NASA TECH BRIEF

NASA Headquarters

Simulated Breath Waveform Control

The problem:

For proper simulation of human breathing, the breathing metabolic simulator (see Notes) required a subsystem to control the bellows driving mechanism which reproduced the exhaled breath. The signal supplied to the mechanism had to be a nonsymmetrical periodic waveform which would reproduce a complete range, from normal breathing to forced exhalation.

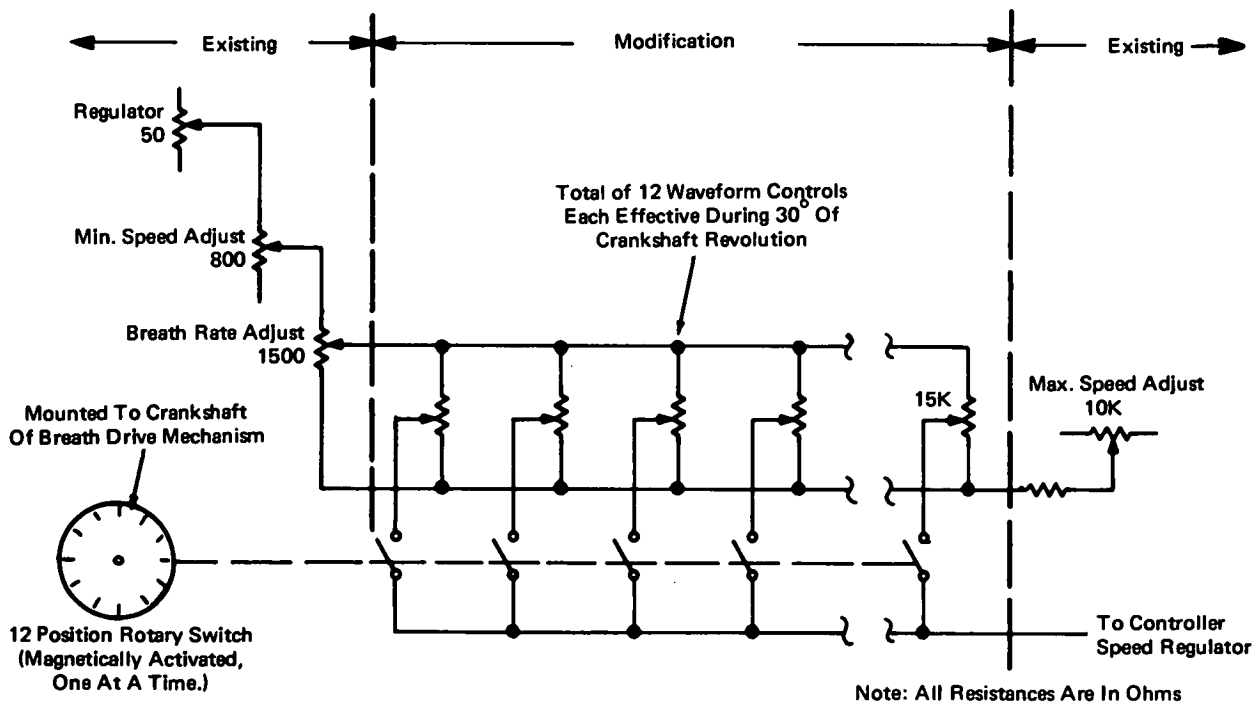
The solution:

A subsystem was developed which provides twelve waveform controls to the breath drive mechanism.

How it's done:

A twelve position, magnetically actuated rotary switch, shown in the figure, is connected to one end of the crankshaft drive such that it makes one complete revolution for each simulated breath (1:1 gearing). The switch is wired so that a different connection to a common point is maintained through each thirty degrees of crankshaft revolution. These connections are included in the modifications made to a standard motor speed controller.

Since the bellows drive motor operates the crankshaft through a 30 percent gear reduction, each speed adjustment is effective for two and one-half motor revolutions.



Modifications To Motor Controller

(continued overleaf)

Inertia in the crank, gear train, and motor itself smooths the effects of transfer between segments. The twelve segments allow independent control of wave shape adjustment for simulated inhalation and exhalation, the slope of bellows position, and simulated breath velocity contours.

The simulated breath waveform control has several unique features:

1. Breath waveform may be adjusted to conform to any reasonable simulation of actual human performance without changing the simulator configuration. This permits rapid changes in test conditions.
2. Breath waveform may be adjusted remotely. This permits changes in simulated loadings without an interruption of the test environment conditions.

Notes:

1. Additional information is contained in the following Tech Briefs: B72-10657 (HQN-10766), B72-10658 (HQN-10776), B72-10659 (HQN-10777), and B72-10660 (HQN-10778).
2. Requests for further information may be directed to:
   Technology Utilization Officer
   NASA Headquarters
   Code KT
   Washington, D. C. 20546
   Reference: B72-10661

Patent status:

NASA has decided not to apply for a patent.

Source: R. G. Bartlett, C. M. Hendricks,
and W. B. Morison of
IBM Corp.
under contract to
NASA Headquarters
(HQN-10779)