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Europäisches Patentamt
European Patent Office
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(11) Publication number:

0 384 149
A1

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 90101525.5

(51) Int. Cl.⁵: D06F 37/36

(22) Date of filing: 25.01.90

(30) Priority: 23.02.89 IT 4571289

(43) Date of publication of application:
29.08.90 Bulletin 90/35(84) Designated Contracting States:
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D-8000 München 22(DE)(54) **Speed variator for a laundry washing machine.**

(57) A speed variator for a laundry washing machine comprising a drum (6) and an electric motor (8) for rotating the drum (6) at laundering and spin-drying speeds.

The speed variator comprises a variable-diameter driving pulley (7) provided with radially displaceable flyweights (19) and fixedly mounted on the output shaft (13) of the electric motor (8) for transmitting the rotation thereof to a driven pulley (10) fixedly mounted on the shaft (11) of the drum (6), by means of a transmission belt (9) of trapezoidal cross-sectional shape.

Each flyweight of the variator (5) is subdivided into two symmetrically identical components (20, 21) adapted to be joined to one another by the interposition therebetween of at least one elastic element (22) made of a material capable of dampening the mechanical loads acting on the components during the operation of the speed variator (5) to thereby obtain a quiet and reliable operation of the speed variator.

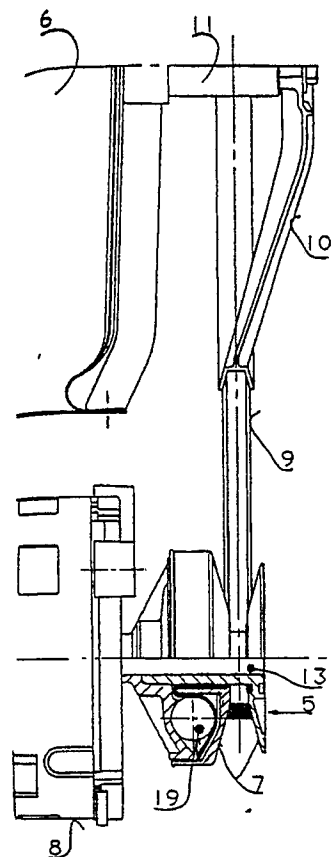


FIG. 1

EP 0 384 149 A1

The present invention relates to a speed variator for a laundry washing machine, which is configured to ensure its silent and reliable operation. Conventional laundry washing machines are equipped with a speed variator operable to rotate the drum of the respective machine at variable transmission ratios and substantially comprising a variable-diameter driving pulley fixedly mounted on the output shaft of the electric motor of the machine and connected by a transmission V-belt to a corresponding driven pulley fixedly mounted on the shaft of the drum, said driving pulley being provided with radially displaceable flyweights dimensioned and designed to be directly displaceable from radially contracted first position corresponding to the laundering speed of the drum, to a radially expanded second position corresponding to the maximum spin-drying speed of the machine, and back again to the first position.

When shifting from the laundering speed to the spin-drying speed, the radial displacement of the flyweights results in a corresponding variation of the diameter of the driving pulley, so that the V-belt is instantly raised to a greater diameter of the pulley to thereby rotate the drum at a different transmission ratio.

Although speed variators of this type are generally satisfactory and reliable in operation, there is the disadvantage that they generate considerable noise when the transmission ratio is varied and/or the rotation of the drum is reversed. These noises result from the inevitable play of the flyweights during the displacements between their corresponding seats in the speed variator, these displacements themselves determining increased mechanical loads acting on the speed variator as a whole, particularly when the electric motor of the respective machine operates at the spin-drying speed.

It is an object of the present invention to eliminate the described shortcoming by the provision of a speed variator provided with flyweights designed to ensure a silent and completely reliable operation of the speed variator during the full operating cycle of a laundry washing machine.

A speed variator of this type is obtained by the incorporation therein of the structural characteristics described with particular reference to the claims of the present application.

The invention will be more fully understood from the following description, given by way of a non-exclusive example with reference to the accompanying drawings, wherein:

fig. 1 is a diagrammatic illustration of a speed variator according to the invention in a first operative position,

fig. 2 shows the speed variator of fig. 1 in a second operative position,

fig. 3 shows a cross-sectional front view of the speed variator of fig. 2, taken along the line A-A in this figure, and

fig. 4 shows a cross-sectional view of a detail of the present speed variator, taken along the line B-B in fig. 3.

With reference to figs. 1 and 2, there is shown a speed variator 5 for a laundry washing machine, operable to control the rotation of the drum 6 of the machine at variable transmission ratios, and comprising a driving pulley 7 adapted to be rotated by an electric motor 8 of the machine and connected by a transmission V-belt 9 to a driven pulley 10 fixedly secured to the rotatable shaft 11 of drum 6.

In particular, driving pulley 7 is composed of a disc 12 fixedly mounted on the output shaft 13 of motor 8, a disc 14 mounted for axial displacement on shaft 13 relative to disc 12, and a further disc 15 secured to the end of output shaft 13, discs 12 and 14 cooperating to form a V-shaped groove 16 for the accommodation therein of V-belt 9.

Discs 14 and 15 on their part cooperate to define at least one internal cavity 17 therebetween, formed with seats 18 for the accommodation therein of a corresponding number of radially displaceable flyweights 19 of preferably cylindrical shape (cf. also fig. 3).

The operation of motor 8 thus results in the rotation of driving pulley 7 in unison with flyweights 19.

Motor 8 is advantageously designed to rotate drum 6 at two different speeds, specifically at a lower laundering speed and a higher spin-drying speed; the motor may also be designed, however, to operate at a greater number of different speeds.

The same results can of course be achieved by combining the present speed variator with suitable electromechanical or purely mechanical actuators of conventional construction, or by the provision of a variable-diameter driven pulley 10 instead of or in combination with a variable-diameter driving pulley 7, without thereby leaving the purview of protection of the present invention.

Flyweights 19 on their part are dimensioned and designed to radially expand in response to the operation of motor 8 at the spin-drying speed, to thereby cause movable disc 14 to be axially displaced towards fixed disc 12, with the consequent variation of the effective diameter of driving pulley 7.

In this manner V-belt 9 is displaced between different diameters of driving pulley 9, specifically between a minimum diameter as shown in fig. 1 and a maximum effective diameter illustrated in fig. 2, corresponding respectively to the laundering speed and the spin-drying speed of motor 8, to thereby rotate drum 6 at different transmission ratios.

For eliminating or at least considerably reducing the generation of noise and of mechanical loads acting on the present speed variator during its operation as a result of the inevitable play of flyweights 19 during their radial displacement in the respective seats 18, the invention provides that each flyweight 19 is subdivided into at least two symmetrically identical metal components 20 and 21 adapted to be joined to one another by the interposition therebetween of at least one elastic element 22 made of rubber or a similarly elastic material capable of dampening mechanical loads (cf. figs. 3 and 4).

Elastic element 22 is formed with a central flange 23 of circular shape and two cylindrical portions 24 and 25 projecting laterally from flange 23 and adapted to be inserted by the exertion thereon of a slight force into corresponding blind bores 26 and 27 formed respectively in the two components 20 and 21 of flyweight 19.

Each cylindrical portion 24 and 25 is formed with a central recess 28 and 29, respectively, of preferably conical shape extending thereinto from the respective outer end face, and with a number of grooves or slots 30 and 31, respectively, extending over the full length of the outer surface of the respective portion.

Conical recesses 28 and 29 serve the purpose of permitting the material of the cylindrical portion 24 and 25 of elastic element 22 to resiliently yield to mechanical loads, so that, thanks to the abutment of the central flange 23 of the elastic element on the respective end faces of the two components 20 and 21 of flyweight 19, the elastic element 22 is capable of effectively absorbing and dampening the mechanical loads transmitted axially through the flyweight during the operation of the speed variator.

The axial grooves or slots 30 and 31 on their part serve the purpose of permitting air to escape from the blind bores 26 and 27 of the two parts 20 and 21, respectively, of flyweight 19 when the cylindrical portions 24 and 25 of elastic element 22 are inserted thereinto during assembly of flyweight 19, to thereby establish a state of equilibrium between the air pressure within the respective blind bore and the outside air pressure, resulting in the correct positioning of the cylindrical portions in the respective blind bores during the operation of the laundry washing machine.

In each one of the thus assembled flyweights 19, the central flange 23 of the respective elastic element 22 is additionally capable of effectively absorbing and dampening mechanical loads acting on the flyweight in the radial direction, thanks to the elastic yielding of the material of the flange when coming into contact with the wall of the respective seat 18 formed in the speed variator for the accom-

modation of the respective flyweight.

Thanks to the substantially complete elimination of mechanical loads acting on the speed variator and of vibrations thereof, it is thus possible to ensure a silent and wholly reliable operation of the speed variator during the execution of the laundering cycles of the laundry washing machine.

Claims

Speed Variator for a Laundry Washing Machine

1. A speed variator for a laundry washing machine having a drum and an electric motor for rotating said drum at laundering and spin-drying speeds, said speed variator comprising at least one transmission belt connected to respective driving and driven pulleys associated to said motor and said drum, respectively, and a plurality of radially displaceable flyweights, preferably of cylindrical shape, accommodated in corresponding seats formed in at least one of said pulleys, preferably the driving pulley, the respective pulley having its effective diameter variable in accordance with the rotary speed of said motor, said speed variator being characterized in that each of said flyweights (19) is subdivided into at least two symmetrically identical components (20, 21) adapted to be joined to one another by the interposition therebetween of at least one elastic element (22) made of an elastomeric material or a similar suitable material capable of dampening mechanical loads.

2. A speed variator according to claim 1, characterized in that each of said flyweight components (20, 21) is formed with a respective blind bore (26, 27).

3. A speed variator according to claim 2, characterized in that said elastic element (22) is provided with a central flange (23) of circular shape and two lateral cylindrical portions (24, 25) adapted during assembly of the flyweight (19) to be inserted into said blind bores (26, 27), each of said cylindrical portions (24, 25) being formed with a central recess (28, 29), preferably of a conical shape, and with grooves or slots (30, 31) extending over the full length of the outer surface of the respective cylindrical portion, said central flange (23) being dimensioned so as to come into contact with the interior wall surface of the seat (18) accommodating the respective flyweight (19).

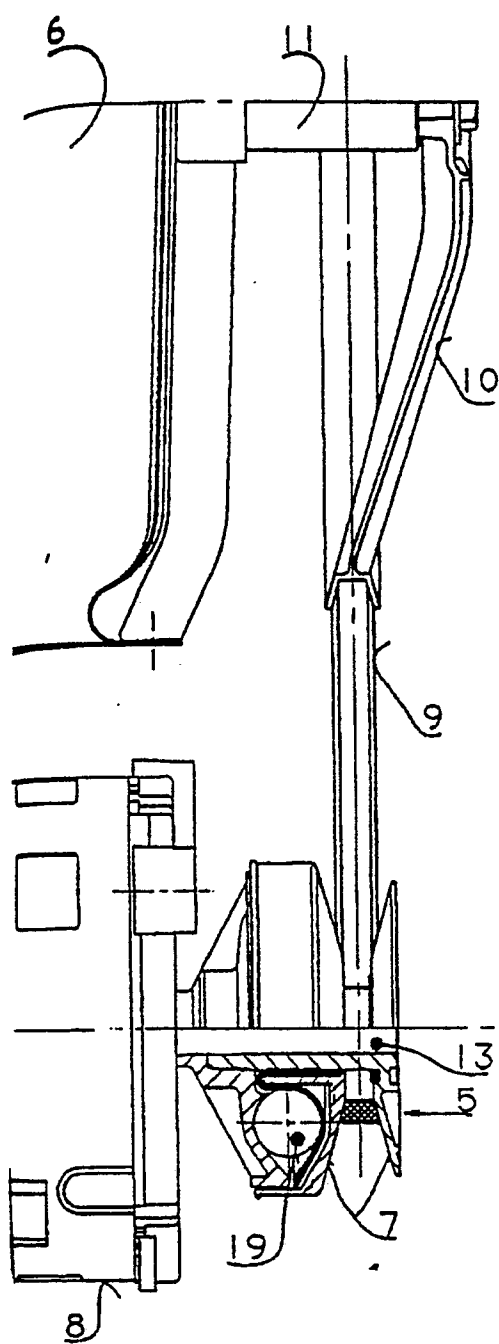


FIG. 1

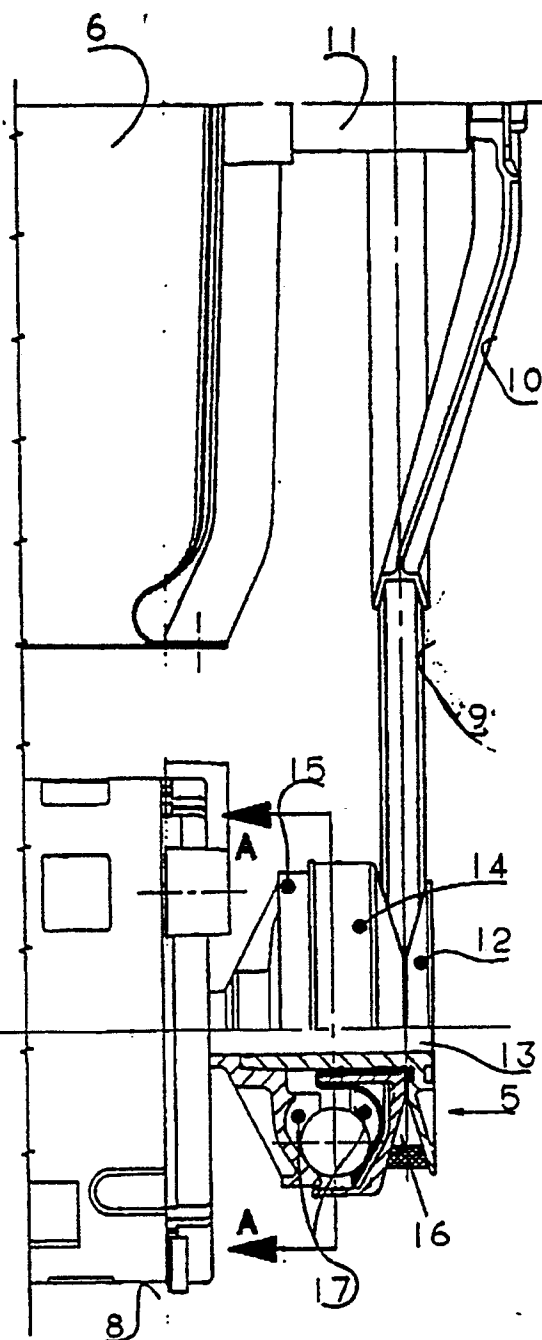
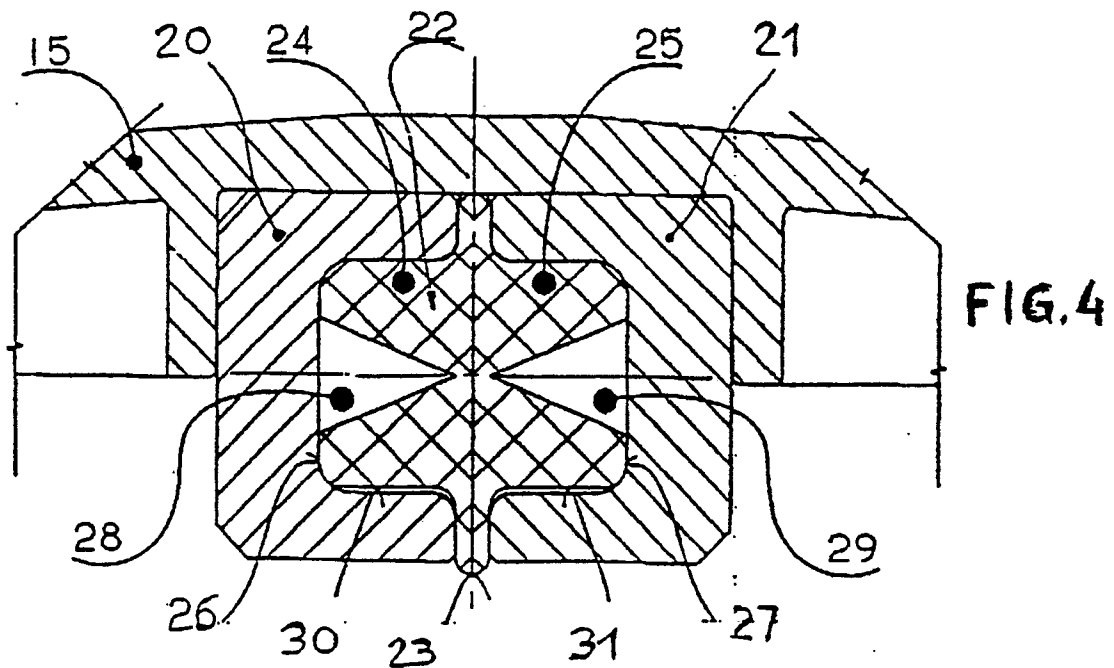
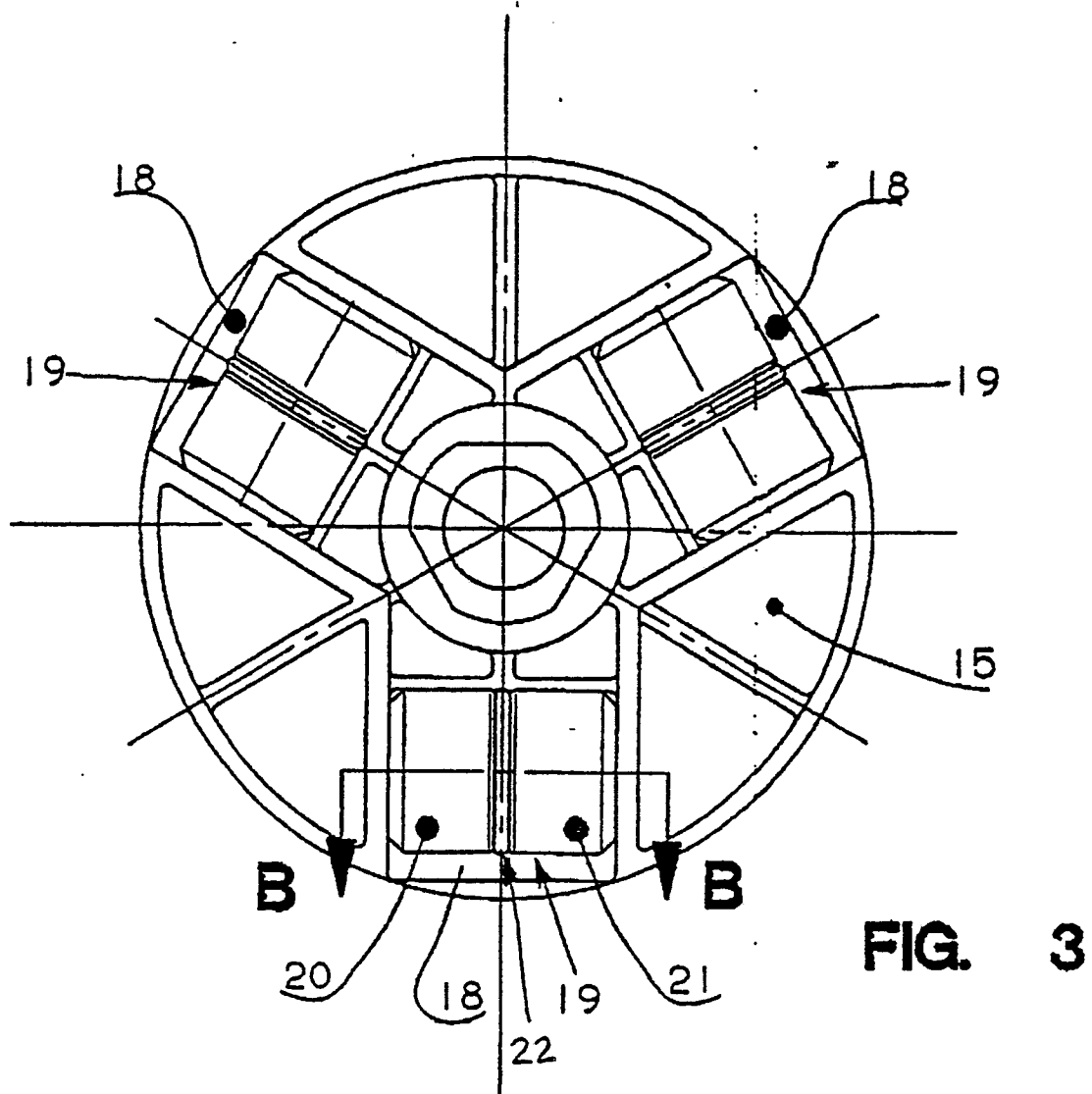


FIG. 2





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EUROPEAN SEARCH REPORT

Application Number

EP 90 10 1525

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	GB-A-2129072 (R. BERTOLINO) * page 1, line 56 - page 1, line 122 *	1, 2	D06F37/36
A	EP-A-0175218 (ZANUSSI ELETTRODOMESTICI S.P.A.) * claim 1; figure 2 *	1	
A	US-A-4496335 (T. R. QUICK; J. P. MIRANTI, JR.; R. C. FOSTER) * column 3, line 33 - column 4, line 2; figure 2 *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D06F F16H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 MARCH 1990	Examiner GOODALL C. J.
CATEGORY OF CITED DOCUMENTS			
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