

Dec. 25, 1962

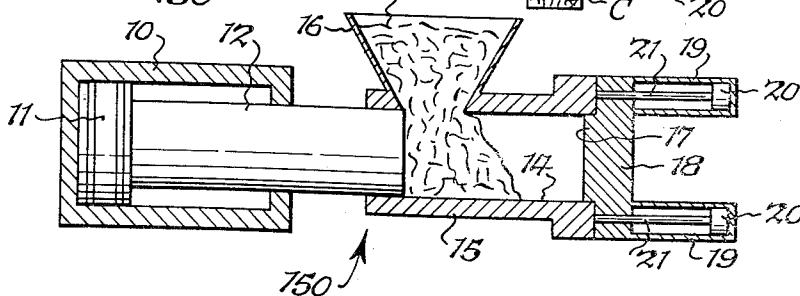
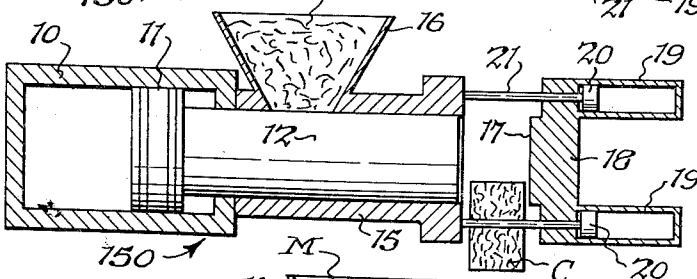
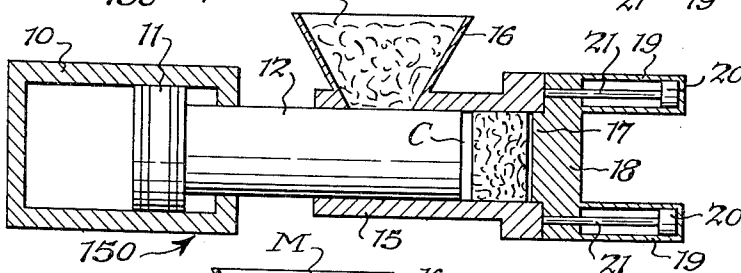
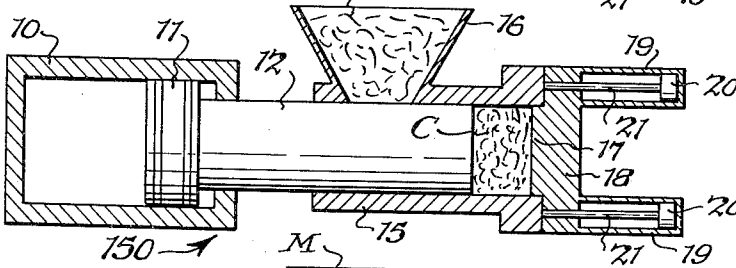
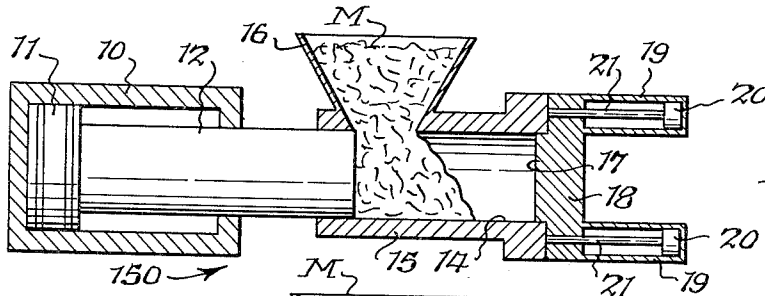
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3,070,003

AUTOMATIC CAGE TYPE PRESS

Filed May 16, 1960

3 Sheets-Sheet 1



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3 Sheets-Sheet 3

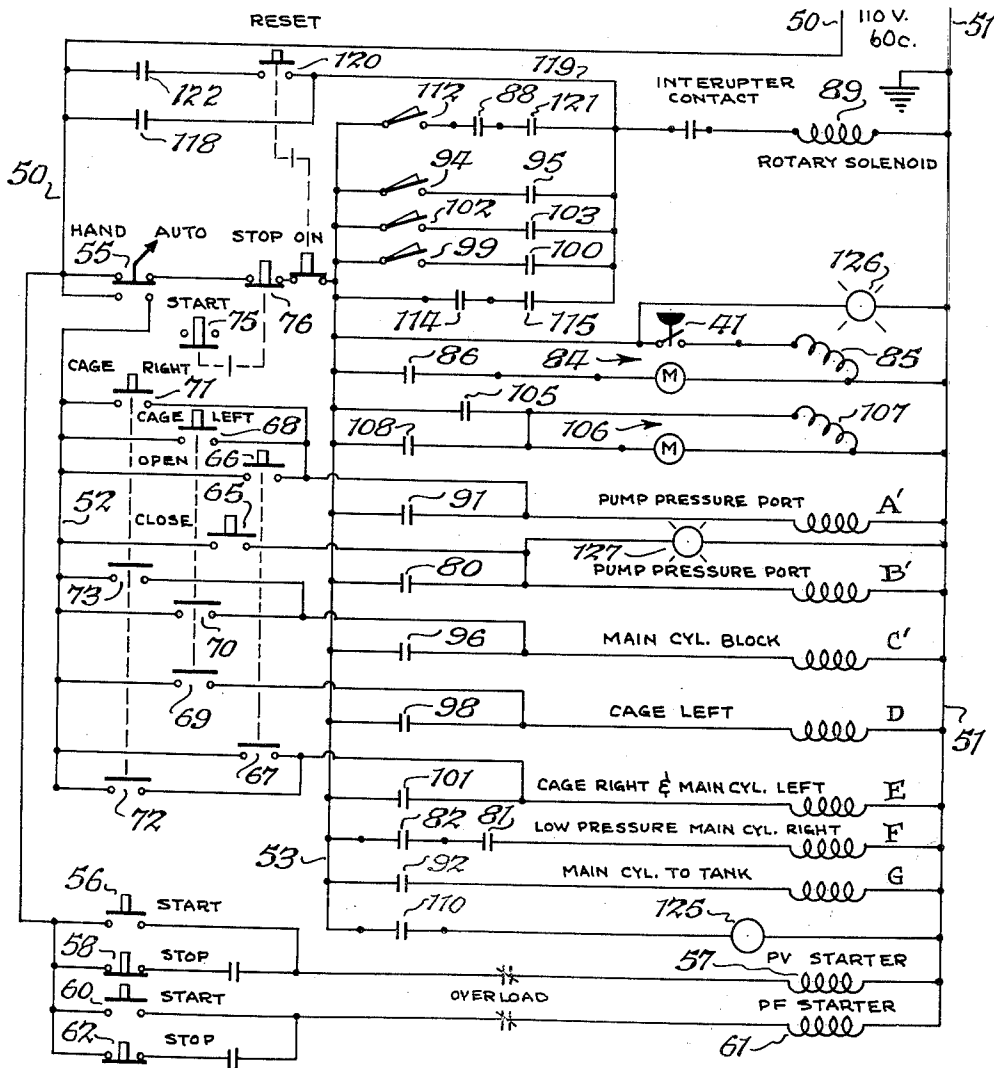


Fig. 7.

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3,070,003

AUTOMATIC CAGE TYPE PRESS

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14 Claims. (Cl. 100—51)

This invention relates to presses of the type generally used in the extracting of oils or other liquids from vegetable or other matter. More particularly the invention relates to hydraulic cage type presses, and one of the objects of this invention is to provide a press of this type which is automatic in operation and capable of running continuously without human supervision.

A further object is to provide a press which automatically discharges the cake or residue after the liquid has been expressed by the press.

In the drawings which illustrate by way of example one embodiment of this invention:

FIG. 1 is a sectional elevation of a press embodying this invention showing the same in idling or filling position.

FIG. 2 is a similar view thereof showing the press closed and the material under final pressure.

FIG. 3 is a similar view thereof showing the plunger slightly retracted and the cake freed.

FIG. 4 is a similar view thereof showing the cage of the press retracted and the cake dropping from the press.

FIG. 5 is a similar view thereof showing the parts returned to the position shown in FIG. 1 with the cage moved forward, the plunger in retracted position and the press being refilled by gravity feed and in position to restart the cycle.

FIG. 6 is a diagrammatic showing of the hydraulic system and the necessary hydraulic components used to control the automatic press.

FIG. 7 is a diagrammatic showing of the electrical system used with the hydraulic components.

As shown in FIGS. 1 through 5 my improvements are shown as applied to a horizontal hydraulic press 150 which comprises a hydraulic cylinder 10 which encloses the piston 11 of a hydraulic ram or plunger 12. The plunger 12 is received into a cylindrical bore 14 of a cage 15 having its other end closed by a dowel end portion 17 of the cage head or closure 18. The cage closure is provided with hydraulic cylinders 19 containing pistons 20 and piston rods 21. These piston rods 21 at the ends opposite their pistons are fastened to the cage 15 and serve to reciprocate the cage to the left or right as is required. The cage 15 also has a hopper or equivalent receptacle to guide the material M into the cage cylinder 14.

In FIGS. 1 and 5 with the parts in the positions shown, material drops from the hopper 16 into the cage cylinder 14 to whatever volume gravity and bulk permits—this constituting a charge to be pressed.

After a proper interval of time for the filling, the plunger 12 and piston 11 are moved to the right to compress the material M in the cylinder 14 of the cage 15 whereupon the plunger arrives at the position shown in FIG. 2. After an interval of time the piston and plunger 12 retract slightly to the left to free the cake C, FIG. 3. Shortly thereafter the cage pistons 20 and rods 21 are activated to move the cage 15 to the left and thereby strip the cake C free of the cylinder 14 whereupon it falls away free of the press. After another time interval the plunger 12 is returned to the left and the cage 15 is returned to the right returning the parts to the positions shown in FIGS. 1 and 5 and ready for another cycle after time is provided for filling the cage.

To make possible the above operation, hydraulic power is derived from a single variable displacement pump 25 and a double fixed displacement pump 26, the pump 25

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being driven by an electric motor 27 and the pump 26 by an electric motor 28. Flow of the hydraulic fluid from the pump 26 is controlled by a 3 position-4 connection-spring centered solenoid operated valve 30 in the pressure outlet conduit 31, this conduit having a connection to a pressure relief valve 31'. As is clearly shown in FIG. 6 the valve 30 has a solenoid F at its left end and a solenoid G at its right end.

The variable displacement pump 25 is provided with an outlet port A controlled by a solenoid A' and an outlet port B controlled by a solenoid B'. A conduit 32 from port A leads to a 3 position, 4 connection, closed center, spring centered, solenoid operated valve 33. A solenoid D controls movement toward the left side of the valve 33 while a solenoid E controls movement toward the right side. This conduit 32 also goes to a shut-off valve 34 actuated by the plunger 12 through cam and roller actuation 13 and to a check valve 35, both the shut-off valve 34 and check valve 35 connect to the back area of the plunger 12 by a conduit 36.

A conduit 38 from port B of pump 25 connects to a shut-off valve 39 which is controlled by a solenoid C', and then connects by conduit 39' to the valve 30, a pressure gage 40, pressure switch 41 and the head of cylinder 10.

A conduit 43 connects the valve 33 to the head of pistons 20 of the cage cylinders 19 while a conduit 44 connects to the cylinders 19 to act on the other ends of the pistons 20 and also connects to the shut-off valve 46. This valve also connects to the aforementioned conduit 36 and cylinder 10 and is mechanically operated by a cam and roller actuator 48.

In FIG. 7 illustrated diagrammatically is the electrical circuitry which governs the automatic sequence of actions that the hydraulic controls will take to make the press operate automatically after it is set into operation.

In FIGS. 6 and 7 symbols are employed which are commonly used in hydraulics and which will readily be understood by persons skilled in that art. There is also employed in connection with these symbols an intermittently rotating circuit closing and opening device which is not shown to avoid unnecessary complication and confusion of the drawings and for the further reason that such rotary devices are well known in the art.

Current is supplied to the leads 50 and 51 in FIG. 7 to actuate the various electrical components. As shown when the "hand-automatic" switch 55 is moved to hand operation, the line 50 will be connected to the line 52 through the lower pair of contacts of switch 55. For automatic operation the switch is moved into position shown in FIG. 7. When the start button 56 is depressed manually, the starter coil 57 of the motor 27 of pump 25 is energized and the pump builds up pressure. If stop button 58 is depressed, coil 57 is deenergized and the motor will stop. Similarly the starter 61 of the motor 28 of pump 26 may be energized by depressing start button 60 or stopped by depressing stop button 62.

If compressing movement of the plunger 12 is desired the push button switch 63 is depressed and pump solenoid B' is energized permitting fluid to flow from pump 25, port B through shut-off valve 39 into the cylinder 10 pressing piston 11 to the right or compressing position. To move the main plunger 12 in the reverse position, button 66 is depressed completing the circuit to solenoid A' of pump 25 permitting fluid to flow from the A port of pump 25. Mechanically connected to button 66 is a switch button 67 which closes at the same time energizing solenoid E which lets fluid flow from port A of pump 25 to conduit 32, valve 33, conduit 44, valve 46 and conduit 36 into the pull back area of piston 11 and cylinder 10, thus returning plunger 12 to the left.

To move the cage 15 to the left to drop the cake C,

button 68 is depressed thereby completing a circuit through solenoid A' of pump 25 and also through mechanically connected switch 69, and line 52 to the solenoid D and the other side of the line 51, thus energizing solenoid D of valve 33, shifting the valve so that conduit 32 of port A is connected to conduit 43, thereby pushing pistons 20 and cage 15 to the left. At the same time that switch 68 is depressed, another mechanically connected switch 70 closes and the line 52 is connected to the solenoid C' and line 51 thus energizing solenoid C' to close valve 39 stopping flow of liquid from main cylinder 10. To reverse and push cage 15 to the right, button 71 is depressed thus energizing solenoid A' and mechanically closing the switch 72 so that current flows from line 52 into solenoid E to line 51. This energizes solenoid E shifting valve 33 to connect conduit 32 to conduit 44 and thus permitting fluid to push pistons 20 and cage 15 to the right. At the same time switch 73, which is also mechanically connected to push button 71 connects line 52 to the solenoid C' of shut-off valve 39 stopping the flow of liquid out of the main cylinder 10.

Automatic Operation

Let us assume that the press is open, as shown in FIG. 1, and loaded with material and the pump motors 27 and 28 are running. The operator moves switch 55 to the automatic position shown in FIG. 7. The start button 75 is actuated manually to close the stop switch 76 thus supplying current from line 50 to the bus bar 53. The movable circuit controller, herein referred to but not shown, will then be in its No. 1 position, in which contacts 80 and 81 will be closed. Solenoid B' will then be energized through closed contacts 80 as will be solenoid F of valve 30 through closed contacts 81. Solenoid B' shifts the pump 25 to full discharge volume through its port B to conduit 38 through shut-off valve 39 and conduit 39' to the main cylinder 10. Solenoid F moves the valve 30 to connect the discharge conduits 31 of pump 26 to the conduit 39', combining with flow from pump 25 whereupon plunger 12 moves to the right compressing the material M in the cage 15. Fluid from the material drains through the screen bars (not shown) of the cage to the drainage system that is provided as is the usual practice. The plunger continues to move at high speed until pressure builds up to a predetermined setting controlled by pressure switch 41 which closes the circuit to timer coil 85, closing contacts 86 to run timer motor 84. Contact 82, timer 85 opens to break circuit to solenoid F thus returning valve 30 to center position causing pump 26 to discharge at low pressure back to a tank and also to block main plunger area from tank. This disconnects the pump 26 from the main area of the plunger piston 11 and the plunger 12 continues to advance at slow speed and high pressure supplied from port B of pump 25. The plunger will continue to advance at the high pressure low volume until the predetermined pressure setting of the pump pressure compensator 49 is reached, and if this occurs the plunger will stop and pressure will be maintained on the material as shown in FIG. 2 until timer 85 times out. Contacts 114 of timer 85 then close to energize a rotary solenoid 89. This advances step switch of rotary solenoid 89 to its second position, whereupon step switch contacts 91 are closed to energize pump solenoid A' and step switch contacts 80 open to deenergize solenoid B'. Solenoid A' being now energized discharges high pressure from port A through conduit 32, shutoff valve 34 and conduit 36 to the pull back area of cylinder 10. This moves plunger back to left. Also step switch contacts 92 close to energize solenoid G of valve 30 thus connecting the main area of the cylinder through conduit 39 to tank, thus releasing this fluid. The plunger 12 retracts approximately one inch. This distance is controlled by the adjustable cam roller actuator 13 of the valve 34, this blocking the supply of oil from port A of pump 25 to the pull back area of the

piston 11. Cam switch 94 is thus closed, energizing the rotary solenoid 89 through step switch contacts 95. This advances the step switch to its third position.

Step switch contacts 96 are then closed to energize the solenoid C' of the shut-off valve 39 thus blocking pressure liquid from the head of the plunger piston 11 from port B of pump 25 through the conduits 39' and 38. Step switch contacts 92 now open and solenoid G is deenergized returning valve 30 to center position thus blocking the main area of main cylinder 10 from tank and stopping the plunger 12 in the position shown in FIG. 3. Step switch contacts 98 now close to energize the solenoid D of valve 33 which permits oil from the port A of pump 25 to flow through the conduit 32 to the conduit 43 and the main area of the cage cylinder 19 moving the piston 20 and cage 15 to the left, stripping the cake C out of the cage 15 as shown in FIG. 4. The cage moves to the left and actuates limit switch 99, which energizes the rotary solenoid 89 through step switch contacts 100 which advances the rotary switch into its fourth position.

Solenoid E of valve 33 is then energized through step switch contacts 101 closing, as the step switch contacts 98 open to deenergize solenoid D. This shifts the valve 33 to permit the pump 25 to supply oil from port A to conduits 32 and 44 to the push back area of the cage cylinders and returning the cage 15 back to the right hand open position. At this position the cam roller actuator 48 of the valve 46 holds the valve 46 in the position shown in FIG. 6 and admits pressure fluid to the pull back area of main cylinder 10 from the pump 25, conduit 32, valve 33, conduit 44, valve 46 and conduit 36.

Solenoid G, of valve 30, is energized at the same time that limit switch 99 is actuated. This causes plunger 12 to move to the left until limit switch 102 is actuated whereupon rotary solenoid switch 89 is energized through switch 103. This advances the step switch to the fifth position and step switch contacts 105 close to energize the timer winding of timer 107. Holding contacts 108 of timer 107 then close to hold in the timer 107. Timer contacts 110 then close to energize a control valve or scale 125 if such is used to control the amount of material fed to the press. However the apparatus may operate without such valve or scale. Plunger 12 continues to move to the left to the end of its stroke where limit switch 112 is closed by it.

When the timer 107 times out contacts 88 close to energize the rotary solenoid 89 through switch 121 which advances step switch to the sixth position and through the step switch contacts 118 and the line 119 it advances on to its first position which starts the cycle automatically over again, without the operator actuating the cycle start button 75.

Anytime during the automatic cycle the reset button 120 may be operated to return the step switch to its First position by energizing rotary solenoid through switch 122. The "Hand Automatic" switch 55 is then turned to the hand position and the main plunger 12 and cage 15 are returned to their retracted positions. This readies the press for automatic operation by moving switch 55 to automatic position and then pushing the start button 75. At any time it is desired or necessary to stop the cycle the stop button 76 may be operated to stop the press. Upon resumption of the cycle by pressing the start button 75 the cycle starts where it left off when it was stopped.

Signal light 126 when illuminated indicates the press is in action cycling and signal light 127 indicates the main plunger 12 is in closed or pressing position.

The cams 13 and 48 are shown diagrammatically in FIG. 6 as mounted directly on the plungers 12 and 21, but it will be understood that they are actually not so mounted but are mounted on different parts connected with these plungers and move in synchronism with the plungers.

The rotary switch member or controller operated by the solenoid 89 preferably is of a type which is well

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known and which can readily be purchased on the open market and is therefore not shown. Also the various solenoid controlled valves employed in connection with this invention are all available on the open market and it is therefore not deemed necessary to illustrate them in detail.

It will be understood that various changes in the details, materials and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art, within the principle and scope of the invention, as expressed in the appended claims.

I claim:

1. A cage press having a movable plunger cooperating with a movable cylinder cage, said cage having an opening in the side thereof through which material to be pressed is admitted when said plunger and cage are in material-receiving position, electrical switch means actuated when a charge of material has been admitted to said cage, a valve actuated by said switch means to admit liquid to said press to advance the plunger, a pressure control valve responsive to the pressure of liquid in the press, a timer, means actuated by said last mentioned valve for interrupting the supply of liquid to said press and for actuating said timer, means actuated by said timer for effecting a positive partial return movement only of said plunger, holding the plunger in that position, and thereafter for advancing said cage to extend around said plunger and expel the pressed material, a limit switch actuated by said cage when said plunger is completely surrounded by the same, an electric circuit partly closed by said limit switch hydraulic means actuated by said circuit when completed to return said plunger and said cage to their initial positions, and a cam roller switch actuated concomitantly with the movement of said cage to complete said circuit when said cage completely surrounds said plunger.

2. A cage press having a movable plunger cooperating with a movable cylinder cage, said cage having an opening in the side thereof through which material to be pressed is admitted when said plunger and cage are in material-receiving position, electrical switch means actuated when a charge of material has been admitted to said cage, a valve actuated by said switch means to admit liquid to said press to advance the plunger, a pressure control valve responsive to the pressure of liquid in the press, a timer, means actuated by said last mentioned valve for interrupting the supply of liquid to said press and for actuating said timer, means actuated by said timer for effecting a partial return movement of said plunger and for advancing said cage to extend around said plunger, a cam roller switch actuated by said plunger to interrupt flow of liquid into and out of said press to hold said plunger in partly returned position, to permit a cake of material to drop out of said press, and electrically operated hydraulic means for returning said plunger and said cage to their initial positions.

3. A cage press of the type such as is employed in the pressure extraction of liquids from vegetable and other materials, which comprises a pressing cylinder and a press head spaced apart but fixed relatively to one another, a piston reciprocable in said cylinder endwise toward and from said press head, a tubular extraction cage open at both ends and telescoped over and sliding endwise on and supported by said piston, said cage having near its end portion nearest said cylinder an upwardly opening lateral port with a hopper leading thereto for delivering a charge of said material to be pressed for extraction of a liquid therefrom into said cage in advance of said piston when said piston is retracted and said cage abuts said head, means for causing an advance of said piston in said cylinder towards said press head, first across said port to close it and then to compress said material in said cage and against said head until a selected pressure is reached, means for positively causing a short and partial

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retraction of said piston sufficient for its free end to separate from said pressed material and to hold the piston positively and temporarily in said partially retracted position, means for then moving said cage along said partially retracted piston away from said press head until it fully uncovers said pressed material which is then free to drop by gravity, means for then causing a return of said cage on said piston into contact with said head, and means for causing a full retraction of said piston to uncover said cage port for introduction of a new charge of said material to be pressed through said port into said cage.

4. A cage press of the type such as is employed in the pressure extraction of liquids from vegetable and other materials, which comprises a press cylinder and a press head fixed apart a selected distance, a piston reciprocable in said cylinder endwise toward and from said head and extending from said cylinder nearly to said head when it is moved toward said head, an extraction cage having a bore open at opposite ends, sliding lengthwise along and fitting the outer end of said piston, with the piston entering one of said open ends, and with the opposite open end closed by said head when the cage abuts it, said cage having at its end portion nearest said cylinder, a laterally opening port through which a charge of said material to be pressed may be introduced into said bore of said cage in advance of said piston when said piston is fully retracted and said cage abuts said head, means for creating a pressure in said cylinder to cause an advance of said piston toward said head and first close said port and then compress said charge of material in said cage bore and against said head, means for causing a short and partial only retraction of said piston from its advanced pressing position until it separates from said pressed material, and positively holding it in that partially retracted position, means for then moving said cage along said partially retracted piston in a direction away from said head until it fully uncovers said pressed material which is then free for removal from between said piston and said head, and means for then causing full retraction of said piston and return of said cage against said head.

5. The press according to claim 4, and control means for all of said means for causing their individual operations in the sequence recited.

6. The press according to claim 5 wherein said control means includes pressure responsive means for stopping the pressing advance of said piston when a selected pressure has been reached.

7. The press according to claim 5 wherein said control means includes pressure responsive means for stopping the pressing advance of said piston when a selected pressure has been reached, and also includes timed means for maintaining the piston in its stopped position for a selected interval of time before its said partial retraction.

8. The press according to claim 5, wherein said control means includes means activated by the piston for determining the distance of such partial retraction.

9. The press according to claim 5, wherein the means for returning the cage to abut said head has a limit cam that activates the means for causing full retraction of said piston after the cage has returned to its position abutting said head.

10. The press according to claim 5, wherein the means for returning the cage to abut said head has a limit cam that activates the means for causing full retraction of said piston after the cage has returned to its position abutting said head, and also wherein timer means maintains said piston in its advanced position for a selected period in which liquid may drain from said pressed material.

11. A cage press of the type such as employed in the pressure extraction of liquid from vegetable and other materials, which comprises relatively fixed but spaced apart hydraulic cylinder and press head, a piston reciprocable in said cylinder endwise toward and from said head, an extraction cage having a bore open at both ends and telescopically fitting and sliding along the outer end of said

piston into and out of abutting contact with said head, with the head closing the end of said bore that is opposite from said piston, when the cage abuts said head, said cage having in its wall near its end toward said piston and in advance of the end of the retracted piston, a port through which material to be pressed may be introduced into said bore between said piston and said head, means for delivering fluid to said cylinder to cause an advance of said piston along the bore of said cage to first close said port and then compress said introduced material against said head, means responsive to such fluid pressure on said piston for stopping said advance when a selected pressure has been reached and maintaining that pressure for a selected time interval during which liquid may drain from said pressed material, means operable at the expiration of said time interval for causing partial only retraction of said piston until it separates from said pressed material, and positively holding it there temporarily, means effective after said partial retraction of said piston for moving said cage along said piston toward said cylinder until the pressed material is uncovered and can move laterally from between the cage and said head, and means for then causing return of said cage along said piston until it again abuts said head and for causing retraction of said piston into said cylinder until it uncovers said port, ready for introduction into said bore of a new charge of material to be pressed.

12. A cage press having a movable plunger cooperating with a movable cylinder cage, said cage having an opening through which material to be pressed is admitted when said plunger and cage are in material receiving position and which is closed by said plunger when the same is moved into position for compressing material in said cage, means for partly and positively moving said plunger back from its pressing position sufficiently to release the cake of compressed material and holding it in that position, means for then moving said cage in telescopic relation to said plunger to release said cake completely for discharge from the press when discharged by said plunger, time controlled means for controlling the movement of said plunger into pressing position, and said first named means comprising a mechanism actuated by a timer for partly and positively withdrawing said plunger from engagement with the resulting cake to release the cake for discharge from the press.

13. A cage press having a movable plunger cooperating with a movable cylinder cage, said cage having an opening through which material to be pressed is admitted when said plunger and cage are in material receiving position and which is closed by said plunger when the same

is moved into position for compressing material in said cage, means for partly and positively moving said plunger back from its pressing position sufficiently to release the cake of compressed material and holding it in that position, means for then moving said cage in telescopic relation to said plunger to release said cake completely for discharge from the press when discharged by said plunger, time controlled means for controlling the movement of said plunger into pressing position, said first named means comprising a timer mechanism actuated by a timer for partly and positively withdrawing said plunger from engagement with the resulting cake sufficiently to release the cake for discharge from the press and positively holding the plunger in that partly withdrawn position, a hydraulic mechanism which telescopes said cage about said plunger when said plunger is partly withdrawn, and a time controlled mechanism for returning said plunger and cage to their receiving positions.

14. A cage press having a movable plunger cooperating with a movable cylinder cage, said cage having an opening through which material to be pressed is admitted when said plunger and cage are in material receiving position and which is closed by said plunger when the same is moved into position for compressing material in said cage, means for partly and positively moving said plunger back from its pressing position sufficiently to release the cake of compressed material and holding it in that position, means for then moving said cage in telescopic relation to said plunger to release said cake completely for discharge from the press when discharged by said plunger, and time controlled means for controlling the movement of said plunger into pressing position, and said first named means comprising a time controlled mechanism for partly and positively withdrawing said plunger out of engagement with the cake after completion of the pressing operation and before the cake is moved into cake-releasing position.

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