BLOOD PIPELINE SHAKING MACHINE

BY

K. C. PARRY AND G. E. SIMMONDS

From the Medical and Engineering Divisions, Atomic Energy Research Establishment, Harwell

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The counting of red and white blood cells is probably one of the most frequent investigations performed in a routine haematological laboratory. The errors associated with this are well known (Biggs and Macmillan, 1948).

In this laboratory at least three pipettes are used for each patient as a routine, one red and two white cell pipettes. Each pipette is shaken for three minutes before the contents are placed on the haemacytometer for counting. This shaking time has been recommended as a minimum if reasonably accurate results are to be obtained (Macfarlane, 1938). The method employed here in the mixing of the contents of a pipette is to place the forefinger of the left hand over the tip of the pipette and with the right hand to rotate with a reciprocal motion, at the same time tilting the pipette to enable the glass bead to traverse the length of the chamber and around it. Therefore an apparatus was required that would: (1) reproduce this double motion of tilting and rotating; (2) enable up to six pipettes to be shaken at the same time; (3) hold pipettes of various lengths; (4) enable pipettes to be removed easily and quickly on completion of shaking; (5) be simple to operate, portable, mains-driven, and silent-running; (6) enable the period of shaking to be varied if required; (7) allow shaking process to be stopped at will; and (8) give a predetermined duration of shaking by control with an automatic process timer.

In any laboratory, such as ours, with a large number of counts daily, the time involved in shaking the pipettes is considerable. A mechanical method of blood pipette shaking would be of advantage in saving time, standardizing procedure, and possibly reducing variations due to incomplete mixing of the diluted blood in the pipettes.

As far as is known no machine capable of satisfying these requirements is available commercially, so one has been designed and made here. It is easy to use, gives no trouble, and is time-saving.

Description of Blood Pipeline Shaking Machine

A small electric motor (a) drives through a coupling the single throw crank shaft (b) which engages with a slotted arm (c) attached to the shaft (d). Integral with the shaft is a toothed quadrant which engages with the pinion wheel (e). The pinion (e) is secured to the hollow spigot which is part of the pipette mounting body (f). Rotation of the motor output shaft imparts a tilting movement to the pipette mounting body about the axis "B"-"B" and rotating about the centre line "A"-"A" via the crank, slotted arm, toothed quadrant, and pinion.
Passing coaxially through the hollow spigot is a shaft (g) one end of which is permanently fixed to the mounting bracket (h); the other end carries a bevel wheel (j) terminating inside the pipette mounting body. A bevel wheel (k) carried on a shaft, mounted with and running coaxially inside the pipette mounting body, engages with the fixed bevel wheel (j). The other end of the shaft carries a larger gear wheel (l). Spaced around and engaging the gear wheel (l) are six pinions carried on shafts mounted in the pipette mounting body. The other end of each of these shafts terminates in a metal cup (m) housing a concave rubber seating. This seating carries one end of a pipette, the other end of which is carried in a spring loaded adjustable slide (n), fitted with a similar rubber seating, mounted on the pipette mounting body. This adjustable slide gives ease of insertion and detachment and enables varying lengths of pipette to be used. Six pipettes can be carried at the same time. The concave rubber seating prevents slipping and fluid loss.

Any tilting movement of the pipette mounting body imparts a rotary movement to the metal cup, via the pinion, gear (l), and bevel (k) as the latter rolls around the fixed pinion (j). Thus the motion imparted to the six pipettes is ± 30° tilt about the axis "B" and ± one and two-thirds revolutions per cycle. The total number of cycles per minute is approximately 90. The shaking time is controlled by a synchronous process timer. By means of knob (y) varying intervals from 0 to 5 minutes as required can be set on the timer. The timer is automatically reset at the end of a cycle.
run so that each run takes the same time unless and until a different time interval is set on the dial. The shaking process can be stopped and automatically reset at any time by depressing button (x) and can be started by depressing button (t).

Smooth, vibration-free running is obtained by a universal coupling between motor and main mechanism and all rotating shafts are carried in ball bearings. The mechanism, motor, and timer is housed in a dust-proof cover; all the rotating and moving parts on the pipette mounting body are enclosed. The pipette mounting body is nickel plated and polished for easy cleaning. The whole is mounted on a wooden base 22 in. long x 9 in. wide. The machine is portable. A mains supply of 230 volts 50 cycles is required for operation, and the apparatus can be plugged in to a 3 amp. plug.

A statistical survey is being carried out to compare the relative efficiency of hand-shaking with machine-shaking and to determine the minimum time for machine-shaking to ensure complete mixing.
BLOOD PIPETTE SHAKING MACHINE

Should this machine be produced commercially the estimated cost is about £70, and, should the timing mechanism not be required, the cost would be proportionately less by about £10.

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REFERENCES