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16 October 1957

The Files (2045-4)

[Redacted]

TP-3 Motors

REF

Trip Report
30 September 1957

dated

25X1

25X1

1. Maximum Speed Variation: Five redesigned armatures were completed at [redacted] and the motors run-in for at least 12 hours by October 3, 1957. Over the torque-voltage range (with the governor operating), the average speed variation was 57 rpm or $\pm 1.35\%$ (minimum speed variation 50 rpm - maximum 63 rpm). The speed variation from 23°C, minimum load-maximum voltage to -10°C, minimum load-maximum voltage was 20 rpm for [redacted], an original engineering sample. Under these conditions a total deviation of $\pm 1.5\%$ or 77 rpm instead of the specified 40 rpm is possible.

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2. Speed Control by Voltage Regulation: Even if the line voltage is closely regulated, this regulated voltage must increase with increasing load. In order to maintain a speed of 2100 rpm, the curve relating this increasing voltage with load (based on [redacted] figures received October 4, 1957) differs in slope by a factor of 2:1 for sample motors #1 and #2 as opposed to the remainder of the sample units. The rates of change in voltage at the higher torque values account for most of the variation. It is very unlikely that the regulator circuit could be compensated for two sets of feed back conditions this far apart without the circuitry occupying space beyond what is now available and without providing a separate armature winding for control purposes.

25X1

3. Plus or Minus 5% Speed Control by Varying Governor Resistance: Another approach yields satisfactory results. If the governor resistor shown in Figure 1 is replaced by a 2-watt rheostat or an N5 transistor (Figure 2) the collector emitter IR drop may be adjusted by base current control (0 - 2 ma) to permit speed adjustment to precisely 2100 rpm over an extended voltage range of from 9 to 15 volts. This circuit has certain advantages.

- (a) With the control set in the mid position printing which is ± 50 rpm is recognizable. Depending on whether the slant is up or down the operator can adjust for straight line copy.

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- (b) No power is wasted in external circuitry. The power dissipated in the transistors is normally dissipated in the governor resistor. The small potentiometer and base current amount to less than 3 ma.
- (c) If the motor is stalled the governor shorts the rheostat or the transistor which prevents any possibility of impairing the performance of these elements.
- (d) Variations due to changing battery voltage, brush voltage drop, temperature, spring tensions, armature resistance, bearing load, and printer load may be compensated.
- (e) It is possible to find space for the additional circuitry. On arrival of the five production motors, tests will be run to determine the actual motor speed variation as mounted in five printer mechanisms. If the speed variation is excessive the range of control necessary to bring in the worst motor under most stringent operating conditions will be determined and a control made available for speed correction.

4. Several minor changes have been suggested in the mechanical specification which loosens the mechanical tolerance within the capabilities of Balmotor machines. These changes have been studied carefully in relation to the production castings and the gears and shafts. The tolerances as relaxed will maintain the printer load under the maximum torque specified.



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Lab/AJS/rkb (16 October 1957)

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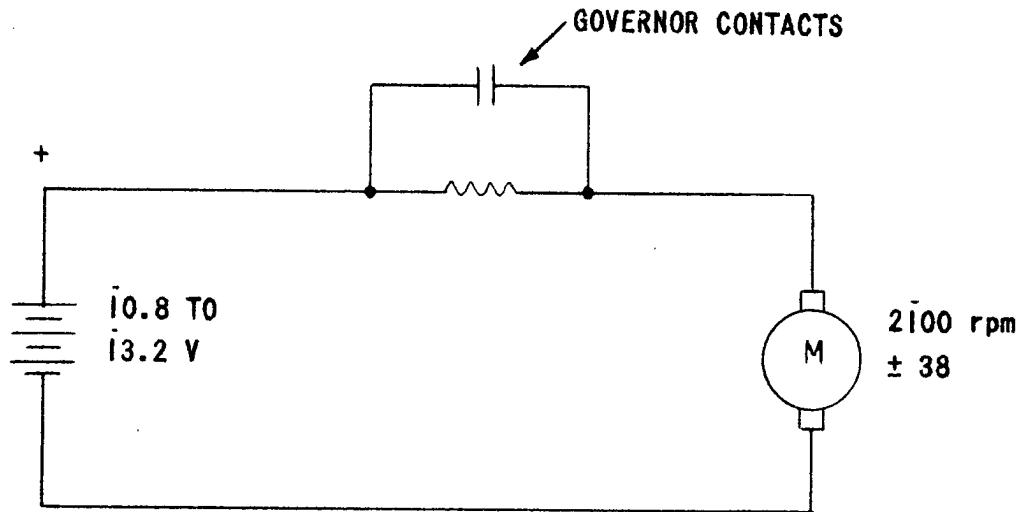
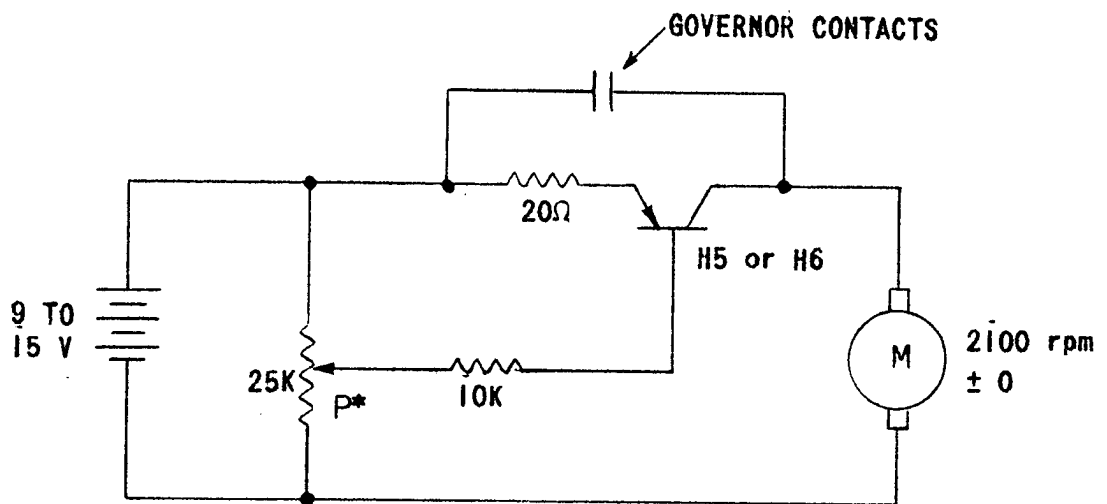


FIG. #1



NOTE: P* is a small
Centralab hearing
aid control.

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FIG. #2