

(19)



(11)

EP 3 477 003 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
01.04.2020 Bulletin 2020/14

(51) Int Cl.:
D21F 5/02 (2006.01) D21F 5/18 (2006.01)

(21) Application number: **17199425.4**

(22) Date of filing: **31.10.2017**

(54) A METHOD OF MANUFACTURING A YANKEE DRYING CYLINDER

VERFAHREN ZUR HERSTELLUNG EINES YANKEE-TROCKNUNGSZYLINDERS

PROCÉDÉ DE FABRICATION D'UN CYLINDRE DE SÉCHAGE YANKEE

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(43) Date of publication of application:
01.05.2019 Bulletin 2019/18

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a method of manufacturing a Yankee drying cylinder.

BACKGROUND OF THE INVENTION

[0002] A known way of making Yankee drying cylinders for tissue machines is to manufacture the Yankee drying cylinder from welded steel. In such a manufacturing process, end covers (sometimes referred to as "end walls") are welded to a circular cylindrical shell such that an enclosed space is defined by the shell and the end covers. Examples of this are disclosed in, for example, EP 2126203 B1 and EP 2920360. During manufacturing of a Yankee drying cylinder, it is important that the final product has uniform dimensions, for example uniform thickness such that it can be used to produce tissue paper with uniform properties. It is an object of the present invention to provide a method of manufacturing a Yankee drying cylinder that can produce uniform drying results.

DISCLOSURE OF THE INVENTION

[0003] The invention relates to a method of manufacturing a Yankee drying cylinder for drying wet fibrous webs by heat. The inventive manufacturing method comprises the steps of providing a shell which is a circular cylindrical steel shell with two axial ends and the shell having a diameter in the range of 2 m - 8 m and forming circumferential grooves on an internal surface of the shell. The method further comprises providing an end cover of steel for each axial end of the shell, each end cover having a circular circumference and welding each end cover to an axial end of the shell. According to the invention, each end cover is welded to its respective axial end of the shell at 16 - 32 separate welding points that are made in a sequence, one after the other and separated from each other along the circumference of the end cover. Furthermore, for at least the first 8 welding points, the welding points are made in pairs of two in which the second welding point in a pair is made directly after the first welding point of that pair and wherein the second welding point in each pair is placed at an angular distance along the circumference of the end cover which lies in the range of 175° - 185° from the first welding point of that pair. In this context, it should be understood that the indicated range of 175° - 185° can alternatively be expressed as 180° +/- 5°.

[0004] In preferred embodiments, not just the first 8 welding points but all welding points are made in pairs of two that are made in such a sequence that the second welding point of each pair is made directly after the first welding point of that pair and such that the second welding point of each pair is separated from the first welding point of that pair by an angular distance of 175° - 185°

along the circumference of the end cover (i.e. 180° +/- 5°).

[0005] Preferably, the third and the fourth welding points are located at an angular distance from the first welding point in the entire sequence which is in the range of 85° - 95°.

[0006] The gaps between the separate welding points may be closed by additional welding after the separate welding points have been made. In preferred embodiments of the inventive method, this is done in two steps. First, welding is performed between the separate welding points. Thereafter, a continuous weld bead can be made that covers both the separate welding points and the welds between them.

[0007] If a continuous weld bead is made, submerged arc welding (SAW) is preferably used to make the continuous weld bead but other welding techniques may be considered.

[0008] Preferably, grinding is performed on the separate welding points before further welding is made.

[0009] In advantageous embodiments, all welding points are evenly spaced around the circumference of the end cover in a symmetrical pattern such that the angular distance between adjacent welding points is the same for all welding points and every welding point belongs to a pair of welding points located at an angular distance of 180° from each other.

[0010] In advantageous embodiments, the manufacturing method is carried out such that, before the end cover is welded to the circular cylindrical shell, the circular cylindrical shell is lifted onto the end cover such that the welding points are made when the circular cylindrical shell is standing on the end cover which is being welded to it.

[0011] Preferably, but not necessarily, both end covers are welded to their respective axial end of the circular cylindrical shell before the gaps between the separate welding points are closed by further welding.

SHORT DESCRIPTION OF THE DRAWINGS

[0012]

Figure 1 is a schematic representation of a Yankee drying cylinder in operation.

Figure 2 is an exploded perspective view of the end covers and the circular cylindrical steel shell.

Figure 3 is a cross-sectional view of the same parts as in Figure 2.

Figure 4 is a cross-sectional view of a part of an end cover and an axial end of the steel shell.

Figure 5 is a view similar to Figure 4 but with the two pieces brought into contact with each other.

Figure 6 is a view similar to Figure 5 but with a weld-

ing point applied.

Figure 7 shows an end cover with the applied welding points.

Figure 8 is a schematic representation of how the welding may be applied.

Figure 9 is a schematic representation of a further manufacturing step.

Figure 10 is a schematic representation of how different welds belonging to separate phases of the welding may be located in relation to each other.

DETAILED DESCRIPTION OF THE INVENTION

[0013] With reference to Figure 1, a Yankee drying cylinder 1 is shown. The Yankee drying cylinder 1 receives a fibrous web W which may in particular be a tissue web W intended for such end products as bathroom, kitchen, paper towel, facial tissue and the like and for which the basis weight of the end product may be in the range of - for example - 12 g/m² - 30 g/m². The still wet fibrous web W is brought on a fabric 22 to a nip formed between a roll 23 and the Yankee drying cylinder 1. The fabric 2 may be, for example, a water-absorbing felt or an open wire. In the nip between the roll 22 and the Yankee drying cylinder, the fibrous web W is transferred to the outer surface of the Yankee drying cylinder 1 that is rotating in the direction of arrow R. The Yankee drying cylinder is heated, normally by hot steam that is supplied to the interior of the Yankee drying cylinder 1. Due to the high temperature of the Yankee drying cylinder 1, water in the fibrous web W is evaporated such that the web W reaches a high dryness. The web W can then be creped from the outer surface of the Yankee drying cylinder 1 by a doctor blade 21. In Figure 1, only one doctor blade 21 is shown but it should be understood that two or even more doctor blades may be placed after each other in the circumferential direction of the Yankee drying cylinder 1. The Yankee drying cylinder manufactured according to the present invention may be used in a context such as the one schematically indicated in Figure 1. The roll 23 in Figure 1 may be, for example, a suction roll, a shoe roll, a deflection compensated roll or a solid roll. The fabric 22 may also be a water impervious belt with a coating of, for example, polyurethane and such a belt may have a surface facing the web W which is smooth (even) or provided with a pattern for imparting a three-dimensional structure to the web W. A Yankee hood (not shown) may optionally be placed over the Yankee drying cylinder for blowing hot air against the fibrous web W.

[0014] Reference will now be made to Figure 2 and to Figure 3 in which the inventive method of making a Yankee drying cylinder 1 is initially explained. A shell 2 is provided which is a circular cylindrical steel shell and which will form the shell of the ready-made Yankee drying

cylinder. The shell 2 has a diameter in the range of 2 m - 8 m or in the range of 3 m - 7 m. For example, the shell 2 may have a diameter of 4 m or 5.5 m. The shell 2 extends in an axial direction and it has a first axial end 3 and a second axial end 4. The shell 2 has an interior surface 5 which is provided with circumferential grooves 6 in which condensate water may be collected to be subsequently evacuated. The circumferential grooves 6 are made at some point in the manufacturing process and normally before end covers have been welded to the shell 2. The circumferential grooves 6 may be formed by a cutting operation in which material is removed by a cutting tool that may be mounted on a machine (not shown). It should be understood that embodiments are conceivable in which the circumferential grooves 6 are formed only after one or both of the end covers 7, 8 have been welded to the shell 2 and all welding is completed. Such embodiments may be less preferred but are nevertheless conceivable.

[0015] The manufacturing process further comprises providing an end cover 7, 8 for each axial end and each end cover 7, 8 is made of steel. Each end cover 7, 8 has a circular circumference- Each end cover is welded to an axial end 3, 4 of the shell. For example, the end cover 7 in Figure 2 and Figure 3 may be welded to the axial end 3 of the shell 2 while the end cover 8 is welded to the axial end 4 of the shell 2 such that the shell 2 and the end covers 7, 8 define an enclosed space and the present invention relates to a method in which the end covers 7, 8 are welded to the axial ends 3, 4 of the shell 2. Each end cover 7, 8 is a coherent detail before it is welded to the steel shell 2. It may be made of, for example, a piece of rolled steel that has been machined to a circular cylindrical plate.

[0016] Reference is now made to Figure 4, Figure 5 and Figure 6. The end covers 7, 8 and the axial ends 3, 4 may be subjected to an operation in which a groove is formed in which a weld may be applied. In Figure 4, it can be seen how the part of the end wall 7 that is to be welded to the shell 2 is provided with a slanting or beveled surface 9 that may be shaped in two sections and the axial end 3 of the shell 2 is given a similar slanted or beveled surface 10. When the end cover 7 has been brought into contact with the shell 2, those surfaces form together a groove 11 in which a weld can be applied. In Figure 6, it can be seen how a weld 12a has been applied.

[0017] With reference to Figure 6, it should now be explained that the weld 12a is not to be understood as representing a continuous weld bead that extends around the entire circumference of the end cover 7 (and the axial end 3 of the shell 2).

[0018] If the end covers 7, 8 are directly welded to the shell 2 such that one continuous weld bead is applied directly, there will inevitably be heat deformations in the material of both the end covers and the steel shell and such heat deformations may affect the roundness of the final product (i.e. the Yankee drying cylinder). If the Yankee drying cylinder is then subjected to an external ma-

chining operation (for example by turning) to produce an outer surface that is perfectly circular cylindrical (or as close to perfectly circular cylindrical as possible), this may have the undesired effect that, since heat deformations have already occurred, the thickness of the steel shell will not be identically the same in all places along the axial direction of the steel shell. This is particularly the case if circumferential grooves 6 have already been formed in the internal surface of the steel shell 2. If the thickness of the steel shell 2 varies, this will almost inevitably result in different temperature levels on the external surface of the steel shell 2 when the Yankee drying cylinder 1 is being used and the drying of the fibrous web W may become uneven. The present invention provides a solution to this problem.

[0019] The invention will now be further explained with particular reference to Figure 7. When an end cover 7 (or 8) is initially welded to an axial end 3, 4 of the shell 2, this is made in a sequence in which the welds are made as separate welding points that are separated from each other in the circumferential direction of the end cover 7, 8 and the welding sequence follows a certain pattern.

[0020] In Figure 7, the welding point 12a represents the first weld that is made, and this is made at a single point. The second welding point 12b is made at a position that is at an angular distance (in the circumferential direction of the end cover 7) that lies in the range of 175°-185° from the first welding point 12a (preferably 180°). In this way, any heat deformation caused by the welding points will be more symmetrically distributed which in turn makes it possible to achieve more uniform thickness of the shell 2 when an external machining operation is performed on the shell 2. Since the sections that are welded are short in relation to the circumference of the end cover 7, 8, the movements/deformations will be smaller than if a continuous weld bead had been made directly and this also contributes to a good result. The inventors have found that, in the circumferential direction of an end cover, the length of a welding point 12a, 12b, 12c, 12d, 12e, 12f.....12x should suitably be in the range of 100 mm - 250 mm and preferably in the range of 150 mm - 200 mm. The indicated length of the welding points 12a, 12b, 12c, 12d...12x is viewed by the inventors as suitable at least when the diameter of the shell 2 is in the range of 2 m - 8m. The third welding point 12c is made at an angular distance (along the circumference of the end cover 7) from the first welding point 12a that lies in the range of 85° - 95° (clockwise or counter-clockwise) and the fourth welding point 12d is made at an angular distance from the third welding point 12c which is in the range of 175°- 185° and which is preferably 180°. The fifth and sixth welding points 12e, 12f are likewise placed at an angular distance from each other which is in the range of 175° - 185° (i.e. 180° +/- 5°) and the same is also the case for the seventh and eighth welding points 12g, 12h. At least the first 8 welding points 12a - 12h are made in pairs where every second welding point in each pair

is located 175° - 185° from the first welding point of that pair and in which the second welding point of each pair is made immediately after the first welding point of that pair. In the example shown in Figure 7, 16 welding points 12a, 12b, 12c, 12d, 12e, 12f, 12g, 12h, 12i, 12j, 12k, 12l, 12m, 12n, 12o and 12p are used. It should be understood that more than 16 welding points may be used. If the diameter of the Yankee drying cylinder is greater than 4 m, 16 welding points are believed to be insufficient and 32 welding points would be preferable.

[0021] Preferably, the angular distance α between different welding points is the same for all welding points. It is also preferable that the angular distance between two welding points in a pair is 180° or as close to 180° as possible in order to achieve a more symmetrical distribution of thermal deformations.

[0022] It is preferable that the third and the fourth welding points 12c, 12d are located at an angular distance from the first welding point 12a in the entire sequence which is in the range of 85° - 95°, preferably at an angular distance of 90°. All welding points 12a, 12b, 12c, 12d.....12x would then be evenly spaced around the circumference of the end cover 7, 8 in a symmetrical pattern such that the angular distance between adjacent welding points 12a, 12b, 12c, 12d.....12n is the same for all welding points 12a, 12b, 12c, 12d.....12x and which every welding point 12a, 12b, 12c, 12d.....12x belongs to a pair of welding points located at an angular distance of 180° from each other.

[0023] Since at least the first 8 welding points are placed in pairs that are separated from each other by an angular distance of 175° - 185° (preferably 180°), heat deformations from the opposing welding points will be more symmetrical as explained previously. The end result is that machining of the external surface of shell 2 will cause less thickness variation in the shell.

[0024] While embodiments are conceivable in which the number of welding points is uneven (for example 17 or 23, it is preferable that an even number of welding points is used such that each and every welding point can have an opposing welding point at an angular distance of 180° or about 180°. At least the first 8 welding points that are made should be made in pairs where each welding point in a pair is placed at an angular distance of 175° - 185° (preferably 180°) from the other welding point of that pair.

[0025] A possible way of applying the different welding points 12a, 12b, 12c, 12d.....12x to an end cover 7, 8 will now be explained with reference to Figure 8. An end cover 7 is placed on supports 14 and the shell 2 is lifted onto the end cover 7 and the welding points are applied as the shell 2 is standing on the end cover 7. The shell 2 can then be lifted while the second end cover 8 is placed on the supports 14. The shell 2 is turned upside down and placed standing on the second end cover 8 whereafter the second end cover 8 is welded to the shell 2 by separate welding points 12a, 12b, 12c, 12d.....12x. Alternatively, the second end cover can simply be placed on

top of the shell 2 such that the welding points of the second end cover 8 are applied without first turning the shell 2 upside down. Whether the shell 2 is turned upside down or not before welding the second cover 8 may depend on the dimensions of the Yankee drying cylinder, available space and other practical considerations.

[0026] The gaps between the separate welding points can now be closed by welding between the separate welding points. Thereafter, the Yankee drying cylinder can be provided with a continuous weld bead 14. With reference to Figure 9, a welding machine 17 (for example a welding robot) may be used to make a continuous welding bead 14 that covers both the separate welding points and the welds between separate the welding points 12a, 12b, 12c, 12d.....12x. This can be done as the Yankee drying cylinder 1 is kept on a roller bed (not shown) and rotated as indicated by the arrow A. The continuous welding bead 14 can be performed using submerged arc welding (SAW) but other solutions may also be contemplated. In Figure 8 and Figure 9, the reference numeral 19 represents a manhole allowing internal inspection of the Yankee drying cylinder. The reference numeral 20 represents an opening for a journal through which steam can be supplied to the interior of the Yankee drying cylinder 1.

[0027] Figure 10 is a schematic representation of how the welds may be located in relation to each other. Separate welding points 12 that have been made first have gaps between them that are closed by intermediate welds 24. A continuous weld bead 14 is applied on top of the separate welding points 12 and the intermediate welds 24.

[0028] Grinding is preferably performed on the separate welding points before the gaps between them are closed by further welding. This removes small defects and makes it easier for the separate welding points to coalesce with the welds applied between the separate welding points. Alternatively, grinding may possibly be performed only after the continuous welding bead 14 has been applied. Grinding may also be performed after each welding step.

[0029] The welding between separate welding points as well as the continuous weld bead 14 may possibly be applied to one end cover 7 before the second end cover 8 has been welded by separate welding points but it is preferable that both end covers 7, 8 are welded to their respective axial end 3, 4 of the circular cylindrical shell 2 by separate welding points before further welding is performed.

[0030] After all welding operations have been completed, the welds (including both the separate welding points, the welds 24 between them and the continuous weld bead 14) are preferably subjected to heat treatment.

[0031] Thanks to the invention, a Yankee drying cylinder can be manufactured in which thickness variations in the shell can be reduced and the drying of the fibrous web will become more even.

Claims

1. A method of manufacturing a Yankee drying cylinder (1) for drying wet fibrous webs (W) by heat, the manufacturing method comprising the steps of: providing a shell (2) which is a circular cylindrical steel shell (2) with two axial ends (3, 4) and the shell (2) having a diameter in the range of 2 m - 8 m; forming circumferential grooves (6) on an internal surface (5) of the shell; providing an end cover (7, 8) of steel for each axial end (3, 4) of the shell (2), each end cover (7, 8) having a circular circumference, and welding each end cover (7, 8) to an axial end of (3, 4) the shell (2), **characterised in that** each end cover (7, 8) is welded to its respective axial end (3, 4) of the shell (2) at 16 - 32 separate welding points (12a, 12b, 12c, 12d.....12x) that are made in a sequence, one after the other, and separated from each other along the circumference of the end cover (7, 8) and **in that**, for at least the first 8 welding points (12a, 12b, 12c, 12d.....12x), the welding points (12a, 12b, 12c, 12d.....12x) are made in pairs of two in which the second welding point (12a, 12b, 12c, 12d.....12x) in a pair is made directly after the first welding point (12a, 12b, 12c, 12d.....12x) of that pair and wherein the second welding point (12a, 12b, 12c, 12d.....12x) in each pair is placed at an angular distance along the circumference of the end cover (7, 8) which lies in the range of 175° - 185° from the first welding point of that pair.
2. A method according to claim 1, wherein all welding points (12a, 12b, 12c, 12d.....12x) are made in pairs of two that are made in such a sequence that the second welding point of each pair is made directly after the first welding point of that pair and wherein the second welding point of each pair is separated from the first welding point of that pair by an angular distance of 175° - 185° along the circumference of the end cover (7, 8).
3. A method according to claim 1, wherein the third and the fourth welding points (12c, 12d) are located at an angular distance from the first welding point (12a) in the entire sequence which is in the range of 85° - 95°.
4. A method according to claim 1, wherein, after all the welding points (12a, 12b, 12c, 12d.....12x) have been made, the gaps between the welding points (12a, 12b, 12c, 12d.....12x) are closed by further welding.
5. A method according to claim 4 wherein, after the gaps between the welding points (12a, 12b, 12c, 12d.....12x) have been closed by further welding, a continuous weld bead (14) is made that covers both the separate welding points (12a, 12b, 12c, 12d.....12x) and the welds made between the sepa-

rate welding points (12a, 12b, 12c, 12d,.....12x).

6. A method according to claim 4, wherein grinding is performed on all separate welding points (12a, 12b, 12c, 12d.....12x) before further welding is performed. 5
7. A method according to claim 5 in which submerged arc welding is used to make the continuous weld bead (14). 10
8. A method according to claim 1, wherein all welding points (12a, 12b, 12c, 12d.....12x) are evenly spaced around the circumference of the end cover (7, 8) in a symmetrical pattern such that the angular distance between adjacent welding points (12a, 12b, 12c, 12d.....12x) is the same for all welding points (12a, 12b, 12c, 12d.....12x) and in which every welding point (12a, 12b, 12c, 12d.....12x) belongs to a pair of welding points located at an angular distance of 180° from each other. 15 20
9. A method according to claim 1, before the end cover (7, 8) is welded to the circular cylindrical shell (2), the circular cylindrical shell (2) is lifted onto the end cover (7, 8) such that the welding points (12a, 12b, 12c, 12d.....12x) are made when the circular cylindrical shell (2) is standing on the end cover (7, 8) which it is being welded to it. 25
10. A method according to claim 8, wherein both end covers (7, 8) are welded to their respective axial end (3, 4) of the circular cylindrical shell (2) whereafter the gaps between separate welding points are closed by further welding. 30
11. A method according to claim 1, wherein the circumferential grooves (6) are formed on the internal surface (5) of the shell (2) before any of the end covers (7, 8) is welded to the shell (2). 35
12. A method according to any of the preceding claims wherein, in the circumferential direction of an end cover (7, 8), each separate welding point (12a, 12b, 12c, 12d.....12x) has a length in the range of 100 mm - 250 mm and preferably a length in the range of 150 mm - 200 mm. 40 45

Patentansprüche

1. Verfahren zum Herstellen eines Yankee-Trocknungszyinders (1) zum Trocknen nasser faserförmiger Bahnen (W) durch Wärme, wobei das Herstellverfahren umfasst die Schritte von: Bereitstellen eines Gehäuses (2), das ein kreisförmiges zylindrisches Stahlgehäuse (2) mit zwei axialen Enden (3, 4) ist, und wobei das Gehäuse (2) einen Durchmesser in dem Bereich von 2 m - 8 m aufweist; Bilden 50 55

von umlaufenden Nuten (6) auf einer innenliegenden Fläche (5) des Gehäuses; Bereitstellen einer Endabdeckung (7, 8) aus Stahl für jedes axiale Ende (3, 4) des Gehäuses (2), wobei jede Endabdeckung (7, 8) einen kreisförmigen Umfang aufweist, und Schweißen jeder Endabdeckung (7, 8) an ein axiales Ende (3, 4) von dem Gehäuse (2),

gekennzeichnet dadurch, dass jede Endabdeckung (7, 8) an ihr jeweiliges axiales Ende (3, 4) des Gehäuses (2) an 16 - 32 separaten Schweißpunkten (12a, 12b, 12c, 12d 12x) geschweißt wird, die in einer Sequenz, einer nach dem anderen, und separiert voneinander entlang des Umfangs der Endabdeckung (7, 8) hergestellt werden, und **gekennzeichnet dadurch, dass**, für wenigstens die ersten 8 Schweißpunkte (12a, 12b, 12c, 12d 12x), die Schweißpunkte (12a, 12b, 12c, 12d 12x) in Paaren hergestellt werden, in denen der zweite Schweißpunkt (12a, 12b, 12c, 12d 12x) in einem Paar direkt nach dem ersten Schweißpunkt (12a, 12b, 12c, 12d 12x) von diesem Paar hergestellt wird und wobei der zweite Schweißpunkt (12a, 12b, 12c, 12d 12x) in jedem Paar in einem Winkelabstand entlang des Umfangs der Endabdeckung (7, 8) platziert wird, der in dem Bereich von 175° - 185° von dem ersten Schweißpunkt dieses Paares liegt.

2. Verfahren nach Anspruch 1, wobei alle Schweißpunkte (12a, 12b, 12c, 12d ... 12x) in Paaren hergestellt werden, die in solch einer Sequenz hergestellt werden, dass der zweite Schweißpunkt jedes Paares direkt nach dem ersten Schweißpunkt dieses Paares hergestellt wird und wobei der zweite Schweißpunkt jedes Paares von dem ersten Schweißpunkt dieses Paares durch einen Winkelabstand von 175° - 185° entlang des Umfangs der Endabdeckung (7, 8) separiert wird. 35
3. Verfahren nach Anspruch 1, wobei sich der dritte und der vierte Schweißpunkt (12c, 12d) in einem Winkelabstand von dem ersten Schweißpunkt (12a) in der gesamten Sequenz befinden, der in dem Bereich von 85° - 95° liegt. 40
4. Verfahren nach Anspruch 1, wobei, nachdem alle Schweißpunkte (12a, 12b, 12c, 12d ... 12x) hergestellt wurden, die Abstände zwischen den Schweißpunkten (12a, 12b, 12c, 12d, 12x) durch weiteres Schweißen geschlossen werden. 45 50
5. Verfahren nach Anspruch 4, wobei, nachdem die Abstände zwischen den Schweißpunkten (12a, 12b, 12c, 12d, 12x) durch weiteres Schweißen geschlossen wurden, eine kontinuierliche Schweißnaht (14) hergestellt wird, die sowohl die separaten Schweißpunkte (12a, 12b, 12c, 12d 12x) als auch Schweißungen, die zwischen den separaten Schweißpunkten (12a, 12b, 12c, 12d, 12x) 55

12x) hergestellt wurden, abdeckt.

6. Verfahren nach Anspruch 4, wobei Schleifen an allen separaten Schweißpunkten (12a, 12b, 12c, 12d ... 12x) durchgeführt wird, bevor weiteres Schweißen durchgeführt wird. 5
7. Verfahren nach Anspruch 5, bei dem Unterpulverschweißen verwendet wird, um die kontinuierliche Schweißnaht (14) herzustellen. 10
8. Verfahren nach Anspruch 1, wobei alle Schweißpunkte (12a, 12b, 12c, 12d ... 12x) gleichmäßig beabstandet sind um den Umfang der Endabdeckung (7, 8) in einem symmetrischen Muster, so dass der Winkelabstand zwischen benachbarten Schweißpunkten (12a, 12b, 12c, 12d 12x) der gleiche für alle Schweißpunkte (12a, 12b, 12c, 12d 12x) ist und in dem jeder Schweißpunkt (12a, 12b, 12c, 12d 12x) zu einem Paar von Schweißpunkten gehört, die sich in einem Winkelabstand von 180 ° voneinander befinden. 15 20
9. Verfahren nach Anspruch 1, bevor die Endabdeckung (7, 8) an das kreisförmige zylindrische Gehäuse (2) geschweißt wird, wobei das kreisförmige zylindrische Gehäuse (2) auf die Endabdeckung (7, 8) gehoben wird, so dass die Schweißpunkte (12a, 12b, 12c, 12d 12x) hergestellt werden, wenn das kreisförmige zylindrische Gehäuse (2) auf der Endabdeckung (7, 8) steht, an das sie geschweißt wird. 25 30
10. Verfahren nach Anspruch 8, wobei beide Endabdeckungen (7, 8) an ihr jeweiliges axiales Ende (3, 4) des kreisförmigen zylindrischen Gehäuses (2) geschweißt werden, wonach die Abstände zwischen separaten Schweißpunkten durch weiteres Schweißen geschlossen werden. 35
11. Verfahren nach Anspruch 1, wobei die umlaufenden Nuten (6) auf der innenliegenden Fläche (5) des Gehäuses (2) gebildet werden, bevor eine der Endabdeckungen (7, 8) mit dem Gehäuse (2) verschweißt wird. 40
12. Verfahren nach einem der vorhergehenden Ansprüche, wobei, in der Umfangsrichtung einer Endabdeckung (7, 8), jeder separate Schweißpunkt (12a, 12b, 12c, 12d ... 12x) eine Länge in dem Bereich von 100 mm - 250 mm und vorzugsweise eine Länge in dem Bereich von 150 mm - 200 mm aufweist. 50

Revendications

1. Un procédé de fabrication d'un cylindre de séchage Yankee (1) pour sécher des bandes fibreuses humides (W) par de la chaleur, le procédé de fabrication

comprenant les étapes suivantes : prévoir une enveloppe (2) qui est une enveloppe (2) cylindrique circulaire en acier avec deux extrémités axiales (3, 4) et l'enveloppe (2) ayant un diamètre situé dans une gamme allant de 2 m à 8 m ; former des rainures circonférentielles (6) sur une surface interne (5) de l'enveloppe ; prévoir un couvercle d'extrémité (7, 8) en acier pour chaque extrémité axiale (3, 4) de l'enveloppe (2), chaque couvercle d'extrémité (7, 8) ayant une circonférence circulaire, et souder chaque couvercle d'extrémité (7, 8) à une extrémité axiale (3, 4) de l'enveloppe (2), **caractérisé en ce que** chaque couvercle d'extrémité (7, 8) est soudé à son extrémité axiale (3, 4) respective de l'enveloppe (2) en 16 à 32 points de soudure séparés (12a, 12b, 12c, 12d.....12x) qui sont réalisés selon une séquence, l'un après l'autre, et séparés les uns des autres le long de la circonférence du couvercle d'extrémité (7, 8) et **en ce que**, pour au moins les 8 premiers points de soudure (12a, 12b, 12c, 12d.....12x), les points de soudure (12a, 12b, 12c, 12d.....12x) sont réalisés par paires de deux dans lesquelles le deuxième point de soudure (12a, 12b, 12c, 12d.....12x) d'une paire est réalisé directement après le premier point de soudure (12a, 12b, 12c, 12d.....12x) de cette paire, et dans lesquelles le deuxième point de soudure (12a, 12b, 12c, 12d.....12x) de chaque paire est placé à une distance angulaire le long de la circonférence du couvercle d'extrémité (7, 8) qui se situe dans une gamme allant de 175° à 185° depuis le premier point de soudure de cette paire.

2. Un procédé selon la revendication 1, dans lequel tous les points de soudure (12a, 12b, 12c, 12d.....12x) sont réalisés par paires de deux qui sont réalisées dans une séquence telle que le deuxième point de soudure de chaque paire est réalisé directement après le premier point de soudure de cette paire, et dans lequel le deuxième point de soudure de chaque paire est séparé du premier point de soudure de cette paire par une distance angulaire allant de 175° à 185° le long de la circonférence du couvercle d'extrémité (7, 8).

3. Un procédé selon la revendication 1, dans lequel les troisième et quatrième points de soudure (12c, 12d) sont situés à une distance angulaire du premier point de soudure (12a) dans toute la séquence qui est dans une gamme allant de 85° à 95°.

4. Un procédé selon la revendication 1, dans lequel, après que tous les points de soudure (12a, 12b, 12c, 12d.....12x) aient été réalisés, les espaces entre les points de soudure (12a, 12b, 12c, 12d.....12x) sont fermés par un soudage supplémentaire.

5. Un procédé selon la revendication 4, dans lequel, après que les espaces entre les points de soudure

(12a, 12b, 12c, 12d,.....12x) aient été fermés par un soudage supplémentaire, un cordon de soudure continu (14) est réalisé qui recouvre à la fois les points de soudure séparés (12a, 12b, 12c, 12d.....12x) et les soudures effectuées entre les points de soudure séparés (12a, 12b, 12c, 12d,.....12x).

à 200 mm.

- 5
6. Un procédé selon la revendication 4, dans lequel un meulage est effectué sur tous les points de soudure séparés (12a, 12b, 12c, 12d..... 12x) avant d'effectuer un soudage supplémentaire. 10
7. Un procédé selon la revendication 5, dans lequel un soudage à l'arc submergé est utilisé pour réaliser le cordon de soudure continu (14). 15
8. Un procédé selon la revendication 1, dans lequel tous les points de soudure (12a, 12b, 12c, 12d..... 12x) sont régulièrement espacés autour de la circonférence du couvercle d'extrémité (7, 8) selon un motif symétrique tel que la distance angulaire entre des points de soudure adjacents (12a, 12b, 12c, 12d..... 12x) est la même pour tous les points de soudure (12a, 12b, 12c, 12d..... 12x), et dans lequel chaque point de soudure (12a, 12b, 12c, 12d..... 12x) appartient à une paire de points de soudure situés à une distance angulaire de 180° l'un de l'autre. 20
25
9. Un procédé selon la revendication 1, avant que le couvercle d'extrémité (7, 8) ne soit soudé à l'enveloppe cylindrique circulaire (2), l'enveloppe cylindrique circulaire (2) est soulevée sur le couvercle d'extrémité (7, 8) de telle sorte que les points de soudure (12a, 12b, 12c, 12d.....12x) sont réalisés lorsque l'enveloppe cylindrique circulaire (2) se trouve sur le couvercle d'extrémité (7, 8) auquel elle est soudée. 30
35
10. Un procédé selon la revendication 8, dans lequel les deux couvercles d'extrémité (7, 8) sont soudés à leur extrémité axiale respective (3, 4) de l'enveloppe cylindrique circulaire (2), après quoi les espaces entre les points de soudure séparés sont fermés par un soudage supplémentaire. 40
45
11. Un procédé selon la revendication 1, dans lequel les rainures circonférentielles (6) sont formées sur la surface interne (5) de l'enveloppe (2) avant que l'un quelconque des couvercles d'extrémité (7, 8) ne soit soudé à l'enveloppe (2). 50
12. Un procédé selon l'une quelconque des revendications précédentes, dans lequel, dans la direction circonférentielle d'un couvercle d'extrémité (7, 8), chaque point de soudure séparé (12a, 12b, 12c, 12d....12x) a une longueur située dans une gamme allant de 100 mm à 250 mm et de préférence une longueur située dans une gamme allant de 150 mm 55

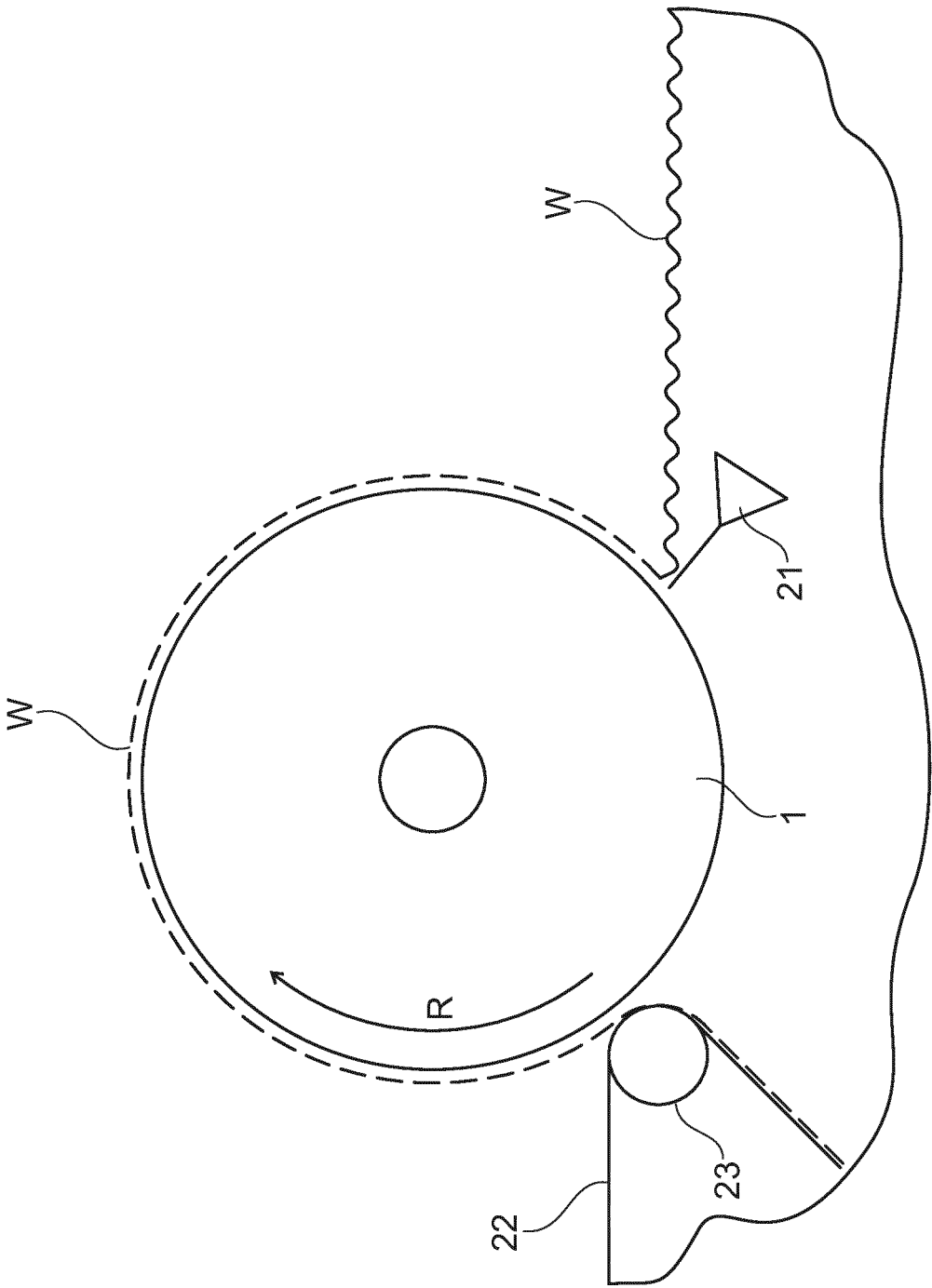


Fig. 1

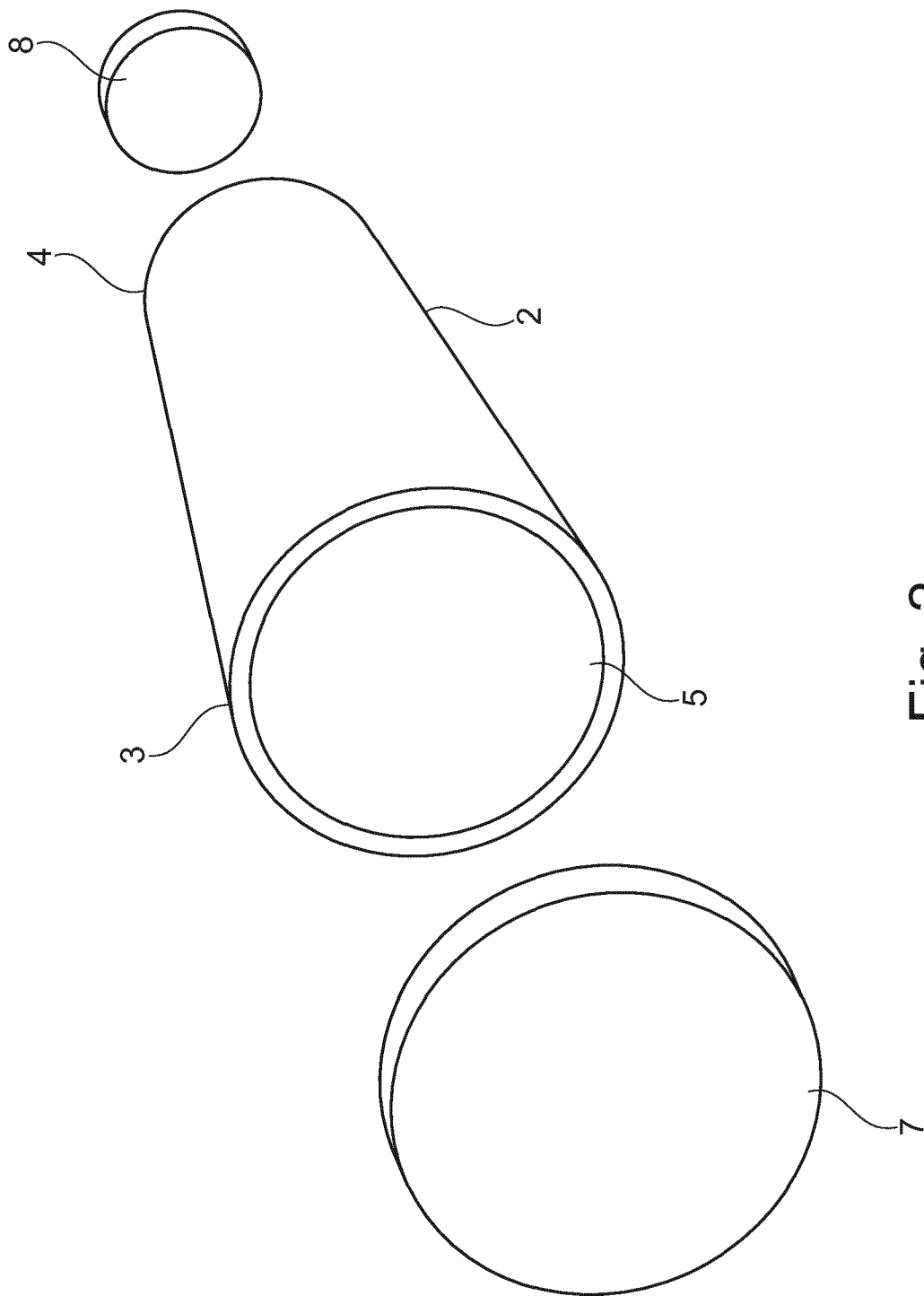


Fig. 2

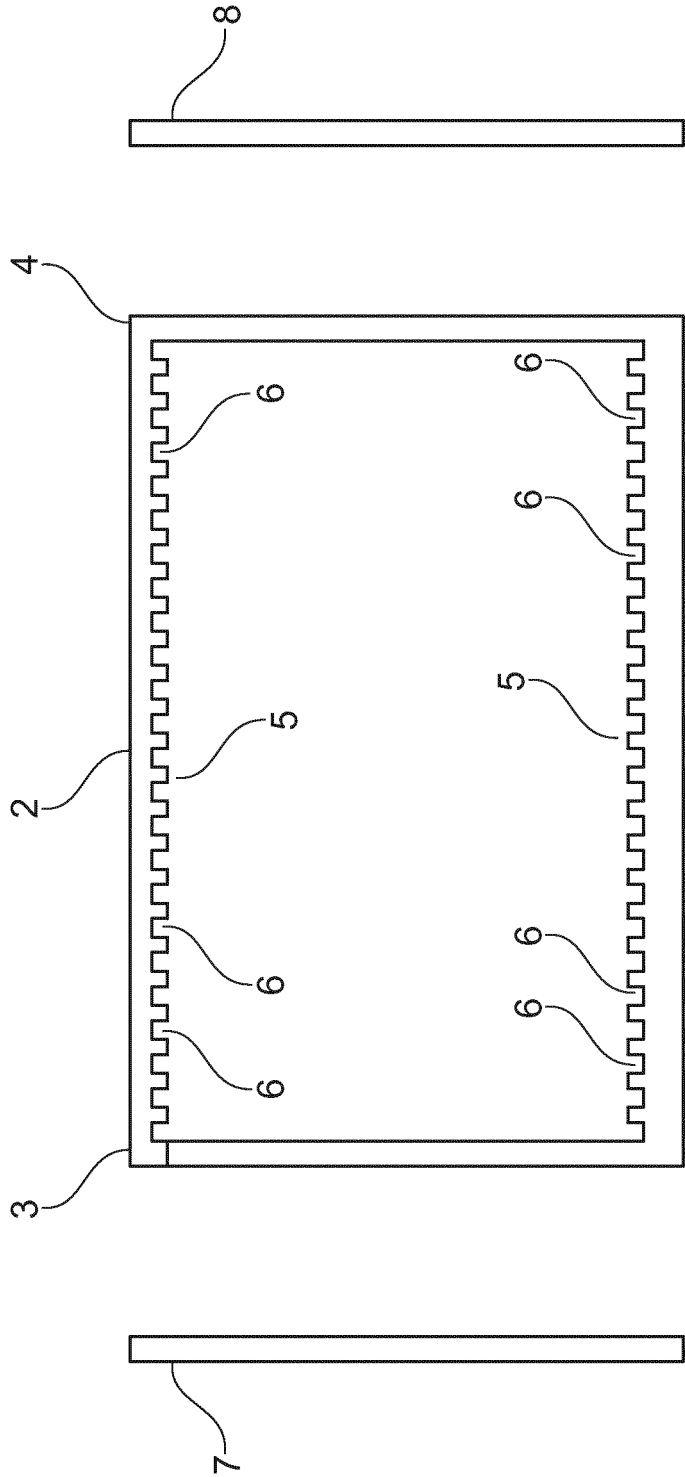


Fig. 3

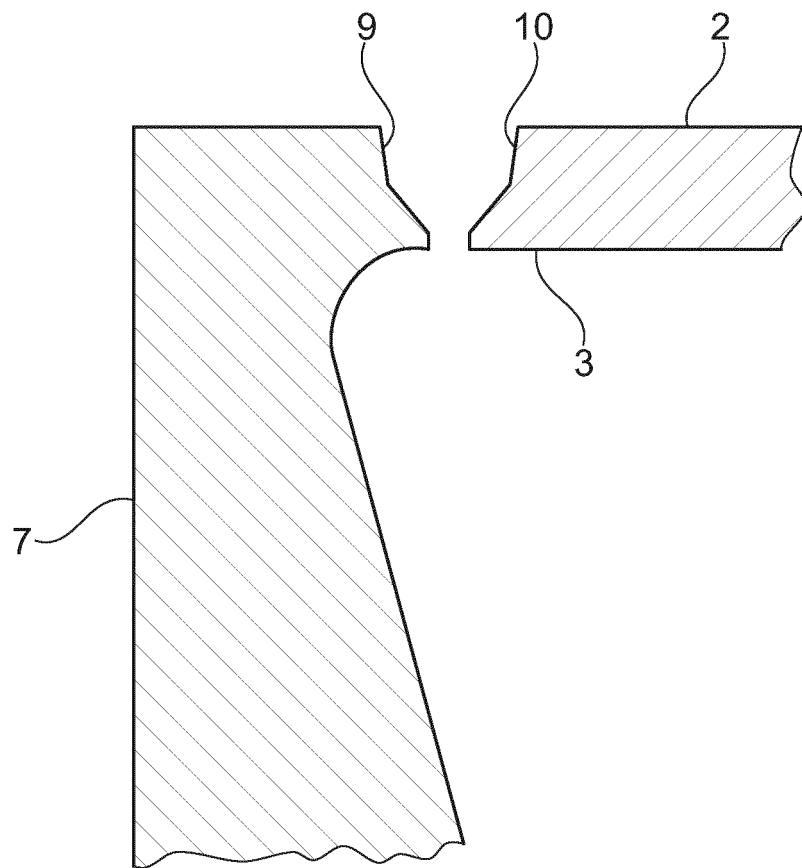


Fig. 4

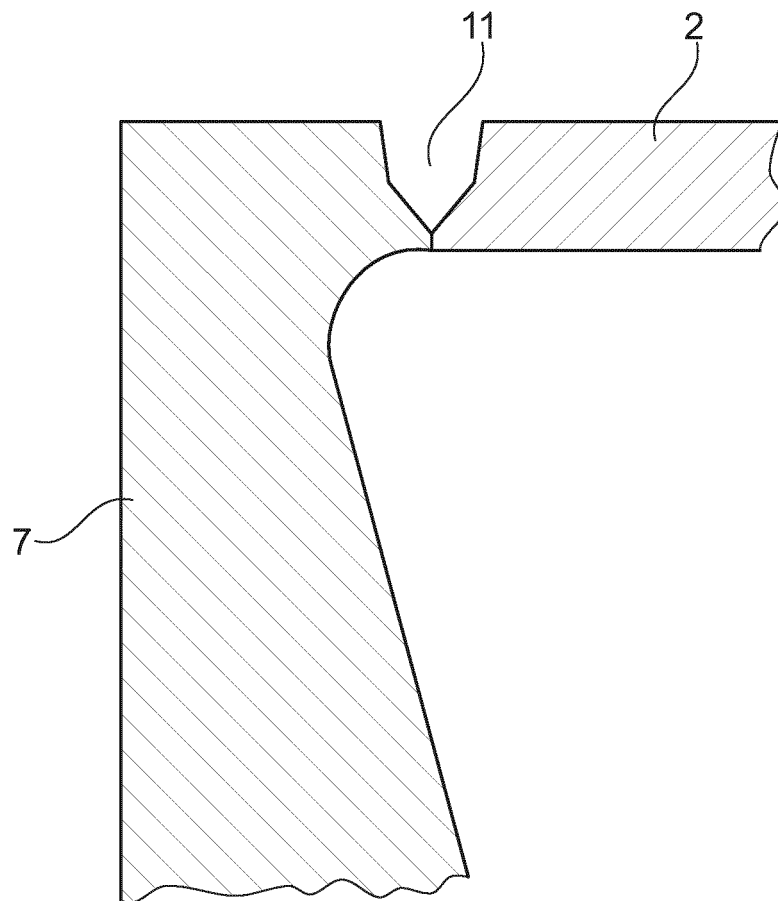


Fig. 5

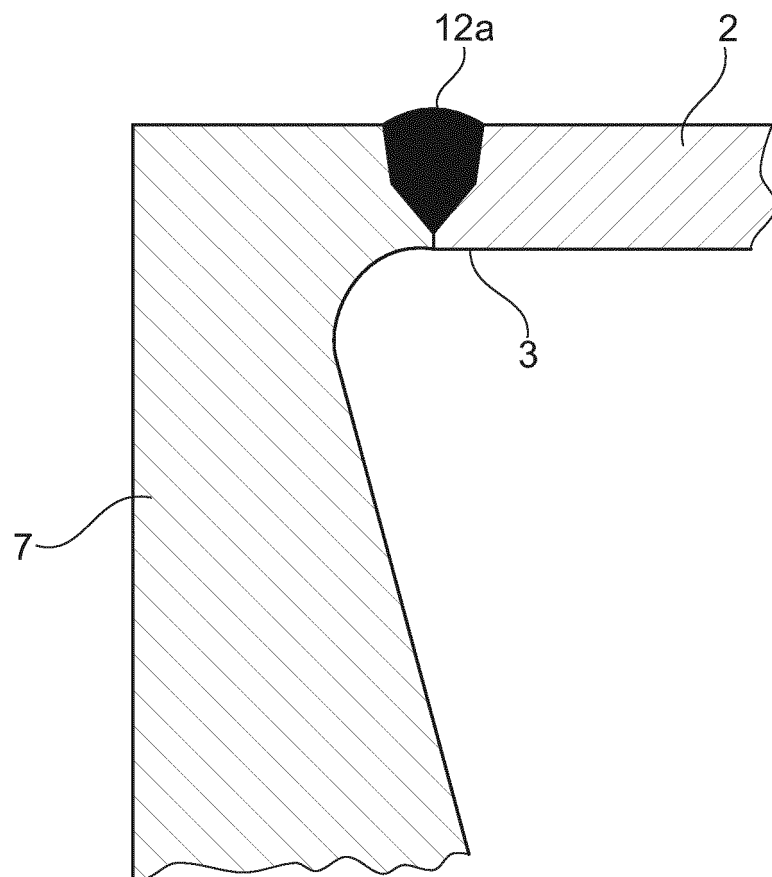


Fig. 6

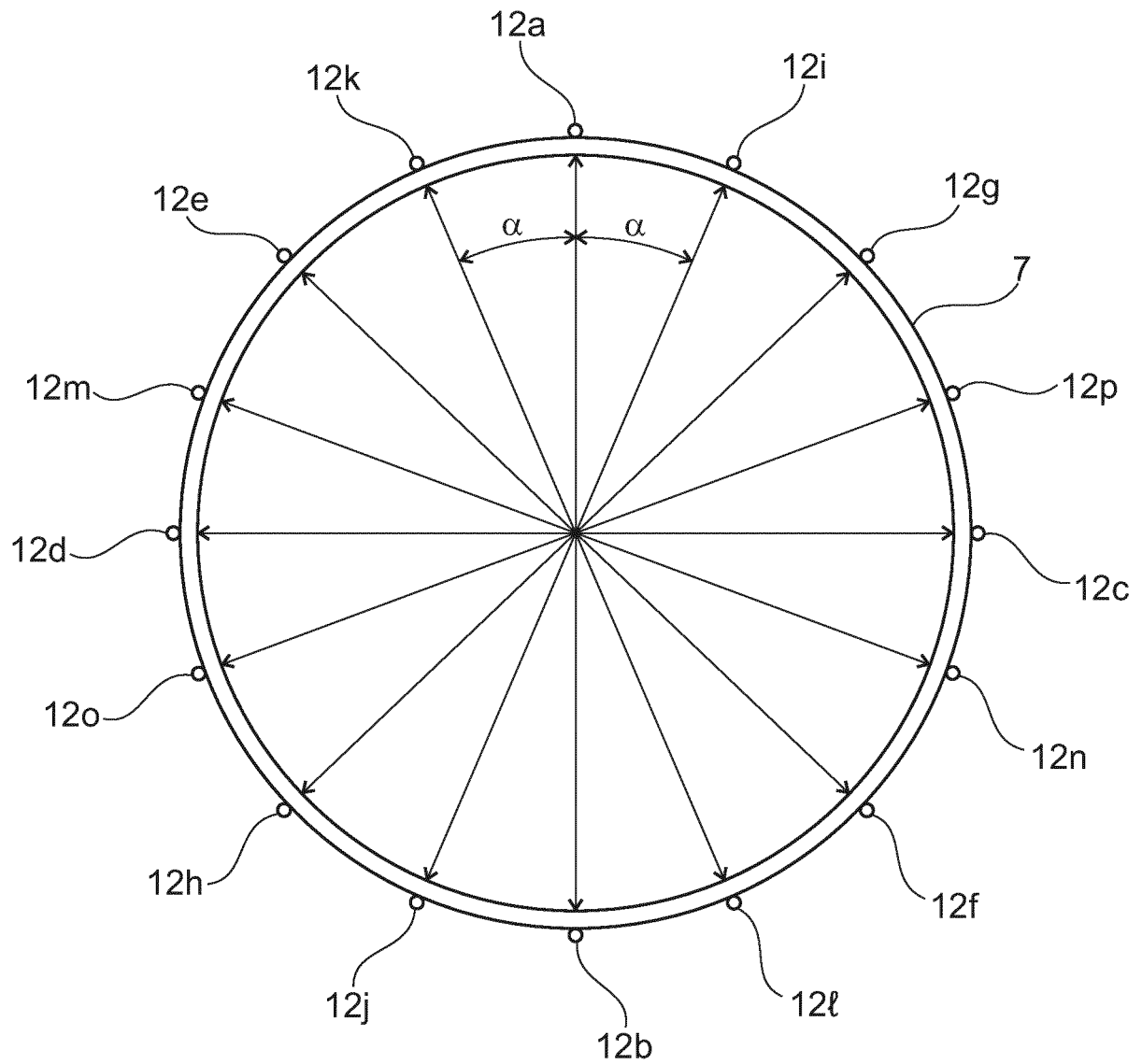


Fig. 7

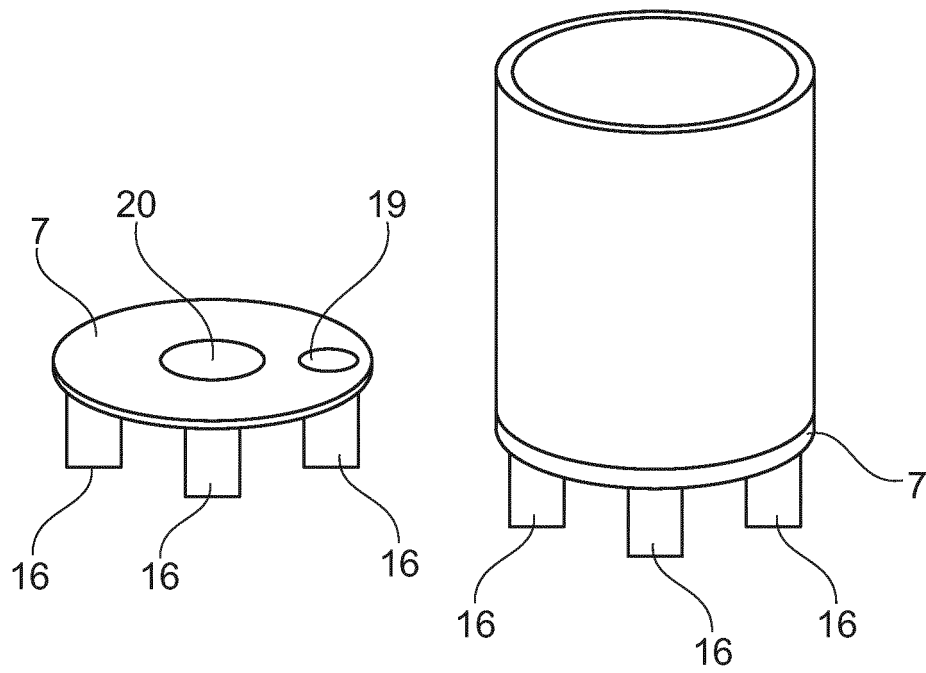


Fig. 8

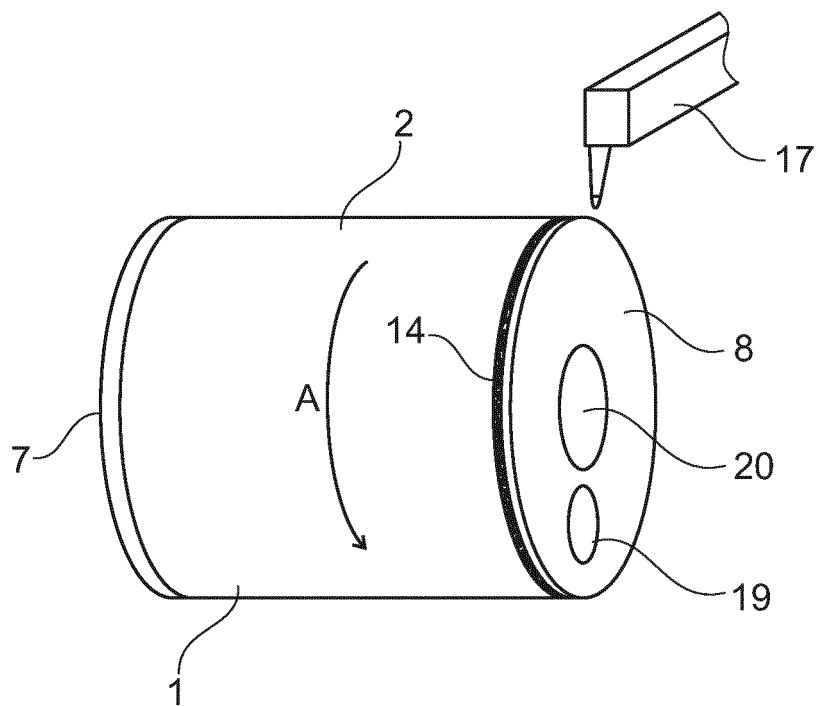


Fig. 9

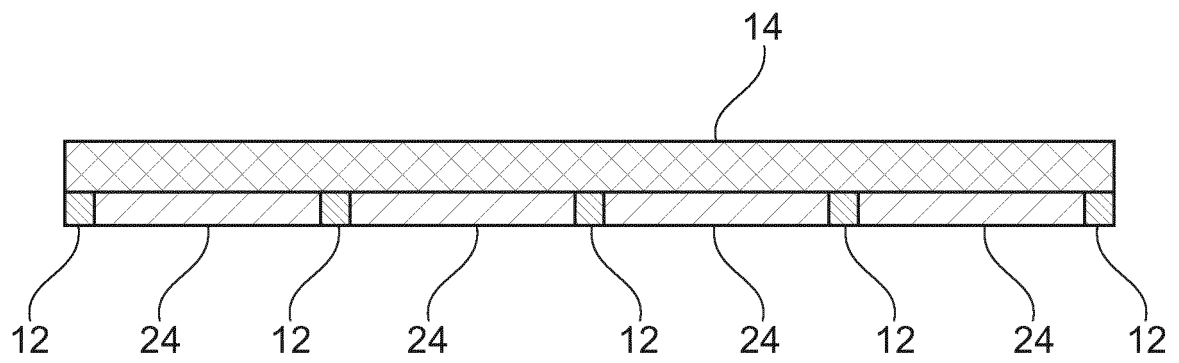


Fig. 10

REFERENCES CITED IN THE DESCRIPTION

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