

J. A. BURGARD
AUTOMATIC DOOR LOCK
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Fig. 4.

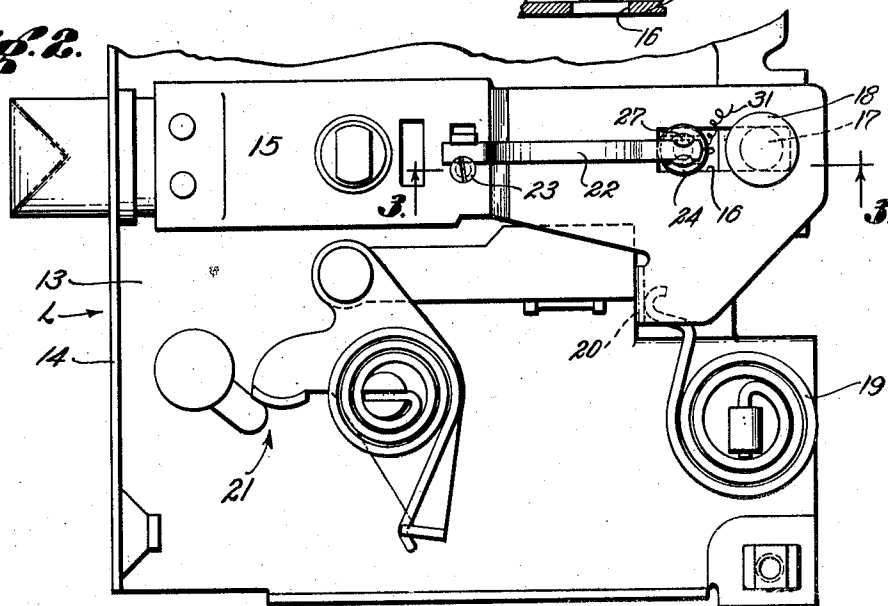
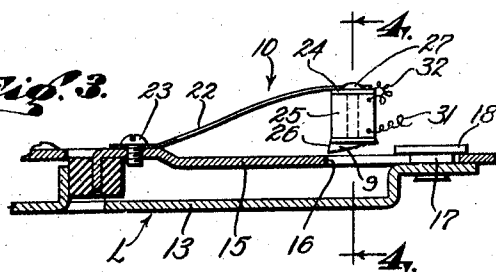


Fig. 3.



Inventor
JOSEPH A. BURGARD
By *Wm. H. Hall of Ill*
Attorney

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AUTOMATIC DOOR LOCK

Joseph A. Burgard, Los Angeles, Calif.

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6 Claims. (Cl. 180-82)

This invention relates to door locks and relates more particularly to automatic door locks for vehicles. A general object of this invention is to provide a practical, dependable and very inexpensive automatic door lock for vehicles such as automobiles, trucks, aircraft, etc.

It is highly desirable to positively lock the doors of an automobile, truck, or the like, to prevent children and other passengers from falling from the vehicle when the same is in motion, and to prevent highwaymen, etc. from gaining an entrance to the vehicle. It has been the general practice to depend upon the conventional door latches to hold the doors closed and the operators of some vehicles are in the habit of locking the latches with the usual manual lock means. These manual locks or latches are readily opened by children and may be accidentally opened by a person falling against them. Further, it is extremely inconvenient to latch each door of the vehicle each time the vehicle is started and then unlatch the doors when the passengers are to alight. The problem has been recognized by the prior art but the automatic door locks that have been proposed are either inadequate or are so expensive to produce and install that they are wholly impractical.

An object of the present invention is to provide an automatic door lock for vehicles that may be inexpensively produced and embodied in the vehicles.

Another object of this invention is to provide a safety lock or automatic lock for vehicles which may be easily and inexpensively added to or incorporated in the standard vehicle door latches or locks.

Another object of this invention is to provide an automatic door locking means of the character referred to which may be incorporated in the vehicle at the time of its manufacture, or following its manufacture, at a minimum of expense, only necessitating the employment of some electrical wiring, additional contacts at the cut out or circuit breaker, and simple electromagnets at the conventional door locks.

Another object of this invention is to provide an automatic vehicle door lock means that is practical and dependable and entirely automatic in operation. The automatic door lock means of the invention requires no manual operation or attention and automatically goes into operation when the engine of the vehicle is operated beyond a predetermined speed.

A further object of this invention is to provide an automatic door lock means for vehicles that

may be readily embodied in standard or conventional vehicle constructions without necessitating alteration of the vehicle door or door frame structure and requiring only a minimum alteration or addition to the conventional door locks.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawing, in which:

Fig. 1 is a wiring diagram of the present invention as embodied in or associated with the electrical lighting and ignition system of an automotive vehicle. Fig. 2 is a fragmentary side view of a conventional automobile door lock showing an electromagnetic means of the present invention associated therewith. Fig. 3 is an enlarged fragmentary horizontal detailed sectional view taken as indicated by line 3-3 on Fig. 2, and Fig. 4 is an enlarged fragmentary detailed sectional view taken as indicated by line 4-4 in Fig. 3 illustrating the manner in which the lock member engages in the slot of the bolt.

The automatic door locking means of the present invention may be said to comprise, generally, electromagnetic means 10 at each vehicle door latch or lock L, a circuit 11 for the electromagnetic means 10 and means 12 for energizing the circuit.

The electromagnetic means 10 of the invention may be employed with various forms and types of locks and latches for holding vehicle doors closed. In the drawing I have shown the invention associated with one typical or conventional form of vehicle door lock L, it being understood that this is merely an illustrative application of the invention. The lock L shown is adapted to be secured in a vehicle door at its free edge or swinging edge and comprises a base or body 13 of steel, or the like. The lock body 13 is generally flat and rectangular and has an outstanding ridge or flange 14 extending along its edge which is located at the swinging edge of the door. The sliding bolt 15 of the lock passes through an opening in the flange 14 to cooperate with the keeper (not shown) in the jamb of the doorway. A slot 16 occurs in the rear portion of the bolt 15 and a stud 17 is fixed to the plate or body 13 and passes through the slot 16 to assist in guiding the bolt 15. A head 18 on the stud 17 overlies the outer face of the bolt 15 to assist in steadying the bolt. A coiled spring 19 has an end part cooperating with an ear 20 on the bolt 15 to urge the bolt to the closed position. The lock further

includes a mechanism 21 for manually throwing or shifting the bolt 15. The present invention is not primarily concerned with the mechanism 21 or other details of the lock.

In accordance with the invention the electromagnetic means 10 is operable to prevent retraction of the bolt 15 and in the preferred construction acts as a positive stop to definitely hold the bolt against disengagement from its keeper. In the construction illustrated the electromagnetic means 10 is carried directly by the bolt 15 and embodies a part engageable between the bolt and a stationary member. The electromagnetic means 10 includes a flexible resilient arm 22. The arm 22 is in the nature of a light spring arm or leaf spring having one end anchored to the bolt 15. In the case illustrated the arm 22 has one end secured to a raised portion of the bolt 15 by a screw 23. The arm 22 is preferably electrically or magnetically connected with the bolt 15. The spring arm 22 extends longitudinally of the bolt 15, that is, it extends rearwardly toward the inactive or rear end of the bolt. As illustrated in Fig. 3 of the drawing the spring arm 22 curves or slopes outwardly away from the face of the bolt 15 as it extends rearwardly. The rear end portion of the arm 22 overlies the slot 16.

The electromagnetic means further includes an electromagnetic coil carried by the arm 22. The coil embodies a suitable spool 24 on the outer end of the arm 22. The spool 24 is fixed to the side of the arm 22 which opposes the bolt 15 and the longitudinal axis of the spool is substantially normal to the axis of movement of the bolt 15. The spool 24 may be secured to the arm 22 by any selected means. In the simple case illustrated ears or lugs 27 on the outer end of the spool are formed over and clamped to the arm 22 to fix the spool to the arm. The spool 24 is formed of magnetic material for the reason to be later described. A suitable winding 25 of light wire is provided on the spool 24. The inner end of the spool 24 is preferably flat and the spool is proportioned so that it will not enter the slot 16. Accordingly, the spool 24 has a flat end face adapted to cooperate with the surface of the bolt 15 at the mouth of the slot 16.

In accordance with the invention the spool 24 carries or is provided with a part 26 adapted to enter the slot 16. In practice, the part 26 may be an integral portion of the spool 24. The part 26 projects from the end of the spool 24 and occurs at the end of a diametric key or ridge 9 on the spool end. The ridge 9 is flat sided and proportioned to enter the slot 16 (see Fig. 4). The part 26 is formed and positioned to enter the forward end portion of the slot 16, that is, the end of the slot most remote from the stud 17. This relationship is clearly illustrated in Fig. 3. It may be desired to slope the outer or active face of the part 26 so that its cooperation with the end of the slot 16 resists disengagement from the slot. Fig. 3 of the drawing illustrates the manner in which the surface of the part 26 may be sloped for engagement with the end wall of the slot 16. The parts are formed and related so that the spool 24 freely and entirely clears the stud head 18 when the spool moves into engagement with the bolt 15, thus insuring the engagement of the part 26 in the slot 16. The inner flange portion of the spool 24 may be quite thick to dependably resist distortion and breakage when engaged between the end wall of the slot 16 and the stud head 18, as will be more fully described.

It is to be understood that there is an electro-

magnetic means 10 associated with the lock or latch of each door of the vehicle. Thus, as illustrated in Fig. 1 of the drawing, there are four electromagnetic means 10 for the four doors of the vehicle.

The circuit 11 for the electromagnetic means 10 connects the several coils 25 for simultaneous energization and simultaneous de-energization. The coils 25 of the several electromagnetic means 10 are connected in parallel and it is preferred to connect them in a simple single wire circuit to simplify the installation and reduce the cost. As illustrated in Fig. 1 of the drawing the circuit 11 includes what may be termed a main line 30 extending from the electrical circuit system of the vehicle engine, as will be later described, and passing through the instrument panel or dash board portion of the vehicle. Branches 31 extend from the main line 30 and each branch 31 has an end connected with a terminal of coil 25. The other terminals of the coils 25 are grounded, for example, they may be grounded to the spring arm 22 as at 32, Fig. 3. The leads or branches 31 extending to the coils 25 may have flexible insulated portions running along the spring arms 22 to their respective coils 25. It is preferred to interpose an emergency switch or safety switch 35 in the circuit 11 to permit the operator of the vehicle or a passenger to de-energize the electromagnetic lock means 10 when the vehicle engine is in operation. The switch 35 may be a simple push button switch and is normally closed. The switch 35 may be located at the instrument panel or dash board where it is readily accessible to the driver or operator of the vehicle. It is to be observed that the circuit 11 for the electromagnetic means 10 is extremely simple and easy to install. The branches 31 leading to the respective electromagnetic means 10 may have flexible insulated and protected portions leading from the door frames to the jamb portions of the vehicle doors, (not shown). The single wire circuit 11 is very easily installed in the vehicle body structure at the time of manufacture or even subsequent to the fabrication of the vehicle.

The means 12 is operable to automatically energize the electromagnetic means 10 so that the magnetic attraction or force set up by the coils 25 moves the electromagnetic means to positions where the parts 26 engage in the slots 16 and where the ends of the spools 24 engage the faces of the bolts 15 so that the spools will cooperate with the stud heads 18 to prevent retraction or operation of the bolts 15. The means 12 is associated with the electrical system of the vehicle engine to be energized by the E. M. F. produced by the generator G of the electrical system. It is to be understood that the means 12 may be adapted for employment with electrical engine systems of various kinds; and that the disclosure in the drawing is merely conventional and illustrative. The electrical system of the vehicle as illustrated includes the ignition system 36 having a lead 37 governed by the key controlled ignition switch 38. A lighting circuit including head lamps 39 and a tail lamp 40 has a main lead or feeder lead 41 controlled by a switch 42. The usual storage battery 43 has a lead connected with one terminal of the ammeter 44 and a line 45 extends from the other terminal of the ammeter to the cut out or circuit breaker 46. The generator G has one side grounded and a line 47 extends from the other side of the generator to the circuit breaker 46.

The cut out or circuit breaker 46 may be of

typical or conventional design. As diagrammatically illustrated, the circuit breaker comprises a coil 48 having one pole connected in the line 47 from the generator G and the other pole grounded. The coil 48 operates a movable contact 49. As illustrated, the movable contact 49 is electrically connected in the line 47 from the generator G and when actuated by the coil 48 is adapted to engage a stationary contact 50 forming the terminus of the line 45 from the ammeter 44. When the speed of the generator G reaches the value where the generator voltage is sufficient to energize the coil 48 the contact 49 cooperates with the contact 50 to cut the generator G into the ignition and lighting circuits. This is conventional practice.

The means 12 of the invention includes a stationary contact 51 at the circuit breaker 46 forming the terminus of the line 30 leading to the electromagnetic means 10. A movable contact 52 is electrically connected in the line 47 from the generator G and is adapted to cooperate with the stationary contact 51 when the coil 48 is energized. In practice, the contact 52 may be connected in gang relation to the contact 49 to be closed against the stationary contact 51 when the contact 49 is closed against the contact 50.

In the use or operation of the automatic door lock means of the invention the electromagnetic means 10 remain de-energized so long as the engine of the vehicle remains idle. With the means 10 de-energized the spring arms 22 hold the spools 24 of the electromagnets entirely clear of the slots 16, the parts 26 being clear of or spaced above the slots, as illustrated in Fig. 3. Accordingly, the doors of the vehicle may be opened and closed without interference by the automatic door lock means. When the engine of the vehicle is started and operated to drive the vehicle the generator G is, of course, driven or operated. When the output of the generator G reaches a given value the coil 48 of the circuit breaker 46 is energized. Energization of the coil 48 moves the contact 49 into engagement with the contact 50 to cut the generator into the ignition and lighting circuits of the vehicle and the contact 52 is moved into engagement with the contact 51. Upon engagement of the contact 52 with the contact 51 the circuit 11 is supplied with current from the generator G and the electromagnetic means 10 are all simultaneously energized.

Upon energization of the coils 25 of the means 10 the electromagnets are attracted to the bolts 15. In this connection it will be observed that the magnetic fields or fluxes are concentrated at the parts 26. These concentrated magnetic fields assure the sudden attraction of the spools 24 to the bolts 15 and the spools are attracted to the bolts with such force that the parts 26 fully enter the slots 16. The attraction of the magnetic spools 24 to the bolts 15 brings the ends of the spools against the faces of the bolts so that the ends of the spool lie in the same planes as the stud heads 18. The spools 24 remain in these positions so long as the engine of the vehicle is operated by a sufficient speed to maintain the coil 48 of the circuit breaker 46 energized. With the electromagnetic means 10 energized so that the parts 26 are engaged in the slots 16 the bolts 15 are locked against retraction and the vehicle doors cannot be opened. If an attempt is made to throw a bolt 15 for the purpose of opening the door the spool 24 of that bolt is almost immediately brought into engagement with the

stud head 18. Thus, the lower flange portion of the spool 24 with its part 26 forms a positive stop for preventing retraction of the bolt. It will be observed that the lower flange portion of the spool 24 and the part 26 thereon are subjected to compression between the end of the slot 16 and the stud head 18 and the spool, while quite small, is capable of withstanding very heavy compression or shear forces of this nature without failing or distorting. It is to be observed that all of the door locks or latches are simultaneously locked against opening when the cut out or circuit breaker 46 operates. There is no need for the driver or operator to manipulate parts at the individual locks and the locking means is entirely automatic.

When the speed of the vehicle engine is reduced to below the point where the coil 48 is energized or where the engine is stopped, the cut out or circuit breaker 46 opens so that the circuit to the several electromagnetic means 10 is opened. Upon opening of the circuit to the means 10 the spring arms 22 automatically flex outwardly to disengage the parts 26 from the slots 16 and to bring the spools 24 to positions spaced from and entirely clear of the bolts 15. Thus, the automatic lock means of the several doors are automatically released so that the doors may be opened.

It is to be particularly noted that the automatic lock means of the present invention may be embodied in an automotive vehicle, or the like, with a minimum of expense or alteration. The standard or conventional locks L of the vehicle require no alteration whatsoever. The spring arms 22 carrying the means 10 may be easily and appropriately applied to the locks in such a way that the parts 26 and the coil spools 24 will be engaged between a moving lock part and a stationary lock part. The electromagnetic means 10 are very small so that they may be incorporated in or added to the conventional lock without increasing the size of the lock or the lock case. The circuit 11 for the electromagnetic means 10 may be a single wire circuit as shown and may be easily embodied in the vehicle. The means 12 requires a minimum of alteration to the conventional or standard cut out or circuit breaker 46. The contacts 51 and 52 may be incorporated in the circuit breaker at a minimum cost.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims:

Having described my invention, I claim:

1. In combination with a vehicle having an engine-operated generator, and a door lock having relatively movable parts with opposing surfaces, an electromagnet, means supporting the electromagnet for movement from an idle de-energized position clear of said surfaces to an active energized position where it is attracted to said parts thereby positioning a part of said electromagnet between said surfaces, a circuit for the electromagnet, and a circuit breaker operable to connect said circuit with the output side of the generator when the output of the generator reaches a given value so that the electromagnet is attracted to said parts.

2. In combination with a vehicle having an engine-operated generator, and a door lock having

relatively movable parts with opposing surfaces, an electromagnet, spring means supporting the electromagnet in a position where it will be attracted to said parts to assume a position between said surfaces when the magnet is energized, a circuit for the electromagnet, and a relay operable to connect said circuit with the output side of the generator when the output of the generator reaches a given value.

3. In combination with a vehicle having an engine-operated generator, and a door lock having relatively movable parts with opposing surfaces, an electromagnet, a spring arm on one part normally supporting the electromagnet in a position clear of said surfaces and adapted to yield when the electromagnet is attracted to said parts so that the energized electromagnet assumes a position between said surfaces, a circuit for the electromagnet, and a relay operable to maintain the circuit in connection with the output of the generator so long as the generator output is above a given value, the spring arm automatically returning the electromagnet to the position clear of said surfaces when the circuit is deenergized.

4. In a lock means of the character described a body, a shiftable bolt, the body and bolt having

opposing surfaces, a spring arm on the bolt, an electromagnet on the arm normally clear of said surfaces, and a part on the electromagnet movable between said surfaces when the electromagnet is energized.

5. In a lock means of the character described a body, a shiftable bolt having a slot, a stud on the body received in the slot, the bolt being formed of magnetic material, a spring arm on the bolt, and an electromagnet on the arm attracted to the bolt when energized and having a part adapted to enter the slot in front of the stud to prevent movement of the bolt.

6. In combination with a vehicle having an engine driven generator and a lock having relatively movable parts formed of magnetic material, a relay operated when the output of the generator reaches a given value, a spring arm on one of said parts, an electromagnet on the arm attracted to said parts to prevent relative movement between the same when energized, a circuit for the magnet, and contacts at the relay for connecting said circuit with the output of the generator when the relay is operated.

JOSEPH A. BURGARD.