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(54) A FILTER FOR A DUST SEPARATOR

(71) We, AKTIEBOLAGET SVENSKA FLAKTFABRIKEN of Sickla Alle 1, Nacka, Sweden, a Swedish Joint Stock Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a filter for a dust separator and, more particularly, to an assembly of a filter cassette, comprising filter bags, a frame supporting the cassette, and means detachably connecting the cassette to the frame.

Such filter assemblies, in use, are inserted in a filter housing. The dust-laden gas is introduced into a dirty gas chamber of the housing and passes through material of the filter and the dust is deposited on the surface of the material. The cleaned gas leaves the filter housing via a clean-gas chamber, which can be common to several filter cassettes. It will be appreciated that an efficient sealing must be provided between the cassette frame and filter housing to ensure that all the gas passes through the filter material on its way from the dirty gas chamber to the clean-gas chamber.

For ensuring efficient operation of the filter, the dust collected on the filter material must be removed regularly. According to a known technique, the dust is removed by subjecting the filter material to vibratory movements, which are usually brought about by pressure pulses of a suitable gas, usually air. Furthermore, the filter material is exposed in operation to varying degrees of wear depending on gas load, dust concentration, dust type and cleaning process. Satisfactory operation of the filter requires regular inspections and, if necessary, exchange of the filter material. It is, therefore, essential that the inspection can be carried out easily and that the filter bags can be exchanged simply and rapidly, so that the filter section concerned must not be taken out of operation for a long period. Conventional filters, in general, do not meet these requirements. In known installations, the exchange of filters

is often tedious and heavy work, which often requires several persons to carry it out, and the manufacturing, transportation and storage costs for the filters and their spare parts are high in view of their complicated, bulky and heavy structural design. Owing to these factors, the filter process on the whole often requires large resources or does not operate satisfactorily.

The present invention has the object to eliminate the aforesaid disadvantages and produce a filter which is of simple and lightweight design, the parts of which are non-expensive to manufacture, transport and store, and the filter bags of which, if necessary, can be exchanged rapidly and easily by one man.

According to the invention there is provided an assembly of a filter cassette, comprising a plurality of filter bags, a frame supporting the cassette and two locking rods detachably connecting the cassette to the frame, the assembly, in use, being mounted in a filter housing and making a seal therewith, in which assembly:

(a) the filter bags of the cassette are closed at their lower ends and form clean-gas passageways, the upper ends of the bags together forming a common clean-gas opening of the cassette, and the filter cassette includes a collar surrounding the common clean-gas opening;

(b) the frame is of rectangular shape when the assembly is viewed in plan and surrounds the common clean-gas opening, and each of the four sides of the frame is formed of a U-section element having upper and lower side walls and an intermediate member together defining a groove, with the open side of the groove facing outwards away from the common clean-gas opening;

(c) the free ends of the upper and lower side walls of two of said U-section elements each have an inturned leg, the ends of the two legs facing each other and defining a gap forming an entry into the groove;

(d) said collar comprises four collar portions each folded over a respective one of the upper side walls of the four U-section

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elements and entering into the groove of the associated element, and at least those collar portions associated with the said two U-section elements having inturned legs are each in the form of a sleeve;

(e) each of said locking rods is L-shaped and one limb of each rod passes through a respective one of the two sleeves, and the combined thickness of a rod plus the surrounding sleeve is greater than the width of said gaps whereby the filter cassette is connected to the frame;

(f) the other limb of each of the locking rods is situated in the groove of a respective one of the other two U-section elements and is partially encircled by the associated collar portion which folds round the limb, between the limb and the intermediate member of the U-section element whereby said other limbs can be removed from their grooves to withdraw said one limbs of the locking rods from their sleeves and enable the filter cassette to be detached from the frame; and

(g) upwardly facing surface portions of said collar portions are adapted to make a seal with the filter housing when said assembly is mounted in the housing.

A filter assembly embodying the invention is diagrammatically illustrated, by way of example, in the accompanying drawings, in which:—

Figure 1 is a perspective view of part of a filter cassette connected to a cassette frame;

Figure 2 is a perspective view of a whole filter cassette;

Figure 2a shows on an enlarged scale a detail of the filter cassette;

Figure 3 is a view of the cassette frame together with mounting means for the cassette;

Figures 4a and b are sectional views of a detail of the cassette frame;

Figures 5a to 5c are sectional views of a details of the cassette frame together with a detail of the filter cassette.

Referring to the drawings, Figure 1 shows a filter cassette 1 comprising a plurality of filter bags 2, which constitute clean-gas passageways 3 for gas cleaned of dust. The passageways are closed at the lower portion 4 of the filter bags and at the upper portion of the filter cassette form a common clean-gas opening 5. The filter cassette 1 is mounted in a cassette frame generally denoted by reference 30 and including a rectangular frame 31, which comprises means for connecting the filter cassette to the cassette frame. The assembly of cassette frame and filter cassette is intended to be inserted in a filter housing (not shown) where the common clean-gas opening is sealingly connected to the clean-gas passageways of the filter housing. It will be understood that one or more cassette frames with associated filter cassettes can be

mounted in the same filter housing. The numeral 50 designates one of a plurality of stiffening elements for stiffening the filter bags. The construction of the elements 50 is described in detail in our copending application No. 31862/77 (Serial No. 1582662).

Figure 2 shows a perspective view of the filter cassette by itself and separated from the cassette frame 30. The filter cassette shown consists of filter material having two deep folds forming two rows 6 and 7 of filter bags 2, the individual bags being formed by sewing together the folds with seams 8 parallel to each other. At end surfaces 9 and 10 of each row 6 and 7, longitudinal members in the form of sleeves 11 are provided for connecting the filter cassette to the cassette frame 30. The filter cassette is provided at its upper (as viewed) end with the clean-gas opening 5 common to all the filter bags and interconnecting the clean-gas passageways 3 formed by each respective filter bag. The filter bags are closed at their lower ends 4. At the upper end of the filter cassette, that is around the common clean-gas opening 5, collars 12a to 12d are provided, and the collars on at least two sides of the opening 5, preferably, the collars 12b and 12d of the two opposed long sides, are formed as sleeves 16 and 17. In the embodiment shown, however, each of the collars 12a to 12d is formed as a sleeve.

In Figure 2a the two adjacent collars 12c, 12d of the filter cassette are shown in detail. The collars are sewn together at a right angle relative to each other and formed as sleeves 16, 18 open at both ends. The dashed lines 14 indicate seams, by which the collars are connected to the remaining parts of the filter cassette and by which the sleeves are formed.

In Figure 3 a view of the cassette frame 30 is shown. The upper portion of the frame 30 consists of the rectangular frame 31, at two ends of which end walls 32 and 33 are provided. The end walls 32 and 33 include retaining means in the form of bars 35 and 36 for detachable connection to each row of filter bags at its opposite ends. The bars 35 and 36 are inserted through cross-bars 32a and 33a of the end walls and through the longitudinal sleeves 11 at the lateral edges of the filter bag rows. The two opposed end walls 32 and 33 are rigidly interconnected at their lower end by a bottom beam 34, which may be formed as shown in Figure 3, i.e. the beam, of, preferably a tubular section, is attached to the end walls of the frame 31 and constitutes an integrated part of the end walls 32 and 33, forming a bow at the lower portion of the cassette frame. This bow serves as a support for the cassette frame before its positioning in the filter housing and also makes it possible to apply a relatively great pressure when connecting the bars

35 and 36 to the filter bag rows, i.e. without the pressure bending the end walls 32 and 33 toward each other.

5 The rectangular frame 31 consists of four elements 37a to 37d of a U-shaped section, each of which forms an outwardly open U-shaped groove 41 forming part of a groove extending around the frame 31. In the Figure also two L-shaped locking rods 60 are shown
10 which are used for fixing the filter cassette to the frame as described later.

In Figures 4a and 4b the U-shaped section side elements 37a to 37d constituting the rectangular frame 31 are shown in detail.
15 Two sides of the frame, preferably the opposed long sides (37b and 37d in Figure 3) are formed by elements with a generally U cross-section as shown in Figure 4a, defining the groove 41. The open side of the groove
20 41 faces outwardly while the two side flanges 42a, 42b of the U-section are horizontal. The web 43 of the U-section is vertical. The outer ends of the flanges 42a and 42b are provided with legs 38 and 39 directed
25 toward each other to form a gap 40 therebetween. The remaining two sides of the frame (37a and 37c in Figure 3) are also formed by elements of U-section having flanges 42a, 42b and vertical webs 43, but
30 these flanges do not have legs 38 and 39.

The cassette frame 30 is inserted in the filter housing and locked thereto in a way not described here in detail, a frame 80 of the filter housing being shown in Figure 5c. As
35 can be seen in Figures 5a to 5c, a packing 13 is attached to the filter collars 12a to 12d and provides a more efficient sealing between the filter housing frame 80 and cassette frame. The packing 13 preferably is attached to the
40 collars by the seams 14. The packing 13 according to Figures 5a and 5b only extends along the upper flanges 42a of the side elements 37a to 37d, while the packing 13 according to Figure 5c also extends along the
45 web 43 of the side elements. Thus the packing 13 also serves as a reinforcement of the collars at the position where they are folded over the frame elements 37a to 37d and where substantial wear can be expected. It is also
50 apparent from Figure 5c, which shows an alternative embodiment from that of Figure 5a how the collars such as collars 12b and 12d are connected to the remainder of the filter cassette by an extra seam 15.

55 Figures 5a to 5c also show in detail how the attachment of the filter cassette to the side elements 37a to 37d of the frame is effected. The collars 12b and 12d of the filter cassette which are formed as sleeves 17 and 16 are
60 inserted in the grooves 41 in the frame side elements 37b and 37d provided with the legs 38 and 39. Thereafter, one leg 60a of each of the two locking rods 60 is introduced through a corresponding one of the sleeves 16 and 17
65 located in the grooves 41. The total thickness

of the locking rod leg 60a and sleeve exceeds the size of the gap 40, so that an efficient locking of the collars 12b and 12d to the frame elements 37b and 37d is obtained. This is apparent from Figure 5a. The other
70 collars 12a and 12c are placed around the other legs 60b of the locking rods before they are pressed into the open grooves 41 of the other frame side elements 37a and 37c. This is shown in Figure 5b. The total thickness
75 of the locking rod leg 60b and collar 12a or 12c is selected so that the leg 60b is not locked in the groove 41 of the element 37a or 37c. When both locking rods 60 have been introduced in the manner intended, an
80 efficient releasable locking of the filter cassette 1 to the cassette frame 30 is obtained. When the collars 12a to 12d of the filter cassette are folded over the upper flanges 42a of the frame side elements 37a to 37d, the
85 filter material serves as a sealing between the cassette frame and the connecting frame 80 of the filter housing.

The filter is assembled as follows. For mounting the filter cassette 1 in the cassette
90 frame 30, the frame is placed with the bottom beam 34 on the floor or on a floor plane of the filter housing. The filter cassette 1 which can be delivered in a folded-up state, is then positioned in the cassette frame with its
95 collars 12a to 12d folded over the upper flanges 42a of the U-section rectangular frame 31. The filter collars are fastened to the frame 31 by inserting the legs 60a of the locking rods 60 in the sleeves 16 and 17 of
100 the collars 12d and 12b, when the sleeves are positioned in the grooves 41 of the elements 37d and 37b. When the two long sides have thus been fixed, the other legs 60b of the locking rods are pressed into the grooves 41
105 of the elements 37a and 37c, and due to the location of the filter collars 12a and 12c inside of the legs 60b, these collars also are efficiently secured to the cassette frame. As one side of the cassette 1 is fastened at a time,
110 this can be carried out easily by one person. The filter material is connected to the end walls 32 and 33 of the frame 30 by threading the bars 35 and 36 through holes in the cross-bars 32a and 33a of the end walls and
115 through the sleeves 11. During this operation, the filter material is in a slack state, which makes this connecting relatively easy. The stiffening elements 50 are thereafter introduced into each respective pairs of the filter
120 bags 2, which thereby assumes a rhombic or square configuration, as considered in horizontal section, which is highly advantageous because the planes of the lateral surfaces of adjacent filter bags form substantially a right
125 angle to each other. The filter surfaces do not cover each other, and there is no risk of dust migration from one surface to an adjacent one during cleaning operations. When all the stiffening elements 50 have been mounted, 130

the entire filter cassette is very stably fastened in the cassette frame 30, i.e. the filter material can withstand variations in the dirty gas flow and it can be subjected to cleaning operations without jeopardising its attachment to the cassette frame. Thereafter the filter cassette 1 assembled with the frame 30 is inserted in the filter housing and connected to the clean-gas passageway of the filter housing by pressing the rectangular frame 31 with the intermediate collars, which serve as packing, against the connecting frame 80 of the filter housing and then locking it to the housing by a suitable means. The filter can be dismantled by carrying out the above sequence of operations in reverse. It will be understood that the invention also makes possible a simple and rapid dismantling of the filter.

It will be understood too that filter cassettes of different dimensions can be mounted in this way to a frame. The filter cassettes, however, must not be so large and heavy that they are difficult to handle, nor must they be so small as to have low capacity, because then a great number of cassettes are required for a definite capacity demand. In a specific example the cassette frame 30 had a length of 0.95 m, a width of 0.25 m and a height of 1.55 m. The filter surface amounted to 7.5 m². The weight of the cassette frame was 15 kg, and the total weight of a filter cassette mounted in the cassette frame was 20 kg. Filters having this weight and constructed according to the invention, as may be pointed out again, can easily be handled by one man. Four to eighteen cassette frames with filter cassettes are usually positioned in a common filter housing.

The construction of the cassette frame, filter cassette and locking rods shown in the drawings ensures a very efficient and well-defined attachment of the filter cassette to the cassette frame. The mounting can easily be carried out by one man, because one side at a time of the filter cassette is fastened. During filter cassette exchange, the locking rods 60 can be released, and the cassette can be removed from the cassette frame, in a very simple way. During mounting, the filter collars are folded over the upper side of the frame 31 and serve as a fastening means and simultaneously as a sealing between the cassette frame and the filter housing when the frame, rigid by design, is pressed upward against the connecting frame 80 of the filter housing. Said sealing is very efficient, and due to the absence of loose packings a safe sealing effect is always ensured during filter exchange, because the filter collar portion additionally serving as packing, is automatically intact in a new filter. The absence of loose packings provides advantages also from a handling and storing aspect.

Attention is drawn to the invention claimed

in our copending application No. 31862/77. (Serial No. 1582662).

WHAT WE CLAIM IS:—

1. An assembly of a filter cassette, comprising a plurality of filter bags, a frame supporting the cassette, and two locking rods detachably connecting the cassette to the frame, the assembly, in use, being mounted in a filter housing and making a seal therewith, in which assembly:

(a) the filter bags of the cassette are closed at their lower ends and form clean-gas passageways, the upper ends of the bags together forming a common clean-gas opening of the cassette, and the filter cassette includes a collar surrounding the common clean-gas opening;

(b) the frame is of rectangular shape when the assembly is viewed in plan and surrounds the common clean-gas opening, and each of the four sides of the frame is formed of a U-section element having upper and lower side walls and an intermediate member together defining a groove, with the open side of the groove facing outwards away from the common clean-gas opening;

(c) the free ends of the upper and lower side walls of two of said U-section elements each have an inturned leg, the ends of the two legs facing each other and defining a gap forming an entry into the groove;

(d) said collar comprises four collar portions each folded over a respective one of the upper side walls of the four U-section elements and entering into the groove of the associated element, and at least those collar portions associated with the said two U-section elements having inturned legs are each in the form of a sleeve;

(e) each of said locking rods is L-shaped and one limb of each rod passes through a respective one of the two sleeves, and the combined thickness of a rod plus the surrounding sleeve is greater than the width of said gaps whereby the filter cassette is connected to the frame;

(f) the other limb of each of the locking rods is situated in the groove of a respective one of the other two U-section elements and is partially encircled by the associated collar portion which folds round the limb, between the limb and the intermediate member of the U-section element whereby said other limbs can be removed from their grooves to withdraw said one limbs of the locking rods from their sleeves and enable the filter cassette to be detached from the frame; and

(g) upwardly facing surface portions of said collar portions are adapted to make a seal with the filter housing when said assembly is mounted in the housing.

2. An assembly according to Claim 1, in which said two U-section elements provided with inturned legs, form opposite sides of

said rectangular shape frame and the two U-section elements forming the other opposite, sides of the frame are not provided with inturned legs.

- 5 3. An assembly according to Claim 1 or Claim 2, in which a packing is interposed between the collar portions and the upper side walls of the U-section elements, which packing upon locking of the frame to a
10 connecting frame of the filter housing serves for effecting a seal between the frame, filter cassette and filter housing.

- 15 4. An assembly according to Claim 3, in which the packing is a strip of fabric or other suitable material attached to the collar portions, which strip, when the filter cassette is mounted on the frame extends along at least the upper side walls of the U-section elements.

- 20 5. An assembly according to Claim 3 or

Claim 4, in which a separate length of the packing is attached to each collar portion by two or more seams.

6. An assembly according to any preceding claim, in which the collar portions are connected to the remainder of the filter cassette by a seam. 25

7. An assembly of a filter cassette, a frame supporting the cassette, and means detachably connecting the cassette to the frame, substantially as hereinbefore described with reference to and as shown in the accompanying drawings. 30

8. A dust separator including an assembly according to any preceding claim. 35

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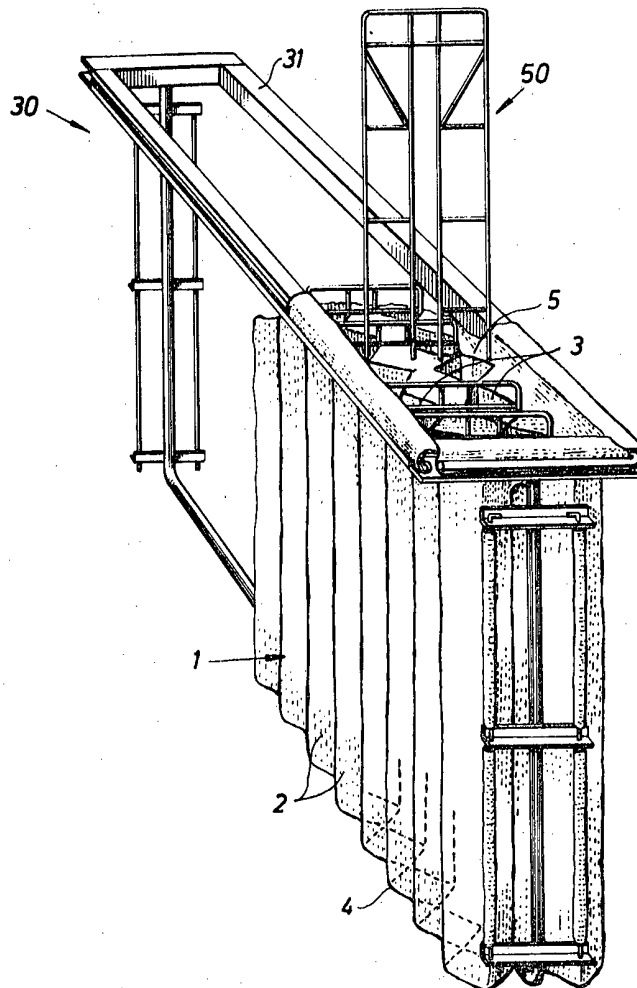
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COMPLETE SPECIFICATION

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Sheet 1

Fig. 1



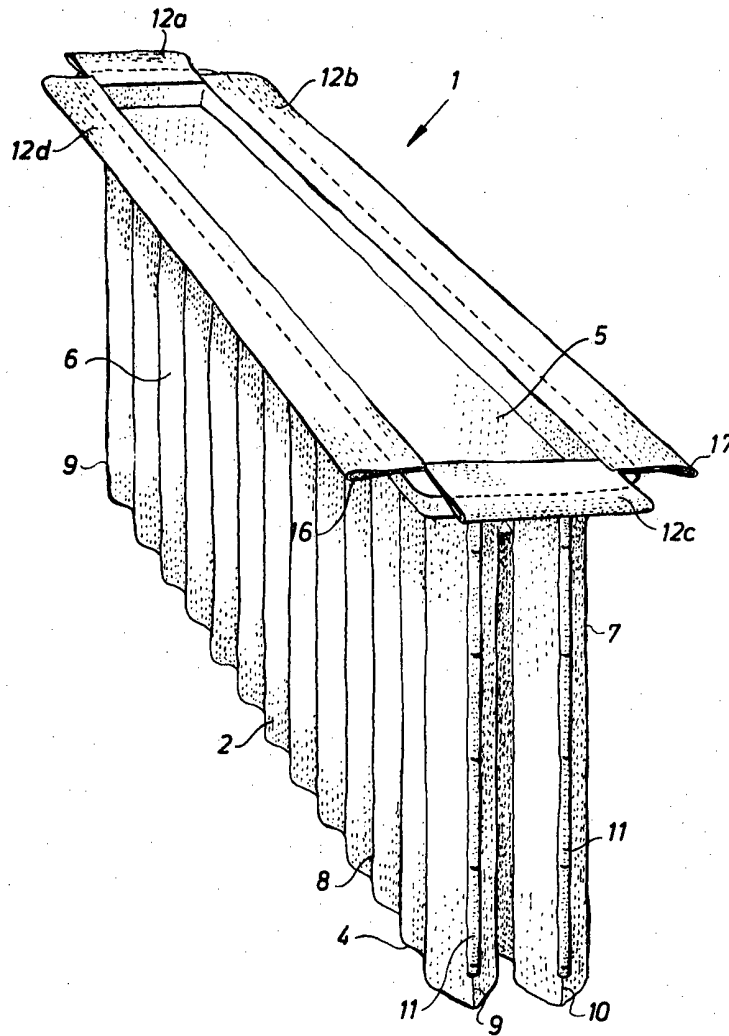
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Fig. 2



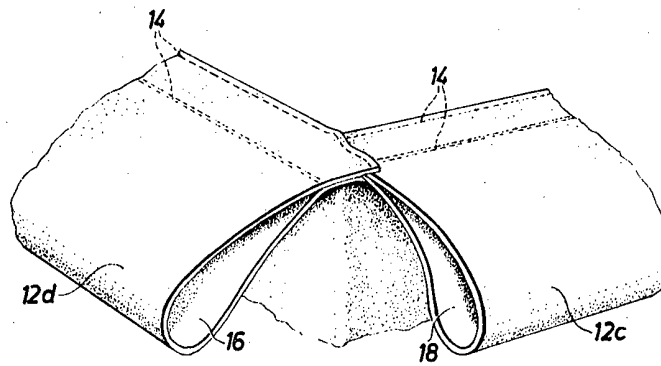
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Fig. 2a



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Fig. 3

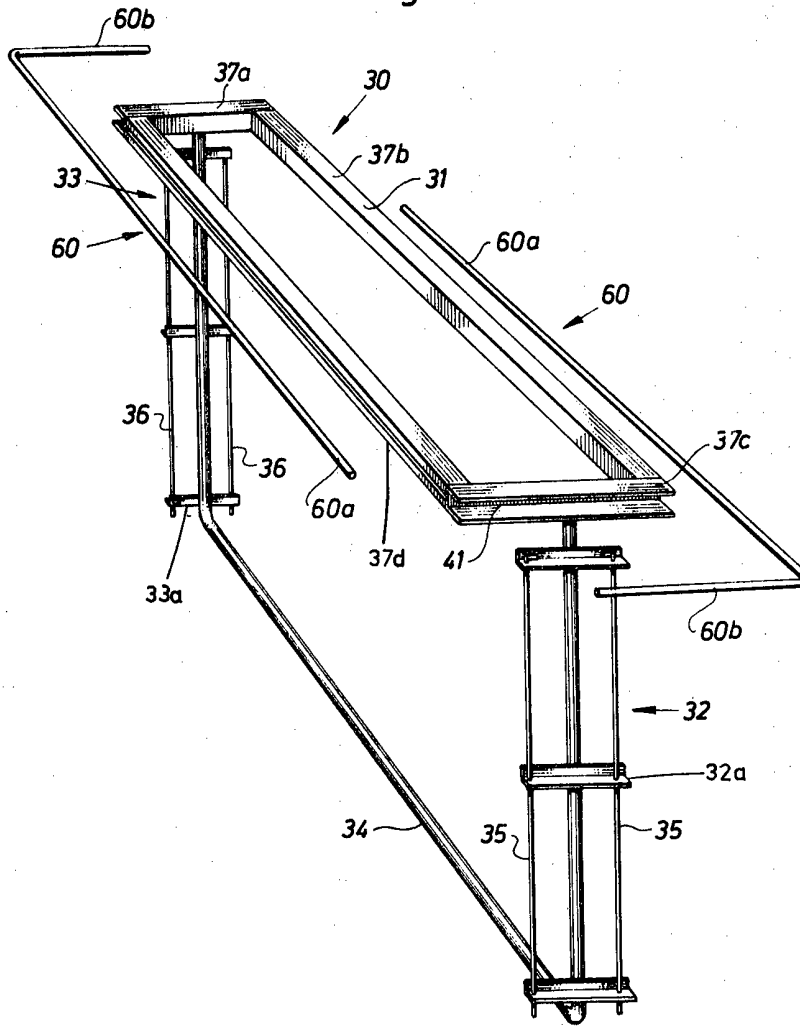


Fig. 4a

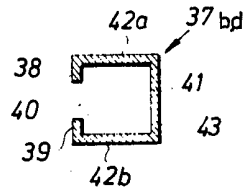


Fig. 4b

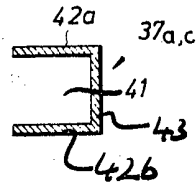


Fig. 5a

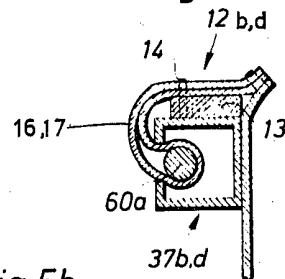


Fig. 5b

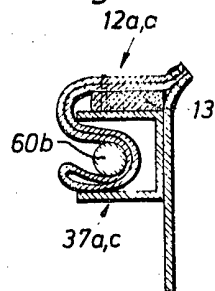


Fig. 5c

