

July 30, 1963

W. J. HAGENDOORN ET AL

3,099,547

POCKET-TYPE FILTERS

Filed Sept. 19, 1960

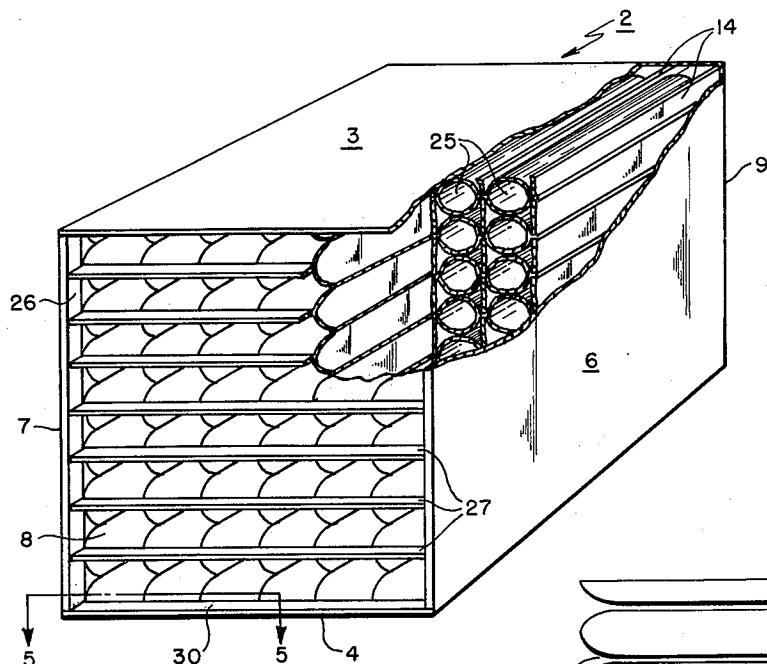


FIG. 1

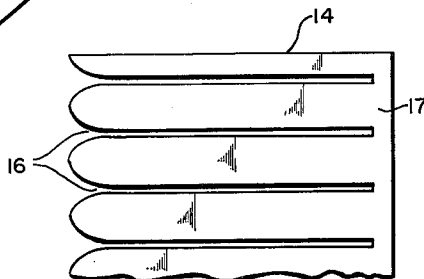


FIG. 3

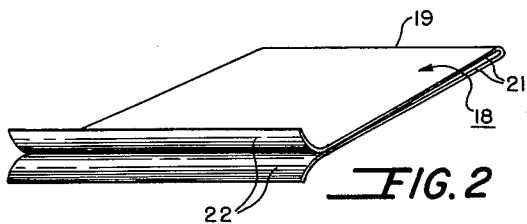


FIG. 2

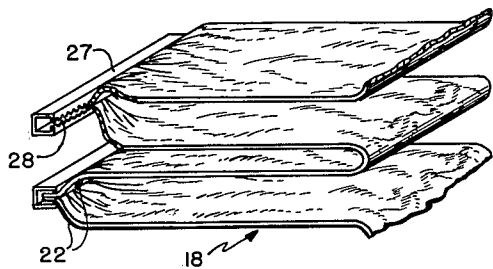


FIG. 4

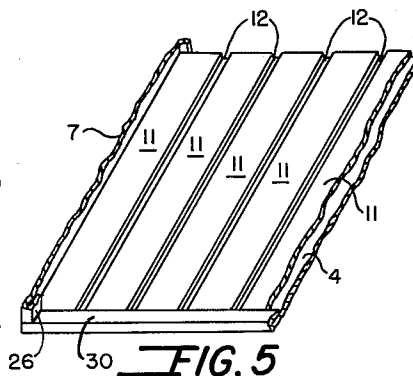


FIG. 5

INVENTORS
WILLEM J. HAGENDOORN
TOM R. SMITH
BY

Rafel B. Bricks
ATTORNEY

1

3,099,547

POCKET-TYPE FILTERS

Willem J. Hagendoorn and Tom R. Smith, Louisville, Ky., assignors to American Air Filter Company, Inc., Louisville, Ky., a corporation of Delaware
Filed Sept. 19, 1960, Ser. No. 56,932
16 Claims. (Cl. 55-341)

The present invention relates to fluid filters and more particularly to improved fluid filters of the high efficiency pocket-type.

In accordance with the present invention, a filter arrangement is provided which permits ready and economical assembly of flexible filtering material into pocket members of increased effective filtering area without damage to the filter fabric as a result of assembly operations. Further, the present invention provides for a pocket-type filter which not only is compact and light for ready and efficient handling but which also includes stable, longitudinally supported pocket members that can be readily replaced whenever necessary.

Various other features of the present invention will become obvious to one skilled in the art upon reading the disclosure set forth hereinafter.

More particularly the present invention provides a pocket-type fluid filter comprising a web of flexible filtering material having at least one fold line dividing the web into at least one pair of pleat forming sections, the pleat forming sections of the pair being folded about such fold line to face each other and form a pleat, and a plurality of spaced divider members, each of the divider members having at least one slit snugly engaging the pleat transverse the fold line to divide the pleat into a plurality of separate pocket members.

It is to be understood that various changes can be made by one skilled in the art in the arrangement, form, and construction of the apparatus disclosed herein without departing from the scope or spirit of the present invention.

Referring to the drawings which disclose one advantageous embodiment of the present invention:

FIGURE 1 is a partially broken away perspective view of a pocket-type filter structure including the features of the present invention;

FIGURE 2 is a perspective view of a web of flexible filtering material arranged in pleated form for installation in the apparatus of FIGURE 1;

FIGURE 3 is a side elevational view of a divider member of the apparatus of FIGURE 1;

FIGURE 4 is a schematic perspective view of a clamping member in engagement with gathered mouth portions of adjacent separate webs of material; and

FIGURE 5 is a partial horizontal view taken in a plane passing through line 5-5 of FIGURE 1 and looking in the direction of the arrows, disclosing a portion of the lower wall of the filter structure of FIGURE 1.

As can be seen in FIGURE 1, an open-ended, rectangularly shaped housing 2 is provided including opposite upper and lower walls 3 and 4 respectively and opposite side walls 6 and 7. The housing 2, being open-ended, further includes upstream inlet 8 and downstream outlet 9 for a fluid stream to be treated. It is to be understood that housing 2 can be formed from any one of a number of suitable, substantially rigid sheet materials. Advantageously, it can be formed from a two-ply or three-ply corrugated cardboard sheet which can be folded and stapled readily into erected form and which can be disposed of economically after use. As can be seen in FIGURE 5, the inner face of lower wall 4 is provided with facing strip members 11, which also can be of cardboard. Strip members 11 can be blued or stapled to lower wall 4 and are positioned in spaced relationship to each other to provide slots 12 which extend substantially parallel to

2

each other along the line of fluid flow from upstream inlet 8 to downstream outlet 9. It is to be understood that the inner face of upper wall 3 is provided, in like manner (not shown), with spaced, slot forming facing strips so that each of slots 12 in lower wall 4 has an equal and opposite slot in upper wall 3.

Adapted to engage slidably in the spaced opposed slots and fastened therein by some suitable means such as gluing or stapling are the edges of divider members 14. Divider members 14, like housing 2, can be made from any one of a number of suitable disposable materials and, advantageously, can be made of two-ply or three-ply cardboard. When positioned in slots 12, divider members 14 rest in spaced planes which are substantially parallel the direction of fluid flow. Each of divider members 14 is provided with a plurality of spaced, parallel slits 16 which extend just short of the overall length of the divider member to provide an unslit, integral portion 17. It is to be understood that the spaced slits of one divider member 14, advantageously, correspond with the spaced slits of an adjacent divider member to provide slit sets. It further is to be understood that when divider members 14 are mounted in slot engaging position in housing 2, the entrance portions of the slits 16 of the divider members are adjacent upstream inlet 8 of housing 2 and the unslit integral portion 17 of the divider members is adjacent downstream outlet 9. Finally, it is to be understood that suitable rod-like structural support members can be supplied (not shown) transverse the divider members where necessary to insure further support and proper spacing of the divider members.

As can be seen in FIGURE 2, adapted to be inserted into nesting engagement in gathered form with each of the slit sets in divider members 14 is one of a set of parallel, separate webs of flexible material 18. Each web 18 is provided with fold lines 19 which divide the web into a pair of pleat forming sections 21 intermediate a pair of mouth portions 22, the pleat forming sections 21 being folded about one of fold line 19 to face each other and form a pleat. It will be obvious to one skilled in the art that when each of webs 18 is properly folded to form a pleat, it can then be inserted in gathered form into one of slit sets 16 formed by spaced divider members 14, the pleat engaging snugly in the slits of the set to be firmly supported and divided into a plurality of separate pocket members 25. By dividing each of the pleats into smaller pocket members, the chance of one pleat adhering to an adjacent pleat so as to inhibit filtering operations and raise resistance is substantially reduced, a large, efficient filtering area being provided from the webs of flexible filtering material 18 in the form of pocket members having elliptically shaped cross-sectional areas during operation.

Webs 18 can be made from any one of a number of suitable air filtering materials which are relatively non-stretchable and porous in nature. Advantageously, a woven fabric or fibrous glass type of material having fibers of substantially 1 micron in size can be used. To provide tensile strength to webs 18 and to insure that the filter unit formed therefrom is adequately supported when the web is positioned in the fluid stream to be filtered, the web can be faced with a suitable scrim type material, this material being stronger in nature than the web and of maximum porosity.

Referring again to FIGURE 1 of the drawings, it is to be noted that housing 2 is provided with narrow, clamp supporting strip members 26 projecting inwardly from opposite walls 6 and 7 of housing 2 (only one of such strip members being shown). Strip members 26 can be made from separate pieces of rigidly disposable material to be fastened to walls 6 and 7 or, advantageously, walls 6 and 7 can be folded to include such strips. Each of strips 26 is provided with a plurality of slits spaced along

the strips so as to be disposed intermediate slits 16 of divider members 14, the slits of one strip 26 corresponding to the slits of the other strip. Adapted to be inserted in corresponding slits of strips 26 for support are the ends of longitudinally extending U-shaped clamp members 27 (FIGURE 4). The opposite edges of clamp members 27 are provided with serrate margins 28 which serve to grip adjacent gathered mouth portions 22 of adjacent webs 18 to hold the mouths of pocket members 25 in open position during filtering operations. It is to be noted that, if desired, clamp members 27 can be provided along the upper and lower walls 3 and 4 respectively to hold gathered outer mouth portions 22 of extreme webs in position. Advantageously, suitable flap members 30 (FIGURE 5) are integral with walls 3 and 4 respectively. These flap members are folded in overlapping position with outer mouth portions 22 and are glued into holding position. It is to be understood that since the flexible webs of material 18 which form mouth portions 22 and the body of pocket members 25 are in gathered form, the mouths and pocket bodies blouse out during gas cleaning operations, with the cross-section of the bodies of the pockets taking a substantially elliptical shape, as aforementioned, to permit ready passage there-through of gas to be treated.

It finally is to be understood that the features of the present invention as above described are not limited to the specific embodiment disclosed. For example, a single web of continuous flexible material rather than a plurality of separate web members 18 can be employed with the present invention. Further, the divider members 14 can be employed with pocket-type filter apparatus such as disclosed in assignee's co-pending application Serial No. 702,094, filed on December 11, 1957, in the name of Richard D. Rivers, and now abandoned.

The invention claimed is:

1. A pocket type fluid filter comprising: a web of flexible filtering material having at least one fold line dividing said web into at least one pair of pleat forming sections, said pleat forming sections of said pair being folded about said fold line to face each other and form a pleat, and a plurality of spaced divider members, each of said divider members having at least one slit snugly engaging said pleat transverse said fold line to hold said pleat forming sections in facing contact along said slit whereby said divider members divide said pleat into a plurality of separate pocket members.

2. A pocket type fluid filter comprising: a web of flexible filtering material having spaced fold lines dividing said web into pairs of adjacent pleat forming sections, said pleat forming sections of each pair being folded about one of said fold lines to face each other and form a pleat, and a plurality of spaced divider members, each of said divider members including a plurality of slits snugly engaging said pleats transverse said fold lines to hold said pleat forming sections in facing contact along said slits whereby said divider members divide said pleats into a plurality of separate pocket members.

3. A pocket type fluid filter comprising: a web of flexible filtering material having at least one fold line dividing said web into at least one pair of pleat forming sections interposed between mouth portions of said web, said pleat forming sections of said pair being folded about said fold line to face each other and form a pleat, a plurality of spaced divider members, each of said divider members having at least one slit snugly engaging said pleat transverse said fold line to hold said pleat forming sections in facing contact along said slit whereby said divider members divide said pleat into a plurality of separate pocket members, and means cooperable with said mouth portions of said web to maintain said mouths of said pocket members in opened position to receive a fluid stream to be filtered.

4. A pocket type filter comprising: a web of flexible filtering material having spaced fold lines dividing said web into pairs of pleat forming sections interposed between

mouth portions so that adjacent pairs of pleat forming sections are spaced from each other by one of said mouth portions, said pleat forming sections of each pair being folded about a fold line to face each other and form a pleat, a plurality of spaced divider members, each including a plurality of slits snugly engaging said pleats transverse said fold lines to hold said pleat forming sections in facing contact along said slits to divide said pleats into a plurality of separate pocket members, and means cooperable with said mouth portions to maintain said mouths of said pocket members in opened position to receive a fluid stream to be filtered.

5. A pocket type fluid filter comprising: a plurality of separate webs of flexible filtering material, each of said webs having a fold line to divide the web into a pair of adjacent pleat forming sections, said pleat forming sections being folded about said fold line to face each other and form a pleat, and a plurality of spaced divider members, each of said divider members having a plurality of slits snugly engaging said pleats transverse said fold lines to hold said pleat forming sections in facing contact along said slits whereby said divider members divide said pleats into a plurality of separate pocket members.

6. A pocket type fluid filter comprising: a plurality of separate webs of flexible filtering material, each of said webs having fold lines to divide the web into a pair of pleat forming sections interposed between mouth portions, said pleat forming sections being folded about a common fold line to face each other and form a pleat, a plurality of spaced divider members, said divider members having a plurality of correspondingly spaced slits snugly engaging said pleats transverse said fold lines to hold said pleat forming sections in facing contact along said slits to divide said pleats into a plurality of separate pocket members, and means cooperable with said mouth portions of said pleats to maintain said mouths of said pocket members in opened position to receive a fluid stream to be filtered.

7. A pocket type fluid filter comprising: an open-ended housing defining a fluid flow path, a web of flexible filtering material disposed within said housing to extend between opposite side walls thereof transverse said fluid flow path, said web of filtering material having at least one fold line dividing said web into at least one pair of pleat forming sections, said pleat forming sections of said pair being folded about said fold line to face each other and form a pleat, and a plurality of spaced divider members extending within said housing intermediate of a pair of opposite walls of said housing, each of said divider members having at least one slit snugly engaging said pleat transverse said fold line to hold said pleat forming sections in facing contact along said slit whereby said divider members divide said pleat into a plurality of separate pocket members.

8. A pocket type fluid filter comprising: an open-ended housing defining a fluid flow path, a web of flexible filtering material disposed within said housing to extend between opposite side walls thereof transverse said fluid flow path, said web of flexible filtering material having at least one fold line dividing said web into at least one pair of pleat forming sections interposed between mouth portions of said web, said pleat forming sections of said pair being folded about said fold line to face each other and form a pleat, a plurality of spaced divider members, each of said divider members having at least one slit snugly engaging said pleat transverse said fold line to hold said pleat forming sections in facing contact along said slit whereby said divider members divide said pleat into a plurality of separate pocket members, and means extending between opposite sides of said housing transverse said gas flow path cooperable with said mouth portions of said web to maintain the mouths of said pocket members in open position to receive a fluid stream to be filtered.

9. The apparatus of claim 8, said divider members extending substantially parallel the path of fluid flow.

10. The apparatus of claim 9, said divider members

5

having opposite edges engaging with opposite walls of said housing.

11. A pocket type fluid filter comprising: an open-ended housing defining a fluid flow path, a plurality of separate webs of flexible filtering material disposed within said housing, each of said webs having a fold line to divide the web into a pair of adjacent pleat forming sections, said pleat forming sections being folded about said fold line to face each other and form a pleat, and a plurality of spaced divider members disposed within said housing in cooperable relationship with said pleats, each of said divider members having a plurality of slits snugly engaging said pleats transverse said fold lines to hold said pleat forming sections in facing contact along said slits whereby said divider members divide said pleats into a plurality of separate pocket members.

12. A pocket type fluid filter comprising: an open-ended housing defining a fluid flow path, a plurality of spaced divider members mounted and extending between opposite walls of said housing substantially parallel said path of fluid flow, each of said divider members having at least one slit disposed therein, and a web of flexible filtering material having at least one fold line dividing said web into at least one pair of pleat forming sections, said pleat forming sections of said pair being folded about said fold line to face each other and form a pleat, said pleat engaging snugly in said slits of said divider members to hold said pleat forming sections in facing contact along said slits whereby said pleat is divided into a plurality of separate pocket members.

13. A pocket type fluid filter comprising: an open-ended housing defining a fluid flow path, opposite walls of said housing having slots extending along the line of said fluid flow path, spaced divider members extending between opposite walls of said housing and having opposite edges disposed within said slots, each of said divider members having at least one slit disposed therein, and a web of flexible filtering material having at least one fold line dividing said web into at least one pair of pleat forming sections, said pleat forming sections of said pair being folded about said fold line to face each other and form a pleat, said pleat engaging snugly in said slits of said divider members to hold said pleat forming sections in facing contact along said slits whereby said pleat is divided into a plurality of separate pocket members.

14. A pocket type fluid filter comprising: an open-ended housing defining a fluid flow path, a plurality of separate webs of flexible filtering material disposed within said housing, each of said webs having a fold line to divide the web into a pair of adjacent pleat forming sections, said pleat forming sections being folded about said fold line to face each other and form an open mouth pleat, the pleats formed from said webs extending substantially parallel to and adjacent each other with the edges of adjacent pleats' mouths in abutting relationship, clamping means cooperable with said housing and said abutting edges of

6

said pleat mouths to hold said mouths of said pleats in open position across said fluid flow path, and a plurality of spaced divider members extending between opposite walls of said housing substantially parallel to said path of fluid flow, each of said divider members including a plurality of slits snugly engaging said pleats transverse said fold lines to hold said pleat forming sections in facing contact along said slits to divide said pleats into a plurality of separate pocket members.

15. A pocket type fluid filter comprising: an open-ended housing defining a fluid flow path, opposite walls of said housing having slots extending along the line of said fluid flow path, spaced divider members extending between opposite walls of said housing and having opposite edges disposed within said slots, each of said divider members having a plurality of correspondingly spaced slits disposed therein, and a plurality of separate webs of flexible filtering material, each of said webs having at least one fold line dividing said web into at least one pair of pleat forming sections, said pleat forming sections of said pair being folded about said fold line to face each other and form a pleat, each of said pleats of said webs engaging snugly in corresponding slits of said spaced divider members to hold said pleat forming sections in facing contact along said slits whereby said pleats are each divided into a plurality of separate pocket members.

16. A pocket type fluid filter comprising: an open-ended housing defining a fluid flow path, opposite walls of said housing having spaced opposed slots extending along the line of said fluid flow path, spaced divider members extending between opposite walls of said housing in nesting engagement with said slots so as to be substantially parallel said path of fluid flow, each of said divider members having a plurality of correspondingly spaced parallel slits disposed therein, a plurality of separate webs of flexible filtering material, each of said webs having a set of fold lines dividing said web into a pair of pleat forming sections intermediate a pair of mouth portions, said pleat forming sections of said pair being folded about a fold line to face each other and form a pleat, each of said pleats of said web engaging snugly in corresponding slits of said spaced divider members to hold said pleat forming sections in facing contact along said slits whereby said pleats are each divided into a plurality of separate pocket members, and spaced U-shaped clamping means extending transverse opposite walls of said housing and cooperating with adjacent mouth portions of adjacent pleats to hold the mouths of said pocket members in open position to receive a fluid stream to be filtered.

References Cited in the file of this patent

UNITED STATES PATENTS

1,779,458	Annis	Oct. 28, 1930
1,830,096	Dollinger	Nov. 3, 1931
2,853,154	Rivers	Sept. 23, 1958