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GB 353837
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(54) **Gas filter**

(57) Separate filter elements (2), *e.g.* compact filter cells, grouped around a common centre, have their clean gas outlets (5) situated in the floor (8) of a common clean gas chamber (6) and are successively cleaned by pulses of compressed air, delivered to outlets (5) from a quick-opening valve (15) by a rotary nozzle (4) which diverges to a trumpet-like mouth. The opening of valve (15) and the step-wise rotation of the nozzle are synchronised. The shape of the nozzle ensures maximum pulse energy reaching the filter elements, rather than being lost in the nozzle itself.

Fig. 1

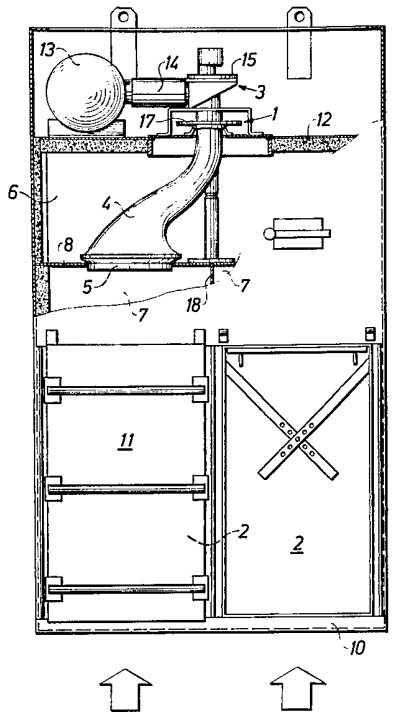

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Fig. 1

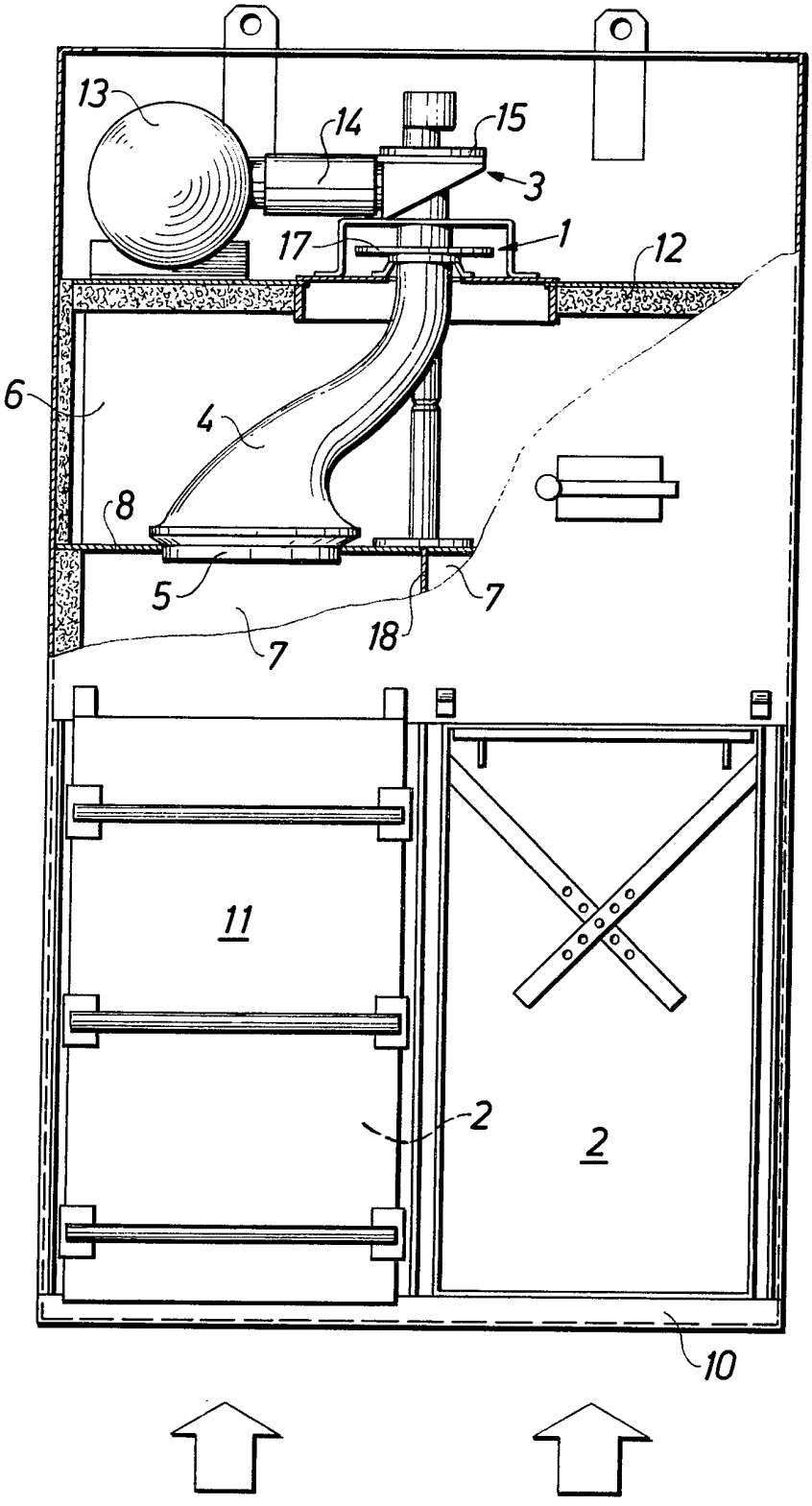


Fig. 2

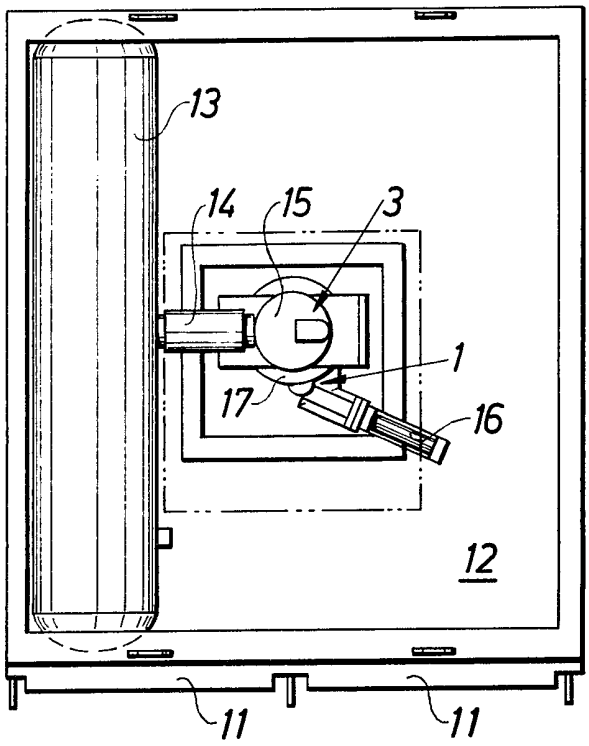


Fig. 3

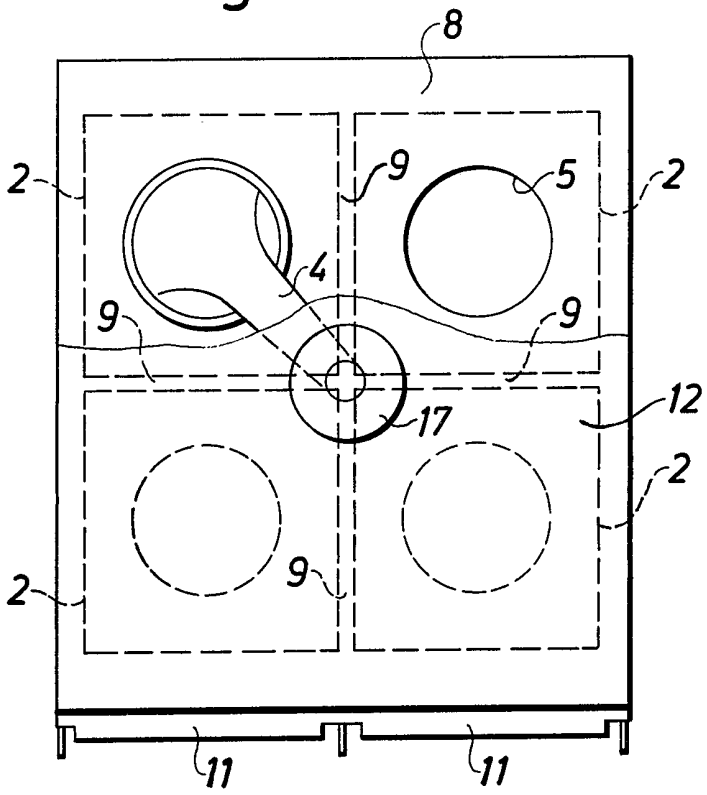


Fig. 4

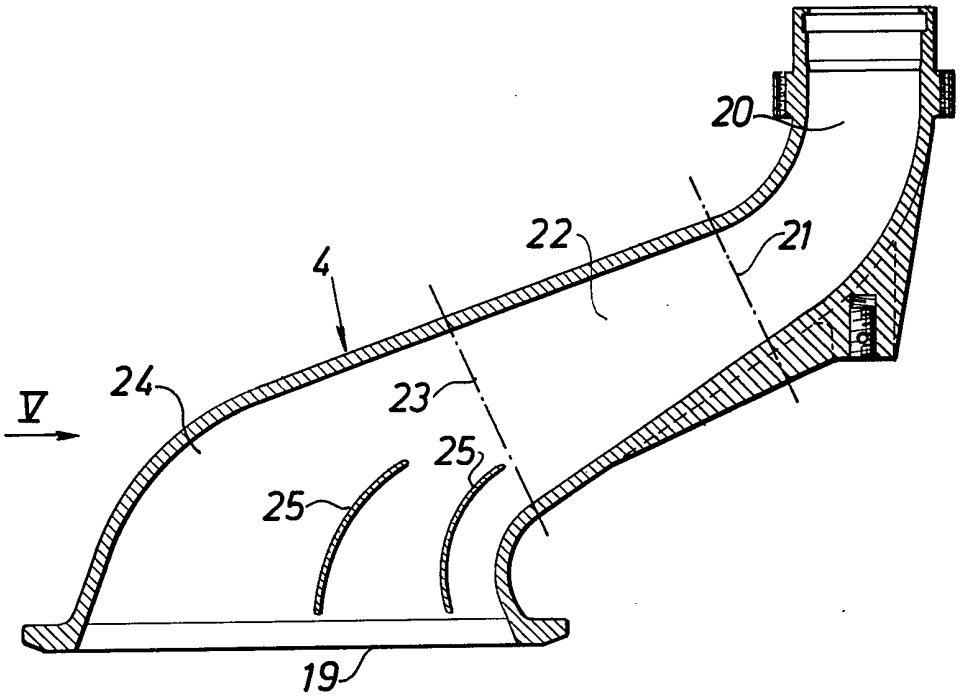
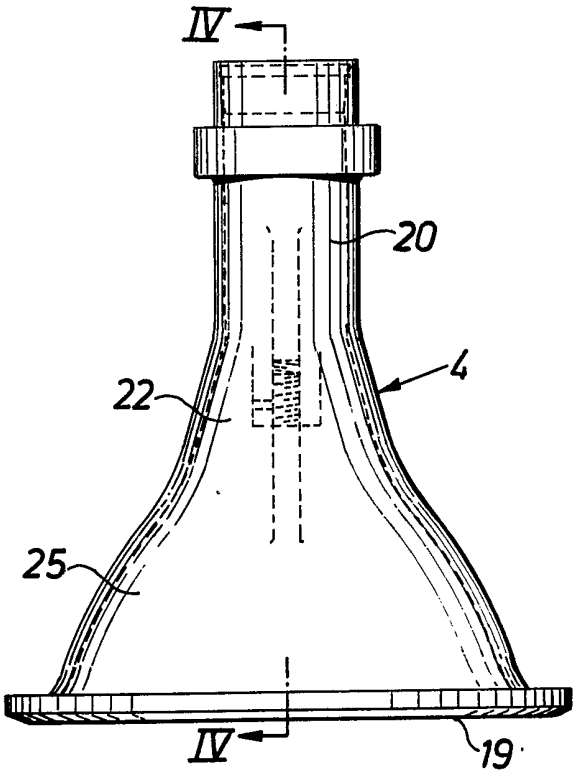


Fig. 5



SPECIFICATION

Apparatus for cleaning filter elements

The invention relates to an apparatus for the cleaning by compressed air of a plurality of separate filter elements, *e.g.* compact filter cells, which are grouped around a common centre with their clean gas outlets situated in the bottom of a common clean gas chamber.

Compressed air at an excess pressure of 6 bar, for example, is generally used for blowing filter elements clean, using an impulse of very short duration, which impulse is counter to the flow of the gas which is cleaned when the filter element is in use. The flow of gas which is being cleaned is temporarily interrupted during cleaning of the filter element.

It is known to direct an air stream by means of a rotatable distributor to one or another of a plurality of filter elements arranged around a common centre. Such a rotatable distributor for supplying a large air volume to a filter element is illustrated in the Swedish Patent Specification 185,552 (or the U.S. Patent Specification 2,731,107). A distributor according to said publication is, however, not usable for transferring a compressed air impulse of short duration to a filter element, since the major portion of the shock-cleaning effect of the pulse would be lost in the distributor.

The object of the invention is therefore to provide an apparatus which is capable of transferring a compressed air impulse from a central point, with minor loss of shock-cleaning effect, to any one of a plurality of filter elements surrounding the vertical axis of the point.

According to the invention, apparatus for the cleaning by compressed air of a plurality of separate filter elements, *e.g.* compact filter cells, which are grouped about a common centre and have respective clean gas outlets situated at the bottom of a clean gas chamber common to all the filter elements, comprises a duct of gooseneck configuration which at its inlet end is connected to and swivelable about a single compressed air source, said duct having its outlet end opening out centrally over any one of the clean gas outlets of the filter elements at optional stations, for leading a cleaning pulse of compressed air to the particular filter element, said duct flaring out along a considerable portion of its length towards its outlet end, within a first portion for preventing expanding compressed air from not following the inside of the duct, within a second portion for preventing already expanded compressed air from not following the inside of the duct, and within a third, terminating portion at the outlet end of the duct, formed like the belled portion at the end of a wind instrument or a megaphone.

An embodiment of the invention will now be described in more detail by way of example and with reference to the accompanying drawings, in which:-

Figure 1 is a partially sectioned front view of a compact cell filter with four filter elements in the form of exchangeable cells, of which one is visible through a removed service hatch,

Figure 2 is a view seen from above of the filter, with an upper hatch taken away, to show the blowing equipment for filter cleaning,

Figure 3 is a view corresponding to that in Figure 2, with the blowing equipment in the upper part of the filter taken away, and the bottom in this upper portion partially broken off to show the clean gas chamber below,

Figure 4 is a longitudinal section along the line IV-IV in Figure 5 through a distribution duct for the compressed air impulse, the duct being of an S-shape and incorporated in the blowing equipment for filter cleaning, and

Figure 5 is a view of the duct in Figure 4, as seen in the direction of the arrow V.

To provide initial familiarity with the drawings, it is mentioned that the compact cell filter has a step feeder 1, partially controlling the cleaning sequence; four filter elements 2, which are in the form of compact cells, and are uniformly disposed in a square configuration about a common centre; a compressed air source 3, with the ability of emitting cleaning shocks in the form of compressed air impulses of very short duration; a duct 4 driven by the step feeder for distributing the cleaning shocks to the respective filter elements; clean gas outlets 5 from the filter elements; a clean gas chamber 6, in which the duct 4 is arranged and into which the outlets 5 open; chambers 7 connecting each filter element 2 separately to its clean gas outlet 5; a bottom 8 in the clean gas chamber 6, with which the duct 4 coacts, and in which the outlets 5 are situated, said bottom 8 having portions apart from the outlets serving as rest positions 9 for the duct 4 during its stepwise movement.

The compact cell filter according to the drawings is conventionally provided with a dust hopper (not shown) below it, *via* which the raw gas for cleaning is supplied, this gas arriving at the inlet of the filter element, *i.e.* its bottom surface 10, where the downwardly open raw gas channels of the filter elements 2 have their openings, and where the filter fabric folds close the ends of the intermediate clean gas channels.

It will be seen from Figure 3 that the filter has four filter elements 2, each of which has a substantially quadratic cross-section, the elements being grouped substantially side by side in a configuration which similarly has a quadratic cross-section. The four filter elements are placed in a common chamber, downwardly open towards the dust hopper, said chamber upwardly merging into the separate chambers 7, one for each of the filter elements. The filter elements are accessible for exchange after removing service hatches 11.

The clean gas channels open out of the upper ends of the filter elements 2, where the filter fabric folds close the ends of the raw gas channels. Cleaned gas thus comes to the chambers 7. The streams of clean gas then come into the common clean gas chamber 6 *via* openings 5 in the bottom 8 thereof, and depart collectively *via* an outlet (not shown).

For compressed air cleaning of the filter elements the filter is provided, on the roof 12 of the clean gas chamber 6, with said compressed air supply 3, comprising a pressurised tank 13 connected to a

compressed air network (not shown) and a valve 15 connected to the tank by a short trunk 14, said valve being of the conventional quick-opening type for generating very heavy shocks of short duration. This normally electromagnetically-pneumatically actuated valve 15 is controlled, together with the step feeder 1, by a programme unit (not shown), which thereby provides individual clean-blowing of the filter elements 2 at uniform intervals in order, and one at a time.

A piston-cylinder apparatus or other linear motor 16 and a toothed wheel 17 are the main components of the step-feeder 1.

The toothed wheel 17 is fixed to the duct 4, for rotation therewith. The duct is rotatably mounted in bearings on the roof 12. The duct 4 is of a generally goosenecked shape, and at its upper end is connected to the outlet of the valve 15 for the compressed air impulse. The bottom end of the duct 4 is situated at a radial distance from the rotational axis of the duct and is dimensioned such that in selected angular positions, and under the control of the step feeder 1, it can connect the duct to any one of the four equally large clean gas outlets 5 in the bottom 8. The outlets 5 are arranged at the same distance from the axis of rotation and with uniform spacing.

As may best be seen in Figure 4, the duct flares out continuously, substantially along the whole of its length, towards its outlet end 19. The duct suitably has a substantially circular cross-section. More specifically, the duct flares to a minor extent within a first portion 20, and to a somewhat greater degree within a second portion 22. The first portion extends substantially from the duct inlet end to a position denoted by a chain-dotted line 21, and constitutes an expansion zone for the compressed air. The second portion 22 extends between the places denoted by chain-dotted lines 21 and 23, and with its diffusor-like form it serves to regain pressure from the generally expanding compressed air. From the chain-dotted line 23 to the outlet end 19 the duct 4 further flares, and here in its terminating third portion 24 it has been given a form similar to the flare at the end of a wind instrument or a megaphone.

To achieve uniform distribution of the compressed air pulse in the filter cell, guide fins 25 are disposed at the severely curved inner bend of this sharply flared third portion 24.

Within its first portion 20, the duct 4 has a flare angle selected such that the cross-sectional area of the duct increases generally in proportion to the expansion of the compressed air flowing through. Measured between opposing side portions of the duct, this flare angle suitably lies within the range of 5°-20°, preferably 6°-15°. The angle can be constant or vary along the length of the portion 20.

Within its second portion 22, the duct 4 has a flare angle selected so as to serve the purpose of pressure recovery. The angle is suitably within the range of 5°-45°, preferably 6°-20°, and can be constant or it can vary along the length of the portion 22.

The step feeder 1 drives the duct 4 in eight steps of 45° per revolution, and thus the rest positions 9, which are separate from the clean gas outlets 5, are obtained between the outlets by suitable dimensioning of the latter and the lower end of the duct 4, in relation to the available circumference for rotational movement of this duct end. The step feeder thus operates with double as many steps per revolution, selected angularly symmetrical, as the number of filter elements.

For most of the time the programme unit keeps the duct 4 in one of the rest positions 9, all filter elements 2 then being utilized for cleaning the raw gas. At uniform intervals the programme unit moves the duct 4 to the nearest clean gas outlet in the rotational direction and momentarily opens the valve 5 which, while utilizing the stored air of the pressure tank, provides a sudden and heavy compressed air shock through the duct 4 to the filter element 2 connected thereto at that instant, the element 2 being separated from the three other filter elements by means of intermediate walls 18 separating adjacent chambers 7 and the seal of the duct 4 against the edges of the clean gas outlet 5. With the aid of the duct 4, and particularly its configuration, the compressed air shock is effectively utilized for cleaning the connected filter element, from the raw gas side of which liberated dust falls down into the dust hopper (not shown) under the filter elements.

CLAIMS

1. Apparatus for the cleaning by compressed air of a plurality of separate filter elements, *e.g.* compact filter cells, which are grouped about a common centre and have respective clean gas outlets situated at the bottom of a clean gas chamber common to all the filter elements, comprising a duct of gooseneck configuration which at its inlet end is connected to and swivelable about a single compressed air source, said duct having its outlet end opening out centrally over any one of the clean gas outlets of the filter elements at optional stations, for leading a cleaning pulse of compressed air to the particular filter element, said duct flaring out along a considerable portion of its length towards its outlet end, within a first portion for preventing expanding compressed air from not following the inside of the duct, within a second portion for preventing already expanded compressed air from not following the inside of the duct, and within a third, terminating portion at the outlet end of the duct, formed like the belled portion at the end of a wind instrument or a megaphone.

2. Apparatus as claimed in claim 1, wherein the duct is driven by a step feeder in a number of angularly symmetrically selected steps which is double as great as the number of filter elements, so that the rest positions not having connection to the clean gas outlets of the filter elements can be obtained between said outlets.

3. Apparatus as claimed in claim 1 or 2, wherein chambers between the filter elements and their clean gas outlets are arranged such that they are separated from each other, the duct in a connected position over the clean gas outlet of the respective element acting as a tightly closing shutter to close off the ordinary gas flow through the element while

it is cleaned.

4. Apparatus as claimed in any one of the preceding claims, wherein guide fins are arranged inside the duct.

5. Apparatus as claimed in any one of the preceding claims, wherein the duct has within its first portion a constant or varying angle of flare, selected such that the cross-sectional area of the duct increases generally in proportion to the expansion of the compressed air flowing through this flare angle being selected within the range 5°-20°, preferably 6°-15°.

6. Apparatus as claimed in claim 5, wherein the duct has within its second portion a flare angle, selected such that it serves to regain pressure and lies within the range 5°-45°, preferably 6°-20°.

7. Apparatus for the cleaning by compressed air of a plurality of separate filter elements, substantially as hereinbefore described with reference to the accompanying drawings.

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