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Description

[0001] The present invention relates to ovens, especially household ovens comprising an oven muffle with a muffle wall defining an oven cavity and a heating loop for heating the oven cavity. The heating loop is fixedly mounted onto the muffle wall in a fixing region of the heating loop, where the fixing region is adjacent to the current entry and the current exit provided through the muffle wall for delivering electrical power to the heating loop. In order to prevent contact between the heating loop and the muffle wall and hence a damage of the muffle wall, the heating loop comprises at least one spacer mounted onto the heating loop outside the fixing region for maintaining a predetermined minimum distance between the heating loop and the muffle wall.

[0002] From WO2039021A1 an oven with a heating element that is fastened with mounting legs and screws to apertures in an oven wall is known. From DE3528696C1 a facility for holding a heating rod in a dishwasher sump is known that comprises a clamping spring for holding the heating rod and a corresponding embossment of the dishwasher sump.

[0003] A problem related to such conventional ovens is that due to the temperature cycling of the heating loop and the related thermal stress an unwanted lateral displacement of the center of heating loop parallel the muffle wall can occur. This cannot only result in reversible displacement but also - especially after many temperature cycles - a constant displacement of the heating loop can remain. Since such a heating loop is usually rather close to a fan for circulating the hot air within the interior cavity of the oven muffle a predetermined minimum distance between heating loop and fan or a fan cover could be undershot. This can result in a damage of these parts or at least impair the baking results.

[0004] It is an object of the present invention to provide an oven, in which the above problems are solved, and in particular to provide an oven where on the one hand the heating loop can freely perform the unavoidable thermal expansion and contraction movements, where, however, a permanent displacement of the heating loop due to thermal cycling can be avoided.

[0005] This object is solved by an oven according to claim 1.

[0006] In an oven according to the present invention a spacer connected to the heating loop for maintaining a predetermined minimum distance between the heating loop and the muffle wall comprises an extension directed towards the muffle wall. In the region of this extension the muffle wall comprises an elongated impression positioned relative to the extension so as to receive the extension. The impression is designed so as to enable at most limited lateral displacement of the heating loop arising under working conditions of the oven. This means that the extension of the spacer will abut against the lateral limitation of the impression in the case of a lateral displacement of the heating loop.

[0007] The impression may have a lateral width being in the range of the width of the cross-section of the extension of the spacer in the same direction, preferably being between said width of the extension and twice said width.

[0008] The orientation of the elongated impression is in a first direction, which is in particular perpendicular to an adjacent section of the heating loop, so as to allow a sliding movement of the extension within the elongated impression in this first direction. The heating loop is hence allowed to perform a movement relative to the muffle and along the muffle wall in this first direction. On the other hand a movement of the extension and hence the heating loop in a second direction parallel to the adjacent section of the heating loop along the muffle wall is suppressed. Accordingly the heating loop is free to move in an outward and inward first direction (in a radial direction) so as to perform a certain expansion or contraction movement due to thermal expansion or thermal contraction of the loop material. On the other hand a lateral displacement of the complete heating loop with its center relative to the muffle wall and along the said second direction is blocked or merely slightly possible since the extension can only move along the elongated impression but not or only slightly cross-wise.

[0009] In a preferred embodiment the at least one spacer can be mounted on a side of the heating loop opposite to the fixing region of the heating loop. This provides the most effective and easiest support of the heating loop for avoiding a contact between the heating loop and the muffle wall. The orientation of the elongated impression is then along the (imaginary) line connecting the fixing region with the spacer.

[0010] Preferably, the heating loop has a circular footprint and consists of at least one heating coil. This has, amongst others, the advantage that thermal expansion or contraction is directed in a radial direction and it is hence easier to control the thermal movement of the heating coil.

[0011] In case of a circular heating coil the orientation of the elongated impression is in radial direction with respect to the heating coil and hence allows a radial expansion or radial contraction of the heating coil due to the thermal expansion or thermal contraction of the heating coil and on the other hand suppresses a lateral movement of the whole heating coil in a lateral direction (i.e. a movement of the coil center in a direction perpendicular to a line connecting the fixing area of the heating coil with the center of the coil).

[0012] In a further preferred embodiment the muffle wall comprises a first impression for receiving the heating coil, which in case of a circular heating coil is a respective circular impression and the elongated impression for receiving the extension of the spacer is impressed as a second, further elongated impression into this first impression.

[0013] Any of these so far discussed impressions are impressed in a direction towards the outer side of the

wall with respect to the oven cavity.

[0014] Preferably, the fixing region within which the heating coil is fixed to the muffle wall is smaller than 90° and more preferably smaller than 45° of the whole heating coil so that the thermal expansion or thermal contraction is not disturbed in the remaining larger area of the heating coil.

[0015] In a further preferred embodiment of the present invention the spacer is formed as a bracket which is clipped or otherwise fixed onto the heating loop.

[0016] Preferably, the heating loop is mounted onto a rear muffle wall of the oven cavity.

[0017] In a further preferred embodiment only one single spacer comprising the discussed extension is mounted onto the heating loop.

[0018] To make the controlling of the movements of the heating effective, the elongated impression needs to be longer than the length of the cross-section of the extension in the same direction, preferably it has a length in a radial direction with respect to the heating loop of several lengths of the length of the cross-section of the extension in the same direction, most preferably it is at least 3 times longer than said length.

[0019] A preferred embodiment of the present invention will be described below by reference to the drawings, in which:

Fig. 1 is a view onto a muffle rear wall of an oven according to the present invention; and

Fig. 2 is a view onto the muffle rear wall of Fig. 1 where a fan and a heating coil are mounted, including two successively enlarged cross-sections in the area of an elongated impression according to the present invention are shown.

[0020] Fig. 1 shows a muffle rear wall element 10 for an oven according to the present invention. Muffle rear wall 10 comprises a circular impression 12, which is adapted for receiving a circular heating coil 20 being not yet mounted. Within the circular impression 12 an elongated impression 14 is provided, which is a further impression on the bottom of the first circular impression 12 and which is like the circular impression 12 directed in a direction outward the oven cavity, which means into a direction of the rear side of the oven. A fixing region 16 is provided in the rear wall 10 for receiving a heating coil and providing electrical contact to that heating coil.

[0021] Fig. 2 shows (on the left side) the muffle rear wall 10 of Fig. 1 where now a fan 18 and a heating coil 20 are mounted.

[0022] Heating coil 20 has a center 30 and is fixed by means of two screws 28 to the muffle rear wall 10 in a fixing region of the heating coil 22 where heating coil 20 is contacted on its ends with a current entry and a current exit provided through the muffle rear wall for delivering electrical power to the heating loop. Fixing region 22 of the heating coil 20 can be formed as a plug with two contacts for contacting both ends of the heating coil with

a connector in or behind the rear wall 10 and where the screws 28 are provided for an additionally fixing the plug-like fixing region 22 of the heating coil 20 with the muffle rear wall 10.

[0023] As can be seen better in the most right sided enlarged sectional view of the area comprising the elongated impression 14 of the rear wall 10 a spacer is provided in form of a bracket 24, which is clipped onto the heating coil 20 so as to maintain a predetermined minimum distance between the heating coil 20 and the muffle wall 10. This bracket 24 is clipped or can be otherwise fixed onto the heating coil 20 in a section opposite to the fixing region 22 of the heating coil 20 so that an optimum leverage is provided for supporting the heating coil 20 against movements towards the rear wall 10. A further enlargement of this enlarged cross-section is shown left from the first enlargement. As can be seen in the second enlargement bracket 24 comprises an extension 26, which is directed towards the rear wall 10. Extension 26 extends into the elongated impression 14 of the muffle rear wall 10, which is dimensioned such that a certain radial (with respect to center 30) movement of the extension 26 along the elongated impression 14 is possible (typically in a range of up to 5 cm, more preferably up to 2 cm). In contrast to that the dimension of elongated impression 14 in a direction perpendicular to the longitudinal extension is so narrow that, although a sliding movement of the extension along the longitudinal extension of elongated impression 14 is still possible, a lateral movement is suppressed. This co-action of extension 26 of the bracket 24 and the elongated impression 14 of rear muffle wall 10 allows the heating coil 20 to freely expand and contract in a radial direction (towards the center 30 of heating coil 20 and away from the center 30, respectively), however prevents the heating coil 20 from a lateral displacement along the rear wall 10 (a lateral movement of the center 30 of the circular heating coil 20 along direction B of Fig. 1). In addition bracket 24 and its extension 26 forms a spacer so as to inhibit a movement of the heating coil 20 towards rear wall 10 so that a predetermined minimum distance between the heating coil and the rear muffle wall 10 is maintained.

[0024] In order to avoid a lifting of the extension 26 away from the impression 14 thus enabling the extension 24 to escape from the impression 14 the heating coil 20 is mounted under a pre-load pressing the heating coil 20 and in particular the bracket 24 against the muffle wall 10.

List of reference signs

[0025]

- 10 : rear wall
- 12 : circular impression
- 14 : elongated impression
- 16 : fixing region in rear wall
- 18 : fan
- 20 : heating coil

22 : fixing region of heating coil
 24 : bracket
 26 : extension
 28 : screws
 30 : center

Claims

1. An oven comprising an oven muffle with a muffle wall (10) defining an oven cavity and a heating loop (20), the heating loop (20) being fixedly mounted onto the muffle wall (10) in a fixing region (22) of the heating loop (20), the fixing region (22) being adjacent to a current entry and a current exit provided through the muffle wall for delivering electrical power to the heating loop (20), and the heating loop (20) comprising at least one spacer (24) mounted onto the heating loop outside the fixing region (22) for maintaining a predetermined minimum distance between the heating loop and the muffle wall (10), and the spacer (24) comprises an extension (26) directed towards the muffle wall (10) **characterized in that** the muffle wall (10) comprises an impression (14) positioned relative to the extension (26) so as to receive the extension (26), the impression (14) being designed so as to enable at most limited lateral displacement of the heating loop arising under working conditions of the oven, wherein the impression (14) is elongated and dimensioned so as to allow a sliding movement of the extension (26) within the elongated impression (14) relative to and along the muffle wall in a first radial outward and inward direction (A) so as to perform thermal expansion or contraction of the loop material and to suppress a movement of the extension (26) in a direction (B) parallel to an adjacent section of the heating loop (20).
2. The oven of claim 1, wherein said impression (14) has a lateral width being in the range of the width of the cross-section of said extension (26) in the same direction, preferably being between said width of the extension (26) and twice said width.
3. The oven of claim 1 or 2, wherein the first direction (A) is perpendicular to an adjacent section of the heating loop (20).
4. The oven of anyone of the preceding claims, wherein one spacer (24) is mounted on a side of the heating loop (20) opposite to the fixing region (22) of the heating loop.
5. The oven of anyone of the preceding claims, wherein the heating loop has a circular footprint and consists of at least one heating coil (20).
6. The oven of claim 5 wherein the orientation of the elongated impression (14) is radial with respect to the heating coil (20) hence allowing a radial expansion or a radial contraction of the heating coil due to thermal expansion or thermal contraction of the heating coil and suppressing a lateral movement of the heating coil (20).
7. The oven of claim 6, wherein the muffle wall (10) comprises a circular impression (12) for receiving the heating coil (20) and wherein the elongated impression (14) is impressed into said circular impression (12).
8. The oven of claim 7, wherein the circular impression (12) is impressed in a direction towards the outer side with respect to the oven cavity of the muffle wall (10).
9. The oven of anyone of claims 5 to 8, wherein the fixing region (22) of the heating coil (20) covers a section smaller than 90° of footprint of the heating coil (20).
10. The oven of claim 9, wherein the fixing region (22) of the heating coil (20) covers a section smaller than 45° of footprint of the heating coil (20).
11. The oven of anyone of the claims 3 to 10, wherein the elongated impression (14) is impressed in a direction towards the outer side with respect to the oven cavity of the muffle wall (10).
12. The oven of anyone of the preceding claims, wherein said spacer is a bracket (24) clipped onto the heating loop (20).
13. The oven of anyone of the preceding claims, wherein said muffle wall onto which the heating loop (20) is mounted is a rear muffle wall (10).
14. The oven of anyone of the preceding claims, wherein one single spacer (24) is mounted onto the heating loop (20).
15. The oven of anyone of the claims 3 to 14, wherein said elongated impression (14) has a longitudinal extension being longer than the length of the cross-section of said extension (26) in the same direction, preferably being at least 3 times said length.
16. The oven of anyone of the preceding claims, wherein the heating loop (20) is pressed against the muffle wall (10) in the region of the placement of the spacer (24), in particular by a pre-load introduced in the region of the fixed mounting of the heating loop (20).

Patentansprüche

1. Ofen, umfassend eine Ofenmuffel mit einer Muffelwand (10), die eine Ofenkammer definiert, und einer Heizschleife (20),
wobei die Heizschleife (20) fest auf der Muffelwand (10) in einer Befestigungsregion (22) der Heizschleife (20) montiert ist, wobei die Befestigungsregion (22) sich neben einem Stromeintrag und einem Stromaustrag befindet, die durch die Muffelwand bereitgestellt werden, um der Heizschleife (20) elektrische Energie bereitzustellen, und wobei die Heizschleife (20) mindestens ein Distanzstück (24) umfasst, das auf der Heizschleife außerhalb der Befestigungsregion (22) montiert ist, um einen vorbestimmten Mindestabstand zwischen der Heizschleife und der Muffelwand (10) aufrechtzuerhalten, und wobei das Distanzstück (24) eine Verlängerung (26) umfasst, die zu der Muffelwand (10) gerichtet ist, **dadurch gekennzeichnet, dass** die Muffelwand (10) eine Vertiefung (14) umfasst, die relativ zu der Verlängerung (26) positioniert ist, um so die Verlängerung (26) aufzunehmen, wobei die Vertiefung (14) so konzipiert ist, dass höchstens begrenzte seitliche Verschiebung der Heizschleife möglich ist, zu der es unter Arbeitsbedingungen des Ofens kommt, wobei die Vertiefung (14) länglich und so bemessen ist, dass eine gleitende Bewegung der Verlängerung (26) innerhalb der länglichen Vertiefung (14) relativ zu und entlang der Muffelwand in einer ersten radialen Richtung (A) auswärts und einwärts möglich ist, um so Wärmeexpansion oder -kontraktion des Schleifenmaterials durchzuführen und eine Bewegung der Verlängerung (26) in einer Richtung (B) parallel zu einem benachbarten Abschnitt der Heizschleife (20) zu unterdrücken.
2. Ofen nach Anspruch 1, wobei die Vertiefung (14) eine seitliche Breite im Bereich der Breite des Querschnitts der Verlängerung (26) in derselben Richtung hat, vorzugsweise zwischen der Breite der Verlängerung (26) und der doppelten Breite derselben.
3. Ofen nach Anspruch 1 oder 2, wobei die erste Richtung (A) senkrecht zu einem benachbarten Abschnitt der Heizschleife (20) ist.
4. Ofen nach einem der vorhergehenden Ansprüche, wobei ein Distanzstück (24) an einer Seite der Heizschleife (20) gegenüber der Befestigungsregion (22) der Heizschleife montiert ist.
5. Ofen nach einem der vorhergehenden Ansprüche, wobei die Heizschleife eine kreisförmige Grundfläche hat und aus mindestens einer Heizspirale (20) besteht.
6. Ofen nach Anspruch 5, wobei die Orientierung der länglichen Vertiefung (14) in Bezug zu der Heizspirale (20) radial ist, wodurch eine radiale Expansion oder eine radiale Kontraktion der Heizspirale infolge von thermischer Expansion oder thermischer Kontraktion der Heizspirale ermöglicht wird und eine seitliche Bewegung der Heizspirale (20) unterdrückt wird.
7. Ofen nach Anspruch 6, wobei die Muffelwand (10) eine kreisförmige Vertiefung (12) zum Aufnehmen der Heizspirale (20) umfasst, und wobei die längliche Vertiefung (14) in die kreisförmige Vertiefung (12) eingeprägt ist.
8. Ofen nach Anspruch 7, wobei die kreisförmige Vertiefung (12) in einer Richtung zu der Außenseite in Bezug auf die Ofenkammer der Muffelwand (10) eingeprägt ist.
9. Ofen nach einem der Ansprüche 5 bis 8, wobei die Befestigungsregion (22) der Heizspirale (20) einen Abschnitt bedeckt, der kleiner als 90° der Grundfläche der Heizspirale (20) ist.
10. Ofen nach Anspruch 9, wobei die Befestigungsregion (22) der Heizspirale (20) einen Abschnitt bedeckt, der kleiner als 45° der Grundfläche der Heizspirale (20) ist.
11. Ofen nach einem der Ansprüche 3 bis 10, wobei die längliche Vertiefung (14) in einer Richtung zu der Außenseite in Bezug auf die Ofenkammer der Muffelwand (10) eingeprägt ist.
12. Ofen nach einem der vorhergehenden Ansprüche, wobei das Distanzstück eine Klammer (24) ist, die auf die Heizschleife (20) geklemmt ist.
13. Ofen nach einem der vorhergehenden Ansprüche, wobei die Muffelwand, auf der die Heizschleife (20) montiert werden soll, eine hintere Muffelwand (10) ist.
14. Ofen nach einem der vorhergehenden Ansprüche, wobei ein einzelnes Distanzstück (24) auf die Heizschleife (20) montiert wird.
15. Ofen nach einem der Ansprüche 3 bis 14, wobei die längliche Vertiefung (14) eine Längsausdehnung hat, die länger als die Länge des Querschnitts der Verlängerung (26) in derselben Richtung ist, vorzugsweise mindestens das 3-fache der Länge.
16. Ofen nach einem der vorhergehenden Ansprüche, wobei die Heizschleife (20) in der Region der Platzierung des Distanzstücks (24) gegen die Muffelwand (10) gepresst wird, insbesondere durch eine Vorlast, die in die Region der befestigten Montage

der Heizschleife (20) eingebracht wird.

Revendications

1. Four comprenant un moufle de four avec une paroi de moufle (10) définissant une cavité ouverte et une boucle de chauffage (20), la boucle de chauffage (20) étant montée de façon fixe sur la paroi de moufle (10) dans une région de fixation (22) de la boucle de chauffage (20), la région de fixation (22) étant adjacente à une entrée de courant et une sortie de courant disposées à travers la paroi de moufle pour délivrer de l'énergie électrique à la boucle de chauffage (20), et la boucle de chauffage (20) comprenant au moins une entretoise (24) montée sur la boucle de chauffage à l'extérieur de la région de fixation (22) pour maintenir une distance minimale prédéterminée entre la boucle de chauffage et la paroi de moufle (10), et l'entretoise (24) comprenant un prolongement (26) dirigé vers la paroi de moufle (10),
caractérisé en ce que
la paroi de moufle (10) comprend un évidement (14) positionné par rapport au prolongement (26) de manière à recevoir le prolongement (26), l'évidement (14) étant conçu de manière à permettre tout au plus un déplacement latéral limité de la boucle de chauffage survenant dans des conditions de fonctionnement du four, l'évidement (14) étant allongé et dimensionné de manière à permettre un mouvement de glissement du prolongement (26) à l'intérieur de l'évidement allongé (14) par rapport à et le long de la paroi de moufle dans une première direction radiale vers l'extérieur et vers l'intérieur (A) de manière à effectuer une dilatation ou contraction thermique du matériau de la boucle et à supprimer un mouvement du prolongement (26) dans une direction (B) parallèle à une section adjacente à la boucle de chauffage (20).
2. Four de la revendication 1, dans lequel ledit évidement (14) a une largeur latérale se situant dans la gamme de la largeur de la section transversale dudit prolongement (26) dans la même direction, de préférence se situant entre ladite largeur du prolongement (26) et deux fois ladite largeur.
3. Four de la revendication 1 ou 2, dans lequel la première direction (A) est perpendiculaire à une section adjacente de la boucle de chauffage (20).
4. Four de l'une quelconque des revendications précédentes, dans lequel une entretoise (24) est montée sur un côté de la boucle de chauffage (20) à l'opposé de la région de fixation (22) de la boucle de chauffage.

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5. Four de l'une quelconque des revendications précédentes, dans lequel la boucle de chauffage a une empreinte circulaire et consiste en au moins un serpent de chauffage (20).
6. Four de la revendication 5 dans lequel l'orientation de l'évidement allongé (14) est radiale par rapport au serpent de chauffage (20), permettant ainsi une dilatation radiale ou une contraction radiale du serpent de chauffage due à une dilatation thermique ou une contraction thermique du serpent de chauffage et supprimant un mouvement latéral du serpent de chauffage (20).
7. Four de la revendication 6, dans lequel la paroi de moufle (10) comprend un évidement circulaire (12) destiné à recevoir le serpent de chauffage (20) et dans lequel l'évidement allongé (14) est creusé dans ledit évidement circulaire (12).
8. Four de la revendication 7, dans lequel l'évidement circulaire (12) est creusé dans une direction vers le côté extérieur par rapport à la cavité de four de la paroi de moufle (10).
9. Four de l'une quelconque des revendications 5 à 8, dans lequel la région de fixation (22) du serpent de chauffage (20) couvre une section inférieure à 90° de l'empreinte du serpent de chauffage (20).
10. Four de la revendication 9, dans lequel la région de fixation (22) du serpent de chauffage (20) couvre une section inférieure à 45° de l'empreinte du serpent de chauffage (20).
11. Four de l'une quelconque des revendications 3 à 10, dans lequel l'évidement allongé (14) est creusé dans une direction vers le côté extérieur par rapport à la cavité de four de la paroi de moufle (10).
12. Four de l'une quelconque des revendications précédentes, dans lequel ladite entretoise est un support (24) attaché sur la boucle de chauffage (20).
13. Four de l'une quelconque des revendications précédentes, dans lequel ladite paroi de moufle sur laquelle est montée la boucle de chauffage (20) est une paroi arrière de moufle (10).
14. Four de l'une quelconque des revendications précédentes, dans lequel une seule entretoise (24) est montée sur la boucle de chauffage (20).
15. Four de l'une quelconque des revendications 3 à 14, dans lequel ledit évidement allongé (14) a un prolongement longitudinal qui est plus long que la longueur de la section transversale dudit prolongement (26) dans la même direction, de préférence qui fait

au moins 3 fois ladite longueur.

- 16.** Four de l'une quelconque des revendications précédentes, dans lequel la boucle de chauffage (20) est comprimée contre la paroi de moufle (10) dans la région du positionnement de l'entretoise (24), en particulier par une précharge introduite dans la région du montage fixe de la boucle de chauffage (20).

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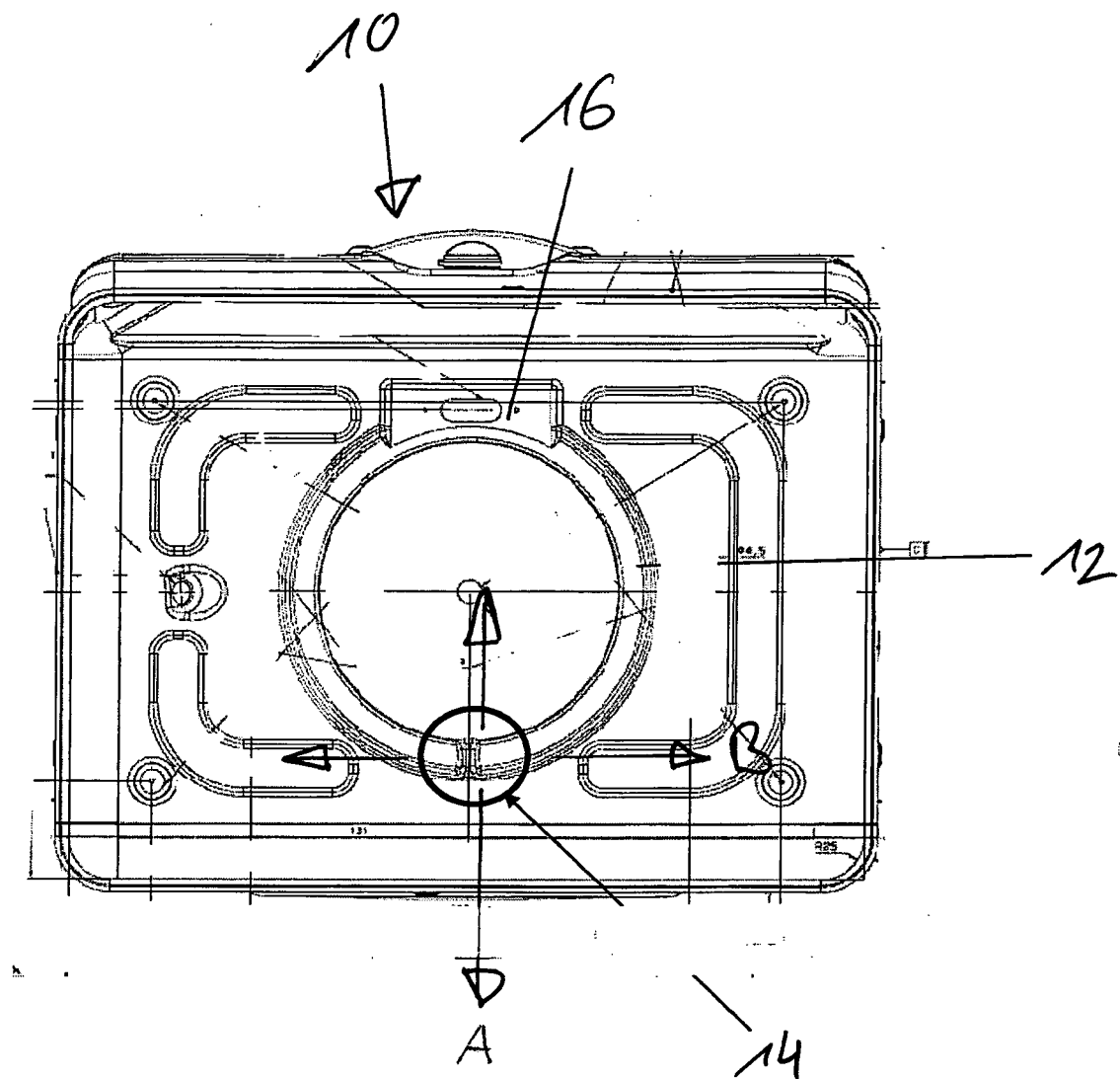
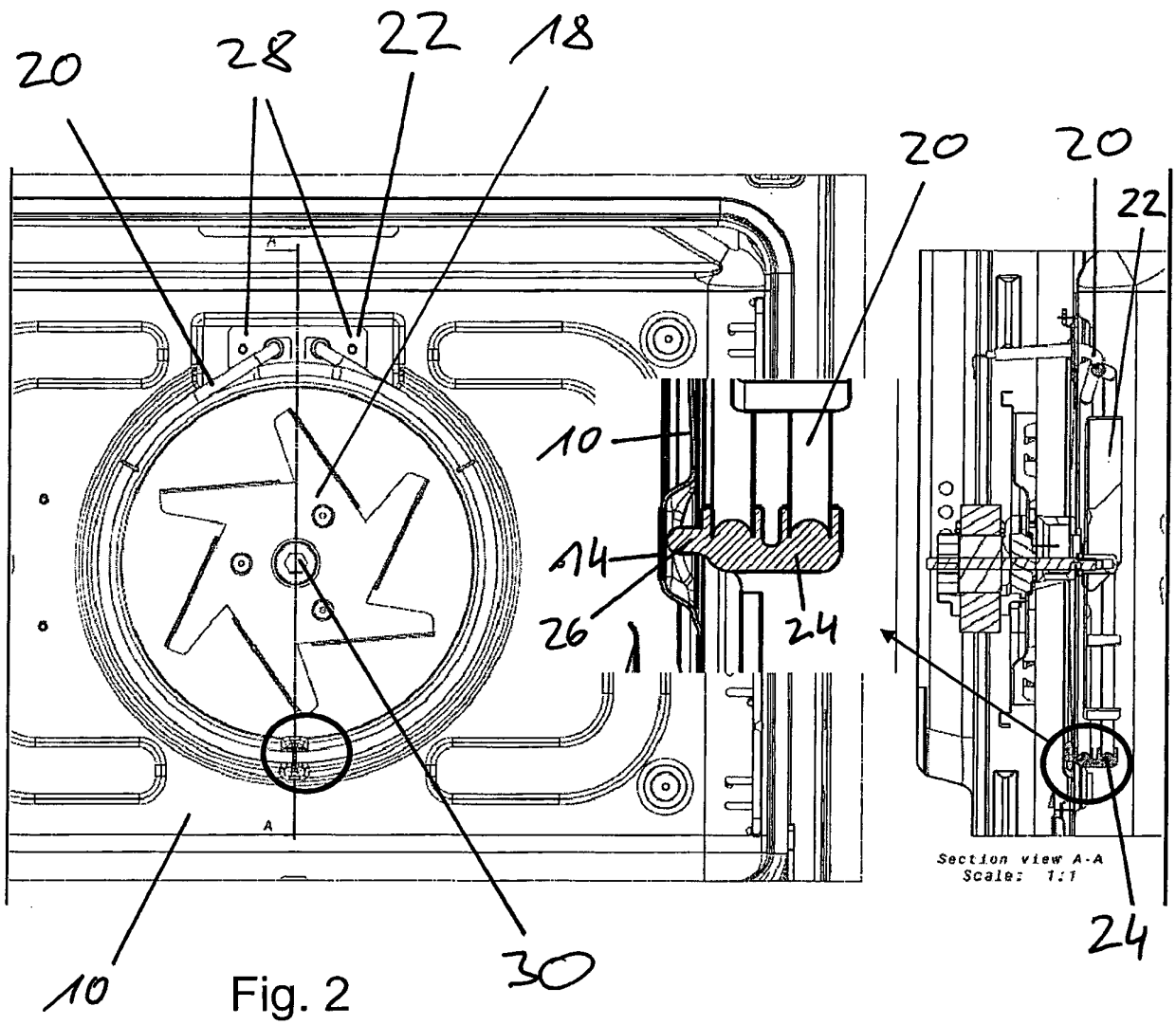


Fig. 1



REFERENCES CITED IN THE DESCRIPTION

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