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(54) **COOLING CYLINDER FOR ICE-FLAKE MAKING APPARATUS**

KÜHLZYLINDER FÜR EINE VORRICHTUNG ZUR HERSTELLUNG VON EISFLOCKEN

CYLINDRE DE REFROIDISSEMENT POUR MACHINE A GLACE EN PAILLETTES

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Description

[0001] The invention relates to a cooling cylinder for forming ice flakes or granular ice according to the preamble of claim 1. Such a cooling cylinder is known for example from US-A-2001/0 045 275.

[0002] This type of ice, which is widely used to keep at a low temperature food inside containers for display or transportation, is obtained by means of apparatus which use a cooling cylinder such as, for example, that forming the subject of Italian Utility Model No. 0216265.

[0003] In short it may be stated that the cylinder of these apparatus consists of a central body in the form of a tubular interspace which is closed at the ends by two flanges; the interspace has, arranged inside it, radial baffles which define a channel extending along the generatrices of the cylinder. The refrigerating fluid is made to evaporate inside the channel and thus cools the outer surface of the cylinder onto which the water is sprayed: the latter freezes and is scraped off in the form of flakes by a knife rotating about the cylinder.

[0004] The known apparatus described above is advantageous from a constructional point of view since the body of the cylinder may be manufactured by means of single casting of aluminium or the like: on the other hand, however, this constructional solution requires seals between the body of the cylinder and the flanges arranged at the ends in order to prevent leaks of the circulating fluid.

[0005] Furthermore, the Applicant is of the opinion that it is advantageous to increase the heat exchange of the refrigerating fluid with the cooling cylinder since in this way it is possible to increase the hourly production of ice, all other conditions being equal, such as for example the fluid and water flowrate, the dimensions of the cylinder, etc.

[0006] The technical problem which forms the basis of the present invention is therefore that of achieving these results: the idea for solving this problem consists in providing a novel cooling cylinder in which the path along which the refrigerating fluid flows has a winding progression with coil-like sections, which are preferably short compared to the height of the cylinder, such that the turbulence of the flow and consequently also the heat exchange increases.

[0007] According to the invention this problem is solved by a cooling cylinder having the features of claim 1.

[0008] Preferably the flow is obtained with a channel formed on the surface of the cylinder body, closed externally by a tubular jacket mounted on the aforementioned body.

[0009] These and other characteristic features of the invention will be understood more clearly in the light of the description which is provided hereinbelow, relating to a preferred and non-exclusive example of embodiment, illustrated in the accompanying drawings in which:

- Fig. 1 shows a cooling cylinder according to the invention;
- Fig. 2 shows a cross-section through the above cylinder, along the plane A-A of Fig. 1;
- Fig. 3 shows in detail the outer surface of the cooling cylinder according to Fig. 1;
- Fig. 4 shows the planar extension of the surface according to Fig. 3;
- Fig. 5 shows a horizontal cross-section through the apparatus according to Fig. 1 along the plane B-B;
- Fig. 6 shows another application of the invention.

[0010] With reference to these figures, these show an overall view of a cooling cylinder 10, according to the invention, which is intended to be used in combination with a compressor and a condenser, not shown in the drawings, in accordance with the usual operating principle of known refrigerating units.

[0011] The cylinder 10 acts instead as an evaporator of the unit and comprises a central body 20 with a cylindrical geometry, to which a jacket 40 is joined externally; in accordance with a preferred embodiment, the cylindrical body 20 is made of high-impact strength steel (instead of aluminium) and the jacket 40 is welded onto it at the ends so as not to require seals for sealing thereof.

[0012] Alternatively, the cylindrical body 20 may be made of aluminium and the jacket 40 shrunk on it, while the seal between them is ensured by means of sealing gaskets.

[0013] Respective flanges 80 and 81 are mounted on the top and bottom ends of the body 20, thus closing off the space inside them; these flanges are constrained together with isolating spacers 82 and 83 by means of bolts 84 and the upper flange has a neck 86 through which two pipes 22, 24 for entry and return, respectively, of a refrigerating fluid pass.

[0014] A collar 87 is mounted on the outside of the neck 86 and is able to rotate on revolving bearings 88; a gear wheel 89 is fixed (by means of screws visible in Fig. 2) around the collar 87, while a scraper knife 90 projects radially therefrom; the knife has a series of comb-like blades 91 of the known type and is connected at the bottom by means of a radial tie-rod 92 to a rotating ring 93, so as to be free to rotate with respect to the vertical axis of the cylinder.

[0015] For this purpose, the apparatus in which the cooling cylinder 10 is used has a motor-driven pinion (not shown in the drawings) which meshes with the gear wheel 89, causing rotation of the knife 90 so as to scrape off the ice.

[0016] The latter is formed as a result of freezing of the water which is sprayed onto the outside of the jacket 40 by means of a pipe (not shown in the drawings) which rotates about the cylindrical body 20, integrally with the knife 91.

[0017] This cooling action is achieved as a result of evaporation of the refrigerating fluid along a channel 50 (visible in detail in Figs. 3 and 4) formed on the outer surface of the cylindrical body 20; as can be seen, this

channel 50 has a coil-like progression along superimposed horizontal circular bands 55a, 55b, 55c, 55d which are connected together by means of vertical sections 53.

[0018] The jacket 40 is joined to the cylinder 20 so that the respective surfaces are juxtaposed and the channel 50 closed on the outside, thus defining a continuous path for the refrigerating fluid, at the ends of which an inlet 61 and an outlet 62 connected respectively to the pipes 22 and 24 are situated.

[0019] Therefore, the refrigerating fluid supplied by means of a compressor (not shown in the drawings) reaches the cylinder 20 in the liquid condition, passes into the pipe 22, enters the inlet 61 which is situated at the bottom of the body 20 (c.f. Fig. 3) and flows along the channel 50 along which it evaporates, cooling the jacket 40; when it reaches the outlet 62 it is in the gaseous state and is evacuated from the top via the return pipe 24.

[0020] From the explanation provided hitherto it is easy to understand the operating principle of the invention.

[0021] In fact the methods with which the ice is formed are substantially similar to the known methods, in the sense that the water is sprayed onto the outer surface of the jacket 40 and freezes in contact with it when it is cooled from the inside by the refrigerating fluid which flows inside the channel 50; the ice is scraped off by the blades 91 of the knife 90 which rotates about the axis of the cylinder 20 as a result of operation by means of the gear wheel 89.

[0022] The coil-like progression of the channel 50 which extends in the form of the various circular bands 55a, b, c, d causes a turbulent flow of the refrigerating fluid, thus favouring the heat exchange for cooling the jacket 40; in this connection it is important to note the considerable difference from the Italian Utility Model referred to further above in which the refrigerating fluid flows along straight sections oriented in the manner of the generatrices of the cooling cylinder so as to produce in fact a laminar movement without turbulence.

[0023] Consequently the efficiency of the cylinder 10 according to the present invention is greater, all other conditions being equal, than that of the already mentioned known cylinder.

[0024] Variations of the invention with respect to that described hitherto are nevertheless possible.

[0025] For example, a possible modification consists in forming the path for the refrigerating fluid by means of a raised rib on the wall of the body 20, instead of forming thereon the channel 50 as in the example shown in the drawings; it is obvious, however, that by mounting the jacket 40 externally, a fluid flow path equivalent to that already seen is obtained.

[0026] It moreover needs to be mentioned that the channel 50 (or aforementioned rib) may be formed on the jacket 40 instead of on the cylinder 20, which in this case will instead be smooth; in other words it is possible to reverse the position of the smooth or channelled surfaces which together form the coil-like flow path of the refrigerating fluid.

[0027] This path may obviously be configured differently provided that it is able to promote the turbulence and therefore the heat exchange for cooling the jacket 40 of the cylinder 10; for example, instead of following the circular bands 55a, 55b, 55c, 55d which extend horizontally with respect to the cylindrical body 20, it could be possible to form a channel 50 with vertical sections, namely arranged along the generatrices of the body 20 as in the already mentioned Italian Utility Model, but with the coil-like progression explained above.

[0028] Finally it is possible that the principle of the invention may also be applied to apparatus of a type different that considered here.

[0029] This possibility is illustrated in the last figure which shows (with a part removed) the cooling cylinder 100 of a granular ice making machine; for the sake of simplicity, in this variant the elements common with the previous example have been indicated by the prefix "1".

[0030] This machine comprises a tubular body 120 on the outer surface of which a channel 150 identical to that formed on the cylindrical body 20 seen above is formed; a rotating screw (not shown in the drawing) is housed inside the body 120.

[0031] A jacket or sleeve 140 is mounted on the outside of the tubular body 120 and closes off the channel 150 so as to define together therewith a path in which the refrigerating fluid supplied by an output pipe 122 and a return pipe 124 flows.

[0032] During operation of the apparatus, the bottom part of the tubular body 120 is filled with water supplied by a pipe 125 and raised upwards by the screw, while at the same time the refrigerating fluid circulates inside the channel 150 and, evaporating, cools the wall of the tubular body 120.

[0033] As the water rises, it flows over the inner surface of the body 120, freezing, and is then scraped off by the screw which conveys the ice towards the top end of the tubular body 120, from which it emerges in the form of flakes.

[0034] Basically, in this case the ice is formed inside the cylinder, instead of outside, as in the example of Figs. 1-5; the operating principle and the advantages achieved by the channel are in any case the same.

[0035] It is therefore clear that the teaching of the invention is applicable with success to all ice-making machines where a wall is cooled by means of heat exchange with a refrigerating fluid which flows in contact with the said wall.

Claims

1. Cooling cylinder for forming granular ice, comprising a cylindrical body (20), a jacket (40) mounted on the outside thereof, a flow path (50) for refrigerating fluid defined between the outer surface of the cylindrical body (20) and the jacket (40), said flow path (50) being formed by superimposed horizontal circumfer-

ential bands (55a, 55b, 55c, 55d) which are connected together by means of vertical sections (53), **characterised in that** each of said horizontal circumferential bands (55a, 55b, 55c, 55d) has a coil-like progression.

2. Cylinder according to Claim 1, in which said path (50) extends peripherally with respect to the cylindrical body (20).

3. Cylinder according to Claims 1 and 2, in which said path (50) extends mainly in a circumferential direction with respect to the cylindrical body (20).

4. Cylinder according to Claim 1, in which said path comprises a channel (50) formed on the outer surface of the cylindrical body (20) and the jacket (40) joined thereto.

5. Cylinder according to Claim 1, in which said path comprises a channel (50) formed on the inner surface of the jacket (40) and the smooth outer surface of the cylindrical body (20).

6. Cylinder according to Claims 4 and 5, in which the jacket (40) is welded to the cylindrical body (20) in a sealed manner.

7. Ice-flake making apparatus, **characterized in that** it comprises a cooling cylinder (10) in accordance with Claim 1 to 6.

8. Granular ice making apparatus comprising a cooling cylinder according to any claims 1 to 6 having a screw (125) arranged inside the cylindrical body of said cooling cylinder.

9. Apparatus according to Claim 8, in which said path comprises a channel (150) formed on the outer surface of the tubular body (120) and the jacket (140) joined thereto.

10. Apparatus according to Claim 8, in which said path comprises a channel (150) formed on the inner surface of the jacket (140) and the smooth outer surface of the tubular body (120).

11. Apparatus according to Claims 8, 9 or 10, in which the part of the tubular body (120) where said path is defined consists of a drum assembled on the rest of the tubular body (120).

12. Apparatus according to Claim 8, in which the drum is connected to the rest of the tubular body (120) by means of a joint with flanges or the like.

Patentansprüche

1. Kühlzylinder zum Bilden von körnigem Eis, aufweisend einen zylindrischen Körper (20), einen Mantel (40), der an einer Außenseite desselben angebracht ist, einen Strömungspfad (50) für Kühlfluid, der zwischen der äußeren Oberfläche des zylindrischen Körpers (20) und dem Mantel (40) definiert ist, wobei der Strömungspfad (50) gebildet ist durch überlagerte horizontale umfängliche Bänder (55a, 55b, 55c, 55d), die miteinander durch vertikale Abschnitte (53) verbunden sind,
dadurch gekennzeichnet, dass die horizontalen umfänglichen Bänder (55a, 55b, 55c, 55d) einen Kühlschlangen-artigen Verlauf haben.

2. Zylinder nach Anspruch 1, bei dem sich der Pfad (50) peripher bezogen auf den zylindrischen Körper (20) erstreckt.

3. Zylinder nach Anspruch 1 oder 2, bei dem sich der Pfad (50) hauptsächlich in einer Umfangsrichtung bezüglich des zylindrischen Körpers (20) erstreckt.

4. Zylinder nach Anspruch 1, bei dem der Pfad einen Kanal (50) aufweist, der an der Außenoberfläche des zylindrischen Körpers (20) und dem damit verbundenen Mantel (40) ausgebildet ist.

5. Zylinder nach Anspruch 1, bei dem der Pfad einen Kanal (50) aufweist, der an der Innenoberfläche des Mantels (40) und der glatten Außenoberfläche des zylindrischen Körpers (20) ausgebildet ist.

6. Zylinder nach Anspruch 4 oder 5, bei dem der Mantel (40) an den zylindrischen Körper (20) in einer abdichtenden Weise geschweißt ist.

7. Scherbeneisbildungsvorrichtung, **dadurch gekennzeichnet, dass** sie einen Kühlzylinder (10) gemäß einem der Ansprüche 1 bis 6 aufweist.

8. Korneisbildungsvorrichtung, aufweisend einen Kühlzylinder gemäß einem der Ansprüche 1 bis 6 mit einer Schraube (125), die innerhalb des zylindrischen Körpers des Kühlzylinder angeordnet ist.

9. Vorrichtung nach Anspruch 8, bei der der Pfad einen Kanal (150) aufweist, der an der Außenoberfläche des Röhrenkörpers (120) und des daran befestigten Mantels (140) ausgebildet ist.

10. Vorrichtung nach Anspruch 8, bei dem der Pfad einen Kanal (150) aufweist, der an der Innenoberfläche des Mantels (140) und der glatten Außenoberfläche des Röhrenkörpers (120) ausgebildet ist.

11. Vorrichtung nach Anspruch 8, 9 oder 10, bei dem

der Teil des Röhrenkörpers (120), an dem der Pfad definiert ist, aus einer Trommel besteht, die an dem Rest des Röhrenkörpers (120) angeordnet ist.

12. Vorrichtung nach Anspruch 8, bei dem die Trommel mit dem Rest des Röhrenkörpers (120) mittels einer Verbindung mit Flanschen oder dergleichen verbunden ist.

Revendications

1. Cylindre de refroidissement pour former de la glace granulaire, comprenant un corps cylindrique (20), une chemise (40) montée sur son extérieur, une trajectoire d'écoulement (50) pour réfrigérer le fluide, définie entre la surface externe du corps cylindrique (20) et la chemise (40), ladite trajectoire d'écoulement (50) étant formée par des bandes circonférentielles horizontales superposées (55a, 55b, 55c, 55d) qui sont raccordées ensemble au moyen de sections verticales (53),
caractérisé en ce que chacune des bandes circonférentielles horizontales (55a, 55b, 55c, 55d) a une compression de type hélicoïdal.

2. Cylindre selon la revendication 1, dans lequel ladite trajectoire (50) s'étend de manière périphérique par rapport au corps cylindrique (20).

3. Cylindre selon les revendications 1 et 2, dans lequel ladite trajectoire (50) s'étend principalement dans une direction circonférentielle par rapport au corps cylindrique (20).

4. Cylindre selon la revendication 1, dans lequel ladite trajectoire comprend un canal (50) formé sur la surface externe du corps cylindrique (20) et la chemise (40) assemblée à ce dernier.

5. Cylindre selon la revendication 1, dans lequel ladite trajectoire comprend un canal (50) formé sur la surface interne de la chemise (40) et la surface externe lisse du corps cylindrique (20).

6. Cylindre selon les revendications 4 et 5, dans lequel la chemise (40) est soudée au corps cylindrique (20) d'une manière étanche.

7. Appareil de fabrication de glace pilée, **caractérisé en ce qu'**il comprend un cylindre de refroidissement (10) selon les revendications 1 à 6.

8. Appareil de fabrication de glace granulaire comprenant un cylindre de refroidissement selon l'une quelconque des revendications 1 à 6, ayant une vis (125) agencée à l'intérieur du corps cylindrique dudit cylindre de refroidissement.

9. Appareil selon la revendication 8, dans lequel ladite trajectoire comprend un canal (150) formé sur la surface externe du corps tubulaire (120) et la chemise (140) assemblée à ce dernier.

10. Appareil selon la revendication 8, dans lequel ladite trajectoire comprend un canal (150) formé sur la surface interne de la chemise (140) et la surface externe lisse du corps tubulaire (120).

11. Appareil selon les revendications 8, 9 ou 10, dans lequel la partie du corps tubulaire (120) où ladite trajectoire est définie, constitue un tambour assemblé sur le reste du corps tubulaire (120).

12. Appareil selon la revendication 8, dans lequel le tambour est raccordé au reste du corps tubulaire (120) au moyen d'un joint avec des rebords ou similaire.

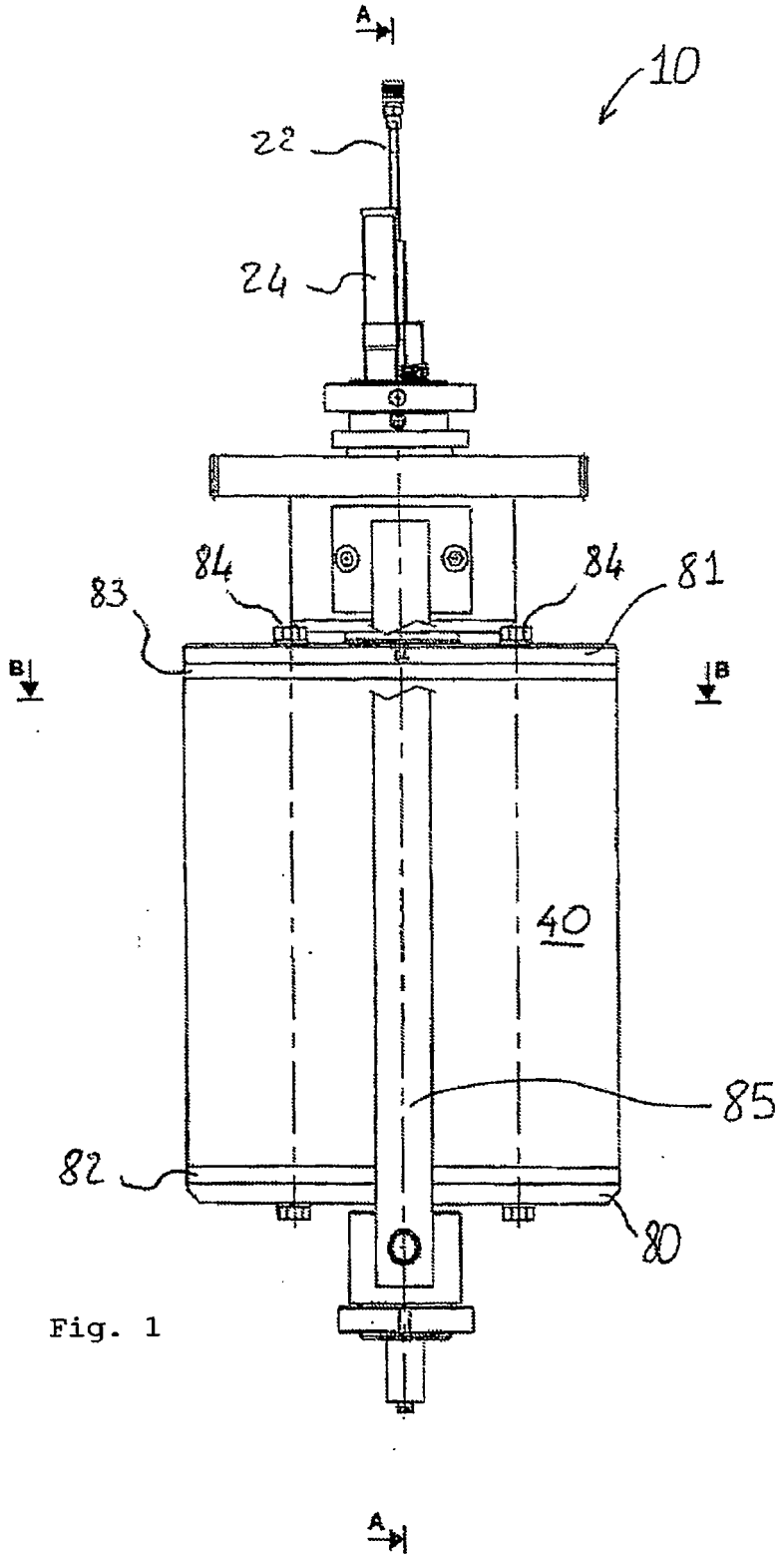

Fig. 1

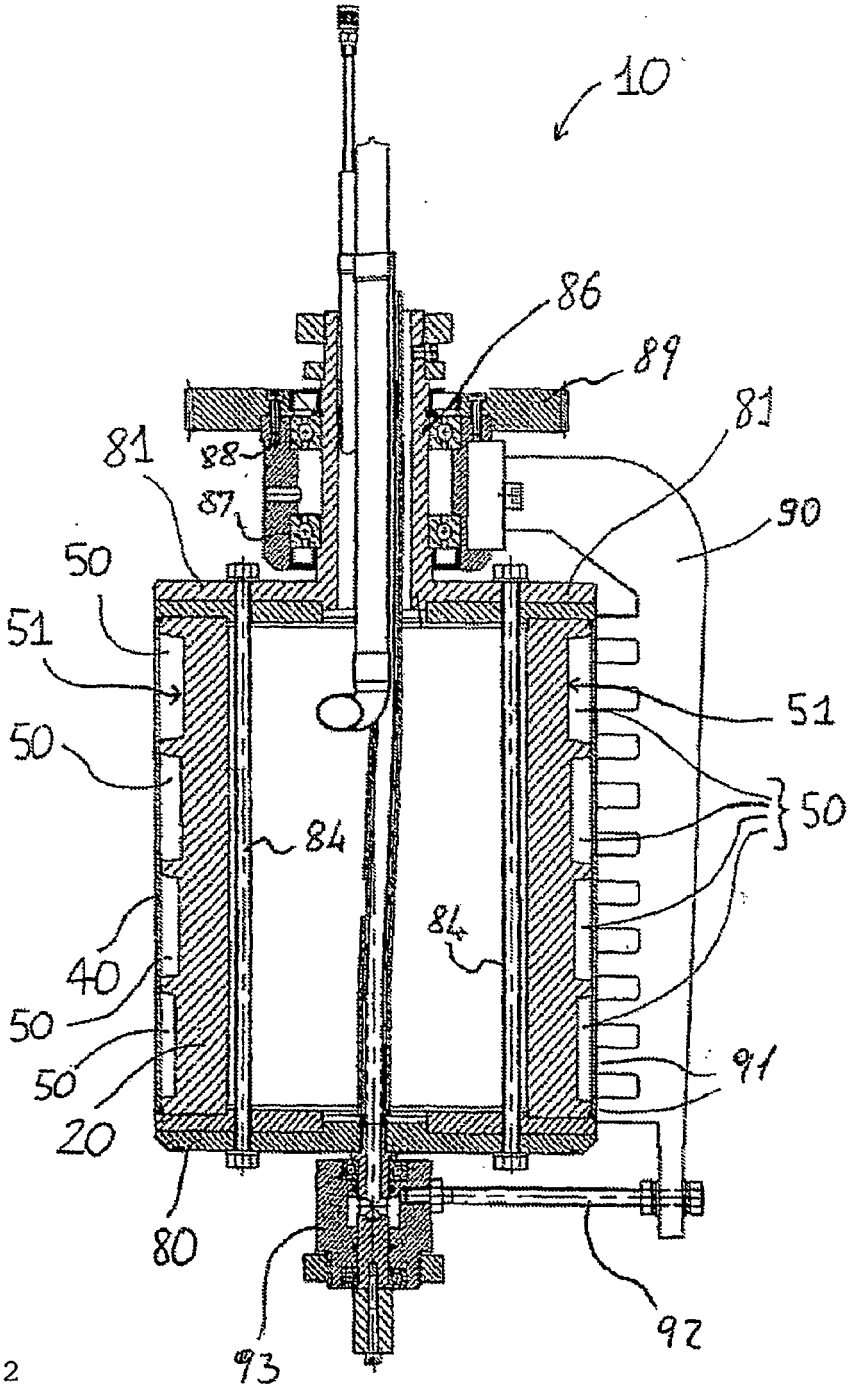

Fig. 2

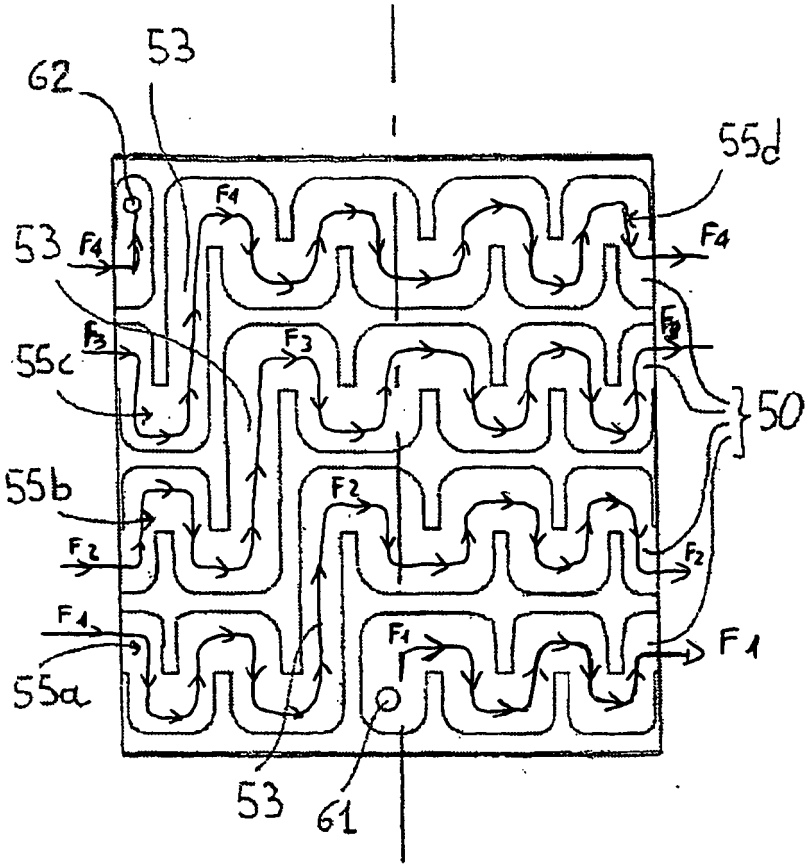

Fig. 3

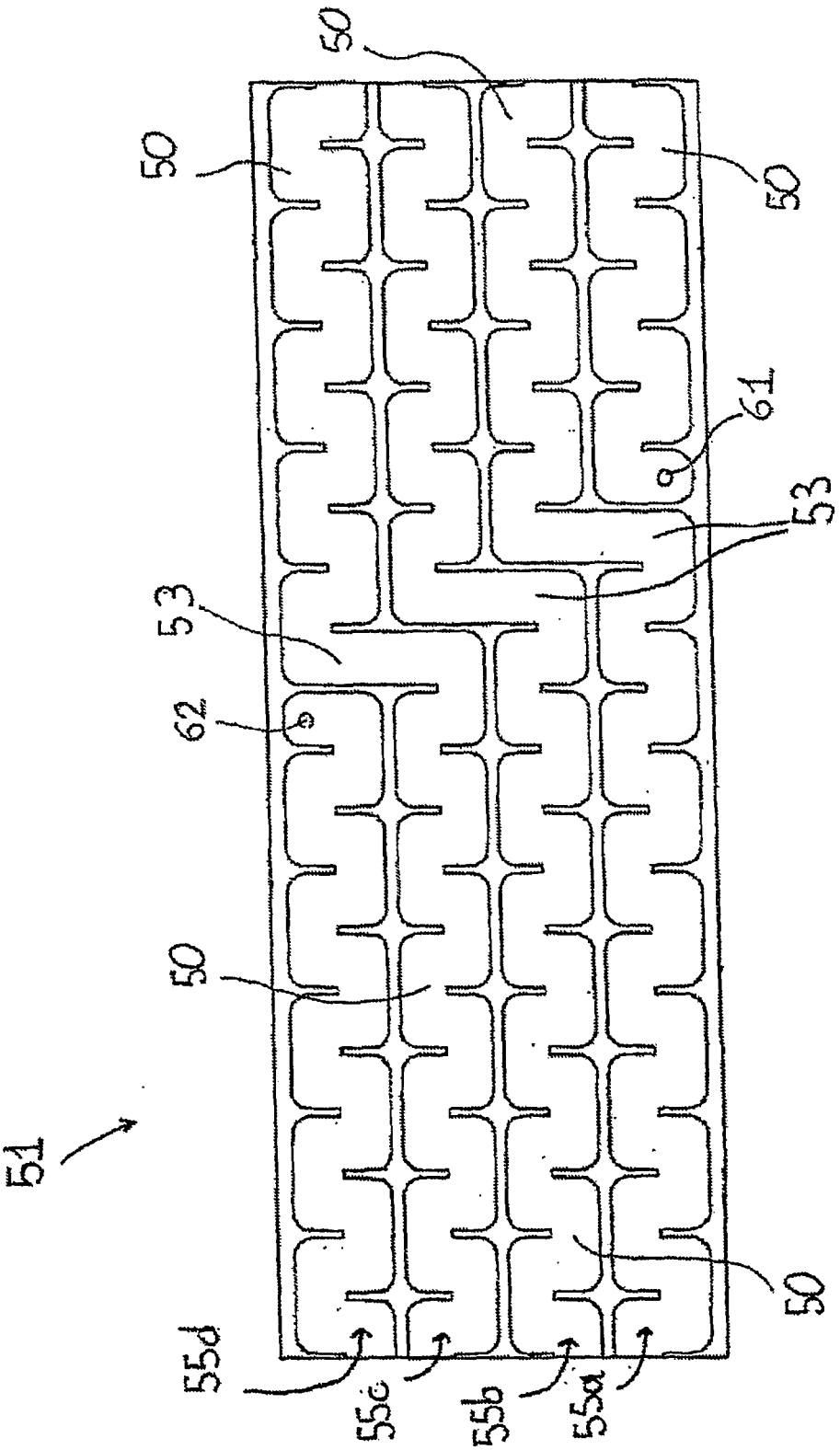

Fig. 4

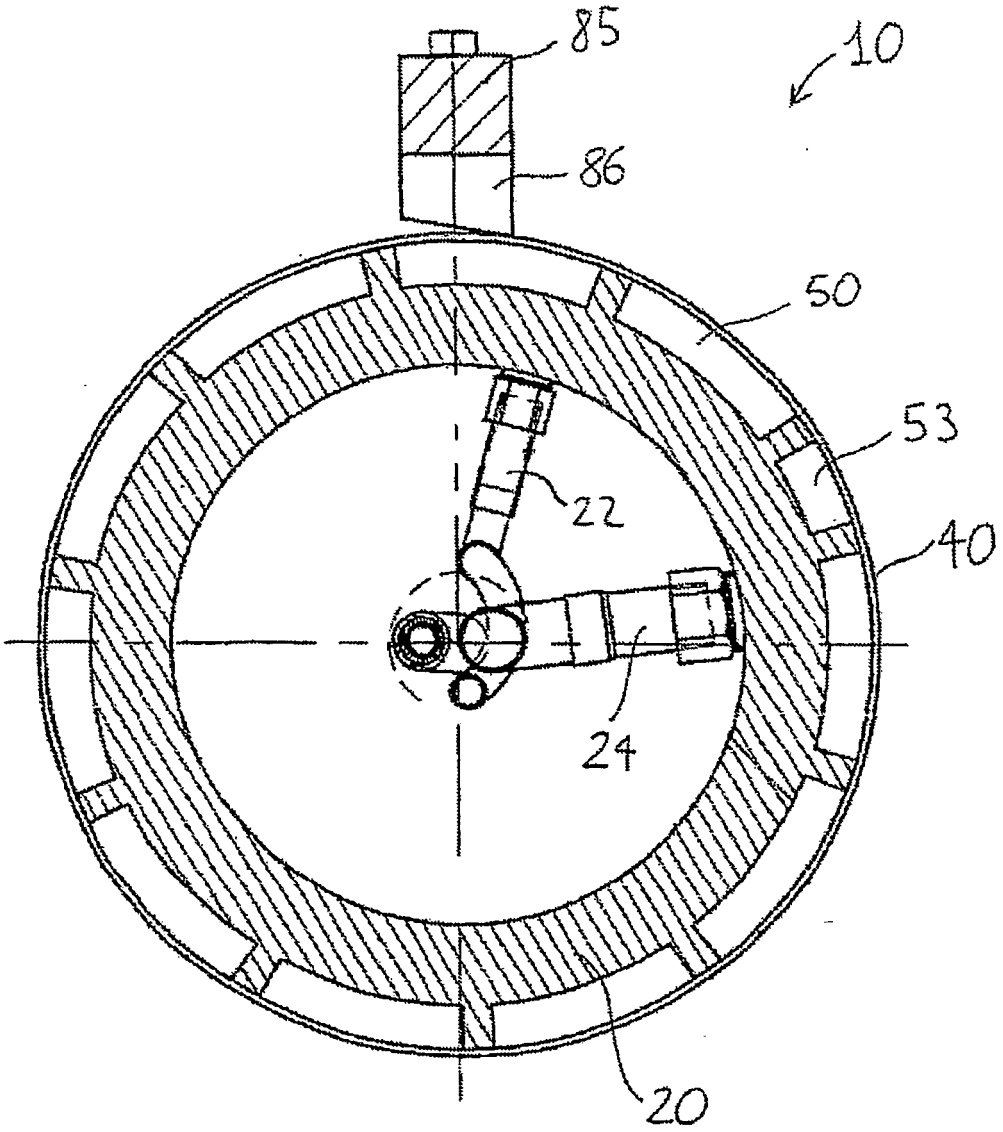

Fig. 5

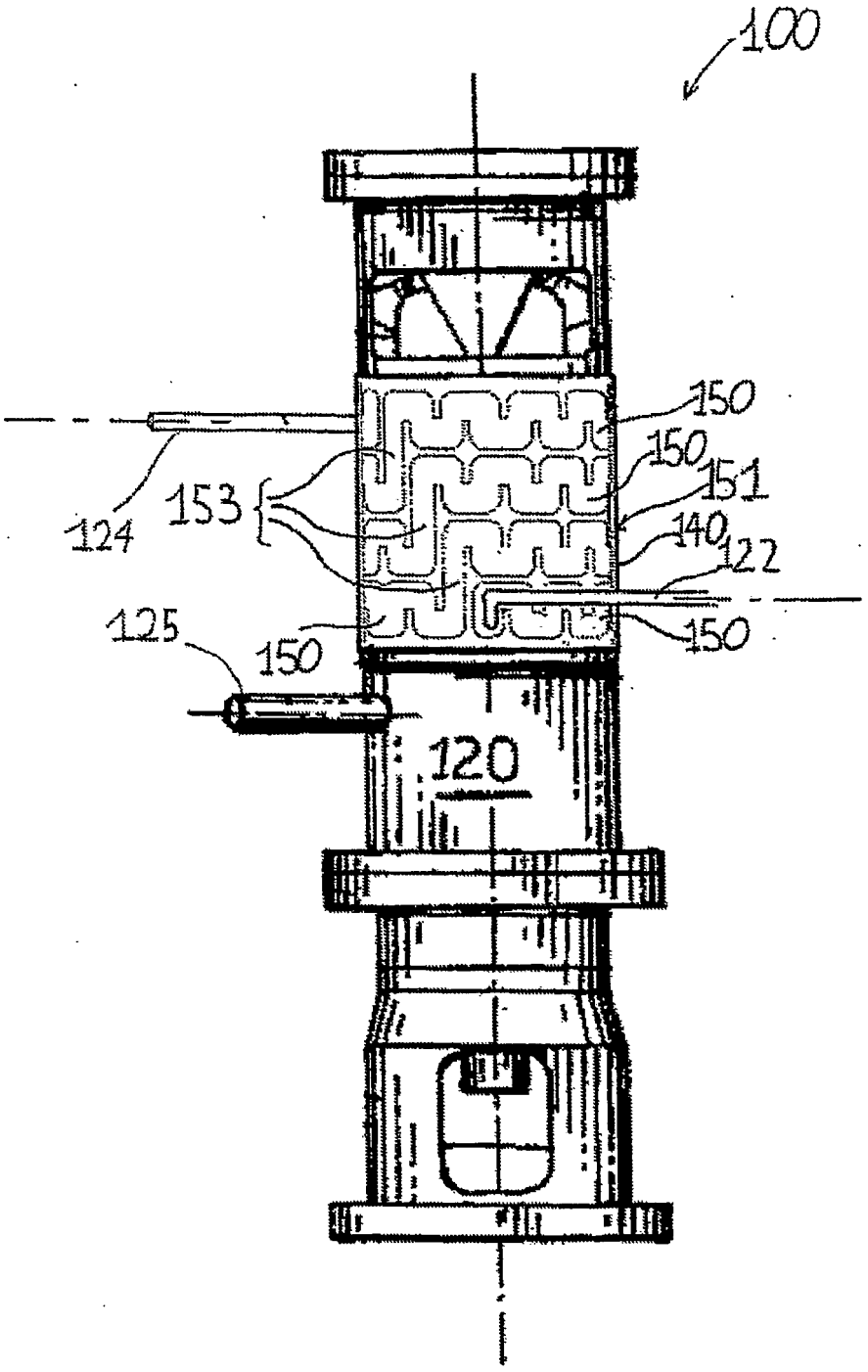

Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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