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Macdonald

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[54] **TORQUE CONVERTER HAVING RESILIENTLY LOADED BYPASS CLUTCH PISTON**

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[51] **Int. Cl.**[7] **F16D 33/00**

[52] **U.S. Cl.** **192/3.28**; 192/3.3

[58] **Field of Search** 192/3.29, 3.3, 192/3.31

[56] **References Cited**

U.S. PATENT DOCUMENTS

5,383,540	1/1995	MacDonald	192/3.29
5,477,950	12/1995	Maloof	192/3.29
5,826,688	10/1998	Arhab et al.	192/3.29

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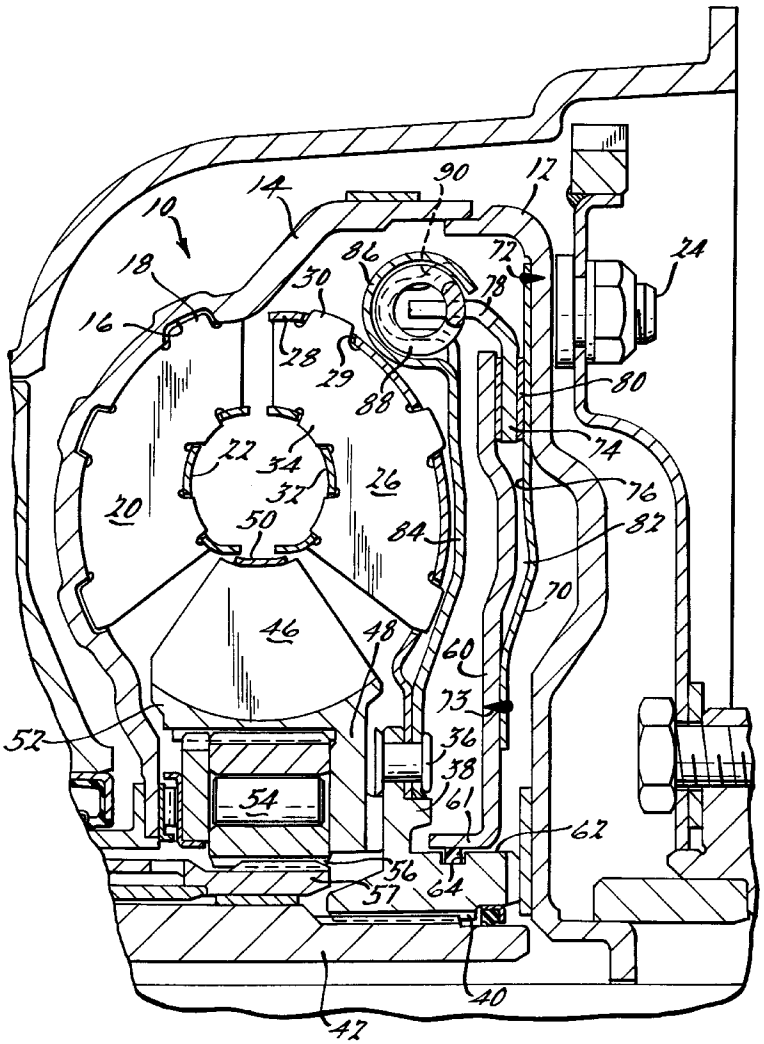
[57] **ABSTRACT**

A hydrokinetic torque converter includes an impeller cover and a bypass clutch. A drive ring is located between adjacent surfaces of the cover and a clutch piston, which moves axially on a support surface. The piston is welded at a radially outer position to thin clutch plate, which is supported at another radial location on the cover. As the piston moves into engagement with the ring and cover, the clutch plate permits this movement by bending elastically. When clutch apply pressure is reduced, energy stored in the clutch plate is used to move the piston out of engagement with the drive ring and cover.

8 Claims, 3 Drawing Sheets



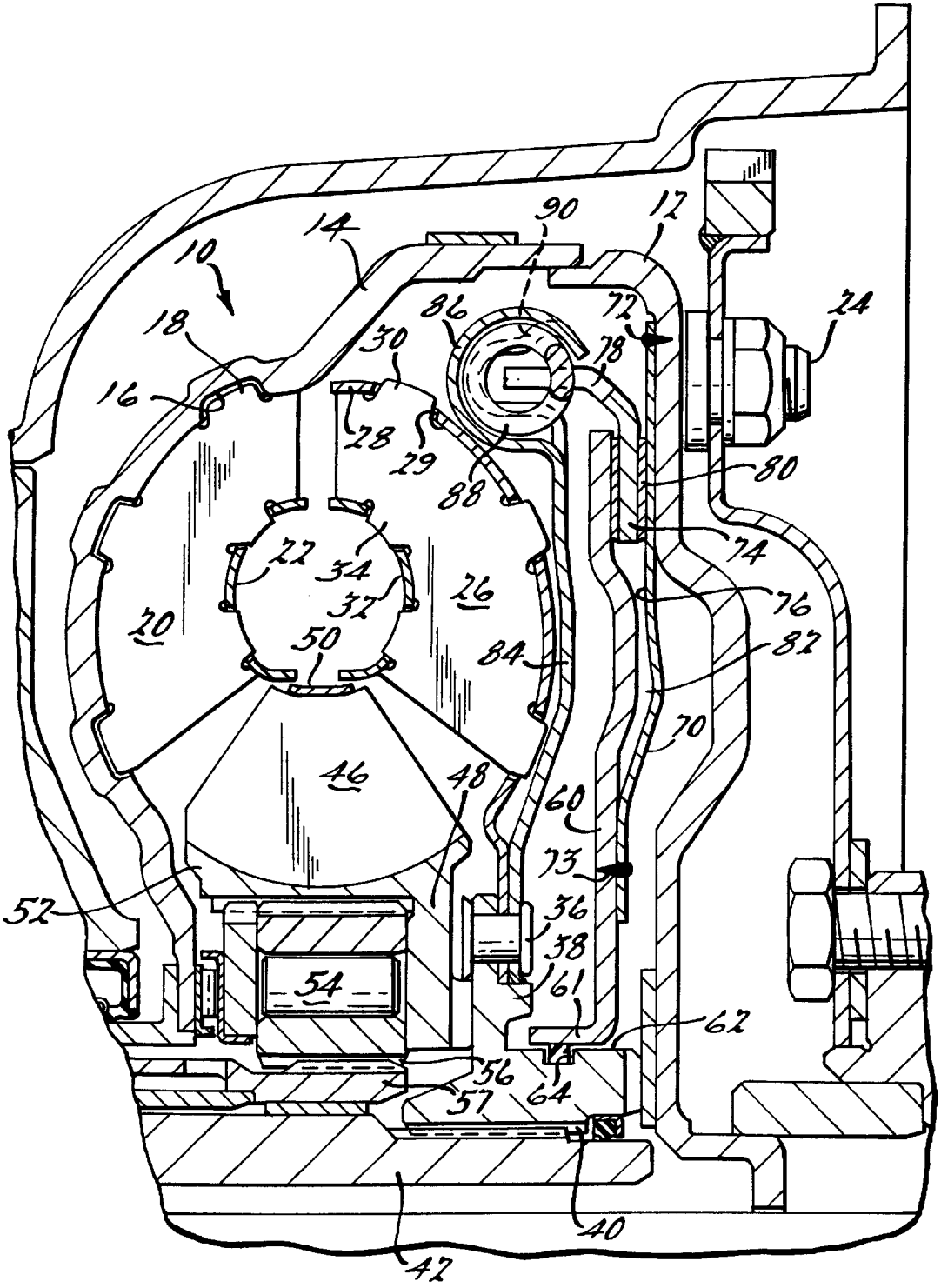


Fig. 1.

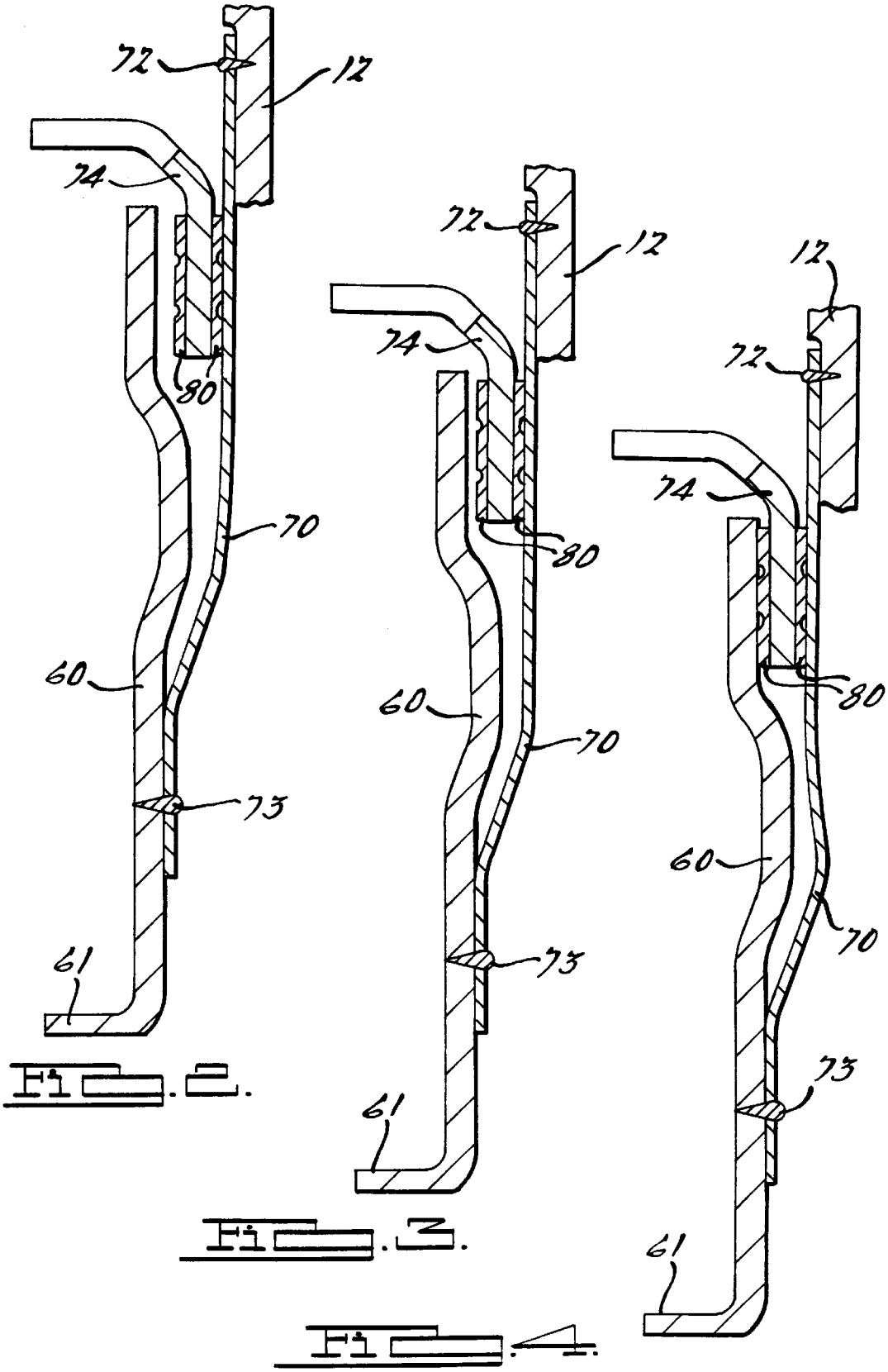
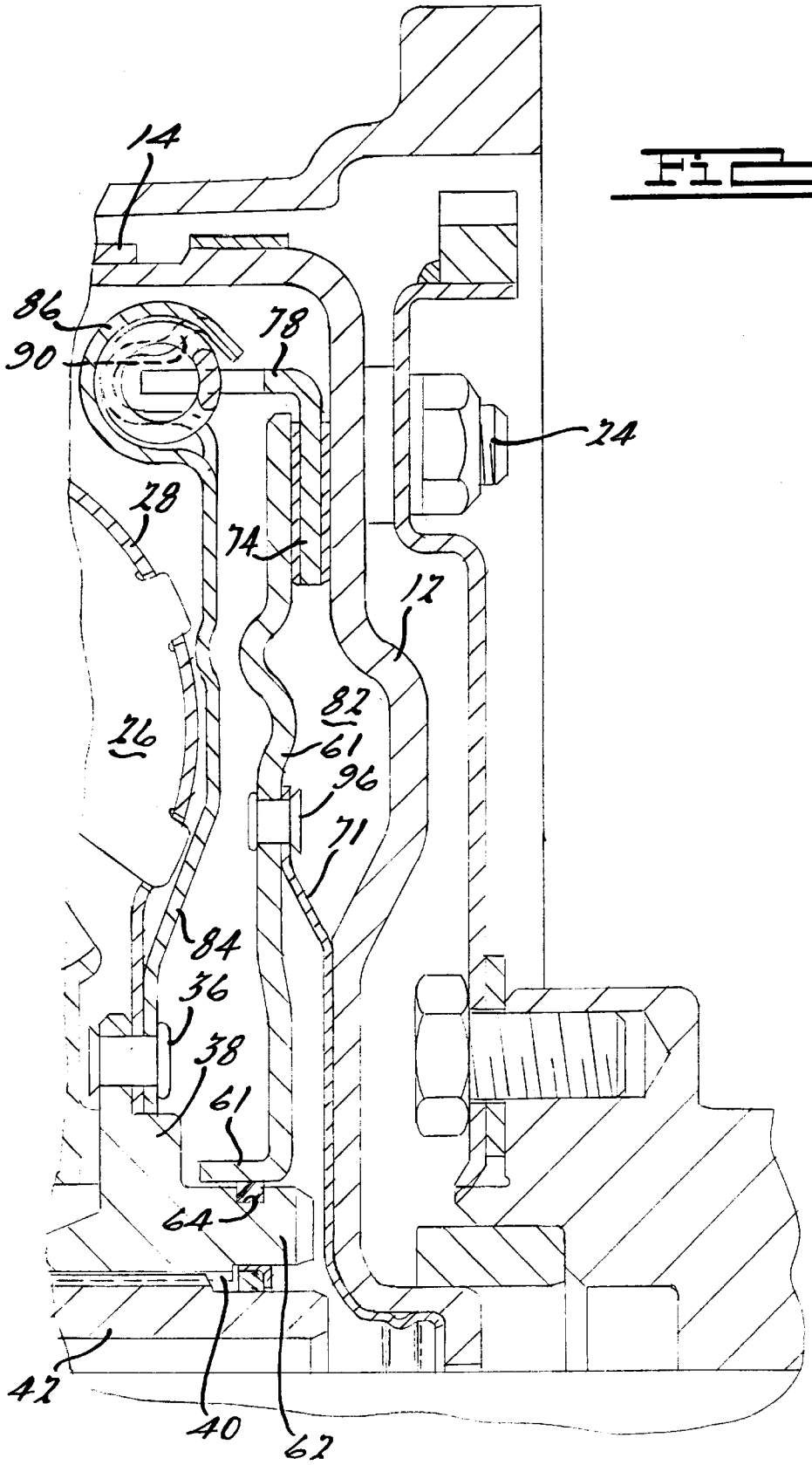


FIG. 2.

FIG. 3.

FIG. 4.

Fig. 5.



TORQUE CONVERTER HAVING RESILIENTLY LOADED BYPASS CLUTCH PISTON

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of automatic transmission hydrokinetic torque converters. The invention pertains particularly to a bypass clutch for a torque converter.

2. Description of the Prior Art

A device for deducing noise and vibration in a torque converter bypass clutch is described in U.S. Pat. No. 5,477,950, which is assigned to the assignee of this invention. The hydrokinetic torque converter includes an impeller wheel and turbine wheel. The housing for the impeller includes a lockup clutch assembly having a clutch plate that engages a friction surface on the impeller housing. The clutch plate carries friction material that establishes a frictional driving connection between the impeller and the turbine when differential pressure across the clutch plate is sufficient to establish a clutch-engaging force.

The clutch plate is connected through a damper assembly to the hub of the turbine, thus establishing a mechanical torque transfer between an engine crankshaft and the turbine shaft, which bypasses the hydrokinetic torque flow path through the torque converter.

The clutch plate is both welded to the impeller cover and pinned to the clutch piston. Furthermore, the pin that connects the piston and plate carries a spring-loaded detent ball that is forced radially outward from the piston into contact with the plate. This arrangement driveably connects the plate and piston, and transmits torque between the components of the assembly without producing noise, despite engine speed torque and speed variations.

It is preferable that a minimum number of parts be used to produce a resilient connection between the impeller cover and bypass clutch piston including elimination of the thrust washer between the turbine hub and clutch piston.

SUMMARY OF THE INVENTION

It is an object of the present invention to prevent torque converter bypass clutch idle rattle, a noise generated by engine firing pulses at idle speed, by eliminating backlash between the converter cover and bypass clutch piston. It is another object to eliminate impact loads associated with this backlash, thereby increasing durability of the bypass clutch.

This invention accomplishes these objects with the advantage that the number of parts is minimized and the construction is simplified in relation to a conventional bypass clutch arrangement.

In realizing these objects and advantages, a bypass clutch, according to this invention, includes a bladed wheel, such as a turbine wheel, supported for rotation about an axis; a cover supported for rotation about the axis and having a first surface facing the wheel; a piston supported for displacement relative to the cover and for rotation about said axis, having a second surface facing the first surface; a clutch plate located between the piston and casing, fixed to the piston at a first location, fixed to the cover at a second location spaced radially from the first location, the disc adapted for elastic bending deflection between the first location and second location due to movement of the piston relative to the cover, said deflection tending to resist movement of the piston toward the cover and tending to displace the piston away from the cover; and a drive ring supported for axial displacement, having a radial leg located between the first surface and the second surface, the piston adapted to driveably engage the drive ring and the drive ring adapted to driveably engage the clutch plate as the clutch is applied and the clutch plate deflects.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cross section of a torque converter, taken at a plane defined by axial and lateral axes, showing a bypass clutch according to the invention.

FIGS. **2–4** are cross sections of the torque converter of FIG. **1** in the vicinity of the bypass clutch piston showing the piston at various positions along its range of travel.

FIG. **5** is a cross section showing an alternate embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. **1**, a torque converter includes an impeller cover **12** welded to an impeller shell **14** having recesses **16**, which receive tabs **18** located on the outer surface of impeller blades **20**. The impeller blades are retained between shell **14** and an inner impeller shroud **22**. Cover **12** is driveably connected to an engine crankshaft.

Impeller cover **12** supports a circular pattern of threaded studs **24** to which a flywheel, rotatably supported on the engine crankshaft, is bolted, thereby driveably connecting the cover to an engine.

Turbine blades **26** are spaced mutually about the axis of rotation and are located with respect to the impeller blades so that a toroidal fluid flow path within the torque converter exits the impeller and enters the turbine at the radially outer area and leaves the turbine at the radially inner area. The outer periphery of the turbine blades is fixed mechanically or by welding or brazing to a turbine shell **28**, which has openings **29** that receive tabs **30** formed on the turbine blades. The inner periphery of the turbine blades is connected to an inner turbine shroud **32** by locating tabs **34** within slots formed in shroud **32** and by bending the tabs over the inner surface of the shroud, thereby fixing the position of blades **26** between shell **28** and shroud **32**. Turbine shell **28** and retainer **97** are secured by rivets **36** to a turbine hub **38** having an internally splined surface **40** adapted to engage an externally splined surface on a transmission input shaft **42**.

Located between the flow exit section of the turbine and the flow entrance section of the impeller is a stator assembly comprising stator blades **46**, spaced mutually around the axis of rotation, a hub **48** supporting blades **46**, an inner shroud **50** connecting the radially inner tips of the stator blades, and an outer shroud **52** connecting the radially outer ends of the stator blades. An overrunning brake **54**, fixed by splines **56** to a stationary shaft **57**, provides one-way braking between the stator blades **46** and the sleeve shaft.

A bypass clutch includes a piston **60** formed with a flange **61** that is slideably mounted on an axially directed surface **62** formed on turbine hub **38** and sealed against the passage of hydraulic fluid by an O-ring seal **64**, located in a recess formed in surface **62**.

A clutch plate **70** is fixed to the inner surface of impeller cover **12** by a 360 degree laser weld or resistance weld **72** located near a radially outer edge of the plate. The weld provides a seal against the passage of hydraulic fluid between the axially outer surface of plate **70** and the adjacent inner surface of the cover **12**. Plate **70** is welded similarly to

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