April 22, 1958 R. A. BUB 2,831,550

GAS FILTER ELEMENT

Filed April 3, 1957 2 Sheets-Sheet 1

Fig. 1

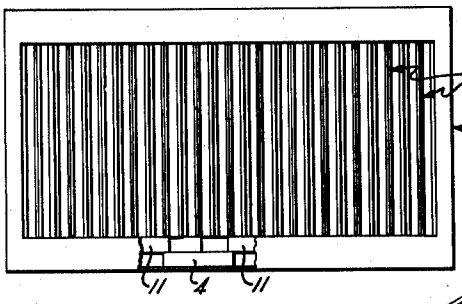

Fig. 2

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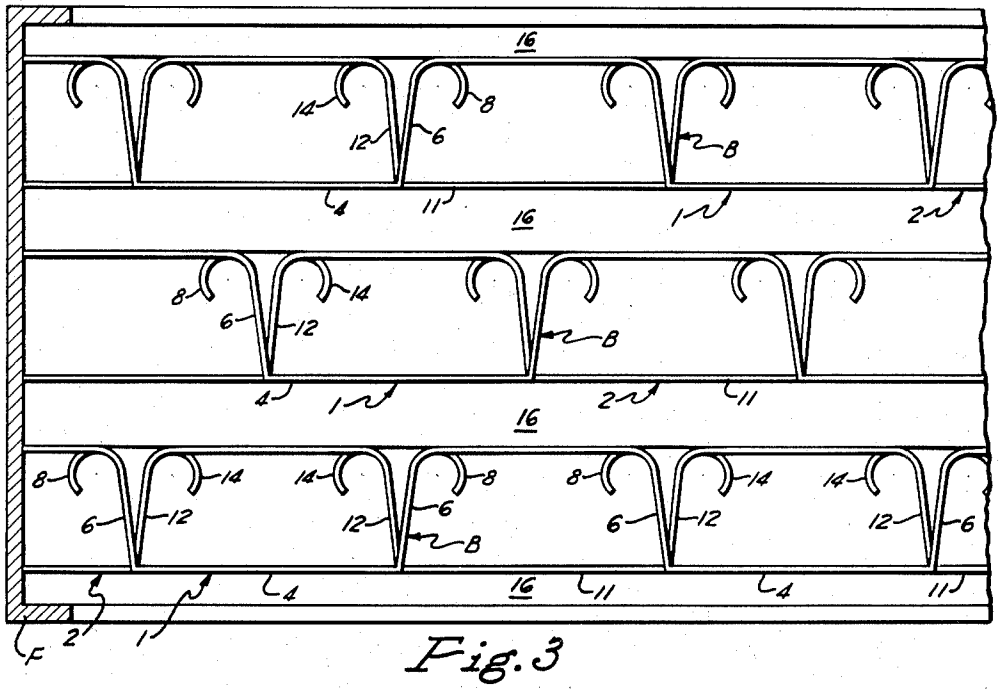

Fig. 3

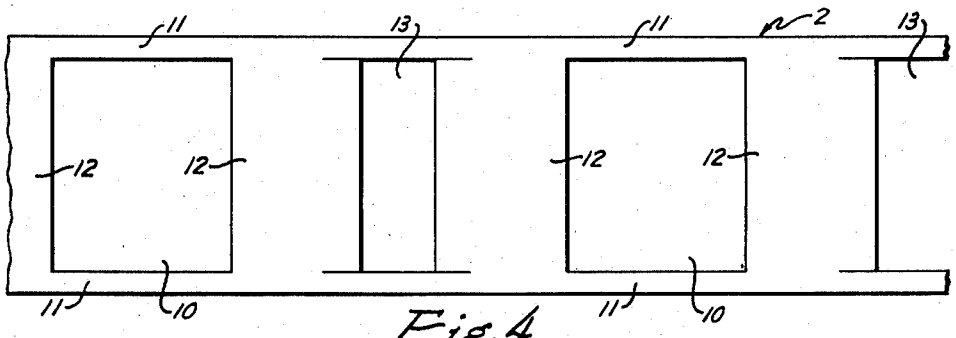

Fig. 4

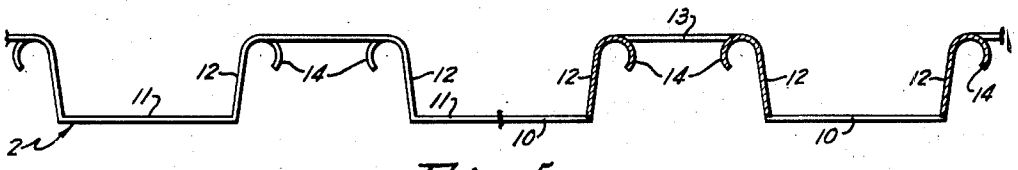

Fig. 5

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United States Patent Office 2,831,550 Patented Apr. 22, 1958

2,831,550

GAS FILTER ELEMENT

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Application April 3, 1957, Serial No. 650,387

1 Claim. (Cl. 183—75)

This invention relates to filters for streams of gas, and more particularly to a filter element that removes dust or other particulate matter from a gas stream by inertia and direct interception.

It is among the objects of this invention to provide a gas filter element composed of a number of substantially identical bars for changing the direction of gas flow in such a way that dust is deposited on the bars by inertia as well as direct interception, and which is relatively easy and inexpensive to make.

In accordance with this invention, each of two relatively stiff elongated sheets is provided with a plurality of laterally spaced rectangular openings extending across it between narrow strips of the sheet at their opposite ends. Each sheet is corrugated to form between its openings valleys that are connected by the strips. Each valley has forwardly flaring side walls and a central rear window narrower than the space between those walls. The narrow portions of the sheet between the sides of the windows and the side walls of the valleys form lateral extensions of those walls at their rear edges. These extensions are concave transversely to form dust collecting portions of the bars. The length of each of the strips of the sheets is equal to the distance between the forward edges of the side walls of a valley. One of the sheets is narrower than the other, its width being substantially equal to the length of the rectangular openings in the other sheet. The narrow sheet is superimposed on the wide sheet, with the strips of the first sheet extending across the valleys of the second sheet and with the valleys of the narrow sheet extending back through the rectangular openings in the other sheet. The adjoining side walls of the valleys of the two sheets engage each other along their forward edges and diverge rearwardly to form parallel forwardly tapered bars. Gas flowing back along the sides of these bars will pass around the curved extensions at their rear edges and deposit dust on the curved surfaces. The gas then will flow forward out of the dust-collecting portions of the element and around their longitudinal edges and then back between the bars.

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

Fig. 1 is a front or upstream view of my filter;

Fig. 2 is an enlarged fragmentary isometric view of one of the filter elements, partly broken away;

Fig. 3 is an enlarged fragmentary view of the upper ends of the filter elements, with the upper part of the frame removed;

Fig. 4 is a front view of a part of a flat sheet that has been cut to form half of one of the filter elements; and

Fig. 5 is a combined top and horizontal section of the sheet shown in Fig. 4, after it has been corrugated and formed.

Referring to Fig. 1 of the drawings, the filter has a flanged rectangular frame F formed of any suitable material that will satisfactorily support the large number of bars which do the filtering. Assuming that the filter is

upright, which is the position in which it generally will be used, the bars extend from the top to bottom of the frame and are arranged in several parallel rows from front to back, three rows being shown by way of example only. The bars in the center row are staggered relative to the front and back rows, and the bars in each row are spaced apart a distance about equal the width of each bar at its widest point. In any event, the bars should not be so close together as to restrict air flow between them and create a back pressure.

Each bar has a central deflector portion extending lengthwise of the bar. As shown in Fig. 3, this deflector is tapered forward or upstream relative to the stream of gas flowing through the filter. The opposite surfaces of the deflector should diverge rearwardly enough to deflect the gas stream to the side, but not enough to change the direction of the stream abruptly. Preferably, the two sides of the deflector are disposed at an angle of approximately 15° to each other.

At opposite sides of the back or downstream end of the deflector, the bar has dust collecting portions that extend away from each other and then upstream. The inner surfaces of these portions are curved transversely, and preferably each forms an arc of a circle tangent to the adjoining deflector surface. Consequently, gas flowing back along the diverging sides of a deflector will pass around the curved surfaces at its rear end and then out of the dust collecting portions and around their vertical longitudinal edges and back between the bars. As the gas flows around the inside of the collecting portions, dust is thrown out against the curved surfaces by centrifugal or cyclonic action and adheres to them. This adherence may be produced by using roughened surfaces or by coating them with oil or a suitable tacky adhesive.

It is a feature of this invention that the bars in each row are formed from two superimposed and interlocked thin corrugated sheets 1 and 2 made of any suitable material stiff enough to retain its shape. For example, metal foil, kraft paper or treated asbestos paper can be used. The thickness of the sheets in the drawings is exaggerated. One of the sheets is substantially as wide as the distance between the upper and lower walls of the filter frame. The other sheet 2 is slightly narrower, but otherwise is formed in the same way. As shown in Fig. 2, corrugated sheet 1 is provided with a plurality of laterally spaced rectangular openings extending vertically across its front between narrow strips 4 of the sheet remaining at the upper and lower ends of the openings. Between the rectangular openings the corrugated sheet has laterally spaced valleys that are connected by strips 4. It will be seen that the sheet is bent back at the opposite ends of the strips to form the valleys. Each valley has forwardly flaring side walls 6, between the rear edges of which there is a rear window 7 that is narrower than the space between those walls. The spaces between the side walls and the sides of the window are occupied by narrow portions 8 of the sheet that are free of the sheet except where they join side walls 6. They therefore form lateral extensions of the side walls and curve toward each other and forward.

The corrugated narrow sheet 2 likewise is provided with rectangular openings 10, top and bottom strips 11, valley side walls 12, rear windows 13 and curved wall extensions 14.

The length of each of the horizontal strips of either sheet is equal to the distance between the forward edges of the side walls of the valley which it spans. The width of the narrower of the two sheets is substantially equal to the length or height of the rectangular openings in the other sheet. The narrow sheet is interlocked with the wide one by inserting its valleys in the rectangular openings 3 of the wide sheet. The strips 11 of the narrow

sheet therefore extend across the valleys of the wide sheet. Also, the adjoining side walls 6 and 12 of the valleys of the two sheets engage each other along their forward edges and diverge rearwardly to form the forwardly tapered deflector portions of bars B.

After the two corrugated sheets have been interlocked in this manner to form a filter element, it is cut to length and inserted in the filter frame. The three parallel elements may be held in place in various ways. A convenient way is to place straight spacing bars 16 between the elements at their upper and lower edges and also between the front and rear elements and the front and rear flanges of the frame. The horizontal strips 4 and 11 at the top and bottom of each element will be hidden behind the upper and lower flanges of the frame.

In order to make the corrugated sheets, a long strip of material of correct width may be cut into the desired lengths, or a wider strip may be cut lengthwise too to separate it into strips of proper width that are then cut into length. Each sheet is then die cut to provide it with the rectangular openings, windows and wall extensions at the sides of the windows, all as shown in Fig. 4. If a sheet is metal foil, it can be corrugated as shown in Fig. 5. In the same operation the curved extensions 14 are formed. In order to collect as much dust as possible, the free edges of these extensions should be curved back toward the deflector to some extent, but they cannot be curved around from the adjoining wall much more than 180° if they are to be shaped during the corrugating operation. A wide and a narrow sheet cut and corrugated and shaped in this way are then interlocked as shown in Figs. 2 and 3 to form a filter element. The element is cut to the proper length for the filter frame and then mounted in it.

If kraft paper is used instead of foil, it is desirable to employ heated corrugating rolls.

When asbestos paper is used, it is saturated with colloidal silica after die cutting and then it is corrugated and dried between heated corrugating rolls. The sheet will then be stiff enough to hold its shape.

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 claim, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

A gas filter element for use in a stream of gas that contains dust or other particulate matter, comprising two relatively stiff elongated sheets each provided with a plurality of laterally spaced rectangular openings extending across it between narrow strips of the sheet at their opposite ends, each sheet being corrugated to form between said openings valleys that are connected by said strips, each valley having forwardly flaring side walls and a central rear window narrower than the space between those walls, the narrow portions of the sheet between the sides of the windows and said side walls forming lateral extensions of the side walls at their rear edges, said extensions being transversely concave, the length of each of said strips being equal to the distance between the forward edges of the side walls of a valley, one of said sheets being narrower than the other and having a width substantially equal to the length of said rectangular openings in said other sheet, the narrow sheet being superimposed on the wide sheet with the strips of the narrow sheet extending across the valleys of the wide sheet and with the valleys of the narrow sheet extending back through said rectangular openings in the wide sheet, and the adjoining side walls of the valleys of the two sheets engaging each other along their forward edges and diverging rearwardly to form parallel forwardly tapered bars.

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