A filter apparatus (10) having a bag filter subassembly (14) for collecting contaminating material. The bag filter subassembly includes a bag filter (38) having a top end portion (66) and an integral collar (60). The collar has a lower portion (62) fixedly connected to the bag filter, and has a middle portion (68) to be supported within a vessel, and has a top lip portion (70) to engage a cover plate of the vessel. The collar has a pivotal web portion (78) disposed between the middle portion and the top lip portion, and has an inner surface with a groove having sidewalls, whereby internal pressure on the sidewalls pivot the top lip portion causing a sealing ring bearing area (82) on the cover plate (24).
### Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

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+ Any designation of “SU” has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.
FILTER BAG SEAL

The invention relates to a filter bag seal and in particular the invention relates to a filter bag seal having a pivotal lip portion.

RELATED APPLICATION

A related application, which is assigned to the same assignee as this application, is Ser. No. 502,714 filed 04/02/90 in the name of Moshe Gershenson entitled "Filter Apparatus Having A Bag With A Gasket".

BACKGROUND OF THE INVENTION

The prior art filter apparatus having a bag with a resilient gasket is described in U.S. Patent Number 4,460,468, issued July 17, 1984. Related patents include U.S. Patent Numbers

3,771,664, issued November 13, 1973,
4,133,769, issued January 9, 1979,
4,204,966, issued May 27, 1980,
4,259,188, issued March 31, 1981,
4,285,814, issued August 25, 1981,
4,419,240, issued December 6, 1983,
4,460,468, issued July 17, 1984,
4,490,253, issued December 25, 1984, and

The prior art filter apparatus having a bag with a resilient gasket includes a housing, a cover plate, and a bag filter subassembly. The bag filter subassembly has a filter bag and a rubber seal member. The seal member has a web portion and a peripheral head portion for forming a seal between the housing and the cover plate, the rubber seal being attached to the bag filter at its open end by an adhesive or heat seal.
One problem with the prior art filter apparatus is that there is a gap between the seal member and the cover plate thereby causing a leakage past the seal member.

SUMMARY OF THE INVENTION

According to the present invention, a filter apparatus is provided. The filter apparatus comprises an enclosure subassembly having a housing and a cover plate and a bag filter subassembly, the bag filter subassembly having a filter bag and a molded plastic collar, the collar having a lower portion attached to the filter bag and having a middle portion fixedly connected to the lower portion and having a top lip portion pivotally connected to the middle portion, the middle portion and top lip portion forming an inner groove, whereby internal housing pressure pivots the top lip portion engaging the top lip portion in sealing engagement with the cover plate.

By using the collar, the collar lip portion is urged against the cover plate with a sealing pressure which is in proportion to the housing internal pressure whereby leakage past the collar is minimized.

The foregoing and other objects, features and advantages will be apparent from the following description of the preferred embodiment of the invention as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a vertical section view of a filter apparatus according to the invention;
Figure 2 is a portion of Figure 1;
Figure 3 is a plan section view as taken along the line 3-3 of Figure 1;
Figure 4 is a section view as taken along the line 4-4 of Figure 3; and
Figure 5 is a section view as taken along the line 5-5 of Figure 4.
DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in Figure 1 a pressure filtration apparatus 10 is provided. Apparatus 10 includes an enclosure subassembly 12, a basket subassembly 16, and a bag filter subassembly 14, which are coaxial about an axis 18. Enclosure subassembly 12 is a pressure vessel.

Enclosure subassembly 12, which encloses a chamber 20, has a housing 22, and a cover plate 24, which has a plurality of hold-down bolts 26, 28 with nuts. Housing 22 also has an outlet pipe 30 with an outlet passage 32 from chamber 20. Cover plate 24 has an inlet pipe 34 with an inlet passage 36 to chamber 20. Cover plate 24 has an upper surface 38 and a lower surface 40.

Housing 22 also has an inner flange or support bracket 42, which supports basket subassembly 16, and has an outer flange 44, which supports bolts 26, 28.

As shown in Figure 2, basket subassembly 16 has a basket portion 46, and has an annular member 48, which has an O-ring 50 of rubber-like material. Annular member 48 has an underside surface 52, which has a groove 54 that receives O-ring 50. Annular member 48 is fixedly connected to and supports basket portion 46. Annular member 48 also has an upper bearing surface 56. Annular member 48 bears on O-ring 50, which bears on inner flange 42.

Filter subassembly 14 has a filter bag 58 and a seal ring or integral collar 60. Collar 60 is preferably made of a molded thermoplastic rubber manufactured by Monsanto. Collar 60 has a lower flange portion 62, which has a ring-shaped one-sided recess 64 that receives a top end portion 66 of filter bag 58. Collar 60 also has a middle portion 68 and a top lip portion 70. Bag 58 is attached to portion 62 by sewing stitches and/or by heat sealing. Middle portion 68 and top lip portion 70 together form a circumferential cavity or inner groove 72. Groove 72 has a slanted lower sidewall 74 and a slanted upper sidewall.
76. Top lip portion 70 and middle portion 68 have a pivotal web portion, 78 therebetween, for pivoting of portion 70 relative to portion 68. Top lip portion 70 forms a bottom, ring-shaped sealing area 80 with portion 48, and forms a top ring-shaped sealing area 82 with cover plate 24, due to internal pressure forces on sidewalls 74, 76.

Collar 60 also has a handle 84 for lifting bag 58 from chamber 20. Handle 84 has flared end portions 86, 88, each of which is integrally molded with collar 60 and is connected to lower portion 62.

Collar 60 is retained between cover plate 24 and annular member 48. Liquid pressure inside bag 58 exerts a force on each of the sidewalls 74 and 76. Such forces flex lip portion 70 and cause the formation of a substantially leak-proof sealing between lip portion 70 and cover plate 24. A lever-type action about the web portion 78 causes a seal area 80 between the underside of lip portion to an annular member 48 and causes a seal area 82 between the top of lip portion 70 and cover plate 24. The higher the internal pressure, the higher is the sealing force exerted on cover plate 24 and on annular member 48. Thus the sealing by collar 60 is better than the sealing by the prior art seal member.

Handle 84 curves upwardly away from its end portions 86, 88. Handle 84 at the center portion, between end portions 86, 88, is relatively close to the top of collar 60, and near to top of basket member 48, so that handle 84 is not normally submerged in liquid. Thus, handle 84 facilitates removal of bag 58.

The advantages of filter apparatus 10 with its axially expandable collar 60 are indicated hereafter:

A) Collar 60 substantially minimizes by-pass leakage of liquid past collar 60 between cover plate 24 and filter bag 58.

B) Collar 60 and bag filter subassembly 14 are adaptable to basket subassemblies and enclosure
subassemblies which are made by different manufacturers, and which have relatively slight variation in bag diameter and collar depth.

While the invention has been described in its preferred embodiment, it is to be understood that the words which have been used are words of description rather than limitation and that changes may be made within the purview of the appended claims without departing from the true scope and spirit of the invention in its broader aspects.

For example, a second handle, like handle 84, can be provided in a symmetrical arrangement for ease of lifting bag 58 from gasket portion 46.
What is claimed is:

1. A filter apparatus comprising:
   an enclosure subassembly having an axis and having a housing with a top flange and having a cover plate connected to the housing;
   a basket subassembly having a basket portion and having an annular ring in sealing engagement with the top flange; and
   a bag filter subassembly having a filter bag and a collar in sealing engagement with the annular ring and with the cover plate.

2. The apparatus of claim 1 wherein the collar has at least one elongated handle and a radial inner face;
   the handle having opposite end portions, each end portion having an arcuate flexible connection to the radially arranged inner face;
   whereby an axial lifting force on handle is disposed parallel to and slightly offset from the filter bag tension force, for minimizing twisting of the gasket ring.

3. The apparatus of claim 1, wherein the collar is composed of a molded thermoplastic rubber.

4. A filter apparatus comprising:
   an enclosure subassembly having an axis and having a housing with a top flange and having a cover plate connected to the housing;
   a basket subassembly having a basket portion and having an annular ring in sealing engagement with the top flange;
   a bag filter subassembly having a filter bag and an integral collar in sealing engagement with the annular ring and with the cover plate;
   said collar having a lower portion fixedly connected to the filter bag and having a middle portion supported by
the annular ring and having a top lip portion engaging the
cover plate;
said collar having an inner surface with an inner
groove having a lower sidewall disposed adjacent to the
middle portion and having an upper sidewall disposed
adjacent to the top lip portion;
said collar having a pivotal web portion disposed
between the middle portion and the top lip portion;
whereby forces normal to the groove sidewalls due to
internal pressure within the bag filter subassembly pivots
the top lip portion about the pivotal web portion causing
a sealing ring area of the lip portion on the cover plate
and causing a sealing ring area of the lip portion on the
annular member.

5. The apparatus of claim 4 wherein
the collar has at least one elongated handle and a
radial inner face;
the handle having opposite end portions, each end
portion having an arcuate flexible connection to the
radially arranged inner face;
whereby an axial lifting force on handle is disposed
parallel to and slightly offset from the filter bag
tension force, for minimizing twisting of the gasket ring.

6. The apparatus of claim 4, wherein the collar is
composed of a molded thermoplastic rubber.

7. A bag filter subassembly for an enclosure
subassembly having a cover plate comprising;
a filter bag having a top end portion of ring shape;
and
a collar having a lower portion fixedly connected to
the bag top end portion and having a middle portion
supported by the enclosure subassembly and having a top
lip portion engaging the cover plate;
said collar having an inner surface with an inner
groove, said groove having a lower sidewall disposed
adjacent to the middle portion and having an upper
sidewall disposed adjacent to the top lip portion;
said collar having a pivotal web portion disposed
between the middle portion and the top lip portion;
whereby forces normal to the groove sidewall due to
internal pressure within the bag filter assembly pivots
the top lip portion about the pivotal web portion causing
a sealing ring area of the lip portion on the cover plate
and causing a sealing ring area of the lip portion on the
annular member.
INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) #

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC(5): B01D 29/13
US CL: 210/232

II. FIELDS SEARCHED

Minimum Documentation Searched 7

Classification System Classification Symbols

US 210/232, 448, 450, 451, 453, 470, 487

Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched 4

III. DOCUMENTS CONSIDERED TO BE RELEVANT 9

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<td>US, A, 4,133,769 (MORGAN) 09 JANUARY 1979 See entire document.</td>
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* Special categories of cited documents: 10

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"R" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step.

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"Z" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search 05 DECEMBER 1991

Date of Mailing of this International Search Report 10 JAN 1992

International Searching Authority ISA/US

Signature of Authorized Officer WANDA I. MILLARD