

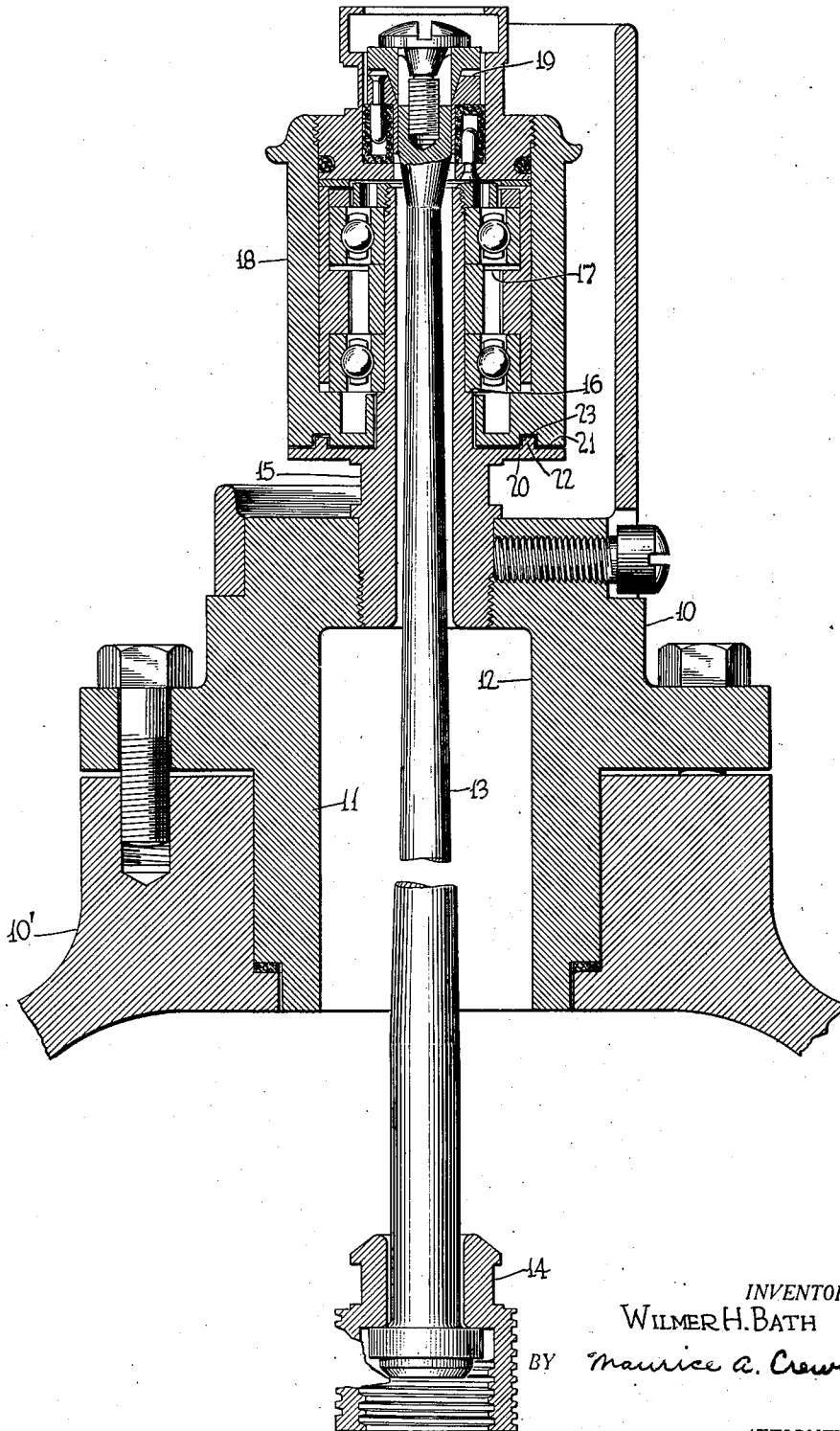
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SEAL FOR CENTRIFUGAL SEPARATORS

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SEAL FOR CENTRIFUGAL SEPARATORS

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2 Claims. (Cl. 286—5)

The present invention relates to the art of centrifugal separators and it was conceived as an improvement with respect to the type of centrifugal separator described and claimed in the patent to Leo D. Jones and Arthur U. Ayres, No. 1,634,246, patented June 28, 1927. In that patent a number of features are disclosed relating to the centrifugal treatment and discharge of liquids within a conditioned atmosphere. Among the features described in that patent, an important modification relates to the subjection of liquids discharged from a centrifugal rotor in a finely dispersed form to the conditioning effect of a rarefied atmosphere which is maintained in the casing surrounding the rotor.

Serious difficulties are encountered in attempts to maintain seals which are both effective and durable between relatively rotatable surfaces of the type involved in the bearing and driving arrangements in this type of machine. Seals of the ordinary packing type are unsatisfactory for such use because of their rapid destruction under the high heat generated by the rotation of the bowl of a high speed centrifugal separator under a high friction load and by the vibration encountered in such a separator. Liquid seals are subject to the objection that they are complicated and difficult to maintain. They are also subject to the objection that the heat generated in the rotation of the body of the sealing liquid tends to volatilize the liquid and thus contaminate the conditioned atmosphere, thereby sometimes tending to defeat the very object for which they are designed. This last-named objection presents unusual difficulties in cases where it is desired to maintain a vacuum within the frame of the machine and requires unusual care in operation.

It has been a primary object of the present invention to provide a seal which is of a simple and inexpensive nature and is peculiarly applicable to the problem of maintaining a vacuum within the frame and rotor of a centrifugal separator. An important feature of the arrangement by which these objects have been attained consists in the utilization of the centrifugal force generated upon a thin layer of air to preclude the ingress of air through the space to be sealed.

Further objects and advantages of the invention and the manner in which they have been attained will be obvious from a reading of the following detailed description in the light of the attached drawing, in which,

The single figure is a central vertical section through the bearing and drive connections of a

centrifugal separator of the Sharples type, illustrating the application of the invention thereto.

Referring to the drawing by reference characters, the numeral 10 indicates a support adapted to be secured in gas-tight relationship with respect to a gas-tight casing 10' surrounding a centrifugal rotor, the general arrangement of casing and rotor being preferably similar to that illustrated in the joint patent to Jones and Ayres referred to above. The support is provided with an annular projection 11 adapted to be received within the casing and is recessed at 12 to afford provision for the drive spindle 13 of the machine, the spindle being provided with a suitable coupling nut 14 at its lower end in order that it may be detachably secured to the centrifugal rotor.

A sleeve 15, which is designed to receive the drive spindle and support the bearing assembly and drive pulley, is secured at its lower end to the support 10. This sleeve is provided with a shoulder 16 adapted to support a bearing assembly 17 by which a drive pulley 18 is mounted for rotation with respect to the supporting sleeve, the pulley being connected with the driving spindle by a detachable coupling connection indicated generally at 19.

Centrifugal separators having the features described above are unsuited to the maintenance of a controlled atmosphere, and particularly of a vacuum, within the casing which surrounds the rotor, because of leakage of air between the supporting sleeve 15 and the pulley 18 through the bearing assembly 17 and thence through the space surrounding the spindle 13 downwardly into the main casing of the machine. In order to obviate such leakage, in the practice of the present invention an annular flange 20 of substantial radial extent is formed upon the sleeve 15 and the pulley 18 is provided with a complementary surface 21 spaced in closely contiguous relationship with respect to the upper face of the flange 20.

The arrangement of these two surfaces in closely spaced relationship affords a thin column of air interconnecting the outside atmosphere with the portion of the bearing assembly communicating with the interior of the main frame of the machine. When power is applied to the pulley 18 to rotate the spindle 13 and the rotor of the machine, the rapid rotation of the surface 21 causes rotation of the air column between the flange 20 and surface 21 and causes an outward radial pressure within this column by reason of the centrifugal force exerted upon the column in this manner.

While a seal having the features described above is of great assistance in maintaining a vacuum, turbulence within the column of air between the flange 20 and surface 21 sometimes seriously impairs the maintenance of such a vacuum. An important feature of the invention, therefore, consists in the provision of an arrangement whereby turbulence can be avoided and partially isolated zones of differential pressure set up between the surfaces 20 and 21. To this end, a nested projection and groove arrangement is provided between these surfaces. In the embodiment illustrated, an annular projection 22 interrupts the inner surface of the flange 20 and the surface 21 of the pulley is interrupted by an annular groove 23 adapted to receive this projection in nested relationship. In the operation of the machine, the column of air lying radially within the projection 22 is subjected to a centrifugal force which is considerably less than that generated upon the column of air lying radially without this projection. Zones of high and low pressure are thus obtained which are substantially physically isolated from each other, thus affording a pressure seal to prevent ingress of air to the interior of the frame.

While the features of the invention have been described in detail, it will be obvious that they are susceptible of considerable modification. Thus, while a substantially radial flange has been indicated at 20, it will be obvious that a flange extending in another direction might be substituted so long as it affords a surface which is of substantial extent in its radial projection.

While the features of the invention were especially conceived with reference to a centrifugal separator, they are doubtless capable of other applications. In view of these facts, I do not wish

to limit myself except by the scope of the subjoined claims.

What I claim is:

1. In a machine having a rapidly rotating rotor and a surrounding housing adapted to have a sub-atmospheric pressure maintained therein, centrifugal seal means for sealing between said housing and said rotor comprising surfaces of substantial radial extent between said rotor and said housing, said surfaces being so related as to maintain at all times a thin column of air therebetween in which, upon rotation of the rotor, centrifugal force acting thereon builds up a pressure sufficient to prevent the ingress of air between said members.

2. In a machine having a rotor and a surrounding housing adapted to have a sub-atmospheric pressure maintained therein, a rotatable drive spindle secured to the rotor and extending through said housing, centrifugal seal means for sealing between said housing and said rotor comprising a member having a surface of substantial radial extent carried by said spindle and a stationary member having a surface of substantial radial extent contiguous and parallel to said first named surface fixed with respect to the housing, an annular projection upon one of said surfaces and an annular depression in the other of said surfaces adapted to receive said annular projection in nested relationship, the contiguous and parallel relation of said surfaces being such as to maintain at all times a thin column of air therebetween in which, upon rotation of the spindle, centrifugal force acting thereon builds up a pressure sufficient to prevent the ingress of air between said members.

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