March 13, 1962 C. J. STOCKHAUSEN ETAL 3,024,579

TRANSPARENT PACKAGING FOR BEARINGS

Filed Dec. 29, 1958 3 Sheets-Sheet 1

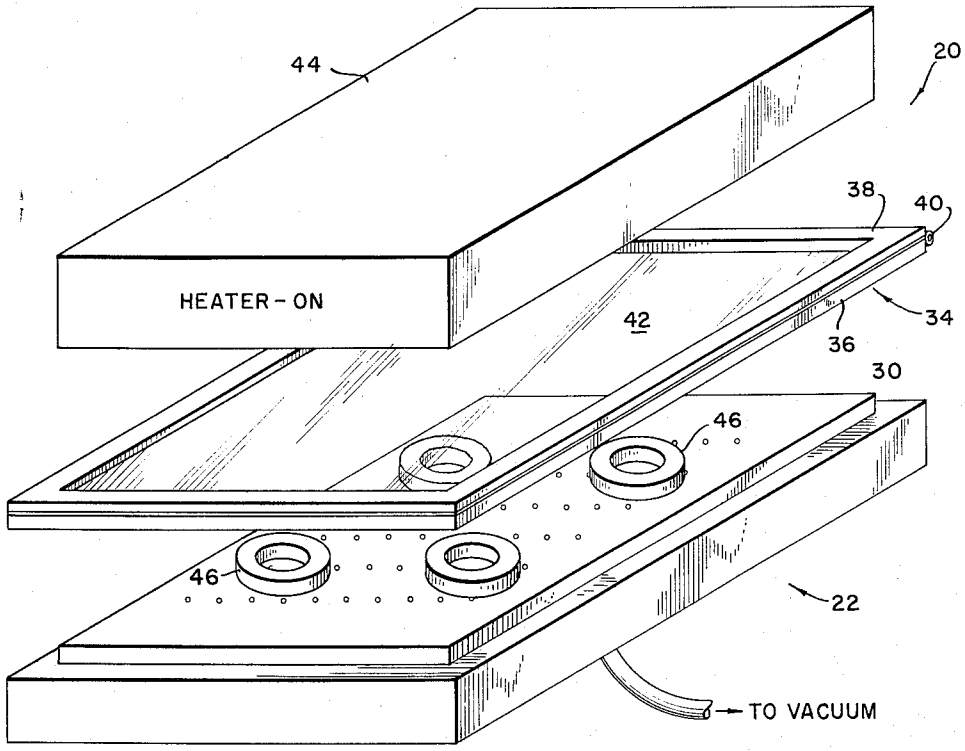

FIG. 1.

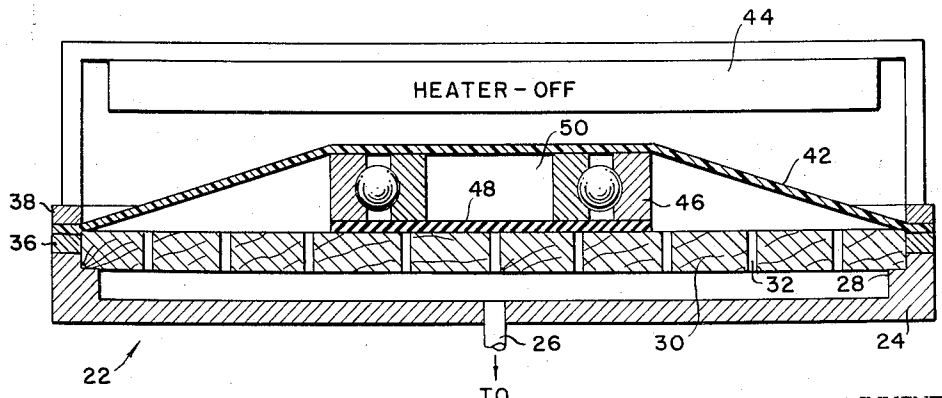

FIG. 2.

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TRANSPARENT PACKAGING FOR BEARINGS

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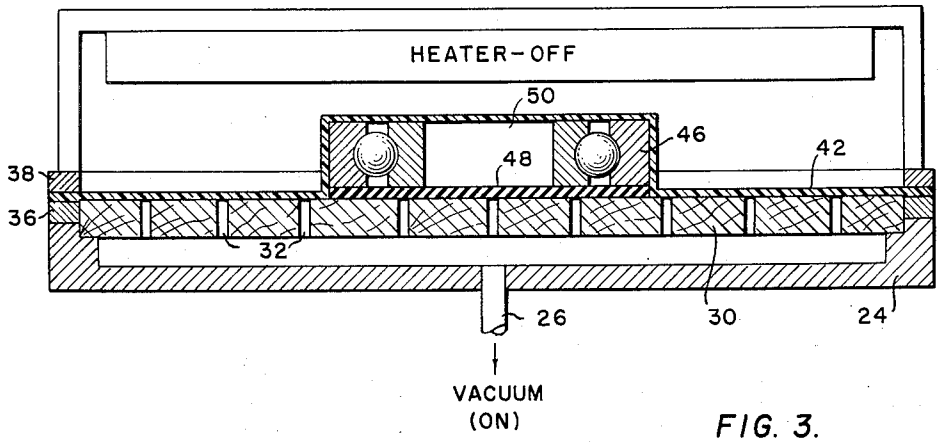

FIG. 3.

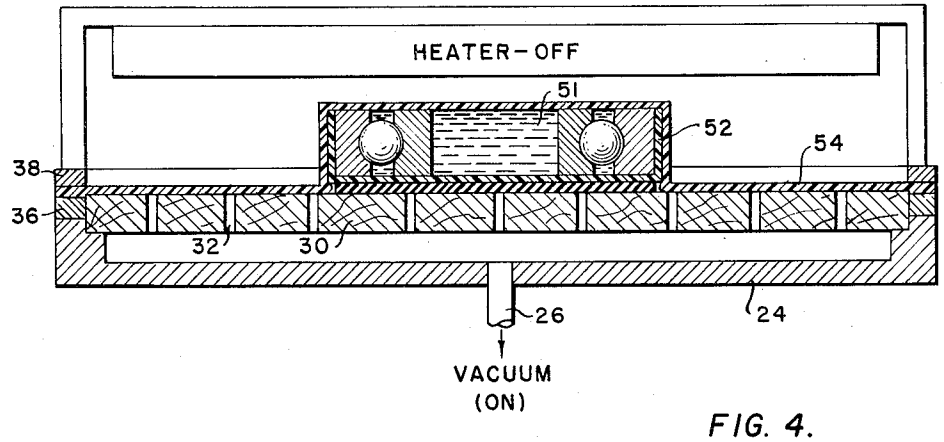

FIG. 4.

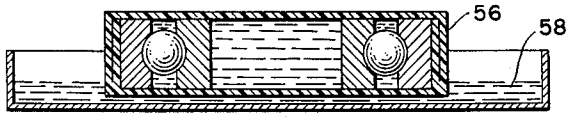

FIG. 5.

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TRANSPARENT PACKAGING FOR BEARINGS

Filed Dec. 29, 1958 3 Sheets-Sheet 3

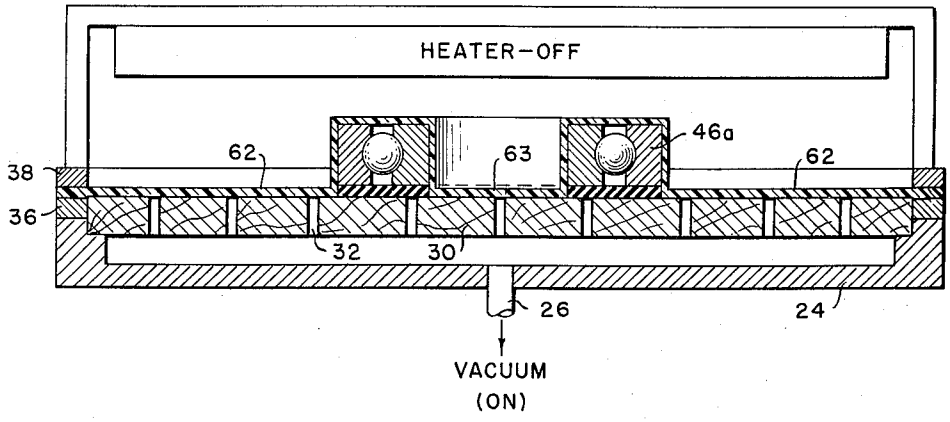

FIG. 6.

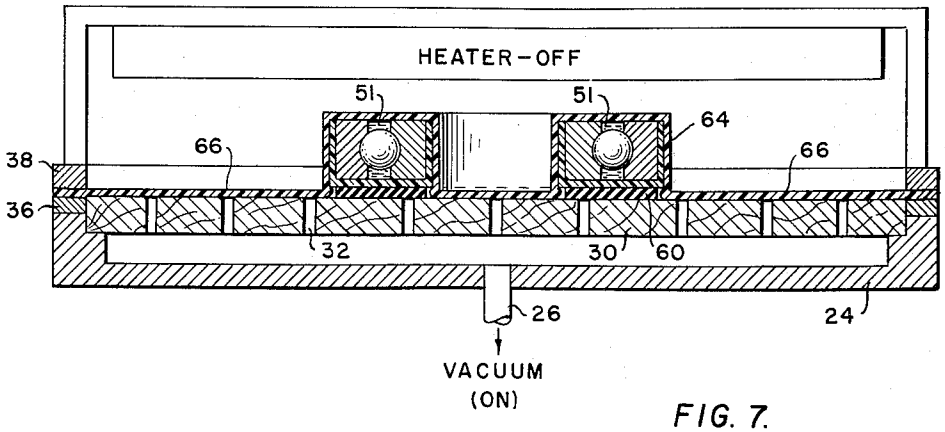

FIG. 7.

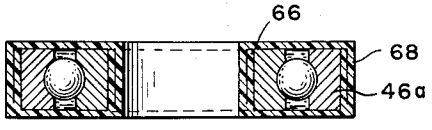

FIG. 8.

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3,024,579

TRANSPARENT PACKAGING FOR BEARINGS

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9 Claims. (Cl. 53—22)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to a package and a method of making the same, and more particularly to packaging with transparent plastic materials so that the package conforms intimately with the shape of the article that is packaged.

The instant invention is particularly directed to the packaging of anti-friction bearings of either the ball or roller type, but it is emphasized that the packaging techniques hereinafter described may be applied to other articles. In accordance with one prior art practice, bearings are packaged in either translucent or opaque materials that are simply wrapped around the bearing so as to protect the bearing from atmospheric conditions, the bearing then being placed in some form of outer container such as a box or the like. This packaging technique has a material disadvantage in that it renders the bearing invisible to observation, so that it is impossible to determine the size and type of bearing without unwrapping the same, and thus exposing the bearing to moisture and the like which may cause corrosion of the bearing.

Another prior art bearing packaging technique makes use of transparent bags of polyethelene plastic, wherein the bearing is placed in the bag and the bag is sealed to close the same. This structure has the disadvantage of generally requiring a bag that is substantially larger than the bearing contained therein, further by virtue of the rather loose fit of the package around the bearing, it is difficult to observe the nature of the bearing within the package since the package usually contains some form of preservative.

In accordance with the instant invention a bearing is provided with a transparent package, formed in the manner hereinafter set forth, that intimately contacts the peripheral surfaces of the bearing thereby making examination of the bearing quite simple through the packaging material. In the case of extremely large roller or ball bearings the package is so formed that it is doughnut shaped in configuration thereby conforming to the shape of the bearing thus providing a stronger package for the bearing and eliminating areas near the center of the package which may be subject to breakage due to the weakness of the package material in such area. The instant packages, described above, are vacuum formed about the bearing to be packaged therein utilizing the bearing itself as the mold, thereby eliminating the need for a separate package forming die.

It is an object of this invention to overcome the disadvantages found in the prior art.

It is another object of this invention to provide a transparent package and method of making the package.

Still another object of this invention is to provide a package that conforms exactly to the shape of an article being packaged.

A further object of this invention is to provide a transparent package for an anti-friction bearing, wherein said package conforms exactly to the shape of the bearing.

Still a further object of this invention is to provide an airtight package that conforms exactly to the shape of the article being packaged.

An added object of this invention is to provide an airtight transparent package for an anti-friction bearing, wherein said package conforms exactly to the shape of said bearing.

Still an added object of this invention is to provide a packaging process wherein the package is formed by moulding around the article being packaged.

An additional object of this invention is to provide a packaging process wherein an article is packaged by forming a heat stretchable material around the article using said article as a die for forming the package.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is an exploded perspective view showing the first step in the practice of the instant invention;

FIG. 2 is a transverse sectional view of the structure shown in FIG. 1 showing the instant invention at a subsequent step in the instant process of forming a package;

FIG. 3 is a transverse sectional view corresponding to FIG. 2 and showing the next step in the instant process;

FIG. 4 is a transverse sectional view following in sequence from FIG. 3 showing a further step in the instant process;

FIG. 5 is a transverse sectional view showing a means for sealing the package formed in accordance with the method shown in the preceeding figures;

FIG. 6 is a transverse sectional view showing a modified embodiment of the instant inventive process;

FIG. 7 is a transverse sectional view corresponding to FIG. 6 and showing the process carried through a further step; and

FIG. 8 is a transverse sectional view of a bearing packaged in accordance with the method shown in FIGS. 6 and 7.

Referring now to the drawings wherein like reference characters designate like or corresponding parts throughout the several views there is shown in FIG. 1 a schematic, perspective view of an apparatus **20** utilized in practicing the instant invention.

The packaging apparatus **20** includes a vacuum table **22** that comprises a tray member **24** that is more or less bowl shaped in form and has extending therethrough a pipe **26** connected to a source of vacuum. The tray **24** is provided with an interior ledge **28** extending around the periphery thereof. Either a wooden or metal plate **30**, having a plurality of holes **32** extending therethrough, is supported on the ledge **28**, the area of contact between the plate **30** and the ledge **28** being substantially air tight.

The vacuum forming apparatus **20** further comprises a rectangular frame **34** which consists of two frame sections **36** and **38** that are hingedly connected to one another at one end thereof by a hinge **40**. The frame sections **36** and **38** are adapted to clamp a transparent sheet of cellulose acetate or some other heat stretchable plastic material **42**, in the manner shown in FIG. 1.

The instant apparatus further includes an infra red heater **44** of any desired and conventional type, said heater **44** being of such a size that it is adapted to heat the entire surface of the sheet **42**.

In carrying out the process of the instant invention, a plurality of anti-friction either roller or ball bearings **46**, which have been pre-treated so as to render the same free of moisture and dirt, are placed on the perforated plate **30** in the manner shown in FIG. 1, for example. For purposes hereinafter described, an air impervious disc **48** conforming in size and shape to the outer periphery of the bearing **46**, is interposed between the bearing **46** and the plate **30**. The disc **48** may be made of various mate-

rials that are impervious to air, for example, a closed cell sponge rubber has been found particularly useful for this purpose. After the bearings 46 have been placed on the disc 48, a transparent sheet of a heat stretchable plastic such as cellulose acetate for example, is placed in the frame 34 in the manner shown in FIG. 1. The term "heat stretchable" is herein used to define those plastic materials that are formable and are adapted to take on a new and permanent configuration under the influence of heat and pressure.

The heater 44 is next placed over the plastic sheet 42, in the manner shown in FIG. 1 for a period of time sufficient to render the sheet 42 stretchable, and yet not long enough to damage the sheet. The heater 44 is then either retracted from above the sheet 42, or the heat is turned off, and the frame 34 is lowered into contact with the tray 24, in a manner shown in FIG. 2. The elements are so proportioned that there is an air tight seal around the periphery of the plastic sheet 42 between said sheet and the upper surface of the plate 30. It should be borne in mind that at this stage of the operation, the sheet 42 is still stretchable and will take the form shown in FIG. 2. At this time, the tube 26 is connected to a source of vacuum which communicates through the holes 32 with the area between the sheet 42 and the plate 30 thereby drawing said sheet 42 down against the plate 30 around the outer periphery of the bearing 46, as shown more clearly in FIG. 3.

The vacuum is then turned off and the entire assembly, consisting of the bearing 46 and the sheet 42 are lifted free of the plate 30. It is pointed out that by virtue of having the air impervious disc 48 interposed between the bearing 46 and the plate 30, the plastic sheet 42 is drawn below the lower edge of the bearing, as can be seen in FIG. 3. The disc 48 serves a further function, namely, it prevents the vacuum from drawing the sheet 42 down into the central area 50 of the bearing and/or into other interstices found in said bearing.

The next step is the removal of the disc 48 from beneath the bearing 46, after which the excess plastic 42 is trimmed from the edge of the bearing 46, said trimming operation leaving a cup shaped transparent plastic enclosure around the bearing that is flush with one edge of the bearing 46. The bearing is now partially enclosed in a transparent, tightly fitting plastic cup 52 which is then inverted to the position shown in FIG. 4 and filled with anti-corrosion preservative of one sort or another, as for example cosmoline. The operation described above, and shown in FIGS. 1 and 2 is then repeated, utilizing a second sheet 54 of transparent cellulose acetate or the like which in accordance with the instant process, is heated to a stretchable point as was the sheet 42, lowered over the bearing 46 and vacuum drawn about the outer periphery of the bearing 46 which in this step includes the first cup member 52. The assembly is then removed from the plate 30, the disc 48 is removed and the excess plastic 54 is trimmed off substantially flush with the lowest surface of the cup 52 forming a second plastic cup 56.

The bearing 46 is now completely enclosed in an extremely tight fitting package composed of the cups 52 and 56, said fit being tight by virtue of the vacuum drawing of the stretchable plastic about the bearing in the two operations described above. The package is subsequently sealed by dipping the lower edge of the bearing, as viewed in FIG. 4, into a quantity of acetone 58 or other plastic solvent in the manner shown in FIG. 5. This step of course results in a fusion between the bottom of the plastic cup shaped enclosure 52 and the lower peripheral edge of the second plastic cup 56, all as shown in FIG. 5.

It is emphasized that the above process results in a transparent bearing package that is extremely durable, moisture and air impervious, and also is of a very minimum in size and of such a nature that the bearing 46 carried therein may be readily inspected.

While the instant invention, as described above, may be practiced with bearings of various sizes, it has been found that somewhat better packaging results are obtained with extremely large bearings when a somewhat different approach is used. Attention is accordingly directed to the modified method shown in FIGS. 6, 7 and 8. It is emphasized that the apparatus 20 utilized in the method shown in FIGS. 6–8 is the same as that shown in FIGS. 1–5 and that the process steps, that is, heating and subsequent drawing of the plastic about the bearing is substantially the same. However, instead of using the continuous air impervious disc 48 utilized in the process shown in FIGS. 1–5, an annular disc 60 of like material is utilized and has a width the same as the distance between the inner periphery and the outer periphery of a bearing 46*a*. The annular disc 60 is placed between the bearing 46*a* and the plate 30, and the same process steps are carried out as described above.

To be more specific, a sheet of plastic 62 is placed over the bearing 46*a*, is heated to the stretching point, lowered over the bearing and vacuum drawn about the bearing in the manner shown in FIG. 6. It should be noted that in accordance with this embodiment of the invention, the plastic sheet 62 is not only drawn about the outer periphery of the bearing but is also drawn down into the axial hole formed in the bearing, thereby forming what might be described as a half doughnut shaped enclosure for the bearing 46*a*. The partially formed structure is then removed from the plate 30 and the excess of the plastic sheet 62 is trimmed from the outer and inner peripheries of the bearing, including the circular plastic piece 63 in the center of the bearing, thus forming a half doughnut shaped enclosure section 64 for the bearing 46*a*. The bearing 46*a* is then inverted, and the partial enclosure 64 is filled with preservative 51 and once again placed on the plate 30 on top of the annular disc 60. The process is then repeated with a second sheet of plastic 66, after which the unit is removed from the plate 30 and the excess of the plastic sheet 66 is trimmed from around the outer and inner peripheries of the bearing thereby providing the bearing 46*a* with a tightly fitting second half doughnut shaped enclosure 68, said enclosure 68 being in tight surface contact with the enclosure section 64. The unit is then sealed by dipping in the acetone 58 in much the same manner shown in FIG. 5. The latter step serves to fuse together the lower edge of the cup 68 and the bottom surface of the cup 64, in the manner shown in FIG. 8, thereby providing a moisture and air impervious transparent plastic, doughnut shaped enclosure for a bearing.

The process shown in FIGS. 6 through 8 is resorted to in the case of larger bearings as a means for conserving preservative 51 and also as a means for providing a stronger package, inasmuch as it serves to eliminate the large central enclosure of the bearing which would normally have to be filled with preservative in the manner shown in FIGS. 1–5. The process in FIGS. 6–8 also eliminates the large expanse of plastic across the central preservative filled area, which area is quite likely to be punctured, with an ensuing loss of preservative.

The instant invention accordingly results in an inexpensive, easily executed process and resultant package for the air-tight and moisture proof sealing of bearings and/or of other structures of like character. It is emphasized that the instant process requires only relatively simple equipment and can be carried out by persons of ordinary skill. In addition, it is emphasized that the instant process results in a new and improved sealed package for a bearing, said package utilizing a minimum amount of plastic material and also being moisture and air impervious while at the same time being of such a nature that one can readily examine the bearing enclosed within the package, without breaking the seal. It should also be noted that inasmuch as the instant package is free of excess plastic projecting beyond the periphery of the bearing, said package is substantially stronger than pre-

vious attempts at transparent packaging of bearings which have utilized heat sealing techniques on peripherally extending layers of plastic. Furthermore, by eliminating the aforementioned peripherally extending layers of plastic, the instant package may be enclosed in an outer container of relatively simple construction, such as an ordinary cardboard box or the like, said box requiring no particular internal structure for supporting the bearings as has been the case in the past with bearings packaged in transparent material having peripherally extending, heat fused layers. Such previous packing techniques result in a package that is more or less T-shaped in form and therefore requires a specially constructed box in which to be contained.

It should be understood, of course, that the foregoing disclosure relates to only preferred embodiments of the invention and that numerous modifications or alterations may be made therein without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. A method of packaging an annularly shaped article comprising the steps of placing said annular article in proximity with a source of vacuum, interposing an air impervious annular layer of material between said article and said source of vacuum, placing a first sheet of heat strethable material over said article, heating said first sheet to a stretchable condition, placing said first sheet in surface contact with said annular article, vacuum drawing said first sheet about the inner and outer peripheral surfaces of said article trimming off any excess of said first sheet that extends beyond the inner and outer peripheral surfaces of said article, thereby forming a first annular, partial enclosure for said article; inverting said partially enclosed article, placing a second sheet of heat stretchable material over said article, heating said second sheet to a stretchable condition, placing said second sheet in surface contact with said article, vacuum drawing said second sheet about the inner and outer peripheral surfaces of said partially enclosed article, trimming off any excess of said second sheet from beyond the inner and outer peripheral surfaces of said partially packaged article, thereby completely enclosing said article in a doughnut-shaped package.

2. A method as set forth in claim 1 wherein both of said sheets are formed of transparent cellulose acetate.

3. A method as set forth in claim 2 comprising the further step of applying a cellulose acetate solvent to the superimposed surfaces of said cellulose acetate partial enclosures, thereby bonding said enclosures together to form a moisture and air impervious package for said article said package being doughnut shaped in form.

4. A method of packaging an annular bearing structure comprising an outer race and an inner race, comprising the steps of placing one side of said bearing in proximity with a source of vacuum, interposing an air impervious annular member between one side of said bearing and said source of vacuum, placing a first sheet of heat stretchable material over the opposite side of said bearing, heating said first sheet to a stretchable condition, placing said first sheet in surface contact with said opposite side of said bearing, vacuum drawing said first sheet about the outer surface of said outer race and the inner surface of said inner race, removing said air impervious member from between said bearing and said source of vacuum, trimming off any excess of said sheet that extends outwardly beyond any surface of the inner and outer races of said bearing, thereby forming a first, annular, partial enclosure for the bearing; inverting said partially enclosed bearing, placing said inverted bearing in proximity with said source of vacuum placing a second sheet of heat stretchable material over the other side of said bearing, heating said second sheet to a stretchable condition, placing said second sheet in surface contact with the other side of said bearing, vacuum drawing said second sheet about the partially enclosed bearing, trimming off any excess of said second sheet that extends outwardly beyond any surface of the inner and outer races of the bearing, thereby completely enclosing said bearing in an annular shaped package.

5. A method of packaging an annular bearing structure comprising an outer race and an inner race, comprising the steps of placing one side of said bearing in proximity with a source of vacuum, interposing an air impervious annular member between one side of said bearing and said source of vacuum, placing a first sheet of heat stretchable material over the opposite side of said bearing heating said first sheet to a stretchable condition, placing said first sheet in surface contact with said opposite side of said bearing, vacuum drawing said first sheet about the outer surface of said outer race and the inner surface of said inert race, removing said air impervious member from between said bearing and said source of vacuum, trimming off any excess of said sheet that extends outwardly beyond any surface of the inner and outer races of said bearing, thereby forming a first, annular, partial enclosure for the bearing; inverting said partially enclosed bearing, placing a quantity of anti-corrosion preserving agent within said partial enclosure in contact with said partially enclosed bearing, placing said inverted bearing in proximity with said source of vacuum placing a second sheet of heat stretchable material over the other side of said bearing, heating said second sheet to a stretchable condition, placing said second sheet in surface contact with the other side of said bearing, vacuum drawing said second sheet about the partially enclosed bearing, trimming off any excess of said second sheet that extends outwardly beyond any surface of the inner and outer races of the bearing, thereby completely enclosing said bearing in an annular shaped package.

6. A method of packaging an annular bearing structure comprising an outer race and an inner race, comprising the steps of placing one side of said bearing in proximity with a source of vacuum, interposing an air impervious annular member between one side of said bearing and said source of vacuum, placing a first sheet of heat stretchable material over the opposite side of said bearing, heating said first sheet to a stretchable condition, placing said first sheet in surface contact with said opposite side of said bearing, vacuum drawing said first sheet about the outer surface of said outer race and the inner surface of said inner race, removing said air impervious member from between said bearing and said source of vacuum, trimming off any excess of said sheet that extends outwardly beyond any surface of the inner and outer races of said bearing, thereby forming a first, annular, partial enclosure for the bearing; inverting said partially enclosed bearing, placing said inverted bearing in proximity with said source of vacuum, placing a second sheet of heat stretchable material over the other side of said bearing, heating said second sheet to a stretchable condition, placing said second sheet in surface contact with the other side of said bearing, vacuum drawing said second sheet about the partially enclosed bearing, trimming off any excess of said second sheet that extends outwardly beyond any surface of the inner and outer races of the bearing, thereby completely enclosing said bearing in an annular shaped package, and sealing together the partial enclosures in moisture and air impervious condition by at least partially fusing together the overlapping portions of said partial enclosures, thereby rendering the resultant annular shaped package moisture and air impervious.

7. A method of packaging an annularly shaped article comprising the steps of placing said annular article in proximity with a source of vacuum, interposing an air impervious annular layer of material between said article and said source of vacuum, placing a first sheet of heat stretchable material over said article, heating said first sheet to a stretchable condition, placing said first sheet in surface contact with said annular article, vacuum drawing

said first sheet about the inner and outer peripheral surfaces of said article, trimming off any excesses of said first sheet that extend beyond the inner and outer peripheral surfaces of said article thereby forming a first annular partial enclosure for said article; inverting said partially enclosed article, placing a quantity of anti-corrosive preserving agent in contact with said partially enclosed article, placing a second sheet of heat stretchable material over said article, heating said second sheet to a stretchable condition, placing said second sheet in surface contact with said article, vacuum drawing said second sheet about the inner and outer peripheral surfaces of said partially enclosed article, trimming off any excess of said second sheet from beyond the inner and outer peripheral surfaces of said partially enclosed article, thereby completely enclosing said article in a doughnut-shaped package.

8. A method as set forth in claim 7 wherein both of said sheets are formed of transparent cellulose acetate.

9. A method as set forth in claim 8 comprising the further step of applying a cellulose acetate solvent to the superimposed surfaces of said cellulose acetate partial enclosures, thereby bonding said enclosures together to form a moisture and air impervious package for said article, said package being doughnut-shaped in form.

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