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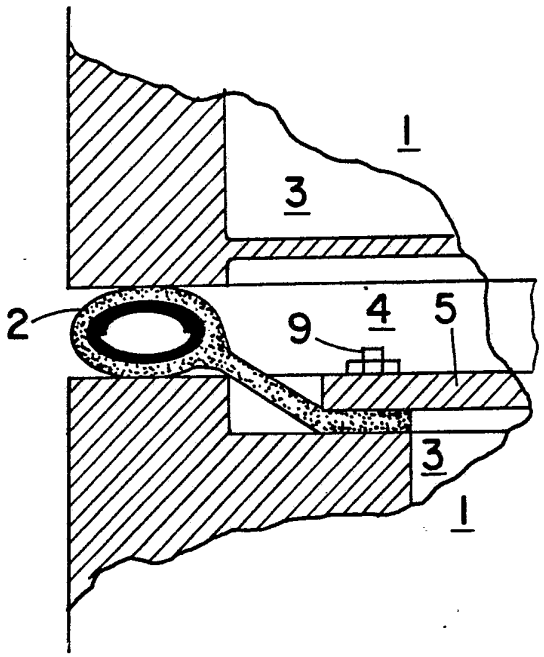
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(54) Title: RESILIENT GASKET HAVING AUXILIARY RESILIENCY MEANS

(57) Abstract

Flexible, resilient gasketing material (2) with auxiliary resiliency means, such as ridges or beads (12) or internally-positioned spring means (6). The gaskets (2) may be straight or curved or made into continuous forms such as rectangles or circles. Preferably the gaskets are flanges (11).



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RESILIENT GASKET HAVING AUXILIARY RESILIENCY MEANS

BACKGROUND OF THE INVENTION

There are various types of process equipment which require seals or gaskets between two or more sections, wherein leak-proof joints are desired, that will withstand the environment in which they are used and which will adjust to the expansions and contractions of the sections.

There are various sealing putties and gasketing which have been used for these purposes, but for the most part, they tend to lose their resistance to aggressive environments, or become brittle, or undergo compression-set to an extent that they lose resiliency and cannot continue to provide leak-proof joints between sections which undergo expansion and contraction.

I have now devised a gasketing arrangement which is ideally suitable for providing secure joints between sections of process equipment wherein a good seal is achieved, even though the sections undergo expansions and contractions.

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SUMMARY OF THE INVENTION

Substantially as illustrated in figures attached herewith, there is provided an elongate strip or elliptical tube of flexible resilient material having auxiliary resilience means along its length, said elongate strip or elliptical tube preferably having a flange portion along one or both edges thereof. The elongate strip may be straight, or curved, or may be embodied as a structure having the general overall shape of a triangle, square, rectangle, polygon, circle, or ellipse. The flange portions may lie in substantially the same general plane in which the elongate strip lies, or may be skewed from, or offset from the plane of the elongate sheet.

DETAILED DESCRIPTION

Figures 1-10, none of which are drawn to scale, are provided as visual aids in describing various embodiments of the present invention.

Figure 1 may be considered as a top view of a horizontally-positioned series of compartments (1) with gaskets or seals (2) between the compartments, or may be considered as a side view of a vertically-stacked series of compartments (1). The series of compartments is shown as being held in place between end members (8) by tensioned rods (7), though other suitable means for maintaining the positions of the compartments may be used.

Figure 2 is a view of Figure 1 taken along offset line A-A of Figure 1 and shows a rectangular shape of gasket (2) along an exposed edge of one of the

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compartments (1) which is, itself, shown to be of a "picture-frame" type of configuration. Holes (9) may be provided in a flanged portion (11) of gasket (2) for fastening purposes.

Figure 3 is a enlarged cross-section view of a cutaway portion of Figure 1 to reveal in greater detail the positioning of an embodiment of gasket (2) between two compartments (1) and to show use of holes (9) for fastening gasket (2) in place along the outer perimeter of a surface of a compartment divider (5). When installed, the divider provides a space (4) which is distinct from spaces (3) within the compartments (1). The means for fastening the flanged portion of gasket (2) and divider (5) is shown as a bolt-means, though other means may be used.

Figure 4 is an enlarged cross-section view of a portion of gasket (2) to demonstrate positioning of metal spring means (6) which may be (and preferably are) used within an elliptically-shaped embodiment of gasket (2) having an elliptically-shaped centrally-located, opening (10) running the length of the gasket. The spring means (6) is described in Figure 5.

Figure 5 illustrates an end-view or cross-sectional view of a preferred metal spring means for use inside various embodiments of the resilient gaskets of the present invention to provide auxiliary resiliency. As illustrated, the springs represent two elongate strips of spring steel which are curved along their length with the concave surfaces facing each other, forming an elliptically shaped area between them. When

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under compression the curved surfaces are forced closer together. As shown, the curved strips have a small distance between their cooperating edges to expedite movement of the edges when the springs are compressed; other means or configurations for obtaining expedient movement of the edges may be used. Preferably, the metal spring means are made of "spring steel" though any material which will undergo numerous compression-decompression cycles may be used. Other metal spring configurations may be used.

Figure 6 illustrates, in cross-section, an embodiment wherein the gasket (2), having a flange-like extension (11) is provided with auxiliary resiliency means (12) as well an internal void area (10) and a stiffening edge (13) opposite the flange (11). The spring steel means of Figure 5 may also be used within the area (10) as an auxiliary resiliency means along with, or instead of, the auxiliary resiliency means (12). The auxiliary resiliency means (12) illustrate a plurality of resilient ridges or beads on the effective sealing surfaces of gasket (2). When used, the auxiliary means (12) may comprise a single ridge or bead, but preferably comprises a plurality of such ridges or beads which are parallel to each other. The ridges (12) may also be used, if desired, along the flange (11). The stiffening edge (13) may be used for structural purposes, such as for helping to avoid side-ways distortion of the gasket or as an aid in positioning the gasket during installation. The stiffening edge (13) may be thick enough, itself, to augment the total area of seal when gasket (2) is totally compressed, but should not be so thick that it will prevent the main effective portion of gasket (2) from

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being compressed the desired amount. Auxiliary reinforcement means may be provided in the stiffening edge (13), if desired, and/or functional tabs or flanges may be attached to stiffening edge (13). The flanged portion (11) is illustrated as being an offset (bent) member attached obliquely, but it may also be a substantially straight or flat member attached at a different angle than that shown in Figure 6. Furthermore, the flanged portion (11) may be curved, as viewed in cross-section. Various configurations of the flanged portion (11) may be used, depending on the process equipment in which it is to be used.

Figure 7 illustrates an embodiment wherein the only auxiliary resiliency means for gasket (2) is that of a plurality of ridges or beads (12) positioned on the effective seal-surfaces of gasket (2) and arranged parallel to each other. If desired, the ridges or beads (12) may also be positioned along flange (11). In some cases a single ridge or bead (12) may be used along each sealing surface, but a plurality of such ridges or beads is generally preferred. The ridges (12) do not have to be at right angles to gasket (2).

Figure 8 illustrates an embodiment wherein the gasket (2) is circular and has ridges or beads (12) concentrically-located along the effective sealing surfaces of the gasket. Here again, the flange (11) is illustrated as an off-set, oblique member, but other configurations may be used. The drawing is not to scale and it will be realized that the central open area within the gasket may be much larger, relative to the entire dimensions, than is illustrated.

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Figure 9 is a cross-sectional view of gasket (2) taken along line B-B of Figure 8 to more clearly show the ridges or beads (12) and to show the relative position of flange (11).

Figure 10 is a cross-sectional view of a gasket (2) having paired counter-biased ridges or beads (12) which are intentionally made to be at an acute angle to gasket (2). Along each side of gasket (2) are shown three pairs of counter-biased ridges (12) arranged so that they bend toward the central portion (14) of gasket (2) when the configuration becomes compressed between two compartments, each compressed ridge overlapping the ridge toward which it bends. Only one such counter-biased pair of ridges along each side may be used, but a plurality of two or more such pairs is preferable.

In Figure 10, there is shown an angle (∠A) which is counter-biased to an angle (∠B) for the outside (i.e., the third) pair of ridges (12). Whereas the acute angle for the counter-biased pairs of ridges may effectively be any angle less than 90°, it is preferable that it be in the range of about 75° to about 80°. For angles ∠A and ∠B, it is most preferred to use a value of about 11° ± 1°.

The present invention, then, provides resilient gasketing material having auxiliary resiliency means comprising at least one of the following:

1. Resilient ridges or beads positioned along the effective sealing surfaces of the gasketing material, said ridges or beads being substantially parallel or concentric to each other;

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2. Resilient ridges or beads positioned along the effective sealing surfaces of the gasketing material, said ridges or beads being substantially parallel or concentric to each other, said gasketing material containing a hollow portion (especially a hollow portion that is elliptical in cross-section) running internally through the gasketing material;

3. Spring members comprising elongate strips which are curved along their length, the curved portions forming, when viewed in cross-section, an elliptical shape, said spring members being positioned within a hollow portion of a gasket material which hollow portion conforms to the dimensions of said spring members;

4. Spring members positioned internally within an elongated gasket material, along the length of the gasket, said spring members responding resiliently to compression and decompression forces acting on the gasket;

5. Resilient ridges or beads as in Item 2 above, along with spring members as in Item 3 or 4 above.

The resilient gasketing material may be made of natural or synthetic rubber or resilient polymers, taking into account the environment to which the gasket is to be exposed. Polychloroprene rubber is usually a good choice as it has the ability to withstand contact with a large number of chemicals and can withstand moderately high temperatures. Rubbery formulations based on polybutene, polybutadiene, polyisoprene, fluoropolymers, polyvinylchloride, polysilicones, and the like may be used in many applications. The rubber formulations generally contain fillers or other additives

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to enhance their physical and chemical properties. Rubbery formulations covered with fluoropolymers or other flexible coatings or sheaths are within the purview of the present invention.

The resilient gasketing material can be prepared by molding-in the auxiliary resiliency means of the present invention. In some cases, it may be best to extrude, cast or mold the gasketing material as sections, including (if desired) the resilient ridges or beads, and then inserting the spring members between the sections and bonding the sections together. In other cases, the internally-positioned spring members may be included during the casting or molding operation. The flanges are preferably formed along with the gasket, but may be formed separately and then bonded to, or anchored to, the gasket.

The general configuration of the gasket can be that of straight gaskets or curved gaskets or may be continuous gaskets for use along triangular, square, rectangular, polygonal, circular, or elliptical surfaces.

While Figures 1-10 illustrate certain embodiments (not to scale) of the present invention, it will be understood that variations may be made without departing from the inventive concept expressed herein. For instance, more than one hollow portion may be used within the gasket and the internally-positioned spring members may be used in more than one area of the gasket.

Equipment in which these gaskets can be used may be, in size, from very small to very large and the concomitant gasket is conveniently sized for the particular equipment.

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One of the greatest advantages of the present gaskets is that the gaskets, when used in very large structures are easily fastened in place by use of the flanges and a series of compartments can be more easily pressed together, horizontally, without having the gasket droop, sag, or slip out of place during the placement of the compartments. Furthermore the flanges can serve as gasketing for internal parts of the equipment, such as compartment dividers or separators, while serving to hold the main portion of the gasket in place.

The invention is limited only by the following claims.

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I CLAIM:

- 1 -

A resilient gasket having auxiliary resiliency means, said auxiliary resiliency means comprising at least one of

a) resilient ridges or beads positioned along the effective sealing surfaces of the gasket, said ridges or beads being substantially parallel or concentric to each other,

b) resilient ridges or beads positioned along the effective sealing surfaces of the gasket, wherein the gasket contains a hollow portion running internally through the gasket along its length,

c) spring members comprising elongate strips which are curved along their length, the curved strips forming, as viewed in cross-section, an elliptical shape, said spring members being positioned within a hollow portion running internally through the gasket along its length, and

d) spring members positioned internally within an elongate gasket material, along the length of the gasket, said spring members responding resiliently to compression and decompression forces acting on the gasket.

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- 2 -

The gasket of Claim 1 wherein the gasket is provided with flange means along its length.

- 3 -

The gasket of Claim 1 wherein the auxiliary resiliency means comprises the resilient ridges or beads.

- 4 -

The gasket of Claim 1 wherein the auxiliary resiliency means comprises the spring member positioned within the gasket.

- 5 -

The gasket of Claim 1 wherein the auxiliary resiliency means comprises the internal spring means and the external ridges or beads.

- 6 -

The gasket of Claim 1 wherein the auxiliary resiliency means comprises the internal spring means and the gasket is provided with flange means along its length.

- 7 -

The gasket of Claim 1 wherein the auxiliary resiliency means comprises resilient ridges or beads which are counter-biased in pairs along each side of the gasket in a manner such that each ridge or bead is biased toward a central portion of the gasket and, when under compression, will overlap the ridge or bead toward which it is biased.

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- 8 -

The gasket of Claim 7 wherein the counter-biased ridges or beads are each deposed at an acute angle from the gasket, at an angle of about 75° to about 80°.

- 9 -

The gasket of Claim 8 wherein the acute angles are about 79° ± 1°.

- 10 -

The gasket of Claim 7 wherein the gasket is provided with flange means along its length.

- 11 -

The gasket of Claim 1 wherein the auxiliary spring means comprises internal spring means along the length of the gasket, said spring means comprising elongate strips which are curved along their length, said curved strips forming, as viewed in cross-section, an elliptical shape.

- 12 -

The gasket of Claim 11 wherein the gasket is provided with flange means along its length.

- 13 -

The gasket of Claim 12 wherein the gasket is also provided with auxiliary resiliency means comprising resilient ridges or beads along the effective sealing surfaces, said ridges or beads being substantially parallel or concentric to each other.

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- 14 -

The gasket of Claim 1 wherein the gasket is a continuous gasket enclosing an area.

- 15 -

The gasket of Claim 14 wherein the enclosed area is circular or oval.

- 16 -

The gasket of Claim 14 wherein the enclosed area is triangular, square, or rectangular.

- 17 -

The gasket of Claim 14 wherein the enclosed area is polygonal.

- 18 -

A gasket for sealing two mating surfaces of a container or vessel to maintain a fluid impervious seal therebetween comprising

a resilient member having a general configuration matingly engagable with the mating surfaces and having at least one auxiliary and cooperative resilient element integral therewith consisting of

a) at least one resilient protuberance extending from each side of said resilient member said protuberance being positioned substantially normal to the direction of the exertion of pressure of the fluid within said vessel; and,

b) matingly opposed spring-like segments internally positioned within said member to cooperatively exert resiliency, independent of said resiliency inherent in said member, toward the mating surfaces of the vessel.

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- 19 -

A gasket capable of sealing a joint between two elements of a fluid container, thereby to maintain the contents of said container which may be under pressure internal of said container, comprising

a resilient member having a shape substantially conforming to the surface configuration of the elements to be joined,

said member having auxiliary resilient members integral therewith consisting essentially of at least one of

a) resilient protuberences extending from the surface of said member and normal to the direction of pressure exerted by said fluid of said container, and

b) two resilient convexical opposing halves of a spring-like assembly positioned internal of the member extending said member's surface against the surfaces of elements to be joined.

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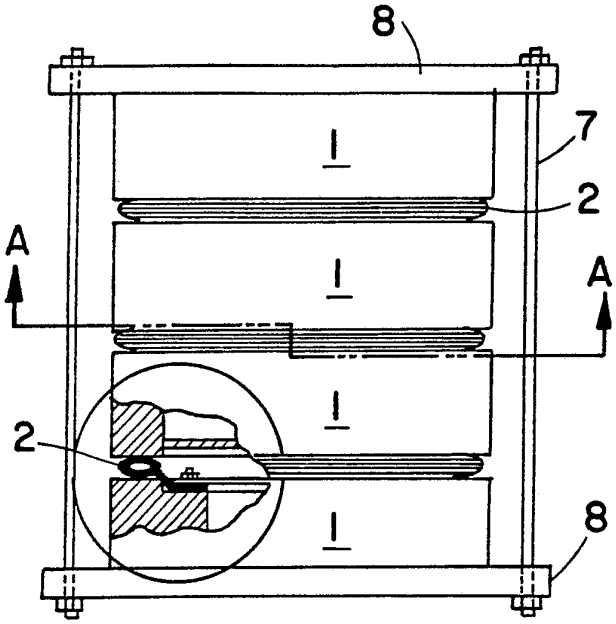


FIG.1

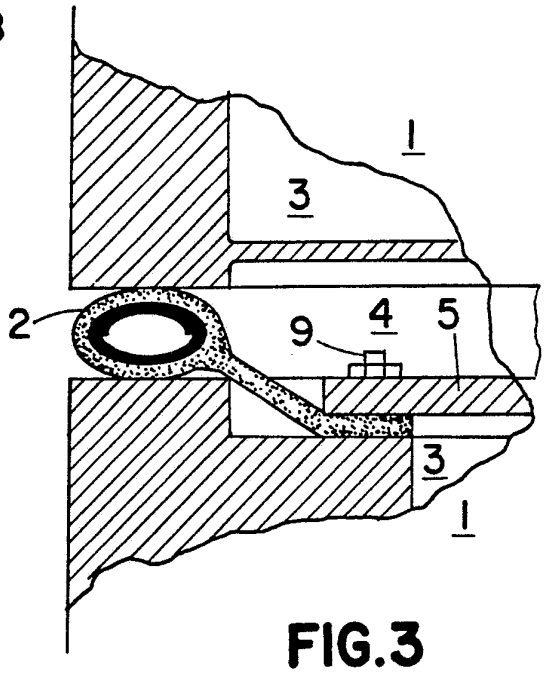


FIG.3

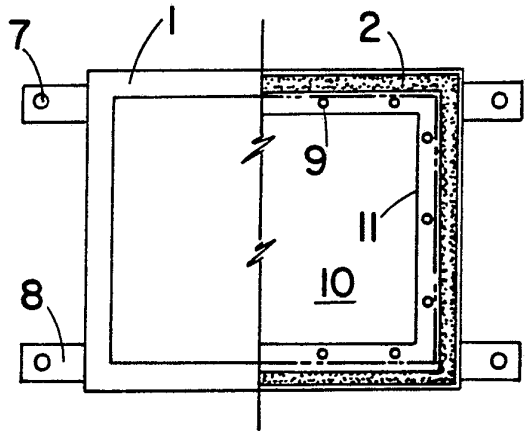


FIG.2

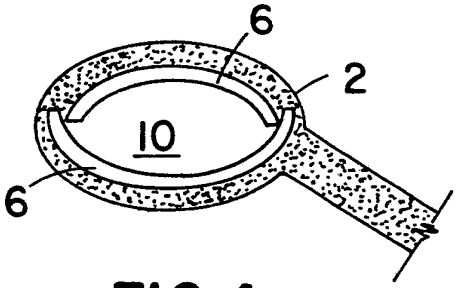


FIG.4

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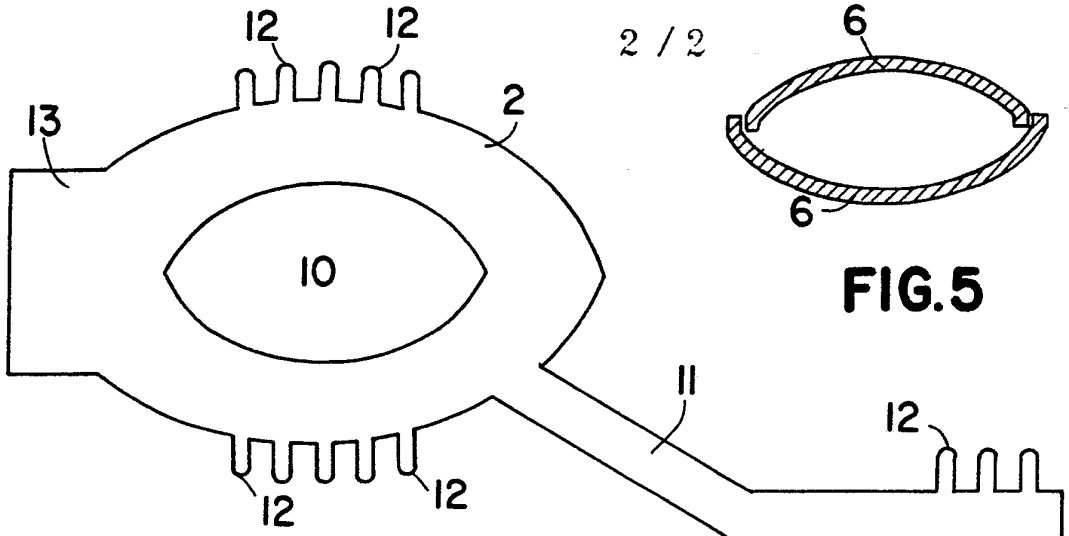


FIG.6

FIG.5

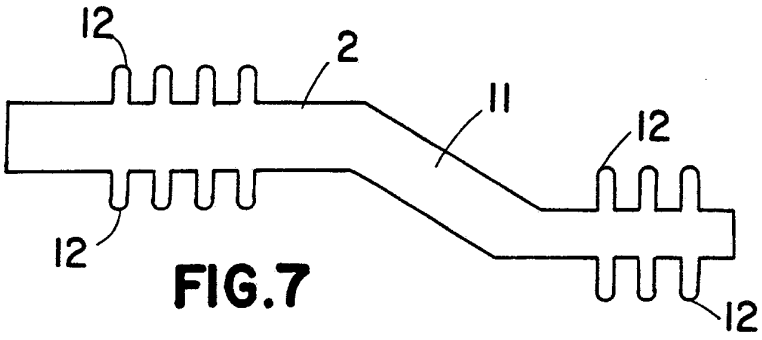


FIG.7

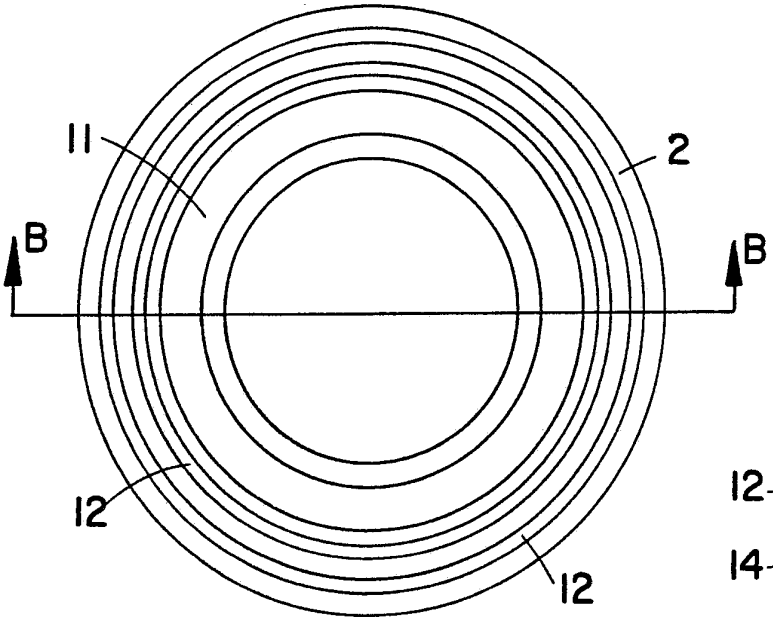


FIG.8

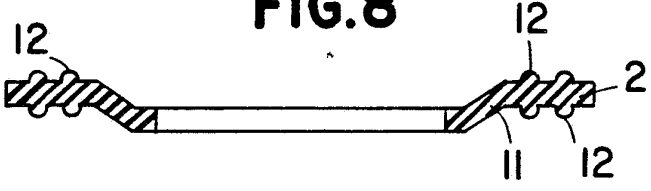


FIG.9

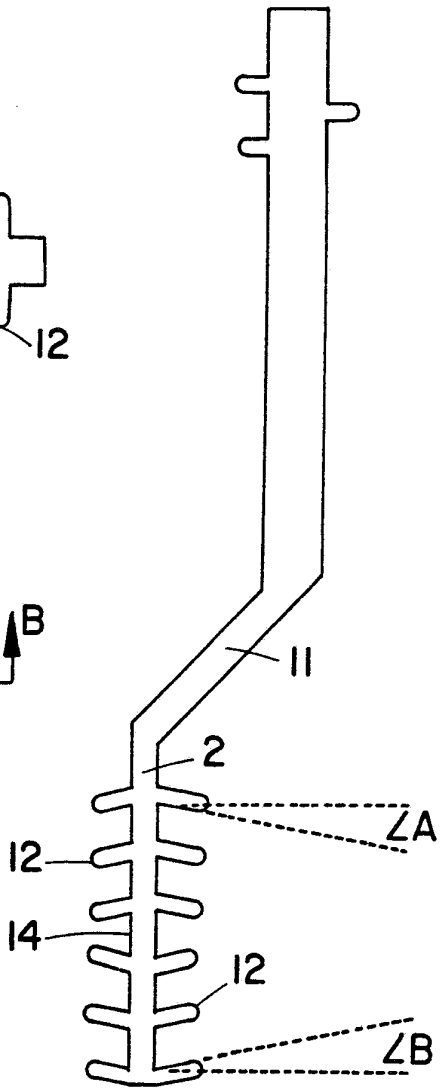


FIG.10

SUBSTITUTE SHEET

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INTERNATIONAL SEARCH REPORT

International Application No PCT/US83/00878

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

INT. CL.[3] F16J 15/12
U.S. CL. 277/164, 207R, 226, 235R

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	277/34,34.3,34.6,164,198,205,207R,207A,208-211,226, 227,235R,236,901;49/477,480,481,498;174/35GC;251/DIG.1; 285/95,97,100,108,109,230,232,235,338,345,346,DIG.11, DIG.19

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	US, A 1,674,038 Published 19 June 1928 Glass	1,4,5,6,18 19
A	US, A 2,195,046 Published 26 March 1940 Best	1,4,5,6
X	US, A 2,306,160 Published 22 December 1942 Freyssinet	1,3,5,7-10, 14-19
X	US, A 2,315,588 Published 6 April 1943 Brickman	1,4,5,18,19
A	US, A 2,753,074 Published 3 July 1956 Schmid	7
A	US, A 2,859,496 Published 11 November 1958 Nelson	1,2,6
A	US, A 2,914,212 Published 24 November 1959 Fino	1,2,6
A	US, A 2,923,984 Published 9 February 1960 Jecmen (Cont'd on second sheet)	1,4,5,6,18, 19

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
17 August 1983	09 SEP 1983
International Searching Authority [1]	**Signature of Authorized Officer** [20]
ISA/US	Robert L. Ward, Jr.

Form PCT/ISA/210 (~~second~~ sheet) (October 1981)

FIRST

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, 16 with indication, where appropriate, of the relevant passages 17	Relevant to Claim No 18
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A	US, A 3,508,587 Published 28 April 1970 Mauch	1,4,5,6,11-13, 18,19
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A	US, A 3,604,716 Published 14 September 1971 Webert	1,4,5,6,18, 19
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FURTHER INFORMATION CONTINUED FROM THE ~~SECOND~~ SHEET

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A	US, A 3,040,393 Published 26 June 1962 Dailey	1,3,5,18,19
A	US, A 3,247,312 Published 19 April 1966 Alessi	14-17
A	US, A 3,398,977 Published 27 August 1968 Yoneda (Con't on third sheet)	1,4

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [10]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers....., because they relate to subject matter [12] not required to be searched by this Authority, namely:

2. ☐ Claim numbers....., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out [13], specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [11]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.