

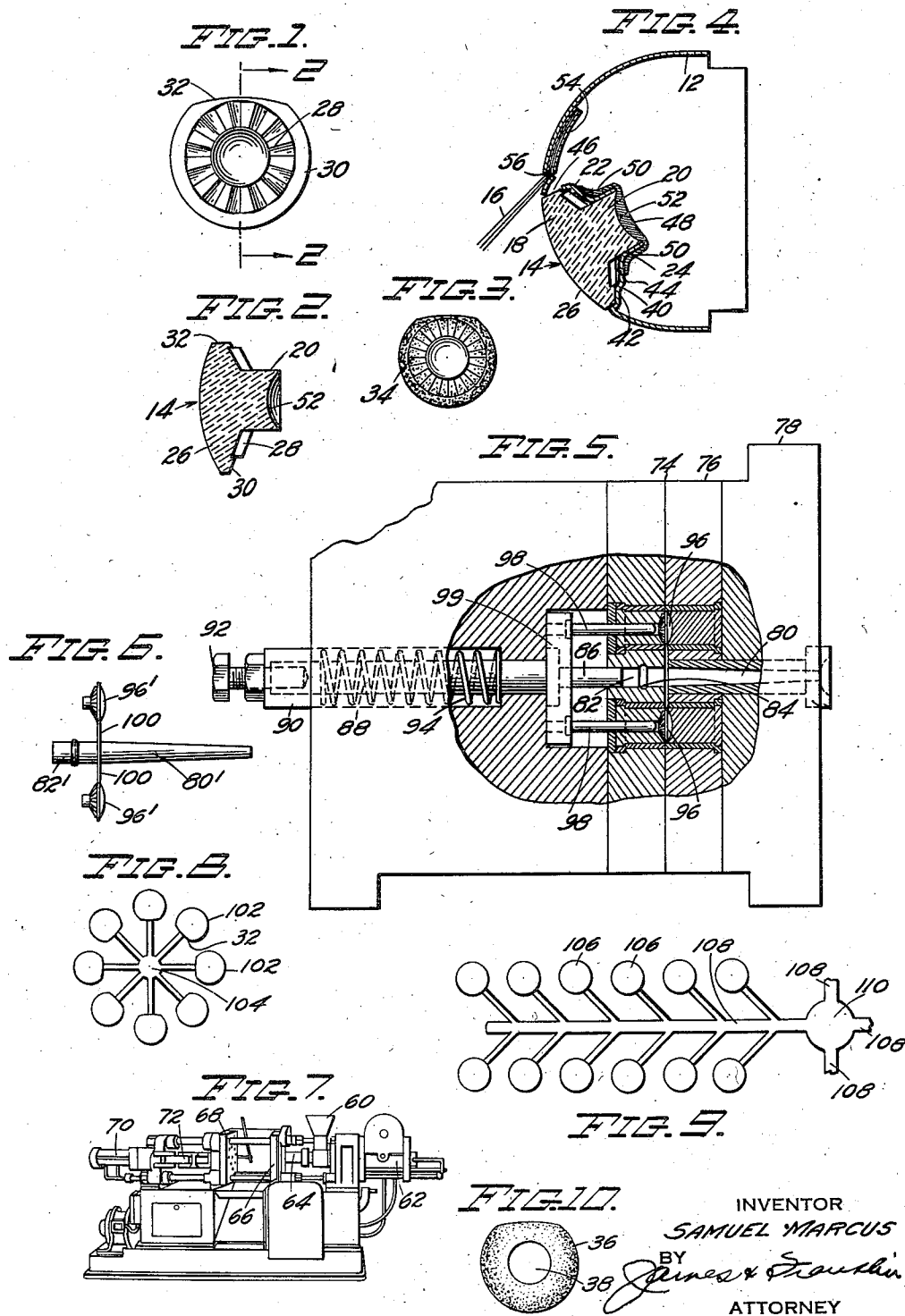
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DOLL EYE AND METHOD OF MAKING SAME

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DOLL EYE AND METHOD OF MAKING SAME

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14 Claims. (Cl. 46—165)

This invention relates to simulated eyes, especially for dolls.

The primary object of my invention is to generally improve doll eyes and methods for making the same.

Inexpensive doll eyes have been made from metal which is painted or lithographed to provide a pupil and iris simulation on the eye shell. Such eyes are dull and unsatisfactory. Expensive eyes have been made entirely of glass, but these eyes are costly and difficult to satisfactorily mount for oscillation or sleeping movement. As a compromise between these two types, doll eyes have been made out of a metal shell provided with a large hole receiving a Celluloid lens, the edge of the lens being fitted to the edge of the hole. The Celluloid tends to warp with age, with consequent loosening of the lens. Moreover, a lash can not be added after insertion of the lens, because any working of the eye shell directly above the lens tends to loosen or release the lens from the shell.

To overcome this difficulty, an eye has been made in which the lens is preliminarily equipped with a center rivet or eyelet having a closed forward end. This rivet or eyelet is later passed through a hole in the eye shell and expanded to securely attach the lens to the shell at the center of the lens, thereby dispensing with the necessity for accurate fit at the edge. Such an eye is disclosed in my co-pending application Serial No. 230,217, filed September 16, 1938 and entitled "Manufacture of doll eyes." This eye is somewhat expensive to manufacture, because it is necessary to first make the eyelet and to then embed the same in the lens, the resulting lens assembly later being riveted to the shell. Moreover, the pupil depth is reduced by insertion of the eyelet rather deeply into the lens, the forward end of the eyelet acting as the pupil.

Important objects of the present invention are to overcome the foregoing difficulties and to provide a doll eye having all of the advantages of a center eyelet, yet requiring no separate eyelet, and no labor to make and insert the same, and having the additional advantage of increased rather than a decreased pupil depth. A further advantage of the present invention is that the pupil area is accurately defined, despite the spreading of excess black coloring over the inside of the eye at the pupil, the excess painted area in no way affecting the limitedly exposed or visible portion acting as the pupil of the eye.

To fulfill the foregoing objects, I provide a lens consisting of a single piece of transparent ma-

terial including a cylindrical stud projecting rearwardly from and formed integrally with the iris portion of the lens. The eye shell is indented to form a seat for the lens, and is also provided with a hole for the stud. The back of the lens immediately surrounding the stud is preferably provided with radial serrations to simulate iris lines. The stud is received in the shell with a force fit, thereby anchoring the lens to the shell. The inner end of the stud is painted with black coloring and acts as a pupil, this pupil being of great depth because the length of the stud is added to the thickness of the lens.

Heretofore the lens has been stamped and shaped out of sheet Celluloid. The present lens is rather complex in configuration and would be difficult to make in that manner. Furthermore, the usual process is wasteful of material, and scratches the lens surface. Further objects of the invention are to make the new lens cheaply and rapidly, and to eliminate the waste and lack of perfect transparency which occur when working with sheet Celluloid. For this purpose, I find that the lenses may be made by heating and thereby softening a transparent plastic, such as cellulose acetate, and then injecting the same under pressure into a mold appropriately shaped to form the desired lens. This procedure is valuable with ordinary lenses, and is especially important in connection with the present improved lens with its central projecting stud.

Ordinarily the stud would be tapered to facilitate ejection from the mold. In accordance with more detailed features and objects of the invention, the stud is made perfectly cylindrical in order that it may have a permanently tight fit in the shell, and any difficulty arising from attempted removal of the lens from the mold is overcome by providing a special ejector pin at each stud. The end of the ejector pin is preferably rounded, thereby giving the inner end of the stud a cupped or concaved surface. This holds a thick coat or filling of black coloring when the stud is painted to form the pupil thereon. The black coloring used is preferably a solvent for the lens plastic, and thereby acts to cement the stud to the shell.

To the accomplishment of the foregoing, and such other objects as may hereinafter appear, my invention consists in the doll eye elements, and the method of making and assembling the same, and their relation one to the other, as are hereinafter more particularly described in the specification and sought to be defined in the

claims. The specification is accompanied by the drawing in which

Fig. 1 is a rear elevation of a lens embodying features of the present invention;

Fig. 2 is a section taken in the plane of the line 2-2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 showing one method for providing iris coloring;

Fig. 4 is a section through a complete doll eye made in accordance with the present invention;

Fig. 5 is a partially sectioned elevation of a simple mold for making the improved lens;

Fig. 6 illustrates the casting including the gate formed by the mold of Fig. 5;

Fig. 7 is a perspective view of a typical injection molding machine which may be used with the mold of Fig. 5;

Fig. 8 is a schematic diagram explanatory of a modified mold intended to make a greater number of lenses during each molding operation;

Fig. 9 is a schematic diagram explanatory of a still larger mold intended to make a very large number of lenses during each molding operation; and

Fig. 10 shows a separate colored disc which may be used behind the lens to provide iris coloring.

Referring to the drawing, and more particularly to Fig. 4, the doll eye of the present invention comprises a shell 12, a lens 14 and a lash 16. The shell 12 is preferably made of sheet metal drawn to approximately hemispherical configuration. The lens 14 consists of a single piece of transparent material and is shaped to form a substantially circular buttonlike or iris portion 18, and a cylindrical stud 20 projecting rearwardly therefrom. The shell 12 is indented to form a seat 22 for the iris portion 18 of the lens. The center of the seat is punched inwardly to form a preferably flanged opening 24, said opening receiving the stud 20 with a drive or force fit. The outer surface 26 of the lens is shaped to conform to the spherical surface of the shell.

Referring now to Figs. 1 and 2, the inner surface of the lens is frusto-conical in configuration. The portion 28 immediately surrounding the stud 20 is provided with radial corrugations or serrations which later function to simulate iris lines. These serrations may be made unusually deep, distinct, and accurate, because of the molding process by which they are produced. The serrations preferably stop within the periphery of the lens, thus providing a marginal portion 30 which is smooth and comparatively thin. While the lens is generally circular, it may be flattened somewhat at one edge, as is indicated at 32, this being done to facilitate proper location of the simulated eyelid and lash.

Referring now to Fig. 3, the lens may be printed with a suitable coloring material for the iris, this being indicated at 34. Blue is used to simulate blue eyes; brown for brown eyes, and so on. The coloring material is predominant around the edge or smooth marginal portion 30 of the lens, but is carried inwardly somewhat over the serrated portion 28. The serrations themselves break up the printing, and as a result the coloring is lighter toward the center and darker toward the periphery, which is as it should be. A part immediately outside the pupil stud 20 may be left clear.

The iris coloring may be provided in other ways. For example, small discs of colored or appropriately printed paper may be punched out,

as shown in Fig. 10. The outline 36 of the color disc conforms to that of the lens, and the hole 38 at the center is large enough for the stud 20, and may, if desired, be larger. It will be understood that the color disc of Fig. 10 is inserted between the back of the lens and the seat 22 of the eye shell when assembling the lens with the shell. The color disc is used in lieu of printing the lens.

Reverting now to Fig. 4, the seat 22 may be stepped at 40, thus providing a shallow portion 42 which receives and supports the comparatively thin marginal part 30 of the lens, and a deeper portion 44 which receives the serrated part 28 of the lens. The portion 44 is preferably made deeper than the serrated part 28 of the lens, leaving some clearance or space therebetween. The metal of seat 22 may become severed from shell 12 at the top point 46, this resulting from the fact that at this point the seat is struck inwardly very abruptly, and to a comparatively great depth, in order to receive the flat 32 of the lens.

To complete the eye, black coloring material 48 is applied to the inner end of stud 20. In Fig. 4, it will be noted that this coloring extends beyond the pupil area, the excess coloring being indicated at 50. There is no need to confine or localize the coloring to the exact pupil area, for the only part of the coloring that is visible from the outside is that part which is exposed by the transparent lens. The pupil area is thus accurately defined as being the same as the cross-section of stud 20. The flange walls 24 of the opening in shell 12 are opaque and prevent the excess coloring 50 from being seen. The coloring may be applied by means of a small brush or nozzle or other suitable tool, and may be applied rapidly, in fact even carelessly, instead of being painstakingly limited to the exact pupil area.

The inner end of stud 20 is preferably concaved or hollowed, as is indicated at 52, for this insures the retention of a comparatively thick coating or filling of black coloring material at the inner end of the stud. The pupil is thus given an intense, solid black color and this, together with the large distance at which it is located in back of the front surface of the lens, adds greatly to the depth and realism of the eye.

A coloring material is selected which preferably has as its solvent a liquid which is also a solvent for the lens material, and the coating thereby fulfills a dual purpose; first, in providing the black pupil color, and second in helping cement the lens to the eye shell. This procedure also insures good adhesion of the black coloring to the lens. For example, the lens may desirably be made of cellulose acetate, in which case the black coloring may be a lacquer having a solvent such as acetone which is also a solvent for cellulose acetate. If a different plastic is used for the lens, the coloring may be appropriately modified.

The lash 16 may be of conventional character, and may be added in accordance with the procedure described in my co-pending application, Serial No. 230,217, previously referred to. The hair strands of the lash are commonly bound or cemented between strips of paper forming a base or foundation 54 for the lash. The lash is inserted in a slit 56 cut through the shell closely above the lens. After the lash is inserted in slit 56, the walls of the slit may be closed somewhat toward one another to bind the lash in position,

and to help hold the lash strands in an outwardly projecting position. No additional fastening of the lash is needed, but if desired, the foundation 54 of the lash may be cemented to the inside of the eye shell.

One advantage of the present mounting for the lens is that it is so secure that the lash may be added after the lens has been inserted, without loosening the lens attachment. The lash does not have to be added after insertion of the lens, but it is convenient to follow that procedure, because then the lash strands are not in the way when the lens is being inserted. The present lens attachment is so strong that even the slit or incision 56 for the lash may be made after insertion of the lens, and without loosening or releasing the lens.

Lenses for doll eyes have heretofore been made by stamping a disc of Celluloid from sheet Celluloid, and then shaping the disc to slightly curve one side, and to score or serrate the opposite side. This operation involves considerable waste of sheet Celluloid, and the lens obtained is not perfectly clear, because there is some abrasion and scratching of the Celluloid surface during the punching and shaping operations. It would be particularly difficult to make the present lens out of sheet Celluloid, because of the stud projecting rearwardly from the center of the lens.

To overcome these difficulties, I have found that it is entirely feasible to mold the lenses by injection molding of a suitable transparent plastic. I prefer to use a cellulose acetate plastic, of which Tenite is an example, but other transparent plastics may be used, such as those known under the trade names, Lumarith, Lucite and Plasticel. For the last named, the coloring at the pupil may be Alaka of the Lacquer & Chemical Corporation, or Duco of Dupont Company.

An injection molding machine of known standard type may be used. One such machine is shown in Fig. 7, and comprises as its main parts a hopper 60 into which the molding material is placed; an ejection plunger, the operating cylinder of which is indicated at 62; and an electric heating sleeve 64 for softening the molding material as it is forced from the hopper toward the stationary head or die plate 66. The movable head or die plate is shown at 68, it being reciprocated by appropriate mechanism, such as a cylinder 70 and toggle locking mechanism 72. A suitable die is mounted in the machine, the cover die being mounted on the stationary die plate 66, and the ejector die being mounted on the movable die plate 68.

A simple form of die for this purpose is illustrated in Fig. 5. This die is designed to make only two lenses at each molding operation or "shot" of the machine, but the principles to be followed in designing a larger die are illustrated in the small die shown in Fig. 5.

Referring to that figure, the die opens on a parting face indicated at 74. The cover die is built up of plates 76 and 78 and includes a gate passage 80. This gate passage is projected into the ejector die at 82, in order to insure removal of the gate with the casting, and the extension 82 may even be provided with an undercut 84 to make certain of removal of the gate from the cover die. After the mold has been opened, the gate, and with it the casting, may be ejected by means of an ejector pin 86, actuated by a plunger 88, the exposed end of which is enlarged at 90 and provided with an adjustable head 92. When the

die is opened the movable die is moved back by the movable die plate to a point where head 92 bears against and strikes a suitable stationary surface. It will be understood that adjustment of the amount of projection of the head 92 determines the resulting ejection stroke of ejector pin 86. The ejector pin is normally held in retracted position by a suitable compression spring 94.

The die cavities for forming the lenses are indicated at 96. These are connected to the gate 80 by means of suitable passages on the parting face of the die, said passages being constricted or thinned down, in accordance with usual practice, at the point of connection to the lens cavity, thereby facilitating subsequent breakage of the lens from the gate. When, as in the present case, the lens is provided with a flat (32 in Fig. 1), the lens is preferably connected to the gate at the flat. This leaves the remaining periphery of the lens smooth and unmarred when the lens is broken from the gate.

The stud 20 of the lens is preferably cylindrical, rather than conical. In other words, I recommend that there be no taper toward the free end, even though such a taper would greatly facilitate removal of the molded lenses from the die. The die is, therefore, preferably provided with an additional ejector pin 98 at each lens, this ejector pin bearing directly against the end of the stud and functioning to eject the lens and stud from the die. Ejector pins 98 are mounted on an ejector plate 99, which is moved by the plunger 88 previously referred to. The end of each ejector pin 98 is preferably rounded, thus functioning to form the desired concavity at the end of the stud.

The nature of the casting produced by the die shown in Fig. 5 will be clear from reference to Fig. 6, in which it will be seen that the molded piece comprises a gate 80' having a gate extension 82' and a pair of lenses 96' connected to the gate at 100.

It will be understood that more than two lenses may be made at each molding operation. Thus, referring to Fig. 8, I schematically show a die arrangement in which eight lenses 102 are made at each molding operation, the gate being at the center 104. It will be understood that the construction of this die may be exactly like that shown in Fig. 5, except that additional lens cavities are formed in the die about the gate passage, and corresponding ejector pins are mounted on the ejector plate.

In actual practice, a much larger number of lenses may be made during each operating stroke of the press. Thus, referring to Fig. 9, twelve lenses 106 are formed on each branch 108, and there are four such branches radiating out from the central gate 110. This die makes forty-eight lenses at each operating stroke. The flats 32 have been omitted in Fig. 9, to indicate that they are not essential, as circular lenses may also be made. Here also the die is preferably provided not only with a main ejector pin for the gate, but also with forty-eight small ejector pins, one for each of the lenses, the said ejector pins acting directly on the cylindrical studs of the lenses.

It will be understood that in each case the material forming the gate may be remelted and re-used. There is no appreciable waste of the molding material.

It is believed that the improved doll eye of my invention, as well as the method of making the same and the many advantages thereof, will

be apparent from the foregoing detailed description. The lenses are made in large numbers under rapid production conditions with minimum expense and no waste of material. The lens may be assembled onto the eye in a single, simple and rapid operation. A brilliant, clear lens is obtained with a particularly black pupil of great depth. The lens including the iris lines and the stud are all formed in a single operation. The black coloring for the pupil may be applied rapidly by inexperienced operators, the material being applied freely in the general region of the pupil. The black coloring material functions as a cement to increase the security of the lens attachment. This is not essential, for the stud is preferably made with no taper toward the pupil, and is forced into the mating flanged opening of the eye shell with a force or drive fit. The lens can not be pushed out of place from the outside into the eye, because it rests on a solid seat forming an integral part of the eye shell. A lash may be added in any desired fashion, preferably after insertion of the lens, and even the lash slit may, if desired, be cut through the shell after insertion of the lens.

It will be apparent that while I have shown and described my invention in a preferred form, many changes and modifications may be made without departing from the spirit of the invention defined in the following claims. In the claims, the reference to black coloring for the pupil is intended to include variations such as reddish black and others, which are often used for human and animal eyes, instead of a pure black.

I claim:

1. A lens for a doll eye, said lens comprising a single piece of solid transparent plastic shaped to form an iris portion, the outer face of which conforms to the surface of a sphere and the inner face of which is frustoconical, and a pupil portion including a cylindrical projection or stud projecting for a substantial distance rearwardly at the center of the iris portion, the rear face of the frustoconical portion surrounding the stud being provided with radial serrations, said stud having a diameter equal to the desired pupil diameter and the inner end of the stud being concave and entirely coated with black coloring to simulate a pupil.

2. A doll eye comprising a generally hemispherical sheet metal eye shell, the iris portion of said shell being indented to form a seat for a lens, the pupil portion being punched through to form an inwardly flanged opening, and a lens made of a single body of transparent material, said lens including an iris portion, having an outer surface conforming to the spherical surface of the eye shell, and having a frustoconical inner surface, and further including a cylindrical stud projecting rearwardly through the flanged opening in the eye shell, said stud being dimensioned to be received in said opening with a force fit, the rear face of the iris portion surrounding the stud being provided with radial serrations, said serrations terminating within the periphery of the lens, and thereby providing a comparatively thin marginal portion, the lens seat of the shell being stepped to receive the iris portion of the lens, and black coloring material on the inner end of the stud.

3. In the manufacture of a doll eye comprising a metal shell and a transparent lens, the method

which includes forming the sheet metal to generally hemispherical configuration and indenting the same to form a seat for the lens with an opening at the center, said opening having a diameter substantially equal to the desired pupil diameter for the eye, forming the lens to desired configuration including a rearwardly projecting stud at the center, said stud having a diameter substantially equal to the desired pupil diameter, inserting the lens in the shell by forcing the stud through the opening and the lens body into the seat, and thereafter applying black coloring to the inner end of the stud inside the eyeshell.

4. In the manufacture of a doll eye comprising a metal shell and a transparent lens, the method which includes forming the sheet metal to generally hemispherical configuration and indenting the same to form a seat for the lens with an opening at the center, said opening having a diameter substantially equal to the desired pupil diameter for the eye, molding the lens to desired configuration including a rearwardly projecting stud at the center and radial serrations outside said stud, said stud having a diameter substantially equal to the desired pupil diameter, inserting the lens in the shell by forcing the stud through the opening and the lens body into the seat, and thereafter applying black coloring to the inner end of the stud inside the eyeshell.

5. In the manufacture of a doll eye comprising a metal shell and a transparent lens, the method which includes forming the sheet metal to generally hemispherical configuration and indenting the same to form a seat for the lens with an opening at the center, said opening having a diameter substantially equal to the desired pupil diameter for the eye, molding the lens to desired configuration including a rearwardly projecting stud at the center and radial serrations outside said stud, said stud having a diameter substantially equal to the desired pupil diameter, inserting the lens in the shell by forcing the stud through the opening and the lens body into the seat, and thereafter applying to the inside of the eye at and about the inner end of the stud a black coloring material selected to act as a solvent for the lens material.

6. A lens for a toy eye, said lens being localized to the iris of the eye, and comprising a single piece of solid transparent material shaped to form an iris portion and a pupil portion, the diameter of the lens equalling the diameter of the iris portion of the toy eye, the pupil portion being a cylindrical projection or stud projecting for a substantial distance rearwardly at the center of the iris portion, said stud having a diameter only a fraction of the iris diameter and equal to the desired pupil diameter and having a length of the same order of magnitude as its diameter, the entire inner end of the stud being coated with black coloring to simulate the pupil of the eye.

7. A lens for a toy eye, said lens being localized to the iris of the eye, and comprising a single piece of solid transparent material shaped to form an iris portion and a pupil portion, the diameter of the lens equalling the diameter of the iris portion of the toy eye, the pupil portion being a cylindrical projection or stud projecting for a substantial distance rearwardly at the center of the iris portion, the rear face of the iris portion surrounding the stud being provided with radial serrations, said stud having a diameter only a fraction of the iris diameter and equal to the desired

pupil diameter, and having a length of the same order of magnitude as its diameter, the entire inner end of the stud being coated with black coloring to simulate a pupil.

8. A lens for a toy eye, said lens being localized to the iris of the eye, and comprising a single piece of solid transparent material shaped to form an iris portion, the outer face of which conforms to the surface of a sphere, and a pupil portion including a cylindrical projection or stud projecting for a substantial distance rearwardly at the center of the iris portion, the diameter of the lens equalling the diameter of the iris portion of the toy eye, the rear face of the iris portion surrounding the stud being provided with radial serrations, said stud having a diameter only a fraction of the iris diameter and equal to the desired pupil diameter, and having a length of the same order of magnitude as its diameter, the inner end of the stud being concave and adapted to receive black coloring to simulate a pupil, the radial serrations of the iris portion terminating within the periphery of the lens to leave a marginal portion of reduced thickness.

9. A toy eye comprising an opaque eye shell formed to receive a lens localized to the iris of the eye, and a lens made of a single body of solid transparent material having a diameter equal to the desired iris diameter, and said lens having an outer surface conforming to the spherical surface of the eye shell and having a cylindrical stud projecting rearwardly for a substantial distance into the eye shell, said stud having a diameter only a fraction of the iris diameter and equal to the desired pupil diameter, and the entire inner end of the stud being colored black.

10. A toy eye comprising an opaque eye shell formed to receive a lens localized to the iris of the eye, and a lens made of a single body of solid transparent material having a diameter equal to the desired iris diameter, and said lens having an outer surface conforming to the spherical surface of the eye shell and having a cylindrical stud projecting rearwardly for a substantial distance into the eye shell, the rear face of the iris portion surrounding the stud being provided with radial serrations, said stud having a diameter only a fraction of the iris diameter and equal to the pupil diameter, and the entire inner end of the stud being colored black.

11. A toy eye comprising an opaque hollow sheet metal eye shell and a lens localized to the iris of the eye, the portion of said shell behind the iris being indented to form a seat for the lens, said indentation and said lens having a diameter equal to the desired iris diameter, and the pupil portion of said indented portion of said shell being cut through to form a circular opening, the lens being made of a single body of transparent material, said lens having an outer surface conforming to the spherical surface of the eye shell and having a cylindrical stud projecting rearwardly through the opening in the eye shell, said stud being dimensioned to be received in said opening with a force fit and having a diameter only a fraction of the iris diameter

and equal to the desired pupil diameter, and black coloring material painted on the entire inner end of the stud.

12. A toy eye comprising an opaque sheet metal eye shell and a lens localized to the iris of the eye, the portion of said shell in back of the iris being indented to form a seat for the lens, and the pupil portion being cut through to form an inwardly flanged circular opening, and a lens made of a single body of transparent material, said lens having a cylindrical stud projecting rearwardly into the flanged opening in the eye shell, said stud being dimensioned to be received in said opening with a force fit, and having a diameter only a fraction of the iris diameter and equal to the desired pupil diameter, black coloring material painted on the inside of the eye at and around the inner end of the stud, said coloring material being a solvent for the lens material and acting as a cement to additionally secure the lens to the eye shell, the inner end of said stud being cupped or concaved to receive a heavy thickness of black coloring material.

13. A toy eye comprising a generally hemispherical sheet metal eye shell and a lens localized to the iris of the eye, the portion of said shell in back of the iris being indented to form a seat for the lens, the pupil portion being cut through to form a circular opening, and a lens made of a single body of transparent material, said lens having an outer surface conforming to the spherical surface of the eye shell and having a cylindrical stud projecting rearwardly through the opening in the eye shell, said stud being dimensioned to be received in said opening with a force fit, and having a diameter only a fraction of the iris diameter and equal to the desired pupil diameter, the rear face of the iris portion surrounding the stud being provided with radial serrations, black coloring material painted on the inside of the eye at and around the inner end of the stud, said black coloring material being a solvent for the lens material and acting as a cement to additionally secure the lens to the eye shell.

14. A toy eye comprising an opaque eye shell and a lens, the portion of said shell behind the iris being indented to form a seat for the lens, said indentation and said lens being localized to the iris of the eye and having a diameter equal to the desired iris diameter, and the portion of said indented portion of said shell at the pupil being cut through to form a circular opening, the lens being made of a single body of transparent material, said lens having an outer surface conforming to the spherical surface of the eye shell and having a cylindrical stud projecting rearwardly through the opening in the eye shell, said stud having a diameter only a fraction of the iris diameter and equal to the desired pupil diameter, and passing through and being secured in the aforesaid opening to hold the lens in position on the eye shell.

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