift having a cylinder and piston, said piston being actuated by fluid pressure, a first valve means connected to said cylinder to control the flow of fluid thereto, a source of pressurized fluid, second valve means having normally closed inlet means, normally open outlet means, and normally open exhaust means, said second valve means having a plunger means which when depressed, opens said normally closed inlet means and closes said normally open exhaust means, said normally open outlet means coupling the said first valve means by a first conduit means, said inlet means coupled to said source by a second conduit means, a second fluid actuated cylinder having a second piston, a third conduit means connecting to said second fluid actuated cylinder through a normally closed third valve means having exhaust open to atmosphere, a pedal means having an actuating element to position said third valve means to actuate said second cylinder and move said second piston, means responsive to the actuation of said second cylinder to depress the plunger means of the second valve means and open the inlet means therein and close the exhaust means therein to allow fluid to flow through the outlet therein and into the first valve means.

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