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**Heel wear parts for dragline buckets**

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(56) Related Art  
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**ABSTRACT**

A heel wear part for a dragline bucket including an elongate body having a lower face profile, an upper face spaced from said lower face profile, a forward face extending between  
5 said lower face profile and said upper face, and a rearward face extending between said lower face profile and said upper face, a layer of hardfacing material comprising a wear resistant material supported in a weld matrix substantially covering the lower face profile and at least some of each of  
10 the forward and rearward faces of said body; and one or more inclusions of said hardfacing material spaced inward from said lower face profile and said forward and rearward faces and extending substantially along the length of said body to be substantially encased within said layer of hardfacing.

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**COMPLETE SPECIFICATION FOR A STANDARD PATENT**

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***Invention Title:*** **"HEEL WEAR PARTS FOR DRAGLINE  
BUCKETS"**

The following statement is a full description of this invention,  
including the best method of performing it known to us:

## **HEEL WEAR PARTS FOR DRAGLINE BUCKETS**

### **FIELD OF INVENTION**

THIS INVENTION relates to heel wear parts for dragline buckets and a method of forming same.

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### **BACKGROUND ART**

Dragline buckets are required to engage with and slide over the ground in order to perform their required function of picking up or scooping up a load of rock or soil. Wear plates, sometimes with hardfacing applied thereto, are often attached to the underside of the heel portion of the buckets in an effort to increase service life. It will be seen that increasing the life of heel wear parts is desirable from both a cost and maintenance scheduling point of view.

Heel wear parts when provided are attached to the underside of the heel portion of a dragline bucket. It will be appreciated that terms such as "upper", "lower", "downward", "under" and the like refer to the heel wear part in its normal orientation, and do not limit the wear parts to any particular orientation.

The present invention aims to provide a heel wear part for a dragline bucket having a longer service life than wear parts of the prior art. Other aims and advantages of the invention may become apparent from the following description.

### **DISCLOSURE OF THE INVENTION**

25 With the foregoing in view, the present invention resides broadly in a heel wear part for a dragline bucket including:

an elongate body having a lower face profile, an upper face spaced from said lower face profile, a forward face extending between said lower face profile and said upper face,

and a rearward face extending between said lower face profile and said upper face;

a layer of hardfacing material comprising a wear resistant material supported in a weld matrix substantially covering the  
5 lower face profile and at least some of each of the forward and rearward faces of said body; and

one or more inclusions of said hardfacing material spaced inward from said lower face profile and said forward and rearward faces and extending substantially along the length of  
10 said body to be substantially encased within said layer of hardfacing.

Preferably, the lower face profile includes a rearward rebate extending substantially along the length of the intersection between the rearward face and the lower face  
15 profile. It is further preferred that a forward rebate is provided extending substantially along the length of the intersection between the forward face and the lower face profile. It is also preferred that a channel is provided in the lower face profile intermediate the forward and rearward  
20 faces.

In another aspect, the present invention resides broadly in a heel wear part for a dragline bucket including:

an elongate supporting portion having a lower face profile, an upper face spaced from said lower face profile, a  
25 forward face extending between said lower face profile and said upper face, and a rearward face extending between said lower face profile and said upper face;

one or more inclusions of said hardfacing material comprising a wear resistant material supported in a weld

matrix, said inclusions being spaced inward from said lower face profile and said forward and rearward faces and extending substantially along the length of said supporting portion;

5 one or more elongate projections extending downward from said lower face profile substantially below said one or more inclusions of hardfacing material to substantially cover said inclusions of hardfacing; and

10 a layer of hardfacing material substantially covering least some of each of the forward and rearward faces of said supporting portion and the exposed portions of said lower face and said elongate projections to substantially encapsulate said inclusions.

15 In another aspect, the present invention resides broadly in a heel wear part for attachment to the underside of the heel portion of a dragline bucket, the heel wear part when so attached depending below the heel portion of the dragline bucket and being elongate in form and provided with a layer of hardfacing having supported therein a wear resistant material, the heel wear part including one or more downward  
20 depending ridge portions having incorporated therein one or more inclusions of the hardfacing substantially encapsulated by the one or more ridge portions, and the heel wear part being having a layer of hardfacing comprising a wear resistant material supported in a weld matrix substantially covering the  
25 exposed surfaces of the heel wear part to substantially encapsulate said one or more inclusions.

The inclusions of hardfacing in each of the aforesaid aspect of the present invention are preferably in the form of a plurality of straight strips extending substantially from one  
30 end to the other of the wear part. In another example, layers

of hardfacing material may be provided in laminar fashion to one or more strips of rectangular section attached or fixed to the lower face of the body of the wear part. It will be appreciated that many other forms of inclusion may be utilised, 5 such as, for example, a zig-zag strip or a series of parallel stripes running at an oblique angle or at right angles to the elongate direction of the wear part. The function of the inclusion or inclusions is to provide additional hardfacing material which would wear away relatively slowly along with the 10 wear of the remainder of the wear part, it having been found advantageous to provide one or more "islands" of encapsulated hardfacing material within the wear part profile.

In another aspect, the present invention resides broadly in a method of forming a heel wear part including;

15 forming an elongate supporting portion to have a lower face profile, an upper face spaced from said lower face profile, a forward face extending between said lower face profile and said upper face, and a rearward face extending between said lower face profile and said upper face;

20 providing one or more attachment portions for attachment to the lower face of said supporting portion, said one or more attachment portions extending substantially along the length of said supporting portion;

25 providing one or more formations on, in or along at least one of said one or more attachment portions for supporting a layer of hardfacing, said one or more formations extending substantially along the length of said one or more attachment portion or portions;

depositing an inclusion of hardfacing material comprising a wear resistant material supported in a weld matrix on, in or along substantially the length of said one or more formations;

5 attaching said one or more formations to the lower face of said supporting portion substantially in alignment with the elongate axis of said supporting portion such that said one or more inclusions are covered by said one or more formations; and

10 forming a layer said hardfacing material on the exposed portions of said lower face, to at least some of each of the forward and rearward faces of said supporting portion, and to said exposed surface or surfaces of said one or more attachment portions.

Preferably, the inclusions and the formations are formed as elongate one or more recesses to depth sufficient to support  
15 a layer of hardfacing, said one or more recesses extending substantially along the length of said lower face of said supporting portion, and the method includes depositing an inclusion of hardfacing material comprising a wear resistant material supported in a weld matrix in said one or more  
20 recesses to be substantially level with said lower face, forming one or more attachment portions to have a mating face substantially conforming to the lower face of said supporting portion, and one or more other faces to form said attachment portions into respective solid bodies, aligning said one or  
25 more attachment portions with said supporting portion to substantially cover said recesses and said inclusion or inclusions of hardfacing, and attaching said one or more attachment portions to said supporting portion when so aligned, and forming a layer said hardfacing material on the exposed  
30 portions of said lower face, to at least some of each of the



forward and rearward faces of said supporting portion, and to said other faces of said one or more attachment portions.

Preferably, there are a plurality of heel wear parts attached to the underside of the heel portion of a dragline  
5 bucket, and although they may be arranged in any orientation across the base of the heel portion of the dragline bucket, they are preferably each in substantially spaced parallel relationship and running transverse to the dragline bucket.

Preferably, the wear resistant material is a tungsten  
10 carbide grit material and is added to a molten weld pool in a manner understood in the art to form a composite weld for such hardfacing. In such form, the single layer is preferably provided by providing abutting parallel beads of weld. Of course, some of the beads may be overlaid upon previously laid  
15 beads to build up thickness, bearing in mind the limitations imposed on the technique by the dissolution of the grit material in the weld matrix of the first laid down beads when subsequent beads are added in close proximity to form the layer. If desired, the layer may be made up from several  
20 passes overlaid upon one another using techniques known in the art. For example, where hardfacing alloys are used, a build-up of thickness in the layer may be provided by several strata of hardfacing.

In order to apply the hardfacing, the heel wear parts are  
25 oriented such that the face to be welded is substantially horizontal and upward facing, the wear resistant material being fed into the molten weld pool behind the direction of travel of the welding torch by, or assisted by, gravity. It is also preferred that the recesses be formed as a plurality of grooves  
30 such that the inclusions may be formed as strips of hardfacing in the grooves.

**BRIEF DESCRIPTION OF THE DRAWINGS**

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate two preferred  
5 embodiments of the invention, and wherein:

Fig. 1 is diagrammatic sectional view of an assembly of three heel wear parts according to the invention attached to the underside of the heel portion of a dragline bucket;

10 Fig. 2 is a detail sectional view of one of the heel wear parts of Fig. 1; and

Fig. 3 is a detail sectional view of an alternative heel wear part according to the invention.

**DETAILED DESCRIPTION OF THE DRAWINGS**

15 Three heel wear parts 10 are attached to the underside 15 of the heel portion of a dragline bucket (not shown) in parallel spaced relationship as shown on Fig. 1 and running across the width of the bucket at least for the greater portion thereof. It can be seen that the heel wear part shown in Fig  
20 2 is the same in section detail as those of Fig. 1, the reference numerals of Fig. 2 referring to like parts of the three heel wear parts of Fig. 1. The attachment of the heel wear parts to a dragline bucket is by welding, bolting or latching according to methods known in the art.

25 The heel wear part has a supporting portion 11 configured as a rectangular prism, elongate in form extending at right angles to the page, and having attached thereto, two wear bars 12, also of rectangular section. The rectangular section of the supporting portion is bound by a forward face 27, a

rearward face 28, an upper face 20 and a lower face 29. The relative sizes of the supporting portion and the wear bars are selected to provide for a forward rebate 22 and a rearward rebate 26 and a central channel 24 such that the section is  
5 symmetrical about a vertical plane bisecting the wear part in the elongate direction.

A layer of hardfacing 19 is provided covering the exposed faces of the wear bars and the lower face of the supporting portion, as well as most of the forward and rearward faces of  
10 the supporting portion. An upper edge portion 31 is provided on the forward face without any hardfacing, and a corresponding upper edge portion 32 is provided on the rearward face.

Six hardfacing strips shown typically at 13 are provided in parallel spaced relationship to one another, and spaced from  
15 the forward and rear faces of the supporting portion. The strips are provided in two groups of three, each group being located between one of the wear bars and the lower face of the supporting portion. The strips are each in two sections by virtue of having been formed by filling respective grooves in  
20 the lower face of the supporting portion and corresponding grooves in the mating faces of the wear bars with the hardfacing described herein. Each groove is filled substantially to be level with the face into which it has been formed such that when the wear bars are attached to the  
25 supporting portion, (such as by welding), the two sections of each strip are brought together substantially in alignment with one another.

Once the layer of hardfacing has been applied, the lower side of the heel wear part has a lower face profile having two  
30 downward projecting ridges 33 and 34 disposed between a forward

portion 21, a central portion 23 and a rearward portion 25 of the lower face 29 of the supporting portion.

A leading wear bar 17 is provided spaced forward from the forward most heel wear part as shown in Fig. 1. The leading wear bar is a five-sided section formed by providing a forward chamfer 44 on a square section. The hardfacing is provided to cover the exposed faces of the leading wear bar with the exception of an upper groove 41 on the forward side and a corresponding upper groove of the rearward side in a similar fashion to the upper grooves form on each of the wear parts as hereinbefore described.

The three wear parts and the leading wear bar are attached running cross-wise to the underside of a dragline bucket, and as the bucket is dragged in the direction of arrow 18, pulverised material can build up against the leading faces of the wear parts and the leading wear bar.

The alternative heel wear part 10' shown in Fig. 3 has the same parts as the heel wear part 10 shown in Figs 1 and 2 where the same reference numerals are provided. However, instead of the wear bars 12 and hardfacing strips 13, two sets of two wear plates 14 are provided each having an encapsulated layer of hardfacing 16 and 16' formed thereon and arranged with the respective encapsulated layers against one another in abutting relationship so that the layer of hardfacing may be applied without substantially affecting the encapsulated layers of hardfacing.

The formation of inclusions in accordance with the invention is believed to provide additional hardfacing material without the problems associated with multiple layering of hardfacing such as dissolving of wear resistant material in the

weld matrix of subsequent layers. The internal hardfacing material is gradually exposed as the wear part wears, but such exposure enables the wear part to continue to resist wear due to the exposure of the wear resistant material.

- 5        Although the invention has been described with reference to one or more specific examples, it will be appreciated by persons skilled in the art that the invention may be embodied in other forms within the broad scope and ambit of the invention as defined by the following claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A heel wear part for a dragline bucket, wherein the heel wear part includes:

an elongate body having a lower face profile, an upper  
5 face spaced from said lower face profile, a forward face extending between said lower face profile and said upper face, and a rearward face extending between said lower face profile and said upper face;

a layer of hardfacing material comprising a wear  
10 resistant material supported in a weld matrix substantially covering the lower face profile and at least some of each of the forward and rearward faces of said body; and

one or more inclusions of said hardfacing material spaced  
15 inward from said lower face profile and said forward and rearward faces and extending substantially along the length of said body to be substantially encased within said layer of hardfacing.

2. A heel wear part according to Claim 1, wherein the lower  
20 face profile includes a rearward rebate extending substantially along the length of the intersection between the rearward face and the lower face profile.

3. A heel wear part according to claim 2, wherein a forward  
25 rebate is provided extending substantially along the length of the intersection between the forward face and the lower face profile.

4. A heel wear part according to Claim 3, wherein the lower  
30 face profile include a channel intermediate the forward and rearward faces.

5. A heel wear part for a dragline bucket, wherein the heel wear part includes:

an elongate supporting portion having a lower face profile, an upper face spaced from said lower face profile, a forward face extending between said lower face profile and said upper face, and a rearward face extending between said lower face profile and said upper face;

one or more inclusions of said hardfacing material comprising a wear resistant material supported in a weld matrix, said inclusions being spaced inward from said lower face profile and said forward and rearward faces and extending substantially along the length of said supporting portion;

one or more elongate projections extending downward from said lower face profile substantially below said one or more inclusions of hardfacing material to substantially cover said inclusions of hardfacing; and

a layer of hardfacing material substantially covering least some of each of the forward and rearward faces of said supporting portion and the exposed portions of said lower face and said elongate projections to substantially encapsulate said inclusions.

6. A heel wear part for attachment to the underside of the heel portion of a dragline bucket, the heel wear part when so attached depending below the heel portion of the dragline bucket and being elongate in form and provided with a layer of hardfacing having supported therein a wear resistant material, the heel wear part including one or more downward depending ridge portions having incorporated therein one or more inclusions of the hardfacing substantially encapsulated by the one or more ridge portions, and the heel wear part having a layer of hardfacing comprising a wear resistant

material supported in a weld matrix substantially covering the exposed surfaces of the heel wear part to substantially encapsulate said one or more inclusions.

5 7. A heel wear part according to any one of the preceding claims, wherein the inclusions of hardfacing are in the form of a plurality of straight strips extending substantially from one end to the other of the wear part.

10 8. A heel wear part according to any one of the preceding claims, wherein layers of hardfacing material are provided in laminar fashion to one or more strips of rectangular section attached or fixed to the lower face of the body of the wear part.

15 9. A heel wear part according to any one of Claims 1 to 7, wherein said inclusion is formed into a zig-zag strip running at an oblique angle to the elongate direction of the wear part.

20 10. A heel wear part according to any one of Claims 1 to 7, wherein said inclusion is form into a series of parallel stripes running at an oblique angle or at right angles to the elongate direction of the wear part.

25 11. A method of forming a heel wear part including;  
forming an elongate supporting portion to have a lower face profile, an upper face spaced from said lower face profile, a forward face extending between said lower face profile and said upper face, and a rearward face extending  
30 between said lower face profile and said upper face;



providing one or more attachment portions for attachment to the lower face of said supporting portion to extend substantially along the length of said supporting portion;

providing one or more formations on, in or along at least one of said one or more attachment portions extending substantially along the length of said one or more attachment portion or portions;

depositing an inclusion of hardfacing material comprising a wear resistant material supported in a weld matrix on, in or along substantially the length of said one or more formations;

attaching said one or more formations to the lower face of said supporting portion substantially in alignment with the elongate axis of said supporting portion such that said one or more inclusions are covered by said one or more formations; and

forming a layer said hardfacing material on the exposed portions of said lower face to at least some of each of the forward and rearward faces of said supporting portion, and to said exposed surface or surfaces of said one or more attachment portions.

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12. A heel wear part according to Claim 11, wherein the inclusions and the formations are formed as one or more elongate recesses to depth sufficient to support a layer of hardfacing, said one or more recesses extending substantially along the length of said lower face of said supporting portion, and the method includes depositing an inclusion of hardfacing material comprising a wear resistant material supported in a weld matrix in said one or more recesses to be substantially level with said lower face, forming one or more attachment portions to have a mating face substantially conforming to the lower face of said supporting portion, and one or more other faces to form said attachment portions into respective solid

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bodies, aligning said one or more attachment portions with said supporting portion to substantially cover said recesses and said inclusion or inclusions of hardfacing, and attaching said one or more attachment portions to said supporting portion when  
5 so aligned, and forming a layer said hardfacing material on the exposed portions of said lower face, to at least some of each of the forward and rearward faces of said supporting portion, and to said other faces of said one or more attachment portions.

10

13. A dragline bucket having a plurality of heel wear parts according to any one of the preceding claims, each said heel wear part being attached to the underside of the heel portion of the dragline bucket, and arranged in substantially spaced  
15 parallel relationship and running transverse to the dragline bucket.

Dated this 16<sup>th</sup> day of August, 2002.

THE TRACK SHOP PTY LTD

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by their Attorneys

AHEARN FOX

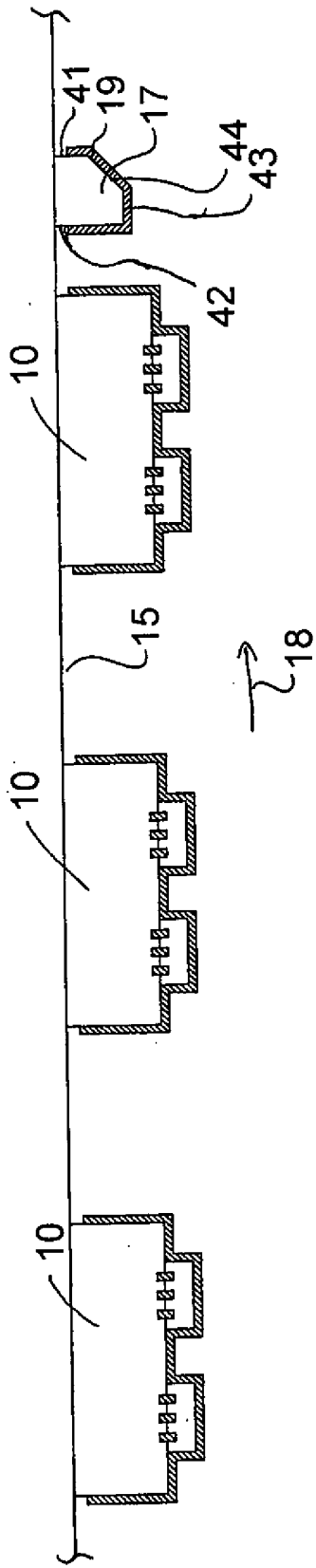


Fig. 1

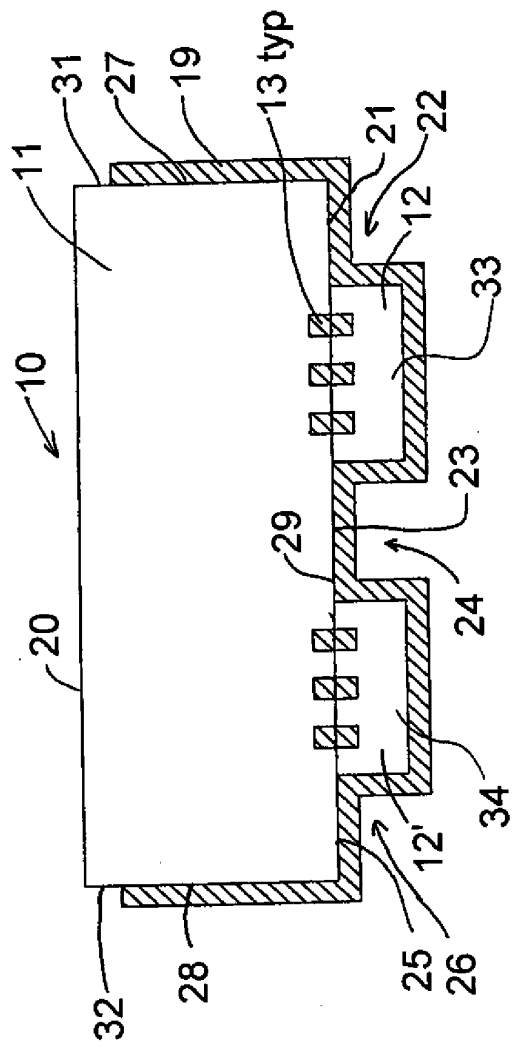


Fig. 2

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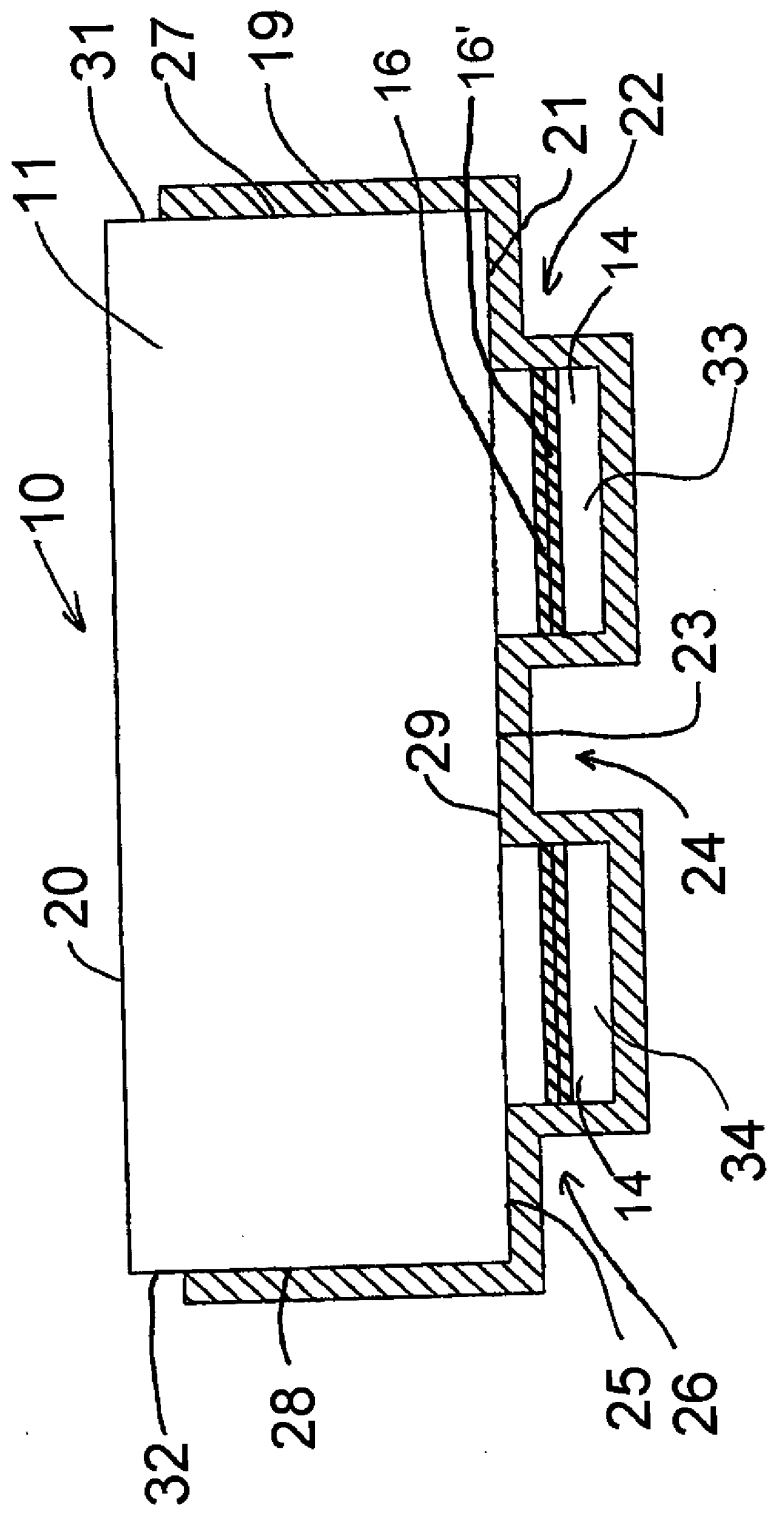


Fig. 3