

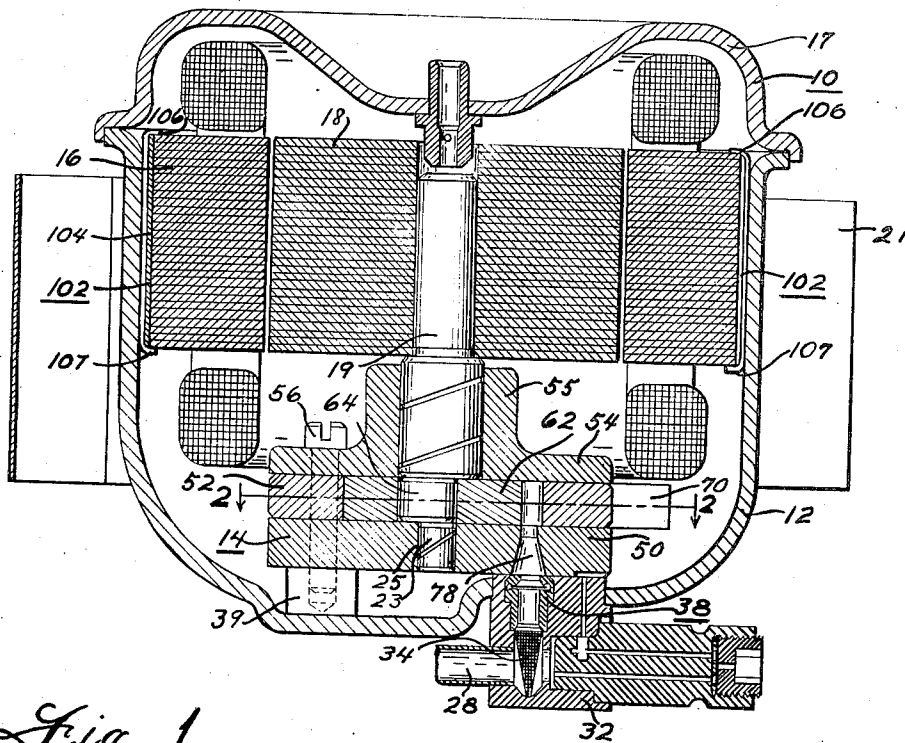
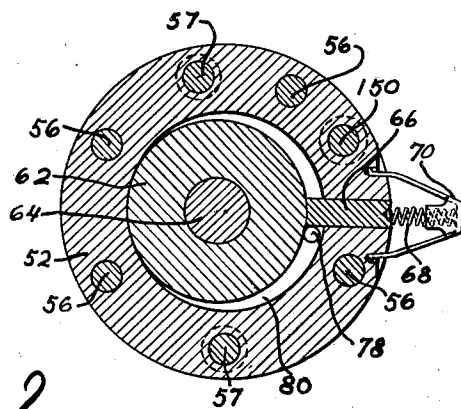
June 12, 1945.

F. I. RATAICZAK

2,377,965

POSITIONING FIXTURE

Original Filed Dec. 11, 1942 4 Sheets-Sheet 1



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4 Sheets-Sheet 2

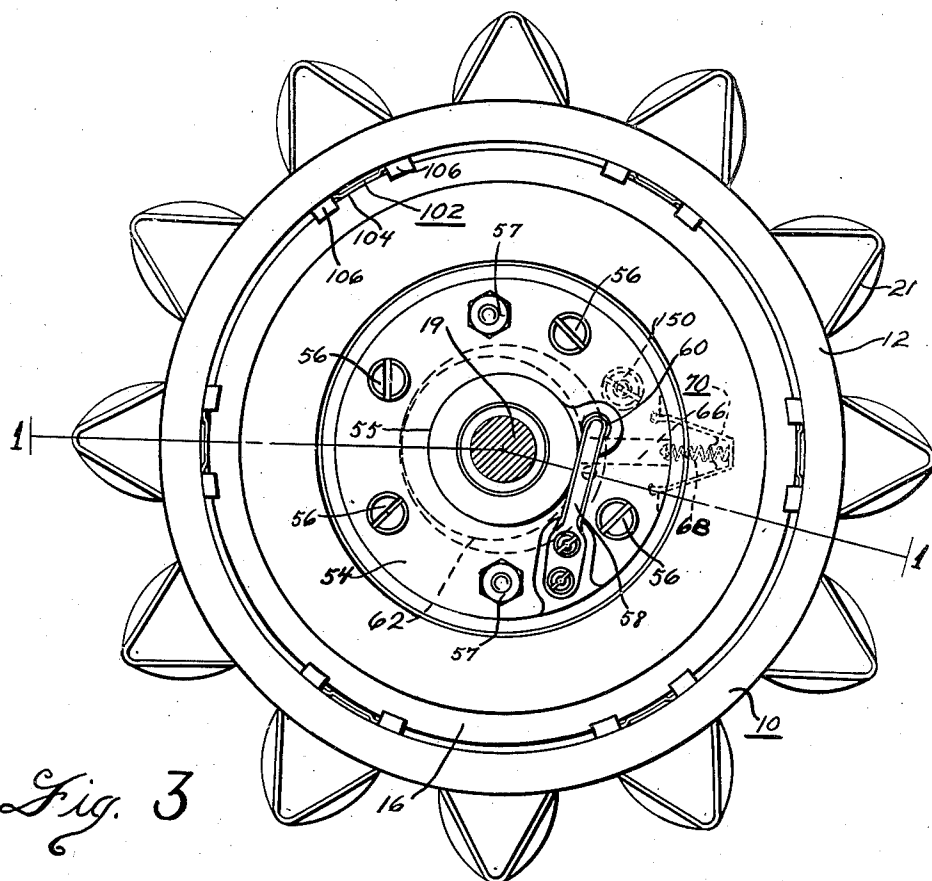


Fig. 3

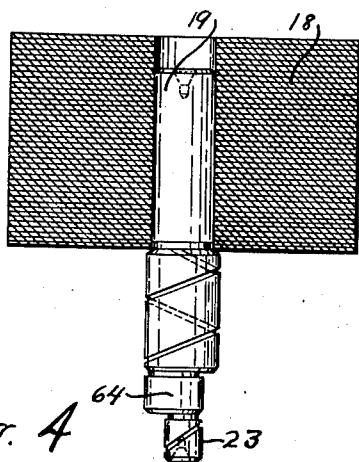


Fig. 4

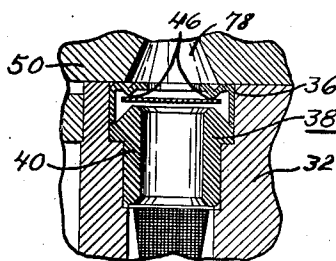


Fig. 5

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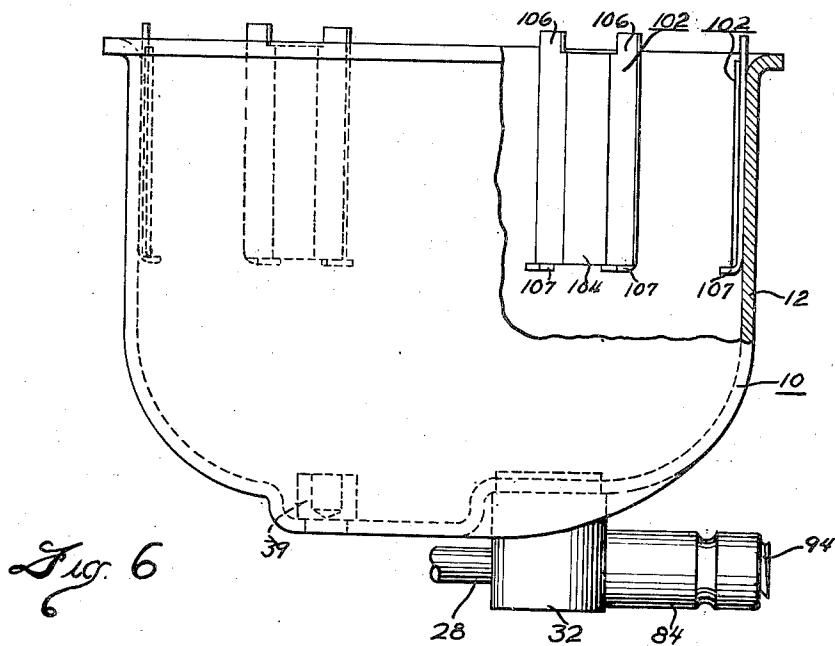
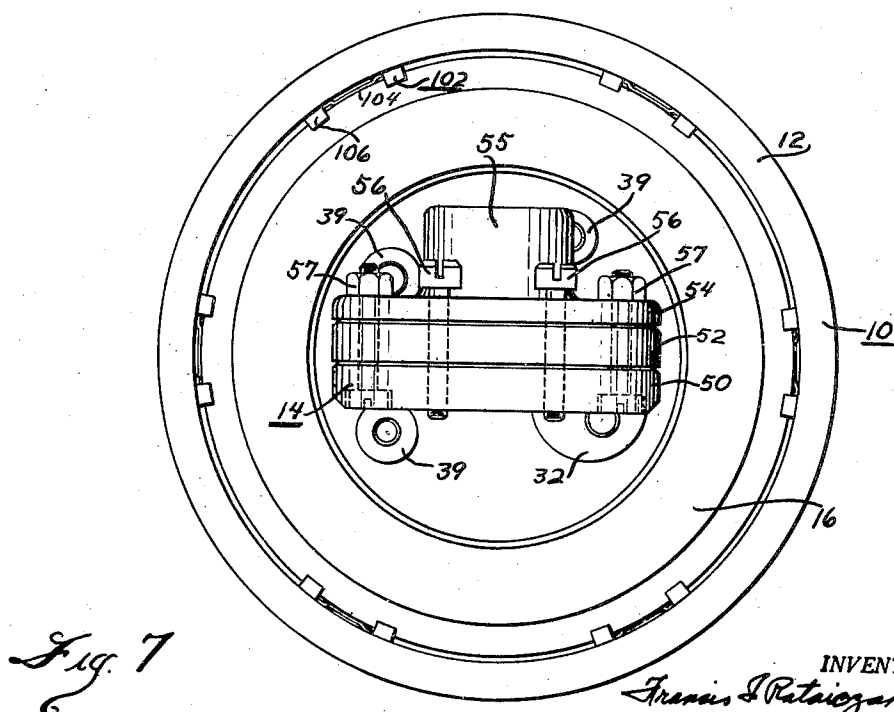
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POSITIONING FIXTURE

Original Filed Dec. 11, 1942

4 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,377,965

POSITIONING FIXTURE

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Original application December 11, 1942, Serial No.
468,615, which is a division of application Serial
No. 395,645, May 28, 1941. Divided and this
application September 9, 1943, Serial No.
501,665

7 Claims. (Cl. 33—181)

This invention relates to refrigerating apparatus and more particularly to a positioning fixture for use in fabricating a motor-compressor unit.

This application is a division of my copending application Serial Number 468,615, filed December 11, 1942, which in turn is a division of my copending application Serial Number 395,645, filed May 28, 1941.

One of the objects of this invention is to provide a positioning fixture for facilitating mass production of motor-compressor units.

Another object of this invention is to provide means for detecting errors in alignment in motor-compressor parts during the assembly of these parts.

A further object of this invention is to simplify the assembly of the motor-stator within the motor-compressor housing.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a partly diagrammatic view of a refrigerating system showing the motor-compressor unit in section;

Fig. 2 is a sectional view of the compressor unit taken on the line 2—2 of Fig. 1;

Fig. 3 is a plan view of the motor-compressor unit with the cover of the casing removed and with the motor-rotor broken away;

Fig. 4 shows the construction of the main shaft and the motor-rotor;

Fig. 5 is an enlarged sectional view showing the suction valve assembly;

Fig. 6 is an elevational view of the main casing without the heat radiating fins and with a portion of the casing broken away so as to more clearly show the motor-stator mounting means;

Fig. 7 is a plan view of the main casing and the motor-stator and illustrates the manner in which the main compressor casing is inserted through the motor-stator;

Fig. 8 is an elevational view partly in section showing the apparatus used for aligning the main compressor cylinder with the motor-stator; and

Fig. 9 is a fragmentary elevational view, with parts broken away, illustrating the apparatus for aligning the main compressor bearing with the motor-stator.

In the manufacture of motor-compressor units, it is customary and, in fact, necessary to tolerate small errors in the dimensions and concentricity of various elements. In the ordinary motor-com-

pressor design the accumulation of tolerances materially affects the efficiency of the unit and frequently renders the unit completely inoperative, in which case, it becomes necessary to re-operate some of the parts or to match certain parts with other parts in which the dimensional errors balance out upon assembly. This is especially true in case the compressor and its associated motor-rotor is assembled with a stator which is not perfectly concentric with the main bearing due to tolerances necessary in the manufacture of the stator or due to a slight error in the manufacture of the stator mounting means or due to an accumulation of errors in the motor-stator and its mounting means.

Referring now to Fig. 1 of the drawings, in which I have shown a preferred embodiment of my invention, reference numeral 10 designates generally a hermetically sealed motor-compressor unit. Reference numeral 12 designates a substantially cup-shaped stamped sheet metal casing which forms the main support for the compressor assembly 14 and also the motor-stator 16. Reference numeral 18 designates a conventional motor-rotor. A stamped sheet metal end cap 17 closes the upper end of the cup-shaped casing element 12 and forms therewith a high pressure refrigerant vapor chamber. The end cap 17 is welded or otherwise secured to the main casing 12. Heat conducting fins 21 may be secured to the outside of the casing element 12 to help dissipate the heat.

As best shown in Fig. 5, the upper side of the adapter block 32 is provided with a recess 36 in which a check valve, generally designated by the reference numeral 38 is mounted. The valve 38 is held in place by the compressor end plate element 50 which rests upon the adapter block 32 and one or more mounting blocks 39 which are welded or otherwise secured to the bottom wall of the casing 12. The upper surfaces of the blocks 32 and 39 are machined so as to be perpendicular to the motor-stator support surfaces described hereinafter.

As best shown in Fig. 1, the compressor assembly 14 comprises a lower end plate 50, a cylinder element 52 and an upper end plate 54 which has formed integrally therewith the main bearing 55. The upper end plate 54, as shown in Fig. 3, carries a conventional discharge valve assembly 58 which controls the flow of refrigerant through the compressor outlet 60 provided in the end plate 54. An impeller 62 is provided within the cylinder 52. The impeller 62 is mounted on the eccentric 64 which causes the impeller to

compress the refrigerant in accordance with well-known practice.

A divider block 66 cooperates with the cylinder 52 and the impeller 62 in accordance with well-known practice. A spring 68 biases the divider block into engagement with the impeller 62. The outer end of the spring rests against the spring retainer 70. The spring retainer 70 is slipped into place before the cylinder 52 is clamped between the end plates 50 and 54 and is held in place by the end plates 50 and 54.

The end plate 50 is provided with a tapered passage 78 which conveys the low pressure refrigerant vapor from the inlet valve 38 to the compression chamber 80. By virtue of the taper in the walls of the passage 78, any slight misalignment between the end plate 50 and the inlet valve 38 will not interfere with the free flow of refrigerant from the inlet valve to the compression chamber.

The motor-stator 16 is held in place by means of special clamps such as 102. The clamps 102 are initially formed as shown in Fig. 6, and are spot welded or otherwise secured to the shell 12. In the prior art devices, it is customary to provide a press fit between the outer shell of the compressor and the motor-stator. In such an arrangement, it is very difficult to properly hold the motor-stator in place unless a very heavy cast iron frame or the equivalent is used; and once the motor-stator is in place, it is very difficult to remove it for inspection or repair purposes. By virtue of the clamping arrangement shown, a light weight sheet metal casing may be used and the final sizing operation may be performed merely by forcing a die of proper size into the opened end of the casing so as to deform the projecting portion 104 of each clamp 102 the necessary amount. This arrangement of parts and method of sizing eliminates the necessity for turning the inner surface of the outer shell 12 to size on a lathe. Furthermore, the clamping elements 102 serve to compensate for any taper or irregularity in the walls of the shell 12. It is difficult to form the outer sheet metal casings to any exact dimension since the strains and stresses in the sheet metal casing produced by the drawing operation tend to distort the walls of the casing. The clamps 102, however, sufficiently compensate for such distortions.

After the motor-stator has been inserted in place, the projecting ends 106 of the clamp elements 102 are bent over onto the upper side of the motor-stator so as to hold the motor-stator in a fixed position. This not only reduces the cost of construction and facilitates the assembly of the apparatus, but also facilitates the removal of the motor-stator in the event that it becomes necessary to replace the motor-stator. The lower ends of the clamps 102 are provided with ears 107 which limit the downward movement of the motor-stator.

In order to avoid the harmful accumulation of tolerances in dimensions in assembling the various parts, the various parts of the unit are assembled in the following manner. In assembling the various elements that go to make up the compressor unit, the first step is to position the cylinder 52 with respect to the lower end wall 50. This is done by means of a conventional positioning mandrel (not shown) which holds the member 52 in proper alignment with the member 50 while one or more bolts such as bolt 150 (see Fig. 3) is or are tightened so as to clamp the elements 50 and 52 together in their proper

relationship. After the elements 50 and 52 have been fastened together in proper alignment, the impeller 62, the divider block 66, the divider block spring 68 and the spring retainer 70 are inserted in place and the upper end plate 54 is bolted to the cylinder 52 and the lower end plate 50 by means of bolts 57. A positioning mandrel (not shown) is used for holding the end plate 54 in alignment while the bolts 57 are being tightened.

The compressor assembly may then be inserted downwardly through the opening in the motor-stator as shown in Fig. 7. The compressor assembly is of such shape and size that it may readily pass through the opening in the motor-stator. After the compressor assembly has been slipped into place in the bottom of the casing 12, a specially constructed positioning fixture 152 is used for aligning the main compressor bearing with the inner surface of the motor-stator.

The positioning fixture 152 comprises a central shaft 154 provided with a knurled handle 156. The main portion of the central shaft 154 has a diameter corresponding to the internal diameter of the main compressor bearing 55. Another portion 158 of the central shaft 154 has a diameter slightly less than the internal diameter of the impeller 62. The lowermost portion 160 of the central shaft 154 has a diameter corresponding to the internal diameter of the bearing 25 provided in the lower end plate 50 for the lowermost portion 23 of the main compressor shaft 19. The positioning fixture 152 has an intermediate sleeve member 162 which is slidably mounted on the central shaft 154. The intermediate sleeve 162 is provided with a knurled handle portion 164. The lower end of the sleeve 162 is tapered for a purpose explained hereinafter. The main body 166 of the positioning fixture 152 has a central aperture through which the sleeve 162 and the shaft 154 may be inserted. The outer diameter of the main portion of the element 166 is slightly less than the internal diameter of the motor-stator 16.

As best shown in Fig. 9, the main body 166 of the positioning fixture is provided with four longitudinally extending slots 168 in each of which is mounted a shoe element 170. Each shoe element 170 is provided with a shank 172 which passes through a radially extending hole 174 formed in the body 166. The inner end of each shank is provided with a cam surface 176 which is adapted to engage the tapered portion of the sleeve 162. The element 166 is provided with a shoulder 178 which limits the movement of the element 166 within the motor-stator 16. The arrangement is such that when the positioning fixture is inserted into the motor-stator and the sleeve element 162 is moved into the position in which it is shown in Fig. 8, the sleeve 162 cams the shoes 170 into engagement with the motor-stator, whereby the central shaft 154 of the positioning mandrel may be used for lining up the compressor assembly with respect to the motor-stator.

The main body 166 of the positioning fixture is provided with a plurality of apertures 180 through which access may be had to the cap screws 56 which secure the compressor assembly to the mounting blocks 32 and 39. While the positioning fixture is in place, the cap screws 56 are securely tightened so as to rigidly hold the compressor assembly in position. After having tightened the cap screws 56, the positioning mandrel is removed. By removing the sleeve 164, the shoes 170 release their hold on the walls of the

motor-stator whereby the mandrel may be removed without difficulty.

In the event that the upper surfaces of the block 39 and the adapter element 32 are not perpendicular to the inside walls of the motor-stator, the positioning mandrel will bind when the cap screws 56 are tightened. This serves to give notice that the proper perpendicularity is lacking so that the compressor assembly may be immediately removed and the parts reoperated so as to obtain the proper perpendicularity. After removal of the positioning mandrel 152, the motor-rotor 18 and its associated shaft 19 may be dropped into place.

Inasmuch as the above described construction allows the motor-rotor to be secured to the shaft 19 prior to the assembly of the shaft in the main bearing, it is possible to true-up the outer diameter of the motor-rotor after it has been mounted on the shaft, thus eliminating the accumulation of tolerances in the concentricity of the main shaft, the internal bore of the motor-rotor and the external diameter of the motor-rotor.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A positioning fixture for positioning a compressor bearing assembly in concentric relationship to a motor-stator comprising, in combination, a central shaft element for engaging said compressor bearing assembly, an inner sleeve member slidably mounted on said central shaft, an outer sleeve member slidably mounted on said inner sleeve member, the outer diameter of said outer sleeve member being slightly less than the inner diameter of said motor-stator, a plurality of stator engaging shoes carried by said outer sleeve member, and means carried by said inner sleeve member for forcing said shoes into engagement with the inner wall of said motor-stator so as to centrally locate the central shaft with respect to said motor-stator.

2. A positioning fixture for positioning a compressor bearing assembly in concentric relationship to a motor-stator comprising, in combination, a central shaft element for engaging said compressor bearing assembly, an inner sleeve member slidably mounted on said central shaft, an outer sleeve member slidably mounted on said inner sleeve member, the outer diameter of said outer sleeve member being slightly less than the inner diameter of said motor-stator, a plurality of stator engaging shoes carried by said outer sleeve member, and means carried by said inner sleeve member for forcing said shoes into engagement with the inner wall of said motor-stator so as to centrally locate the central shaft with respect to said motor-stator, one portion of said mandrel including an access opening through which means for securing the compressor assembly in fixed relationship to said motor-stator may be operated.

3. A positioning fixture for positioning a bearing in concentric relationship to a housing having a cylindrical opening comprising, in combination, a central shaft element for engaging said bearing, an inner sleeve member slidably mounted on said central shaft, an outer sleeve member slidably mounted on said inner sleeve member, the outer diameter of said outer sleeve member being slightly less than the inner diameter of said opening, a plurality of shoes carried by said outer sleeve member for engaging the wall of said opening, and means carried by said inner sleeve member for forcing said shoes into engagement with the wall of said opening so as to centrally locate the central shaft with respect to said housing.

4. A positioning fixture for positioning a bearing in the lower part of a cup-shaped casing substantially in concentric relationship to the central axis of said casing comprising in combination, a shaft element for locating said bearing within the lower part of said casing, a sleeve member slidably mounted on said shaft, an outer sleeve member slidably mounted on said first named sleeve member, the outer diameter of said outer sleeve member being slightly less than the inner diameter of said casing, a plurality of shoes carried by said outer sleeve member for engaging the inner wall of said casing, and means for forcing said shoes into engagement with the inner wall of said casing so as to centrally locate said shaft with respect to the inner wall of said casing.

5. A positioning fixture for positioning an element within a recess in a support comprising in combination, means slidable into said recess and having one portion adapted to engage said element to hold said element in place and having another portion adapted to engage the walls of said recess, and an aperture in said means through which a tool may be inserted down into said recess to fix said element within said recess.

6. A positioning fixture for positioning a compressor bearing assembly in concentric relationship to a motor-stator comprising in combination, a mandrel, a tapering member mounted thereon, expanding members carried by said mandrel and operated by said tapering member for engaging the inner surface of said motor-stator, and means carried by said mandrel for positioning said bearing assembly in concentric relationship to said motor-stator.

7. A positioning fixture for positioning a compressor bearing assembly in concentric relationship to a motor-stator comprising in combination, means having one portion adapted to engage said compressor bearing to hold said bearing in place and having another portion adapted to engage the walls of the central opening of said motor-stator, said means having aperture means therein through which a tool may be inserted through said central opening to fix said bearing assembly in place.