# United States Patent

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## [54] FLUID MOVING DEVICE


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[51] Int. Cl. ..... F01c 5/02

[58] Field of Search ..... 418/112, 153, 154, 155, 191, 418/205, 156, 157; 417/320; 198/1, 184



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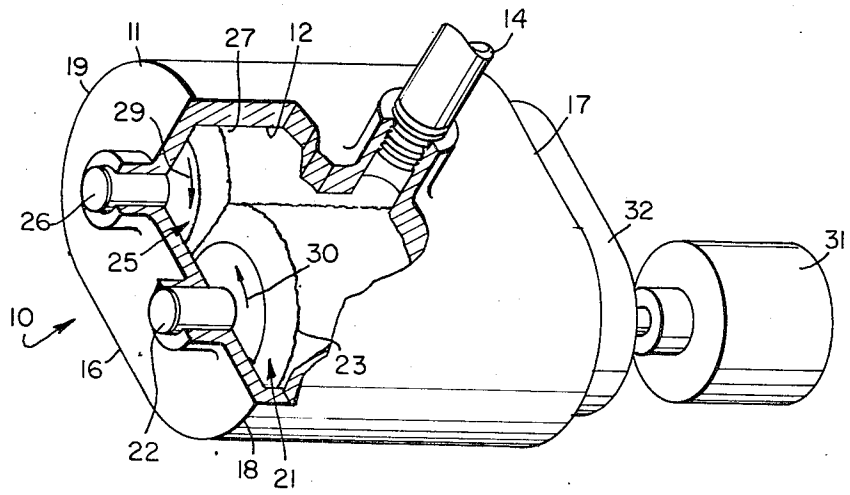
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[57] ABSTRACT

A carrier movable about an endless path in one direction from an inlet to an outlet and in the other direction from an outlet to an inlet, at least a portion of the carrier being of resiliently compressible permeable material, and compressing means along said other direction of the path to compress the resilient carrier portion and expel therefrom fluid toward the outlet, the elastic carrier portion expanding in the direction from the inlet toward the outlet to absorb fluid and transfer the same.


**6 Claims, 2 Drawing Figures**



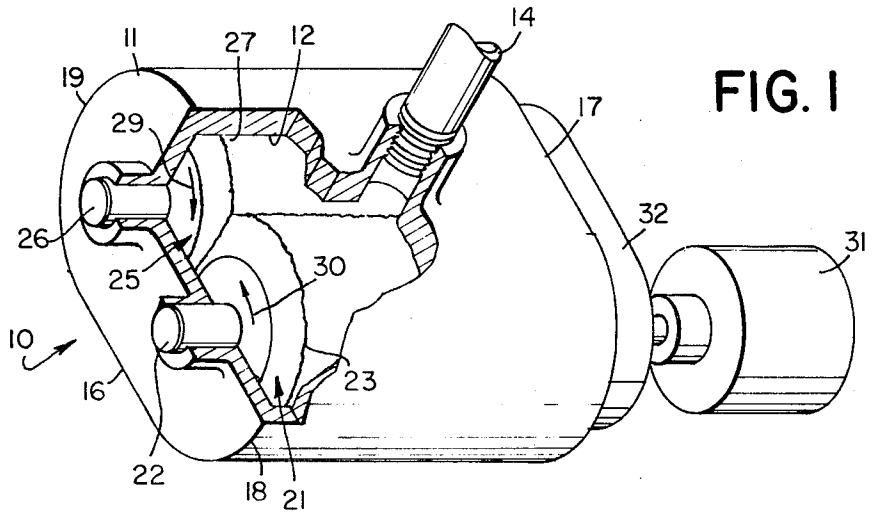



FIG. 1

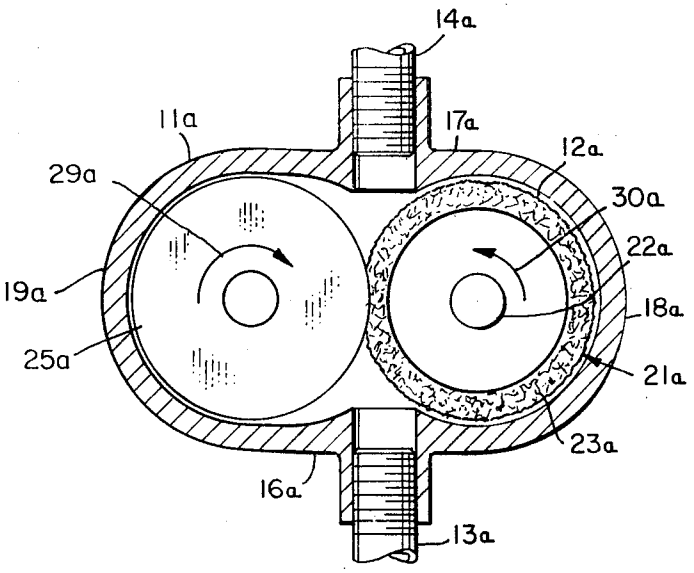



FIG. 2

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# FLUID MOVING DEVICE

## BACKGROUND OF THE INVENTION

Fluid moving devices, such as pumps, compressors, and the like, have assumed a wide variety of structures and modes of operation, usually involving valves or other reciprocating parts, or relatively expensive precision manufacture of complex shapes.

## SUMMARY OF THE INVENTION

In accordance with the instant invention it is an important object to provide a novel construction and operation of fluid movement device which is relatively inexpensive to manufacture, requiring relatively little machining and a minimum of parts, so as to substantially lower the cost and enhance the efficiency, durability and reliability of fluid handling systems.

It is still a further object of the present invention to provide a unique fluid moving apparatus adaptable for handling both liquid and gaseous fluids, to create both pressure and velocity heads, and to achieve the same in a quiet and efficient manner.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view, partly broken away, illustrating a fluid moving device of the present invention.

FIG. **2** is a sectional view illustrating a slightly modified device in accordance with the teachings of this invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to the drawings, and specifically to FIG. **1** thereof, a fluid moving device or pump is there generally designated **10**, and is illustrated as including a hollow housing or casing **11** of generally ovaloid or oblate cylindrical configuration. The casing **11** has its interior hollow **12** provided with fluid communication means or nipples, such as a fluid inlet conduit **13** and a fluid outlet conduit **14**.

The casing **11** is configured to include lower and upper generally flat wall portions, as at **16** and **17**, which are in substantial parallelism with each other, and connected together by arcuate, generally semicircular edge walls **18** and **19**, all of which combine to define the oblate cylindrical casing **11**.

Opposite ends of the casing **11** are closed by suitable end walls, and the inlet and outlet conduits **13** and **14** communicate respectively through the lower and upper casing side walls **16** and **17**, generally midway between the arcuate casing walls **18** and **19**.

Interiorly of the casing **11** is a generally cylindrical roll or carrier **21** which is located concentrically with one of the casing edge walls, say arcuate edge wall **18**. The cylindrical carrier **21** has axial stub shafts **22** extending from opposite ends for journaling in opposite ends of the casing **11**. Thus, the carrier **21** is axially rotatable concentrically with respect to the arcuate casing wall region **18**. A peripheral portion of the carrier **21**, say a circumferential covering **23** secured about the carrier roll is fabricated of a resiliently compressible, fluid permeable material, such as an open cell polyurethane foam, but may be of any other suitable resiliently compressible fluid permeable material, such as a porous elastic or fibrous material, or other.

The diameter of the carrier **21**, as determined by the outside diameter of the compressible permeable material **23**, is approximately equal to or slightly less than the internal diameter of the casing wall portion **18**, so that the carrier **21** is mounted for close conforming engagement along one side (the right hand side as seen in FIG. **1**) with respect to the adjacent wall portion **18** of casing **11**.



An additional rotary, generally cylindrical carrier is generally designated **25** and is disposed in parallel relation with respect to the carrier **21**, within the casing **11** having its axis coincident with the center of curvature of casing wall region **19**. The carrier **25** may include a generally cylindrical roll having at opposite ends stub shafts **26** journaled for rotation in respective opposite ends of the casing **11**. Further, at least a peripheral portion of the carrier **25**, say a circumferential covering **27**, is advantageously fabricated of resiliently compressible permeable material, such as that of the peripheral covering **23**. The outer diameter of the peripheral material **27**, in its uncompressed condition is approximately equal to or just slightly less than the internal diameter of the arcuate casing wall portion **19** for a closely conforming relation there between, as described in connection with the carrier **21**. Further, the distance between the centers of curvature of wall portions **18** and **19** is somewhat less than double the radius of curvature, so that the resiliently compressible peripheral portions **23** and **27** are necessarily in engagement with each other along their common diameter, and consequently squeezed or compressed by each other. Of course, the thickness of compressible roll covers **23** and **27** is selected with regard to the inter-axis spacing between carriers **21** and **25** to permit of resilient mutual compression without damage.

In addition to the relative close fitting relation of casing wall regions **18** and **19** with adjacent portions of respective carriers **21** and **25**, the casing end walls are also preferably in a relatively close fitting relation with respect to the adjacent ends of the carriers. However, these close fitting relations are not of a nature to require precision machining and the like.

In operation, the carriers **21** and **25** are rotated, as in the directions of arrows **29** and **30** by any suitable means. For this purpose, there may be provided a motive device or electric motor, as at **31**, and a transmission or gear box **32**, which may be positively connected to either one or both of the carriers **21** and **25** to effect controlled rotation thereof.

In operation, the fluid moving device **10** effects compression of the resilient portions **23** and **27** along their common diameter, so that the resilient portions are free to expand under the elastic restoring forces of the material while in communication with the interior casing region **31** which communicates with the inlet **13**. On expansion of the compressible peripheral portions **23** and **27**, fluid is absorbed by the compressible portions and carried thereby in a generally upward direction along respective casing wall regions **18** and **19** toward the fluid outlet **14**. While in communication with the internal casing region **32** communicating with the fluid outlet **14**, the compressible peripheral portions are compressed or squeezed to expel the previously absorbed fluid contents into the casing region **32** for egress therefrom through outlet **14**. This procedure is, of course, continuous, the rate of fluid movement being related to the speed of carrier rotation. A variety of adjustments, in addition to speed of carrier rotation, may be accomplished, say center-to-center distance between carriers, et cetera. Further, the direction of fluid movement may be reversed upon mere reversal of the direction of carrier rotation; and additionally, the instant fluid moving device may be used in a series of stages for obtaining higher pressures.

From the foregoing it will be appreciated that the pair of carriers **21** and **25** combine with each other to mutually compress the peripheral portions **23** and **27** of each other to achieve the desired fluid moving operation.

However, the principle of operation may be achieved with only a single carrier and a noncompressible compressing member in association with the single carrier. Such a modification is shown in FIG. **2**, wherein is illustrated a fluid moving device generally designated **10***a*.

The modified embodiment **10***a* of FIG. **2** may include a casing or housing **11***a* of a shape and construction essentially similar to that of the first described embodiment. The casing

11*a* includes an inlet conduit 13*a* and an outlet conduit 14*a* which are respectively connected to opposite sides of the casing for communication between the interior and exterior of the casing.

Mounted in the casing 11*a* in close conforming engagement with one region of the casing is a carrier 21*a*, which may be essentially the same as the carrier 21 of FIG. 1. However, a generally cylindrical, nonresiliently compressible compressing member or roll 25*a* is mounted in the casing 11a generally in the position of carrier 25 of the first described embodiment. As the compressing member or roll 25*a* is noncompressible, it effects a compression of the resiliently compressible peripheral portion 23*a* of carrier 21*a*, but is not compressed itself. Thus, by the embodiment of FIG. 2 a fluid moving action is achieved by the rotation of carrier 21*a* carrying fluid, but the compressing member 25*a* does not carry any fluid, serving only to compress the carrier 21*a* and thereby expel fluid from the latter.

From the foregoing, it will now be understood that a fluid moving device is provided by the instant invention which is extremely simple in construction and operation, requiring a minimum of parts and expense, and which otherwise fully accomplishes its intended objects. It will also be understood that the instant fluid moving device may be employed where it is desired to achieve certain separating action as between media of different densities, by reason of the centrifugal forces applied to the media.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention.

What is claimed is:

1. A fluid moving device comprising a casing having a hollow interior, a fluid inlet communicating between the exterior and interior of the casing, a fluid outlet communicating between the interior and exterior of the casing at a location spaced from said inlet, a carrier mounted in said casing for movement about an endless path extending from said inlet to said outlet in one direction and extending from said outlet to said inlet in the other direction, at least a portion of said carrier being fabricated of resiliently compressible permeable material for movement about said path, and compressing means along said other direction of said path for compressing engagement with said carrier portion to expel fluid from said portion to said outlet, said portion expanding by elastic restoring force along said one direction of said path to absorb fluid and transfer the same to said outlet, said compressing means comprising a rotor in rolling engagement with said carrier for effecting said compressing.

2. A fluid moving device according to claim 1, said carrier comprising a rotor, and said portion comprising a peripheral portion of said rotor.

3. A fluid moving device according to claim 1, said internal casing hollow being specifically configured for conforming reception of said carrier, to minimize pressure loss along said path in said other direction.

4. A fluid moving device according to claim 1, said carrier comprising a generally circular rotor, and said casing interior conformably receiving said rotor to minimize loss of pressure in said casing.

5. A fluid moving device comprising a casing having a hollow interior, a fluid inlet communicating between the exterior and interior of the casing, a fluid outlet communicating between the interior and exterior of the casing at a location spaced from said inlet, a carrier mounted in said casing for movement about an endless path extending from said inlet to said outlet in one direction and extending from said outlet to said inlet in the other direction, at least a portion of said carrier being fabricated of resiliently compressible permeable material for movement about said path, and compressing means along said other direction of said path for compressing engagement with said carrier portion to expel fluid from said portion to said outlet, said portion expanding by elastic restoring force along said one direction of said path to absorb fluid and transfer the same to said outlet, said compressing means comprising a second carrier mounted in said casing for movement about an endless path extending from said inlet to said outlet in said one direction and extending from said outlet to said inlet in the other direction, at least a portion of said second carrier being fabricated of resiliently compressible permeable material for movement about said path, said first and second carriers being in compressing engagement with each other to mutually expel fluids from said portions to said outlet, said portions expending by elastic restoring forces along said one directions of said paths to absorb fluid and transfer the same toward said outlet.

6. A fluid moving device comprising a casing having a hollow interior, a fluid inlet communicating between the exterior and interior of the casing, a fluid outlet communicating between the interior and exterior of the casing at a location spaced from said inlet, a carrier mounted in said casing for movement about an endless path extending from said inlet to said outlet in one direction and extending from said outlet to said inlet in the other direction, at least a portion of said carrier being fabricated of resiliently compressible permeable material for movement about said path, and compressing means along said other direction of said path for compressing engagement with said carrier portion to expel fluid from said portion to said outlet, said portion expanding by elastic restoring force along said one direction of said path to absorb fluid and transfer the same to said outlet, said carrier comprising a generally circular rotor, and said casing interior conformably receiving said rotor to minimize loss of pressure in said casing, said compressing means comprising a second circular rotary carrier mounted in said casing for movement about an endless path extending from said inlet to said outlet in one direction and extending from said outlet to said inlet in the other direction, at least a portion of said second carrier being fabricated of resiliently compressible permeable material for movement about said path, said first and second carriers being in compressing engagement with each other to mutually expel fluid from said portions to said outlet.

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