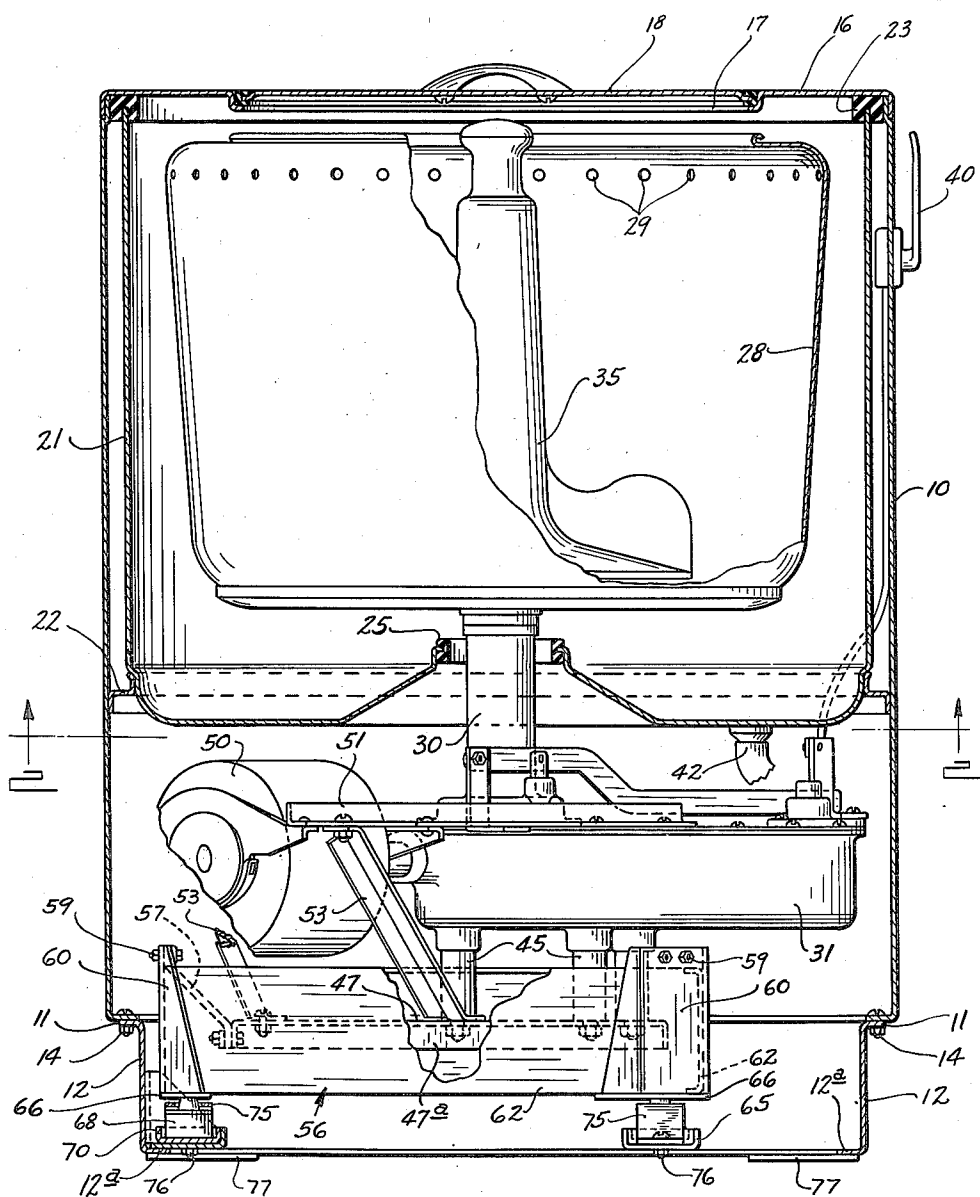


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CENTRIFUGAL EXTRACTOR

Filed March 1, 1941

2 Sheets-Sheet 1



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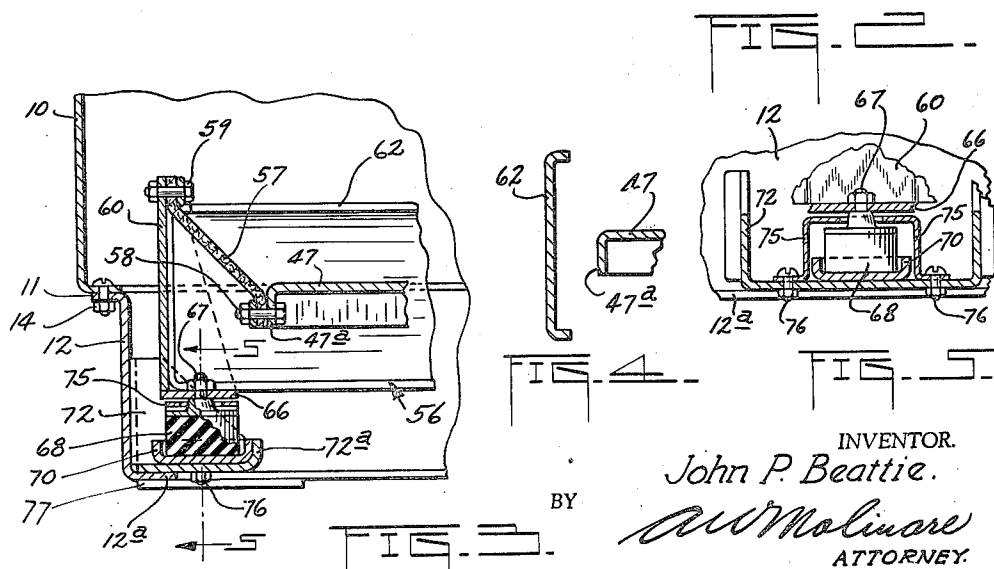
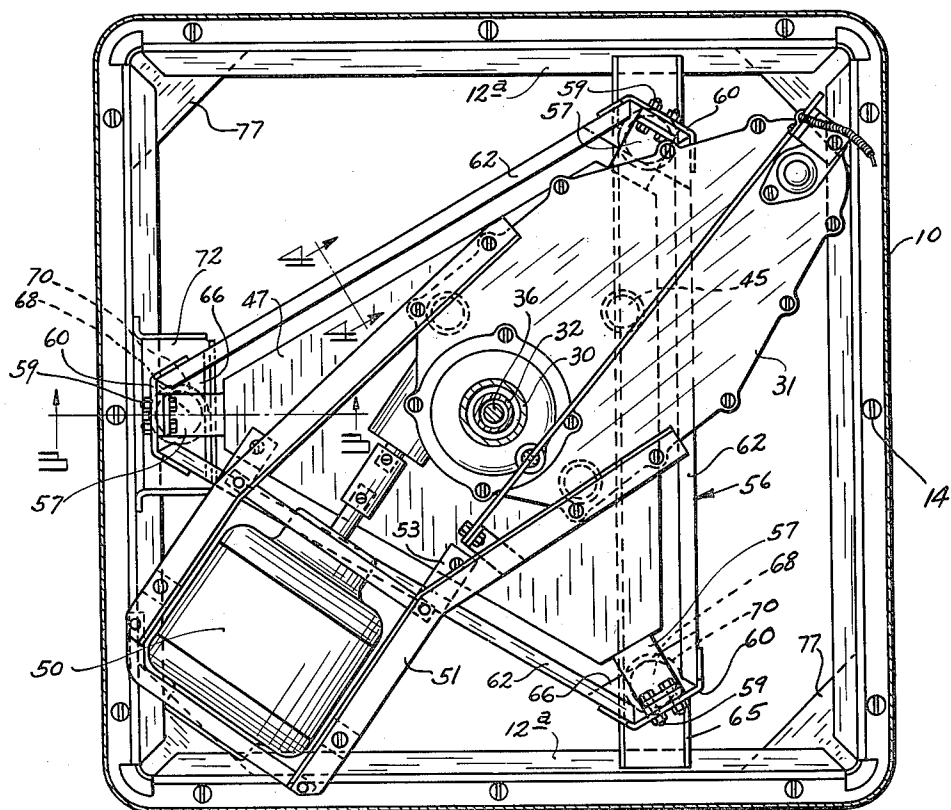
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CENTRIFUGAL EXTRACTOR

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,334,858

CENTRIFUGAL EXTRACTOR

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Application March 1, 1941, Serial No. 381,243

16 Claims. (Cl. 210—72)

This invention relates to centrifugal machines, such as used in laundries and other industries, for extracting liquids from solids and, more particularly, to machines of the type which, for convenience, may be termed "portable"; and by the term "portable" is meant machines that do not require permanent securement or anchorage to a stationary body or a floor.

Machines of this type usually include a basket into which the liquid and solid material, such as wet clothes, are placed and the basket, which is provided with suitable driving means for rotating the basket at a relatively high rate of speed to effect removal of a relatively large percentage of the liquid by centrifugal force.

Machines of this type as used in the laundry industry must necessarily be provided with a basket of adequate size to accommodate a substantial volume of clothes. Heretofore, considerable difficulty has been experienced with such machines due to the fact that the clothes, even upon exercise of great care, cannot be uniformly distributed about the axis of rotation of the basket, and thus results in an unbalanced condition, which produces excessive and undesired vibration of the machine.

As is well known, a rotating mass describing an orbit about an axis sets up a force on the axis dependent upon its radius of gyration and speed of rotation. The direction of the force is diametrically opposite every half revolution. The constantly changing position of the applied force tends to set up a pulsation or vibration in the axis. This pulsation or vibration is caused to be transmitted to any body to which the axis is secured. If the axis is flexibly mounted, the mass tends to describe an orbital path about its true axis of rotation. Since the force changes diametrically every half revolution, the displacement of the mass from its original axis of rotation tends to diminish as the speed of rotation increases, because the period between these opposite forces occurs more rapidly. Hence, it is desirable to drive the basket at as high a rate of speed as practical; but in doing so, the centrifugal force produced by said mass is increased. Therefore, it is desirable to utilize a speed at which the extraction is comparable in efficiency with other conventional means provided for effecting extraction of liquids. Because the centrifugal force increases in direct proportion to the square of the speed of rotation, the speed of rotation should not exceed that wherein the vibration, due to unbalanced load, can be practically dissipated by suitable suspension means.

Various types of suspension means and arrangements for supporting the basket have heretofore been made and proposed with a view to providing a flexible mounting for the basket for the purpose of reducing or eliminating vibration. Such prior forms of suspension means, when embodied in "portable" machines, do not adequately reduce or eliminate vibration to render such machines practical, especially for domestic use.

One of the primary objects of the present invention is to provide in a machine of the character indicated, a novel and improved form and arrangement of suspension means, for the rotatable basket and associated parts, which tends to greatly reduce vibration of the machine.

Another object is to provide in a machine of the type indicated, improved suspension means composed of a plurality of spaced-apart, flexible, substantially non-stretchable straps of greater width than thickness.

A further object is to provide in a machine of the type indicated, improved suspension means in the form of flexible, non-stretchable straps disposed at an angle to vertical in the range of 30° to 50°.

Still another object is to provide in a machine of the type indicated, three frame structures disposed one within another, the two innermost frames being interconnected by a plurality of flexible, non-stretchable elements to receive and dissipate the lateral forces produced by the rotation of an unbalanced load in the basket, together with elastic members interposed between the outer frame and the intermediate frame to absorb the vertical components of said forces.

Other objects and advantages of this invention will be apparent from the following description, taken in connection with the accompanying drawings, in which:

Fig. 1 is a vertical, sectional view through a centrifugal machine, provided with the novel form and arrangement of suspension means constituting the present invention.

Fig. 2 is a transverse, horizontal, sectional view taken substantially as indicated at line 2—2 on Fig. 1.

Fig. 3 is an enlarged, fragmentary, vertical section through the novel suspension means, taken as indicated at line 3—3 on Fig. 2.

Fig. 4 is a fragmentary, vertical, sectional view through two of the frame structures, taken as indicated at line 4—4 on Fig. 2.

Fig. 5 is a fragmentary, vertical, sectional view through the elastic mounting between frames,

taken substantially as indicated at line 5—5 on Fig. 3.

The structure embodying the present invention is capable of adaptation to a variety of forms of machines of this general class, and the form shown in the drawings is intended merely as illustrative of the application of the invention to one form of such machines. For example, the basic principles of my invention are readily and easily applicable to machines wherein the basket rotates either about a vertical or horizontal axis and irrespective of whether or not agitating means is employed within the basket for washing clothes. Moreover, it is also to be understood that the tub or receptacle which is provided to surround the basket, may be mounted directly upon the same frame as the basket, or may be independent thereof, as herein shown, while at the same time obtaining substantially the same identical advantages in machines of either type wherein the basket rotates about a vertical or a horizontal axis.

The machine illustrated in the drawings is intended primarily for domestic use and is, therefore, provided with an external rectangular cabinet or casing 10 mounted at its lower end on a horizontally extending flange 11 of a main frame structure designated at 12. The casing is secured to the flange 11 of the main frame by any suitable fastening members and, as herein shown, by bolts 14. The upper marginal edge of the casing is formed with an inwardly offset portion for receiving in telescopic relation to the body proper a top member 16. Said top is provided with a central opening 17 to afford access to the interior of the machine, and said opening is adapted to be normally closed by a removable cover element 18.

Fixedly mounted with respect to the casing 10 is a tub or receptacle 21, disposed in spaced relation to the walls of the casing, said tub being formed at its lower end with an inwardly offset shouldered portion for seating upon a supporting annulus 22, adapted to be secured to the inner wall of the casing, such as by welding. The upper marginal edge of the tub is embraced by a rubber or resilient band 23 of such dimensions as to engage both the inner wall of the casing and the underside of the top member 16. The central portion of the bottom of the tub is of frusto-conical form with the central area cut out to provide clearance for a standard of the centrifugal machine, as will hereinafter be described. The marginal edge of the cut-out portion of the bottom of the tub, as may be seen in Fig. 1 of the drawings, extends a substantial distance upwardly above the bottom proper, and is provided with an elastic or rubber grommet 25 to serve as a resilient bumper member in the event that the centrifugal machine moves an abnormal amount in a lateral direction.

The centrifugal machine proper includes a rotatable basket 28, of circular cross-section, with the continuous lateral wall thereof tapering in an upwardly and outwardly direction and converging inwardly at its upper edge, a substantial distance inwardly from said lateral wall thereof. The lateral wall of the basket, adjacent the upper end thereof, is provided with a series of apertures 29 through which the liquid is caused to be discharged, in a manner familiar in the art, when the basket is rotated at a sufficient speed for effecting extraction of the liquids from the solids, such as liquid from clothes.

Said basket is journal supported on an upright standard 30, extending downwardly through the tub or receptacle 21, substantially central with respect to the grommet 25, surrounding the opening in the bottom of the tub 21. The lower end of the standard is connected to a housing 31, containing the driving mechanism. It is to be understood that the basket is connected to a tubular drive shaft, as indicated at 32, extending downwardly through the standard 30, for operable connection to the driving mechanism within the housing 31, by virtue of which said basket 28 may be caused to rotate. In the machine illustrated in the drawings, an agitator element 35 is mounted centrally within the basket, and may be understood to be operably connected to a drive shaft 36, extending downwardly through the tubular shaft 32, the lower end of said shaft 36 also being operably connected to the driving mechanism in said housing 31.

It is to be understood that suitable controls may be provided for selectively engaging the drive connections to either the agitator or the basket proper, as may be desired, and for this purpose I have shown a single control handle 40 mounted on the exterior of the cabinet 10 and which is connected by a "Bowden" wire to control elements for engaging and disengaging said driving connections, and inasmuch as said driving connections form no part of the present invention, further detailed description with respect thereto will be omitted.

It will be apparent that when said basket is rotated at high speed, a centrifugal force is set up to cause the liquid to flow outwardly against the inner surface of the lateral wall of the basket; and due to the inclination of said wall, the liquid will travel in an upward direction and will be conveniently discharged through the apertures 29, into the tub or receptacle 21 for removal in any suitable manner, such as through the drain connection as indicated at 42.

As above mentioned, the present invention is not directed to the particular form of basket and tub construction or mounting thereof, and it is to be understood that if desired, the basket may be of the type wherein the lateral walls are perforated substantially from top to bottom, and wherein the tub or receptacle is totally closed at its lower end and connected to the standard or other parts of the structure which serves to support the basket, so that in performing the washing operation by means of the agitator 35, the washing fluid will be at the same level in the basket and in the tub or receptacle. In the construction shown, the total washing operation is performed within the basket "per se," and when an extracting operation is to be performed, the washing fluid is discharged by centrifugal force in the manner above set forth.

The housing 31, containing the driving mechanism, is provided with three spaced-apart depending supports 45, rigidly secured at their lower ends to a supporting frame 47, which, as herein shown, is of substantially triangular outline. Said frame is formed of a sheet of metal, having its outer marginal edges downturned, as indicated at 47^a for purposes of reinforcing and rigidifying the body of the frame. Said frame also provides support for an electric driving motor 50, which is mounted on a framework 51, having leg portions secured to the top of the housing 31, as seen in Fig. 2 of the drawings. To assist in rigidifying the framing 51, to support

said motor, there is provided a pair of angularly disposed brackets 53, connected at their upper ends to said framing 51, and at their lower ends to said supporting frame 47.

It will now be apparent that the centrifugal machine proper, as above described, is a unitary structure, totally supported upon the triangular supporting frame 47. Said unitary structure and frame 47 are carried by an auxiliary frame 56, also of generally triangular outline, and surrounding the supporting frame 47, as seen in the drawings. Said unitary structure together with the supporting frame 47 are flexibly supported by the auxiliary frame 56 by suspension means, comprising three circumferentially spaced-apart flexible straps 57, of greater width than thickness, and preferably formed of leather. As may be seen in Fig. 3 of the drawings, the supporting frame 47 and auxiliary frame 56 are so dimensioned and related to each other that the flexible straps 57 are normally disposed in an upwardly and outwardly inclined position, with their lower ends secured by suitable means, herein shown as bolts 58, to the corner portions of the triangular supporting frame 47, and their upper ends secured by any suitable means, and as shown by bolts 59, to the upper ends of bracket members 60, constituting corner portions of the auxiliary frame 56.

It has been found that in using leather straps, a substantial advantage is attained in dampening and dissipating pulsations or vibrations produced by out-of-balance or off-center loads when the basket 28 is rotated. Said straps are substantially non-stretchable and due to the fact that their width is considerably greater than the thickness, there is an additional dampening action obtained for opposing forces at an angle to the generally radial or lateral forces which are produced by the centrifugal forces resulting from the out-of-balance condition referred to.

It has been found from substantial experiment that the angle of disposition of the flexible suspension means, herein shown as straps 57, is of considerable moment for efficiently dissipating pulsations and vibrations, and it has been determined that the optimum angle of said straps is 45° to vertical. It has likewise been found, however, that reasonably good results may be obtained when the strap is disposed at an angle within the range of 30° to 50° to vertical.

It will be noted that the straps, 57, are so disposed that transverse lines extending parallel to or in the planes of the faces of the straps, intersect to define a triangle. To state it differently, the straps are so disposed that the planes of the face surfaces thereof lie substantially in the three planes of the lateral surfaces of an inverted triangular pyramid. The term "faces" as used herein and in the claims, is intended to define the large surface areas of the straps, indicated by the length and width thereof, as distinguished from the surfaces of the edges or ends thereof.

The auxiliary frame 56 is formed of three side members 62 of generally channel shape formation, as seen in Fig. 4 of the drawings, the ends of which are connected, as by welding, to corner bracket members 60. The disposition of the suspension means at such a substantial angle, as indicated, tends to eliminate counter forces set up in the suspension means, and also tends to preclude the possibility of displacement of the normal out-of-balance load in rotation, from mov-

ing through and beyond a vertical plane passing through the upper end of anchorage of the suspension means. This arrangement definitely tends to check and reduce vertical components of the centrifugal force by reason of the fact that when one of the straps tends to move downwardly, the other two straps move inwardly and tend to raise the weight of the entire unitary structure of the centrifugal machine.

Furthermore, it has been found from practical experiment that while the flexible straps 57 definitely reduce and dissipate the pulsations and vibrations set up in the machine due to the out-of-balance load condition, there still remain small component forces which tend to transmit vibration to the auxiliary frame. To eliminate these pulsations and vibrations, I interpose a plurality of elastic bodies between the auxiliary frame 56 and the main frame 12. As may be seen in the drawings, the main frame 12 is of generally rectangular outline and is formed of sheet metal with the lower marginal edges terminating in inwardly extending flanges 12^a. Due to the fact that the supporting frame 47 and auxiliary frame 56 are of generally triangular outline, one of the supporting brackets 60, constituting a corner of the auxiliary frame, is mounted for support, substantially centrally of the length of one side of the main frame, on the flange 12^a of the main frame 12, as seen in Fig. 2 of the drawings. The other two brackets 60 forming the other corners of the auxiliary frame 56 are indirectly supported on a channel member 65, the ends of which are supported on and connected to the flanges 12^a, at opposite sides of the main frame 12, as seen in Fig. 2.

The brackets 60 are each formed with a bottom or foot 66 to which is connected a bolt 67, the lower end of which is imbedded in an element of resilient or elastic material 68, such as semi-hard rubber. Said elastic elements, as herein shown, are of substantially cylindrical form and are seated at their lower ends in dished-shaped elements 70. The support for the elastic element at the lefthand side of the casing, as seen in Fig. 2, is made directly upon the base portion of a bracket 72 welded to the inner surface of the adjacent vertical wall of the main frame 12. The outer edge of the base portion of said bracket is formed with an upturned flange 72^a tending to confine the cup-shaped element 70 in place. Similarly, the elastic elements 70 at the opposite corners of the triangular auxiliary frame 56 have their cup-shaped elements 70 seated between the flanges of the channel 65, and in all instances, each of said cup-shaped elements is welded to the part upon which it is seated.

To confine the unitary centrifugal machine, together with its associated supporting frame 47, and auxiliary frame 56, from excessive vertical movement with respect to the main frame, such as when moving the machine from place to place, there is provided an inverted U-shaped bracket 75, as seen in Fig. 5 of the drawings, apertured to permit passage of the bolt 67, and positioned to straddle the elastic element in spaced relation thereto, and secured to the mounting for cup elements 70, by bolts 76. Thus movement of the machine proper, with respect to the main frame 12, is definitely limited.

The underside of the corners of the main frame 12 are each provided with a pad 77, of generally triangular form, and it is to be understood that said pads in effect are to constitute feet, and may be formed of either metal or other suitable ma-

terial, and preferably a material which will provide a relatively high coefficient of friction, so as to preclude any tendency for the total machine to creep or move on the floor while in operation.

By virtue of the construction above described, there is provided in effect three separate frame structures disposed one within another and wherein the intermediate and innermost frames are interconnected by flexible and substantially non-stretchable straps, and the outer and intermediate frames being interconnected by elastic elements, which arrangement effects a diminishing of amplitude of movement in each frame until the last frame, or main frame, remains substantially motionless.

While I have shown and described one embodiment of my invention, manifestly it is capable of adaptation to other forms and arrangements of centrifugal extracting machines as above pointed out. I do not, therefore, wish to limit this invention to the precise form herein disclosed, excepting as it may be so limited by the appended claims.

I claim:

1. In a centrifugal machine of the character described, the combination of a receptacle, a basket mounted for rotation about a substantially vertical axis, within said receptacle, mechanism arranged below and serving to drive and support said basket, means connected to the driving mechanism and serving as a supporting frame for said mechanism and basket, an auxiliary frame surrounding and including portions extending above and below the supporting frame, and suspension means comprising three circumferentially spaced-apart, flexible, substantially non-stretchable straps for flexibly supporting said mechanism and basket to permit gyration of said basket and mechanism in an orbit, said straps being of substantially greater width than thickness, and being disposed in upwardly and outwardly inclined positions, with their lower ends fastened to said supporting frame and their upper ends fastened to said auxiliary frame, said straps being so disposed that transverse lines extending parallel to or in the planes of the faces thereof, at substantially any horizontal section therethrough, intersect to define a triangle.

2. In a centrifugal machine of the character described, the combination of a receptacle, a basket mounted for rotation about a substantially vertical axis, within said receptacle, mechanism arranged below and serving to drive and support said basket, means connected to the driving mechanism and serving as a supporting frame for said mechanism and basket, an auxiliary frame surrounding and including portions extending above and below the supporting frame, and suspension means comprising a plurality of circumferentially spaced-apart, flexible, substantially non-stretchable straps for flexibly supporting said mechanism and basket to permit gyration of said basket and mechanism in an orbit, said straps being of substantially greater width than thickness, and each being disposed in an upwardly and outwardly inclined position, in the range of 30° to 50° to vertical, with the lower end fastened to said supporting frame and the upper end fastened to said auxiliary frame, said straps being so disposed that transverse lines extending parallel to or in the planes of the faces thereof, at substantially any horizontal section therethrough, intersect to define a triangle.

3. In a centrifugal machine of the character described, the combination of a receptacle, a basket mounted for rotation about a substantially vertical axis within said receptacle, mechanism arranged below and serving to drive and support said basket, means connected to the lower end of the driving mechanism and serving as a supporting frame for said mechanism and basket, an auxiliary frame surrounding and including portions extending above and below the supporting frame, and suspension means comprising a plurality of circumferentially spaced-apart, flexible, substantially non-stretchable straps for flexibly supporting said mechanism and basket to permit gyration thereof in an orbit, said straps being of substantially greater width than thickness, and being disposed in upwardly and outwardly inclined positions, with their lower ends fastened to said supporting frame and their upper ends fastened to said auxiliary frame, said straps being so disposed that transverse lines extending parallel to or in the planes of the faces thereof, at substantially any horizontal section therethrough, intersect to define a triangle.

4. In a centrifugal machine of the character described, the combination of a receptacle, a basket mounted for rotation about a substantially vertical axis within said receptacle, mechanism arranged below and serving to drive and support said basket, means connected to the lower end of the driving mechanism and serving as a supporting frame for said mechanism and basket, an auxiliary frame surrounding and including portions extending above and below the supporting frame, and suspension means comprising a plurality of circumferentially spaced-apart, flexible, substantially nonstretchable straps for flexibly supporting said mechanism and basket to permit gyration thereof in an orbit, said straps being of substantially greater width than thickness, and each being disposed in an upwardly and outwardly inclined position, in the range of 30° to 50° to vertical, with the lower end fastened to said supporting frame and the upper end fastened to said auxiliary frame, said straps being so disposed that transverse lines extending parallel to or in the planes of the faces thereof, at substantially any horizontal section therethrough, intersect to define a triangle.

5. In a centrifugal machine of the character described, the combination of a receptacle, a basket mounted for rotation within said receptacle, mechanism arranged for driving and supporting said basket, means connected to the driving mechanism and serving as a supporting frame for said mechanism and basket, an auxiliary frame surrounding the supporting frame, suspension means comprising a plurality of circumferentially spaced-apart flexible members for flexibly supporting said mechanism and basket, said members being disposed in an upwardly and outwardly inclined position with their lower ends fastened to the supporting frame and their upper ends fastened to said auxiliary frame, a main frame below said auxiliary frame, receptacle supporting means carried by the main frame and circumferentially engaging the receptacle and supporting it in outwardly spaced relation with respect to the basket, and a plurality of circumferentially spaced-apart elastic elements interposed between said auxiliary frame and main frame and serving to yieldingly support said auxiliary frame and associated parts on the main frame.

6. In a centrifugal machine of the character

sion means comprising a plurality of circumferentially spaced-apart flexible members for flexibly supporting said mechanism and basket, said members being disposed in an upwardly and outwardly inclined position with their lower ends fastened to the supporting frame and their upper ends fastened to said auxiliary frame, a main frame below said auxiliary frame, a casing surrounding said receptacle, and carried on said main frame, a plurality of circumferentially spaced-apart elastic elements interposed between said auxiliary frame and main frame and serving to yieldingly support said auxiliary frame and associated parts on the main frame, and a plurality of circumferentially spaced-apart non-elastic friction pads mounted on the bottom of said main frame.

13. In a centrifugal machine of the character described, the combination of a receptacle, a basket mounted for rotation within said receptacle, mechanism arranged for driving and supporting said basket, means connected to the driving mechanism and serving as a supporting frame for said mechanism and basket, an auxiliary frame surrounding the supporting frame, suspension means comprising a plurality of circumferentially spaced-apart flexible members for flexibly supporting said mechanism and basket, each of said members being disposed in an upwardly and outwardly inclined position, in the range of 30° to 50° to vertical, with the lower end fastened to the supporting frame and the upper end fastened to said auxiliary frame, a main frame below said auxiliary frame, a casing surrounding said receptacle, and carried on said main frame, a plurality of circumferentially spaced-apart elastic elements interposed between said auxiliary frame and main frame and serving to yieldingly support said auxiliary frame and associated parts on the main frame, said elastic elements being disposed below and in substantially vertical alignment with said flexible members, and a plurality of circumferentially spaced-apart non-elastic friction pads mounted on the bottom of said main frame.

14. In a centrifugal machine of the character described, the combination of a receptacle, a basket mounted for rotation within said receptacle, mechanism arranged for driving and supporting said basket, means connected to the driving mechanism and serving as a supporting frame for said mechanism and basket, an auxiliary frame surrounding the supporting frame, suspension means comprising a plurality of circumferentially spaced-apart leather straps for flexibly supporting said mechanism and basket, each of said straps being disposed in an upwardly and outwardly inclined position, in the range of 30° to 50° to vertical, with the lower end fastened to the supporting frame and the upper end fastened to said auxiliary frame, a main frame below said auxiliary frame, a casing surrounding said receptacle, and carried on said main frame, a plurality of circumferentially

spaced-apart elastic elements interposed between said auxiliary frame and main frame and serving to yieldingly support said auxiliary frame and associated parts on the main frame, said elastic elements being disposed below and in substantially vertical alignment with said straps, and a plurality of circumferentially spaced-apart non-elastic friction pads mounted on the bottom of said main frame.

15. In a centrifugal machine of the character described, the combination of a receptacle, a basket mounted for rotation within said receptacle, mechanism arranged below and serving to drive and support said basket, a generally triangular shaped supporting frame connected to and disposed below said driving mechanism for supporting the latter together with the basket, a generally triangular shaped auxiliary frame surrounding the supporting frame, with the sides of the frames in substantially parallel relationship, suspension means including three flexible members disposed in an upwardly and outwardly inclined position, with their lower ends fastened to the supporting frame at the corners thereof and their upper ends fastened to the auxiliary frame at the corners of said auxiliary frame, a main frame disposed below the auxiliary frame, a casing surrounding the receptacle, and carried on said main frame, and elastic elements interposed between the auxiliary frame and main frame, substantially in vertical alignment with the respective flexible members, for yieldingly supporting said auxiliary frame and associated parts on the main frame.

16. In a centrifugal machine of the character described, the combination of a receptacle, a basket mounted for rotation within said receptacle, mechanism arranged below and serving to drive and support said basket, a generally triangular shaped supporting frame connected to and disposed below said driving mechanism for supporting the latter together with the basket, a generally triangular shaped auxiliary frame surrounding the supporting frame, with the sides of the frames in substantially parallel relationship, suspension means including three flexible members disposed in an upwardly and outwardly inclined position, with their lower ends fastened to the supporting frame at the corners thereof and their upper ends fastened to the auxiliary frame at the corners of said auxiliary frame, a main frame of rectangular outline, disposed below the auxiliary frame, a casing surrounding the receptacle, and carried on said main frame, elastic elements interposed between the auxiliary frame and main frame, substantially in vertical alignment with the respective flexible members, for yieldingly supporting said auxiliary frame and associated parts on the main frame, and non-elastic friction pads mounted on the bottom of said main frame adjacent each of the corners thereof.

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