Feb. 14, 1967 R. K. YATES 3,304,032

SELF-BALANCING SUPPORT MECHANISM

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FIG. 1

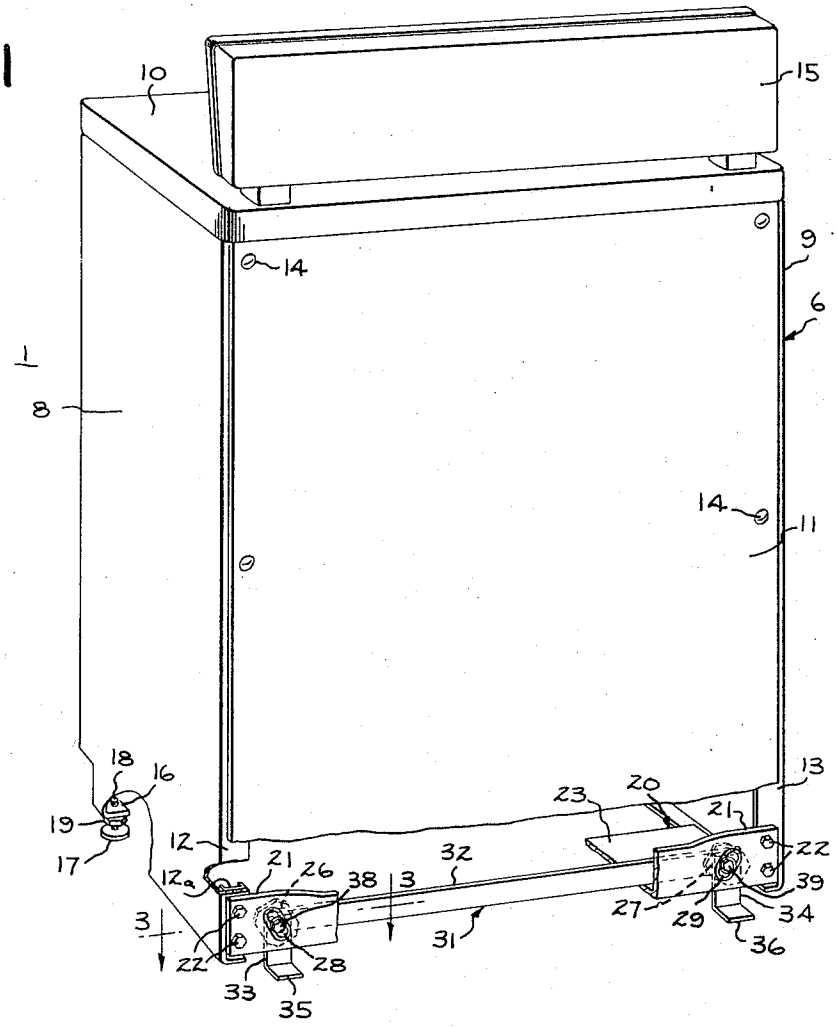
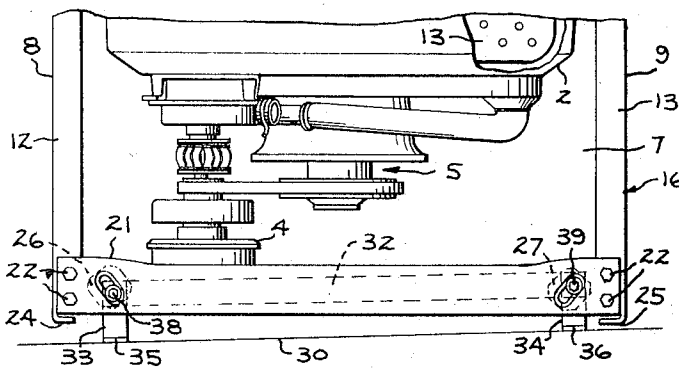


FIG. 2



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SELF-BALANCING SUPPORT MECHANISM

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FIG. 3

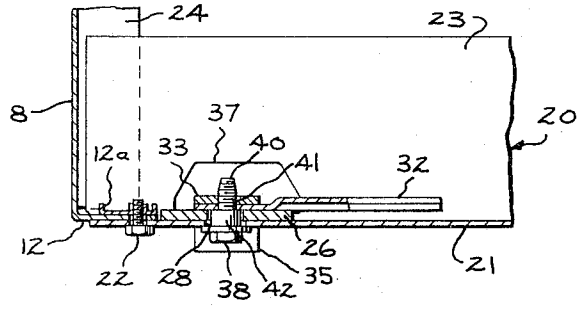


FIG. 4

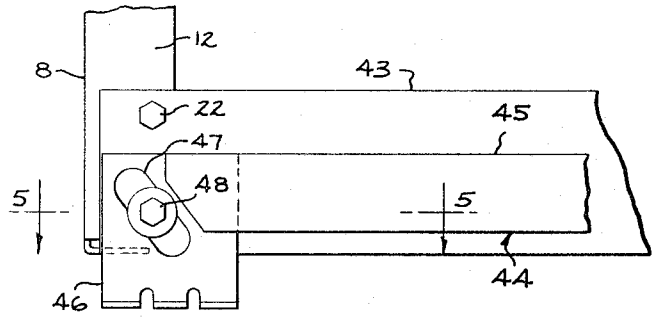
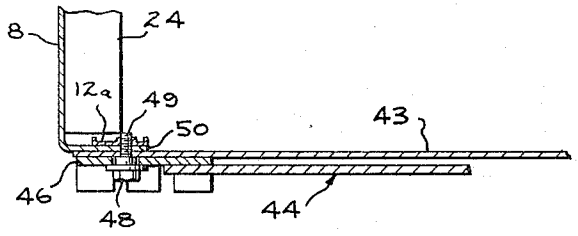


FIG. 5



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3,304,032

SELF-BALANCING SUPPORT MECHANISM

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4 Claims. (Cl. 248—2)

This invention relates to machines such as automatic washing machines, and more particularly, to self-balancing support mechanisms for use with such machines.

In machines such as automatic washing machines the weight distribution of the operational components of a machine may be unequal. Additionally, such machines are often required to stand on uneven base surfaces. In order to function properly the weight distribution of the machine should be balanced among the support contact members of the machine. This is particularly true of automatic washing machines which accomplish a spin or centrifugal extraction operation. If the weight distribution of this machine is not balanced, the forces generated by the rotating basket and its load of clothes during the spin operation may cause the machine to shake badly and to "walk" across the base surface on which the machine is mounted. Since the user may move these machines slightly during the course of their use it is highly desirable that the weight balancing mechanism for such machines be self-balancing so that such slight movement of the machine by the user will not cause the machine to become unbalanced.

An object of the present invention, therefore, is to provide a novel and improved support mechanism for such machines which balances the weight of the machine among its support contact members.

Another object of the present invention is to provide such a support mechanism which is self-balancing in the sense that it will automatically cause the machine to assume a position in which the weight distribution on the various support contact members of the machine is even.

A further object of this invention is to provide such a support mechanism which "locks up" in a balanced position to the extent that normal operational vibrations of the machine will not cause it to become unbalanced.

In accordance with one embodiment of this invention I provide a support mechanism including a cabinet to receive the machine. One side of the cabinet is provided with a strap member which extends across the lower end of the cabinet and includes a pair of spaced upwardly diverging slots. I also provide a mounting leg for operative attachment to the strap. The mounting leg includes an elongated, generally horizontal central portion with one of a pair of downwardly extending support feet formed at each end thereof. The mounting leg includes a pair of spaced threaded holes and an attachment stud is securely treaded into each of these holes and extends through a cooperating one of the slots. Each stud includes a bushing portion having a close sliding engagement with one of the corresponding slots. When the machine is mounted on a base surface the weight of the machine causes the studs to slide within the slots until the machine assumes a position in which the weight distribution among the various support contact members or feet is balanced.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. My invention, however, both as to organization and method of operation, together with further objects and advantages thereof may best be understood by reference to the following description taken in conjunction with the accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view of a clothes washing machine including one embodiment of my invention, the view being partly broken away to illustrate details;

FIGURE 2 is a fragmentary rear elevational view of the clothes washing machine shown in FIGURE 1;

FIGURE 3 is a view taken along line 3—3 of FIGURE 1;

FIGURE 4 is a fragmentary rear elevational view of a washing machine similar to that shown in FIGURE 1 illustrating another embodiment of my invention; and

FIGURE 5 is a view taken along the line 5—5 of FIGURE 4.

Referring now to the drawings, particularly FIGURES 1–3, there is shown therein a machine, more specifically a washing machine generally indicated by the numeral **1**. The washing machine may include the various operational components conventionally utilized in a domestic automatic washing machine, for instance, an imperforate tub **2** enclosing a perforate basket **3**, an electric motor **4**, and an apparatus generally indicated at **5** so that the electric motor may cause suitable washing, centrifuging, and pumping action to take place. The operational components of the washing machine are supported on a suitable base surface by means of a support mechanism including a cabinet **6**. The cabinet includes a front wall **7**, a pair of side walls **8** and **9**, a top wall **10**, and a rear wall **11**. The side walls **8** and **9** are formed along the rear edges with inwardly extending flanges **12** and **13** respectively which extend partially across the cabinet. The cabinet also includes a frame which supports the front, rear and side walls. The frame includes a pair of apron struts (such as **12***a*) which extend along the vertical rear edges of the machine. Rear wall **11** and side walls **8** and **9** are secured together by a number of screws **14** which pass through mating openings in wall **11** and flanges **12** and **13** and are received in the apron struts. Additionally, a backsplasher or control panel **15**, which houses controls (not shown) to control the operation of the various operational components of the washing machine, extends up from wall **10**.

Washing machines often are mounted on basement floors which have a predominant slope toward one point for ease of drainage. In order to compensate for such a slope each of the side walls **8** and **9** are formed adjacent its front edge with an inwardly extending tab such as that shown at **16**. A supporting foot **17** is mounted on each tab **16** by means of a threaded shaft **18** which extends upwardly from foot **17** and is received in a threaded opening in tab **16**. A lock nut **19** is mounted around the shaft **18** and is screwed up tight against the underside of tab **16** in order to lock foot **17** in its adjusted position.

The weight of the various operational components of the washing machine may be such that the weight distribution of the machine is not symmetrical. Also the base surface on which the machine is mounted may be uneven. The unevenness of the base surface may be due to faulty construction of the base surface, sagging of the surface under the weight of the machine or any one of a number of other reasons. If the machine is mounted on such a base surface by means of a fixed supporting structure the unevenness of the surface would tend to add to the nonsymmetrical weight distribution of the machine and the machine may vibrate excessively and "walk" across the base surface.

In order to insure that the weight distribution within the appliance is balanced with regard to the points of contact between the machine and the base surface I construct the support mechanism so as to be self-balancing. For this purpose cabinet **6** includes an L-shaped strap member **20** having a first portion **21** that extends across

the back of the cabinet and is secured to the frame by means of bolts **22** and a second portion **23** which extends across the bottom of the cabinet and engages a pair of flanges **24** and **25** which are turned inwardly along the bottom edges of side walls **8** and **9** respectively. Reinforcing plates **26** and **27** are secured to the portion **21** adjacent each end thereof by some suitable means such as welding. Slots **28** and **29** are provided in the portion **21** and reinforcing plates **26** and **27**, respectively with the slots **28** and **29** diverging in the upward direction.

In order to mount the machine on a base surface, such as that indicated at **30** in FIGURE 2, I provide as part of the support mechanism a mounting leg **31** including an elongated, generally horizontal portion **32** with downwardly extending support feet **33** and **34** formed on each end thereof. The support feet include horizontally extending pads **35** and **36** which engage the surface **30**. Normally the central portion **32** may be constructed from a strip of relatively light metal with the downwardly extending support feet constructed of heavier material and attached to the central portion by suitable means such as welding. So that the mounting leg **31** may be operatively connected to the strap member the mounting leg is placed inside portion **21** of the strap with the downwardly extending support feet **33** and **34** extending through openings in the strap portion **23** (such as that shown at **37**).

In order to operatively connect the mounting leg to the strap member I provide a pair of attachment studs **38** and **39** which extend through the slots **28** and **29** respectively and are securely attached to the mounting leg **31**. In the embodiment shown in FIGURES 1 through 3, each of the studs is provided with a threaded portion **40** which is received in a threaded opening (such as **41**) in the mounting leg, and a bushing portion **42** which extends through a corresponding one of the slots (such as **28** in FIGURE 3) with a close sliding fit. The bushing portion is longer than the thickness of the cooperating slot so that the mounting leg **31** will be free to move relative to the strap **20**.

With such a construction, when the machine is placed on a floor or other base surface any unequal weight distribution among the supporting feet of the machine as a result of the unsymmetric weight distribution of the operational components of the machine or unevenness of the support surface will cause the attachment studs **38** and **39** to slide within the slots **28** and **29** respectively. The orientation of the slots will cause one stud to move up as the other moves down so that the machine will automatically assume a position in which the weight is evenly distributed among the support feet. Once the weight is evenly distributed the mechanism essentially "locks up" in that the static friction between the bushing portions and cooperating edges of the slots is sufficient to prevent the mechanism from moving in response to normal operational vibration of the machine.

The embodiment shown in FIGURES 4 and 5 is similar to that shown in FIGURES 1–3; however, the slots in this embodiment are provided in the mounting leg rather than in the strap member and reinforcing plates. Referring now to FIGURES 4 and 5 the cabinet is provided with side walls, such as that shown at **8**, with each of the side walls having an inturned flange, such as **12**, at the rear thereof. A strap member **43** is provided which extends across the rear of the cabinet and is attached to the side walls by bolts **22** which extend through mating opening in the strap member and side walls and are received in threaded openings in the strut **12***a*. I provide a mounting leg **44** which includes an elongated generally horizontal central portion **45** with a downwardly extending support foot, such as **46**, formed at each end thereof. Normally the central portion **45** is constructed of a relatively light metal material and the support feet are formed from relatively heavy material and are attached to the central portion **45** by a suitable means such as welding. A slot, such as that shown at **47**, is provided in each

support foot with the two slots diverging in the upward direction in a manner similar to the slots **28** and **29** shown in the strap member **20** of FIGURE 1. A stud **48** extends through each of the openings **47** and is threadedly attached to the strut **12**. This attachment may easily be accomplished by omitting the lowermost bolt **22** on each side of the cabinet so that aligned openings in strap **43**, each of the side walls, and corresponding struts remain open to receive the studs **48**. Each of the studs **48** extends through aligned openings in the strap and one side wall and is threadedly received in a corresponding opening in one of the struts, thus the studs **48** securely connect together the strap, the side walls and the struts and, in turn, are securely connected to these members. It will be understood that, in machines which do not include struts such as **12***a*, the threaded openings may be provided in the strap and side wall members themselves.

As seen in FIGURE 5 each of the studs **48** includes a screw threaded portion **49** which is threadedly engaged in the screw-threaded opening in the strut **12***a* and extends through the aligned openings in the strap and side wall with a close fit. The stud also includes a bushing portion **50** which extends through one of the slots **47** with a close sliding engagement. The bushing portion **50** is longer than the thickness of the corresponding slot **47** so that mounting leg **44** may move relative to strap **43**. With this construction, as with the construction shown in FIGURE 1, an unequal weight distribution of the machine will cause the studs to slide within the slots when the machine is placed on a base surface so that an even or balanced distribution of weight will be obtained among all of the supporting feet.

With each of the embodiments shown the attachment studs have been shown as having threaded portions which are received in threaded openings in one of the members and bushing portions received in corresponding slots in another of the members. Such a construction is preferable because of the ease of assembling that it provides. However, the attachment studs may assume any desired form so long as they are firmly connected to either the strap or the mounting leg and extend through appropriate slots provided in the other one with a close sliding engagement.

It will be seen that, by my invention, I have provided a simple and highly effective support mechanism which insures an equal weight distribution among the support feet of a machine such as an automatic washing machine regardless of the non-symmetric weight distribution of the operative elements of the machine or the unevenness of the floor or other supporting base surface on which the machine is mounted.

It will be understood that, while in accordance with the patent statutes, I have described what at present is considered to be the preferred embodiment of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from my invention, and it is therefore aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a machine subject to vibration during operation in response to an unbalanced weight distribution, a support mechanism including a cabinet to receive the machine, one side of said cabinet including a strap member extending across the lower end thereof, said strap member including a pair of spaced, upwardly diverging slots, a mounting leg for operative attachment to said strap member, said mounting leg including an elongated, generally horizontal central portion with a downwardly extending support foot formed at each end thereof, and a pair of spaced attachment studs, each of said studs being securely attached to said mounting leg and extending through a corresponding one of said slots with a close sliding engagement.

2. A support mechanism as set forth in claim 1 wherein said mounting leg includes a pair of spaced, threaded openings and wherein each of said studs includes a threaded portion received in a cooperating one of said openings and a bushing portion having a close, sliding engagement with a corresponding one of said slots.

3. In a machine subject to vibration during operation in response to an unbalanced weight distribution, a support mechanism including a cabinet to receive the machine, a strap member extending across one side and the bottom of said cabinet, a reinforcing plate attached in juxtaposition to the side portion of said strap member adjacent each end thereof, an elongated slot formed in said strap member and each reinforcing plate, said slots diverging in the upward direction, a mounting leg for operative attachment to said strap member, said mounting leg including an elongated, generally horizontal central portion with a downwardly extending support foot formed at each end thereof, said mounting leg also including a pair of spaced, threaded openings formed therein, and a pair of threaded studs, each of said studs being received in a cooperating one of said threaded openings and having a bushing portion providing close, sliding engagement with a corresponding one of said slots.

4. In a machine subject to vibration during operation in response to an unbalanced weight distribution, a support structure including a cabinet to receive the machine, each of two opposite side walls of said cabinet including

a flange extending across a portion of the cabinet between said opposite side walls, a generally vertical strut extending adjacent each flange, each strut having a threaded opening adjacent the lower end thereof, each of said flanges including an opening in alignment with the threaded opening in a corresponding one of said struts, a strap attached to said side walls and extending across the lower portion of the cabinet between said side walls, said strap having an opening in alignment with each of said openings in said flanges and in said struts, a mounting leg for operative attachment to said cabinet, said leg including an elongated, generally horizontal central portion with a downwardly extending support foot formed at each end thereof, said mounting leg including a pair of spaced, upwardly diverging slots, and a pair of attachment studs, each stud including a threaded portion received in a cooperating set of said aligned openings and a bushing portion having a close sliding engagement with a corresponding one of said slots.

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