

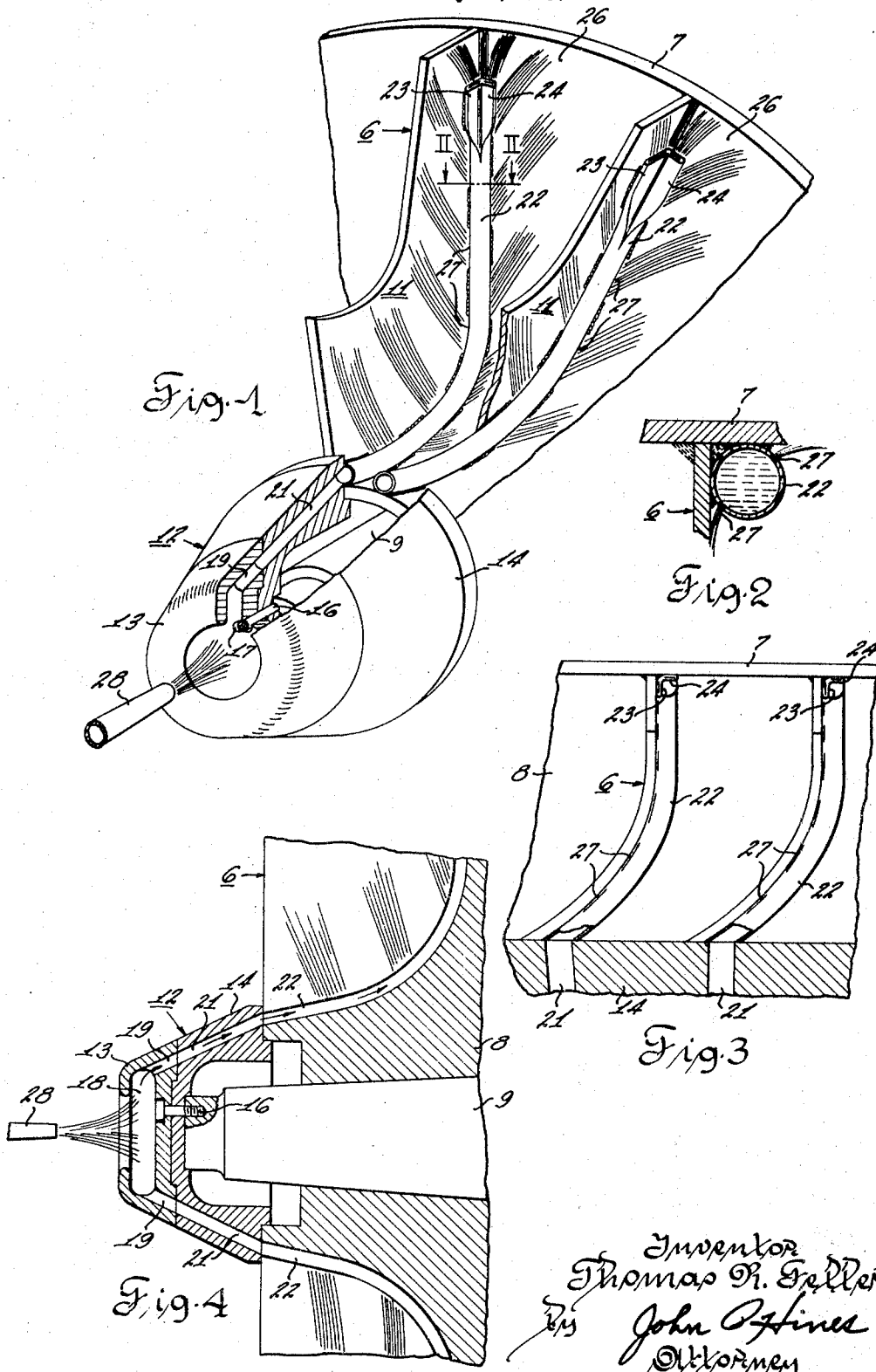
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DEVICE FOR WASHING CENTRIFUGAL COMPRESSOR

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DEVICE FOR WASHING CENTRIFUGAL COMPRESSOR

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5 Claims

ABSTRACT OF THE DISCLOSURE

A compressor washing device having tubes at the base of the low pressure side of the compressor impeller blades with nozzles to direct high pressure liquid directly onto the portions of the compressor which require cleaning.

This invention pertains in general to compressors and more particularly to a means for cleaning the surfaces of the compressor which are likely to have a buildup of foreign material due to dirt in the gas being pumped.

Centrifugal compressors are replacing reciprocating compressors at an ever increasing rate for the compression of dirty gases. These dirty gases present a serious balancing problem as the speed and size of the compressors increase. Deposits from the dirty gas build up on the surfaces of the compressor. When the deposits grow large enough, centrifugal force causes chunks of the deposits to fly off creating an unbalance in the compressor wheel. Chunks as large as a man's hand have been known to fly off a compressor wheel rotating at 3600 r.p.m. and having a diameter of four feet. It is easy to appreciate the large unbalance forces that will immediately result from such an occurrence. It is therefore extremely necessary to insure that these deposits do not build up to the point where chunks will fly off the compressor wheel.

It has been found through experimentation, that deposits do not form on those portions of the compressor exposed to the main stream of the gas being pumped if a liquid is injected into the gas stream. This is because the liquid wets the surfaces of the compressor exposed to the main gas stream. However, the portions of the compressor that are not exposed to the main gas stream are dry since the liquid injected into the compressor is not carried to these surfaces. These surfaces have been found through experimentation to be the radially outer rear or trailing edge of the impeller blades and the radially outer surface on the shroud plate immediately adjacent and to the rear of the trailing edge of the impeller blade. It is extremely difficult to insure a wetting of these surfaces since the rotational speed of the impeller causes the injected liquid to fall behind the compressor blade onto the leading surface of the next oncoming blade before the liquid reaches the radially outer surface of the blade and shroud plate.

It is therefore the general object of this invention to provide a compressor with means to insure wetting of the impeller surfaces which are not in the main stream of the gas being pumped.

An additional object of the subject invention is to provide a compressor with means to direct a stream of water on the trailing surface of the impeller blade and the adjacent radially outer surface of the impeller shroud plate.

A further object of the subject invention is to provide a compressor of the above described type with liquid confining passageways at the rear of the impeller blades having nozzles that will cause the liquid in the passageways to be expelled on the dry surfaces of the compressor wheel.

These and other objects of the subject invention will

become more apparent as the following description is read in light of the attached drawing wherein:

FIG. 1 is a perspective view showing a portion of a compressor wheel constructed in accordance with the invention;

FIG. 2 is a cross section taken along the lines II—II in FIG. 1;

FIG. 3 is a partial top view of FIG. 1; and

FIG. 4 is a partial cross section side view of FIG. 1.

The compressor shown herein for purposes of illustration is composed of a plurality of radially directed circumferentially spaced blades generally designated 6. These blades are connected at their base portion to a rear shroud plate 7. This connection may be made in any conventional manner such as by welding. The blades and the shroud plate are connected to a hub portion 8 which fits onto a drive shaft 9. As shown in FIG. 1, the compressor wheel or impeller would be rotating in a counterclockwise direction with the low pressure side of the blades 6 being designated 11.

A manifold generally designated 12 is connected to the forward portion of the compressor wheel in coaxial alignment with the compressor shaft. This manifold is herein shown as composed of a collector portion 13 and a distributor portion 14. The distributor portion 14 is located relative to the compressor hub 8 by means of a dowel pin (not shown). The collector portion 13 is connected to the compressor drive shaft by means of cap screws 16. These cap screws pass through the distributor portion 14 and into threaded bores in the end of drive shaft 9. The cap screws pass through elongated slots 17 in the collector 13.

The collector 13 has an intake chamber 18 and a plurality of passageways 19 radially emanating therefrom. The distributor 14 also has a plurality of passageways 21. The collector 13 may be rotated to align any portion of the passageways 19 with the passageways 21.

The passageways 21 align with tubes or passageways 22 rigidly attached, such as by welding, to the joint between the impeller blades and the compressor hub 8 and shroud plate 7. The tubes 22 are located on the low pressure side of the impeller blades.

In this particular embodiment of the invention the tubes 22 are flattened at their outer end to provide two distinct washing nozzles 23 and 24. The nozzle 23 directs a stream of high pressure liquid onto the rear surface of the impeller blade and the nozzle 24 directs a stream of liquid onto the area 26 of the impeller shroud plate 7. Depending on the need, a series of openings 27 may be provided along the length of the tubes 22 to permit washing liquid to be sprayed on the impeller blade and the shroud plate at different portions along the length of the blades.

Any means may be provided to deliver liquid to the intake chamber 18 and herein the liquid is shown provided by a stationary nozzle 28. In operation, water or any other satisfactory liquid is sprayed into the chamber 18. Due to the high rotational speed of the compressor blade the water is thrown outward into the outer peripheral surface of the chamber 18. It then finds the passageways 19 and 21, and due to centrifugal force moves outward along these passageways into the tubes 22. Here the centrifugal force is even greater as the peripheral speed of the compressor blades increases as the water moves radially outward from the axis of the impeller. Considerable high pressure is developed due to the centrifugal force and due to the constricted openings in the tubes. The water leaving the nozzles 18 and 19 will be sprayed onto the adjacent surfaces and provides sufficient wetness to overcome deposits of foreign matter building up on the compressor wheel.

From the above it can be seen that an inexpensive

and improved means of washing a compressor blade has been disclosed. Applicant has solved a very serious problem in the compressor field; a problem that is becoming more and more troublesome due to the increased speed and larger size of compressor wheels being used.

Although only one embodiment of the subject invention has been herein shown and described, other embodiments will be obvious to those skilled in the art after reading this disclosure and all such embodiments as come within a reasonable interpretation of the appended claims are intended to be covered.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a rotary compressor having a plurality of radially directed circumferentially spaced blades connected at their base portions to a hub and at their rear portions to a shroud plate, the improvement comprising: walls defining a liquid carrying passageway positioned on the rear low pressure side of said blades; an inlet to said passageway positioned adjacent the inlet to said compressor; an outlet from said passageway positioned adjacent the radially outer end of said blade adjacent the point of contact to said shroud plate so that liquid in said passageway will impinge on the radially outer rear surface of said blade and on the adjacent radially outer surface of said shroud plate; and means for supplying a liquid to the inlet of said passageway when said compressor is rotating.

2. The compressor set forth in claim 1 wherein said inlet to said passageway comprises; a first part having a collection chamber for said liquid and a plurality of first passageways emanating therefrom; a second part connected to said compressor hub about said compressor inlet having a plurality of second passageways aligned with

said liquid carrying passageways; and means attaching said first and second parts in a manner to permit selective relative movement therebetween whereby said first and second passageways may be locked in different degrees of alignment to permit a throttling of the washing liquid.

3. The compressor set forth in claim 1 wherein said liquid carrying passageway is positioned along the base joint between said blade and said hub and shroud plate.

4. The compressor set forth in claim 1 wherein said outlet comprises; first nozzle means directing liquid on the radially outer rear surface of said blades; and second nozzle means directing liquid on the radially outer surface of said shroud plate adjacent the rear surface of said blade.

5. The compressor set forth in claim 1 and further comprising a plurality of nozzles disposed along the length of said liquid carrying passageway directing liquid on the rear surface of said blades and said shroud plate.

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