United States Patent

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[54] **MAILBOX OPERATED ELECTRONIC SIGNAL DEVICE**
1 Claim, 7 Drawing Figs.

[52] **U.S. Cl.** **340/224,** 200/61.63, 232/37, 325/102, 325/362, 340/281
[51] **Int. Cl.** **G08b 21/00,** G08c 17/00, B65d 91/00
[50] **Field of Search** 340/281, 224, 283; 200/61.63; 232/34–37; 343/900; 325/102, 119, 170, 362, 477

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ABSTRACT: A rural mail indicator signal system of the electric type, comprising a miniature solid state crystal-controlled radio signal transmitter at the mailbox, which sends out a pulselike signal when the mailbox door is opened or closed. In the residence a miniature radio receiver intercepts the pulse signal and converts it to either an audible signal, or a visual signal, or both.

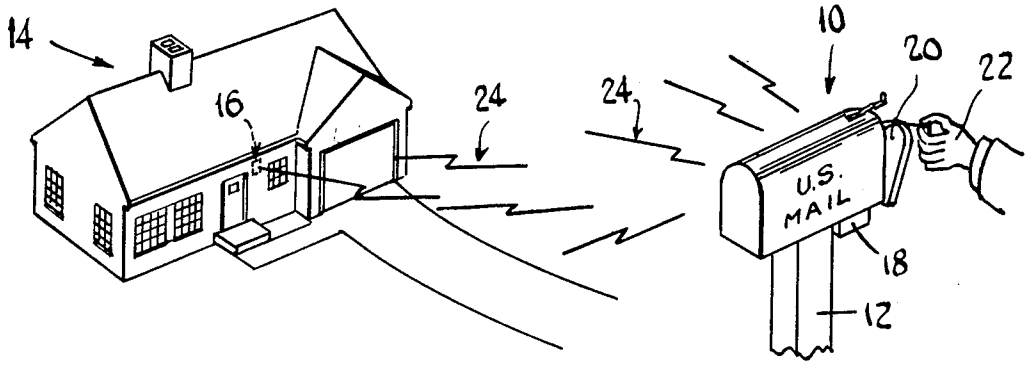


Fig. 1

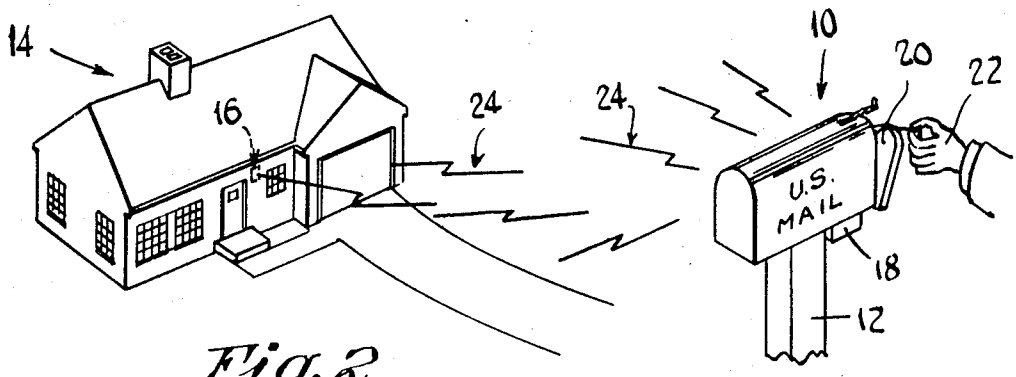


Fig. 2

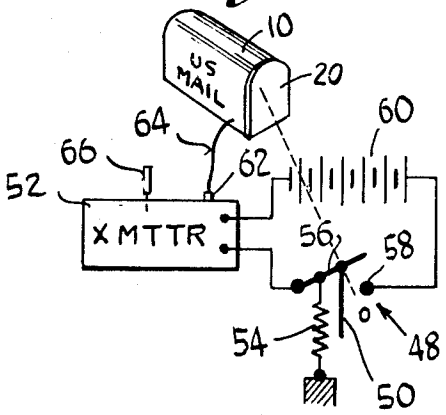


Fig. 3

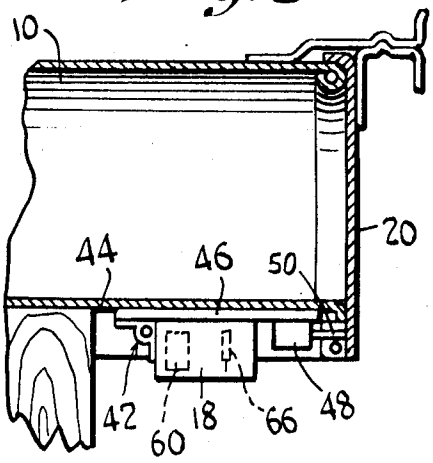


Fig. 4

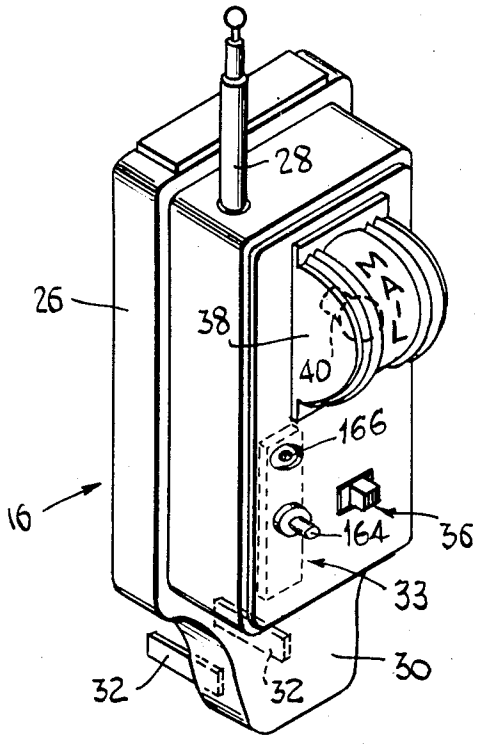
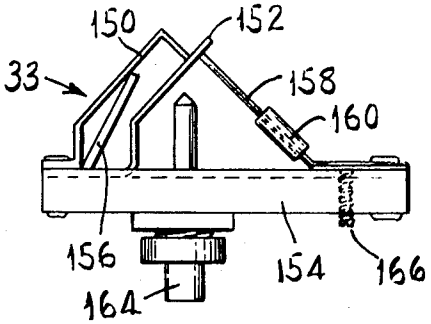


Fig. 7



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Fig. 5

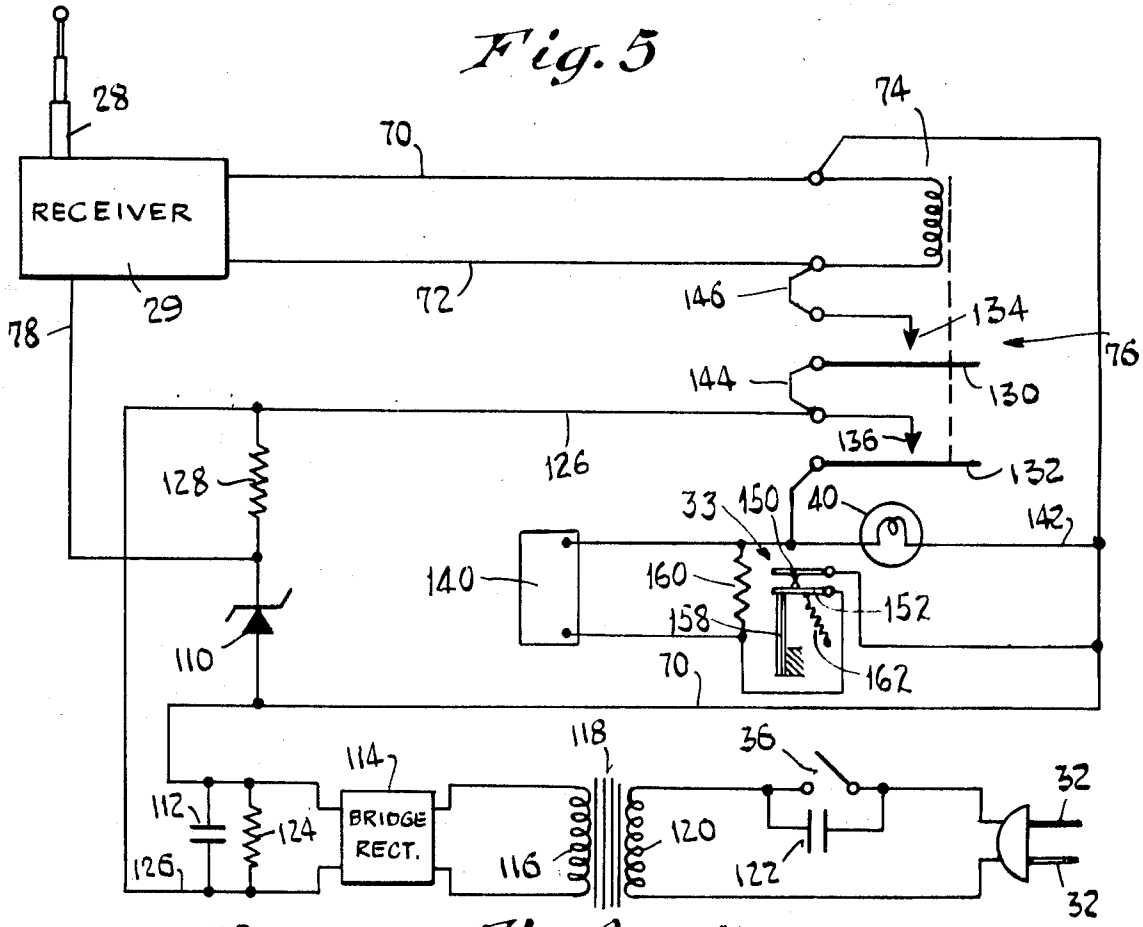
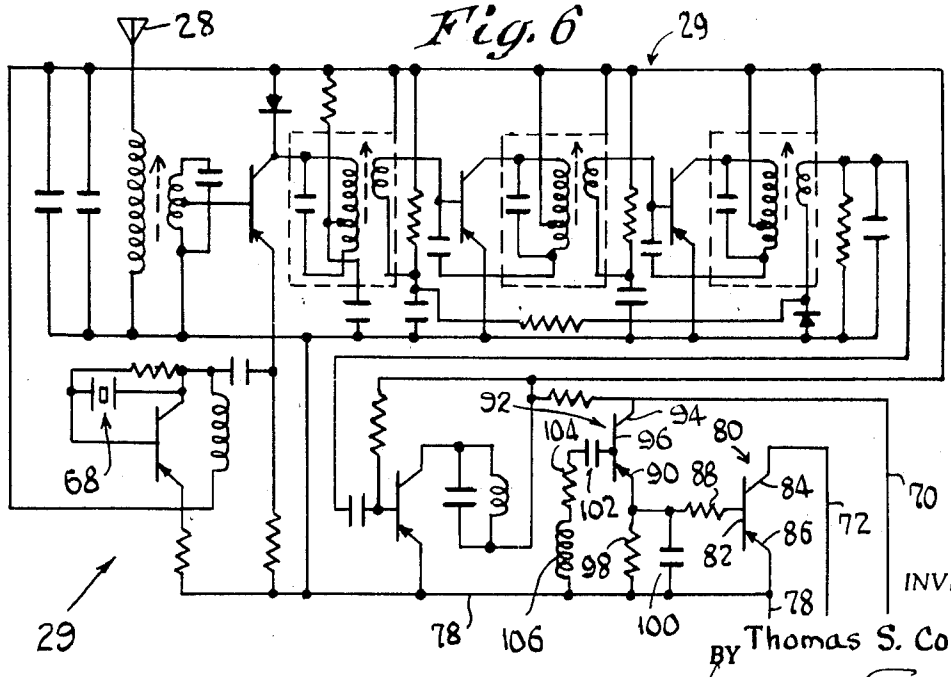


Fig. 6



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MAILBOX OPERATED ELECTRONIC SIGNAL DEVICE

BACKGROUND

This invention relates to electric devices which indicate the presence of mail being deposited in a mail box by the carrier.

Heretofore, electric mail indicator devices generally have involved wired systems wherein an electric switch at the mail box was actuated by the opening or closing of the box door, the switch being wired to a signal located within the residence to effect the desired indication. Some prior devices made use of existing electric wiring as it was already installed for doorbell or annunciator systems, thus obviating the need to install new lines except as required from the mail box to the adjoining push button for the bell, and as required in the house from the bell to the mail indicator device. However, although there was a saving as regards the stringing of long lines, the short wiring still required an electrician or skilled handyman, and this constituted a drawback. Where, as in rural areas, the mail box was remote from the residence with no existing wires, it became necessary to additionally string lines, as in the ground, from the mail box to the house. Such more extensive wiring represented an added expense in materials and labor, constituting still further drawbacks.

SUMMARY

The above disadvantages and drawbacks of prior devices of the kind indicated are obviated by the present invention, one object being to provide an improved electric mail indicator which completely eliminates the need for an electrician, for its installation. A related object of the invention is to provide an improved electric mail indicator in accordance with the foregoing, which requires an absolute minimum amount of time, effort and skill to effect its installation. These objects are accomplished by the provision of unconnected, radio wave transmitter and receiver devices located respectively at the mail box and in the residence, so arranged that operation of the mail box door causes a signal pulse to be broadcast from the transmitter and picked up by the receiver, the latter rendering operative visual signal or an audible signal or both. The transmitter is battery operated, and turned on for only an instant by means of a sweep-by type switch responding to the door movement at the mail box; it comprises a completely self-contained weatherproof unit adapted for attachment to the underside of the box. The receiver is also a self-contained unit, having a plug for reception by any 115-volt outlet receptacle of the house, whereby it is always energized and in readiness for operation.

Other features and advantages of the invention reside in the provision of an improved, remote control mail indicator as above set forth, which is selective so as to resist pulses due to operation of appliances in the residence, or operation of adjoining electronic indicators; an improved indicator as characterized, which is reliable, easily serviced, especially small and compact, relatively low in cost, and easily operated by the user.

Still other features and advantages will hereinafter appear.

In the drawings:

FIG. 1 is a diagrammatic representation of the remote control electronic mail indicator device provided by the invention.

FIG. 2 is a diagrammatic representation of the transmitter portion of the mail indicator device.

FIG. 3 is a fragmentary longitudinal section through a mail box having attached to its underside the transmitter portion of the indicator device.

FIG. 4 is a perspective view of the receiver portion of the indicator device, showing the power supply plug and also the receiving antenna.

FIG. 5 is a schematic circuit diagram of the signal and power supply system associated with the radio wave receiver, and

FIG. 6 is a schematic circuit diagram of the radio wave receiver.

FIG. 7 is a side elevational view of a thermal cutout switch for limiting the operational period of the audible signal.

The present improved mail indicator system is shown in its entirety diagrammatically in FIG. 1. In this figure there is depicted a mail box **10** carried by the usual post **12** which is supported in the earth, and a residence **14** located at a considerable distance from the mail box. Located in the residence **14** is an electronic mail indicator or signalling device **16** which is provided with a source of current, preferably by means of the domestic household voltage used for lighting, appliances, etc.

At the mail box **10** and preferably attached to the underside thereof is a weatherproof casing **18** containing a radio transmitter which is activated momentarily at the time that the door **20** of the mail box is being swung open or closed. In FIG. 1 the mail carrier's hand **22** is shown in the process of opening the door **20** prior to insertion of mail in the box. FIG. 1 also depicts the radio waves, indicated generally by the zigzag lines **24** emanating from the metal mail box **10** which is made to function as a transmitting antenna, such waves travelling to the receiving electronic indicator and signalling device **16** and actuating the latter so as to indicate the presence of mail in the box. Such indication may be either by means of an electric lamp, or else by a buzzer, bell or similar audible signal, or else both.

Referring to FIG. 4, the electronic indicator may comprise a small sized housing **26** provided with a telescopic antenna **28** and with an electric plug portion **30** comprising prongs **32** adapted to be received in a wall receptacle (not shown) providing house current. In the casing **16** there is disposed a resettable thermal cutout switch **33** adapted to render inoperative the audible signal after a short elapse of time, and also a slide switch **36** to control the energization of the receiver. Additionally there is carried by the casing **26** a lens **38** in which there is disposed an electric signal lamp **40**.

Referring to FIGS. 2 and 3, the transmitter unit at the mail box is shown in greater detail. The housing **18** is mounted by means of a hinge **42** to the underside or bottom wall **44** of the box, said mounting preferably including a base plate **46** secured to the bottom and on which there is carried a sweep-type switch **48** having a spring-biased actuating finger **50**, normally engaged with the inner surface of the mail box door **20**. The switch **48** is normally held open by the door, as shown in the positions of FIGS. 2 and 3. However, when the mail box door **20** is either swung down and opened from the closed position of FIG. 3 or else swung up and closed from the fully open position, the actuator arm **50** will be shifted and will momentarily close and then again open the switch **48**, effecting a momentary energization of the transmitter **52** indicated by the box labeled "XMTTR." In FIG. 2 the on-off switch **48** is shown as having a biasing spring **54** connected to a suitable anchorage and biasing the switch actuator arm **50** for sweeping (downward or outward) movement when it is not restrained by the mail box door **20**, such sweeping movement momentarily connecting the movable contact **56** of the switch **48** with the stationary contact **58** thereof. The switch **48** is connected to a battery **60**, which effects the energization of the transmitter **52**. Terminals on the transmitter **52** are connected respectively to the battery **60** and the on-off switch **48**, as shown in FIG. 2. The transmitter **52** has an RF output terminal **62** which is connected by a lead **64** made to act as a transmitting antenna. Or, the mail box can advantageously function as part of the antenna by having the metal base plate **46** capacitively coupled to it, in which case the plate **46** is connected to the transmitter output and also constitutes part of the antenna. With a capacitive coupling, as is well understood in the electronic arts, no electrical connections need be made between the base plate **46** and the mail box **10**, and therefore the plate can be merely cemented or adhered by an adhesive to the box to obtain the capacitive coupling, thus facilitating the installation since no drilling or screwing is needed. FIG. 3 shows no drilling or screwing into the mail box **10**. This is an advantage when installing the transmitter casing **18**. The transmitter **52** may be of conventional construction, and may

be crystal controlled using plug-in crystals **66** by which the frequency may be changed within a given band.

Replacement of the battery **60** and changing of the crystal **66** may be easily and quickly effected by swinging down the casing **18** of the transmitter to expose the interior compartment for such purpose. Preferably the baseboard **46** remains fixedly secured to the bottom wall **44** at all times, even during replacement of the battery.

It will be understood from the foregoing that the transmitter **52** is normally not energized. However, during an actuation of the mail box door **20**, both for opening the mail box and also closing it, the transmitter will be momentarily energized, causing a signal pulse to be emitted from the metal box constituting the antenna. The transmitter **52** comprises solid state components whereby no preliminary heating period is necessary, but instead a transmission of RF energy is effected immediately upon closing the energizing circuit of the battery **60** by means of the switch **48**.

Considering now the receiver unit **16**, referring to FIG. **4** it will be understood that in place of the plug-in portion **30** of the casing **26** there may be provided a line cord having a two-prong plug for connection with a suitable receptacle whereby the casing and receiver unit may be located at a distance more remote from the power receptacle. A suitable solid-state circuit for the RF receiver **29** of the unit **16** is shown in FIG. **6**. The receiver **29** is also crystal controlled, there being shown a crystal **68** for this purpose. The control receiver circuit includes a pickup antenna which comprises the telescopic collector **28** shown in FIG. **4**. Most of the receiver circuit is conventional, and accordingly those components not directly concerned with the novel aspects of the present invention are not described herein.

The receiver circuit of FIG. **6** is of the type arranged to effect a control when it receives the proper RF signal at the antenna **28**. For this purpose, the receiver has output wires **70**, **72** which in FIG. **5** are shown as connected with the coil **74** of a relay **76**. The wire **70** is also part of the energizing or power supply circuit for the receiver, which has another wire **78** constituting the other power supply lead. The control receiver has an output transistor **80** having a base **82**, a collector **84**, and an emitter **86**. The collector **84** and emitter **86** are connected respectively to the wires **72** and **78**, and the base **82** is connected through a resistor **88** to the emitter **90** of a preceding transistor **92** having a collector **94** and a base **96**. The emitter **90** is connected through a resistor **98** to the power lead **78**, and is bridged by a capacitor **100**. In accordance with the invention, the base **96** is connected to a capacitor **102** which has a value of 10 microfarads, such capacitor being connected to a 6,200 ohm resistor **104** which is in turn connected to an RF choke **106** having its other end connected to the power lead **78**. The provision of the resistor **104** and capacitor **102** connected to the base **96** of the transistor **92** renders the receiver circuit more selective and less sensitive to RF disturbances other than the intended signal pulse, as may be occasioned by the operation of lights, appliances or other equipment in the domicile. **102**, **104** comprise a delay circuit.

The signalling device circuit which includes the control receiver **29** is given in FIG. **5**. The power supply wires **70**, **78** for the receiver have a Zener diode **110** connected across them for close control of the supply voltage, the wire **70** going to the negative terminal of an electrolytic filter capacitor **112** and to the output of a bridge rectifier **114** which is supplied from the secondary **116** of a power transformer **118** having its primary **120** connected with the supply plug or prongs **32**. The on-off switch **36** is bridged by a capacitor **122**, in accordance with invention, to eliminate arcing and spikes which could activate the receiver. The switch **36** is connected to the supply from the plug prongs **32**.

The positive output terminal from the bridge **114** is connected to the positive side of the filter capacitor **112**, which latter is bridged by a bleeder resistor **124** providing a load for the bridge. The positive side of the bridge **114** is connected to a wire **126** which connects through a resistor **128** to the Zener diode **110**.

The relay **76** has movable contacts **130**, **132** which are normally open and cooperable with stationary contacts **134**, **136**. The movable contact **132** is connected to the signal lamp **40** and to an audible signal or buzzer **140**, the latter being connected through the thermal cutout switch **33** with the negative line **70**. The lamp **40** is connected by a wire **142** to the negative line **70**. The stationary contact **136** of the relay is connected with the wire **126** which is the positive side of the DC power unit. The stationary contact **136** is also connected by a jumper **144** to the movable contact **130**, thus constituting a holding circuit for the relay. The stationary relay contact **134** is connected by a jumper **146** with the relay coil **74**.

The thermal cutout switch **33** is described and claimed in detail in U.S. Pat. No. 3,258,564 issued June 28, 1966 and entitled "Automatic Thermal Cutout For Use With Mail Box Indicator and Door Signal" and accordingly no claims thereto are made herein. Briefly described, the switch **33** comprises normally engaging cooperable leaf spring contact blades **150**, **152** carried by a base **154** which also carries a rigid stop arm **156** engaging the blade **150** to prevent forward movement of the latter beyond a certain limit. The base **154** mounts a bimetal arm **158** on which there is disposed a heater **160**, comprising at least 100 ohms of resistance wire. The end of the arm **158** abuts the spring contact **152** which is biased away from the arm **150** (represented by the spring **162** in FIG. **5**) and normally maintains the arms **150**, **152** engaged with each other whereby the circuit through the buzzer **140** is not interrupted. The base **154** has a downward biased reset plunger **164** which can be depressed (shifted upward in FiG. **7**) to move the blades **150**, **152** away from the bimetallic arm **158** so that the latter can reset to the positions shown in FIGS. **5** and **7**. An adjusting screw **166** bears against the bimetallic arm **158** to vary the time of delay in opening of the switch.

Operation of the signalling device is as follows: Normally the on-off switch **36** is kept closed whereby a continuous DC supply voltage is had at the wires **70**, **126**, and in turn at the wires **70**, **78**. The relay **76** is normally deenergized and open, as shown. When the RF receiver **29** is activated by a signal received at the antenna **28** and sent out from the transmitter **52**, this will effect a switching of the control wire **72** to the positive supply wire **78** by means of the output transistor **80**, thus causing energization of the coil **74** of the relay **76**. The relay contacts will then close, whereupon a holding circuit is established from the positive supply wire **126** to the control wire **72**. Such holding circuit will maintain the energization of the relay when the signal received by the receiver **28** is discontinued. It will be remembered that such signal is of momentary duration, due to the momentary closing of the transmitter switch **48**. The closing of the relay **76** and the maintaining of the relay contacts close will not result in the signal bulb **40** being energized through the relay contacts **132**, **136**, and will also result in the buzzer **140** sounding due to the thermal switch **33** being in the closed condition. The resident of the domicile will not be apprised of the fact that the mail box door has been actuated, as by the insertion of mail therein, and such mail may therefore be picked up.

With energization of the buzzer **140**, the heater **160** will be energized. This heats and flexes the bimetallic arm **158** to the left as viewed in FIG. **5** or upward and to the right as viewed in FIG. **7**. The arm **158** thereby disengages from the blade **152**, permitting the latter to separate from the blade **150** and opening the circuit through the buzzer **140** and heater **160**. The buzzer becomes silent and the lamp **40** assumes full brilliance. The resident resets the signal device by merely pushing the plunger **164** to reestablish the contacts **150**, **152** into engagement, and by actuating the slide switch **36** to the open and then back again to the closed position. This actuation of the switch **36** deenergizes the relay **76**, breaking the holding circuit thereof and resetting the signal for its next operation.

It will now be understood from the foregoing that I have provided a novel and improved remote control mail indicator device comprising a radio transmitter which is located at the mail box and is automatically actuated as the mail box door is opened and closed, and comprising a receiver unit located at a

distance from the mail box, in the domicile which the mail box serves. Solid state circuitry is used throughout, and the transmitter and receiver units accordingly are instant acting and may be extremely small and compact in construction. The frequency is preferably controlled by the use of crystals, whereby adjoining domiciles may utilize systems having different frequencies to eliminate interference with similar systems or with garage door operators.

An important advantage of the transmitter-switching arrangement illustrated herein resides in the fact that the transmitter is activated twice when the mail is being inserted by the carrier. The first activation is effected by opening the mail box door, and the second activation is effected by closing the door. Thus, if for some reason the opening door movement fails to establish the signal, there is a second opportunity to establish the signal as the mail box door is closed.

The novel method of the invention comprises a signalling procedure which involves activating a radio transmitter at the mail box in response to operation of the box door, intercepting the transmitter signal by a receiver located in a building remote from the mail box, and rendering a sensory signal operative in the said building in response to activation of the radio receiver. The method involves maintaining the sensory signal operative after the receiver has been pulsed.

Variations and modifications are possible, within the scope of the claims.

I claim:

1. A mail indicator device comprising, in combination, a miniature radio transmitter and means for mounting the same on the mail box; means for momentarily switching on the transmitter in response to operation of the mail box door in a given direction; a transmitting antenna connected to said transmitter; a receiving antenna and a radio receiver connected to the same and adapted to be activated by a signal broadcast from the transmitter; a sensory signal device; means responsive to activation of said receiver, for rendering operative the sensory signal device; a mail box, said means for mounting the transmitter comprising a base attachable to and disposed exteriorly of the mail box and a housing hingedly secured to the base and swingable away therefrom to expose the housing interior, said transmitter including a battery carried in the housing for power and the swinging away of the housing providing for accessibility to the battery to facilitate replacement thereof; said switching means comprising a switch mounted on the base and engageable with the mail box door said base comprising a metal plate connected to the transmitter output and capacitively coupled to the mail box, said baseplate and mail box constituting the transmitting antenna.