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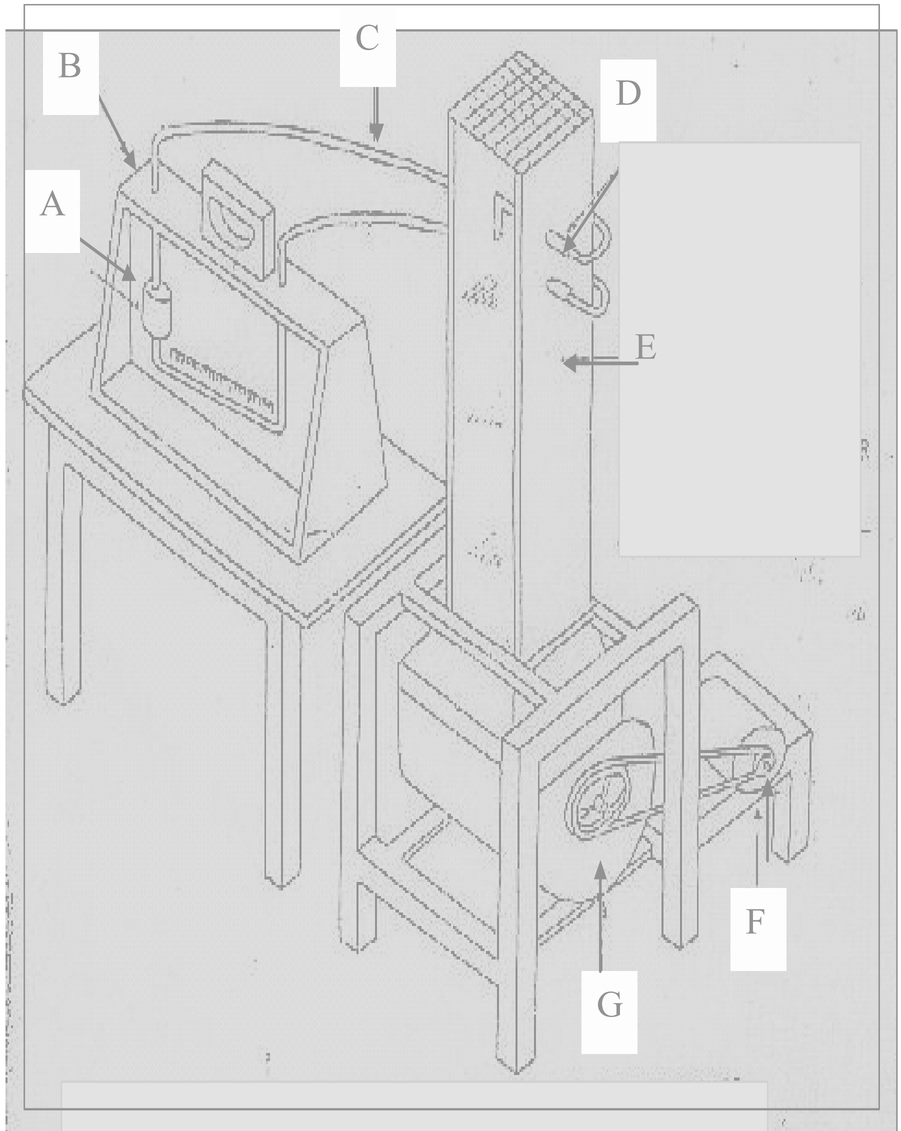

Figure 1: Isometric View of the Terminal Velocity Test Equipment
A – Manometer; B – Manometer Box; C – Rubber Hose;
D – Pitot Tube; E – Wind Duct; F – Electric Motor; G – Blower

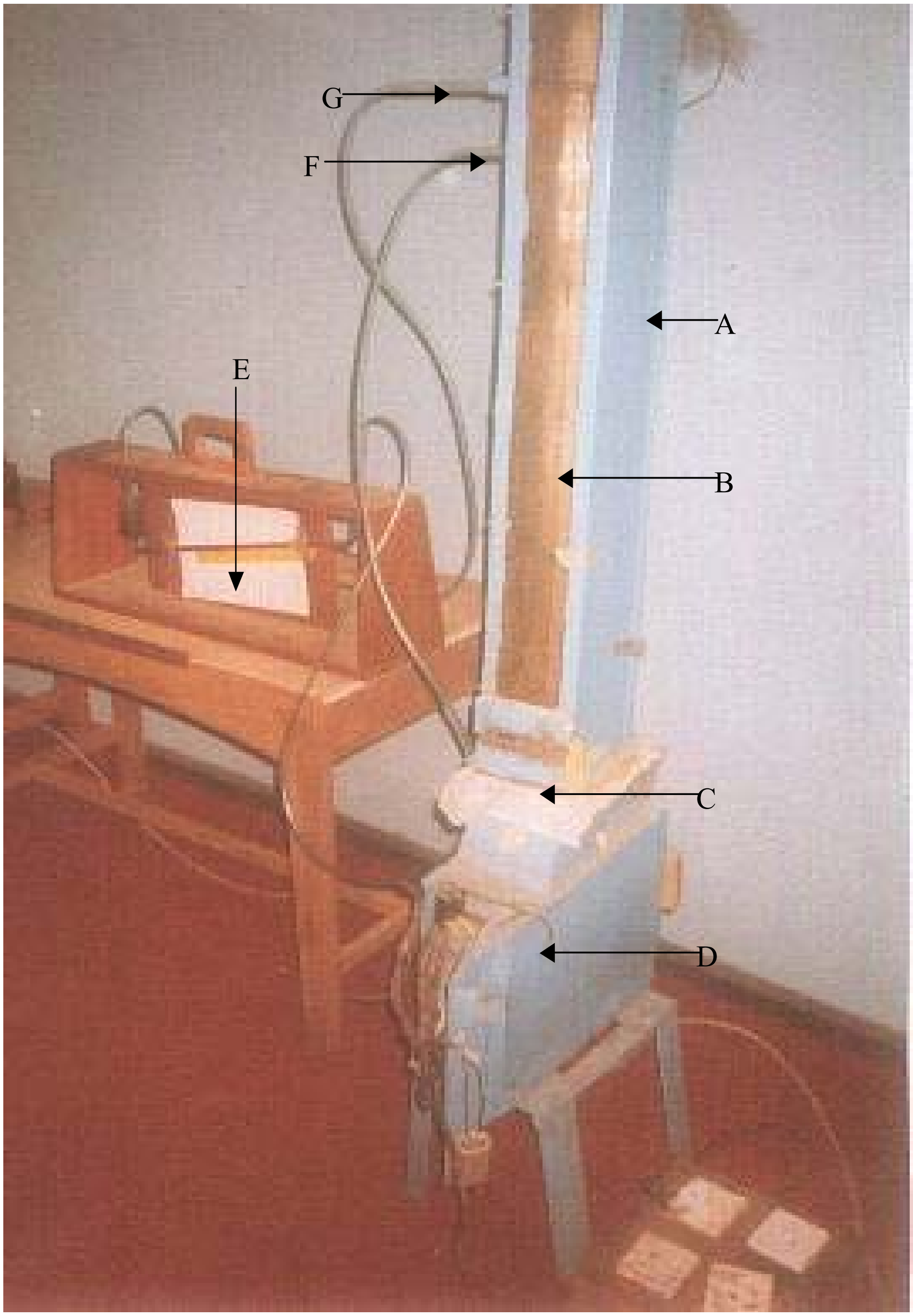

Figure 2: Terminal Velocity Test Equipment
A – Vertical Tunnel; B – Perspex Glass; C – Seed Inlet; D – Centrifugal Blower; E – Manometer; F – Total Pressure Tube; G – Static Pressure Tube

Principle of Operation

From Bernoulli's equation (Douglas et al), at two points 1 and 2 in a flowing fluid (Figure 3):

$$\frac{P_1}{D} + \frac{V_1^2}{2g} + m = \frac{P_2}{D} + \frac{V_2^2}{2g} + h_2$$

where $\frac{P}{D}$ is the pressure head

$\frac{V^2}{2g}$ is the velocity head and h is the elevation head.

D is the density based on gravity.

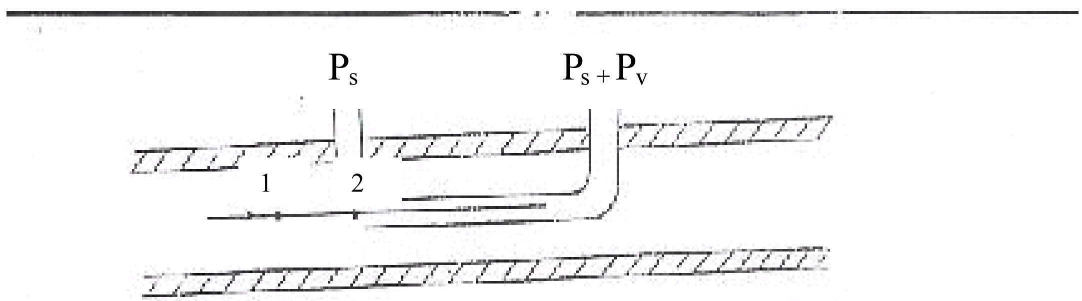

Figure 3: Static and Total Pressure Pitot Tubes

Bernoulli's principle states that in a pipe where fluid flows under steady state conditions without friction, total head is constant; if pressure head is lost, it appears as a $Ø = 12^0$ gain in velocity head. In a flow of fluid through a level pipe as shown above, applying Bernoullis equation to points 1 and 2 gives:

$$\frac{P_1}{D} + \frac{V^2}{2g} = \frac{P_2}{D} + 0$$

The velocity at point 2 is zero as this is a stagnation point where only static pressure is considered to be acting. Therefore,

$$\frac{P_2 - P_1}{D} = \frac{V^2}{2g}$$

The pressure heads measured by the manometer is h. Therefore,

$$V = \sqrt{2gh}$$

where h is the head measured by the manometer after it has been converted into head of working fluid. In this, the range of different air velocities was obtained by adjustable speed motor attached with blower.