

SPECIFICATION

Method and Apparatus for Assembling Electrolytic Condenser with Sealing Rubber

Background of the Invention:

Field of the Invention;

The present invention relates to method and apparatus for assembling an electrolytic condenser having leads and a sealing rubber having holes, wherein prior to inserting the leads through the holes, a plurality of items are inspected in connection with the sealing rubber, specifically with respect to the outer diameter of the sealing rubber, presence and absence of the holes and the positional precision thereof. Thus only a sealing rubber proved competent by the inspection is used to assemble the electrolytic condenser which will have the leads correctly inserted through the holes of the sealing rubber, thereby to increase the production efficiency of the electrolytic condenser without producing incompetent electrolytic condenser.

Description of the Related Art:

Generally the aluminum electrolytic condenser is produced by superposing an electrolytic paper and an electrode foil having positive and negative leads attached thereto and by rolling up into a cylindrical condenser element which is then impregnated with electrolytic liquid and is accommodated in an aluminum container having a bottom and an opening with the leads being extended out as inserted through the holes of a sealing rubber closing the opening which is processed with curring to seal with the sealing rubber.

In case the leads are inserted through the holes of the sealing rubber, it is required that the angular position of the leads and the angular position of the holes of the sealing

rubber are in agreement with each other. The electrolytic condenser element is, therefore, supplied with the leads being set at a predetermined angular position while the sealing rubber is rotated to a predetermined angular position where the angular position of the holes is in agreement with the angular position of the leads, such that the holes may allow the leads to pass through the holes.

According to the prior art, whether or not the holes and the leads are in a same angular position is determined by one fiber sensor which detects one of the holes to be at a predetermined position on the assumption the two holes are formed at predetermined angular positions respectively. It is, therefore, recognized that the holes and the leads are in a same angular position if one of the holes comes to a predetermined position with rotation of the sealing rubber.

As shown in Fig. 9, in case the sealing rubber 51 has holes 51a, 51b formed at the eccentric positions thereof respectively (Fig. 9 (a)), it is required that the angular position of the holes 51a, 51b is in agreement with the angular position of leads (not shown) which are to be inserted through the holes 51a, 51b. In Fig. 9 (b), as the sealing rubber 51 is rotated to move one (51a) of the holes 51a, 51b near to one (52a) of the circles 52a, 52b, it may happen that the other (51b) of the holes 51a, 51b comes to a position remarkably displaced from the other (52b) of the circles 52a, 52b. In Fig. 9 (c), as the sealing rubber 51 is further rotated until one (51a) of the holes 51a, 51b comes to a position substantially in agreement with one (52a) of the circles 52a, 52b, it may happen that the other (51b) of the holes 51a, 51b comes to a position further remarkably displaced from the other (52b) of the circles 52a, 52b. This is because only one of the holes 51a, 51b is inspected by use of one fiber sensor according to the conventional inspecting method. Namely according to the conventional inspecting method, if one of the holes 51a, 51b comes to a position substantially in agreement with one (52a) of the circles 52a, 52b as shown in Fig. 9 (c), it is recognized that the sealing

rubber 51 is competent, and the lead inserting operation is started.

As the result, the sealing rubber is assembled to the electrolytic condenser with one of the leads being bent. Moreover, in case the sealing rubber is thin, one of the leads may pierce the sealing rubber with one hole remains as it is. The one hole will allow the electrolytic liquid to leak from the electrolytic condenser. Such electrolytic condenser will be practically useless.

Further in case the sealing rubber 51 has the holes 51a, 51b formed slightly displaced from predetermined positions respectively, the leads will be inserted through the holes 51a, 51b as are guided by the displaced holes 51a, 51b. As the result, the electrolyticpaper (not shown) to which the leads are attached will be deformed and creased. Such electrolytic condenser will be a product of inferior electric property.

Further in case the sealing rubber 51 has the holes 51a, 51b, one of which is completely formed while the other of which is incompletely formed, it may happen that only the complete hole may be inspected according to the conventional inspecting method and the sealing rubber is recognized as being competent. Such a sealing rubber will produce an incompetent electrolytic condenser.

Since the work for assembling the electrolytic condenser is automatically carried out, the defects as mentioned above will be found out at the final process where a finished up electrolytic condenser is finally inspected. The finished up electrolytic condenser recognized as being incompetent at the final inspecting process must be scrapped. Such scrap will bring about material and economical loss because the scrapped electrolytic condenser contains at least a normal electrolytic condenser element and a container having a bottom.

One or more embodiments may eliminate the defects and disadvantages of the prior art.

One or more embodiments may efficiently produce an electrolytic condenser which is reliable in its function.

One or more embodiments may inspect a sealing rubber having holes and used to close the opening of a container having a bottom for accommodating therein an electrolytic condenser element having leads which are to be inserted

One or more embodiments may efficiently produce an electrolytic condenser which is reliable in its function.

One or more embodiments may inspect a sealing rubber having holes and used to close the opening of a container having a bottom for accommodating therein an electrolytic condenser element having leads which are to be inserted through the holes of the sealing rubber the leads, the inspection being made reference to a plurality of predetermined inspecting items including at least inspection of the dimension of outer diameter of said sealing rubber, inspection of presence and absence of holes of the sealing rubber and the positional precision thereof, so as to assemble the electrolytic condenser by use of a sealing rubber proved competent by the inspections.

One or more embodiments may use an image treating device to inspect at least the dimension of outer diameter of said sealing rubber, presence and absence of holes of the sealing rubber and the positional precision thereof, and to calculate out a difference between the present angular position of the holes and a reference angular position where the leads may be inserted through the holes and then to rotate the sealing rubber by the calculated difference to the reference angular position.

One or more embodiments may remove a sealing rubber proved incompetent by said inspections from the assembling line, so as to assemble the electrolytic condenser only by use of a sealing rubber proved competent by the inspections.

Summary of the Invention:

In accordance with a first aspect of the invention, there is provided a method for assembling an electrolytic condenser including a condenser element impregnated with an electrolytic liquid and having leads secured thereto, a container for accommodating the condenser element therein and having a bottom and an opening at which the condenser element is inserted into the container and a sealing rubber for closing the opening of the container and having holes through which the leads of the condense element are to be inserted,

presence and absence of the holes through which said leads are to be inserted, the position precision of the holes by which said leads are to be inserted through the holes and removal of the sealing rubber which is proved to be incompetent by the comparison, so as to assemble the electrolytic condenser by use of a sealing rubber which is proved competent by the comparison.

In accordance with a second aspect of the invention there, is provided a method for assembling an electrolytic condenser including a condenser element impregnated with an electrolytic liquid and having leads secured thereto, a container for accommodating the condenser element therein and having a bottom and an opening at which the condenser element is inserted into the container and a sealing rubber for closing the opening of the container and having holes through which the leads the condenser element are to be inserted, the opening being processed with curring to seal the opening with the sealing rubber, the method comprising the steps of inspection of said sealing rubber in reference to a plurality of predetermined inspecting items prior to inserting the leads through the holes of said sealing rubber, said inspection including at least comparison of the image data of said sealing rubber with a predetermined reference data of said sealing rubber as to the dimension of outer diameter, the presence and absence of the holes through which said leads are to be inserted, the position precision of the holes by which said leads are to be inserted through the holes, calculation of the difference between the angular position of the holes and a predetermined angular position of the holes and removal of the sealing rubber which is proved to be incompetent by the comparison, so as to assemble the electrolytic condenser by use of a sealing rubber which is proved competent by the comparison.

In accordance with a third aspect of the invention, there is provided an apparatus for assembling an electrolytic condenser including a condenser element impregnated with an electrolytic liquid and having leads secured thereto, a container for accommodating the condenser element therein and having a bottom and an opening at which the condenser element

is inserted into the container and a sealing rubber for closing the opening of the container and having holes through which the leads of the condenser element are to be inserted, the opening being processed with curring to seal the opening with the sealing rubber, said apparatus comprising inspecting means for inspecting said sealing rubber in reference to a plurality of predetermined inspecting items prior to inserting the leads through the holes of said sealing rubber, said inspection including at least comparison of the image data of said sealing rubber with a predetermined reference data of said sealing rubber as to the dimension of outer diameter, the presence and absence of the holes through which said leads are to be inserted, the position precision of the holes by which said leads are to be inserted through the holes and removal of the sealing rubber which is proved to be incompetent by the comparison, so as to assemble the electrolytic condenser by use of a sealing rubber which is proved competent by the comparison.

In accordance with a fourth aspect of the invention, there is provided an apparatus for assembling an electrolytic condenser including a condenser element impregnated with an electrolytic liquid and having leads secured thereto, a container for accommodating the condenser element therein and having a bottom and an opening at which the condenser element is inserted into the container and a sealing rubber for closing the opening of the container and having holes through which the leads of the condenser element are to be inserted, the opening being processed with curring to seal the opening with the sealing rubber, said apparatus comprising inspecting means for inspecting said sealing rubber in reference to a plurality of predetermined inspecting items prior to inserting the leads through the holes of said sealing rubber, said inspection including at least comparison of the image data of said sealing rubber with a predetermined reference data of said sealing rubber as to the dimension of outer diameter, the presence and absence of the holes through which said leads are to be inserted, the position precision of the holes by which said leads are to be inserted through the holes and calculation of a difference between the angular position of said holes, and further comprising parts removing means for

removing a sealing rubber which is proved to be incompetent away from the assembling line and positioning means for rotating the sealing rubber proved competent by the calculated difference to angularly position said sealing rubber to a predetermined position, said comparing, calculating, removing and positioning operations being made prior to inserting the leads through the holes of said sealing rubber, so as to assemble the electrolytic condenser by use of a competent sealing rubber.

Brief Description of the Drawings:

Figs. 1 through 8 relate to the embodiment of the invention, wherein.

Fig. 1 is a diagrammatic view of an apparatus for assembling an electrolytic condenser with a sealing rubber.

Fig. 2 is a perspective view of a device for assembling the electrolytic condenser.

Fig. 3 is a plan elevational view of a device for supplying the sealing rubber to the assembling device.

Fig. 4 is a perspective view of an image treating device partly exploded.

Fig. 5 is a perspective view of a mechanism for positioning the sealing rubber.

Fig. 6 is a side elevational view of the positioning mechanism shown partly in vertical section.

Fig. 7 is a side elevational view of the positioning mechanism shown partly in vertical section and showing the operation to hold the sealing rubber at the upper and lower sides thereof.

Fig. 8 is a side elevational view of the positioning mechanism shown partly in vertical section and showing the operation to rotate the sealing rubber to a predetermined angular position.

Fig. 9 (a), (b) and (c) are plan elevational views of a sealing, rubber having holes, the sealing rubber being rotated to be angularly positioned in connection with leads which are inserted through the holes according to the conventional method.

Detailed Description of the Preferred Embodiments:

The invention will be described in detail in reference to the embodiments as shown in the attached drawings. In Figs. 1 and 2, the apparatus 1 of the invention for assembling an electrolytic condenser with a sealing rubber is provided with an image treating device 2, a removing mechanism (not shown) and a positioning mechanism 4.

In reference to Fig. 2 wherein a general structure of the apparatus is shown, a plurality of sealing rubbers 6 are supplied at an inspecting station ST1 in the direction as indicated by arrow B from a parts supplying device 5 (Fig. 3) to a turn table 8 which is intermittently rotated, and are held by a cramp mechanism (not shown). Subsequently each of the sealing rubbers 6 is inspected by the image treating device 2 with respect to a plurality of inspecting items including the dimension of outer diameter, presence or absence of holes 6a, 6b and the positional precision thereof and a difference is calculated out between the present angular position of holes 6a, 6b as inspected and a predetermined reference angular position of holes 6a, 6b which may allow leads (not shown) to be inserted therethrough.

Subsequently at a positioning station ST2, the sealing rubber 6 is positionally adjusted by rotation thereof made by the positioning mechanism 4 by the angular difference calculated out by the image treating device 2 at the inspecting station ST1. After such inspections, at a parts removing station ST3, a sealing rubber 6 proved incompetent by the inspections is removed away from the assembling line by the removing mechanism in the direction as indicated by arrow C. A sealing rubber 6 proved competent is transported to an assembling station ST4 and is supplied to the next assembling device (not shown) in the direction as indicated by arrow D in the condition that the sealing rubber 6 is angularly positioned with respect to the holes 6a, 6b.

In Fig. 1, the electrolytic condenser assembling apparatus 1 of the invention is operated under control of a main control

device 9. A CCD camera 10 for taking a picture of the sealing rubber 6, a monitor device 11 an image data treating unit 12 a power source 13 all composing the image treating device 2 are electrically connected to the main control device 9. Further, a motor 14 is electrically connected to the main control device 9 so as to be controlled thereby.

In Fig. 3, the parts supplying device 5, which is operated at the inspecting station 1, to supply the sealing rubber 6 to the turn table 8, includes a table 21 for catching the sealing rubber 6. The catching table 21 is rotatable step by step with a rotation angle 180° around a center shaft 20 in the direction as indicated by arrow B. The catching table 21 has two semicircular cutouts 21a formed at the outer periphery thereof diametrically opposite to each other. A catching arm 22 is provided so as to be swingable around a shaft 23 with respect to each of the cutouts 21a. The catching arm 22 has a follower rotatably provided at one end 24 thereof. The catching arm 22 has the other end 22b normally urged toward the cutout 21a by a tension spring 25. A cam 26 is arranged opposite to the follower 24. The cam 26 is rotated to move the follower 24 so as to rotate the catching arm 24 cutout 21a against the tension spring 25 and thus to move the end 22b away from the cutout 21a, so that the catching arm 22 may hold the sealing rubber 6 in cooperation with the cutout 21a.

With the sealing rubber 6 being held by the cutout 21a and the catching arm 22, the catching table 21 may be rotated step by step with a rotation angle 180° in the direction as indicated by arrow B so as to transport the sealing rubber 6 one after another to the turn table 8.

In Figs. 1 and 4, the image treating device 2 is arranged at the inspecting station ST1 so as to inspect the sealing rubber 6. A support shaft 31 fixed to a base supports a light source 30 at a position below the sealing rubber 6 and supports the CCD camera 10 at a position above the sealing rubber 6 which is transported to the inspecting station ST1 by the turn table 8. The CCD camera 10 photographs the light from the light source

30 passing through the holes 6a, 6b of the sealing rubber 6 and the upper surface shape of the sealing rubber 6. The photographed image is indicated at the monitor device 11 and the obtained image data is transported to the image data treating unit 12 so as to be subjected to predetermined treatments. Cylindrical light interrupting members 32, 33 are provided between the light source 30 and the sealing rubber 6 and between the sealing rubber 6 and the CCD camera 10 respectively to help the CCD camera 10 to take a clear image of the sealing rubber 6.

The image data treating unit 12 has a memory provided therein. The memory stores therein the reference data of a shape of the sealing rubber 6 and of reference angular position of the holes 6a, 6b of the sealing rubber 6 through which the leads are to be inserted. The transported image data is compared with the reference data stored in the memory with respect to a plurality of inspecting items including the dimension of outer diameter of the sealing rubber 6, presence or absence of holes 6a, 6b and the positional precision thereof, and further a calculation is made as to the difference between the actual angular position of the holes 6a, 6b of the sealing rubber 6 and the reference one. By the way, the light source 30 arranged below the sealing rubber 6 to pass the light through the holes 6a, 6b of the sealing rubber 6 will never fail to surely inspect if the holes 6a, 6b are completely conductive or not.

In Figs. 5 and 6, the positioning mechanism 4 is arranged at the positioning station ST2 so as to positionally adjust the sealing rubber 6, namely to rotate the sealing member 6 to a predetermined angular position where the holes 6a, 6b may be in alignment with the leads which are to be inserted through the holes 6a, 6b.

A first holding member 37 is arranged above the turn table 8. The first holding member 37 is secured to the top of a second slide shaft 34 which is mounted to a base (not shown) and is vertically movable through a fixed second holding member 39 and through a bearing 36 mounted to the second holding member

39. A second slide shaft 35, which is vertically sliceable, is fixedly connected to the second holding member 39 and is sliceable through the first holding member 37 and a bearing 38 mounted to the second holding member 37. The first and second shafts 34, 35 are connected to each other with a swingable link mechanism (not shown) such that the first slide shaft 35 may be moved up a cam device (not shown) to move down the second slide shaft 35 and such that the first slide shaft 35 may be moved down to move up the second slide shaft 35. Namely the first and second slide shafts 34, 35 are moved in the opposite directions such that the first holding member 37 and the second holding member 39 may be moved away from and toward each other. The first and second holding member 37, 39 are connected with a tension spring 40 to normally absorb a play between the two members.

The first holding member 37 has a vertical shaft 42 mounted thereon for holding the sealing rubber 6. The holding shaft 42 is rotatably supported by a bearing 41 and has a lower end 42a which is of a diameter slightly smaller than the outer diameter of the sealing rubber 6. The lower end 42a of the holding shaft 42 is pressed against the upper side of the sealing rubber 6 when the holding shaft 42 is moved down. The second holding member 39 has a vertical shaft 44 rotatably mounted thereon for rotating the sealing rubber 6. The vertical shaft 44 is rotatably supported by a bearing 43 and has an upper end 44a which is of a diameter slightly smaller than the outer diameter of the sealing rubber 6. The upper end 44a of the vertical shaft 44 is pressed against the lower side of the sealing rubber 6 to hold the sealing rubber 6 in cooperation with the holding shaft 42.

The rotatable vertical shaft 44 has a gear 45 fixed thereto and arranged in mesh with a drive gear 47 which is secured to a rotational shaft 46 of a motor 14 such as a stepping motor. The rotatable vertical shaft 44 is rotated in association with rotation of the motor 14 to rotate the sealing rubber 6 in cooperation with the holding shaft 42. The rotation angle of

the sealing rubber 6 is determined by the difference calculated out by the image data treating unit 12 from the comparison between the image data showing the actual angular position of the holes 6a, 6b of the sealing rubber 6 and the reference data stored in the memory of the image data treating unit 12, the difference calculated out being used to rotate the stepping motor 14 by the angular difference, thereby to rotate the sealing rubber 6 by the angular difference to position the sealing rubber 6 to a predetermined angular position where holes 6a, 6b of the sealing rubber 6 are in alignment with the leads which are to be inserted through the holes 6a, 6b respectively.

In Fig. 2, the removing mechanism (not shown) is provided at the removing station ST3 and is operated to remove a sealing rubber 6 from the assembling line, the sealing rubber 6 being decided incompetent by inspection of the image data treating device 12. Precisely the removing mechanism is operated in response to a signal from the image data treating device 12 indicating that the sealing rubber 6 is incompetent to release the sealing rubber 6 from the holding shafts 42, 44 and drop the incompetent sealing rubber 6 in the direction as indicated by arrow C into a box (not shown).

Subsequently a method of the invention for assembling the electrolytic condenser will be described. The electrolytic condenser is generally assembled by putting an electrolytic liquid impregnated condenser element (not shown) into a container having a bottom, and the sealing rubber 6 is inserted into the container at the opening thereof while the leads (not shown) secured to the electrolytic condenser are inserted through the holes 6a, 6b of the sealing member 6, and then the opening of the container is processed with curring so as to be sealed with the sealing rubber 6. According to the method of the invention for assembling the electrolytic condenser, prior to inserting the leads through the holes 6a, 6b of the sealing rubber 6, a plurality of inspecting items are inspected including at least the outer diameter dimension of the sealing rubber 6, presence or absence of the holes 6a, 6b of the sealing

rubber 6 and the precision thereof. The inspection is made to decide if the sealing rubber 6 is competent or incompetent as a member to be assembled into the electrolytic condenser. Thus the electrolytic condenser is assembled only with a sealing rubber 6 decided as competent.

Another aspect of the method of the invention is as follows. Namely the plurality of items to be inspected as mentioned above are inspected by use of the image treating device 2, wherein a difference is calculated out between the present angular position of the holes 6a, 6b of the sealing rubber 6 and a predetermined reference angular position of the holes 6a, 6b of the sealing rubber 6 stored in a memory of the image treating device 2. Thus the sealing rubber 6 decided as incompetent is removed from the assembling line, and a competent sealing rubber 6 is rotated by the difference by the positioning mechanism 4 to the predetermined angular position and is transported to an assembling process. Thus the electrolytic condenser is assembled only with a sealing rubber 6 decided as competent.

Operation of the invention is as follows.

In Figs. 2 and 3, at the inspecting station ST1, the sealing rubber 6 is held by the cutout 21a and the holding arm 22 of the parts supplying device 5, and then the parts supplying device 5 is rotated by 180° in the direction as indicated by arrow B to transport the sealing rubber 6 to the turntable 8. Subsequently the CCD camera 10 of the image treating device 2 photographs the sealing rubber 6 to indicate the image of the sealing rubber 6 at the monitor device 11, thereby to obtain the data of the photographed sealing rubber 6. The obtained image data of the sealing rubber 6 is transported to the image data treating unit 12 where the image data of the sealing rubber 6 is compared with the reference data stored in a memory and showing a predetermined shape of the sealing rubber 6 and a predetermined angular position of the holes 6a, 6b of the sealing rubber 6 through which the leads are to be inserted. Thus the outer diameter of the sealing rubber 6, presence and absence of the holes 6a, 6b and the positional precision thereof are inspected.

Further calculation is made to decide a difference between the present angular position of the holes 6a, 6b and the reference angular position of the holes 6a, 6b stored in the memory.

The turn table 8 is then rotated by 45° in the direction as indicated by arrow A to position the sealing rubber 6 at the positioning station ST2. In case the sealing rubber 6 is proved competent at the inspecting station ST1, the first slide shaft 34 is moved down by operation of a cam device to move up the second slide shaft 35 which is connected to the first slide shaft 34 by a link mechanism (Fig. 5). With the first and second slide shafts 34, 35 being vertically moved, the first holding member 37 is moved in the direction as indicated by arrow E while the second holding member 39 is moved in the direction as indicated by arrow F. Namely the first and second slide shafts 34, 35 are moved toward each other as shown in Fig. 7. As the result, the upper holding shaft 42 and the lower rotational shaft 44 will hold the sealing rubber 6.

In Fig. 8, the motor 14 is rotated in the direction as indicated by arrow G to rotate the sealing rubber 6 in the direction as indicated by arrow H by the difference calculated out by the image data treating unit 12 with respect to the angular position of the holes 6a, 6b of the sealing rubber 6. As the sealing rubber 6 is released from hold of the turn table 8 at the time of rotation of the sealing rubber 6, the sealing rubber 6 is smoothly rotated together with the holding shaft 42 by the difference calculated out as the rotational shaft 44 is rotated, and thus the sealing rubber 6 is positioned at a predetermined angular position where the leads may be inserted through the holes 6a, 6b of the sealing rubber 6.

In case the sealing rubber 6 is proved incompetent at the inspecting station ST1, the sealing rubber 6 is not subjected to the positioning treatment at the positioning station ST2 and is transported to the parts removing station ST3 with rotation by 45° of the turn table 8 in the direction as indicated by arrow A. At the parts removing station ST3, the incompetent sealing rubber 6 is removed from the assembling line in the direction

as indicated by arrow C into a box (not shown) while the turn table 8 releases the sealing rubber 6 in response to a signal from the image treating device 2 indicating that the sealing rubber 6 is incompetent.

The sealing rubber 6 proved competent and angularly positioned at the positioning station ST2 is transported to the assembling station ST4 and is supplied in the direction as indicated by arrow D to the next assembling device (not shown) while the angular position of holes 6a, 6b of the sealing rubber 6 is adjusted.

Thus according to the invention as described above, the sealing rubber having holes through which the leads are to be inserted is inspected at least with respect to the dimension of outer diameter, presence and absence of the holes and the positional precision thereof, so as to assemble the electrolytic condenser by use of a sealing rubber which is proved competent by the inspections which will remove an incompetent sealing rubber from the assembling line prior to inserting the leads through the holes of the sealing rubber.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications are intended to be included within the scope of the following claims.

CLAIMS:

1. A method for assembling an electrolytic condenser including a condenser element impregnated with an electrolytic liquid and having leads secured thereto, a container for accommodating the condenser element therein and having a bottom and an opening at which the condenser element is inserted into the container and a sealing rubber for closing the opening of the container and having holes through which the leads of the condense element are to be inserted, the opening being processed with curring to seal the opening with the sealing rubber, said method comprising the steps of: inspection of said sealing rubber in reference to a plurality of predetermined inspecting items prior to inserting the leads through the holes of said sealing rubber, said inspection including at least comparison of the image data of said sealing rubber with a predetermined reference data of said sealing rubber as to the dimension of outer diameter, the presence and absence of the holes through which said leads are to be inserted, the position precision of the holes by which said leads are to be inserted through the holes and removal of the sealing rubber which is proved to be incompetent by the comparison, so as to assemble the electrolytic condenser by use of a sealing rubber which is proved competent by the comparison.

2. A method for assembling an electrolytic condenser including a condenser element impregnated with an electrolytic liquid and having leads secured thereto, a container for accommodating the condenser element therein and having a bottom and an opening at which the condenser element is inserted into the container and a sealing rubber for closing the opening of the container and having holes through which the leads the condenser element are to be inserted, the opening being processed with curring to seal the opening with the sealing rubber, said method comprising the steps of: inspection of said sealing rubber in reference to a plurality of predetermined inspecting items prior to inserting the leads through the holes of said sealing rubber, said inspection including at least comparison of the image data of said sealing rubber with a predetermined reference data of said sealing rubber as to the dimension of outer diameter, the

presence and absence of the holes through which said leads are to be inserted, the position precision of the holes by which said leads are to be inserted through the holes, calculation of the difference between the angular position of the holes and a predetermined angular position of the holes and removal of the sealing rubber which is proved to be incompetent by the comparison, so as to assemble the electrolytic condenser by use of a sealing rubber which is proved competent by the comparison.

3. An apparatus for assembling an electrolytic condenser including a condenser element impregnated with an electrolytic liquid and having leads secured thereto, a container for accommodating the condenser element therein and having a bottom and an opening at which the condenser element is inserted into the container and a sealing rubber for closing the opening of the container and having holes through which the leads of the condenser element are to be inserted, the opening being processed with curring to seal the opening with the sealing rubber said apparatus comprising inspecting means for inspecting said sealing rubber in reference to a plurality of predetermined inspecting items prior to inserting the leads through the holes of said sealing rubber, said inspection including at least comparison of the image data of said sealing rubber with a predetermined reference data of said sealing rubber as to the dimension of outer diameter, the presence and absence of the holes through which said leads are to be inserted, the position precision of the holes by which said leads are to be inserted through the holes and removal of the sealing rubber which is proved to be incompetent by the comparison, so as to assemble the electrolytic condenser by use of a sealing rubber which is proved competent by the comparison.

4. An apparatus for assembling an electrolytic condenser including a condenser element impregnated with an electrolytic liquid and having leads secured thereto, a container for accommodating the condenser element therein and having a bottom and an opening at which the condenser element is inserted into the container and a sealing rubber for closing the opening of the container and having holes through which

the leads of the condenser element are to be inserted, the opening being processed with curring to seal the opening with the sealing rubber, said apparatus comprising inspecting means for inspecting said sealing rubber in reference to a plurality of predetermined inspecting items prior to inserting the leads through the holes of said sealing rubber, said inspection including at least comparison of the image data of said sealing rubber with a predetermined reference data of said sealing rubber as to the dimension of outer diameter, the presence and absence of the holes through which said leads are to be inserted, the position precision of the holes by which said leads are to be inserted through the holes and calculation of a difference between the angular position of said holes, and further comprising parts removing means for removing a sealing rubber which is proved to be incompetent away from the assembling line and positioning means for rotating the sealing rubber proved competent by the calculated difference to angularly position said sealing rubber to a predetermined position, said comparing, calculating, removing and positioning operations being made prior to inserting the leads through the holes of said sealing rubber, so as to assemble the electrolytic condenser by use of a competent sealing rubber.

5. An electrolytic condenser made in accordance with the method of claim 1 or 2.

Method and Apparatus for Assembling Electrolytic
Condenser with Sealing Rubber

Abstract of the Invention

Disclosed is method and device for assembling an electrolytic condenser with a sealing rubber 6 having holes 6a, 6b through which the leads of the condenser are to be inserted, wherein prior to inserting the leads through the holes 6a, 6b, the sealing rubber 6 is inspected by image treating means 2 at least with respect to the dimension of outer diameter, presence and absence of the holes 6a, 6b and the positional precision thereof and a difference is calculated out between the presently inspected angular position of the holes 6a, 6b and a reference angular position of the holes 6a, 6b. Positioning means 4 is then operated to rotate the sealing rubber 6 by the calculated difference to position the sealing rubber 6 so that the holes 6a, 6b may be in agreement with the reference angular position of the holes 6a, 6b where the leads may be inserted through the holes 6a, 6b, thereby to assemble the electrolytic condenser by use of a sealing rubber 6 which is proved competent by the inspections to increase the production efficiency of the electrolytic condenser.

Figure 2