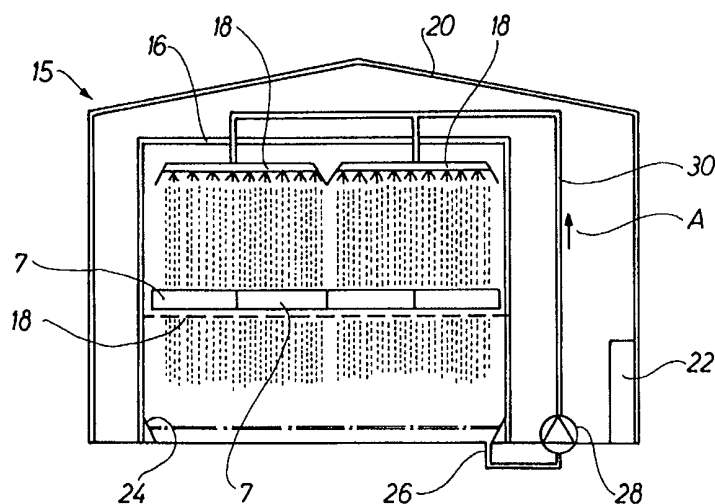




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : A01C 1/02 // 1/04</p>	<p>A1</p>	<p>(11) International Publication Number: WO 00/00006</p> <p>(43) International Publication Date: 6 January 2000 (06.01.00)</p>
<p>(21) International Application Number: PCT/DK99/00352</p> <p>(22) International Filing Date: 23 June 1999 (23.06.99)</p> <p>(30) Priority Data: PA 1998 00841 29 June 1998 (29.06.98) DK</p> <p>(71) Applicant (for all designated States except US): BENTLE PRODUCTS AG [CH/CH]; Grabenstrasse 1, CH-6301 Zug (CH).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): AHM, Poul, Henrik [DK/ES]; Edf. Mar Bella, Atico A, Calle San Pedro, 43, E-03590 Altea (ES).</p> <p>(74) Agent: CHAS. HUDE A/S; H.C. Andersens Boulevard 33, DK-1553 Copenhagen V (DK).</p>		<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>

(54) Title: A METHOD OF GERMINATING SEEDS OR THE LIKE GROWTH-SUITED PARTS OF A PLANT CONTAINED IN GERMINATING UNITS, AS WELL AS A GERMINATING BOX AND A GERMINATING ASSEMBLY FOR USE WHEN CARRYING OUT THE METHOD



(57) Abstract

A method is provided for germinating seeds or the like contained in germinating units joined by way of a tape. In addition to a seed the germinating unit comprises a mixture of a carrier and additives with the water-absorbing substances. The zigzag folded tape is placed edgewise in a germinating box (7). Then the germinating box (7) is placed in an irrigation room (21) comprising a support (18) for the germinating boxes. The germinating boxes are now soaked in successive irrigation periods interrupted by breaks. The soaking is stopped when the tape is saturated with water and said water drips heavily from the bottom side of the germinating box. The germinating box (7) is then moved with the tape to the germinating room (23) in which it is subjected to a climate necessary for an optimum germination. The germination is interrupted by the germinating box being removed from the germination room, cooled and/or transferred for a direct bedding out of the tape.

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Title: A method of germinating seeds or the like growth-suited parts of a plant contained in germinating units, as well as a germinating box and a germinating assembly for use when carrying out the method.

Technical Field.

- 5 The invention relates to a method of germinating seeds or the like growth-suited parts of a plant contained in germinating units joined by way of a tape, and where the germinating units furthermore comprise a mixture of a carrier and additives including water-absorbing substances.

Background Art

- 10 The term "germinating unit" is here to be construed as a unit formed by two thin material layers, such as paper layers, comprising at least one seed, carriers, additives and a binder.

- The term "seed" is here to be construed as a seed germinated in such a manner that the radicle has penetrated the seed coat in most cases. By the term plant is here meant
15 a seed or the like growth-suited part of a plant germinated or developed in such a manner that it comprises a top with leaves and a root.

- One of the advantages obtained by subjecting a seed tape to a germinating process prior to the bedding out is that the germination can proceed under optimum conditions, i.e. by involving a minimum amount of storing nutrition from the seed. The
20 latter is of importance for each seed, as said seed possesses a maximum residual energy for the further development of the plant. The maximum residual energy of the seed has a positive effect on the plant during its entire life, especially when it is a question of its capacity of protecting itself against diseases and to some extent also against insects. A further advantage is found in the fact that a seed germinated prior

to the bedding out or a plant developed prior to said bedding out is many days, approximately 10 to 12 days, ahead of weeds, which cannot develop until a while after the bedding out of the germinated seed or plant tape.

Interest has long been attached to the possibility of making the germinating process
5 more efficient on the germinating units available in tapes than hitherto known.

Brief Description of the Invention

The object of the invention is to solve the above problem.

The method according to the invention is characterised in that the zigzag folded tape is placed in a germinating box with the tape placed edgewise, said germinating box
10 comprising a grate-like bottom and a side frame extending from said bottom, whereafter the germinating box is placed in an irrigation room associated with the germinating assembly, said irrigation room comprising a support for the germinating boxes, whereafter the germinating boxes are subjected to a soaking with a germinating fluid free of disease germs and providing the tape with the desired pH and nutrient con-
15 tent, said soaking being carried out in successive irrigation periods interrupted by breaks during which said germinating fluid can be absorbed by the germinating units in the tape and by the water-absorbing substances of said germinating units, where the successive irrigation is interrupted when the tape is saturated with germinating fluid and said germinating fluid drips from the bottom side of the germinating box,
20 whereafter the germinating box with the tape is moved to a germinating room associated with the germinating assembly so as there to be subjected to a climate necessary for an optimum germination, such as temperature, moisture and light conditions, a constant temperature and a constantly high atmospheric moisture being maintained, and that the germination is interrupted by the germinating box being removed from
25 the germinating room and cooled down and/or transferred for a direct bedding out of the tape.

As a result, a very efficient germination of each seed is obtained because each germinating unit is advantageously soaked to the maximum extent until it is saturated with the germinating fluid, viz. until the fluid drips from the box. Most of the remaining water is simultaneously absorbed by the water-absorbing substances of the germinating units with the result that at least 20% by volume of air is provided in the pore volume of the germinating unit, said state being maintained by means of osmotic forces. This air volume is important for the oxygen uptake of the seed, viz. the respiration process. The zigzag folding renders it simultaneously possible to obtain a substantially uniform distribution of the germinating fluid in the germinating units, especially in the height of each germinating unit.

According to the invention the water added in the irrigation room may be adjusted to a pH of 6.1 to 6.3, preferably by means of phosphoric acid.

In addition, the tape may according to the invention be transferred prior to the interruption of the germination to a growing room with a controlled temperature, a controlled moisture and a controlled light intensity, whereby the tape can be supplied with a nutritive fluid containing an optimum amount of nutrients for the plants, especially an excess of phosphorus. In this manner an optimum way of developing true plants is obtained. The nutritive fluid is here typically added once a day.

Moreover it is according to the invention possible prior to the termination of the attraction of plants to subject said plants to a hardening off, whereby the resulting plants are forced to increase their number of roots with the result that an improved water intake of the plants after the bedding out is ensured.

The invention relates also to a germinating box for use when carrying out the method according to the invention, and this germinating box is characterised in that it comprises a frame formed by side members and end members as well as a grate-like bottom secured to the bottom rim of said frame, where the frame comprises a dis-

dispensing opening in one of the end members, said dispensing opening allowing the germinated tape to be pulled out of the germinating box through said opening. This germinating box turned out to be particularly efficient because it reliably supports the tape placed edgewise, and when the germination has been terminated the tape can be
5 moved while placed in said germinating box to a bedding machine, where said tape is pulled through the above dispensing opening during the bedding out. As the bottom of the germinating box is gratelike, the excess germinating fluid originating from the soaking can easily run out of said box. In addition, the gratelike bottom ensures that the roots of the plants only extend a few mm below the gratelike bottom, at which
10 length said roots are singed due to a too high evaporation. As a result, the roots of the plants are homogeneous with the effect that a favourable bedding out is ensured.

According to the invention the inner surfaces of the germinating box as well as the delimitations of the dispensing opening may be smooth without protruding projections. In this manner the tape can be pulled out of the germinating box through the
15 dispensing opening in a particularly easy manner when said tape is to be bedded out.

The germinating box is inclined during the bedding out, and in order to avoid an unintentional sliding downwards of the entire tape towards the dispensing opening, the inner surfaces of said germinating box may, however, also be rough, and a plurality of removable ribs may be provided substantially parallel to the end member
20 that can be opened, said ribs projecting from both sides of the box towards the interior of said box and being of the same height as the frame and a length corresponding to approximately 1/3 of the length of the end member of the box.

According to the invention the germinating box may be moulded of plastics. The resulting germinating box is both inexpensive to produce and easy to clean in order
25 to be reused.

Moreover, the frame may according to the invention below the gratelike bottom

comprise a rim portion projecting downwards and preferably being of a height of approximately 2 cm. In this manner the grate-like bottom is protected to a predetermined degree as it cannot be damaged by the previously described support when the germinating box is placed thereon.

- 5 In addition, water does not accumulate below the grate-like bottom, but instead a free access of air to the bottom side of the tape is provided in the germinating box.

The invention relates furthermore to a germinating assembly for use when carrying out the method according to the invention. This germinating assembly is characterised in that it comprises an irrigation room optionally installed in a separate house, said irrigation room comprising a stand and a support arranged in said stand for the support of one or more germinating boxes, at least one row of water spraying nozzles arranged on the stand at a distance below the germinating box or boxes, as well as a germinating room placed adjacent the irrigation room and in which a climatic control unit is provided, said climatic control unit controlling the composition of the air, the relative moisture, the temperature and the light conditions, where these parameters are to be maintained at a constant high level, and optionally a growing room with a nozzle irrigation system placed in connection with the germinating room. The resulting germinating assembly is particularly advantageous as it is ensured that the germination can proceed with a very accurate feeding of germinating fluid to all the portions of the seed tape and with an accurate control of the very germination.

Furthermore, an outlet for excess germinating fluid may according to the invention be provided below the support of the irrigation room, said excess germinating fluid optionally being caught, cleaned and recirculated. The resulting germinating assembly is very environmentally acceptable because the consumption of fluid involved can be reduced.

Finally the nozzle irrigation system of the growing room may according to the invention be adapted to spray the nutritive fluid in form of rather large drops, which turned out to be very advantageous.

Brief Description of the Drawings

- 5 The invention is explained in detail below with reference to the accompanying drawing, in which

Fig. 1 is a diagrammatic view of the individual steps of the method according to the invention,

- Fig. 2 is a perspective view of a germinating box according to the invention, where
10 the grate-like bottom of the box appears clearly,

Fig. 3 corresponds to Fig. 2, but here the dispensing opening of the germinating box appears clearly,

Fig. 4 is a diagrammatic end view of a germinating assembly according to the invention,

- 15 Fig. 5 is a top view of the germinating assembly of Fig. 4,

Fig. 6 is a diagrammatic top view of a germinating box and clearly showing how the tape is placed edgewise and folded up in a zigzag way.

Best Mode for Carrying Out the Invention

- In Fig. 1 the reference numerals 1, 2, 3 and 4 indicate the most important steps of
20 the method according to the invention. 1 indicates the step where a zigzagged tape

with germinating units is placed in a germinating box with a grate-like bottom. 2 indicates the step where the germinating box comprising the zigzagged tape with germinating units is placed on a support in a germinating assembly. 3 indicates the step where the tape is subsequently soaked with water in successive irrigation periods in such manner that the germinating box is sprayed with germinating fluid until the spraying is interrupted by breaks. 4 indicates the succeeding step where the tape placed in a germinating room is subjected to a climate optimum for a germination, viz. a climate optimized preferably with respect to temperature, moisture and light conditions. The germination is interrupted by the germinating box being removed from the germinating room, cooled and/or transferred for a direct bedding out of the tape.

The germinating box 7 of Fig. 2 is used for carrying out the method according to the invention and comprises a frame 8 with end walls 8a and 8c and side walls 8b and 8d. A grate-like bottom 10 is secured to the bottom rim of the frame. The aperture of the grate-like bottom is typically 10 to 40 mm. As illustrated at 8' in Fig. 3, a rim portion 8' projecting downwards can be secured to the bottom side of the frame. This rim portion 8' serves to maintain a distance between the grate-like bottom 10 and a surface on which the germinating box 7 may be placed.

As also indicated in Fig. 3, the frame 7 can be provided with a dispensing opening 14 in the end wall 8a, the completely germinated tape being pulled out through said dispensing opening during the bedding out. The dispensing opening 14 is, however, not shown in detail as it can be established in many different ways.

In Fig. 3, the delimitations of the dispensing opening 14 are smooth without projections, and optionally rounded. The germinating box can be made of many different materials, but the most advantageous germinating box is moulded and made of plastics. In the latter case the grate-like bottom 10 is formed by thin plastic ribs. Removable ribs 9a, 9b can extend from the side walls 8d and towards the interior of the

frame, cf. Fig. 3. The ribs are preferably of an upwardly pointed cross section. Correspondingly, removable ribs can extend from the opposite side wall 8b.

Figs. 4 and 5 show a germinating assembly 15, which can be used for carrying out the method according to the invention. This germinating assembly comprises an irrigation room 21, in which a stand 16 is provided. A perforated support 18, such as a grate, is placed on the stand 16, said grate serving to support one or more germinating boxes 7, four boxes being provided in the illustrated embodiment. At least one row 12 of water spraying nozzles is placed on the stand 16 above and at a distance of the germinating boxes 7 for spraying said germinating boxes 7 with germinating fluid. The illustrated embodiment involves two rows of water spraying nozzles.

The germinating assembly is also associated with a germinating room 23 with a covering structure 20. The structure 20 can be common to the rooms 21 and 23 or be provided for the room 23 only. The structure 20 is provided with a climatic control unit 22 for controlling the composition of the air, the relative moisture, temperatures and light conditions, said parameters preferably being maintained at a constant high level. The climatic control unit is also diagrammatically indicated.

As shown, a catching trough 24 can be provided below the support 18 for the catching of excess germinating fluid. This trough comprises an outlet 26, through which the water in the trough can be returned to the irrigation rows 12 by means of a pump 28 and a recirculation pipe 30 through a cleaning assembly not shown, in which the germinating fluid is cleansed from disease germs. The flow direction of the water through the pipe 30 is indicated by the arrow A.

It appears clearly from Fig. 4 how an amount of the germinating fluid sprayed from the rows 12 rains downwards through the boxes 7. The excess water penetrates through the support 18 and further downwards into the trough 24.

It should be noted concerning the climate provided by the climatic control unit inside the greenhouse that as far as germination of beet seeds is concerned this climate is as follows:

The temperature is in the range of 18 to 21°C, the relative moisture is kept at 96 to 98%, and the light conditions 120 to 160 W/m². As indicated, a growing room 27 may be provided in which a nozzle irrigation system 25 is provided for sprinkling the germinating boxes 7 with water admixed nutrients. The sprinkled water drops can be rather large. The room 27 is provided with its own climatic control unit 29 for controlling the temperature, moisture and light intensity of the room. The room 27 allows a germination up to the plant stage of the seed or of the like growth-suited parts of a plant contained in the germinating units in the boxes 7.

Concerning the placing of the tape with germinating units in the germinating box it should be noted that the tape 5 is placed edgewise, cf. the diagrammatic view of Fig. 6 also showing the zigzags of said tape. Concerning the method according to the invention it should be noted that the soaking of the tapes in the germinating boxes 7 in the room 21 is carried out in successive irrigation periods interrupted by breaks. An irrigation period lasts typically 5 minutes, and a break lasts typically approximately 3 minutes. After an irrigation for approximately 15 to 20 minutes involving a water consumption of 5 to 6 l per germinating box in the room 21, the germinating boxes 7 are moved into the germinating room 23 in which they typically stay for approximately 2 to 3 days. Before the germination is completed, the germinating boxes 7 are removed from the germinating room 23, cooled and/or transferred for a direct bedding out of the tape. As an alternative, the germinating boxes can be moved into the growing room 7. Here the germinating boxes 7 are subjected to a sprinkling with water admixed nutrients and an excess of phosphorous at regular intervals by means of the nozzle irrigation system 25. The sprinkling in the room 27 is typically carried out once a day. The nozzle irrigation system 25 is connected to a recirculation system not shown for the nutritive fluid. This recirculation system corresponds substantially to the one shown in connection with the room 23.

When the germinating units are made of paper, care is usually taken that the paper possesses a suitably high wet strength.

The invention may be modified in many ways without thereby deviating from the scope of the invention.

Claims

1. A method of germinating seeds or the like growth-suited parts of a plant contained in germinating units joined by way of a tape, and where the germinating units furthermore comprise a mixture of a carrier and additives including water-absorbing substances, c h a r a c t e r i s e d in that the zigzag folded tape is placed in a germinating box (7) with the tape placed edgewise, said germinating box (7) comprising a grate-like bottom (10) and a side frame (8) extending from said bottom, whereafter the germinating box (7) is placed in an irrigation room (21) associated with a germinating assembly (15), said irrigation room (21) comprising a support (18) for the germinating boxes, whereafter the germinating boxes are subjected to a soaking with a germinating fluid free of disease germs and providing the tape with the desired pH and nutrient content, said soaking being carried out in successive irrigation periods interrupted by breaks during which said germinating fluid can be absorbed by the germinating units in the tape and by the water-absorbing substances of said germinating units, where the successive irrigation is interrupted when the tape is saturated with germinating fluid and said germinating fluid drips from the bottom side of the germinating box, whereafter the germinating box (7) with the tape is moved to a germinating room (23) associated with the germinating assembly (15) so as there to be subjected to a climate necessary for an optimum germination, such as temperature, moisture and light conditions, a constant temperature and a constantly high atmospheric moisture being maintained, and that the germination is interrupted by the germinating box being removed from the germinating room and cooled down and/or transferred for a direct bedding out of the tape.

2. A method as claimed in claim 1, c h a r a c t e r i s e d in that the water added in the irrigation room (21) is adjusted to a pH of 6.1 to 6.3, preferably by means of phosphoric acid.

3. A method as claimed in claim 1, c h a r a c t e r i s e d in that prior to the interruption of the germination the tape is transferred to a growing room (27) with a controlled temperature, moisture and light intensity, and that the tape is supplied with a nutritive fluid containing an amount of nutrients optimum to the plants, especially an excess of phosphorous.
4. A method as claimed in claim 3, c h a r a c t e r i s e d in that prior to the attraction of the plant, said plants are subjected to a hardening off.
5. A germinating box (7) for use when carrying out the method as claimed in one or more of the claims 1 to 4, c h a r a c t e r i s e d in that it comprises a frame (8) formed by one of the side members (8b, 8d) and the end members (8a, 8c), said frame (8) comprising a grate-like bottom (10) secured to the lower rim of said frame, where the frame (8) is provided with a dispensing opening (14) in one of the end members (8a), said dispensing opening (14) allowing the germinated tape to be pulled out of the germinating box therethrough.
6. A germinating box as claimed in claim 5, c h a r a c t e r i s e d in that the inner surfaces of said germinating box as well as the delimitations of the dispensing opening (14) are smooth without protruding projections.
7. A germinating box as claimed in claim 5, c h a r a c t e r i s e d in that the inner surfaces of said germinating box are rough, and that a plurality of removable ribs (9a, 9b) are provided substantially parallel to the end member (8a) provided with the dispensing opening, said ribs extending from both sides of the box towards the interior thereof and being of the same height as the frame (8) and of a length corresponding to approximately 1/3 of the length of the end member (8a) of the box.
8. A germinating box as claimed in claim 5, 6 or 7, c h a r a c t e r i s e d in that it is moulded and made of plastics.

9. A germinating box as claimed in one or more of the claims 5 to 8, c h a r a c t e r i s e d in that below the grate-like bottom (10) the frame (8) comprises a rim portion (8') projecting downwards and preferably being of a height of approximately 2 cm.
- 5 10. A germinating assembly (15) for use when carrying out the method as claimed in one or more of the claims 1 to 4, c h a r a c t e r i s e d in that it comprises an irrigation room optionally installed in a separate house, said irrigation room comprising a stand (16) and a support (18) arranged in said stand for the support of one or more germinating boxes (7), at least one row (12) of water spraying nozzles arranged
10 on the stand at a distance below the germinating box or boxes, as well as a germinating room (23) placed adjacent the irrigation room and in which a climatic control unit (22) is provided, said climatic control unit (22) controlling the composition of the air, the relative moisture, the temperature and the light conditions, where these parameters are to be maintained at a constant high level, and optionally a growing room (23)
15 with a nozzle irrigation system (25) placed in connection with the germinating room (23).
11. A germinating assembly as claimed in claim 10, c h a r a c t e r i s e d in that an outlet (26) is provided for excess germinating fluid below the support (18) of the irrigation room, said excess germinating fluid optionally being caught, cleaned and
20 recirculated.
12. A germinating assembly as claimed in claim 10 or 11, c h a r a c t e r i s e d in that the nozzle irrigation system (25) of the growing room (27) is adapted to feed nutritive fluid in form of rather large drops.

- 1 — Placing of zigzagged tapes with germinating units in a germinating box with a grate-like bottom
- 2 — Placing of the germinating-box in a germinating assembly with a grate-like bottom
- 3 — Soaking of the tape in successive irrigation periods
- 4 — Subjecting the tape to a climate optimum for the germination

Fig. 1

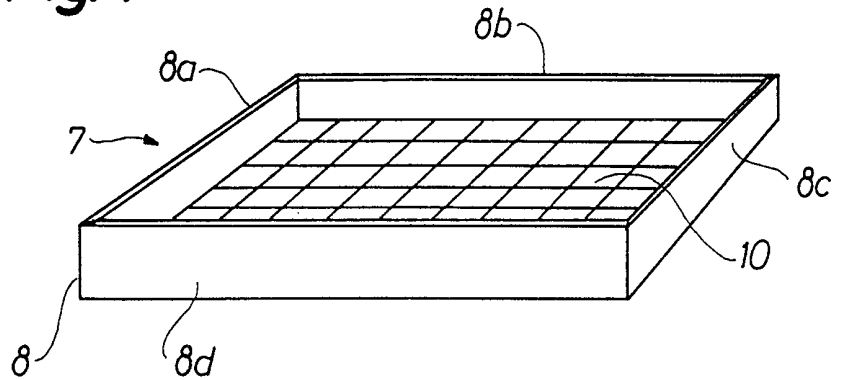


Fig. 2

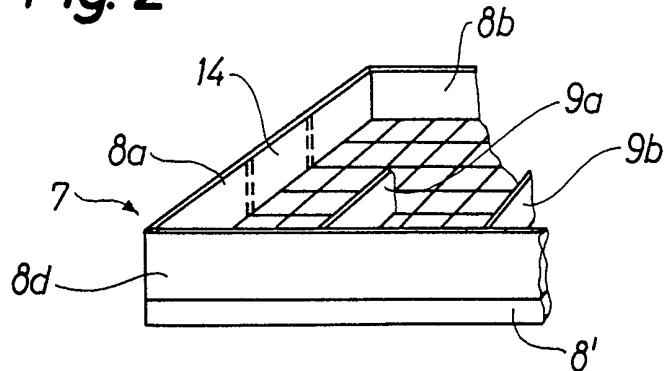


Fig. 3

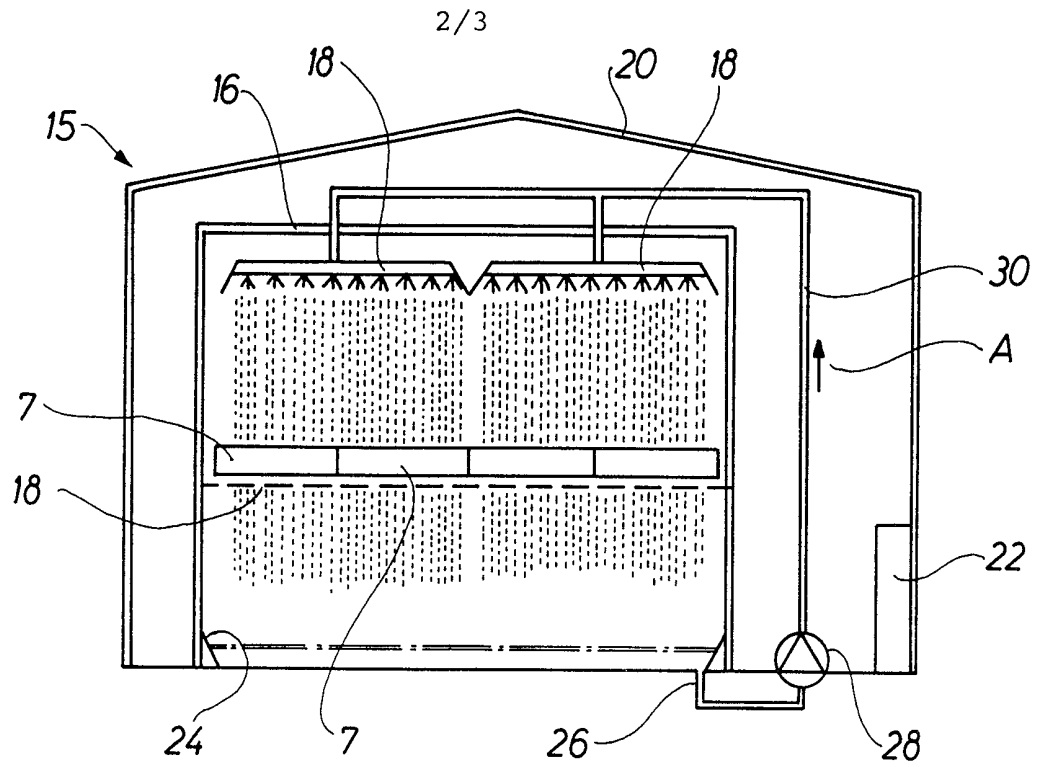


Fig. 4

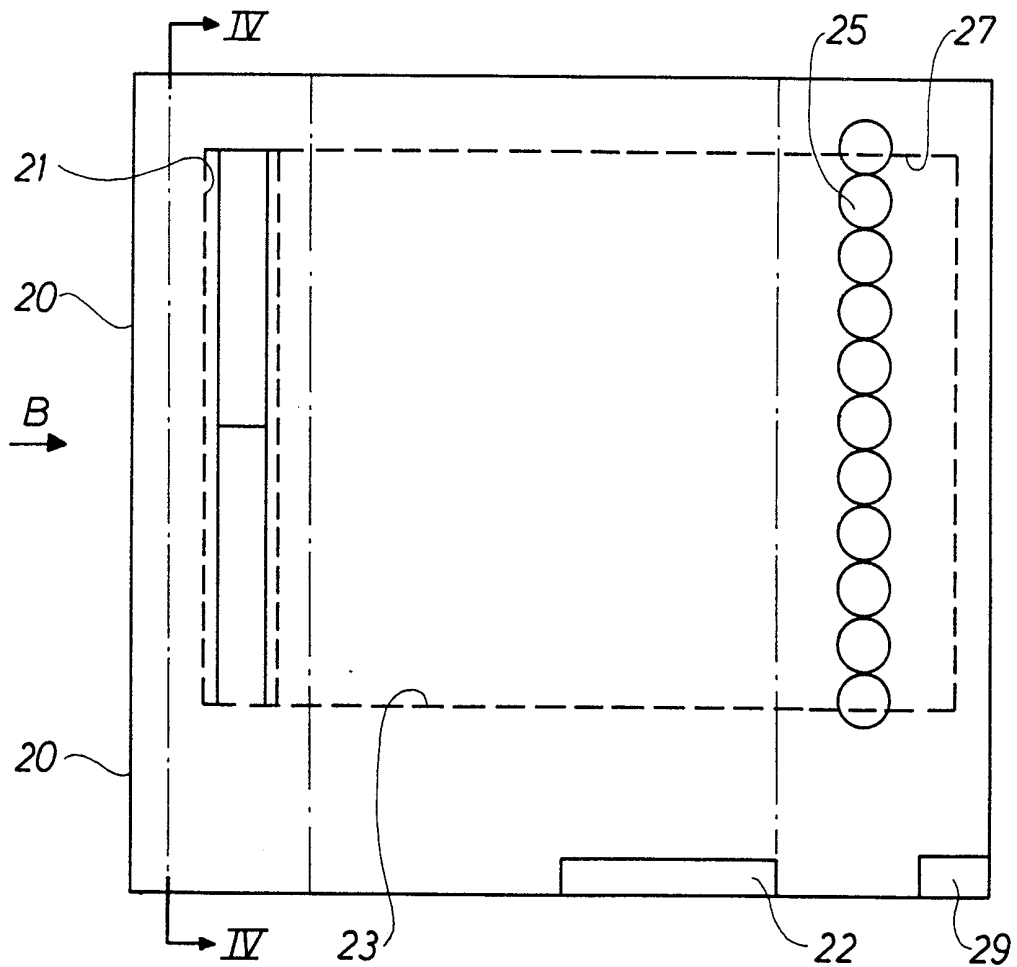


Fig. 5

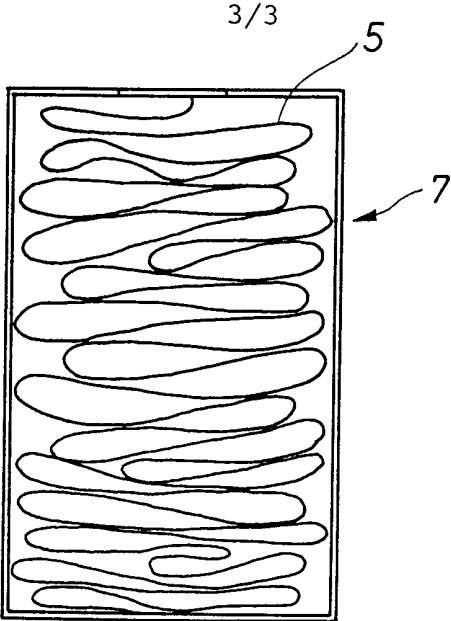


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 99/00352

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A01C 1/02 // A01C 1/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0823203 A1 (HONDA GIKEN KOGYO KABUSHIKI KAISHA ET AL), 11 February 1998 (11.02.98), column 19, line 44 - line 56; column 10, line 10 - column 12, line 29 -- -----	1-12

 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search

16 Sept 1999

Date of mailing of the international search report

19-10-1999

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