Nov. 11, 1969 P. BARNISH ET AL 3,477,259

DOMESTIC WASHING MACHINES

Filed Aug. 30, 1967 3 Sheets-Sheet 1

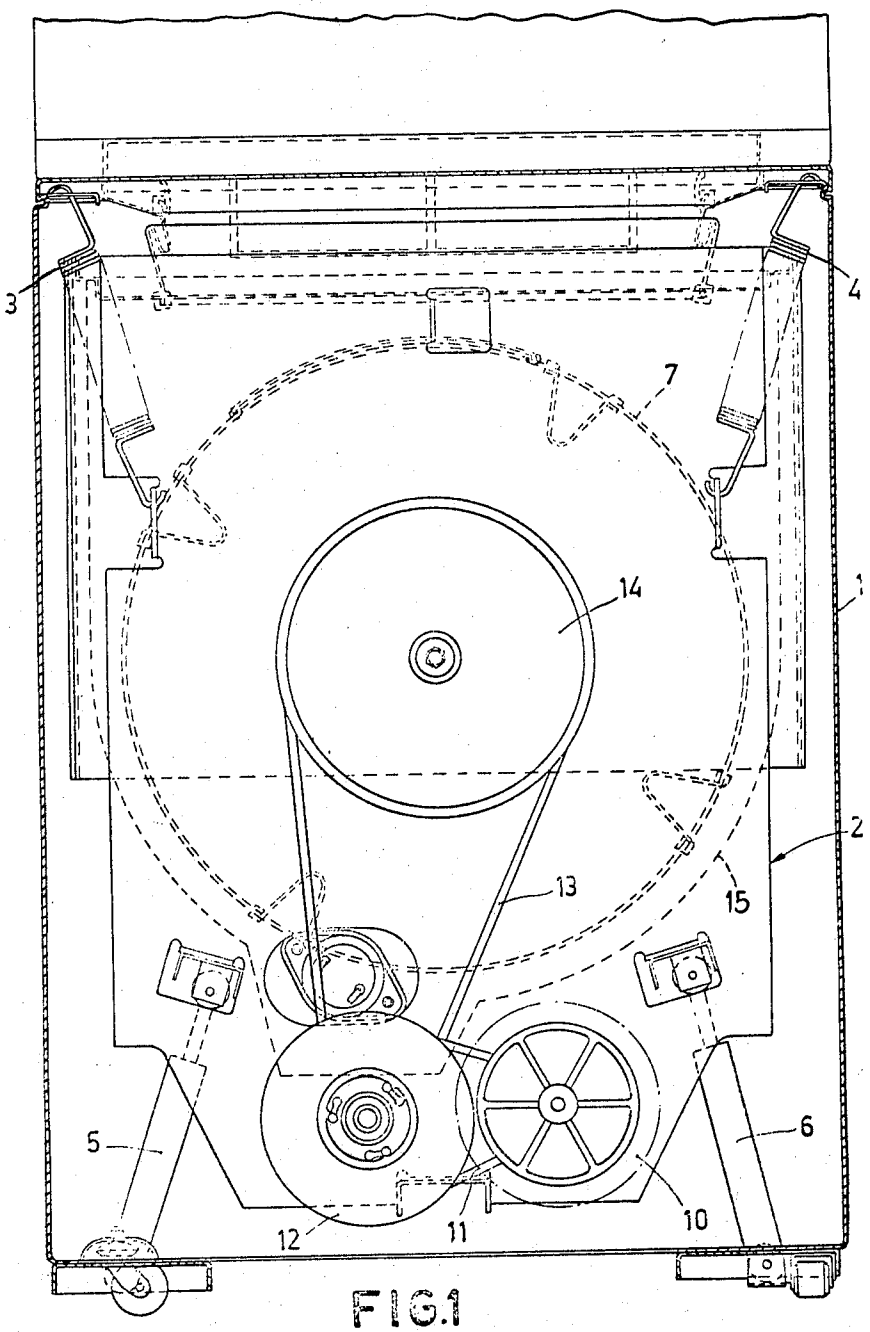

FIG.1

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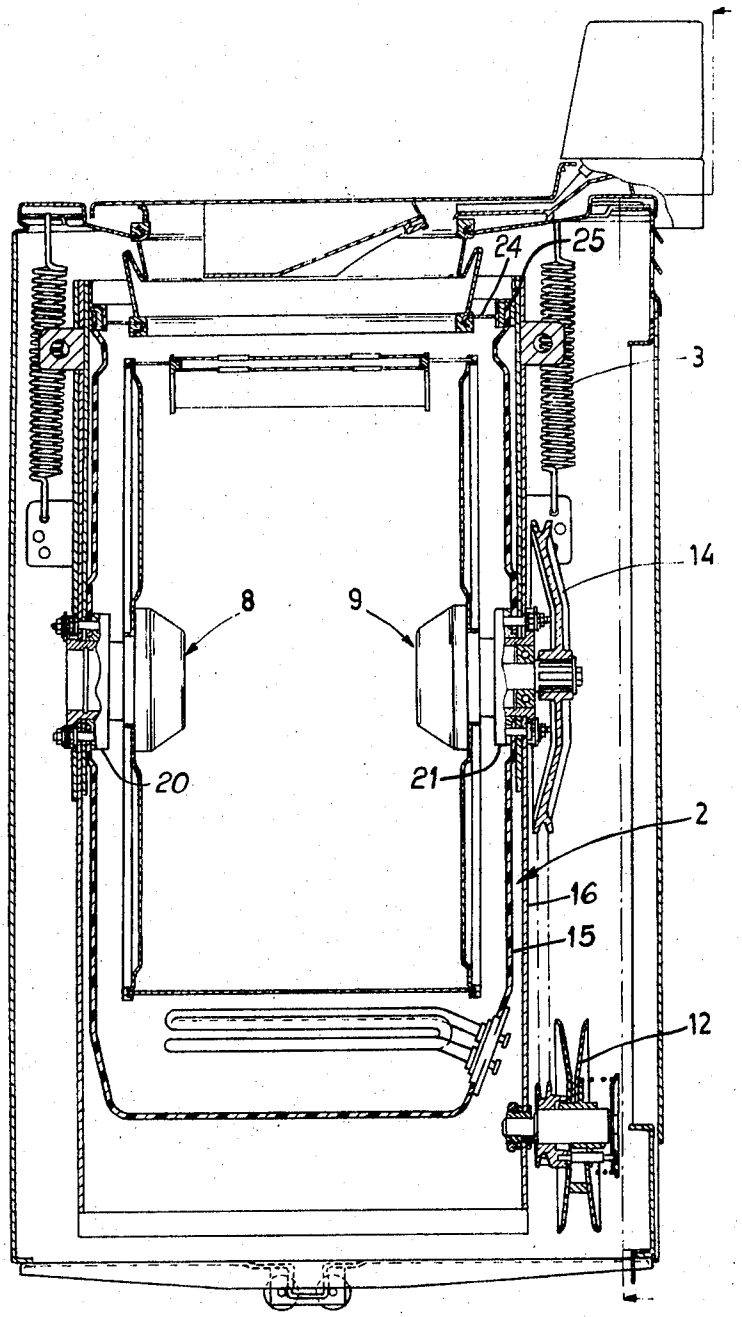

FIG.2

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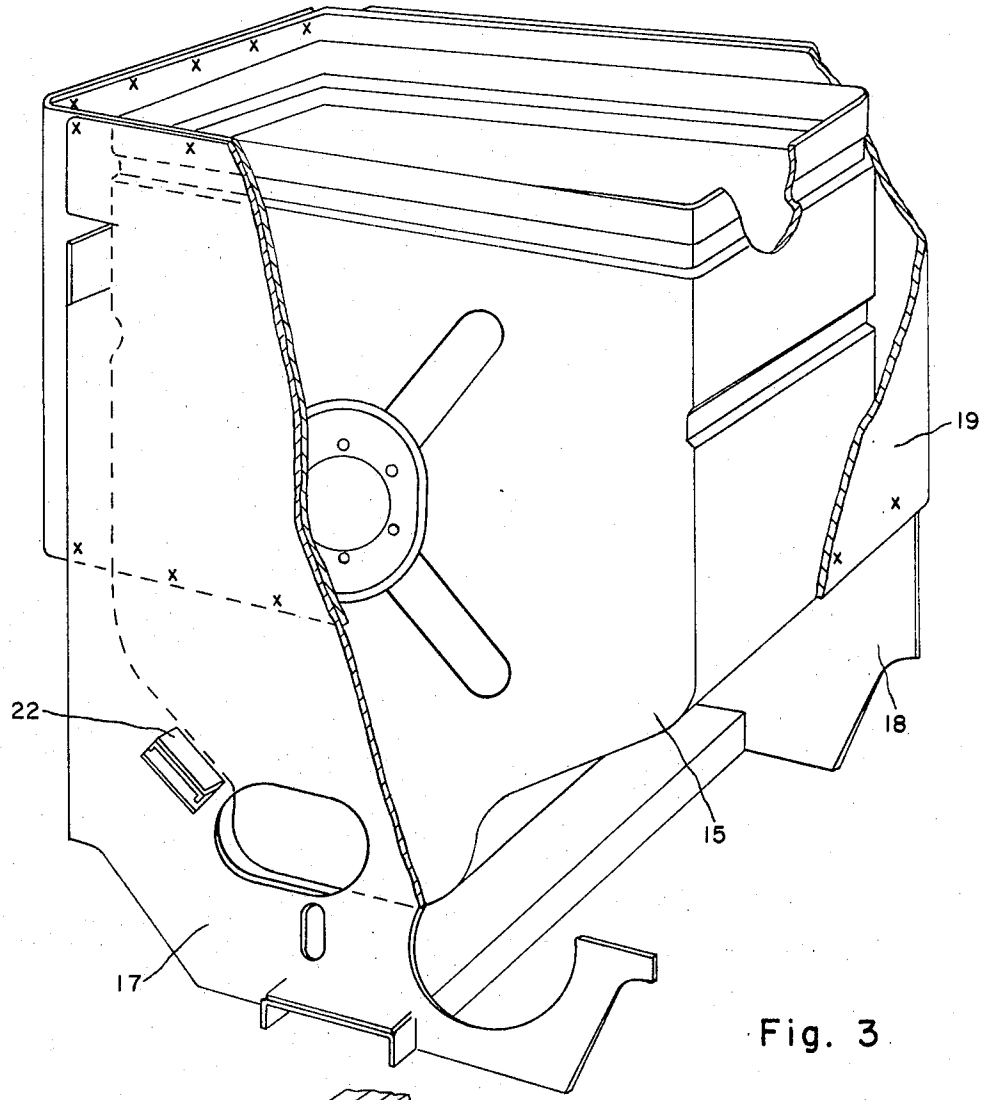

Fig. 3

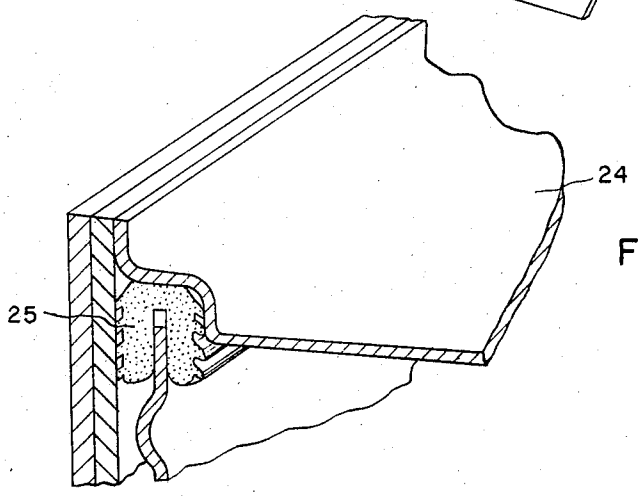

Fig. 4

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DOMESTIC WASHING MACHINES

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Int. Cl. D06f 23/02
U.S. Cl. 68—23.1 3 Claims

ABSTRACT OF THE DISCLOSURE

A washing machine of composite construction having a rotatable drum positioned within an inner polypropylene washing tub; the inner tub being attached to and supported by an outer metal casing which provides the necessary weight for minimizing vibration during the operation of the machine.

The invention relates to domestic washing machines of the kind comprising a perforated washing drum rotatable about a substantially horizontal axis within a tub resiliently mounted in an outer casing or cabinet, the washing drum having an opening for the insertion (and removal) of the articles to be laundered and being adapted to be driven by an electric motor at a relatively slow rotational speed for "tumble action" washing and at a higher speed for spin drying of the articles.

In machines of the above described kind it is advantageous to make the tub heavy compared with the weight of the articles to be laundered so that the amplitude of vibration during spin drying occasioned by any unbalance due to uneven distribution of the articles in the washing drum is minimized. To a first approximation the radial amplitude of vibration of the resiliently mounted tub and drum assembly at speeds above the critical speed is equal to the unbalance weight divided by the total suspended weight and multiplied by the radius of action of the unbalance weight.

It is also desirable that the tub should be made of a non-rusting or nonstaining material. In known constructions when the tub is made of relatively light gauge stainless steel to minimize expense it is necessary to attach heavy masses to achieve the necessary total suspended weight. Such a construction is still expensive because of the difficulties of fashioning and/or welding stainless steel parts to provide a water-tight deep tub which has the required strength to withstand the vibrational stresses.

The invention consists in a washing machine of the kind first above referred to wherein the washing tub is a composite structure comprising an inner water-tight washing tub of synthetic material, attached to and supported within a substantially rigid outer mild steel casing. Preferably the inner tub is fabricated as by molding from polypropylene and the outer casing from mild steel sheet or plate of a suitable thickness to provide a major portion of the desired total suspended weight and the necessary stiffness to support the bearings for the washing drum.

Since the thermal coefficient of expansion of polypropylene and steel are widely different other features of the invention are concerned with the attachment of the tub to its surrounding casing and the provision of a water-tight cover for the tub.

In order that the invention may be more clearly understood it will now be described in one convenient embodiment with reference to the accompanying drawings in which:

FIGURE 1 shows a front elevation partly in section of a washing machine according to the invention,

FIGURE 2 is a side elevation in section of FIGURE 1,

FIGURE 3 shows a perspective view partly in section of the outer casing surrounding the inner tub, and

FIGURE 4 is a detail to a larger scale showing the sealing of the top of the tub.

In the drawings FIGURES 1 and 2 show the main features of a washing machine incorporating the invention. The machine has an outer casing or cabinet **1** within which is resiliently suspended a composite washing tub having the general reference **2**, by means of four springs, only two of which **3**, **4** are shown in FIGURE 1. Vibrational movements of the tub are controlled by dampers **5**, **6** extending between the tub and the base of the cabinet. A perforated washing drum **7** is rotatably mounted by bearing assemblies **8**, **9** in the walls of the tub **2** and is driven by an electric motor **10** through a belt transmission including a centrifugally operated expanding pulley on the motor shaft, a belt **11** driving a follower expanding pulley **12** acting as an idler pulley and a belt **13** engaging a pulley **14** on a shaft attached to the washing drum **7**.

The composite tub **2** comprises an inner water-tight washing tub **15** (FIGURES 1 and 2) fabricated as by moulding from polypropylene attached to and supported within an outer, substantially rigid sheet metal casing **16** (FIGURE 2).

As shown more clearly in FIGURE 3 the outer casing **16** comprises a pair of end plates **17**, **18** which are secured as by spot welding to the main portion **19** of the casing. The end plates and the casing have circular holes through which the bearing assemblies **8**, **9** for the washing drum project. The end walls of the polypropylene tub **15** are secured at regions intermediate the top and bottom of the tub to the casing **16** by the clamps **20**, **21** which hold the bearing assemblies **8**, **9** in position. The lower portions of the tub may be arranged to seat on foam rubber supports (not shown) secured to channel section cross members one of which is shown as **22**, extending between the end plates **17**, **18**.

The top of the tub **2** is closed by a metal cover **24** (FIGURES 2 and 4) having a loading port for the insertion and removal of the laundry. Since polypropylene, which is the preferred synthetic material for the washing tub, has a very high thermal coefficient of expansion compared with steel, it is necessary to allow for this expansion in providing a water-tight joint between the top of the tub and the surrounding casing. This is effected as shown in FIGURES 2 and 4 by shaping the periphery of the cover to provide a recess which extends all round the cover and which houses a U-shaped gasket **25** carried by the top edge of the wash tub **15**. The gasket may be of resilient material, for example an elastomer, the transverse resilience being provided by external ribs or it may be formed of foamed resilient elastomeric material. Expansion of the tub in the vertical direction above and below the places where the end walls of the tub are clamped to the casing is thus permitted in the downward direction by the resilient foam rubber supports when used and in the upward direction by the top sealing arrangement above described. Expansion of the tub in the direction of the washing drum axes is accommodated by flexure of the material since, as will be seen from the drawings, the tub is not a close fit in the casing.

The above described arrangement provides a wash tub construction which is relatively inexpensive, has the required weight and the advantage of a water-tight washing tub of plastics material which is substantially unaffected by detergents or washing ingredients at the usual washing temperatures.

What is claimed is:

1. A washing machine having a composite construction comprising a washing tub made of a synthetic resinous

material, an outer metal casing surrounding the washing tub, a washing drum mounted within the washing tub, a bearing assembly supporting said drum for rotation about a horizontal axis and clamp means forming part of the bearing assembly housing, secured to the opposite walls of the tub for coupling the bearing assembly and the washing tub to the outer metal casing to thereby minimize vibrations of the machine.

2. A washing machine as claimed in claim 1 wherein the outer casing has an opening defined therein for insertion and removal of laundry, and a cover adapted to close said opening, said cover having a peripheral recess which when in the closed position lies adjacent to the tub walls, and a U-shaped gasket positioned over said walls and spaced from the top edge of the walls so as to form a seal between the wall and the cover and to also provided space for expansion of the wall.

3. A washing machine as claimed in claim 2 wherein the U-shaped gasket is made of a foamed resilient synthetic material.

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68—139, 140: 220—9, 63