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(54) Title: VANE ASSEMBLY WITH AN INTEGRATED SPRING ELEMENT

(57) Abstract: A vane assembly for a rotor is disclosed. The vane assembly is located along the diameter of the rotor. The vane assembly comprises at least a first blade, a second blade and a flexible component. The flexible component is integrated in between the first blade and said second blade. The vane assembly is made of polymeric materials.



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Title: VANE ASSEMBLY WITH AN INTEGRATED SPRING ELEMENT

Applicant's Name: BOSCH LIMITED and Robert Bosch GmbH

FIELD OF THE INVENTION:

This invention relates to a vane assembly.

In particular this invention relates to a vane assembly with an integrated spring element.

BACKGROUND OF THE INVENTION:

US patent number 4659298 discloses a vane actuating assembly for radially slidable vanes. Vanes are slidingly positioned in slots. A hollow sleeve with a plunger is reciprocally disposed in the slots. A spring is positioned in the hollow sleeve and biases the plunger. The biased plunger is in contact with the inner surface of the vanes.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS:

Different modes of the invention are disclosed in detail in the description and illustrated in the accompanying drawing:

Figure 1 illustrates a vane assembly for a rotor in accordance with this invention; and
Figure 2 illustrates one application of the vane assembly for a rotor in accordance with this invention.

DETAILED DESCRIPTION OF THE INVENTION:

Figure 1 illustrates a vane assembly for a rotor in accordance with this invention. The vane assembly 10 is located along the diameter of the rotor 12. The vane assembly 10 comprises at least a first blade 14a, a second blade 14b and a flexible component 14c. The flexible component 14c is located in between the first blade 14a and second blade 14b and is integrated with the first blade 14a and second blade 14b.

Positive displacement pump is one of the many difference types of pumps known in the art. Positive displacement pumps may be further classified based on the type of internal drive mechanism that they use. Our focus will be rotary positive displacement pumps which have a eccentrically located rotor inside the stator. Further static or sliding vanes are provided in the eccentric rotor such that they extend from said radially from the rotor. The radially extending vanes make contact with the inner surface of the stator along which the vanes move in transporting liquids through the pump. As is known to those skilled in the art, a centrifugal force acts outwardly on the vanes as the rotor rotates. However, in many applications, and particularly with fluids of high specific gravity or high viscosity, the vanes will lift from the inner surface, and thus fluid will slip by the vanes. The result is a decrease in pumping efficiency.

One method of placing additional outwardly acting forces on the vanes in addition to the centrifugal force is done by drilling holes are through the rotor interconnecting opposite pairs of vanes. A solid pin is slidingly positioned in the hole in between the two vanes such that as one vane moves inwardly, the opposite vane is forced outwardly. Disadvantage of this arrangement is that the dimension across the drilled hole may not be constant and allows no compensation for wear on the outer edges of the vanes. Also at high speeds with which positive displacement pumps may be operated, the force of impact of the pin on the vanes can be quite high, quickly resulting in damage to the vanes. However the use of a solid pin makes the assembly heavy, further additional effort is required while assembling the components of the assembly. Also the wear and tear on the inner surfaces of the vanes causes in reduction of pumping efficiency of the pump.

Another solution has been the use of two pins disposed in a hole intercommunicating two opposite slots with a spring positioned there between. This arrangement has the advantage of reduced wear and tear on the inner surfaces of the vanes, but still has the disadvantage of wear on the outer surfaces of the spring because the spring must slide in the hole in the rotor along with the pins. Another disadvantage of the multiple pin and spring arrangement is that the pins and springs must be installed separately.

The disadvantages of the vane assemblies discussed above is that all the vane assembly

have to be assembled as a piece by piece assembly in the rotor. This assembly of the vane assembly is time consuming. Further since there are more than one parts there will be wear and tear between the various components of the vane assembly which reduces the life and efficiency of the vane assembly that is used in a rotor.

The vane assembly 10 in accordance with this invention provides a one piece integrated vane assembly 10 for a rotor 12. The flexible component 14c which is integrated in between the first blade 14a and second blade 14b provides a functionality which is similar to a compression spring. The flexible component 14c pushes the two blades 14a and 14b outwards in a manner such that the blades 14a and 14b project out of the rotor.

The vane assembly 10 is such that the first blade 14a, second blade 14b and the flexible component 14c are made of a polymeric material. Another embodiment envisaged is that the first blade 14a and second blade 14b are made from one polymeric material and the flexible component 14c is made from another polymeric material. The polymeric material from which the vane assembly is made is able to withstand the stress that is incident on the blades at the point of contact with the stator.

The working of the vane assembly 10 can be explained with one application in which the vane assembly is used. Figure 2 illustrates one such application. This application is related to a pump (shown in the figure) comprising a stator 16 and a rotor 12. The rotor 12 with the vane assembly 10 is located eccentrically in a stator 16. The blades 14a and 14b always maintain contact with at least a portion of the stator 16. When the rotor 12 starts to rotate in the anti-clockwise direction the vane assembly which is line with the vertical axis of the rotor also moves in the anticlockwise direction. As the first blade 14a moves the flexible component 14c gradually comes back to its normal expanded state. Consequently, as the blade 14b along the surface of the stator 16 it is pushed inside this compresses the flexible component 14c. It is envisaged as shown in the figure 2 multiple vane assemblies 10 can be used at the same time. However it must be understood that the application of the vane assembly 10 as provided in description is only illustrative and many embodiments and combinations can be envisaged the embodiment and combination shown and described do not limit the scope of this invention. One such combination may include a plurality of

centrifugal vanes along with a single vane assembly 10. Yet another embodiment envisaged is plurality of centrifugal vanes in combination with plurality of vane assemblies 10. If a plurality of vane assemblies 10 are used it is also possible that the flexible components may be connected at one point.

ADVANTAGES OF THE INVENTION:

The invention as claimed in the independent claim of the specification has the following advantages. The vane assembly is one integrated assembly with two blades and a flexible component in between the two blades. The integrated assembly reduces the time required to manufacture the vane assembly. Further the cost of manufacturing of vane assembly is less as compared to conventional vane assemblies. As the vane assembly is a single integrated assembly without any moving parts, there is no possibility of any damage to the components which is a problem in conventional vane assemblies.

Another advantage of the vane assembly 10 is that since it is made from a polymeric material the cost of manufacturing is comparatively less as compared to conventional.

Another important advantage that the vane assembly 10 of this invention has over conventional vane assemblies is that due to nature of the flexible component provided in the vane assembly it is able to provide the required working at lower speeds of rotation as well as at higher speeds of rotation.

CLAIMS:

1. A vane assembly (10) for a rotor (12), said vane assembly (10) located along the diameter of said rotor (12), said vane assembly (10) comprising at least a first blade (14a), a second blade (14b) and a flexible component (14c), said flexible component (14c) integrated in between said first blade (14a) and said second blade (14b).
2. The vane assembly (10) as claimed in claim 1, wherein said first blade (14a), said second blade (14b) and said flexible component (14c) are made of a polymeric material.
3. The vane assembly (10) as claimed in claim 1, wherein said first blade (14a) and second blade (14b) are made from one polymeric material and said flexible component (14c) is made from another polymeric material.
4. The vane assembly (10) as claimed in claim 1, wherein said first blade (14a), said second blade (14b) and said flexible component (14c) are made from a composite of polymeric materials.
5. The vane assembly (10) as claimed in claim 1, wherein said vane assembly (10) is used in a rotor (12) in a vane pump.
6. The vane assembly (10) as claimed in claim 1 and 5, wherein said first blade (14a) and said second blade (14b) are in contact with at least a portion of the stator (16).
7. The vane assembly as claimed in claim 6, wherein the flexible component (14c) is compressed due to contact of said first blade (14a), said second blade (14b) and said stator (16)

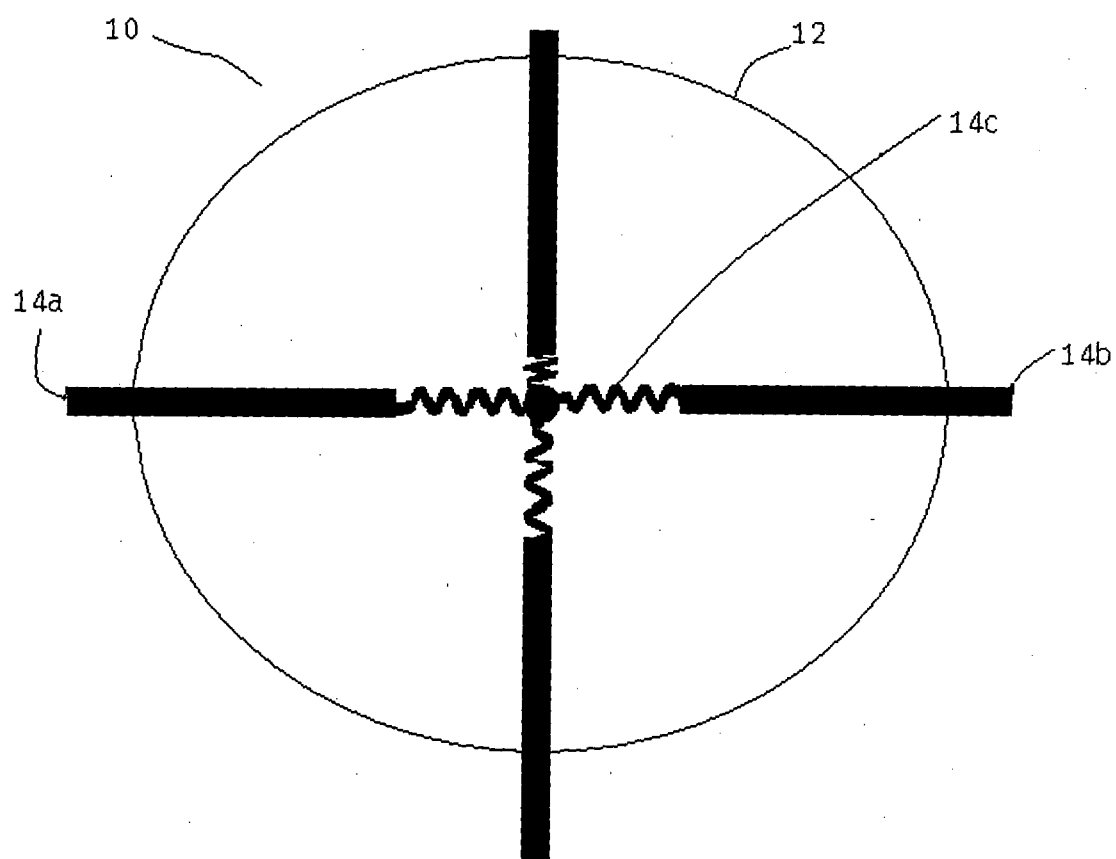


Figure 1

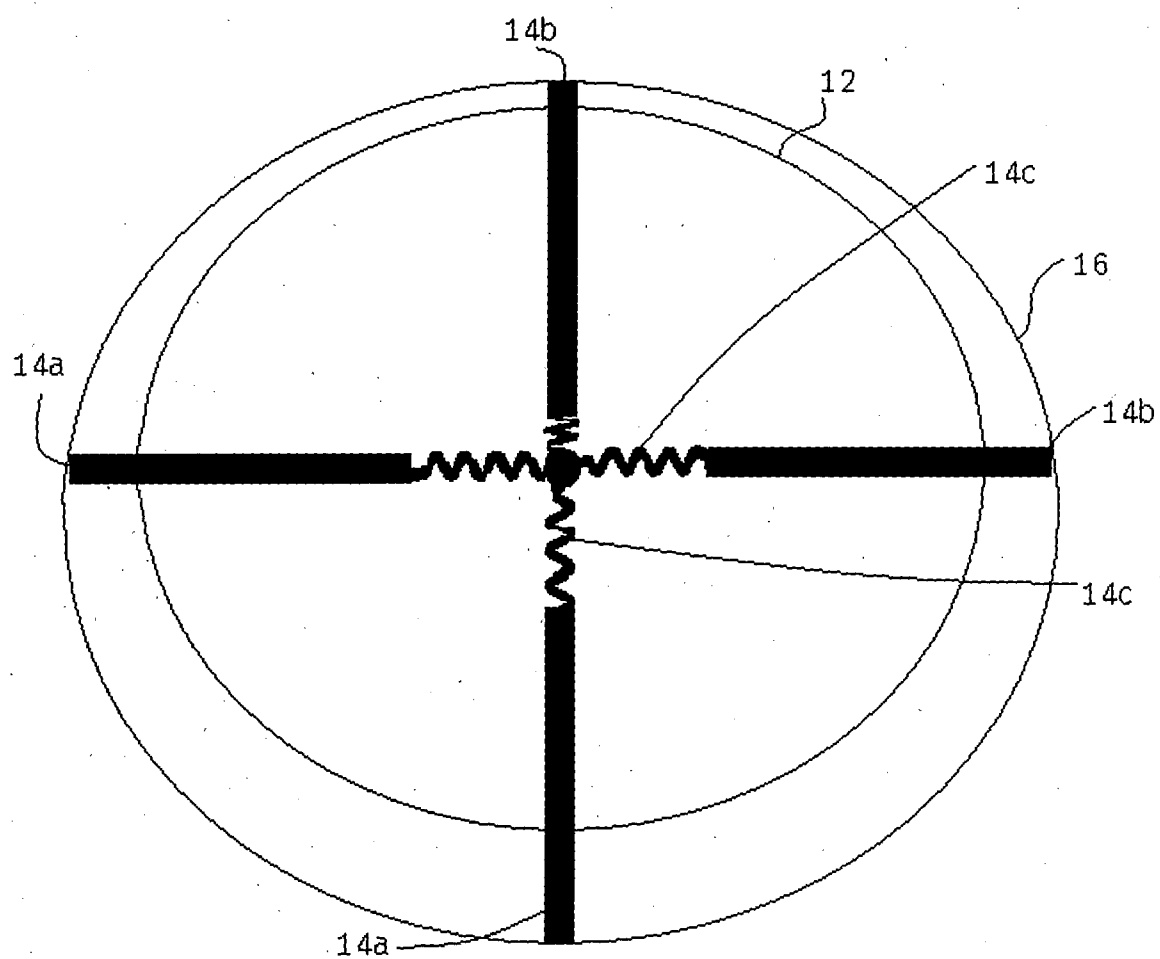


Figure 2