

MONSANTO CHEMICAL COMPANY OF ALABAMA
INSPECTION DEPARTMENT

DETERMINATION OF DIELECTRIC CONSTANT OF LIQUID AROCLORS AT 100°C.

A. Circuit Arrangement for Dielectric Constant.

Power Source: 6 volt plate battery with Audio Oscillator, General Radio Type 213B giving frequency of 1000 cps.

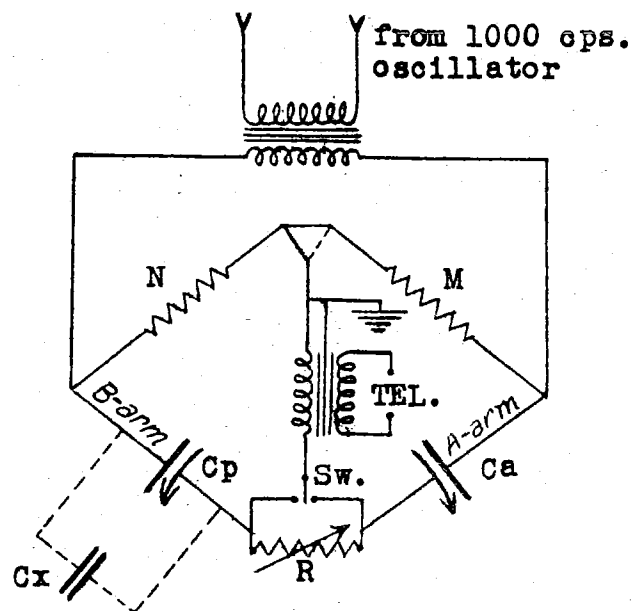
Capacity Bridge: General Radio Type 216.

Telephone: Head phones with two stage amplification.

Ca: Variable Air Condenser, 1500 MMF capacity, G.R. Type 246-L.

Cp: Precision Condenser (variable air), 1500 MMF capacity, G.R. Type 222-L.

Cx: Condenser of about 200 MMF air capacitance, arranged so that space between plates may be filled with liquid dielectric under test. The "unknown" condenser.



Bridge Balance: With resistances N and M equal and the bridge in balance, then
$$Ca = Cp + Cx$$

B. Procedure for Measurements.

1. Since dielectric constant is the ratio of capacity of a condenser using the substance under test as the dielectric to the capacity of the same condenser using air as the dielectric, the measurements to be taken are capacity measurements. Capacity is measured by a substitution method using a modified Wheatstone Bridge.
2. Determine capacitance of Cx with air as dielectric by balancing Cx and Cp (in parallel) against Ca. Then disconnect Cx and without changing Ca, adjust Cp until balance is again obtained. The difference in readings on Cp will show the air capacitance of Cx.
3. Introduce the liquid dielectric under test between plates of Condenser Cx and balance Cx and Cp (in parallel) against Ca. Disconnect Cx and without changing Ca, obtain balance again by adjusting Cp. The difference in readings on Cp will show capacitance of Cx with the liquid under test as dielectric.
4. Calculate dielectric constant by dividing capacitance of Cx using liquid dielectric by capacitance of Cx with air dielectric.
5. During the measurements, Condenser Cx is kept in a constant temperature oven to maintain temperature of dielectric at 100° C.
6. The resistance R is adjusted simultaneously with the variable condenser to obtain balance. The resistance readings are immaterial.

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