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(12) # EUROPEAN PATENT SPECIFICATION

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FR-A-2 138 464
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Description

This invention relates to heating apparatus and in particular, though not exclusively to heating apparatus of the kind disclosed in our copending U.K. Patent Application No. 8320717, (Publication No. 2132060A), wherein one or more sources of infra-red radiation are mounted beneath a layer of an infra-red transmissive glass ceramic to form a cooking hob.

The heating apparatus disclosed in U.K. Patent Application No. 8320717 consists of, in one example, four quartz-halogen, infra-red lamps supported above a generally circular metallic tray member, having a layer of thermally-insulative, microporous material disposed on the base thereof.

The apparatus is mounted beneath a layer of glass ceramic and each lamp is preferably provided with an infra-red reflective coating on the underside of the quartz envelope of the lamp, to reflect infra-red radiation emitted downwardly therefrom back in an upward direction, towards and through the glass ceramic layer.

It is an object of the present invention to provide an alternative arrangement of heating apparatus of this kind.

According to the invention there is provided a heating apparatus including one or more tungsten-halogen lamps (6; 21—24) mounted beneath a layer (19) transmissive of infra-red radiation generated by said lamp or lamps (6; 21—24) and a base structure (1) comprising a tray, a body of a thermally-insulating material and means for reflecting infra-red radiation, emitted by said lamp or lamps in a direction away from said layer (19), back towards said layer (19) for transmission therethrough characterised in that said tray, said body of a thermally insulating material and said reflective means comprise an integral structure (1; 20; 26; 28) made of a ceramic material reflective of, and directly exposed to, said generated infra-red radiation.

The structure may form a support for the infra-red source or sources, the support preferably being shaped as a generally circular tray member.

The structure may be profiled to conform to the shape of the source or sources, which preferably consist of one or more tubular infra-red lamps.

Alternatively, in conjunction with the infra-red lamps, the structure may consist of one or more respective troughs of the infra-red-reflective ceramic material, each trough extending along the length of a lamp and around substantially one half of the lamp circumference.

The invention will now be further described by way of example only with reference to the accompanying drawings, wherein:

Figure 1 shows schematically a plan view of one embodiment of the invention,

Figure 2 shows schematically a sectional view through A—A in Figure 1, with the apparatus beneath a glass ceramic cook-top of a cooking hob,

Figure 3 shows schematically a plan view of a second embodiment,

Figure 4 shows schematically a sectional view through B—B of the second embodiment in Figure 3, also with the apparatus beneath a glass ceramic cook-top, and

Figures 5 to 7 show schematically sectional views, through a plane orthogonal to those of sections A—A and B—B, of three further embodiments of the present invention.

Referring to Figures 1 and 2, wherein the first embodiment of heating apparatus, in accordance with the present invention, is shown, a generally circular shallow tray 1, formed from an infra-red reflective ceramic material, has two extending flanges 2 and 3 arranged on opposite sides of the rim of the ceramic tray 1. Each flange 2 and 3, has upturned end portions 4 and 5, respectively.

A number of sources of infra-red radiation, preferably four, are disposed above the ceramic tray 1 and are supported at each end by the flanges, 2 and 3.

A moulding 7 of ceramic fibre material is disposed above the ceramic tray 1 and press-fitted around the ends of each source 6 to provide a suitable packing therefor.

Each source 6 of infra-red radiation comprises a quartz-halogen infra-red lamp including a tungsten filament 8 supported within a tubular quartz envelope 9. One suitable example of such a lamp is disclosed in copending European Application No. 84 301636.1, in the name of Thorn EMI plc.

Each lamp has moulded ceramic end caps, one shown at 10, enclosing a pinch seal (not shown) with an electrical connection connected to an end of the filament 8 sealed therein. Each end cap 10 is provided with a location tab 11 for easy insertion of the lamps into the correct position on flanges 2 and 3.

One or more, preferably four, of the heating apparatus are mounted beneath a layer 19 of infra-red transmissive material, such as glass ceramic, so as to form respective hotplate areas of a cook-top of a cooking hob.

A thermal limiter 12, which is intended to monitor the temperature of the glass ceramic, includes a metallic wire 13 contained within a quartz tube 14. The wire 13 is arranged to activate a microswitch 15, so as to disconnect the lamps 6 from a power supply, when the temperature of the glass ceramic reaches a maximum predetermined value, thereby preventing overheating and damage to the glass ceramic.

It has been found that the diameter of the wire 13 may be crucial to the temperature of the glass ceramic to which the limiter 12 is sensitive. To ensure that the limiter 12 monitors the a particular temperature of the glass ceramic, it may therefore be necessary to utilise a wire 13 of a particular diameter. Alternatively, other techniques may be used to achieve the desired selectivity in the response characteristics of the limiter.

Figures 3 and 4, wherein like parts are labelled with like reference numerals with respect to Figures 1 and 2, show a second embodiment of the heating apparatus, in accordance with the present invention. In the second embodiment, the flanges

2 and 3, as provided in the first embodiment, have been replaced by suitably-shaped pieces of insulative material, 16 and 17, through which the ends of each lamp 6 extend and being shaped so that substantially equal portions 18 of each lamp is exposed thereby ensuring that substantially equal amounts of heat are dissipated at the ends of all of the lamps.

The second embodiment also enables cool air to circulate around the end cap 10, so as to aid in cooling the pinch seal enclosed therewithin, this being necessary to ensure longevity of the lamps.

The ceramic tray 1 acts as a good infra-red reflector, so that radiation emitted from the lamps in a downward direction is reflected upwardly towards the layer of glass ceramic, and is thus transmitted therethrough.

Figures 5 to 7 show schematic illustrations of embodiments which may be used as alternatives to, or in conjunction with, those shown in Figures 1 to 4.

Figure 5 illustrates a flat sheet 20 of the ceramic material, disposed beneath four infra-red lamps 21 to 24, mounted beneath a glass ceramic cooktop 25, the sheet 20 either being spaced from, or in close proximity to, the lamps.

In Figure 6, the apparatus is provided with a profiled sheet 26 of ceramic material, which is shaped to conform to the shape of the tubular lamps 21 to 24. Each profiled portion 27 of the sheet 26 may be directly connected to an adjacent portion, as shown, or alternatively the profiled portions may be joined by connecting flat portions of the sheet 26.

Figure 7 shows another embodiment, wherein each lamp 21 to 24 is provided with a respective trough 28 of the infra-red-reflective ceramic material. The troughs 28 may be shaped to give the required reflectivity, i.e. they may be semi-circular, parabolic or semi-elliptical, for example.

Each trough 28 preferably extends at least along the whole length of the respective lamp filament and around substantially the lower half of its cross-sectional circumference.

The pinch seals of each lamp are required to be kept relatively cool to ensure longevity of the lamps, so that it may be preferable that the troughs 28 do not extend to beneath, or around, the pinch seals.

It may be preferable to shape the troughs 28 so that the filament, such as at 29, of each lamp is situated at the focal point of the trough.

Alternatively, the shaped sheet 26 may be incorporated into the base of the tray 1, as shown in Figures 2 and 4.

As an additional infra-red reflector, the lower half of the quartz envelope 9 of each lamp 6 may be provided with a suitable infra-red-reflective coating, to aid in reflecting downwardly-emitted radiation in an upward direction towards the glass ceramic layer.

The heating apparatus may be provided with thermal insulation, such as a microporous material as used in our above-mentioned copending U.K. Patent Application No. 8320717, disposed within the cooking hob below and/or around the apparatus, in contact therewith or spaced therefrom, so as to aid in preventing heat dissipation from the apparatus. In the embodiments shown in Figures 5 to 7, the insulative material may, alternatively or additionally be used as a support for the lamps.

Additionally or alternatively, the cooking hob may include a forced air cooling system, to aid in preventing overheating of certain parts of the apparatus, particularly the pinch seals of the lamps which are required to be kept relatively cool.

Additional or alternative cooling of the pinch seals may be provided by heat sinking and/or natural air convection techniques, such as those disclosed in any of copending European Patent Application Nos. 84303424.0, 84303729.2 and 84303846.4.

Claims

1. Heating apparatus including one or more tungsten-halogen lamps (6; 21—24) mounted beneath a layer (19) transmissive of infra-red radiation generated by said lamp or lamps (6; 21—24) and a base structure (1) comprising a tray, a body of a thermally-insulating material and means for reflecting infra-red radiation, emitted by said lamp or lamps in a direction away from said layer (19), back towards said layer (19) for transmission therethrough characterised in that said tray, said body of a thermally insulating material and said reflective means comprise an integral structure (1; 20; 26; 28) made of a ceramic material reflective of, and directly exposed to, said generated infra-red radiation.

2. Heating apparatus as claimed in Claim 1 wherein said integral structure (1; 20; 26; 28) provides a support for said tungsten-halogen lamp or lamps (6; 21—24).

3. Heating apparatus as claimed in Claim 1 or Claim 2 wherein said integral structure (1; 20; 26; 28) is shaped as a generally circular tray member (1).

4. Heating apparatus as claimed in any preceding claim wherein said integral structure (1; 20; 26; 28) is profiled to conform to the shape of said tungsten-halogen lamp or lamps (6; 21—24).

5. Heating apparatus as claimed in Claim 1 or Claim 2 wherein said integral structure (1; 20; 26; 28) includes one or more respective troughs (28) of said infra-red-reflective ceramic material, each trough (28) extending along the length of a lamp (6; 21—24) and around substantially one half of the circumference of said lamp (6; 21—24).

6. Heating apparatus as claimed in Claim 1 or Claim 2 wherein said infra-red-reflective means (1; 20; 26; 28) consists of a substantially flat sheet (20) of said infra-red-reflective ceramic material.

7. Heating apparatus as claimed in any preceding claim and including further thermally insulating material to aid in preventing heat dissipation from said apparatus and/or to support said tungsten-halogen lamp or lamps (6; 21—24).

Patentansprüche

1. Heizgerät mit einer oder mehreren Wolfram-Halogen-Lampen (6; 21 bis 24) die unterhalb einer Schicht (19) angeordnet sind, die für von der Lampe oder den Lampen (6; 21—24) erzeugte Infrarotstrahlung durchlässig ist, und mit einem Basisaufbau (1), der eine Schale, einen Körper aus einem thermisch isolierenden Material und Mittel umfaßt, um von der Lampe oder den Lampen in eine Richtung weg von der genannten Schicht (19) ausgesendete Strahlung zurück zu der genannten Schicht zum Hindurchführen durch diese zu reflektieren, dadurch gekennzeichnet, daß die genannte Schale, der genannte Körper aus thermisch isolierendem Material und die genannten reflektierenden Mittel einen integralen Aufbau (1, 20, 26, 28) umfassen, der aus einem keramischen Material besteht, das die erzeugte Infrarotstrahlung reflektiert und ihr direkt ausgesetzt ist.

2. Heizgerät nach Anspruch 1, bei dem der genannte integrale Aufbau (1, 20, 26, 28) eine Halterung für die Wolfram-Halogen-Lampe oder Lampen (6; 21—24) vorsieht.

3. Heizgerät nach Anspruch 1 oder Anspruch 2, bei dem der genannte integrale Aufbau (1, 20, 26, 28) als ein im allgemeinen kreisrundes Schalenelement (1) ausgebildet ist.

4. Heizgerät nach einen der vorgehenden Ansprüche, bei dem der genannte integrale Aufbau (1, 20, 26, 28) mit einem Profil zur Anpassung an die Form der Wolfram-Halogen-Lampe oder Lampen (6; 21 bis 24) versehen ist.

5. Heizgerät nach Ansprüch 1 oder 2, bei dem der genannte integrale Aufbau (1, 20, 26, 28) eine oder mehrere entsprechende Mulden (28) aus dem genannten infrarotreflektierenden keramischen Material enthält, wobei jede Mulde (28) sich über die Länge der Lampe (6; 21 bis 24) und etwa um den halben Umfang der genannten Lampe (6; 21 bis 24) herum erstreckt.

6. Heizgerät nach Anspruch 1 oder 2, bei dem die genannten infrarotreflektierenden Mittel (1, 20, 26, 28) aus einer im wesentlichen ebenen Platte (20) aus dem genannten infrarotreflektierenden keramischen Material bestehen.

7. Heizgerät nach einem der vorgehenden Ansprüche, das weiteres termisch isolierendes Material enthält, um die Verhinderung eines Heizverlustes von dem genannten Gerät zu unterstützen und/oder um die Wolfram-Halogen-Lampe oder Lampen (6, 21 bis 24) zu halten.

Revendications

1. Dispositif de chauffage comprenant une ou plusieurs lampes à tungstène-halogène (6; 21—24) montées au-dessous d'une couche (19) transmettant le rayonnement infrarouge produit par la ou lesdites lampes (6; 21—24), et une structure de base (1) comportant une cuvette, un corps réalisé en un matériau thermiquement isolant et des moyens pour réfléchir, en arrière, le rayonnement infrarouge, émis par la ou lesdites lampes dans une direction s'écartant de ladite couche (19), en direction de cette couche pour obtenir une transmission du rayonnement à travers cette couche, caractérisé en ce que ladite cuvette, ledit corps réalisé en un matériau thermiquement isolant et lesdits moyens réfléchissants forment une structure monobloc (1; 20; 26; 28) réalisée en un matériau céramique réfléchissant ledit rayonnement infrarouge produit, et directement exposé à ce rayonnement.

2. Dispositif de chauffage selon la revendication 1, dans lequel ladite structure monobloc (1; 20; 26; 28) fournit un support pour la ou lesdites lampes à tungstène-halogène (6; 21—24).

3. Dispositif de chauffage selon la revendication 1 ou 2, dans lequel ladite structure monobloc (1; 20; 26; 28) possède la forme d'un élément en forme de cuvette de forme générale circulaire (1).

4. Dispositif de chauffage selon l'une quelconque des revendications précédentes, dans lequel ladite structure monobloc (1; 20; 26; 28) est profilée de manière à avoir une forme adaptée à celle de la ou desdites lampes à tungstène-halogène (6; 21—24).

5. Dispositif de chauffage selon la revendication 1 ou 2, dans lequel ladite structure monobloc (1; 20; 26; 28) inclut un ou plusieurs éléments respectifs en forme d'auges (28), formés par ledit matériau céramique réfléchissant le rayonnement infrarouge, chaque élément en forme d'auge (28) s'étendant sur l'étendue en longueur d'une lampe (6; 21—24) et sensiblement autour d'une moitié de la circonférence de ladite lampe (6; 21—24).

6. Dispositif de chauffage selon la revendication 1 ou 2, dans lequel lesdits moyens (1; 20; 26; 28) réfléchissant le rayonnement infrarouge sont constitués par une feuille sensiblement plate (20) formée dudit matériau céramique réfléchissant le rayonnement infrarouge.

7. Dispositif de chauffage selon l'une quelconque des revendications précédentes, incluant en outre un matériau thermiquement isolant contribuant à empêcher une dissipation de chaleur à partir dudit dispositif et/ou supportant la ou lesdites lampes à tungstène-halogène (6; 21—24).

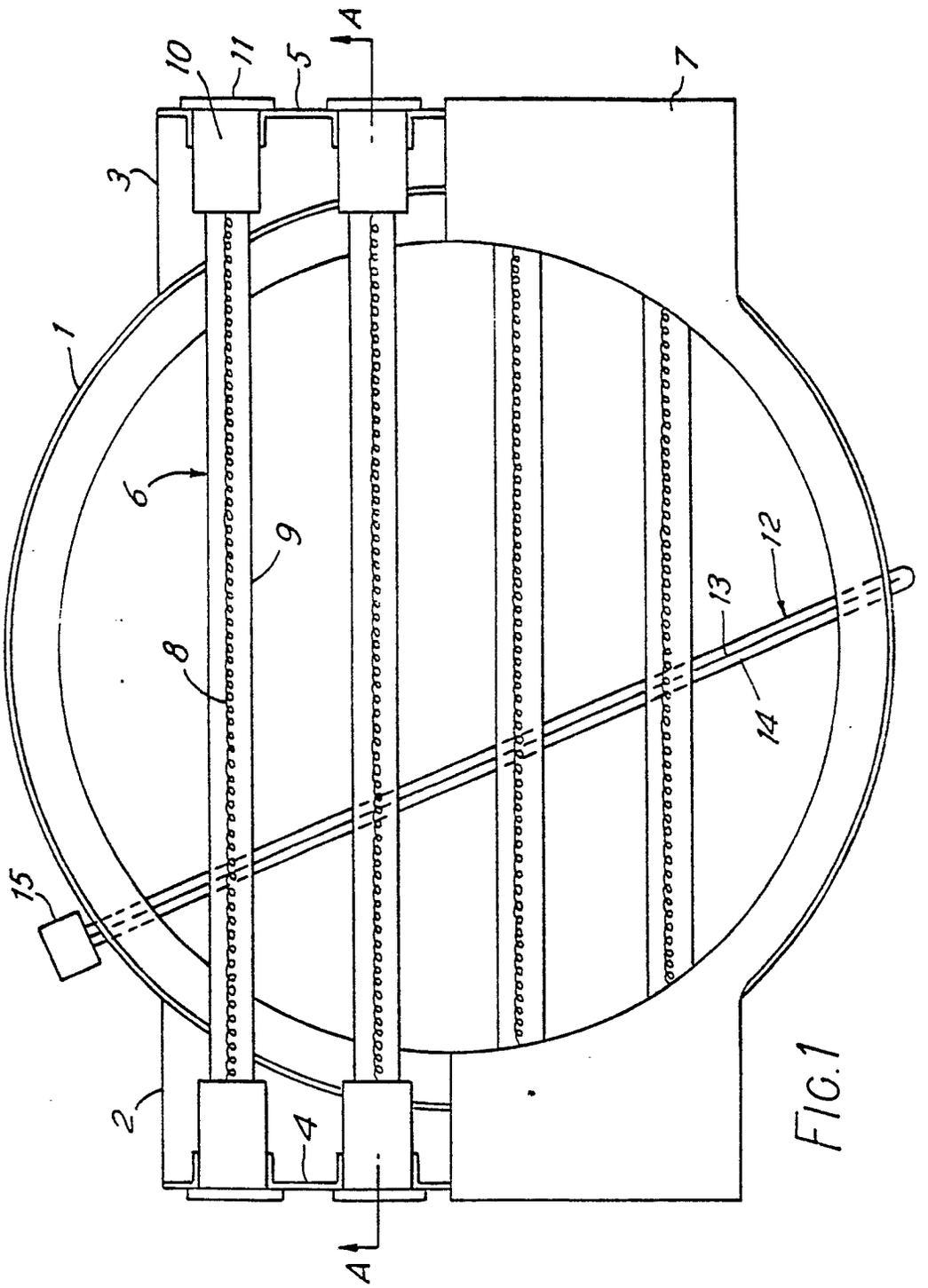

FIG.1

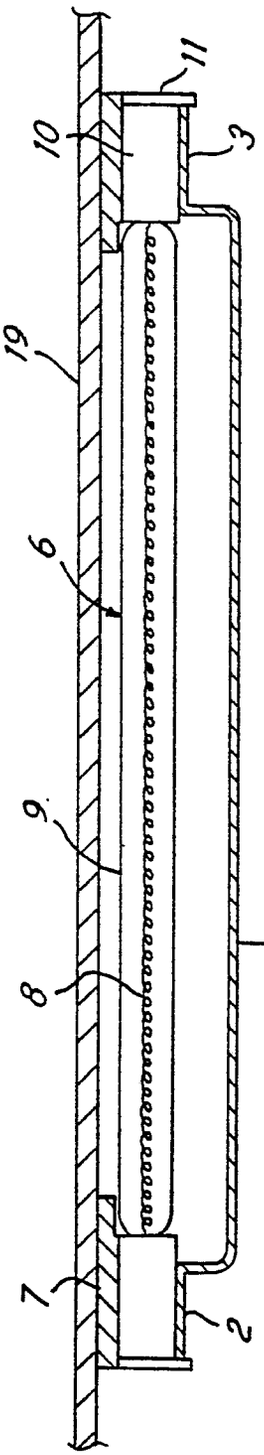

FIG.2

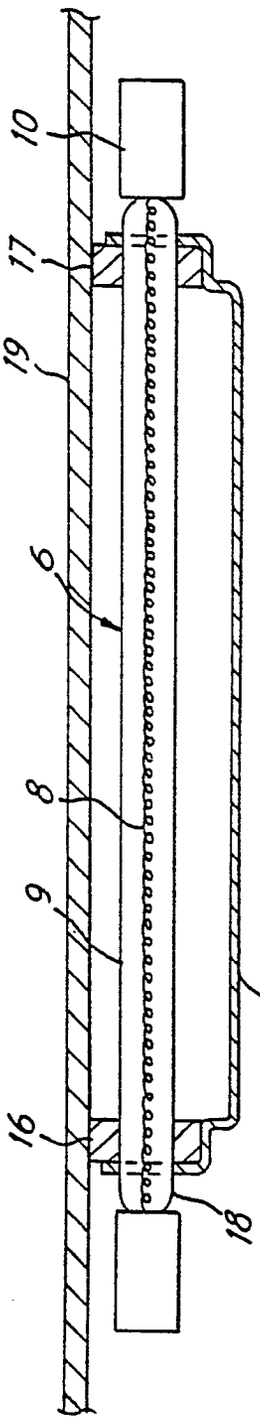

FIG.4

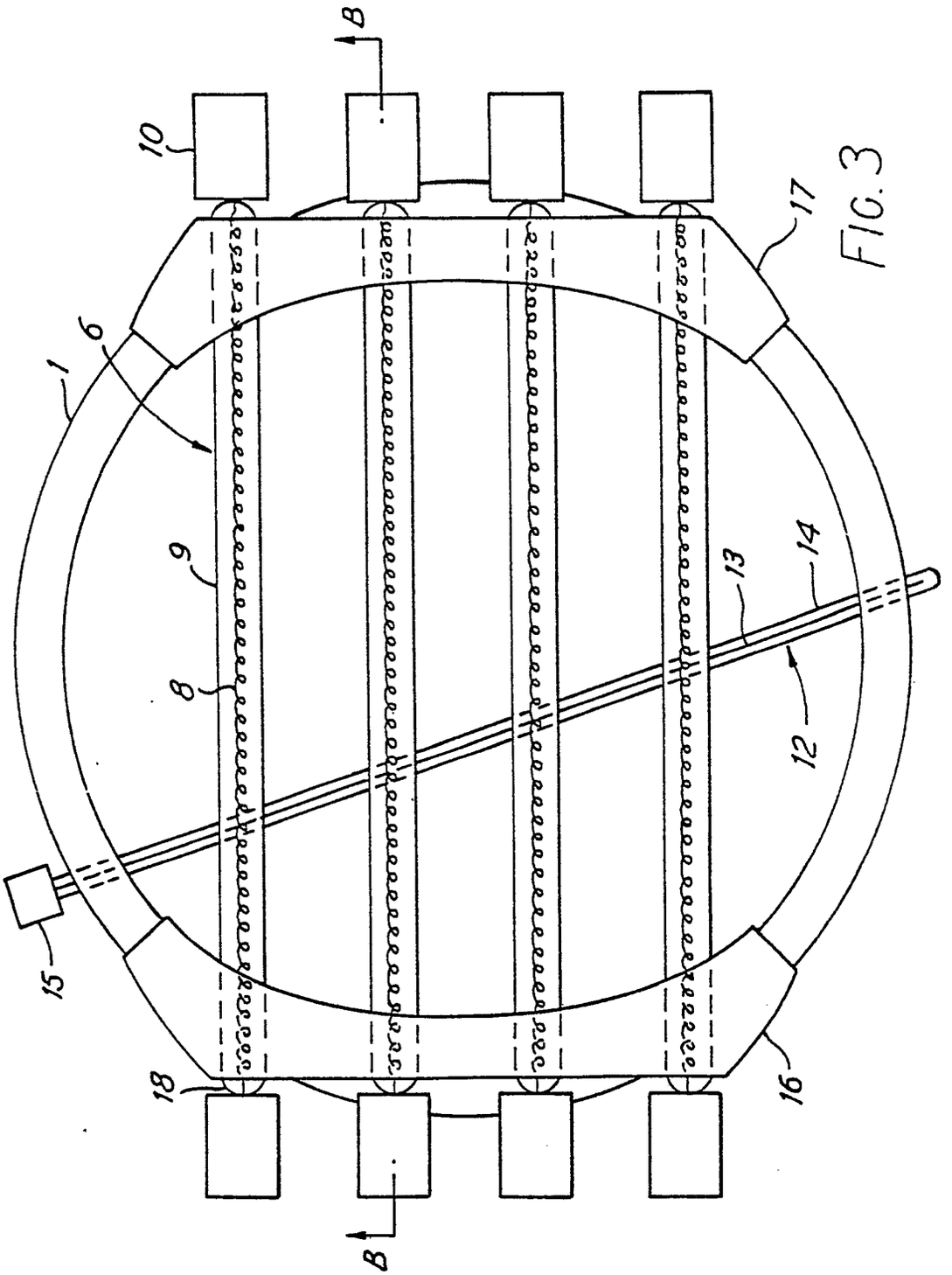

FIG. 3

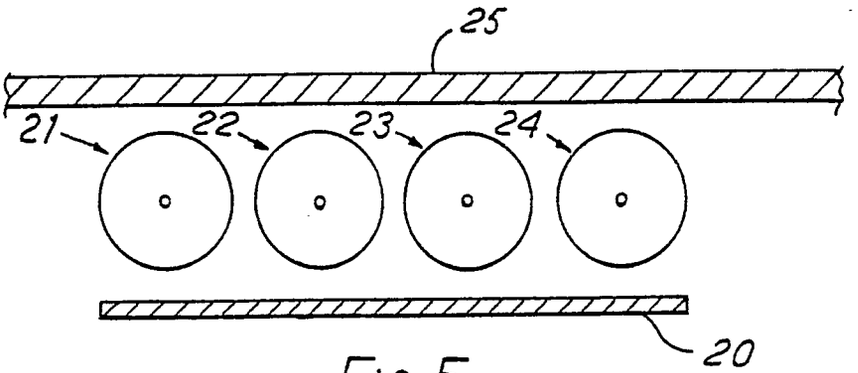

FIG.5

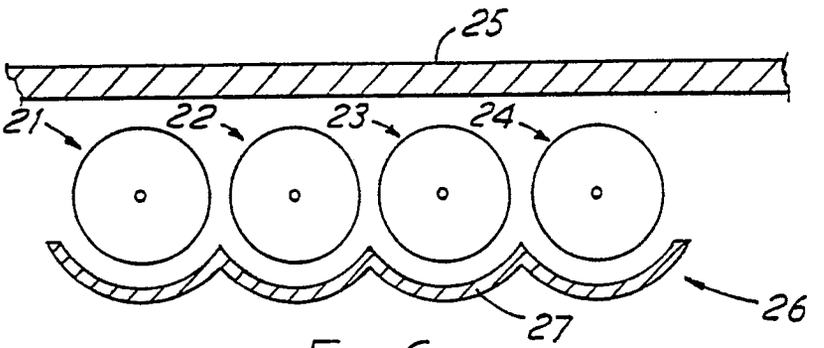

FIG.6

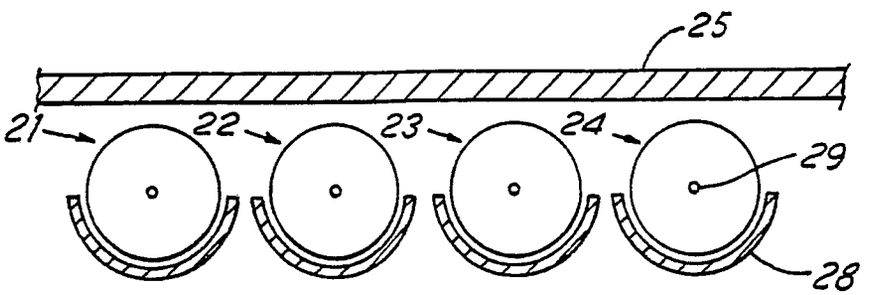

FIG.7