

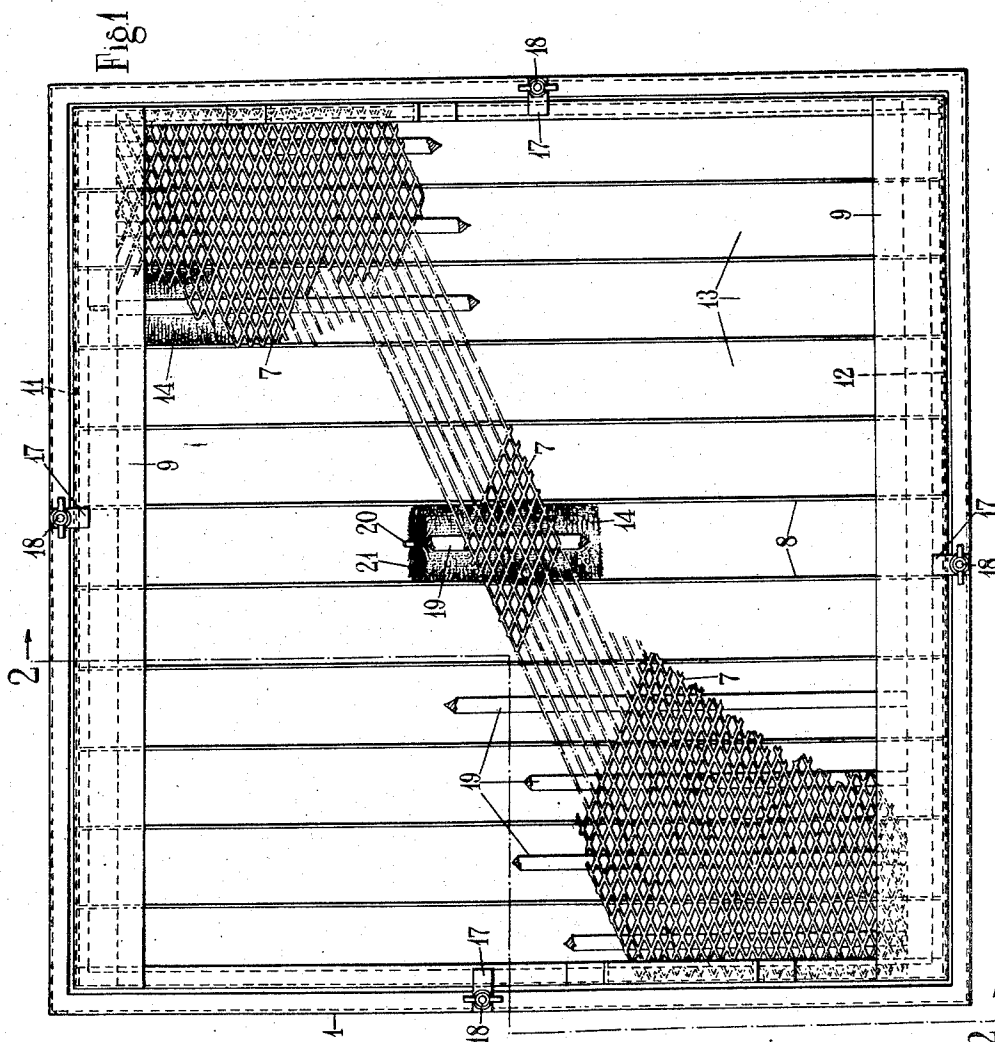
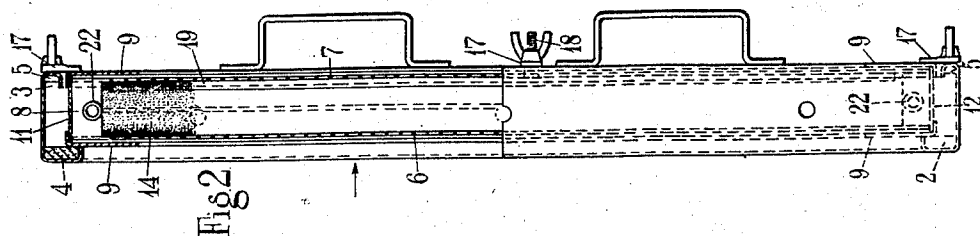
Aug. 13, 1957

D. G. LEWIS
FLUID FILTERS

2,802,544

Filed Feb. 4, 1955

2 Sheets-Sheet 1



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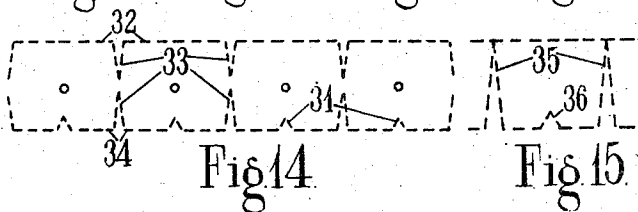
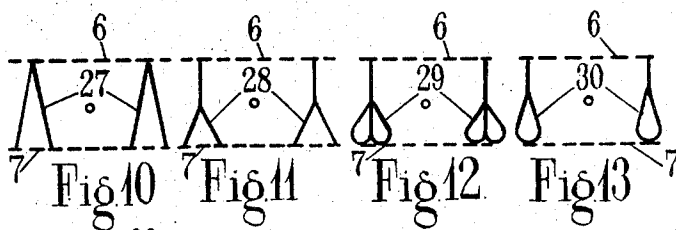
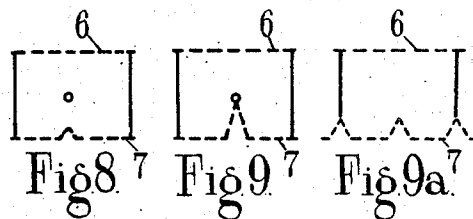
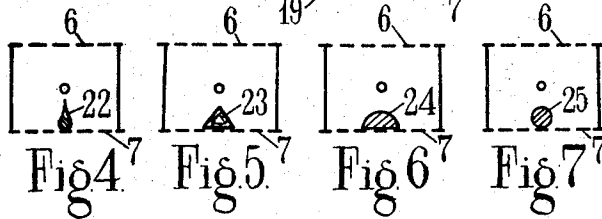
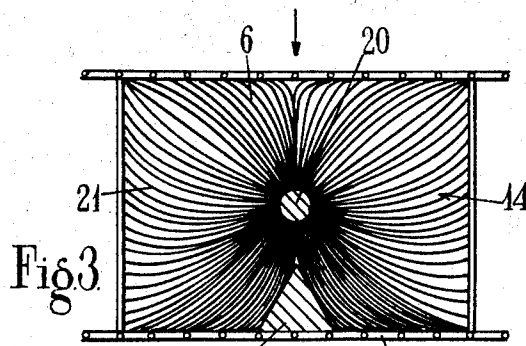
Aug. 13, 1957

D. G. LEWIS
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2,802,544

Filed Feb. 4, 1955

2 Sheets-Sheet 2



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2,802,544

FLUID FILTERS

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Application February 4, 1955, Serial No. 486,171

Claims priority, application Great Britain
February 20, 1954

3 Claims. (Cl. 183—44)

The invention relates to filter screens for fluids of the kind wherein the filtering medium is a brush or a plurality of brushes each having bristles radiating from all parts of the periphery of a central stem and confined between a pair of foraminous walls or grids.

The invention is particularly but not exclusively applicable to screens of this kind for filtering air before entry into a ventilating or air conditioning plant, or for collecting or arresting dust and the primary object of the invention is to provide an improved screen which will ensure that a greater quantity of solid particles per volume of fluid filtered will be entrained. In this respect it is pointed out that hitherto in such filter screens the distribution of the bristles between the foraminous walls or grids was substantially uniform at least adjacent each wall or grid so that particles of smaller size than the interstices between the bristles escaped therethrough and thus were not removed from the air or other fluid.

According to the present invention, the bristles of the brush or each brush, which project from the stem or stems to one wall or grid are provided with means which extends inwardly from said one wall or grid whereby the bristles are held in closer relation than those that project from the stem or stems to the other wall or grid.

More specifically a filter screen or panel according to the invention may comprise a plurality of said brushes each confined in a cell of square, oblong or other cross-section, defined by division plates, perforate or imperforate, hereinafter referred to as midfeather plates fitting between the foraminous walls or grids one of the latter having inward projections parallel to the stems and each of which extends into and between the adjacent bristle of one of the brushes.

A filter screen according to the invention thus functions as a two stage filter sieve, the larger particles will first be entrapped by the bristles during flow to the mid plane of the screen and thereafter the finer particles will be entrapped by the bristles which are held in closer relation.

It is to be understood that the term bristles herein employed includes any natural or synthetic fibers or metal wires.

The cross-section of a brush is usually circular but it may be of oval, rectangular, multi-sided or of eccentric-section, and greater than the cross-sectional area of the cell into which it is inserted. The relation of the area of the brush to the cell is determined by the type of bristle constituting the brush and the particular application for which the filter panel is required.

The screen may be constructed so that the brushes can be withdrawn individually from the cells for cleaning them.

Reference is now made to the accompanying drawings in which:

Figure 1 is an elevation of a filter screen suitable for use with an air conditioning plant, looking towards the left of Figure 2,

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Figure 2 is a side elevation, the upper part being in section, the section being taken on the line 2—2 Figure 1,

Figure 3 is a sectional plan of one of the cells, and

Figures 4 to 15 are views each similar to Figure 3 but with the brush omitted, showing modified forms.

In carrying out the invention the filter screen, Figures 1 to 3, is a rectangular panel screen suitable for filtering atmospheric air before entry into an air conditioning plant or a ventilation opening, the panel, for example, fitting in or being secured over an opening in an outside wall of a building in which the plant is located. The panel comprises a four sided rectangular metal frame 1, each side being channel section modified by having the marginal portions of each flange internal to lie parallel to the web thereof. Thus, each side has a pair of inwardly facing parallel channels 2, 3, the channel 3 being substantially half the width of the channel 2. The channel 2 of each side of the frame has fitted therein a strip of felt packing 4 and the channel 3 of each side of the frame has fitted therein intermediate its length the head 5 of a screw which projects through a hole in the flange to the exterior for a purpose which will hereafter appear.

The filter screen comprises rectangular front and rear foraminous sheets 6 and 7 of expanded metal spaced apart and having between them a plurality of uniformly spaced midfeather plates 8 which may be perforate or imperforate which are each secured by their side edges to both the sheets 6 and 7. This assembly is provided with marginal angle section frame members 9 secured on each face thereof and having fixed thereto side edge plates, the top and bottom edge plates 11 and 12 being slidable to and from the position shown. Thus there is provided a unit having a plurality of rectangular prismatic cells 13 one for each brush 14.

The cell assembly is held in position within the frame 1 by four clamping plates 17 each apertured for threading on to one of the aforementioned screws, the latter having wing nuts 18 for holding the clamping plates in position, and as appears in Figure 2 the unit seats on the packing.

The rear foraminous sheet has secured thereto on its inner face ribs 19 of triangular shape in cross-section, each rib projecting into one of the cells midway between the adjacent midfeathers and extending longitudinally of the cell parallel to the midfeathers. Each rib as shown in Figure 3 deflects the bristles.

Each brush has a stem 20 having bristles 21 radiating outwardly therefrom from all parts of the periphery throughout its length except for end portions 22 which are formed as eyes which facilitate withdrawal from the cells for cleaning the brushes after the unit has been removed from the frame 1, and one of the plates 11 or 12 has been slid from position to expose the open ends of the cells.

As will be apparent from Figure 3, the bristles extend from the stem to the cell walls so that no voids are left whereby air flowing through the cell cannot by-pass the brush. For this purpose, the brushes may be square in cross-section to fit the cell or of slightly greater dimension than the cross-section of the cell. In the form shown in Figures 1, 2 and 3 the brushes are circular in cross-section, the diameter being greater than the width of the sides of the cell to the extent that the bristles are deflected slightly and project into the corners of the cell as indicated so that there are no voids which permit the air being filtered to by-pass the brush. As will also be seen from Figure 3, the ribs deflect the bristles extending beyond the stem in the sense of the direction of flow of air through the cell as indicated by the arrow, so that they lie in closer relation than those that extend from the stem on the other side of the latter. Thus air passing through the filter screen will first have larger solid particles and then

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finer particles arrested before leaving the screen, and the screen therefore functions as a two-stage filter.

Referring now to Figures 4 to 7, modified forms of ribs are designated respectively 22, 23, 24, 25. The rib 22 is of aerofoil form in cross-section, the rib 23 is of hollow V-shape in cross-section, the rib 24 is of semi-circular cross-section and the rib 25 is of circular cross-section.

Figure 8 shows a further modification wherein the foraminous sheet 7 is indented at 26 to V-shape, and as will be seen from Figure 9, such indenting can extend to the brush stem or various depths according to the density of bristles required for arresting the finer particles.

Referring to Figures 10 to 13, the side walls 27 of each cell are convergent from the foraminous wall 6 where it leaves the screen. In Figure 11 at 28 the side walls are partly convergent. At 29, Figure 12, each midfeather has an extension folded over on to itself to V-form, and 30, Figure 13, is a similar arrangement but the V is bisected by a plane containing the other part of the midfeather.

In Figure 14, the cells and the projections 31 and the midfeathers are provided by foraminous sheet metal, for example expanded metal as shown in Figure 1. As will be seen from Figure 14 two sheets of expanded metal are formed by bending so that the sheet 32 provides one half or approximately so of each midfeather 33, and this also applies to sheet 34 but in addition the sheet 34 is also provided with V bends, providing the projections 31 which hold the brush bristles in closer relation on that side of the screen. The arrangement shown in Figure 14 will be assembled with a frame as described with reference to Figures 1 and 2.

In Figure 15 which is a modification of the form shown in Figure 14 one only of the foraminous sheets of expanded metal is bent so that it completely provides the midfeathers 35 which extend to the other foraminous sheet and the former sheet is also indented to provide V projections or ribs 36.

The invention is not confined to filter screens as shown in which the brush axes are in a common plane as it may be applied to other forms of filter screen, for example air filters for the air supply to internal combustion engines or air compressors wherein the brushes are arranged in continuous annular series confined between inner and outer cylindrical foraminous walls between which midfeathers extend providing a cell for each brush. The inner cylindrical foraminous wall will house V-shaped indentations or ribs, so that the bristles of each brush which project from the stem to the inner foraminous wall will be flexed so that they be in closer relation than the bristles which project to the outer foraminous wall. With such an arrangement a closure cap will cover the whole of one end and have a cylindrical rim which fits the exterior of the outer foraminous wall and the other end will be provided with a fitting which covers the adjacent ends of the cells only but also has a rim which fits the outer foraminous wall and a tubular projection which communicates with the interior of the inner foraminous wall.

The tubular projection is provided on its outer end with a flange for connecting it to the air intake of an internal combustion engine compressor. The closure cap and fitting are secured in position in any suitable manner and with this arrangement atmospheric air flows under the action of suction from the periphery of the outer cylinder into and through the cells into the inner cylinder and then through the aforesaid tubular projection to the intake.

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During traverse of the cells the larger particles of dust are first arrested by the brushes and then the finer particles are arrested thereby so that the air is cleaned before entering the engine or compressor. It is also pointed out that in the case of a screen for fitting in a small opening the filter screen may consist of one cell only having a single brush therein in which case the plates 8 are impermeforate and one of the foraminous walls will have a rib to hold the bristles that project from the stem thereto in closer relation than those that project to the other foraminous wall.

The bristles of the brushes may be moistened by dipping in or spraying with oil or other liquid for treatment of the air before being inserted in the cells and after a period of use the filtrate may be removed by a solvent, the brushes washed and dried and then re-moistened with the oil or other liquid before being replaced in the cells. When the brushes are used dry they may be cleaned by shaking, air jet or vacuum cleaning or by washing in soapy water or its equivalent.

I claim:

1. A screen for filtering fluids comprising a parallel series of brushes of the same diameter each having bristles extending outwardly from all parts of the periphery of a stem and each being confined in a cell formed by two spaced impermeforate plates which extend transversely between oppositely disposed front and rear walls, said front and rear walls having openings therein for the passage of fluid into the screen through the openings in the front wall, through the interspaces between the brush bristles transversely thereto and then out of the screen through the openings in the rear wall, all the bristles which project from the sides of the stems to the rear wall being held in closer relation than those which project to the front wall by V-shaped projections each secured to the rear wall and arranged parallel to the stems and midway between two of the said spaced impermeforate plates, whereby larger and then finer particles will be entrapped during the passage of fluid through the screen.

2. A screen for filtering fluids comprising a parallel series of brushes of the same diameter each having bristles extending outwardly from all parts of the periphery of a stem and each being confined in a cell formed by two spaced impermeforate plates which extend transversely between oppositely disposed front and rear walls, said front and rear walls having openings therein for the passage of fluid into the screen through the openings in the front wall, through the interspaces between the brush bristles transversely thereto and then out of the screen through the openings in the rear wall, all the bristles which project from the sides of the stems to the rear wall being held in closer relation than those which project to the front wall by V-shaped projections on the rear wall, each projection being parallel to the stems and arranged midway between two of the said spaced impermeforate plates, whereby larger and then finer particles will be entrapped during the passage of fluid through the screen.

3. A screen as defined in claim 2 wherein each of said V-shaped projections is an integral part of said rear wall.

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