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(71) Applicant: Innovent AB
Industrivägen 7
S-171 48 Solna(SE)

(72) Inventor: Ljungqvist, Bengt
Djursholmsvägen 67
S-181 51 Täby(SE)

(72) Inventor: Allander, Claes G. Allander
Sund 57
S-156 00 Vagnhärad(SE)

(74) Representative: Hammar, Ernst et al,
H. ALBIHNS PATENTBYRA AB Box 7664
S-103 94 Stockholm(SE)

(54) An arrangement for blowing clean air into rooms.

(57) The invention relates to a clean-air blowing arrangement for use, for example, in operating theatres, clean rooms and like rooms. The arrangement includes a horizontal, ventilated ceiling unit (1) provided with air-supply means for supplying air (L) through the downwardly facing surface (2) of the unit, and a vertical, ventilated wall unit (3) whose upper edge (4) borders an edge (5) of the ceiling unit. The wall unit is provided with air-supply means for distributing air (L) through the inner surface (6) of the unit facing in towards the space beneath the ceiling unit. Air-supply means (7) for producing an obliquely and downwardly directed air supply (L_s) in the form of at least one air curtain are arranged in the intersection line (S) between the air-supply surfaces of respective units or the geometric extensions of these surfaces.

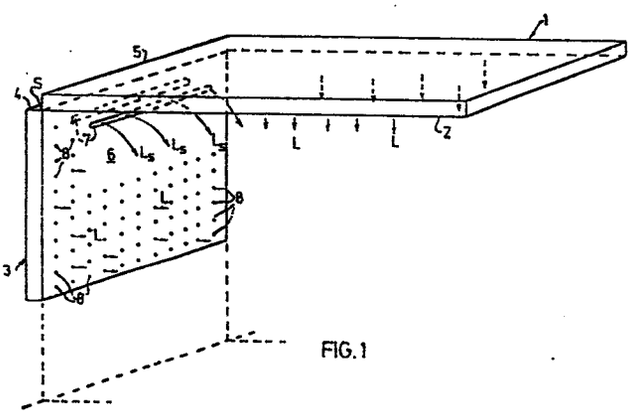

FIG.1

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An arrangement for blowing clean air into, for example operating theatres and so-called clean rooms.

The present invention relates to an arrangement for blowing or injecting clean air into a room in which high requirements are placed on the cleanliness and purity of the air in the room, or in at least a part of the room. Examples of rooms for which the invention is intended include operating theatres in hospitals and like health centres, and industrial clean rooms. In health centres efforts are made to keep down effectively the amount of particulate impurities carried by the air, and therewith the amount of airborne bacteria-carrying particles. In the manufacturing industries, clean rooms are necessary in order to protect sensitive devices, for example in such cases as the manufacture of integrated circuits where dust particles can readily destroy a circuit.

Since it is in most cases unrealistic to maintain the general ventilation of a room or a locale, or to blow clean air thereinto, at such a high level of efficiency as to positively achieve a low content of airborne impurities in all parts of the room, inter alia for reasons of economy, it is necessary in practice to reconcile oneself with establishing clean-air conditions in one restricted cubic area of a respective room or locale in which to work.

With regard to the application of clean-air conditions in health centres etc., reference is made with respect to known techniques, to the guidelines mapped out in the article "Operationsrumsventilation: En orientering", (Ventilation of operating theatres: An orientation.) published in the magazine Sjukhuset 10/83.

It can be said in summary that from an economic aspect and

from the technical aspect of ventilation, the known technique offers no satisfactory solution when desiring to achieve a low particle content or a low content of undesirable gases within a restricted working area of a room with the aid of simple means therefor. This restricted working area may constitute an operating table in an operating theatre, or a working area in the manufacturing industry.

Consequently, the primary object of the invention is to enable a given, desired low content of airborne particulate impurities (or alternatively gaseous impurities) to be maintained within a restricted cubic area of a room, or of a space in the room, for example on/around a surgical operating table or some other form of work surface, with the aid, among other things, of an obliquely and downwardly directed air shield or air curtain.

The problem upon which the invention is based resides in positively providing air-flow conditions around the obliquely located air curtain, produced with the aid of separate air-supply means in such a manner as to avoid effectively co-ejection of insufficiently clean air (for example air having a particle content which lies above the low level desired).

This object is achieved according to the invention with an arrangement of the kind mentioned in the introduction, which is characterized in that it comprises a substantially horizontal, ventilated ceiling unit which incorporates air-supply means effective to produce a uniformly distributed supply of air via the downwardly facing surface of the air-supply means of said unit; a substantially vertical ventilated wall unit, the upper edge of which adjoins a side-edge of the ceiling unit, this wall unit incorpora-

ting air-supply means effective to produce a uniformly distributed supply of air via that surface of the wall-unit air-supply means which faces in towards the space located beneath the ceiling unit; and in that separate air-supply means are arranged in the proximity of the intersection line between the air-supply surface of the ceiling unit and the air-supply surface of the wall assembly, or between the geometric extension of these surfaces, so as to produce an at least substantially oblique and downward supply of air through an air curtain or through a plurality of substantially mutually parallel air curtains.

Although not necessary, the upper edge of the wall unit may be connected directly to the aforesaid side-edge of the ceiling unit. If the two units do not extend into direct abutment with one another, the aforesaid intersection line lies on the point of mutual intersection of the geometric extension of respective air-supply surfaces. When the ceiling unit and the wall unit terminate at a distance from the intersection line, it may be beneficial to place the separate air-supply means in precisely this extension area or in the angular region outside the intersection line.

Embodiments of the arrangement according to the invention preferred for mutually different and having mutually different fields of application are set forth in the dependent Claims 2-9.

Claims 7-9 refer to a method in which the ceiling unit, the wall unit and associated air-supply means constitute parts of a box or cage structure, which can be incorporated in or placed in a surrounding locale. The cage structure is provided with vertical side-walls which extend from opposing side-edges of the ceiling unit and which

have vertical edge portions which connect with the wall unit. This embodiment of the invention is particularly suited for use as a so-called operating-theatre cage in health centres.

The invention will now be described in more detail with reference to a number of embodiments of an air-blowing arrangement according to the invention, illustrated in the accompanying drawings.

In the drawings, Figure 1 illustrates an arrangement according to the invention schematically and in perspective, the obliquely and downwardly directed air flows from respective separate air-supply means being indicated by the long flow-arrows, and the supply of air over the ventilated wall unit being indicated by a plurality of horizontal short arrows extending from holes or apertures in the air-supply surface of the wall unit;

Figure 2 is a perspective and schematic illustration of an air-blowing arrangement according to the invention in the form of a surgical-operation cage;

Figures 3-5 are partial views in vertical section of various embodiments of connecting arrangements located in the region between the ceiling unit and the wall unit, and illustrate the manner in which the separate air-supply means can be arranged in this region.

Reference will now be made to Figure 1, which illustrates in perspective a clean-air blower arrangement according to the invention. The arrangement includes a horizontal ventilated ceiling unit 1 and a vertical ventilated wall unit 3, the upper edge 4 of which adjoins the side-edge 5 of the ceiling unit 1. Clean air is blown or injected into

the space beneath the downwardly facing surface 2 of the ceiling unit 2 and inwardly of the inner surface 6 of the wall unit, through a large number of holes or apertures 8 which are distributed uniformly over respective surfaces and from which the clean air issues in the form of air jets L. Thus, the inner surface 6 of the wall unit 3 and the downwardly facing surface of the ceiling unit 1 are provided with similar air apertures 8. As illustrated in Figure 1 the wall unit 3 and the ceiling unit 1 of this embodiment both have the form of a flat box-like chamber to which clean air is supplied from a clean-air supply system (not shown). The clean air supply to the units 3 and 1 leaves the units in the form of air jets L through the apertures 8 located in the inwardly facing surface 6 and the downwardly facing surface 2 of respective units.

Arranged in the region of the intersection line S where the air-supply surface 2 of the ceiling unit intersects or meets the air-supply surface 6 of the wall unit (or the line where the geometric extension of these surfaces intersects) are separate air-supply means 7 which are operative in producing a substantially downwardly and obliquely directed supply of air L_s in the form of mutually parallel curtains of air issuing from the separate air-supply means, which in this case have the form of horizontal air-supply slots. Alternative embodiments and positioning of the air-supply means 7 are illustrated in Figures 3-5.

Figure 3 is a partial sectional view of an alternative embodiment of a clean-air blowing arrangement in accordance with the invention, particularly with regard to the connection of the ceiling unit 1 with the wall unit 3. In this case, the separate air-supply means 7 comprises a single air-supply slot which extends parallel with the

edges 4 and 5 and which is located on the intersection line S of the geometric extensions of the surfaces 2 and 6. The clean air supplied issues from the slot 7 in the form of an obliquely and downwardly facing air curtain L_s.

Figure 4 is a vertical sectional view similar to that of Figure 3 and illustrates a further embodiment in which a separate air-supply device 10 is arranged in the angular region outwardly of the intersection line S at which the geometric extensions of the air-supply surfaces 2 and 6 of the mutually adjoining units 1 and 3 intersect. The air-supply device 10 of this embodiment is connected to an air- supply system (not shown) and comprises an elongated, horizontally extending, hollow element of triangular cross-section, and is provided with two mutually parallel air-supply slots 7 in the forwardly located, oblique wall 9 of said separate air-supply means. The clean air issuing from the slots 7 of the air-supply device 10 has the form of two substantially parallel air curtains L_s. As will be understood, the air-supply device 10 may be given a cross-sectional shape other than triangular, without consequent impairment to the function of the air-supply means.

Figure 5 illustrates a further embodiment in which a horizontal air-slot 7 is provided in the upper part of the inner surface 6 of the wall unit 3, and in which two air-supply slots 7 parallel therewith are placed in the region where the downwardly facing surface of the ceiling unit 1 borders on the intersection line S. In this embodiment the clean air leaves the slots 7 in the form of three mutually parallel air curtains L_s.

Reference is now made to Figure 2, which is a perspective illustration similar to that of Figure 1 and which illu-

strates schematically an air-blowing arrangement according to the invention in the form of a so-called surgical operating cage. In this embodiment the ceiling unit 1, the wall unit 3, and the parallel air-supply slots 7 are incorporated in a cage structure placed in a surrounding locale and comprising vertical, parallel side-walls 16 which extend down from the two separated, parallel side-edges of the ceiling unit projecting out from the wall unit 3. The vertical side-wall 16 of the cage structure comprise air-impervious screening elements in the form, for example, of curtains, drapes or the like.

The ceiling unit 1 is provided on the side-edge 12 remote from the wall unit 3 with a box-shaped air-supply device 13, which is connected to an air-supply system not shown. The air-supply device 13 has a downwardly facing, bottom air-supply surface 14 having provided therein two mutually parallel air-supply slots 15, through which air is blown downwardly from the air-supply means 13 in the form of a depending air curtain D, which forms opposite the wall unit 3 an "air-curtain wall" which closes-off the illustrated cage structure, which structure may constitute a surgical operating cage for example.

CLAIMS

1. An arrangement for blowing clean air (L, L_s) into a room in which high requirements are placed on the cleanliness of the air therein, or at least in a region of the room, for example in an operating theatre or a so-called industrial clean room, characterized in that the arrangement includes a substantially horizontal, ventilated ceiling unit (1) incorporating air-supply means for producing a uniformly distributed air supply (L) via the downwardly facing surface (2) of the air-supply means of the unit; a substantially vertical, ventilated wall unit (3) having an upper edge (4) which adjoins a side-edge (5) of the ceiling unit, and which wall unit incorporates air-supply means for producing a uniformly distributed supply of air (L) through the air supply means of the wall unit in towards the space beneath the downwardly facing surface (6) of the ceiling unit; and in that separate supply means (7) for producing at least a substantially obliquely and downwardly directed air supply (L_s) through one or more substantially parallel air curtains is arranged in the proximity of the intersection line (S) between the air-supply surface of the ceiling unit and the air-supply surface of the wall unit, or between the geometric extensions of these surfaces.

2. An arrangement according to Claim 1, characterized in that the ventilated wall unit (3) and the ventilated wall unit (1) each comprise at least one slab-like chamber incorporating an air inlet intended for connection to an air-supply system, and an air outlet in the form of a large number of uniformly distributed holes/apertures (8) provided in the chamber side-wall forming the air-supply surface of the unit.

3. An arrangement according to Claim 1 or 2, characterized in that the separate air-supply means incorporate at least one substantially horizontal air-supply slot (7) positioned in the air-supply surface of the ceiling unit (1) or the wall unit (2) at a relatively small distance from the intersection (S) between the air-supply surface of respective units or the geometric extensions of these surfaces (Figure 5).

4. An arrangement according to Claim 3, characterized in that the air-supply means includes at least two parallel air-supply slots (7) located in one of the air-supply surfaces or placed with at least one slot in each surface or in the extension of said surface (Figure 5).

5. An arrangement according to Claim 1 or 2, characterized in that the separate air-supply means comprise one or more parallel, substantially horizontal air-supply slots in one wall (9) of a separate air-supply device (10) arranged in the angular region outside the intersection line between the air-supply surfaces of respective units or between the respective geometric extensions of the surfaces, said air-supply device being arranged for connection to an air-supply system.

6. An arrangement according to any of Claims 2-5, characterized in that the ventilated wall unit and the ventilated ceiling unit include a pressure equalizing unit (11) through which the air supplied to the unit must pass on its path to the holes or apertures (8) located in the air-supply surface (6 or 2) of said unit.

7. An arrangement according to any of the preceding Claims, characterized in that the ceiling unit and the wall unit, together with their associated separate air-

supply means form components of a cage structure which is incorporated in or can be positioned in a surrounding room and which comprises vertical side-walls (16) which extend down from the ceiling unit from the side-edges thereof projecting out from the wall unit and which con- nect with the wall unit through vertical edge portions (Figure 2).

8. An arrangement according to Claim 7, characterized in that arranged on the side-edge (12) of the ceiling unit (1) remote from the wall unit (3) is a further air-supply device (13) which is intended to be connected to an air-supply system and which presents a downwardly facing air-supply surface (14) having provided therein at least one air-supply slot (15) through which air (D) is blown from said further air-supply means in a manner to form a depending air curtain which forms opposite the wall unit an air-curtain wall of the cage structure.

9. An arrangement according to Claim 7 or 8, characterized in that the vertical side-walls (16) of the cage structure comprise air-impermeable screening elements, such as all forms of hanging curtains, screens, drapes, sliding panels or equivalent devices, for example curtains made of plastic film.

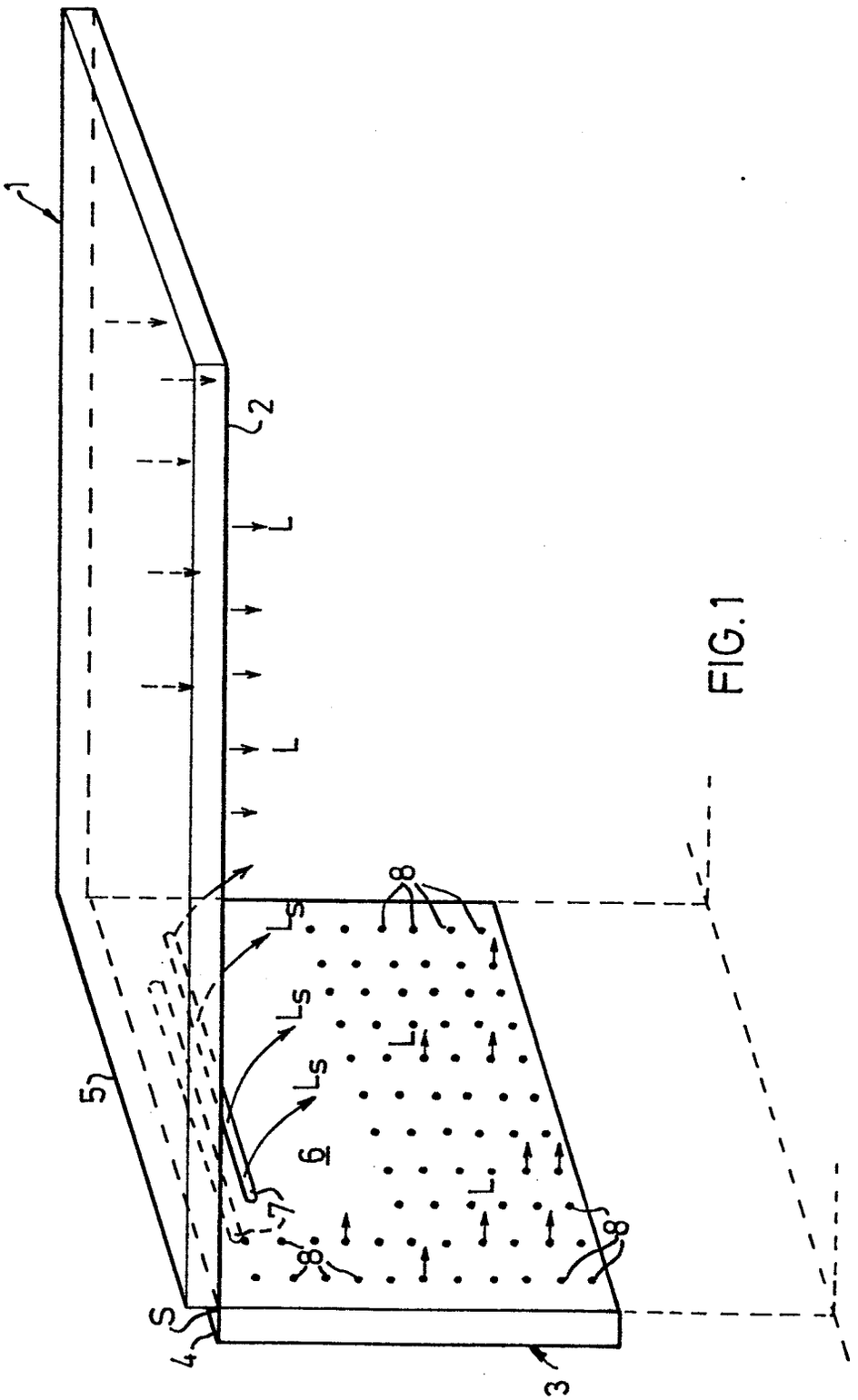

FIG.1

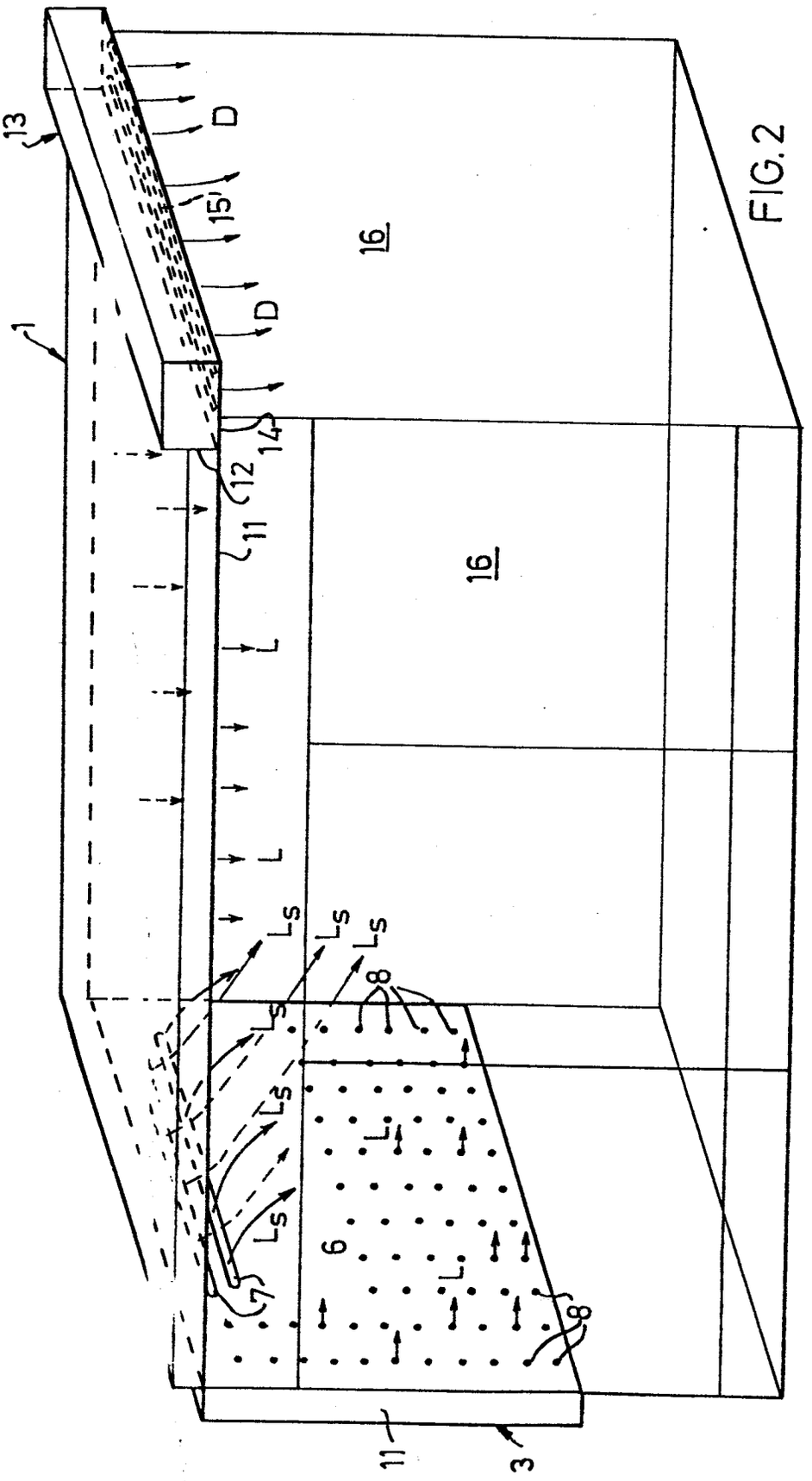

FIG.2

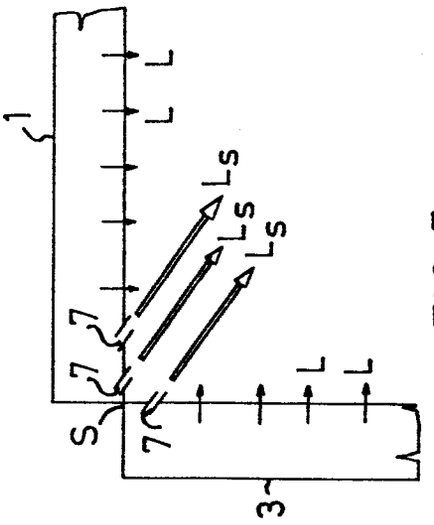

FIG.5

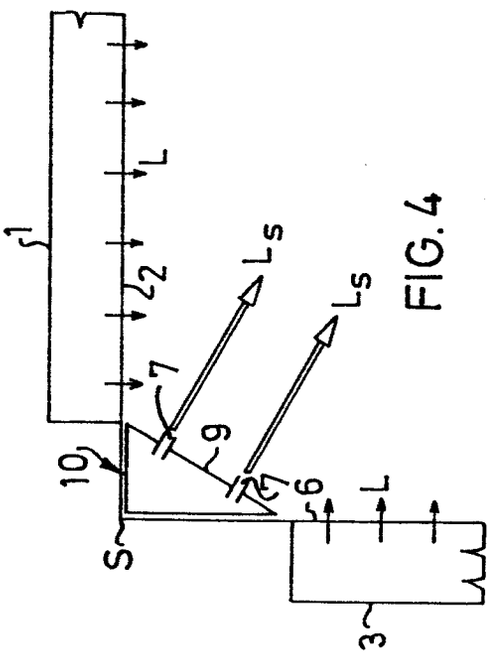

FIG.4

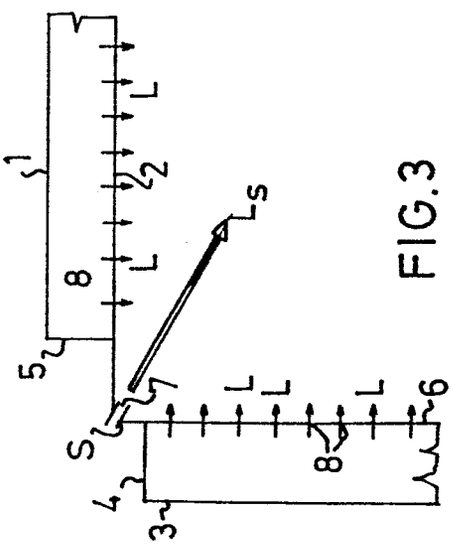

FIG.3

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EUROPEAN SEARCH REPORT

Application number
86850150.3

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)
A	DE, B 2, 2 260 380 (BRANDI INGENIEURE, GMBH)		F 24F 3/16// A 61G 10/02
A	DE, A 1, 3 228 401 (M. ZAMBOLIN)		
A	AU, A, 36 449 (GELMAN CLEMCO PTY)		
A	US, A, 3 511 162 (A. TRUHAN)		
A	US, A, 3 998 142 (FOREMAN ET AL)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

A 61 G
B 01 L
F 24 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	18-07-1986	AXELSSON N-Å

CATEGORY OF CITED DOCUMENTS

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