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Capacitor and its Size

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ABSTRACT

This article is about capacitor, electric circuit, energy and capacity of capacitor. Reasonable ideas and opinions are used throughout the article. Conclusions and suggestions are given at the end of the article.

KEYWORDS: Condenser, electric circuit, capacitor capacity and its types, capacitor energy, batteries, charge, electric charge, lead, tin, aluminum strips.

Condenser (from the Latin "condense") is a device for condensing a gaseous substance (steam) in heat engineering; a type of heat exchange device. There are surface and contact (or mixing) types of capacitors.

Electrical engineering, especially radio engineering and television, requires large-capacity devices that can store a lot of charge. Devices that collect a large amount of electric charges are called capacitors. The capacitor consists of two conductors, which are isolated from each other and collect equal amounts of charges of opposite signs, placed close to each other.

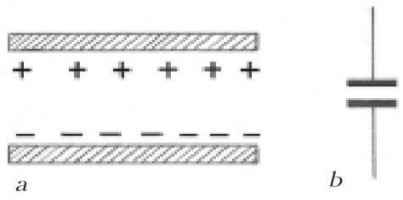

Figure 1

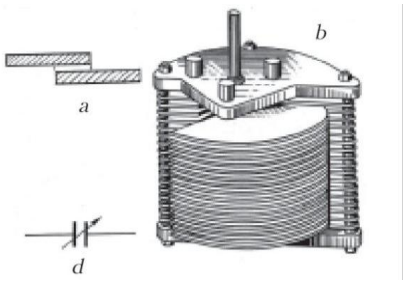

Figure 2

The conductors forming the capacitor are called capacitor covers. The simplest capacitor is a flat capacitor, which consists of two identical parallel metal plates placed very close to each other (Fig. 1a). How capacitors are designated in circuits is described in

Fig. 1 b. If the plates of the capacitor are moved relative to each other (Fig. 2 a), its electric capacity changes. The principle of structure and operation of capacitors with variable capacity, which are widely used in tuning radio receivers, is based on this, in which there is often air instead of an insulator. Such capacitors are made of metal plates isolated from each other (Fig. 2b). It is possible to change the capacitor capacity uniformly by changing the overlapping surface of the plates by turning the movable system. Fig. 2 d shows the conventional symbol of capacitors with variable capacity in the electrical circuit. Typical technical capacitors consist of two tinfoil strips insulated from each other and from the metal body with paraffin-soaked paper strips.

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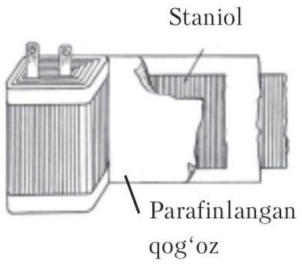

Figure 3

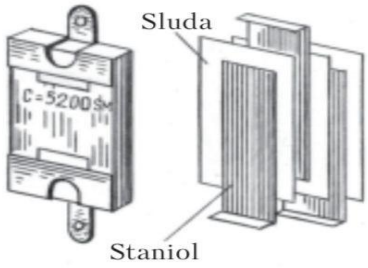

Figure 4

Tinfoil tape and paper tape are tightly wrapped in the form of a smaller package. Figure 3 shows the external appearance and internal structure of the technical condenser.

In addition, capacitors made of mica are also used. The covers of these capacitors are made of lead, tin or aluminum foil. Figure 4 shows the appearance and individual parts of such a condenser. In ceramic capacitors (Fig. 5), the insulator is made of special ceramics. Coatings of ceramic capacitors are a layer of silver applied to the ceramic surface, and lacquer is applied on top of this layer. One of the capacitors with a very large capacity is electrolytic capacitors (Fig. 6).

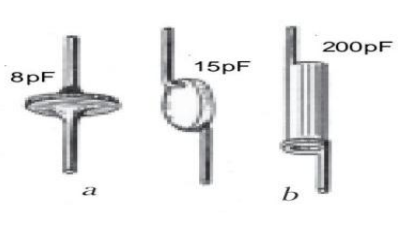

Figure 5

Figure 6

A thin layer of aluminum oxide applied to one of the aluminum covers of such a capacitor acts as a dielectric. The coverings of the electrolytic capacitor are made of two aluminum strips, between these aluminum strips, fiber paper soaked in electrolyte solution is placed and wrapped in a spiral. Such capacitors can be used only in devices with constant voltage.

The process of accumulating charge in capacitor covers is called charging. When the capacitor is charged, charges of different and equal amounts accumulate on both of its covers. To charge the capacitor, one of its covers is connected to the positive pole of the electric source, and the other to the negative pole. Instead of the negative pole, one of the covers can be connected to the ground. The electric field of the charged capacitor is concentrated in the space between its covers, so the electric capacity of the capacitor does not depend on the surrounding objects. Capacitor charge means the amount of charge in one of the coatings. The quantity measured by the ratio of the charge of the capacitor to the potential difference between its covers is called the capacity of the capacitor:

$$C = \frac{q}{\Delta\varphi}$$

If we connect capacitor covers through a conductor, the charges jump from one cover to the other cover and neutralize each other. This phenomenon is called capacitor discharge.

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Each capacitor is designed for a certain potential difference. If the potential difference between the capacitor covers increases too much, the capacitor can be discharged directly through the dielectric, that is, the dielectric is punctured. The perforated condenser becomes unsuitable for further use.

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