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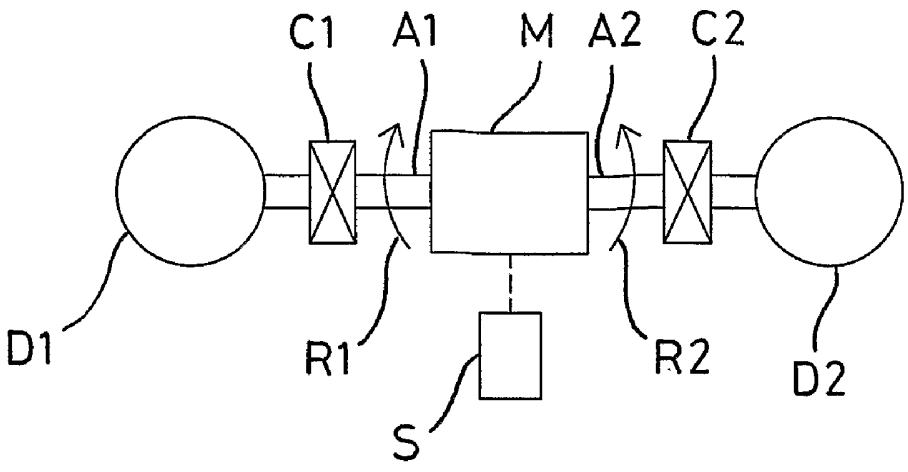
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(54) Title: A MULTI-PURPOSE MACHINE WITH TWO OPERATING DEVICES ACTUATED BY A SINGLE ELECTRIC MOTOR



(57) Abstract: A multi-purpose, electric powered machine comprising an electric motor (M) and two operating devices (D1, D2) such as a high-pressure water pump and a compressor, wherein the shaft of the motor (M) has two pins (A1, A2) to which said devices (D1, D2) are respectively connected; means (S) are provided for reversing the rotation direction of the motor (M); the first device (D1) is connected to the first pin (A1) by a freewheel (Ca) which engages in a first direction of rotation (R1); the second device (D2) is connected to the second pin (A2) by another freewheel (C2) engaging in the opposite direction of rotation (R2).

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A MULTI-PURPOSE MACHINE WITH TWO OPERATING DEVICES ACTUATED BY A SINGLE ELECTRIC MOTOR

The present invention relates to electric-powered machines like air compressors, vacuum cleaners, high pressure water pumps or high-pressure water cleaners, for domestic use, do-it-yourself, or professional use.

A particular reference is made to air compressors and high-pressure water cleaners, that are widely used for many tasks such as cleaning of large surfaces, washing of motor vehicles, or any other job requiring a compressed air or a high-pressure water jet.

Generally speaking, these air compressors essentially comprise an air tank, a volumetric compressor and an electric motor with a direct connection or, especially in professional items, with a belt drive transmission. Water cleaners are generally equipped with a high-pressure piston pump, normally with three or more pistons; the pistons may be aligned and actuated by an eccentric shaft, or arranged in a circumference and actuated by a wobble plate.

The motor is generally an inductive or brush electric motor, with a power of a few kW.

In most cases, workshops, small companies, and also domestic or do-it-yourself users feel the need of at least one air compressor and one high-pressure water pump, and often of other machines such as a vacuum cleaner or a wet vacuum cleaner. Of course, the purchase of two or more machines of this type gives some problems of cost and

space.

It can be understood that it would be very attractive to provide a multi-purpose machine featuring a single electric motor together with two different operating devices, for example a compressor and a high-pressure water pump.

However, a similar machine creates further problems, mainly because the devices are operated by the same motor, and the idling of a device, when the other is used, must be avoided. Referring to the above example, if the piston pump were running even when the air compressor is used, and vice-versa, this would result in a rapid wear out of the components and greater energy consumption.

It has to be noted that this disadvantage is to be overcome with very simple and low-cost means, in order not to nullify the economic advantage from substituting two machines with a single one.

Thus, the aim of the invention is to realize a multi-purpose machine for domestic, hobby or professional use, comprising two operating devices, particularly an air compressor or a vacuum cleaner together with a high-pressure pump, actuated selectively and independently by a single electric motor, using very simple and low-cost means.

This aim is achieved by a multi-purpose machine comprising an electric motor, a first operating device and a second operating device, actuated by said motor, wherein the motor is provided with a shaft having a first pin and a second pin to which said devices are respectively connected, characterised in that:

- the motor is connected to means suitable for inverting its rotation

direction;

- the first device is connected to the first pin through unidirectional coupling means transmitting torque in a first direction of rotation only;
- the second device is connected to the second pin through further unidirectional coupling means, transmitting the torque only in the direction of rotation opposite to said first direction.

Said unidirectional coupling means preferably comprises two freewheel clutches, briefly referred to as 'freewheels', each of them being placed between the pin of the motor and the corresponding device; in this way the invention is made with low-cost components and with few and simple modifications to already existing machines available on the market.

The main advantage of the invention is that the user can selectively and independently run the first or the second device, at its choice, simply by reversing the rotation direction of the motor.

The invention is now disclosed in a greater detail, with particular reference to a preferred application, which is that of realizing a multi-purpose machine featuring an air compressor and a high-pressure pump, with the aid of the figures, wherein:

Fig. 1 is an essential diagram of the invention;

Figs. 2 and 3 are respectively a schematic side view and a schematic top view of a machine according to the invention, comprising a compressor and a high-pressure piston pump.

Referring to the general scheme of Fig. 1, the invention relates to a

multi-purpose machine comprising an electric motor M and two operating devices, that is a first operating device D1 and a second operating device D2, actuated by said motor M.

The motor M has a motor shaft with a first pin A1 and a second pin A2, protruding from two opposite sides of the motor. The first operating device D1 and the second operating device D2 are respectively connected to said first pin A1 and second pin A2.

The motor M is connected to means for reversing the rotation direction of the motor shaft, which means is advantageously realized with a selector S inverting the supply phase.

The first device D1 is connected to the first pin A1 through unidirectional coupling means C1, engaging and transmitting torque in a first direction of rotation R1, but allowing idling in the opposite direction; the second device D2 is connected to the second pin A2 through further unidirectional coupling means C2, engaging and transmitting torque only in the opposite direction of rotation R2.

In a preferred embodiment, said unidirectional coupling means C1 and C2 comprise a first freewheel, connecting the device D1 to the pin A1, and a second freewheel, connecting the device D2 to the pin A2.

Other equivalent unidirectional coupling means may be used: another embodiment, for example, provides for a magnetic clutch friction instead of at least one of the freewheels C1 and C2.

As stated above, the invention is preferably but not exclusively suited for a multi-purpose machine wherein the first operating device is a compressor and the second operating device is a high-pressure

water pump.

A practical example of such a machine is given in Figs. 2 and 3. In addition to the motor M, the machine comprises a compressor 1, a piston pump 2, a compressed air tank 3.

Both the compressor 1 and the piston pump 2 are connected to the respective pin of the motor shaft through a freewheel. The freewheel of the compressor and the freewheel of the pump are adapted to transmit torque in opposite directions.

The compressor 1 is operated by the motor M through a belt drive 4 connecting two pulleys 5 and 6, that are respectively keyed onto the first pin A1 of the motor M and onto the shaft of the compressor.

The freewheel of the compressor is advantageously interposed between the pin A1 and the pulley 5, so that the motor M can drive the pulley 5 in one rotation direction only.

The pump 2 is screwed directly onto the motor M, thereby creating a single body therewith. In this way, as illustrated in figures 2 and 3, overall dimensions of the machine are about the same as those of a commercially available compressor, thus also reducing costs.

The pump 2 is preferably of the type with a wobble plate that actuates the pistons. In this case, the freewheel of the pump may be inserted into the wobble plate. In practice, it is possible for example to bore the wobble plate of a commercially available pump, to obtain the seat for mounting the freewheel.

Insertion of the freewheel into the wobble plate gives the following advantages: the motor-pump alignment is made easier; overall

dimensions are reduced; the lubricant of the pump can act also on the freewheel itself; savings in time and cost for assembling are obtained.

According to a preferred embodiment, the wobble plate actuates the pistons of the pump by means of a first axial thrust bearing, and a load spring is provided that keeps said bearing in contact with the wobble plate.

According to a further preferred embodiment, a second thrust bearing is provided, behind the freewheel of the pump, on the opposite side of the above mentioned first thrust bearing. Said second thrust bearing is provided to avoid that the thrust of the spring causes the freewheel to be dragged also in the idle direction of rotation.

According to another embodiment (not shown), the compressor and the pump are mounted adjacent, on the same side of the motor: in this case, said second thrust bearing is particularly advantageous, because the freewheel of the compressor and the freewheel of the pump are rather close together, and there may be some mechanical contact between them, with the consequence that the compressor could be running even when the motor M is driving the pump, or vice versa.

If the pump 2 is a piston pump with eccentric shaft, the freewheel can be mounted between the pin of the motor and the shaft of the pump, instead of the rigid tongue connection that is normally used.

The compressor 1 can also be connected to the motor M in a different way; for example, it can be monobloc. In a further embodiment (not shown), the compressor is coaxial to the motor M,

with the freewheel being fixed to the motor shaft and to the eccentric of the compressor.

The motor M is normally a brush motor, an inductive motor, or a Hall-effect motor. For silent operation, a low-rpm motor together with an overdrive, in accordance with the italian patent application no. CR2002A000005 of the same applicant, may be used.

According to the invention, the user may choose to run the compressor 1 or the pump 2 simply acting on the selector S that reverses the rotation direction of the motor M.

When the motor M is running, only one of the two freewheels C1 and C2 is engaged, whilst the other remains idle. The user has a multi-function and multi-use machine, passing from one function to the other by simply switching a selector.

The invention is not limited to the illustrated example, but is subject to many different applications and enables to realize a vast range of multi-purpose machines, particularly in the field of fluid machines such as compressors, pumps or vacuum cleaners, in the field of domestic and industrial cleaning machines, in the field of tools, domestic appliances, do-it-yourself, and so on. As an example, other applications may cover a combined air compressor and vacuum cleaner machine, a machine comprising an air compressor and an aspirator for liquids, or a machine comprising a high-pressure pump and a tool such as a disc grinder.

CLAIMS

1. A multi-purpose machine comprising an electric motor (M), a first operating device (D1) and a second operating device (D2) actuated by said motor (M), wherein said motor (M) has a shaft with a first pin (A1) and a second pin (A2) to which said devices are respectively connected, characterised in that:
   - the motor (M) is connected to means (S) suitable for reversing the direction of rotation of the motor shaft;
   - the first device (D1) is connected to the first pin (A1) through unidirectional coupling means (C1), transmitting torque in a first direction of rotation (R1) only;
   - the second device (D2) is connected to the second pin (A2) through further unidirectional coupling means (C2), transmitting torque in the direction of rotation (R2) opposite to said first direction (R1).
2. A machine according to claim 1, characterised in that the coupling means of at least one of said first device (D1) and second device (D2) comprises a freewheel-clutch.
3. A machine according to claim 1, characterised in that the coupling means of at least one of said first device (D1) and second device (D2) comprises a magnetic clutch.
4. A machine according to claim 1, characterised in that one of said operating devices (D1, D2) is an air compressor (1).
5. A machine according to claim 1, characterised in that one of said operating devices (D1, D2) is a vacuum cleaner.

6. A machine according to claim 1, characterised in that one of said operating devices (D1, D2) is a high-pressure piston pump (2).
7. A machine according to claim 6, wherein said pump (2) is a piston pump with a wobble plate actuating the pistons, characterised in that the coupling means between the pump (2) and the motor (M) comprises a freewheel associated with the wobble plate of the pump.
8. A machine according to claim 7, characterised in that it comprises a first thrust bearing between the wobble plate and the pistons of the pump, and a second thrust bearing next to the freewheel associated with said wobble plate.
9. A machine according to claims 1 and 2, characterised in that the connection means between one of the operating devices (1) and the corresponding pin (A1) comprises a belt drive transmission with a belt (4) connecting a driving pulley (5) to a driven pulley (6), and the respective freewheel is associated with said driving pulley (5).

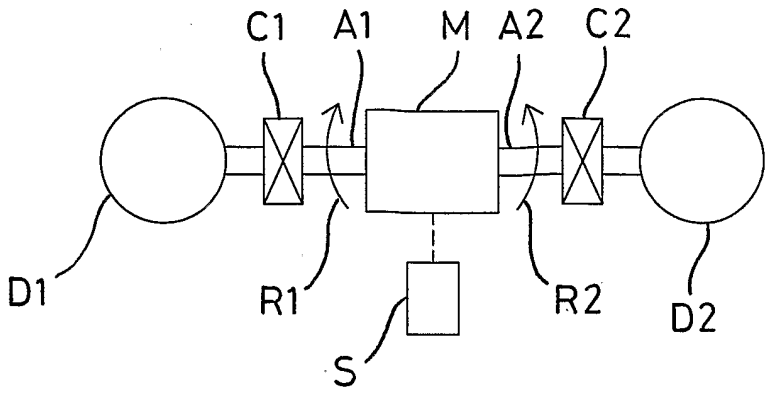


FIG. 1

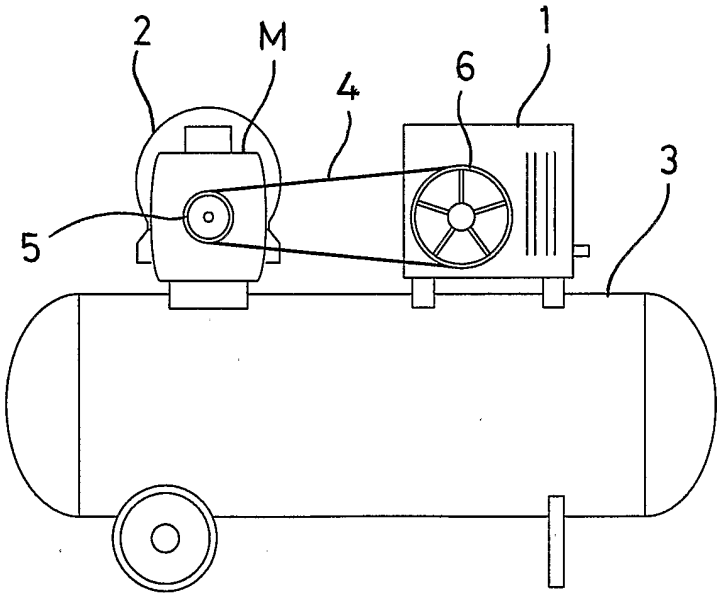


FIG. 2

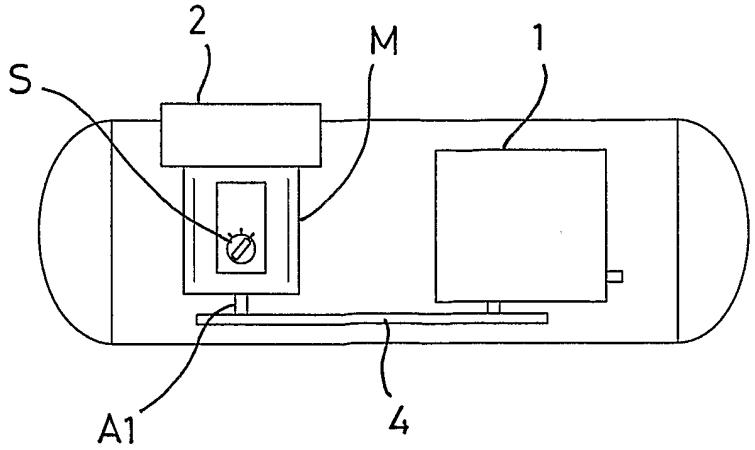


FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H02K7/10 F04B35/00 F04B23/08 A47L7/00 B08B3/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H02K F04B A47L B08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 351 870 B1 (MORITSCH ERICH) 5 March 2002 (2002-03-05) column 1, line 28 - line 67	1-6
Y	column 2, line 50 - column 4, line 4; figure 2	9
Y	GB 2 060 087 A (STIEBER PRAEZISION) 29 April 1981 (1981-04-29) abstract	9
A	GB 2 073 827 A (WELL MEN IND CO LTD) 21 October 1981 (1981-10-21) abstract	4
A	US 5 046 927 A (KIMURA KAZUYA ET AL) 10 September 1991 (1991-09-10) figure 1	7,8

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
24 September 2004	11/10/2004

Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Form PCT/ISA/210 (continuation of second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

Information on patent family members

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