

Aug. 29, 1944.

W. C. BRUCKMAN

2,356,818

CLEANING APPARATUS

Filed Oct. 2, 1942

2 Sheets-Sheet 1

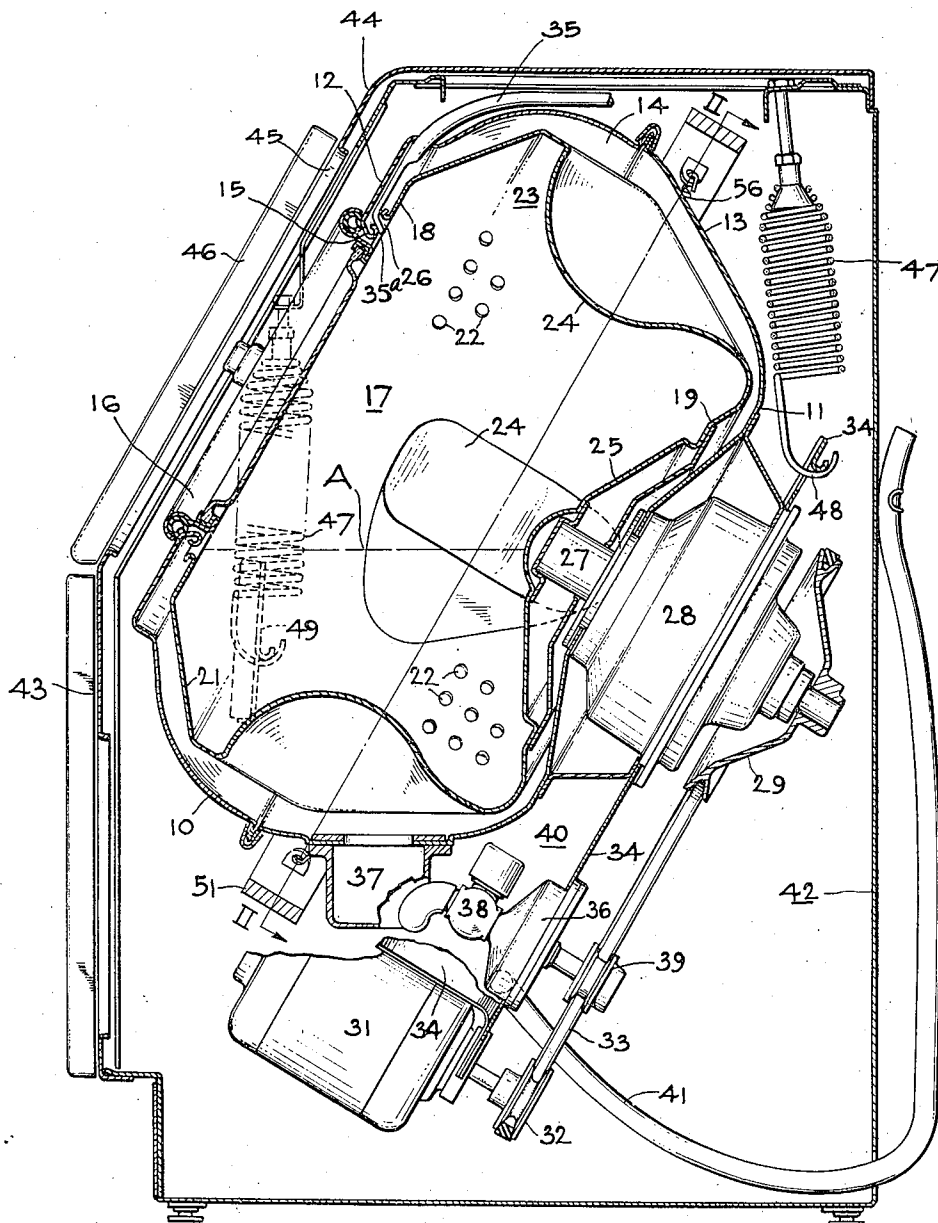


FIG. 1.

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2 Sheets-Sheet 2

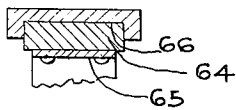
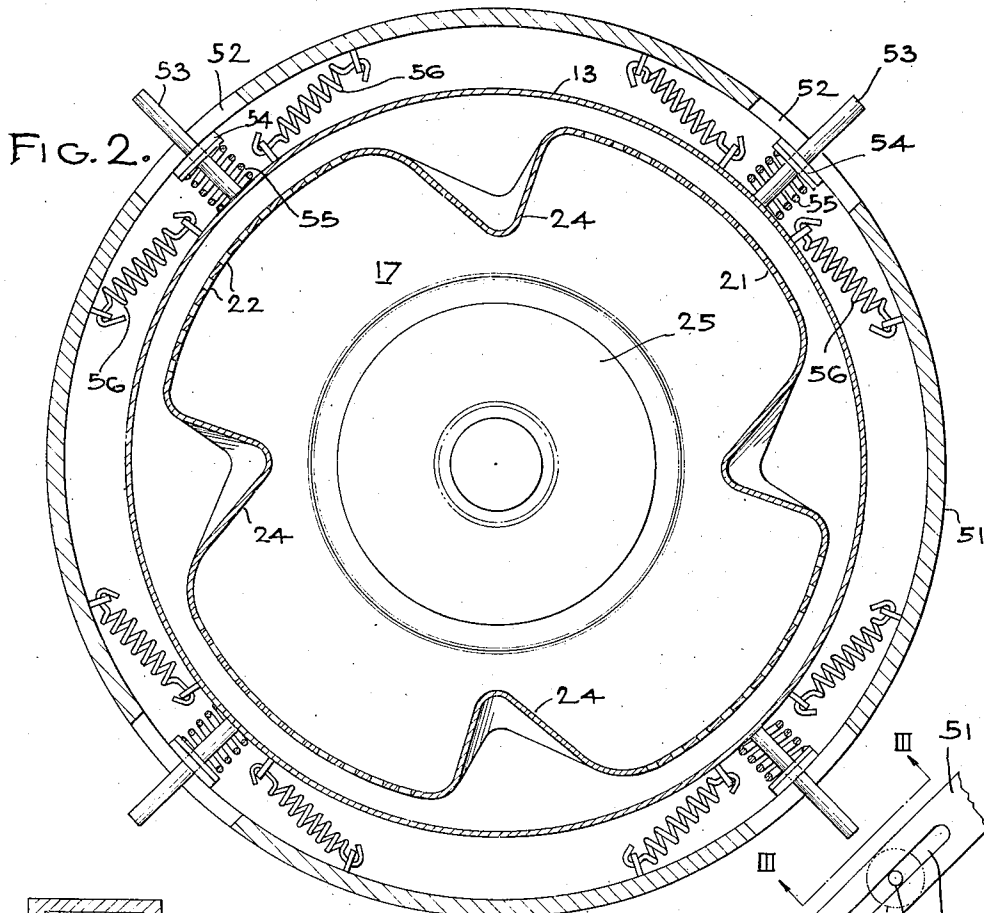


FIG. 5.

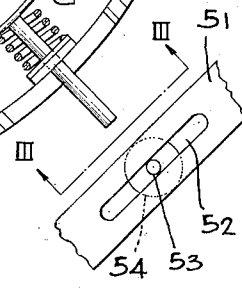


FIG. 3.

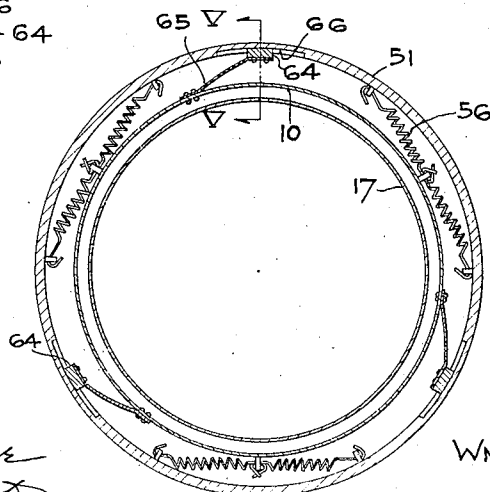


FIG. 4.

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2,356,818

CLEANING APPARATUS

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Application October 2, 1942, Serial No. 460,507

16 Claims. (Cl. 68—24)

My invention relates to cleaning apparatus and has for an object to provide improved apparatus of this kind.

A further object of the invention is to provide an improved machine for cleaning fabrics and subsequently extracting cleaning fluid from the fabrics wherein vibratory forces imparted to the support for the machine are maintained at a low value.

It is another object of the invention to provide improved stabilizing and vibration damping means for a resiliently-supported washing and spinning structure.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a vertical sectional view taken longitudinally through a cleaning and centrifuging machine constructed and arranged in accordance with my invention;

Fig. 2 is a transverse sectional view taken along the lines II—II of Fig. 1;

Fig. 3 is a view of a detail looking in the direction of the arrows III—III in Fig. 2;

Fig. 4 is a transverse sectional view similar to Fig. 2 and showing a second embodiment of the invention; and

Fig. 5 is a sectional view of a detail taken along the line V—V of Fig. 4.

Reference will now be had particularly to Figs. 1 and 2 of the drawings, wherein I have shown my invention applied to a washing and spinning machine constructed generally along the lines of the machine shown in the copending application of Frank Breckenridge, Serial No. 203,804, filed April 23, 1938, and assigned to the assignee of the present application. This type of machine includes a tub structure 10 for containing a body of cleaning fluid and having a relatively small rear end wall 11 and a relatively large front end wall 12 connected by a side wall 13. The side wall 13 is generally circular in cross section and diverges from the front and rear end walls 12 and 11, respectively, for defining an intermediate tub portion 14 which is relatively large in diameter. An access opening 15 is provided in the front end wall 12, which opening 15 is closed by a suitable gasketed door 16.

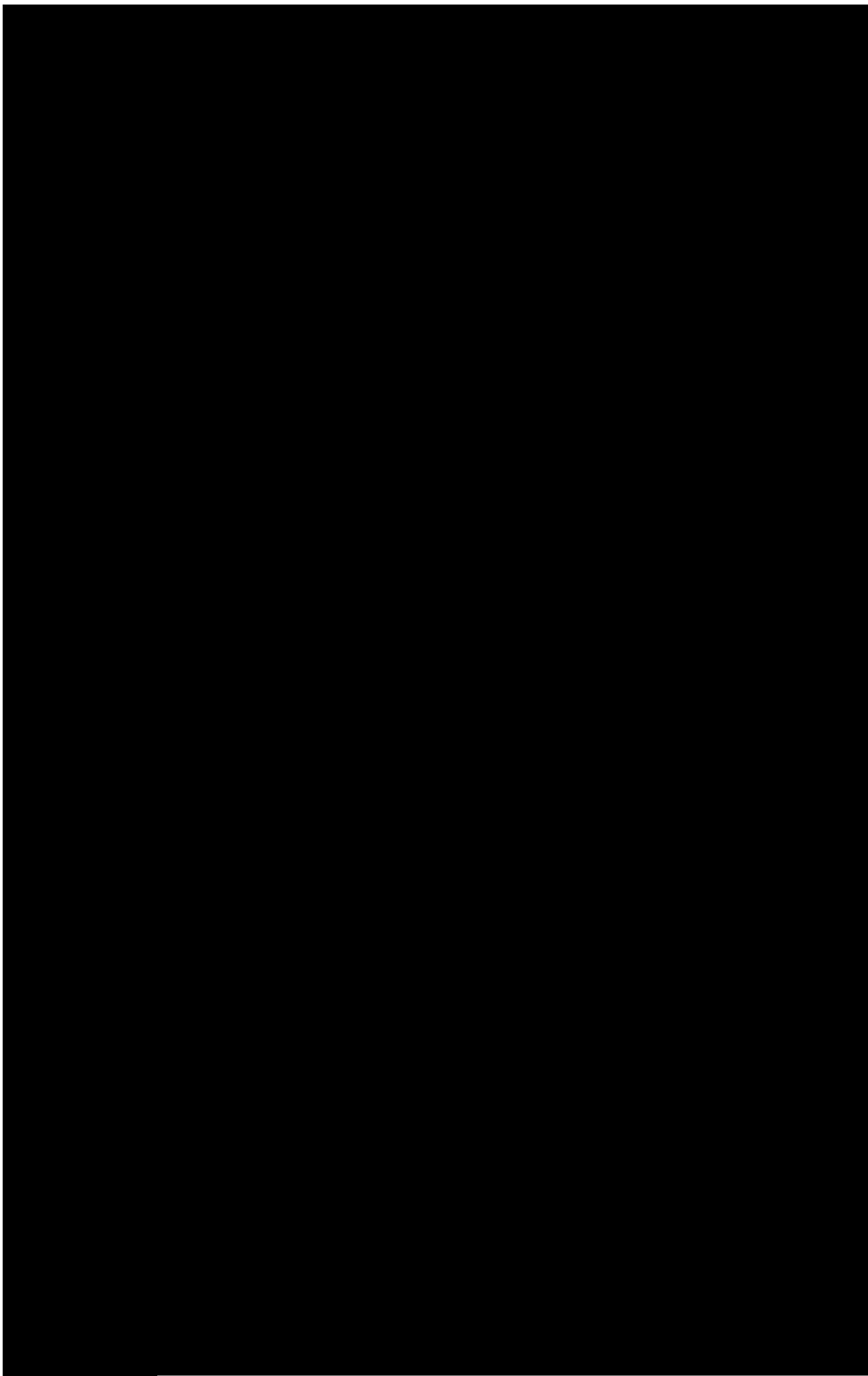
A basket structure, generally indicated at 17, is disposed within the tub structure 10 and is rotatable about an axis inclined substantially from both the vertical and horizontal. In the embodiment which I have shown, this axis is ar-

anged approximately 30 degrees above the horizontal. The basket 17 includes a relatively large front wall 18 and a relatively small rear end wall 19 connected by a side wall structure 21, generally circular in cross section and perforate throughout substantially its entire extent. A number of the perforations in the side wall basket are shown at 22. The side wall structure 21 diverges generally from both the front and rear end walls 18 and 19 and defines a basket portion 23 of maximum diameter intermediate the end walls. The basket structure 17 is provided with a plurality of protuberances or vanes 24 which are circumferentially spaced within the basket and which extend generally radially inwardly of the basket. The vanes 24 are employed for agitating the fabrics in the body of washing fluid contained within the tub 10 for effecting a washing action, further reference to which is made hereinafter. The end wall 19 is provided with a reentrant portion or dome 25 arranged centrally of the end wall 19, and further reference to this dome 25 will be made hereinafter. An access opening 26 is provided in the front end wall 18 of the basket, which opening 26 registers with the access opening 15 of the tub structure 10.

Rotation of the basket 10 about its axis at relatively low speed during washing periods and at relatively high speed during water-extracting periods is effected by a shaft or driven element 27 of a two-speed mechanism generally indicated at 28. The latter is carried by the end wall 11 in any well-understood manner and is driven by a sheave 29. The sheave 29 is rotated at substantially constant speed by a motor 31 through a pulley 32 and belt 33. The motor is carried by a lower portion of the tub structure 10 by means of suitable brackets shown at 34 in Fig. 1.

The two-speed mechanism 28 is adjustable so that the basket 17 is rotated at a relatively low speed of, for example, 50 R. P. M. during washing periods, and at a relatively high speed of, for example, 500 R. P. M. during centrifuging periods. The multiple-speed mechanism 28 may be of any well understood construction and, since the specific form of speed changing mechanism which may be employed forms no part of the present invention, it has not been shown in detail. However, a suitable two-speed mechanism of the type shown at 28 is disclosed and claimed in the patent to H. E. Edwards, No. 2,284,047, dated May 26, 1942.

Washing water is admitted to the tub 10 from a suitable source through a conduit 35 which ter-



axially of the guide. Each damping washer 54 is biased into engagement with the ring 51 by a compression spring 55, as clearly shown in Fig. 2.

Additional support for the ring 51 is provided by a plurality of tension springs 56, one end of the springs 56 being attached to the ring 51 and the opposite ends thereof being secured to the tub 10. The springs 56 function to center the ring 51 relative the tub and, in conjunction with the springs 55, provide a resilient support for the ring 51 such that the ring 51 is free to vibrate in all directions in a plane normal to the axis of the basket. The mass of the ring 51 and the constant of the spring support provided by the springs 55 and 56 are such that the natural frequency of vibration of the ring 51 relative the structure 40 is considerably higher than the natural frequency of vibration of the structure 40 on its supporting springs 47. For example, the natural period of the unitary structure 40 may be of the order of 115 cycles per minute and the natural period of the ring 51 of the order of 200 cycles per minute.

During washing periods, the structure 40 is subject to low frequency vibration which may be of high amplitude. The forces exciting these vibrations vary, depending upon the character of the load, so that the vibrations may be erratic, resulting in bouncing or wobbling of the structure 40. These low frequency vibrations are resisted by the mass of the ring 51 and are damped to some extent by the friction between the washers 54 and the ring 51. However, there is very little movement between these members at this low speed operation, so that the effectiveness of the ring 51 in restricting vibrations resides in its mass. In other words, at this time the ring 51 functions as an inertia stabilizer in about the same manner that it would if rigidly secured to the tub.

As the basket is accelerated, the vibrations of the structure 40 increase in frequency progressively. These vibrations are excited by the centrifugal action of an unbalanced load in the basket and cause precessing of the axis of the basket. The damping action provided by the frictional engagement of the washers 54 and ring 51 increases with the increase in basket speed and is maximum at the critical speed of 115 R. P. M. in the example recited. As the frequency of vibration of the suspended structure 40 increases beyond the natural frequency of vibration of the ring 51, movement of the ring relative the tub changes phase so that at spinning speed, which is far above the natural period of the ring, the latter remains substantially stationary and, by means of the springs 55 and 56 and the damping action afforded by the washers 54, resists or damps tub vibrations.

From the foregoing description, it will be apparent that large amplitude vibrations at the critical speed of the basket are prevented by the heavy ring 51 which vibrates in such phase with the tub 10 that its force is opposed to the force produced by the unbalanced load. The balancing force provided by the ring increases in magnitude during acceleration of the basket and, as the critical speed is approached and passed through, the friction damper defined by the washer 54 and ring 51 absorbs energy and prevents the amplitude of vibration from building up. When the balancer critical is reached, during the acceleration of the basket, the motion of the ring relative the tub changes phase, so that the ring is substantially stationary at the maximum spin-

ning speed and the damper is, therefore, effective to resist the low amplitude, high frequency vibrations of the suspended tub structure at this time.

During deceleration, the balancing system operates in the manner described. As the natural period of the ring 51 is above the natural period of the tub 10, the balancing ring 51 will vibrate in its proper phase with the tub as the speed of the basket decelerates through its critical speed.

The embodiment of my invention shown in Figs. 4 and 5 is similar to the embodiment described heretofore, except that a different arrangement of the damper mechanism is disclosed. Similar reference numerals are employed for parts which are common to both embodiments. The damper mechanism shown in Figs. 4 and 5 includes damper blocks 64 (three in number) which are resiliently supported from the tub structure 10 by respective cantilever springs 65, secured at one end to the damper blocks 64 and at their other ends to the tub. The damper blocks 64 move in respective arcuate recesses 66 formed on the interior of the ring 51. The ring 51 is also suspended from the tub by tension springs 56, as described in connection with the prior embodiment, except that three groups of springs 56 are shown instead of four groups as in the prior embodiment. The operation of the apparatus shown in Figs. 4 and 5 is substantially identical with the operation of the apparatus shown in the prior embodiment, so that no further description of the second embodiment of the invention is deemed necessary.

From the foregoing description, it will be apparent that I have provided an improved cleaning and centrifuging machine for treating fabrics or the like, wherein vibratory forces caused by unbalanced loads are effectively resisted and damped so that the alternating forces imparted to the foundation of the machine are maintained at a low value. The improved resilient support and damper arrangement which I have devised provides for mechanical simplicity, low cost of production, and effective vibration control at critical speed.

While I have shown my invention applied to a cylinder type washing and spinning machine operable about a generally horizontal axis, it will be understood that it may be applied equally well to vertical axis or other types of cleaning apparatus actuated at two speeds for the cleaning and centrifuging of the fabrics being treated.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a container for a body of cleaning fluid and the fabrics to be treated, driving means for agitating the fabrics in the body of cleaning fluid at relatively low frequency for cleaning the fabrics and for rotating the fabrics in the container at relatively high frequency, in the absence of said body of fluid, for centrifugally extracting fluid from the fabrics, means for resiliently supporting the container and said driving means as a unitary structure, a balancing mass and means

for resiliently carrying said balancing mass upon the unitary structure.

2. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a container for the cleaning fluid, a perforate basket arranged within the container for containing the fabrics to be treated, means disposed within the basket for agitating the fabrics during cleaning periods, means for driving said agitating means and said basket and adjustable for low and high speed operation, means for resiliently supporting the container, basket and driving means as a unitary structure, a balancing mass, means for resiliently supporting the balancing mass upon said unitary structure, and means for damping vibratory movements of the balancing mass relative the unitary structure.

3. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a container for a body of cleaning fluid and the fabrics to be treated, means for agitating the fabrics in the fluid at relatively low frequency for cleaning the fabrics and for rotating the fabrics in the container at relatively high frequency, in the absence of said body of fluid, for centrifugally extracting fluid from the fabrics, means for resiliently supporting the container, a balancing mass, and means for resiliently carrying said mass upon said container; the natural frequency of vibration of the container as determined by the first-mentioned resilient supporting means being less than the natural frequency of vibration of said mass relative the container as determined by the second-mentioned resilient supporting means.

4. The combination as claimed in claim 3 including means interposed between said mass and said container for damping vibratory movements of the mass relative the container.

5. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a container for a body of cleaning fluid and the fabrics to be treated, means for agitating the fabrics in the fluid at relatively low frequency for cleaning the fabrics and for rotating the fabrics in the container at relatively high frequency, in the absence of said body of fluid, for centrifugally extracting fluid from the fabrics, means for resiliently supporting the container, a balancing mass, and means for resiliently carrying said mass upon said container; the natural frequency of vibration of the container as determined by the first-mentioned resilient supporting means being less than the natural frequency of vibration of said mass relative the container as determined by the second-mentioned resilient supporting means, and said second-mentioned natural frequency being intermediate said relatively low frequency at which the fabrics are agitated and said relatively high frequency at which the fabrics are rotated.

6. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a container for a body of cleaning fluid, a basket disposed within the container and rotatable about a generally horizontal axis, means carried by the container for rotating the basket at relatively low speed during cleaning periods and at relatively high speed for centrifuging cleaning fluid from the fabrics, said container, basket and rotating means defining a unitary structure, means for resiliently supporting the unitary structure, a balancing mass, and means for resiliently supporting the balancing mass upon the unitary structure.

7. The combination as claimed in claim 6 including means for damping vibratory movements of the balancing mass relative said unitary structure.

8. In apparatus for cleaning fabrics and for centrifugally extracting cleaning fluid therefrom, the combination of a tub for containing a body of cleaning fluid, a perforate basket arranged within the tub for containing the fabrics to be treated, said basket being rotatable about a generally horizontal axis, means carried by the tub for rotating the basket at relatively low speed for agitating the fabrics in the body of cleaning fluid and for rotating the basket at relatively high speed, in the absence of the body of cleaning fluid, for centrifuging fluid from the fabrics, means for resiliently supporting the tub, basket and rotating means as a unitary structure, a relatively heavy ring defining a balancing mass entirely encompassing the tub, and means for resiliently supporting said ring from the unitary structure.

9. In apparatus for cleaning fabrics and for centrifugally extracting cleaning fluid therefrom, the combination of a tub structure for containing a body of cleaning fluid, a perforate basket for containing the fabrics to be treated and rotatable within the tub structure about a generally horizontal axis, means carried by the tub structure for rotating the basket at relatively low speed for cleaning the fabrics and at relatively high speed for centrifugally extracting fluid from the fabrics, means for resiliently supporting the tub, basket and rotating means as a unitary structure, a relatively heavy balancing ring, and means for resiliently supporting the balancing ring upon said unitary structure, said balancing ring being arranged in a plane normal to the axis of rotation of the basket and intersecting a portion of the basket.

10. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a tub structure, a perforate basket arranged within the tub structure for containing the fabrics to be treated and rotatable about a generally horizontal axis, said basket having a side wall substantially circular in cross section and having a portion intermediate the ends thereof relatively large in diameter, means carried by the tub structure for rotating the basket at relatively low speed for cleaning the fabrics and at relatively high speed for spinning fluid therefrom, said tub, basket and driving means defining a unitary structure, means for resiliently supporting the unitary structure, a relatively heavy ring encompassing the tub structure and disposed in a plane normal to the axis of rotation of the basket and adjacent the portion of the basket of maximum diameter, and means for resiliently supporting said ring upon the tub structure.

11. In apparatus for cleaning fabrics and for extracting cleaning fluid therefrom, the combination of the tub for containing cleaning fluid, a rotatable perforate basket disposed within the tub, said tub and basket each having end portions connected by a side wall which is substantially circular in cross section and said tub and basket each having an intermediate portion of large diameter, the circumferential side walls of the tub and basket diverging from the end walls to said intermediate portion of large diameter, said basket having its axis of rotation so disposed at an acute angle from the vertical that said intermediate portion of large diameter of the tub and basket are disposed upwardly with

respect to the respective smaller end portions, means for rotating the basket in a single direction at relatively low speed for agitating the fabrics therein during cleaning periods and subsequently at relatively high speed for extracting fluid from the fabrics, means for resiliently supporting the tub, basket and rotating means as a unitary structure, a balancing ring encompassing the tub adjacent the portion thereof of maximum diameter and means for resiliently supporting the balancing ring upon the unitary structure.

12. The combination as claimed in claim 11 wherein the natural frequency of vibration of the unitary structure is less than the natural frequency of vibration of the ring relative the unitary structure.

13. The combination as claimed in claim 11 including means for damping vibratory movements of the balancing ring relative the unitary structure.

14. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a tub structure, a perforate basket arranged within the tub structure for containing the fabrics to be treated and rotatable about a generally horizontal axis, said basket having a side wall substantially circular in cross section and having a portion intermediate the ends thereof relatively large in diameter, means carried by the tub structure for rotating the basket at relatively low speed for cleaning the fabrics and at relatively high speed for spinning fluid therefrom, said tub, basket and driving means defining a unitary structure, means for resiliently supporting the unitary structure, a relatively heavy ring encompassing the tub structure and disposed in a plane normal to the axis of rotation of the basket and adjacent the portion of the basket of maximum diameter, said ring having a plurality of elongated slots circumferentially spaced therein, a plurality of radially-

extending guide members secured to the tub structure and projecting, respectively, into said slots, a plurality of damping shoes carried by the respective guide members and frictionally engaging the inner surface of said ring, and a plurality of compression springs interposed between the tub structure and the respective damper shoes.

15. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a container for a body of cleaning fluid and the fabrics to be treated, driving means for agitating the fabrics in the body of cleaning fluid at relatively low frequency for cleaning the fabrics and for rotating the fabrics in the container at relatively high frequency, in the absence of the body of cleaning fluid, for centrifugally extracting fluid from the fabrics, means for resiliently supporting the container, a balancing mass and means for resiliently supporting the balancing mass upon said container.

16. In apparatus for cleaning fabrics and for centrifuging cleaning fluid therefrom, the combination of a container for a body of cleaning fluid, a basket disposed within the container and rotatable about a generally horizontal axis, means carried by the container for rotating the basket at relatively low speed during cleaning periods and at relatively high speed for centrifuging cleaning fluid from the fabrics, said container, basket and rotating means defining a unitary structure, means for resiliently supporting the unitary structure, a balancing ring encompassing said container and having a plurality of circumferentially-spaced recesses formed therein, means including a plurality of springs for resiliently supporting said ring from the unitary structure, a plurality of friction dampers arranged within said recesses and engaging said ring, and resilient means for supporting said friction dampers from the unitary structure.

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