

July 13, 1954

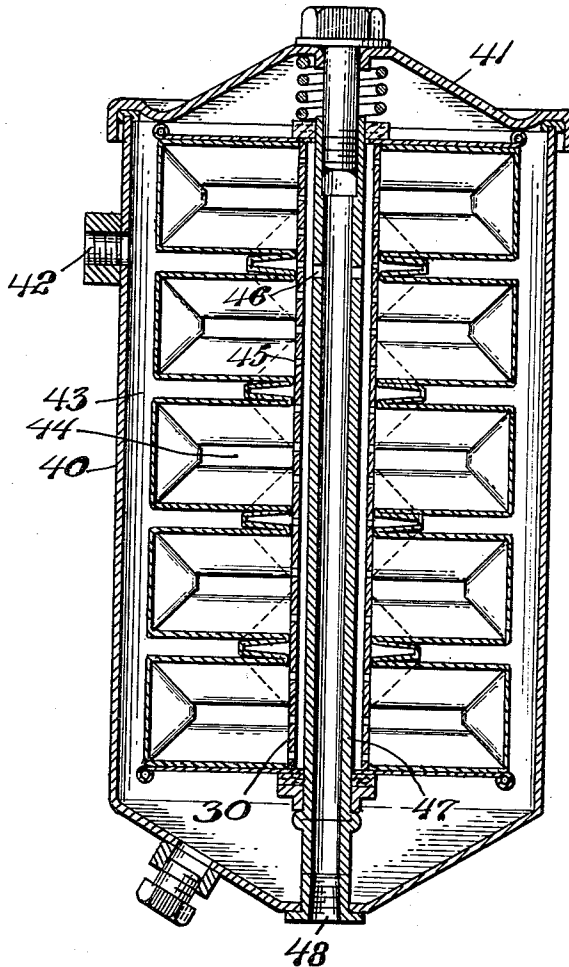
M. DOBROLET
PLEATED FILTER ELEMENT

2,683,537

Filed June 11, 1949

3 Sheets-Sheet 1

Fig. 1.



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3 Sheets-Sheet 2

Fig. 2.

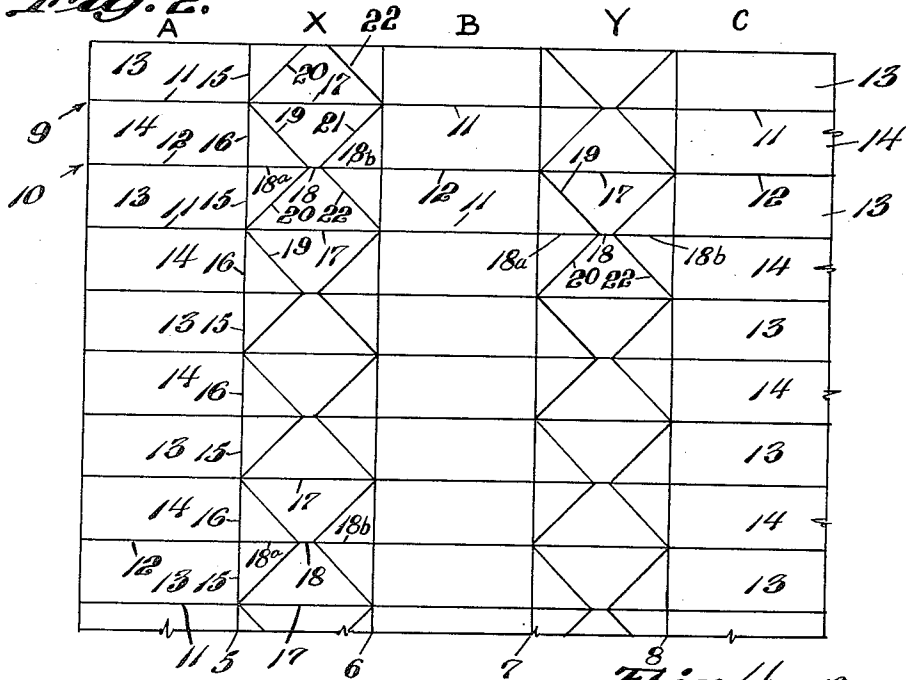


Fig. 4.

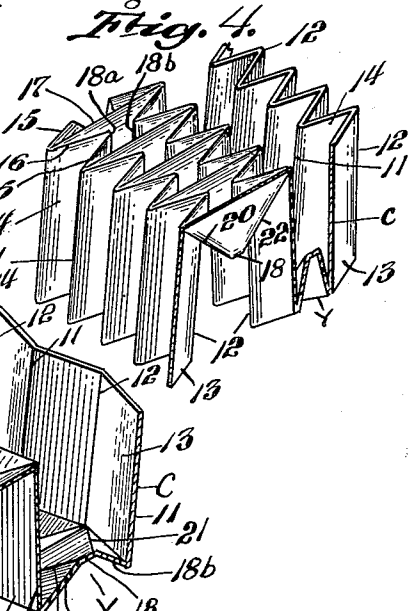


Fig. 5.

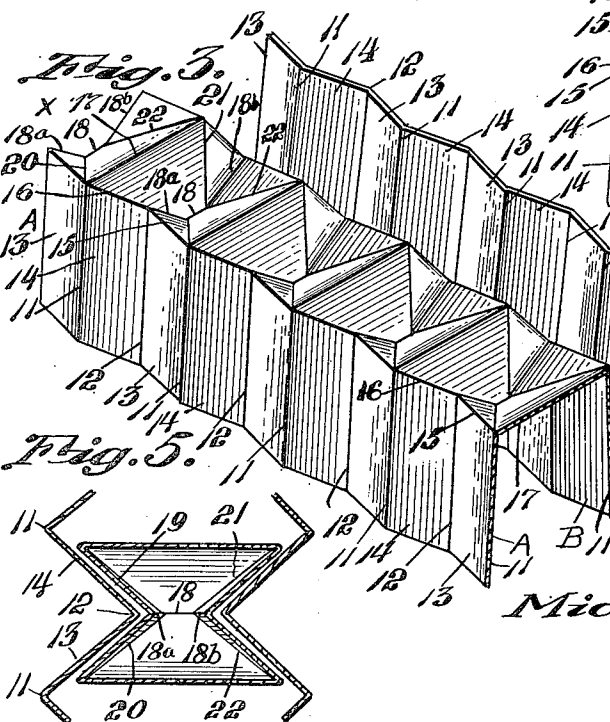
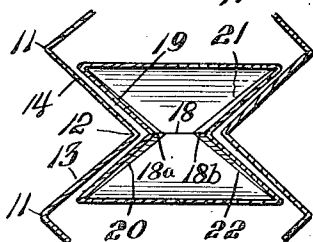


Fig. 5.



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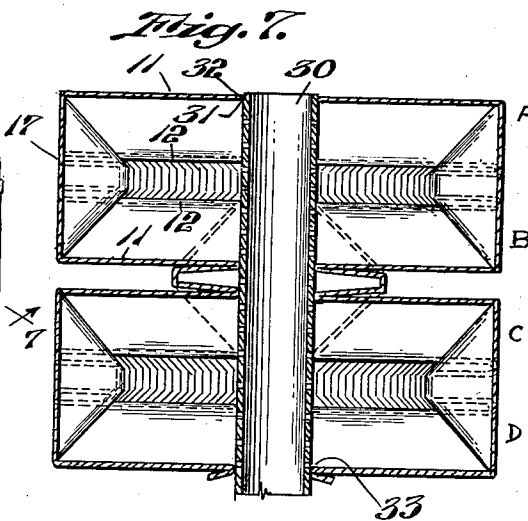
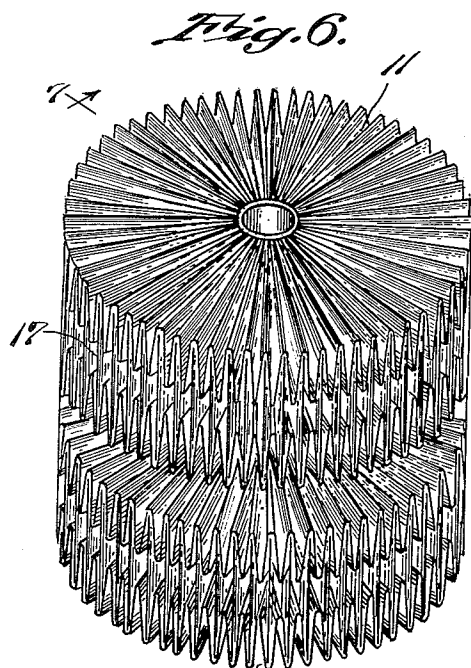
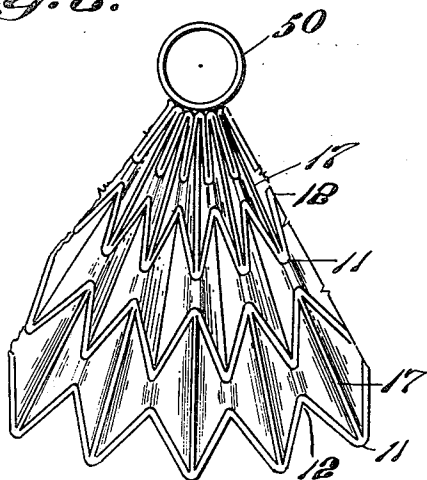


Fig. 8.



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UNITED STATES PATENT OFFICE

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PLEATED FILTER ELEMENT

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This invention relates to a filter element of the type which may be used for filtering either liquids or gases, and of the type which may be removed and disposed of when a certain amount of contaminant has been collected, while a new element will be substituted to replace the used one for further operation.

Filter elements using various materials for collecting contaminant have been provided, one of which materials is paper. In the use of paper of a porous character, there is always the problem involved of securing together sheets of paper or of arranging the paper in such a form that it will retain its desired shape and yet perform its desired function.

One of the objects of this invention is to provide a filter element which will be largely of a single piece of paper which is so folded that it will present a large filtering surface for the collection of contaminant and so folded that it will provide the required strength to be self-supporting.

Another object of this invention is to fold a piece of paper so that it may be disposed in a circular fashion to provide a generally cylindrical filter element.

Another object of this invention is to provide a single sheet of paper folded in such a way that it will have generally zigzag courses which may be of any number or length desired, depending upon the size of the piece of paper with which the filter originates.

Another object of the invention is to provide a single piece of paper which is so folded that it may be disposed circularly and in either one of two directions about axes at right angles to each other, so that the element either may be increased axially indefinitely in extent while maintaining a certain radial dimension or may be increased radially indefinitely in extent, while maintaining a given axial dimension.

Another object of the invention is to provide a simple and inexpensive form of element that may be easily creased and folded as desired.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully shown and particularly pointed out in the appended claims.

In the accompanying drawings:

Fig. 1 is a sectional view of a casing with a removable folded filter element positioned therein;

Fig. 2 is a sheet of paper which is shown with crease lines for folding the same into the desired shape;

Fig. 3 is a perspective view of the sheet of Fig. 2 folded into zigzag relation;

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Fig. 4 is a view similar to Fig. 3 but illustrating the paper in more collapsed form;

Fig. 5 is a sectional view through the folded relation which joins the ends of the parallelly disposed pleated courses;

Fig. 6 is a perspective view of the element with four different pleated courses disposed about a center tube;

Fig. 7 is a central sectional view through the structure shown in Fig. 6 and taken on substantially line 7-7 of Fig. 6;

Fig. 8 is a fragmental view illustrating a modified form of element showing the disposition of the courses at right angles to the showing of the courses in Figs. 1, 6 or 7.

In proceeding with this invention, I provide a single sheet of paper and score the same by forming parallel score lines for folding the paper to pleat the same, and I reverse the direction of fold of certain of these parallel score lines so as to provide zigzag pleated courses by additionally angularly folding a portion of the paper at the change of direction of the courses so as to provide tucks to use the otherwise excess material at these connecting areas. The general form of the connecting area between pleats may be considered as right triangles having one edge as one of the parallel score lines, a second edge at right angles thereto and the third edge extending between parallel score lines. This provides for a reversal of the pleated courses without severing the paper so that an indefinite extent of spaced pleated courses may be provided in a zigzag relation.

After the paper is so folded, it is disposed in a generally cylindrical form about an axis in either one of two directions relative to the sheet of paper.

With reference to the drawings in greater detail, a single sheet of paper as shown in Fig. 2 is scored along generally parallel lines to provide main courses A, B and C and connecting courses X and Y and is also scored along right angularly extending parallel lines 5, 6, 7, 8, 9, and 10, for folding so as to provide pleated courses A, B and C with areas 13 and 14 alternating with each other along an indefinite extent. The sections 11 of score line 9 as shown in Figs. 3 and 4 dispose the sections 13 and 14 in generally V-shape so that the score lines 11 are the outer fold in course A while the folds about the sections 12 of score line 10 are in the opposite direction so as to dispose the sections 12 of score line 10 as an inner fold line in course A. Sections 15 and 16 of score line 5 are at the ends of the areas 13 and 14 at right angles to the score line sections

11 and 12, while a section 17 of score line 9 extends as a continuation of the section lines 11 and connects the folds 11 of course A with the folds 11 in an oppositely disposed course designated B. The score line 10 which joins the folds 12 in courses A and B is divided into three sections 18a, 18b and an intermediate section 18. The arrangement of the folds are such that the fold 18 is oppositely disposed from the folds 18a and 18b in the section A and the folds 18 are disposed in the same direction as the folds 12 in the courses A and B which these fold sections 18a, 18 and 18b connect. Fold lines 19, 20, 21 and 22 join the ends of the fold lines 11 and the ends of the fold lines 18, thus providing triangular areas for the angular disposition of the courses A and X or X and B.

At the end of the pleated course B, a similar folded arrangement will occur along the area between score line 7 and 8 in the course Y so that the course C may be disposed to return in a direction parallel to the course A and B but spaced therefrom (see Fig. 3). In this case, the sections 17 will be disposed in the score line 10 to join score line sections 12 and the sections 18, 18a and 18b will connect the score line sections 11 in the parallel courses A and B. The arrangement in the course Y will be staggered with respect to the arrangement in the course X for the reverse of direction of courses B and C with respect to the relative direction of the courses A and B. An additional course of folds may be had as beneath the letter X and so on to dispose the paper in a zigzag fashion with each of the courses pleated as shown at A, B, or C, connected by folded portions as shown at X and Y.

By relation of the fold lines to provide a pleated formation, a structure is built up which is sufficiently rigid to maintain its shape against collapse. After a length of paper has been folded, depending upon the size of the filter element desired, the paper may be disposed as shown in Fig. 6 about a core tube designated 30 with the fold lines 11 extending radially from the axis of the core tube and the fold line 17 parallel to the tube axis. The end 31 of course A will be secured by cement 32 to the perforated core tube 30. In the form shown in Figs. 6 and 7, there are four courses shown, A, B, C, and D, and these courses may extend indefinitely for the axial length desired. The end of the last course is also secured by cement to the core tube as at 32.

The arrangement provides a rather rigid formation and as shown in Fig. 1, the element is disposed within a casing 40 with the core 30 telescoping the center tube 47. A removable cover 41 and an inlet boss 42 is provided. The liquid to be filtered may enter as at 42 filling the area in the casing 43 about the filter element. The liquid to be filtered will be in contact with the entire pleated surface area and may pass thickness-wise of the paper into the interior between each of the courses as designated at 44 from whence it may pass into the openings 45 in the core tube 30 and thence into the opening 46 in the center tube 47 of the casing and out through the discharge opening 48 through the bottom of the casing.

In some cases instead of disposing the filter paper as shown in Fig. 6, the same may be disposed at right angles to the showing in Fig. 6 wherein the fold lines 17 instead of being disposed parallel to the axis will be disposed radial

to the axis of the core and the fold lines 11 and 12 will be disposed parallel to the axis of the core 30 so that the element will be built up radially as shown in Fig. 8 rather than axially as shown in the view in Fig. 6. This disposition of the folds may be about a core 50 if desired or this may be omitted. The ends of the sheet will be cemented to a plate at one end for closing the structure.

It will be apparent that each course A, B, C, X, and Y are of pleated formation and that the triangular areas where the courses extend at right angles may be formed to tuck in between either pleated course, although I have shown them as tucked into the courses X and Y only.

I claim:

1. A generally cylindrical filter element comprising a sheet of filtrate permeable material disposed in parallel pleated courses with the ends of said courses connected by portions of the same piece of sheet material scored and folded to provide triangular areas and extending in opposite directions from opposite ends of a pleated course, said sheet being disposed as a wall of an enclosed space to and from which the material to be filtered passes through said sheet, and a core tube secured centrally within the filter element and communicating with the interior of said enclosed space.

2. A generally cylindrical filter element comprising a sheet of filtrate permeable material disposed circularly to extend generally axially in radially inwardly and outwardly parallel pleated courses with the ends of said courses connected by portions of the same piece of sheet material and arranged generally radially with portions scored to provide generally triangular areas, and a core tube secured centrally within the filter element and communicating with the interior of such element.

3. A generally cylindrical filter element comprising a sheet of filtrate permeable material disposed in parallel pleated courses radiating from a common axis with the ends of said courses connected by portions of the same piece of sheet material scored to provide generally triangular areas extending inwardly from each pleated area and connected together by a fold parallel to the pleated course with the third edge connected by areas extending between courses, and a core tube secured centrally within the filter element and communicating with the interior of such element.

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