



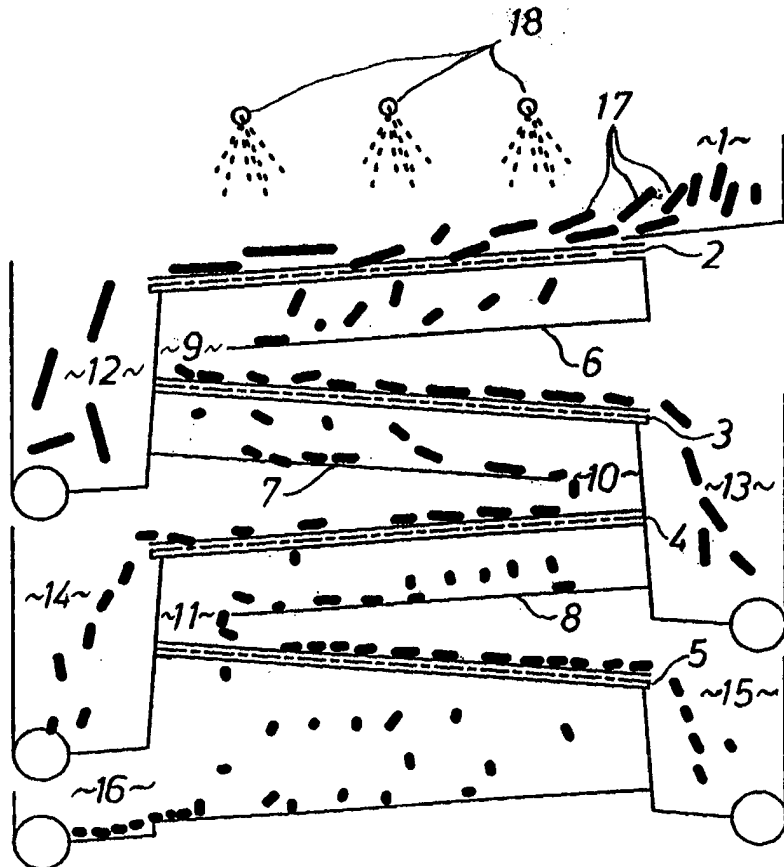
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : A01K 61/00</p>	<p>A1</p>	<p>(11) International Publication Number: WO 98/49892 (43) International Publication Date: 12 November 1998 (12.11.98)</p>
<p>(21) International Application Number: PCT/DK97/00204 (22) International Filing Date: 5 May 1997 (05.05.97) (71) Applicant (for all designated States except US): DIAT DEVELOPMENT APS [DK/DK]; DK-6040 Egtved (DK). (72) Inventor; and (75) Inventor/Applicant (for US only): PEDERSEN, Ole, Enggaard [DK/DK]; DK-6040 Egtved (DK). (74) Agent: BUDDE, SCHOU & CO. A/S; Vestergade 31, DK-1456 København K (DK).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, 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, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p>

(54) Title: METHOD AND APPARATUS FOR GRADING FISH ACCORDING TO SIZE

(57) Abstract

Fish (17) of different sizes are graded by means of gently sloping grilles (2, 3, 4, 5) consisting of smooth rounded rods or tubes extending in directions parallel to the plane of the drawing, preferably being kept wet by water sprayed from nozzles (18). In this manner, rapid grading can be achieved without damage to the fish and using relatively light equipment, as distinct from water-filled tanks previously used for this purpose.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

METHOD AND APPARATUS FOR GRADING FISH ACCORDING TO SIZETECHNICAL FIELD

5

The present invention relates to a method of grading fish according to size, said method being of the kind set forth in the preamble of claim 1.

10 BACKGROUND ART

SU 1,665,862-A discloses the use of vertical sorting grilles situated in a tank filled with water. This method suffers from two main disadvantages, i.e.

- the requisite apparatus, i.e. the tank, is very heavy and cannot easily be
15 moved about, and
- the fish can swim freely about in the tank and are not urged particularly strongly to swim towards the grilles, through which only some of them may pass so as to be graded according to size.

20

DISCLOSURE OF THE INVENTION

It is the object of the present invention to provide a method of the kind referred to above, with which it is possible to achieve grading of fish according to size
25 considerably faster than what is possible with the method referred to above, and this object is achieved by, according to the invention, proceeding in the manner set forth in the characterizing clause of claim 1.

By proceeding in the manner indicated, the fish will be graded according to
30 principles not differing greatly from those applying to the grading of e.g. potatoes, but in addition to this, it appears that the fish have a natural tendency to try to "hide" between the parallel rods or tubes, so that they are motivated both by gravity and by natural instinct to try to pass through the grille. As is well-known, many

species of fish can survive being out of water for a short period, and for a somewhat longer period if sprayed with water. This fact is exploited in the method according to the invention, as the time taken for fish to pass through the requisite grading apparatus can be made to be considerably shorter than the survival period.

5

The present invention also relates to an apparatus for carrying out the method of the invention, and this apparatus is characterized by the feature set forth in the characterizing clause of claim 7.

10 Advantageous embodiments of the method and the apparatus, the effects of which - beyond what is obvious - are explained in the following detailed part of the present description, are set forth in claims 2-6 and 9-14, respectively.

15 BRIEF DESCRIPTION OF THE DRAWINGS

In the following detailed part of the present description, the invention will be explained in more detail with reference to the exemplary embodiment of an apparatus for grading fish according to size according to the invention shown

20 highly simplified and diagrammatically in the drawings, in which

Figure 1 shows the apparatus in vertical section through a plane parallel to the rods or tubes used in the grilles,

Figure 2 is a perspective view of one of the grilles of the apparatus of Figure 1, and

Figures 3a-3c are cross-sectional views showing a grille of the kind shown in Figure

25 2 in three different adjustments.

DESCRIPTION OF THE PREFERRED EMBODIMENT

30 The fish-grading apparatus shown in Figure 1 comprises four grilles 2, 3, 4 and 5 placed one below the other and sloping gently in alternate directions as shown. In a manner to be explained below, each grille 2-4 consists of a number of parallel rods or tubes extending in directions parallel to the plane of the drawing in Figure 1.

Below each of the first three grilles 2, 3 and 4 there is a guide plate 6, 7 and 8, respectively, each extending parallel to but ending short of the respective grille 2, 3 and 4 so as to leave a passage 9, 10 and 11, respectively.

5 The upper side of each of the grilles 2, 3, 4 and 5 communicates directly with an associated chute 12, 13, 14, 15, respectively, whereas the lower side of the lowermost grille 5 communicates with a final chute 16. All the chutes 12-16 extend transversely to the plane of the drawing in Figure 1 and independently of one another, such as by communicating with individual post-grading bins (not shown).

10

In operation, fish 17 of different size are introduced at an entry region 1, from which they slide, preferably "lubricated" by fresh water or sea water issuing from a number of spray nozzles 18, along the top of the first grille 2. Here, let it be assumed that the fish can be classified in five different size classes: "very large", "large", "medium", "small", and "very small".

15

In the preferred embodiment, the first grille 2 is adapted to allow fish in the four smallest categories, i.e. "large" and smaller, to pass through to the guide plate 6, only the fish of the "very large" category landing in the chute 12.

20

All the remaining fish, i.e. those in the categories "large" and smaller, will slide along the guide plate 6 and fall through the passage 9 onto the second grille 3. The spacing in this grille 3 is adjusted to allow fish of the category "medium" and smaller to pass through the grille so that only the fish of the category "large" will land in the second chute 13, whereas fish of the category "medium" and smaller will slide along the guide plate 7 and fall through the passage 9 onto the third grille 4.

25

The grading continues in the third and fourth grilles 4 and 5, respectively, so that finally, fish of the categories "medium", "small" and "very small" will land in the chutes 14, 15 and 16, respectively.

30

The grille shown diagrammatically in Figure 2 may be any one of the grilles 2-5 shown in Figure 1. The grille shown in Figure 2 consists of two sets of rods 19 and 20, of which the upper set 19 is secured to a first common frame 21, while the second set 20 is secured to a second common frame 22.

5

As shown in Figures 3a, 3b and 3c, the distance 23 between the first common frame 21 and the second common frame 22 can be adjusted, i.e. by moving one set of rods relative to the other set along a direction at right angles to the main plane of the grille concerned.

10

With the adjustment shown in Figure 3a, the width 24 of the openings between the rods in the sets 19 and 20 is at a maximum, whereas with the adjustment shown in Figure 3c, this width 24 is at a minimum.

15 As diagrammatically indicated in Figures 3a-3c, only fish 17 smaller than those of the category "very large" will pass through the grille shown in Figure 3a, whereas in the grille shown in Figure 3c, only fish of the category "very small" will pass.

As can be seen from Figures 3a-3c, it is possible for all the grilles 2-5 in the apparatus shown in Figure 1 to be of identical construction, the only difference being that they are individually adjusted so as to have a width 24 varying from a large value in the uppermost grille 2 to a small value in the lowermost grille 5.

20 In order to influence the speed, at which the fish slide down along the various grilles, their inclination may be adjusted by suitable means (not shown), preferably of a kind permitting adjustment during operation.

25 In a further embodiment (not shown), the inclination of the two sets of rods 19 and 20 relative to each other may also be varied, so that the width 24 will increase or decrease along the length of the grille concerned. Like the means mentioned above for adjusting the inclination of the grilles, the means for adjusting the relative inclination of the two sets of rods 19 and 20 are also not shown, but a person skilled in the art of mechanics will be capable of devising and constructing the

30

requisite means for these purposes. The same applies, of course, to the means used for adjusting the two frames 21 and 22 relative to each other.

LIST OF PARTS

	1	Entry region
	2	Grille
5	3	Grille
	4	Grille
	5	Grille
	6	Guide plate
	7	Guide plate
10	8	Guide plate
	9	Passage
	10	Passage
	11	Passage
	12	Chute
15	13	Chute
	14	Chute
	15	Chute
	16	Chute
	17	Fish
20	18	Spraying nozzle
	19	Set of rods (upper)
	20	Set of rods (lower)
	21	First common frame
	22	Second common frame
25	23	Distance
	24	Width

CLAIMS

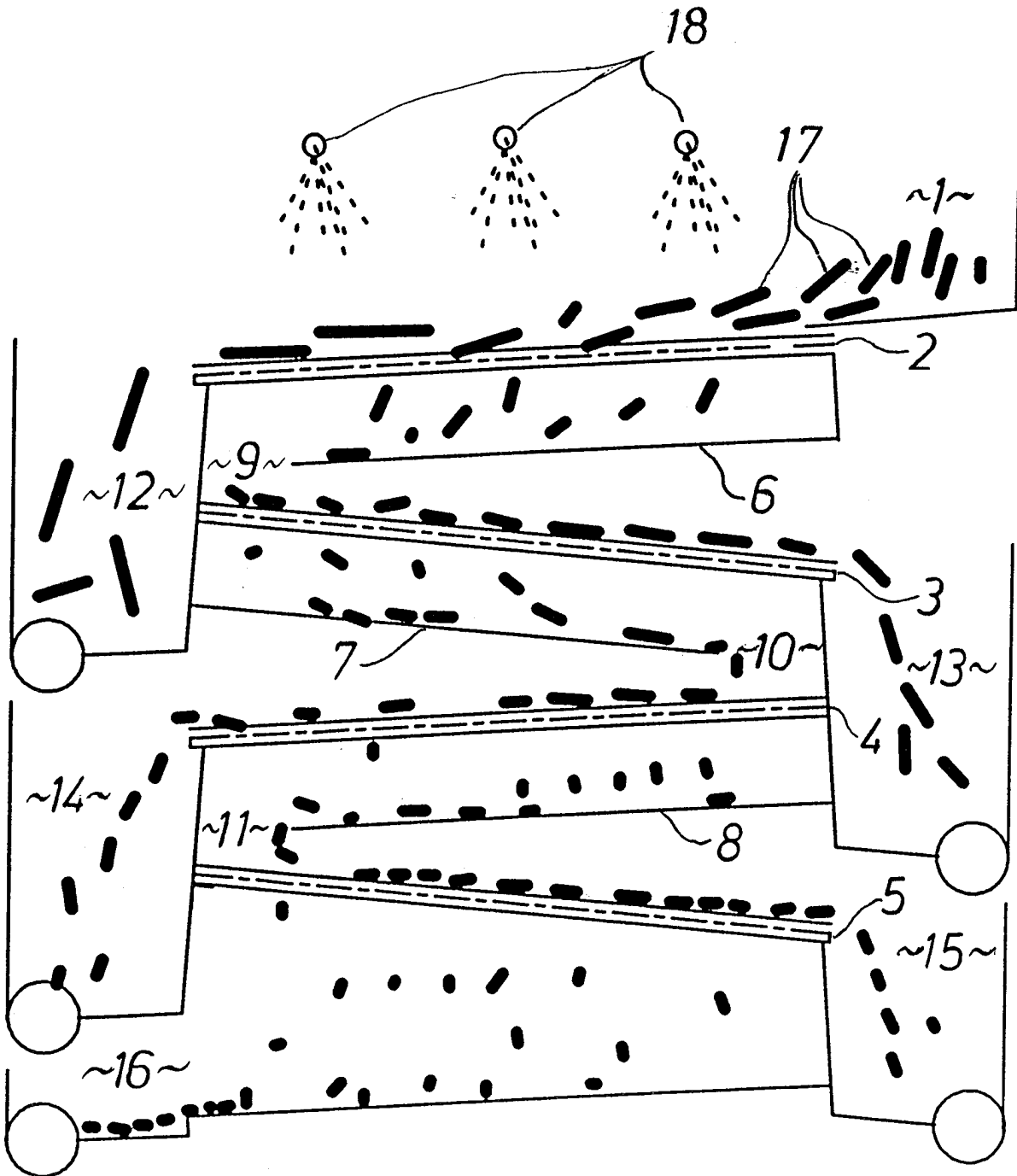
1. Method of grading fish according to size, said method being of the kind, in which the fish to be sorted are made or allowed to encounter at least one grille having openings allowing fish up to a certain size to pass therethrough, c h a r a c t e r i z e d by the use of at least one grille consisting of parallel rods or tubes sloping gently in their longitudinal direction.
5
2. Method according to claim 1, c h a r a c t e r i z e d by the use of a grille consisting of parallel rods or tubes, the surfaces of which encountered by the fish are smooth and rounded without sharp edges or points.
10
3. Method according to claim 1 or 2, c h a r a c t e r i z e d by the use of an assembly of grilles placed one below the other in such a manner, that fish having passed through one grille will encounter the next grille below it.
15
4. Method according to any one or any of the claims 1-3, c h a r a c t e r i z e d by spraying a liquid, preferably fresh water or seawater, onto the fish being graded.
- 20 5. Method according to any one or any of the claims 1-4, c h a r a c t e r i z e d by the use of at least one grille consisting of at least two sets of parallel rods or tubes, of which sets at least one is movable relative to the other(s) in a direction at right angles to the main plane of the grille so as to vary the width of the openings between said rods or tubes.
25
6. Method according to any one or any of the claims 3-5, c h a r a c t e r i z e d by the use of grilles, in which the width of said openings decreases from the uppermost to the lowermost grille.
- 30 7. Apparatus for grading fish according to size by carrying out the method according to any one or any of the claims 1-6, c h a r a c t e r i z e d by at least one grille (2, 3, 4, 5) comprising parallel rods or tubes (19, 20) sloping gently in their longitudinal direction.

8. Apparatus according to claim 7, characterized in that the surfaces of said rods or tubes (19, 20) expected to be encountered by the fish (17) are smooth and rounded without sharp edges or points.
- 5
9. Apparatus according to claim 7 or 8, characterized by
- a) an assembly of grilles (2, 3, 4, 5) placed one below the other and sloping in alternate directions, and
- b) in the spaces between said grilles (2, 3, 4, 5): guide plates (6, 7, 8), each
10 extending substantially parallel to and ending short of the grille (2, 3, 4) immediately above so as to leave a passage (9, 10, 11) for fish to pass to the next grille (3, 4, 5) below it.
10. Apparatus according to any one or any of the claims 7-9, characterized
15 in that at least one of the grilles (2, 3, 4, 5) consists of at least two sets of parallel rods or tubes (19, 20), of which sets at least one is movable relative to the other(s) in a direction at right angles to the main plane of the grille so as to vary the width (24) of the openings between said rods or tubes (19, 20).
- 20 11. Apparatus according to claim 9 or 10, characterized in that the width (24) of said openings decreases from the uppermost grille (2) to the lowermost grille (5).
12. Apparatus according to any one or any of the claims 7-11, characterized
25 in that by spraying means (18) situated and adapted to spray a liquid onto the fish being graded by said grille or grilles (2, 3, 4, 5).
13. Apparatus according to any one or any of the claims 7-12, characterized
30 in that the inclination of each grille (2, 3, 4, 5) can be adjusted individually during operation.
14. Apparatus according to any one or any of the claims 10-12, characterized in that each end of said at least one set of rods or tubes (19, 29) is movable

independently of the other so as to produce openings having a width (24) gradually increasing or decreasing from one end to the other.

1/2

Fig. 1



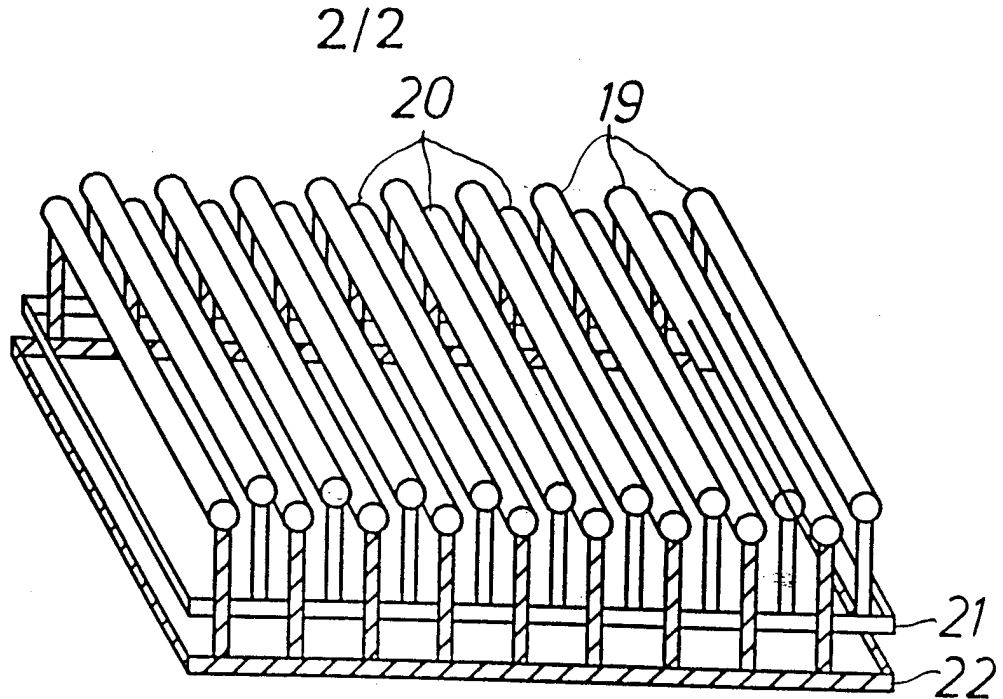


Fig. 2

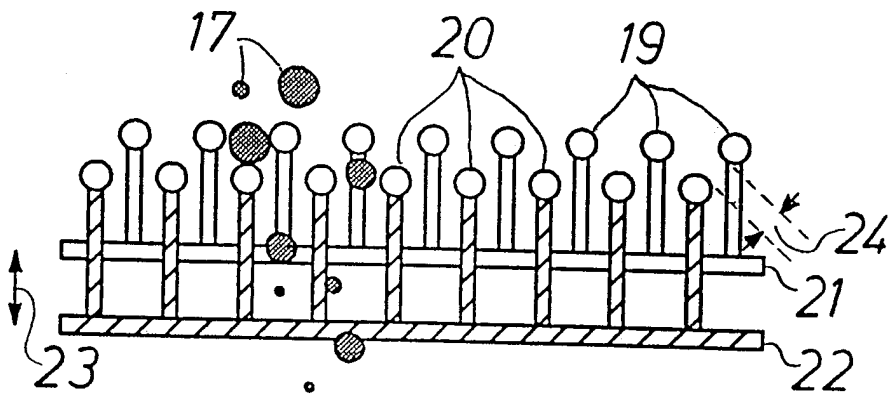


Fig. 3a

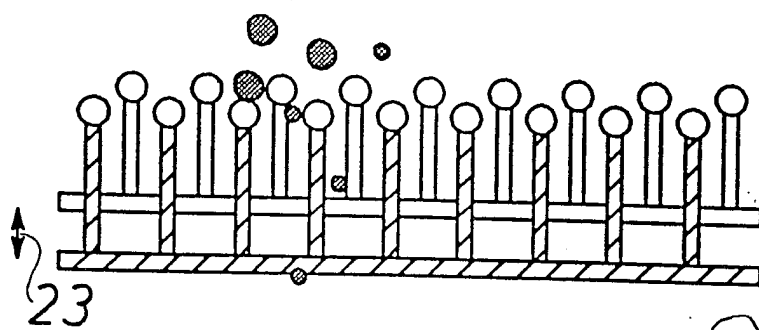


Fig. 3b

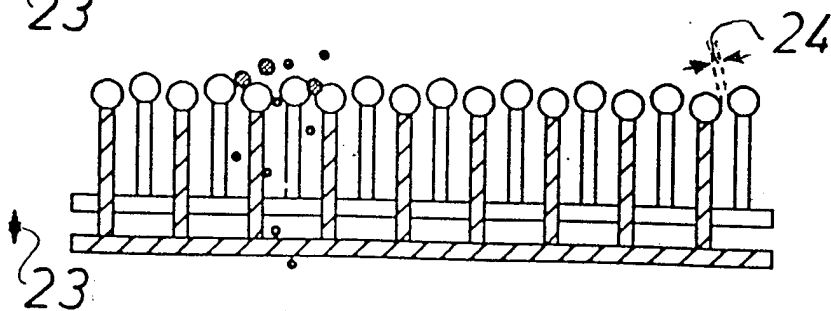


Fig. 3c

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 97/00204

A. CLASSIFICATION OF SUBJECT MATTER		
IPC6: A01K 61/00 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: A01K		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
WPAT, CLAIMS, JAPIO		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 2531507 A1 (FAIVRE, C.), 29 January 1976 (29.01.76), page 7, line 8 - line 14, figures 1,2 --	1,7
Y	DD 239933 A1 (INSTITUT FÜR HOCHSEEFISCHEREI UND FISCHVERARBEITUNG), 15 October 1986 (15.10.86), figures 1-3, claims 1-6 --	1,7
Y	SU 1090309 A (..), 7 May 1984 (07.05.84), figures 2,3,4 -- -----	1,7
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
10 December 1997		22 -12- 1997
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86		Authorized officer Catarina Forssén Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

04/11/97

International application No.

PCT/DK 97/00204

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2531507 A1	29/01/76	CH 583503 A FR 2278256 A,B	14/01/77 13/02/76
DD 239933 A1	15/10/86	NONE	
SU 1090309 A	07/05/84	NONE	