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(54) Title: SOLAR RECEIVER SYSTEM

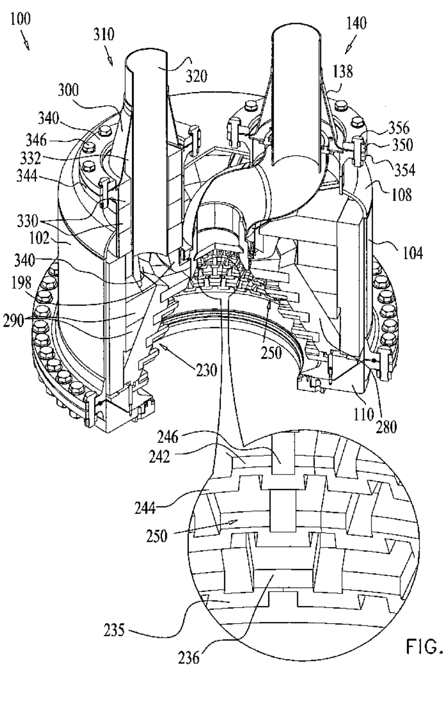

FIG. 2B

(57) Abstract: A solar receiver is provided, comprising a receiver housing extending along a longitudinal axis, having front and rear ends; a window configured to allow radiation to pass therethrough, the window being mounted at the front end and projecting within the housing; a receiver chamber defined between the housing and the window, the receiver chamber having a working fluid inlet for ingress of working fluid to be heated therewithin, and a working fluid outlet for egress therethrough of the heated working fluid; and a solar radiation absorber configured for absorbing the radiation and heating the working fluid thereby, the absorber being located within the receiver chamber and surrounding at least a portion of the window, the solar radiation absorber being formed with channels and made of a foam material, such as a ceramic or metallic foam material, having a characteristic average pore diameter. Each of the channels is open at a proximal, window-facing, end; extends radially within the absorber, and terminates at a distal end being closed by the material of the absorber.

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SOLAR RECEIVER SYSTEM

FIELD OF THE INVENTION

The present invention relates generally to solar energy systems and more particularly to solar energy systems with solar receivers.

BACKGROUND OF THE INVENTION

Turbines are commonly used to produce electrical power. Typically, a working fluid, such as air, steam or any other gas, is compressed and heated before being supplied to the turbine, wherein the working fluid is expanded and some of the energy content of hot, compressed working fluid is converted to mechanical motion which is then converted to electricity by use of a generator.

In solar energy systems one device known in the art for heating the working fluid prior to entering the turbine is a solar receiver. Such a receiver utilizes solar radiation which impinges upon a solar radiation absorber within the solar receiver. The working fluid is heated by the absorber, and thereafter the working fluid transfers the heat via the turbine for producing electrical power therefrom. Additionally, heat exchangers, chemical reactions, or any other suitable apparatus or process may be used to generate electricity from the heated working fluid.

SUMMARY OF THE INVENTION

According to one aspect of the present invention, there is provided a solar receiver comprising:

- a receiver housing extending along a longitudinal axis, having front and rear ends;
- a window configured to allow radiation to pass therethrough, the window being mounted at the front end and projecting within the housing;
- a receiver chamber defined between the housing and the window, the receiver chamber having a working fluid inlet for ingress of working fluid to be heated therewithin, and a working fluid outlet for egress therethrough of the heated working fluid; and
- a solar radiation absorber configured for absorbing the radiation and heating the working fluid thereby, the absorber being located within the receiver chamber and

surrounding at least a portion of the window, the solar radiation absorber being formed with channels and made of a foam material, such as a ceramic or metallic foam material, having a characteristic average pore diameter, each of the channels:

- being open at a proximal, window-facing, end;
- extending radially within the absorber; and
- terminating at a distal end being closed by the material of the absorber. The channel thus extends only partially in the radial direction; part of the absorber is located distally to each channel.

Foams which are suitable for use as solar radiation absorbers allows solar radiation to pass therethrough, heating portions thereof which are within its thickness. Working fluid similarly enters the foam for transfer thereto of energy absorbed by the foam. The amount of energy which is absorbed by the foam, and is thus useful for heat transfer to working fluid, decreases as the radiation penetrates deeper into the foam. This can be expressed as:

$$\textit{Total Absorbed Radiation} = A\left(1 - e^{-bx}\right)$$

where A is a constant related to system characteristics, b is the extinction coefficient, which is related to the foam structure, and x is the distance traveled through the material. In practice, the value of this equation is close to one when x is about 3 times the average pore diameter of the foam, indicating that when the radiation has penetrated to a distance equal to about three times the average pore diameter of the material, nearly the maximum amount of radiation which can be absorbed has been. Once the radiation exits the material, this effect is "reset", i.e., upon impinging upon a second piece of material, the value of x returns to zero, allowing additional absorption thereof within the second piece of material.

The solar radiation absorber may define a plurality of circumferential bands, each comprising a plurality of the channels. It may further comprise a plurality of circumferential absorber elements arranged axially, each absorber element comprising portions of one or more of the bands. The absorber elements may be formed with the channels formed in an axially-facing side thereof, all of the channels disposed within a single band being open toward a single axial direction. Each of the elements may comprise two of the bands, the channels of each of the bands being open toward an opposite axial direction than the channels of the other of the bands. The channels in each of the bands may be disposed axially adjacent to portions of material of the absorber between the channels of the other band. The absorber elements may be arranged such that channels thereof are disposed axially adjacent to portions of material of the absorber between the channels of an adjacent absorber element. Portions of material of the absorber between the channels of each of the bands may circumferentially overlap portions of material of the absorber between the channels of the other of the bands.

Portions of material of the absorber between the channels may constitute a wave-shaped window-facing profile.

The axial thickness of each of the sections of the material of the absorber bounding the channels may be greater than three times or five times the average pore diameter.

The material of the absorber closing the distal end of each channel may have a thickness, in the radial direction, greater than three times or five times the average pore diameter.

The channels may have a shape in a cross-section of a plane which is perpendicular to the radial direction, being substantially rectangular. The shape may comprise rounded corners.

The circumferential length of each channel may be smaller than that of the portion of material of the absorber circumferentially adjacent thereto.

The radial length of each channel may be larger than that of the material of the absorber closing the distal end thereof.

The solar receiver may further comprise a radiation shield disposed between the working fluid inlet and the receiver chamber. The radiation shield may be configured to allow working fluid to flow therethrough.

The solar receiver may be designed to facilitate working fluid to flow from the working fluid inlet around and along the window prior to flowing into the absorber.

According to another aspect of the present invention, there is provided a solar receiver system comprising:

- a solar receiver as described above; and
- a turbine operative to receive the working fluid from the working outlet and to generate electricity therefrom.

According to a further aspect of the present invention, there is provided a solar radiation absorber for use in a solar receiver, the solar radiation absorber being configured for absorbing radiation and heating a working fluid thereby, the solar radiation absorber being formed with channels and made of a foam material having a characteristic average pore diameter, each of the channels:

- being open at a proximal, radiation-facing, end;
- extending radially within the absorber; and
- terminating at a distal end being closed by the material of the absorber.

BRIEF DESCRIPTION OF THE DRAWINGS

The present subject matter will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a perspective view of a solar receiver;

Figs. 2A and **2B** are partial sectional views of the receiver illustrated in Fig. 1;

Fig. 3A is a perspective view of an absorber element of a solar absorber for use with the solar receiver illustrated in Figs. 1 through 2B;

Fig. 3B is a perspective view of another example of an absorber element of a solar absorber for use with the solar receiver illustrated in Figs. 1 through 2B; and

Fig. 4 schematically illustrates the operation of the solar receiver illustrated in Figs. 1 through 2B.

DETAILED DESCRIPTION

In the following description, various aspects of the present subject matter will be described. For purposes of explanation, specific configurations and details are set forth in order to provide a thorough understanding of the present subject matter. However, it will also be apparent to one skilled in the art that the present subject matter may be practiced without the specific details presented herein. Furthermore, well known features may be omitted or simplified in order not to obscure the description of the subject matter.

As seen in Fig. 1, a solar receiver **100** comprises a receiver housing **102** formed of stainless steel or any other suitable material. Housing **102** may be configured of a generally cylindrical main portion **104** having a central axis **X** (see Fig. 2A), and being formed with a top portion **108** at a rear end thereof, and a bottom portion **110** at a front end thereof. Housing **102** may be shaped in any suitable form.

As seen in Figs. 2A and 2B, wherein Fig. 2A illustrates the intact solar receiver **100** with a window and in Fig. 2B the window is not shown so as to illustrate elements surrounding the window, main portion **104** is engaged with top portion **108** by any suitable means, such as by welding, for example. Main portion **104** is engaged with bottom portion **110** by any suitable means, such as by a peripheral protrusion **126**, protruding from main portion **104**, mounted to a peripheral protrusion **128**, protruding from bottom portion **110**, by screws **130**. An O-ring **136** may be disposed between protrusions **126** and **128**. O-ring **136** is provided to ensure the engagement of respective main portion **104** with bottom portion **110** is a tight sealed engagement.

An inlet conduit housing **138** of an inlet conduit assembly **140** protrudes from top portion **108**. An inlet conduit **142** is formed of a generally cylindrical portion **144** which is partially disposed within inlet conduit housing **138**. A generally central inlet conduit portion **148** is disposed within main portion **104** of receiver housing **102** and is connected to cylindrical portion **144** by a generally angular portion **150**. Inlet conduit **142** may be formed of stainless steel or any other suitable material.

As seen in the inset in Fig. 2A, central inlet conduit portion **148** defines on a bottom portion thereof a peripheral protrusion **170** which presses upon a central radiation shield enclosure **172** of a radiation shield assembly **174** at an inclined surface **178** thereof. Protrusion **170** may be formed of stainless steel or any other suitable material. Enclosure **172** may be provided for thermal insulation of high-temperature working fluid flowing through radiation shield assembly **174**, as will be further described hereinbelow with reference to Fig. 4. Enclosure **172** may be formed of a ceramic or any other suitable material. A ridge **180**, defined by enclosure **172**, is seated on a peripheral ring support **182** formed of stainless steel or any other suitable material.

Enclosure **172** defines an annular recess **188** in a middle portion **190** thereof. A radiation shield **192** is seated within recess **188** and may be formed of any suitable material, such as ceramics or metals adopted to withstand relatively high temperatures. Radiation shield **192** may be formed of tubes, pins or any perforated structure, for example, so as to allow working fluid to flow therethrough.

An annular insulating element **198** may be provided to surround peripheral protrusion **170** and a portion of enclosure **172** and may be connected to peripheral protrusion **170** and ring support **182** via screws **200** inserted therein or by any other suitable means.

Radiation shield **192** may be provided so as to shield the inlet conduit assembly **140** from solar radiation entering receiver **100** via a window **222** while allowing the working fluid to flow from inlet conduit **142** via perforation in the radiation shield **192** on to window **222**.

It is noted that the radiation shield **192** may be replaced by any other suitable means for shielding the inlet conduit assembly **140** from solar radiation.

Window **222** is mounted at the front end of the housing **102**, and is disposed so as to project therewithin. Window **222** is designed so as to allow solar radiation to impinge thereon and penetrate therethrough, as will be further described hereinbelow with reference to Fig. 4.

A receiver chamber **233** is defined between the window **222** and the housing **102**. The termination of the inlet conduit **142** constitutes a working fluid inlet of the receiver chamber **233**, and an outlet conduit **320** (described below) constitutes a working fluid outlet of the receiver chamber **233**.

Window **222** may be shaped, e.g., as a portion of a paraboloid of revolution, as a portion of a hyperbolic paraboloid, or as any suitable geometric configuration defining a streamlined contour wherein there is no profile transition from one geometric shape to the other. The streamlined contour minimizes turbulent flow of the working fluid flowing along the window **222** and minimizes reflection losses of incoming solar radiation therethrough. Additionally, the streamlined contour minimizes tensile stresses on the window **222** caused, e.g., by profile transitions, and allows for increased accuracy in production thereof.

It is noted that window **222** may be shaped in any suitable conical-like or frusto-conical-like configuration or a geometric configuration defining a streamlined contour wherein there is a profile transition from one geometric shape to the other or any other suitable form so as to allow solar radiation to impinge thereupon and working fluid to flow therearound. Window **222** may be formed of any suitable material able to withstand relatively high temperatures and admit solar radiation therein. For example, window **222** may be formed of fused quartz.

Window **222** may be mounted to housing **102** by any suitable means.

A solar radiation absorber **230** is disposed around and along at least a portion of an internal surface **232** of window **222**. The solar radiation absorber **230** may be formed of any suitable material allowing solar radiation and a working fluid to pass therethrough. For example, absorber **230** may be formed of a perforated material thereby defining perforations **234** (see Fig. 3A) therein. The perforated material may be any suitable material, such a metallic or ceramic foam material comprising a network of ceramic strings defining pores therebetween. Such a material is operative to withstand relatively high temperatures, for example.

Solar radiation absorber **230** may comprise a plurality of solar radiation absorber elements **235**, which are axially arranged to constitute the solar radiation absorber **230**. Solar radiation absorber elements **235** are formed with projections **236**, as seen in Fig. 3A, which is not shown to scale. Projections **236** are preferably formed with upper projections **242** in an upper circumferential band **243a**, and lower projections **244** in a lower circumferential band **243b**. The axial and/or circumferential thickness of each of the upper and lower projections **242**, **244**, may be at least three or five time the average pore diameter of the ceramic foam which constitutes the absorber. Alternatively, the thickness may be related or equal to the thickness of foam which is necessary to absorb at least 95%, or even at least 99%, of incident solar radiation.

Upper projections **242** may be staggeringly arranged to circumferentially overlap axial lower projections **244** thus defining channels **246** formed between adjacent upper projections **242** and between adjacent lower projections **244**. This arrangement results in the channels **246** of each of the bands **243a**, **243b** being adjacent to, in an axial direction, projections **242**, **244** of the other band.

The channels **246** are open at a proximal (window-facing) end **247a** thereof and are open in the axial direction. They extend radially toward a distal end **247b** thereof, terminated by closing material **248** of the absorber **230**. The radial thickness, indicated at **248a**, may be equal in length to three times the average pore diameter of the ceramic foam which constitutes the absorber. In a more particular example, the radial thickness **248a** may be equal in length to five times the average pore diameter of the ceramic foam which constitutes the absorber. Alternatively, the thickness may be related or equal to the thickness of foam which is necessary to absorb at least 95% of incident solar radiation. The radial length of the channel **246** may be longer than the radial thickness **248a** of the closing material **248**.

As seen in Fig. 3A, the channels **246** have a cross-sectional shape (when viewed in a plane which is perpendicular to the radial direction, i.e., an axial-circumferential plane) which is substantially rectangular. Corners **249** of the shape may be right-angular or rounded.

Absorber elements **235** are arranged circumferentially so as to form an annular array **250** surrounding window **222**. Alternatively, the absorber element **235** may be formed as a complete annular array, e.g., formed as a complete circle or loop.

As illustrated in Fig. 3B, the absorber elements **235** may be formed with a projection **251** having a wave-shaped window-facing profile **253**, defining channels **246** which face alternating axial directions. It will be appreciated that, as described above, the absorber element **235** may be formed as a complete annular array, and the solar radiation absorber **230** may be formed as a monolithic element comprising a plurality of similar projections, each having a wave-shaped window-facing profile **253**, arranged axially.

A plurality of arrays **250** are arranged axially, thus forming the solar radiation absorber **230**. The arrays may be arranged such that channels **246** of one array are disposed axially adjacent to projections **242**, **244** (when the absorber elements **235** are in accordance with Fig. 3A) or crests of the waves (when the absorber elements are in accordance with Fig. 3B) of an axially adjacent array.

The channels **246** allow for incoming solar radiation which had penetrated some of the material of the absorber **230**, e.g., through an upper or lower projection **242**, **244** to exit the material of the absorber and impinge upon and penetrate a different portion of the solar radiation absorber **230**. As the amount of radiation which is absorbed decreases with the depth of penetration, as noted above, this exiting and re-penetration allows the radiation to be absorbed by a different portion of the solar radiation absorber **230**. Additionally, channels **246** allow for incoming solar radiation, which had penetrated at a proximal (window-facing) end **260** of a lower circumferential band **243b**, to penetrate the distal end **247b** of an adjacent upper circumferential band **243a**, thereby increasing the area of the projections **236** available for absorbing radiation.

It is noted that though in the embodiment illustrated in Figs. 2A, 2B, 3A and 3B the absorber elements **235** are formed with perforations **234**, the perforations **234** are only shown in Fig. 3A so as not to obscure the illustrations of Figs. 2A, 2B and 3B.

The channels **246** and perforations **234** define together an absorber fluid channel operative to allow working fluid to flow therethrough.

Absorber elements **235** may be embedded within an insulating support element **280** formed of any suitable insulating material.

A plurality of annular thermal insulating elements **290** may be disposed within receiver **100**. Thermal insulating elements **290** may be formed of a ceramic material or any other suitable material and are provided to prevent solar radiation emission into housing **102**. It is appreciated that thermal insulating elements **290** may be configured in any suitable manner, such as in the form of a single element, for example.

An outlet conduit housing **300** of an outlet conduit assembly **310** protrudes from top portion **108**. An outlet conduit **320** is formed of a generally cylindrical portion which is partially disposed within outlet conduit housing **300** and partially disposed within top portion **108**. Outlet conduit housing **300** and outlet conduit **320** may be formed of stainless steel or any other suitable material. Outlet conduit assembly **310** is provided for egress of a working fluid from receiver **100**.

A plurality of thermal insulating elements **330** may be disposed around and along an outer surface **332** of outlet conduit **320** and are provided to prevent heating of receiver housing top portion **108** by relatively high temperature working fluid flowing through outlet conduit **320**. Thermal insulating elements **330** may be formed of a ceramic material or any other suitable material. Outlet conduit **320** is in fluid communication with an outlet fluid chamber **340** defined by the vicinity formed between insulating element **198**, absorber **230** and insulating elements **290**.

Outlet conduit housing **300** may include a first flange **340** protruding therefrom. First flange **340** may be mounted to a second flange **344** protruding from top portion **108** via screws **346** inserted therein. First flange **340** is provided as an interface with a solar energy system component, such as a turbine (not shown).

Inlet conduit housing **138** may include a first flange **350** protruding therefrom. First flange **350** may be mounted to a second flange **354** protruding from top portion **108** via screws **356** inserted therein. First flange **350** is provided as an interface with a solar energy system component, such as a compressor (not shown).

It is noted that first flanges **340, 350** of the outlet and inlet conduit housings **300, 138** may be replaced with any other suitable element or elements for providing an interface with the solar energy system component.

As seen in Fig. 4, a working fluid, such as air, for example, is introduced into inlet conduit **142** of receiver **100**. Working fluid may flow in following compression within a compressor (not shown).

Working fluid flows from inlet conduit **142** via radiation shield **192** on to the internal surface **232** of window **222**. At a base portion **380** of window **222** the working fluid expands into absorber **230**.

It is noted that the incoming working fluid from inlet conduit **142** flows via radiation shield **192** initially to the internal surface **232** of window **222** prior to flowing into the absorber **230** due to the decrease of the surface area of the working fluid flow from the radiation shield **192** to a top portion **390** of window **222**. As seen in the inset in Fig. 2A, the surface area of the radiation shield **192** is substantially larger than the surface area defined by the area between a bottom portion **392** of enclosure **172** and top portion **390** of window **222**. This area is designated by reference numeral **394**. The difference in the surface areas is illustrated by the difference in a radius **396** of the radiation shield surface area and a radius **398** of surface area **394**. Thus, as the surface area of the working fluid flow decreases from the radiation shield surface area to surface area **394** the velocity of the working fluid consequentially increases, thereby urging the working fluid to flow along window **222** from top portion **390** to base portion **380** thereof. At base portion **380** the velocity of the working fluid decreases thus allowing the working fluid to expend into absorber **230**. The initial flow of the working fluid along window **222** provides for cooling of the window **222** subjected to relatively high temperatures due to admission of solar radiation therethrough.

Solar radiation, designated by reference numeral **400**, is admitted into absorber **230** via window **222** typically following concentration by a concentrator **402** of the solar energy system. It is noted that concentrator **402** is not shown to scale.

Solar radiation **400** passes window **222** and thereafter readily penetrates some of the material of the absorber **230**, e.g., through an upper or lower projection **242**, **244** to exit the material of the absorber and impinge upon and penetrate a different portion of the solar radiation absorber **230**. As the amount of radiation which is absorbed decreases with the depth of penetration, as noted above, this exiting and re-penetration allows the radiation to be absorbed by a different portion of the solar radiation absorber **230**. Additionally, solar radiation **400** penetrates projections **236** via perforations **234**.

Furthermore, incoming solar radiation, which had penetrated at proximal end **260** of a lower circumferential band **243b**, penetrates projections **236** to distal end **247b** of upper circumferential band **243a,** thereby allowing the radiation to be absorbed by substantial portions of projections **236**.

The solar radiation absorbed within projections **236** is emitted as heat to working fluid flowing within the absorber **230** thereby heating the working fluid therein.

Heated working fluid flows from absorber **230** to outlet fluid chamber **340** and exits receiver **100** via outlet conduit **320**. Thereafter heated working fluid may be introduced into a turbine (not shown) for generation of electrical energy therefrom.

It is appreciated that the solar receiver **100** may be incorporated in solar thermal systems such as on-axis tracking solar thermal systems, or off-axis tracking solar thermal systems. The on-axis tracking solar system is known in the art as a solar system wherein the target, e.g., a solar receiver, is always kept on a center-line formed between a solar reflector (or reflectors) and the sun, therefore the target location continuously changes to follow the sun movement. Examples of on-axis tracking solar systems include parabolic dish reflectors/concentrators and Fresnel lens concentrators. In off-axis tracking solar systems the target (e.g., solar receiver) may be stationary or move, but generally not kept in the center-line formed between the reflector (or reflectors) and the sun. Examples of off-axis tracking solar systems include central solar receivers such as solar towers.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described herein above. Rather the scope of the present invention includes both combinations and subcombinations of the various features described hereinabove as well as variations and modifications which would occur to persons skilled in the art upon reading the specifications and which are not in the prior art.

CLAIMS:

1. A solar receiver comprising:

- a receiver housing extending along a longitudinal axis, having front and rear ends;
- a window configured to allow radiation to pass therethrough, said window being mounted at said front end and projecting within said housing;
- a receiver chamber defined between the housing and the window, said receiver chamber having a working fluid inlet for ingress of working fluid to be heated therewithin, and a working fluid outlet for egress therethrough of the heated working fluid; and
- a solar radiation absorber configured for absorbing said radiation and heating said working fluid thereby, said absorber being located within said receiver chamber and surrounding at least a portion of said window, said solar radiation absorber being formed with channels and made of a foam material having a characteristic average pore diameter, each of said channels:
    - being open at a proximal, window-facing, end;
    - extending radially within said absorber; and
    - terminating at a distal end being closed by said material of the absorber.

2. A solar receiver according to Claim 1, wherein said solar radiation absorber defines a plurality of circumferential bands, each comprising a plurality of said channels.

3. A solar receiver according to Claim 2, wherein said solar radiation absorber comprises a plurality of circumferential absorber elements arranged axially, each absorber element comprising portions of one or more of said bands.

4. A solar receiver according to Claim 3, wherein said absorber elements are formed with said channels formed in an axially-facing side thereof, all of the channels disposed within a single band being open toward a single axial direction.

5. A solar receiver according to Claim 4, wherein each of said elements comprises two of said bands, the channels of each of the bands being open toward an opposite axial direction than the channels of the other of the bands.

6. A solar receiver according to Claim 5, wherein the channels in each of the bands are disposed axially adjacent to portions of material of the absorber between the channels of the other band.

7. A solar receiver according to any one of Claims 5 and 6, wherein the absorber elements are arranged such that channels thereof are disposed axially adjacent to portions of material of the absorber between the channels of an adjacent absorber element.

8. A solar receiver according to any one of Claims 5 through 7, wherein portions of material of the absorber between the channels of each of the bands circumferentially overlaps portions of material of the absorber between the channels of the other of the bands.

9. A solar receiver according to any one of Claims 1 through 3, wherein portions of material of the absorber between the channels constitute a wave-shaped window-facing profile.

10. A solar receiver according to any one of the preceding claims, wherein the axial thickness of each of said sections of the material of the absorber bounding said channels is greater than three times said average pore diameter.

11. A solar receiver according to Claim 9, wherein the axial thickness of each of said sections of the material of the absorber bounding said channels is greater than five times said average pore diameter.

12. A solar receiver according to any one of the preceding claims, wherein the material of the absorber closing the distal end of each channel has a thickness, in the radial direction, greater than three times said average pore diameter.

13. A solar receiver according to Claim 12, wherein the material of the absorber closing the distal end of each channel has a thickness, in the radial direction, greater than five times said average pore diameter.

14. A solar receiver according to any one of the preceding claims, wherein said channels have a shape in a cross-section of a plane which is perpendicular to the radial direction, being substantially rectangular.

15. A solar receiver according to Claim 14, wherein said shape comprises rounded corners.

16. A solar receiver according to any one of the preceding claims, wherein the circumferential length of each channel is smaller than that of the portion of material of the absorber circumferentially adjacent thereto.

17. A solar receiver according to any one of the preceding claims, wherein the radial length of each channel is larger than that of the material of the absorber closing the distal end thereof.

18. A solar receiver according to any one of the preceding claims, further comprising a radiation shield disposed between said working fluid inlet and said receiver chamber.

19. A solar receiver according to Claim 18, wherein said radiation shield is configured to allow working fluid to flow therethrough.

20. A solar receiver according to any one of the preceding claims, being designed to facilitate working fluid to flow from said working fluid inlet around and along said window prior to flowing into said absorber.

21. A solar receiver according to any one of the preceding claims, wherein said foam material is selected from the group comprising a ceramic foam material and a metallic foam material.

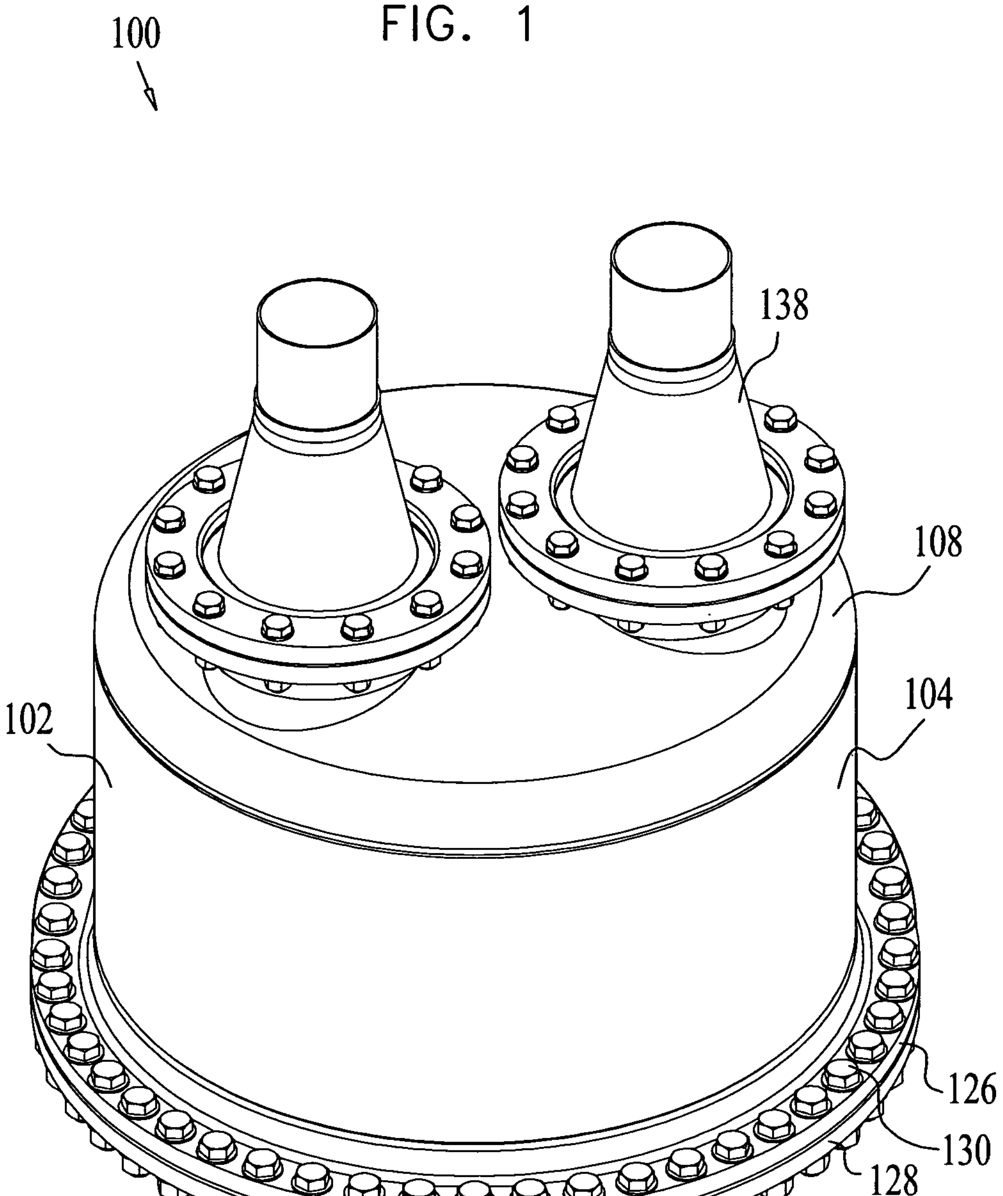
22. A solar receiver system comprising:

- a solar receiver according to any one of the preceding claims; and
- a turbine operative to receive said working fluid from said working outlet and to generate electricity therefrom.

23. A solar radiation absorber for use in a solar receiver, the solar radiation absorber being configured for absorbing radiation and heating a working fluid thereby, said solar radiation absorber being formed with channels and made of a foam material having a characteristic average pore diameter, each of said channels:

- being open at a proximal, radiation-facing, end;
- extending radially within said absorber; and
- terminating at a distal end being closed by said material of the absorber.

FIG. 1



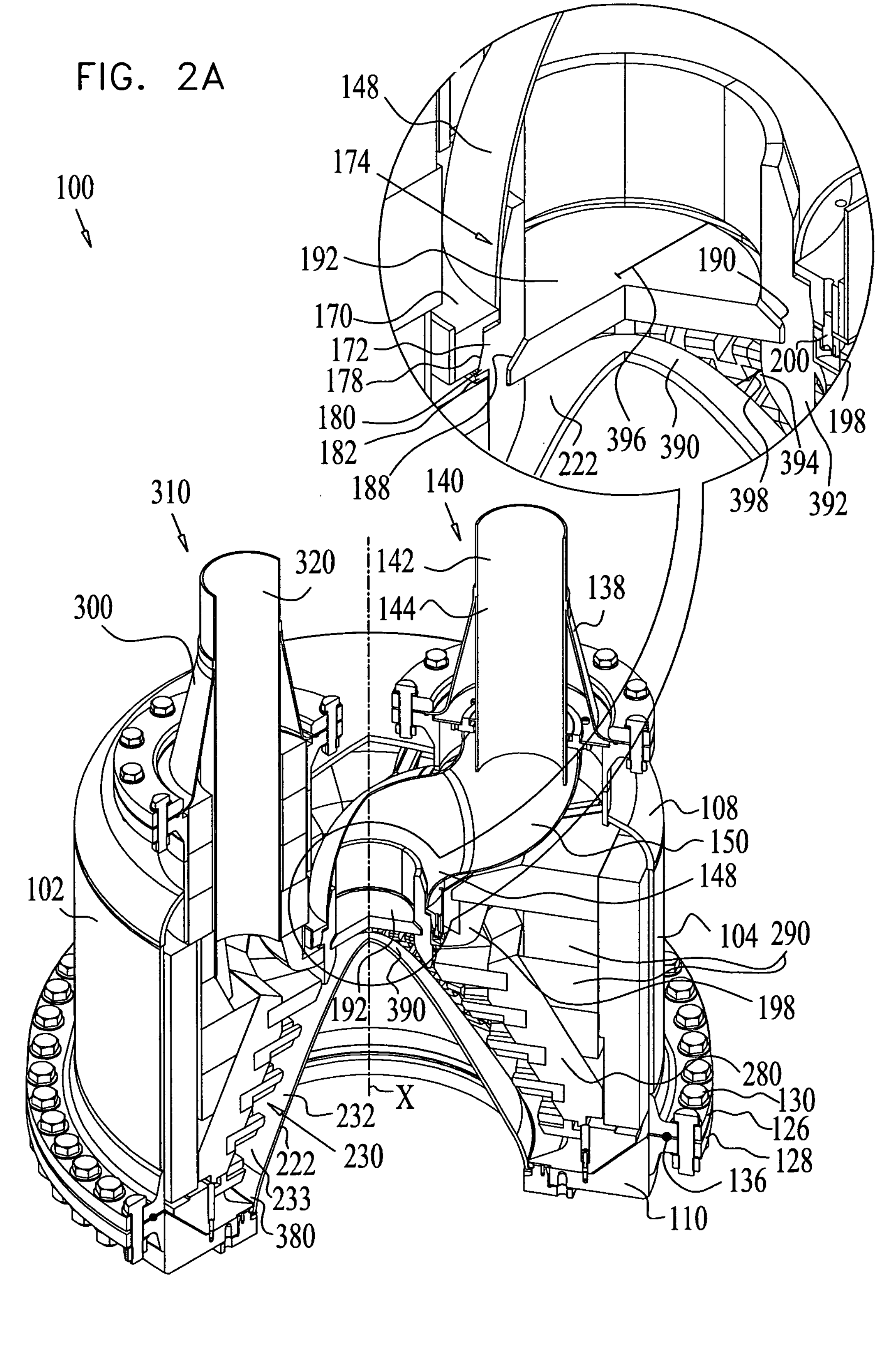
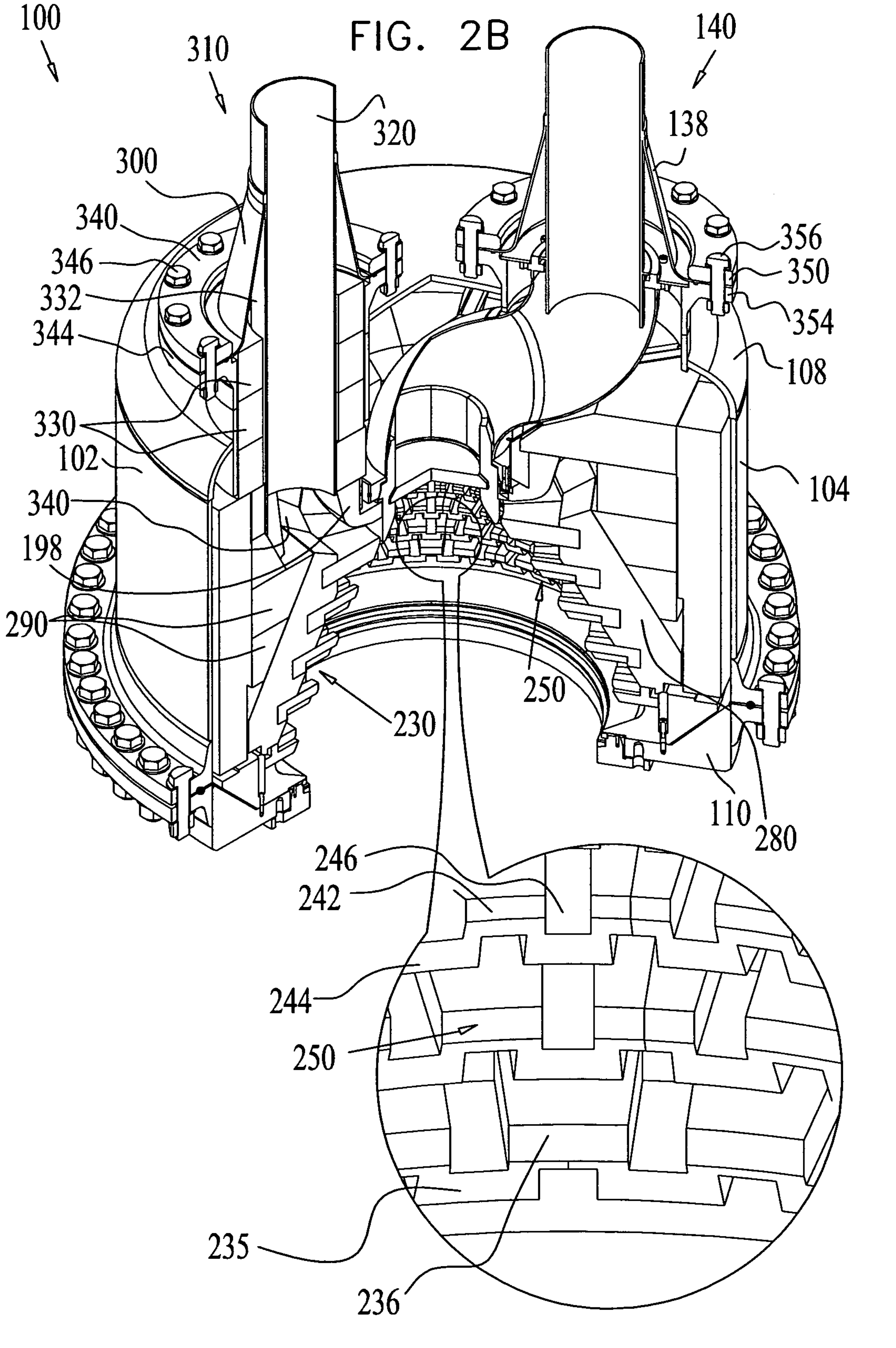


FIG. 2A
100
148
174
192
190
170
172
178
180
182
188
200
198
222
396
390
394
398
392
310
140
320
142
138
300
144
108
150
148
102
104
290
192
390
198
280
130
126
232
X
128
230
222
136
233
110
380

FIG. 2B


100
310
320
300
340
346
332
344
330
102
340
198
290
230
250
140
138
356
350
354
108
104
110
280
246
242
244
250
235
236

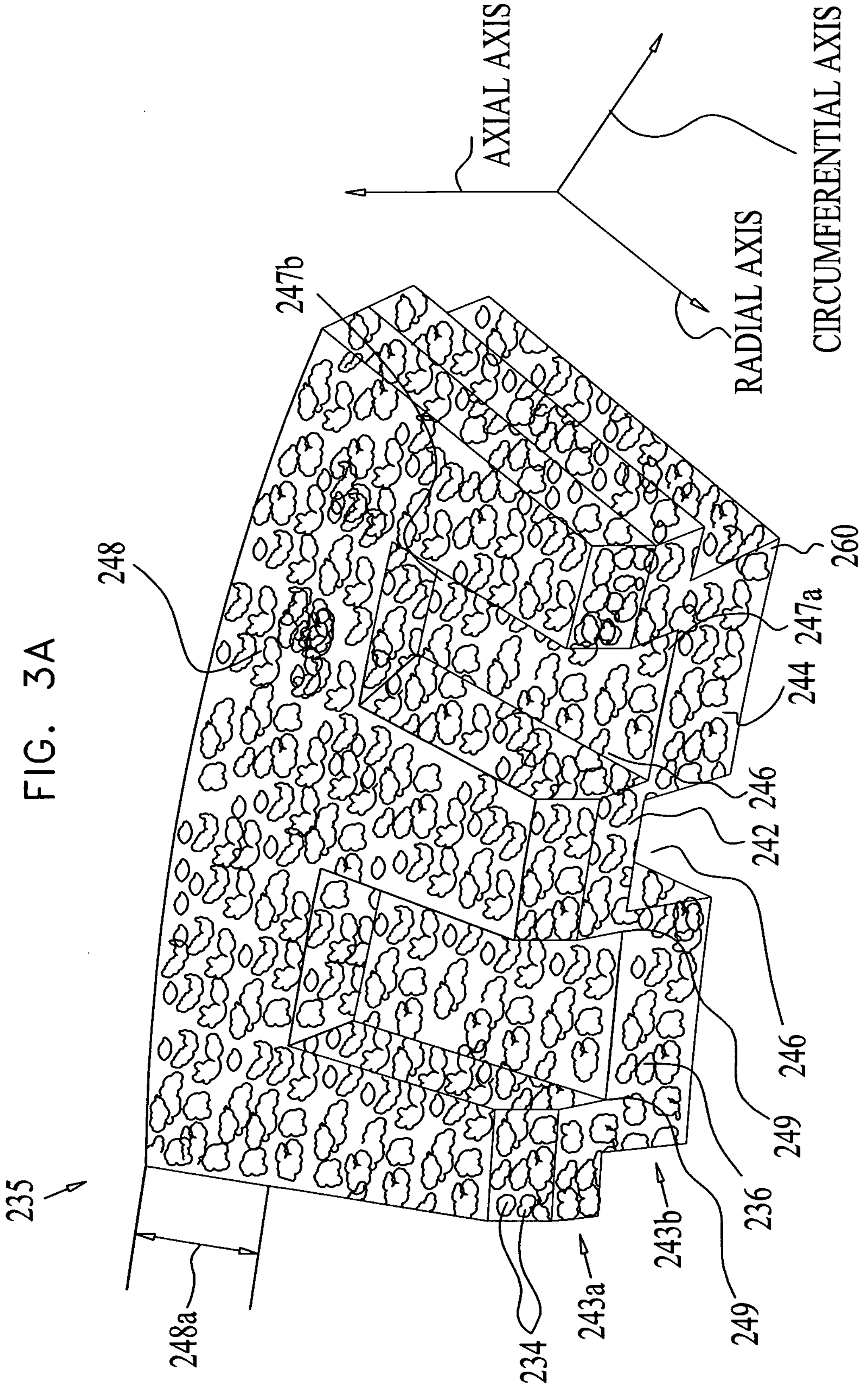

AXIAL AXIS
CIRCUMFERENTIAL AXIS
RADIAL AXIS
247b
248
260
247a
244
246
242
246
249
236
249
235
243b
243a
234
248a

FIG. 3A

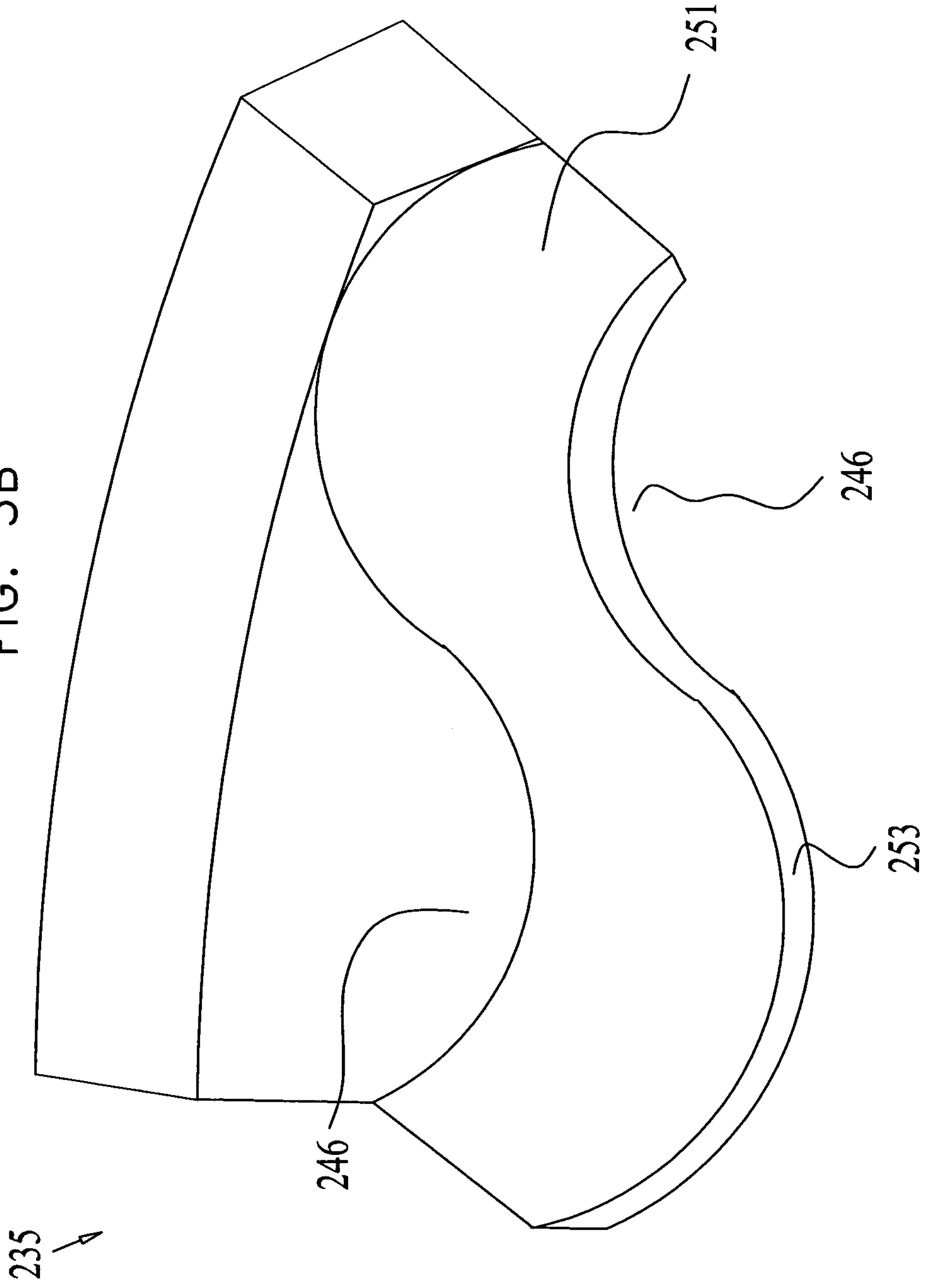


FIG. 3B

FIG. 4