United States Patent

Jansson

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[54] CONTROL MECHANISM FOR FLUID TRANSLATING DEVICE

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[51] Int. Cl. **F01c 1/00**, F03c 3/00, F04c 1/00

[58] Field of Search 418/177, 185, 187, 176, 174

[56] **References Cited**

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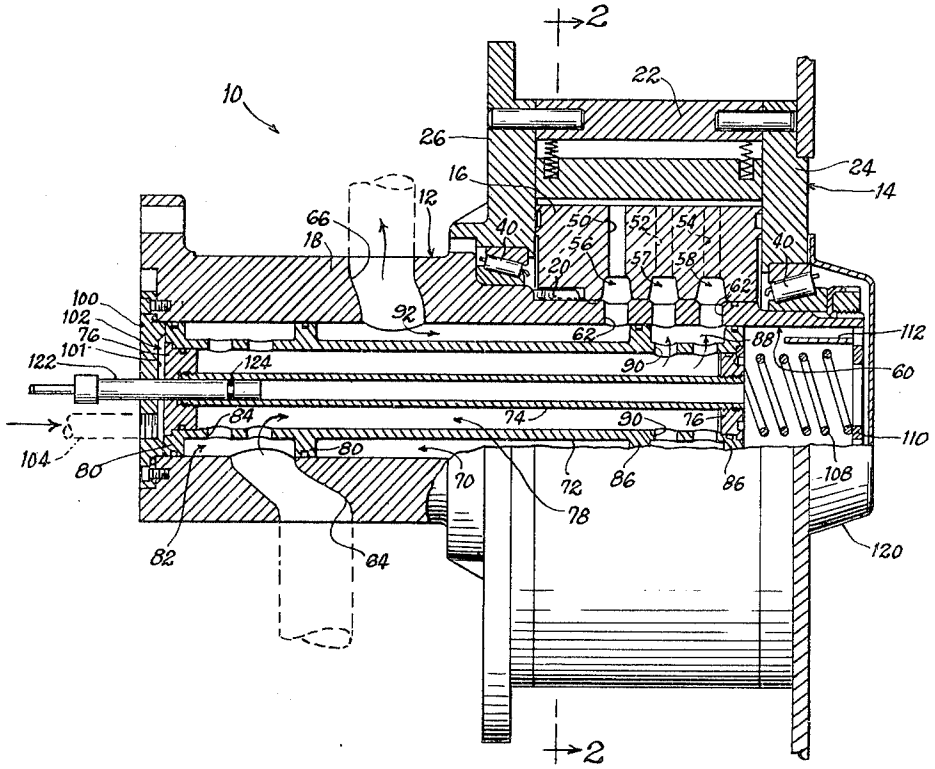
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[57] **ABSTRACT**

A fluid translating device having a fixed stator and a rotor cooperating to define at least one fluid chamber. The device incorporates fluid conducting means for supplying and exhausting fluid from an external source to the working chamber. The fluid conducting means is remotely controlled and is normally maintained in a first position by automatic means. The fluid conducting means is in the form of a movable valve member and the remotely controlled means includes additional fluid conducting means cooperating with the valve member to move the valve member from the first position and vary the output of the fluid translating device.

4 Claims, 2 Drawing Figures



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SHEET 1 OF 2

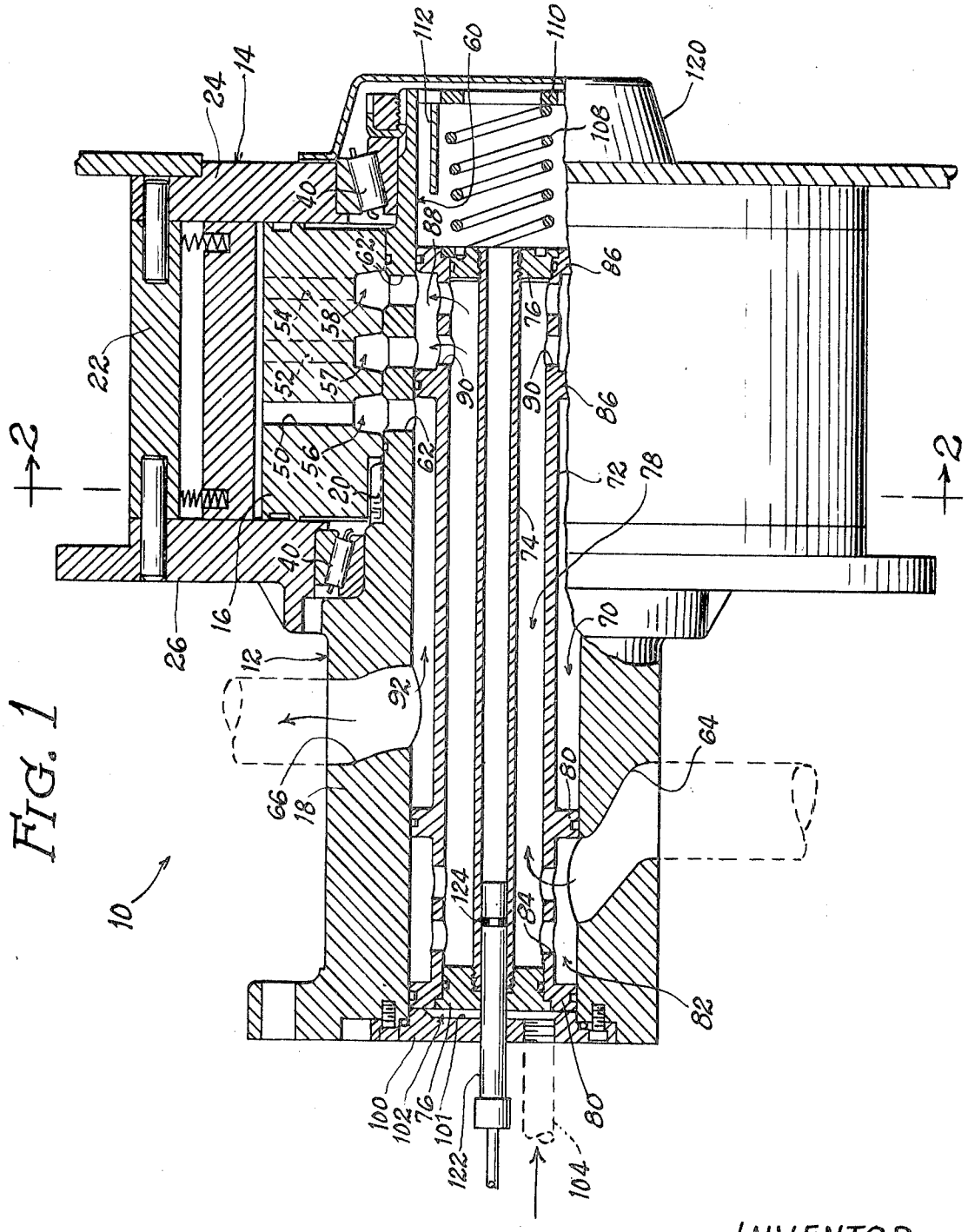


FIG. 1

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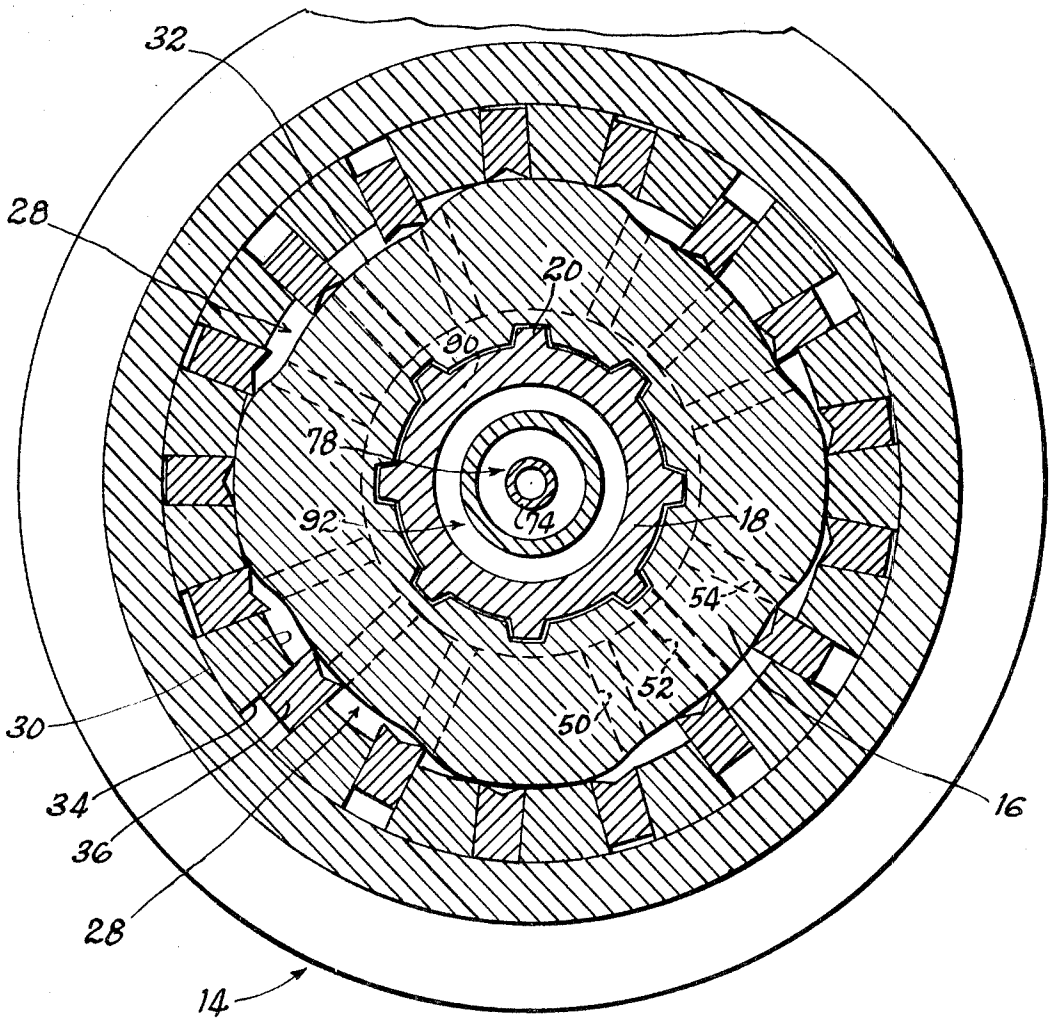


FIG. 2

CONTROL MECHANISM FOR FLUID TRANSLATING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to improvements in fluid translating devices of the type disclosed in U.S. Pat. No. 3,391,609, issued to Albert A. Schmitz.

Fluid translating devices of the type disclosed in the above mentioned patent are generally referred to as vane-type fluid motors. These fluid motors generally incorporate a fixed element including an annular stator having a peripheral surface of irregular contour which cooperates with the internal surface of a rotating element surrounding the stator to define at least one working chamber. Pressured fluid is directed to and exhausted from the working chamber through a pair of flow paths defined by a valve member incorporated within the fixed element. The flow paths are placed in communication with the chamber through a plurality of radially extending passageways and the valve member is movable within the fixed element to vary the number of passageways respectively in communication with the respective flow paths. Furthermore, the direction of rotation of the rotating element may be reversed by reversing the connection of pressured fluid and the exhaust port with the respective flow paths.

BRIEF SUMMARY OF THE INVENTION

The present invention contemplates movement of the valve member forming part of a fluid translating device of the above type in a simple and efficient manner which may be remotely controlled and may be readily incorporated into existing fluid translating devices. Furthermore, the means for moving the valve member is capable of being remotely controlled without the necessity of incorporating any mechanical linkage connections.

Specifically, the present invention contemplates producing a cavity adjacent the valve member with a portion of the valve member defining a portion of the cavity. The cavity is adapted to receive pressured fluid so as to move the valve member from a first position. Furthermore, the present fluid translating device, constructed in accordance with the present invention, incorporates mechanism which normally maintains the valve means in the first position. This mechanism is illustrated as including a spring cooperating with the fixed element and the valve member to bias the valve member in the first position.

While any number of positions for the valve may be designed into the system, the present invention also contemplates that the means for moving the valve member incorporate a stop for defining a second position for the valve means so that it is only necessary to supply pressured fluid in sufficient quantities to the cavity to move the valve member into engagement with the stop. This eliminates the need for a controlled amount of pressured fluid being supplied to the cavity to define a second position for the valve spool.

According to a further aspect of the present invention, the internal structure of the valve member also defines exhaust means for exhausting fluid from the remote end of the valve chamber. This exhaust means is in the form of a conduit extending the length of the valve means with a second conduit telescoped into one end of the first conduit and extending through the cavity. In this way, any fluid which may be received in the remote end of the valve chamber may be channeled through the respective conduits and into a fluid reservoir.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a fragmentary vertical sectional view of a fluid translating device having the present invention incorporated therein; and

FIG. 2 is a transverse sectional view taken generally along line 2—2 of FIG. 1.

DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

FIG. 1 of the drawings discloses a fluid translating device generally designated by the reference numeral **10**. The fluid translating device **10** is illustrated as a fluid motor having a fixed element **12** and a rotating element, generally designated by the reference numeral **14**. The fixed element **12** is in the form of a member or stator **16** nonrotatably secured to a fixed support or load bearing member **18** through a splined connection **20**.

The rotatable element **14** includes an outer member **22** having spaced end plates **24** and **26** fixedly secured to opposite ends thereof. A plurality of chambers **28** are defined between the circular inner surface **30** of the outer element and the irregularly contoured outer surface **32** on the inner member or stator **16**. While the illustrated fluid translating device is of the four lobe type (having four chambers **28**), any number of chambers may be formed between the rotating element **14** and the fixed element **12** which allows for the design of multispeed and direction translators.

The outer rotating element has a plurality of circumferentially spaced slots **34**, each of which slidably supports a vane **36** which is spring biased into engagement with the peripheral surface **32** of the fixed element or stator **16**. Also, the respective end plates **24** and **26** are rotatably supported on the fixed member **18** by suitable bearings **40** and the outer ends of the respective plates are capable of having a supporting member, such as a wheel secured thereto. The end plates **24** and **26** cooperate with the stator or fixed element **16** to seal the opposite ends of the respective chamber **28**.

Pressured fluid is delivered and exhausted from the working or displacement chambers **28** through a plurality of groups of passageways **50**, **52** and **54**. The outer ends of each group of passageways are in communication with the respective chambers **28** while the inner ends are in communication with circumferential grooves or recesses **56**, **57** and **58** defined on the internal surface of the stator **16**.

Each of the annular grooves **56**, **57** and **58** is in communication with one end of a bore **60**, defined within the load bearing member of shaft **18**, through openings **62**.

The bore **60** has first and second ports **64** and **66** adjacent the opposite end thereof and slidably supports a valve means or member **70**. The valve means **70** defines first and second flow paths which are respectively in communication at one end with the respective ports **64** and **66** and at the opposite end with a selected number of the passageways **50**, **52** and **54**. For this purpose, the valve means **70** includes a sleeve **72** having a reduced diameter conduit **74** concentrically arranged therein and supported at opposite ends by end caps **76** to define an annular chamber **78**. One end of the peripheral surface of the sleeve **72** has axially spaced annular flanges **80** which are located at opposite sides of the port **64** to define an annular chamber **82** communicating with the chamber **76** through a plurality of apertures **84**. Likewise, the opposite end of the sleeve has spaced flanges **86** to define a further annular chamber **88** in communication with the chamber **74** through a plurality of apertures **90**.

Thus, a first flow path is defined by the annular chamber **82**, the apertures **84**, the annular chamber **76**, apertures **90** and annular chamber **88**. This flow path is at all times in communication with one of the ports, namely port **64**. Likewise, the adjacent annular flanges **80** and **86** cooperate to define a second flow path **92** between the bore **60** and the external surface of the sleeve **72**, which is at all times in communication at one end with the port **66**.

In the position illustrated in FIG. 1 of the drawings, the annular groove or recess 56 is in communication with the second flow path 92 thus placing all of the associated passageways 50 in communication with the port 66, while the first flow path is in communication with each of the annular grooves 57 and 58 and thus places both of the sets of passageways 52 and 54 with the port 64. Thus, assuming that the port 64 is in communication with a pressured fluid source (not shown) and the second port 66 is in communication with a reservoir (not shown), pressured fluid will be received into each of the chambers 28 through either of the passageways 52 or 54 and will produce a rotating force on the respective vanes 36 and the pressure exerted on the side surfaces of the respective vanes will cause the rotating element including member 22 and plates 24 and 26 to rotate with respect to the fixed element or stator 16. The pressured fluid received into the chambers 28 will be exhausted through the passageways 50 and then through the second flow path 92 to a fluid reservoir.

According to the present invention, the fluid translating device 10 incorporates remotely controlled mechanism for moving the valve member 70 within the bore 60 to place the respective flow paths in communication with a different number of the passageways 50, 52 or 54. For this purpose, the bore 60 is closed at one end by an end plate 100 having a recess 101. The end plate 100 and a portion of the bore cooperate with the adjacent end portion of the valve member 70 to define a cavity 102. Fluid conducting means are selectively connectable to the cavity through a conduit 104 to thereby vary the size of the cavity and change the position of the valve member or means 70 within the bore 60.

As the valve means is moved from the position illustrated in FIG. 1, the intermediate annular flange 86 moves from a position between the annular grooves 56 and 57 and ultimately is located between the annular grooves 57 and 58. In this position, only the passageways 54 are in communication with the first flow path while the passageways 50 and 52 are in communication with the second flow path, thus, decreasing the amount of pressured fluid being supplied to the respective chambers 28.

The mechanism or means for moving the valve member between a plurality of positions further includes mechanism for normally maintaining the valve member in a first position, which is illustrated in FIG. 1 of the drawings. This mechanism includes a spring 108 having one end in engagement with the adjacent end of the valve means 70 and an opposite end in engagement with an apertured plate 110 fixedly secured in the adjacent end of the bore 60. The spring 108 normally maintains the plates 76 and 100 in contacting engagement and the recessed portion 101 on the plate 100 defines a small cavity 102 in such a position. The means for moving the valve member 70 to a plurality of positions further includes stop means 112 extending from the apertured plate 110 towards the valve member 70 to define a second position for the valve means.

According to another aspect of the present invention, the fluid translating device 10 incorporates a simple mechanism for channeling away any fluid which may be trapped between the remote end of the bore 60 and a closure cap 120 received in the end plate 14. For this purpose, the conduit 74 is open at both ends with one end being in direct communication with the remote end of the bore. The opposite end of the conduit 76 telescopingly receives a conduit 122 which extends through an opening in the plate 100 and is fixedly secured to the plate. Thus, the conduit 122 extends through the cavity 102 and a fluid seal 124 is interposed between the respective conduits 74 and 122 to prevent any pressured fluid, which is received into the cavity 102, from being transmitted into the conduit 74.

Thus, it will be appreciated that the present invention provides a simple and efficient mechanism, which may be remotely controlled, to move the valve means 70 of a fluid translating device 10 to a plurality of positions. This mechanism can readily be incorporated into any of the fluid translating devices of the type disclosed in the above mentioned patent, which is incorporated herein by reference.

While the fluid translating device 10 has been illustrated as being a fluid motor having four working chambers 28, each of which has three fluid conducting passageways in communication therewith, various modifications may be made without departing from the spirit of the present invention. For example, the number of passageways in communication with the respective working chambers 28 may be increased to thereby increase the available number of speed ratios for the rotating element. Furthermore, if desired, some of the passageways may be in communication with less than the total number of chambers, as is explained in the above mentioned patent, so as to produce high speed and low torque rotation of the rotatable element relative to the fixed element.

What is claimed is:

1. In a fluid translating device having a rotating element and a fixed element cooperating to define at least one fluid chamber, one of said elements having a bore and a plurality of passageways communicating at one end with said bore and an opposite end with said at least one chamber; fluid inlet and exhaust ports communicating with said bore, said inlet port adapted to have a source of fluid under pressure connected thereto; valve means in said bore defining first and second flow paths between said ports and said plurality of passageways; means for moving said valve means in said bore to vary the number of passageways in communication with the respective flow paths, said last means including a portion of said one of said elements and a portion of said valve means cooperating to define a cavity at one end of said bore; fluid conducting means selectively connectable to said cavity to vary the size of said cavity and change the position of said valve means within said bore; conduit means extending through said valve means and communicating with the opposite end of said bore and a conduit extending through said cavity and telescopingly received in said conduit means to channel away any fluid received in said opposite end of said bore.

2. A fluid translating device as defined in claim 1, in which said means for moving said valve means further includes mechanism normally maintaining said valve means in a first position and said fluid conducting means includes a pressured fluid source selectively connected to said cavity to move said valve means from said first position.

3. A fluid translating device as defined in claim 1, in which said means for moving said valve means includes biasing means normally maintaining said valve means in a first position, and stop means disposed in the path of movement of said valve means and defining a second position for said valve means; and in which said fluid conducting means includes a pressured fluid source selectively in communication with said cavity to overcome said biasing means and move said valve means into engagement with said stop means.

4. A fluid translating device as defined in claim 1, in which said portion on said valve means is one end of said valve means and said bore has a closed end defining said portion of said one of said elements, the further improvement of said means for moving said valve means including a spring engaging an opposite end of said valve means and normally maintaining said valve means in a first position, and stop means adjacent said opposite end defining a second position for said valve means; and in which said fluid conducting means supplies pressured fluid to said cavity to move said valve means from said first to said second position.

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