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(11) **EP 1 475 167 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**10.11.2004 Bulletin 2004/46**

(51) Int Cl.7: **B21C 51/00, B65C 7/00,  
G09F 3/02**

(21) Application number: **04252648.3**

(22) Date of filing: **06.05.2004**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**  
Designated Extension States:  
**AL HR LT LV MK**

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(30) Priority: **06.05.2003 ZA 200303449  
02.12.2003 ZA 200309369**

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(54) **Steel section tagging system**

(57) The invention concerns a steel section tagging system in which an identification mark, typically a computer-readable 2D code (22, 56), is applied to the steel section (12, 62). The mark is located in a recess in or on the steel section. In a preferred embodiment, the mark is carried by the base of a cup-shaped receptacle (16, 60) which is fixed in a hole (14) through the steel section. The mark is protected by a plug (26, 68) located over it in the receptacle. The plug is typically moulded or cast *in situ* of a material, such as a settable refractory cement, over the identification mark and is removable to expose the mark when identification of the steel section is necessary.

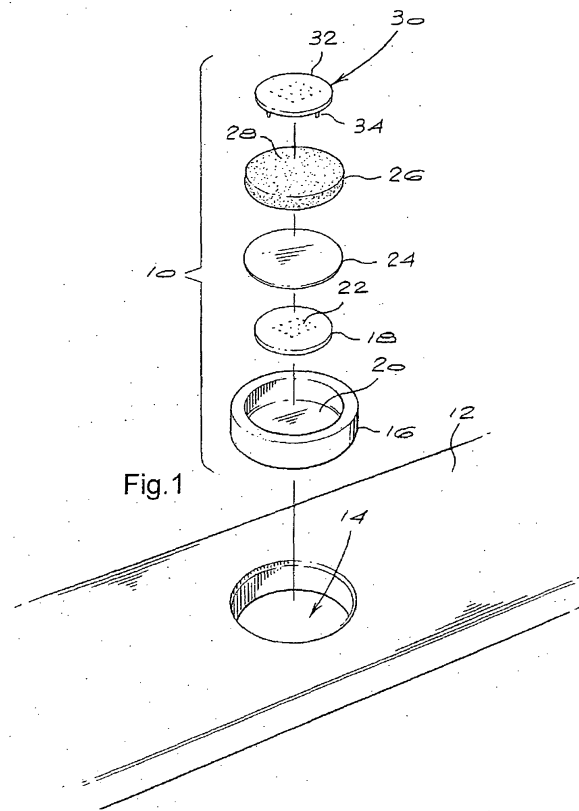


Fig.1

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## Description

### BACKGROUND TO THE INVENTION

[0001] THIS invention relates to a steel section tagging system.

[0002] In steel fabrication plants it is of critical importance to the efficiency of the fabrication operation to be able to monitor the location and progress of steel sections through the plant, i.e. through the various stations at which different procedures in the fabrication process are carried out, such as cutting, punching, drilling, shot-blasting, acid pickling, galvanising and so on.

[0003] A number of systems to facilitate identification of steel sections have been tried. Identification marks have for instance been stamped onto exposed surfaces of the steel sections. Apart from the fact that the stamped marks may be obliterated during shot blasting, galvanising or other procedures, the system relies on visual recognition of the marks and a generally unsophisticated tracking system based on such identification. Other fabricators have affixed metal labels, carrying identification marks, externally to the steel sections. Although this provides the ability to use bar coding on the labels, and hence opens the door for computerised tracking, the metal tags are often torn free or otherwise damaged through normal handling or during shot blasting, galvanising or other procedures.

[0004] Infosight Corporation has proposed laser-marked bar-coded metal tags, under the name Pic-Anneal®, which are resistant to acid pickling and high temperature annealing and which are attached to steel wire and rod. However these tags are not resistant to galvanising. The same entity has also proposed metal bar code tags, under the name KettleTag® which are attached externally to steel sections and which are said to be resistant to galvanising. However such tags experience the same problem as other externally affixed tags and are prone to being torn free and/or damaged during handling.

### SUMMARY OF THE INVENTION

[0005] According to one aspect of the invention there is provided a method of applying an identification mark to a steel section, the method comprising the step of providing a recess in or on the steel section and locating the identification mark in the recess. Conveniently the identification mark is applied to an identification tag and the tag is mounted to the steel section such that the tag is recessed relative to a surface of the steel section. This allows the mark to be applied to the tag at a remote site before being mounted to the steel section.

[0006] It is also convenient if the identification mark is located in a receptacle, such as a cup-shaped member, which is mounted in a recess, typically a hole in the steel section, although it is also feasible for the receptacle to be mounted externally to a surface of the steel section.

The identification mark may be applied directly to an internal base surface of the cup-shaped member which itself serves as the tag, or it may be applied to a separate tag which is fixed internally in the cup-shaped member.

[0007] In each case it is preferred that a protective cover is provided over the identification mark, the cover being removable to expose the identification mark. The cover may be in the form of a protective plug formed *in situ* over the identification mark, the plug being resistant to galvanising and being made, for example, of a settable refractory material. The identification mark may also be applied to a further tag which is fixed over the plug.

[0008] The cup-shaped member can be fixed in the hole by means of an adhesive or by mechanical fixing means. In the latter case, in a preferred embodiment the receptacle comprises a central zone to which the identification mark is applied and a series of prongs radiating from the central zone. The central area is located within a hole extending through the steel section and the prongs are bent appropriately to engage opposite surfaces of the steel section adjacent the hole.

[0009] In other embodiments the identification mark is applied to a tag and the tag is fixed to the base of a blind hole in the steel section or it is applied to the base of a blind hole in the steel section. In either event, as discussed above, a protective plug which is resistant to galvanising can be cast or moulded in the blind hole over the identification mark, the plug being removable to expose the identification mark.

[0010] In yet another embodiment the identification mark is applied to the base of a cup-shaped receptacle and the receptacle is fixed to a surface of the steel section. Once again, a protective plug may be provided over the mark.

[0011] According to another aspect of the invention there is provided a steel section which is identified by an identification mark applied to the steel section by a method as summarized above.

[0012] According to a further aspect of the invention there is provided an identification tag for a steel section, the tag comprising a central zone carrying a computer-readable identification code and a series of prongs radiating from the central zone with alternate prongs extending in opposite directions from the central zone, whereby the tag can be anchored to a steel section by locating the central zone of the tag in a hole through the steel section with the prongs bent as appropriate to engage opposite surfaces of the steel section adjacent the hole.

[0013] Other features of the invention will appear from the following description and the appended claims.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

- Figure 1** shows an exploded perspective view of a preferred steel section tagging system according to the invention;
- Figure 2** shows a cross-sectional view of the tagging system of Figure 1 in an installed condition;
- Figure 3** shows a cross-sectional view of a tagging system according to a second embodiment of the invention in an installed condition;
- Figure 4** shows a perspective view of a basic steel element used in a third embodiment of the invention;
- Figure 5** shows a perspective view of the steel element of Figure 4 after application of an identification mark and bending of the prongs;
- Figure 6** illustrates the manner in which the embodiment of Figures 4 and 5 is fixed to a steel section; and
- Figure 7** illustrates another embodiment of the invention.

#### DETAILED DESCRIPTION OF THE DRAWINGS

**[0015]** Figures 1 and 2 illustrate a steel section tagging system, generally indicated by the numeral 10, according to a first embodiment of the invention. The system 10 is used to tag a steel section 12 to enable the steel section to be identified and tracked during progress through, for instance, a steel fabrication plant, and is particularly suited to tracking of steel sections which undergo galvanising after fabrication, possibly at a site away from the fabrication plant. The steel section 12 may be any typical steel section, such as a flat plate, angle, channel, I-beam, RSJ (rolled steel joist) or other section.

**[0016]** A round hole 14 is formed through a part of the steel section, typically by a punching operation. In the case of an angle, for instance, the hole may be punched through either leg of the section, typically towards one end thereof.

**[0017]** A cup-shaped steel receptacle 16 has a diameter very slightly less than the diameter of the hole 14. There is also a round tag 18 having a diameter which enables it to locate internally on the base 20 of the receptacle 16. In this embodiment, the tag 18 is a round disc of thin gauge mild or stainless steel. The disc carries a visible and computer-readable identification mark 22, in this case a so-called 2D code. The mark or code may be applied to the disc using a computer-programmable stylus marker or scribe, such as a model 320 Scriber/Stylus Marker available from Borries® Marking Systems.

**[0018]** As indicated previously, the tag or disc 18 may alternatively be made of a suitable plastics material. In either case, the disc is fixed to the base 20 of the receptacle 16, typically by means of a suitable adhesive.

**[0019]** A separator 24 in the form of a round disc is located in the receptacle over the disc 18. The separator in this embodiment is a graphite-backed membrane such as that sold under the trade mark Klinker 80. Although the disc is not fixed in the receptacle, its diameter is such that it makes a close fit with the internal surface of the wall of the receptacle.

**[0020]** Next, a plug 26 of material which is resistant to galvanising is cast or moulded in the receptacle over the separator 24. The material used for the plug is typically a settable refractory material able to withstand the temperatures and chemistry encountered in a hot dip galvanising process. In this embodiment, the material used is an air-setting cement or fireclay marketed under the name Elgin 1600™ mixed prior to moulding with an adhesive, in this case Genkem™ brake bonding adhesive which is likewise resistant to high temperatures. The material is moulded in the receptacle so as to have an outer surface 28 which is flush with the upper edge of the wall of the receptacle.

**[0021]** In this embodiment a further identification tag 30 is fastened to the surface 28 of the plug 26. The tag 30 includes a disc 32, typically of the same material as the disc 18 and carrying the same identification mark, from which prongs 34 extend. The prongs 34 are embedded in the plug material before that material sets, and serve to anchor the tag 30 in place. The diameter of the disc 32 is such that its outer periphery rests on the upper edge of the wall of the receptacle 16, generally flush with the surface of the steel section or slightly recessed relative thereto. However in other embodiments, the diameter of the disc may be slightly less than the internal diameter of the wall of the receptacle 16, so that the disc can be arranged with its upper surface, carrying the identification mark, flush with the upper edge of that wall.

**[0022]** The independently manufactured identification unit, consisting of the receptacle 16, tag 18, separator 24, plug 26 and tag 30, is then fixed in the hole 14 in the steel section. In this embodiment this is achieved by means of an adhesive 36 between the outer surface of the wall of the receptacle and the inner surface of the hole 14. A suitable adhesive is Durabond™ 950, 952 or 954 metallic adhesive.

**[0023]** The final assembly is illustrated in Figure 2 from which it will be seen that the receptacle, including the identification tag 18, is located within the hole 14. In this position, the tag 18 is protected from external impacts or other physical damage. The plug 26 protects the tag 18 from galvanising as well as other procedures to which the steel section 12 may be subjected.

**[0024]** During many of the normal procedures which the steel section will be subjected, the outer tag 30 will remain visible to provide a ready means for identifying,

locating and tracking the steel section. Should the tag 30 be separated as a result of an internal impact or otherwise, or should it be damaged during galvanising or other procedure, the tag 18 remains fixed to the steel section for identification purposes. Should it be necessary to view the tag 18 after a galvanising step, the plug 26 is removed. This may, for instance be achieved using a sharp tool to extract it from the receptacle 16. The separator 24 facilitates removal of the plug and prevents the plug from contacting the tag 18 directly. After removal of the plug 26, the separator 24 can itself be extracted from the receptacle, thereby exposing the identification mark 22 to view optically or by tracking scanners or the like.

**[0025]** It will be understood that an important feature of the invention is the fact that the identification tag 18 is recessed relative to the surface of the steel section and is protected by the plug 26 against damage from galvanising or otherwise while still being accessible for tracking purposes.

**[0026]** Figure 3 illustrates a second embodiment of the invention in which the receptacle 16 is fixed mechanically to the steel section. The receptacle has a flange 38 which rests on one surface of the steel section 12 alongside the hole 14 while the opposite end of the receptacle has an extension 40 carrying prongs 42 which are peened over the opposite surface of the steel section to anchor the receptacle relative to the steel section. Although the tag 18 is again located within the hole 14, inside the receptacle, is recessed with respect to the surface of the steel section and is protected by the plug 26 as before, this embodiment is less preferred than that of Figures 1 and 2 for the reason that the receptacle itself projects partially from the hole with the attendant possibility of impact or other damage.

**[0027]** The invention also envisages an embodiment in which the identification mark 22 is applied directly to the base of the receptacle 16, i.e. there is no separate tag 18. A plug corresponding to the plug 26 is then cast or moulded in the receptacle, possibly over a separator as described above, so that the tag 18 is adequately protected.

**[0028]** Figures 4, 5 and 6 of the accompanying drawings illustrate another embodiment of the invention. In this embodiment, an identification tag is formed from a basic steel element 50, seen in Figure 4, which has been punched or otherwise cut from steel sheet of appropriate thickness. The element 50 has a circular central zone 52 and a series of prongs 54 radiating from the central zone.

**[0029]** Figure 5 illustrates a further step in the preparation of the tag which is to be mounted to a steel section. The identification mark 56 is stamped or otherwise applied to the central zone 52. Alternate prongs 54.1 are bent upwardly relative to the central zone while the remaining prongs 54.2 are bent downwardly and shaped as shown to provide outwardly splayed feet 58.

**[0030]** Referring to Figure 6, the tag 60 seen in Figure

5 is inserted through a hole in a steel section 62 such that the outwardly splayed feet 58 bear against one surface 64 of the steel. The central zone 52 is recessed below the opposite surface 66 of the steel and the upper extremities of the prongs 54.1, which initially project above the surface 66, are bent or peened over as illustrated to anchor the tag to the steel section.

**[0031]** Where galvanising is to take place a plug 68, corresponding to the plug 26 described previously, can then be located over the central zone to provide protection for the mark 56. As before the plug can be removed when it is necessary to have access to the mark for identification purposes. To facilitate this, a separator 70, corresponding to the separator 24 described previously, may be located over the central zone 52 beneath the plug 68.

**[0032]** Still further the invention envisages an embodiment (not illustrated) in which an identification tag, such as the tag 18 described above, is fixed directly to the base of a blind hole formed in the steel section. A separator may again be placed over the tag and a plug is then cast or moulded over the separator so that its surface is flush with that of the steel section. It is however recognised that a disadvantage of this embodiment is that the plug has to be cast or moulded *in situ* in the hole rather than remotely in a receptacle or tag which is subsequently mounted in the hole.

**[0033]** According to yet another possibility, once again with no receptacle 16, the identification mark is applied directly to the base of a blind hole in the steel section with the plug then being cast or moulded over the mark, possibly with an interposed separator to facilitate subsequent removal of the plug.

**[0034]** Yet another possibility is illustrated in Figure 7. This embodiment has similarities to the embodiment of Figure 3 and once again employs acupshaped receptacle 16. However in this instance, the receptacle 16 has a flat underside which is placed on a surface of the steel section 12. The flange 38 is spot-welded at 80 to the steel section to anchor it in position.

**[0035]** It will be understood that in the embodiment of Figure 7 there is no hole in the steel section, and that the receptacle 16, as in Figure 3, stands proud of the surface of the steel section. The identification code can be stamped directly onto the base of the receptacle 16, or it can be provided on a tag which is located in the receptacle. Thus, although this tagging system has the disadvantage that it stands proud and hence is prone to impact damage, the mark itself is recessed in the receptacle 16 and is accordingly provided with protection against external impacts and the like. Protection against damage during post-fabrication galvanising can, as before, be provided by an *in situ* plug of refractory material, possibly with a separator interposed between the identification mark and the plug as described above.

**[0036]** In the embodiments described above an *in situ* plug of refractory material is used to protect the identification mark during galvanising. However other opera-

tions which are commonly performed on steel sections, for example shot blasting and painting, also have the potential to obliterate or damage the identification mark. Accordingly the invention also envisages a tagging system in which the mark is temporarily protected during such operations. Particularly in the case of relatively non-aggressive operations such as painting, the mark may be protected temporarily by any suitable covering material which can subsequently be extracted without undue difficulty. An example of a suitable material is that sold under the name Prestik™ by Bostik.

### Claims

1. A method of applying an identification mark to a steel section, the method being **characterised by** the steps of providing a recess in or on the steel section and locating the identification mark in the recess.
2. A method according to claim 1 **characterised in that** the identification mark is applied to an identification tag and the tag is mounted to the steel section such that the tag is recessed relative to a surface of the steel section.
3. A method according to claim 1 or 2 **characterised in that** the identification mark is located in a receptacle which is mounted in a recess in the steel section.
4. A method according to claim 3 **characterised in that** the receptacle is mounted in a recess provided by a hole in the steel section.
5. A method according to claim 4 **characterised in that** the receptacle is a cupshaped member located in the hole.
6. A method according to claim 5 **characterised in that** the identification mark is applied directly to an internal base surface of the cupshaped member which itself serves as the tag.
7. A method according to claim 5 **characterised in that** the identification mark is applied to a separate tag which is fixed internally in the cup-shaped member.
8. A method according to claim 6 or claim 7 **characterised in that** a protective cover is provided over the identification mark, the cover being removable to expose the identification mark.
9. A method according to claim 8 **characterised in that** a protective plug is formed *in situ* over the identification mark.
10. A method according to claim 9 **characterised in that** a protective plug which is resistant to galvanising is cast or moulded over the identification mark.
11. A method according to claim 10 **characterised in that** a protective plug of a settable refractory material is cast or moulded over the identification mark.
12. A method according to claim 10 or claim 11 **characterised in that** a separator is located over the identification mark and the plug is cast or moulded over the separator, the separator facilitating subsequent removal of the plug.
13. A method according to any one of claims 9 to 12 **characterised in that** the identification mark is applied to a further tag which is fixed over the plug.
14. A method according to any one of claims 3 to 13 **characterised in that** the receptacle is fixed in the hole by means of an adhesive.
15. A method according to any one of claims 3 to 13 **characterised in that** the receptacle is fixed in the hole by mechanical fixing means.
16. A method according to claim 15 **characterised in that** the receptacle comprises a central zone to which the identification mark is applied and a series of prongs radiating from the central zone, the central area is located within a hole extending through the steel section and the prongs are bent appropriately to engage opposite surfaces of the steel section adjacent the hole.
17. A method according to any one of the preceding claims **characterised in that** the identification mark is a computer-readable mark.
18. A method according to claim 17 **characterised in that** the identification mark comprises a 2D code.
19. A method according to claim 1 **characterised in that** the identification mark is applied to a tag and the tag is fixed to the base of a blind hole in the steel section.
20. A method according to claim 1 **characterised in that** the identification mark is applied to the base of a blind hole in the steel section.
21. A method according to claim 19 or claim 20 **characterised in that** a protective plug which is resistant to galvanising is cast or moulded in the blind hole over the identification mark, the plug being removable to expose the identification mark.
22. A method according to claim 1 **characterised in**

**that** the identification mark is applied to the base of a cup-shaped receptacle and the receptacle is fixed to a surface of the steel section.

23. A steel section which is **characterised in that** it is identified by an identification mark applied to the steel section by a method according to any one of the preceding claims. 5
24. An identification tag for a steel section, the tag being **characterised in that** it comprises a central zone carrying a computer-readable identification code and a series of prongs radiating from the central zone with alternate prongs extending in opposite directions from the central zone, whereby the tag can be anchored to a steel section by locating the central zone of the tag in a hole through the steel section with the prongs bent as appropriate to engage opposite surfaces of the steel section adjacent the hole. 10  
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25. An identification tag according to claim 23 **characterised in that** the central zone of the tag carries a 2D code. 25

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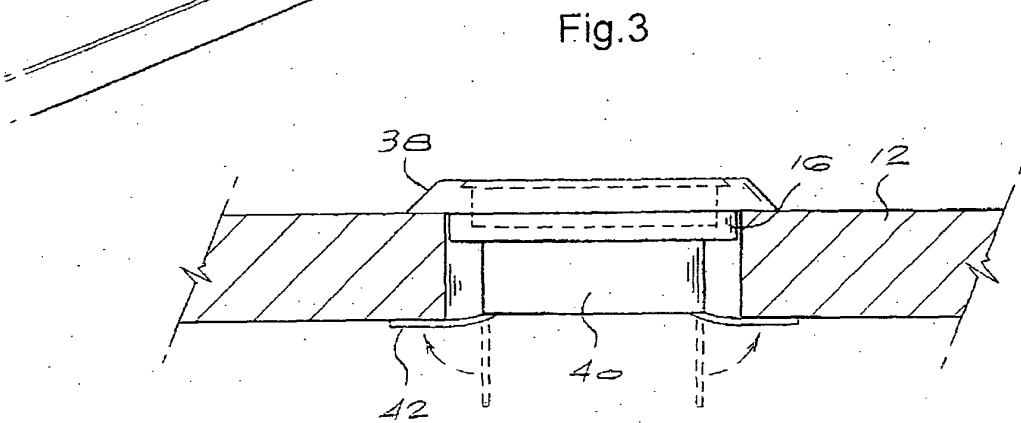
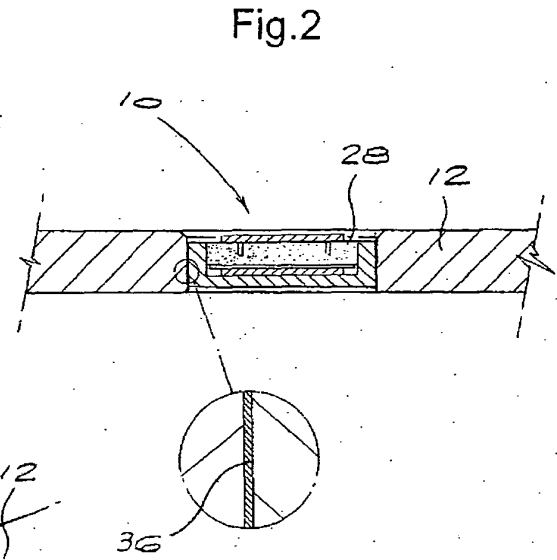
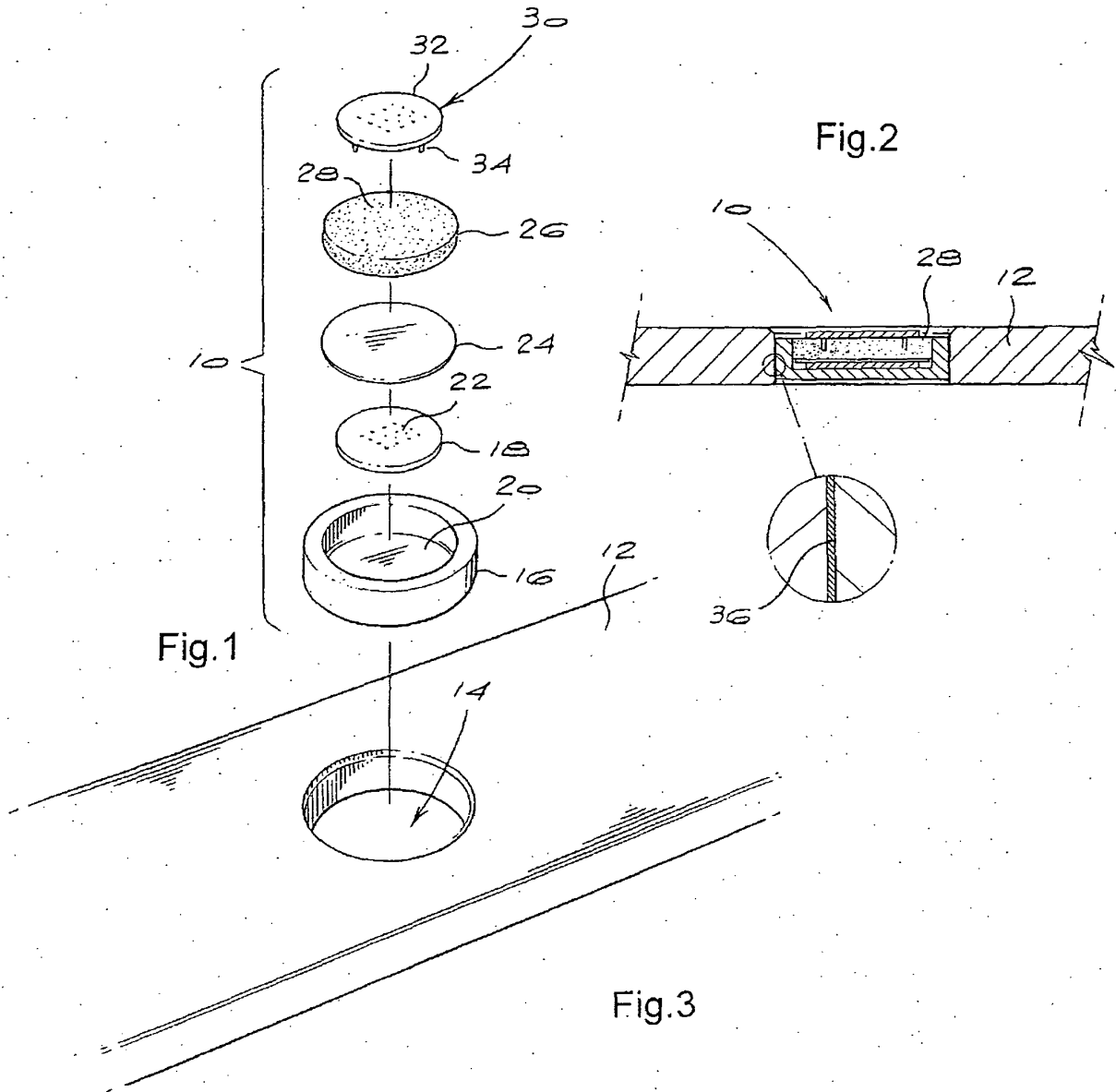


Fig.4

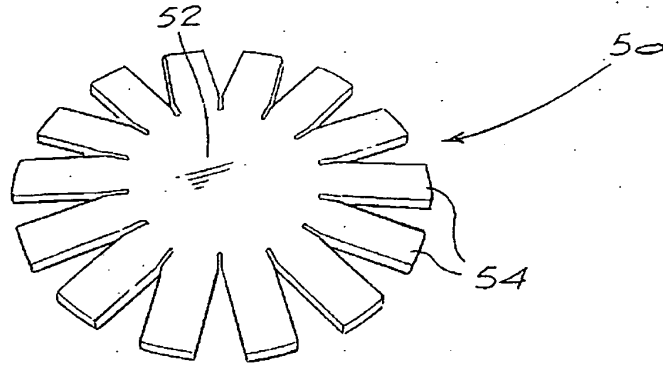


Fig.5

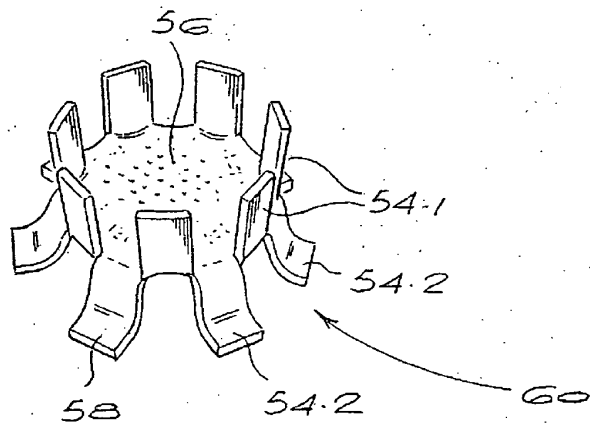


Fig.6

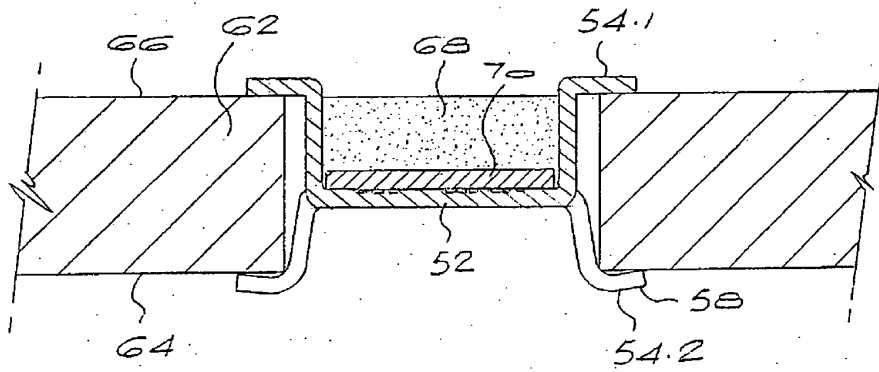


Fig.7

