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(54) **Apparatus for drying substantially ellipsoid products, such as for instance eggs**

(57) Apparatus for drying substantially ellipsoid products, such as, for instance, eggs (E), which are conveyed over a conveying path (L) by means of a conveyor (1), the apparatus comprising a number of nozzles (2,3) which are connected to a compressor, the nozzles (2,3) being designed and arranged relative to the conveying

path (L), such that the drying air blown out by these nozzles (2,3) has a main flow direction (D) which is both directed substantially perpendicularly to the surface (S) of a passing product (E) and blows directly onto at least the areas adjacent the points (P) of a passing product (E).

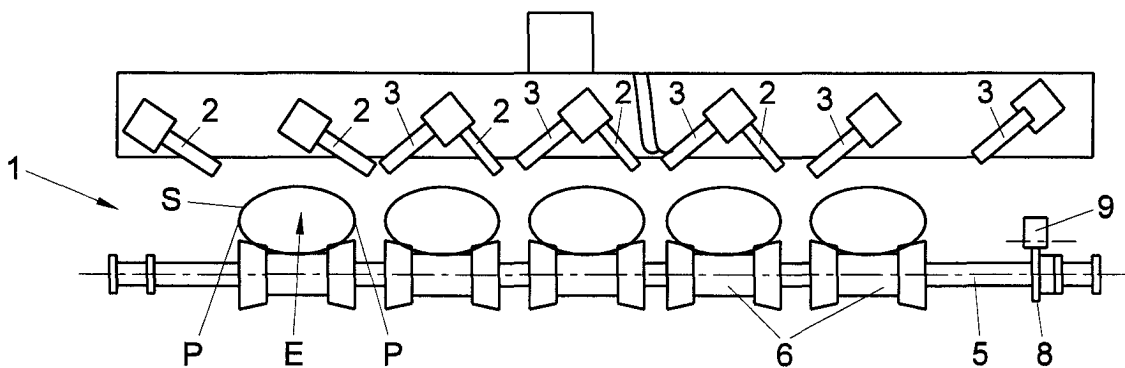


Fig. 3

Description

[0001] This invention relates to an apparatus for drying substantially ellipsoid products, such as, for instance, eggs, which are conveyed over a conveying path by means of a conveyor, the apparatus comprising a number of nozzles which are connected to a compressor.

[0002] In some countries, it is mandatory to wash eggs before they are packed. Moreover, some packers believe that the impression of hygiene and quality is enhanced when eggs, before being packed, are washed, so that manure and feathers are removed from the eggs. After washing the eggs, it is important that the eggs be dried as soon as possible. In fact, when drying is deferred too long, the moisture with which the eggs have been washed migrates through the porous shell and thus affects the taste and/or the quality of the egg. It may also be advantageous to wash ellipsoid products other than eggs, for instance fruit.

[0003] For drying eggs, various apparatuses are known, which apparatuses are described in, for instance, US-A-4 173 831, US-A-4 750 277 and JP-U-3-2134.

[0004] In these known apparatuses, the dry air is blown down from above, perpendicularly to the plane of conveyance. The principal drawback of the known apparatuses is that in order to achieve an acceptable drying result, a huge amount of air needs to be blown onto the eggs. Upon visual inspection of the eggs dried with the known apparatuses, a dried surface percentage of about 70% is observed. A flow rate of 1500 m³ per 10,000 eggs per hour, with the pressure being about 50 mbar (5,000 Pa) at the outflow slots, is not unusual in the known apparatuses. In a machine in which twelve rows of eggs are conveyed side by side, with a capacity of 10,000 eggs per row per hour, this requires a power of 54 kW. According to standardized measurements, the noise level produced as a result of the large amount of air being blown out is certainly 95-105 dB(A), which makes it necessary to encase the entire drier. Such a large amount of drying air which is blown down vertically above the eggs with a fairly low pressure leads to the drying result of about 70%, which in itself is little satisfactory. In particular at the points of an egg, that is, at the opposite ends with the highest degree of curvature, there is a substantial chance that moisture will remain present there after the egg has passed the drier.

[0005] The object of the invention is to adapt the apparatus of the type described in the opening paragraph hereof, such that it no longer has the above-described disadvantages. To that end, the apparatus is characterized, according to the invention, in that the nozzles are designed and movably or immovably arranged relative to the conveying path, such that the drying air blown out by these nozzles has a main flow direction which is both directed substantially perpendicularly to the surface of a passing product and blows directly onto at least the

areas adjacent the points of a passing ellipsoid product.

[0006] As a result of the fact that the nozzles blow the drying air substantially perpendicularly to at least those surface portions of a passing product that are located adjacent the points of the passing product, at the points of the product which are difficult to dry, still an excellent drying result is obtained. The term 'points' is herein understood to refer to those portions of the ellipsoid product where the curvature of the surface is strongest, i.e., essentially the positions where the longitudinal axis of the ellipsoid product intersects the surface of the product. Substantially halfway the two points on the longitudinal axis lies the center of the egg. The nozzles are designed and arranged such that the drying air blown out by them is directed substantially at the middle of a passing product and also blows directly upon the areas adjacent the points of the product. In that way, upon visual inspection, a dried surface percentage of at least about 90% is observed.

[0007] According to a further elaboration of the invention, it is particularly favorable when the conveyor is designed as a roller conveyor, so that the products can be rotated as they pass the nozzles, which yields a greater product surface exposed to direct blowing action.

[0008] According to a further elaboration of the invention, the surface exposed to direct blowing can be further enlarged when the rollers, for the purpose of their rotation, are driven such that the movement of the upwardly facing side of the products, which movement occurs as a result of the rotation, has a direction which is equal to the conveying direction of the conveyor.

[0009] It is then preferred when, according to a further elaboration of the invention, the rotational speed of the rollers and the distance of the nozzles are adjusted to each other such that each product, after passing the nozzles, does not have any shell surface portion, at least adjacent the points of the product, that has not been directly blown upon by drying air from one of the nozzles.

[0010] Further elaborations of the invention are defined in the subclaims and will hereinafter be further clarified on the basis of an exemplary embodiment, with reference to the drawings.

Fig. 1 shows a top plan view of a drying section, with omission of the conveyor arranged under it;

Fig. 2 shows a side elevation of the drying section represented in Fig. 1;

Fig. 3 shows a cross-sectional elevation taken on the line III-III in Fig. 1;

Fig. 4 shows a detail of a cross-sectional elevation as represented in Fig. 3;

Fig. 5 shows a detail of a bottom view of a part of the drying section which is arranged above a conveyor;

Fig. 6 shows a left-hand portion of a drop extraction unit; and

Fig. 7 shows a cross-sectional elevation, taken on the line VII-VII in Fig. 6, of the drop extraction unit.

[0011] The exemplary embodiment of an apparatus according to the invention comprises a roller conveyor 1 provided with shafts 5 on which rollers 6 are mounted. The shafts 5 are advanced in a conveying direction T by means of chains with which the shafts 5 are rotatably connected. The rollers 6 are located at a mutual distance such that the rollers 6 in pairs enclose a nest in which one egg E is receivable. Typically, a shaft 5 carries a plurality of rollers 6 mounted side by side, so that in the conveying direction T a number of rows of eggs extend along a conveying path L. These conveying paths L are represented by a centerline in Fig. 1 and Fig. 5. Arranged above the conveyor 1 are nozzles 2, 3 which are connected to a compressor. In the present exemplary embodiment, the nozzles 2, 3 are connected with lines 10 extending in the conveying direction T. The ends of the lines 10 are connected with a transverse line 11, 12 which are each connected to a supply 13, 14 by means of which compressed air is supplied.

[0012] In the present exemplary embodiment, on opposite sides obliquely above each row of rollers of the roller conveyor 1 extending in the conveying direction T, nozzles 2, 3 are arranged. The main flow direction D of the drying air blown out by the nozzles 2, 3 includes an angle α with the rotation axis 5 of the rollers 6, which is in the range of 10° - 85° . The angle α and the main flow direction D are clearly represented in Fig. 4. It will be clear that the exemplary embodiment is given by way of example. Also when the angle α is about 10° , an excellent drying result can be obtained. As a result of this arrangement, the drying air blown out by these nozzles 2, 3 has a main flow direction which is directed substantially perpendicularly to the shell S of a passing egg E. Because the nozzles 2, 3 are arranged on opposite sides, obliquely above each row of rollers 6 of the roller conveyor 1, in particular the areas adjacent the points P of a passing egg E are directly blown upon. Thus, an excellent drying of the point areas P of the egg E, which are generally difficult to reach, is accomplished.

[0013] Figs. 3 and 4 clearly show that the shaft 5 carrying the rollers 6 further comprises a gear wheel 8. The conveyor 1, at least adjacent the drying apparatus, is provided with a gear rack 9 which engages the upwardly facing side of the gear wheels 8. As a result of the presence of the gear wheels 8 and the gear rack 9 engaging the upper side of the gear wheels 8, the rollers 6 will rotate during the conveyance through the drying apparatus. The direction of this rotation is such that the top side of the eggs E has the same direction of movement as the conveyor 1. As a consequence, the shell surface S of the eggs exposed to direct blowing by the nozzles 2, 3 as the eggs pass a nozzle 2, 3 is considerably enlarged. The rotational speed of the rollers is preferably adjusted to the distance between the nozzles 2, 3, as viewed in the conveying direction, such that each egg E, after passing the nozzle 2, 3, does not have any shell surface portion S, at least adjacent the points P, that has not been directly blown upon by drying air from one of

the nozzles.

[0014] As is clearly represented in Fig. 1, the nozzles 2 which, viewed in the conveying direction T, are arranged on the left above a row of rollers 6, are arranged so as to be staggered in the conveying direction T relative to the nozzles 3 which, viewed in the conveying direction T, are arranged on the right above a given row of rollers 6. What is prevented as a result of this staggered arrangement is that the air flow directed to the right, coming from the nozzles 3, disturbs the air flow directed to the left, coming from the nozzles 2. The reason is that such a disturbance might adversely affect the extent of drying that is accomplished. As appears clearly from the top plan view represented in Fig. 1, in case the conveyor 1 comprises a plurality of rows of rollers 6 extending in the conveying direction T, it is particularly favorable when the nozzles 2, 3 which are in one line viewed in a direction transverse to the conveying direction T and parallel to the plane of conveyance all blow to the same side, while the nozzles 2, 3 succeeding each other in the conveying direction and located in one line in transverse direction, alternately blow to the left and to the right. Such a design prevents the dry air from nozzles 2, 3 of different rows of rollers 6 from disturbing each other, which might also lead to an adverse effect on the drying action of the apparatus.

[0015] In contrast to the known apparatuses, in the present apparatus, a much lower flow rate of drying air has been chosen. In the present exemplary embodiment, the amount of drying air blown out by the nozzles 2, 3 is about 150 m^3 per 10,000 eggs per hour. The nozzles 2, 3 are arranged relatively freely and each comprise a substantially rectangular outflow opening 7 of about $1 \times 10 \text{ mm}$. Optionally, the slits can have a slightly deviant form, for instance a lesser width halfway the outflow opening 7. Because the nozzles 2, 3 are freely arranged, air from above the nozzles 2, 3 can be entrained with the drying air blown out by the nozzles 2, 3. The free arrangement moreover results in a lower noise level. The substantially rectangular outflow opening 7 is clearly visible in the bottom view of Fig. 5 of a portion of the drying apparatus, where, for the sake of clarity, the drying line 10, which is arranged straight above the row of rollers 6 which traverses the conveying path L, has been omitted since that line 10 is intended for an adjacent row of rollers. The longitudinal direction of the outflow opening 7 lies in an imaginary vertical plane which extends perpendicularly to the conveying direction T of the conveyor 1. With outflow openings 7 of such design, an excellent drying result is obtained when the overpressure of the drying air to be blown out is in the range of at least about 100 mbar ($= 10,000 \text{ Pa}$). Partly as a result of this considerably higher overpressure than was conventional in the prior art, and the considerably lower flow rate, upon visual inspection an excellent drying result of at least about 90% dry surface is observed, with the noise level being relatively low (about 80 decibels). As a consequence of the much lower noise level, the en-

casing which the prior art apparatuses necessitated can be omitted in the apparatus according to the invention.

[0016] Figs. 1 and 2 represent a single drying section. In order to obtain an optimum drying result, it is particularly favorable when the nozzles 2, 3 are arranged in two drying sections above the conveyor, while between these sections, viewed in the conveying direction T, there is a certain distance, which is such that the water still present after the first drying section is redistributed over the eggs E. In the second drying section, this redistributed water can be removed. The above-mentioned optimum drying result is obtained, for instance, when the length A of the drying sections, viewed in the conveying direction T, is about 800 mm, the distance between the two drying sections being about 500 mm.

[0017] Optionally, the apparatus may comprise a heating element arranged for heating the drying air to be blown out by the nozzles. In that way, the moisture absorbing capacity of the drying air is further increased. Further, optionally, under the conveyor 1 suction openings could be provided which are connected to a suction pump for the purpose of creating a reduced pressure under the conveyor 1. Such a reduced pressure stimulates the evaporation of moisture and hence the drying of the eggs.

[0018] In some cases, there is a chance that a drop of moisture adheres to the underside of the eggs. Figs. 6 and 7 show partly schematic elevations of a drop extraction unit which may be arranged under the rollers 6 of the conveyor 1. The drop extraction unit comprises a number of tubes 15 each having their ends connected with two discs 16 which are rotatably arranged. The tubes 15 are located on a pitch circle at regular angular distances from each other, the center of this pitch circle coinciding with the center of rotation of the rotatable disc 16. Fig. 6 shows only the left portion of the drop extraction unit, the view being against the conveying direction T of the conveyor 1. In the tubes 15, on the radially outward sides thereof, openings 17 are provided via which air can be drawn in or blown off. For the purpose of discharging and optionally supplying air to the interior of the tube 15, stationary discs 18 are arranged next to the rotatable discs 16. These stationary discs 18 are provided with two openings 19, 20 which are connected to an overpressure air source and a reduced pressure air source, respectively, for instance the pressure and suction line of an air compressor. Provided in the rotary discs 16 are bores 23 which pass through the disc 16 and terminate in the interior of the tubes 15. When during rotation a bore 23 passes the opening 19 or the opening 20 in the stationary disc, this creates an overpressure and a reduced pressure, respectively, in the tube 15 in question. As a result, air will be blown out via the openings 17 or be drawn into the tube 15. As is clearly visible in Fig. 7, the pressure opening 19 in the disc 18 is in a lower position, while the suction opening 20 in the stationary disc 18 is in an upper position. Accordingly, when a tube 15 rotates into the upper position, a re-

duced pressure will be created therein, yielding an air flow from the outside via the opening 17 in the direction of the interior of the tube 15 in question. Because the tube 15 moves just below the surface of the conveyor 1, the suction opening 17 is located quite close to the underside of an egg E disposed on the conveyor 1. A drop D, if any, which clings to the underside of the egg E is then sucked from the egg E via the opening 17. The drop D ends up in the interior of the tube 15 which rotates further. When the tube 15 enters the lower region of the circle it traverses, the interior of the tube 15 is brought into fluid communication with the pressure opening 19 in the stationary disc 18. As a result, air present in the tube 15 is blown away via the openings 17 while entraining any moisture present in the tube 15.

[0019] For driving the rotatable disc 16, a separate driving motor can be utilized. It is preferred, however, when the drive of the rotatable discs 16 is coupled with the drive of the conveyor 1. This can be simply done, for instance, by providing the rotatable discs 16 with a gear wheel profile having such dimensions that the shafts 5 on which the rollers 6 are mounted can cooperate therewith. In that way, the conveyor 1 drives the rotatable discs 16, so that the position of the tubes 15 is always fixed relative to the shafts 5 of the conveyor 1.

[0020] Optionally, between the rollers 6 located on one shaft 5, air guiding profiles could be arranged for guiding the blown-out drying air around the egg E. In that way, a still faster drying of the eggs can be accomplished.

[0021] It will be understood that the invention is not limited to the exemplary embodiment described, but that various alterations are possible within the scope of the invention. Thus, use could be made of nozzles having a curved outflow opening of a total length corresponding approximately to the length of the largest egg that may occur, the curved outflow opening thereby following approximately the curvature of the ellipsoid product, so that the drying air blown out thereby is both directed substantially perpendicularly to the surface of the product and blows directly upon the points of the ellipsoid product. It will be understood that the apparatus is also suitable for drying ellipsoid fruit products, such as lemons, kiwis and the like. Although in the present exemplary embodiments the nozzles are fixedly arranged, a movable arrangement of the nozzles is also possible.

Claims

1. An apparatus for drying substantially ellipsoid products, such as, for instance, eggs (E), which are conveyed over a conveying path (L) by means of a conveyor (1), the apparatus comprising a number of nozzles (2, 3) which are connected to a compressor, the nozzles (2, 3) being designed and movably or immovably arranged relative to the conveying path (L) such that the drying air blown out by these noz-

- zles (2, 3) has a main flow direction (D) which is both directed substantially perpendicularly to the surface (S) of a passing product (E) and blows directly onto at least the areas adjacent the points (P) of a passing ellipsoid product (E).
2. An apparatus according to claim 1, characterized in that the conveyor (1) is designed as a roller conveyor (1).
 3. An apparatus according to claim 2, characterized in that the rollers (4), for the purpose of their rotation, are driven such that the movement of the upwardly facing side of the products relative to the conveyor (1), which movement arises as a result of the rotation (R), has a direction which is equal to the conveying direction (T) of the conveyor (1).
 4. An apparatus according to at least claim 3, characterized in that each shaft (5) of the conveyor (1) that is provided with rollers (6) comprises a gear wheel (8), the conveyor (1) being provided, at least adjacent the drying apparatus, with a gear rack (9) which engages the upwardly facing side of the gear wheels.
 5. An apparatus according to any one of claims 2-4, characterized in that on opposite sides obliquely above each row of rollers (6) of the roller conveyor (1) extending in the conveying direction, nozzles (2, 3) are arranged, the main flow direction (D) of the drying air blown out by the nozzles (2, 3) including an angle (α) with the rotation axis (5) of the rollers (6) of the roller conveyor (1) which is in the range of 10° - 85° .
 6. An apparatus according to claim 5, characterized in that the nozzles (2) which, viewed in the conveying direction (T), are arranged on the left above a given row of rollers (6), are arranged so as to be staggered in the conveying direction (T) relative to the nozzles (3) which, viewed in the conveying direction (T), are arranged on the right above a given row of rollers (6).
 7. An apparatus according to claim 6, characterized in that the roller conveyor (1) comprises a plurality of rows of rollers (6) extending in the conveying direction (T), while the nozzles (2, 3) which, viewed in a direction transverse to the conveying direction and parallel to the plane of conveyance, are located in one line, all blow to the same side, and the nozzles (2, 3) succeeding each other in the conveying direction, lying in one line in transverse direction, alternately blow to the left and to the right.
 8. An apparatus according to any one of the preceding claims, characterized in that the amount of drying air blown out by the nozzles (2, 3) is about 150 m^3 per 10,000 products per hour.
 9. An apparatus according to any one of the preceding claims, characterized in that the nozzles (2, 3) are freely arranged and are each provided with a substantially rectangular outflow opening (7) of about $1 \times 10 \text{ mm}$.
 10. An apparatus according to claim 9, characterized in that the longitudinal direction of the outflow opening (7) lies in an imaginary vertical plane which extends substantially perpendicularly to the conveying direction (T) of the conveyor (1).
 11. An apparatus according to at least claims 8 and 9, characterized in that the overpressure of the compressor lies in the range of from 100 to 500 mbar (= 10,000-50,000 Pa).
 12. An apparatus according to any one of the preceding claims, characterized in that the nozzles (2, 3) are arranged in two drying sections above the conveyor (1), while between these sections, viewed in the conveying direction, there is a certain distance, which is such that the water still present after the first drying section is redistributed over the eggs.
 13. An apparatus according to claim 12, characterized in that the length (A) of the drying sections, viewed in the conveying direction (T), is about 800 mm, while the distance between the two drying sections is about 500 mm.
 14. An apparatus according to at least claim 2, characterized in that the rollers (6) are drivable for rotation, the rotational speed of the rollers (6) and the distance of the nozzles (2, 3) being adjusted to each other such that each product (E), after passing the nozzles (2, 3), does not have any surface portion (S), at least adjacent the points, that has not been subject to direct blowing by drying air from one of the nozzles (2, 3).
 15. An apparatus according to any one of the preceding claims, characterized in that it comprises a heating element arranged for heating the air to be blown out by the nozzles.
 16. An apparatus according to at least claim 2, characterized in that between the rollers (6) located on one shaft (5), air guiding profiles are arranged which guide blown drying air around the product (E).
 17. An apparatus according to any one of the preceding claims, characterized in that under the conveyor (1) suction openings (17) are provided which are connected to a suction pump for creating a reduced

pressure under the conveyor (1).

- 18.** An apparatus according to claim 17, characterized in that the suction openings (17) are provided in tubes (15) which are rotatably arranged and which in an upper rotational position are brought into fluid communication with a reduced pressure source and in another rotational position are brought into fluid communication with an overpressure source.

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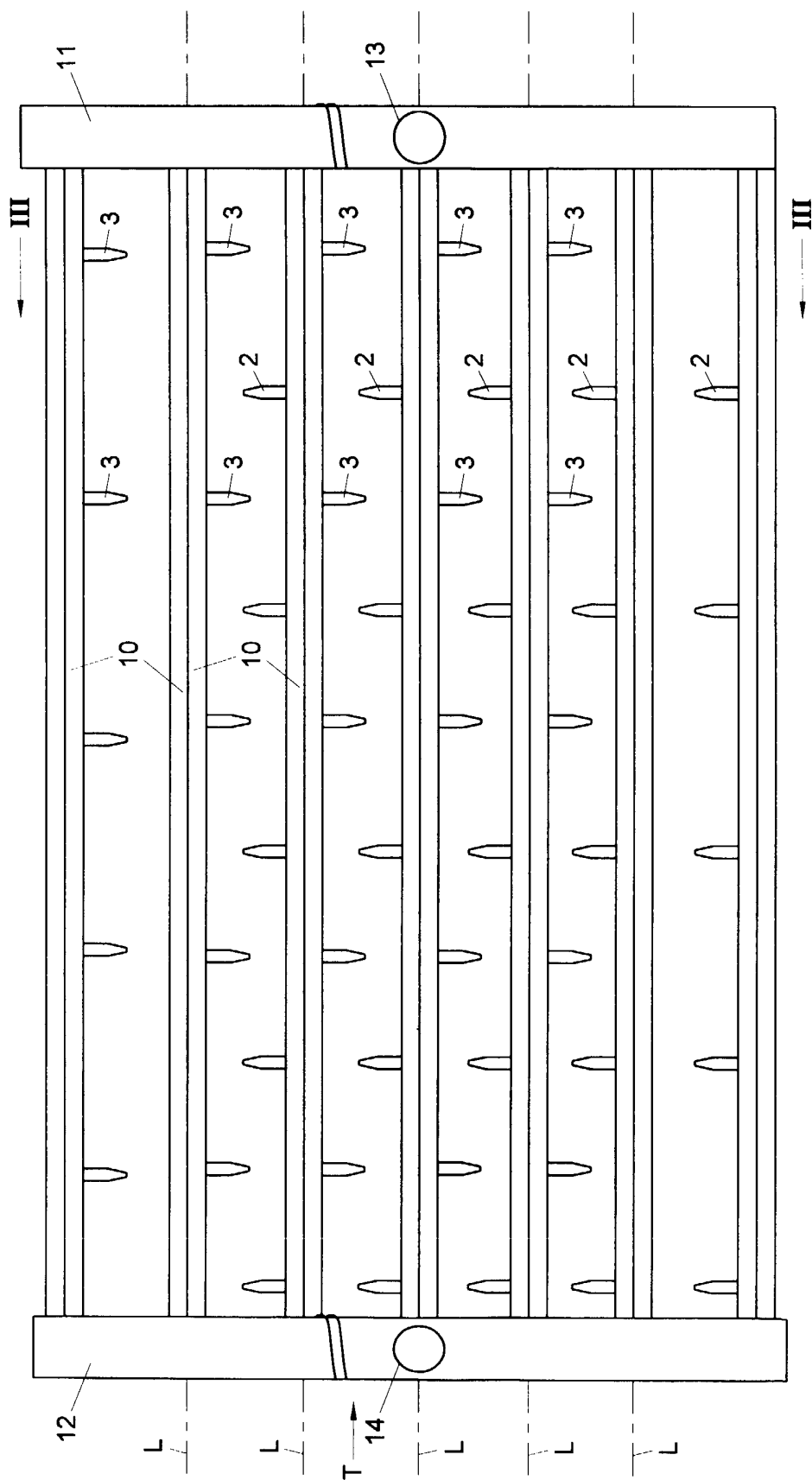


Fig. 1

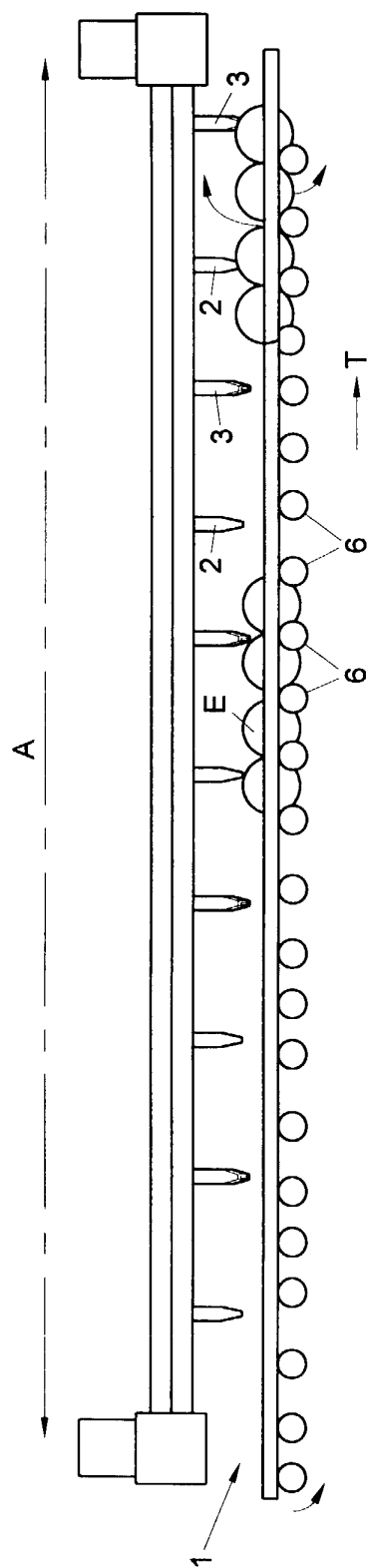


Fig. 2

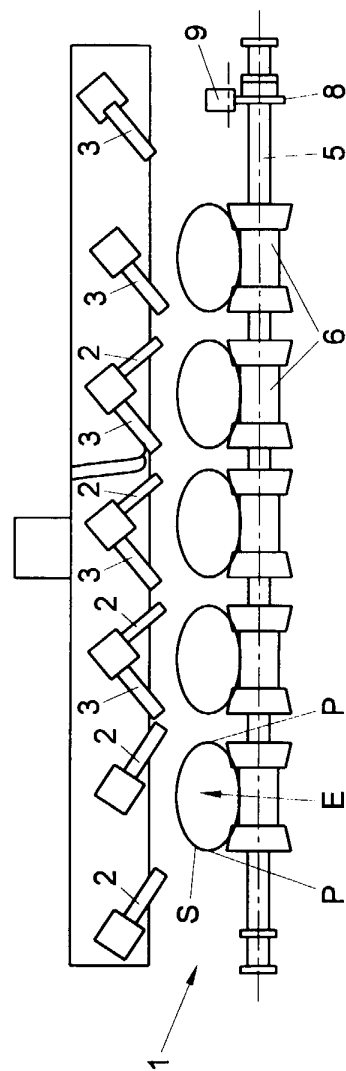


Fig. 3

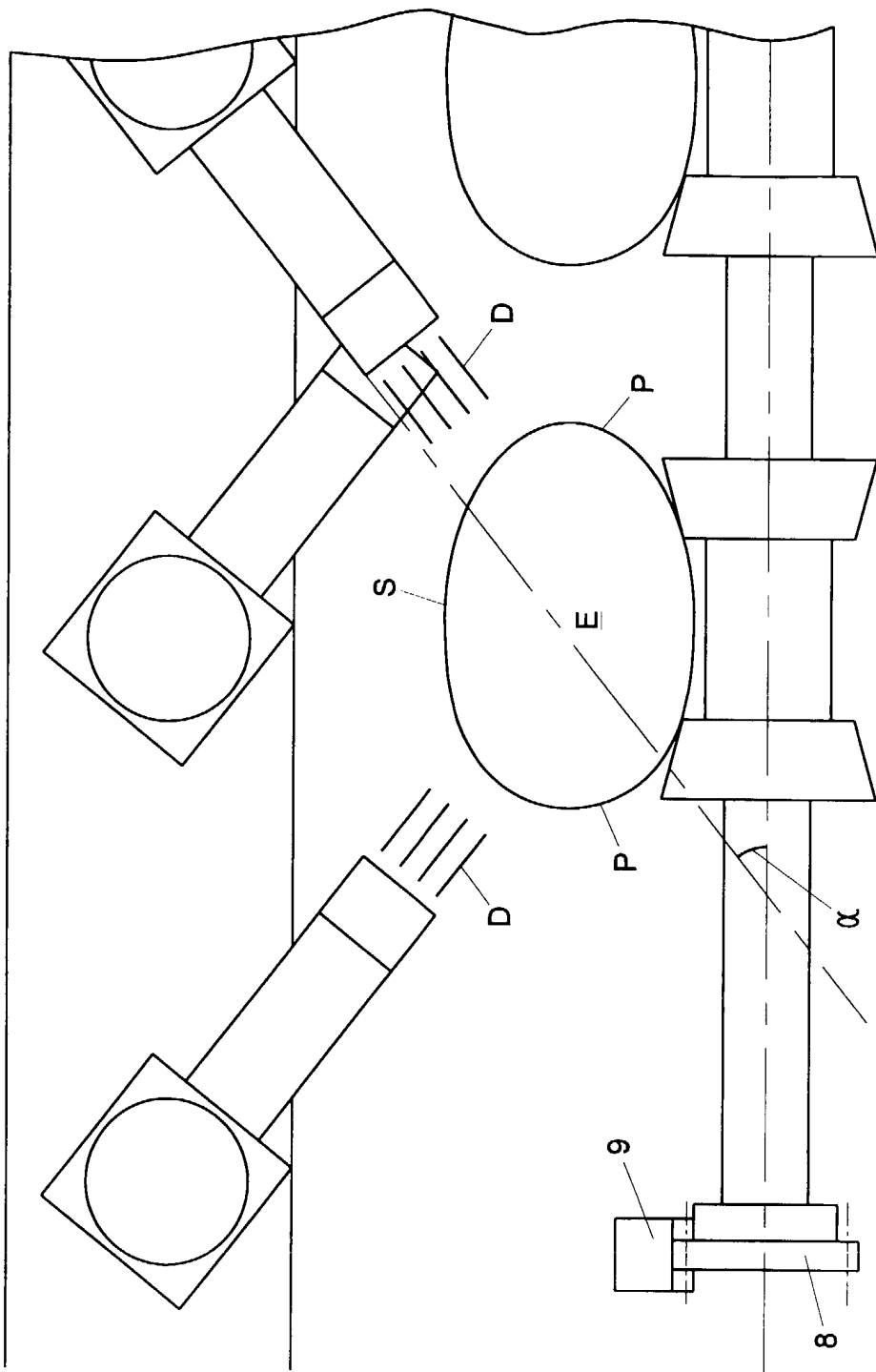


Fig. 4

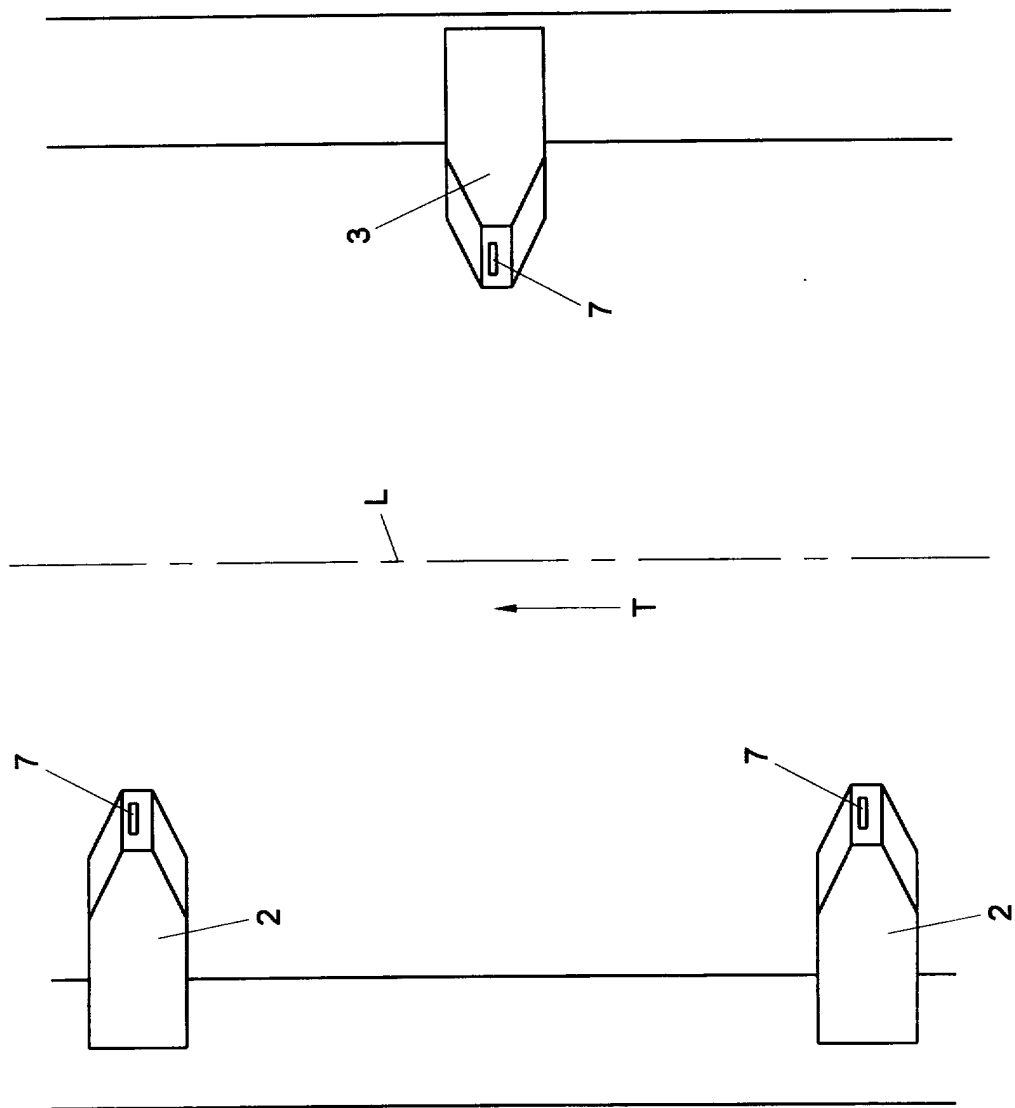


Fig. 5

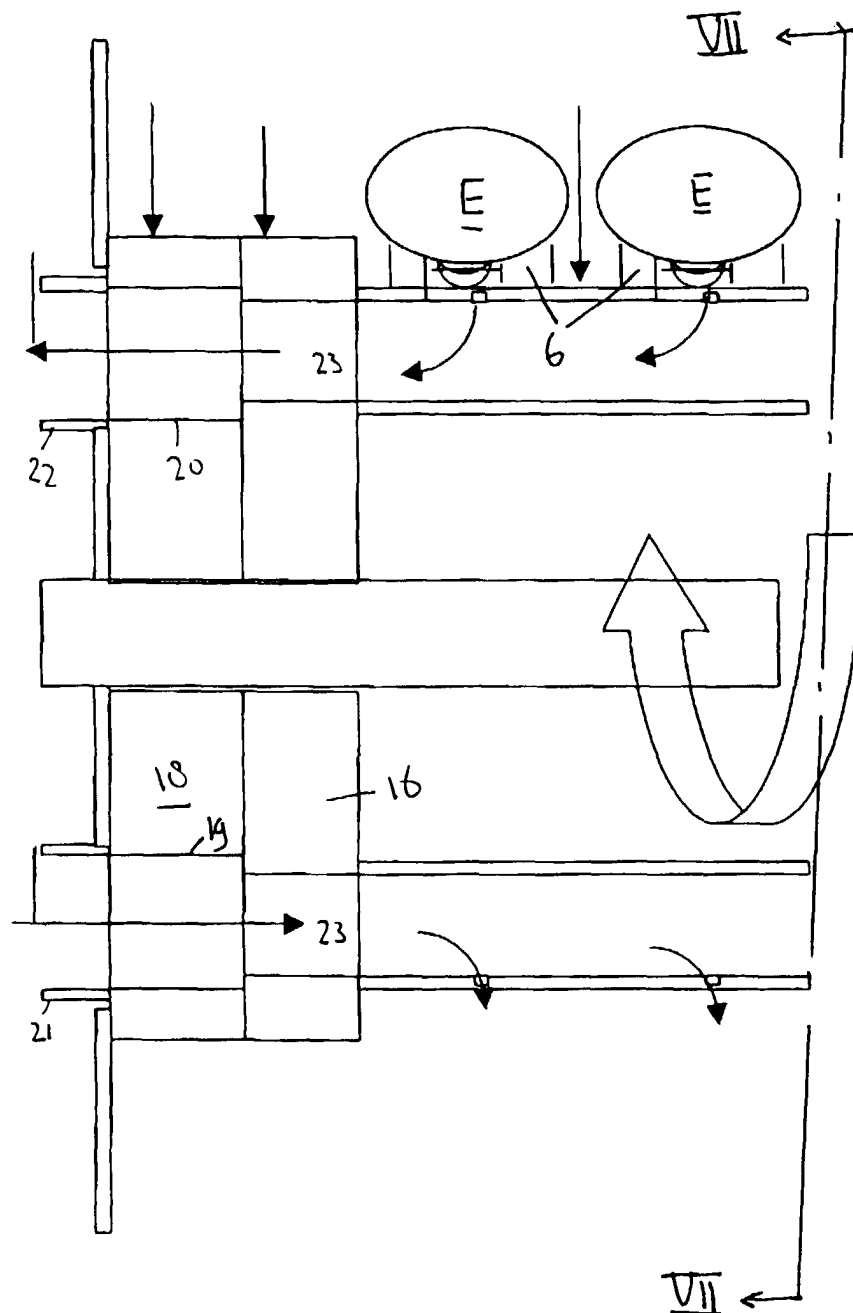


Fig. 6

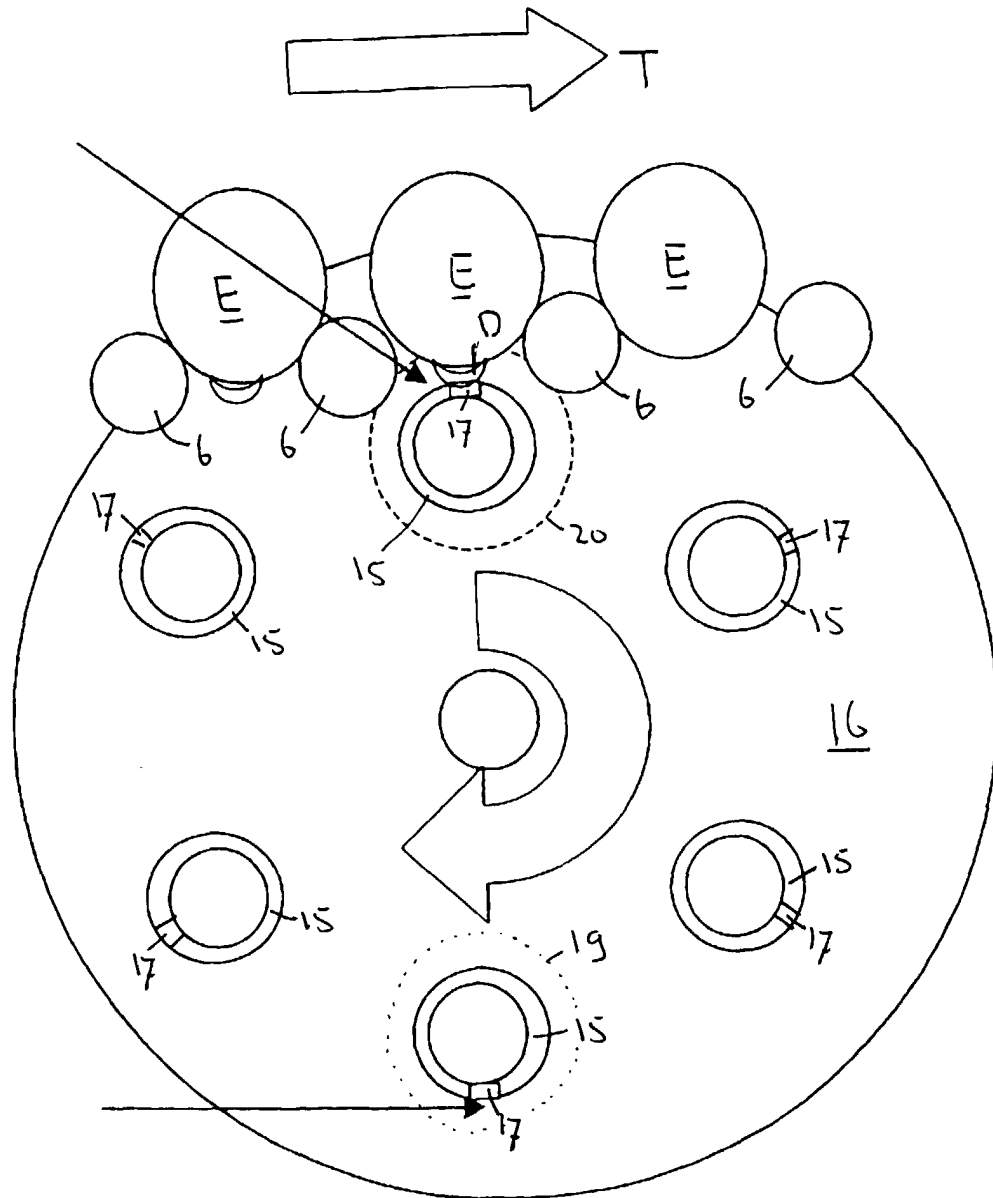


Fig. 7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 20 2627

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.7)
A	US 1 711 763 A (WHITE) 7 May 1929 (1929-05-07) * the whole document *	1,2,5	F26B15/12 F26B21/00
A	US 1 531 865 A (MCNIEL) 31 March 1925 (1925-03-31) * the whole document *	1,2	
A	US 4 777 734 A (ELFERINK HENDRIK) 18 October 1988 (1988-10-18) * the whole document *	1,2,15, 17	
A	US 1 665 627 A (HEIDENHAIN) 10 April 1928 (1928-04-10) * the whole document *	1	
A	EP 0 533 406 A (LIVERSIDGE DAVID CHARLES) 24 March 1993 (1993-03-24) * the whole document *	1,5	
D,A	US 4 173 831 A (MCCORD ROBERT C) 13 November 1979 (1979-11-13) * the whole document *	1,2	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F26B
D,A	US 4 750 277 A (KUHL HENRY Y) 14 June 1988 (1988-06-14) * the whole document *	1	
A	US 2 481 130 A (LINDEMUTH) 6 September 1949 (1949-09-06) * the whole document *	2-4	
A	US 2 714 257 A (READING) 2 August 1955 (1955-08-02) * the whole document *	1,16	
		-/--	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 January 2000	Examiner Silvis, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 20 2627

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.7)
A	GB 852 655 A (THE SPOONER DRYER & ENGINEERING CO. LIMITED) 26 October 1960 (1960-10-26) * the whole document *	17	
A	US 4 189 849 A (DER SCHOOT JELLE VAN) 26 February 1980 (1980-02-26)		
A	CH 666 341 A (INAUEN MASCH AG) 15 July 1988 (1988-07-15)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
Place of search THE HAGUE		Date of completion of the search 14 January 2000	Examiner Silvis, H
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03/82 (P4/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 20 2627

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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14-01-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1711763 A	07-05-1929	NONE	
US 1531865 A	31-03-1925	NONE	
US 4777734 A	18-10-1988	JP 2000416 A	05-01-1990
US 1665627 A	10-04-1928	NONE	
EP 0533406 A	24-03-1993	DE 69216335 D	13-02-1997
		JP 5194014 A	03-08-1993
		US 5388346 A	14-02-1995
US 4173831 A	13-11-1979	NONE	
US 4750277 A	14-06-1988	NL 8602152 A,B,	02-11-1987
US 2481130 A	06-09-1949	NONE	
US 2714257 A	02-08-1955	NONE	
GB 852655 A		NONE	
US 4189849 A	26-02-1980	NONE	
CH 666341 A	15-07-1988	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82