United States Patent [19]

Mateson

[11] **3,768,233**

[45] **Oct. 30, 1973**

[54] **FILTER CONSTRUCTION**

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[22] Filed: **Dec. 30, 1971**

[21] Appl. No.: **214,026**

[52] **U.S. Cl.**..... **55/100,** 55/103, 55/242, 55/279, 55/329, 55/387, 55/442, 55/477, 55/524, 55/529, 55/DIG. 16, 55/DIG. 24, 55/DIG. 31, 55/DIG. 39, 210/222, 210/500

[51] **Int. Cl.**..... **B03c 1/02**

[58] **Field of Search**..... 55/100, 101, 103, 55/124, 126, 128, 129, 130, 155, 315, 318, 319, 320, 321, 322, 323, 325, 326, 329, 477, 418, 434, 442, 445, 461, 522, 242, 279, 387, 524, 529, DIG. 16, DIG. 24, DIG. 31, DIG. 39; 210/222, 500

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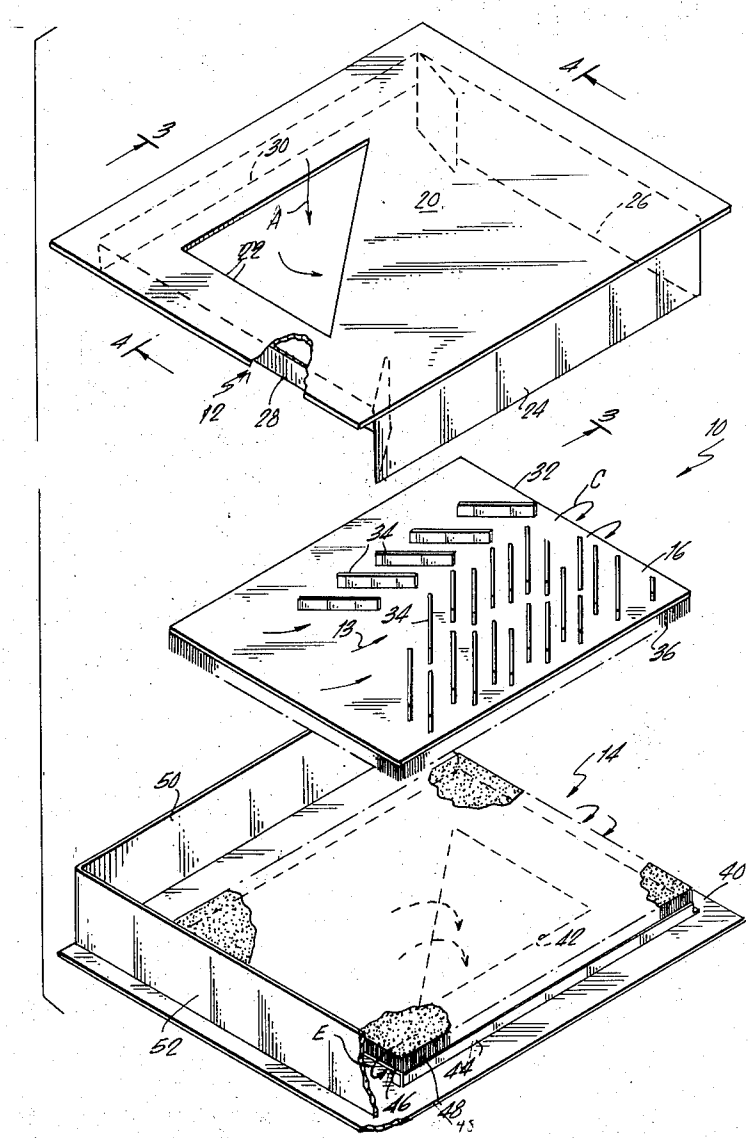
[57] **ABSTRACT**

A filter employing molded plastic fibrous elements which may be impregnated with magnetic metallic particles. The fibrous elements are integrally molded as part of a two piece assembly which may be easily taken apart for cleaning and reassembled.

9 Claims, 5 Drawing Figures



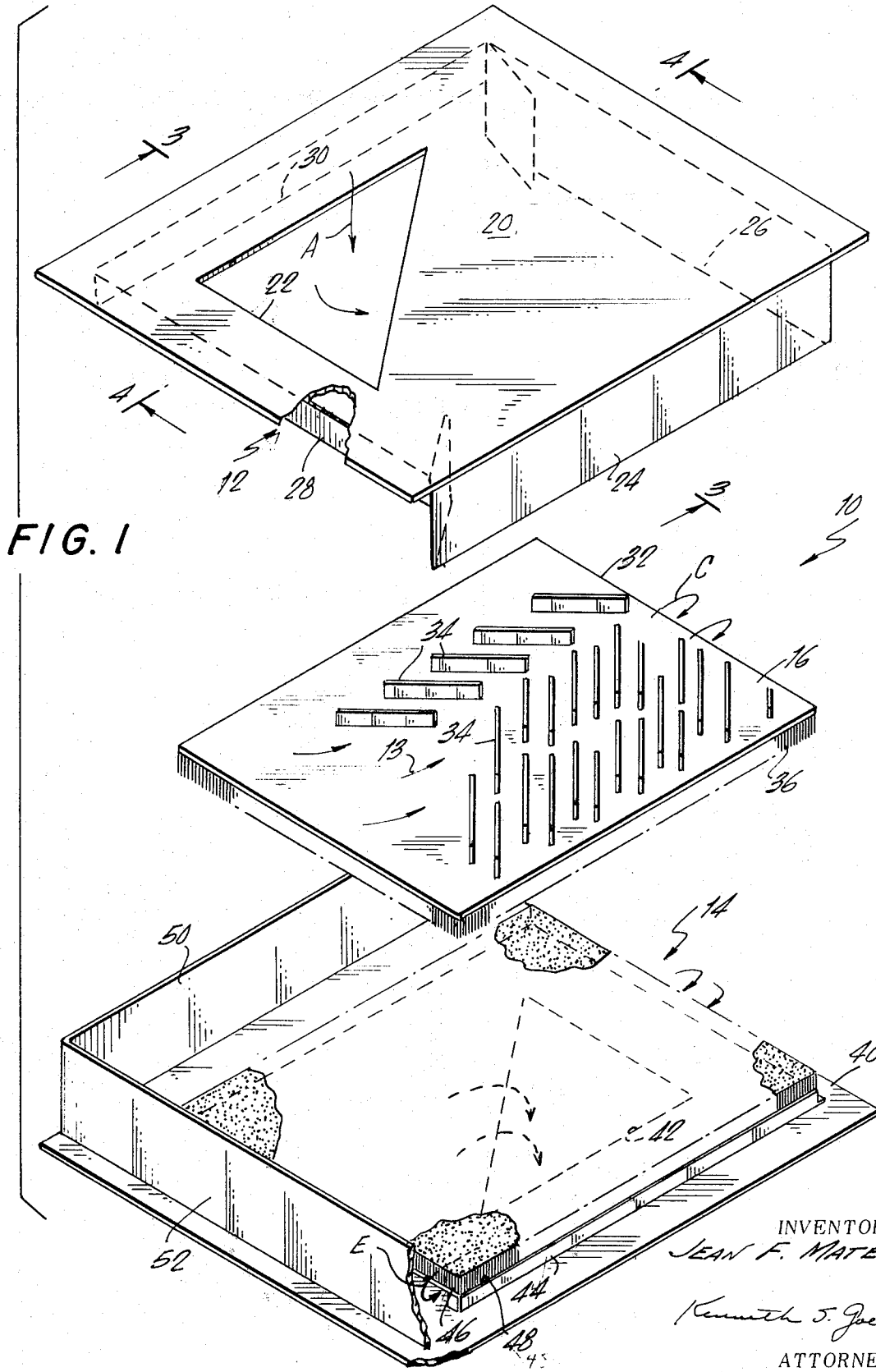


FIG. 1

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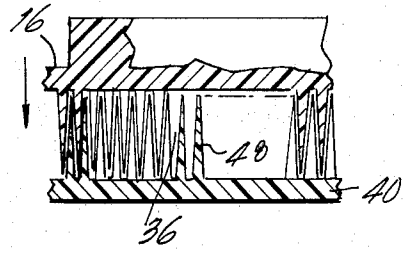

FIG. 2

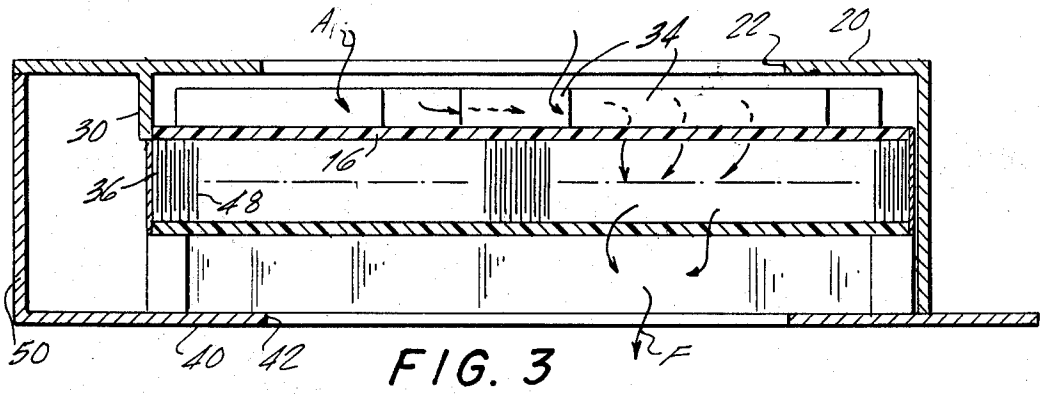

FIG. 3

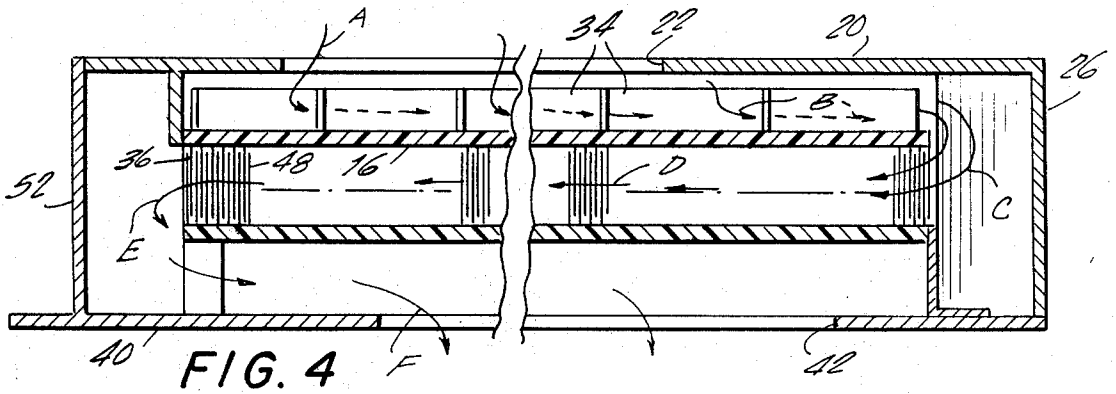

FIG. 4

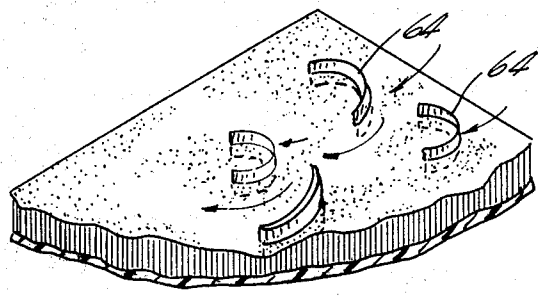

FIG. 5

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FILTER CONSTRUCTION

This invention relates to filters and more particularly to molded plastic air filters having molded plastic fibrous elements.

In the past, air filters were developed from the use of fibrous wood shavings, excelsior, and were either wetted with water or run dry, however, even as "dry," still processing the natural wood oils and essential oils common to the wood itself.

Metal shavings or spun metal wool has also been used, however, metals were found lacking until various hydrocarbon oils were applied to provide "adhesive" surfaces, similar to that for wood shavings. In some instances, where the air environment contained a large percentage of airborne oil droplets, the metal filter elements become "oiled" naturally due to the condensation and entrapment of these droplets.

With the advent and development of synthetic plastic fibers for the textile industry, these same fibers have been applied in air filters, mostly as felted or non-woven pads, however, most synthetic plastic materials are water repellent, and many are oil repellent.

Oils were still used to provide an adhesive surface for adhering and retaining collected dirt, soot and dusts. Spun glass fibers have also been employed.

In all of the above cases in producing air filters, a felted or non-woven matt is placed inside a plastic, metal, wood, or paper trough frame, fronted and backed with a screen, and mounted in all various sizes, normally these fibers are approximately 1 to 2 inches thick, extremely light, and often considered disposable after the fiber has become loaded. These filters cannot be cleaned and returned to service.

There are also urethane, open-cell, "cloth-like" fibers; however, these can only be classed as extremely low-efficiency fibers because they are very thin — one-eighth to one-fourth inch thick and are mostly used on newer window air conditioners, and small fan blower units.

The present invention employs the concept of a two-piece filter which can be manufactured on a molding machine, snapped together, producing a high degree of filter efficiency. Smaller filter elements can be molded, allowing stacking or staggering in arrangement, to form most any configuration necessary. These elements are also stronger than prior devices and resist deformation, even when subjected to the highest air velocities possible in air handling systems.

This invention also contemplates a filter with theoretically no limits as to the air velocity it can effectively filter, because the fibrous elements can be lengthened as required.

Accordingly, an object of the present invention is to provide a two-piece filter which can be removed from its holder, snapped apart, and washed or rinsed under any suitable solvent or water source, snapped together and reused unlimited times, while also having the advantage of possessing a long path for travel of the air to be filtered.

An important concept of this invention resides in locking and interspacing integrally molded fibrous plastic elements formed on a plastic base. By varying the number, the diameter, the length and the configuration of these fibrous elements, an optimum air filter efficiency can be attained for any particular application, especially noting that in applications of this invention air flow is not restricted as in the case of matt filters.

In accordance with the invention, the fibrous elements can be impregnated with metallic powders, preferably magnetic in nature, and/or activated carbons. After molding, the fibers are magnetically oriented by passing the sections through a strong magnetic field, producing a positive or negative charge. The filter is thus accorded the ability to remove and collect airborne particles with positive or negative charges.

The plastic used in molding the fibrous elements can be impregnated with non-toxic insect repellents, scenting agents, fungicides or bacteriostatic agents. The parts of the filter can be predipped or sprayed with any suitable filter adhesives to provide physical bonding surfaces for airborne solid contaminates and gaseous contaminates.

Still further objects and features of this invention reside in the provision of an air filter which may be molded out of any readily available and selected synthetic plastic material, which can be coated with any suitable substance to increase the effectiveness of the filtering action, as may be desired, which is simple in construction and inexpensive to manufacture, is easy to handle and has no obnoxious materials forming a part thereof, and which may be used in practically any system which requires the filtering of fluid to remove impurities, whether air, gas, water, or other liquid systems.

These, together with the various ancillary objects and features of this invention, which will become apparent as the following description proceeds, are attained by this filter construction, preferred embodiments of which are illustrated in the accompanying drawing, by way of example only, wherein:

FIG. 1 is an exploded perspective view of an embodiment of a filter constructed in accordance with the concepts of the present invention, with parts thereof being broken away to show other parts in detail;

FIG. 2 is an enlarged sectional detail view showing the manner in which the filter elements are interenegaged;

FIG. 3 is a vertical sectional view, taken along the plane of line 3—3 in FIG. interengaged;

FIG. 4 is a vertical sectional view taken along the plane of line 4—4 in FIG. 1; and

FIG. 5 is a partial perspective view illustrating another embodiment of a portion of the invention.

With continuing reference to the accompanying drawing wherein like reference numerals designate like parts throughout the drawing, reference numeral **10** is used to generally designate a filter constructed in accordance with the concept of this invention. The filter **10** is preferably formed of two main parts, an intake assembly generally indicated at **12** and a discharge assembly generally indicated at **14.**

As shown in FIG. **1**, the intake assembly **12** includes a baffle plate **16** preferably integrally molded as a part of the intake assembly but shown separate in FIG. **1** for the purpose of clarification. Of course, the baffle plate **16** may be molded separately from the balance of the air intake assembly. If molded separately from the balance of the air intake assembly, the baffle plate **16** may be bonded, ultrasonically welded or otherwise attached, made part of and secured to the air intake assembly **12.**

The air intake assembly **12** includes a front plate **20** having a triangular air intake opening **22** therein and

depending from the plate **20** is a side wall **24** and an end wall **26.** Peripheral separator walls **28** and **30** also depend from the front plate **20** and the baffle plate **16** has its periphery integral with or secured to the bottom edge of the walls **28** and **30** and has its edge **32** spaced from the wall **26.** Integrally molded with the baffle plate **16** are a plurality of vanes **34** which extend normal to the plate **16** and are arranged annularly in rows so as to form a maze. Integrally molded with the baffle plate **16** are a plurality of synthetic plastic molded fibrous elements **36** which form a most important part of this invention. These individual fibers project from the plate **16** and may be electrostatically charged by having impregnated or embedded therein magnetic metal powders.

The air discharge assembly **14** includes a rear plate **40** which has a triangular opening **42** therein and which has separator walls **44** which carry a mounting plate **46** on which there are integrally molded synthetic plastic fibrous elements **48** of the same type as the fibrous elements **36.** These fibrous elements extend upwardly into and mesh and interlock with the fibrous elements **36.** A side wall **50** is integral with the rear wall **40** and an end wall **52** is also integrally molded with the rear wall **40.** The side wall **24** and the end wall **26** in conjunction with the front plate **20** serve to form a front housing. A rear housing is formed of the side wall **50,** end wall **52** and rear plate **40** and the front housing and rear housing cooperate to form a rectangular box which is imperforate except for the inlet opening **22** and the discharge opening **42.**

Air enters through the inlet opening **22** in the direction of arrows A. Then, the air passes in the direction of arrows B through the maze formed by the baffles **34** and thence in the direction of arrows C between the edge **32** and wall **36,** and thence in the direction of the arrows D through interlocking fibrous elements **36** and **48,** and thence in the direction of arrows E into the space between the supporting plate **46** and the front plate **40** and out of the opening in the direction of arrows F.

As shown in FIG. **5,** in lieu of vanes **34,** arcuate vanes may be employed and may be of any shape desired.

A latitude of modification, change and substitution is intended in the foregoing disclosure, and in some instances some features of the invention will be employed without a corresponding use of other features.

What is claimed is:

1. A filter comprising an intake assembly and a discharge assembly, said intake assembly comprising a front housing having an inlet opening therein, baffle plate means in said front housing for directing intake fluid in a circuitous path, and a first plurality of molded fibrous elements integral with said baffle plate and extending into said circuitous path, said discharge assembly including a rear housing having integral therewith a second plurality of molded fibrous elements, said rear housing having a discharge opening therein, said second plurality of elements extending into the fluid path between said first plurality of elements and said discharge opening.

2. A filter according to claim **1,** wherein said first plurality of fibrous elements are interengaged between and with said second plurality of fibrous elements.

3. A filter according to claim **2** wherein said front housing and said rear housing cooperate to form a rectangular box imperforate except for said inlet opening and said discharge opening.

4. A filter according to claim **2,** wherein said elements are molded of a synthetic plastic material.

5. A filter according to claim **4,** wherein said elements have a magnetic metallic-powder embedded therein.

6. A filter according to claim **4,** including magnetic means embedded in said synthetic plastic material for providing a magnetic charge on said filter.

7. A filter according to claim **1,** wherein said baffle plate has a plurality of vanes extending normal thereto.

8. A filter according to claim **1** wherein said vanes are arranged in parallel rows.

9. A filter according to claim **1,** wherein said vanes are arcuate in shape.

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