

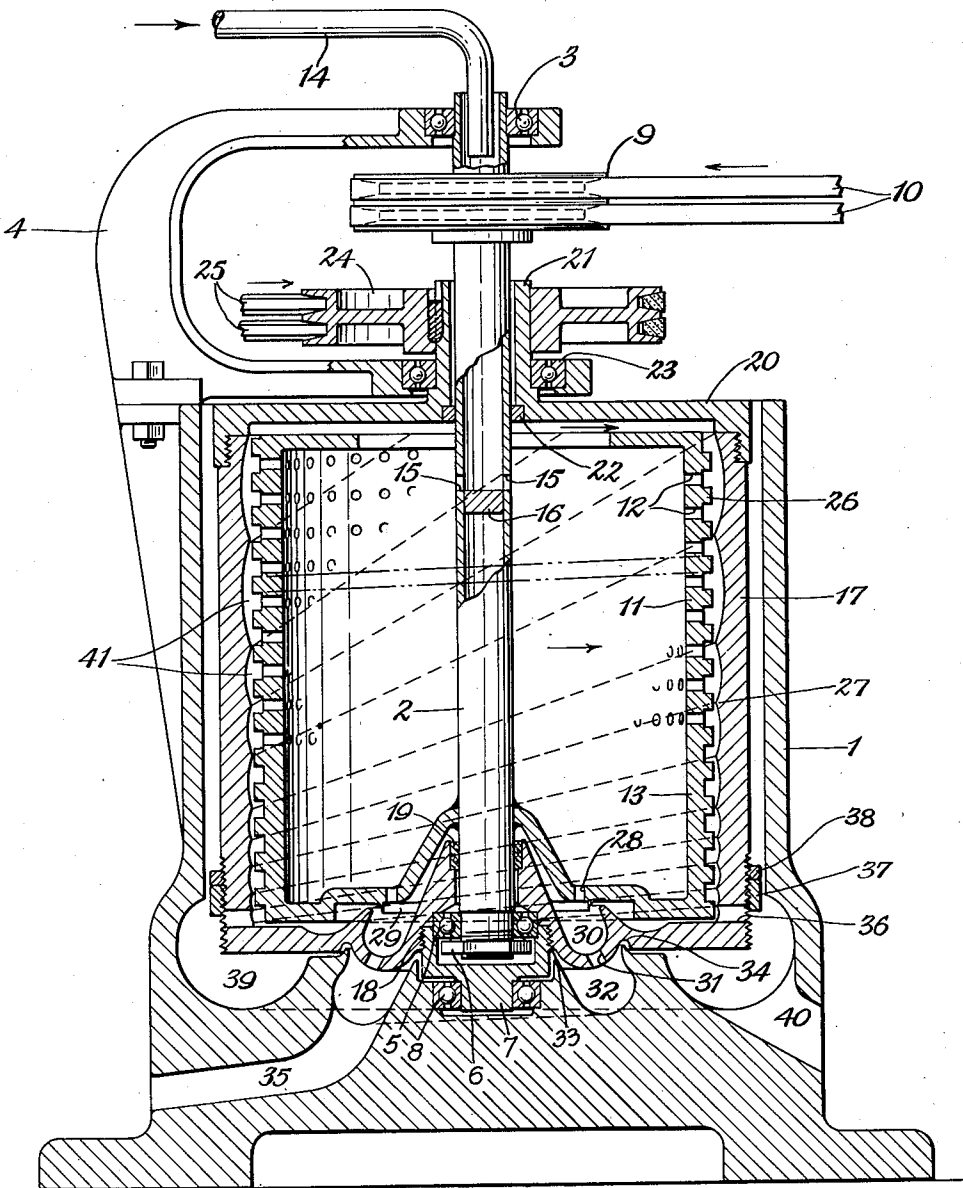
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CONTINUOUS EXTRACTOR

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CONTINUOUS EXTRACTOR

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This invention relates to continuous extractors, and more particularly to an extractor for continuously extracting juice from grapes and the like.

The principal object of the present invention is to provide an extractor into which material from which the contained liquid is to be extracted, such as grapes or grape mash, can be introduced in a constant flow and which separates the grape juice from the pulp as a continuous operation.

Another object is to provide such an extractor which separates juice from the pulp by first impacting the mash and thereafter gently but with progressively increased force pressing the pulp so as to express the remaining juice contained therein.

Another object is to provide such an extractor with means for controlling or varying the extent or degree of extraction of the juice from the pulp.

Another object is to provide such an extractor with means for continuously and separately removing the extracted juice and pulp from the extractor.

Other objects are to provide such an extractor which is compact, sturdy and simple in construction, not liable to get out of order, easy to keep clean and maintain, and inexpensive to manufacture.

The accompanying drawing is a vertical, central section through the continuous extractor forming the subject of the present invention.

The numeral 1 represents a generally cylindrical frame or housing which is open at its upper end and closed at its lower end, except as more fully described hereinafter, the base of this housing being provided with feet which rest upon any suitable supporting surface. A hollow shaft 2 is journaled at its lower end in the bottom of the housing 1, and its upper end is supported by a bearing 3 mounted on an arm of a bracket 4 which may be secured to the housing 1 in any suitable manner. The means shown for journaling the lower end of the shaft 2 in the bottom of the housing 1 include a bearing 5 arranged on a slightly reduced end extension of the shaft 2, a nut 6 screwed on the extreme threaded end portion of the reduced shaft end and thus holding the bearing in position on the shaft, a cup-shaped journal member 7 supporting the bearing 5, and a bearing 8 in turn supporting the member 7 and being mounted in a central recess provided in the bottom of the housing 1. The shaft 2 is shown as being rotated by a pulley 9 fast to the shaft and belts 10 driven by a power source (not

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shown), although any other suitable driving means may be employed.

Fast to the lower end of the shaft 2 is an inner basket or cylinder 11 having a series of radial holes 12 arranged in the upper part thereof, the lower part 13, however, of the cylinder 11 being unprovided with such holes. The grapes or grape-mash are introduced into the upper end of the shaft 2 from a supply pipe 14 and flow into the inner cylinder 11 through holes 15 provided in the shaft 2. A plug 16 is arranged in the shaft 2 immediately below the holes 15 to prevent the lower portion of the hollow shaft from becoming plugged with mash.

An outer basket or cylinder 17, the upper portion of which is imperforate, encloses the inner cylinder 11 in spaced relation thereto and is arranged inside the housing 1. This outer cylinder is journaled on the lower end of shaft 2 by being threadedly secured to the journal member 7, as indicated at 18. A seal 19 is interposed between the central bore provided in the bottom of the outer cylinder 17 and the shaft 2.

The upper, open end of the outer cylinder 17 is covered by a cover plate 20 having an internally threaded depending rim which screws on the external threads provided on the upper end of the outer cylinder 17. The cover 20 has an upwardly extending neck 21 which surrounds a portion of the shaft 2 in slightly spaced relation thereto; a seal 22 being interposed between the cover 20 and the shaft 2. The cover 20 is journaled on an arm of the bracket 4 by means of the bearing 23 carried thereby. The cover 20 and outer cylinder 17 are rotated by means of a pulley 24, keyed, as shown, to the neck 21 of the cover and belts 25 which are operatively connected to any suitable power source (not shown), although any other suitable driving means may be employed. The inner and outer cylinders, 11 and 17, respectively, are caused to rotate in the same direction in a manner hereinafter described and as shown by the arrows on the drawing.

The exterior of the inner cylinder 11 is formed to provide a thread 26 which is shown as being rectangular in cross-section and of uniform pitch throughout its entire axial length. Opposing the thread 26 and formed on the inner periphery of the outer cylinder 17 is a thread 27. This thread 27 is shown as having ridges separated by grooves of concave form in cross-section and has a pitch which progressively decreases from the top of the outer cylinder 17 toward the bottom thereof, this thread also progressively decreasing in depth toward the bottom of the outer cylinder.

The lands of the thread 26 and ridges of the thread 27 may be so arranged as either to contact each other or have a small amount of radial clearance.

The bottom of the inner cylinder 11 is provided with a series of vertical holes 28 arranged in a circular ring concentric with the axis of the shaft 2. An annular splash guard 29 depends from the underside of the bottom of the inner cylinder 11 and surrounds the holes 28. An annular trough 30 is provided in the bottom of the outer cylinder 17 immediately below the ring of holes 28, the outer wall of the trough 30 extending upwardly and inwardly so that its top edge extends upwardly slightly beyond the lower edge of the splash guard 29. A series of circumferentially spaced holes 31 are provided in the bottom of the trough 30. The holes 31 are shown as having their axes extending upwardly and inwardly. The base portion of the housing 1 is provided with an annular trough 32 arranged below the outlet holes 31 of the trough 30, the side walls of the trough 32 extending upwardly and inwardly into grooves provided in the underside of the bottom of the outer cylinder 17, as indicated at 33 and 34. The bottom wall of the annular trough 32 is inclined downwardly toward an outlet passageway 35 provided in one side of the housing 1.

A plurality of circumferentially spaced radial holes or openings 36 are provided in the side wall of the outer cylinder 17 immediately adjacent the floor thereof. The total effective area of all the openings 36 is made variable and can be regulated by adjustment of the ring 37 which has internal threads engaging the threads provided on the lower portion of the outer cylinder 17. A locking ring 38 is arranged immediately above the ring 37 and also is in threaded engagement with the outer cylinder 17. The locking ring 38 by being screwed down tight against the ring 37 serves to hold the ring 37 in the desired adjusted position.

A trough 39 is provided in the housing 1 below the holes 36, the floor of this trough inclining downwardly toward an outlet 40 provided in one side of the housing 1.

In operation of the continuous extractor, the inner and outer cylinders 11 and 17, respectively, are rotated in the same direction, and as shown in the drawing would be rotated in a clockwise direction as viewed from the top and as shown by the arrows in the drawing. For example, but in no sense with the intention of being limited to these speeds, the inner cylinder 11 is rotated at a speed of 4000 revolutions per minute while the outer cylinder 17 is rotated in the same direction at a speed of 3520 revolutions per minute. A speed differential of 480 revolutions per minute thus exists and there will be a relative motion of the inner cylinder 11 in a clockwise direction of 480 revolutions per minute with respect to the outer cylinder 17.

The inner cylinder 11 is driven by the hollow shaft 2 to which it is secured and the shaft in turn is driven by the pulley 9 and belts 10. Thus, grapes or grape mash introduced through the pipe 14 are thrown radially outwardly through the holes 15 in the shaft 2 against the inside of the perforated upper portion of the inner cylinder 11. The impact of the grapes or grape mash against the wall of the inner cylinder will effect the initial separation of the juice from the pulp, the juice running down the inside of the inner cylinder and collecting in the bottom portion of the cylinder, the side wall of this bottom portion being imperforate. In the case of whole grapes, the im-

pact against the wall of the inner cylinder 11 will cause the grape skins to rupture and free some of the juice contained within the grape.

Because of centrifugal force acting upon the grape mash, the mash will be forced to pass through the openings 12 into the spaces 41 between the inner and outer cylinders 11 and 17, respectively. Inasmuch as the inner cylinder 11 rotates relatively to the outer cylinder 17 and further in view of the arrangement of the threads 26 and 27, the mash will be moved downwardly by the joint action of these threads. As pointed out hereinabove, the thread 27 progressively decreases in pitch and depth from the top of the outer cylinder 17 toward the bottom thereof and therefore the mash will be gradually and gently pressed more and more as it progresses downwardly in the spaces 41 so as to express more and more juice. The juice so expressed in the spaces 41 will be forced to flow radially inwardly through the openings 12 into the inner cylinder 11 and downwardly therein to be collected in the bottom of the cylinder. It is pointed out that when the spaces 41 are filled with mash there is no escape for the juice expressed therefrom except back through the openings 12. Opposite the lower unperforated side wall portion of the inner cylinder 11 the semi-treated mash is in its final stages of being squeezed or pressed and the juice so expressed will work upwardly in the spaces 41 and thence radially inwardly through the openings 12 to the interior of the inner cylinder 11. This backward flow of juice is due to the fact that the mash moving downwardly past the unperforated side wall portion 13 of the inner cylinder 11 is progressively being compacted to a greater degree by the coacting threads 26 and 27 and hence the mash at the openings 36 is so compacted as to block the flow of juice through these openings and which can therefore only flow upwardly or countercurrent to the movement of the mash.

The degree of dryness of the pulp or the extent of juice expression can be varied as desired and is regulated by the position of the ring 37. As shown, this ring overlaps a portion of the holes 36. By screwing the ring 37 farther down on the outer cylinder 17 the total effective area of the holes 36 will be less and this more restricted opening thus produced will more greatly impede the extrusion of the pulp from the spaces 41 and more juice will be expressed therefrom. On the other hand, by screwing the ring 37 in the opposite direction, the ring will not obstruct the holes 36 so much and treated pulp will be permitted to more easily pass through the holes. The amount of closing off of the holes 36, determined by the position of the ring 37, determines the dryness of the pulp, and the ring 37 can be readily adjusted to the desired position. The locking ring 38 is loosened before the ring 37 is adjusted and then tightened down against the ring 37 so as to hold it in its desired adjusted position.

The treated pulp expelled through the holes 36 is collected in the annular trough 39 and can be removed therefrom through the outlet 40.

The juice collected in the bottom of the inner cylinder 11 flows through the openings 28 provided therein and is caught in the annular trough 30 provided in the outer cylinder 17. The juice then flows through the openings 31 in the bottom of the trough 30 into the annular trough 32 provided in the housing 1 and drained from the trough 32 through the outlet passageway 35.

From the foregoing it will be seen that the pres-

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ent invention provides a continuous juice extractor which separates the juice from grapes and like material by first impacting the mash and thereafter gently but with progressively increased force pressing the remaining pulp so as to express the residual juice contained in the pulp. Further, the degree of dryness of the pulp after treatment can be regulated as desired and the treated pulp can be continuously removed from the extractor as well as the juice separated therefrom. Also, the extractor has the advantages of compactness, strength, simplicity, dependability, ease of cleaning and maintenance, and inexpensive manufacture.

I claim

1. A continuous extractor comprising a frame, a hollow shaft journaled on said frame and having openings, a cylinder mounted on said shaft and having openings in the side thereof opposite from said shaft openings but in spaced relation thereto, an outer cylinder surrounding said first cylinder and being journaled on said shaft, means for rotating said shaft, means for rotating said outer cylinder relative to said first cylinder, means for introducing material to be treated into said hollow shaft, said material being conducted through said shaft openings and through said openings in said first mentioned cylinder, thread means arranged on the opposing peripheral surfaces of the cylinders for compressing said material, and means for removing the liquid separated from said material.

2. A continuous extractor comprising a frame, a hollow shaft journaled on said frame and having openings, a cylinder mounted on said shaft and having openings in the side thereof opposite from said shaft openings but in spaced relation thereto, an outer cylinder surrounding said first cylinder and being journaled on said shaft, means for rotating said shaft, means for rotating said outer cylinder relative to said first cylinder, means for introducing material to be treated into said hollow shaft, said material being conducted through said shaft openings and through said openings in said first mentioned cylinder, thread means arranged on the opposing peripheral surfaces of the cylinders for compressing said material, means for continuously removing the liquid separated from said material, and means for separately and continuously removing the residue of said treated material.

3. A continuous extractor comprising inner and outer cylinders rotatable about a common axis, means for rotating one cylinder relative to the other, means for introducing material to be treated into the space between said cylinders, means arranged on the opposing peripheral surfaces of said cylinders for moving said material toward one end of said cylinders and progressively compressing said material thereby to express the liquid from said material, said outer cylinder being provided with an outlet for the residue of said treated material and means arranged adjacent the end of said outer cylinder toward which said material is moved for changing the size of said outlet, means for collecting and removing the said residue discharged through said outlet, and means for removing the liquid separated from said material.

4. A continuous extractor comprising an inner cylinder rotatable about a vertical axis and having openings in its upper part and having an imperforate portion in its lower part, an outer cylinder surrounding said inner cylinder and rotatable about said vertical axis and having an

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imperforate portion surrounding said upper and lower parts of said inner cylinder, means for rotating said cylinders in the same direction but at different speeds, means for impacting material to be treated against said upper part of said inner cylinder thereby to express some of the liquid contained in the material, the extracted liquid remaining in said inner cylinder and collecting in the said imperforate portion of the lower part thereof and the balance of the partially treated material passing through said openings due to the action of centrifugal force thereon into the annular space between said inner and outer cylinders, means arranged in said space for compressing said partially treated material, the liquid expressed from said partially treated material by such compression flowing into said inner cylinder through said openings therein, means for continuously discharging the liquid from said inner cylinder, and means for continuously discharging the residue of said treated material from said space.

5. A continuous extractor comprising an inner cylinder rotatable about a vertical axis and having openings in its upper part and having an imperforate portion in its lower part, an outer cylinder surrounding said inner cylinder and rotatable about said vertical axis and having an imperforate portion surrounding said upper and lower parts of said inner cylinder, means for rotating said cylinders in the same direction but at different speeds, means for impacting material to be treated against said upper part of said inner cylinder thereby to express some of the liquid contained in the material, the extracted liquid remaining in said inner cylinder and collecting in the said imperforate portion of the lower part thereof and the balance of the partially treated material passing through said openings due to the action of centrifugal force thereon into the annular space between said inner and outer cylinders, an external thread arranged on said inner cylinder, an internal thread arranged on said outer cylinder, said threads having their respective pitches and depths so arranged as to move said partially treated material downwardly through said space and progressively compress said partially treated material, the liquid expressed from said partially treated material by such compression flowing into said inner cylinder through said openings therein, and means for continuously discharging the liquid from said inner cylinder, the lower part of said outer cylinder having an outlet leading from said space and through which the residue of the treated material is continuously discharged.

6. A continuous extractor comprising an inner cylinder rotatable about a vertical axis and having openings in its upper part and having an imperforate portion in its lower part, an outer cylinder surrounding said inner cylinder and rotatable about said vertical axis and having an imperforate portion surrounding said upper and lower parts of said inner cylinder, means for rotating said cylinders in the same direction but at different speeds, means for impacting material to be treated against said upper part of said inner cylinder thereby to express some of the liquid contained in the material, the extracted liquid remaining in said inner cylinder and collecting in the said imperforate portion of the lower part thereof and the balance of the partially treated material passing through said openings due to the action of centrifugal force thereon into the annular space between said inner and outer cyl-

inders, an external thread arranged on said inner cylinder, an internal thread arranged on said outer cylinder, said threads having their respective pitches and depths so arranged as to move said partially treated material downwardly through said space and progressively compress said partially treated material, the liquid expressed from said partially treated material by such compression flowing into said inner cylinder through said openings therein, means for continuously discharging the liquid from said inner cylinder, and adjustable outlet means arranged adjacent the lower end of said outer cylinder for continuously discharging the residue of the treated material from said space.

7. A continuous extractor comprising a housing having a trough in the base thereof and an outlet leading from said trough, an inner cylinder journaled in said housing so as to rotate about a vertical axis and having openings in the bottom thereof, an outer cylinder surrounding said inner cylinder on the side and bottom thereof and journaled in said housing so as to rotate about said vertical axis and having a trough in the bottom thereof and openings in the bottom of this trough, means for rotating one of said cylinders relative to the other, means for introducing material to be treated into the annular space between said cylinders, means for compressing said material in said space, and means for permitting the liquid expressed from said material to enter said inner cylinder, the liquid in said inner cylinder being continuously discharged therefrom through said first mentioned openings into said second mentioned trough, and through said second mentioned openings into said first mentioned trough from which it is discharged through said outlet.

8. A continuous extractor comprising a housing including a base having inner and outer troughs and an outlet for each trough, an inner cylinder journaled in said housing so as to rotate about a vertical axis and having openings in the bottom thereof, an outer cylinder surrounding said inner cylinder on the side and bottom thereof and journaled in said housing so as to rotate about said vertical axis and having a trough in the bottom thereof arranged below said inner cylinder openings, said outer cylinder trough having openings in the bottom thereof, said inner trough in said housing being arranged below said last mentioned openings, means for rotating one of said cylinders relative to the other, means for introducing material to be treated into the annular space between said cylinders, means for compressing said material in said space, and means for permitting the liquid expressed from said material to enter said inner cylinder, the liquid in said inner cylinder being continuously discharged therefrom through said inner cylinder openings into said outer cylinder trough, through said outer cylinder trough openings into said inner trough from which it is discharged through said inner trough outlet, said outer cylinder having openings connecting said space with said outer trough whereby the residue of the treated material is continuously discharged from said space through said outer cylinder openings into said outer trough and thence through said outer trough outlet.

9. A continuous extractor comprising a housing including a base having inner and outer troughs and an outlet for each trough, an inner cylinder journaled in said housing so as to rotate about a vertical axis and having openings in the bottom

thereof, an outer cylinder surrounding said inner cylinder on the side and bottom thereof and journaled in said housing so as to rotate about said vertical axis and having a trough in the bottom thereof arranged below said inner cylinder openings, said outer cylinder trough having openings in the bottom thereof, said inner trough in said housing being arranged below said last mentioned openings, means for rotating one of said cylinders relative to the other, means for introducing material to be treated into the annular space between said cylinders, means for compressing said material in said space, means for permitting the liquid expressed from said material to enter said inner cylinder, the liquid in said inner cylinder being continuously discharged therefrom through said inner cylinder openings into said outer cylinder trough, through said outer cylinder trough openings into said inner trough from which it is discharged through said inner trough outlet, said outer cylinder having openings connecting said space with said outer trough whereby the residue of the treated material is continuously discharged from said space through said outer cylinder openings into said outer trough and thence through said outer trough outlet, and means for regulating the size of said outer cylinder openings so as to control the dryness of the residue of the treated material.

10. A continuous extractor, comprising an inner cylinder rotatable about a vertical axis, an outer cylinder surrounding said inner cylinder in spaced relation thereto and rotatable about said vertical axis, means for rotating said cylinders in the same direction but at different speeds, means arranged to admit the material to be treated into said inner cylinder to be acted upon by centrifugal force and to be impacted against the inner cylinder thereby to express some of the liquid contained in said material, conducting means arranged for movement of the balance of the partially treated material from the interior of said inner cylinder into the annular space between said inner and outer cylinders, means arranged in said space for compressing said partially treated material, said conducting means permitting the liquid expressed from said partially treated material by such compression to flow from said annular space counter-current to the movement of said partly treated material into said inner cylinder, means for continuously discharging the liquid from said inner cylinder, and means for continuously discharging the residue of said treated material from said annular space.

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