Oct. 1, 1940. A. ORTLIEB 2,216,558

ELECTROSTATIC CONDENSER

Filed Jan. 17, 1938

Fig. 1

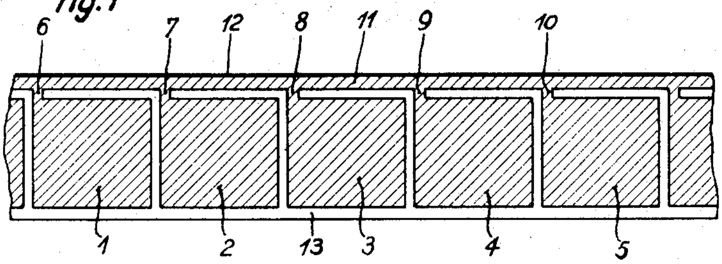


Fig. 2

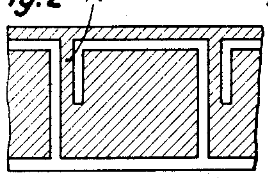


Fig. 3

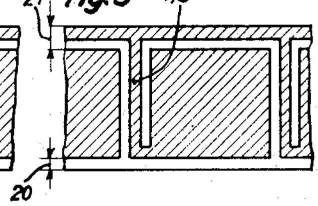


Fig. 4

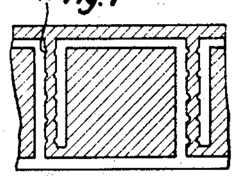


Fig. 5

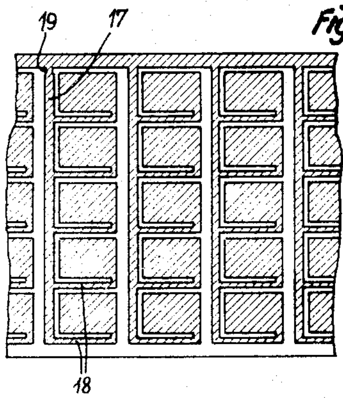


Fig. 6

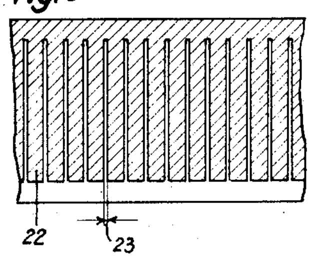


Fig. 7

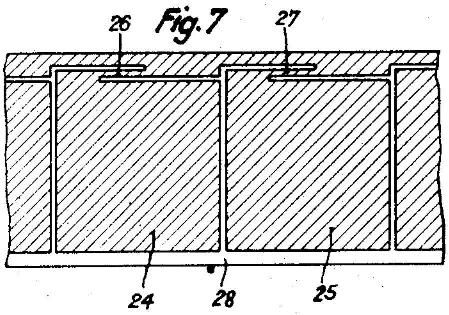
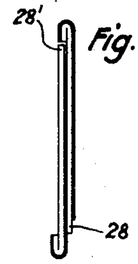


Fig. 8



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ELECTROSTATIC CONDENSER

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4 Claims. (Cl. 175—41)

The present invention concerns electrostatic condensers. It is known to connect such condensers to the network through a safety cut-out, which can be arranged inside or outside the casing of the condenser. If, with such an arrangement, a puncture occurs in the condenser, then in the case of a normal condenser, the latter is short circuited as a result of the puncture, and the short circuit current flowing into the point of puncture causes the cut-out to fuse. By this means injurious effects of the short circuit on the network are reduced considerably. However, the condenser itself is unserviceable after the puncture and must be replaced by another.

According to the present invention, at least one of the condenser coatings is divided into a fairly large number of separate metal surfaces, which are each connected through a fuse strip with the current connection strip common to all the metal surfaces. If, with a condenser with coatings divided thus, a puncture occurs at one of the separate metal surfaces, then as a result of the short circuit current, merely the fuse strip located before this surface fuses, and only those metal surfaces in which the weak spot is situated are thereby disconnected. All the other metal surfaces, however, remain completely serviceable, as before. The only result of the dropping out of the one metal surface is that the capacity of the condenser has become somewhat smaller. However, with sufficient division, this reduction of the capacity is generally of no importance.

In the practical construction of a condenser of this kind, the fuse strips of the separate metal surfaces are preferably arranged within the condenser winding or pack. The fuse strips with the appropriate metal surfaces can consist of a cohering metal coating.

Examples of construction of the invention are shown in the drawing.

Figures 1 to 7 show metallised winding bands as used for the construction of condensers according to the invention.

Figure 8 shows the cross-section through two bands located one upon the other in the condenser constructed according to Figure 7.

Figure 1 shows a dielectric band, for instance a paper band, which is metallised at the hatched points. The non-hatched points are free of metal. The metal coating is so arranged that individual separate metal surfaces 1, 2, 3, 4, 5 and so on are formed. These separate metal surfaces represent condensers connected in parallel. As current leads to the metal surfaces are employed, the strips 6, 7, 8, 9, 10 and so on, which are connected on the one hand with the metal surfaces, and on the other hand with a metallised rim 11. At 12, the metal coating of the rim is somewhat thickened, and a strip, not visible in the drawing, of the rim, is folded over for the current connection.

Two bands of this kind are wound together to form a condenser. The second band is wound in in such a position that its metallised border is located on that side on which the first band has its metal-free border 13. A metal coating, which serves as a current connection surface, is sprayed on to the two front surfaces present after winding.

Now if a puncture occurs in this condenser within one of the metal surfaces, within the surface 4, for instance, a short circuit current flows from the network and from the remaining metal surfaces over the strip 9 and causes this strip to fuse. Naturally, the strip must be so narrow and so long that the short circuit current develops the necessary heat of fusion here. After the strip 9 has fused, the metal surface 4 is disconnected and the condenser is capable of further use without this surface. For example, if a condenser has 100 or 1000 such surfaces, its capacity has only been lowered after the fusing process by 1% or 0.1%.

The resistance of the strips can be varied by varying their length or their breadth, and they may thus be brought to any desired resistance value which is necessary for a good fusing. Figures 2 and 3 show examples of construction in which the strips 14 and 15 have a considerably greater length than in the construction according to Figure 1.

To make easier the fusing of the strips leading to the metal surfaces, especially in the event of serious short circuits, one or more constrictions 16 may be made on the strip, corresponding to Fig. 4, and the disconnecting of the flow of short circuit current which is to be interrupted may thus be divided on to a number of fuse points.

Since, after the disconnection of the strip the metal surface located behind it is lost for the capacity of the condenser, it is preferable to keep the separate surfaces as small as possible. For this purpose, an arrangement according to Fig. 5 may be employed, in which main strips 17 are used, which start from the metallised border. The fuse strips which go to the separate small metal surfaces branch off only from these main strips. These metal surfaces can be reduced in certain circumstances to the average size of a normal point of puncture, i. e. to 0.5 to 2 $cm.^2$ The breadth of the fuse strips is made so much smaller than the breadth of the main strips that in the event of a serious puncture the latter are not involved by the fusing of a single strip. The single strips can here have all shapes as indicated by way of example in Figs. 1 to 4.

In order to protect the condenser also from a puncture which might occur in the main strip, it is suitable to provide, at the point 19, a constriction of such size that it withstands a somewhat larger current than the separate strips 18.

In order to insulate the strips against the neighbouring metal surfaces, metal-free strips are necessary. These metal-free strips are naturally lost for the capacity of the condenser. For this reason, it is preferable to make them as small as possible, in which case, of course, their smallest admissible breadth depends on the working voltage of the condenser. In particular, for wound condensers with medium voltages (i. e. in the region of 500 volts) breadths of the metal-free strips between 0.2 and 0.5 mm. are suitable.

In order to lose as little capacity as possible owing to the strips which remain free, it is to be recommended in all cases to make the metal-free strip 20 (see Fig. 3) and the spacing 21 from the metallised border 12 to the adjoining edge of the nearest capacity surface equal in size. For the breadth of the metal-free border 20 does of course, also become lost on both sides as regards the capacity of the condenser.

Fig. 6 shows a construction of the metal coating in which the separate metal surfaces 22 are constructed like a comb and so narrow that they act at the same time as fuse strips. With this mode of division, it is possible for instance, to proceed so far that the separate metallised strips 22 have a breadth of 1 mm. and the metal-free strips 23 located between them have a breadth of 0.1 mm.

As far as it can be made possible, the fuse strips are preferably laid in a zone of the condenser which is free of field. By this means is obtained the advantage that a puncture does not occur in the fuse strip. A puncture in the fuse strip would have the drawback that the entire metal surface adhering thereto would thereby cease to function.

An example of construction in which the bars are located in the zone which is free of field, is shown in Figs. 7 and 8. Fig. 7 again shows a dielectric band, which is metallized at the hatched surfaces. 24 and 25 denote two separate metal surfaces, and 26 and 27 denote the fuse strips belonging to them. 28 is the metal-free border of the dielectric band.

The metallised dielectric band shown in Fig. 7 is shown in Fig. 8 in cross-section, together with a second correspondingly metallised band, in the position employed in winding, in which position the metal-free border 28 of one band is located on the side opposite to the metal-free border 28' of the other band. In comparison with Fig. 7 it can be clearly seen that the strips 26, 27 come at points at which the metal-free border of the second band is opposite to them, so that an electric field cannot be formed here.

The dielectric bands shown in the example of construction can be metallised in a simple manner by printing the metal coating on to the dielectric, in the shape of the surfaces to be metallised, which shape has perhaps a somewhat complicated appearance. However, there may also be printed on in the shape of the metal-free surfaces a material which does not take on the metalcoating, or to which it does not adhere firmly, so that afterwards no metal coating results here or it can be wiped away. If the dielectric is metallised in vacuo, for instance by thermal vaporization or by cathode sputtering, then the portions of the dielectric which are to remain free of metal can be printed with heavy hydrocarbons, particularly oils or greases, so that these parts do not take on any metal during the metallisation.

Of course, the metal coatings may also be stamped out of foil in the shapes indicated, but the metallising process is to be preferred.

The invention can, of course, be applied not only with winding condensers, but also with layer condensers. Here the metal coating can be applied to the dielectric plates in a similar manner as in the case of the winding bands.

I declare, that what I claim is:

1. An electrostatic condenser comprising a dielectric, metal coatings applied thereto, at least one of said coatings being divided up into a number of separate metal surfaces, a current connection common to all said surfaces, and fuse strips connecting said surfaces in parallel to said current connection, said metal surfaces, fuse strips and current connection being formed by a layer of metallization applied to said dielectric.

2. An electrostatic condenser comprising a dielectric, and a metal coating applied thereto and providing a plurality of separate metal surfaces on said dielectric, a current connection formed from said coating, and a plurality of fuses also formed from said coating and connecting the separate metal surfaces in parallel to said current connection.

3. An electrostatic condenser comprising two dielectrics metallised to form thereon a plurality of separate metal coatings, each coating providing a plurality of metal coated portions separated by uncoated portions to provide each dielectric with a current connection strip along one edge, a plurality of separate metal surfaces, a plurality of fuse strips connecting said metal surfaces in parallel to said connection strip and an uncoated portion along the opposite edge of said dielectric, said dielectrics being superposed so that the uncovered edge of one dielectric is opposite the fuse strips of the other dielectric.

4. An electrostatic condenser comprising a dielectric, metallic coatings applied thereto, at least one of said coatings being divided into separate metal surfaces, a current connection common to all of said surfaces, main strips branching off from said common current connection, fuse strips branching off from said main strips and connecting said surfaces, said metal surfaces, main strips, fuse strips and current connection being made by metallising portions of said dielectric.

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