cartridge is installed correctly. If desired, a single large filter cartridge can be provided to replace multiple (e.g., 6) AB style cartridges a filter housing.

[0021] Each of the components of the invention will now be described in more detail below, wherein like components have like reference numbers.

[0022] As will be described in more detail below, embodiments of the invention provide a filter assembly comprising a first cartridge secured to a support in a fluid-tight manner, wherein a first coupling member is engaged with a second coupling member by rotational movement.

[0023] Figures 1A and 1B show an embodiment of a filter cartridge 1000 comprising a closed end 501 and an open end 502 and a filter module 450 interposed between the closed end and the open end. In this illustrated embodiment, the cartridge includes a housing 500 providing the closed end and the open end, and having a handle 510 (also shown in Figure 1C) attached to the closed end, and the filter module includes a first filter 410 and a second filter 420, the filters each including end caps, wherein end cap 401 can be closed, and/or closed by housing closed end 501, and end cap 402 is open. First coupling member 100 (which preferably comprises a polymeric material, e.g., polypropylene), which has a central lumen 120 therethrough, is attached to the open end 502 (e.g., via end cap 402). The first coupling member has an external surface 110', and at least 1 lug 101 extending from the exterior surface (Figure 1A shows 3 lugs). The lug 101 has an outer diameter (represented by "II" in Figure 4A).

[0024] The first coupling member 100 has a projection 150, including a shoulder 155, and at least one groove (Figures 1A and 1B show grooves 150A and 150B), wherein the groove is suitable for receiving a resilient ring. As will be discussed in more detail below, the projection can assist in providing a fluid tight seal between the first coupling member 100 and a support 275 comprising a second coupling member 200. Preferably, as shown in Figure 2, the projection 150 has resilient rings 151A and 151B in the respective grooves 150A and 150B.

[0025] Figure 2 shows an embodiment of support 275 comprising second coupling member 200 (which preferably comprises a metal material, e.g., stainless steel), having a central lumen 220 therethrough, and having a side wall 200' having at least one channel 201 for receiving the lug(s) of the first coupling member (Figure 2 shows 3 channels, and Figures 6A-6C show 1 channel). The illustrated channel 201 has corresponding continuous channel walls, a terminal section 215 having a closed end 215A and a horizontal axis H and an angled

section A, angled from the horizontal axis (shown in Figure 5), the angled section having an open end 216. The terminal section includes a lug retaining section 210, having a cross-sectional area (the space between corresponding walls of the channel; represented by "I" in Figure 4A) that is narrower that the outer diameter of the lug ("II" in Figure 4A). As will be described in more detail below, as the lug 101 passes along the channel 211, the lug retaining section provides resistance as the lug passes through the lug retaining section, allowing the user to recognize that the first and second coupling members are aligned, thus indicating that the filter cartridge is properly engaged with the support. Additionally, the lug retaining section prevents the lug from rotating out of the terminal section of the channel (e.g., during reverse pressurization of the filter assembly when utilized in a device housing).

[0026] Figures 4A-4F show coupling of the first and second coupling members together. Figures 4A, 4C, and 4E show, respectively, a lug 101 sliding along a channel 201 as the first coupling member is rotationally advanced; the lug passing through a lug retaining section 210 of the channel; and the lug in a terminal section 215 of the channel, wherein the lug retaining section prevents the lug from rotating out of the channel. Since the distance "II" between corresponding walls of the channel is narrower than the outer diameter "I" of the lug, the lug is preventing from rotating out of the terminal section 215, and the operator recognizes from the change in resistance when the lug passes from the angled section of the channel to the terminal section of the channel, that the filter cartridge and support are properly aligned.

[0027] Figures 4B, 4D, and 4F, show the respective positions of the first and second coupling members as the lug slides along the channel, wherein the respective positions are the same when the lug passes through the lug retaining section, and when the lug is in the terminal section of the channel. Thus, Figure 4B shows a distance "A" between the first and second coupling members, and Figures 4D and 4F both show the same distance "B" between the first and second coupling members, wherein distance "A" is greater than distance "B."

[0028] In the embodiments illustrated in Figures 4A, 4C, and 4E, the walls 201A and 201B of the angled section of the channel are parallel to each other as continuous straight walls, and the walls 201C and 201D in the terminal section are parallel to each other as continuous straight walls.

[0029] The angled section can be provided as any suitable angle. For example, as shown in Figure 5, the angled section can be at an angle of about 20°/160° from the horizontal axis, but the invention is not so limited. Typically, the angled section is at an angle in the range of from about 20°/160° to about 40°/140° from the horizontal axis

CLAIM(S):

1. A filter assembly comprising:

(a) a filter cartridge comprising a closed end and an open end; a handle attached to the closed end, at least one filter module interposed between the closed end and the open end; and a first coupling member attached to the open end, the first coupling member having a central lumen therethrough and an external surface, and at least one lug extending from the exterior surface, the lug having an outer diameter; and,

(b) a support comprising a second coupling member, the second coupling member having a central lumen therethrough and a side wall having at least one channel for receiving the lug, the channel having corresponding channel walls, a terminal section including a closed end and a horizontal axis, and an angled section, angled from the horizontal axis, the angled section having an open end, the terminal section including a lug retaining section having a cross-sectional area narrower than the outer diameter of the lug, the lug retaining section providing resistance as the lug passes through the narrower cross-sectional area;

wherein the filter cartridge is engageable with the support by coupling the first and second coupling members together such that the lug is rotated in the channel from the angled section, through the lug retaining section, into the terminal section, the lug retaining section preventing the lug from rotating out of the terminal section.

2. The filter assembly of claim 1, having at least two lugs and at least two channels, each channel receiving a separate lug.

3. The filter assembly of claim 1 or 2, wherein the central lumen of second coupling member includes a tapered cross-sectional area.

4. The filter assembly of any one of claims 1-3, wherein the first coupling member comprises a cylindrical end with an exterior surface including at least one groove and at least one resilient ring in the groove, and the central lumen of the second coupling member also includes a non-tapered cross-sectional area having a vertical wall with an

internal surface, wherein the resilient ring on the first coupling member is compressed when contacting the internal surface of the vertical wall, the ring sealing against the internal surface when the filter cartridge is engaged with the support.

5. The filter assembly of any one of claims 1-4, wherein a user engaging the filter assembly with the support feels a change in resistance as the lug passes through the lug retaining section, such that the user recognizes that the filter assembly is properly engaged with the support.

6. A filter device comprising a filter device housing comprising an inlet and an outlet and including the filter cartridge engaged with the support of any one of claims 1-5 arranged in the filter device housing, providing a fluid flow path between the inlet and the outlet, wherein the filter cartridge is across the fluid flow path.

7. A method for engaging a filter cartridge with a support, the method comprising:

engaging (a) a filter cartridge comprising a closed end and an open end; a handle attached to the closed end, at least one filter module interposed between the closed end and the open end; and a first coupling member attached to the open end, the first coupling member having a central lumen therethrough and an external surface, and at least one lug extending from the exterior surface, the lug having an outer diameter, with (b) a support comprising a second coupling member, the second coupling member having a central lumen therethrough and a side wall having at least one channel for receiving the lug, the channel having corresponding channel walls, a terminal section including a closed end and a horizontal axis, and an angled section, angled from the horizontal axis, the angled section having an open end, the terminal section including a lug retaining section having a cross-sectional area narrower than the outer diameter of the lug, the lug retaining section providing resistance as the lug passes through the narrower cross-sectional area;

the method including coupling the first and second coupling members together and rotating the lug in the channel from the angled section, through the lug retaining section, into the terminal section, the lug retaining section preventing the lug from rotating out of the terminal section.

8. The method of claim 7, comprising engaging the filter cartridge with the support until a change in resistance is felt as the lug passes through the lug retaining section, indicating that the filter cartridge is properly engaged with the support.

9. The method of claim 7 or 8, further comprising arranging a filter assembly comprising the filter cartridge engaged with the support in a filter device housing having an inlet and an outlet, and providing a filter device providing a fluid flow path between the inlet and the outlet, wherein the filter cartridge is across the fluid flow path.

cartridge is installed correctly. If desired, a single large filter cartridge can be provided to replace multiple (e.g., 6) AB style cartridges a filter housing.

[0021] Each of the components of the invention will now be described in more detail below, wherein like components have like reference numbers.

[0022] As will be described in more detail below, embodiments of the invention provide a filter assembly comprising a first cartridge secured to a support in a fluid-tight manner, wherein a first coupling member is engaged with a second coupling member by rotational movement.

[0023] Figures 1A and 1B show an embodiment of a filter cartridge 1000 comprising a closed end 501 and an open end 502 and a filter module 450 interposed between the closed end and the open end. In this illustrated embodiment, the cartridge includes a housing 500 providing the closed end and the open end, and having a handle 510 (also shown in Figure 1C) attached to the closed end, and the filter module includes a first filter 410 and a second filter 420, the filters each including end caps, wherein end cap 401 can be closed, and/or closed by housing closed end 501, and end cap 402 is open. First coupling member 100 (which preferably comprises a polymeric material, e.g., polypropylene), which has a central lumen 120 therethrough, is attached to the open end 502 (e.g., via end cap 402). The first coupling member has an external surface 110', and at least 1 lug 101 extending from the exterior surface (Figure 1A shows 3 lugs). The lug 101 has an outer diameter (represented by "II" in Figure 4A).

[0024] The first coupling member 100 has a projection 150, including a shoulder 155, and at least one groove (Figures 1A and 1B show grooves 150A and 150B), wherein the groove is suitable for receiving a resilient ring. As will be discussed in more detail below, the projection can assist in providing a fluid tight seal between the first coupling member 100 and a support 275 comprising a second coupling member 200. Preferably, as shown in Figure 2, the projection 150 has resilient rings 151A and 151B in the respective grooves 150A and 150B.

[0025] Figure 3 shows an embodiment of support 275 comprising second coupling member 200 (which preferably comprises a metal material, e.g., stainless steel), having a central lumen 220 therethrough, and having a side wall 200' having at least one channel 201 for receiving the lug(s) of the first coupling member (Figure 3 shows 3 channels, and Figures 6A-6C show 1 channel). The illustrated channel 201 has corresponding continuous channel walls, a terminal section 215 having a closed end 215A and a horizontal axis H and an angled

section A, angled from the horizontal axis (shown in Figure 5), the angled section having an open end 216. The terminal section includes a lug retaining section 210, having a cross-sectional area (the space between corresponding walls of the channel; represented by "I" in Figure 4A) that is narrower that the outer diameter of the lug ("II" in Figure 4A). As will be described in more detail below, as the lug 101 passes along the channel 211, the lug retaining section provides resistance as the lug passes through the lug retaining section, allowing the user to recognize that the first and second coupling members are aligned, thus indicating that the filter cartridge is properly engaged with the support. Additionally, the lug retaining section prevents the lug from rotating out of the terminal section of the channel (e.g., during reverse pressurization of the filter assembly when utilized in a device housing).

[0026] Figures 4A-4F show coupling of the first and second coupling members together. Figures 4A, 4C, and 4E show, respectively, a lug 101 sliding along a channel 201 as the first coupling member is rotationally advanced; the lug passing through a lug retaining section 210 of the channel; and the lug in a terminal section 215 of the channel, wherein the lug retaining section prevents the lug from rotating out of the channel. Since the distance "I" between corresponding walls of the channel is narrower than the outer diameter "II" of the lug, the lug is preventing from rotating out of the terminal section 215, and the operator recognizes from the change in resistance when the lug passes from the angled section of the channel to the terminal section of the channel, that the filter cartridge and support are properly aligned.

[0027] Figures 4B, 4D, and 4F, show the respective positions of the first and second coupling members as the lug slides along the channel, wherein the respective positions are the same when the lug passes through the lug retaining section, and when the lug is in the terminal section of the channel. Thus, Figure 4B shows a distance "A" between the first and second coupling members, and Figures 4D and 4F both show the same distance "B" between the first and second coupling members, wherein distance "A" is greater than distance "B."

[0028] In the embodiments illustrated in Figures 4A, 4C, and 4E, the walls 201A and 201B of the angled section of the channel are parallel to each other as continuous straight walls, and the walls 201C and 201D in the terminal section are parallel to each other as continuous straight walls.

[0029] The angled section can be provided as any suitable angle. For example, as shown in Figure 5, the angled section can be at an angle of about 20°/160° from the horizontal axis, but the invention is not so limited. Typically, the angled section is at an angle in the range of from about 20°/160° to about 40°/140° from the horizontal axis

CLAIMS

1. A filter assembly comprising:

(a) a filter cartridge comprising a closed end and an open end; a handle attached to the closed end, at least one filter module interposed between the closed end and the open end; and a first coupling member attached to the open end, the first coupling member having a central lumen therethrough and an external surface, and at least one lug extending from the exterior surface, the lug having an outer diameter; and,

(b) a support comprising a second coupling member, the second coupling member having a central lumen therethrough and a side wall having at least one channel for receiving the lug, the channel having corresponding parallel channel walls, a terminal section including a closed end and a horizontal axis, and an angled section, angled from the horizontal axis, the angled section having an open end, the terminal section including a lug retaining section having a cross-sectional area narrower than the outer diameter of the lug, the lug retaining section providing resistance as the lug passes through the narrower cross-sectional area;

wherein the filter cartridge is engageable with the support by coupling the first and second coupling members together such that the lug is rotated in the channel from the angled section, through the lug retaining section, into the terminal section, the lug retaining section preventing the lug from rotating out of the terminal section.

2. The filter assembly of claim 1, having at least two lugs and at least two channels, each channel receiving a separate lug.

3. The filter assembly of claim 1 or 2, wherein the central lumen of second coupling member includes a tapered cross-sectional area.

4. The filter assembly of any one of claims 1-3, wherein the first coupling member comprises a cylindrical end with an exterior surface including at least one groove

and at least one resilient ring in the groove, and the central lumen of the second coupling member also includes a non-tapered cross-sectional area having a vertical wall with an internal surface, wherein the resilient ring on the first coupling member is compressed when contacting the internal surface of the vertical wall, the ring sealing against the internal surface when the filter cartridge is engaged with the support.

5. The filter assembly of any one of claims 1-4, wherein a user engaging the filter assembly with the support feels a change in resistance as the lug passes through the lug retaining section, such that the user recognizes that the filter assembly is properly engaged with the support.

6. The filter assembly of any one of claims 1-5, wherein the angled section is at an angle in the range of from about 20°/160° to about 40°/140° from the horizontal axis.

7. A filter device comprising a filter device housing comprising an inlet and an outlet and including the filter cartridge engaged with the support of any one of claims 1-6 arranged in the filter device housing, providing a fluid flow path between the inlet and the outlet, wherein the filter cartridge is across the fluid flow path.

8. A method for engaging a filter cartridge with a support, the method comprising:

engaging (a) a filter cartridge comprising a closed end and an open end; a handle attached to the closed end, at least one filter module interposed between the closed end and the open end; and a first coupling member attached to the open end, the first coupling member having a central lumen therethrough and an external surface, and at least one lug extending from the exterior surface, the lug having an outer diameter, with (b) a support comprising a second coupling member, the second coupling member having a central lumen therethrough and a side wall having at least one channel for receiving the lug, the channel having corresponding parallel channel walls, a terminal section including a closed end and a horizontal axis, and an angled section, angled from the horizontal axis, the angled section having an open end, the terminal section including a lug retaining section having a cross-sectional area narrower than the outer diameter of the lug, the lug retaining section providing resistance as the lug passes through the narrower cross-sectional area;

the method including coupling the first and second coupling members together and rotating the lug in the channel from the angled section, through the lug retaining section, into the terminal section, the lug retaining section preventing the lug from rotating out of the terminal section.

9. The method of claim 8, comprising engaging the filter cartridge with the support until a change in resistance is felt as the lug passes through the lug retaining section, indicating that the filter cartridge is properly engaged with the support.

10. The method of claim 8 or 9, further comprising arranging a filter assembly comprising the filter cartridge engaged with the support in a filter device housing having an inlet and an outlet, and providing a filter device providing a fluid flow path between the inlet and the outlet, wherein the filter cartridge is across the fluid flow path.

11. The method of any one of claims 7-10, comprising rotating the lug in the angled section along an angle in the range of from about 20°/160° to about 40°/140° from the horizontal axis.