

(12) UK Patent Application (19) GB (11) 2 196 874 (13) A

(43) Application published 11 May 1988

(21) Application No 8725020
(22) Date of filing 26 Oct 1987
(30) Priority data
(31) 8626144 (32) 1 Nov 1986 (33) GB

(51) INT CL⁴
B01D 27/06
(52) Domestic classification (Edition J):
B1T DGA
B5A 1R314C1E 1R460 2E7A 9G5 9H1 9H2 9S M5A T16A
U1S 1272 1737 1887 B1T B5A

(71) Applicants
Roger Gladding,
Rosegarth, Butts Ash Lane, Hythe, Southampton
SO4 6RL.

Allan Richard Powell,
3 Michelmersh Close, Rownhams, Southampton
SO1 8DX

(56) Documents cited
GB A 2131717 GB 1282987 GB 1190460
GB 1564872 GB 1272564 GB 0847726

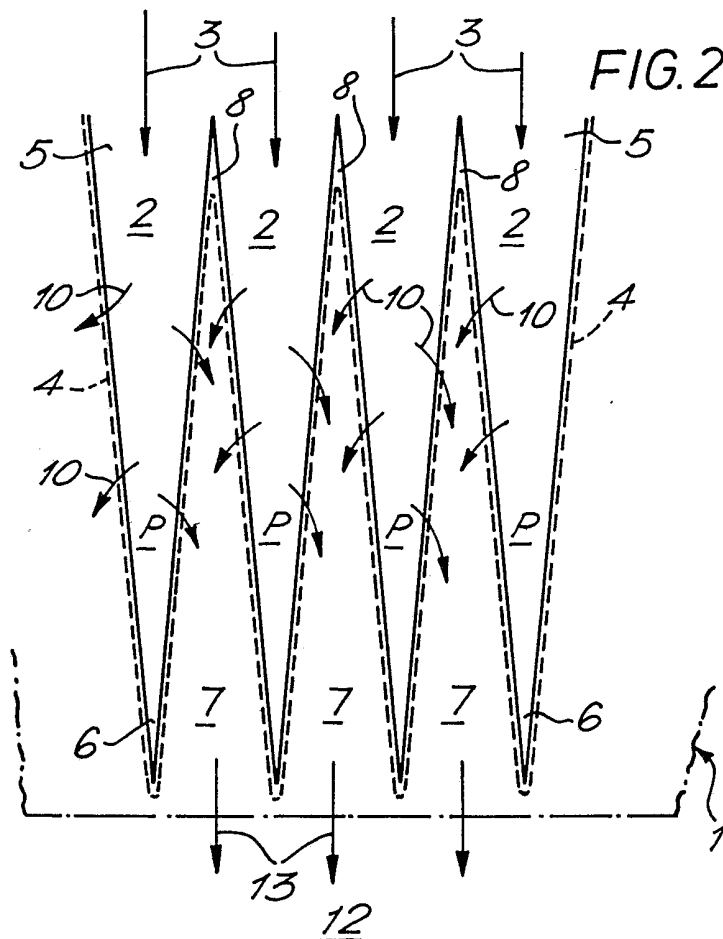
(58) Field of search
B1D
B1T
Selected US specifications from IPC sub-class B01D

(72) Inventors
Roger Gladding
Allan Richard Powell

(74) Agent and/or Address for Service
J. A. Boutland,
8 Heatherstone Avenue, Hyth, Southampton SO4 5LQ

(54) Filter element

(57) A filter element comprises two layers of glass filter paper folded to form pockets 2, 7 which are of tapered cross section, and filters downwardly flowing air 3. The pockets contain corrugated spacers of tapered form (Fig. 1), which are made by vacuum forming on to a mould (Figs. 3 to 7) made up of a row of spaced parallel bars.



1/4

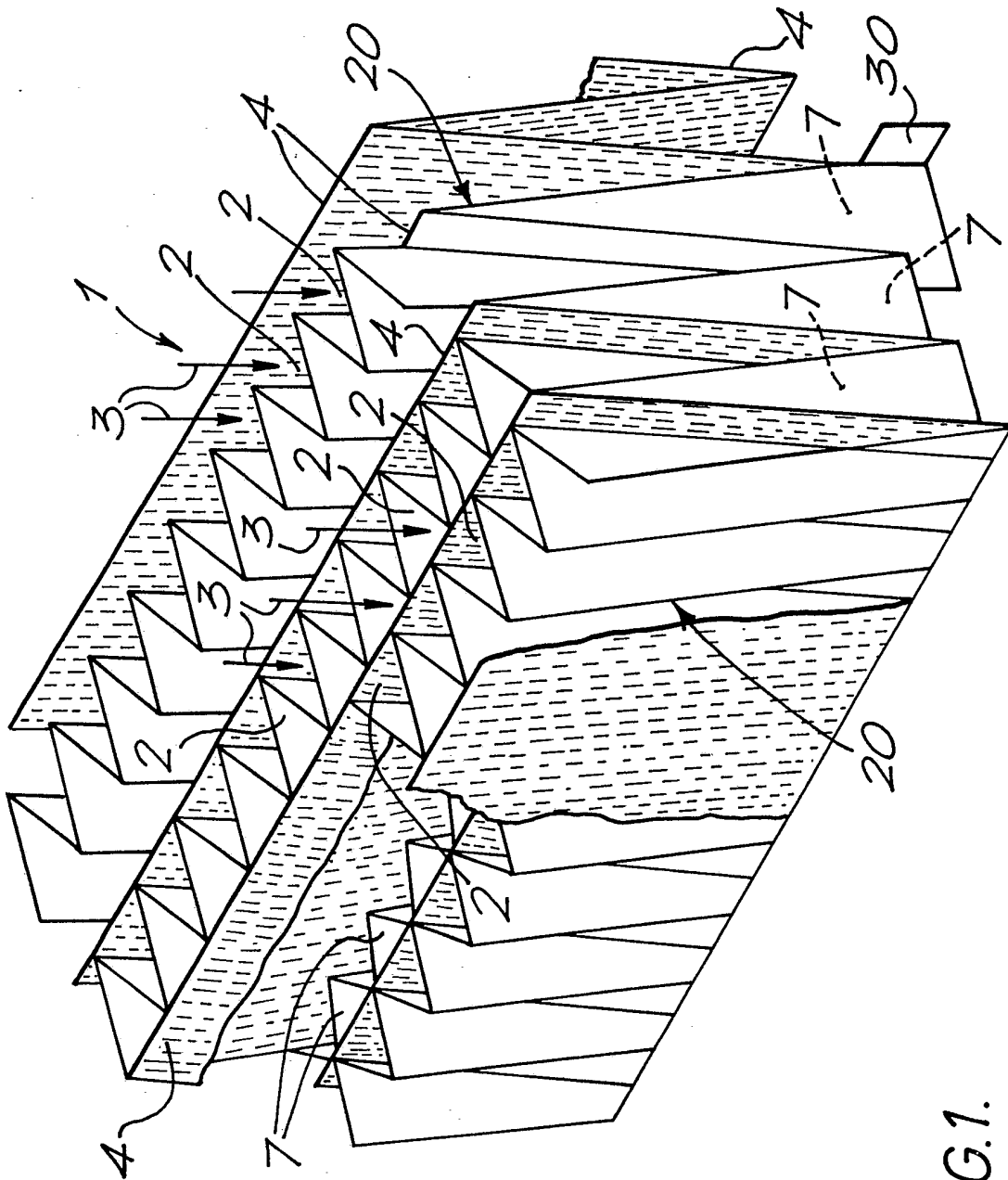


FIG.1.

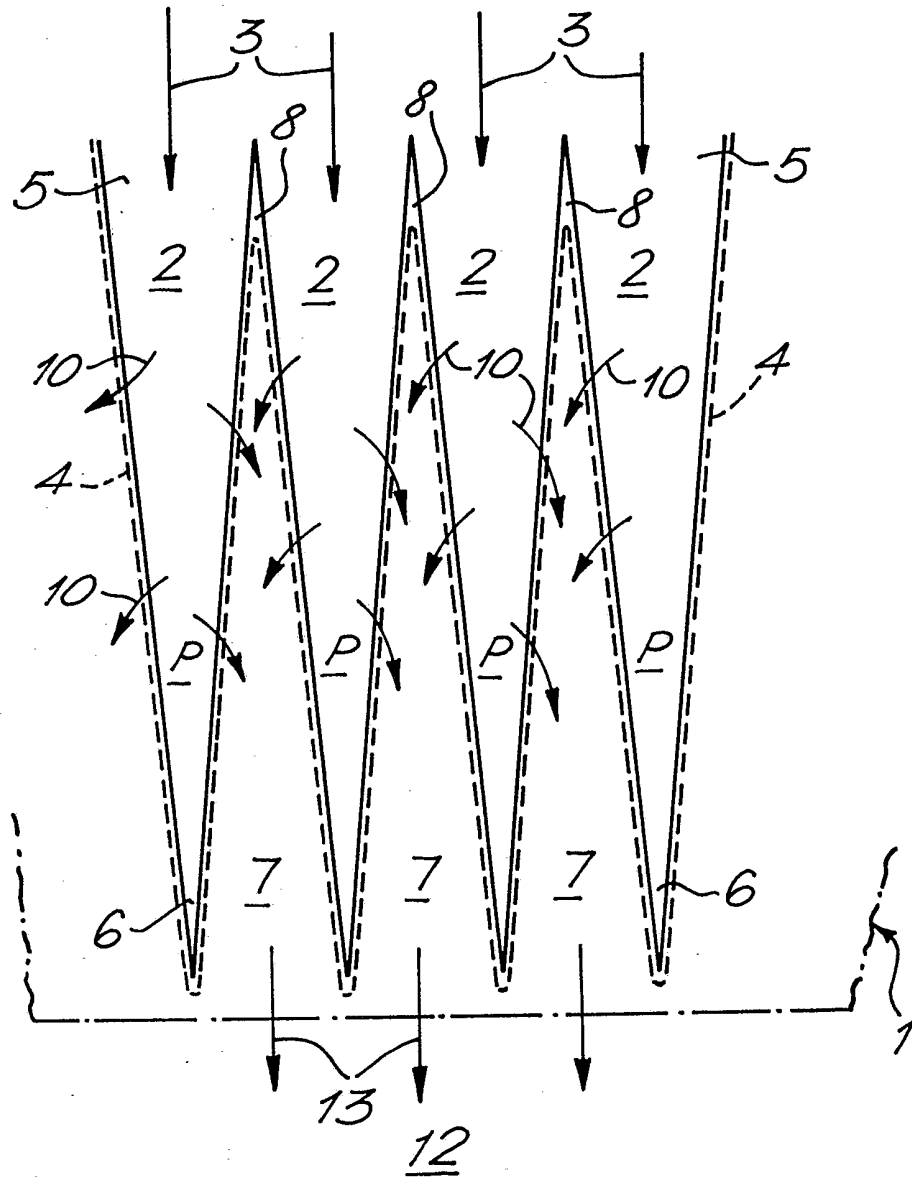


FIG. 2.

3/4

FIG. 3.

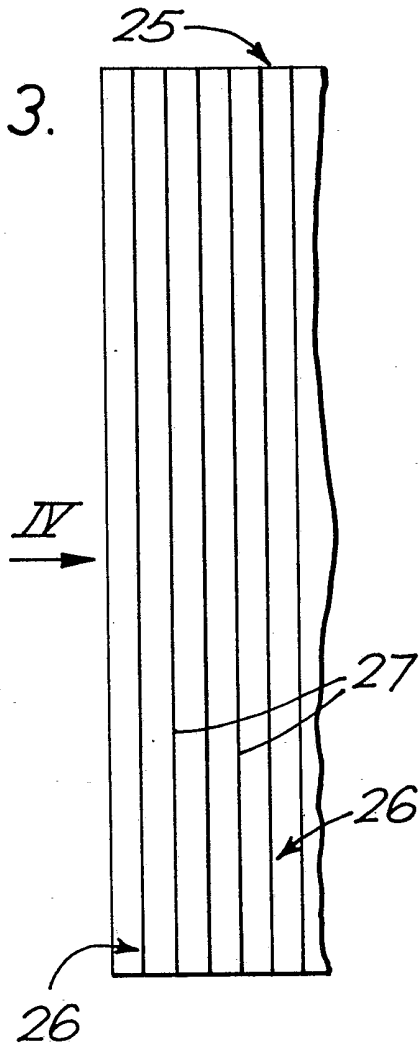


FIG. 4.

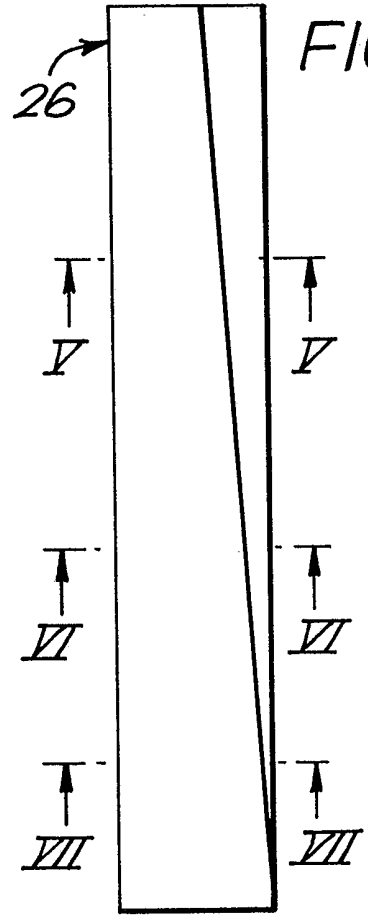


FIG. 5.



FIG. 6.

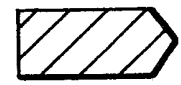


FIG. 7.



4/4

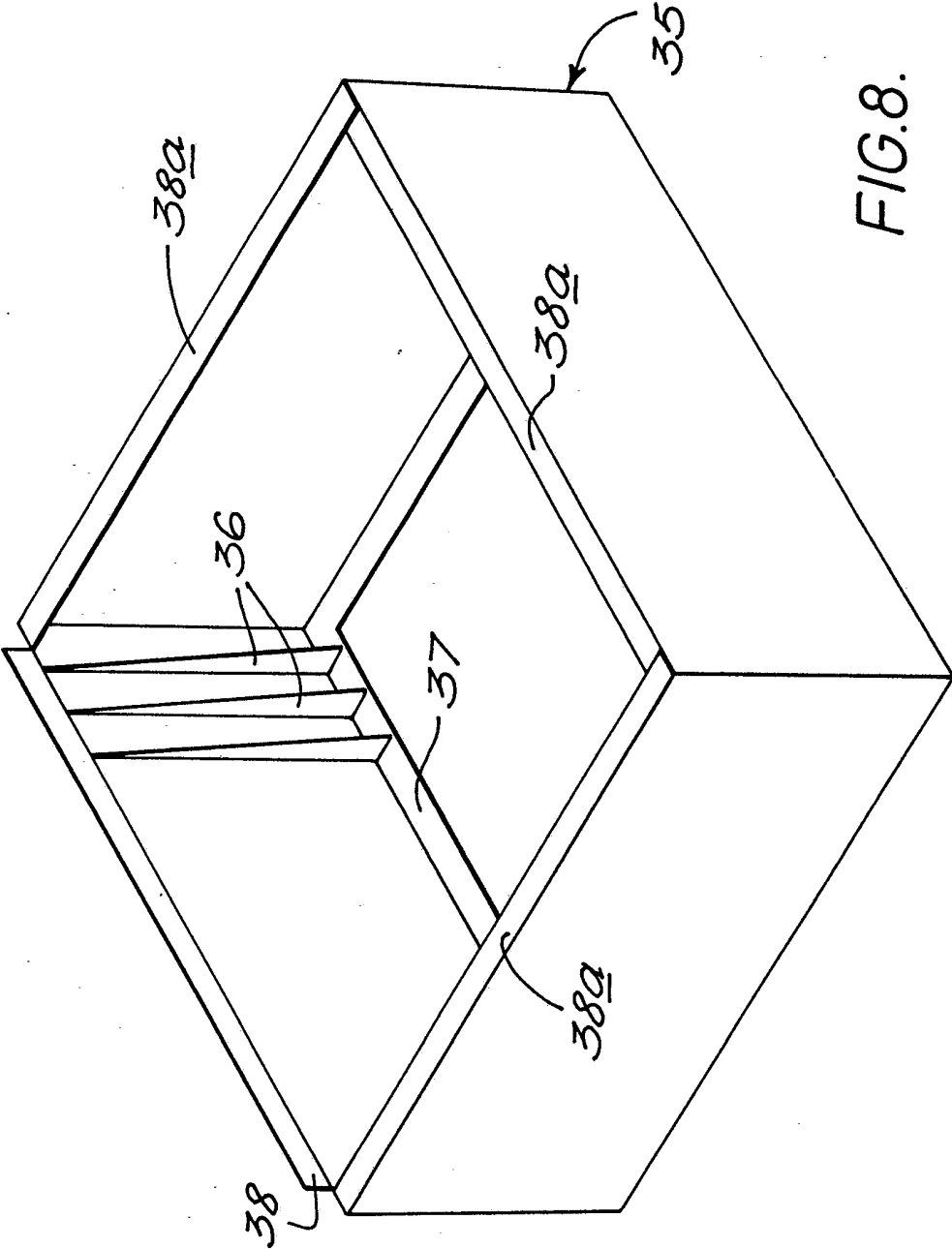


FIG.8.

SPECIFICATION

Improvements in or relating to fluid filters

5 BACKGROUND TO THE INVENTION

This invention relates to fluid filters.

The invention is particularly concerned with high efficiency air filters, used for example, in the supply of air to "clean" rooms.

- 10 Such filters are traditionally made by folding filter paper over interleaving spacers of corrugated form. The spacers are usually made of thin (say 0.0015" or 0.0381mm) aluminium foil or Kraft paper, but such spacers cannot
15 be stored without losing shape and, furthermore, have sharp edges which can puncture the filter paper.

SUMMARY OF THE INVENTION

- 20 According to the present invention, a fluid filter comprises a plurality of juxtaposed pockets, each of elongate form for receiving fluid to be filtered, at least part of each pocket being of filter material, the pockets reducing in
25 cross-sectional area from one end of a pocket to the opposite end thereof.

When fluid is caused to enter the larger end of a pocket, pressure forces are built up at the smaller end thereof which tend to divert
30 incoming fluid so that it passes laterally through the filter material.

The pockets are preferably formed with a cross-section of triangular form, and are preferably tapered from end to end.

- 35 A plurality of further pockets may be provided, each of substantially the same form as the first-mentioned pockets, disposed so that one of the further pockets is positioned between an adjacent pair of the first-mentioned
40 pockets, with its smaller end between the larger ends of said pair.

The pockets may be formed by non-filtering spacers disposed between sheets of filter material. The spacers may be of plastics material,
45 formed by vacuum techniques.

The invention also comprises a spacer *per se*.

BRIEF DESCRIPTION OF THE DRAWINGS

- 50 An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, wherein :-

Figure 1 is a view in perspective of an air filter, with parts removed,

Figure 2 is a diagrammatic side view illustrating air flow through the filter,

Figure 3 is a fragmentary plan view of a spacer moulding former,

- 60 *Figure 4* is a side view of a moulding bar, looked at in the direction of arrow *IV* of *Fig. 3*,

Figures 5, 6 and 7 are, respectively, cross-sectional views taken on lines *V-V*, *VI-VI* and
65 *VII* of *Fig. 4*, and

Figure 8 is a view in perspective of a filter housing.

70 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

- With reference to *Figs. 1* and *2*, an air filter 1 for use in a "clean" room comprises a plurality of juxtaposed pockets 2, each of elongate form for receiving a downward flow of ventilating air 3 to be filtered. Parts of the
75 pockets 2 are provided by folded sheets 4 of filter paper. The pockets 2 reduce in cross-sectional area from the air-receiving end 5 of a pocket to the opposite, closed, end 6 thereof.

The pockets 2 are of triangular cross-section when viewed in plan, and are tapered from end to end.

- 85 The filter paper 4 comprises sub-micron glass fibres, formed into high density paper.

- The filter 1 further comprises a plurality of further pockets 7, of substantially the same form as pockets 2. The pockets 7 are disposed so that each pocket 7 is positioned between an adjacent pair of pockets 2, but with its smaller (closed) end 8 between the larger ends 5 of said pair.

- As shown in *Fig. 2*, when the down-flowing air 3 is caused to enter the larger end 5 of a pocket 2, pressure forces *P* are built up at the smaller end 6 thereof, which forces tend to divert the incoming air so that it passes laterally through the filter paper 4, as indicated by arrows 10.

- 100 The diverted air then enters the pockets 7 to enter the clean room 12 as indicated by arrows 13. As the air leaves the pockets 7, pressure is reduced therein which tends to assist the flow of air leaving the pockets 2. (Arrows 10).

The air filter 1 is more efficient than a traditional filter. Thus it can be made smaller and less expensively.

- The parts of the pockets 2 and 7 not formed by filter paper 4 comprise spacers 20 (*Fig. 1*) of plastics material. The favoured plastics material is P.V.C. (Polyvinyl chloride). P.V.C. sheet of about 0.005 inch thickness (0.127 mm) is presently preferred.

- 115 A spacer 20 is preferably made by vacuum forming techniques. With reference to *Figs. 3* to *7*, a former 25 is provided, comprising a plurality of moulding bars 26 stacked side by side in parallel array, and clamped together. Small gaps 27 between a pair of contiguous bars 26 form passageways for the extraction of air.

A one-piece former may be used as an alternative.

- 125 To assist assembly of the filter 1, a spacer 20 is formed with lugs 30 (*Fig. 1*) whereby the spacer may be handled more readily.

- 130 *Fig. 1* is not a wholly accurate representation of the air filter 1 as it shows alternative depth spacers 20. In practice, the depth of

spacers 20 would be uniform. Furthermore, the filter 1 would, in practice, be encased in a housing of box-like form.

5 With reference to Fig. 8, a housing 35 may be provided, comprising an open-ended moulding of plastics material formed with internal, oppositely-disposed rib-like locators 36 for the spacers 20. When the assembly of spacers 20 and paper 4 is fitted into the
10 housing 35, the result is a tightly-packed structure. One end of the housing 35 is formed with an internal flange 37. The other end of the housing 35 is formed with flaps 38 which can be folded over (as shown at 38a)
15 so as to form channels for receiving sealant material.

The spacers 20 do not have sharp edges and thus do not tend to puncture the filter paper, and, unlike spacers of thin metal foil,
20 are stronger than such spacers and do not lose their shape when stored. In addition, the spacers 20 are cheaper than spacers of aluminium foil.

Adhesive techniques may be employed to
25 seal any slight gaps existing between the ends of a spacer 20 and the adjacent filter paper.

In a non-illustrated modification, an air filter is formed by a plurality of juxtaposed elements, each constructed entirely of filter material.
30

CLAIMS

1. A fluid filter comprising a plurality of juxtaposed pockets, each of elongate form for
35 receiving fluid to be filtered, at least part of each pocket being of filter material, the pockets reducing in cross-sectional area from one end of a pocket to the opposite end thereof.

2. A filter as claimed in Claim 1, wherein
40 the pockets are formed with a cross-section of triangular form.

3. A filter as claimed in Claim 1 or 2, wherein the pockets are tapered from end to end.

4. A filter as claimed in Claim 1, 2 or 3, provided with further pockets, each of substantially the same form as the first-mentioned pockets, disposed so that one of the further
45 pockets is positioned between an adjacent pair of the first-mentioned pockets, with its
50 smaller end between the larger ends of said pair.

5. A filter as claimed in any one of Claims 1 to 4, wherein the pockets are formed by
55 non-filtering spacers disposed between sheets of filter material.

6. A filter as claimed in Claim 5, wherein the spacers are of plastics material.

7. A filter as claimed in Claim 6, wherein
60 the spacers are formed by vacuum techniques.

8. A spacer for use with a filter according to Claim 5, 6 or 7.

9. A fluid filter, substantially as hereinbefore described with reference to Figs. 1 to 8
65 of the accompanying drawings.

10. A spacer, substantially as hereinbefore described with reference to Figs. 1 to 8 of the accompanying drawings.

11. Any novel subject matter or combination including novel subject matter herein disclosed.

Published 1988 at The Patent Office, State House, 66/71 High Holborn, London WC1R 4TP. Further copies may be obtained from The Patent Office, Sales Branch, St Mary Cray, Orpington, Kent BR5 3RD. Printed by Burgess & Son (Abingdon) Ltd. Con. 1/87.