A drive configuration for a washing machine or a dryer contains a drum disposed rotatably in a tub. The tub is connected non-rotatably to a stator and the drum is connected non-rotatably to a rotor of an electric motor and the stator is disposed directly on the tub. The drive configuration has the stator disposed at a periphery of the tub, preferably near the center of the longitudinal extent thereof, and the rotor is disposed at the periphery of the drum in opposite relationship to the stator.
WASHING MACHINE OR DRYER WITH A DRIVE INTEGRATED ON THE TUB AND DRUM

BACKGROUND OF THE INVENTION

[0001] Field of the Invention

[0002] The invention concerns a drive configuration containing a drum disposed rotatably in a tub. The tub is connected non-rotatably to a stator and the drum is connected non-rotatably to a rotor of an electric motor and the stator is disposed directly on the tub.

[0003] A direct drive with a segment-shaped stator is known for example from Published, European Patent Application EP 0 350 429 A2. In that configuration a segment-shaped stator is mounted behind the tub. It acts on a rotor configuration which is also disposed behind the tub and which is rigidly connected to the shaft of the drum. Such a drive requires a great deal of space behind the tub. Ultimately that space has to be saved in terms of the length of the drum. Particularly in the case of an inclinedly disposed tub, as has become usual for comfortability and conveniently loading the machine with laundry, that structure is inappropriate for that reason.

[0004] In another direct drive disclosed in Published, Non-Prosecuted German Patent Application DE 101 46 134 A1 the permanent magnets of the rotor member are fixed on the rear wall of the drum. The stator with its windings projects into the wet space between the rear wall, the drum and the tub and is rigidly connected to the support spider that carries the ball bearing assemblies for the drum shaft. That structure also results in that the drive increases the length of the tub and thus limits the usable space for the drum.

SUMMARY OF THE INVENTION

[0005] It is accordingly an object of the invention to provide a washing machine or dryer with a drive integrated on the tub and drum which overcomes the above-mentioned disadvantages of the prior art devices of this general type, which provides the largest possible usable space for the drum.

[0006] With the foregoing and other objects in view there is provided, in accordance with the invention, a drive configuration for a washing machine or a dryer. The drive configuration contains an electric motor having a stator and a rotor. A tub is connected non-rotatably to the stator and the stator is disposed directly on the tub at a periphery of the tub. A drum is disposed rotatably in the tub and is connected non-rotatably to the rotor. The rotor is disposed at a periphery of the drum in opposite relationship to the stator.

[0007] Preferably stator segments (or the stator) are disposed in the center of the tub or in the proximity thereof, more specifically above and/or beneath the drum. The lateral free space between the tub and the washing machine casing that is required for oscillating movements, caused by unbalance in the drum, is not reduced. In conventional washing machines there is free space above and beneath the drum for the stator of the invention. The weight of the stator segment or segments acts near the center point of the drum. That configuration avoids a tilting moment rearwardly, forwardly or laterally of the resiliently suspended system containing the drum-tub and the machine casing. In the invention of the instant application, it is possible to eliminate the compensating weights that are usual nowadays on the tub.

[0008] In a preferred embodiment the permanent magnets of the rotor member are fixed directly to the outer periphery of the drum and project into the free space between the outside diameter of the drum and the inside diameter of the tub. They are thus at a spacing, of optimum size, from the center of rotation of the drum. The force for the necessary torque remains small due to the long lever arm involved (spacing of the center of rotation relative to the drum periphery). The air gap between the rotor pole and the stator pole can be increased to between 1 and 2 mm without disadvantages in terms of the electrical data of the motor. Assembly of the rotor magnets becomes particularly simple if, in accordance with the invention, they are fixed on an iron ring and the iron ring is pushed on to the drum. In that case the iron ring serves at the same time as a magnetic return for the rotor poles. It is thus also possible to use non-magnetic drums of plastic material or high-grade steel.

[0009] The stator poles advantageously project through the outer periphery of the tub into the free space between the drum periphery and the tub casing. They are scaled off in relation to the tub by a simple peripherally extending soft seal. The washing solution flows directly around them and for that reason they have to be protected from corrosion by a thin protective layer. The rise in temperature thereof in the washing operation is transmitted directly to the washing solution.

[0010] The invention provides a drive configuration in which the rotor can act with a large diameter so that the high level of torque that is necessary with washing machines can be implemented. At the same time the waste heat of the stator winding can contribute to heating the washing solution. The invention further affords the effect that the loading on the tub by the weight of the drive is kept centrally in relation to the suspension device of the system: the tub—machine casing, so that even without compensating weights there are no tilting moments of the tub forwardly, rearwardly or laterally.

[0011] Other features which are considered as characteristic for the invention are set forth in the appended claims.

[0012] Although the invention is illustrated and described herein as embodied in a washing machine or dryer with a drive integrated on the tub and drum, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

[0013] The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a diagrammatic illustration of a drum washing machine from behind with a rear wall removed, with a segment-shaped stator near a center of a longitudinal extent of a tub, according to the invention;

[0015] FIG. 2 is a diagrammatic, sectional side view of the drum washing machine shown in FIG. 1;
I claim:

1. A drive configuration for a washing machine or a dryer, the drive configuration comprising:

   - an electric motor having a stator and a rotor;
   - a tub connected non-rotatably to said stator and said stator disposed directly on said tub at a periphery of said tub; and
   - a drum disposed rotatably in said tub and connected non-rotatably to said rotor, said rotor disposed at a periphery of said drum in opposite relationship to said stator.

2. The drive configuration according to claim 1, wherein said tub has a peripheral wall and said stator projects through said peripheral wall into a free space defined between an inside of said tub and an outside of said drum; and

   further comprising a seal for sealing off said stator in relation to said tub.

3. The drive configuration according to claim 1, wherein said stator contains at least two stator segments which are disposed on a top side and an underside of said tub, said stator segments do not directly adjoin each other so that said stator does not form a closed ring.

   4. The drive configuration according to claim 1, wherein said stator has poles; and

   further comprising permanent magnets mounted in fixed positions on an outside diameter of said drum and are disposed in opposite relationship to said poles of said stator.

5. The drive configuration according to claim 3, further comprising a machine casing housing said tub, said electric motor and said drum, a weight of said stator segments does not exert in any direction a tilting moment on said tub-drum combination which is suspended in sprung relationship with said machine casing.

6. The drive configuration according to claim 1, wherein said stator contains stator poles having windings and a thin protective layer covering said stator poles with said windings.

7. The drive configuration according to claim 1, wherein said stator contains stator poles having windings and an electrically insulating material covering said stator poles with said windings.

8. The drive configuration according to claim 4, wherein said permanent magnets functioning as rotor poles are disposed on an outside diameter of said drum in a wet space under said stator poles.

9. The drive configuration according to claim 8, further comprising an iron band holding said rotor poles, said iron band in a prefabricated condition is pushed onto said drum and functions as a magnetic return for said rotor poles.

10. The drive configuration according to claim 1, wherein said stator is disposed near a center of a longitudinal extent of said tub.