Aug. 2, 1960 J. W. BEAMS ET AL 2,947,471

CENTRIFUGE END CAP

Filed June 13, 1944 2 Sheets-Sheet 1

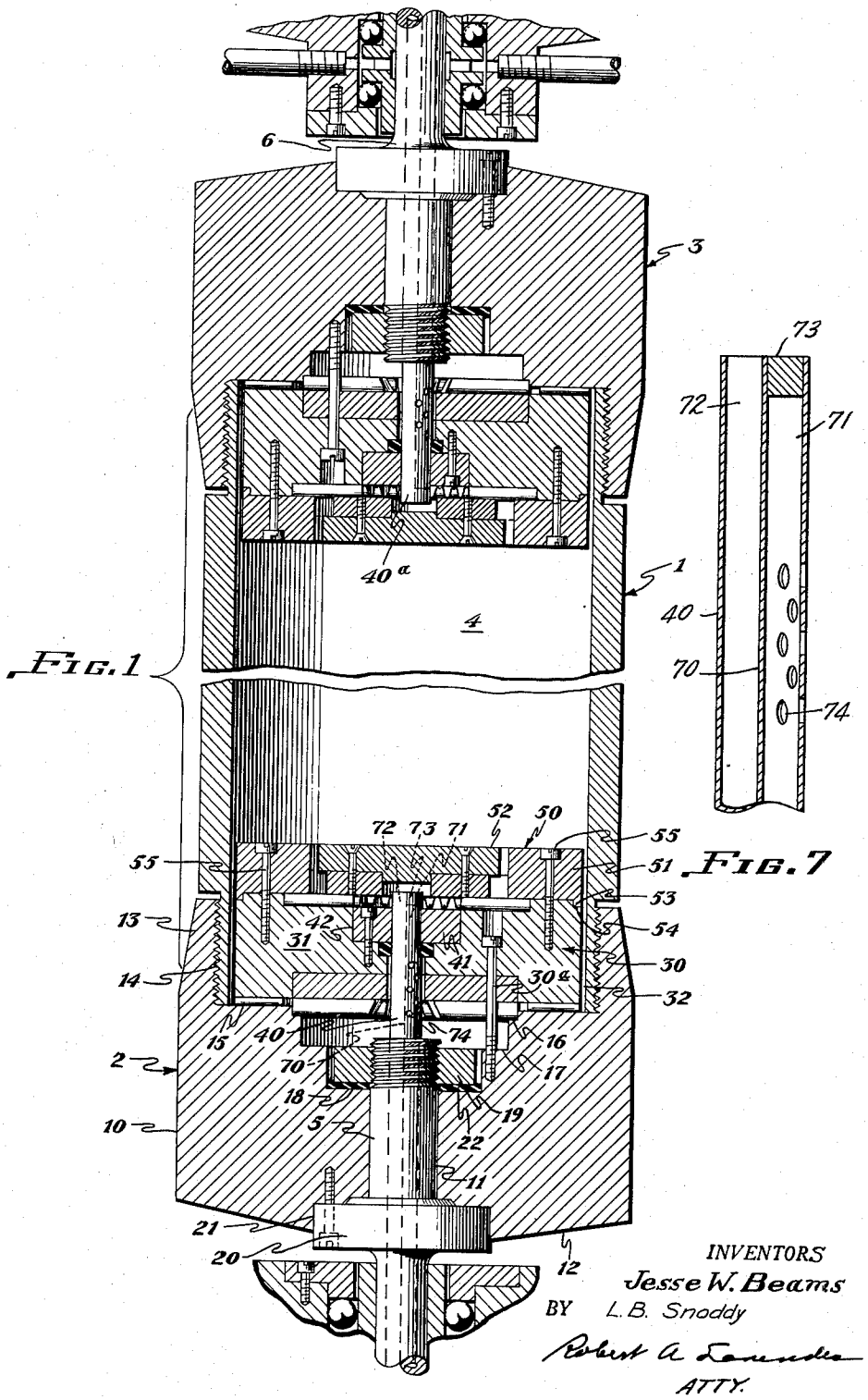

FIG. 1

FIG. 7

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CENTRIFUGE END CAP

Filed June 13, 1944 2 Sheets-Sheet 2

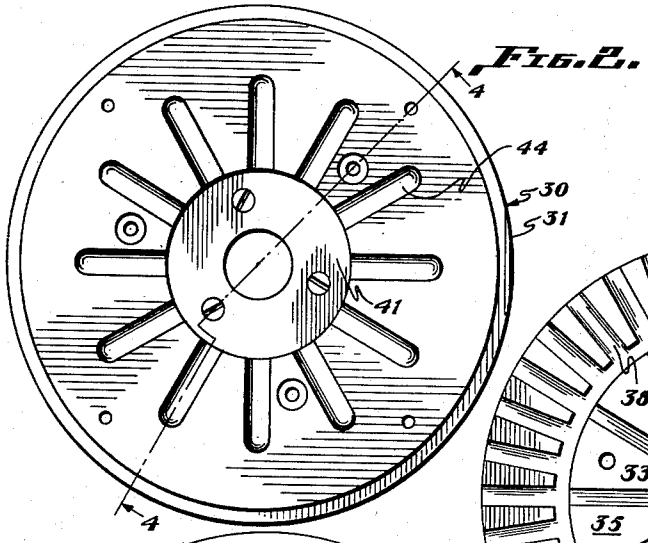

Fig. 2.

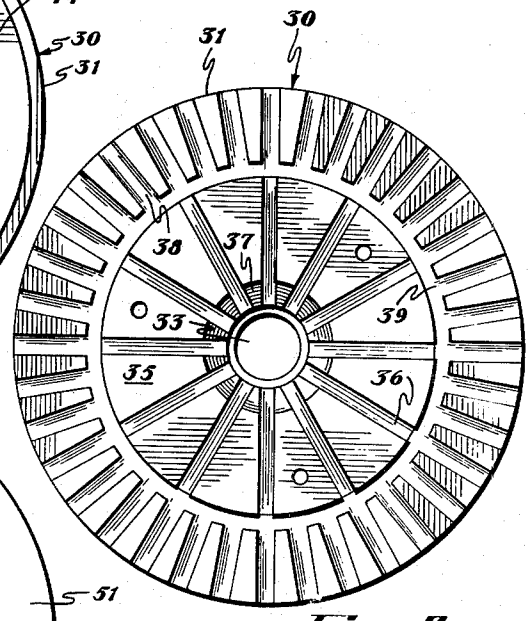

Fig. 3.

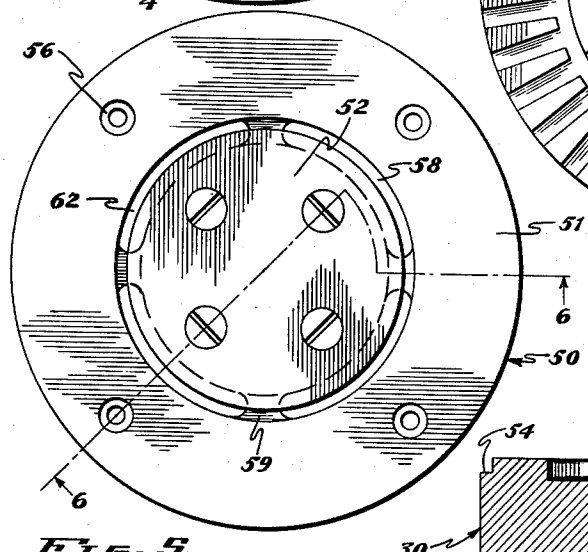

Fig. 5.

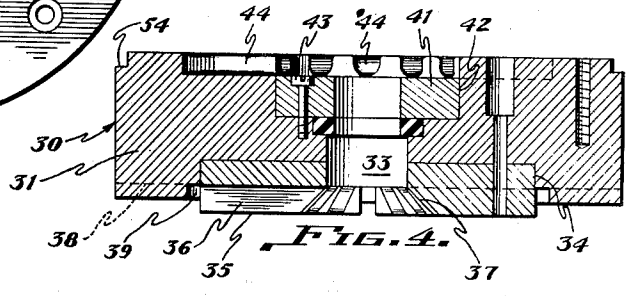

Fig. 4.

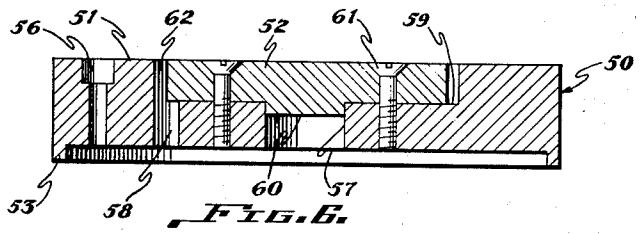

Fig. 6.

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United States Patent Office 2,947,471 Patented Aug. 2, 1960

2,947,471

CENTRIFUGE END CAP

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Filed June 13, 1944, Ser. No. 540,154

19 Claims. (Cl. 233—13)

This invention relates to new and useful improvements in centrifuge devices for separating gaseous mixtures or isotopic gaseous mixtures, and more particularly relates to the construction and arrangement of the centrifuge end caps through which the process gases enter and leave the centrifuge.

In centrifugal separators, and particularly those of the refluxing countercurrent type described in the copending application of Karl P. Cohen, Ser. No. 575,533, filed January 31, 1945, it is desirable that the process gases enter and leave the centrifuge endwise thereof at predetermined points radially with respect to the rotational axis of the centrifuge. Thus the streams of process gases must be guided to enter and leave the centrifuge chamber at the proper radial position, and, in the case of the entering gases, these must be directed into streams along the length of the centrifuge chamber at such proper radial positions. In addition, to obtain the maximum separative work per unit length of the centrifuge, the entering process gases should be accelerated to the angular momentum of the centrifuge prior to entering the chamber, and the gas separation fractions leaving the centrifuge should be decelerated from the angular momentum of the centrifuge. Furthermore, the gases flowing through the centrifuge should be brought into thermal equilibrium with the centrifuge and maintained at a substantially uniform temperature.

Since it is desirable that the process gases initially enter the centrifuge chamber at the proper radial points, and at the angular momentum of the centrifuge and in thermal equilibrium therewith, and also leave the centrifuge chamber under similar conditions, guidance and conditioning of the process gases necessarily must take place during travel of said gases through the centrifuge end caps.

Accordingly, an object of the present invention is to provide, in conjunction with centrifuge devices for separating gaseous mixtures and isotopic gaseous mixtures, a novel end cap construction that operates to deliver the entering process gases to the centrifuge chamber and to withdraw the gas fractions from said chamber at the proper positions radially of the rotational axis thereof.

Another object of the present invention is to provide a novel centrifuge end cap construction of the stated character that operates to accelerate the gases entering the centrifuge chamber substantially to the angular momentum of the centrifuge and to decelerate from the angular momentum of the centrifuge the gases leaving the centrifuge chamber.

A further object of the invention is to provide a novel end cap construction of the character set forth that operates effectively to bring the incoming gases into thermal equilibrium with the centrifuge and maintain the gases at a substantially uniform temperature.

These and other objects of the invention and the various features and details of the construction and operation thereof, are hereinafter fully set forth and described with reference to the accompanying drawings, in which:

Fig. 1 is a sectional view taken diametrically through a centrifuge rotor having end caps embodying the present invention.

Fig. 2 is a top plan view of a baffle structure that forms a part of the end cap construction shown in Fig. 1.

Fig. 3 is a bottom plan view in plan of the baffle structure shown in Fig. 2.

Fig. 4 is a sectional view taken on line 4—4, Fig. 2.

Fig. 5 is a top plan view of a second baffle structure that is cooperatively disposed with respect to the baffle structure of Fig. 2 in the cap member shown in Fig. 2, and

Fig. 6 is a sectional view taken on line 6—6, Fig. 5.

Fig. 7 is a vertical sectional view of the upper portion of the tubular shaft shown in Fig. 1.

Referring now more particularly to the drawings, and particularly to Fig. 1 thereof, the end cap construction of the present invention is shown in conjunction with, or as a part of, a centrifuge of the refluxing countercurrent type employed for separating gaseous mixtures and isotopic gaseous mixtures into lighter and heavier fractional components. As shown, such a centrifuge may comprise a rotor consisting essentially of a cylindrical tubular wall member **1** and end caps **2** and **3**, respectively, secured to opposite ends thereof to form therewith a separating chamber **4**, the rotor being supported for rotation about its longitudinal axis by means of tubular shafts **5** and **6** secured coaxially in the rotor end caps **2** and **3**, respectively.

In the centrifuge illustrated in Fig. 1, the end caps **2** and **3** are identical, and it will therefore be necessary to describe the construction of one end cap, for example, the end cap **2**, it being understood that like reference numerals are employed in the drawings to designate like elements and features of construction of both ends caps **2** and **3**.

Referring particularly to Fig. 1 of the drawings, an end cap embodying the present invention comprises a relatively massive body **10** having a bore **11** of predetermined diameter axially therethrough to receive the tubular supporting shaft **5** that extends inwardly of the body **10** from the outer end or face **12** thereof. The inner end of the body **10** is provided with a peripheral, axially extending flange portion **13** that may be internally threaded as indicated at **14** so that it may be screwed onto the externally threaded adjacent end of the tubular rotor wall member **1** as shown.

The inner end face of the cap body **10**, radially inward from the base of the flange portion **13**, provides an annular plane surface **15** that is perpendicular to the rotational axis of the rotor and terminates inwardly in a series of stepped annular shoulders **16**, **17** and **18** respectively. The shaft **5** extends into the cap body **10** substantially to the plane of the shoulder **17** and is fixedly secured in the body **10** by means of a nut **19** that is threaded on the shaft **5** and tightened against the shoulder **18** as shown, tightening of the nut **19** being opposed by an enlarged portion **20** on shaft **5** that seats within a recess **21** in the outer body end face **12**. To render the joint between the shaft **5** and cap body **10** completely gas-tight, a gasket **22** of suitable material, for example, neoprene, is interposed between the nut **19** and the shoulder **18**.

Secured in abutting relation to the inner end of the cap body **10** is a baffle structure **30**, the construction and arrangement of which is more clearly shown in Figs. 2, 3 and 4 of the drawings. As there shown, the baffle **30** comprises a member **31** of circular configuration having a diameter slightly less than the internal diameter of the rotor wall member **1** so that when the cap body, with the baffle **30** properly positioned thereon, is secured on the end of the wall member **1**, there is provided between

the periphery of the baffle member 31 and the inner wall surface of the member 1, an annular space or passage 32 (see Fig. 1).

Extending axially through the baffle member 31 is a bore 33, and the underside or face of the member is recessed as indicated at 34 to receive an annular member 35. The annular member 35 has a diameter substantially equal to the diameter of the shoulder 16 in the cap body 10, and the thickness of the member 35 is greater than the depth of its recess 34 by the amount of the depth of the cap body shoulder 16 so that when the baffle structure 30 is positioned upon the inner end of the cap body 10, the projecting portion of the annular member 35 of the baffle seats upon the shoulder 16 of said cap body as shown in Fig. 1. In this position the outwardly adjacent under surface of the baffle member 31 seats upon the flat plane surface portion 15 of the cap body 10 and the assembly is secured in this relation to said body 10 by means of a plurality of screws 30^a as shown.

The under side or face of the member 35 is provided with a plurality of circumferentially spaced radially extending grooves or passages 36 therein that extend from the outer peripheral edge of the member 35 inwardly to the inner peripheral edge thereof that is bevelled, as indicated at 37. Similar grooves 38 are provided in the underside or face of the member 31 that lies outwardly adjacent the member 35, and these cooperate with the cap body surface portion 15 to form a series of independent radial passages extending to the outer periphery of the member 31. It is to be noted, however, that a substantially greater number of passages 38 are provided in the member 31 than there are passages 36 in the member 35, and communication from the inner passage 36 to all of the outer passages 38 is insured by providing a continuous circumferential groove or passage 39 between the radial passages 36 of member 35 and the radial passages 38 of the body member 31 (see Fig. 3).

The axial bore 33 in the baffle member 31 is adapted to receive the end portion of a tubular shaft 40 that extends into the end cap through the shaft 5 and is fixedly secured in the member 31, for rotation therewith and with the centrifuge rotor, by means of an annular retaining washer 41 that seats within a recess 42 provided in the upper face of the baffle body 31 as shown, the washer being secured to said body 31 in any suitable manner such as by means of a screw 43.

As more clearly shown in Fig. 4, the recess 42 has a depth greater than the thickness of the washer 41 so that the surface of the latter resides below the plane of the outer surface of the baffle member 31, and extending radially outward from the recess 42 about the plane of washer 41 are a plurality of circumferentially spaced grooves or passages 44 of equal length that terminate at points inwardly spaced from the outer periphery of the member 31.

Disposed in abutting relation to the baffle structure 30 is a second baffle structure 50 comprising an annular member 51 and what may be termed a cover member 52. As shown in Figs. 1 and 6 the member 51 has an outer diameter equal to that of the member 31, and the face of the member 51 that abuts the baffle structure 30 is provided with an axially extending peripheral flange portion 53 that is arranged to seat upon a shoulder 54 formed peripherally of the adjacent outer edge of the baffle member 31. The radial length of the flange portion 53 is the same as the depth of the shoulder 54 so that the surface portions of the baffle members 31 and 51 residing inwardly adjacent the flange and shoulder are disposed in abutting relation with the member 51 overlying the grooves or passages 44 formed in the upper surface of member 31. The baffle structure 50 is fixedly secured in this position with respect to the baffle structure 30 by means of screws or the like 55 that pass through openings 56 in the baffle body 51 and threadably engage the baffle member 31.

As more clearly shown in Figs. 5 and 6 of the drawings the member 51 of the baffle structure 50 has a central bore 57 therethrough, and arranged in concentric spaced relation thereabout are a plurality of circumferentially arranged arcuate slots 58, the particular disposition of which radially of the member 51 will be more fully set forth hereinafter. The central portion of the face of the member 51 remote from the baffle structure 30 is recessed as indicated at 59 to receive therein the cover member 52 previously mentioned. This cover member 52 has a central boss 60 thereon that is arranged to fit within the central bore 57 in the member 51, the member 52 being secured to the member 51 in the described relation, for example, by means of screws 61. As will be noted, the diameter of the cover member 52 is slightly less than the diameter of the recess 59 in the baffle member 51 to thereby provide an annular space 62 between the cover member 52 and member 51, so that the slots 58 and space 62 afford openings or passages through the baffle structure 50 in a direction parallel to the rotational axis of the rotor 1 and end caps 2 and 3.

The arcuate slots 58 and the annular space 62 are disposed radially of the baffle structure 50 so that the slots 58 communicate with the radial grooves or passages 44 in baffle structure 30, and in a centrifuge employed to separate gaseous mixtures of uranium hexafluoride, the annular space 62 resides outwardly from the rotational axis of the centrifuge rotor a distance that is approximately 53% of the distance from said rotational axis to the inner surface of the rotor wall 1 in accordance with the invention disclosed in the copending application of Karl P. Cohen and Harold C. Urey, Ser. No. 575,532 filed January 31, 1945 now matured into U.S. Patent 2,536,423. For other gaseous mixtures, the position of the space 62 radially of the axis of rotation will vary and must be determined with reference to the particular gases employed.

As previously stated, the tubular shaft 40 is fixed secured in the baffle structure 30, and in the particular centrifuge illustrated in the drawings, gases are adapted to enter and leave the rotor through this shaft 40, as well as through the corresponding shaft 40^a that is associated with the end cap 3 at the upper end of the rotor. To this end, therefore, the tubular shaft 40 is provided with a partition or wall 70 that extends the full length thereof and subdivides the shaft 40 into two parallel flow passages 71 and 72, respectively. One of these, for example the inlet passage 71, is plugged at the rotor end thereof, as indicated at 73, and a plurality of openings 74 are provided in the wall of the shaft 40 adjacent the baffle passages 36 for egress of gases from the shaft passage 71. Gases that emerge from the shaft passage 71 through the openings 74 are forced radially outward through the end cap passages 36, channel 39 and passages 38 to the annular passage 32 through which they travel in an axial direction along the exterior of the baffle structures 30 and 50, and between them and the surface of the wall member 1, to interior of the rotor chamber 4.

On the other hand, the rotor end of the shaft passage 72 is not plugged, and is in open communication with the space provided by the bore 57 in the baffle body 51. Thus, gases to be withdrawn from the rotor chamber 4 through shaft passage 72, pass outwardly of the rotor through the annular space 62, slots 58, and inwardly along the radial passages 44 from which they emerge and enter the passage 72 of shaft 40 through the open end thereof.

Of course it is not essential that gases enter and leave the rotor through the particular shaft and end cap passages just described and gases could be admitted to the rotor through shaft passage 72 and the end cap passage associated therewith, and be withdrawn from the rotor through shaft passage 71 and its associated end cap passages. Actually, in operation of the centrifuge illustrated both of these procedures are followed, and at the lower end of the rotor, gases enter through shaft passage 71

and its associated end cap passages that deliver the gases into the chamber 4 at the periphery thereof, and as these gases travel upwardly through the chamber 4 they are separated into outer heavier, and inner lighter, fractions. The outer heavier fraction is withdrawn from the chamber 4 through the outer, peripheral opening passages of the upper end cap 3 and returned to the rotor through the inner opening passages thereof to be refluxed downwardly through the chamber 4 along with the lighter separation fraction. Further fractional separation takes place during this countercurrent travel of the lighter fraction and refluxed heavier fraction, and the resulting composite lighter fraction thus produced is withdrawn from the chamber 4 through the inner opening passages 44 and shaft passage 72 of the lower end cap 2.

From the foregoing, it will be observed that the present invention provides a novel end cap construction for centrifuge devices employed in the separation of gases whereby the gases are guided to enter and leave the centrifuge rotor at predetermined, proper positions radially with respect to the rotational axis of the centrifuge. In addition, the construction and arrangement of the passages through which the gases enter and leave the rotor are such that gases entering and leaving the rotor are respectively accelerated to, and decelerated from the angular momentum of the centrifuge during their travel through the end cap. Furthermore, the construction and arrangement of the gas passages in the end cap are such that they provide a path of travel for the gases of such length that gases entering the centrifuge therethrough are brought into thermal equilibrium with the centrifuge during travel through the end caps.

While a particular embodiment of the invention has been illustrated and described herein, it is not intended that the invention is limited to such disclosure and changes and modifications may be made without departing from the spirit of the invention within the scope of the appended claims.

We claim:

1. An end cap for the rotor of a centrifuge, comprising a body member having an annular end surface portion, a first baffle secured in abutting relation with said body surface and including a member constructed and arranged to provide in cooperation therewith a plurality of circumferentially arranged passages extending radially to the periphery of said baffle, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves, the outer ends of the grooves being positioned inwardly from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages.

2. An end cap for the rotor of a centrifuge having a tubular wall, comprising a body member having an end face circumscribed by an axially extending peripheral flange threaded for connection with an end of the tubular rotor wall, a first baffle secured in abutting relation with said body end face and including a member constructed and arranged to provide in cooperation therewith a plurality of circumferentially arranged gas passages extending radially to the periphery of said baffle, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves terminating radially inward from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages.

3. A rotor for a centrifuge comprising a tubular wall and an end cap, the end cap comprising a body member having an end face circumscribed by an axially extending peripheral flange threaded to an end of the tubular rotor wall, a first baffle secured in abutting relation with said body end face and including a member constructed and arranged to provide in cooperation therewith a first group of circumferentially arranged gas passages extending radially to the periphery of said baffle, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves terminating radially inward from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages, and the first and second baffles each having a diameter slightly less than the internal diameter of the rotor wall to provide peripherally of said baffles an axially extending annular passage communicating at one end with the radial extremities of the first group of gas passages.

4. An end cap for the rotor of a centrifuge, comprising a body member having an annular end surface portion, a first baffle secured in abutting relation with said body surface and constructed and arranged to provide in cooperation therewith a first group of passages comprising an outer series of circumferentially arranged passages extending radially to the baffle periphery and an inner series of circumferentially arranged radially extending passages spaced inwardly from said outer series of passages, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves the outer ends of the grooves being positioned inwardly from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough, disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages.

5. An end cap for the rotor of a centrifuge having a tubular wall, comprising a body member having an end face circumscribed by an axially extending peripheral flange threaded for connection with an end of the tubular rotor wall, a first baffle secured in abutting relation with said body surface constructed and arranged to provide in cooperation therewith a first group of passages comprising an outer series of circumferentially arranged passages extending radially to the baffle periphery and an inner series of circumferentially arranged radially extending passages spaced inwardly from said outer series of passages, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves terminating radially inward from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages.

6. A rotor for a centrifuge comprising a tubular wall and an end cap, the end cap comprising a body member having an end face circumscribed by an axially extending peripheral flange threaded to an end of the tubular rotor wall, a first baffle secured in abutting relation with said

body surface, constructed and arranged to provide in cooperation therewith a first group of passages comprising an outer series of circumferentially arranged passages extending radially to the baffle periphery and an inner series of circumferentially arranged radially extending passages spaced inwardly from said outer series of passages, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves terminating radially inward from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages, and the first and second baffles each having a diameter slightly less than the internal diameter of the rotor wall to provide peripherally of said baffles an axially extending annular passage communicating at one end with the radial extremities of the first group of gas passages.

7. An end cap for the rotor of a centrifuge, comprising a body member having an annular end surface portion, a first baffle secured in abutting relation with said body surface and constructed and arranged to provide in cooperation therewith a first group of passages comprising an outer series of circumferentially arranged passages extending radially to the baffle periphery and an inner series of circumferentially arranged radially extending passages spaced inwardly from said outer series of passages, said first baffle having an annular passage therein intermediate and communicating with said inner and outer series of passages, and said baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves the outer ends of the grooves being positioned inwardly from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages.

8. An end cap for the rotor of a centrifuge having a tubular wall, comprising a body member having an end face circumscribed by an axially extending peripheral flange threaded for connection with an end of the tubular rotor wall, a first baffle secured in abutting relation with said body surface constructed and arranged to provide in cooperation therewith a first group of passages comprising an outer series of circumferentially arranged passages extending radially to the baffle periphery and an inner series of circumferentially arranged radially extending passages spaced inwardly from said outer series of passages, said first baffle having an annular passage therein intermediate and communicating with said inner and outer series of passages, and said baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves terminating radially inward from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages.

9. A rotor for a centrifuge comprising a tubular wall and an end cap, the end cap comprising a body member having an end face circumscribed by an axially extending peripheral flange threaded to an end of the tubular rotor wall, a first baffle secured in abutting relation with said body surface constructed and arranged to provide in cooperation therewith a first group of passages comprising an outer series of circumferentially arranged passages extending radially to the baffle periphery and an inner series of circumferentially arranged radially extending passages spaced inwardly from said outer series of passages, said first baffle having an annular passage therein intermediate and communicating with said inner and outer series of passages, and said baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves terminating radially inward from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages, and the first and second baffles each having a diameter slightly less than the internal diameter of the rotor wall to provide peripherally of said baffles an axially extending annular passage communicating at one end with the radial extremities of the first group of gas passages.

10. An end cap for the rotor of a centrifuge, comprising a body member having an annular end surface portion, a first baffle secured in abutting relation with said body surface and including a member constructed and arranged to provide in cooperation therewith a first group of circumferentially arranged passages extending radially to the periphery of said baffle, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves, the outer ends of the grooves being positioned inwardly from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages, and a tubular member extending axially through said body and secured in said first baffle, said tubular member having two independent passages therein communicating respectively with the first and second groups of radial passages.

11. An end cap for the rotor of a centrifuge having a tubular wall, comprising a body member having an end face circumscribed by an axially extending peripheral flange threaded for connection with an end of the tubular rotor wall, a first baffle secured in abutting relation with said body and face and including a member constructed and arranged to provide in cooperation therewith a first group of circumferentially arranged gas passages extending radially to the periphery of said baffle, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves terminating radially inward from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages, and a tubular member extending axially through said body and secured in said first baffle, said tubular member having two independent passages therein communicating respectively with the first and second groups of radial passages.

12. A rotor for a centrifuge comprising a tubular wall and an end cap, the end cap comprising a body member having an end face circumscribed by an axially extending peripheral flange threaded to an end of the

tubular rotor wall, a first baffle secured in abutting relation with said body end face and including a member constructed and arranged to provide in cooperation therewith a first group of circumferentially arranged gas passages extending radially to the periphery of said baffle, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves terminating radially inward from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages, and the first and second baffles each having a diameter slightly less than the internal diameter of the rotor wall to provide peripherally of said baffles an axially extending annular passage communicating at one end with the radial extremities of the first group of gas passages, and a tubular member extending axially through said body and secured in said first baffle, said tubular member having two independent passages therein communicating respectively with the first and second groups of radial passages.

13. An end cap for the rotor of a centrifuge, comprising a body member having an annular end surface portion, a first baffle secured in abutting relation with said body surface and constructed and arranged to provide in cooperation therewith a first group of passages comprising an outer series of circumferentially arranged passages extending radially to the baffle periphery and an inner series of circumferentially arranged radially extending passages spaced inwardly from said outer series of passages, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves, the outer ends of the grooves being positioned inwardly from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages, and a tubular member having two independent passages therein extending axially through said body and secured in said first baffle, one of said passages of the tubular member communicating with the first groups of radial passages and the other of said passages communicating with the second group of radial passages.

14. A rotor for a centrifuge comprising a tubular wall and an end cap, the end cap comprising a body member having an end face circumscribed by an axially extending peripheral flange threaded to an end of the tubular rotor wall, a first baffle secured in abutting relation with said body surface constructed and arranged to provide in cooperation therewith first group of passages comprising an outer series of circumferentially arranged passages extending radially to the baffle periphery and an inner series of circumferentially arranged radially extending passages spaced inwardly from said outer series of passages, said first baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves terminating radially inward from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages, and the first and second baffles each having a diameter slightly less than the internal diameter of the rotor wall to provide peripherally of said baffles an axially extending annular passage communicating at one end with the radial extremities of the first group of gas passages, and a tubular member having two independent passages therein extending axially through said body and secured in said first baffle, one of said passages of the tubular member communicating with the first group of radial passages and the other of said passages communicating with the second group of radial passages.

15. An end cap for the rotor of a centrifuge, comprising a body member having an annular end surface portion, a first baffle secured in abutting relation with said body surface and constructed and arranged to provide in cooperation therewith a first group of passages comprising an outer series of circumferentially arranged passages extending radially to the baffle periphery and an inner series of circumferentially arranged radially extending passages spaced inwardly from said outer series of passages, said first baffle having an annular passage therein intermediate and communicating with said inner and outer series of passages, and said baffle having in the opposite face thereof from said body a plurality of circumferentially spaced radially extending grooves, the outer ends of the grooves being positioned inwardly from the periphery thereof, and a second baffle secured in abutting relation with said opposite face of the first baffle and cooperating with said grooves therein to form a second group of radially extending gas passages, said second baffle having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with said second group of radial passages, and a tubular member having two independent passages therein extending axially through said body and secured in said first baffle, one of said passages of the tubular member communicating with the first group of radial passages and the other of said passages communicating with the second group of radial passages.

16. An end cap for a centrifuge having a tubular rotor wall, comprising an annular body member having a peripheral flange portion projecting axially beyond one end face of said body and arranged to receive one end of the tubular rotor wall, said one end face of the body being provided centrally thereof with a recessed shoulder portion, a first baffle secured in abutting relation to said one end face of the body member and having a part thereof seated in said body shoulder portion, the abutting surface of said first baffle structure having a first group of passages therein comprising inner and outer series of radially extending passages therein arranged at opposite sides of and communicating with an intermediate annular passage, and the opposite surface of said baffle structure having a series of radially extending grooves therein terminating inwardly from the periphery thereof, a second baffle secured in abutting relation with respect to the first baffle and cooperating with the grooves in the adjacent surface of the latter to form a second group of radially extending dead-ended passages, said baffle structure having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with the second group of passages.

17. An end cap for a centrifuge having a tubular rotor wall, comprising an annular body member having a peripheral flange portion projecting axially beyond one end face of said body and arranged to receive one end of the tubular rotor wall, said one end face of the body being provided centrally thereof with a recessed shoulder portion, a first baffle secured in abutting relation to said

one end face of the body member and having a part thereof seated in said body shoulder portion, the abutting surface of said first baffle structure having a first group of passages comprising inner and outer series of radially extending passages therein arranged at opposite sides of and communicating with an intermediate annular passage, and the opposite surface of said baffle structure having a series of radially extending grooves therein terminating inwardly from the periphery thereof, a second baffle structure secured in abutting relation with respect to the first baffle and cooperating with the grooves in the adjacent surface of the latter to form a second group of radially extending dead-ended passages, said baffle structure having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with the second group of passages and means extending axially through the end cap body member and secured in said first baffle structure providing independent passages communicating respectively with the inner extremities of the first group of radial passages and the inner extremities of the second group of radial passages.

18. A rotor for a centrifuge comprising a tubular rotor wall and an end cap, the end cap comprising an annular body member having a peripheral flange portion projecting axially beyond one end face of said body and fixed to one end of the tubular rotor wall, said one end face of the body being provided centrally thereof with a recessed shoulder portion, a first baffle secured in abutting relation to said one end face of the body member and having a part thereof seated in said body shoulder portion, the abutting surface of said first baffle having provided a first group of passages comprising inner and outer series of radially extending passages therein arranged at opposite sides of and communicating with an intermediate annular passage, and the opposite surface of said baffle structure having a series of radially extending grooves therein terminating inwardly from the periphery thereof, a second baffle secured in abutting relation with respect to the first baffle and cooperating with the grooves in the adjacent surface of the latter to form a second group of radially extending dead-ended passages, said baffle structure having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with the second group of passages, the diameter of said first and second baffles

being less than the internal diameter of the rotor wall received by the flange of the body member to provide peripherally of said baffle structures an axially extending annular passage communicating between the radial extremities of the first group of passages and the rotor chamber.

19. An end cap for a centrifuge having a tubular rotor wall, comprising an annular body member having a peripheral flange portion projecting axially beyond one end face of said body and arranged to receive one end of the tubular rotor wall, said one end face of the body being provided centrally thereof with a recessed shoulder portion, a first baffle secured in abutting relation to said one end face of the body member and having a part thereof seated in said body shoulder portion, the abutting surface of said first baffle having provided a first group of passages comprising inner and outer series of radially extending passages therein arranged at opposite sides of and communicating with an intermediate annular passage, and the opposite surface of said baffle structure having a series of radially extending grooves therein terminating inwardly from the periphery thereof, a second baffle secured in abutting relation with respect to the first baffle and cooperating with the grooves in the adjacent surface of the latter to form a second group of radially extending dead-ended passages, said baffle structure having a plurality of axially extending openings therethrough disposed circumferentially of the second baffle at a predetermined position radially thereof and communicating at one end with the second group of passages, the diameter of said first and second baffle being less than the internal diameter of the rotor wall received by the flange of the body member to provide peripherally of said baffle structures an axially extending annular passage communicating between the first group of passages and the rotor chamber, and means extending axially through the end cap body member and secured in said first baffle structure providing independent passages communicating respectively with the first and second groups of passages.

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