# A ROCKING BED RESPIRATOR FOR USE WITH PREMATURE INFANTS IN INCUBATORS

## Description of Apparatus

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THIS paper describes an apparatus for applying the Eve tilt-table method of resuscitation to small premature infants. The method as originally suggested by Eve[1, 2] has been widely applied to adults. Recently it has been gaining acceptance for use in delivery room resuscitation of the newborn infant. Apparatus has been described for such use.[3, 4, 5]

The method is also useful in resuscitating small premature infants who present persistent apnea. No mechanical apparatus has been available for accomplishing this *inside an incubator*.

When accomplished simply by holding the infant in the hand and rocking back and forth the method is fatiguing if it must be prolonged. Simple manually operated tilt-tables serve well enough for brief emergency use but mechanically driven apparatus has great advantages where a prolonged application is necessary.

The rocking bed shown in Figs. 1 and 2 was designed and constructed for use inside the Isolette incubator. Figs. 3 and 4 show a 3 pound premature infant on the rocker in an Isolette.

Peculiar to the requirements was the need for a machine *small enough to be used in the incubator* and operable in an atmosphere of increased oxygen tension. The latter requirement precluded using an electric motor for the drive. A plunger or push rod from the outside would have necessitated modification of the incubator. The present machine avoids the above difficulties by using suction as the source of power.* It operates by means of a diaphragm type windshield wiper motor. As little as 8 pounds negative pressure is sufficient for its operation and therefore the usual hospital suction apparatus is adequate. Most such machines produce enough suction so that with a Y-tube arrangement both suction and power for the resuscitator may be obtained at the same time.

The motor is mounted immediately under the tilt-top for the sake of compactness. The oscillatory movement of the windshield wiper motor arm is transferred to the tilt-top by way of a heavy braided nylon cord running under two pulleys. The motor supplies power for the oscillation in one direction and a pair of obliquely mounted springs return the table top to its opposite extreme position against braking action of the return stroke of the motor.

A speed control is mounted on the upright and permits of operation from 10 to 50 cycles per minute.

The attachment of the nylon cord is adjustable in a linear direction to per-

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*Oxygen concentration in the incubator operating at 40 per cent is lowered approximately 5 per cent by the operation of the suction driven motor. If necessary, this can be compensated by increasing oxygen by ½ to 1 liter per minute.

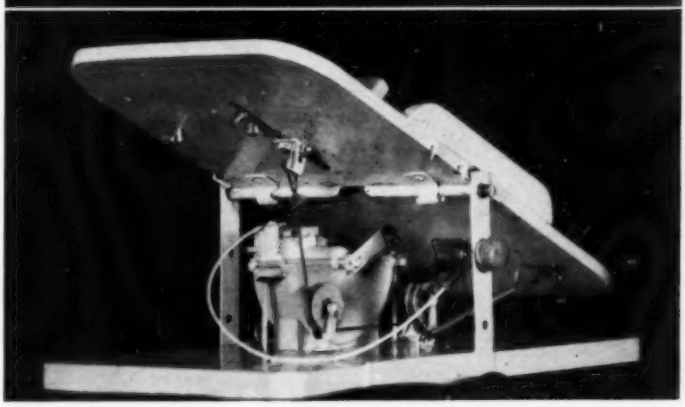
mit alteration of the angle attained by the tilt-top in its oscillation.

The tilt-top itself has two adjustable shoulder supports moveable in two planes and an adjustable cross bar which help in supporting the infant. bandage is placed across the hips and over the hooks on the side of the tilt-top. The three supports plus this cotton band serve to keep the infant in place. The entire unit is designed to fit inside the Isolette incubator and

Fig. 1.



Fig. 2.



Over these supports is placed a piece of ordinary bed padding. The infant is placed on the padding, the supports adjusted, and a piece of elastic cotton the only external attachment is the rubber suction hose which is brought in through one of the vent holes in the side of the incubator.

## DISCUSSION

It should be emphasized that the rocking bed method is useful for only a selected group of premature infants. It is useless in the absence of an open airway. It cannot improve the situation when an infant is vigorously making its own efforts to breathe. It is for the apneic infant, the one who is not adequately attempting to breathe, that the machine is useful. This situation occurs with narcotized infants at

Fig. 3.

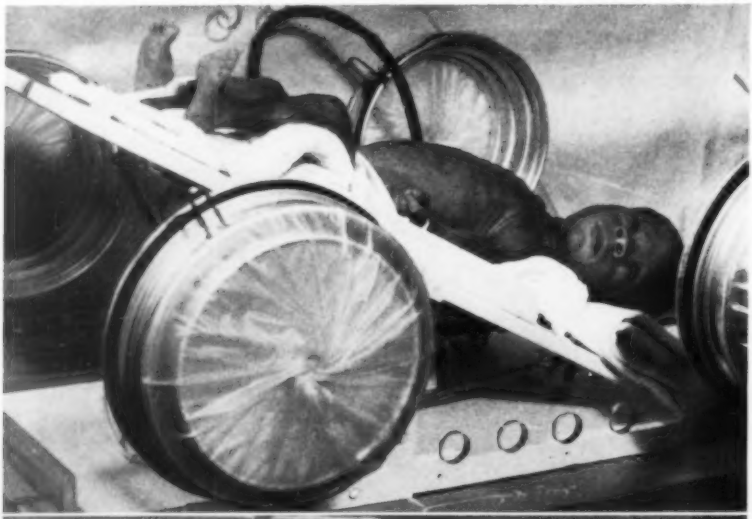
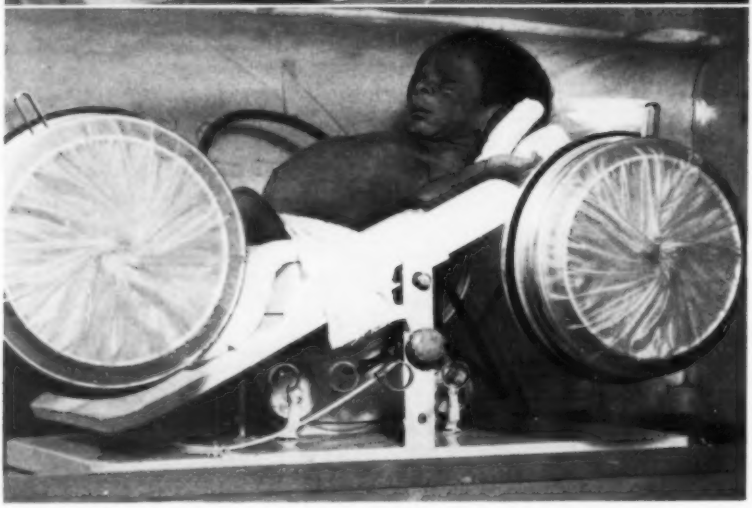


Fig. 4.



and after birth and not infrequently with very small premature infants after the first three or four days when fatigue becomes a factor. Such infants, whose prolonged apneic spells produce marked and more or less constant cyanosis, are often greatly improved on the tilt-table and may be maintained for prolonged periods.

During the past year we have used the machine on a number of apneic infants. In some cases the response has been immediate and excellent. Some infants have been maintained for many hours and have finally improved sufficiently to be able to continue without further aid. In other instances the machine has improved the infants' color but they have not recovered to the point of being able to maintain themselves and have finally died. The degree to which the machine produces actual pulmonary ventilation in the small premature infant is an open question.* It may function partly by supplying external physical stimulation to the activation of the infant's own respiratory mechanism or by mechanically improving cerebral circulation.

In its applications to adults the rocking bed has been rather thoroughly investigated. Eve and Killick[2] showed that rocking produced at least as good a respiratory exchange as other methods of artificial respiration. Comroe and Dripps[6] reported that tidal flow of air produced is greater than that produced by the Schaefer method. No data are available for infants.

The thoracic wall of the premature infant has relatively little elasticity. Physical compression of the chest as a means of resuscitation or artificial respiration is not satisfactory. The rocking bed seems to offer a reasonable solution for these small infants. Observation suggests that pulmonary ventilation is actually attained but objective data are lacking.* In the absence of objective evidence of ventilation other than improvement in color and heart action, any appraisal of any apparatus or method must indeed be guarded. Enthusiasm for what seems to be a useful method must not be permitted to relax attention to observation, aspiration, and every other factor of good premature care simply because there is an additional means of possible resuscitation at hand.

*Studies are in progress.

## SUMMARY

An apparatus has been constructed for applying the rocking bed method of resuscitation or artificial respiration to premature infants within the Isolette incubator.

## REFERENCES

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