

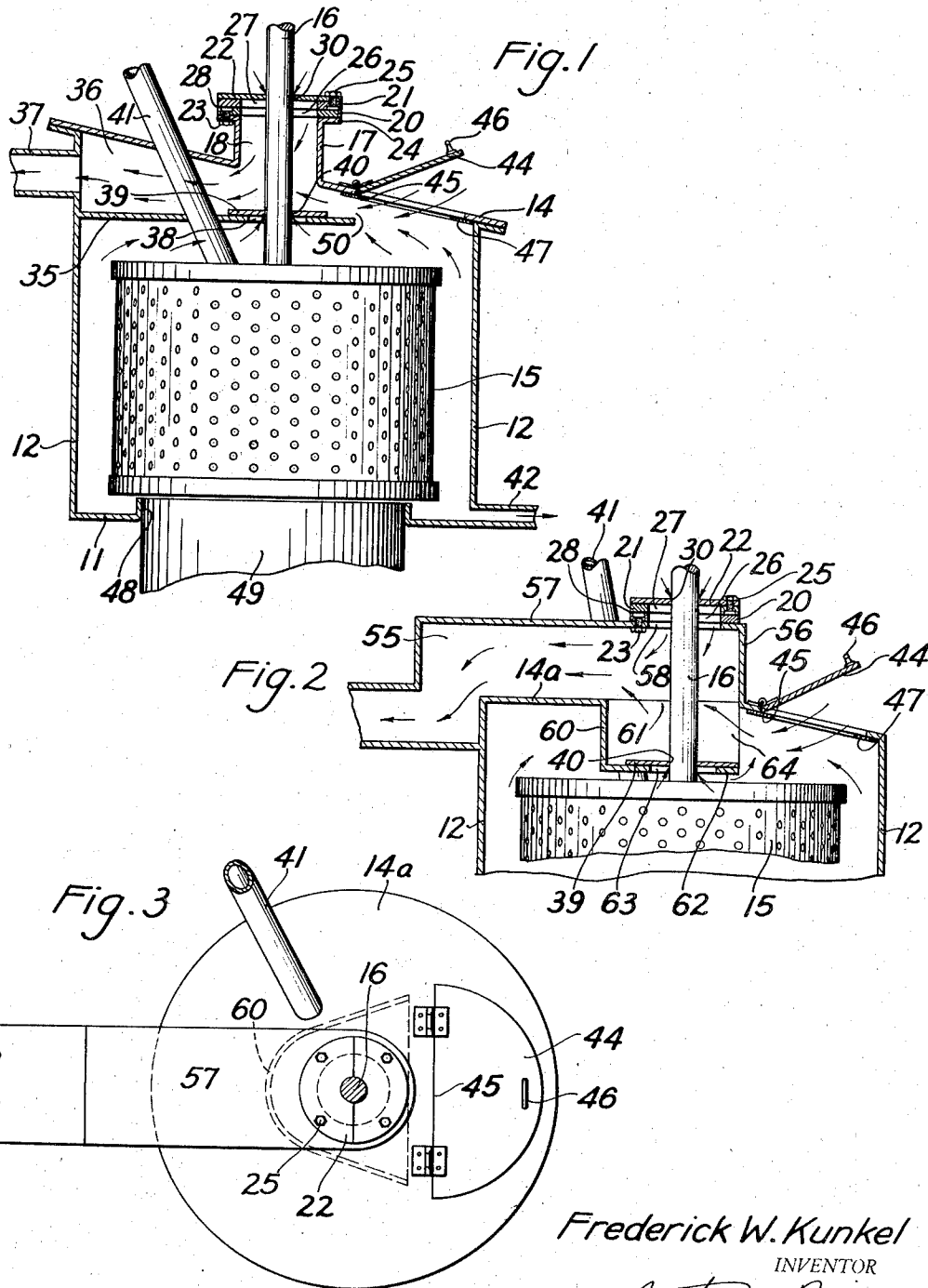
June 4, 1940.

F. W. KUNKEL

2,203,654

VENTILATING DEVICE FOR CENTRIFUGE CASINGS

Filed Dec. 30, 1938



Frederick W. Kunkel

INVENTOR

BY *Newton M. Parnas*  
*J. Griffin Little*  
 ATTORNEYS

## UNITED STATES PATENT OFFICE

2,203,654

## VENTILATING DEVICE FOR CENTRIFUGE CASINGS

Frederick W. Kunkel, Rochester, N. Y., assignor  
to Eastman Kodak Company, Rochester, N. Y.,  
a corporation of New Jersey

Application December 30, 1938, Serial No. 248,466

6 Claims. (Cl. 210—63)

The present invention relates to an improved form of centrifuging device which is particularly adapted for centrifuging nitro-cellulose or similar materials.

5 It is commonly known that in the production of nitro-cellulose, there is a stage in the process when the product is easily denitrated by contact with air at high water content. This stage occurs when the acid has been centrifuged off the product and before the product has been "soused" in water. Such denitrated products, when dissolved in solvents, have portions which are rendered insoluble by partial denitration so that such products are not satisfactory when used as a dope for making photographic film base.

10 This denitration reaction can be controlled by three methods. First, the air which comes in contact with the nitro-cellulose at this stage can be conditioned to a water content low enough to prevent rapid denitration. Second, the centrifuging process could be stopped at an earlier stage, thereby leaving more acid on the nitro-cellulose which consequently requires the absorption of more water from the air before denitration takes place. This method is quite expansive because the additional acid left on the product is lost in subsequent stages. Third, the flow of air into and out of the centrifuge can be controlled in such a way that the product is maintained in essentially the same atmosphere from the time the centrifuge is loaded until it is emptied. This method is effective because the large amount of acid which is removed during the centrifuging serves as an effective dehumidifying agent and so produces a dry atmosphere inside the centrifuge before the process is sufficiently free of acid to be susceptible to denitration. Therefore, if the atmosphere is not changed, the product will not suffer from denitration. None of the above methods have however been entirely satisfactory.

15 The present invention has as one of its objects the provision of a centrifuging device which is ventilated to permit normal operation under any humidity conditions encountered in operation, without any loss of product quality.

20 Another object of the invention is the provision of a ventilating duct positioned within the centrifuging case and surrounding the basket spindle so that any leakage along the spindle is immediately exhausted from the casing, thus preventing outside air from reaching the nitro-cellulose in the basket during the centrifuging operation.

25 A further object of the invention is the provision of a ventilating duct positioned within the centrifuging casing and having the main vent opening positioned adjacent the unloading door so that when the door is opened the acid vapors within the casing are prevented from

escaping into the room, and the flow of humid room air into the centrifuging basket is eliminated.

To these and other ends, the invention resides in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawing:

Fig. 1 shows a vertical sectional view through a centrifuging device of standard construction, showing the relation thereto of a ventilating duct and spindle seal construction constructed in accordance with the present invention.

Fig. 2 is a view similar to Fig. 1, showing a modified form of ventilating duct and spindle seal; and

Fig. 3 is a plan view of the arrangement illustrated in Fig. 2.

Similar reference numerals throughout the various views indicate the same parts.

The present invention is embodied in an apparatus based on the use of a centrifuging case which is made practically air tight with the exception of the point where the basket spindle enters the case. Prior to the present invention no practical seal had been found for this point. To this end, the present invention provides a ventilating duct which extends across the casing in such a way that the basket spindle passes directly through the duct. In this way, any leakage which tends to pass along the spindle will flow into the duct from which it is exhausted to a point outside the centrifuging casing. In this way, outside air is prevented from entering the centrifuge basket during the centrifuging operation, thus effectively preventing denitration of material in the basket. This arrangement also eliminates changes in the atmosphere of the centrifuging casing when the centrifuge is in operation.

30 However, when the casing door is opened for unloading, it is necessary to prevent the acid vapors in the casing from escaping into the room, and it is also necessary to prevent the humid room air from entering the centrifuging casing and basket. To this end the ventilating duct is placed so that the main vent opening thereof is along the back edge of the door and just under the casing cover or top. By such an arrangement, it has been possible to produce high quality nitro-cellulose when the humidity is high without resorting to expensive air conditioning or to more expensive reduction of centrifuging time.

35 The drawing shows a centrifuging device constructed in accordance with the present invention. The device shown in Fig. 1 comprises, in general, the stationary cylindrical outer casing formed to provide a bottom 11, upwardly ex-

tending sides 12 and inclined or sloping top 14. A bottom discharge perforated centrifuging basket 15, of standard or well-known construction, is positioned within but out of contact with the casing. This basket is supported and rotated by means of a vertical spindle 16 which extends upwardly through an enlarged neck 17 formed in the top portion, as clearly shown in Fig. 1. The casing is air tight, as later explained, except where the spindle 16 passes through the neck 17.

In centrifuges of the type shown in the drawing, the spindle 16 is supported at the upper end in a suitable bearing, not shown. The spindle and basket thus hang in suspended relation from the bearing much in the manner of the well-known pendulum. With such a mounting, any eccentric loading of the basket 15 will cause the latter, and spindle 16, to sway from side to side, as is well-known. For this reason, the opening 18 in the neck 17 is made a sufficient size to accommodate the maximum swing without the spindle touching the sides of the neck.

However, to provide a seal or closure for the neck 17, a set of annular plates 20, 21, and 22 are provided, the plates 20 and 21 being preferably of stainless steel, and the plate 22 being preferably aluminum. The plate 20 is secured, by countersunk rivets 23, or other suitable fastening means, to an outturned portion or flange 24 formed on the neck 17, while the plate 21 is secured, by countersunk rivets 25, to the aluminum plate 22. The plates 20 and 21 are provided with registering central openings 26 and 27 respectively which are equal in size to the opening 18 of the neck 17, as clearly shown in Fig. 1, and the contacting faces 28 of the plates are ground smooth so they may freely slide relative to each other. The plate 22, on the other hand, is provided with an opening 30 which is slightly larger than the spindle 16 to afford a substantially tight fit therearound, but of sufficient size that the plate, as well as the plate 21, but not rotate with the spindle. When, however, the spindle 16 sways, as pointed out above, the plates 21 and 22 will move radially with the spindle 16, while the smooth ground contacting surfaces 28 afford a substantially air tight sliding connection between the plates 20 and 21. As the spindle 16 has enlarged ends, not shown, which are of larger diameter than the opening 30 in the plate 22, the latter is split, as shown in Fig. 3, so that it may be positioned on the spindle. The plates 20 and 21 are so proportioned that even with the maximum sway of the spindle, the opening 18 will not be uncovered. The plates 20, 21 and 22 thus afford a relatively tight seal at the point where the spindle 16 passes through the top of the casing, yet permits free radial movement of the spindle, as is apparent from Fig. 1 of the drawing.

As is well known, the rotation of the basket 15 will create a vacuum within the basket, the area of highest vacuum being of course along the spindle 16. With such a vacuum, outside air may be drawn along the spindle and through the opening 30. Such leakage of outside air into the casing may denitrate the nitro-cellulose, as pointed out above. In order to overcome this feature, the present invention provides a ventilating duct positioned within the casing, and arranged to vent such leakage to a point outside the casing, thus preventing denitration of the material in the basket 15.

In the preferred embodiment, this ventilating duct is formed by means of a horizontal plate or

baffle 35 which is secured to the side wall 12 of the casing and extend part way across the casing, terminating short of the opposite side wall, as shown in Fig. 1. This baffle is spaced from the inclined top 14 but cooperation therewith to provide a ventilating duct 36 which converges to the right. An exhaust connection 37 is secured to the side 12 and is in fluid communication with the duct 36 so that any air or fumes which are drawn into the duct may be suitably vented to a point outside the casing. Suitable exhaust equipment, not shown, is applied to the connection 37.

The baffle 35 is formed of any suitable material, preferably stainless steel, and is provided with an opening 38 through which the spindle 16 extends. This opening 38 is made of sufficient size to prevent engagement of the spindle 16 therewith even for maximum spindle sway. The opening 38 in the baffle is covered with a split sealing plate 39, similar to or identical with the plate 20, formed with an opening 40 which is slightly larger than the spindle 16 and through which the latter passes. The plate 39 is also movable radially with the spindle 16, sliding on the baffle 35, and thus cooperates with the plates 20, 21 and 22 to form a seal for the spindle at the points where it passes through the ventilating duct 36. It is apparent that the above-described arrangement will quickly, effectively, and continuously exhaust or withdraw any outside air which may tend to leak downward along the spindle 16 during the centrifuging operation, thus eliminating a changing atmosphere within the centrifuging casing.

The nitro-cellulose is loaded into the basket 15 through a loading pipe 41 which is connected to a suitable source of supply, not shown. Upon rotation of the spindle 16, the acid is then removed from the material in the basket and is drained away through a discharge pipe 42 in which is arranged a suitable trap, not shown, to provide an air seal for the discharge line 42. At the end of the centrifuging operation, a door 44, hinged along one edge 45 to the top 14, is opened. A handle 46 may be provided for facilitating opening and closing of the door 44. A suitable gasket 47 may be provided for forming an air seal around the door when the latter is closed. In unloading, a suitable stick is inserted through the door 44 and the material which has now collected around the periphery of the basket 15 is pried loose and discharged through a bottom opening, not shown, in the basket 15. This relatively acid-free nitro-cellulose then falls through a registering opening 48 formed in the bottom 11 and is conveyed by the pipe 49, connected to the opening 48, to a water bath in which the centrifuged nitro-cellulose is "soused." A suitable water seal, not shown, is provided in the pipe 49 to render the latter air tight to prevent leaking into the centrifuging casing. By means of such an arrangement, the entire centrifuging casing is air tight except at the point where the spindle 16 passes through the opening 30 of the split plate 22.

However, when the door 44 is opened for the unloading operation, it is not only necessary to prevent the acid vapors within the casing from escaping into the room, but also to insure that humid room air does not enter the casing and basket and thus denitrate the centrifuged nitro-cellulose. To this end, the ventilating duct 36 as shown in Fig. 1, provides a main vent opening 50 which is positioned along the back edge 45 of

the door just under the top or cover 14. The arrows in Fig. 1 clearly indicate that when the door 44 is opened, the vapors in the casing as well as the outside air which entered through the door 44 are exhausted through the main vent opening 50 and the vent duct 36.

Figs. 2 and 3 show a modified arrangement of a ventilating duct for the basket spindle, parts corresponding to those in Fig. 1 will be designated by the same numerals. In this embodiment the left portion 14A of the top is flat rather than inclined as in Fig. 1. An exhaust pipe or duct 55, connected to a suitable source of vacuum not shown, extends across the top 14A and terminates at 56 adjacent the hinged edge 45 of the door 44, as clearly shown in Fig. 2. The top wall 57 of the duct 55 is provided with a relatively large opening 58 through which the spindle 16 extends. The opening 58 is substantially the same size as the opening 18, Fig. 1, and is closed by the plates 20, 21 and 22, plate 20 being secured by countersunk rivets 25 to the top 57 of the duct 55. The spindle 16 extends through the opening 30 of the plate 22 in a manner described in connection with Fig. 1.

A U-shaped plate member 60, of the shape best shown in Fig. 3, is secured to and depends from the edges of an opening 61 formed in the top 14A of the centrifuging casing. A horizontal baffle or plate 62 closes the bottom of the member 60 and cooperates therewith to provide a portion of the duct 55 which surrounds the spindle 16, as shown in Fig. 2. The baffle 62 is also formed with an opening 63 which is covered by the split plate 39 through the opening 40 of which the spindle 16 passes, as above described. In this way leakage along the spindle 16 is exhausted through the duct 55. The right end of the U-shaped member 60 terminates adjacent the rear end 45 of the door to provide a main vent opening 64 for exhausting any leakage which may tend to enter the casing when the door 44 is opened, as clearly indicated by the arrows in Fig. 2.

It is apparent from the above description that the disclosed ventilating duct provides an effective air seal for the basket and spindle during the centrifuging operation, and for the door during the unloading operation, thus preventing denaturation of the cellulose nitrate in the centrifuging basket. It is also apparent from an inspection of Figs. 1 and 3 that a portion of the ventilating duct surrounds the basket spindle 16.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is therefore not to be limited to the precise details described, but is intended to cover all variations and modifications thereof falling within the spirit of the invention or the scope of the appended claims.

I claim:

1. In a centrifuging device, the combination with a casing having a top, a door on said top, a rotatable basket positioned within said casing and adapted to hold material to be centrifuged, a basket driving spindle extending through said top, of a ventilating duct having a portion thereof positioned within said casing so that said spindle passes therethrough to provide an air seal for said spindle, and a main vent opening for said duct adjacent said door.

2. In a centrifuging device, the combination with a casing having a top, a door in said top, a rotatable basket positioned within said casing

and adapted to hold material to be centrifuged, a basket driving spindle extending through said top, of a baffle extending across said casing in spaced relation to said top and cooperating therewith to provide an air seal duct through which said spindle passes, and a main vent opening for said duct adjacent said door, and an exhaust connection for said duct.

3. In a centrifuging device, the combination with a casing having a top, a door hinged along one edge to said top, a rotatable basket positioned within said casing and adapted to hold material to be centrifuged, a basket driving spindle extending through said top, of a horizontal baffle extending across said casing in spaced relation to said top and cooperating therewith to provide a ventilating duct through which said spindle passes to prevent air leaking along said spindle, a main vent opening for said duct adjacent said edge, and an exhaust connection for said duct.

4. In a centrifuging device, the combination with a casing having side and top walls, a rotatable basket positioned within said casing and adapted to hold material to be centrifuged, a basket driving spindle extending through said top wall, a door hinged along one edge to said top wall adjacent said one side thereof, of a horizontal baffle operatively connected to one of said walls and extending across said casing in spaced relation to said top and cooperating therewith to provide a ventilating duct through which said spindle passes, said duct providing an air seal for said spindle to prevent air leaking along said spindle from entering said basket, a main vent opening for said duct adjacent said one edge, and an exhaust connection on said side wall connected to said duct.

5. In a centrifuging device, the combination with an outer casing having a top, a rotatable basket positioned within said casing and adapted to hold material to be centrifuged, a spindle projecting exteriorly of said casing for supporting and rotating said basket, of a horizontal baffle extending across said casing in spaced relation to said top to provide a ventilating duct through which said spindle passes, said top and baffle being formed with registering openings for said spindle, plates surrounding said spindle and covering said openings to provide seals for said spindle where it passes through said top and said baffle, said plates being movable radially with said spindle but nonrotatable therewith, and an exhaust connection for said duct.

6. In a centrifuging device, the combination with an outer casing having a top, a rotatable basket positioned within said casing and adapted to hold material to be centrifuged, a supporting and driving spindle for said basket, a door hinged along one edge of said top, of a baffle extending horizontally across said casing in spaced relation to said top and cooperating therewith to provide a ventilating duct through which said spindle passes, said top and baffle being formed with aligned openings for said spindle, apertured plates surrounding said spindle and overlying said opening to provide seals for said duct at the points where said spindle passes therethrough certain of said plates being slidable on said top and said baffle when said spindle moves radially, a main vent opening for said duct adjacent said one edge, and an exhaust connection for said duct.

FREDERICK W. KUNKEL.