March 18, 1947. J. N. PAUL 2,417,443

SIGNAL

Filed July 19, 1941 3 Sheets-Sheet 1

Fig. 1

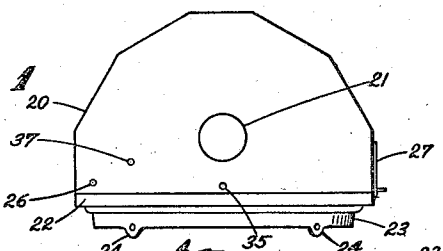


Fig. 2

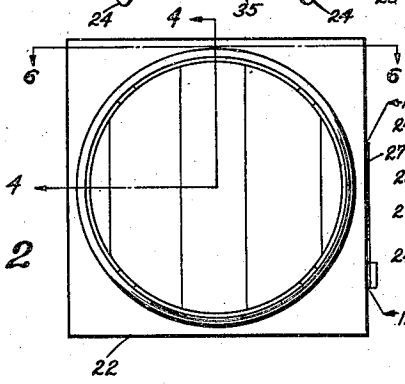


Fig. 3

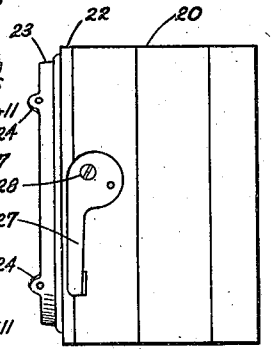


Fig. 5

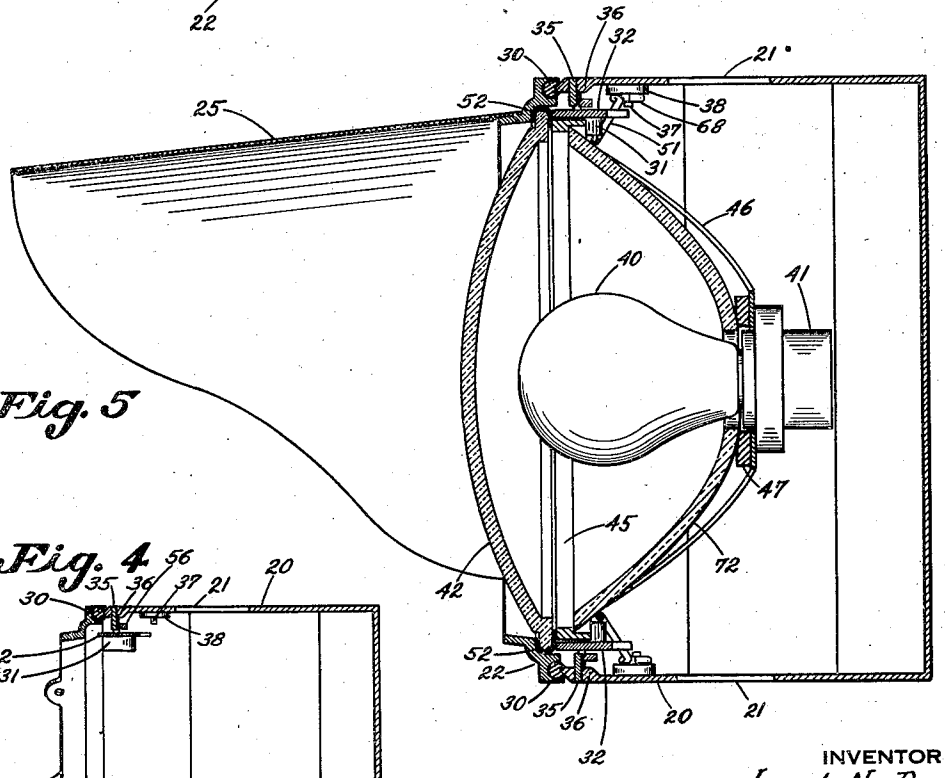


Fig. 4

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SIGNAL

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Fig. 6

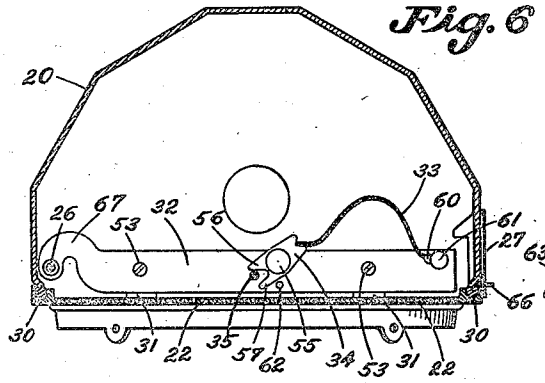
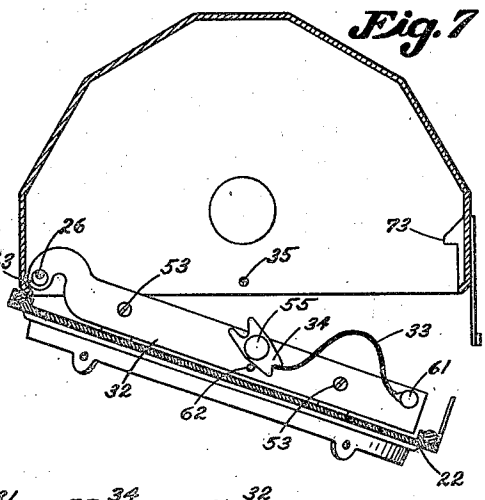


Fig. 7



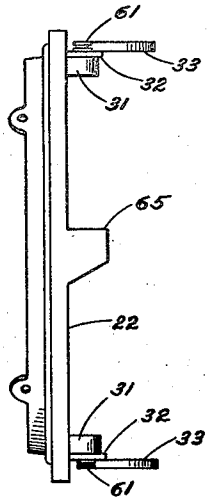


Fig. 8

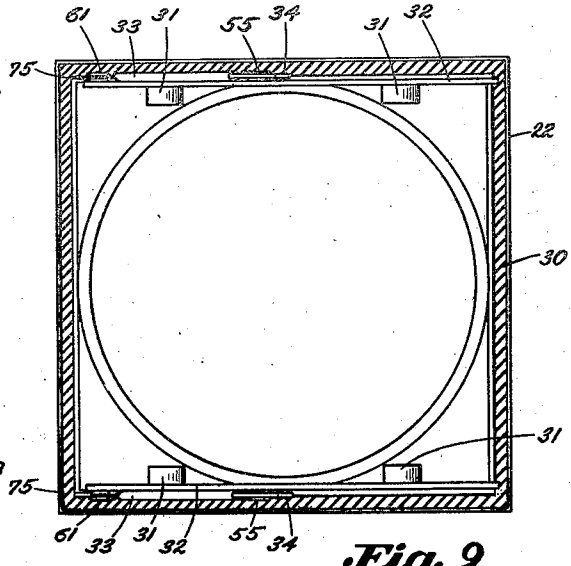


Fig. 9

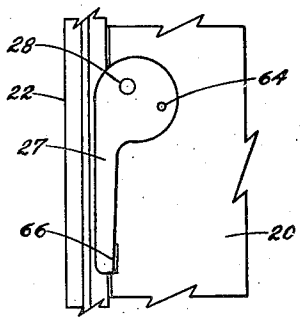


Fig. 10

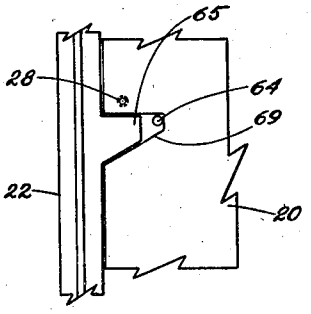


Fig. 11

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SIGNAL

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Fig. 12

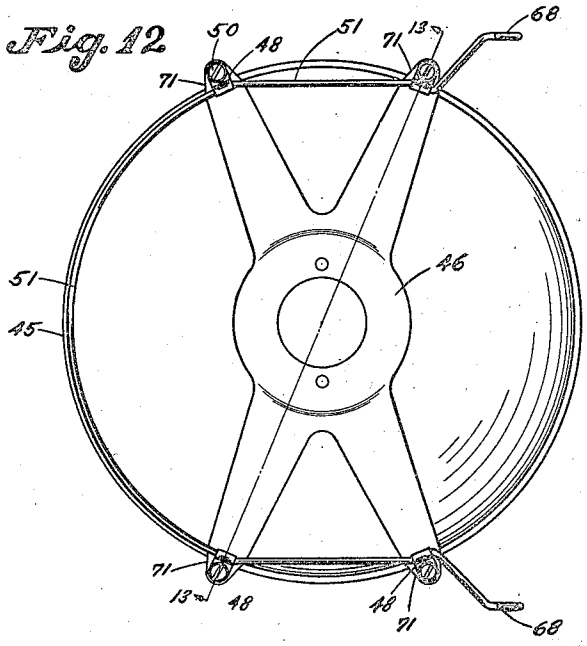
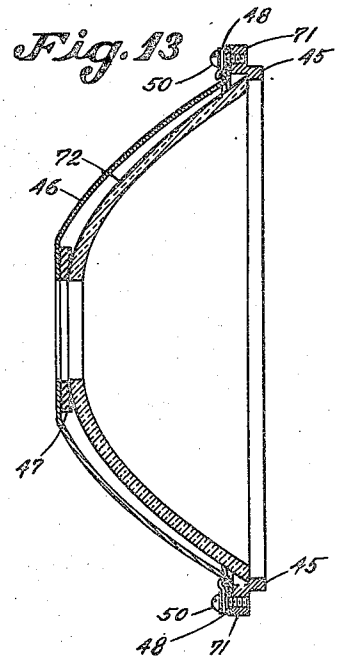


Fig. 13



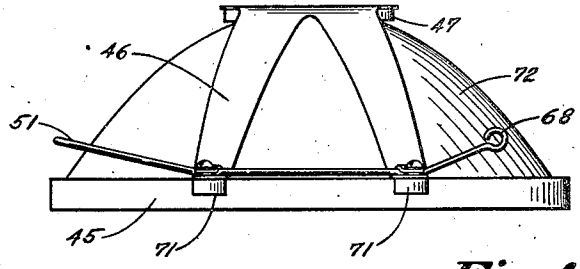


Fig. 14

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UNITED STATES PATENT OFFICE

2,417,443

SIGNAL

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Application July 19, 1941, Serial No. 403,129

6 Claims. (Cl. 177—329)

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This invention relates to a signal, particularly to a signal unit of the general type employed for traffic signals for road intersections. Signals of similar type are also employed at danger points on highways and at drawbridges, for example. Such traffic signals ordinarily have one or more unit assemblies of a lamp, a reflector and a lens. The lens may be colored green, yellow or red for example or may be lettered or provided with some other form of signalling indication, and the lens is illuminated to display its color or indication by means of the lamp.

In one familiar form of traffic signal one of these signal units or an assembly of such units pointing in several directions as desired is used as a cautionary signal with a steady or flashing illumination. In another familiar form a red lens unit and a green lens unit are assembled together to direct traffic to stop and go respectively, and in many cases a third intermediate unit with a yellow lens is included as a signal change indicator, thus providing a three color traffic signal assembly.

As traffic signals, such multiple unit signal assemblies may be employed to give signal indications in one direction only or several assemblies may be grouped to display indications in several directions as required or desired.

The assembly of a lamp socket and reflector and lens is often referred to as the optical assembly of the signal and this assembly is placed in a signal casing for mechanical protection and proper spacing of several assemblies, and for protection against the weather.

The signal casing is provided with a door to hold the lens, and to provide necessary access to the inside of the casing and the optical assembly to change lamps as they burn out or become inefficient and to clean the reflector and lens on the inside, as well as to work on the wiring for the electric power supply to the lamp. The door should be weather-tight but should be adapted to be opened readily since such signals are ordinarily mounted on relatively high posts or over the road for good visibility, and require the use of a tower truck or a ladder by a service man working on the signals. Under such conditions the service man is often able to have only one hand free to work on the signal. In many cases where the signal is suspended over the road the service man working on the signal is exposed to the danger of accident from traffic in the road and where the signal is suspended over the center of an intersection of two or more roads

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it is sometimes necessary to stop all traffic while repairs are being made on the signal.

Since the signals are in use as safety control devices it is important to minimize the time they have to be out of service for repair or adjustment and it is desirable therefore to have the casing designed so that the door can be opened quickly and easily under various conditions.

Thus it is desirable to be able to open or close the door quickly and readily by hand or by a simple prying action of a screw driver, and it is desirable to have the door pressed tightly against gasket material when closed to protect the inside of the signal from dust and from the weather.

It will be appreciated that traffic signals are installed in all kinds of climate and that weather conditions are variable over an extremely wide range from time to time at one location and that any one lot of signals manufactured may have signal units delivered to widely separated locations having widely differing conditions, so that an important object of signal design is to provide a rugged and tight construction to meet severe conditions but also a simplified and convenient construction for accessibility of the various parts for service work, particularly inside the signal.

In various types of signal construction in prior use with which I am familiar some form of voluntary action by the service man is required to tighten the door after it is closed. A lever wedge or a thumb screw or thumb nut must be operated by hand to tighten the door in two familiar forms of traffic signals for example.

With such forms of construction it is very difficult to obtain sufficient or uniform tightness of the door against its gasket consistently in service work on the signals and when the usual exposed thread bolt is employed with a thumb nut the thread is frequently coated with paint or otherwise clogged and it is difficult for the service man to determine whether he has tightened the door sufficiently.

These difficulties are increased when gloves are worn by the service man in cold weather.

It is desirable to provide a strong and tight construction but also to make the door opening and closing operation simple and to make the door tightening operation positive and substantially automatic to avoid the possibility of human error in tightening the door insufficiently or unevenly.

According to the present invention an improved signal is provided with a toggle catch construction for the door giving positive control of door closure pressure with simplified opening and clos-

ing operation of the door. In the preferred construction in accordance with the invention the signal is provided with concealed hinges and concealed toggle catches for the door so as to keep these working parts free from outside exposure and from being clogged with paint in the frequent painting necessary on the outside of signals. The catches employ a toggle device with a high pressure spring so that the door engages its gasket tightly with substantially uniform pressure automatically in the closed position, without the need of any tightening adjustment by hand.

It is a general object of the invention to provide an improved signal of simplified and rugged construction and a minimum of exposed operating parts.

It is another object of the invention to provide an improved signal door construction giving positive and substantially uniform closure pressure in the closed position.

It is also an object of the invention to provide an improved signal casing having a door with concealed hinge and catch construction.

It is a further object of the invention to provide an improved signal casing having a door with a toggle spring catch.

An additional object of the invention is to provide a signal of the character described, with a lever member having a concealed bearing member for opening the door of the signal.

A further object of the invention is to provide an improved toggle catch mechanism for a door.

The construction of one preferred embodiment of the invention will be better understood in connection with the following description by reference to the several drawings in which:

Figs. 1, 2 and 3 are top, front and side views respectively of the signal casing of a signal unit.

Fig. 4 is a partial vertical sectional view on the lines 4—4 of Fig. 2.

Fig. 5 is an enlarged sectional view of a form of traffic signal unit showing a sectional view of the improved signal casing as in Fig. 4 but in full section and in connection with the other principal parts of the signal unit.

Fig. 6 is a horizontal sectional view of the casing, along the lines 6—6 in Fig. 2, and showing the door and door control in closed position.

Fig. 7 is a sectional view as in Fig. 6 except that the door and door control are shown in open position.

Figs. 8 and 9 show views of the door from the right side and rear respectively.

Fig. 10 is an enlarged view of the door release lever.

Fig. 11 is a sectional view of the door release lever device along the lines 11—11 of Fig. 2.

Fig. 12 is a rear view of the reflector holder of the signal unit.

Fig. 13 is a section along lines 13—13 of Fig. 12.

Fig. 14 is a top view of the reflector holder.

Considering the signal casing of Figs. 1, 2 and 3 in greater detail, the main housing and door of the casing are shown in these figures of the drawings without the optical unit of the signal for clearness of illustration. The housing 20 forms the back of the signal unit and the main support for the optical assembly. This housing is ordinarily provided with a hole 21 in the top as shown in Fig. 1 and a corresponding hole in the bottom to provide for connection between signal units when several of these units are assembled together to form the usual multi-color traffic signal. Where such holes are provided the cross-section of the housing at the hole may be thickened or ribbed or both for additional strength if necessary or desired. On the outer surfaces of the top or bottom sections of such assembly the hole may be omitted or plugged or covered with a pipe fitting or ornament as desired, depending upon the means employed for suspending or mounting the signal for traffic control purposes for example.

In some instances the signal unit may be used as an individual unit and may be back mounted against an outlet box in a wall or the like and a hole may be provided if desired in the back to care for electrical connections.

A door 22 is provided on the front of the signal casing as shown in the front view of Fig. 2. The door is preferably provided with a circular flange 23 and lugs 24 on the front for attachment of a sun shield or hood 25 as shown in the sectional view of Fig. 5. The door as shown in Figs. 1, 2 and 3 is hinged at the left side of Fig. 2 on upper and lower pins 26 in the housing 20, the upper pin 26 appearing in Fig. 1. A lever 27 operating on a pivot 28 is provided at the right side of the door. This lever is more fully described below.

In the half-section view in Fig. 4 on the vertical center line of the signal casing, along the lines 4—4 in Fig. 2, the housing 20 appears partly in section and partly in inside view, and the door 22 and its hood flange 23 appear similarly.

The left half of the signal casing is symmetrical about a horizontal axis as it appears in Fig. 2, and the top half section above the axis of symmetry as shown in Fig. 4 serves to illustrate the full section.

A gasket 30 appears in section between the door and housing in Figs. 4–7. This gasket preferably extends along all four edges of the door.

Four lugs 31 are provided on the inside of the door near the corners and one of these lugs appears in the sectional view of Fig. 4. A plate 32, appearing in section in Fig. 4, is attached to the top of the upper lugs 31, and the spring and toggle cam of the toggle catch are mounted on this plate 32.

The spring 33 and toggle cam 34 appear more clearly in Figs. 6 and 7. A pin 35 is fixed in a boss 36 in the top of the housing 20, and cooperates with the toggle cam in controlling the door closing and opening. The pin 35 appears in vertical section in Fig. 4 and in horizontal section in Figs. 6 and 7.

Another pin 37 in a boss 38 in the top of the housing serves as a bearing for the reflector holder spring as will be more fully described below.

Fig. 5 shows a full sectional view of a signal unit including the signal casing and the optical unit assembly and hood. The sectional view is taken along the vertical center line of the signal as in Fig. 4 except that a full view is shown in Fig. 5 instead of the half view of Fig. 4, in order to show the hood 25. The lamp 40 and lamp socket or receptacle 41 are shown in regular full view instead of in section for convenience of illustration but the remainder of the signal unit is shown just as it should appear in the sectional view as described. A clear lamp is ordinarily used but for simplicity in the drawing the lamp filament is not shown.

The optical unit includes the lens 42, the lamp 40, and socket 41, and the reflector 72. The reflector holder may also be considered a part of the optical unit and includes the ring 45, the spider 46, the gasket 47, the clamps 48 and screws 50, and the spring wire holder 51.

The door 22 is provided with a recess on the inner side near each of its four edges and the gasket 30 is placed in this recess to bear against the front edge of the housing 20 when the door is closed. The door is slightly smaller than the housing so that when signal units are assembled together the edges of adjacent doors will not interfere. The lens 42 is set in an inner circular recess in the door and is separated from the door by a gasket 52 which preferably extends over the edge of the lens for a short distance on both the inner and outer sides. The lens is shown of plain cross-sectional shape for simplicity of illustration although it may have any of various well known shapes depending on the type of light distribution desired outside the signal.

The lens is held in place in the door by the two plates 32, 32 bearing against the inner side of the lens gasket near the upper and lower edges of the lens. These plates are fastened to the raised portions or bosses 31 on the door, by means of screws 53 through the plates. The upper plate is fastened to the two upper bosses and the lower plate to the two lower bosses. The upper plate 32 and screws 53 can be seen in Fig. 6.

The reflector holder ring 45 also bears against the lens gasket 52 in the closed position of the door.

The toggle catch mechanism for control of the door in accordance with the invention is best illustrated in Figs. 6 and 7 which show the door in closed and open positions respectively. These are sectional views looking down at a horizontal section line 6—6 just below the top of the signal unit in Fig. 2. The plate 32 seen is the upper of the two similar plates on the door. The bearing pin 35, fastened in the top of the housing, is seen only in section.

The toggle cam 34 is positioned by the pin 55 but is free to rotate on this pin. This pin 55 is preferably provided with a shoulder resting against the top of the plate 32 and with another shoulder or head extending over the top of the toggle cam 34 so as to allow the cam to rotate on the pin 55 but to restrict the end play of the cam on the pin. The pin may be peened under the plate to hold the pin firm in place. The cam 34 is relatively long and narrow and one end of the cam is bifurcated into the lobes 56 and 57 and the other end is provided with a notch 58. A strong flat type spring 33 fits into the notch 58 at one end and is twisted one quarter turn at its other end 60 to bear on pin 61.

The pin 61 passes through a hole in the end 60 of the spring to key this end of the spring against accidental release but the spring is free to rotate on the pin 61. The pin 61 is preferably provided with a shoulder bearing against the plate 32 and with a washer 74, and with another shoulder or head overlapping the end of the spring to limit its end play on the pin. The hole in the spring is made large enough to allow passage of the pin shank.

Instead of twisting the end 60 of the spring 33 and providing a hole therein, this end may be formed into a loop to key it around the pin 61, if desired.

The spring 33 is compressed by being bowed as shown in Figs. 6 and 7, and exerts considerable pressure tending to turn the toggle cam counterclockwise with the door in closed position as in Fig. 6. With the door in the open position as in Fig. 7 the spring exerts considerable pressure tending to rotate the toggle cam clockwise.

A stop pin 62 is preferably placed in the plate 32 to limit rotation of the cam 34, particularly in the open position of the door. A small amount of clearance is provided between the stop pin 62 and the cam 34 in the closed position of the door so that the pressure of the spring 33 will be transmitted fully through the lobe 56 of the cam against the pin 35 to press the door gasket 30 firmly against the front edge of the housing 20.

The door can be closed simply by pressure against the front. Such pressure brings the lobe 57 of cam 34 into contact with the pin 35 and rotates the cam counterclockwise and thus compressing the spring 33 until the midpoint of maximum compression is reached, after which the spring aids in rotating the cam rapidly to force the door closed with a snap action.

In opening the door it is pulled away from the housing against the pressure of the spring, since the inner branch or lobe 56 of the bifurcated cam 34 bears against the inner side of pin 35 and thus causes clockwise rotation of the cam and compresses the spring 33.

As soon as the cam passes the center point of maximum spring compression the cam is rapidly rotated further clockwise by pressure of the spring, the cam coming to rest against the stop pin 62. In the latter position the lobe 56 of the cam is clear of the pin 35 so that the door can be swung freely open.

As shown in the side and rear views of the door in Figs. 8 and 9 a similar toggle catch is provided at the bottom of the door. Thus the two toggle catches, operating on the pins 35 substantially at the middle of the top and bottom of the door, serve to balance the pressure of the door gasket against the front edge of the housing on all sides, providing a floating contact effect under spring pressure.

The hole 63 in the plate 32 is made oversize so that there is considerable clearance between the hinge pin 26 and the bearing edge of the plate around the hole in the closed position of the door, thus permitting a free-balancing action of the upper and lower toggle catches.

To provide a convenient means of opening the door the release lever device 27 is mounted on the right side of the door—that is, opposite the hinge as shown in enlarged view in Fig. 10. The lever 27 is pivoted on the shoulder screw 28 which is fixed in the housing. A rivet pin 64 is fixed in the lever 27 and projects slightly on the inside. This side wall of the housing is mortised as shown at 69 to receive the projection 65 on the door. This projection has only a thin cross-section so that the mortise is shallow. The lever also requires only a thin cross-section.

It will be appreciated that the lever arrangement for opening the door may be omitted if desired and the door may be opened by inserting a screw driver between the door and the housing or between the projection and the edge of the mortise in the housing for leverage for example, and in the latter case a smaller clearance is preferably provided at this point.

In the preferred construction of the invention the upper and lower plates 32 bear against the lens gasket 52 for some distance along the inner edge of the lens at the top and bottom of the lens to hold the lens in position in the door. Other provisions such as removable lugs might be employed to fasten the lens into the door but in the present preferred embodiment of the invention the plates 32 serve the dual purpose of

a mounting base for the toggle catches and also a holder for the lens.

It will be understood that the reflector holder could be hinged on the door with the spring wire 51 shape modified somewhat to accommodate it to the size and shape of the door, or one or more other well known forms of construction may be substituted for mounting the reflector either in the housing or on the door without departing from the spirit of the invention, but in the preferred construction as shown the lens is attached to the door and the reflector is attached to the housing so that only the door need be opened to obtain access to the inside of the lens and reflector and to the lamp.

It will also be appreciated that the toggle catch cam and spring assembly could be mounted in the housing and the bearing pins 35 mounted on a projection from the door so as to reverse these parts of the toggle catch with respect to the door and housing in place of the preferred construction shown. However the preferred construction has the advantage of making the plate and toggle catch assembly more accessible for assembly and repair of the signal.

A small flange 66 may be provided on the lower end of the lever to provide a grip or bearing for the edge of the finger in operating the lever to open the door. A small amount of clearance is provided between the rear edge of the projection 65 and the pin 64 as shown in Fig. 11, to allow the lower end of the lever arm to be pulled out beyond the outer edge of the door so that a more convenient grip on the lever may be obtained by the fingers.

The pin 64 is shown in cross-section in Fig. 11 as this figure shows a sectional view immediately under the lever. The pivot screw or pin 28 appears in cross-section also in Fig. 11.

In operating the lever to open the door the lower end of the lever is pulled forward freely a short distance until the pin 64 engages the edge of the projection 65 on the door. Further pull on the lever is exerted against the spring action of the toggle catches by rotation of the toggle cams until the toggle catches are past dead center position. The stroke of the pin 64 against the edge of the projection 65 is long enough to carry the toggle catches beyond dead center.

The plates 32, 32 at the top and bottom of the door, have a U-shaped sweep 67 at the hinge side of the door to provide clearance for the forward edge of the housing when the door is open, thus permitting the door to be swung wide open even though the hinge is inside the housing.

The reflector and reflector holder of the signal unit are shown in more detail in Figs. 12, 13 and 14. In the rear and bottom views of Figs. 12 and 14 respectively the heavy spring wire frame 51 is shown most clearly. At the right side of these figures the wire is formed into upper and lower loops 68 to bear on the upper and lower reflector hinge pins 37 in the housing. These loops must be brought nearer together than their free position by deflection of the spring wire to place the loops over the ends of these hinge pins 37, and after being snapped into place the loops are held on the pins only by spring action so that the entire reflector and reflector holder assembly may be removed readily without tools.

The spring wire is formed in a U-shaped loop and is held at the four outer ends of the spider 46 by four clamps 48 which in turn are fastened to the spider legs by screws 50 into lugs 71 on

the ring 45. The assembly of the ring lugs 71 and the clamps 48 and screws 50 are also shown in Fig. 13 showing a section through the reflector and holder assembly along the lines 13—13 of Fig. 12.

A notched stop 73 is preferably provided for the reflector holder spring wire 51 inside the right side of the housing as shown in Figs. 6 and 7 to hold the reflector in its normal operating position. The spring wire 51 can be deflected easily to swing the reflector holder out on its hinges if desired.

The reflector 72 bears against the offset inner edge on the rear of the ring 45 as shown in Fig. 13 and is held against this edge light but firmly by the gasket 47 between the spider and the reflector. The reflector 72 may be of silvered glass or polished aluminum alloy or other material of high reflecting power.

The large hole in the middle of the rear of the reflector and spider as shown in the middle of Fig. 12 and at the left side of Fig. 13 is provided for the lamp socket as illustrated in Fig. 5. The holes 74—74 in the back of the spider are provided for screws to hold the lamp socket in place.

With the loops 68, 68 sprung into place on the upper and lower hinge pins 37, 37 as shown in Fig. 5 the complete reflector and reflector holder assembly swings on these hinge pins and can be swung out for access to the back of the lamp receptacle and wiring for example with the door open.

When the door is closed the gasket 52 on the inside of the lens presses against the front edge of the reflector ring 45 so as to make a substantially dust tight chamber inside the optical unit. This aids in maintaining the inside lens surface and the reflector and lamp surfaces at a high efficiency.

It will be understood that the preferred construction illustrated herein employs a pair of oppositely placed toggle catches to equalize the pressure in the closing and opening the door and on the door gasket in the closed position, and provides clearance at the door hinges to allow such balancing of pressure entirely by said catches, but that in some conditions of application of the toggle catch construction in signals it may be satisfactory to employ one toggle catch of the present construction opposite the hinge of the door with reduced hinge clearance.

It will be appreciated that the signal unit employing the concealed hinge and toggle catch construction has been described and illustrated herein particularly as applied to street traffic signals but that the application of such construction is not limited to such signals. Another example of advantageous application of such construction is in railroad signals. Although railroad signals differ considerably in size and appearance and in optical assembly arrangement they have quite similar service requirements.

It will be understood that various changes in the character and arrangement of the parts or substitution of equivalent parts or omission of parts might be made in the construction of the present signal without departing from the spirit of the invention as defined by the claims.

I claim:

1. In a signal having a lens, a housing and a door for the housing, and said door providing a substantially central opening to receive said lens, a toggle catch mechanism between said housing and door, and means supporting said

mechanism on the inside of said door and bearing against said lens to hold said lens in said door.

2. In a signal having a housing and a door for the housing, a toggle catch mechanism between the door and housing, said mechanism including a pair of cams, means including a pair of pivots supporting said cams adjacent opposite edges on the inside of said door, a pair of members mounted on the inside of said housing in position to bear against the respective cams to rotate the cams through an angle about said pivots in closure of the door, and spring means connected with said cams to provide a toggle action in rotation of said cams through said angle and to maintain pressure to hold the door firmly against the housing when the door is closed.

3. In a signal having a housing and a door for the housing, an improved construction for connection of the door to the housing including the combination of a toggle catch device having a toggle spring cam element and a cooperating bearing pin, one on the inside of the door and the other on the inside of the housing adjacent one edge of the door, a second toggle catch device having a similar toggle spring cam element and cooperating bearing pin, one on the inside of the door and the other on the inside of the housing adjacent an opposite edge of the door, both said devices cooperating to control closing of said door against said housing and hold said door closed normally under spring pressure against rotation of said cams by said pins, and a pair of hinge pins within said housing closely adjacent to the door and edge of the housing and a pair of cooperating hinge members connected with the inside of said door and formed in an arc to provide clearance for the edge of the signal housing and permit the door to open wide when open but to conceal the hinges entirely inside the housing when the door is closed, said hinge members having considerable clearance from the hinge pins to permit the toggle catch devices to equalize substantially such closing spring pressure, whereby the hinge and catch connection of the door and housing is completely enclosed and closing pressure around the edge of the door is substantially balanced when the door is closed.

4. In a signal having a housing and a door for the housing, a toggle catch mechanism between the door and housing, said mechanism including a pair of cams, means including a pair of pivots supporting said cams adjacent opposite edges on the inside of said door, a pair of members mounted on the inside of said housing in position to bear against the respective cams to rotate the cams through an angle about said pivots in closure of the door, and spring means connected with said cams to provide a toggle action in rotation of said cams through said angle and to maintain pressure to hold the door firmly against the housing when the door is closed, said door being adapted to be opened from said housing by reverse rotation of said cams by external leverage applied between said door and housing.

5. In a signal having a housing and a door for the housing, a plurality of substantially balanced toggle catch devices between the housing and the door and enclosed within said housing and door when the door is closed, each said toggle catch device including a cam, means including a pivot supporting said cam on the inside of said door, a member mounted in said housing in position to bear against said cam to rotate the same through an angle in closure of the door, and a spring connected with said cam to provide a toggle action in rotation of said cam through said angle, said cam having one side bifurcated into two lobes, and said bearing member being located between said lobes in the closed position of the door and bearing against the inside edge of one lobe tending to rotate the cam against pressure of the toggle spring to hold the door closed against the housing through the spring action.

6. In a signal having an optical assembly including a lamp receptacle, a reflector for said receptacle and a lens for covering said receptacle and reflector, and a casing for enclosing the optical assembly, said casing including a housing and a door, and a toggle catch mechanism between said housing and door, a gasket at the edge of said lens, said toggle catch mechanism including a pair of plates adjacent opposite edges on the inside of the door and bearing against said gasket to hold the lens in said door, a pair of cams pivotably supported on said plates and having two lobes on one side of each cam, and means within the housing and located so as to engage said cams between said lobes to rotate the cams through an angle as said door is closed, and a pair of springs one connected with each cam to provide a toggle spring action as said cams are so rotated through said angle and to maintain pressure tending to rotate said cams against said means in the housing to hold the door firmly against the housing in the closed position.

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