PRESSURE ALARM FOR KOLFF TWIN-COIL KIDNEY

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During dialysis, the hydrostatic pressure in the circuit of the Kolff twin-coil artificial kidney may fluctuate unexpectedly. Coil rupture is a serious complication of pressures in excess of 300 mm.Hg. An alarm to warn against excessive pressures was described by Bienenstock and Shaldon (1). To overcome certain disadvantages of Bienenstock and Shaldon's device, Low and Matheson (2) made an improved alarm which incorporated a mercury manometer, a pressure switch, and a bell and relay supplied with 4V direct current from the alternating current (a.c.) mains through a transformer and rectifier.

The alarm has now been modified and improvements have resulted in a simpler and very much smaller device which retains the advantages and safety of our first alarm. The pressure switch and mercury manometer have been replaced with an aneroid gauge to which electrical contacts have been fitted. A 12 V a.c. relay and a 4 V telephone buzzer replace the rectifier and bell respectively. Clamps are attached to the alarm casing so that it may be mounted on either of the vertical pillars at the front of the artificial kidney as illustrated in Figure 1. Circuit details are shown in Figure 2.

Operation
Before the start of dialysis the pressure lead from the bubble traps is connected with tubing (disposable recipient set extension tubing is suitable) to the Luer mount at A in Figure 1. When S1 is closed the buzzer rings, thus testing the alarm system. Then the push switch S2 is pressed: the relay is energised and the contacts change over, starting the pump motor and stopping the bell. During dialysis the coil pressure is shown on the aneroid gauge; if this pressure rises high enough (250 mm.Hg. in this case but provision is made for adjustment to other pressures) the contacts fitted to the gauge open, the bell rings and the motor stops. The motor cannot be restarted until the pressure is lowered and the push switch S2 is again pressed. The mode of operation ensures that failure in the alarm circuit, or the relay energising circuit, immediately shuts off the pump. The device thus "fails safe". In the event of such a failure dialysis may be continued by switching the pump motor directly on to the mains supply through S3, in the full knowledge that the alarm is not in the circuit.

REFERENCES


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Figure 1. The alarm mounted on the twin-coil artificial kidney.

Figure 2. Circuit details.