

Oct. 17, 1950

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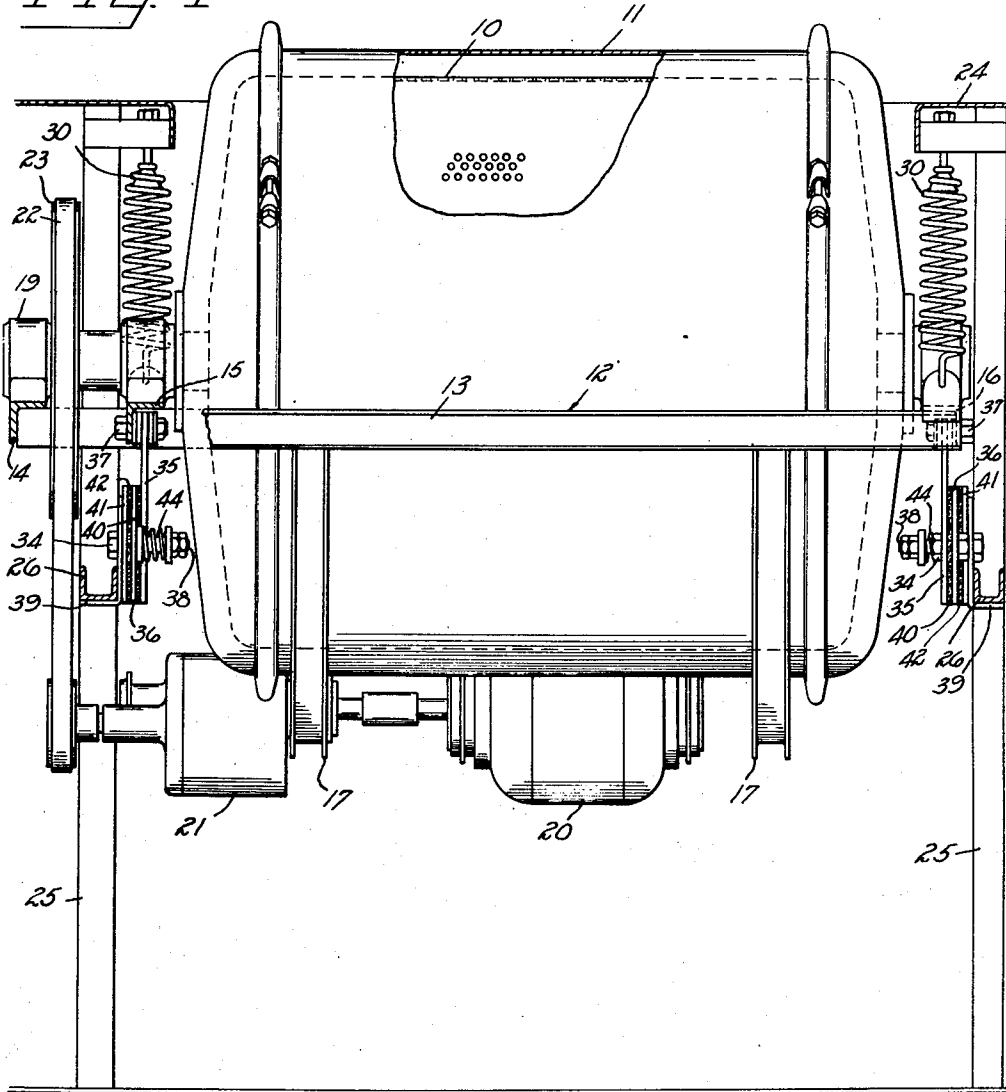
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VIBRATION DAMPING DEVICE FOR LAUNDRY MACHINES

Filed Dec. 13, 1945

4 Sheets-Sheet 1

Fig. 1



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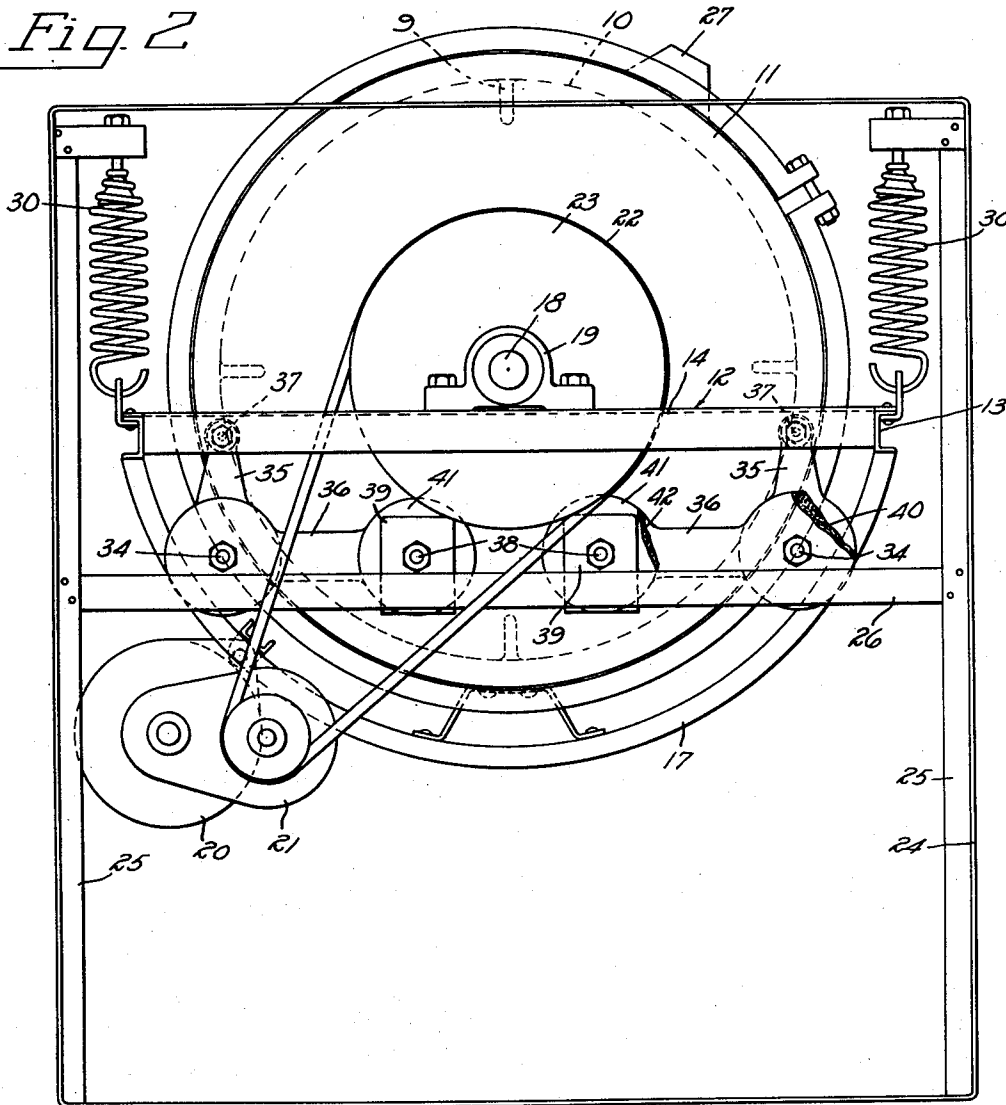
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Filed Dec. 13, 1945

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Fig. 2



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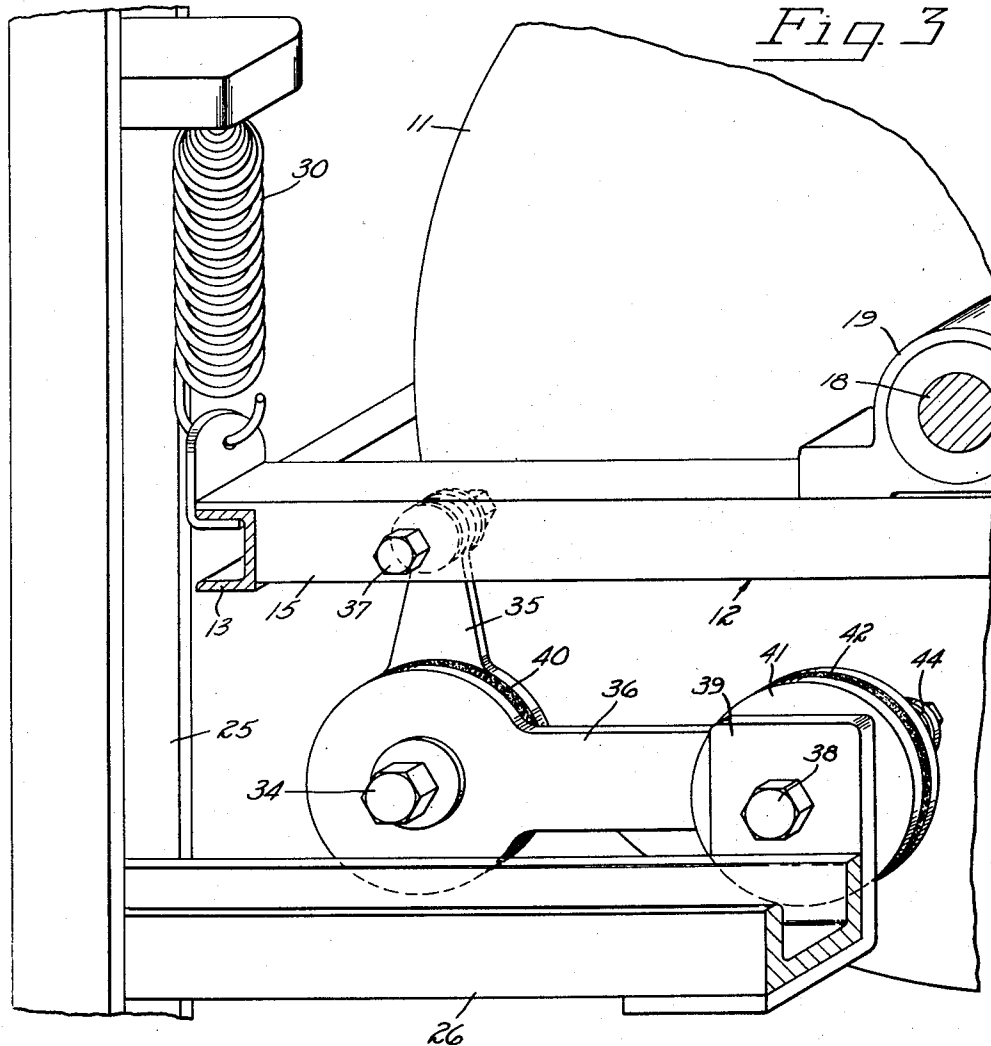
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2,526,048

VIBRATION DAMPING DEVICE FOR LAUNDRY MACHINES

Filed Dec. 13, 1945

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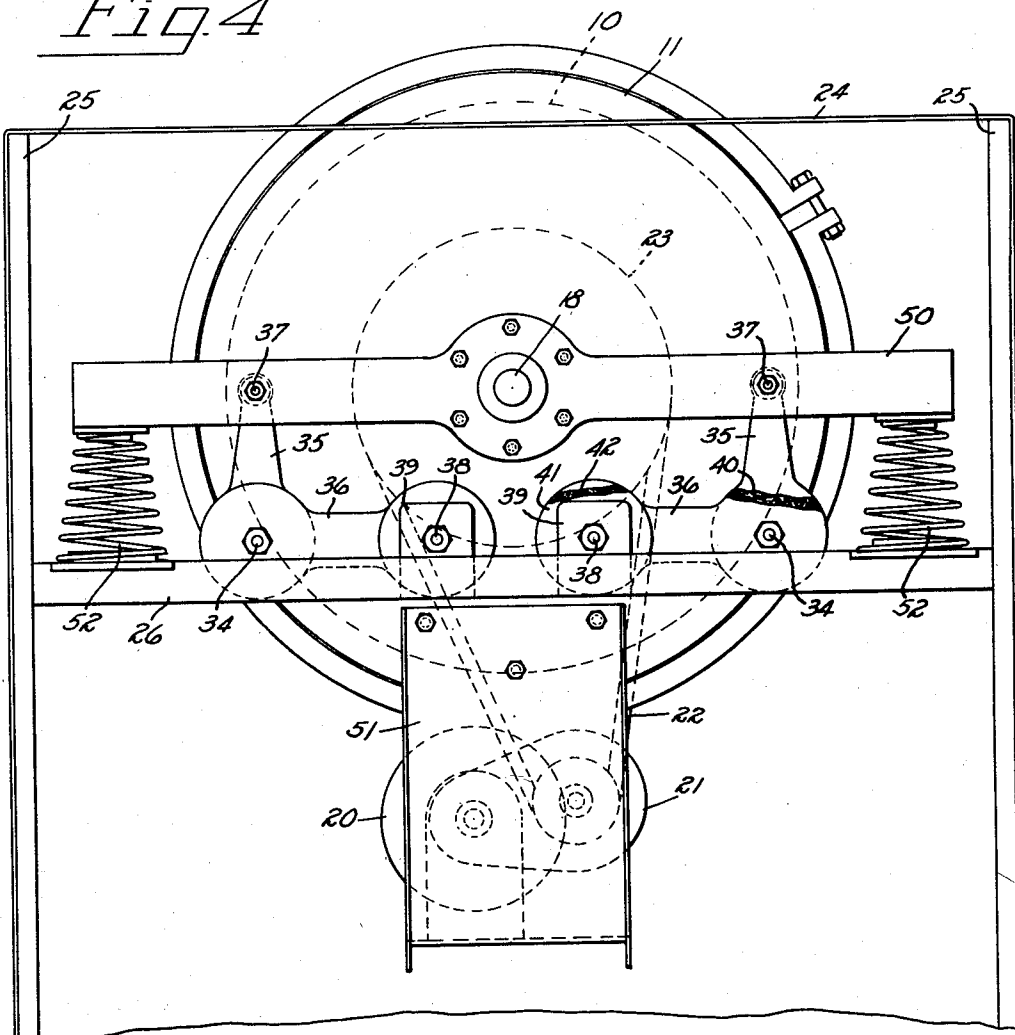
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VIBRATION DAMPING DEVICE FOR LAUNDRY MACHINES

Filed Dec. 13, 1945

4 Sheets-Sheet 4

Fig. 4



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2,526,048

VIBRATION DAMPING DEVICE FOR
LAUNDRY MACHINES

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Application December 13, 1945, Serial No. 634,759

4 Claims. (Cl. 68—24)

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The invention relates to laundry machines for washing and drying, or partially drying, fabrics or the like and has particular reference to a laundry machine of the type having a horizontal, perforate basket or drum located in a tub and driven at a relatively low speed during washing periods and at a relatively high speed during fluid extracting periods.

In laundry machines of this sort, the tub unit, comprising the tub and the basket journaled therein, is subjected to various vibrations and gyratory actions which are largely due to unbalanced conditions as when the fabrics are not uniformly distributed within the basket. Varying vibrational forces are encountered throughout the entire cycle of operation of the machine but the amplitudes of vibration are particularly pronounced at the critical speed, i. e., when the speed of the basket during transition between washing and spinning speeds is such that the forced vibrations are in step or resonance, or nearly so, with the natural frequency of the unit.

The object of the invention is to provide an improved and simplified arrangement in a laundry machine of this type for so mounting the tub unit and controlling the vibrations thereof that the vibrations are largely absorbed and damped, and transmission thereof to the supporting structure, and thence to the floor or foundation on which the machine may rest, is effectively minimized.

A further aim of the invention is to provide in a laundry machine of this sort an improved arrangement wherein the tub structure is spring mounted for resilient movement in all directions in planes normal to the axis of rotation of the basket, and friction damping devices having a predetermined frictional resistance are effective to restrain and damp vibrations in all directions in planes normal to the axis of rotation of the basket throughout the entire cycle of operation of the machine.

A further aim of the invention is to provide an improved arrangement of the sort described wherein the friction damping devices are employed for resiliently restraining endwise movement of the tub structure.

A still further object of the invention is to provide an improved spring mounting and vibration damping arrangement for laundry machines having the above and other advantages, and which is very simple in construction, which comprises relatively few parts, which may be economically manufactured and easily assembled, and which will have a long, effective life without requiring adjustment or repair.

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My improved arrangement provides a structure which permits of a relatively light casing or supporting structure for the tub structure, and it is not necessary to anchor the supporting structure to the floor or other foundation as the disturbing forces, which may be transmitted to the supporting structure, are of such low value as to not cause the supporting structure to move from its position.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings, wherein I have shown, for illustrative purposes, two embodiments which the present invention may take:

Figure 1 is a front view of so much of a laundry machine as is necessary to disclose the present invention;

Fig. 2 is an end view thereof;

Fig. 3 is a partial detail view illustrating, in perspective, one of the suspension springs and one of the friction damping devices disposed at the left-hand end of the machine as viewed from Fig. 1; and

Fig. 4 is an end view of a laundry machine showing, somewhat diagrammatically, another embodiment of my invention.

In the drawings, I have shown in each embodiment, for illustrative purposes and somewhat conventionally, a laundry machine having a perforated cylindrical drum or basket 10 mounted within a horizontally disposed cylindrical tub 11. The tub and basket may have suitable openings to permit the fabrics to be placed into and removed from the basket. The openings and the doors therefor are not shown in the drawings as they may be of any suitable construction. The basket is provided with vanes 9 for causing the fabrics to be tumbled and agitated during washing periods.

In the embodiment illustrated in Figs. 1 to 3, the tub is shown as fixed to a frame 12 which includes two longitudinally extending channel irons 13; transverse angle irons 14 and 15 at one end of the tub; a transverse angle iron 16 at the other end of the tub, and two curved channel irons 17 encircling the lower portion of the tub. The frame 12 is not necessary or required and is shown for illustrative purpose only. In place thereof cross members or brackets (such as are designated by the numeral 50 in Fig. 4) may be secured

to opposite ends of the tub and the hereinafter described springs and damping devices may be associated with such cross members. The tub has, at its opposite ends, gudgeons 18 which are shown as being journaled in bearing brackets 19 secured to the members 14, 15, and 16.

The basket may be rotated at a relatively slow speed during washing and rinsing operations and at a relatively high speed during spinning periods in any suitable manner as by means of an electric motor 20 operating through a two-speed transmission mechanism 21 and a belt 22 passing about a pulley 23 fixed to the left hand gudgeon 18 (Fig. 1). The two-speed transmission mechanism is shown diagrammatically as structures of this sort are old and any suitable arrangement may be employed. The motor and transmission mechanism are shown as suitably supported by the frame 12 to the lower side of the tub. If the frame is omitted, the transmission mechanism and motor may be carried by a bracket 51 directly connected to and depending from the tub, as shown in Fig. 4. Suitable weights 27 may be secured to the top of the tub to counterbalance the motor and transmission mechanism.

The tub structure or unit, comprising the tub 11, the basket 10, and the means for driving the basket, is located within a casing or supporting structure of any suitable sort, the same here being shown as comprising a skeleton frame formed of channel iron and sheet metal panels 24 secured thereto so as to house the structure. In the present illustrative disclosure, the skeleton frame has four upright members 25, one at each corner of the machine and cross members 26, one at each end of the machine.

Referring now to my improved arrangement for resiliently mounting the tub unit and controlling the vibrations thereof, in Figs. 1 to 3, inclusive, the tube structure is shown as being suspended from the supporting structure by coiled springs 30. By way of example, four such springs are shown, two at each end of the tub structure and the two opposite sides thereof. The upper ends of the springs are connected to the supporting structure, and the lower ends are secured to the frame 12 adjacent the corners thereof. The springs for resiliently supporting the tub structure may be variously arranged and, if desired, compression springs 52, as shown in Fig. 4, may be employed, the main considerations being to so resiliently support the tub unit that the basket is somewhat free to assume a position where the same may gyrate about its center of mass so that vibrations, due to unbalanced conditions, are considerably reduced, and the springs largely absorb the vibrational forces and prevent them from being transmitted to the supporting structure in such values that the position of the machine on the floor is disturbed and objectional vibrational forces are imparted to the floor.

In order to further absorb the vibrational forces set up in the tub unit during the operation of the machine and to limit the amplitude of vibration of the tub structure, damping devices of a very simple and economical nature are provided which have a fixed or established friction throughout the entire cycle of operation of the machine. These friction devices damp the vibratory movement of the tub structure in all directions in planes normal to the axis of rotation of the basket and resiliently restrain or restrict endwise longitudinal movement of the tub structure. In the present illustrative disclosure, two such friction devices are shown as located adjacent opposite ends of

the tub structure. Each friction device may comprise a pair of links 35 and 36 angularly disposed relative to one another and respectively connected to the tub structure and the supporting structure. In the present instance, the links 35 are pivotally connected by bolts 37 to the cross members 15 and 16 of the frame 12; the links are pivoted together by bolts 34, and the links 36 are pivotally connected by bolts 38 to brackets 39 fixed to the cross members 26 of the supporting structure or frame. Between the links is a friction member or washer 40 of suitable material, such as brake lining material. Located between the pivoted end of the link 36 and a metal disk 41 fixed to the bracket 39 is a like friction member or washer 42. The amount of friction exerted by the damping devices may be determined by the amount of vibration encountered through the critical speed which usually occurs between 100 and 150 R. P. M. of the basket and the maximum amount of unbalance at spinning speeds. In the present illustrative disclosure, the amount of friction exerted by each frictional member may be established by loosening or tightening the bolts 34 and 38. If desired, the friction washers 42 may be spring pressed between the disks 41 and the links 36 by means of springs 44 carried by the bolts 38. It is to be understood that, while the amount of friction exerted by the friction devices may be initially adjusted, preferably at the factory, the amount of friction having been established, it remains constant throughout the entire cycle of operation, i. e., during washing, rinsing, and spinning periods, and while the speed of the basket is accelerating up to and decelerating away from spinning speed. The links of the damping devices are pivoted for swinging movement in a plane generally normal to the axis of the basket and they are rigid in the direction in which they swing. The links, however, are somewhat resilient transversely of their planes so that they accommodate, while at the same time resiliently restrain or restrict, endwise movement of the tub structure.

The operation will be understood from the foregoing description taken in connection with the accompanying drawings. It is observed that, when the tub is empty of water, the springs resiliently support the tub unit in an upper position as shown in the drawings. The fabrics, having been put into the basket, upon admitting water into the tub, the tub unit, due to the added weight, will move down to a relatively lower position in which the washing operations are carried out. Such movement is permitted by the extension of the suspension springs in the embodiments shown in Figs. 1 to 3, and by contraction of the compression springs in the embodiments shown in Fig. 4. The basket is now rotated continuously about its axis at a relatively low speed through the driving mechanism previously described with the results that the fabrics are tumbled or agitated in the basket and move through the water in the bottom portion of the tub. After the clothes have been so washed, they may be subjected to the usual rinsing operation. The water is then drained from the tub with the result that the springs will urge the tub structure to approximately the upper position shown and at which position the basket is driven at a relatively high speed so as to extract the water from the clothes by centrifugal action. After the clothes are substantially dry, the machine is stopped and the fabrics are removed from the basket. In all positions of the tub structure and

throughout the entire cycle of the machine, the springs are effective to resiliently support the tub structure and largely absorb the vibrational forces so that they are not transmitted to the supporting structure to an objectionable extent. It may further be observed that the friction damping devices have a predetermined frictional resistance and, in all positions of the tub structure and throughout the cycle of operation of the machine, these friction devices are effective to damp the vibratory movement of the tub unit in all directions in planes normal to the axis of rotation of the basket, as previously described. The arrangement is such that the vibratory forces present during critical speed periods are effectively controlled.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim as my invention:

1. In a laundry machine for washing fabrics and for extracting cleaning fluid therefrom by centrifugal force, a supporting structure, a tub structure mounted for movement from an upper fluid extracting position to a lower washing position upon admitting fluid to the tub, a basket journaled in the tub structure for rotation about a horizontal axis, means for rotating the basket at a relatively low speed during washing periods and at a relatively high speed during fluid extracting periods, means comprising springs for resiliently supporting said tub structure and the basket carried thereby in both of said positions and permitting movement thereof in all directions in planes normal to the axis of rotation of the basket, and friction devices for damping vibratory movement of the tub structure in all directions in planes normal to the axis of rotation of the basket, each of said devices comprising a pair of angularly disposed links pivotally connected together and respectively pivotally connected to said tub structure and supporting structure for swinging movement in a plane generally normal to the axis of rotation of the basket and friction elements between said links.

2. In a laundry machine for washing fabrics and for extracting cleaning fluid therefrom by centrifugal force, a supporting structure, a tub structure mounted for movement from an upper fluid extracting position to a lower washing position upon admitting fluid to the tub, a basket journaled in the tub structure for rotation about a horizontal axis, means for rotating the basket at a relatively low speed during washing periods and at a relatively high speed during fluid extracting periods, means comprising springs for resiliently supporting said tub structure and the basket carried thereby in both of said positions and permitting movement thereof in all directions in planes normal to the axis of rotation of the basket, and friction devices for damping

vibratory movement of the tub structure in all directions in planes normal to the axis of rotation of the basket, each of said devices comprising a pair of angularly disposed links pivotally connected together and respectively pivotally connected to said tub structure and supporting structure for swinging movement in a plane generally normal to the axis of rotation of the basket and friction elements between said links, said links being resilient in a direction lengthwise of the tub structure and arranged to resiliently restrain lengthwise movement of the tub structure.

3. In a laundry machine for washing fabrics and for extracting cleaning fluid therefrom by centrifugal force, a supporting structure, a tub structure, a basket journaled in the tub structure for rotation about a horizontal axis, means for rotating the basket at a relatively low speed during washing periods and at a relatively high speed during fluid extracting periods, springs between said supporting structure and tub structure for resiliently supporting the latter for floating movement, and a pair of friction damping devices disposed in substantially vertical planes normal to the axis of rotation at each end of the tub structure, each of said devices comprising a link pivoted to and depending from the tub structure, a laterally extending link pivoted to said first link and pivotally connected to said supporting structure, a friction element between said links, and a friction element between said last mentioned link and the supporting structure.

4. In a laundry machine for washing fabrics and for extracting cleaning fluid therefrom by centrifugal force, a supporting structure, a tub structure, a basket journaled in the tub structure for rotation about a horizontal axis, means for rotating the basket at a relatively low speed during washing periods and at a relatively high speed during fluid extracting periods, springs between said supporting structure and tub structure for resiliently supporting the latter, vibration dampers each comprising a plurality of links forming an articulated linkage system pivotally connected at its extremities to said supporting structure and tub structure, respectively, and friction elements disposed at one or more points of articulation, each linkage system being disposed in a vertical plane normal to the axis of rotation whereby swinging movements of said tub structure are damped in all directions normal to the axis of rotation and movements of said tub structure parallel to the axis are resiliently restrained.

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