March 25, 1969 D. C. LUCKHAM ET AL 3,434,657

PORTABLE CENTRIFUGE

Filed April 26, 1967

FIG. 1.

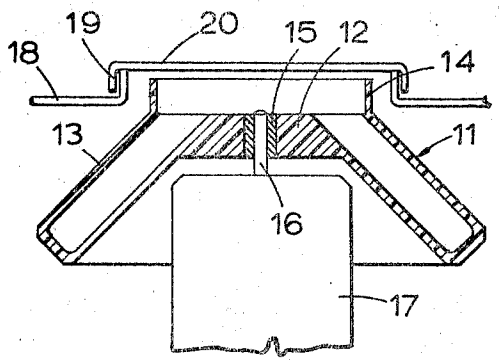
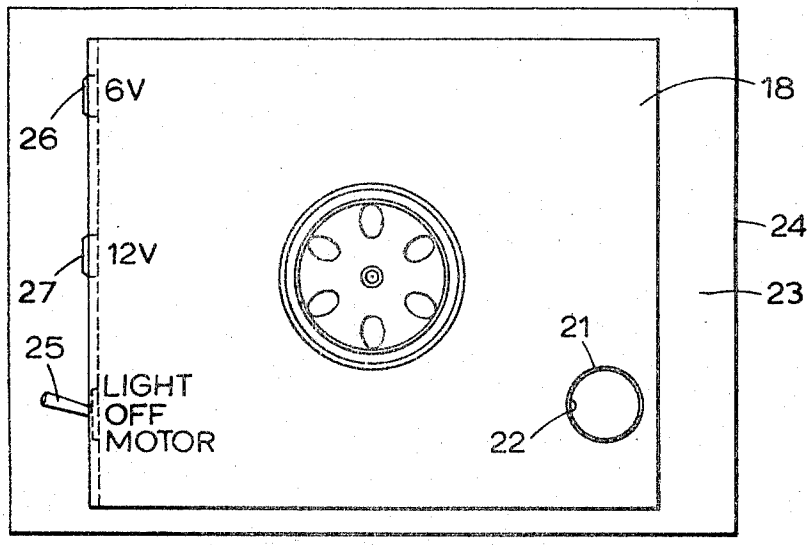


FIG. 2.



INVENTORS
Denis Compton Luckham
Gordon Frederick Green

BY

Watson, Cole, Grindle + Watson
ATTORNEYS

United States Patent Office 3,434,657
Patented Mar. 25, 1969

3,434,657

PORTABLE CENTRIFUGE

Denis C. Luckham, Outwood, and Gordon F. Green, Reigate, England, assignors to Luckham Limited, Burgess Hill, Sussex, England, a British company

Filed Apr. 26, 1967, Ser. No. 633,811
Claims priority, application Great Britain, Mar. 10, 1967, 11,341/67
Int. Cl. B04b 5/02, 1/02
U.S. Cl. 233—26
5 Claims

ABSTRACT OF THE DISCLOSURE

A small portable centrifuge driven by a six or twelve volt or spring motor for cross-matching blood samples, haematocrit estimations and the like having a rotor of hollow frusto-conical form which fits over the driving motor, sample tubes being carried in bores in the rotor wall, the rotor having a resilient bush at its centre so that it may, when running, find its own centre of gravity even if this is not coincident with the motor spindle axis.

This invention relates generally to centrifuges, and more particularly to a small portable centrifuge especially adapted for use in cross-matching blood in connection with blood transfusion services and for similar purposes such as haematocrit estimations.

The provision of a small portable centrifuge capable of operating from a low voltage, for example six or twelve volts, so that it may be energized by dry batteries or by the batteries of a car or ambulance, is highly useful in connection with emergency services such as that known in Great Britain as the "Maternity Flying Squad" or in dealing with military casualties in the field.

Small portable centrifuges are in themselves known but the invention provides a particularly useful and advantageous form of portable centrifuge. Moreover, in one form the centrifuge according to the invention requires no electric power supply at all.

The invention consists of a motor driven centrifuge, particularly for treating blood samples, in which the rotor is of hollow frusto-conical form with the small diameter end at the top, the top of the cone being closed by a platform integral with the cone, a number of bores equally spaced around the axis of the rotor passing downwardly through the wall of the hollow cone to accommodate tubes carrying samples, and a bush made of soft resilient material at the centre by which the rotor is mounted on the motor. There may be an upwardly projecting rim around the top of the rotor, surrounding the platform, to reduce wind resistance caused by the tubes when running.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which—

FIGURE 1 is a section through the centrifuge rotor or head, showing the motor inside the head; and

FIGURE 2 is a plan view of the panel containing the important parts of the apparatus, shown mounted in a box.

Referring to the drawings, the rotor or centrifuging head for the centrifuge according to the invention is of hollow frusto-conical shape, of which a cross section is indicated at **11**. This rotor is made of a synthetic plastics material, preferably a grade of nylon. The skirt or wall of the hollow cone is conveniently set at an angle of 45° to the horizontal and is of uniform thickness around its whole perimeter. The upper (smaller) end of the hollow cone is closed by a platform **12**. The skirt is formed with

six bores **13** equally spaced around the skirt so that six small test tubes (not shown) may be carried in the rotor. An important feature is that a tubular upstanding rim or shield **14** is formed around the top of the rotor which very substantially reduces wind resistance due to the tops of the tubes projecting from the bores **13** when the rotor is spinning at high speed. A further important feature of the rotor is that a central bush **15** is fitted, which is made of soft rubber or a soft synthetic plastics material. The rotor with the bush **15** in place is pressed on to the spindle **16** of a small motor, indicated at **17**. The outline **17** may represent one end of an electric motor which is capable of operating on a supply at six or twelve volts. The box shown in FIGURE 2 is sufficiently large to accommodate dry batteries, at least for the six volt motor, so that the apparatus becomes self-contained. In another form of the invention the outline **17** may represent one end of a spring driven clockwork motor which may be designed on the well known general principles of the gramophone motor, albeit of smaller size and with a much higher output spindle speed. This motor may have a speed governor based on gramophone motor technique and the governed speed may be variable. The power of the spring is advantageously such that, when fully wound it will spin the rotor for a time just sufficient to carry out a desired centrifuging operation. Since the general design principles for both electric and spring driven motors are well known no further description is deemed necessary.

The centrifuging speed may vary between about 3,000 and 7,000 revolutions per minute, and certain speeds are more suitable for some purposes than others. At these high speeds any slight unbalance in the rotor could, of course, lead to very noisy and uneven running but due to the resilience of the bush **15** the rotor is able to find its own centre of gravity and rotate about it, even if the centre of gravity does not coincide exactly with the axis of the motor spindle **16**. The drive to the rotor is, of course, a friction drive through the resilient bush and this makes the rotor very easily removable. If desired, a shoulder may be formed on the motor spindle **16** to form an abutment on to which the bush in the rotor is pressed.

A further feature of the rotor according to the invention is that the body portion is hollow, and the hollow portion is sufficiently large to enable the body of the motor **17** to lie inside the rotor thereby promoting compactness and light weight. The upper panel **18** of the apparatus is formed with an upstanding lip **19** (shown in FIGURE 1) and a cover **20** (also shown in FIGURE 1) is provided to cover the rotor. The cover serves to keep the apparatus free from dust when not in use but it may be placed over the centrifuging head while it is running.

At the lower right-hand side of the panel **18** in FIGURE 2 is an aperture **21** containing a magnifying lens **22**. The panel **18** is raised above the top panel **23** of a box indicated at **24**. The top panel **18** contains an aperture immediately below the aperture **21** and the aperture in the top panel contains a piece of transluscent glass below which is a lamp which may also be energized from an external source or from the batteries contained in the box. A three position switch **25** is provided and this has a central "off" position and two operative positions, in one of which the motor **16** is energized and in the other of which the motor is switched off while the lamp is illuminated. This lamp and the lens are used for examining the specimens of blood.

The space between the panel **18** and the panel **23** is enclosed by vertical walls, the switch **25** being mounted on the vertical wall below the left-hand end of the panel

18 in FIGURE 2. Also mounted on this vertical wall are two sockets 26 and 27, one to accept an external six volt supply and the other to accept an external twelve volt supply, which may be drawn from the battery of a car or ambulance.

There is also space in the box to contain necessary connecting leads and it will, of course, be understood that arrangements may also be made to drive the motor through a small transformer and rectifier operated from a public electricity supply where this is available. Hinges (not shown) and a lid may be provided.

The centrifuging unit according to the invention is rapid and convenient in use, and is very robust. The inclusion of the rubber mounting bush 15, by enabling the rotor to rotate about its own centre of gravity while being driven by the motor 16, promotes very quiet and efficient operation and is conductive to long life of the parts.

We claim:

1. A motor driven centrifuge suitable for use in the field and by the emergency services and particularly for treating blood samples, including a drive motor having a spindle, and a hollow frusto-conical rotor mounted on the spindle with the small diametered end of the frustum uppermost, the rotor being formed in one piece from plastics material with a plurality of bores equally spaced around the axis of the rotor and passing downwardly through the wall of the hollow frustum to accommodate sample-carrying tubes, and with a platform closing the upper end of the frustum and having a central bore, a bush made from soft resilient material frictionally fitting within the central bore and being press-fitted onto said spindle.

2. A portable centrifuge as claimed in claim 1, comprising an upwardly projecting rim around the rotor platform, said rim having its radially outermost surface disposed vertically.

3. A portable centrifuge as claimed in claim 1, wherein the motor spindle and the central bore in the rotor platform are of respective uniform diameters throughout their lengths.

4. A portable centrifuge as claimed in claim 2, further including a housing comprising an upper panel provided with a circular opening defined within an upstanding lip closely surrounding the rim of the rotor platform, and a cap adapted to be fastened on said lip.

5. A portable centrifuge as claimed in claim 4, further including a lower panel disposed beneath said upper panel, a magnifying lens set into said upper panel and a transluscent screen set into said lower panel, a lamp disposed beneath said screen, and a switch for selectively operating the motor or illuminating the lamp.

References Cited

UNITED STATES PATENTS

2,699,289	1/1955	Allen et al.	233—26
3,233,825	2/1966	Lomb	233—26 X
3,244,363	4/1966	Hein	233—26 X

FOREIGN PATENTS

419,288	3/1947	Italy.

WILLIAM I. PRICE, *Primary Examiner.*