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EUROPEAN PATENT APPLICATION

21 Application number: **90200770.7**

51 Int. Cl.⁵: **D06F 19/00**

22 Date of filing: **29.03.90**

30 Priority: **13.04.89 NL 8900929**

43 Date of publication of application:
17.10.90 Bulletin 90/42

64 Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

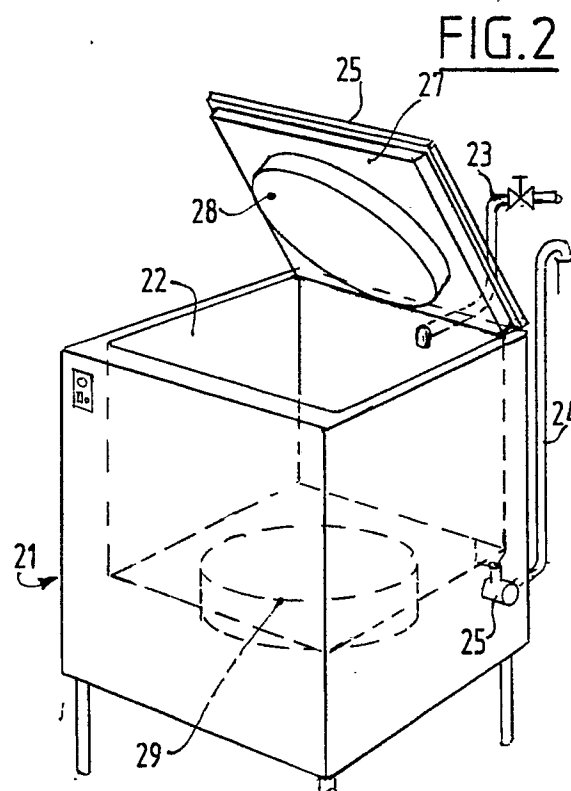
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54 **Method for ultrasonic cleaning of textiles.**

57 The invention relates to a method and apparatus for cleaning textiles submersed in water by means of ultrasonic energy. To avoid the use of chemical additives normally used to improve the cleaning action, the water is subjected to a second movement, enhancing the cleaning action. This second movement may be a stirring movement, but preferably it is an ultrasonic movement as well. Then it is advantageous to have both ultrasonic movements act at the same time. The washing machine is suitable for domestic use.



METHOD FOR ULTRASONIC CLEANING OF TEXTILES

The present invention relates to a method for cleaning textiles submersed in water by means of ultrasonic energy.

Such a method is known from EP-A-0 235 686.

This known method has the disadvantage, that, if a good cleaning action is to be obtained, chemical matter has to be added to the washing water.

This is less desirable from a view of costs and environment.

The aim of the present invention is to provide such a method, in which the addition of chemical matter to the water is limited as far as possible, but in which nevertheless a good cleaning action is obtained.

This aim is reached in that the water is submitted to a second movement.

Subsequently the present invention will be elucidated with the help of the accompanying drawings, in which:

fig. 1 is a schematic view of a first embodiment for the executing of the method according to the present invention;

fig. 2 is a schematic view of a second embodiment for the executing of the method according to the present invention; and

fig. 3 is a diagram of the electric circuit of an embodiment of the present invention.

Fig. 1 shows a washing machine 1, in which a washing vessel 2 has been provided for the executing of the washing or cleaning action. Further a propellor 3 has been provided in the washing vessel 1, which can be driven by an electromotor 4 being provided under the washing vessel.

The propellor 3 comprises ribs 5 for enhancing the agitating action thereof. The washing vessel 2 can be closed at its upper side by means of a top 6, which has been provided at its inner side of a layer 7, which takes care of a good sealing of the washing vessel 2. Further the washing machine 1 comprises a supply pipe 8 for supplying water, whereas for the draining of water, a drain pipe 9 has been provided, in which a pump 10 is incorporated. A control panel 11 has been provided at the front of the washing machine.

As described hitherto, the washing machine does not differ from a washing machine belonging to prior art.

Further the washing machine according to the present invention comprises four transducers 12, 13, 14 and 15, each being provided against a side wall of the washing vessel 2. The transducers generate ultrasonic vibrations in the water being present in the washing vessel 2, and which causes the textiles being present in the washing water to be cleaned.

To enhance the cleaning action of the washing, the actions of the propellor 3 are being combined with those of the ultrasonic transducers 12-15. As a consequence thereof the cleaning action is greatly enhanced.

In the embodiment shown in fig. 1 four transducers are used; it is also possible to use another number of transducers, for instance only one or maybe a much bigger number. Consequently it is nevertheless necessary to locate the transducers against the side walls; they can also be provided in the bottom or in the top.

In view of the frequency of the waves generated by the transducers, it can be stated, that this frequency does not have to be fixed, it may vary continuously or maybe a fixed combination of different frequencies. It is also possible that the transducers generate ultrasonic sound with different frequencies and that they act subsequently.

In fig. 2 another embodiment of a washing machine according to the present invention has been shown, which comprises a washing machine 21, in which a washing vessel 22 has been provided for executing the washing. A supply pipe 23 has been connected to the washing vessel 22, just as a drain pipe 24, in which a drain pump 25 has been provided. The upper side of the washing vessel can be closed by means of a top 26, which has been provided with a sound insulating layer at its lower side. Further a transducer 28 has been provided in the top, whereas in the bottom of the washing vessel a transducer 29 has been provided.

In this embodiment no separate mechanical propellor has been provided, and the agitation of the water takes place by a transducer 29, being provided in the bottom, which generates vibrations, of which the frequency is such, that these cause agitation of the water. The transducer provided in the top generates sound vibrations, which are such, that these act the normal ultrasonic washing.

Also in this case the action of the transducers can be such, that they are used all together or subsequently. It is also possible to vary the amplitude of the electrical signal being supplied to the transducers, and such that an optimal washing action is obtained.

The switching circuit shown in fig. 3 comprises a generator 30 of which a frequency and the wave-shape is adjustable. The output of the generator 30 is coupled to an amplifier 31 with a variable gain. The output of the amplifier 31 is coupled to the input of two transducers 32, 33, which convert the electrical signal received into a mechanic liquid vibration. By adjusting the frequency the wave-shape and the amplitude of the signal to be fed to

the transducer, an optimal washing action can be obtained. Of course the number of transducers can be adapted.

In the embodiment shown in fig. 2 two circuits according to fig. 3 have to be applied, in which one circuit supplies the transducent 28 and the other circuit supplies the transducent 29. The frequencies are different.

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Claims

1. Method for cleaning textiles submersed in water by means of ultrasonic energy, **characterized in** that the water is being submitted to a second movement.

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2. Method according to claim 1, **characterized in** that the second movement of the water is ultrasonic as well.

3. Method according to claim 2, **characterized in** that the frequency of said second movement of the water is not equal to the frequency of said first ultrasonic movement.

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4. Method according to one of the claims 1-3, **characterized in** that the first movement and the second movement take place subsequently.

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5. Method according to one of the claims 1-4, **characterized in** that the water has been provided with additives.

6. Apparatus for executing the method according to one of the preceeding claims, **characterized by** a vessel, at least one transducer being provided in the wall of said vessel, the top of said vessel or the bottom thereof, at least one amplifier connected with said transducer and at least one oscillator connected with the input of said amplifier.

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7. Apparatus according to claim 6, **characterized in** that the frequency of the oscillator is adjustable.

8. Apparatus according to claim 6 or 7, **characterized in** that the wave-shape of the oscillator is adjustable.

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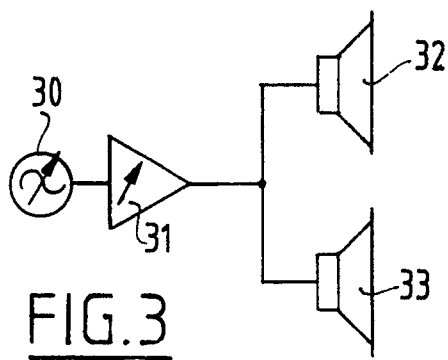
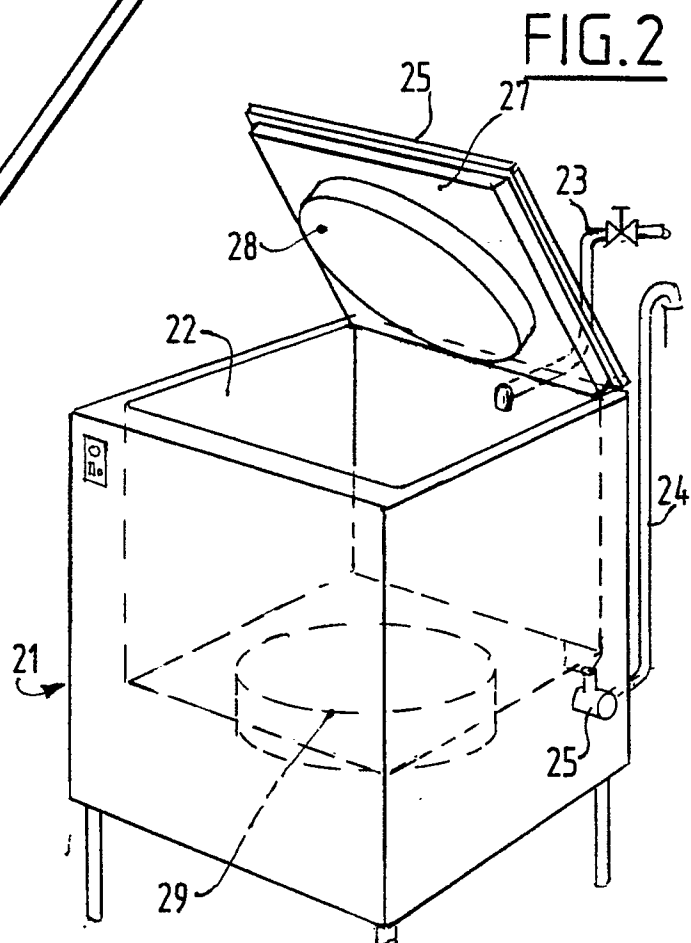
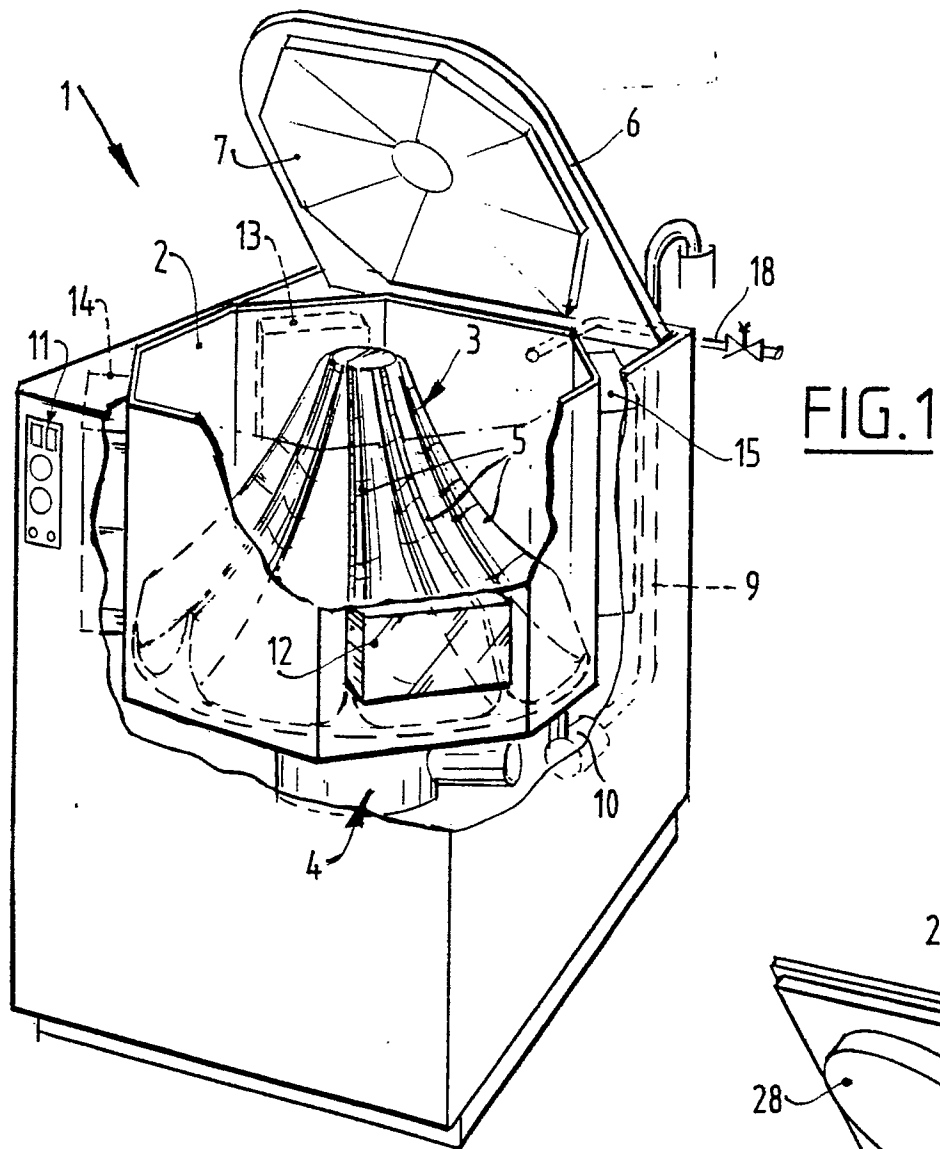
9. Apparatus according to claim 6 or 7, **characterized by** two transducers, amplifiers, each being connected to one of said transducers and an oscillator connected with each amplifier.

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10. Apparatus according to one of the claims 6-8, **characterized in** that the gain of said amplifier is adjustable.

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European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 90 20 0770

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X A	US-A-2985003 (GENERAL MOTORS CORPORATION) * the whole document * ---	1-4, 6, 7, 9, 10 8	D06F19/00
X	GB-A-664502 (LEVER BROTHERS & UNILEVER LIMITED) * the whole document * ---	1-7	
X	GB-A-648609 (SOL BROWN WICZER) * the whole document * -----	1, 2, 5-7, 10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D06F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 05 JULY 1990	Examiner COURRIER G. L. A.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document			