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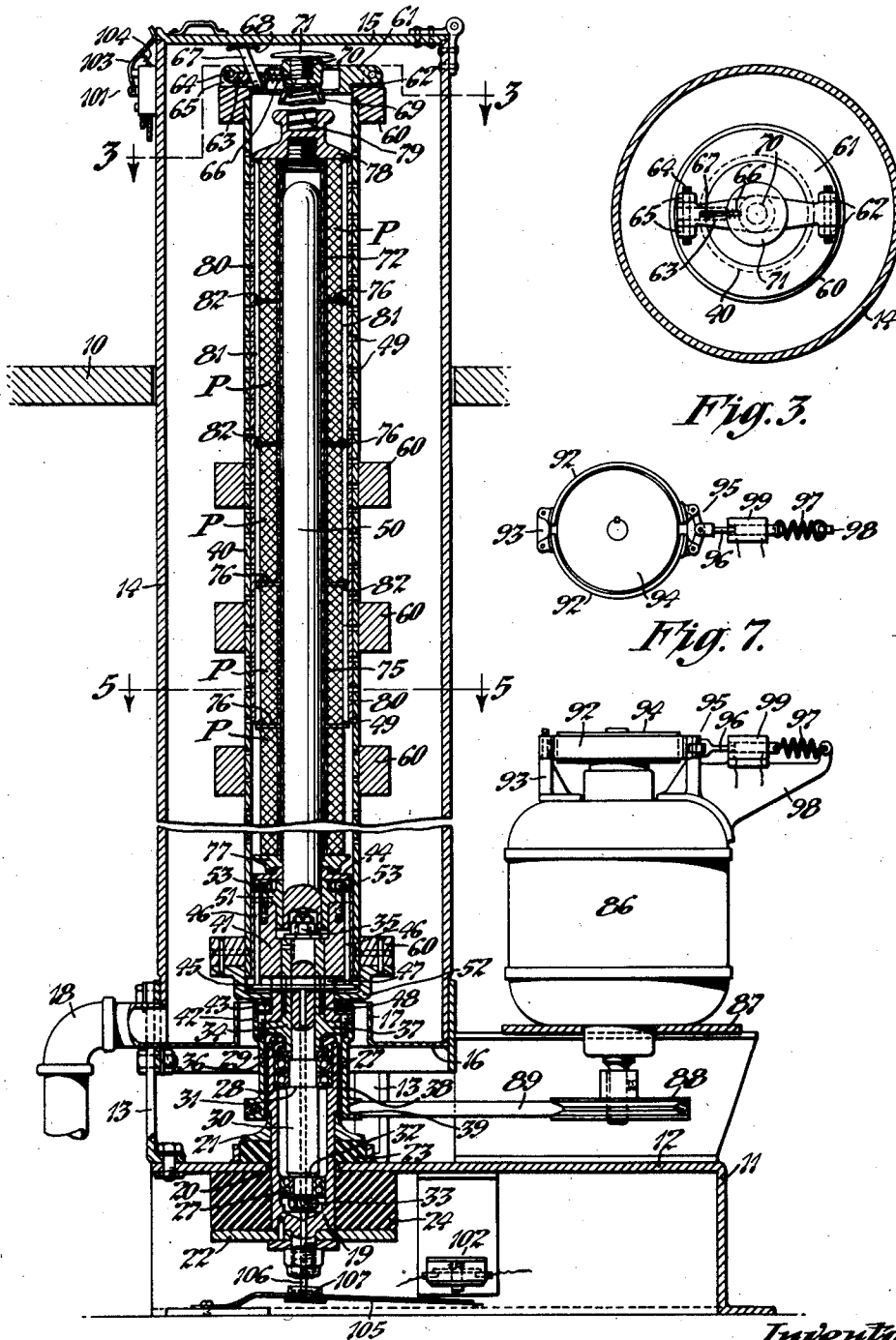


Fig. 1.

Fig. 3.

Fig. 7.

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CENTRIFUGAL EXTRACTOR

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11 Claims. (Cl. 210-71)

The present invention relates to centrifugal extractors and more particularly to apparatus for extracting liquid from a group of textile packages after a processing treatment while the packages are mounted on the holders on which they are processed.

One of the objects of the present invention is to provide a centrifugal extractor of the type indicated including an axial spindle on which the package unit is telescopically mounted and supported throughout its length.

Another object of the invention is to provide a centrifugal extractor of the type indicated having means for supporting the individual packages interiorly and exteriorly throughout their length to hold the yarn mass centered in the rotating basket.

Another object of the invention is to provide a split liner which is applied to the periphery of the packages in the unit before the latter is placed in the basket to hold the yarn mass centered therein.

Another object of the invention is to provide a centrifugal extractor of the type indicated including an electric motor for rotating the basket and a brake normally applied to the motor shaft and automatically released when the motor circuit is energized.

Another object of the invention is to provide automatic safety means in the motor circuit for preventing operation of the extractor until a package unit is mounted in the basket and the parts of the apparatus adjusted and locked in proper operative relationship.

Another object of the invention is to provide an apparatus of simple and compact structure which facilitates the mounting of package units therein and which efficiently performs its intended function in a minimum period of time.

Further objects of the invention are set forth in the following specification which describes one form of construction of the apparatus, by way of example, as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a vertical sectional view of the apparatus showing a package unit mounted in the basket and the parts of the apparatus locked in operative position;

Fig. 2 is a sectional view similar to Fig. 1 showing the apparatus open with its parts in inoperative position prior to the mounting of a package unit in the basket;

Fig. 3 is a transverse sectional view on line 3-3 of Fig. 1 showing the hasp for the basket locked in closed position;

Fig. 4 is a top plan view of a package unit showing the separable parts of the split liner in position to be applied to the periphery of the unit;

Fig. 5 is a transverse sectional view on line 5-5 of Fig. 1 showing the angularly spaced ribs on the liner engaging the periphery of the packages in the unit to hold the yarn mass centered in the basket;

Fig. 6 is a detailed sectional view of the upper end of the basket showing one of the safety devices for preventing closing of the casing cover until the hasp for the basket is locked in its closed position;

Fig. 7 is a top plan view of the motor brake illustrated in Fig. 1 showing the spring for normally holding the brake applied and the solenoid winding for releasing the brake; and

Fig. 8 is a diagrammatic view of the electric circuit for the motor.

The present improved extractor comprises, in general, a relatively long tubular basket resiliently mounted on a suitable base for rotation about a vertical axis. The basket is driven by an electric motor and the extracted liquid is collected in a drain-casing surrounding the basket. A package unit comprising a group of textile packages mounted on the holder on which they are processed is adapted to be telescoped into the basket and means in the basket support the package unit axially thereof. A normally applied brake cooperates with the motor shaft to cause a quick deceleration thereof and the brake is automatically released by the energization of the motor circuit. Circuit-breakers or switches in the motor circuit are adapted to be closed by the application of a package unit to the apparatus and the closing of its cover whereby the operation of the motor is prevented until a package unit is in the basket and its hasp properly locked.

Referring to the drawings, the centrifugal extractor is herein illustrated as mounted in a pit below the floor 10 and supported on a hollow base 11. The base 11 may be of any suitable construction comprising a horizontal platform 12 raised above the floor on which the base is supported. Angular brackets 13 extend upwardly from the platform 12 to support a hollow cylindrical casing 14 having a cover 15 hingedly mounted at the top thereof. A plate 16 at the bottom of the casing 14 has a central opening surrounded by an annular flange 17 which extends upwardly to form a catch basin for extracted liquid. A drain pipe 18 is suitably con-

ected to an opening at the bottom of the casing to provide for draining off the extracted liquid.

A cylindrical journal support or sleeve 19 extends vertically through an opening 20 in the platform 12 and is provided with radial flanges 21 and 22 suitably secured thereto above and below the platform respectively. The support 19 is resiliently mounted on the platform 12 by rings 23 and 24 of rubber or the like compressed between the flanges 21 and 22 and the platform. A shaft 30 is journaled for rotation about a vertical axis in ball-bearings 27 arranged in axial spaced relationship in a bore in the support 19. As herein illustrated the outer double race of the upper bearing 27 is held between a shoulder 28 in the bore of the support 19 and a gland-nut 29 screwed into the bore. The inner double race of the upper bearing 27 is held against a shoulder 31 on the shaft 30 by a hub 34 mounted on the shaft with a washer 36 therebetween. The inner race of the lower bearing 27 is held against a shoulder 32 on the shaft 30 by a nut 33 screwed onto a threaded portion at the lower end of the shaft.

The hub 34 is keyed to the shaft 30 above the support 19 and is held against axial movement by the inner race of the upper bearing 27 and a nut 35 screwed onto the threaded upper end of the shaft. The hub 34 has a radially-extending flange 37 merging into a depending skirt 38 surrounding the support 19 with a pulley 39 formed on its lower end. The shaft 30 and hub 34 extend through the opening in the bottom plate 16 of the casing 14 to support the basket, indicated generally at 40, mounted thereabove. The basket 40 is in the form of a relatively long tubular shell having perforations 49 arranged in spaced relation throughout its length and around its periphery. A base portion 41 integral with, or attached to, the tubular shell of the basket 40 has a radial flange 42 which is secured to the radial flange 37 of the hub 34 by bolts 43.

An axially-movable platform is provided on the base portion 41 comprising upper and lower plates 44 and 45 connected by pins 46 slidable longitudinally in vertical bores in the base portion. The lower plate 45 extends through a transverse slot 47 in the shaft 30, hub 34 and base portion 41 and is normally held in raised position by a compression spring 48 mounted in a cylindrical recess between the hub and the base portion. A cup-shaped retaining ring 52 suitably secured to the lower end of the basket 40, as by riveting, holds the plate 45 against lateral displacement.

A spindle 50 extending axially throughout substantially the entire length of the basket 40 has a flanged collar 51 suitably secured to its lower end. Bolts 53 projecting through holes in the flange of the sleeve 51 and threaded into the base portion 41 of the basket 40 serve to rigidly secure the spindle in position in the basket. A series of gyroscopic rings 60 surrounding the periphery of the basket 40 are arranged in axially spaced relationship for equalizing the stresses set up at high rotative speeds to prevent shifting of the axis of rotation. The upper end of the basket 40 is adapted to be closed by a hasp 61 hingedly mounted at one end between spaced ears 62 on the uppermost ring 60. A sliding bolt or latch 63 on the hasp 61 has a beveled and notched end for engaging a locking pin 64 extending between spaced ears 65 on the side of the uppermost ring 60 opposite from the ears 62. The bolt 63 is adapted to be pressed into locking engage-

ment with the pin 64 by a helical spring 66 and to be released from the pin by a manually-operable lever 67 extending upwardly from the hasp 61 and formed with an arcuately-shaped end 68. A cup-shaped member 69 is attached to the bottom of the hasp 61 by a threaded stud 70, the stud having a convex head 71 at the top serving as a hand-rest for pressing the hasp downwardly to close it against the top of the basket 40.

The self-contained package unit comprises a group of yarn packages P strung on the hollow holder 72 on which they are processed and adapted to be placed in the basket 40 for centrifugal extraction of the fluid from the yarn. The holder 72 may be of any suitable construction for supporting the group of packages P and preferably is of the type illustrated and described in a copending application for United States Letters Patent, Serial No. 108,234, filed October 29, 1936. As herein shown, the holder consists in a perforated tubular support 75 on which the packages P are mounted in axial alinement with spacer plates 76 between their ends. The packages P are held against axial movement on the support or holder 75 between a radial flange 77 at one end and a removable screw-cap 78 at its opposite end to form a self-contained unit. A compression spring 79 is secured to the cap 78 with one end seated in a recess therein and its opposite end projecting axially beyond the end of the holder 72.

As one feature of the present invention a split liner 80 is applied to the periphery of the package unit prior to mounting it in the basket 40, see Figs. 1 and 4. The separable halves of the split liner 80 are of identical construction, each comprising a semicircular shell having longitudinally-extending ribs 81 on its inner periphery arranged in angular spaced relationship. The ribs 81 are interrupted at regular spaced intervals along their length to provide grooves 82 for receiving the peripheries of the spacer plates 76 positioned between the ends of the packages P. As herein illustrated, the liner 80 encloses only the four uppermost packages of the series in the unit; but, if desired, the liner may extend throughout the entire length of the unit which may consist of any desired number of packages. With the liner 80 placed in position on the periphery of the package unit the assembly is lowered into the basket 40 and telescoped over the spindle 50 which supports the tubular holder 75 throughout its length. The liner 80 is dimensioned to provide a close fit against the interior of the basket 40 with its angularly-disposed ribs pressing against the periphery of the yarn mass in the packages P to hold the latter centered in the basket.

The basket 40 is driven rotatively by an electric motor 86 mounted with its axis vertically positioned on a platform 87 supported above the platform 12 of the base 11. A grooved pulley 88 on the motor shaft is alined with the pulley 39 at the base of the basket 40, the pulleys being connected by a driving belt 89. As illustrated in Figs. 1 and 7, a pair of brake-shoes 92 supported at their ends by brackets 93 and 98 on the motor casing cooperate with a brake-drum 94 keyed to the upper end of the motor shaft. The brake-shoes 92 are connected to a toggle 95 operated by a plunger 96 under the tension of a spring 97 attached to the end of the plunger and anchored to the bracket 98. The spring 97 normally tends to slide the plunger 96 to apply the brake-shoes 92 to the drum 94. A solenoid 99 connected in

series in the motor circuit and surrounding the plunger 96 acts to slide the latter to release the brake-shoes when the motor is energized.

The electrical circuit, diagrammatically illustrated in Fig. 8, also includes a manually-operable circuit-breaker or switch 100 and two automatically-operated circuit-breakers 101 and 102. The switch 100 may be of any preferred type, being located at a convenient point for manual operation to control the application of the current from the line leading from its source. The circuit-breaker 101 is preferably of the type having "start" and "stop" push-buttons and is located on the side of the casing 14 adjacent the cover 15. A lever 103 pivotally mounted on the casing 14 is normally held in engagement with the "stop" push-button of the circuit-breaker 101 by a spring 104 whereby to maintain the circuit open while the cover 15 is open. The lever 103 has a latch-shaped end overlying the top of the casing 14 to adapt it to be engaged by the edge of the cover 15 as the latter is closed to release the lever from the "stop" push-button of the circuit-breaker 101 so that the "start" button may be pressed to close the circuit.

The circuit-breaker 102 is a self-closing push-button type, being positioned in the hollow base 11 and normally held open by a leaf-spring 105 positioned below the support 19 in the base 11. The spring 105 is depressed to release it from the push-button of the circuit-breaker 102 by a push-rod 106 extending through an axial bore in the bottom of the support 19 and a bore in the shaft 30. The upper end of the push-rod 106 engages the bottom plate 45 of the movable platform while its lower end is received in the hollow of a cup 107 fastened to the spring 105. The weight of the package unit in the basket 40 depresses the plates 44 and 45 of the movable platform and the lower plate acts through the push-rod 106 to depress the spring 105 to release the push-button to cause the contacts of the switch 102 to close the circuit. The circuit-breakers 101 and 102 thus normally remain open to cause the motor 86 to remain idle so that the basket 40 cannot be rotated until a package unit has been mounted therein and the hasp 61 and cover 15 have been closed. The apparatus having now been described in detail its mode of operation will be next explained.

To apply a package unit to the extractor the cover 15 of the casing 14 and the hasp 61 for the basket 40 are raised to open position as illustrated in Fig. 2. With this relationship of the elements the platform 44, 45 will be held raised by the spring 48, the switch 102 maintained open by the leaf-spring 105, and the circuit-breaker 101 held open by the lever 103. Consequently, the windings of the motor 86 and the solenoid 99 are deenergized and the spring 97 exerts a thrust on the plunger 96 to hold the brake-shoes 92 applied to the brake-drum 94. The separable halves of the split liner 80 are first mounted on the periphery of the package unit and the assembly then lowered into the basket 40 by sliding the hollow holder 72 telescopically over the spindle 50. The hasp 61 is then rocked on its hinge to close it down against the open end of the basket 40, the bolt 63 being latched under the pin 64 by pressure on the top of the hasp. Should the operator fail, however, to properly lock the hasp 61 in closed relationship the lever 67 will remain in upright position to be struck by the cover 15, thus causing the bolt 63 to be automatically withdrawn to effect the further closing and locking

of the hasp. The liner 80 acts as a spacer between the inner walls of the basket 40 and the periphery of the packages in the unit, the ribs 81 engaging the yarn mass to hold it centered in the basket, while at the same time the peripheral rims of the separator plates 76 engage the inner walls of the liner to brace and support the spindle 50. In this way a balanced load is maintained to insure smooth, vibrationless rotation of the basket. The cover 15 of the casing 14 is closed and as it seats on the top of the casing its edge engages the end of the lever 103 and rocks the latter to release the "stop" push-button of the switch 101. When the hasp 61 is closed the cup-shaped member 69 engages the spring 79 on the cap 78 of the holder and acts to seat the flanged base 77 of the package unit against the plate 44 of the movable platform. The plate 44 is thus pressed downwardly with its movement transmitted through the pins 46 to the plate 45 and push-rod 106 to depress the leaf-spring 105 thereby releasing the push-button of the switch or circuit-breaker 102.

The switch 102 being self-closing, the circuit is completed to energize the motor 86 by manually closing the circuit-breakers 100 and 101. As the circuit is energized the solenoid coil 99 actuates the plunger 96 to release the brake-shoes 92 from engagement with the drum 94 thereby starting the motor 86 to rotate the basket 40 connected thereto by the pulleys 39, 88 and driving belt 89. Due to the resilient mounting of the support 19 on the base 11 the basket 40 quickly accelerates to its maximum speed with a minimum vibration. The high speed rotation of the basket 40 causes the liquid carried by the packages P to be thrown radially outward through the perforations 49 in the basket due to centrifugal force, and the extracted liquid is collected in the catch basin at the bottom of the casing 14 and drained off through the pipe 18. During the rotation of the basket 40 the axis of rotation is maintained constant due to the axial spindle 50 which supports the package holder 72 throughout its length. Due to the soft winding of the yarn in the packages P there is ordinarily a tendency for the mass to throw to one side of the axis of the holder. This eccentric movement of the yarn mass is prevented by the angularly spaced ribs 81 on the liner 80 which press against the periphery of the packages and hold the mass centered in the basket. The gyroscopic rings 60 on the periphery of the basket 40 have the effect to maintain its axis of rotation constant and the engagement of the separator plates 76 with the interior of the basket braces the spindle therefrom to cause it to run true. Due to the combined features of internal and external support for the package unit, together with the gyroscopic rings 60, the basket may be rotated at a rate of 6000 R. P. M. without excessive vibration. At this high rate of speed it has been found that four pounds of liquid may be extracted from twelve pounds of wet yarn in a period of approximately two minutes.

At the completion of the two-minute period of operation, more or less as required, which may be controlled by a time switch, the electrical circuit is opened, thereby deenergizing the windings of the motor 86 and also the solenoid 99 and causing the spring 97 to act on the plunger 96 to apply the brake-shoes 92 to the periphery of the drum 94 to promptly stop the motor. In this manner a quick deceleration in the rotation of the basket is effected to avoid delay by normal

deceleration. When the basket 40 has come to rest the cover 15 of the casing 14 and hasp 61 of the basket 40 are raised to open position as illustrated in Fig. 2. The raising of the cover 15 releases the lever 103 which is rocked by the spring 104 into engagement with the "stop" push-button of the switch 101 to maintain the circuit open until the cover is closed again. As the package unit and liner assembly are lifted from the basket 40 at the completion of the extracting operation the platform 44, 45 is released to allow it to rise under the action of the spring 48. The push-rod 106 is then released to permit the spring 105 to engage the push-button of the switch 102 to open the circuit. The apparatus is then in condition to receive another package unit for extraction of the liquid therefrom in the manner as above described.

It will be observed from the foregoing that the invention provides an improved form of centrifugal apparatus for extracting liquid from a group of packages mounted on the original holders on which they are processed. It will further be observed that the centrifugal extractor supports the package unit interiorly and exteriorly throughout its length to maintain the axis of rotation constant. It will still further be observed that a novel form of centrifugal apparatus is provided which prevents operation until a package unit has been mounted therein and the parts locked in a closed position, and which also provides for a quick deceleration of the rotary basket at the completion of the extracting operation.

While the apparatus is herein described and illustrated as embodied in a preferred form of construction, by way of example, it is to be understood that modifications may be made in the structure and arrangement of its parts without departing from the spirit or scope of the invention. Therefore, without limiting ourselves in this respect, we claim:

1. In a centrifugal extractor, the combination of a basket having an axially-extending spindle, a hollow holder mounted on said spindle for supporting a group of textile packages in axial alignment, said spindle supporting the holder throughout its length, a removable two-part liner in contact with the inner wall of the basket and having spaced longitudinal ribs engaging the periphery of the packages, and means for rotating the basket.

2. In a centrifugal extractor, the combination of a tubular basket supported at one end for rotation about a vertical axis, a spindle within the basket extending axially thereof, a hollow holder mounted on the spindle, said holder mounting a group of packages in axial alignment to form a self-contained unit and supported by the spindle throughout its length, a liner in contact with the walls of the basket and having spaced longitudinal ribs engaging the periphery of the packages to support the yarn mass exteriorly and hold it centered in the basket, a hasp at the top of the basket engageable with the end of the holder to seat the latter in the basket, and means for rotating the basket.

3. In a centrifugal apparatus, a base, a basket mounted on said base for rotation about a vertical axis, a spindle within the basket extending axially thereof, a package-holder removably mounted on said spindle, said holder mounting a group of packages in axial alignment to form a self-contained unit and supported throughout its length by the spindle, a motor for rotating

the basket, a brake for said motor, an electric circuit for the motor, means in the motor circuit for automatically releasing the brake when the circuit is energized, and means for applying the brake when the current for the motor is interrupted.

4. In a centrifugal extractor, the combination of a rotary basket for supporting the material to be treated, a motor for rotating the basket, an electrical circuit for the motor, a switch in the motor circuit, means normally maintaining said switch open, and weight-responsive means actuated by the application of the material to be treated to the basket to close the switch.

5. In a centrifugal extractor, the combination of a basket, a package unit in the basket comprising a plurality of individual textile packages arranged in axial alignment, a motor for rotating the basket, an electrical circuit for the motor, a circuit-breaker in the motor circuit, detent-means for normally holding the circuit-breaker open, and means in the basket actuated by the application of the package unit thereto for disabling the detent-means to cause the circuit-breaker to close the circuit whereby the motor can be energized when a package unit is in place.

6. In a centrifugal extractor, the combination of a tubular basket, a package-holder for mounting a group of textile packages in axial alignment to form a self-contained unit, a movable platform in the basket on which the package unit is seated, said platform being depressed when a package unit is mounted in the basket, a motor for rotating the basket, an electrical circuit for the motor, a self-closing circuit-breaker in the motor circuit, means normally acting to hold the circuit-breaker open, and means actuated by the platform to release said last-named means to cause the circuit-breaker to close the circuit when a package unit is mounted in the basket.

7. In a centrifugal extractor, the combination of a base, a support resiliently mounted on the base, a basket having a depending shaft journaled in the support for rotation about a vertical axis, a spindle within the basket having one end fixed thereto and extending axially thereof, an axially movable platform in the basket, a package-holder adapted to be telescopically mounted on the spindle and seated on the platform, said holder mounting a group of textile packages in axial alignment to form a self-contained unit, a motor for rotating the basket, an electrical circuit for the motor, a switch in the motor circuit, means for normally maintaining the switch open, and means actuated by the movable platform to effect the closing of the switch when a package unit is mounted in the basket.

8. In a centrifugal apparatus for extracting liquid from a group of packages mounted in axial alignment on the holder on which they are processed, the combination of a base, a tubular basket mounted on said base for rotation about a vertical axis, a hasp at the open end of said basket, means for locking the hasp in closed position, a casing surrounding the basket for collecting the liquid extracted therefrom, a cover on the casing, means preventing closing of the cover until the basket hasp is locked in closed position, a motor for rotating the basket, an electrical circuit for the motor, a normally open switch in the motor circuit, and means actuated by the closing of the cover to close the switch to energize the motor circuit.

9. In a centrifugal apparatus for extracting

- liquid from a group of packages mounted on the holder on which they are processed, the combination of a basket for supporting a package unit, a motor for rotating the basket, an electrical circuit for the motor, a casing surrounding the basket, a cover for the casing, and normally open circuit-breakers actuated respectively by the weight of the package unit and the closing of the cover for the casing to close the motor circuit.
10. In a centrifugal extractor, the combination of a rotary basket for supporting the material to be treated, means for rotating the basket, a hasp at the open end of the basket, a bolt for latching said hasp in closed position, a casing surrounding the basket, a cover for the casing, and means operated by the closing of the cover on the casing to actuate the bolt to cause it to lock the hasp in closed position.

11. In a centrifugal extractor, the combination of a tubular basket supported at one end for rotation about a vertical axis, a spindle extending axially of the basket, a hollow holder mounted on the spindle, said holder being of sufficient length to mount a group of packages in axial alinement to form a self-contained unit and supported interiorly by the spindle throughout its length, spacer plates on the holder between the packages adapted to engage the interior of the basket at their outer edges, and means for rotating the basket, said spindle and spacer plates acting to support the holder and packages against lateral displacement.

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