

PATENT SPECIFICATION

(11)

1 260 436

DRAWINGS ATTACHED:

1 260 436

- (21) Application No. 61136/69 (22) Filed 16 Dec. 1969
 (31) Convention Application No. 792-005 (32) Filed 17 Jan. 1969 in
 (33) United States of America (US)
 (45) Complete Specification published 19 Jan. 1972
 (51) International Classification B. 01 d 27/00
 (52) Index at acceptance
 B1D 1B4 2A1A3 2A1B



(54) FILTER CONSTRUCTION FOR A FLUID-SOLID SEPARATION

(71) We, JOHNS-MANVILLE CORPORATION, a corporation organized under the laws of the State of New York, United States of America, of 22 East 40th Street, New York 10016, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is concerned with an improved filter construction for fluid-solid separation. Frequently, the composition of a liquid to be filtered, or a contaminant to be removed therefrom, is of a nature which attacks or deteriorates the filtering medium or components thereof diminishing their physical integrities to the point whereby the medium loses its consistency and succumbs to disintegration in use, or in particular in handling in connection with its removal from the system following contamination or exhaustion. Although filter unit disintegration pursuant to removal is not as serious as during operation since the system is at that time usually closed, it prolongs the downtime of the change over and increases labor cost in cleanup and may extend the period of exposure of personnel to noxious materials.

To offset such disadvantageous effects, it has therefore been proposed to enclose the vulnerable filtering medium within an enveloping covering to contain the medium or components against disintegration throughout both the filtering operation and handling during subsequent removal, with typical means therefor comprising cloth-like enclosures of very open, porous construction so as not to inhibit the flow and the filtering operation.

In accordance with the invention a filter for fluid-solid separation comprises a porous body for the separation and retention of

solids from liquids, the porous body having a cylindrical tube-like configuration with a flow channel extending axially therethrough, a permeable and flexible covering enveloping the outer surface of the porous body and extending within the ends of the channel intermediate the channel wall and a hollow perforated reinforcing means positioned within the channel, the reinforcing means having end portions with substantially the same cross-sectional configuration as the ends of the channel, the channel wall and the reinforcing means gripping the covering therebetween to retain the covering in place about the porous body, and the reinforcing means being composed of a multiplicity of sections to enable assembly of the filter by the insertion of a section of the reinforcing means into each end of the channel.

The invention also provides a method of forming a filter for fluid-solid separation, using a cylindrical porous body with a channel extending axially therethrough, comprising, covering the outer surface of the body with a cloth and extending the cloth within the ends of the channel, and inserting into each end of the channel a section of hollow perforated reinforcing means thereby gripping the cloth between the means and the body to retain the cloth in place about the body.

The invention will be more fully understood when reference is made to the following detailed description and the accompanying drawings, in which

Fig. 1 comprises a pictorial perspective view of a filter unit with part broken away to show the details of the construction; and

Fig. 2 comprises a sectional view of the filter unit of Fig. 1.

This invention is especially concerned with fluid filters composed of glass fibers, which because of their availability in very fine diameter and amenability to forming

through intermeshing and/or superimposing into masses with highly uniform, fine and circuitous pores, low cost and generally good resistance to deterioration such as is attributable to mildew or other organisms and attack by many common chemicals, among other reasons, have become popular filter medium materials in many areas of fluid filtration. Typically the glass fibers are bonded, as in many other fields of their application, with an organic resin, preferably thermosetting resin binders such as phenol-formaldehyde or urea-formaldehyde. Although common siliceous glass compositions and/or thermosetting resin exhibit relatively good resistance to chemical attack and/or deterioration, certain liquids or contaminants contained therein, or even very hot water over very long periods of exposure, deteriorate or attack or erode the glass and/or the binder with a resultant loss in consistency and the likelihood of fragmentation. Although this invention is particularly directed to filter units comprising resin bonded glass fiber filtering media, it is nevertheless likewise applicable to filter media of non-glass components such as cellulosic fiber which is prone to attack by organisms as well as chemicals, and particularly filter materials secured together by non-resinous binders which are also likely to be susceptible to attack.

Referring to the drawings, Fig. 1 illustrates a perspective view, partly broken away to more clearly show the arrangement of components, of a common generally annular filter 10, including a hollow cylindrical body 11 comprising the porous filtering medium composed of thermosetting resin bonded, fine intermeshed glass fibers. Cylindrical filter body 11 is provided with a flow channel 12 extending the axial length thereof and terminating with open ends to collect and carry away the filtered effluent, or if the flow is reversed to distribute the influent. Within flow channel 12 is positioned a pair of hollow perforated reinforcing tube-like members 13a, 13b, each of a cross-sectional configuration and dimension to complement the flow channel, having a multiplicity of holes 14 distributed over its surface for the ready passing of fluid. The normal function of the reinforcing members 13 is to brace the highly porous and thus somewhat structurally weak and fragile filtering medium, and to sustain it against erosion from the force of the fluid flow, which may be under substantial pressure.

Enveloping the entire outer surface of the cylindrical body 11 of the filtering medium is protective covering 15, composed of a permeable textile knitted sleeve, which is applied so as to continue around each of the ends of the filter body 11 and,

according to this invention, to extend a short distance into each open terminal end of flow channel 12, intermediate the outer ends of the reinforcing members 13 and internal wall 16 of hollow cylindrical body 11, as shown by portions 17 comprising the ends of covering 15. The filter body 11 and reinforcing members 13 cooperate to provide a forced press grip on the portions 17 of protective covering 15, securely fixing the same in position about the filter body. With this arrangement the protective covering 15 is effectively held and fixed in position without additional components or means, or costs therefor, and the protective covering 15 retains any fragments or sections of the filtering medium material and/or contaminants filtered out and retained thereon which break away either during filtering, or unit removal and replacement. Moreover, the forced press grip effected on portion 17 of protective covering 15 wedged intermediate the internal wall 16 of channel 12 of filter body 11, and reinforcing member 13, additionally serves to securely hold the reinforcing members 13 in location thereby obviating the need for fastening devices or materials such as adhesives, and the added costs and labor connected therewith.

Assembly of the filter involves enveloping the filter body 11 with the protective covering 15 and inserting portions 17 thereof into both the respective adjacent ends of the fluid channel 12, and subsequently pushing each reinforcing members 13a and 13b into the opposite ends of flow channel 12, as indicated by the arrows, which action itself effects the forced press grip securing the protective covering 15 into operating position.

As pointed out hereinbefore, although this invention is primarily concerned with the now common units employing filtering media of resin bonded glass fiber, since the invention is primarily concerned with a physical arrangement of components and clearly has application to units comprising filtering media of other compositions, it is not to be limited to the materials of the preferred embodiment. Also, the protective covering 15 may be composed of other than knitted-type cloths but preferably materials are used having a substantial degree of stretch or resiliency to provide a close sag and wrinkle free fit, as well as high permeability to enable unrestricted flow there-through. The protective covering may be formed of substantially any relatively open textile-type of material such as cotton, nylon, Dynel (Registered Trade Mark).

WHAT WE CLAIM IS:—

1. A filter for fluid-solid separation comprising a porous body for the separa-



through intermeshing and/or superimposing into masses with highly uniform, fine and circuitous pores, low cost and generally good resistance to deterioration such as is attributable to mildew or other organisms and attack by many common chemicals, among other reasons, have become popular filter medium materials in many areas of fluid filtration. Typically the glass fibers are bonded, as in many other fields of their application, with an organic resin, preferably thermosetting resin binders such as phenol-formaldehyde or urea-formaldehyde. Although common siliceous glass compositions and/or thermosetting resin exhibit relatively good resistance to chemical attack and/or deterioration, certain liquids or contaminants contained therein, or even very hot water over very long periods of exposure, deteriorate or attack or erode the glass and/or the binder with a resultant loss in consistency and the likelihood of fragmentation.

Although this invention is particularly directed to filter units comprising resin bonded glass fiber filtering media, it is nevertheless likewise applicable to filter media of non-glass components such as cellulosic fiber which is prone to attack by organisms as well as chemicals, and particulate filter materials secured together by non-resinous binders which are also likely to be susceptible to attack.

Referring to the drawings, Fig. 1 illustrates a perspective view, partly broken away to more clearly show the arrangement of components, of a common generally annular filter 10, including a hollow cylindrical body 11 comprising the porous filtering medium composed of thermosetting resin bonded, fine intermeshed glass fibers. Cylindrical filter body 11 is provided with a flow channel 12 extending the axial length thereof and terminating with open ends to collect and carry away the filtered effluent, or if the flow is reversed to distribute the influent. Within flow channel 12 is positioned a pair of hollow perforated reinforcing tube-like members 13a, 13b, each of a cross-sectional configuration and dimension to complement the flow channel, having a multiplicity of holes 14 distributed over its surface for the ready passing of fluid. The normal function of the reinforcing members 13 is to brace the highly porous and thus somewhat structurally weak and fragile filtering medium, and to sustain it against erosion from the force of the fluid flow, which may be under substantial pressure.

Enveloping the entire outer surface of the cylindrical body 11 of the filtering medium is protective covering 15, composed of a permeable textile knitted sleeve, which is applied so as to continue around each of the ends of the filter body 11 and,

according to this invention, to extend a short distance into each open terminal end of flow channel 12, intermediate the outer ends of the reinforcing members 13 and internal wall 16 of hollow cylindrical body 11, as shown by portions 17 comprising the ends of covering 15. The filter body 11 and reinforcing members 13 cooperate to provide a forced press grip on the portions 17 of protective covering 15, securely fixing the same in position about the filter body. With this arrangement the protective covering 15 is effectively held and fixed in position without additional components or means, or costs therefor, and the protective covering 15 retains any fragments or sections of the filtering medium material and/or contaminants filtered out and retained thereon which break away either during filtering, or unit removal and replacement. Moreover, the forced press grip effected on portion 17 of protective covering 15 wedged intermediate the internal wall 16 of channel 12 of filter body 11, and reinforcing member 13, additionally serves to securely hold the reinforcing members 13 in location thereby obviating the need for fastening devices or materials such as adhesives, and the added costs and labor connected therewith.

Assembly of the filter involves enveloping the filter body 11 with the protective covering 15 and inserting portions 17 thereof into both the respective adjacent ends of the fluid channel 12, and subsequently pushing each reinforcing members 13a and 13b into the opposite ends of flow channel 12, as indicated by the arrows, which action itself effects the forced press grip securing the protective covering 15 into operating position.

As pointed out hereinbefore, although this invention is primarily concerned with the now common units employing filtering media of resin bonded glass fiber, since the invention is primarily concerned with a physical arrangement of components and clearly has application to units comprising filtering media of other compositions, it is not to be limited to the materials of the preferred embodiment. Also, the protective covering 15 may be composed of other than knitted-type cloths but preferably materials are used having a substantial degree of stretch or resiliency to provide a close sag and wrinkle free fit, as well as high permeability to enable unrestricted flow there-through. The protective covering may be formed of substantially any relatively open textile-type of material such as cotton, nylon, Dynel (Registered Trade Mark).

WHAT WE CLAIM IS:—

1. A filter for fluid-solid separation comprising a porous body for the separa-



tion and retention of solids from liquids, the porous body having a cylindrical tube-like configuration with a flow channel extending axially therethrough, a permeable and flexible covering enveloping the outer surface of the porous body and extending within the ends of the channel intermediate the channel wall and a hollow perforated reinforcing means positioned within the channel, the reinforcing means having end portions with substantially the same cross-sectional configuration as the ends of the channel, the channel wall and the reinforcing means gripping the covering therebetween to retain the covering in place about the porous body, and the reinforcing means being composed of a multiplicity of sections to enable assembly of the filter by the insertion of a section of the reinforcing means into each end of the channel.

2. A filter as claimed in Claim 1, wherein the porous body has glass fibers.

3. A filter as claimed in either Claim 1 or 2, wherein the protective covering is

cloth, such as knitted cotton cloth and is of tubular form.

4. A method of forming a filter for fluid-solid separation using a cylindrical porous body with a channel extending axially therethrough, comprising, covering the outer surface of the body with a cloth and extending the cloth within the ends of the channel, and inserting into each end of the channel a section of hollow perforated reinforcing means thereby gripping the cloth between the means and the body to retain the cloth in place about the body.

5. A filter for fluid-solid separation substantially as hereinbefore described, and as illustrated in the accompanying drawings.

6. A method of forming a filter for fluid-solid separation as claimed in Claim 4 substantially as hereinbefore described.

LEWIS W. GOOLD & CO.,
St. Martin's House,
Bull Ring,
Birmingham B5 5EY.
Chartered Patent Agents.