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(19)

(54) ROAD STUDS

(71) We, MOLEHURST LIMITED, a British Company, of 10, De Montfort Street, Leicester, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to road studs and is especially concerned with the provision of road studs which incorporate one or more reflecting surfaces. Such studs are primarily for use to assist drivers driving at night, without adequate street lighting, when it is most important that the boundaries of road lanes should be clearly delineated.

The most widely used reflecting road stud is that known under the trade mark "Catseye", and this consists, basically of three main components, namely a cast iron base, a rubber pad mounted therein, and a lens or lenses. The lenses, and there are normally four of them, are bi-convex glass lenses each contained within a copper tube mount and secured to the lens holder, namely the rubber pad, by copper anchor dowels. The lens holder is fitted inside the cast iron base, which thus acts as a mount for the lenses/holder assembly and protects this assembly from vehicle damage.

Road studs of this type are extremely efficient, and widely acclaimed as such, but they do suffer from certain disadvantages. For example in really wet weather, such as encountered in some countries, water collects in the cavity beneath the lens holder, and if the weather is cold enough this may freeze. Dirt can similarly accumulate in this cavity, and may not be completely flushed out. In either of these conditions, the lens holder will not be able to depress sufficiently to permit the frequent wiping of the lenses that is necessary for the lenses to perform satisfactorily as a reflector. A second disadvantage of this type of road stud is that its installation is a laborious operation. Thus, in order to install one of these road studs, part of the road has to be excavated, followed by the concreting and grouting of the stud in position. Their removal is, consequently also laborious, and in most cases this has to be effected no later than five years after installation, it being normal practice to re-surface most roads at maximum intervals of five years. The normal procedure for re-surfacing roads involves the burning off of the existing surface, making good of any holes or cracks, and then the re-surfacing. It will be apprecoated that road studs of the above type have to be removed before any of this re-surfacing work can begin.

An alternative form of reflecting road stud comprises a plastic shell containing a "corner cube"-type reflector. The reflector has a smooth sloping face, and the body of the shell contains a filler which is specially formulated to absorb impacts from traffic. This form of road stud also has disadvantages, however, amongst these being the fact that it is not particularly robust, and thus has poor durability in normal day to day traffic conditions, and the fact that its installation, which involves it being attached to the surface by means of adhesive, e.g. an epoxy resin, requires that portion of the road to which the road studs have been applied to be protected from traffic for some hours, i.e. until the resin has set. This form of road stud is therefore more commonly used as an edge marker rather than a lane delineator.

It is an object of the present invention to provide a reflecting road stud which obviates or mitigates the above disadvantages.

According to the present invention there is provided a reflecting road stud comprising a base member attached to a road surface

without excavation thereof, said base member defining an upwardly open cavity; a moulded body member mounted in and at all times substantially filling the cavity in said base member to prevent the ingress of water into the cavity; at least one outwardly-directed reflector mounted in or on said body member; a region of resilient deformability below the reflector formed by at least one sealed cavity in the body member or by the body member beneath the reflector being formed from, or filled with a mass of, resiliently deformable material; the body member including integral means for wiping the reflector as the reflector is depressed by passing traffic.

The " region of resilient deformability " allows the reflector or reflectors to return to their original position after the depressing force of a vehicle road wheel thereon has been removed. In a preferred embodiment the region of resilient deformability comprises one or more sealed cavities formed within the body member. When a vehicle wheel contacts the road stud part of it will be deformed into the cavity, and the reflector will consequently be depressed. On removal of the depressing force the cavity will resume its original shape and size and will restore the reflector to its initial position.

The cavity in the body member may contain resilient means, which may partly or wholly fill the cavity and will, when present, control the deformation of the cavity and thus of the body member. For example, the cavity may contain a spring; alternatively it may contain a material, e.g. a foam material, which is more resilient than the material of the body member.

In a preferred form of the invention the body member of the road stud is moulded from mouldable material such as natural or synthetic rubber, a mounting for the reflector or reflectors being moulded integrally therewith as part of the body member and a cavity being formed between the reflector mounting and the road-engaging surface of the body member. Such a cavity may be formed by forming the major part of the body member, including the reflector mounting, with a bottom-facing opening, and then sealing the opening, optionally after partly or completely filling it with resilient material, with a base plate, suitably of the same material as the rest of the body member.

In another embodiment the reflector mounting is formed separately from the body member and is seated on a mass of resiliently deformable material filling a hollow formed in the body member.

It is preferred that the road stud of the invention should be attached to a road surface by means of nails, studs or spikes, which may be integral with or separate from the base member. One or more such studs, nails or spikes may be used to attach each stud to the road surface. Attachment of the stud to the road surface will not, therefore, involve any excavation of the latter. In another construction the road stud may be stuck on the road surface.

The reflector assembly comprises one or more reflex reflecting surfaces and a mounting therefor, which mounting is suitably, but not necessarily, formed as an integral part of the body member, as outlined above. Normally the reflecting surface or surfaces will stand proud of the main part of the body member, but will be pressed towards the road-surface when depressed by a wheel of a road vehicle. The reflecting surface or surfaces must clearly return quickly to their protruding position when the vehicle has passed, and for this purpose we provide the body member with a region of resilient deformability as explained hereinabove. In this way, when the depressing force of a road vehicle is removed, the reflector assembly may return to its original position, with the reflecting surface or surfaces standing proud of the rest of the body member. The resiliently deformable material, from which the body member may be formed, or which may partly or wholly fill the above-mentioned cavity and hollow, may be of any suitable type, and examples include natural and synthetic rubbers, and plastic foams. We have found a high density polyurethane foam to be especially useful, both for the body of the stud itself and also for the deformable material filling the cavity and the hollow where appropriate.

The reflecting surface or surfaces of the road stud of the present invention are of the reflex reflecting sort. There are commonly two main types of reflex reflector, namely those involving refraction and those based on the principle of total internal reflection. Thus, the reflector of the road stud of the invention may be of the biconvex type used in " Catseyes " hitherto, or of the " corner-cube " type.

The reflector wiper is an integral part of the body member of the stud. The vertical reciprocation of the reflector mounting, due to the passage thereover of the vehicle, causes the reflecting surface or surfaces to be " swept " by the wiping edges of the wiper.

It is an important feature of the road stud of the invention that any cavity formed in the body member, when such a cavity is used in the provision of the resiliently deformable region, should at all times be sealed. This ensures that no water or dirt can accumulate in the cavity, so that the deforming action of the reflector assembly is not impaired.

The base member of the stud of the invention may be required to withstand, in certain conditions, fairly rough treatment, for example, where snow ploughs or tracked vehicles are in evidence, and for this purpose it may be formed of a material having itself the property of being relatively rigid. Alternatively a rigidifying element, for example a steel plate, may be incorporated in the base member itself, or, again as an alternative, the base member may be provided as a rigid protective shield, e.g. an aluminium or steel casting, from the upwardly open cavity of which the reflectors protrude.

Some embodiments of the invention will now be described with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a perspective view of one form of road stud in accordance with the invention;

Figures 2 and 3 are, respectively, top and bottom plan views;

Figure 4 is a front or rear view of the road stud of Figure 1;

Figure 5 is a section on the line A-A of Fig. 4, showing also means of affixing the road stud to a road surface;

Figure 6 is a section on the line B-B of Figure 5;

Figure 7 is an elevation of the reflector assembly of the road stud of Figures 1 to 6;

Figure 8 is a view of the reflector itself, of the "corner cube" type;

Figure 9 is a view of the reflector mounted in its holder;

Figure 10 is an illustration of the wiper of the stud of Figures 1-9;

Figure 11 is a sectional view of another form of road stud, shown attached to a road surface;

Figure 12 is a perspective view of the reflector assembly of the road stud of Figure 11;

Figures 13-15 are illustrations of various different forms of base member for use with a reflector assembly of the type shown in Figure 12; and

Figures 16 and 17 are sectional views of two further forms of road stud.

Referring firstly to Figures 1 to 10, the road stud comprises a rigid base member 1 and a body member or reflector holder designated generally 2. The base member 1 is of a rigid material, and thus may be for example of a metallic material or a plastics material The use of a plastics material for the base member 1 enables the entire road stud to be burnt off the surface of the road if the road stud is required to be removed, for example for re-surfacing operations. The base member 1 is provided with arcuately-shaped shoulders 3, for protection of the body member 2. Holes 4 are provided in the base member 1 for the reception of nails, spikes or studs 5, which are suitably provided with collars 6 which accurately fit holes 4. The use of such collars 6 enables nails 5 to be used which are smaller than would otherwise be necessary for holes 4. If desired, the holes 4 could be provided with a splined surround, to enable the use of different sized nails. A hollow 7 formed in the base member 1 is filled by the body member 2. This member comprises a rubber or plastics moulding 8 having flexible edges 9 which constitute wipers for the reflecting surfaces of the reflectors. The moulding 8 is provided with longitudinal flanges 10 which are retained beneath over-hanging ledges 11 formed on the base member 1. By this means the wiper is retained in place. The central hollow portion of the wiper 8 is filled with a mass of resiliently deformable material 12. This may, for example, comprise a rubber or plastics, e.g. polyurethane, foam, the material 12 having substantially an I-section when viewed in plan (see Figures 7 and 9), and constituting a resiliency deformable region. Seated on top of the deformable material 12 is a holder 13, suitably of deformable material such as natural or synthetic rubber, which is moulded around, and carries, a reflector 14 of the corner cube type.

The road stud of Figures 1 to 10 is attached to the surface of the road by hammering in the spikes 5. The spikes or studs 5 may be of the expanding nail type. The stud is mounted so that the reflecting surfaces face in the direction of traffic flow. When a road wheel passes over the stud it contacts the top of holder 13, and depresses this in the manner of a plunger. Deformable core material 12 is compressed, allowing holder 13 to move downwardly relative to wiper 8 and cause the wiping blades 9 to pass over, and clean, the surfaces of the reflector 14. When the vehicle has passed, the resilient nature of the material 12 causes the holder 13 to revert to its initial position as shown in the drawings.

An alternative road stud is shown in Figures 11 and 12. This is of a much simpler form, and comprises a base member 21, suitably of metal or a plastics material, formed with a central spike 22 and two lateral aligning spikes 23, by which it is attached to road surface 24. In a cavity 25 formed in base member 21 is retained a body member 26, shown enlarged in Figure 12, comprising a solid core of resiliently deformable material such as polyurethane foam. The core is formed with a peripheral flange 27, whereby it is retained in an undercut formed in the base body member 21, and is provided with four reflectors 28 of the bi-convex type. A longi-

tudinal slit 29 is cut through the thickness of the core at each end of the body member 26. Thus, during passage of a road wheel over this assembly, whilst flange 27 is held stationary in the base member, the portion 30 of the body member 26 is depressed relatively to it, causing the lenses of the reflectors 28 to contact the edge of the flange 27 formed by the cut 29, which " wipes " the lenses.

Alternative base mebers are shown in Figures 13-15. That shown in Figure 13 is similar to the base member 21 shown in Figure 11, but no integral spikes are provided. Instead, separate spikes 35 of cruciform shape co-operate with and are retained by suitably formed holes 36 in two opposite sloping faces of the base member 37.

A base member suitable for adhesion to a road surface is shown in Figure 14.

The base member shown in Figure 15 is similar to that of Figure 13, but has integrally formed spikes 38 instead of the separately formed spikes 35. Spikes of this particular configuration are especially suitable for use where the substrate of the road is particularly poor, e.g. on minor roads, or when substantial resistance to " creep " has to be provided. Otherwise it is in order to attach the road studs to the road surface by more conventional nails or spikes, depending on the nature of the surface, e.g. concrete or tarmacadam. For most applications masonry nails of e.g. 1/4" diameter and up to e.g. 3" long would be adequate.

The road stud illustrated in Figure 16 comprises a body 40 integrally moulded, from for example a synthetic rubber, with a reflector assembly 41 containing corner-cube type reflectors 42 similar to that shown in Figure 8. The stud is circular in plan and the body 40 is formed with a hollow cavity 43 by moulding the major part of the body with an open-bottomed hollow 43 and sealing this with a base plate 44 made from similar or compatible material to that of the rest of the body 40. The body is formed with two transverse cuts or slots 45 and is surrounded by a metal base member in the form of a protective shield 46 by means of which the stud is fastened to the road surface 47.

When a road wheel of a vehicle passes over the stud shown in Figure 16 the reflector assembly 41 is depressed and " hinges " about the lines 48 representing the lowermost portions of slots 45. This downwards movement of reflector assembly 41 is taken up by the cavity 43, into which part of the reflector assembly 41 moves, and it will be seen that during this downward movement of assembly 41 the outer boundaries 49 of the slots 45 contact and wipe the faces of the reflectors 42. On removal of the wheel from the stud, the reflector assembly 41 " springs " back to its normal position as shown in Figure 16.

The construction of the road stud shown in Figure 17 is broadly similar to that of Figure 16, save that the reflector assembly 141 is modified to accommodate lenses 142 of the bi-convex type, and that two cavities 143 are provided in the body 140. The lenses 142 are retained within tube mounts 144 which are moveable relatively to each other, as is inevitable during use, by means of a spigot 145 on one of them sliding in a cylindrical extension 146 of the other.

The operation of the Figure 17 embodiment is similar to that of the Figure 16 construction

WHAT WE CLAIM IS:—

1. A reflecting road stud comprising a base member attached to a road surface without excavation thereof, said base member defining an upwardly open cavity; a moulded body mmeber mounted in and at all times substantially filling the cavity in said base member to prevent the ingress of water into the cavity; at least one outwardly-directed reflector mounted in or on said body member; a region of resilient deformability below the reflector formed by at least one sealed cavity in the body member or by the body member beneath the reflector being formed from, or filled with a mass of, resiliently deformable material; the body member including integral means for wiping the reflector as the reflector is depressed by passing traffic.

2. A road stud as claimed in claim 1 wherein said resiliently deformable material is a foam material.

3. A road stud as claimed in claim 2 wherein said foam material is a high density polyurethane foam.

4. A road stud as claimed in claim 1, substantially as hereinbefore described with reference to Figures 1 to 10 of the accompanying drawings.

5. A road stud as claimed in claim 1, substantially as hereinbefore described with reference to Figures 11 and 12 of the accompanying drawings.

6. A road stud as claimed in claim 1, substantially as hereinbefore described with reference to Figure 16 or Figure 17 of the accompanying drawings.

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1563798 COMPLETE SPECIFICATION
6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

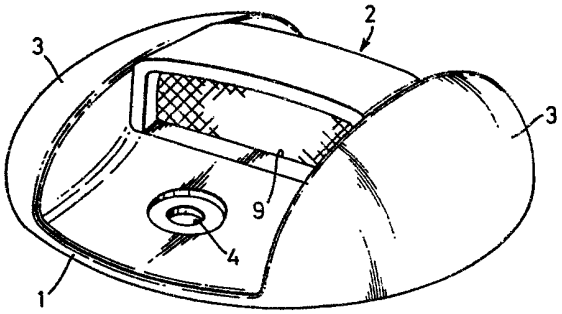


Fig.1

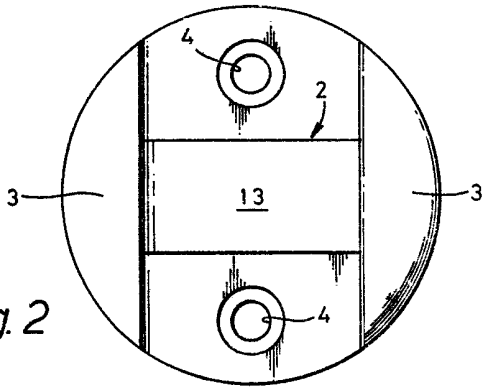
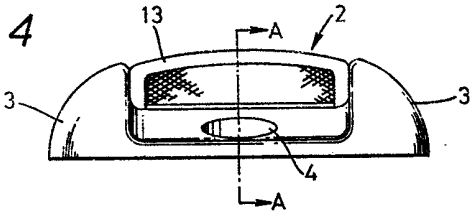


Fig.2

Fig.4



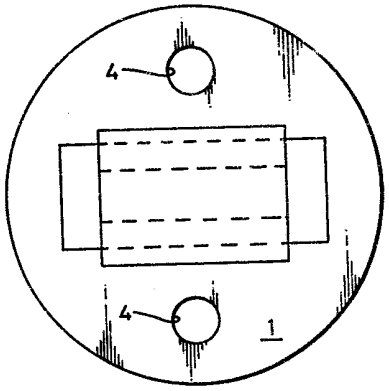


Fig. 3

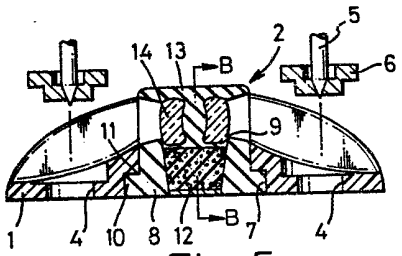


Fig. 5

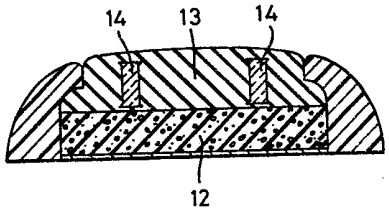


Fig. 6

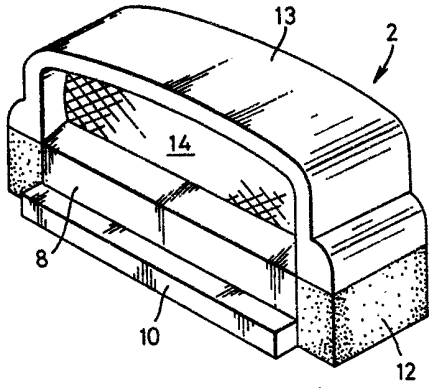


Fig. 7

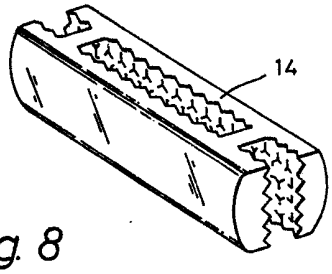


Fig. 8

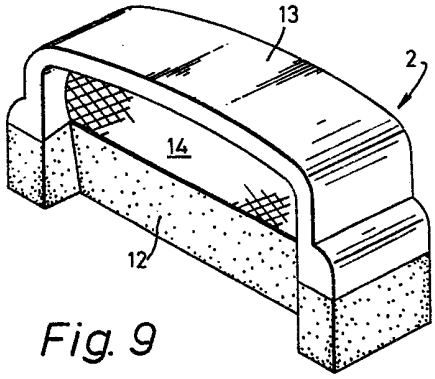


Fig. 9

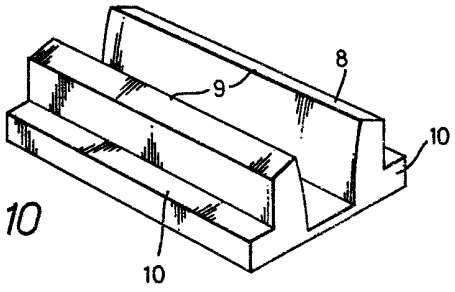


Fig. 10

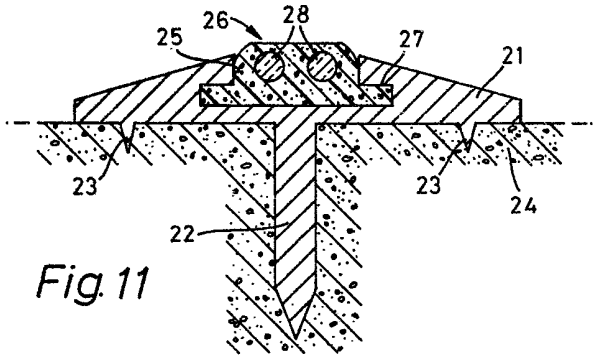
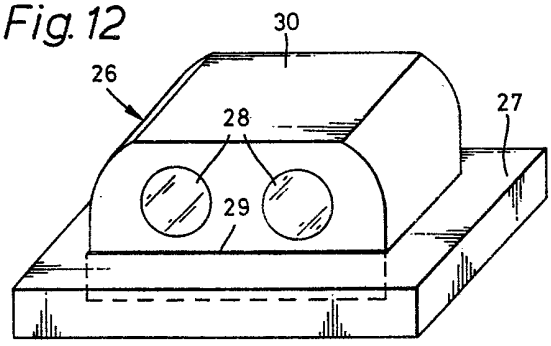


Fig. 11

Fig. 12



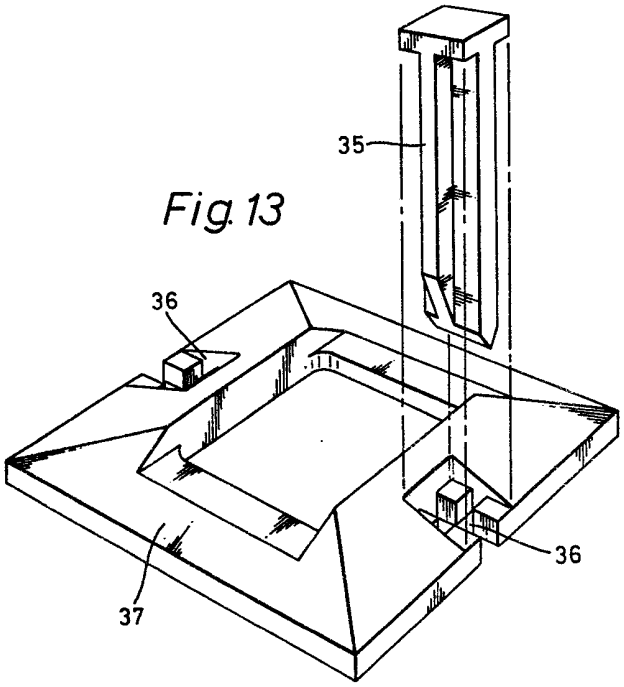


Fig. 13

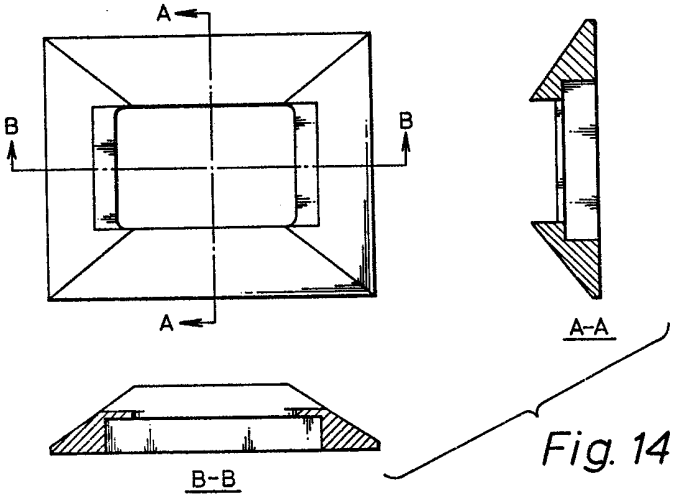


Fig. 14

Fig. 15

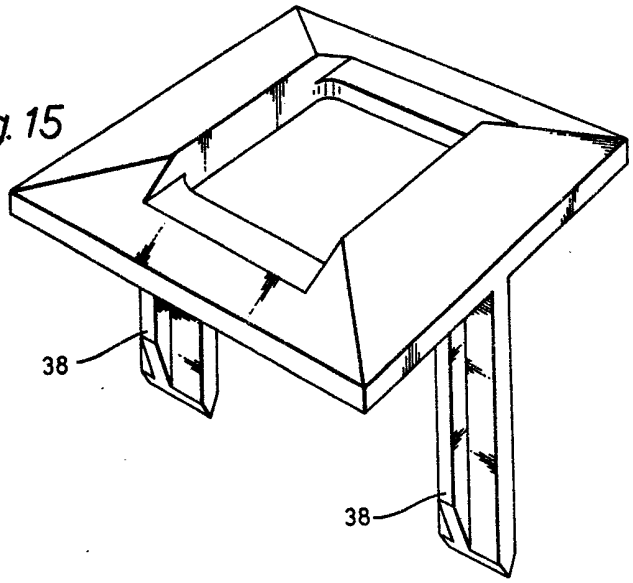


Fig. 16

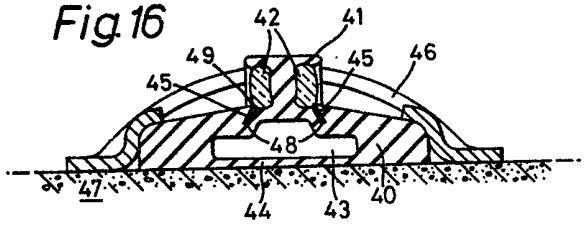


Fig. 17