March 24, 1970 R. S. MACRAE 3,502,008

REFLECTING ROAD STUD

Filed Nov. 29, 1967 2 Sheets-Sheet 1

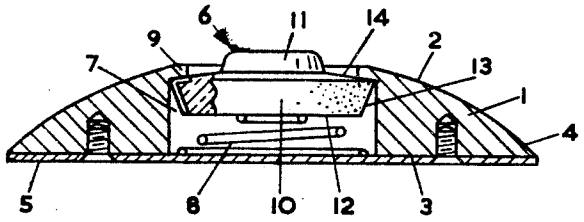


FIG. 1

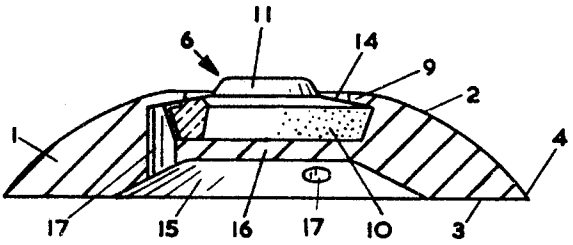


FIG. 2

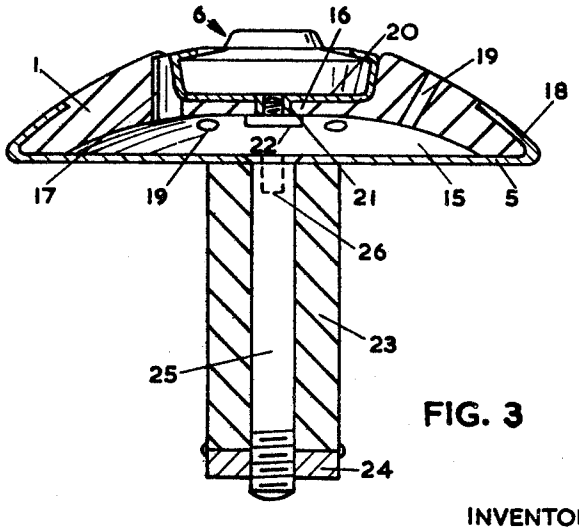


FIG. 3

INVENTOR

ROBERT STUART MACRAE

BY Jacobs & Jacobs

ATTORNEY

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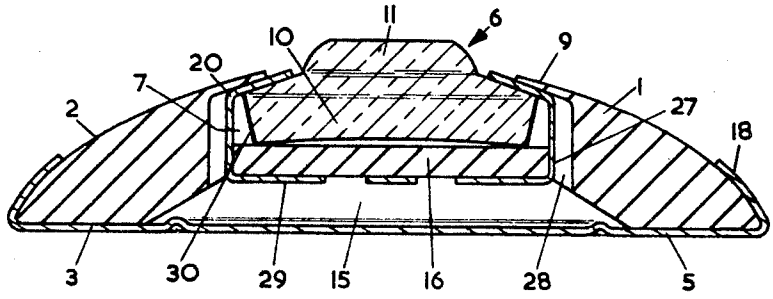


FIG.4

INVENTOR

ROBERT STUART MACRAE

BY Jacobs & Jacobs

ATTORNEY

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REFLECTING ROAD STUD

Robert Stuart Macrae, Beacon House, Beacon Way, Banstead, Surrey, England

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ABSTRACT OF THE DISCLOSURE

A reflecting road stud comprising a head with a flat base and convex upper surface in which a reflecting element is located and an air pocket in the head below the element and ducts through which air from the pocket is forced out round and over the element when a wheel passes over the stud giving a cleaning effect.

This invention relates to road studs fitted with a reflecting element adapted to reflect light directed on to the stud from the lights of a vehicle. Such studs are in common use for indicating at night the demarcation line between different traffic lanes.

According to the invention there is provided a road stud comprising a head and a light reflecting element located in a recess in the top of the head and resiliently supported so that it projects above the head the reflecting element being movable downwards upon application of a load characterised in that the head has an air pocket below the reflecting element from which air is expelled into the upper part of the recess upon downward movement of the reflecting element, and the upper part of the recess has a lip which locates the reflecting element when it is in the upper position and acts as a guide to direct the expelled air on to the surface of the element to effect a cleaning action when the element is depressed.

When a road stud of this kind is fixed to a road surface the reflecting element is forced downwards into the head upon passage of a vehicle wheel over the stud so that the air expelled from the air pocket blows away any debris and dirt which may have collected on the reflecting element.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings which show sectional views through the centres of four different designs of reflecting road stud according to the invention, and wherein;

FIG. 1 is a sectional view through a road stud of the invention;

FIG. 2 is a view similar to FIG. 1 of a modification;

FIG. 3 is a sectional view through a stud and anchor with a head similar to FIG. 2; and

FIG. 4 is a sectional view through a further modified stud head.

The reflecting road stud shown in FIGURE 1 comprises a circular head **1** having a convex upper surface **2** and a flat lower surface **3**, the two surfaces **2** and **3** cooperating to form a wedge-shaped peripheral edge **4** of the head, and a base plate **5** which is secured to the lower surface **3** by four counter-sunk screws. A reflector button **6** is mounted in a central recess **7** in the head and a helical spring **8** is compressed between the button **6** and base plate **5** and urges the button against a circular shoulder **9** at the upper end of the recess **7**. The shoulder can conveniently be formed by counter-boring the aperture **7**, and the lower surface of the shoulder **9** is chamfered for a purpose explained hereinafter.

The button consists of a circular disc **10** formed with a central upstanding boss **11** of circular cross section. The disc **10** has a flat base **12**, a side wall **13** inclined outwardly and upwardly so that the diameter of the lower end of the side wall **13** is smaller than the diameter of the

upper end of the side wall, and an upper surface **14** which slopes upwardly at a small angle towards the base of the boss **11**. The boss has the general shape of a 45 degree truncated cone but with its side wall convex in outline. The side wall of the disc **10** is aluminised or silvered to provide a reflecting surface, which is protected by enamel or a thin metal shield. Alternatively, the reflecting surface can be the inner face of the metal shield.

The reflector button in the stud of FIGURE 1 is forced upwards by the spring **8** so that its upper surface **14** is engaged against the shoulder **9** and the boss **11** projects a distance almost equal to its total height above the top of the head **1**. The angle of the chamfer on the lower surface of the shoulder **9** is the same as the angle of inclination of the upper surface **14** of the button, so that the upper surface of the button engages flat against the lower surface of the shoulder. The upper edge of the sloping side wall **13** of the button is spaced close to the wall of the recess **7** in the head, so that the button forms in effect a piston which is vertically movable in a cylindrical recess formed by the recess and the base plate **5**. The button is movable downwards against the action of the spring into a position in which the top of the button is below the top of the head. During this downward movement, the button displaces air from the cylindrical recess and the displaced air flows through the annular clearance between the side wall of the button and the wall of the cylindrical recess, and is then directed by the shoulder **9** along the upper surface **14** of the button and against the boss **11**.

The head is made of rigid material and can conveniently be of aluminium, the outside surface of the head being anodised or dyed to provide a white finish, in which case it can also be used as a daylight marker, so that a series of such studs can augment or replace the conventional white lines used for marking the dividing line between adjacent traffic lanes. The head can, however, be made of stainless steel, hard rubber, plastics e.g. nylon material, ceramic material, hardened glass or any other suitable material. The spring **8** is preferably rust-proofed by any approved method or protected by a covering of rubber or other material.

In the stud shown in FIGURE 2 the circular head **1** is made of an elastic material for example, natural or synthetic rubber, neoprene or a resilient plastics material, and the reflector button **6** is identical to the button of the stud in FIGURE 1.

This head also has a convex upper surface **2** provided with a central circular recess **7** of a size to receive as a close fit the disc **10** of the button. The bottom surface **3** is provided with a central recess **15** and the upper and lower surfaces **2** and **3** again form a wedge-shaped peripheral edge **4** to the head. The upper edge of the recess **7** is also provided with an overhanging lip **9** and the part of the head separating the recesses **7** and **15** forms a resilient diaphragm **16** which supports the reflector button in an elevated position with its upper surface **14** engaged against the lip **9** and its boss **11** projecting above the top of the head. Three ducts **17** in the head lead from the lower recess **15** into the upper recess **7** below the lip **9** at points spaced equally around the side wall of the upper recess. The diaphragm **16** is thin enough to permit the button to be depressed into a position in which its boss **11** is below the top of the head. Adhesive can be used to secure the reflector button in position on the diaphragm.

In use, when the head is secured to the road surface by an adhesive or other means the wall of the lower recess **15** with the road surface forms an air pocket. In this design downward movement of the button displaces air from the air pocket through the air ducts **17** whence

it is directed by the overhanging lip **9** along the upper surface **14** of the button and against the boss **11** as in the stud of FIGURE 1. When the load has been removed from the stud, the reflector button will be returned to its original position by the elasticity of the diaphragm. If desired, the elasticity of the diaphragm may be supplemented by the use of a compression spring, preferably of the helical type, which can be accommodated in the lower recess **15**. The outer peripheral edge of the head can be strengthened, if desired, by a metal ring embodied in the head.

The stud of FIGURE 3 has a head somewhat similar in construction to the head of the stud of FIGURE 2. The head is fitted to a base plate **5** provided with an upturned edge **18** which embraces the peripheral edge of the head. The head is provided with air ducts **17** and with air vents **19** extending through the head from the lower recess. The button **6** is mounted in an open-topped metal casing **20**, the upper edge of which is turned over into engagement with the upper surface of the button. The inside surface of the casing can conveniently be polished to act as the reflecting surface of the button. The bottom of the casing **20** is provided with a screw threaded socket **21** which extends through an aperture in the diaphragm **16** separating the upper and lower recesses, and the casing is secured in position in the head by a bolt **22** screwed into the socket and engaging against the wall of the recess **15**.

In this stud an anchoring device for securing the stud to a road is provided. It comprises a rubber sleeve **23** bonded to the lower surface of the base plate **5**, a nut **24** bonded to the lower end of the sleeve, and a bolt **25** extending through the sleeve, the upper end of the bolt having a head **26** which bears against the base plate **5** and the lower end of the bolt being screwed into the nut **24**. In use, the anchoring device is inserted in a hole in the road, and the bolt is then rotated to draw the nut upwards and thereby compress the rubber sleeve and cause it to bulge outwardly into engagement with the wall of the hole in the road.

The operation of the stud of FIGURE 3 is similar to that of the stud of FIGURE 2. The air vents **19** permit air from the pocket to escape direct to the atmosphere and thereby prevent the stud being too "solid" to permit depression of the button below the top of the head in the fraction of a second during which a vehicle wheel passes over the stud. The number and size of the vents **19** would, of course, depend upon the size of the air pocket, and the number and size of the air ducts **17**.

The stud shown in FIGURE 4 has the following features in common with one or more of those shown in FIGURES 1 to 3: a head **1** with upper convex surface **2** and flat base **3**; a metallic base plate **5** the periphery of which is upturned as at **18** and into which the head fits closely; an upper recess **7** and a lower recess **15** in the head and a diaphragm **16** between them; a reflector button **6** with a disc base **10** and a reflecting boss **11**; in this figure the sloping side **30** of the disc base is coated with a reflecting material; an open-topped metal casing **20** which holds the button in recess **7** and which casing is in turn held by the base, side walls and lip **9** of the recess.

This design of stud is, however, characterised by having several, e.g. four, metal tongues **27** which extend in a downwardly direction from the lower edge of the cylindrical side wall of the casing **20**. The same number of ducts **28** connecting the upper with the lower recesses are provided through the diaphragm **16**. They are bigger in cross-section than the metal tongues so that on depression of the button by the passage of a wheel over it air from the lower recess can pass up the ducts whence it is directed by the lip **9** on to the boss. Each of the tongues is passed through one of the connecting ducts **28** and then bent across the upper surface of the lower recess as at **29**.

In all embodiments of this invention the optical design of the reflector button used is such that when a beam of light e.g. from the headlamps of a vehicle, strikes the boss from any direction and at any angle up to about 10° from the horizontal, light will be reflected back so that a viewer behind the activating beam and almost in line with it will see a bright light response.

This is an important advantage over the conventional reflecting road studs which give a response in only two directions so that a line of studs cannot be picked up by drivers crossing them at cross road or by a driver who has lost his bearings in fog and is approaching a line of studs at a considerable angle.

The reflector button can be made of glass or a suitable translucent plastic material. A particularly suitable type is manufactured by Corning Glass Works of Corning, N.Y., U.S.A., which they describe as a "reflex button" and is made from specially hardened glass.

In use, the stud can be secured to the road surface by bonding the base to the road surface with epoxy resin or other suitable adhesive. In this case the base is made of a material, preferably metal, which lends itself to attachment to the road surface with adhesive. Alternatively, the base may be fitted with a downwardly projecting anchoring device which can be secured in a hole in the road surface as shown in FIGURE 3. Another way of securing the stud to the road is by means of pins fixed or driven through the base plate before the head is inserted.

The boss normally projects above the head but if the wheel of a vehicle passes over the stud the button is forced downwards below the top of the head and is thereby protected from damage, the head of the stud supporting the load exerted by the vehicle. The recess below the button forms an air pocket which cushions downward movement of the button and prevents damage by the button hammering on the compressed spring or rubber diaphragm. The air displaced from the recess is directed in a blast on to the upper surface and boss of the button, as explained above, so that a self-cleaning action is obtained each time a vehicle passes over the stud.

The improved stud of the invention is very resistant to wear and damage because the convex surface of the head offers practically no obstruction to any vehicle passing over it, and causes no inconvenience or danger to cyclists or pedestrians. Moreover, since the edge of the head of the stud is wedge-shaped, the stud will be substantially immune to damage by snow ploughs, since the blade of the plough will slide up the upper surface of the head and on reaching the glass button will merely tip it downwards into the recess and then pass over without harming it. This is particularly the case in those designs in which a metallic base plate with an upturned periphery is provided.

Another point of importance is that the stud is supported by a relatively large area of the road surface. This ensures that the stud will not be driven down into the roadway, however severely it is punished by heavy traffic. The stud will, therefore, remain effective for many years without attention.

The cleaning action caused by the blast of air upon downward movement of the button has been found to be very efficient in removing debris from the neighbourhood of the button and in keeping clean the exposed glass surface of the boss on the button. In wet weather the air chamber may fill with water, and when the button is depressed the water is squirted on to the upper surface of the button and cleans it even more effectively than by the air blast.

I claim:

1. A road stud comprising a head and a light reflecting element located in a recess in the top of the head and resiliently supported so that it projects above the head, the reflecting element being movable downwards upon application of a load, the head having an air pocket below the reflecting element from which air is expelled into the upper part of the recess upon down-

ward movement of the reflecting element, and the upper part of the recess having a lip which locates the reflecting element when it is in the upper position and acts as a guide to direct the expelled air on to the optically operative surface of the element to effect a cleaning action when the element is depressed, the head being made of an elastic material and the air pocket being a lower recess below that which accommodates the reflecting element, the portion of the head between the two recesses constituting a resilient diaphragm which supports the reflecting element and which has air ducts through it connecting the lower with the upper recess.

2. A road stud as claimed in claim 1, wherein the head is provided with one or more vents leading from the lower recess to the upper surface of the head.

3. A road stud comprising a head and a light reflecting element located in a recess in the top of the head and resiliently supported so that it projects above the head, the reflecting element being movable downwards upon application of a load, the head having an air pocket below the reflecting element from which air is expelled into the upper part of the recess upon downward movement of the reflecting element, and the upper part of the recess having a lip which locates the reflecting element when it is in the upper position and acts as a guide to direct the expelled air on to the optically operative surface of the element to effect a cleaning action when the element is depressed, the head comprising a resilient rubber composition having a convex upper surface and a flat lower surface, an upper recess for receiving the reflecting element and a lower recess communicating with the upper recess by means of several air ducts, the upper recess having an inwardly extending flange on its uppermost edge, wherein the light reflecting element is a glass button which is located in a metal holder through which it protrudes, which holder is in turn located in the upper recess of the head and which holder is held firmly in place by means of the aforesaid flange and metal tongues which pass down through the air ducts and are then bent across the upper surface of the lower recess and wherein a metallic base plate with an upturned peripheral flange is provided into which the head is fitted.

References Cited

UNITED STATES PATENTS

2,229,179	1/1941	Langdon	94—1.5
2,245,336	1/1941	Hamilton	94—1.5
3,343,467	9/1967	Bonvallet	94—1.5
2,146,359	2/1939	Shaw	94—1.5

FOREIGN PATENTS

965,583	7/1964	Great Britain.
903,939	8/1962	Great Britain.
617,795	2/1961	Italy.

JACOB L. NACKENOFF, Primary Examiner