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VEHICLE TAIL, STOP AND TURN SIGNAL LAMP

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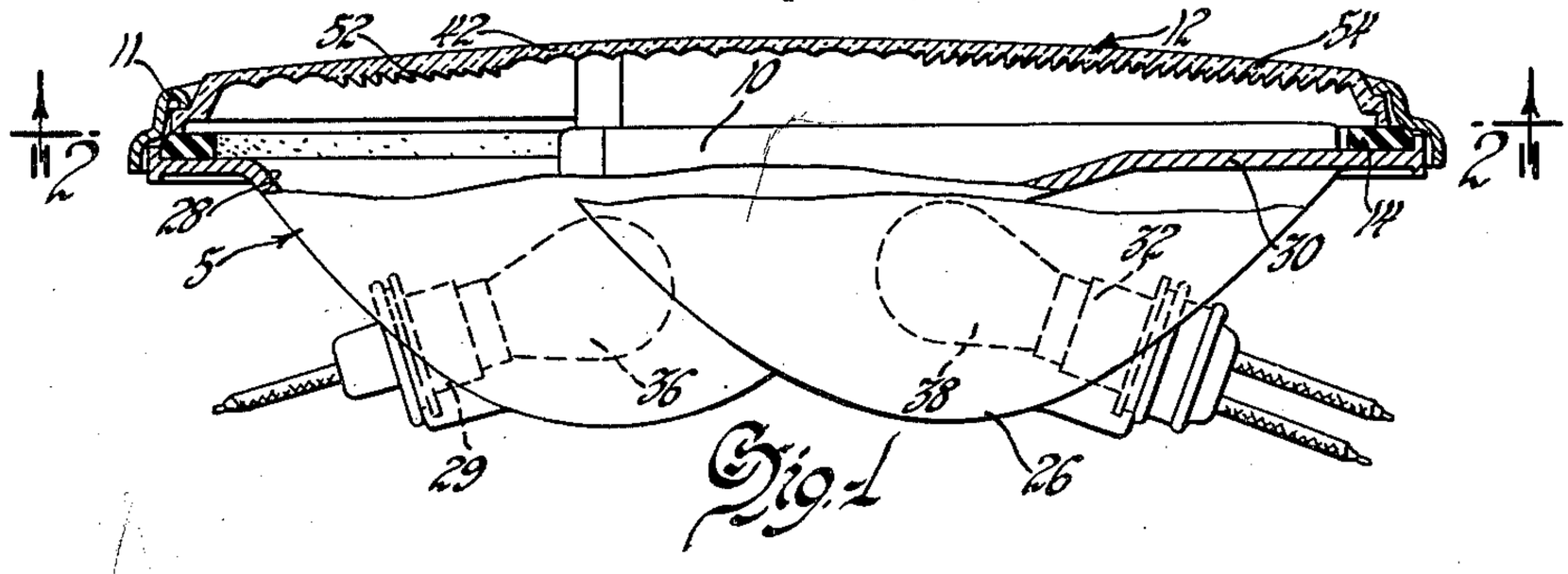

Fig. 1

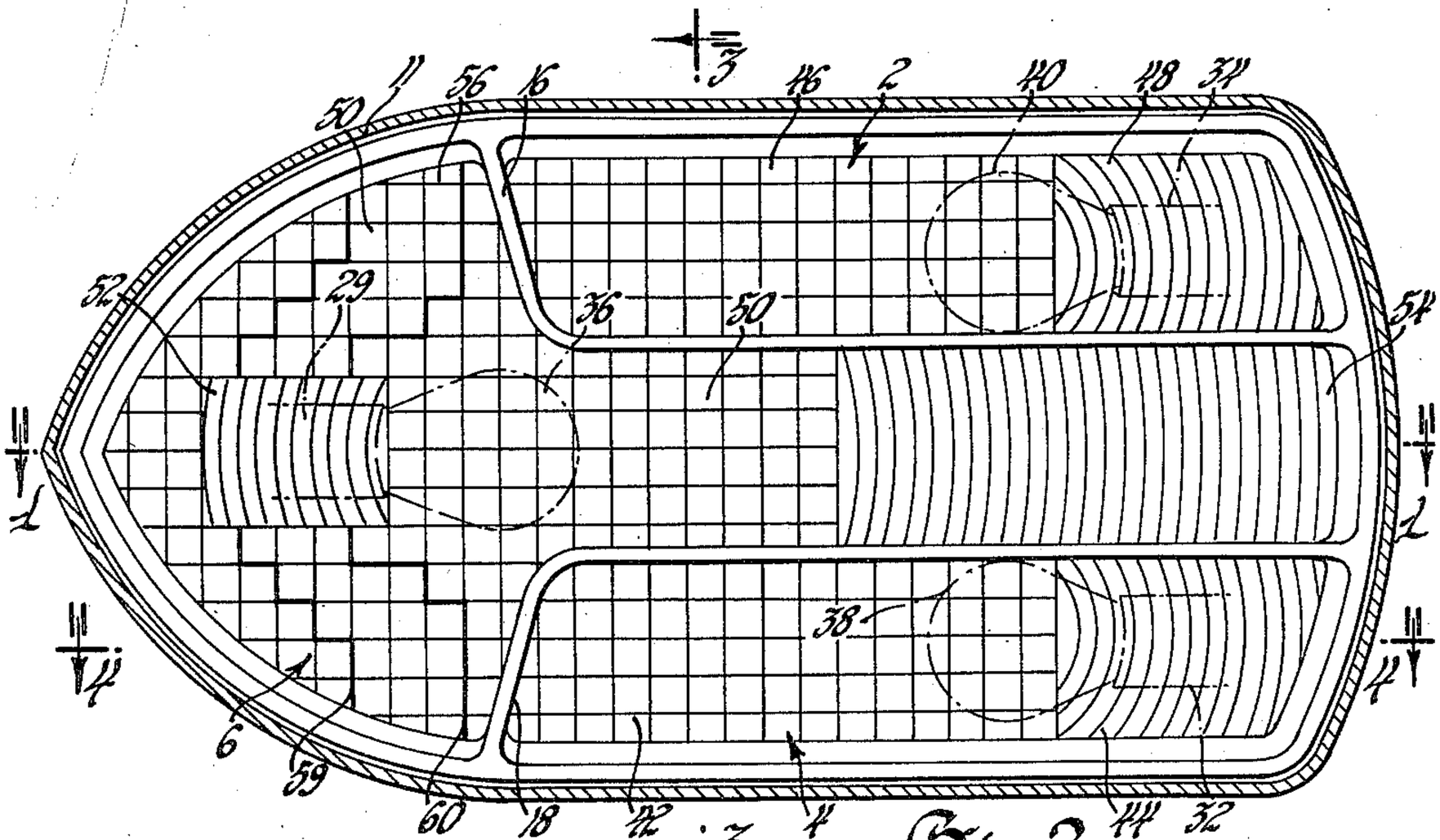

Fig. 2

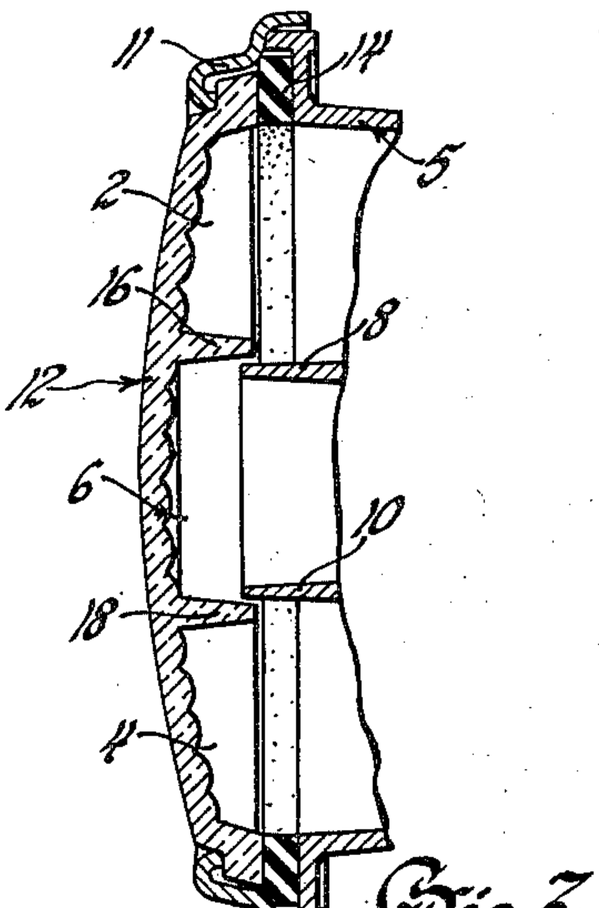

Fig. 3

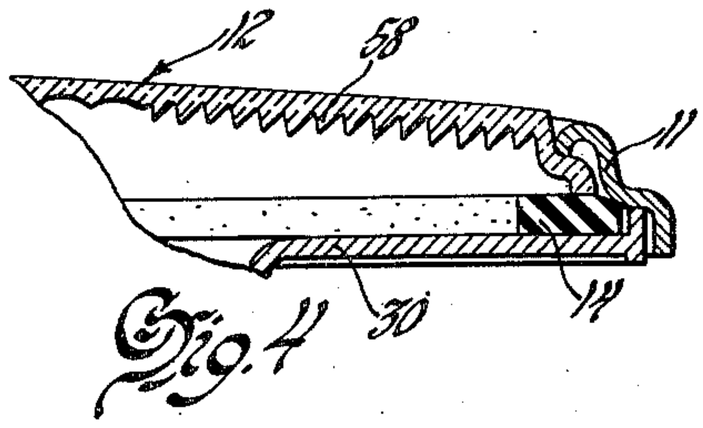

Fig. 4

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VEHICLE TAIL, STOP, AND TURN SIGNAL LAMP

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3 Claims. (Cl. 340—67)

This invention relates to vehicle lamps of the type comprising a reflector, lens and lighting element. More particularly the invention relates to an improved combination turn signal, stop and tail lamp especially suited for use on commercial vehicles such as trucks and buses.

Vehicle lamps of the type to which this invention relates generally comprise a light spreading lens member having positioned behind it a parabolic reflector with a light bulb mounted at the focal point to project parallel light rays toward the lens. In any such lamp it is highly desirable that the lens project light of relatively uniform intensity from over its entire surface, rather than have some portions of the lens brighter than others. This is not particularly difficult to accomplish in a lamp having a lens and a parabolic reflector which are co-extensive so that all portions of the lens are aligned, in the direction of the optical axis, with the reflector surface. In such lamps the uniformity of intensity is, for the most part, accomplished by the reflector member and the lens chiefly functions to spread the light to attain the desired beam pattern. However, where the lamp is such that it is impossible to accommodate a reflector which will project parallel light rays to all portions of the lens such, for example, as where the lens is unsymmetrically shaped and has portions not aligned with the reflector, the problem of accomplishing uniformity of light intensity over the entire surface of the lens becomes quite difficult. The problem is often encountered in lamps designed for installation in a very limited space. It is often necessary, for example, to maintain the thickness of the lamp at a minimum and this may necessitate the use of a reflector which is not co-extensive with the lens. One possible solution to the problem is to use a plurality of light bulbs and a plurality of parabolic reflector surfaces. However, such structure is relatively costly since the parts required are more complicated and numerous.

The present invention has as one of its objects the provision of an improved vehicle lamp which projects light of relatively uniform intensity from all portions of the lens.

More particularly, it is an object of this invention to provide a vehicle lamp of reduced thickness which utilizes a lens having portions not aligned with the reflector but which projects light of relatively uniform intensity from over its entire surface.

These and other objects of the invention are carried out by providing the surface of the lens member with dioptric elements on those portions which are aligned, in the direction of the optical axis, with the parabolic reflector surface and with catadioptric elements on those portions which are not so aligned with the reflector surface. The dioptric elements function to spread the parallel light rays projected from the reflector surface toward the lens at substantially a right angle thereto whereas the catadioptric elements serve to gather and

spread light projected toward the lens at angles up to about 60° to the plane of the lens.

Other objects and advantages of the invention will appear more clearly from the following description of a preferred embodiment and from the drawings in which:

Figure 1 is a side view with parts broken away of a lamp embodying the invention;

Figure 2 is a top view taken on the line **2—2** of Figure 1 and shows the lamp bulbs in broken outline to indicate their position with respect to the lens element;

Figure 3 is a view taken on the line **3—3** of Figure 2; and

Figure 4 is a partial view taken on the line **4—4** of Figure 2.

Referring now to the drawings, the improved lens comprises a lamp housing **5** which is divided into three dish-shaped compartments **2, 4** and **6** by a pair of generally L-shaped partitions **8** and **10**. The lamp housing may be made of sheet metal stampings or, as on the drawing, of die-cast metal. Secured to the lamp housing **5** by means of a bezel **11** is the lens **12**. A gasket **14** of rubber or other suitable material is interposed between the lens and the housing to provide a seal.

Lens **12** is provided with a pair of generally L-shaped partitions **16** and **18** on its inner surface for cooperation with the partitions **8** and **10** formed in the lamp housing. As can be seen in Figure 3, the lens partitions **16** and **18** which may be painted with an opaque material are formed to overlap the housing partitions **8** and **10** to prevent passage of light from one compartment to another. Thus, each of the compartments **2, 4** and **6** formed by the cooperating lens and housing partitions is in effect a separate lamp. Upper and lower compartments **2** and **4**, respectively, are, in the embodiment shown, used as tail and stop signal indicator lamps, while the middle compartment **6**, which is arrow-shaped, is used as a direction signal lamp.

As is indicated at **26** of Figure 1, the rear housing wall of each of compartments **2** and **4** is contoured to form a generally parabolic surface. The rear housing wall of compartment **6** has a parabolically shaped portion **28** and a flat portion **30**. If it were desired to shape the rear wall of compartment **6** so that all portions were parabolic, it will be obvious that the depth of this compartment would have to be increased considerably. For many installations such as increase in depth is not possible, and thus it is required that the portion **30** be a flat or other surface rather than a continuation of parabola **28**.

An aperture is provided in the reflector of each of the compartments for mounting sockets **29, 32** and **34** which carry light bulbs **36, 38** and **40**, respectively. Each of these light bulbs is positioned so that its lighting filament is located on the focal point of the reflector in which it is mounted and thus the parabolic surface of each of the reflectors is adapted to project parallel light rays toward that portion of the lens with which it is aligned. In order to maintain the thickness of the lamp at a minimum, each of the sockets **29, 32** and **34** extends laterally inwardly from the side of the lamp housing. This structure causes each of the sockets to block off a portion of the parabolic surface of the reflector in which it is mounted, thereby rendering that portion ineffective to project parallel light rays to the lens **12**.

From the above description it will be apparent that lamp compartment **4** has a relatively large lens portion **42** which is aligned with the surface of the reflector **26** and a relatively small portion **44** which is aligned with the socket **32** and therefore out of alignment with said reflector. The structure of lamp compartment **2** is of course identical in this respect to that of compartment **4**,

lens portion **46** being aligned with its parabolic reflector surface and lens portion **48** being aligned with the socket **34**. In the instance of lamp compartment **6**, lens portion **50** is aligned with the surface of the reflector **28** whereas portions **52** and **54** are aligned with the socket **29** and flat wall portion **30**, respectively.

In accordance with the present invention, lens portions **42**, **46** and **50** are provided with dioptric elements while lens portions **44**, **48**, **52** and **54** are provided with catadioptric elements. In the preferred embodiment, which is shown in the drawings, the dioptric elements comprise a plurality of contiguous rectangular surfaces of compound curvature, one of which is indicated at **56**. As can be seen in Figs. 1 and 3, these contiguous rectangular surfaces may be formed by superimposing a plurality of horizontal convex flutes over a plurality of vertical concave flutes. It is to be understood, of course, that other types of dioptric elements may be used all within the spirit and scope of the invention.

The catadioptric elements comprise a plurality of arcuate prisms one of which is shown at **58**, which may have differing curvatures, apex angles and radii depending on the exact light bending properties desired.

The dioptric elements of lens portions **42**, **46** and **50** receive light projected by the respective parabolic reflector surfaces at substantially a right angle to the plane of the lens and spread this light through angles determined by the curvatures of the contiguous surfaces or of the flutes from which these surfaces are formed. It may be desirable to form some sections of the dioptric portions of the lens with different curvatures or light bending properties than other sections. Thus, as can be seen in Figure 2, lens portion **50** is divided into three sections having differing light bending properties by the lines **59** and **60**, the section between line **59** and the pointed edge of the lens defining a bright arrow head when the light bulb **36** is energized.

The catadioptric portions **44**, **48** and **52** and **54** receive light projected from the light bulbs **38**, **40** and **36** respectively, at angles up to about 60° to the plane of the lens and direct and spread this light through angles determined by the apex angles and curvatures or the arcuate prisms. While these catadioptric elements will, of course, project light approaching the lens at a relatively small angle to its plane, they are distinguished from the dioptric elements in that they will function to gather and spread light approaching at angles greater than 30°. Thus, even though these lens portions are not aligned with a source of parallel light rays (i. e. a parabolic reflector surface) they function to project light of about the same intensity as that from the dioptric portions of the lens.

By means of this invention, a lamp of minimum thickness and unsymmetrical shape but which projects light of relatively uniform intensity from over the entire surface of the lens may be accomplished. Lens "dark spots" are avoided and all portions of the surface of the lens may be used to project and spread light in the directions desired.

It is to be understood that, although the invention has been described with specific reference to particular embodiments thereof, it is not to be so limited since changes and alterations theerin may be made which are within the full intended scope of this invention as defined by the appended claims.

What is claimed is:

1. A lamp comprising a shallow dish-shaped casing, a portion of the interior of said casing being a parabolic reflector and another portion of the interior of said casing being substantially flat, a lens covering the open end of said casing, a cylindrical socket extending laterally into said parabolic reflector, one side of said socket being thereby exposed to said lens, and a lighting element mounted in said socket at the focal point of said parabolic reflector, said lens member having surface portions aligned with said parabolic reflector and other portions aligned with said flat surface and said socket, those portions of said lens aligned with said parabolic reflector being provided with dioptric light-bending elements adapted to project light from the interior of said casing which is directed toward said lens at angles greater than 60° to the plane of the lens, and those portions of said lens aligned with said flat surface and with said socket being provided with catadioptric light-bending elements adapted to project light from the interior of the casing which is directed toward said lens at angles less than 60° to the plane of the lens, said lamp thereby functioning to project light of relatively uniform intensity from over the entire surface of said lens.

2. A lamp comprising a shallow dish-shaped casing, a portion of the interior of said casing being a parabolic reflector and another portion of the interior of said casing being substantially flat, a lens covering the open end of said casing, a cylindrical socket extending laterally into said parabolic reflector, one side of said socket being thereby exposed to said lens, and a lighting element mounted in said socket at the focal point of said parabolic reflector, said lens member having surface portions aligned with said parabolic reflector and other portions aligned with said flat surface and said socket, those portions of said lens aligned with said parabolic reflector being provided with dioptric surfaces of compound curvature adapted to project light from the interior of said casing which is directed toward said lens at angles greater than 60° to the plane of the lens, and those portions of said lens aligned with said flat surface and said socket being provided with arcuate catadioptric prisms adapted to project light from the interior of said casing which is directed toward said lens at angles less than 60° to the plane of the lens, said lamp thereby functioning to project light of relatively uniform intensity from over the entire surface of said lens.

3. In a vehicle tail-stop-turn signal indicator lamp, a lens member and a shallow casing member having cooperating partitions dividing said lamp into three separate light compartments, in each of said compartments one portion of the casing being substantially flat and another portion of the casing being a parabolic reflector having extending laterally therein a cylindrical socket carrying a lighting element mounted at the focal point of the parabolic reflector, and in each of said compartments the portion of the lens aligned with the parabolic reflector having dioptric surfaces of compound curvature adapted to project light from the interior of the casing which is directed toward said lens at angles greater than 60° to the plane of said lens, and the portions aligned with said flat surface and said cylindrical socket having arcuately shaped catadioptric prisms adapted to project light from the interior of the casing which is directed toward said lens at angles less than 60° to the plane of said lens, each of said lighting compartments thereby functioning to project light of relatively uniform intensity from over the entire surface of all of said lens portions.

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