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⑤④ **Laboratory agitator.**

⑤⑦ A laboratory agitator which can be used for agitating liquids contained either in test tubes or in flasks.

The new agitator is absolutely free from vibration although much lighter than known agitators.

It comprises essentially an eccentric of completely new structure and conception, an interchangeable support for test tubes or flasks, and a plastics piece of special structure which serves to connect the eccentric to the support, and at the same time allow self-lubricated rotation of the eccentric.

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LABORATORY AGITATOR

This invention relates to a laboratory agitator for test tubes or small flasks, which is of improved operation over known agitators.

- 5 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
 - 10 c) a bearing mounted on the eccentric
 - d) a single-piece metal unit mounted on the eccentric and comprising a connecting rod and a support for the test tube holder
 - e) a rubber test tube holder fixed to the support by
 - 15 means of a screw.

Parts a, b, c, d 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

20 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.

5 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.

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In addition, the new agitator has a simple plastics casing which strongly reduces its weight and makes it much more economical to produce.

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

A) an electric motor

B) an eccentric of particular structure, comprising a variable counterweight fixed to the bottom of the
20 eccentric

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

D) a plastic piece of particular structure which connects the eccentric to the test tube holder, and
25 simply called "connector" hereinafter, which has actuator function also.

The structure of the various aforesaid parts, or more precisely the structure of parts (B), (C), (D), the
30 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).

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

Figures 3, 4, 5 are orthogonal projections of the "connector" (piece D), Figure 4 being a sectional view.

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

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

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

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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

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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.

In Figure 6, which illustrates the eccentric, 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 there is provided a cavity 17 for inserting the eccentric shaft, and a side bore 16 by way of which the variable counter-weight 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.

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

10 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.

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

20 The plastics connector 3 is mounted on the metal eccentric 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 and with the projection provided for
25 this purpose on the eccentric, and is fixed by a self-tapping screw 21 inserted into the bore 6 of the connector.

30 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 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.

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The system comprising the stop, spring and ball 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
10 the connector opposing the metal ball.

The upper part of the plastics connector is externally of cylindrical shape, whereas internally it comprises a cavity of shape corresponding to that of the metal insert
15 2, and enabling this latter to be 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
20 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.

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The arm 5 into which the lower part of the plastics connector 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-
30 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 fo the arm 5 also rests on a microswitch 27 which closes under pressure.

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As already stated, the connector can move vertically in a resilient manner, so that when the test tube exerts pressure on the test tube holder 1, the entire body is lowered and the arm closes the microswitch, thus causing the
10 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
15 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
20 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
25 case for retaining a flask, whereas the piece 2 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
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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.

- 5 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
- 10 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.

PATENT CLAIMS

1. A laboratory agitator characterised by being constituted essentially by a variable counter-weighted eccentric, a metal insert embedded in a rubber test tube holder, and a plastics connector which connects the eccentric to the test tube holder in such a manner as to allow self-lubricated rotary motion of the eccentric without bell bearings system and stable fixing of the test tube holder.
2. An agitator as claimed in claim 1, characterised in that the counter-weight fitted on to the shaft inserted into the bottom of the eccentric is calculated on the basis of the rotating mass, the maximum rotational speed and the value of the eccentricity, and is such as to completely absorb the system vibration.
3. An agitator as claimed in claim 1, characterised in that the upper part of the eccentric comprises two communicating cylindrical cavities, the upper cavity being of greater diameter than the lower cavity, the lower cavity housing a metal stop pin with a limited extent of vertical movement, while the second cavity houses a spring which surrounds the emerging upper part of the pin and on which a metal ball rests.
4. An agitator as claimed in claim 1, characterised in that the plastics connector comprises a lower cavity constituted by segments of varying cross-section and such as to allow the housing and self-lubricated rotary

motion of the eccentric.

5. An agitator as claimed in claim 1, characterised in
that the plastic connector comprises an upper cavity of
5 section corresponding to the section of the metal insert
to be housed, and having on its upper edge two pronge
which extend inwards, separated by notches of such a
depth as to allow elastic deformation of the connector
edge by pressure.

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6. An agitator as claimed in claim 1, characterised in
that the plastics connector extends in the form of a
side arm pivoted at its end in such a manner as to act
as a connecting rod for the movement of the eccentric
15 and closing the minorwitchs of the system.

7. An agitator as claimed in claim 1, characterised in
that the metal insert embedded in the rubber test tube
holder is of polyhedral shape, and comprises a groove
20 which ensures its stable fixing by the prongs of con-
jugate section which are present on the edge of the
plastics connector.

8. An agitator as claimed in claim 1, characterised in
25 that the metal insert is embedded in a rubber flask
holder.



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EUROPEAN SEARCH REPORT

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Application number

EP 83 10 1464

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. 3)
X	US-A-3 159 384 (DAVIS) * Column 2, line 19 - column 3, line 22 *	1,2	B 01 L 11/00 B 01 F 11/00
X	FR-A-1 195 462 (CUINIER) * Page 1, column 2, line 31 - page 2, column 1, line 8 *	1,2	
A	DE-A-1 591 961 (LICENTIA PATENT) * Figure *	3	
A	DE-B-2 412 197 (KERNFORSCHUNGSANLAGE JÜLICH) * Claim *	5	
A	FR-A-2 480 619 (JANKE & JUNKEL) * Page 6, lines 1-18; page 7, line 13 - page 8, line 16 *	6	TECHNICAL FIELDS SEARCHED (Int. Cl. 3) B 01 L 11/00 B 01 F 11/00 F 16 C 17/00 F 16 C 19/00 G 04 B 31/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14-07-1983	Examiner LAMMINEUR P.C.G.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	