July 28, 1953 J. W. ROBINSON ET AL 2,646,887

FILTER

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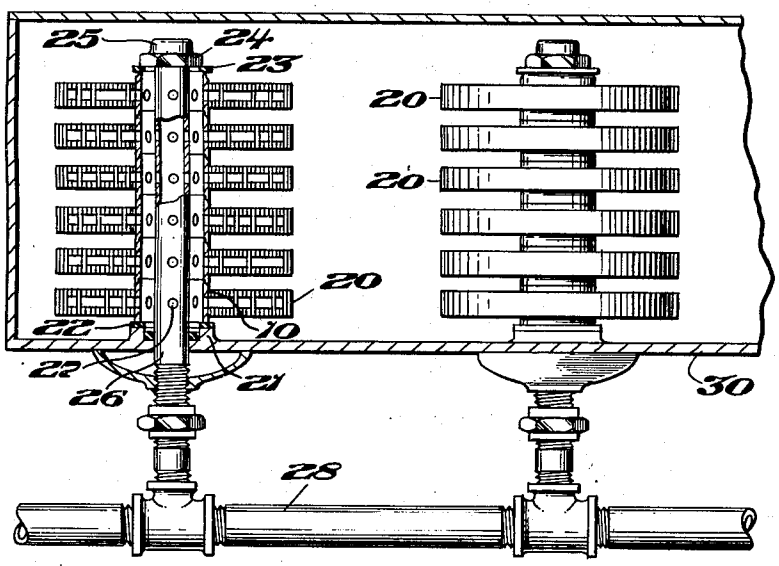

Fig. 1.

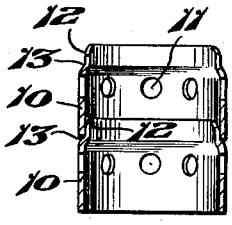

Fig. 3.

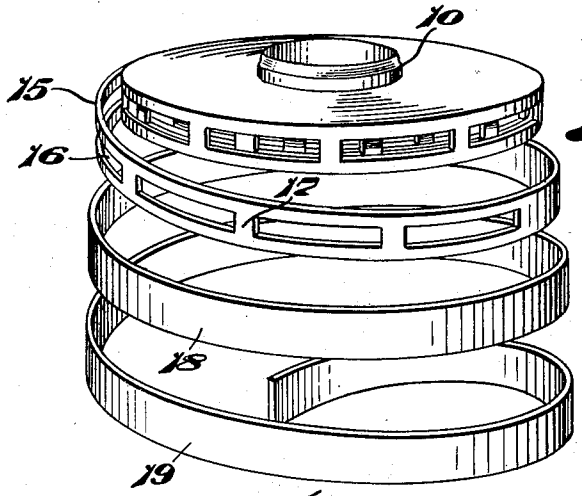

Fig. 2.

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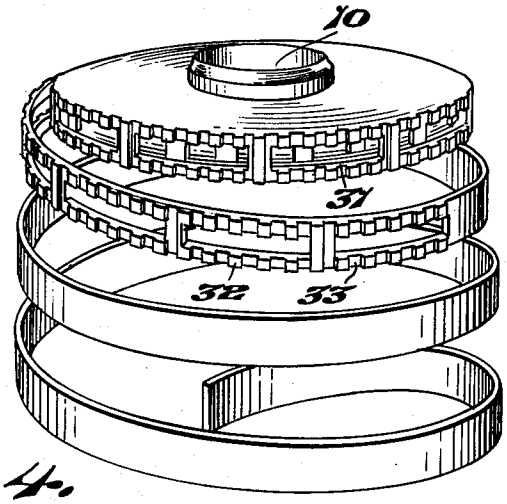

Fig. 4.

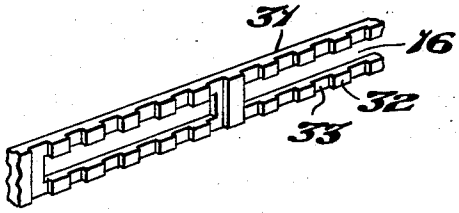

Fig. 5.

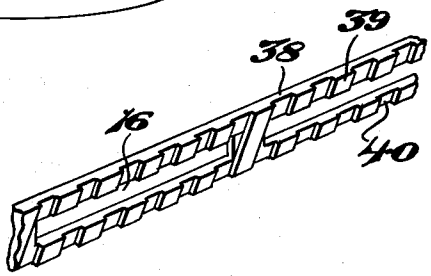

Fig. 6.

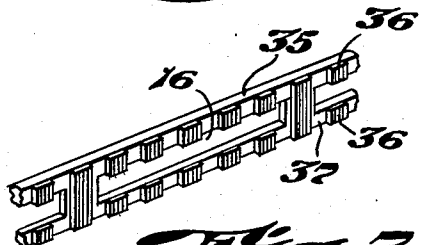

Fig. 7.

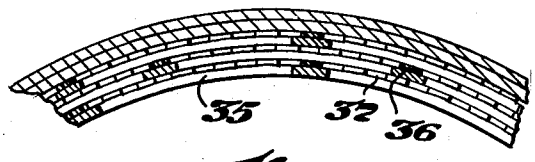

Fig. 8.

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Patented July 28, 1953 2,646,887

UNITED STATES PATENT OFFICE

2,646,887

FILTER

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Application July 14, 1950, Serial No. 173,758

4 Claims. (Cl. 210—169)

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This invention relates to a filter.

One of the objects of this invention is to provide a filter which may be formed inexpensively and which may provide a large surface area for filtration.

Another object of the invention is to provide a unit which may be varied in size radially.

Another object of the invention is to provide a unit which may be stacked upon another like unit so that the size of the filter may be expanded axially.

Another object of the invention is to provide a filter which may be of either the edge type or cross flow type, depending upon slight variations in its structure.

Another object of the invention is to provide a filter which will be of both the edge type and cross flow type.

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

In the accompanying drawings:

Fig. 1 is a sectional view showing two filter elements, one of which is in section, of a construction in accordance with this invention;

Fig. 2 is a perspective view illustrating a method of forming one of the units of the filter element;

Fig. 3 is a sectional view showing the cores of the units superimposed and in interfitting relation;

Fig. 4 is a perspective view of a unit such as shown in Fig. 2 but showing the same in modified form;

Fig. 5 is a perspective view of a strip of the unit of Fig. 4;

Fig. 6 is a perspective view of a strip similar to the strip of Fig. 5 but modified in that the projections are arranged diagonally;

Fig. 7 is a perspective view similar to Fig. 5 of a modified form of construction; and

Fig. 8 is a sectional view looking at the edges of the strips of the construction of Fig. 5, showing the same cut through the perforations in each of the strips.

In proceeding with this invention, I spirally wind a perforated strip of material upon a perforated core such that perforations in one layer will communicate with perforations in another layer in a direction generally radial of the axis of the spiral wind. The perforations are also so located in the core as to register with the radial perforations in the coiled strip. The outer layer of the material is non-perforated so that

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the last one or two coils will seal the openings. The material may be such that it will not pass the filtrate, in which case the coil becomes an edge type filter, or the material may be of a porous type to transmit the filtrate, in which case the coil acts both as an edge type and as a cross flow type of filter.

With reference to the drawings, a core section for one of the units is designated 10 and is preferably formed of metal with perforations 11 at various points circularly about its cylindrical wall. One end of the cylindrical wall is drawn inwardly as at 12 so as to provide a shoulder 13 and thus this reduced neck 12 may be inserted into another section 10 with its lower edge against the shoulder 13. These core sections may be built up in this manner to an indefinite axial extent.

About each core section, a strip of material designated 13 is spirally wound. The strip of material will have perforations 16 intermediate its edges of an elongated character, which may be generally rectangular as shown in Fig. 2. These openings will be spaced apart by portions 17 of the material which remains. This strip of material will be spirally wound about the core in the plane of the perforations 11 in the core section 10 and the extent of the perforations 16 are such that the perforations of one layer will communicate in a general radial direction with the perforations of the next layer, so that, from the center opening of the core through the openings 11 and the communicating openings 16 there will be formed a generally radial passage from the center outwardly. The perforations 16, however, stop short of the outer end of the strip so that the last layers 18 and 19 will be unperforated and will preferably be of the same piece of material, so that the radial openings are sealed and do not extend radially to the outer peripherial surface. Thus, there is provided a disc which may be of any radial extent depending upon the number of wrappings or layers of material and which, in effect, form a disc extending radially from the center core.

If this material is such that it will not pass the filtrate, then the filtrate will pass between the edges of the layers of the strip from the outer upper and lower surfaces to the communicating radial openings 15 and 11 to the center. If, however, the material is of a porous type to transmit the filtrate, then the outer layers of the strip will serve to filter in the form of a cross flow through this layer 18 and 19 and still the filter may act as an edge type filter or the liquid

may pass in the plane of a layer or axial of the coil edgewise through this strip to the radial opening and then at right angles to the axis to the center.

In some cases, the unit when intended for edge type filtration will be constructed as shown in Figs. 4–8, in which the strip 31 will be of metal, with embossed projections 32 along one surface thereof at the opposite marginal edges so that when the strip 31 is in a spiral coil, the layers will be spaced apart the amount that the projections 32 extend above the uniform thickness of the strip throughout its length, which relatively become recesses 33. These projections extend at right angles to the edge of the strip as shown in Fig. 4 or these projections may extend diagonally to the edge of the strip 38 as in Fig. 6 at 39 leaving recesses 40. The projections may extend completely across the strips between the openings 16.

In some cases, instead of the strip being embossed, a strip 35 may be provided in which blocks of resin 36 may be deposited on its surface at its upper and lower edges or completely across between openings 16, such as by printing the same on the strip with an engraved roller. In this case, when a strip is coiled, one strip will be spaced from the next layer by the height of the block 36 from the strip 35 and filtration will occur through the spaces 37 between blocks permitting passage of filtrate, but will prevent passage of particles which are of a size greater than the thickness dimension of the block on the strip 35.

When the resin is used and the coil made, the resin may be cured in such a way that it will serve as a means to cement or secure the coils in helical relation and to bind the coils together to form a substantially uniform rigid disc for edge type filtration through the spaces 37 as shown in Fig. 8.

The tubular cores 10 may be superimposed one upon the other each with its disc designated generally 20 as shown in Fig. 1 by the cores being interfitting as shown in Fig. 3, there being six of these discs so superimposed in a stack which is secured upon a boss 21 with a soft packing 22 interposed while a soft packing 23 provides a sealed closure beneath the nut 24 threaded as at 25 on the tube 26, which is perforated as at 27 so that filtrate which passes inwardly to the center of the core 10 may pass through the drainage openings 27 downwardly to the manifold 28

while the sludge or contaminant to be filtered out collects on the upper surface of each of the discs as a shelf, or on their lower surfaces or their cylindrical surfaces. Any number of these filter elements may be positioned without a shell in a tank 30 and may be replaced as desired.

I claim:

1. A filter element comprising a strip of filtrate permeable material having perforations between its edges and spirally wound with the layers contiguous and locating the perforations in the several layers in juxtaposition providing a generally radial passage from a central space outwardly and with an outer non-perforated layer of the same continuous strip of material to seal said radial passage whereby the filtrate passes edgewise through said spiral coil of material to said perforations and then radially to the center opening.

2. A filter element as in claim 1 wherein the entire strip of material is paper of a character to transmit filtrate whereby filtrate will also flow through the outer layer at right angles to the axis of the coil.

3. A filter element as in claim 1 wherein the strip of material is provided with spaced projections on one face at its opposite edges to space one convolution from the next convolution, said projections being of a resin material and serving to cement one convolution to the next convolution.

4. A filter element as in claim 1 wherein a perforated tubular core is provided at the center of said spiral coil with the perforations communicating with the radial communications of said coil, said cores being reduced at one end to a size for telescopically slidably receiving the end of the next core for stacking axially with the coils extending radial of the axis and in superimposed relation.

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