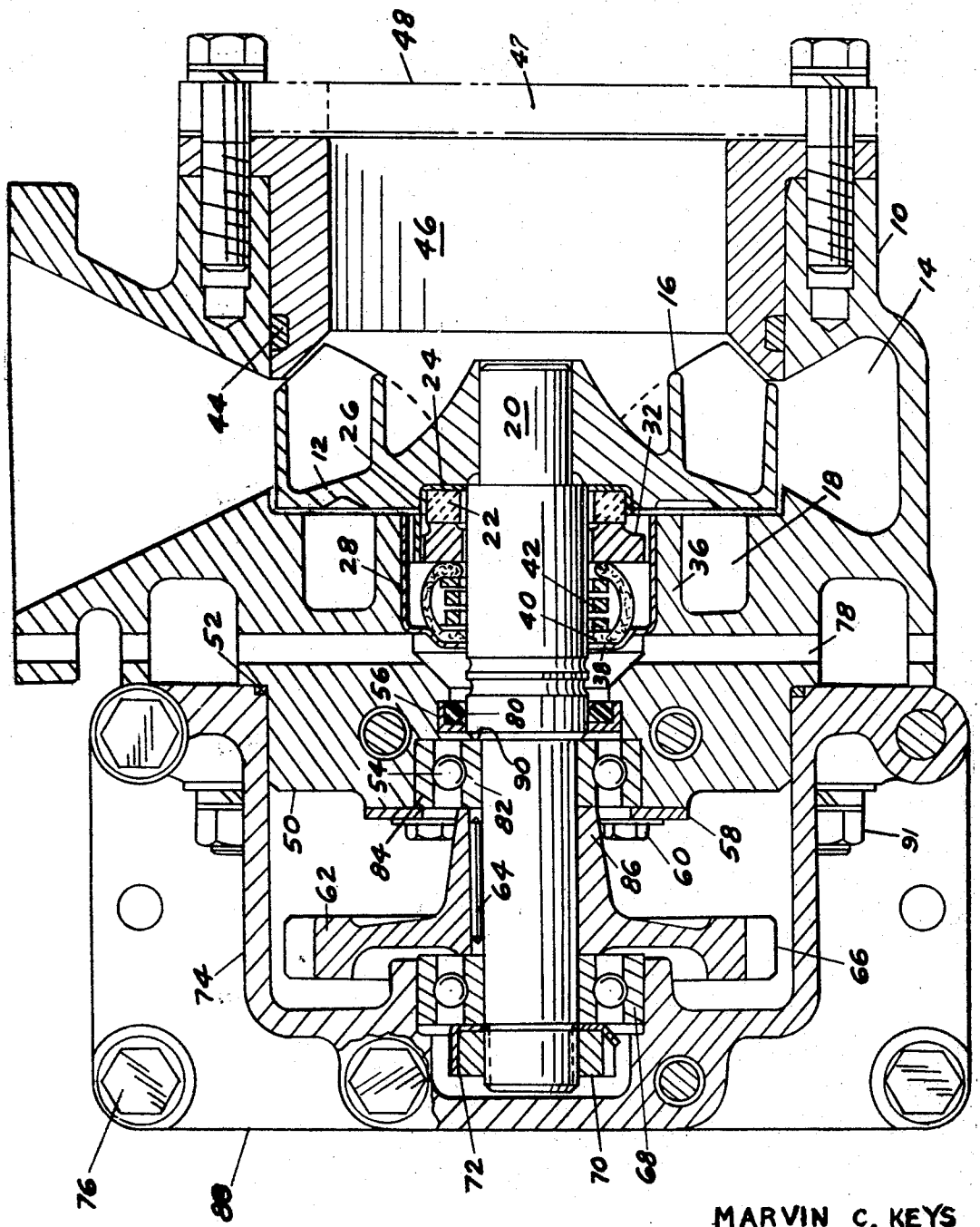
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WATER PUMP AND METHOD OF ASSEMBLY

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WATER PUMP AND METHOD OF ASSEMBLY

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ABSTRACT OF THE DISCLOSURE

A water pump having an impeller and drive gear axially displaced on a shaft which is journalled on bearings which are preloaded as a result of force exerted on the impeller by a spring which surrounds the shaft. The method of completely assembling the water pump and then inserting it into its associated drive housing so that the pump can be installed in or removed from the drive housing as a unit.

This invention relates to a water pump and method of assembling same. In the past, the assembly of water pumps has been expensive, time-consuming, and not amenable to easy repair. Generally when a water pump is assembled or disassembled from its associated drive housing, the elements of the pump must be removed individually this results in a time consuming effort and moreover, the elements of the pump are subject to being lost.

The present invention therefore has for one of its objects the new and improved method of assembling a water pump so that the pump can be entirely assembled prior to installation in the drive housing.

Another object of the present invention is the method of assembling a water pump so that it can be readily installed and removed from its drive housing while all of its parts remain in assembled relation.

Still another object of the present invention is the method of assembling a water pump so that the bearings in which the impeller shaft rotates are preloaded prior to installation of the pump in its associated drive housing.

It is yet another object of the present invention to provide a method of asembling a water pump so that the entire pump including its drive gear are completely assembled and then located in the drive housing by means of a pilot extension of the water pump with all parts of the water pump remaining in proper position during the mating or demating of the water pump and the drive housing.

Yet another object of the present invention is to provide a method of assembling a water pump which will not structurally fail as a result of torsional vibration.

A further object of the present invention is a water pump which can be completely assembled prior to insertion in its drive housing.

A still further object of the present invention is a water pump which has bearings located intermediate the shaft and the water pump casing which are preloaded prior to assembly of the water pump and its drive housing.

Other objects and advantages of the present invention will be made obvious to those skilled in the art by the following description when considered in relation to the accompanying drawing of which;

A longitudinal sectional view of water pump of the present invention is shown in the single figure.

Referring now to the drawing the main casing of the water pump is shown gerenally at **10**. Secured to one end of casing **10** via means of seal **44** and suitable bolts is a cylindrical casing **46**. Fastened to the end of casing **46** is an end plate **47**. Mounted within the casing is an impeller **12**, which is secured to shaft **20** by furnace brazing. Previous designs have been limited in the amount of stress

which the assembly could withstand. In the past, impellers have been secured to the shaft by means of tapers, shrink-fitting, etc. These prior art devices are more subject to failure than the instant invention, however, due to torsional vibration. Hence, the new and improved means of securing the impeller to the shaft has improved the durability of the pump. Impeller **12** has blades **16** which direct the water through outlet port **14**. A low pressure area is shown generally at **18**. Before the impeller **12** and shaft **20** are placed into casing **10**, a seal **24** comprised of ceramic ring **22** and rubber carrier **26** is secured thereto. This design will place ceramic ring **22** in compression. The rubber carrier **26** could also be placed on the inner diameter of the ceramic ring **22**, however, this has a tendency to cause the ceramic to crack when it expands. By placing the rubber on the outside, the ceramic seal **22** is in compression rather than tension, hence the ceramic will not crack. Another marked advantage of this seal arrangement is that carrier **26** and ring **22** can be easily serviced by removing the shft and impeller assembly and installing new parts. Because the ceramic seal is not distorted at assembly, no lapping after installation is required.

Main casing **10** has a flange **36** in which cup-like element **28** is press fitted with an inwardly projecting shoulder **38**. Mounted within element **28** is a complementary ring shaped block **32** of carbon which has a highly polished surface engaging ceramic ring **22**. Helical spring member **42** is mounted within molding **40** and forces carbon block **32** into sealing engagement with ceramic ring **22**. Moulding **40** may be manufactured from a polymer, leather or other similar synthetic material. This entire sealing arrangement prevents water directed by the impeller from reaching shaft **20**.

Main casing **10** has a pilot extension **50** into which casing **56** is press-fitted. Lip seal **80** is secured in casing **56** and rides on shaft **20** in sealing engagement. Lip seal **80** prevents oil which is used to lubricate bearings **54** from passing into the impeller portion of the pump. Bearings **54** are also secured within pilot extension **50** by means of retaining plate **58** and bolts **60** pressing on outer race **84** and longitudinal extension **86** of gear **62** pressing on the inner race **82**. Driving gear **62** is secured to shaft **20** via means of key **64** and has teeth **66** which are driven by any suitable power source such as a power-take-off of a driving engine.

Shaft **20** is also journalled in bearings **68** which are secured within drive housing **74**. Bearings **68** are secured against gear **62** by means of lock washer **72** and lock nut **70**. Main casing **10** is secured to drive housing **74** by means of bolts **91**. Seal **52** is provided to provide adequate sealing of casing **10** and pilot extension **50**. Drive housing **74** is provided with a face plate **88** which is secured to the engine block, power source, or other suitable power-take-off means by means of bolts **76**. A cutout **78** in pilot extension **50** is also provided as an oil or water drainback. In the event oil passes by seal **80** or water passes by seals **24**, **22** and **32**, the liquids will drain through the port **78** rather than intermix the oil and water.

The present invention permits ease of assembly. Moreover, this construction permits complete assembly of the water pump including preloading of bearing **54** prior to inserting it into drive housing **74**. To assemble the pump, cup-like element **28** would be press-fitted into flange **36**. Moulding **40** with spring **42** therein and carbon ring **32** would be inserted in cup-like element **28**. Carbon ring **32** would then be inserted in cup-like element **28**. A composite member comprising impeller **12**, seal **24**, and shaft **20** is then placed through spring **42** with ceramic ring **22** mated in sealing engagement with carbon ring **32**. This arrangement allows the seal to be replaced without

removing impeller **12** from the shaft. Casing **56** carrying seal **80** is then press-fitted into sealing engagement with shaft **20** and pilot extension **50**. Bearing **54** is then secured against shoulder **90** of the shaft by means of retainer plate **58** and longitudinal extension **86** of gear **62**. Gear **62** is keyed to the shaft and secured by lock nut **70** which holds the inner race of bearing **68** against gear **62**. This entire completed assembly can then be installed in drive housing **70** and easily secured by means of bolts **91**.

This method of assembly also facilitates pre-loading of bearing **54**. This can be understood by reference to the drawing. Spring member **42** will tend to force carbon ring **32** against ceramic ring **22** which is a part of the impeller. Since impeller **12** is brazed to shaft **20**, shaft **20** and gear **62** will tend to shift to the right as a result of the compression spring **42** tending to force impeller **12** to the right as shown in the drawings. The longitudinal extension **86** of gear **62** only exerts force against inner race **82** of bearing **54**. Since outer race **84** remains stationary and inner race **82** tends to move with the shaft, the bearing is in a preloaded condition. The bearing **68** is not preloaded and the outer race of bearing **68** slips freely into drive housing **74** with a slight exertion of force. With the drive housing and main casing united, the entire pump may then be mounted on a power source such as a power-take-off of an engine by means of bolts **76** wherein teeth **66** would mesh with the teeth of the power-take-off gearing. This would cause shaft **20** and hence impeller **12** to turn and pump water from inlet port **48** through outlet port **14** as desired. Hence, a water pump and method of assembling same has been provided whereby the pump can be mounted on or removed from the drive housing as a unit while maintaining its bearings in a preloaded condition.

Since it is obvious that many changes and modifications can be made in the above described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not limited to said details except as set forth in the appended claim.

We claim:

1. A water pump which can be completely assembled and integrally mounted as a unit in a drive housing comprising a main casing having a pilot extension extending radially therefrom, a cup-shaped element secured within said pilot extension, a first bearing mounted in said pilot extension, a shaft journalled in said first bearing, an impeller mounted on one end of said shaft having a ring seal integrally attached thereto, a first seal comprising a ring block of material mounted within said cup-shaped element, a spring surrounding said shaft and in compressive engagement with said ring block of material such that said ring block of material is placed in sealing engagement with said ring seal mounted on said impeller, a second seal mounted intermediate said first bearing and said cup-shaped element and in sealing engagement with said shaft, a gear secured to said shaft having a portion in contact with the inner race of said first bearing, a retainer plate secured to said pilot extension and in contact with the outer race of said first bearing, a second bearing axially displaced from said first bearing and in which said shaft is journalled, and locking means holding said second bearing in contact with said gear, said spring exerting force on said impeller, said shaft and said gear whereby said first bearing is preloaded prior to assembly of the water pump as a unit in a drive housing.

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