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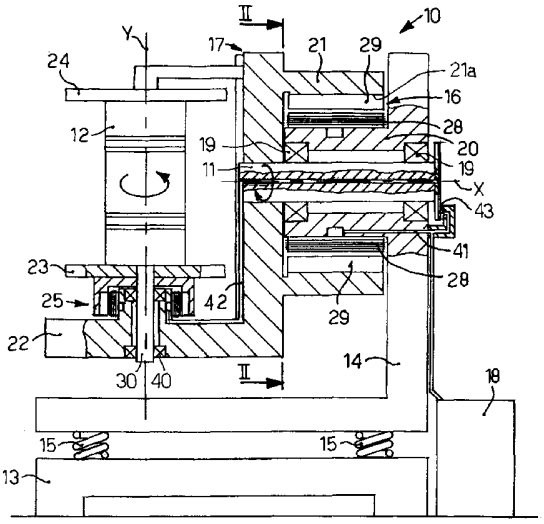
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(54) **Title:** MIXING MACHINE FOR FLUID PRODUCTS



(57) **Abstract:** Mixing machine (10) for fluid products comprising a fixed frame (14), a support (17) for a container (12) containing the fluid products to be mixed and a motor unit (16) able to move the support (17) with respect to the fixed frame (14). The motor unit (16) comprises a fixed part (20), made in a piece with or mounted on the fixed frame (14), and a mobile part (21), made in a piece with or mounted on the support (17) and able to cooperate with the fixed part (20). The fixed part (20) or the mobile part (21) of the motor unit (16) comprises one or more permanent magnets (29) while the other part, mobile (21) or fixed (20), comprises one or more electric windings (28) able to be energized in order to achieve a reciprocal motion of the two parts, fixed (20) and mobile (21).

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"MIXING MACHINE FOR FLUID PRODUCTS"

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FIELD OF THE INVENTION

The present invention concerns a mixing machine able to mix a fluid product, such as for example a painting substance, contained inside a container, imparting to the container determinate oscillatory and/or rotational movements around one or more axes of rotation. For each of the movements an autonomous motor unit is provided, which comprises a part which is fixed at least relative to the element on which it is mounted, and a part mobile linearly, or rotationally, with respect to the fixed part. Each motor unit is fed and controlled autonomously with respect to the possible other motor units.

BACKGROUND OF THE INVENTION

Known mixing machines are able to impart to a container, which contains a fluid product, such as for example a paint, a determinate mixing cycle consisting of a programmed sequence of movements that can be either of the oscillatory type, usually on a vertical axis, or of a rotational type, or of a mixed oscillatory and rotational type.

In turn, the rotational movements can take place on a single axis, vertical, horizontal or inclined, or on several axes, thus giving rise to gyroscopic or orbital movements.

These mixing movements are normally obtained with individual autonomous electric motors, produced separately from the mixing machine, and therefore used as an autonomous component. Usually, the electric motors used in known mixing machines are fed with alternating current and can be provided with inverters.

To be more exact, the European patent EP-B-0617998

discloses a mixing machine in which a first electric motor is mounted on a first frame, elastically connected to the fixed bearing structure, and is able to transmit motion of an orbital type to a second frame, on which a pair of clamping plates are mounted, parallel to each other, between which the container containing the fluid product to be mixed is able to be clamped. A second electric motor is mounted on the second frame and is able to make the two clamping plates rotate, together with the container clamped between them. A third electric motor, also mounted on the second frame, is able to move one clamping plate towards the other, in order to selectively clamp the container.

Mixing machines are also known, of the gyroscopic type with two rotational movements on axes of rotation that are perpendicular to each other, which comprise a single electric motor, mounted on their bearing structure. In this case, the electric motor supplies motion to a first rotary frame, on which a second rotary frame is mounted. The rotational motion of the latter is taken from the rotation of the first rotary frame by means of a second mechanical transmission unit. Consequently, the transmission ratio between the two rotary frames, during the motion, is always the same and can possibly be modified by the operator only when the machine is stationary, for example using a mechanical-type speed change.

Known mixing machines therefore have a very poor mechanical performance, normally comprised between 0.2 and 0.3. This performance is connected to the type of mechanical transmission used, which usually comprises a lot of mechanical members in reciprocal movement which, by their very nature, are subject to great friction, stresses, vibrations and wear.

Moreover, known mixing machines have a very high

consumption of electric energy with respect to the actual work done during the mixing cycle, both because of their poor mechanical performance and also due to the fact that the secondary movement, which is often the most efficient for mixing purposes, derives from and is determined by the main movement, so that a high quantity of electric energy is absorbed by the single motor and by the control electronics.

Furthermore, the mechanical transmissions used cause a poor controllability and repeatability of the movement imparted to the container, due to the wear of the mechanical members and the slipping of the belts on the corresponding pulleys.

These mechanical transmissions also have poor reliability and, in practice, cause numerous and frequent interruptions in the service of the mixing machine, due to breakages or slippage of the belts, wear on the teeth of the gears, or other. It is usually difficult to replace the worn or damaged parts, due to the limited accessibility of the machines, especially when they are in the place of use such as, for example, a sales point for paints.

Another disadvantage of known mixing machines, when the electric motor is mounted on the lower rear part of the fixed frame, is the increase in their bulk, in depth, with associated problems for arranging them in the place of use. Moreover, the action of the electric motor causes strong stresses and vibrations on the fixed frame, so that it must be made in such a manner as to have adequate mechanical resistance, and is thus very heavy. Instead, when the electric motor is mounted on board the mobile frame, it too is subject to the same oscillations, and therefore, in order to maintain adequate reliability, it must be made with special parts, such as bearings or other mechanical

members, with a consequent increase in the cost of the machine in its entirety.

A further disadvantage of known mixing machines is that the poor reliability of the mechanical transmissions used prevents disposing adequate viscous-elastic damper devices between the dynamic parts subject to unbalanced loads and the fixed parts.

A further disadvantage of known mixing machines is their noisiness, so that it is necessary to provide an adequate sound-proofing of the walls, increasing the thickness thereof and/or using special sound-proofing materials.

One purpose of the present invention is to achieve a mixing machine which is provided with motor means able to move the container containing the fluid product to be mixed, which allow to obtain high performance, limited bulk, limited stresses and vibrations on the frame, and high reliability, in order thus to reduce to a minimum the interruptions in service due to possible breakdowns, or the necessary replacement of worn or damaged parts, and which at the same time do not make much noise during functioning.

The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain this and other purposes and advantages.

SUMMARY OF THE INVENTION

The present invention is set forth and characterized in the main claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

In accordance with the above purpose, a mixing machine according to the present invention is able to mix together fluid products contained in a container and comprises a fixed frame, support means able to support the container

and first motor means, able to move the support means with respect to the fixed frame so as to mix the fluid products.

According to a characteristic of the present invention, the first motor means comprise a fixed part, functioning as an inductor and made in a piece with, or mounted on, the fixed frame, and a mobile part, functioning as a mobile armature, made in a piece with, or mounted on, the support means and able to cooperate with the fixed part.

At least one of the parts comprises one or more permanent magnets while the other comprises one or more windings, which are able to be selectively fed with an electric current in order to achieve a reciprocal motion of the fixed part and the mobile part.

In fact, the electric current, which can be either direct or alternating, supplied to the windings of the fixed part, or respectively mobile part, interacts with the constant magnetic field generated by the permanent magnets with which the mobile part or, respectively, fixed part, is made, so as to generate a force that causes the reciprocal displacement of the mobile part with respect to the fixed part. In this way it is possible to move the support means and the relative container with respect to the fixed frame as desired, without needing a mechanical transmission that transmits the motion from a fixed electric motor to the support means.

In this way, it is possible to achieve a mixing machine in which there is a direct drive, integrating the fixed part of the motor means, functioning as an inductor, on the fixed frame and the mobile part of the motor means, functioning as a mobile armature, on the support means. This solution is particularly advantageous and allows to exploit the progress obtained in the technology of electromagnetic drives, mainly relating to continuous

current motors driven electronically, for example of the brushless type, torque, disk, variable reluctance, or other.

Moreover, in this way it is possible to achieve a mixing machine which has high performance, limited energy consumption, high reliability and low noise. This allows to eliminate the frequent interruptions in service caused by breakages, wear or deterioration of the material of which the different parts of the mechanical transmission are made in the state of the art.

In a preferential form of embodiment, the support means are selectively removable, together with the mobile part, from the fixed frame and from the corresponding fixed part. In this way it is possible to mount on the same mixing machine different support means in order to thus carry out a plurality of different mixing cycles.

In another preferential form of embodiment, one of the parts, fixed or mobile, is shaped so as to define a cavity inside which the mobile or respectively fixed part is disposed.

According to a variant, both the cavity and the mobile or fixed part inserted therein are substantially cylindrical in shape and are coaxial with each other.

In this variant, the windings are disposed on a first cylindrical surface of the cavity, or the corresponding fixed or mobile part inserted therein. The permanent magnets, instead, are disposed on a second cylindrical surface coaxial with the first cylindrical surface of the respectively mobile or fixed part.

When the windings of the fixed or mobile part are supplied with current, the mobile part rotates with respect to the fixed part and, consequently, the support means rotate with respect to the fixed frame.

According to another variant, the windings are disposed aligned on one of said parts, fixed or mobile, while the permanent magnets are aligned on the other part, respectively mobile or fixed, so as to be adjacent to the windings.

When the windings of the fixed or mobile part are supplied with current, the mobile part moves in alternating motion with respect to the fixed part and consequently the support means move with alternating motion with respect to the fixed frame.

In another preferential form of embodiment, the mixing machine according to the present invention also comprises motor means able to move the container with respect to the support means.

According to a variant, the support means comprise clamping means able to clamp the container in a determinate operating position.

The movements of the container both with respect to the fixed frame and also with respect to the mobile frame are independent from each other and allow to optimize the mixing cycle in relation to the specific rheological properties of the fluid products to be mixed.

The mixing machine according to the present invention is therefore very versatile and it is also possible, for example, to activate only the second motor means and hence move the container only with respect to the support means.

According to another variant, the second motor means comprise a stator, made in a piece with or mounted on the support means, and a rotor, made in a piece with or mounted on the clamping means, cooperating with the second stator so as to impart to the container a rotational movement around its longitudinal axis.

In another preferential form of embodiment, the mixing

machine comprises control means able to autonomously control and command the functioning of the motor means according to the mixing cycle to be carried out. The control means function by automatically regulating, both in terms of duration and in terms of intensity, the supply of electric current to the first and/or second motor means.

The control means, through the motor means, allow to acquire in real time information on the functioning of the mixing machine, carrying out evaluations, local or remote, on the need to perform preventative maintenance, and also optimizing the mixing cycle in relation to the load conditions.

Moreover, due to the effect of the electronic control exerted on the first and second motor means, the control means allow to eliminate devices for repositioning the container both in the initial position, and in a vertical and radial direction.

The mixing machine according to the present invention is very quiet, not bulky, especially in depth, due to the absence of mechanical transmission members disposed in the rear part, and also allows to perform mixing cycles which are personalized, not traditional, for example of the impulsive and/or bouncing type, exploiting the new construction characteristics and the properties of the motor means.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a schematic side view, partly sectioned, of a first form of embodiment of a mixing machine according to the present invention;

- fig. 2 is a section from II to II of a detail of fig. 1;
- fig. 3 is a schematic side view, partly sectioned, of a variant of the mixing machine in fig. 1;
- fig. 4 is a section from IV to IV of a detail of fig. 3;
- fig. 5 is a schematic front view, partly sectioned, of a second form of embodiment of a mixing machine according to the present invention;
- fig. 6 is a schematic front view of a variant of the mixing machine in fig. 5;
- fig. 7 is a front view, partly sectioned, of the same detail of fig. 1 and fig. 6;
- fig. 8 is a schematic side view, partly sectioned, of another variant of the mixing machine in fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

With reference to fig. 1, in a first form of embodiment, a mixing machine 10 according to the present invention is of the gyroscopic type, that is, able to simultaneously impart to a container 12, containing a fluid product to be mixed, for example paint, a main rotational movement around an axis X, substantially horizontal, and also a secondary rotational movement around a longitudinal axis Y of the container 12 itself, perpendicular to the axis X.

The mixing machine 10 according to the present invention comprises a base 13 resting on the floor, a fixed frame 14 mounted on the base 13, and a damper device 15 located between the base 13 and the fixed frame 14 and able both to dampen the vibrations which are generated during the mixing cycle, and also to reduce noise. The damper device 15 comprises, for example, a plurality of springs, or other viscous-elastic means of a known type.

A first motor unit 16 is mounted on the fixed frame 14 and a support unit 17 is able to support the container 12 and is associated with the first motor unit 16.

A control unit 18 is provided to control at least the drive of the first motor unit 16.

The first motor unit 16 (fig. 2) comprises a first stator 20, made in a piece with or mounted on the fixed frame 14, and a first rotor 21, associated with the support unit 17 as will be explained in more detail later.

The first rotor 21 is shaped so as to have an inner cavity 21a (fig. 1), substantially cylindrical in shape, which is able to be disposed coaxially with the first stator 20, also cylindrical in shape.

The first rotor 21 is selectively removable from the first stator 20, consequently the support unit 17, with which the first rotor 21 is associated, is removable from the fixed frame 14.

The support unit 17 comprises a mobile frame 22, keyed onto a shaft 11, or shaped so as to define its own rotation shaft, coaxial with the axis X and mounted rotatable on the fixed frame 14 by means of two bearings 19.

The support unit 17 also comprises a supporting plate 23, on which the container 12 is able to be rested, and a pressure plate 24, mounted sliding on the mobile frame 22 and able to press the container 12 against the supporting plate 23, so as to clamp it in a determinate position.

The supporting plate 23 is keyed onto a shaft 30, or is shaped so as to define its own rotation shaft, coaxial with the axis Y and in turn mounted rotatable with respect to the frame 22 by means of bearings 40. The pressure plate 24 is able to rotate together with the supporting plate 23.

A second motor unit 25 is able to make the supporting plate 23 rotate, and the container 12 disposed thereon, with respect to the mobile frame 22.

The second motor unit 25 (fig. 7) comprises a second stator 26, made in a piece with, or mounted on the mobile

frame 22, and a second rotor 27, made in a piece with or mounted on the supporting plate 23.

The second stator 26 and the second rotor 27 are cylindrical in shape and are coaxial with the longitudinal axis Y. In this case, the second stator 26 is disposed inside the second rotor 27. The latter is able to rotate with respect to the second stator 26 so as to allow the secondary rotational movement of the container 12 around the longitudinal axis Y. Moreover, the second rotor 27 is selectively removable with respect to the second stator 26, and consequently the supporting plate 23 is removable with respect to the mobile frame 22.

The two stators 20 and 26 (figs. 2 and 7), in this case, each comprise a plurality of windings 28 which are disposed suitably distanced on their outer circular surface and are made of conductive material, for example copper or aluminum.

The two rotors 21 and 27, instead, each comprise a plurality of permanent magnets 29, which are disposed suitably distanced on their inner circular surface in order to generate a constant magnetic field.

Both the stators 20 and 26 are able to be fed autonomously and independently with electric current supplied by the control unit 18, which is programmed to effect the desired mixing cycle, or set according to the fluid product to be mixed.

To be more exact, the first stator 20 is fed through a first cable 41, connected to the control unit 18, while the second stator 26 is fed by means of a second cable 42, also connected to the control unit 18. The latter receives electric current through sliding contacts of a known type, for example brushes 43, mounted on the fixed frame 14 in correspondence with one end of the shaft 11.

During the mixing cycle, each current supplied to the first stator 20 and to the second stator 26 interacts with the constant magnetic field generated by the permanent magnets 29 of the first rotor 21 and the second rotor 27 so that, on these latter two, a force acts such as to make them rotate with respect to the relative stators 20 and 26. This force is proportional to the intensity of the current supplied to each stator 20 and 21, so that, the greater the intensity of the current supplied, the greater is the force acting on the corresponding rotors 21 and 27, and hence the greater is the speed at which the container 12 is made to rotate around the axes X and respectively Y.

In a variant, shown in figs. 3 and 4, it is the first stator 20 that is provided with a cylindrical cavity 20a, on the cylindrical surface of which the windings 28 are disposed, while the first rotor 21, with its permanent magnets 29, is disposed inside the first stator 20 coaxial therewith.

In another variant, shown in fig. 8, the supporting plate 23 and the pressure plate 24 are replaced by a universal basket 44, able to contain the container 12 and associated with the second rotor 27. The universal basket 44 can be, for example, of the type described in the patent application UD-A-2004000138, filed on 01.07.2004 by the present Applicant.

In another variant, not shown here, the first rotor 21 and the second rotor 27 are disposed inside the corresponding stators 20 and 26 and are provided with a plurality of windings 28, while the stators 20 and 26 are provided with a corresponding plurality of permanent magnets 29. In this case, the feed of the electric current to the windings 28 of the rotors 21 and 27 is effected indirectly through sliding contacts.

It is therefore possible to dispose the rotors 21 and 27 both inside and outside the corresponding stators 20 and 26, in relation to the constructional characteristics of the mixing machine 10.

In a second form of embodiment, a mixing machine 110 (fig. 5) according to the present invention is of the vibratory type, that is, able to impart to the container 12 an alternating vertical movement.

The mixing machine 110 comprises the control unit 18, the base 13, a fixed frame 114, mounted on the base 13, and a first damper device comprising in this case a group of springs 31 located between the fixed frame 114 and the base 13.

Two motor units 116, controlled by the control unit 18, are mounted on the fixed frame 114 and are able to impart an alternating vertical movement to a mobile support 117, able to support the container 12.

The mixing machine 110 also comprises a second damper device comprising in this case a plurality of springs 32 disposed between an upper cross-piece 35 of the fixed frame 114 and the upper part of the mobile support 117 and also between the lower part of the latter and a base 33 of the fixed frame 114.

The fixed frame 114 comprises two outer uprights 34, disposed in correspondence with opposite ends of the base 33 and supporting an upper cross-piece 35; two inner uprights 36, each disposed on the base 33 in proximity with the corresponding inner upright 34; and two guides 38, made on the outer uprights 34 and on which the mobile support 117 is able to slide with an alternating vertical movement.

Each motor unit 116, in this case, comprises an inductor 37 mounted on the fixed frame 114, and a mobile armature 39, mounted on the mobile support 117.

Each inductor 37 comprises two or more rows of windings 28, mounted on a corresponding inner upright 36 and fed with electric current through the first cable 41, connected to the control unit 18.

Each mobile armature 39, instead, comprises a corresponding number of rows of permanent magnets 29, each facing the relative row of windings 28 of the corresponding inductor 37.

When the mixing cycle is started, the inductors 37 of both the motor units 116 are fed with a current impulse having a determinate intensity. This current impulse, cooperating with the constant magnetic field generated by the permanent magnets 29 of the corresponding mobile armatures 39, causes a force to act on the mobile support 117 such as to lift it upwards.

The springs 32 react to the vertical movement of the mobile support 117 by thrusting it alternately downwards and upwards.

This alternating movement is exhausted after a certain period of time, which depends on the intensity of the current impulse supplied to the inductors 37. Consequently, according to the duration of the mixing cycle to be effected, the control unit 18 supplies to the inductors 37 a determinate number of current impulses depending on the type of product to be mixed.

According to a variant, shown in fig. 6, the mixing machine 110 is of the roto-vibratory type, that is, able to simultaneously impart to the container 12 a main alternating movement on the vertical plane and a secondary rotational movement around the longitudinal axis Y of said container.

To effect the secondary rotational movement, the supporting plate 23, the pressure plate 24 and the second

motor unit 25 are mounted on the mobile support 117. The second motor unit 25 is fed with electric current through the second cable 42, also connected to the control unit 18.

It is clear that modifications and/or additions of parts may be made to the mixing machine 10, 110 as described heretofore, without departing from the field and scope of the present invention.

According to a variant, a counter-weight is mounted on the mobile frame of the mixing machine 10, so as to reduce the shaking and vibrations caused by the centrifugal force due to the masses rotating around the axis X.

It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of mixing machine for fluid products, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

CLAIMS

1. Mixing machine for fluid products comprising a fixed frame (14, 114), support means (17, 117) able to support a container (12) containing said fluid products, and at least first motor means (16, 116) able to move said support means (17, 117) with respect to said fixed frame (14, 114) for mixing said fluid products contained in said container (12), characterized in that said first motor means (16, 116) comprises a fixed part (20, 37), made in a piece with or mounted on said fixed frame (14, 114), and a mobile part (21, 39), made in a piece with or mounted on said support means (17, 117) and able to cooperate with said fixed part (20, 37), and in that at least one of said parts, fixed (20, 37) or mobile (21, 39), of said first motor means (16, 116) comprises one or more permanent magnets (29), and the other of said parts, respectively mobile (21, 39) or fixed (20, 37), comprises one or more electric windings (28) able to be selectively fed in order to achieve a reciprocal motion of said fixed part (20, 37) and said mobile part (21, 39).

2. Mixing machine as in claim 1, characterized in that said support means (17, 117) are selectively removable, together with said mobile part (21, 39), from said fixed frame (14, 114) and from the corresponding fixed part (20, 37).

3. Mixing machine as in claim 1 or 2, characterized in that one of said parts, fixed (20) or mobile (21), is shaped so as to define a cavity (20a, 21a) inside which said mobile part (21, 39) or respectively fixed part (20, 37) is disposed.

4. Mixing machine as in claim 3, characterized in that both said cavity (20a, 21a) and said mobile (21) or fixed part (20) inserted therein are substantially cylindrical in shape and are coaxial with each other.

5. Mixing machine as in claim 4, characterized in that said windings (28) are disposed on a first cylindrical surface of said cavity (20a, 21a) or the corresponding of said parts, fixed (20) or mobile (21), inserted therein.

6. Mixing machine as in claim 5, characterized in that said permanent magnets (29) are disposed on a second cylindrical surface coaxial with said first cylindrical surface of said respectively mobile (21) or fixed part (20), so that said mobile part (20) is able to rotate with respect to said fixed part (21).

7. Mixing machine as in claim 3, characterized in that said windings (28) are disposed aligned on one of said parts, fixed (37) or mobile (39).

8. Mixing machine as in claim 7, characterized in that said permanent magnets (29) are aligned on the other of said parts, respectively mobile (39) or fixed (37), so as to be facing said windings (28), so that said mobile part (39) is able to move with alternating motion with respect to said fixed part (37).

9. Mixing machine as in any claim hereinbefore, characterized in that it also comprises second motor means (25) able to move said container (12) with respect to said support means (17, 117).

10. Mixing machine as in claim 9, characterized in that said support means (17, 117) comprise clamping means (23, 24, 44) for clamping said container (12) in a determinate operating position.

11. Mixing machine as in claim 10, characterized in that said second motor means (25) comprises a stator (26), made in a piece with or mounted on the frame of said support means (17, 117), and a rotor (27), made in a piece with or mounted on said clamping means (23, 24, 44) and able to cooperate with said stator (26) for rotating therewith.

12. Mixing machine as in any claim from 9 to 11, characterized in that it also comprises control means (18) able to autonomously control and command the functioning of each of said motor means (16, 25, 116).

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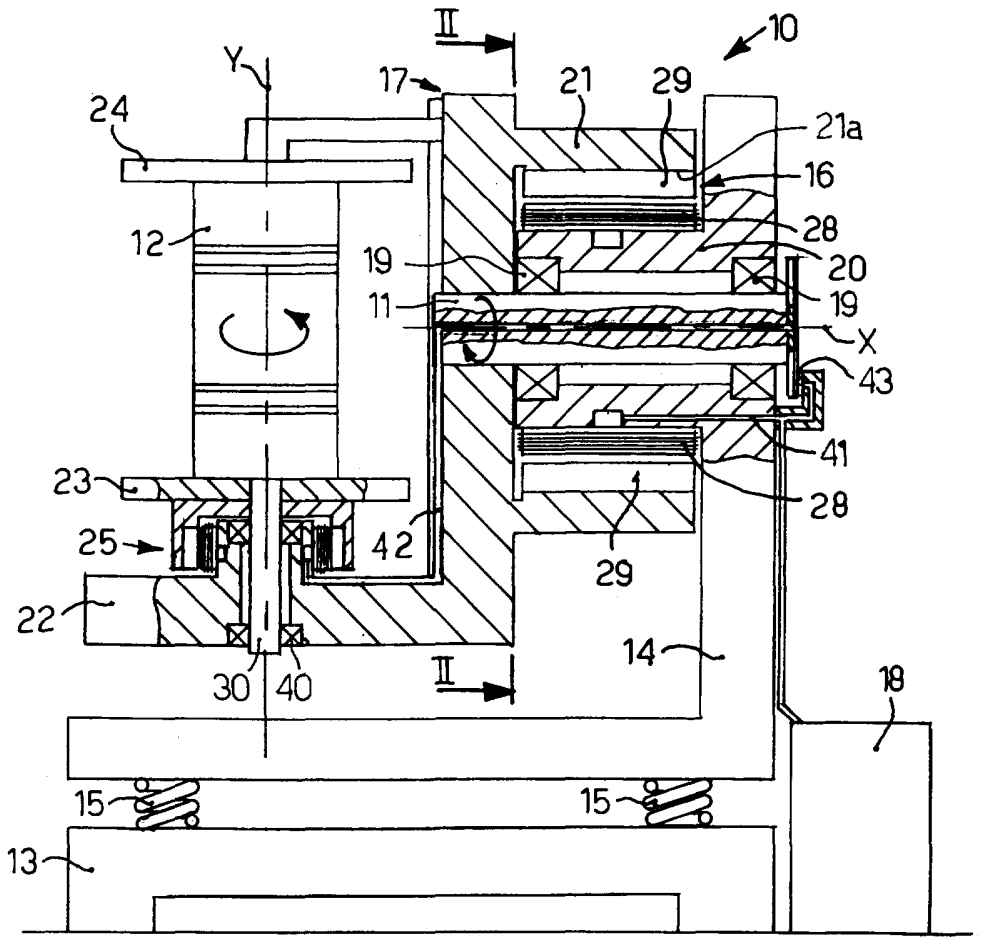

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fig. 1

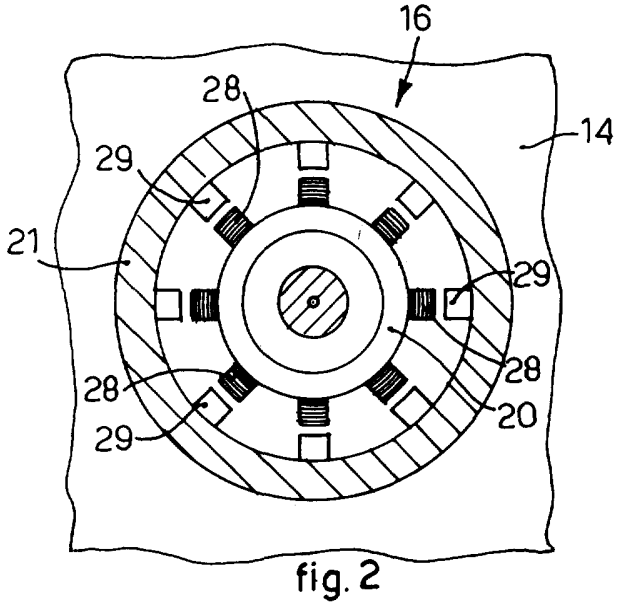

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fig. 2

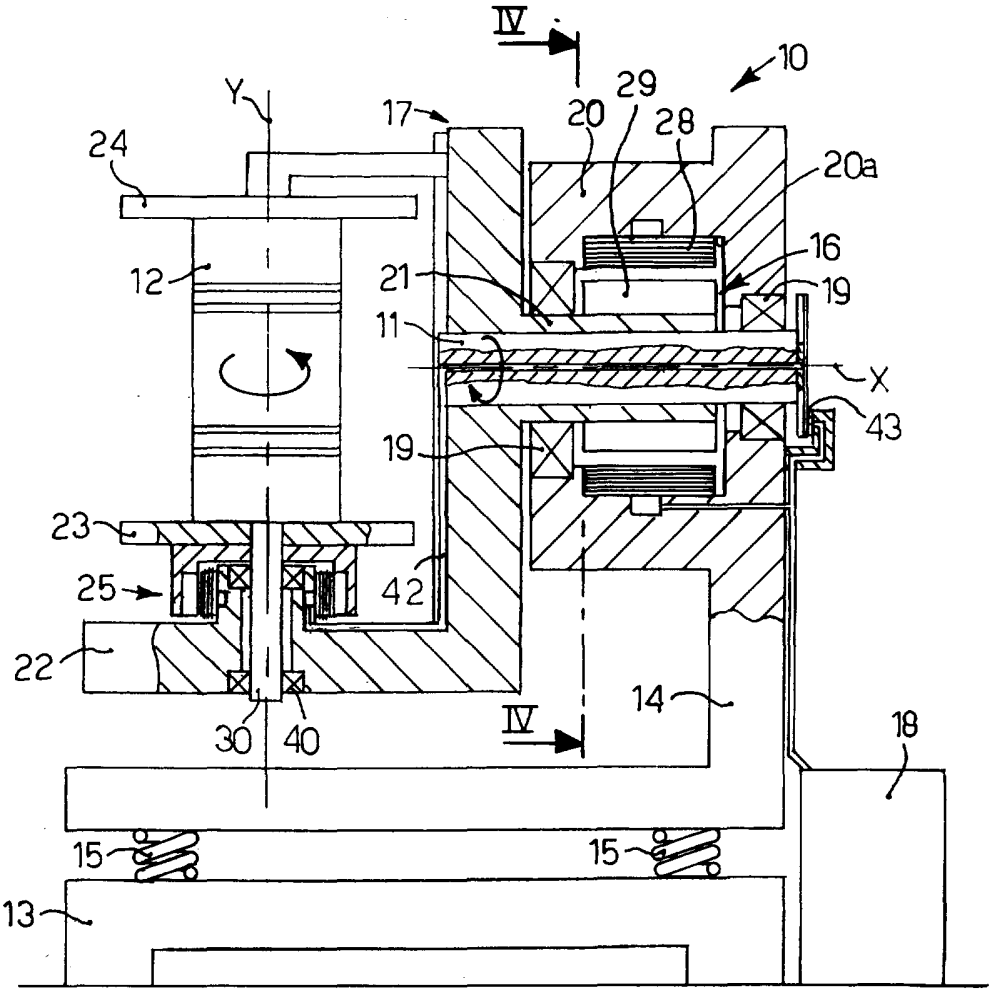

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fig. 3

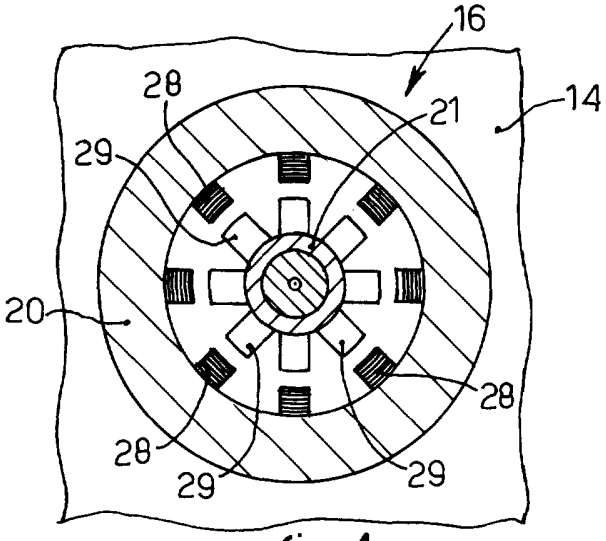

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fig. 4

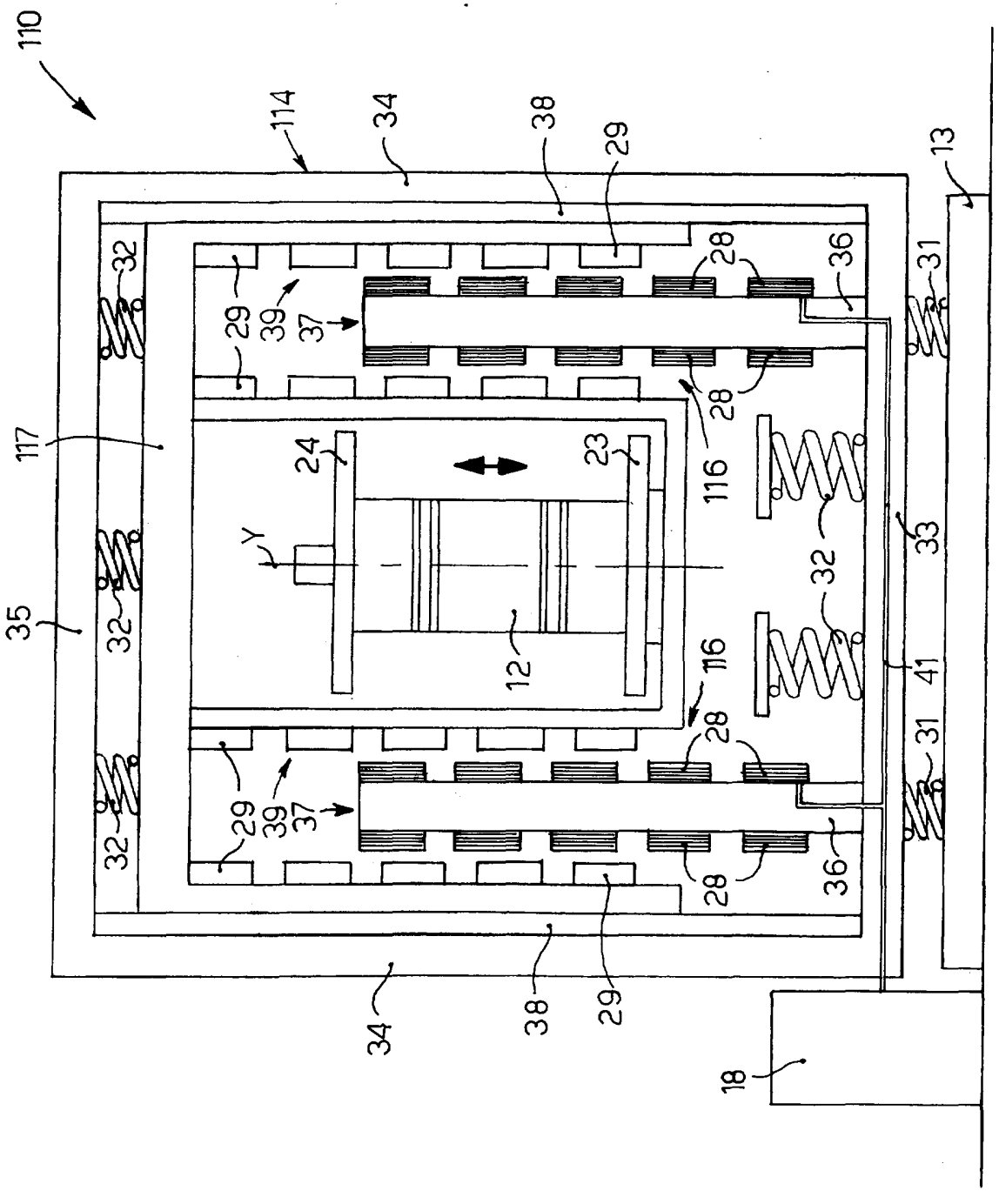


fig. 5

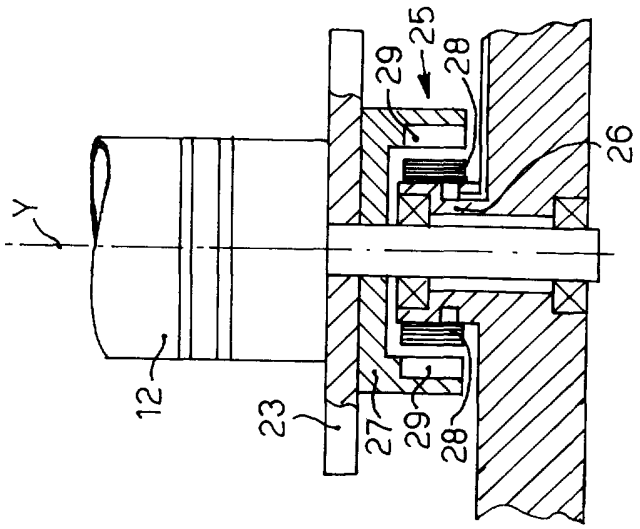

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fig. 7

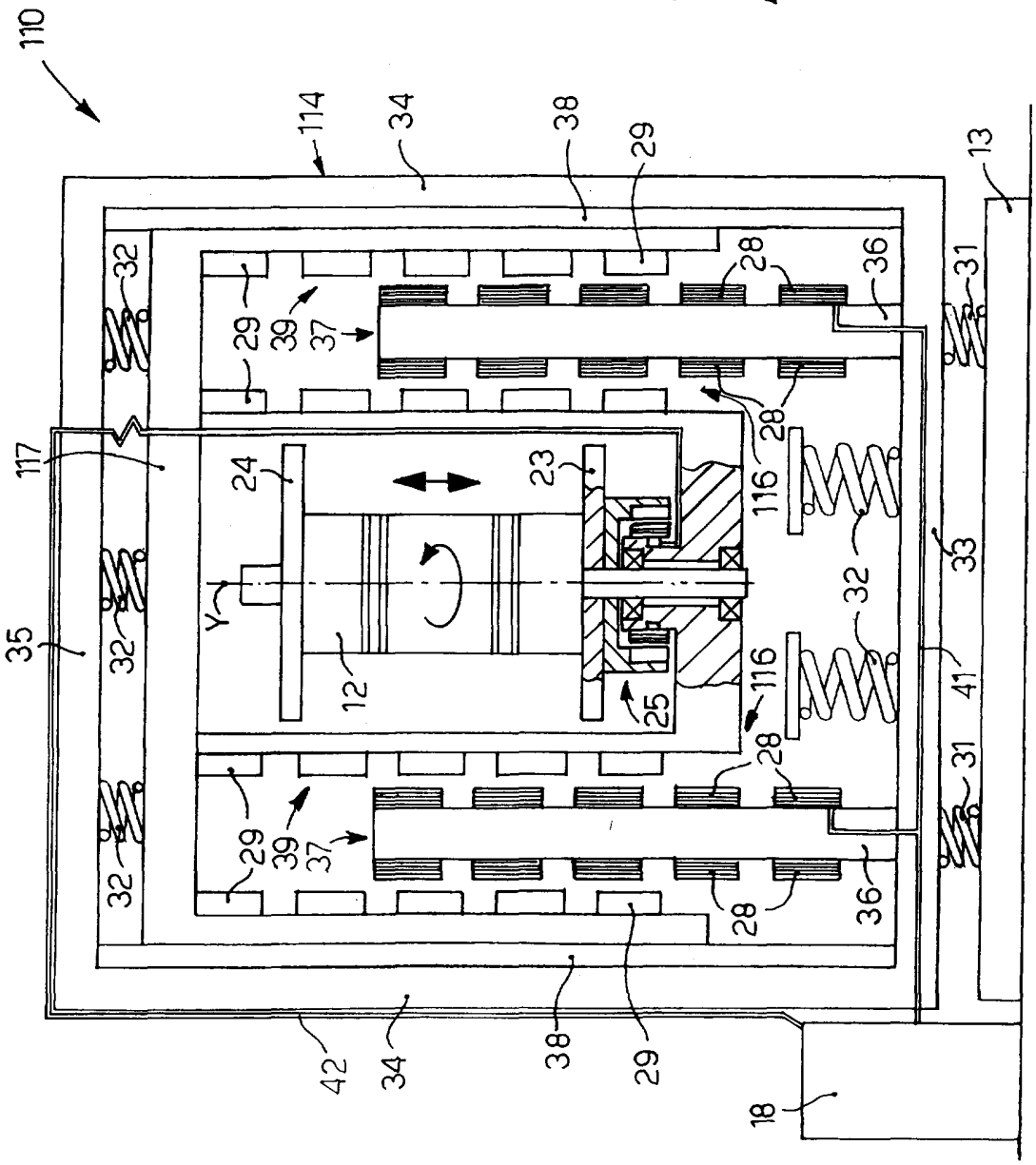

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fig. 6

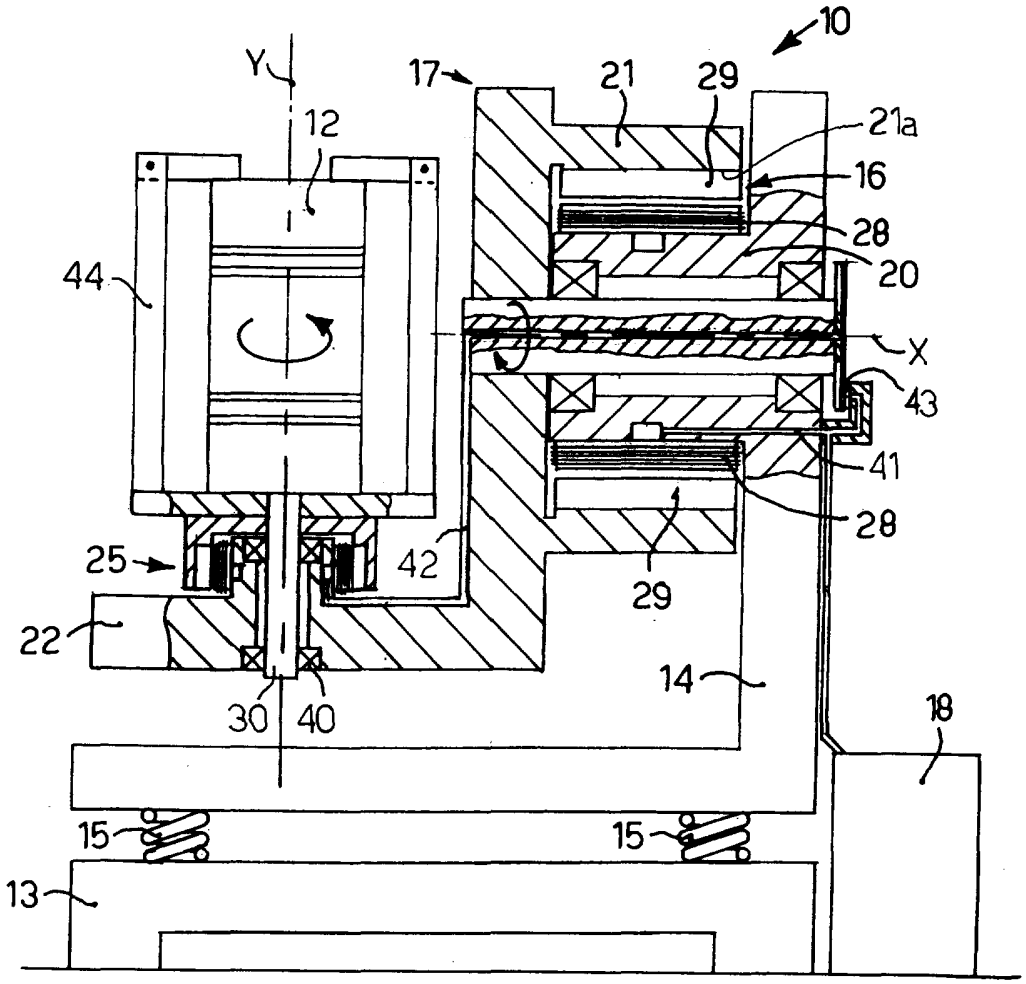

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fig. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/050315

A. CLASSIFICATION OF SUBJECT MATTER
INV. B01F11/00 B01F9/00

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)
B01F

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, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/081499 A1 (FRIEDMAN MITCHELL A) 1 May 2003 (2003-05-01)	1-5,7,8
A	paragraph [0002] paragraph [0012] paragraph [0043] - paragraph [0045] figures 3,4	6,9-12
A	US 5 934 804 A (BRANSON ET AL) 10 August 1999 (1999-08-10) column 4, line 7 - line 41 figure 2	1-12

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 April 2006	26/04/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Real Cabrera, R

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2006/050315

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003081499 A1	01-05-2003	US 2005152216 A1	14-07-2005
US 5934804 A	10-08-1999	NONE	