

Viewing Apparatus

Background to the Invention

The present invention relates to apparatus for viewing by eye a mark on a gemstone facet, using an external light source. The invention also relates more specifically to a jewellery case for holding a gemstone such as a diamond or an article of jewellery mounting a gemstone, such as a finger ring or earring.

It is known to have jewellery cases formed of a body portion which provides means for supporting the gemstone or article and a cover pivoted to the body portion so that when the cover is closed, the gemstone or article is within a protective case, normally opaque, to protect the gemstone or article from damage and to a certain extent to protect the article or gemstone from dust, and also to provide a larger unit so that, particularly for a gemstone, the item is not mislaid.

In recent years, certain diamond manufacturers have adopted the practice of placing a mark on the girdle of gemstones, and more recently, on the table (table facet) of gemstones. The mark can be any information mark or indicium, for instance an alphanumeric mark indicating the origin of the gemstone or its serial number and/or can be a logo or trade mark and/or a mark indicating quality and genuineness. According to modern techniques, the mark is formed in the table by removal of microscopic amounts of the material of the gemstone, which can be referred to as milling. Milling techniques are for instance shown in GB 2 325 392 A and WO 97/03846. The advantage of placing the mark on the table is that the table will not be obscured by the mounting of the gemstone. The mark can be sufficiently small to avoid reducing the value of the gemstone, normally being invisible to the naked eye. Nonetheless, the presence of the mark on the table or any facet of the gemstone is a valuable indicator, for instance that the gemstone is not synthetic and has not been treated to enhance its colour.

There are a number of ways of examining the mark on a facet of a gemstone, but apart from the use of a simple loupe, an inscription loupe or magnifying tweezers, all require relatively cumbersome equipment and require for instance the removal of the gemstone from its case. It is desirable to provide a simple and convenient way of examining the mark. It is preferable to provide a way which does not require removal of the gemstone from its case, whilst still permitting easy removal of the gemstone from its case when desired. It is in general an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art or to provide a useful alternative.

Any discussion of the prior art throughout the specification is not as an admission that such prior art is widely known or forms part of common general knowledge in the field.

The Invention

The invention provides a viewing apparatus as in Claim 1 or 26 and a method as in Claim 27 or 28. The remaining claims claim preferred or optional features of the invention.

Employing the invention, a low cost apparatus can be provided using an external light source such as a normal room light or overhead light or outside light (though a light source, e.g. a light emitting diode, may alternatively be incorporated into the apparatus), enabling say a jeweller or a member of the public to view and discern, recognise or read a mark on the facet of the gemstone. In use, the user holds the lens near the eye, adjusts the angle of the extended member so that the facet of the gemstone is in focus, and then tilts the viewing apparatus to obtain a specular reflection of the external light source (as opposed to a reflection of diffused light). Said border, the part of the shield furthest from the pivotal connection, can be gripped or pressed and moved, the lens moving through a smaller distance due to the lever effect. The magnifying lens will provide an enlarged, virtual and erect image of the mark, provided the mark is in the correct position relative to the axis of the lens. The pivotal connection enables the lens to be adjusted relative to the gemstone facet so that the facet is in the correct

position and is substantially at a pre-determined angle relative to the axis of the lens, and the apparatus will maintain the relative alignment of the lens with the gemstone facet. The apparatus controls the positional relationship between the gemstone and the lens, allowing the mark to be seen very readily. Pivoting the extended member also provides axial focus adjustment. Fine focusing is very easy for the user, compared to positioning a loose gemstone or piece of jewellery and a loupe.

Thus the apparatus provides a simple way of viewing the mark and in the preferred arrangement, the room or outside lighting is used, without the necessity for any additional light source. The light strikes the facet obliquely, i.e. at an angle to the normal. The oblique rays of illumination may enhance the contrast of the milled mark and in any case enable the milled mark to be seen without difficulty using the light specularly reflected off the facet.

The lens can be of any suitable power, for instance being greater than about x2 or about x6 and for instance being less than about x20 or x16, but it is found that a x10 lens will read most marks applied commercially. The axis of the lens is preferably at a small angle to the normal to the line joining said border and the axis of the pivotal connection, being inclined to such normal in the rotary direction of raising the extended member. The angle is preferably not less about 2° and preferably not more than about 8° or 10° .

Said border of extended member and said pivotal connection may each be spaced from the axis of the lens by a distance which is at least about two, three, four or five times the effective radius of the lens. The effective radius of the lens is the part available for light transmission. Preferably the extended member extends a substantial distance in all radial directions from the lens. If so, the extended member can be effectively opaque or at least effectively opaque to at least one band of wavelengths, and act as a shield which increases the definition of the image by reducing stray light that would affect the quality of the image. If the shield is opaque to just one band of wavelengths, then the mark is better seen if it viewed only with that band of wavelength, either by arranging that the light source illuminates only with that band or by having a filter in the light path, for instance associated with the lens. The shield is

extended so as to substantially reduce stray light that would affect the quality of the image of the facet. For instance, the shield can extend in all radial directions from the axis of the lens to a distance which is at least about five times or tens times the effective radius of the lens (i.e. of the part of lens that is available for light transmission).

In a preferred arrangement, the viewing apparatus of the invention can function as a normal jewellery case and enable the mark on the table of the gemstone to be distinguished by eye without any additional equipment. Thus the apparatus of the invention may be in the form of a jewellery case comprising a body portion which has said positioning means, which are for holding the gemstone or article, the extended member being a cover pivoted to the body portion so that when the cover is closed, the gemstone or article is within a protective case. The jewellery case can be as in Claim 11. However, as an alternative, the viewing apparatus need not be closable to form an enclosure for a gemstone or article of jewellery, and can be merely for viewing the marks. For instance, it can have open ends and can be arranged so that a necklace or bracelet can be moved to enable each gemstone to be placed beneath the lens and examined in sequence. In this case, the positioning means need do no more than position the gemstone or article in a steady manner.

The pivotable connection may be in the form of a hinge with a hinge pin. However, this is not essential and in other arrangements the pivotable connection can be provided in any suitable manner, for instance using a one-piece elastically deformable plastic hinge which can be injection moulded integrally with the shield and the means for positioning the gemstone.

The dependant claims claim optional, preferred or alternative features of the invention.

Preferred Embodiment

An embodiment of the invention will be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a front perspective view of a jewellery case;

Figure 2 is a side view of the jewellery case, showing parts in dashed lines;

Figure 3 is a section along the plane in III-III indicated in Figure 1; and

Figure 4 is a top view of the jewellery case, with the lid removed.

A jewellery case 1 has a body portion 2 and an extended member or shield in the form of a cover or lid 3 pivoted to the body portion 2 by a simple hinge pin 4. The body portion 2 has means for positioning, and specifically for holding or supporting, a finger ring 5 mounting a gemstone 6, shown as a brilliant-cut diamond with, as is usual, its table 7 uppermost. The cover 3 can be opened through an angle of somewhat greater than 90° for easy manipulation or removal of the ring 5. When the cover 3 is closed, it provides a protective case.

The positioning means is formed as a rotating holder 8 which has a circular cylindrical barrel 9 received in a cylindrical recess in the body portion 2 and held in position by diametrically opposed snap fingers 10 delineated by inverted U-shaped slots which extend over the top of the respective finger 10 and down either side to the lower part of the barrel 9 (see the dashed outlines in Figure 2); detents 10' of the fingers 10 engage in an annular groove around the cylindrical recess in the body portion 2. The barrel 9 has a foam filling 11 having an upper generally horizontal facing 12 which forms a decorative background for the ring 5 (the facing 12 has a slit for inserting the ring 5), and a base 13 on which the case 1 can be stood. The filling 11 has a conventional slot for receiving the ring 5 so that the ring 5 can be simply placed in position and held by friction, and the ring 5 can be raised and lowered by hand without difficulty. The rotating holder 8 can alternatively be arranged to hold a single gemstone or to hold other articles of jewellery such as an earring while presenting the gemstone with its table uppermost on the axis of the case 1. One of a number of different holders 8 can be inserted during manufacture. Also, due to the snap fingers 10, the holder 8 is readily removable and a different holder 8 can be substituted for the holder 8 already fitted.

The holder 8 has an upwardly-projecting tongue 14 which is the same thickness as the wall of the barrel 9 and whose top acts as a height guide at the correct height for the gemstone table 7; in this way, the height guide is mounted on the body portion 2. The height of the gemstone 6 can be adjusted to place the table 7 roughly level with the top of the tongue 14, for convenient viewing, as explained below. By gripping the base 13, the holder 8 can be rotated about the vertical axis of the body portion 2, for appropriately positioning the gemstone 6 for viewing.

The cover 3 has an opening or aperture 15 in its top containing a magnifying lens 16. The cover 3 extends radially in all directions from the axis of the lens 16 by a distance which is substantially greater than five times the radius of the aperture 15 (which is the effective radius of the lens 16). As seen in Figure 3, the left-hand lip 3' of the cover 3 (which is the border of the cover 3 remote from the pivot (4)) and the pivot (4) are respectively 6.6 and 6 times the effective radius of the lens 16 from the axis of the lens 16. The cover 3 extends below the level of the gemstone 6 when the cover 3 is closed, and has a cut-out 17 on its side opposite the pivot hinge through which light can reach the gemstone table 7 when the cover 3 is raised. The top of the cut-out 17 is substantially rectilinear and the centres of the lens 16 and of the top of the cut-out 17 are in a plane normal to the axis of the pivot (4) of the cover 3. The body portion 2 has an upwards projection 18 which mates with the cut-out 17 when the cover 3 is closed. The arrangement is such that when the cover 3 is opened at roughly 30° (as shown in Figure 3), the gemstone table 7 can be viewed by eye through the lens 16 with the gemstone 6 illuminated by light passing beneath the edge of the cover 3 remote from the pivot (4) and entering the case through the gap formed by opening the cover 3 (indicated by the left-hand arrow in Figure 3), i.e. through the cut-out 17, which light strikes the gemstone table 7 obliquely. The axis of the lens 16 is coincident with the viewing axis, indicated by the right-hand arrow in Figure 3, but is at 15° to the axis of the case 1 (when the cover 3 is closed) and at 4° to the line joining the bottom of the lip 3' and the pivot axis (4). In Figure 3, the light is shown as striking the table 7 at 45° and the viewing axis as being at 45° to the table 7, so that a specular image will be seen by light striking the table 7 and reflected through the lens 16.

The body portion 2 and holder barrel 9 can be injection moulded in any suitable opaque plastics material, such as acrylonitrile butadiene-styrene, and the cover 3 can be injection moulded in the same material or alternatively in a transparent acrylic resin. In the latter case, the cover 3 and lens 16 can be moulded as one unit; the cover 3, excluding the lens 16, may be spray-painted. The holder filling 11 can be formed of a foamed plastic such as polyurethane foam and can have a facing 12 of coloured synthetic velvet. The lens 16 may have a x10 magnification. The lens 16 can be made of glass or plastics material. To give an indication of size, the diameter of the base 13 can be 28 mm.

General

Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise" and the like are to be construed in an inclusive as opposed to an exclusive or exhaustive sense, that is to say, in the sense of "include, but not limited to".

The present invention has been described above purely by way of example, and modifications can be made within the spirit of the invention. Each feature disclosed in the specification, including the claims, abstract and drawings, may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise.

CLAIMS:

1. Apparatus for viewing by eye a mark on a gemstone facet, using an external light source, comprising:
 - means for positioning a gemstone or article of jewellery mounting a gemstone;
 - an extended member;
 - a pivotal connection between the extended member and the positioning means;
 - an aperture in the extended member, between and substantially spaced from the pivotal connection and a border of the extended member remote from the pivotal connection; and
 - a magnifying lens in the aperture;whereby in use the extended member can be swung up or down relative to the gemstone in order to view by eye the gemstone facet by light specularly reflected off the facet at an angle to the normal to the facet, and in order to focus an image of the facet.
2. The apparatus of Claim 1, and arranged to view a mark on the table facet of the gemstone with the table facet in a plane to which the axis of said pivotal connection is parallel.
3. The apparatus of Claim 1 or 2, and arranged to view the mark by specular reflection of light striking said facet at an angle inclined to the normal to the facet.
4. The apparatus of any of the preceding Claims, wherein the positioning means is rotatably adjustable about an axis which is at right angles to, and spaced from, the axis of the pivotal connection and is generally normal to the extended member when lowered.
5. The apparatus of any of the preceding Claims, wherein the positioning means is a separate component from the body portion so that during manufacture an appropriate positioning means can be inserted, chosen from a number of different such positioning means.

6. The apparatus of any of the preceding Claims, wherein the positioning means is readily removable from the body portion so that a different positioning means can be substituted for the existing positioning means.
7. The apparatus of any of the preceding Claims, and such that the gemstone can be adjusted for height.
8. The apparatus of Claim 7 and having a height guide at the correct height for the gemstone facet so that the height of the gemstone or article can be adjusted to place a facet roughly level with the height guide, for convenient viewing through the lens.
9. The apparatus of any of the preceding Claims, wherein the extended member extends a substantial distance in all radial directions from the lens, and is effectively opaque, so that the light passes beneath said border of the extended member and is specularly reflected through the lens.
10. The apparatus of any of Claim 1 to 8, wherein the extended member extends a substantial distance in all radial directions from the lens and is effectively opaque to at least one band of wave lengths of the light source, the aperture and the lens being transparent to said band, so that the light passes beneath said border of the extended member and is specularly reflected through the lens.
11. The apparatus of any of the preceding Claims, wherein said border of the extended member and said pivotal connection are each spaced from the axis of the lens by a distance which is at least about twice the effective radius of the lens.
12. The apparatus of any of the preceding Claims, wherein the axis of the lens is at a small angle to the normal to the line joining said border and the axis of the pivotal connection, being inclined to such normal in the rotary direction of raising the extended member.
13. The apparatus of any of the preceding Claims, wherein the positioning means permit the height of the gemstone or article to be adjusted, and the positioning means

have a height guide at the correct height for the table of the gemstone, so that the height of the gemstone or article can be adjusted to place the table roughly level with the height guide, for convenient viewing through the lens.

14. The apparatus of any of the preceding Claims, wherein there is a body portion supporting the positioning means, and the extended member can close to form with a body portion an enclosure for the gemstone or article.

15. The apparatus of Claim 14, and being a jewellery case comprising a body portion which has said positioning means, which positioning means is for holding the gemstone or article, the extended member being a cover pivoted to the body portion so that when the cover is closed, the gemstone or article is within a protective case, the cover and the lens being so arranged that when the cover is pivoted open through an angle substantially less than 90° , a mark on the gemstone table can be viewed by eye through the lens with the gemstone illuminated by light entering the case through a gap formed by opening the cover.

16. The apparatus of Claim 14 or 15, wherein the height guide is mounted on the body portion.

17. The apparatus of any of Claims 14 to 16, wherein the positioning means is arranged to support a ring mounting a gemstone so that the ring can be positioned with the gemstone uppermost.

18. The apparatus of any of Claims 14 to 17, wherein the cover is arranged to extend below the level of the gemstone when the cover is closed, and has a cut-out on its side opposite the pivotal connection, through which light can reach the gemstone when the cover is raised.

19. The apparatus of Claim 18, wherein the cut-out has a substantially rectilinear top and the centres of the lens and of the top of the cut-out are in a plane normal to the axis of the pivoted connection.

20. The apparatus of Claim 18 or 19, wherein the body portion has an upwards projection for mating with the cut-out when the cover is closed.
21. The apparatus of any of Claims 14 to 20, wherein the positioning means can be rotated about a vertical axis with respect to the body portion, for appropriately positioning the gemstone for viewing.
22. The apparatus of Claim 21, wherein the positioning means is fixed to a base on which the body portion can be stood.
23. The apparatus of both Claim 13 and Claim 21 or 22, wherein the positioning means comprises a member having a circular cylindrical part received in a cylindrical recess in the body portion, a part for supporting the gemstone or article, and an upwardly projecting part providing the height guide.
24. The apparatus of any of Claims 14 to 23, wherein the positioning means is a separate component from the body portion so that during manufacture, a said positioning means can be selected from a number of different positioning means.
25. The apparatus of any of Claims 14 to 24, wherein the positioning means is readily removable from the body portion so that a different positioning means can be substituted for the existing positioning means.
26. Apparatus for viewing, substantially as herein described with reference to the accompanying drawings.
27. A method of viewing a mark on a gemstone facet, using the apparatus of any of Claims 1 to 26, comprising illuminating the gemstone with an external light source and viewing the facet by reflected light, the extended member being swung about its pivotal connection to obtain proper alignment of the viewing axis and to obtain focusing of the image of the facet, the light striking the facet at an angle to the normal and being specularly reflected through the lens.

28. A method of viewing a mark on a gemstone facet, substantially as herein described with reference to the accompanying drawings.