May 8, 1956 F. KAMMER 2,744,462

STOP CONTROL FOR JAW CRUSHERS

Filed Oct. 29, 1952 5 Sheets-Sheet 1

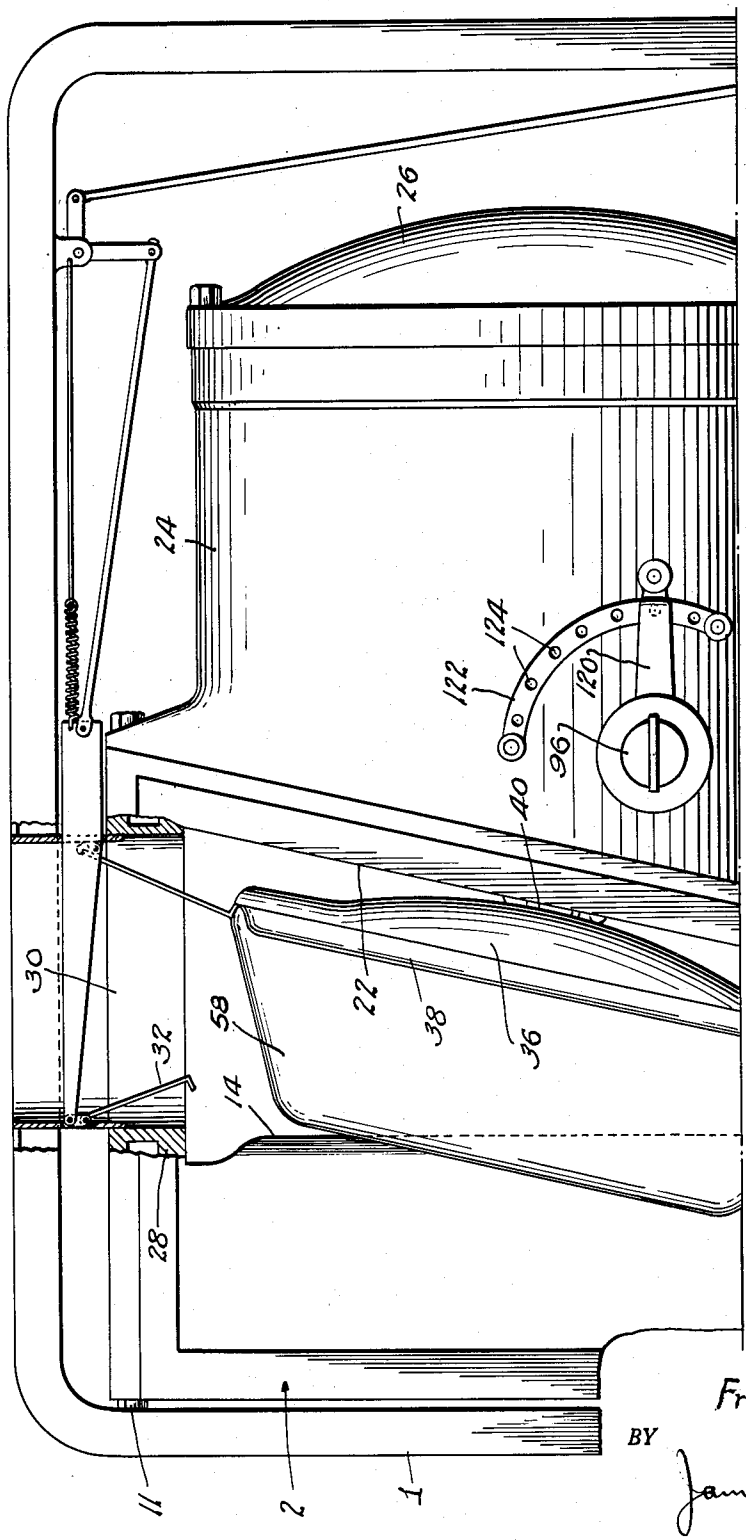


Fig. 1.

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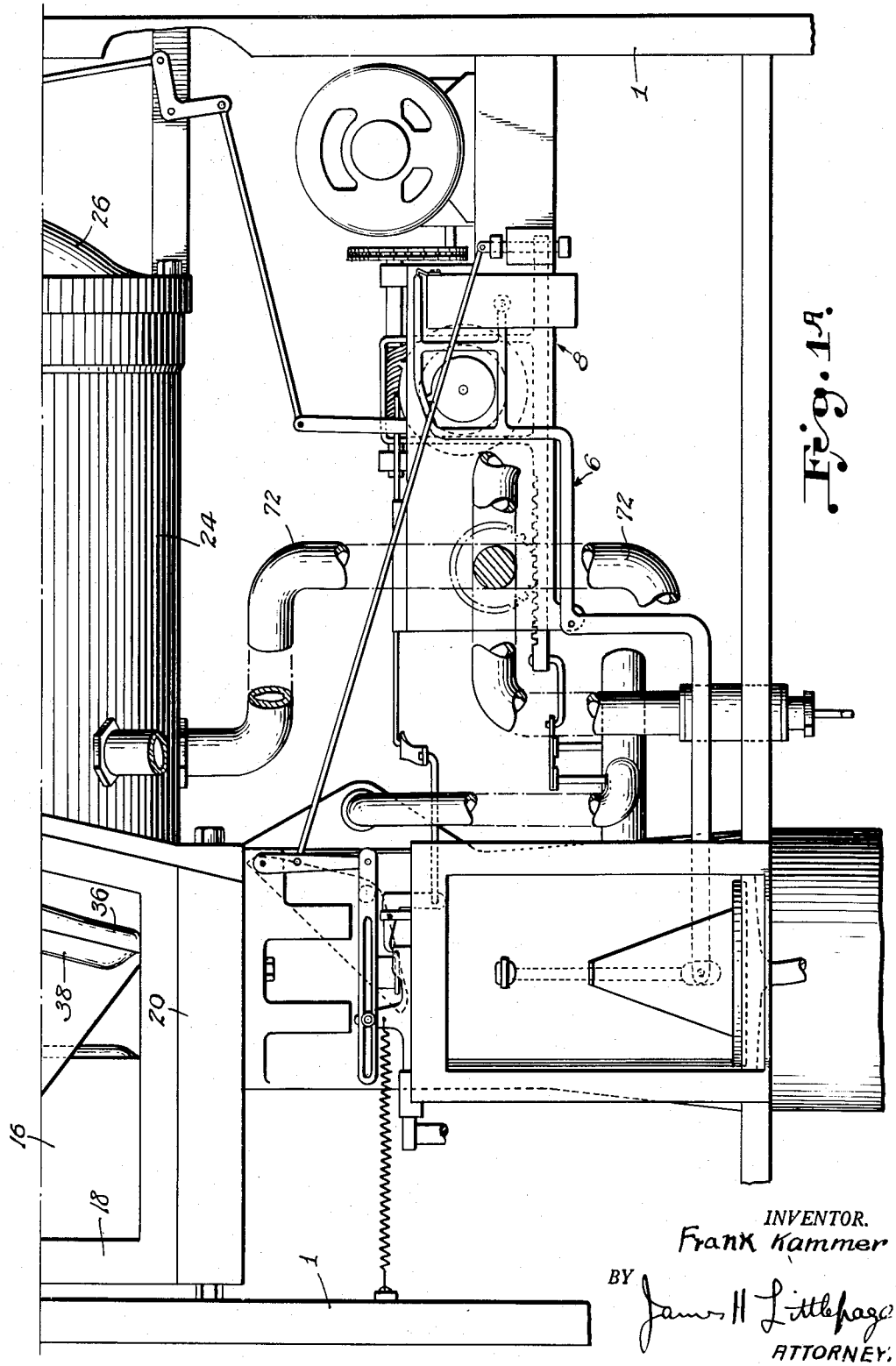


Fig. 1A.

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STOP CONTROL FOR JAW CRUSHERS

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Fig. 2.

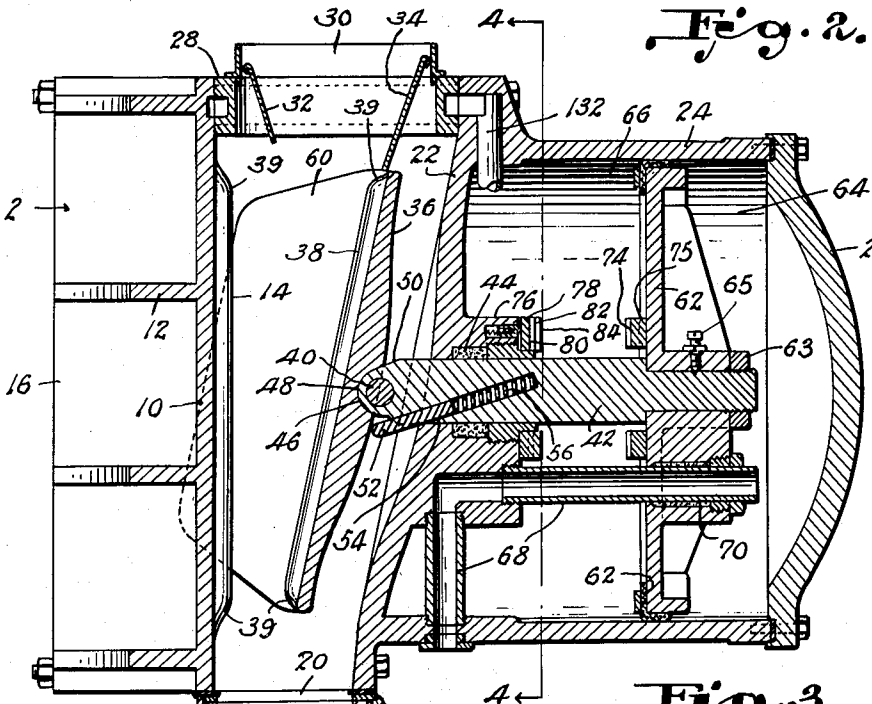


Fig. 3.

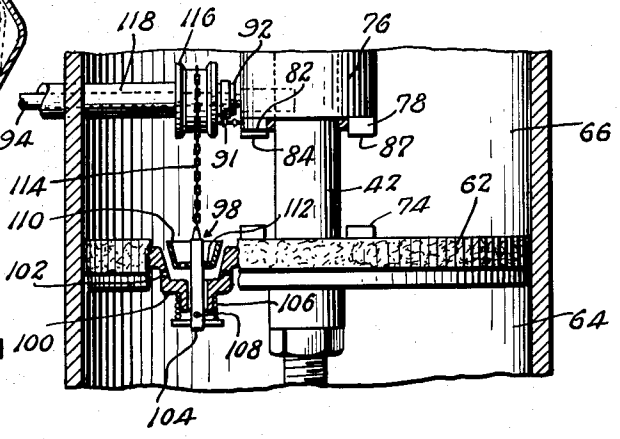
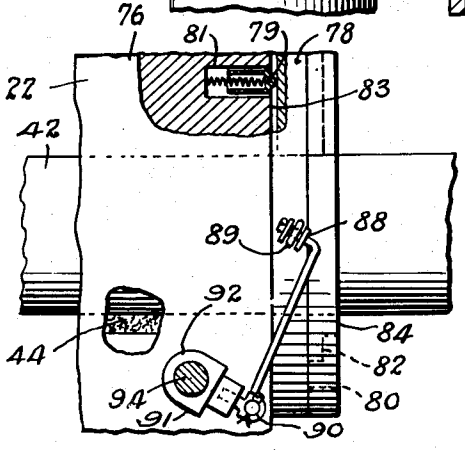


Fig. 6.



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STOP CONTROL FOR JAW CRUSHERS

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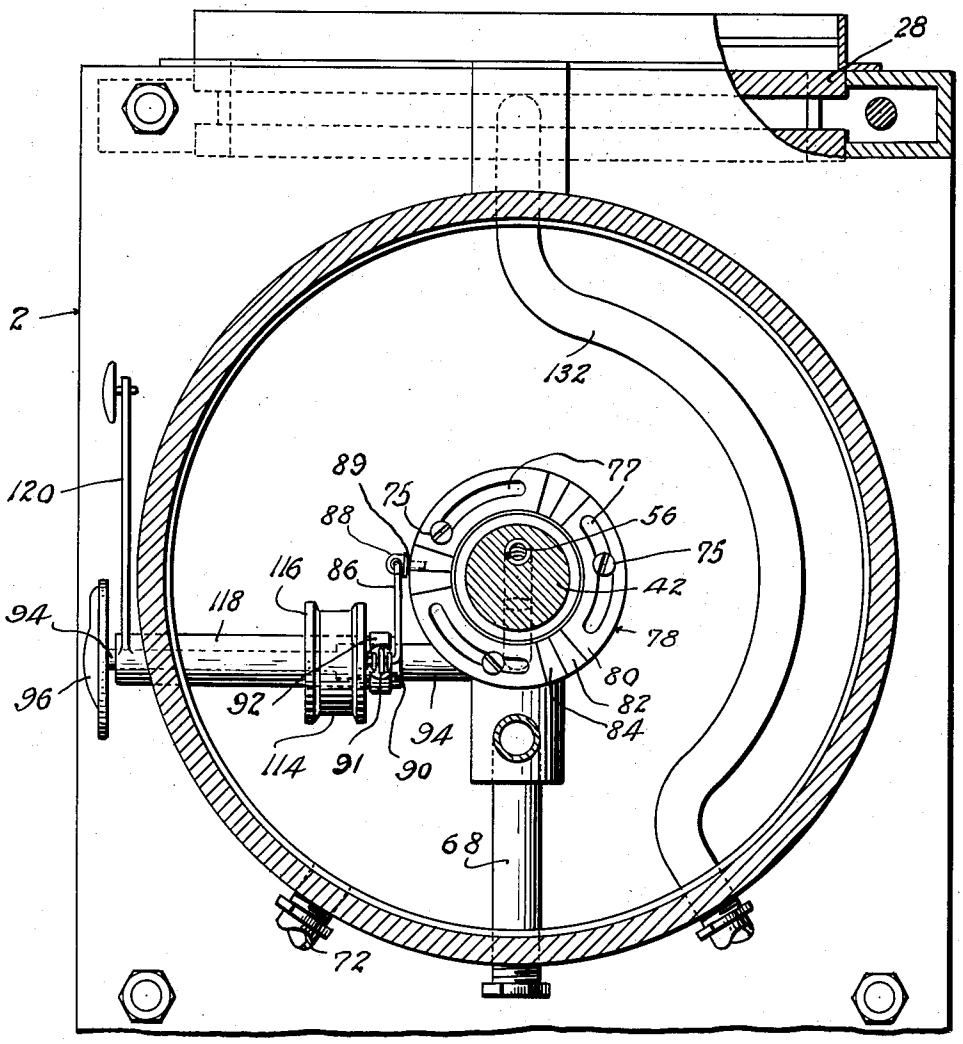


Fig. 4.

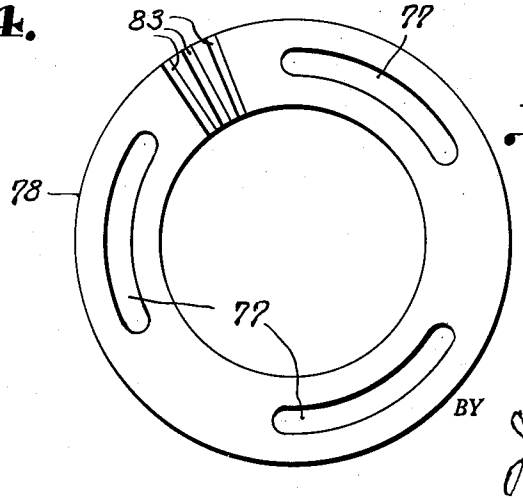


Fig. 5.

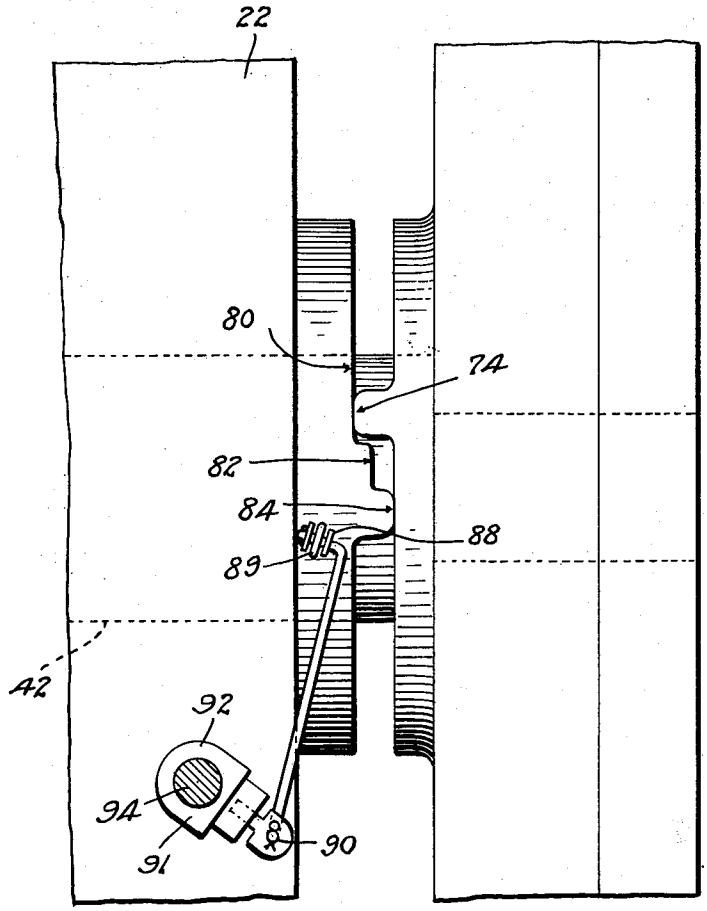
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Fig. 7.



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2,744,462

STOP CONTROL FOR JAW CRUSHERS

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Application October 29, 1952, Serial No. 317,410

10 Claims. (Cl. 100—215)

This invention relates to stop controls for jaw crushers and, particularly, to a mechanism for adjustably limiting the movements of a crusher jaw in a juice machine or the like apparatus. This application is a continuation-in-part of my co-pending application Serial No. 235,749, filed July 9, 1951, entitled Juice Machine.

The object of the invention is to provide for the crushing of fruits or vegetables of various size and various texture or consistency. In a jaw crusher type juice machine capable of operating on various fruits such as apples, oranges or grapefruit, for instance, it has been found that the crushing of an orange to the extent to which an apple should be crushed squeezes out the undesirable oils from the skin of the orange. In fact, the extent of desirable crushing varies according to the thickness of skin and the texture of different varieties of oranges. It is, therefore, intended to provide an adjustable limit control, or stop mechanism for a jaw crusher, the invention being particularly but not exclusively adaptable to machines operated by the ultimate consumer of the juice. It is therefore necessary that the operator be able to set the machine, by easily manipulatable control, to any one of a plurality of arbitrary limits of forward movements for the crushing jaw.

Another object of the invention is to provide for the adjustable limiting of the back-travel or opening movements of a jaw crusher. Where fruits or vegetables of various size are to be crushed it is proposed herein to provide for the limitation of the jaw opening generally in accordance with the size of the fruit to be crushed. In other words, when an apple is to be crushed the maximum opening the jaws should be not much greater than the maximum diameter of the apple, whereas, for grapefruit the opening should be much larger. Grouped with the same controls by which the forward or closing travel of a jaw is limited is, according to this invention, an additional control for limiting the backtravel of the jaw.

These and other objects will be apparent from the following specifications and drawings in which

Figs. 1 and 1A are a side elevation of the entire assembly;

Fig. 2 is a vertical section taken through the pressing head and showing the juice trap chamber partially broken away;

Fig. 3 is a fragmentary horizontal section showing the details of the piston and back travel and forward motion stop mechanisms;

Fig. 4 is a vertical transverse section taken along the line 4—4 of Fig. 2 looking in the direction of the arrows;

Fig. 5 is a rear view of the spacing control ring;

Fig. 6 is a detailed showing of the control and positioning mechanism; and,

Fig. 7 is a fragmentary view showing the forward stop control mechanism in one characteristic position in which maximum closure of the jaws is obtained.

General operation

Referring now to the drawings in which like reference numerals denote the same or substantially similar elements, the juice machine is supported in a fixed supporting frame 1 adapted to rest on a floor or other suitable mounting, the machine being comprised of four cooperating and inter-related units, namely, pressing head 2, distribution and delivery section 4, hydraulic control system 6, and mechanical control linkage 8. Broadly speaking, the function of the pressing head is to squeeze out the juice from a fruit, and the juice drains downwardly to the distribution and delivery section 4. During the juice-extracting operation of the pressing head, distribution and delivery section 4 directs the extract juice to a glass or similar receptacle. After the juice-extracting operation of pressing head 2, the hydraulic control system retracts the pressing head and the distribution and delivery section 4 is conditioned to direct the pulpy residue and forthcoming wash-water to a pulp-disposal unit. Thereupon the hydraulic control system directs wash-water so as to clean off the exposed portion of the pressing head and to flush out the distribution and delivery section 4. The complete cycle of operating is under the positive automatic actuation of mechanical control linkage indicated generally at 8, and the various operations of mechanical control linkage 8 are instituted by the consumer when he places a glass in juice-receiving position and again when he removes the filled glass. The power for operating the pressing head is obtained from a domestic water supply and the power for operating the mechanical control linkage is obtained from the domestic electrical supply system, the details of which are fully described in my co-pending application Serial No. 235,749.

Pressing head

Referring specifically to the pressing head 2, illustrated best in Figs. 1 and 2, inclusive, there is at one end a fixed jaw 10 secured by bolts 11 inside frame 1 at the upper lefthand portion of the assembly. The back of fixed jaw 10 is reinforced by webs 12 and on the front face are vertically running ribs 14 which form a corrugated working face. Rearwardly from the front and rear edges of fixed jaw 10 extend flared sides 16 terminating in forwardly hooked L flanges 18. Glass windows (not shown) are secured to flanges 18 and corresponding flanges around the crushing chamber are disposed on the front and rear sides.

At the lower portion of fixed jaw 10 there is a laterally disposed throat 20 spacing fixed jaw 10 from an upwardly inclined partition plate 22 rigid with frame 1 which forms one end member for a hydraulic cylinder 24, the latter having on its opposite end a removable head 26.

The upper portions of fixed jaw 10 and partition plate 22 are spaced by an annular washing manifold 28 disposed in registry with and immediately below an entrance passage 30 through which fruit may be dropped when pivoted doors 32, 34 are opened downwardly. Doors 32, 34 are open only when the machine is in readiness to commence an extracting cycle of operation, and immediately before extracting starts, the doors automatically close so as to protect the operator and to prevent outward squirting of extracted juice or, subsequently, to prevent outward splashing of wash-water.

Opposite fixed jaw 10 there is a horizontally movable jaw 36, also corrugated on its working face, with vertical ribs 38 interengaging between the vertical ribs 14 on the fixed jaw, it being apparent that the vertical ribs on both jaws not only extend the working surface but also provide vertical drainage for extracted juice, pulp, and wash-water. The ribs 14 and 38 are bevelled at their upper and lower ends as indicated at 39 to prevent liquid or pulp from hanging on.

Approximately at its center, movable jaw 36 is hori-

zontally pivoted by pin 40 to the free end of a piston rod 42, the latter sliding through a packed bearing 44 in plate 22. It is to be particularly noted in Fig. 2 that the back face of movable jaw 36 is provided with an arcuate socket 46 in which fits the arcuate end 48 of piston rod 42, and that the piston rod has a shoulder 50 engageable with the back face of movable jaw 36 to limit the clockwise pivoted movement of the movable jaw, the latter of which is biased clockwise by a cocking pin 52 sliding in an angular bore 54 in piston rod 42. Cocking pin 52 is spring pressed outwardly by an expansion spring 56 in the inner end of angular bore 54 so that when cocking pin 52 presses against the back face of movable jaw 36 below its pivot pin 40, the movable jaw is cocked clockwise until the juncture of its back face and arcuate socket 46 engages with shoulder 50 on piston rod 42. It is thus apparent that the clockwise cocking of movable jaw 36 swings its lower portion towards fixed jaw 10, thereby forming a wedge-shaped pocket so that fruit dropped through entrance passage 30 will lodge between the fixed and movable jaws. As will be seen, the extent of retraction of movable jaw 38 may be varied in accordance with the size of the fruit to be squeezed so that, with proper adjustment of the retracted position of movable jaw 38, fruit will lodge approximately between the upper and lower edges of the jaws. As seen in Figs. 1 and 2, transparent plastic side panels 58 and 60 are affixed to the front and rear vertical edges of movable jaw 36. The side panels flare outwardly so as to nest over the flared side 16 of fixed jaw 10 when the jaws are closed. Transparent plastic side panels 58 prevent lateral dislodgement of the fruit as it is squeezed and also prevent outward squirting of the juices while permitting full view of the squeezing and washing operations.

Referring particularly to Figs. 2 to 5, inclusive, piston rod 42 and, of course, movable jaw 38 are hydraulically driven by a piston 62 affixed by nut 63 on the inner end of the piston rod, the piston rod and piston being further held against relative rotation by a set screw 65. For purposes of explanation, the space between piston 62 and cylinder head 26 has been designated pressure stroke side 64, while the space between piston 62 and partition 22 is the return stroke side 66. Water from the hydraulic control system 6 is conducted to the pressure stroke side 64 of piston 62 by a water conduit 68, the free end portion of which slides in a packed aperture 70 through piston 62. For the return stroke side 66 of cylinder 24, there is a water conduit 72, which forms a part of hydraulic control system 6, it being apparent that piston 62 is driven to the left during its pressure stroke by water input through conduit 68 while water on the return stroke side 66 is being exhausted through conduit 72; during retraction of piston 62 and its attached parts, water under pressure is input through conduit 72 to return stroke side 66 while pressure stroke side 64 exhausts through conduit 68.

Stop controls

The structure detailed thus far has been disclosed and claimed in my co-pending application Serial No. 235,749. The subject invention is concerned with the piston stop control mechanism more fully detailed hereinafter.

In order to limit the extent to which movable jaw 36 may be driven towards fixed jaw 14 in accordance with the nature and consistency of the fruit being pressed, there are affixed annularly spaced forward stops 74 on a base ring 75 affixed on the forward face of piston 62 (Figs. 2 and 3). On a boss 76 integral with the rear side of partition 22 is rotatably supported a stop ring 78 having a base working surface 80 and angularly spaced sets of step stops 82 and 84 of respectively increasing height above base surface 80. Stop ring 78 is rotatably supported on the end of boss 76 by headed bolts 75, the shanks of which slidingly fit through arcuate slots 77 disposed at angularly spaced intervals through stop ring 78. The inner ends of headed bolts 75 are threadably supported in suitably tapped bores in the end of boss 76. From Fig. 7, it will be apparent that if stop ring 78 is adjusted so that its base surfaces 80 are laterally opposite stops 74 on piston 62, the latter will go forward on its pressure stroke to its fullest extent in which the working surface of movable jaw 36 is closely spaced from the working surface of fixed jaw 10; if stop ring 78 is turned so that step stops 82 are engaged by forward stop 74 on piston 62, the latter will travel forwardly a somewhat less maximum distance and forward travel of piston 62 can be further decreased by turning stop ring 78 so that stop steps 84 are engaged by forward stop 74 on piston 62. Stop ring 78 is yieldably restrained in the angular position to which it is set by a spring-pressed detent ball 79 supported in a bore 81 and boss 76 selectively engaging in apertures in stop ring 78. It will be apparent that apertures 83 are angularly spaced from one another according to the angular spacing between stop surfaces 80, 82 and 84 so that ring 78 is releasably restrained by detent 79 in any selected one of the three positions in which stop surfaces 80, 82 or 84 are directly forward and opposite stops 74 on the front of piston 62.

Stop ring 78 is angularly adjusted by a link 86 pivoted at 88 to an arm 89 extending outwardly from periphery of stop ring 78 and connected by pivot 90 to a stub crank arm 91 on a collar 92, the latter being an enlargement on a shaft 94 rotatably supported at its inner end on a suitable bearing in boss 76 and having its reduced outer end 94 extending externally of cylinder 24 and terminating in a control knob 96 (Figs. 2, 5 and 8). In order to limit the forward travel of movable jaw 36 to any one of the three extreme positions, control knob 96 may be turned to any one of three corresponding angular positions so as to render operative, as stop members, base surfaces 80, stop steps 82, or stop steps 84.

As detailed in Fig. 3 and in order to engage fruit of various size mid-way between fixed and movable jaws 10 and 36 respectively, there is provided a control mechanism for limiting the back travel of piston 62, thereby to adjust the maximum gap between fixed jaw 14 and the then-cocked movable jaw 38. A normally closed back-travel control valve indicated generally at 98 includes a cage 100 affixed in an aperture through piston 62 and provided with ports 102 extending laterally through the tapering cylindrical side wall of cage 100. Slidably supported in the base of cage 100, valve stem 104 is normally biased so that compression spring 106 engaging pin 108 on valve stem 104 biases the latter so that tapering cylindrical valve 110 normally seats in tapering cylindrical cage 100. Since the ports 112 extend through the base of valve 110 and since the ports 102 in cage 110 extend laterally through the side wall of the latter, no communication exists through ports 102 and 112 when valve 110 is closed and, because of the port arrangement, hydraulic pressure exerts no significant opening force on the valve. The normally closed valve 110 has attached to its stem 104 a chain 114 and when piston 62 retracts far enough, chain 114 becomes taut and cracks valve 110 off its seat in cage 100. Obviously, the effective length of chain 114 will determine the extent of back travel of piston 62 since, when valve 110 opens, both sides 64 and 66 of cylinder 24 are in direct communication with one another. Chain 114 is secured around a drum 116 and the latter is affixed on hollow shaft 118 rotatable around shaft 94 extending forwardly to the exterior of the machine to terminate in a control lever 120. The free end of the control lever rides over an arcuate strip 122 having angularly spaced stop holes 124 so that a projection (not shown) on the underside of control lever 120 snaps from hole to hole upon manual actuation. The angular disposition of control lever 120 determines the effective length of chain 114 and, in turn, governs the extent of back travel of piston 62 and movable jaw 38. Suitable

indicia may be provided on or adjacent arcuate strip **122** so that the operator may set the back-travel control lever **120** in accordance with the size of the fruit to be lodged between fixed and movable jaws **14** and **36** respectively.

The invention detailed above is not limited to the structure illustrated, but is intended to cover all modifications, substitutions and equivalents within the scope of the following claims:

I claim:

1. In a jaw crusher for fruit, vegetables, and the like products, a fixed frame support, a fixed jaw on said support, a movable jaw, said jaws having opposed working faces, a fluid motor for moving said movable jaw towards and away from the fixed jaw, said fluid motor including a cylinder fixed on said support and a piston connected to said movable jaw, a stop-engaging element rigid with said piston, an adjustable stop mechanism movably positioned within said cylinder, said stop mechanism having a plurality of stop elements selectably engageable in the path of movement of said stop-engaging element for limiting the closing movements of said movable jaw, said stop elements being of respectively different effective magnitude, whereby to provide respectively different gaps between said jaws, when the latter are closed to their fullest extent, and manually operable means extending exteriorly of said cylinder for selectively disposing said stop elements in the path of movement of said stop-engaging element so that the maximum closure of said jaws may be predetermined in accordance with the characteristics of the product.

2. In a jaw crusher for fruit, vegetables, and the like products, a fixed frame support, a first jaw on said support, a hydraulic cylinder fixed on said support, a piston in said cylinder, a piston rod connected to said piston and having a free end slidably projecting through an end of said cylinder to the exterior thereof, a second jaw on the free end of said piston rod, said jaws having opposed working faces, means for introducing pressure fluid into said cylinder whereby to move said movable jaw towards and away from the fixed jaw, a stop-engaging element rigidly connected to said piston, an adjustable stop mechanism movably mounted on said cylinder on the inner side of said end thereof, said stop mechanism having a plurality of stop elements selectably engageable in the path of movement of said stop-engaging element for limiting the closing movements of said movable jaw, said stop elements being of respectively different effective magnitude, whereby to provide respectively different gaps between said jaws, when the latter are closed to their fullest extent, and manually operable means for selectively disposing said stop elements in the path of movement of said stop-engaging element so that the maximum closure of said jaws may be predetermined in accordance with the characteristics of the product.

3. In a jaw crusher for fruit, vegetables, and the like products, a fixed frame support, a fixed jaw and a movable jaw on said support, said jaws having opposed working faces, fluid motor means for moving said movable jaw towards and away from the fixed jaw, said fluid motor means comprising a cylinder affixed on said support, a piston axially movable in said cylinder and a piston rod connected to cylinder, said cylinder having an end wall with a hollow bearing therein, said piston rod having a free end extending exteriorly of said cylinder through said bearing with said movable jaw supported on said free end, a stop-engaging element rigid with said movable piston, an adjustable stop mechanism movably mounted on the inner side of said bearing, said stop mechanism having a plurality of stop elements selectably engageable in the path of movement of said stop-engaging element for limiting the closing movements of said movable jaw, said stop elements being of respectively different thickness in the axial dimension of said cylinder, whereby to provide respectively different gaps between said jaws when the latter are closed to their fullest extent, and manually operable means extending exteriorly of said cylinder for selectively disposing said stop elements in the path of movement of said stop-engaging element so that the maximum closure of said jaws may be predetermined in accordance with the characteristics of the product.

4. The combination claimed in claim 3, said stop-engaging element comprising a plurality of abutments on said piston angularly spaced about said piston rod, said stop elements being affixed on a ring rotatably mounted on the inner end of said bearing surrounding said piston rod and being in sets angularly spaced from one another in correspondence with the angular spacing between said abutments.

5. The combination claimed in claim 4, said manually operable means including a rod having an inner end rotatably supported in the side of said bearing and an outer end projecting radially outward through the wall of said cylinder, crank arms respectively on said ring and rod, a link connecting said crank arm, and a knob on the outer end of said rod.

6. In a jaw crusher, fixed jaw, a cylinder, a piston reciprocable in said cylinder, a piston rod connected to said piston and having a free end extending exteriorly of said cylinder through an end thereof, a movable jaw on the free end of said piston rod, fluid conduits connected respectively to opposite ends of said cylinder for introducing fluid under pressure thereto so as to drive said piston on pressure and return strokes, means for predetermining the extent of said strokes comprising a plurality of stop elements of respectively different effective magnitudes movably supported on one end of said cylinder, stop-engaging means rigid with said piston and moving therewith, means for selectively disposing said stop elements in the path of movement of said stop-engaging means, whereby to stop said piston after predetermined travel in one direction, said piston having a passage therethrough from one side to the other, a normally closed spring-biased valve in said passage, and adjustable means for opening said valve upon predetermined travel of said piston in the other direction.

7. The combination claimed in claim 6, said adjustable means comprising a flexible member having an end connected to said valve, the other end of said flexible member being wound around a drum, a rotatable shaft supporting said drum within adjacent one end of said cylinder, said shaft extending exteriorly of said cylinder, and a manually controlled element on the outer end of said shaft.

8. In a jaw crusher, a vertically disposed, fixed jaw, a horizontal cylinder, a horizontal piston reciprocable in said cylinder, a horizontal piston rod connected to said piston and having a free end extending towards the fixed jaw and exteriorly of said cylinder through an end thereof, a movable jaw disposed generally opposite the fixed jaw, a horizontal pivot mounting the movable jaw on the free end of said piston rod, a spring connected between the free end of the piston rod and said movable jaw, and normally biasing the latter to rock about said horizontal pivot so as to dispose the lower portion of the movable jaw relatively towards the fixed jaw and the upper portion of the movable jaw relatively away from the fixed jaw, a pair of substantially vertically disposed transparent shields respectively disposed forwardly thereof whereby to bracket the fixed jaw during at least the closing movements of the movable jaw, fluid conduits connected respectively to opposite ends of said cylinder for introducing fluid under pressure thereto so as to drive said piston, piston rod and movable jaw on pressure and return strokes respectively towards and away from the fixed jaw, means for predetermining the extent of said strokes comprising a plurality of stop elements of respectively different effective magnitudes movably supported on one end of said cylinder, stop-engaging means rigid

with said piston and moving therewith, means for selectively disposing said stop elements in the path of movement of said stop-engaging means, whereby to stop said piston after predetermined travel in one direction, said piston having a passage therethrough from one side to the other, a normally closed spring-biased valve in said passage, and adjustable means for opening said valve upon predetermined travel of said piston in the other direction.

9. In a jaw crusher for fruit, vegetables, and the like products, a fixed jaw and a movable jaw having substantially vertically disposed opposed working faces, support means for said jaws, means for selectively closing and retracting one of said jaws laterally along a substantially horizontal path towards and away from the other, respectively, horizontal pivot means mounting one of said jaws above its lower end on its support means, the last named jaw pivoting on said horizontal pivot means about a substantially horizontal axis transverse to said path, yieldable bias means engaged between the last-named jaw and its support means and biasing the last-said jaw to rock about its pivot means so that the lower part thereof swings towards the opposite jaw when the jaws are open whereby to hold the product therebetween, adjustable means for limiting the retractive movements of said movable jaw whereby selectively to vary the maximum gap between said jaws, and entrance passage means above said jaws for feeding said product therebetween.

10. In a crushing machine, a pair of jaws having opposed working faces, support means for supporting said

jaws with their working faces substantially vertically disposed, means for moving at least one of the jaws laterally along a substantially horizontal path towards and away from the other to close and open the same, horizontal pivot means mounting one of said jaws above its lower end on its support means the last-named jaw pivoting on said horizontal pivot means about a substantially horizontal axis transverse to said path, a biasing spring engaged between the last-named jaw and its support means and normally tending to rock the last said jaw about the pivot means so that when the lower part thereof swings towards the opposite jaw when the jaws are open, whereby to hold work dropped between said jaws, and means disposed above said jaws for dropping work therebetween.

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