(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 090 165**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **23.07.86**

(51) Int. Cl.[4]: **B 01 L 11/00,** B 01 F 11/00

(21) Application number: **83101464.2**

(22) Date of filing: **16.02.83**

(54) **Laboratory agitator.**

(30) Priority: **29.03.82 IT 2044182**

(43) Date of publication of application:
05.10.83 Bulletin 83/40

(45) Publication of the grant of the patent:
23.07.86 Bulletin 86/30

(84) Designated Contracting States:
AT BE CH DE FR GB LI LU NL SE

(56) References cited:
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DE-B-2 412 197
FR-A-1 195 462
FR-A-2 480 619
US-A-3 159 384

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EP 0 090 165 B1

Courier Press, Leamington Spa, England.

Description

This invention relates to a laboratory agitator for test tubes or small flasks, which is of improved operation over known agitators. Laboratory agitators used at the present time comprise essentially the following parts:

a) an electric motor

b) a pin in the form of an eccentric fixed on to the motor shaft and provided with an adjustable counter-weight

c) a bearing mounted on the eccentric and fixed in a connecting rod and a support for the test tube holder

d) a test tube holder generally of rubber.

Laboratory agitators of the type above mentioned are described for instance in US—A—3.159.384 and FR—A—2.480.619.

Parts a, b, c, are either mounted on a very heavy metal base provided with suckers for its fixing to the working surface, or are suspended in a very heavy metal casing which is also provided with suckers. Although the purpose of the base or casing is to absorb and damp the vibration, known agitators vibrate in all cases, disturbing the uniform agitation of the liquid contained in the test tube and communicating the vibration both to the operator and to the working surface.

Example of laboratory agitators having the features of the points a—d above mentioned are shown in FR—A—1.195.462, FR—A—2.480.619 and US—A—3.159.384.

A laboratory agitator has now been created, and forms the subject matter of the present invention, which is of new design and different from known agitators in each of its parts and overall, and is arranged to ensure effective uniform liquid agitation without vibrating. In addition, the new agitator has a simple plastics casing which strongly reduces its weight and makes it much more economical to produce.

The new agitator according to the present invention comprises essentially the following characterizing parts:

A) an eccentric of particular structure, comprising a lower cavity housing a metal stop pin and an upper cavity housing an elastic bearing element comprising a spring and a metal ball.

B) a connector comprising a lower cavity to allow the housing and self-lubrificated rotary motion of the eccentric an upper cavity for supporting the test tube holder and a side arm pivoted at its end.

C) a test tube holder constituted by a metal insert embedded into the actual rubber support.

The structure of the various aforesaid parts, or more precisely the structure of parts A), B) and C) the method of assembling them and their operation will be more apparent with reference to the accompanying drawings.

Figure 1 is a partial section through the test tube holder (piece C).

Figure 2 is a plan view of the said test tube holder of Figure 1.

Figures 3, 4, 5 are orthogonal projection of the "connector" (piece B).

Figure 4 being a sectional view.

Figure 6 is a section through the eccentric (piece A), with a relative plan view.

Figure 7 is a partly sectional side of the three pieces assembled.

Equal parts are indicated by the same reference numerals on the drawings.

In Figures 1 and 2, the reference numeral 1 indicates the rubber support into which the test tube is inserted under pressure, and 2 indicates the metal insert.

In Figures 3, 4, 5, which illustrate the connector, the reference numeral 3 indicates the connector body 4, the plastics prong by which that part of the upper edge of the connector lying between two notches extends inwards, 5 the side arm into which the connector extends, and 6 the bore into which a self-tapping screw or similar piece can be inserted; 7 and 8 are two internal cylindrical cavities which together with the central frusto-conical part which connects them together constitute the housing for the eccentric; 10 is a metal plate embedded into the plastics part; 9 indicates the cavity of hexagonal cross section, wherein the metal insert 2 is inserted.

In Figure 6, which illustrates the eccentric 10a, the reference numeral 11 indicates the central segment of the upper part of the eccentric, which is of frusto-conical cross-section slightly tapering upwards, and is inserted between two segments 12 and 13 of cylindrical cross-section.

Inside the upper part of the eccentric there is a cavity constituted by two cylindrical segments 14 and 15 of different cross-section.

In the lower part of the eccentric 10a there is provided a cavity 17 for inserting the eccentric shaft 24, and a side bore 16 by way of which the variable counter-weight 23 is fitted to the shaft screwed through the eccentric.

A description will now be given of the assembly and operation of the new agitator with reference to Figure 7.

The electric motor, fixed to a base possibly provided with rubber feet for resting on the working surface, is connected to the shaft 24 inserted into the cavity 17 of the eccentric.

The counter-weight 23 is fitted to the shaft 24 either by screwing or by pressing through the bore 16.

The purpose of this counter-weight is to eliminate system vibration and thus obviate one of the main drawbacks of known agitators by a completely new method.

The mass of the counter-weight is calculated for each apparatus according to the components concerned in the system, i.e. according to the rotating mass, the maximum rotational speed and the value of the eccentricity.

However, the determination of the mass capable of totally damping the vibration is to a large extent experimental.

The counter-weight 23 is fitted on the opposite side of the eccentric axis to the motor axis.

The plastics connector 3 is mounted on the metal eccentric 10a mounted in this manner on the shaft 24. The metal eccentric can rotate in a self-lubricated manner inside the connector, but cannot withdraw from it as it is retained by the plate or washer 22 which engages both with the connector arm 5 and with the projection provided for this purpose on the eccentric, and is fixed by a self-tapping screw 21 inserted into the bore 6 of the connector.

A metal stop pin 20 with a limited facility for vertical sliding is disposed in the cavity 15 of the eccentric.

Coaxially to the pin 20 there is disposed a spring 19 emerging a small distance beyond the pin, and on which there rests a metal ball 18 housed in the cavity 14, which is of greater diameter than the cavity 15.

The system comprising the stop pin 20, spring 19 and ball 18 ensures resilient movement of the connector along its vertical axis. The metal plate 10 which prevents deformation and wear of the plastic material is embedded in that part of the connector opposing the metal ball.

The upper part of the plastics connector 3 is externally of cylindrical shape, whereas internally it comprises a cavity 9 of shape corresponding to that of the metal insert 2, and enabling this letter to the inserted under pressure. Moreover, the upper edge of the connector comprises two notches of approximately 1 cm in depth and such as to allow elastic deformation of the upper edge of the connector. The part lying between the notches extends inwards to form two prongs 4 which engage in the conjugate groove provided in the metal insert 2, thus ensuring stable fixing of the test tube holder 1 to the agitator. To ensure maximum stability, the metal insert is preferably faceted, in general in the form of a hexagonal nut.

The side arm 5 into which the lower part of the plastics connector 3 extends is grooved at its end part in order to receive a seat which allows the guide pin 25 for the arm sliding movement to be inserted. The purpose of the arm-pin assembly is to act as a connecting rod for the movement of the eccentric. The pin 25 is fixed to the bracket 26 which connects it to the base.

The end of the arm 5 also rests on a microswitch 27 which closes under pressure.

As already stated, the connector 3 can move vertically in a resilient manner, so that when the test tube exerts pressure on the test tube holder (rubber support 1), the entire body is lowered and the arm 5 closes the microswitch 27, thus causing the agitator to operate for the duration of the pressure.

Alternatively, the microswitch can be disconnected and the agitator can operate by means of a normal manually operated switch independently of the pressure exerted by the test tube.

It should be noted that although only test tube holders have been mentioned up to this point for simplicity, one of the advantageous aspects of the present invention is that the new agitator can be used both for test tubes and for flasks. In this respect, it is necessary only to provide more than one piece of the type shown in Figure 1, in which the rubber part 1 is of a shape suitable in one case for holding a test tube and in the other case for retaining a flask, whereas the piece 2 (metal insert) is always identical.

In order to convert an agitator arranged for test tubes into an agitator suitable for flasks, it is only necessary to withdraw from the top of the connector the metal insert embedded in a rubber test tube support and replace it with an identical metal insert embedded into a rubber part suitable for holding flasks.

Summarising, the new agitator has the advantages over known agitators of being absolutely free from vibration, thus ensuring effective uniform agitation without drawbacks for the operator, of being of easier and more economical production in that many metal parts are replaced by plastics parts easily produced by moulding suitable thermoplastic resins, of being very easily disassembled and reassembled by anybody, and of being very easily modified to serve either for test tubes or flasks.

Claims

1. A laboratory agitator constituted essentially by an electric motor, a counter-weight eccentric (10a), a metal insert (2) embedded in a rubber holder (1) for a test tube or flask, and a plastics connector (3) which connects the eccentric (10a) to the holder (1), characterized in that the connector (3) comprises a lower cavity of varying cross-section and such as to allow the housing and self-lubricated rotary motion of the eccentric (10a), an upper cavity (9) of section corresponding to the section of the metal insert (2) to be housed, and a side arm (5) pivoted at its end in such a manner as to act as a connecting rod for the movement of the eccentric (10a), and in that the upper part of the eccentric (10a) comprises two communicating cylindrical cavities, the upper cavity (14) being of greater diameter than the lower cavity (15), the lower cavity (15) housing a metal stop pin (20) with a limited extent of vertical movement, while the upper cavity (14) houses a spring (19) which surrounds the emerging upper part of the pin and on which a metal ball (18) rests.

2. An agitator as claimed in claim 1, wherein the upper cavity (9) of the connector (3) has on its upper edge two prongs (4) which extend inwards, separated by notches of such depth as to allow elastic deformation of the connector edge by pressure.

3. An agitator as claimed in claim 3, characterized further in that the metal insert (2) embedded in the rubber holder (1), is of polyhedral shape, and comprises a groove which ensures its stable fixing by the prongs (4) of conjugate section which are present on the edge of the plastic connector (3).

Patentansprüche

1. Laborrührer, bestehend im wesentlichen aus einem Elektromotor, einem Exzenter (10a) mit Gegengewicht, einem in einem Gummihalter (1) für ein Teströhrchen oder eine Flasche eingebetteten Metalleinsatz (2) und einem Kunststoff-Verbindungsteil (3), der den Exzenter (10a) mit dem Halter (1) verbindet, dadurch gekennzeichnet, daß der Verbindungsteil (3) einen unteren Hohlraum mit veränderlichem Querschnitt und solcher Ausbildung, daß die Unterbringung und die unter Selbstschmierung erfolgende Drehbewegung des Exzenters (10a) ermöglicht wird, einen oberen Hohlraum (9) mit einem Querschnitt entsprechend dem Querschnitt des aufzunehmenden Metalleinsatzes (2) und einem Seitenarm (5) aufweist, der an seinem Ende derart schwenkbar gelagert ist, daß er als Pleuelstange für die Bewegung des Exzenters (10a) wirkt, und daß der obere Teil des Exzenters (10a) zwei miteinander in Verbindung stehende zylindrische Hohlräume aufweist, wobei der obere Hohlraum (14) einen größeren Durchmesser als der untere Hohlraum (15) besitzt und der untere Hohlraum (15) einen Metall-Anschlagstift (20) mit begrenzter vertikaler Beweglichkeit aufnimmt, während der obere Hohlraum (14) eine Feder (19) aufnimmt, die den herausstehenden oberen Teil des Stiftes umgibt und auf der eine Metallkugel (18) aufliegt.

2. Rührer nach Anspruch 1, wobei der obere Hohlraum (9) des Verbindungsteiles an seinem oberen Rand zwei sich einwärts erstreckende Klauen (4) hat, die durch Aussparungen mit einer solchen Tiefe getrennt sind, daß eine elastische Verformung des Randes des Verbindungsteiles durch Druck ermöglicht ist.

3. Rührer nach Anspruch 2, weiters dadurch gekennzeichnet, daß der im Gummihalter (1) eingebettete Metalleinsatz (2) von polyedrischer Gestalt ist und eine Nut aufweist, die seine stabile Fixierung durch die Klauen (4) von konjugiertem Querschnitt sicherstellt, die am Rand des Kunststoff-Verbindungsteiles (3) vorhanden sind.

Revendications

1. Agitateur de laboratoire, constitué essentiellement d'un moteur électrique, d'un excentrique à contrepoids (10a), d'une pièce encastrée de métal (2) noyée dans un support de caoutchouc (1) pour un tube à essai ou un ballon, et d'un connecteur de matière plastique (3) qui relie l'excentrique (10a) au support (1), caractérisé en ce que le connecteur (3) comporte une cavité inférieure dont la section transversale varie et dont la forme est telle qu'elle permette le logement et de mouvement rotatif auto-lubrifié de l'excentrique (10a), une cavité supérieure (9) dont la section correspond à celle de la pièce encastrée de métal (2) qu'elle doit recevoir, et un bras latéral (5) monté pivotant à son extrémité de manière à servir de bielle pour le mouvement de l'excentrique (10a), et en ce que la partie supérieure de l'excentrique (10a) comporte deux cavités cylindriques en communication, la cavité supérieure (14) ayant un plus grand diamètre que la cavité inférieure (15), la cavité inférieure (15) logeant une cheville métallique d'arrêt (20) avec une possibilité limitée de mouvement vertical, tandis que la cavité supérieure (14) loge un ressort (19) qui entoure la partie supérieure émergente de la cheville et sur lequel repose une bille métallique (18).

2. Agitateur selon la revendication 1, dans lequel la cavité supérieure (9) du connecteur (3) présente, sur son bord supérieur, deux griffes (4) en saillie vers l'intérieur, séparées par des entailles dont la profondeur est telle qu'elles permettent une déformation élastique du bord du connecteur par pression.

3. Agitateur selon la revendication 2, caractérisé en outre en ce que la pièce encastrée de métal (2), noyée dans le support de caoutchouc (1), a une forme polyédrique et comporte une gorge qui assure sa fixation stable au moyen des griffes (4) de section correspondante qui sont présentes sur le bord du connecteur de matière plastique (3).

FIG 1

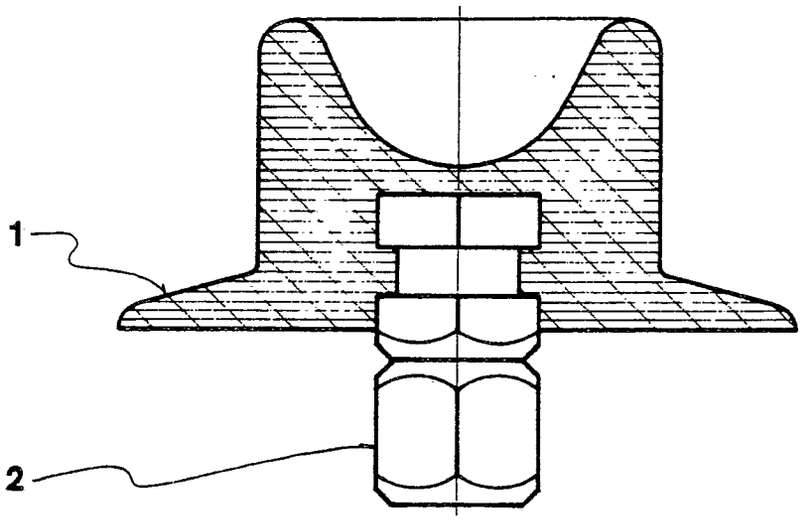
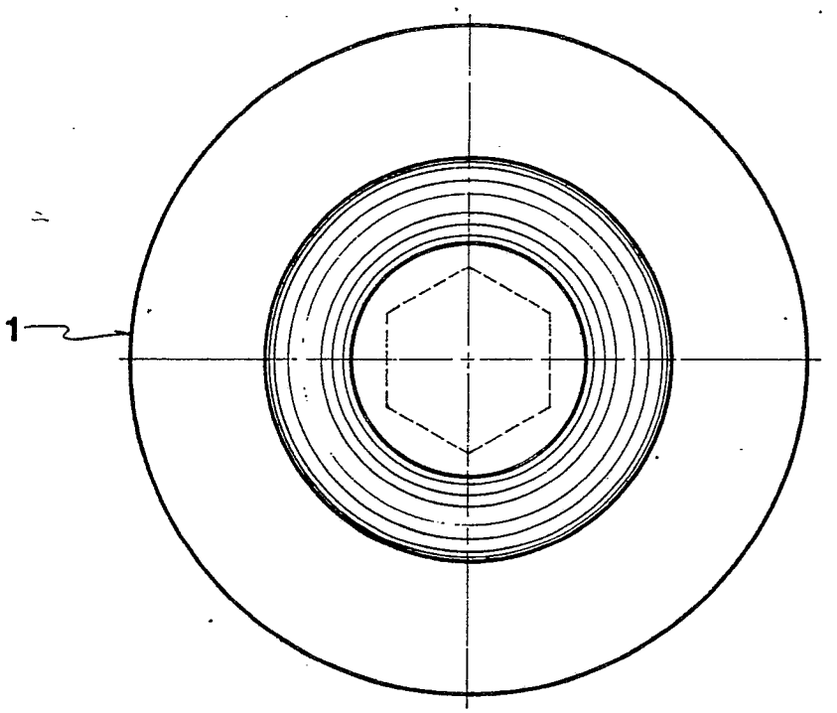


FIG 2



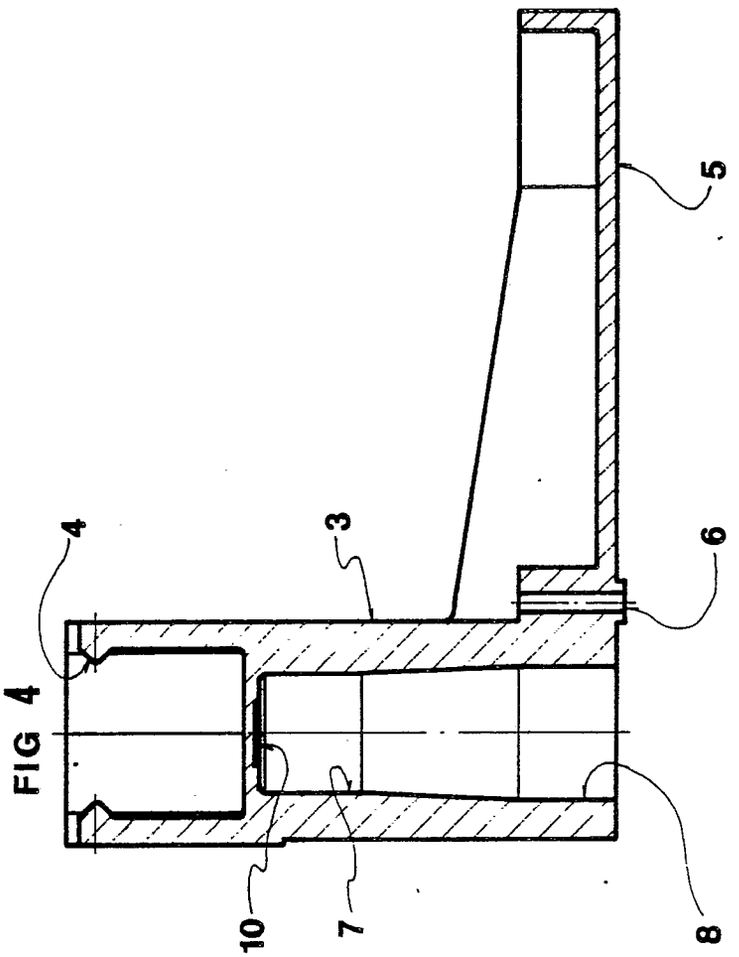


FIG 4

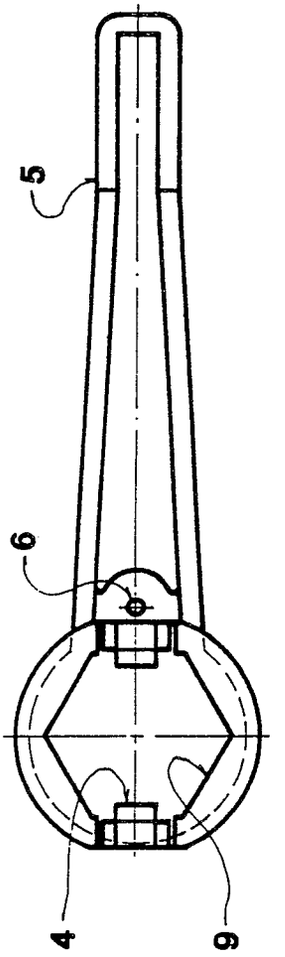


FIG 5

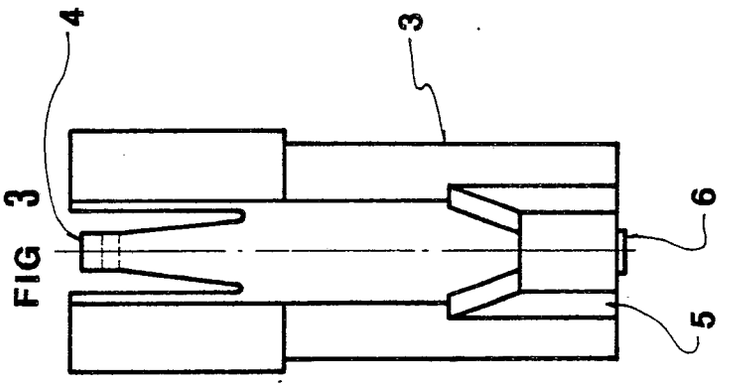
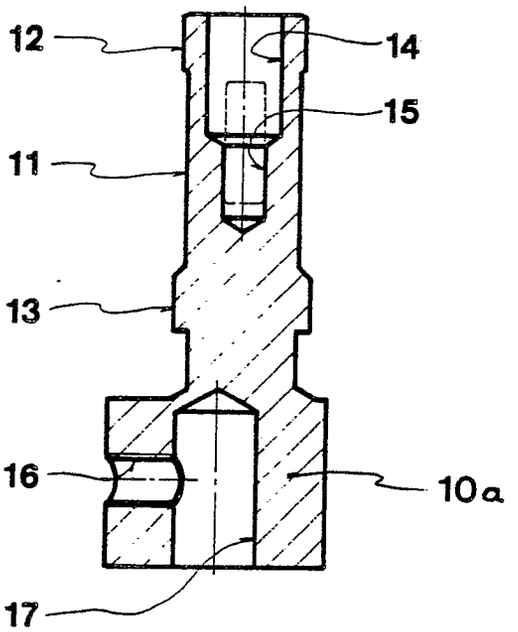


FIG 3

FIG 6



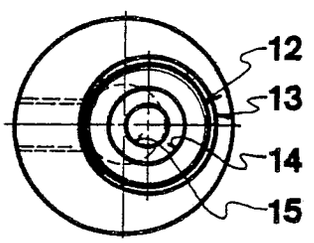


FIG 7.