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(54) Drive device for an impeller for sterile applications

Antriebsvorrichtung eines Rührers für sterile Anwendungen

Dispositif d'entraînement d'un agitateur pour applications stériles

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Description

The present invention relates to a drive device for an impeller which is rotatably mounted within a vessel for stirring and mixing sterile fluids, and which device is located in an inwardly-directed cylindrical recess in a bottom wall of the vessel, the recess being intended to receive the drive device, and which stirrer includes a peripheral section which surrounds the cylindrical recess.

It is known that stirring of fluid within a closed vessel can be accomplished by means of a magnetic coupling between an external rotating drive unit and a completely separate internal stirring impeller. This known driving arrangement is comparatively expensive to achieve, since the external drive unit normally comprises a standard electric motor, a gear drive to transmit the drive through 90°, a rotor with periphally-mounted permanent magnets driven by said gear drive, and an impeller correspondingly equipped with magnets (see for example US 4209259 or US-A-2495895). The strength of the permanent magnets in this device weakens under duration of heat. Hot steam (180°C) can be used for sterilising the vessel.

The object of the present invention is therefore to provide a simpler drive device which can tolerate high temperatures.

This object is achieved according to the invention by a drive device characterised by a stator fixedly secured in the recess, which stator includes a magnetisable iron core and induction coils connectable to a 3-phase a.c. source, and by inductively magnetisable elements located in the peripheral part of the impeller for generating a torque when the stator is supplied with a 3-phase alternating current so that the impeller rotates in a predetermined direction of rotation.

According to the present invention, the impeller is rotatably mounted on a stub axle which is centrally located on an end wall which forms an end gable of the recess of a vessel and which is located at a certain distance above the bottom of said vessel, coaxial with the cylindrical recess.

A small clearance is provided between the cylindrical recess and the peripheral section of the impeller. The magnetisable elements are hermetically encased in the impeller.

The above-mentioned, and further, characteristics of the invention will be described in more detail in the following, with reference to the attached drawings in which

figure 1 shows a perspective view of a mixing vessel equipped with a drive device according to the invention,
figure 2 is a partial sectioned view of the drive device,
figure 3 shows a control unit for the drive device.

The mixing vessel shown in figure 1 is provided with a four-wheeled chassis 10 which supports the vessel 11. The vessel is intended for use in a large process plant, for example for preparation of medicaments, and is provided with a number of inlets and outlets 12 and regulating valves 13. Various sterile fluids are delivered to the vessel, where they are mixed together by means of a driving device 14, after which the resulting mixture is drawn from the vessel.

The driving arrangement 14 is shown more clearly in figure 2 and includes an inwardly-directed cylindrical recess 15 in the bottom wall 16 of the vessel, the recess being welded in such a way that no openings or inlets occur in this section of the vessel wall. A impeller 17 is rotatably mounted on a stub axle 18 which is centrally located on an end wall 19 which forms an end gable of the recess (15) and which is located at a certain distance above the bottom (16) of the vessel, coaxial with the cylindrical recess (15), providing a small clearance without any bearing surfaces between the recess (15) and the peripheral section (21) of the impeller (17)

The impeller 17 is, like the vessel 11, principally manufactured from acidproof stainless steel, with a number of angled blades 20 and a central lifting ring 22. The impeller 17 presents a peripheral section 21 which surrounds the cylindrical recess 15 and contains an inductively magnetisable stack of plates 23 and a rotor which is intended for use in a 3-phase external-rotor a.c. motor.

A stator 24 is fixedly secured in the recess 15, which stator includes a magnetisable iron core 25 and induction coils connectable to a 3-phase a.c. source. When these coils are magnetised by the a.c. current, the plate stack 23 is also magnetised by induction, and, due to the varying direction of the a.c. current in the magnetic field, forces are attained which endeavor to rotate the impeller 17 in a predetermined direction.

Figure 3 shows a control unit 26 for controlling the impeller's drive, comprising a contact breaker 27, a speed regulator 28 (number of revolutions) and an electrical cable 29 connected to the stator 24 of the driving device. The speed regulator 28 enables the rotational speed of the impeller to be steplessly varied from 0-500 rpm (circa).

The invention is not restricted to the above described embodiment, but may be varied within the scope of the following claim. For example, the drive device can be provided with some form of cooling, for example a fan.

Claims

1. A mixing vessel for mixing sterile fluids, comprising:
 - (a) a drive device (14) for an impeller (17), which is rotatably mounted within the vessel (11),
 - (b) said device (14) is affixed in an inwardly

directed cylindrical recess (15) in the bottom wall (16) of the vessel,

(c) said impeller (17) includes a peripheral section (21) which surrounds the cylindrical recess (15),

(d) said drive device comprises a stator (24) which is fixedly secured in the recess (15), said stator including a magnetisable iron core (25) and induction coils connected to a 3-phase a.c. source

(e) inductively magnetisable elements (23) which are hermetically encased in the peripheral section (21) of the impeller (17) for generating a torque when the stator (24) is supplied with the 3-phase alternating current so that the impeller rotates in a predetermined direction,

(f) the impeller (17) is rotatably mounted on a stub axle (18), which is centrally located on an end wall (19) which forms an end gable of the recess (15) and which is located at a certain distance above the bottom (16) of the vessel coaxial with the cylindrical recess (15),

(g) a small clearance without any bearing surfaces is provided between the recess (15) and the peripheral section (21) of the impeller (17), allowing a sterilizing medium to pass between said recess (15) and said peripheral section (21) of the impeller.

Patentansprüche

1. Mischbehälter zum Mischen von sterilen Flüssigkeiten bestehend aus:

(a) einer Antriebsvorrichtung (14) für einen Rührer (17), der drehbar in dem Behälter (11) gelagert ist,

(b) welche Vorrichtung (14) an einer nach innen gerichteten zylindrischen Vertiefung (15) in der Bodenwand (16) des Behälters angeordnet ist,

(c) welcher Rührer (17) eine periferielle Partie (21) aufweist, die die zylindrische Vertiefung (15) umgiebt,

(d) welche Antriebsvorrichtung einen Stator (24) umfasst, der in der Vertiefung (15) fest befestigt ist, welcher Stator einen magnetisierbaren Eisenkern (25) und Induktionsspulen die an eine 3-Phasen-Wechselstromquelle angeschlossen sind enthält,

(e) wobei in der periferiellen Partie (21) des Rührers (17) induktiv magnetisierbare Elemente (23) hermetisch eingeschlossen sind, zur Erzeugung einer Drehkraft, wenn dem Stator (24) 3-Phasen-Wechselstrom zugeführt wird, sodass der Rührer in einer vorbestimmten Umdrehungsrichtung angetrieben wird,

(f) der Rührer (17) ist auf einem Axelzapfen (18)

drehbar montiert, der zentral in der Endwand (19) angeordnet ist, die die Giebelwand der Vertiefung (15) bildet und die aufbestimmten Abstand über dem Boden (16) des Behälters coaxial mit der zylindrischen Vertiefung (15) vorgesehen ist,

(g) ein kleiner Spalt ist ohne jeder Lagerfläche zwischen der Vertiefung (15) und der periferiellen Partie (21) des Rührers (17) angeordnet, der dem Sterilisierungsmedium erlaubt zwischen der Vertiefung (15) und der erwähnten periferiellen Partie (21) des Rührers zu passieren.

Revendications

1. Un réceptacle (11) pour mélanger des liquides stériles comportant:

(a) un dispositif d'entraînement d'un agitateur (17) qui est monté rotatif dans le réceptacle (11),

(b) le dispositif étant situé sur un évidement cylindrique orienté vers l'intérieur dans le paroi de fond (16) du réceptacle

(c) ledit agitateur (17) comportant une section périphérique (21) laquelle entoure l'évidement cylindrique (15).

(d) ledit dispositif d'entraînement comportant un stator (24) étant fixé dans l'évidement (15) ledit stator (15) comportant un noyau de fer magnétisable (25) et des bobines d'induction reliées à un source triphasé à courant alternatif.

(e) des éléments (23) inductivement magnétisables sont enveloppés hermétiquement dans la section périphérique (21) de l'agitateur (17) pour générer un moment de torque quand le stator (24) est alimenté du courant alternatif triphasé pour que l'agitatur tourne dans une direction prédétermine.

(f) l'agitateur (17) est monté rotatif sur un tourillon d'arbre (18) qui est situé centralement sur une paroi au fond (19) qui forme une paroi de face de l'évidement (15) et qui est situé à une certaine distance au-dessus du fond (16) du réceptacle et coaxial avec l'évidement cylindrique (15);

(g) un petit écartement sans des surfaces d'appui est disposé entre l'évidement (15) et la section périphérique (21) de l'agitateur (17) permettant à un medium stérilisant à passer entre ledit évidement (15) et ladite section périphérique (21) de l'agitateur.

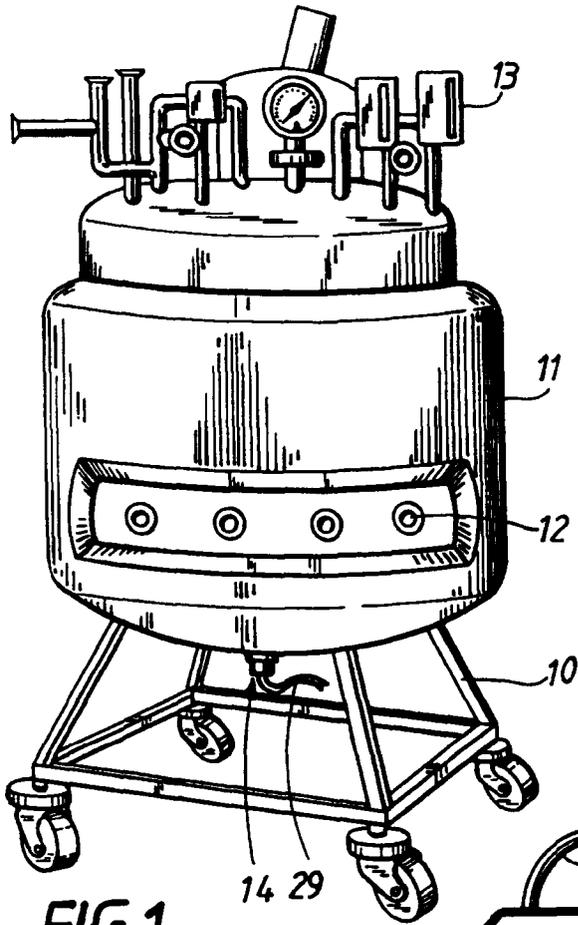


FIG. 1

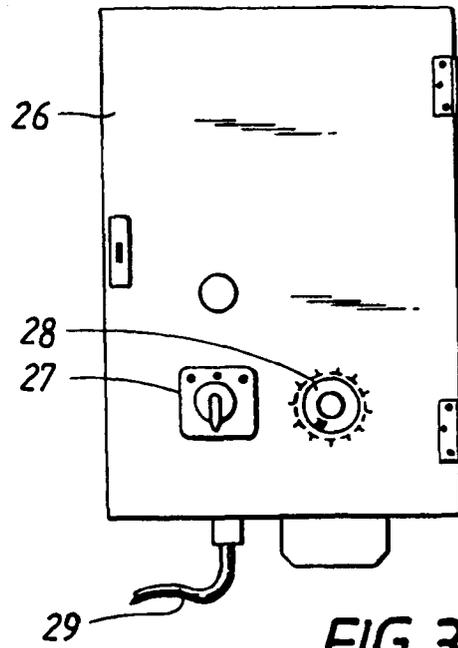


FIG. 3

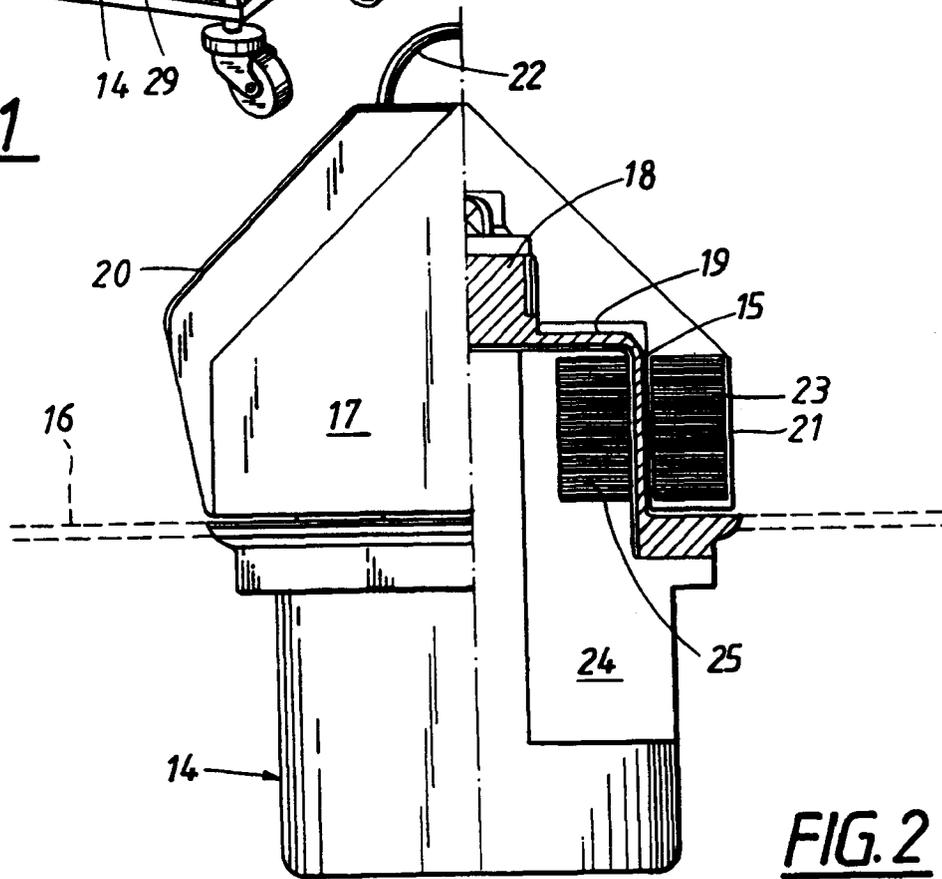


FIG. 2