United States Patent [19]

Smith

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[54] **AIR FILTER WITH BAGS**

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[52] **U.S. Cl.** **55/374,** 55/483, 55/484, 55/493, 55/497, 55/502, 55/507

[51] **Int. Cl.** **B01d 25/02**

[58] **Field of Search** ..... 55/341, 344, 350, 372, 55/374, 378, 483, 484, 493, 497, 502, 507, DIG. 12, DIG. 26

[56] **References Cited**

UNITED STATES PATENTS

2,771,155	11/1956	Palmore	55/502
3,099,547	7/1963	Hagendoorn et al.	55/341
3,204,392	7/1965	Schwab	55/374 X
3,250,063	5/1966	Andrews	55/483
3,394,534	7/1968	Andrews et al.	55/502 X
3,524,304	8/1970	Wittemeier et al.	55/483 X
3,616,625	11/1971	Cotabish et al.	55/483

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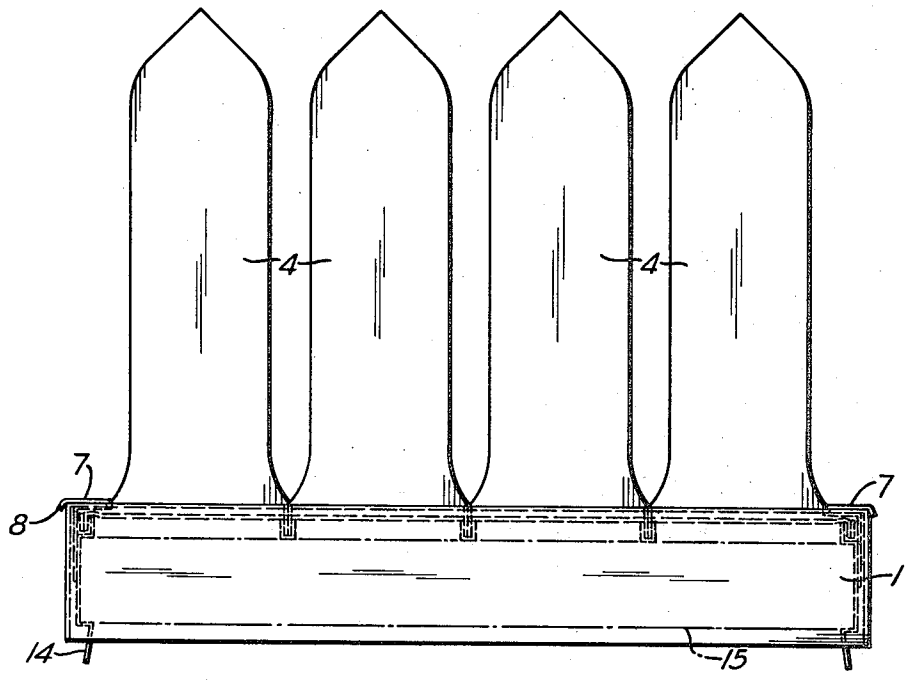
[57] **ABSTRACT**

A row of filter bags disposed side by side extend rearwardly from a rectangular frame, in which spaced parallel intermediate channel member clamp together adjoining sides of the open rectangular front ends of the bags, with the ends of the channels overlapping the front surfaces of flange members projecting inwardly from two opposite sides of the frame. Similar channel members are clamped onto the outer sides of the open ends of the two outermost bags and extend along the front surfaces of the flange members at the other two sides of the frame. Means are provided for holding this last pair of channel members in place with the adjoining areas of the outermost bags engaging the last-mentioned flange members. The portions of the bags that span the spaces between the opposite ends of the channel members overlapping the front surfaces of the first-mentioned pair of flange members being pulled into sealing engagement with those flanges when the bags are inflated behind the frame.

6 Claims, 5 Drawing Figures



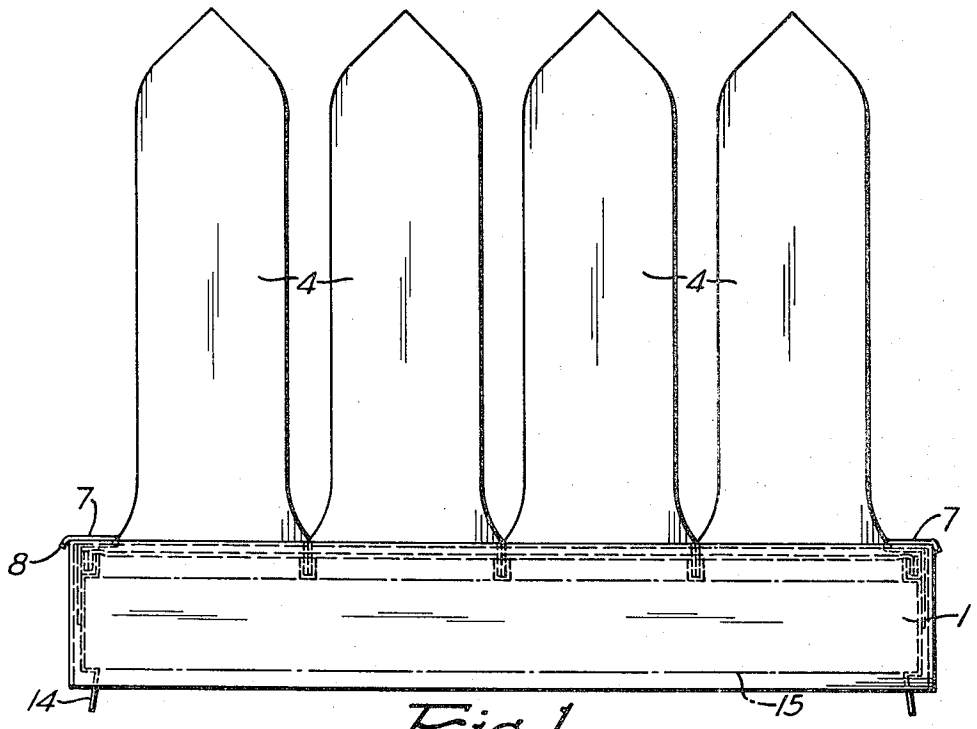


Fig. 1

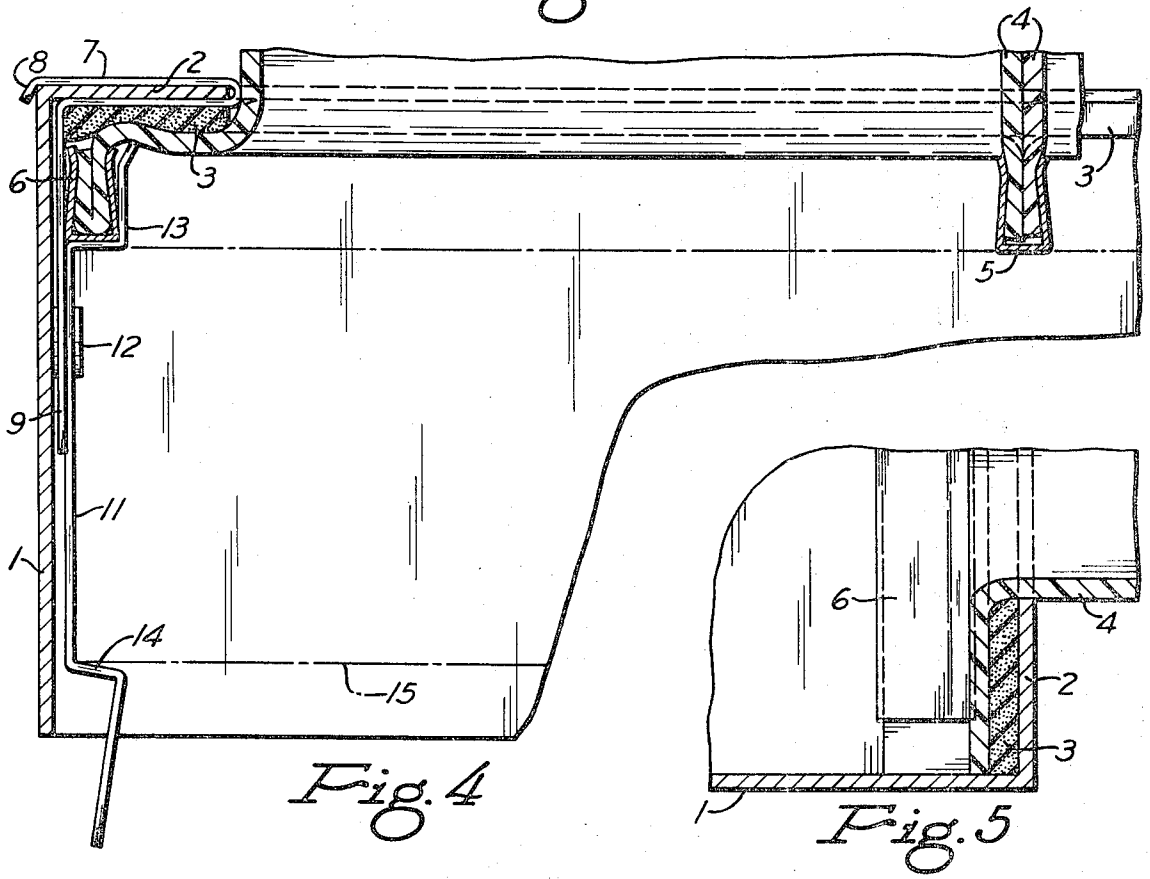


Fig. 4

Fig. 5

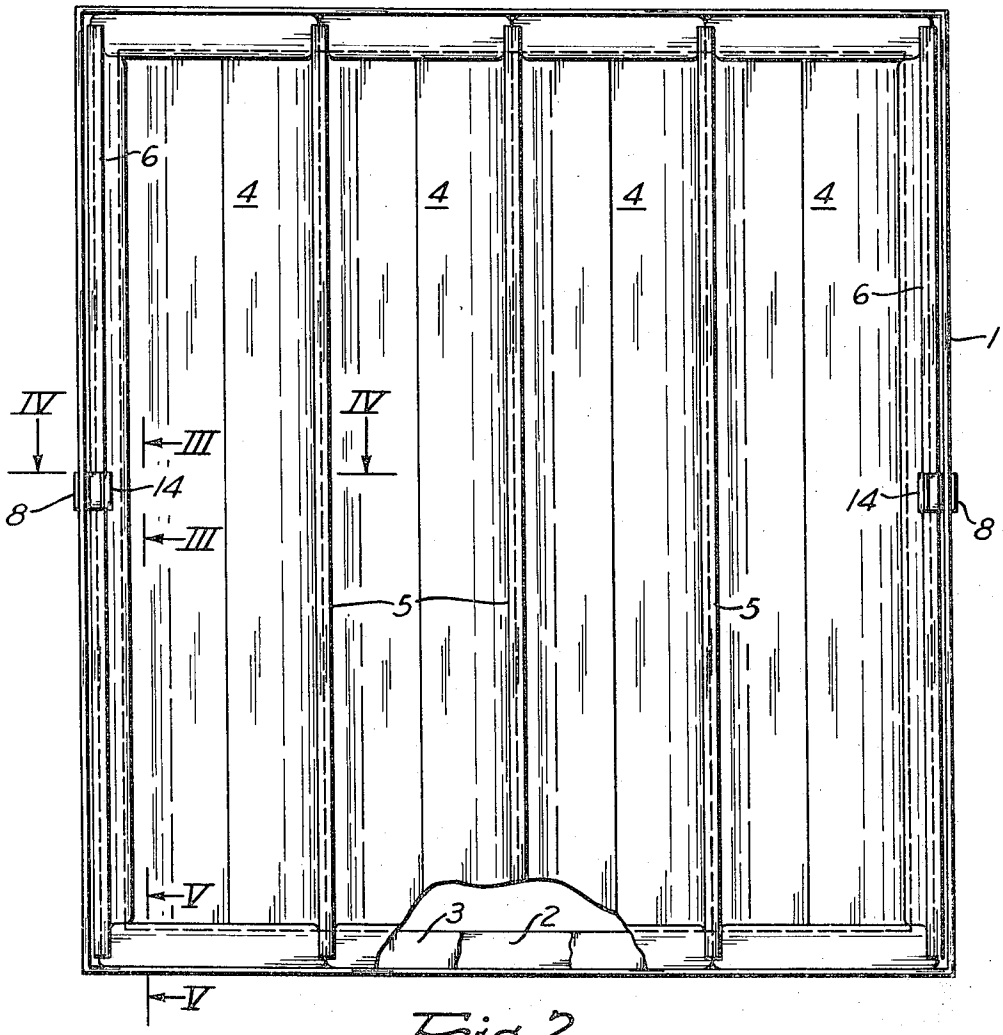


Fig. 2

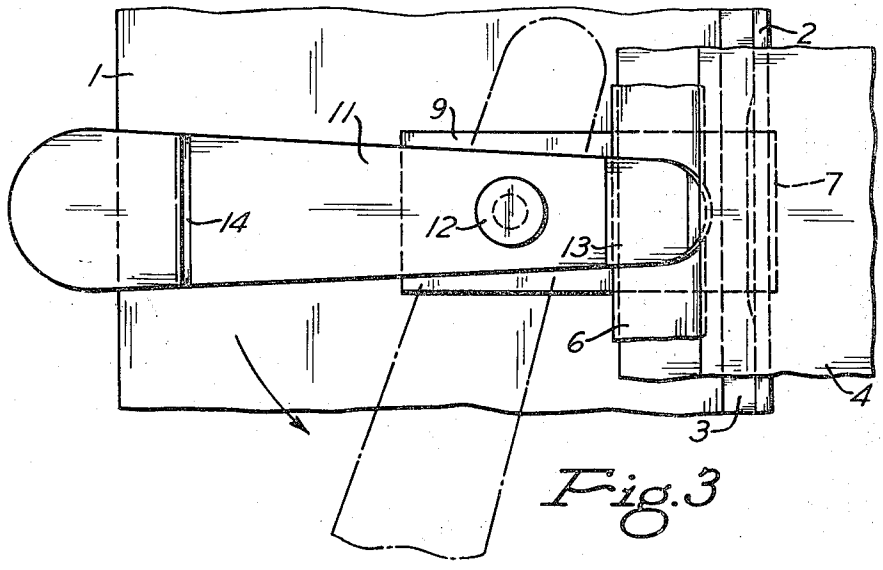


Fig. 3

AIR FILTER WITH BAGS

It is among the objects of this invention to provide a low-cost bag filter which can be assembled quickly, which is compact for storage and shipping or disposal, and which has only a single narrow frame.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a plan view of the filter while it is being used;

FIG. 2 is a front view;

FIG. 3 is an enlarged fragmentary side view of a detail taken on the line III—III of FIG. 2; and

FIGS. 4 and 5 are enlarged fragmentary horizontal and vertical sections, respectively, taken on the lines IV—IV and V—V of FIG. 2.

Referring to the drawings, a rectangular frame 1 that is only a few inches deep has a completely open front but narrow inwardly projecting flange members at its rear end. These members may consist of flanges 2 integral with the four sides of the frame, and gasket strips 3 bonded to the front surfaces of the flanges. Behind the frame there is a row of filter bags 4 disposed side by side. All of these bags extend forward into the frame a short distance and have rectangular open front ends. Adjoining sides of the open ends of the bags are clamped and sealed together by means of spaced parallel intermediate elongated channel members 5 inside the frame as shown in FIGS. 2 and 4. The channel members can be made of metal or plastic. The resiliency of these channel members is such that their opposite sides press tightly against the bag material between them. The ends of the channel members and the bag material gripped by them overlap the front surfaces of the gasket strips at two opposite sides of the frame as shown in FIGS. 2 and 5. In order for the bags to have the rectangular open front ends, the length of the channel members is materially less than the length of the bag sides fo that there will be bag material beyond the ends of the channel members that will permit the channels to be spaced apart as shown in FIG. 2.

In order to hold the front sides of the bags open and to connect them with the frame, a pair of end elongated channel members 6 are spaced from the intermediate channel members and are clamped onto the outer sides of the open ends of the two outermost bags in the row of bags. These channel members are shown as being substantially the same length as channel members 5. As shown in FIGS. 2 and 4, these end channel members extend along the front surfaces of the gasket strips at the other two sides of the frame and are held there close to the adjoining sides of the frame by means of clips. One centrally located clip at each side of the frame may be sufficient, but of course others can be added if desired. The clips are clamped onto the adjoining frame flanges 2 and the support retaining members that hold the channels close to the gasket strips behind them.

Preferably, as shown in FIGS. 3 and 4, each of the clips is formed from a strip of metal or plastic that has a reversely bent foot 7 that is slipped over the adjoining flange from its free inner edge before the gasket strip is applied to the flange. The rear end 8 of the foot is bent forward to overlap the back edge of the frame to hold the foot in place. The clip also has a short leg 9 extending forward from the front or inner end of the foot. This leg is close to the side wall of the frame. The retaining member is secured to the leg of the clip and

likewise is formed from a strip of metal or the like. The retaining member has a straight central portion 11 pivotally connected by a rivet 12 to the leg in front of the adjacent end channel member 6. The rear end 13 of this retaining member strip extends inwardly away from leg 9 across the front of the channel member 6, which it engages. The retaining member strip then extends back toward the flange 2 behind it, whereby the outer side of the channel member is held against the leg 9 of the clip and the channel member is maintained close to the gasket strip and the side of the frame.

At the time the channel members are placed in the frame with the filter bags extending out of the back of it, the retaining members at the opposite sides of the frame are turned on their rivets 12 to swing their rear ends 13 forward to a position such as shown in dotted lines in FIG. 3, where they will not interfere with placing the end channel members in the positions that they are to occupy. Then, while the end channel members are held in place manually, the retaining members are turned back on their rivets to swing their inner ends into overlapping engagement with the channel members to lock them in place as shown.

By extending portions 11 of the retaining members forward in the frame and offsetting their front end portions to form inwardly directed shoulders 14, a space can be provided between each of these shoulders and the rear end portion 13 of the retaining member for receiving a prefilter 15 shown in dotted lines in FIGS. 1 and 4. The prefilter will be locked in place by shoulders 14, but can be released by springing the projecting front ends of the retaining members outwardly away from each other.

When the filter is stored or being shipped, the bags are deflated and flat and can be folded upon one another close to the back of the frame to form a compact package. On the other hand, when the filter is in use and air is flowing into the front of the frame and out through the bags, by which it is filtered, they are inflated as shown in FIG. 1. The pressure of the air against the inside of the bags pulls the areas of the bags that surround their open front ends within the frame into sealing engagement with the flange members of the frame, so that the air being filtered cannot flow between the flange members and the outer surfaces of the bags and thereby avoid being filtered.

The filter disclosed herein is inexpensive to make because a minimum amount of material is used and the bags can be quickly clamped together and assembled with the narrow frame. The tension on the bags during filtering ensures a satisfactory seal between the bags and the frame. When not installed, the filter forms a compact and light-weight package that requires a minimum of space.

The frame and attached clips and retaining members form a permanent piece of hardware that can be used indefinitely. On the other hand, the filter bags and channel members 5 and 6 form a disposable unit that can be replaced as often as necessary.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. An air filter comprising a rectangular frame having a front and back, the back being provided with flange members projecting inwardly from the four sides of the frame, a row of filter bags disposed side by side behind the frame and having rectangular open front ends projecting forward into the frame, spaced parallel intermediate elongated channel members in the frame, each of said channel members receiving and clamping together adjoining side walls of the open ends of two of the bags, each channel member having opposite ends overlapping the front surfaces of said flange members at two opposite sides of the frame, a pair of end elongated channel members spaced from the intermediate channel members and receiving and clamped onto the outer sides of the open ends of the two outermost bags in said row, said end channel members extending along the front surfaces of the flange members at the other two sides of the frame, and holding means engaging said end channel members to hold them in place with the areas of said outer sides of said outermost bags that are between the end channel members and said last-mentioned flange members engaging said last-mentioned flange members, the portions of the bags that span the spaces between the channel members at the opposite ends of those members overlapping the front surfaces of said first-mentioned pair of flange members being pulled into sealing engagement with said first-mentioned flange members when the bags are inflated behind the frame.

2. An air filter according to claim 1, in which said flange members consist of flanges integral with the sides of the frame, and gasket strips engaging the front surfaces of the flanges.

3. An air filter according to claim 1, in which each of said end channel members has a front and back and inner and outer sides, said channel-holding means include clips clamped onto each of said last-mentioned flange members, each of the clips having a leg extending forward in the frame between the inner surface of the frame and the outer side of the adjoining end channel member, and a retaining member secured to the leg and having a portion overlapping the front and inner side of said end channel member to hold that channel member close to the flange member behind it.

4. An air filter according to claim 3, including means pivoting said retaining member to said clip leg on an axis perpendicular to the adjacent side of the frame, whereby the end of the retaining member can be swung away from the channel member engaged by it to release that member.

5. An air filter according to claim 4, in which said retaining member extends forward in the frame and has a front end provided with an inwardly directed shoulder forming a space between the shoulder and the portion of the retaining member that overlaps the front of an end channel member for receiving one side of a prefilter in front of said bags.

6. An air filter unit for use with a rectangular frame having a front and a back, comprising a row of filter bags disposed side by side and having open front ends, each of the bags having two opposite sides substantially in contact with each other, parallel intermediate elongated channel members, each of said members clamping together adjoining sides of the open ends of two of the bags, and a pair of end elongated channel members clamped onto the outer sides of the open ends of the two outermost bags in said row, the length of said channel members being materially less than the length of said bag sides, and the channel members being so located on the bag sides that when said end channel members are pulled laterally away from each other all of said channel members will be spread apart to provide the bags with open front ends that are substantially rectangular.

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