

SPECIFICATION

TITLE OF THE INVENTION:

ELECTROLYTIC CONDENSER

FIELD OF THE INVENTION:

The present invention relates to an electrolytic condenser and more particularly relates to a chip of electrolytic condenser wherein a base plate has a recess formed on the upper side thereof for carrying therein a cylindrical part of the electrolytic condenser in a condition that the electrolytic condenser is laid sidewise with the printed polarity indications being visible, and wherein the base plate and the electrolytic condenser is integrally united at least at three points with a pair of true leads and at least one dummy lead. Thus the chip of electrolytic condenser has the electrolytic condenser considerably reduced in height and accordingly has a fixed resistance against vibrations and is further employed to provide thinner and smaller electronic apparatuses. Further the polarity indications and others need not be printed anew.

BACKGROUND OF THE INVENTION:

The aluminum electrolytic condenser is generally formed up as an electronic part in such manner that the electrode foil and the electrolytic paper are placed one on the other with leads attached thereto and rolled up into a cylinder. The cylinder is inserted into an aluminum housing having an opened end and the axially opposite bottomed end. Then the cylinder is impregnated with electrolyte and then the opened end of the aluminum housing is sealed with a sealing rubber. It is generally known that the electrolytic condenser is

dimensionally bigger in proportion with the condenser capacity. This is the reason that the electrolytic condenser is one of the electronic parts that is difficult to be made smaller although the other electronic parts are being rapidly made smaller.

The electronic parts are arranged on a print board and soldered thereto. The electrolytic condenser is generally soldered lengthwise to the print board. This will substantially make the print board thicker or taller. As the result, such a print board has been an obstacle in the cost reduction of the electronic apparatuses, that is, in making them thinner and smaller.

Recently the electronic parts have been made into smaller and further into chips so as to be mounted and soldered to the print board efficiently and in high density. Moreover such electronic parts may be mounted on both sides of the print board in high density, and thus contribute to make the print board thinner and smaller.

In view of the fact as mentioned above, it has been desired that the aluminum electrolytic condenser should be made into a chip to be mounted to the print board with the face to face relation. The practically used conventional example is shown in Figs. 16 and 17. In reference to these Figures, an electrolytic condenser 1 is inserted into an cylindrical chamber 2a formed in a case 2 of square resin block. A pair of leads 1a are bent along the bottom 2b of the case 2 and positioned to form the surfaces in the same plane with the surface of the bottom 2b of the case 2 which is mounted to the print board in a manner that the electrolytic condenser 1 is laid sidewise with respect to the print board.

With the structure and shape of the chip of electrolytic condenser

3, the electrolytic condenser is laid sidewise on the print board (not shown), and the height of the electrolytic condenser is made lower and may be mounted to the print board in high density. However with the structure of the chip of the electrolytic condenser 3, the indications 2d of polarity, capacity and others printed on the surface of the electrolytic condenser 1 are concealed by the case 2 and not visible from outside. It is therefore required to print anew the same indications 2d on the outer surface 2c of the case 2 by means of a printer 4 which is operated with respect to the case 2 in the directions as indicated by arrow marks E and F.

Actually printing on the resin case 2 requires considerably annoying tasks such as elimination of oil from the print areas, care of the printing ink, change of print types each time the contents of the electrolytic condenser change, and so on. Thus the printing operation is one of the causes leading to the cost up in production of the chip of electrolytic condenser 3.

Further the chip of electrolytic condenser 3 is soldered to the print board only by the portions of the leads 1a bent along the case 2. Therefore if the chip of electrolytic condenser is bigger, the areas of the bottom 2b far from the bent leads 1a are not fixed and unsettled with respect to the print board. This will be subject to the adverse influence of vibrations.

In case of a bigger chip of electrolytic condenser 3, the chip is attached to the print board only by the leads 1a and provides a cantilever structure, wherein the chip is supported only by the leads 1a against vibrations and a too much stress is generated at each root of the leads 1a. This will deteriorate the electric property of the

electrolytic condenser and will often break the leads 1a.

Especially the electronic apparatuses incorporated in the mechanism of vehicles are normally subjected to the vibrations of broad band of frequencies. If the electrolytic condenser 1 is subjected to a vibration approximate to the vibration peculiar to the electrolytic condenser 1, the electrolytic condenser will violently resonate and give rise to a serious result.

Further since the chip of electrolytic condenser 3 is formed in a shape of square block, it is required to prepare a complicated device for aligning the chips to be mounted to the print board. Moreover after the chip has been mounted to the print board, it is considerably difficult to see if the chip is correctly oriented, and therefore the probability of error is high in orientation of the chips.

OBJECTS OF THE INVENTION:

The present invention has been provided to eliminate the defects and disadvantages of the prior art. It is a primary object of the invention to provide an electrolytic condenser which will maintain its own function in a stabilized condition for a long period of time, wherein a dummy lead is connected to the bottom of the electrolytic condenser housing, the cylindrical portion of which is carried on a recess of a base plate, and the dummy lead and the true leads are bent to embrace the base plate together with the electrolytic condenser, thereby to fixedly attach the electrolytic condenser to the base plate at three points defined by the dummy lead and a pair of true leads, thereby to prevent too much stress from generating at the leads if vibrations are applied to the print board to which the electrolytic condenser is mounted, thereby to prevent the deterioration of electric

property of the electrolytic condenser.

It is another object of the invention to provide an electrolytic condenser which will make it possible to produce thinner and smaller electronic apparatuses, wherein the orientation of the electrolytic condenser is easily detected so that the electrolytic condenser may be aligned by a simple device, and the electrolytic condenser is made into a chip where the electrolytic condenser is reduced in height and is mounted to the print board in high density.

It is another object of the invention to reduce the production cost of the electrolytic condenser, wherein the axially extended and oppositely positioned side portions of the base plate have a thickness so set as to leave visible the polarity indications printed on the electrolytic condenser, thereby to make it unnecessary to print anew the same indications, thereby to reduce the production processes and the production cost.

It is another object of the invention to provide an electrolytic condenser which will make it possible to produce the vibration resistant and functionally reliable electronic apparatuses, wherein a dummy lead is connected at one end thereof to the bottom of the electrolytic condenser housing and the opposite end of the dummy lead is processed into a flat part, and each of the true leads has the free end processed into a flat part, and the cylindrical portion of the electrolytic condenser is placed in a recess of a base plate, the dummy and true leads being bent to embrace the base plate together with the electrolytic condenser so that the electrolytic condenser may be firmly fixed to the print board with the large areas of the dummy and true leads being soldered to the print board and further with the

electrolytic condenser being reduced in height.

It is still another object of the invention to firmly attach the electrolytic condenser to the base plate by placing the cylindrical portion of the electrolytic condenser in a recess of the base plate which is arcuated and is of the same radius of curvature with that of the cylindrical portion of the electrolytic condenser.

SUMMARY OF THE INVENTION:

In short, the present invention comprises an aluminum housing having an opened end and an axially opposite bottomed end; cylindrical electrolytic condenser element of a pair of an electrode foil sheet and an electrolytic paper sheet and another pair of an electrode foil sheet and an electrolytic paper sheet which are placed one on another with a pair of leads, each of which being attached between the the electrode foil sheet and the electrolytic paper sheet of each pair and rolled up into a cylinder with the leads being extended out thereof, the cylindrical electrolytic condenser element being inserted into the cylindrical aluminum housing and the opened end of the aluminum housing being sealed with a sealing rubber, each of the leads being processed to have a flat part at the free end thereof to be soldered to a print board; a dummy lead having nothing to do with electric function, the dummy lead having one end connected the bottom of the aluminum housing and the opposite end processed into a flat part to be soldered to the print board; a base plate having a recess formed on the upper side thereof to carry therein the cylindrical portion of the cylindrical aluminum housing, the base plate having axially extended and oppositely positioned side portions of a thickness so set as to leave visible the polarity indications printed on the

cylindrical aluminum housing; said leads and said dummy lead being bent to embrace the base plate together with the cylindrical aluminum housing, and the recess of the base plate being arcuated and of the same radius of curvature with that of the cylindrical aluminum housing.

BRIEF DESCRIPTION OF THE DRAWINGS:

Figs.1 through 8 show a first embodiment of the invention, wherein :
Fig.1 is a perspective view of the chip of electrolytic condenser, in which the electrolytic condenser is laid sidewise;

Fig. 2 is a bottom perspective view of the chip of electrolytic condenser;

Fig. 3 is an exploded perspective view of the chip of electrolytic condenser;

Fig. 4 is a top plan view of the chip of electrolytic condenser;

Fig. 5 is a bottom plan view of the chip of electrolytic condenser;

Fig. 6 is a side elevational view of the chip of electrolytic condenser;

Fig. 7 is a front elevational view of the chip of electrolytic condenser;

Fig. 8 is a rear elevational view of the chip of electrolytic condenser;

Figs.9 through 14 show the production processes of the electrolytic condenser, wherein:

Fig. 9 is a perspective view of electrode foil sheets and electrolytic paper sheets which are placed one on another and partly rolled up;

Fig.10 is a perspective view of the rolled up electrolytic condenser element;

Fig.11 is an exploded perspective view of the electrolytic condenser element, wherein the electrolytic condenser element is inserted into a housing having a bottom and covered with a sealing rubber;

Fig.12 is a perspective view of the electrolytic condenser element, wherein the inserted condenser element has been curing processed and sealed;

Fig.13 is a perspective view of the electrolytic condenser which is to be covered with a thermally contracting tube;

Fig.14 is a perspective view of the electrolytic condenser and a dummy lead which is to be connected to the bottom of the condenser housing;

Fig.15 is a perspective view of a bigger type chip of electrolytic condenser shown as a second embodiment of the invention;

Figs.16 and 17 show the conventional chip of electrolytic condenser wherein:

Fig.16 is a perspective view of the electrolytic condenser contained in a case wherein the electrolytic condenser is laid sidewise; and

Fig.17 is a perspective view of the case to be printed with the polarity indications.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS:

The invention will now be described in reference to the preferred embodiments. In Figs.1 through 8, a chip 9 of electrolytic condenser 10 according to the present invention wherein an electrolytic condenser is laid sidewise is substantially composed of an electrolytic condenser 10, a dummy lead 10a, true leads 10c and a base plate 11.

The dummy lead 10a is provided to fixedly attach the electrolytic condenser 10 to a print board (not shown). The dummy lead 10a may be of a material of soft iron plated with tin (so called the CP lead) or plated with zinc, or may be of copper or brass. In short, the material may be anything that is easily welded or adhered and is easily soldered. The dummy lead 10a has one end adhered or secured to a bottom 12a of an aluminum housing 12, for example, by means of an welding material 13. The dummy lead 10a is something having nothing to do with the electric function of the electrolytic condenser 10.

The electrolytic condenser 10 is produced, for example, in the manner as shown in Figs. 9 through 14. In Fig. 9, a pair of leads 10c, subjected to the spot face working, are separately fixed between an electrode foil sheet 14 and an electrolytic paper sheet 15 provided in two sets which are respectively placed together one on the other, and then the electrode foil sheets and the electrolytic paper sheets are rolled up. Thus an electrolytic condenser element 16 is formed up as shown in Fig. 10.

In Fig. 11, the electrolytic condenser element 16 is taped with a tape 18 and is impregnated with the electrolyte. The electrolytic condenser element 16 is then inserted into the aluminum housing 12 having an opening 12b and the bottom 12a. The aluminum housing 12 is then covered with a sealing rubber 19 pressed thereinto at the opening 12b in such condition that the pair of leads 10c are protruded out of the housing 12 through the sealing rubber 19.

In Fig. 12, the aluminum housing 12 is then curving processed in the neighborhood of the opening 12b thereof to form a constricted part 12c therearound. Thus the aluminum housing 12 is sealed with the

sealing rubber 19. Subsequently as shown in Fig.13, the aluminum housing 12 is covered with a thermally contracting cylindrical tube 20 from the direction as indicated by an arrow mark A. A heated air blow is applied to the thermally contracting tube 20 to contract the same around the aluminum housing 12, thereby to closely attach the tube to the housing. Subsequently as shown in Fig. 14, the dummy lead 10a is at one end thereof pressed against the bottom 12a of the aluminum housing 12 in the direction as indicated by an arrow mark B, and is fixed to the bottom by means of welding, adhering or soldering and the like. It is needless to say that the dummy lead 10a may be formed to have a dimensionally enlarged head at one end thereof to be contacted to the bottom 12a so that the lead may be secured to the bottom with a larger connecting area.

Further, it is mentioned above that the dummy lead 10a is a metal lead having nothing to do with the electric function of the electrolytic condenser 10. Therefore the dummy lead 10a may be of any shape if it has a sufficient function to fixedly attach the electrolytic condenser 10 to the print board. For example, the dummy lead 10a may be formed to have a flat part 10f at the opposite end thereof, or may be wholly flat.

A base plate 11 is provided to carry the electrolytic condenser 10 thereon thereby to provide a chip of electrolytic condenser 9, where the electrolytic condenser 10 is laid sidewise on the base plate 11. The base plate 11 is of an electrically isolated material such as polyacetal resin, nylon resin, ABS resin or glassfiber mixed resin. Further the base plate 11 has a recessed surface 11a formed on the upper side thereof. The recessed surface 11a is of an arc of the same radius of curvature

with that of a cylindrical body 10b of the electrolytic condenser 10. Further the base plate 11 is of an axial length substantially same with that of the electrolytic condenser 10. The axially extended and diametrically opposite side portions 11b of the base plate 11 are of a thickness not exceeding the thickness which will conceal from eyesight the polarity indications 20a and others provided on the surface of the electrolytic condenser 10. In this embodiment, the thickness is set as about 1/3 of the diameter of the electrolytic condenser 10.

The above mentioned recessed surface 11a of the base plate 11 is provided to enable the base plate 11 to carry the aluminum electrolytic condenser 10 thereon in a stabilized condition. The above mentioned thickness of the diametrically opposite side portions 11b of the base plate 11 has been so set as to enable a man to definitely acknowledge the polarity indications 20a and others provided on the thermally contracting tube 20 surrounding the electrolytic condenser 10, instead of concealing these indications.

The chip of electrolytic condenser 9 is formed up in a single unit where the electrolytic condenser 10 is carried on the recessed surface 11a of the base plate 11 in a stabilized condition, and the true leads 10c and the dummy lead 10a are bended to embrace the base plate 11 together with the electrolytic condenser 10.

With the formation of the chip of electrolytic condenser 9 as above mentioned, the electrolytic condenser 10 is prevented from movement in the axial direction by the true leads 10c and the dummy lead 10a which are bent to embrace the base board 11, and is further prevented from movement in the radial direction by the diametrically opposite

side portions 11b of the base plate 11 which are closely in contact with the cylindrical surface of the electrolytic condenser 10.

It is needless to say that the recessed surface 11a of the base plate 11 may be of polygonal shape or of V-shape instead of the arc-shape as mentioned above, if the recessed surface 11a is so formed as to stabilizingly carry the cylindrical electrolytic condenser 10 thereon.

Further as mentioned above, since the diametrically opposite side portions 11b of the base plate 11 have a thickness which is about $1/3$ of the diameter of the cylindrical electrolytic condenser 10, the polarity indications 20a and others on the thermally contracting tube 10b are definitely located in the visible areas.

Fig. 15 shows a second embodiment of the invention, wherein a bigger electrolytic condenser 10 of a larger capacity is laid sidewise on the recessed surface 11a of the base plate 11, and the true leads 10c and the dummy lead 10a are bent to embrace the base plate 11 together with the cylindrical electrolytic condenser 10 thereby to form up a single unit in the same manner as the first embodiment as mentioned above.

Thus according to the present invention, since the electrolytic condenser 10 is laid sidewise on the base plate 11, any bigger condenser may be stabilizingly carried on the base plate which is correspondingly designed to be bigger, and the polarity indications and others may be correctly located in the visible areas.

The present invention is constructed as above mentioned, and the effects or advantages are as follows: As particularly shown in Figs. 1, 2 and 15, the chip of electrolytic condenser 9 is formed up,

wherein the cylindrical electrolytic condenser 10 is laid sidewise on the recessed surface 11a of the base plate 11, and the two true leads 10c and one dummy lead 10a are bent to embrace the base plate 11 together with the electrolytic condenser 10, thereby to form up a unit in which the electrolytic condenser 10 and the base plate 11 are fixed to each other at the three points 10f. Thus this chip 9 is maintained in a stabilized condition.

A bigger sized electrolytic condenser 10, which is normally taller, may be laid sidewise on the base plate 11 as a chip 9 of electrolytic condenser 10 which is to be mounted on a print board, wherein the chip 9 is soldered to the print board at the three points defined by a pair of spaced true leads 10c positioned at one end axially of the chip 9 and by one dummy lead 10a positioned at the opposite end axially of the chip 9. In contrast to the cantilever mounting structure of the conventional electrolytic condenser, the chip 9 can be more firmly attached to the print board at the axially opposite sides thereof.

Further the chip 9 is useful to prevent the leads from being subjected to too much stress if the print board is vibrated, and accordingly prevent the deterioration of the electric property of condenser. Therefore the chip 9 is useful to make up the excellent electronic apparatuses having a sufficient reliability for a long period of time.

Further the chip 9 is useful to reduce the height of the electrolytic condenser which may otherwise be taller when actually mounted to the print board, and is further useful to be attached to the print board in a high density. Therefore the chip 9 will enable the electronic apparatuses to be thinner and smaller.

Further since the polarity indications 20a and others of the electrolytic condenser 10 are definitely visible without being concealed by the axially opposite side portions 11b of the base plate 11, the chip 9 will eliminate the additional task of printing these indications anew, and will reduce the production cost.

Further each of the true leads is flattened at the free end thereof, and the dummy lead is secured at one end thereof to the bottom of the electrolytic condenser at the position axially opposite to the true leads and is also flattened at the free end thereof, and the cylindrical electrolytic condenser is placed on the arcuated recess of the base plate. Further the true and dummy leads are bent to embrace the base plate together with the electrolytic condenser, thereby to form up a unit. The electrolytic condenser is therefore soldered to the print board with the broad areas of the true and dummy leads. As the result, the print board with the electrolytic condenser being mounted thereon is made dimensionally lower in contrast to the conventional print board, and is therefore employed to make up the excellent and reliable electronic apparatuses which are thinner as well as smaller and have a firm resistance against vibrations.

Further the base plate is formed with the arcuated recess on the upper side thereof which is of the same radius of curvature with that of the cylindrical electrolytic condenser. As the electrolytic condenser is placed in the arcuated recess of the base plate, the electrolytic condenser will be firmly fixed to the base plate.

WHAT IS CLAIMED IS:

1. An electrolytic condenser of a type having a positive lead and a negative lead which are extended out of an opened end of the condenser having a bottom at the end axially opposite to the opened end, said electrolytic condenser comprising: a dummy lead having one end fixedly connected to said bottom of said electrolytic condenser, said dummy lead having nothing to do with electric function; a base plate having a recess formed on the upper side thereof for carrying therein a cylindrical portion of said electrolytic condenser, said base plate having axially extended and oppositely arranged side portions of a thickness which is set to leave visible polarity indications printed on said electrolytic condenser; said positive and negative leads and said dummy lead being bent to embrace said base plate together with said electrolytic condenser.
2. An aluminum electrolytic condenser composed of an aluminum housing having an opened end and an axially opposite end having a bottom, and electrode foil sheets and electrolytic paper sheets having true leads attached thereto and placed one on another and rolled up into a cylindrical electrolytic condenser element with the leads extended out thereof, the cylindrical electrolytic condenser element being inserted into the aluminum housing, and the opened end of the housing being sealed with a sealing rubber, said aluminum electrolytic condenser comprising: each of said leads having the free end thereof processed into a flat part; a dummy lead having nothing to do with electric function and having one end fixedly connected to said bottom of said aluminum housing and having the opposite end processed into a flat part to be soldered to a print board; a base plate having a recess formed on the upper side thereof to carry therein an cylindrical part of said aluminum housing, said base plate having axially extended and oppositely arranged side portions of a thickness so set



as to leave visible the polarity indications printed on said aluminum housing; said true leads and said dummy lead being bent so that said flat parts thereof may embrace said base plate together with said aluminum housing.

3. An aluminum electrolytic condenser composed of an aluminum housing having an opened end and an axially opposite end having a bottom, electrode foil sheets and electrolytic paper sheets placed one on another and having true leads attached thereto and rolled up into a cylindrical electrolytic condenser element with said leads extended out thereof, the cylindrical electrolytic condenser being inserted into the aluminum housing, and said opened end of said aluminum housing being sealed with a sealing rubber, said aluminum electrolytic condenser comprising: each of said leads having one end thereof processed into a flat part; a dummy lead having nothing to do with electric function and having one end welded to said bottom of said aluminum housing and the opposite end processed into a flat part to be soldered to a print board; a base plate having a recess formed on the upper side thereof to carry therein a cylindrical part of said aluminum housing, said base plate having axially extended and oppositely arranged side portions of a thickness so set as to leave the polarity indications printed on said aluminum housing; said true leads and said dummy lead being bent to embrace said base plate together with said aluminum housing, and said recess of said base plate being an arcuated recess of the same radius of curvature with that of said cylindrical part of said aluminum housing.

