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54 **Electrostatic air filter.**

57 An air filter for the removal of dust comprises two outside frames (1,2) supporting metallic screens (3,4), a centre frame (14) supporting an inside screen (13), a high voltage supply box (5), and removable fibrous pads (16). The outside frames (1,2) comprise hollow members held together by fitting rigid right angled corner members therein.

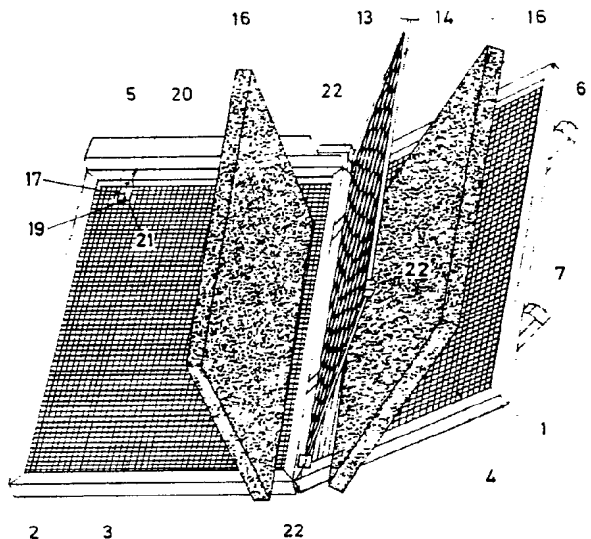


FIG. 2

EP 0 229 857 A1

ELECTRONIC AIR FILTERS

Technical Field

The invention relates to electronic air filters in which dust is collected on a charged medium or screen. Such a filter can well be installed in a furnace or air conditioner, for example.

Background Art

Patent Specification CA 1175754 discloses a filter of this kind comprising outside frame supporting screens attached to each other by hinges, an inside frame supporting a third metallic screen, a high voltage supply unit attached to one of the outside frames, and removable fibrous pads between the screens.

The Invention

According to the invention, the outside frames comprise hollow members held together by fitting rigid right angled corner members therein. This makes it possible to construct frames of various size from standard components without a change of tooling.

DRAWINGS

Figure 1 shows a filter according to the invention;

Figure 2 shows the filter of Figure 1 open to reveal the inside screen and pads;

Figure 3 shows how the outside frames of the filter of Figure 1 are assembled;

Figure 4 is a cross section through a high voltage power supply box, electrode and shorting switch in the filter of Figure 1, the switch being in an open position and the filter closed;

Figure 5 is the same as Figure 4 with the switch closed and the filter open (schematically); and

Figure 6 is a diagrammatic top view of the high voltage box in the filter of Figure 1.

Best Mode

Two hollow outside frames 1, 2 made of metal such as aluminum support metallic screens 3, 4 respectively. A metal box 5 contains high voltage power supply electronic components as shown in

Figure 6. Latches 6 and 7 hold the frames 1, 2 together in a closed position at one side while metal hinges (not shown) secure the frames together at the opposite side.

With particular reference to Figure 2, an electrical socket 8 and plug 9 connect a low voltage cable 10 to a low voltage power supply 11 having prongs 12 which can be plugged into a conventional mains outlet. The socket 8 is connected inside the box 5 to the high voltage supply components. An inside screen 13 (Figure 1) is supported on a centre frame 14. Insulators 22 are attached to the corners of the frame 14 to centre it and the screen 13 between the screens 3, 4. Strips 15 of flexible insulating material function as hinges and attach the centre frame 14 to the outside frame 2. Fibrous pads 16 function as dust collection medium. The pads 16 are made of high quality insulating material such as glass fibre. They are located between the screens 3, 4 and the screen 13 which is attached to an output 18 of the high voltage supply box 5.

A cylindrical metallic terminal 19 (Figures 4, 5) is attached to an end of an electrode 17 to increase the diameter of the electrode 17 and prevent high voltage corona. A flexible spring wire 20 is attached to the box 5 and has a cylindrical terminal 21 to prevent high voltage corona between the electrode 17 and the wire 20 which is at ground potential since it is attached to the box 5 and the frames 1, 2. The spring wire 20 is shaped in such a way that when frames 1, 2 are closed together, the wire 20 is pushed by the frame 1 away from the electrode 17. When the frames 1, 2 are slightly separated, the wire 20 springs back, and the terminal 21 touches the terminal 19 and connects the electrode 17 to ground. When the filter is closed and frames 1, 2 are together, the centre frame 14 comes into contact with the terminal 19 and thus high voltage is applied to the screen 13.

The outside frames 1,2 comprise hollow members 1A which are held together by fitting rigid corner members 23 (Figure 3) therein. The members 1A have grooves 25 in which the screens 3 and 4 are fixed by squeezing the edges of the screens into the grooves 25 with a resilient cord 24. (See also Figures 4, 5). By using this method of construction, filters of different size can be manufactured by simply cutting appropriate lengths for members 1A. The voltage supply outlet 18 is long and slender so as to fit at the end of the filter and be part of the unit (see Figure 6). The electronic part of the power supply in Figure 6 consists of an electronic oscillator A which drives a transformer B. The transformer B produces about one tenth of the

output high voltage. A voltage multiplier C boosts the output of the transformer B to the final high voltage required. The arrangement has high impedance to prevent excessive current flow under high humidity conditions. The voltage is gradually built up to the high voltage required to drive the filter. The supply box 5 contains a long, narrow printed circuit board.

Operation

Low voltage power supply 11 is plugged into a mains outlet via the prongs 12 and provides low voltage such as 9V to the high voltage power supply via the cable 10, plug 9 and socket 8. The high voltage power supply transforms this low voltage to high voltage such as 6 kilovolts, and this is connected to the screen 13 via the electrode 17, terminal 19 and centre frame 14. The return connection of the high voltage power supply is through the box 5. This provides a high voltage potential between the screen 13 and the outside screens 1, and 2. This potential polarizes the fibrous pads 16 and thus positive and negative electric charges form at the surfaces of each fibre. Dust particles passing between the screens also become polarized and are attracted to the fibres.

To clean the filter, it is opened by swinging latches 6 and 7 outwards (as shown for latch in Figure 1). The two outside frames 1 and 2 are separated and the fibre pads are replaced. As soon as the two outside frames are separated slightly, the shorting switch comprising the spring wire 20 connects the electrode 17 to ground and thus eliminates any possibility of shock to the user. By using this arrangement having a low voltage power supply providing power to a high voltage power supply attached to the filter, installation is easy, and it is not dangerous because the user does not handle high voltages. Many filters of this type can be manufactured in tandem to produce filters of higher efficiency and high dust holding capacity.

Claims

1. An electronic air filter comprising two hollow outside frames (1,2) supporting metallic screens - (3,4) and attached to each other by hinges, a centre frame (14) supporting an inside screen (13) and attached to at least one of the outside frames - (1,2) by insulating hinges (15), a high voltage supply unit (5) attached to one of the outside frames - (1,2), removable fibrous pads (16) between the outside screens (3,4) and the inside screen (13),

characterized by the outside frames (1,2) comprising hollow members (1A) held together by fitting rigid right angled corner members (23) therein.

2. A filter according to claim 1 in which the high voltage supply unit (5) comprises an oscillator (A), transformer (B) and voltage multiplier (C).

3. A filter according to claim 1 or claim 2 in which a switch for disabling the high voltage power supply comprises a wire spring (20) contactable with the outside frame (1) in a closed position of the filter and releasable in an open position of the filter to make a short circuit with the inside screen - (13).

4. A filter according to any preceding claim in which the high voltage power supply comprises terminals (19,21) for minimizing high voltage corona.

5. A filter according to any preceding claim in which insulators (22) are connected to the corners of the screen (13) for centering.

6. A filter according to any preceding claim in which the insulating hinges (15) comprise strips of material.

7. A filter according to any preceding claim in which the fibrous pads (16) are of glass fibre.

8. A filter according to any preceding claim in which the high voltage supply has a high internal impedance.

9. A filter according to any preceding claim comprising a latch (6,7) for securing the outside frames (1,2).

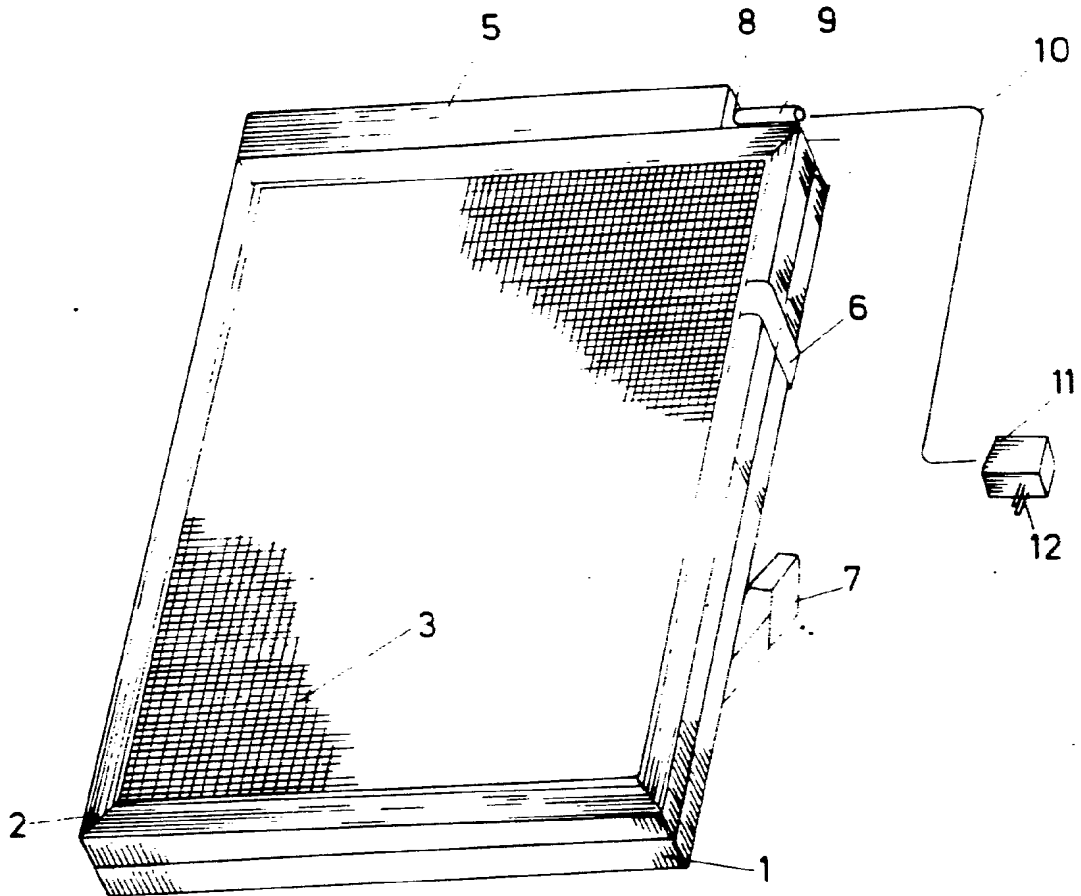


FIG. 1

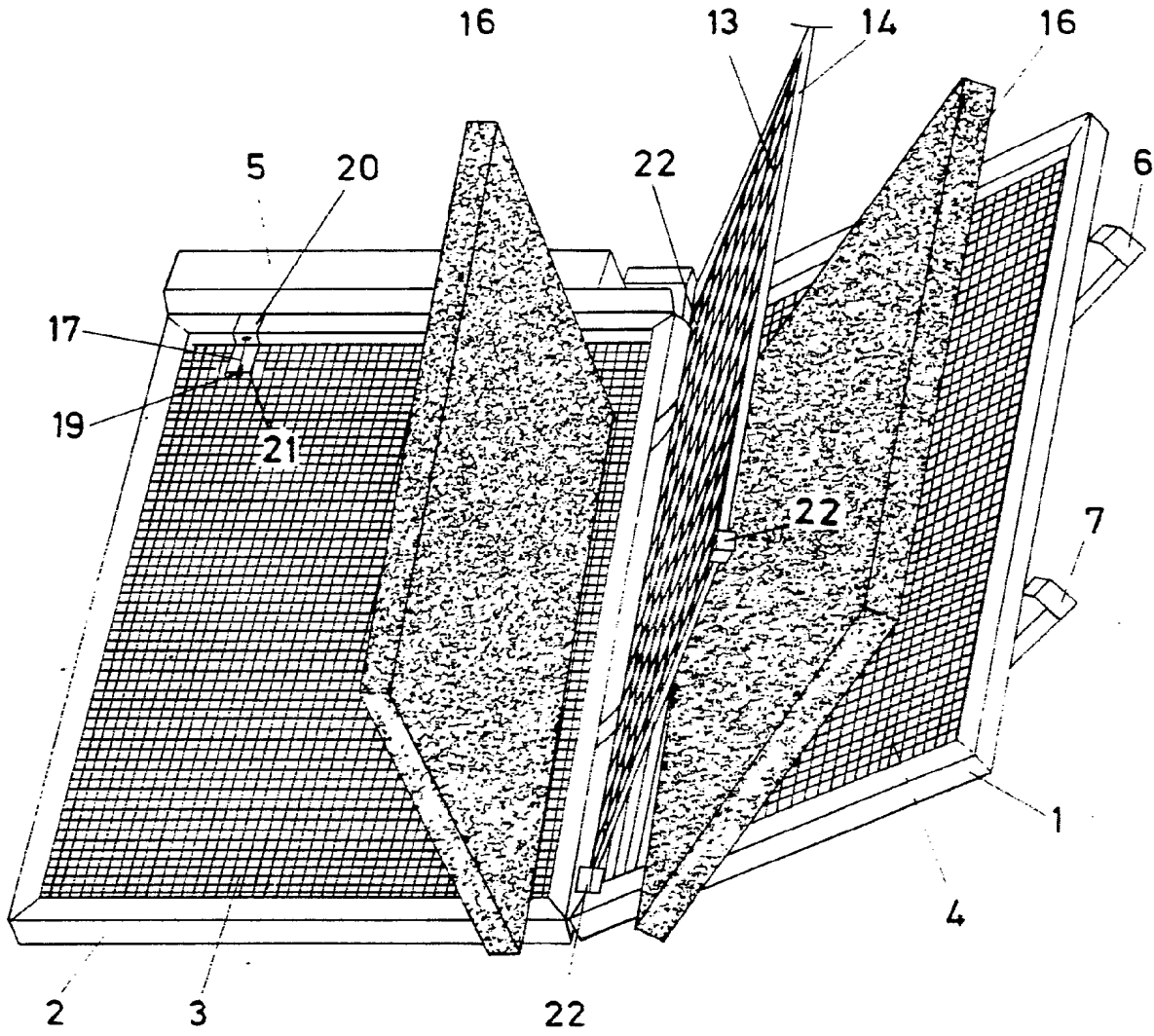


FIG. 2

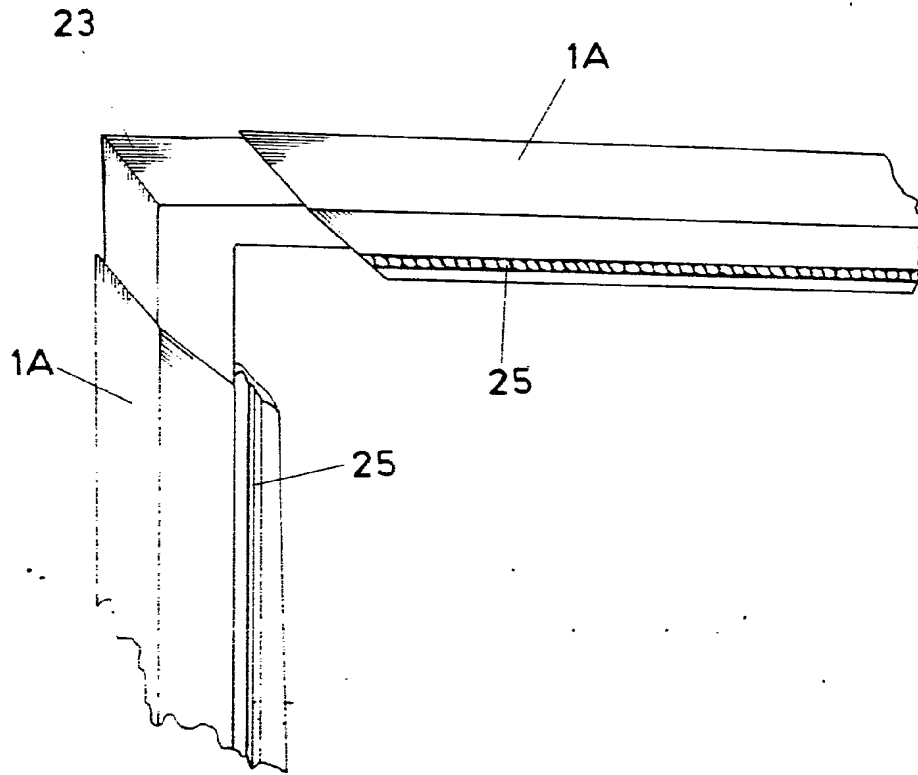


FIG. 3

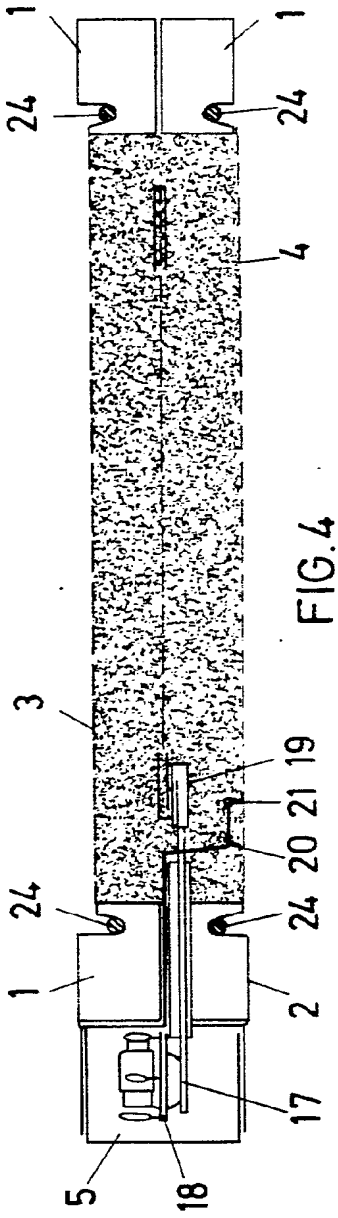


FIG. 4

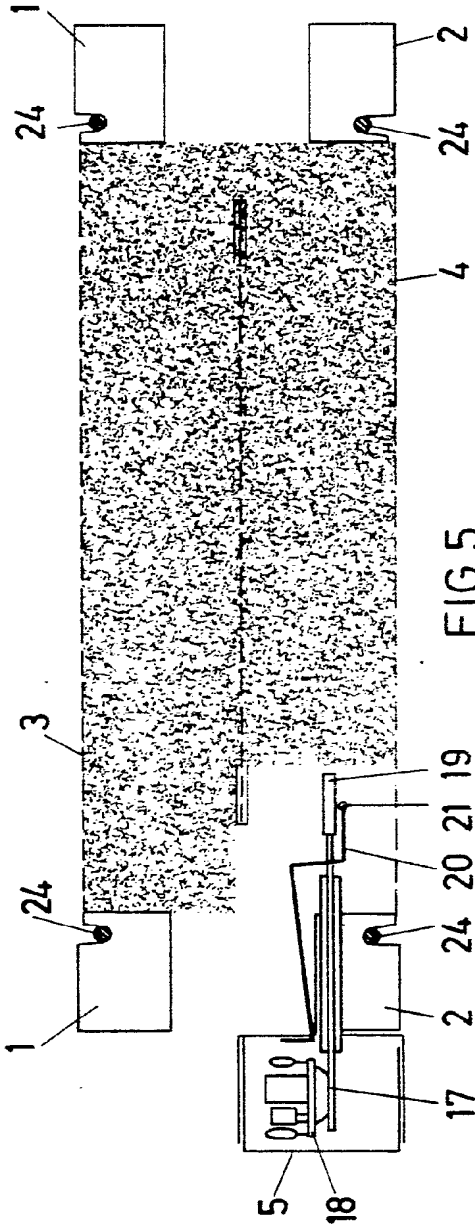


FIG. 5

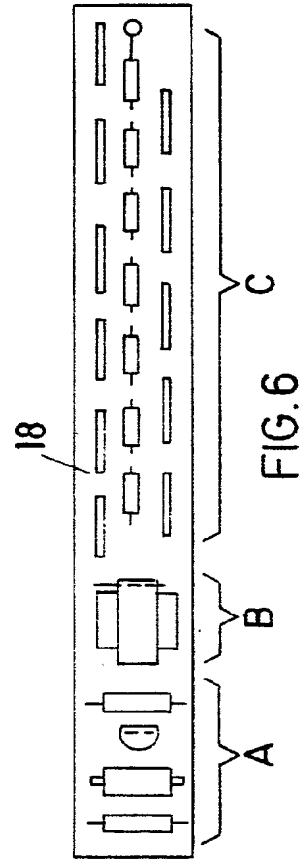


FIG. 6



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y,D	CA-A-1 175 754 (C.J. JOANNOU) * Claims 1,3,7; page 2, line 10 - page 3, line 20; figures 1-5 *	1	B 03 C 3/14 B 03 C 3/72 B 03 C 3/32
A	---	3,4,7	
Y	US-A-3 073 094 (G.F. LANDGRAF et al.) * Claims 1,2; column 3, lines 13-16; figure 1 *	1	
A	---	1,7,9	
A	US-A-3 509 696 (J.L. THOMPSON) * Claims 1,2; column 2, line 57 - column 3, line 50; figures 1-3 *	2	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
	DE-A-2 028 153 (INSTITUT ZA AERODINAMICKA I TERMODINAMICKA ISTRAZIVANJA) * Claim 1; page 2, paragraph 2 *		B 03 C

The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29-05-1986	Examiner DECANNIERE L.J.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			