Sept. 26, 1961 R. GLAVAN ET AL 3,001,841

PILLOW BLOCK ROLLING BEARING OF SELF-ALIGNING TYPE

Filed Nov. 21, 1957

Fig. 1.

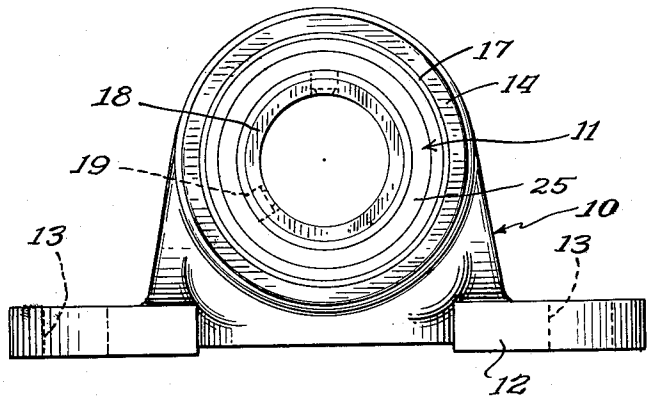


Fig. 2.

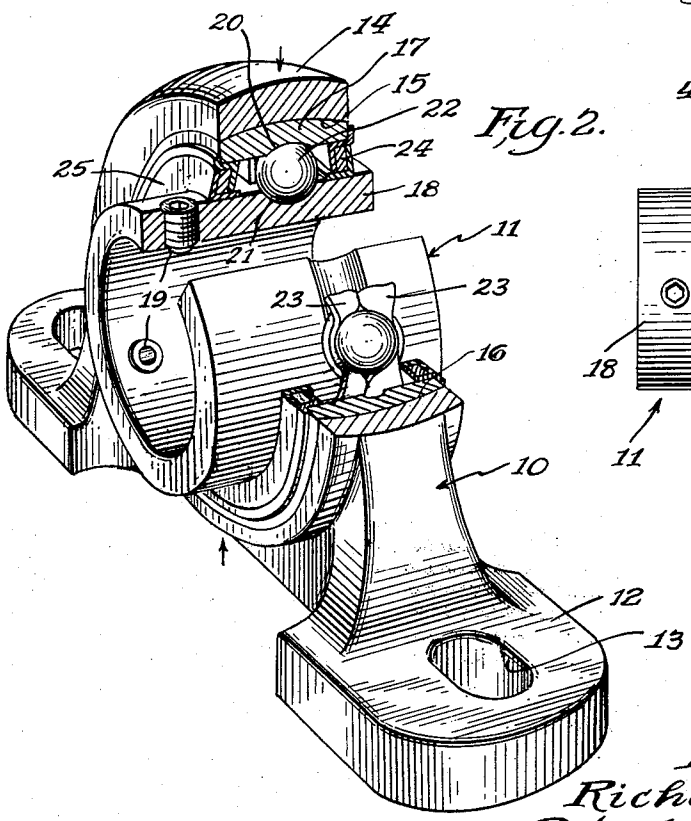
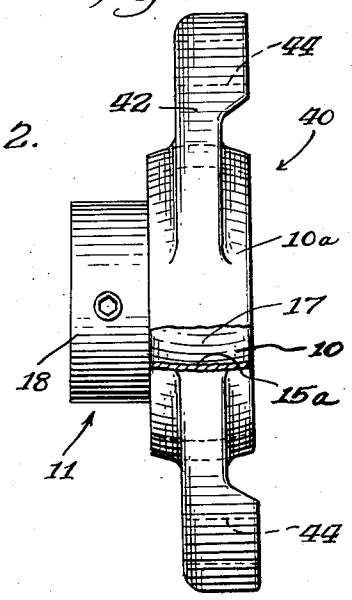


Fig. 3.



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PILLOW BLOCK ROLLING BEARING OF SELF-ALIGNING TYPE

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4 Claims. (Cl. 308—194)

This invention relates to a pillow block rolling bearing unit of the self-aligning type, and is characterized by its simplicity, structural strength, and endurability.

In self-aligning bearing units of the pillow block type, the outer race of the bearing assembly is spherically curved to coact with a correspondingly shaped inner surface of the pillow block so that a shaft mounted in the bearing can adjust itself to shaft misalignment, or be used under conditions in which the shaft changes its axis within limited angular relationships.

Housings for pillow block bearing units of this type are generally made in two parts, i.e., split either horizontally or vertically, with the two parts clamped together so that the convex surface of the outer race may be mounted within the concave surface of the pillow block. Obviously, a two-part bearing housing is objectionable, both from the standpoint of cost and convenience of usage.

Another type of pillow block rolling bearing unit is made in one piece from cast iron or other suitable cast material, and diametrically opposed slots are provided in the face of the pillow block so that the rolling bearing assembly may be slipped endwise into position within the pillow block, and then rotated about a transverse axis to its operative position. Bearing units of this type, because of their mounting slots, are structurally weakened to the extent that material is removed from the pillow block to form the slots.

In both types of pillow block bearing units mentioned above (namely, the two-part pillow block type and the type having mounting slots), it is necessary to machine the concave spherical surface within the pillow block with a single point tool, which is a relatively costly operation. In the pillow block bearing of this invention, this type of machining is unnecessary.

The principal object of this invention, therefore, is to provide a pillow block type of self-aligning rolling bearing unit in which the pillow block support for the bearing assembly is made in one piece, and is characterized by an uninterrupted spherical supporting surface for the correspondingly shaped outer race of the bearing assembly, and, in its preferred form, by the ductility or malleability of the material from which the pillow block support is made.

A further object of the invention is to provide a bearing unit of this type which can be made cheaply, and yet be equal or superior in quality to other pillow block bearing units on the market today.

Further and other objects of the invention will be apparent as the disclosure proceeds and the description is read in conjunction with the accompanying drawings, in which:

FIGURE 1 is a front elevational view showing a pillow block rolling bearing unit embodying this invention;

FIGURE 2 is a perspective view, partly in section, showing details of the bearing unit; and

FIGURE 3 is a plan view, with parts broken away, of a flange type bearing unit embodying this invention.

Referring now to the drawings, the bearing unit comprises a pillow block, generally designated **10**, of unitary construction, and a self-aligning bearing therefor, generally designated **11**.

The pillow block **10** is preferably cast or forged in one piece and is preferably of ductile cast iron, nodular iron,

malleable iron, perlitic malleable iron, Meehanite, bronze, aluminum-bronze, or any other suitable ductile or malleable material. The pillow block may also be forged from a suitable steel such as SAE 4130, 410 SS (stainless steel), aluminum, or any other suitable forging material. In some instances, it may even be made of a harder, more brittle metallic material.

The pillow block **10** comprises a base **12** provided with openings **13** for the reception of mounting screws or bolts. Rising from the base **12** is an integral bearing housing portion **14** having a circular, concave, spherically contoured wall or face **15** therein which coacts with the correspondingly shaped convex outer surface **16** of the outer race **17** of the bearing assembly. It will be observed that wall or face **15** is uninterrupted between its circular side edge portions.

The spherical shape of the face **16** of the outer race and the face **15** of the housing portion **14** permit the bearing assembly as a whole to have limited universal movement with respect to the pillow block so that the bearing may adjust itself to limited angular positions within the pillow block.

The inner race of the bearing assembly is shown at **18**, and it comprises a tubular sleeve which projects outwardly from the pillow block to accommodate shaft set screws **19** which permit a shaft to be locked within the inner race **18**.

The outer race **17** is provided with a bearing groove **20**, and the inner race has a corresponding groove **21** in which ball bearings **22** are adapted to travel. The balls within the bearing are maintained in proper spaced relation within the grooves by retaining rings **23** which are riveted or clamped together in a conventional manner. Sealing rings **24** and **25** complete the bearing assembly.

It will be observed that the housing portion **14** for the bearing assembly **11** is of uniform width and continuous throughout its entire periphery and that it defines a continuous and uninterrupted spherically contoured wall surface forming the bearing seat. This is in contradistinction to the ordinary type of unitary pillow block self-aligning bearing units which necessarily require mounting slots in order to permit the bearing assembly to be inserted within the housing. Because of the omission of these slots in our bearing housing construction, the bearing unit is substantially stronger and is better capable of withstanding thrust loads which are often placed upon the bearings. Furthermore, with the housing completely encasing the bearing assembly **11**, dirt and foreign matter are excluded from the spherical faces **15** and **16**, and this is, of course, advantageous.

It should be mentioned that the bearing unit may be provided with a suitable lubricating fitting if desired without departing from the spirit of the invention.

There are several ways to make a bearing unit of the type herein disclosed, one being disclosed in our co-pending application, Ser. No. 697,839, filed November 21, 1957 and another being disclosed in co-pending application, Ser. No. 697,843, filed November 21, 1957, and the disclosures of both of these applications are hereby incorporated in their entirety by reference.

In the method disclosed in application Ser. No. 697,839, now Patent No. 2,952,898, granted September 20, 1960, the housing portion **14** of the pillow block is formed with a straight cylindrical wall which may readily be broached to size, and the outer race **17** with its convex, spherically shaped periphery is placed centrally within this opening, whereupon the housing portion **14**, being of ductile or malleable metal, may be swaged over the outer race to form the spherical surface **15**. This firmly locks the outer race in place within the housing portion **14**.

Thereafter the pillow block with its encased race **17** is placed on its side in a fixture, and the inner race **18**

is placed within the outer race and against one side thereof, in this instance the bottom side. Balls **22** are then dropped into the crescent-shaped space between the outer race and the inner race; and, in order that the bearing may have maximum load capacity, pressure may be applied against the top and bottom of the pillow block (the direction being indicated by arrows in FIGURE 2) in order to distort the housing portion **14** and outer race **17** to elliptical shape in order to insert one more ball than would otherwise be possible. The distortion of the housing portion **14** can be readily accomplished when the housing is made of ductile material. With the parts thus sprung to elliptical shape, an additional ball bearing may be inserted in the crescent-shaped space and forced downwardly into position, after which the pressure on the housing is released, whereupon the balls may be angularly spaced about the bearing, and then held in place by the retaining rings **23**.

In the second method, which is disclosed in our copending application, Ser. No. 697,843, now Patent No. 2,952,900, granted September 20, 1960, after surface **15** has been machined in the pillow block, the outer race **17** is deformed within its elastic limit to elliptical shape by forcing it edgewise through a tapered squeeze ring positioned adjacent to the opening **15** within the housing and with the smallest diameter of the ring immediately adjacent to such opening. This permits the race **17** to snap past the face of the housing **14** and into a central position within the housing, whereupon the squeeze ring may be removed and the race **17** rotated to its operative position, after which the bearing assembly is completed in the manner previously described.

When the housing **10** is made of a ductile or malleable material, such as previously described, insertion of the outer race **17** into its operative position may be facilitated by applying a squeeze pressure on the housing in a direction normal to that applied to the outer race, and in this way slightly deform the housing **10** to elliptical shape but within its elastic limit.

In cases where it is unnecessary to distort the housing **10** to elliptical shape for application of the outer race **17**, the housing may be made of a more brittle material, such as ordinary cast iron, in which case the spherical seat for the outer race may be formed with conventional machine tools, such as a single point tool.

It will be obvious that the principles of our invention are applicable to other types of bearing units that include housings formed from materials such as those above specified, as illustrated by FIGURE 3, which shows a flange type bearing unit **40** that may be produced by either of the methods described above. The unit **40** includes a bearing assembly **11** mounted in seat **15***a* of flange housing **10***a* that is formed from materials of the type specified above. Housing **10***a* includes flanges **42** appropriately formed with bolt or screw holes **44**. Surface **15***a* is formed and the outer race applied thereto in the same manner as described above, and the bearing assembly completed as also described above.

Therefore, the term "pillow block" as used in the appended claims is intended to mean all rolling bearings that include a housing formed from the materials specified above regardless of the particular manner in which the housing is shaped for purposes of mounting the unit in operating position.

Our improved bearing unit can be produced in volume at low cost, and yet it is equal to or superior to conventional two-piece pillow block bearing units or slotted pillow block bearing units on the market today.

The term "ductile" as employed in the appended claims means all material of the type mentioned in the specification as well as all suitable materials of the ductile or malleable type.

The term "rolling bearing" as used in this specification and in the appended claims is intended to include all forms of bearing units in which one or more members or elements are rolled between inner and outer race members. This term is thus meant to include units employing single and multiple rows of balls, rollers, and the like, and thus is synonymous with the term "antifriction bearing" widely used in the bearing art, and is to be distinguished from plain type bearings or bearing units.

The terms "massive structure type housing member" and "massive structure type housing portion" as used in the appended claims mean cast or forged ball bearing assembly housing members and portions of the general types shown at **10**, **10***a* and **14** of the appended drawings, as distinguished from sheet metal housing members and portions, examples of which are disclosed in Noe Patent 2,794,691.

The terms "bearing" and "bearing assembly" as used in this specification and in the appended claims are intended to mean the combination of the inner and outer race members and the rolling elements associated therewith.

In the appended claims, it should be understood that in describing the ball bearing grooves in the inner and outer races as being "perfectly circular" it is meant that all ball-engaging portions of the grooves are truly circular with respect to the axis of rotation of the ball bearing assembly and are free of indentations such as are caused by brinelling when the spherical seat of the housing is formed by swaging or other pressure forming means over the ball bearing assembly.

We claim:

1. A self-aligning ball bearing unit comprising a one piece pillow block massive structure tye housing member, said housing member including a planar base portion, an upstanding web normal to said base portion, and an annular bearing housing portion, said web integrally uniting said base portion and said housing portion, said housing portion extending normally of said web, with its central axis parallel to the plane of said base portion, said housing portion being formed with a circular opening defined by a spherically contoured continuous and uninterrupted annular internal wall defining a continuous and uninterrupted concave spherically contoured wall surface of uniform width axially of said opening and terminating in continuous and uninterrupted circular side edge portions that correspond to the side edge portions of said wall, said wall surface defining a spherically contoured bearing seat, and a ball bearing assembly swivelly mounted in said bearing seat, said ball bearing assembly comprising a one-piece outer race having a spherically contoured outer periphery that is complemental to the configuration of said housing member wall surface, an inner race received within said outer race, said inner and outer races being formed with concentrically arranged perfectly circular grooves, a plurality of bearing balls received in said grooves about said inner race, and a retainer device for holding said balls in spaced relation about said inner race.

2. The bearing unit set forth in claim 1 in which at least one end of said housing portion extends laterally of said web and includes a continuous and uninterrupted annular rim defining a side edge portion of said surface, the internal portion of said rim constituting a part of said surface.

3. The bearing unit set forth in claim 1 in which both ends of said housing portion extend laterally of said web, said ends each including a continuous and uninterrupted annular rim that defines the respective side edge portions of said surface, the internal portion of said rims constituting a part of said surface.

4. A self-aligning ball bearing unit comprising a housing member including a planar wall portion and an annular bearing massive structure type housing portion extending normally of said wall portion, said housing portion being formed with a circular opening defined by a spherically contoured continuous and uninterrupted an-

nular internal wall defining a continuous and uninterrupted concave spherically contoured wall surface of uniform width axially of said opening and terminating in continuous and uninterrupted circular side edge portions that correspond to the side edge portions of said wall, said wall surface defining a spherically contoured bearing seat, and a ball bearing assembly swivelly mounted in said bearing seat, said ball bearing assembly comprising a one-piece outer race having a spherically contoured outer periphery that is complemental to the configuration of said housing member wall surface, an inner race received within said outer race, said inner and outer races being formed with concentrically arranged perfectly circular grooves, a plurality of bearing balls received in said

grooves about said inner race, and a retainer device for holding said balls in spaced relation about said inner race.

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