Oct. 12, 1943. A. J. PATCH 2,331,565

CENTRIFUGAL SEPARATOR

Filed Oct. 27, 1939 3 Sheets-Sheet 1

Fig. 1

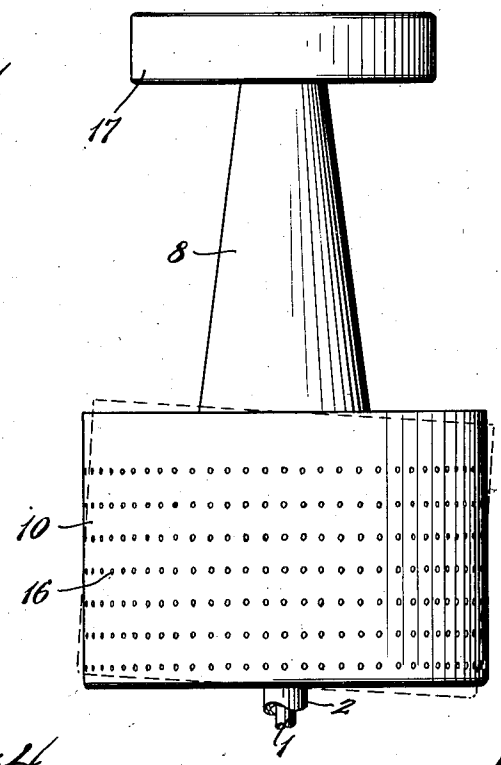


Fig. 4

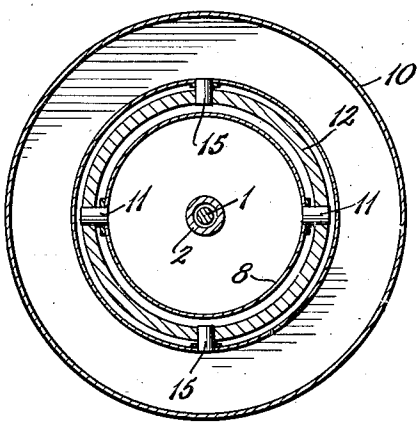
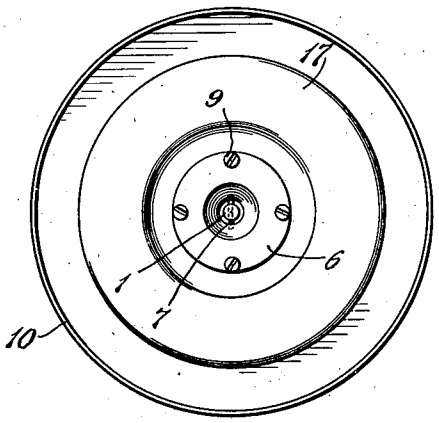


Fig. 3



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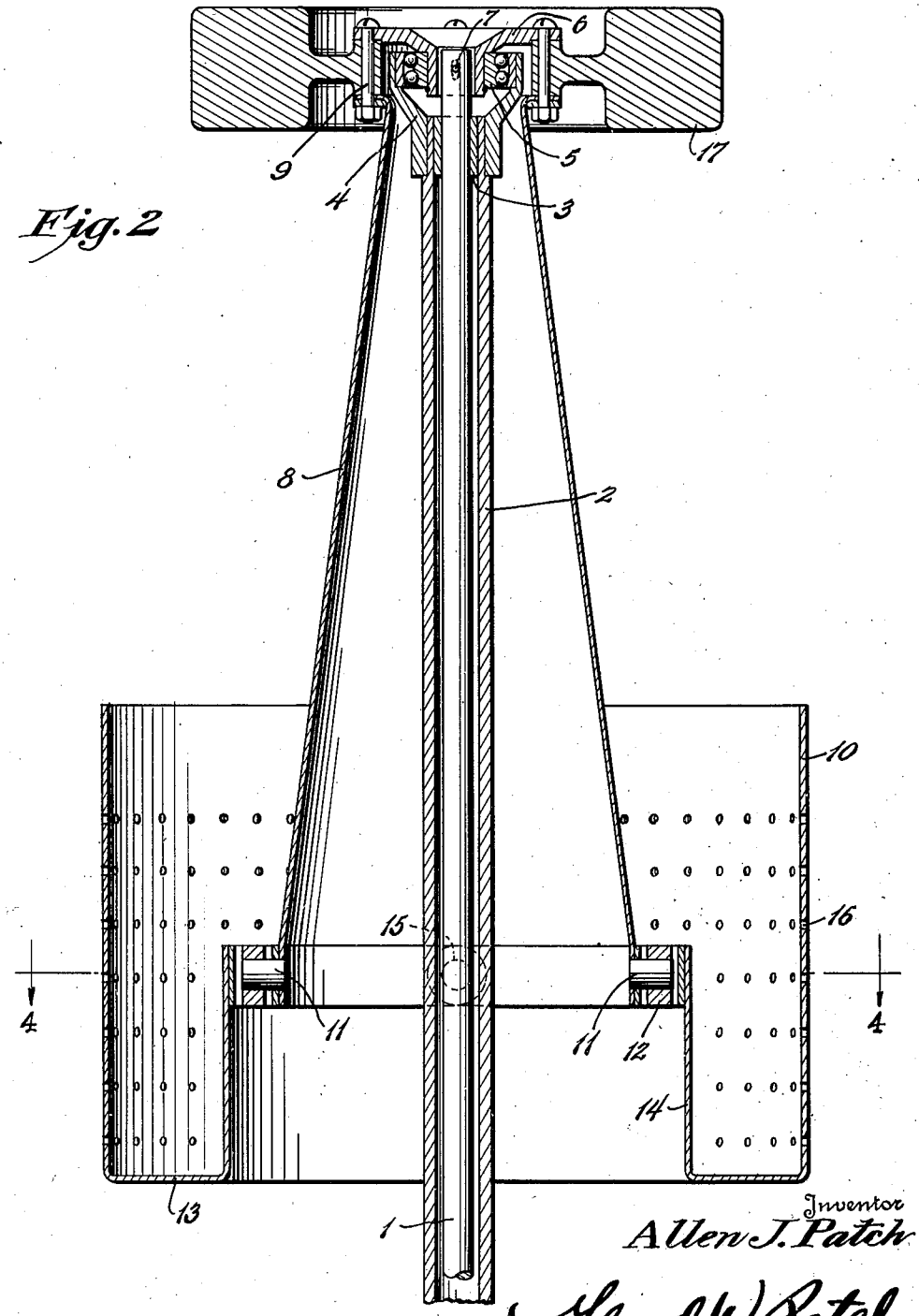
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CENTRIFUGAL SEPARATOR

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Fig. 2



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Fig. 5

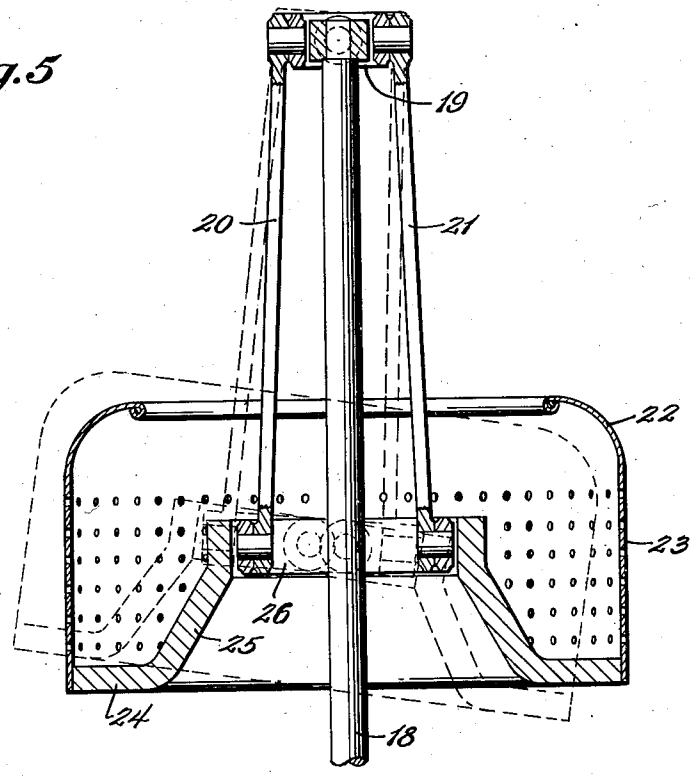
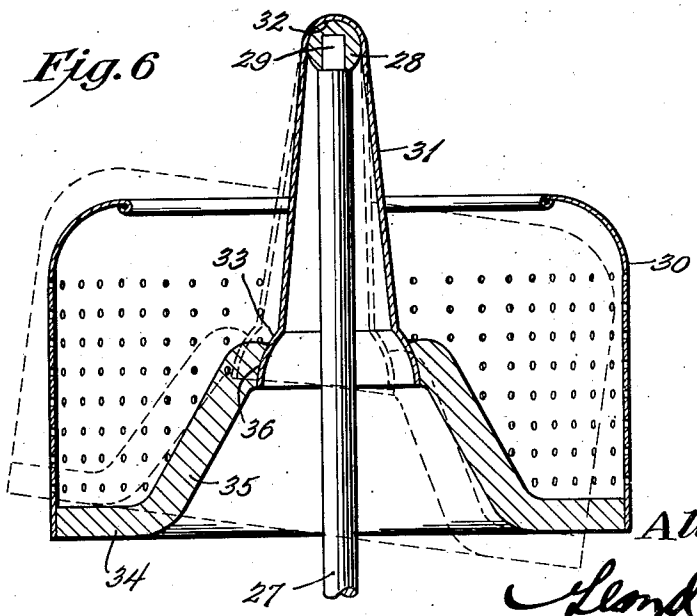


Fig. 6



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UNITED STATES PATENT OFFICE

2,331,565

CENTRIFUGAL SEPARATOR

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Application October 27, 1939, Serial No. 301,663

24 Claims. (Cl. 210—71)

My invention relates to improvements in centrifugal separators and particularly to a structure of this character such as used in laundry equipment and in other connections where clothes or other articles or materials likely to produce unbalanced loads are to be acted upon, this application being a continuation in part of my application Serial No. 587,337.

An object of this invention is to provide a centrifugal separator or extractor or apparatus of the spinner type of such construction that a substantially stable equilibrium will be attained and maintained under unbalanced loads.

Another object is to provide a structure which permits the force of gravity to move the basket or container to a point where the center of gravity coincides with the axis of revolution of the driving part, the centrifugal force acting upon the basket or container and an unbalanced load to bring them into a position where the axis of gyration will coincide with the shaft axis and there will then be a balanced spinning of the parts with no overbalancing force acting to strain upon or to disturb the position of the revolving driving member.

A further object is to provide, with a centrifugal apparatus, means acting substantially gyroscopically to check vibration of the parts during operation.

A still further purpose is to provide a centrifugal separator comprising a shaft rotatable on an upright axis, a container support swingably carried by and depending around and universally swingable with respect to the shaft, a container carried by the support, and means acting substantially gyroscopically to resist swinging of the container support during rotation.

Yet another object is to provide a device and mechanism of this character which is of simple and inexpensive construction to thus insure long life and efficient operation; and, which does not require manual or mechanical adjustments at any time during operation to accomplish or maintain the equilibrium under unbalanced loads.

With the above and other objects in view, some of which will be apparent to those skilled in the art and others of which are inherent in the construction and use of the apparatus, my invention includes certain novel features of construction and combinations and arrangements of parts which will be hereiafter set forth in connection with the drawings, and then pointed out in the claims.

In the drawings:

Figure 1 is a view in side elevation showing centrifugal apparatus constructed in accordance with my invention, and with a loaded position indicated by dotted lines.

Fig. 2 is an enlarged vertical sectional view through the structure as shown in Figure 1.

Fig. 3 is a top plan view.

Fig. 4 is a horizontal sectional view substantially on line 4—4 of Fig. 2.

Fig. 5 is a vertical sectional view through an apparatus disclosing a modified embodiment.

Fig. 6 is a view similar to Fig. 5 disclosing still another modified embodiment of the invention.

As my improved centrifugal separator or apparatus can be built into or substituted for the usual container or basket of an ordinary centrifugal apparatus, and any desired type and form of power operating means can be employed, I have not herein shown nor described the power or driving means.

As such apparatus has been heretofore constructed and used, it can be assumed, theoretically, that normally the drive shaft or driving member will be in an upright position with the axis of rotation upright, and that the center of gravity of the empty container or basket, as well as its axis of gyration will coincide with the center or axis of the driving member, as will also the dimensional axis and center of the basket. However, when the basket is unevenly loaded as is ordinarily the case with laundry machines, the center of gravity of the basket plus the load will not coincide with the dimensional center of the basket, but owing to the fact that ordinarily the basket is supported by universal joints or other mountings permitting rocking movement, the gravity force will cause it to swing on this support until the new center of gravity coincides with the axis of rotation and also with the axis of the shaft. This will permit the loaded basket to rotate around its new center of gravity; however, the basket cannot rotate around its new axis of gyration without imparting a planetary or orbital movement to the drive shaft or driving member.

Since the axis of gyration is an imaginary line which passes through the center of gravity, it becomes necessary to permit relative movement of the unevenly loaded basket or container to a position where the axis of gyration will coincide with the shaft axis, and there will then be no force acting to disturb the position of the shaft or driving member.

The purpose of my invention is to provide a mounting for the basket so that centrifugal force acting on the basket and load will bring them into

a position where the axis of gyration will coincide with the axis of the shaft or driving member, and thus eliminate the necessity for mounting the shaft or driving member to permit planetary movement, and at the same time accomplish a structure much more quiet and efficient in operation.

Also, my invention contemplates provision, with a centrifugal apparatus, of means acting substantially gyroscopically to hold the parts in substantially stable relation during operation thereby checking vibration of the parts and apparatus.

In the embodiment illustrated in Figs. 1 through 4, the shaft or rotatable member 1 is mounted in upright relation by any suitable bearing or supporting structure, and can be rotated in any desired or approved manner. This rotatable member can be supported or mounted to have limited side sway or planetary movement, if desired, and in fact the mounting can be of any type and character such as may be well known; but, it has been found that with my improved structure the forces acting to move the shaft in a planetary or orbital path are substantially reduced or eliminated, and in effect the shaft or rotatable member will rotate on a more or less fixed or stationary upright axis.

The shaft 1 has a bearing and supporting housing 2 therearound, and if desired one or more shaft bearings 3 can be provided in this housing to hold the shaft 1 to a substantially fixed axis of rotation. At the outer end of the bearing and supporting housing 2 a supporting head 4 is provided, and this supporting head 4 carries a bearing structure 5. The bearing structure at 5 is of the self-aligning ball bearing type, or of any other suitable type and character that will permit or allow universal movement. A mounting head 6 is supported and carried by a part of the bearing 5 to thus have universal movement with respect to the end of the shaft 1, and through a pin or key 7, movably received in a slot or other recess in the mounting head 6, this mounting head 6 is connected to be rotated by and with the shaft 1, while at the same time being permitted universal rocking movement.

A container or basket support 8 is connected to the mounting head 6, as by means of bolts 9 or other suitable fastenings, and is thus swingably mounted depending around the rotatable member 1 and is universally swingable with respect thereto. The container support 8 is here shown as being of substantially tubular and tapered construction and shape with the larger end downwardly whereby as this support swings universally it will clear the shaft 1 and the housing 2; however, since only limited swinging movement is ordinarily permitted when the apparatus is in use, it may be appreciated that the support 8 can be of substantially cylindrical form, and where a wider swing is to be permitted the cylindrical diameter or the flare of this member can be increased to such size as may be desirable or necessary.

The container supporting member 8 has the container or basket 10 carried by the swinging end portion thereof and mounted for substantially universal movement in its association with the support 8. In the present instance I have shown the container support 8 as having gimbal bearings or pintles 11 disposed at diametrically opposite points and received in bearings in a gimbal or pintle ring 12. The container or basket 10 is here shown as provided with a bottom portion 13 having a reentrant mounting sleeve 14 provided with pintle bearings or gimbals 15 pivoted in the gimbal or pintle ring 12 on an axis substantially at right angles to the axis of the pintles 11. With this construction and mounting, the container or basket 10 is carried by the swinging end of the container support 8 and is substantially universally swingable with respect to said support. In the present instance I have shown the container or basket 10 provided with a plurality of openings 16, which container basket is suitable for containing and carrying clothes or other articles or material to be subjected to centrifugal extracting forces through spinning of the basket 10.

Normally, as shaft 1 is rotated, and also in positions of rest of the parts, the supporting structure will depend from the swinging universal mounting and the support 8 and the container 10 will be substantially centered around the axis of rotation of the shaft 1, as illustrated in Fig. 2, and in the full lines of Figure 1. When clothes or other material to be operated upon are placed in the container or basket the parts will remain in the centered relation as long as the weight of material is evenly distributed around at all points within the container or basket; but, as in the case of wet clothing it is often substantially impossible to load the basket or container in such a way that the weight is equally distributed on all sides, and in consequence the distribution of the load will be such as to unbalance the container or basket, perhaps somewhat after the manner illustrated by the dotted lines in Fig. 1. With ordinary structures heretofore used, it has been impossible for the container or basket to shift in the manner illustrated, and in consequence as the container or basket thus ordinarily mounted is rapidly rotated or spun through the rotation of shaft 1, the unbalanced load in the basket will exert unbalanced pressures and the operating shaft will receive stresses and strains causing the same to describe or take a planetary or orbital movement, in addition to rotation about its axis. With my improved structure, the container or basket supporting structure is free to shift or swing around the mounting at 5 substantially universally, and the container or basket 10 can also shift around its universal mounting on a depending portion of the container support 8, this double universal mounting permitting the force of gravity, as unequally distributed by the load, to move the basket to a point where the center of gravity coincides with the shaft axis in consequence of which the axis of gyration will coincide with the axis of rotation of the shaft.

In use, it has been found that under some conditions the structure as thus described will be unbalanced in such a manner or to such a degree that the supporting member 8 will have movement other than the rotational movement around the axis of the shaft or rotatable member 1, in consequence of which vibrating or shaking forces are encountered, and to counteract such effects and forces I provide a fly wheel or spinning wheel or disk 17 preferably substantially around the swinging center of mounting of the container support 8. This fly wheel or spinning wheel 17 is preferably provided with a heavy rim so that it will act substantially gyroscopically when the shaft or rotatable member 1 is rotated, in consequence of which this fly wheel 17 spinning or rotated rapidly about its axis serves as a

stabilizing mass, offering great resistance to any effort to change the direction of the axis or to move the fly wheel from its plane of rotation. Thus, the fly wheel 17 serves as means acting substantially gyroscopically to resist any force exerted by the container support 8 tending to swing or tip this member with respect to the axis of rotation of the shaft 1 in such manner that planetary or orbital movement or travel will be set up. Since the rotating mass of material at 17 acts to prevent the basket load from going into an orbital swinging movement, the tendency to vibrate and exerting of disturbing forces is resisted and is controlled.

In the modified embodiment illustrated in Fig. 5, the shaft 18 has a universal joint structure 19, here shown as being of the gimbal or pintle ring type, carried at its upper end, and container supporting arms 20 and 21 are swingably mounted depending around and substantially universally swingable with respect to the shaft, and yet are held and carried to be rotated with this shaft. A container or basket 22, here shown as provided with a reticulated side wall 23 but which can be of any desired form and construction, has a bottom 24 provided with a re-entrant middle supporting sleeve structure 25. This bottom portion 24 is made as a relatively heavy member or structure, of metal or other suitable material that will give weight and mass, and the supporting sleeve portion 25 is associated with the swinging end of the container supporting links 20 and 21 through a gimbal or pintle ring structure 26, or through any other universal connection that will permit swinging and adjustment of the container or basket 22 with respect to the container supporting portions 20 and 21.

With this construction, arrangement and mounting of the parts, the supporting structure 20 and 21 depends downwardly around and has universal swinging connection and movement at its mounting on the upper end of shaft 18, and the basket or container 22 has universally movable mounting at the lower swinging ends of the container supporting structure, thus permitting tilting of the supporting structure with respect to the axis of rotation of the shaft 18 and relative tilting of the basket or container with respect to the supporting structure and the axis of rotation of the shaft. The weighted bottom 24 of the basket or container aids in stabilizing and maintaining the basket, although unevenly loaded, in the position with its axis of gyration coinciding with the axis of rotation of the shaft, and thus the tendency toward planetary movement of the upper end of the shaft is dampened or restricted to a point where it is substantially neligible or is eliminated.

Fig. 6 illustrates another embodiment of the invention, and here the shaft or rotatable member 27 is mounted in upright relation to rotate on an upright axis. This shaft 27 has a bearing ball 28 carried on its upper end in fixed relation. In the present instance the ball is shown as provided with a polygonal socket to receive the correspondingly shaped end 29 of the shaft 27. This shaft 27 is extended to have its upper end and consequently the ball 28 somewhat above the top line of the container or basket 30 the construction of which container or basket may be as set forth above or of any other desired type.

An elongated container support 31, here illustrated as being a tubular sleeve of substantially truncated cone form has its peak end closed and rounded to provide a ball socket 32 shaped to fit and turn or swing upon the bearing ball 28, and in this mounting the elongated container support 31 is permitted to have universal swinging movement substantially as indicated by the dotted lines in Fig. 6. At its lower end this container support has a substantially semispherical flange 33 flared to provide a ball formation normally centered around shaft 27 and shifting its center with the tilting or swinging movement of support 31. The basket 30 has the bottom 34 thereof provided with a supporting sleeve portion 35 in its middle of substantially truncated cone form to draw in around the ball formation 33 of the support 31, a socket 36 being provided in the middle portion 35 so that the container or basket is given universally swingable mounting and support on the ball portion 33.

Obviously, a fly wheel or spinning wheel or other massed weight, similar to fly wheel 17, can be employed with the modified constructions shown in Figs. 5 and 6.

From the foregoing it will be seen that I have provided a centrifugal separator or extractor or apparatus capable of use with many and various types of containers or supports or baskets, and for reception and treatment or operation upon various types and characters of materials, which is of the spinner type and is of such construction that a substantially stable equilibrium will be attained and maintained under unbalanced as well as balanced loads, thus accomplishing smooth and efficient operation of the apparatus and making possible employment of relatively simple and inexpensive mounting and supporting parts and use of the machine in many locations and connections where it might not be employed except for the fact that the operation is substantially stabilized and vibration is controlled.

While I have herein shown and described only certain specific embodiments of this invention and have set forth and suggested only certain possible modifications, it is to be understood and will be apparent that many changes and variations in the form, construction, arrangement, assembly and mounting and association of the parts can be made without departing from the spirit and scope of my invention.

I claim:

1. A centrifugal apparatus comprising a member rotatable on an upright axis, a swingable container support rotatable with said member depending around and universally swingable with respect thereto, and a container carried by and universally swingable with respect to said support.

2. An extractor comprising a member rotatable on an upright axis, a flared swingable basket support rotatable with said member depending and freely universally swingable at its lower end with respect to said rotatable member, and a basket associated with the basket support and universally swingable with respect to said support.

3. In a centrifugal extractor, a flared container support, an upstanding shaft, means for mounting said container support revolubly at its upper central portion and permitting free and unrestrained tilting of said support around the shaft, and a container carried by said support and tiltably movable with respect thereto.

4. In a centrifugal extractor, a container, a driving member, a swingable intermediate member, a universal connection between said driving member and intermediate member disposing the intermediate member to swingably depend around the driving member, and a universal

connection between said intermediate member and said container.

5. In a centrifugal extractor, an upright shaft, a container support connected in its upper central portion at the upper end of said shaft to permit universal tilting of said support, a container carried by said support and bodily tiltable universally with respect thereto, and centrifugally influenced means associated with said container to maintain equilibrium of the same under unbalanced loads when the container is rotated.

6. In a centrifugal extractor, a driving member rotatable on a substantially vertical axis in upstanding relation, an intermediate supporting member, a universal connection between said driving member and said intermediate supporting member by which the supporting member is mounted in suspended depending swingable relation around the driving member, a container, and a universal connection between said intermediate member and said container by which the container is also mounted in suspended relation.

7. A centrifugal extractor comprising, an upright rotatable shaft, an elongated container support mounted on said shaft at its upper central portion to embrace the shaft and be capable of bodily tilting movement with respect to the shaft, said container support being provided with a universal joint on its lower portion, and a container having a reentrant portion provided for attachment with said universal joint.

8. A centrifugal extractor comprising, a driving shaft rotatable on a vertical axis, an elongated container support widened at its lower end, a universal joint connecting said container support at its upper central portion to depend around the shaft, a container having a bottom with a reentrant central portion, and a universal joint connecting the upper central portion of said container bottom with the lower portion of said container support.

9. A centrifugal extractor comprising a container support flared and widened toward its lower end, means to rotatably mount said container support at its upper central portion and permit free and unrestrained tilting of said support, and a container carried by the lower flared portion of said container support at its upper central portion to permit tilting of said container with respect to the support.

10. A centrifugal extractor comprising, a container open in its middle portion and provided with a reentrant weighted bottom portion, an upstanding rotatable driving member, and an intermediate supporting member having universal connection to depend around the upper end of the driving member and having universal connection substantially centrally with the weighted bottom portion of the container to support said container in suspended relation.

11. A centrifugal extractor comprising a member rotatable on an upright axis, a basket support rotatable with said member and swingably mounted at its upper end to depend around and be universally swingable with respect to said member, a basket carried by the swingable basket support, and means substantially gyroscopically resisting swinging of the basket support during rotation.

12. A centrifugal extractor comprising a member rotatable on an upright axis, a basket support rotatable with said member and connected at its upper end to be freely and unrestrainably universally swingable with respect to said member, a basket carried by the swingable basket support, and means substantially gyroscopically resisting swinging of the basket support during rotation.

13. A centrifugal apparatus comprising a member rotatable on an upright axis, a container, a swingable container support rotatable with said member depending around and universally swingable with respect thereto and having the container carried by and universally swingable upon its lower portion, and rotatable weight means resisting swinging movement of the container support.

14. A centrifugal apparatus comprising a member rotatable on an upright axis, a swingable container support rotatable with said member depending around and universally swingable with respect thereto, a container carried by the depending swingable portion of said container support, a universal connection between said container and container support, and means substantially gyroscopically resisting swinging of the container support during rotation.

15. A centrifugal separator comprising a member rotatable on an upright axis, a swingable container support rotatable with said member depending around and universally swingable with respect thereto, a container carried by the depending swingable portion of said container support and mounted for universal adjusting movement with respect to the support, and rotatable weight means associated with said container support adjacent to the swinging mounting thereof and rotating with said support to resist swinging of said support during rotation.

16. A centrifugal separator comprising an upstanding driving member rotatable on an upright axis, a swingable container support connected to rotate with and swingably depending for free and unrestrained swinging movement with respect to the driving member, a container carried by the depending swingable portion of said container support, and a fly wheel rotatable with said container support substantially around the swinging end thereof resisting swinging of the container support during rotation.

17. A centrifugal separator comprising an upstanding driving member rotatable on an upright axis, a swingable container support rotatable with said member and swingably mounted in its upper portion depending around and universally swingable with respect to the driving member, a container carried by the depending swingable portion of said container support mounted thereon for universal swinging movement, and weight means distributed around the container support in the region of the swinging mounting thereof rotatable with said support and resisting swinging of the container support during rotation.

18. A centrifugal extractor comprising, with an upright rotatable shaft, an elongated container support of substantially truncated cone shape mounted for rocking movement at the upper end of said shaft, said container support being provided with parts of a universal connection at its lower end, a container having a reticulated side wall, and a bottom for said container having the middle portion thereof of substantially truncated cone reentrant form and provided with interfitting portions of a universal connection in the upper central portion to fit movably with the parts of the container support.

19. In a centrifugal extractor, with an upright rotatable shaft, a bearing ball carried at the upper end of said shaft, an elongated container support in the form of a substantially truncated conical sleeve provided with a bearing recess to

fit said bearing ball with the flared sleeve-like form depending around and tiltable with respect to said shaft, said container support having a substantially semi-spherical flange flared at its depending end, a container having a reticulated side wall and a bottom for said container having the middle portion thereof formed to be of substantially truncated cone reentrant form and provided with a socket in the upper central portion to fit movably upon the semi-spherical flange of the container support.

20. In a centrifugal extractor, a container support, an upstanding shaft, means for mounting said container support swingably at its upper central portion to depend and rotate and to have swinging movement restrained only by gravity pull with respect to said shaft, a container carried by said support and movable with respect thereto, and means rotating with said support gyroscopically resisting swinging of said support during rotation.

21. A centrifugal apparatus comprising a member rotatable on an upright axis, a swingable container support rotatable with said member and universally swingable with respect thereto, a container carried by the swingable portion of said container support, a universal connection between said container and container support, and means substantially gyroscopically resisting swinging of the container support during rotation.

22. A centrifugal separator comprising a member rotatable on an upright axis, a swingable container support rotatable with said member and universally swingable with respect thereto, a container carried by the swingable portion of said container support and mounted for universal adjusting movement with respect to the support, and rotatable weight means associated with said container support adjacent to the swinging mounting thereof and rotating with said support to resist swinging of said support during rotation.

23. A centrifugal separator comprising an upstanding driving member rotatable on an upright axis, a swingable container support rotatable with said member and swingably mounted in its upper portion with respect to the driving member, a container carried by the swingable portion of said container support mounted thereon for universal swinging movement, and weight means distributed around the container support in the region of the swinging mounting thereof rotatable with said support and resisting swinging of the container support during rotation.

24. A centrifugal extractor comprising a member rotatable on an upright axis, a swingable basket support rotatable with said member depending and freely universally swingable at its lower end with respect to said rotatable member, a basket carried at the lower end of said swingable basket support and universally swingable with respect to said support, and a fly wheel carried by said basket support around its upper swingable end.

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