When the circuit is used in an automatic sorting machine these signals can also be used for controlling the actuating devices. It should be noted that photocells type STsV-51 cover part of the scale when fitted into galvanometers type M-195/1. The layout of galvanometer GPZ-2 is more convenient from that point of view, since the whole of its scale can be used.

**Conclusions.** The above circuit was successfully used for mass-production sorting of plug-in resistors with nominal values from 10 to 9000 ohm used in a universal network model.

Reference resistors of the sorted nominal values are incorporated in the circuit for the convenience of operation. The set is universal and can be used both for measuring resistors and for their sorting with high precision. The resistors are sorted at a rate not exceeding 3 sec per resistor. The circuit can be recommended for use in automatic sorting machines.

**LITERATURE CITED**


**MEASUREMENT OF ELECTRICAL FIELD STRENGTH**

**IN A CORONA DISCHARGE**

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Experimental determination of electrical field strength in a corona discharge is normally made by means of probes (for example, by the Sato probe method) [1]. However, these methods are cumbersome and insufficiently accurate. In the present work methods are examined which are based on the utilization of forces operating in the corona discharge field on a test body. They include the ball deflection method, the ball weighing method, and ellipsoid rotation method.

The test specimen in the ball deflection method consists of a metallic sphere of radius \( \rho \) suspended on a thin thread. This ball attains a charge of \( Q \) when placed into the field of the corona discharge and deflects its thread by an angle \( \alpha \) (Fig. 1). In this position the ball is subjected to a field strength of \( F = B \) (the horizontal component is \( F_x = E_x Q \), the vertical component is \( F_z = E_z Q \)) and a force \( P \) due to gravity. Moreover

\[
\tan \alpha = \frac{E_x Q}{P - E_z Q} = \frac{Q}{E_x - e Q},
\]

where a notation of \( e = E_z / E_x \) is adopted.

For a metal ball according to Roman's formula [1] we obtain

\[
Q = 3E_0 \rho = 3E_x \sqrt{1 + e^2} \rho.
\]

By substituting (2) in (1) we have

\[
E_x = \frac{\rho \tan \alpha}{3 \rho} \sqrt{\frac{1 + e \tan \alpha}{(1 + e \tan \alpha) \sqrt{1 + e^2}}}.\]
In order to find \( \varepsilon \) a ball of radius \( \rho_2 \) is suspended. In this case

\[
\tan \alpha = \frac{Q_2}{P_2 - \varepsilon Q_2} E_x
\]

By comparing (1), (2) and (4) we find

\[
\varepsilon = \frac{P_1 \rho_2^3 \tan \alpha_1 - P_2 \rho_1^2 \tan \alpha_2}{(P_2 Q_1^2 - P_1 Q_2^2) \tan \alpha_1 \tan \alpha_2}.
\]

If the ball is made of a single material we have \( P = \rho^3 \) and

\[
\varepsilon = \frac{\rho_1 \tan \alpha_1 - \rho_2 \tan \alpha_2}{(\rho_1 - \rho_2) \tan \alpha_1 \tan \alpha_2}.
\]

Let us now quote the measurement results: the radii of the balls were \( \rho_1 = 0.15 \) cm and \( \rho_2 = 0.20 \) cm, their weights were \( P_1 = 16 \) mg and \( P_2 = 37.6 \) mg, the thread deflections were \( \tan \alpha_1 = 0.117 \) and \( \tan \alpha_2 = 0.0875 \). By substituting for \( P \) its value thus found (in dynes) we get from (5) \( \varepsilon = 0.1 \); from (3) \( E_x = 5.2 \) CGSE units \( \approx 1.6 \) kv/cm and, finally, \( E_z = 0.16 \) kv/cm.

Hence, in order to determine the value and direction of a field strength it is necessary to measure at the given point of the field the deflection angles of two different balls suspended on threads. The defects of this method consist of the measurements being affected by the charge on the thread, by its weight, and by its elastic and initial deformations.

In order to reduce these effects it is possible to use the ball weighing method. A metal ball is suspended on a thread from the lever of a torsion balance (Fig. 2). If in the absence of the field the ball stretches the thread in the direction of the x-axis, component \( E_x \) will be measured when the field is connected. For measuring component \( E_z \) the model field should be rotated through 90°.

The field strength in the x-direction is represented by the difference of the scale readings in the presence of the field \( F_T \) and in its absence \( P \):

\[
F_x = F_T - P = E_x Q.
\]

From (2) and the above we obtain

\[
E_x = \sqrt{\frac{F_x}{3Q^2 \sqrt{1 + \varepsilon^2}}}.
\]