

June 9, 1959

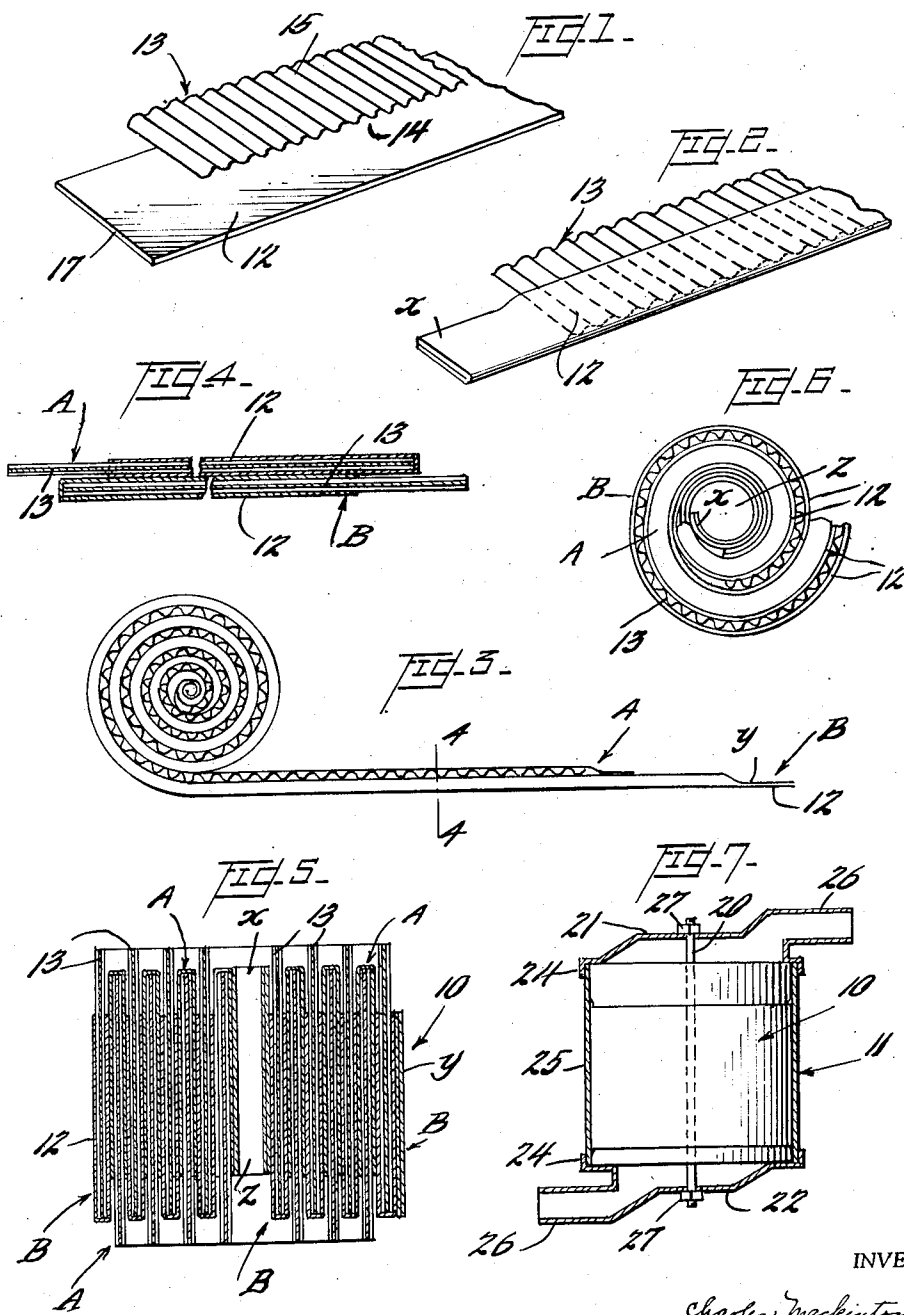
C. MACKINTOSH

2,889,932

FILTERS

Filed March 22, 1957

2 Sheets-Sheet 1



INVENTOR

Charles Mackintosh

BY Watson, Cole, Grindle & Watson

ATTORNEYS

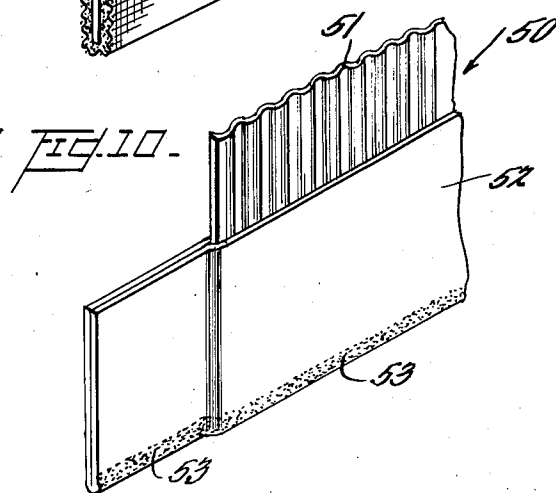
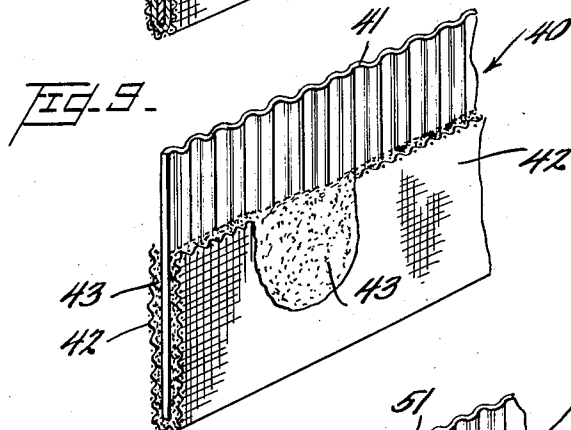
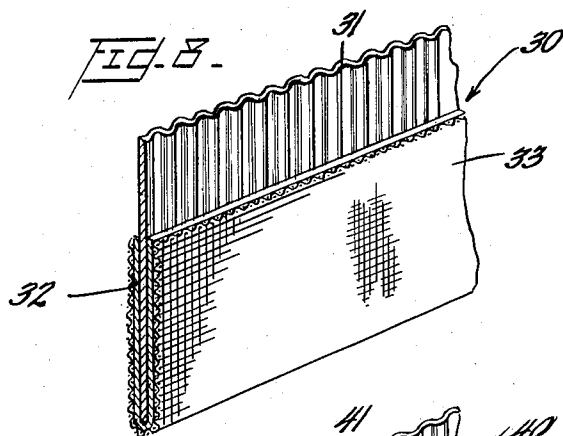
June 9, 1959

C. MACKINTOSH
FILTERS

2,889,932

Filed March 22, 1957

2 Sheets-Sheet 2



INVENTOR

Charles Mackintosh

BY *Watson, Cole, Grindle*
& Watson

ATTORNEYS

1

2,889,932

FILTERS

Charles Mackintosh, Los Angeles, Calif.

Application March 22, 1957, Serial No. 648,470

12 Claims. (Cl. 210-450)

This invention relates to filtering devices and more particularly to devices of this type which embody filter packs or cartridges which comprise alternate laminations of fabrics and supporting and spacing webs.

The general object of the invention is to provide a novel and improved filtering device of the class described which is relatively simple and inexpensive to construct and use but one which will serve effectively to separate solid or semi-solid impurities from water and other liquids.

The invention in its preferred embodiment contemplates the provision of a novel filter of this class which is especially efficient in filtering and re-filtering the water of swimming pools, although the invention may be applied to other analogous uses. The preferred mode of practice of the invention envisions the preparation of a plug or cartridge fitted snugly within a suitable container or enclosure having inlet and outlet ducts associated therewith and preferably one or more closures or access means through which a used cartridge can be removed and a fresh one installed. Back-washing action may also be provided for in any known or suitable way.

Each of such cartridges comprises an approximately cylindrical volute laminated package, formed by rolling up one or more compound sheets consisting of layers of generally laminar filter medium and corrugated board; preferably with the filter sheet doubled and embracing one edge and a portion of each side of the corrugated board.

When tightly rolled the volute assembly is fitted into the container which is arranged to conduct the flow of the fluid to be filtered in an axial direction with respect to the assembly. Any small axially located passage or bore which may be left in the rolled assembly due to possible stiffness of the material of which it is formed, may be filled by a plug of either filter material or of impervious material, such as, for example, an axial bolt for retaining the cartridge or container closure in place.

Further objects of the invention include the provision of variations in the volute laminated filter, one of which contemplates the provision of a filter member consisting of two layers, one comprising filter paper, which in this case may be of relatively weak wet strength, and a supporting and reinforcing mesh placed in close contact with the paper and both of them being arranged with relation to the stiffening sheet as already mentioned.

Another embodiment of the invention includes the utilization as a filter sheet of a mesh lamination confining a thin layer of granular filter-aid between itself and the wall of the corrugated stiffening sheet.

A further variation includes the impregnation of the folded portion of the doubled filter sheet with a stiffening or hardening composition in order to strengthen the sheet at this point.

Other objects and features of novelty will be apparent from the following specification when read in connection with the accompanying drawings in which certain embodiments of the invention are illustrated by way of example.

In the drawings:

2

Figure 1 is a fragmentary diagrammatic perspective view showing an initial step in preparing the filter package;

Figure 2 is a similar view illustrating the next step which comprises folding the filter around the edge of the separator strip;

Figure 3 is a view in side elevation of a partially rolled filter package;

Figure 4 is a transverse sectional view of the double web forming the package and taken on line 4-4 of Figure 3;

Figure 5 is a vertical diametric sectional view taken through the completed package and substantially along line 5-5 of Figure 3;

Figure 6 is a greatly enlarged view as compared with the previous figures and showing the axial opening at the central zone of the package which is to be filled by any of the means described;

Figure 7 is a view on a smaller scale of one exemplary embodiment of the filter container in which the novel filter package or cartridge is inserted;

Figure 8 is a fragmentary view in perspective of a section of a filter device according to another embodiment of the invention, the device being shown before it is rolled into final form;

Figure 9 is a similar view illustrating a still further embodiment of the invention; and

Figure 10 is a view similar to those shown in Figures 8 and 9 illustrating a still further variation employing partially impregnated filter paper.

In Figures 5 and 7 the completed volute filter cartridge is designated generally by the reference numeral 10 and in Figure 7 it is shown enclosed in a typical casing or container to which is applied the general reference character 11.

Perhaps the best way to describe the filter package 10 which forms a preferred embodiment of the invention is to delineate the steps taken in preparing the package. Thus in Figure 1 there is shown an elongated web 12 of filter paper or filter cloth upon which has been laid a strip or web of ordinary flexible corrugated board 13. Preferably the lamination 13 is treated by coating or impregnation with material which will cause it to retain its structural configuration and not collapse when immersed in water.

It will be noted that the corrugated reinforcing web or lamination extends only approximately half way across the filter sheet 12 and is also offset inwardly from the terminal end 17 of the filter sheet. Purely by way of suggestive illustration of certain proportionings which may characterize one embodiment of the invention, it is suggested that the width of the filter strip 12 may be in the neighborhood of, say, twelve inches and the width of the reinforcing strip 13 approximately eight inches.

In Figure 2 the manner in which the filter web 12 is folded over the reinforcing sheet 13 is shown. The filter sheet 12 is doubled and extends over the major portion of each side of the lamination 13 where this lamination occurs. If the dimensions suggested above are adhered to, the folded width of the filter sheet 12 will be approximately six inches and the extension of the uncovered edge of the spacing sheet or lamination 13 will be about two inches.

Referring now to Figures 3 and 4 it will be seen that two assemblies of sheets 12 and 13 are placed together one on top of the other and with the uncovered edges of the intermediate sheets 13 extending in opposite directions and prolonged beyond the edge of the other assembly. This is shown particularly in Figure 4 of the drawings where the upper assembly A extends somewhat further to the left than the lower assembly B, and in the reverse overlapping position at the right-hand edge.

It will also be noted from an inspection of Figure 3 that the upper assembly A terminates at the peripheral

3

portion of the rolled-up package some distance short of the termination of the layer B. This arrangement, together with the extension of the inward or axial edge of the filter paper portions of both assemblies as suggested at the left-hand end of Figure 2, greatly facilitates the initial winding adjacent the axis of the assembly and the termination of the winding at the periphery of the assembly so as to cause it to fit well within the casing 11 without dangerous leakage around the package adjacent the inner wall of the container.

Figure 5 shows very clearly the nature of the rolled-up package. It must be borne in mind throughout an examination of the drawings that due to the requirement for showing even very thin sheets of material in section or with double-line thickness, the relative thickness of the laminations with respect to the full dimensions of the package is very considerably exaggerated.

An inspection of Figures 5 and 6 will reveal the nature of the inner or axial winding of the material. For purposes of more specific identification, the reference character *x* is applied to the inner extension of the filter paper strip which occurs at the axis of the device when the package is rolled up, and the reference character *y* is applied to the extension of the filter paper or cloth 12 which will occur at the periphery of the package. Thus, the nature of the preliminary winding at *x* is clearly shown in Figures 2, 5 and 6 and the nature of the extension *y* is best shown in Figures 3 and 5.

The axial opening *z* shown clearly in Figures 5 and 6 may be plugged with any suitable filter material or with impervious material depending upon the nature of the installation. However, in the suggested example shown in Figure 7 this void *z* is occupied by the axial bolt 20 which extends between the end covers 21 and 22 of the casing 11 which encloses the filter assembly 10. The end structures 21 and 22 are flanged as at 24 to embrace the cylindrical wall 25 of the casing and each end structure may be provided with inlet and outlet nipples 26 through which the water or other liquid to be filtered is made to pass. The tie bolt 20 may be threaded at each end and nuts 27 applied thereto.

In rolling up the laminations to form the substantially cylindrical package 10 pleats may be folded in the upper face of the laminations as required during the rolling operation. It will be noted that the upper face of the lower layer will pleat itself automatically as the rolling proceeds.

It will be noted that the filter as formed is reversible and flow can proceed in either direction. The liquid to be filtered will pass axially edgewise through the corrugations of the separator strip 13 and when reaching the opposite edges about which is folded the filter medium, the liquid will pass through and any solid material will be retained. As to the lamination A or B which is disposed oppositely to the initially mentioned lamination the liquid will encounter the folded edge of the filter paper first and then pass into the corrugations of the separator strip. However, it will be seen that these folded edges are preferably indented a short distance inwardly from the protruding open edges of the separator strips and solid material will be collected in such indentations.

The filter may be cleaned by backwashing, or in the case of its use as a swimming pool water filter it may be cleansed by merely dowsing the package or assembly in a bucket of water or holding it under a gentle flow of water from a faucet or tap.

In Figure 8 of the drawings there is illustrated a variation in the invention which involves the provision of a filter device 30 adapted to be wound in spiral form preferably in conjunction with a similar device as in the preceding embodiments, and which includes the same type of corrugated stiffening lamination 31 as described in connection with the earlier embodiment. The filter sheet in this embodiment is itself laminated and consists of a layer of filter paper or filter cloth shown at 32 and a layer of reticulated material or mesh indicated at 33,

4

these layers being placed in close contact and doubled about the edge of the corrugated supporting sheet 31. In this example the layer 32 may be of relatively weak filter paper and the mesh may be of any suitable filamentary material whether metal or plastic, the material of course being selected with respect to the possibility of corrosion by the liquids being filtered.

In Figure 9 of the drawings the filter device which is wound into volute form, preferably in conjunction with a strip of similar construction, is indicated generally by the reference numeral 40 and comprises the usual corrugated stiffening sheet 41 and a filter layer doubled around the sheet 41, which layer consists of an outer mesh or reticulated sheet 42 within which, and surrounding both sides of the stiffening sheet 41, is a layer of granular filter-aid material 43. This material may be of any suitable or known type whether of perlite composition or not, and this particular arrangement has been found to be very useful when the filter is to be backwashed.

In Figure 10 of the drawings the laminations comprising the filter device 50 are quite similar to those described in the embodiment illustrated in Figures 1-6 of the drawings in which the corrugated stiffening sheet 51 has a layer of filter fabric 52 doubled about it, but in this instance the folded portion of the sheet of paper or other fabric 52 is impregnated, as indicated at 53 with a stiffening material. This may be applied by dipping the paper or fabric in a suitable liquid, or painting it with such a liquid, and then allowing the liquid to dry and harden by gelation, evaporation, oxidation, or otherwise. Examples of such materials useful for preparing filters for various purposes are varnish, shellac, plastic solutions, dissolved waxes such as paraffin, etc.

It will be understood that various changes and modifications may be made in the embodiment illustrated and described herein without departing from the scope of the invention as determined by the following claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A filter for use in clarifying water and other liquids comprising, in combination, a substantially cylindrical casing having inlet and discharge openings for the liquid adjacent the respective opposite ends thereof, filter material disposed in said casing, said material comprising a cartridge of the same generally cylindrical peripheral configuration as the inner wall of the casing and adapted to fit snugly against said inner wall, the casing adjacent the periphery of said cartridge being imperforate, said cartridge formed of volute rolled-up superposed laminations of filter sheets and sheets of spacing material, which latter material is liquid-pervious edgewise thus transmitting the liquid axially between the filter sheets, said filter sheets being doubled about said spacing sheets enveloping one end edge of the latter but extending along said spacing sheets to points short of the opposite end edge, the outer surfaces of the filter sheets of adjacent laminations being in close contact, and the cartridge also being impervious to axial flow of liquid except along the spacing sheets and through the juxtaposed filter sheets.

2. The filter set forth in claim 1 in which the cartridge comprises two assemblies of filter sheets and spacing sheets rolled up together in volute form and substantially identical except for the enveloped edges and exposed edges of the spacing sheets being reversed in the two assemblies.

3. The filter set forth in claim 1 in which the spacing sheet comprises a corrugated material of sufficient rigidity to maintain generally its configuration within the liquid to be filtered.

4. The filter set forth in claim 3 in which the spacing sheet is composed of ordinary flexible corrugated board.

5. The filter as set forth in claim 1 in which the filter sheet itself is in turn laminated and comprises a layer of thin filter fabric and a juxtaposed layer of supporting

5

and reinforcing mesh material, both enveloping the spacing sheet edge as described.

6. The filter as set forth in claim 5 in which the filter fabric is paper of relatively weak wet strength, and the mesh material is of metallic wire.

7. The filter as set forth in claim 1 in which the filter sheet comprises a sheet of filter paper impregnated at the folded portion with a liquid material which upon drying leaves a stiffening residue upon the paper, whereby the major portion at least of the liquid passes through the adjacent laminations of the filter paper, and the folded portions are strengthened at the points where they are in contact with the end edges of the corrugated board.

8. The filter as set forth in claim 1 in which the filter sheet comprises a mesh layer retaining a layer of granular filter-aid between itself and the adjacent surfaces of stiffening spacing sheet.

9. The filter as set forth in claim 2 in which the two laminated layers are offset axially whereby the edges of the separator sheets which are not covered by the folded filter sheets protrude from their respective ends of the laminated cartridge, leaving the opposite edges which are covered by the folded filter sheets indented within said cartridge.

6

10. The filter as set forth in claim 2 in which the layers of filter sheets are longer than the layers of separator material before winding, and extend beyond the ends of the latter material at both the axial central portion of the wound-up cartridge and the periphery thereof.

11. The filter as set forth in claim 1 in which a plug is positioned axially through the cartridge to prevent any seepage of liquid through any central axial opening left after the winding of the rolled cartridge.

12. The filter as set forth in claim 1 in which said plug comprises a bolt for securing the cartridge in the container.

References Cited in the file of this patent

UNITED STATES PATENTS

1,861,576	Liddell	June 7, 1932
2,173,978	Pennebaker	Sept. 26, 1939
2,394,895	Burhans	Feb. 12, 1946
2,427,733	McCann	Sept. 23, 1947
2,525,330	Zaun	Oct. 10, 1950

FOREIGN PATENTS

1,065,017	France	Dec. 30, 1953
-----------	--------	---------------