

Sept. 4, 1934.

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SEPARATOR FOR ACCUMULATORS

1,972,433

Filed Dec. 22, 1931

Fig. 1.

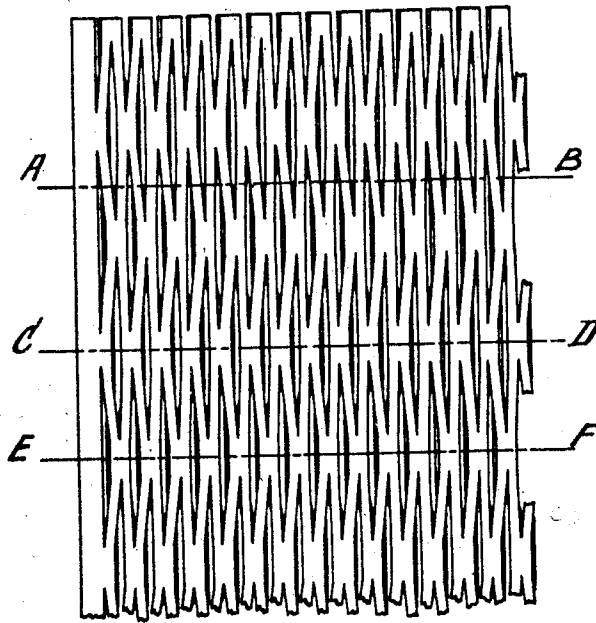


Fig. 2.



Fig. 3.



Fig. 4.



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UNITED STATES PATENT OFFICE

1,972,433

SEPARATOR FOR ACCUMULATORS

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Application December 22, 1931, Serial No. 382,614
In Great Britain December 22, 1930

4 Claims. (Cl. 136-143)

This invention relates to insulating separators for use between the plates of an electric accumulator.

The invention has for its object to provide an insulating separator which shall be easy and simple to manufacture, which shall have good insulating properties, which shall offer a low obstruction to the circulation of electrolyte, and which shall at the same time be springy and comparatively flexible, whereby effective and efficient separation between the plates of an accumulator may be obtained.

It is of course well known to perforate or slot a plane sheet of insulating material, for example, by stamping holes or slots therein to make an insulating separator for use between the plates of an electric accumulator. Such separators, however, are insufficiently springy and flexible, and, if the perforations or slots are sufficiently large to allow free circulation of electrolyte, the degree of separation obtained often leaves much to be desired.

The present invention obviates these disadvantages and may be regarded as providing an improved insulating separator of the slotted type, wherein the slots are replaced by overlapping slits the material on either side of which is bowed or deformed out of the normal initial plane of the unslitted sheet.

A separator in accordance with this invention is therefore not planar, in fact, although at a little distance (about arm's length) it presents the appearance of a "patterned" plane sheet.

According to this invention an insulating separator for use as an inter-plate separator in an accumulator comprises a sheet of insulating material slitted with a plurality of closely spaced slits in parallel rows, the slits in each row being in line with one another and overlapping the spaces between adjacent slits in the next row, the material between said slits being slightly pushed or deformed out of the normal plane of the unslitted sheet to form openings for the free circulation of electrolyte, and so as to form a sheet similar in appearance to the material well known in civil and constructional engineering technique as "intermediate expanded metal". The amount of deformation is small and consists in pushing the material out of the original plane of the sheet and slightly bowing it.

As is well known, the material known as "intermediate expanded metal" is the intermediate product obtained in the manufacture of so-called expanded metal by the well known "slitting and stretching" process, said process consisting in

passing a sheet between slitting rollers and then stretching it to open out the slits into the characteristic diamond shaped openings of expanded metal. "Intermediate expanded metal" is the product obtained after slitting but before stretching, the deformation of the material out of the original plane being effected by the slitting rollers in the same operation with slitting.

Separators in accordance with this invention may be made by a manufacturing process similar to the "slitting" step in the "slitting and stretching" process of manufacture of expanded metal above described, and may be of any convenient insulating material, such as chemically treated wood, ebonite, or rubber composition, or celluloid. If desired the material obtained from the slitting rolls may be stretched slightly in a direction at right angles to the slits.

In one way of manufacturing an insulating separator, a prepared sheet of rubber composition is employed. This sheet is partially vulcanized so as to be sufficiently stiff to be passed through a suitable cutting machine, e. g. between slitting rollers and then, if desired, the sheet is expanded or stretched somewhat in a direction at right angles to the direction of the parallel rows of slits, the cutting and rolling steps in the process of manufacture being similar to those employed in manufacturing intermediate expanded metal. After slitting or, if stretching is resorted to, after stretching, the vulcanization process is completed to the degree necessary to constitute a separator of the desired stiffness and other qualities. Alternatively, in place of employing two vulcanization steps, the rubber may be vulcanized in a single step before slitting and stretching (if any). For example, in the case of an ebonite separator, the ebonite after heating (e. g. passing through a bath of water at about 85° C.) is simply passed through the slitting rolls. It is found that the resultant product, when allowed to cool, will, during cooling, slightly widen itself in a direction at right angles to the directions of the slits, a sheet, which before slitting was only 11.5 cms. wide, increasing its width to 13 cms.

Although in many cases insulating separators in accordance with this invention may be made by a method of manufacture including steps similar to steps in the well known method of manufacturing expanded metal, i. e. by employing slitting rollers (hot) and (if desired) divergent guides for stretching the product obtained from such rollers, it is obvious that the actual method of manufacture employed may be one of any of a number of available methods, the chosen method

- in any particular case being determined with regard to the mechanical and other properties of the material employed. For example, with certain materials it will be found necessary or desirable to manufacture an insulating separator in accordance with the present invention by stamping or pressing rather than by the above described process. The present invention is of general application to accumulators of all known types.
- The accompanying drawing shows in Figure 1 a portion of an insulating separator in elevation in accordance with the present invention, Figures 2, 3 and 4 being sections taken on the lines A—B, C—D and E—F respectively of Figure 1.
- As will be seen, the separator consists of a sheet (of insulating material) which has been slitted with a plurality of slits in parallel rows (the slits in each row being in line with one another overlapping the spaces between adjacent slits in the next row) and deformed as previously stated, the said slits being, if desired, opened out somewhat by stretching the sheet in a direction at right angles to the direction of the parallel rows. The insulating separator thus made has a certain amount of "spring" in it, while free acid circulation through the opened slits may take place.
- What we claim is:—
1. A battery separator comprising a flexible sheet of insulating material having a plurality of closely contiguous rows of slits, the slits of each individual row being alined with each other and adjacent slits in each row being relatively long and having their extremities close to each other leaving a relatively small extent of unslitted material between adjacent slits in the same row, slits in each row being staggered longitudinally relative to slits in the adjacent rows so that the slits in each row terminate substantially adjacent the mid portions of slits in the adjacent rows, the material between slits in each row and between adjacent rows of slits being disposed out of the general plane of the sheet to provide openings having a dimension substantially normal to the plane of the sheet to form a sheet resembling in appearance a sheet of intermediate expanded metal having openings whose dimensions in the general plane of the sheet are very small.
 2. A battery separator comprising a flexible sheet of insulating material of a structural formation similar to intermediate expanded metal, said sheet differing from intermediate expanded metal in that the material comprising the sheet is insulating material instead of metal.
 3. A separator as defined in claim 1 wherein the sheet is of insulating rubber-containing material.
 4. A separator as defined in claim 1 wherein the sheet is of ebonite.
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