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None

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(54) Electrically-operated vehicle door latch

(57) Motor vehicle door latch in which a latch bolt (14) is held in latching condition by a pawl (15), a release lever (25) being drive connected to a pawl operating lever (22) only when a locking element in the form of a dog (34) is at a release position coupling the two levers. The levers are pivoted on an axis common to the output shaft (29) of a small rotary D C motor (24) built into the latch housing, the dog being axially displaced along the shaft by a helical drive formation (31) engaging a radial projection (32) on the shaft.

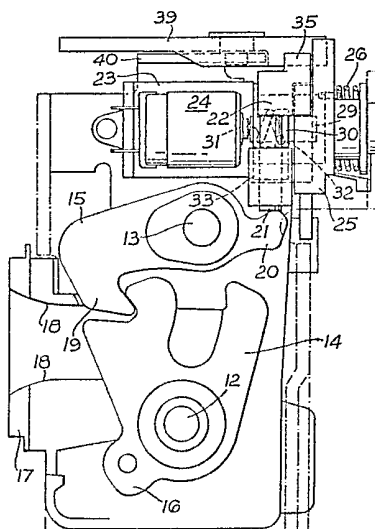


Fig. 1

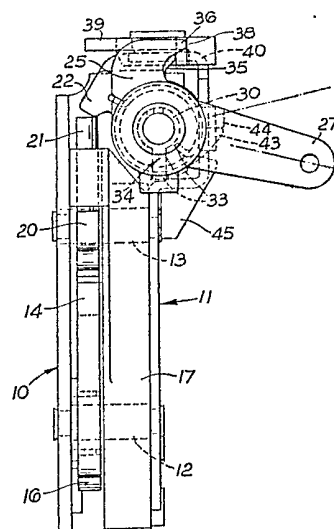


Fig. 2



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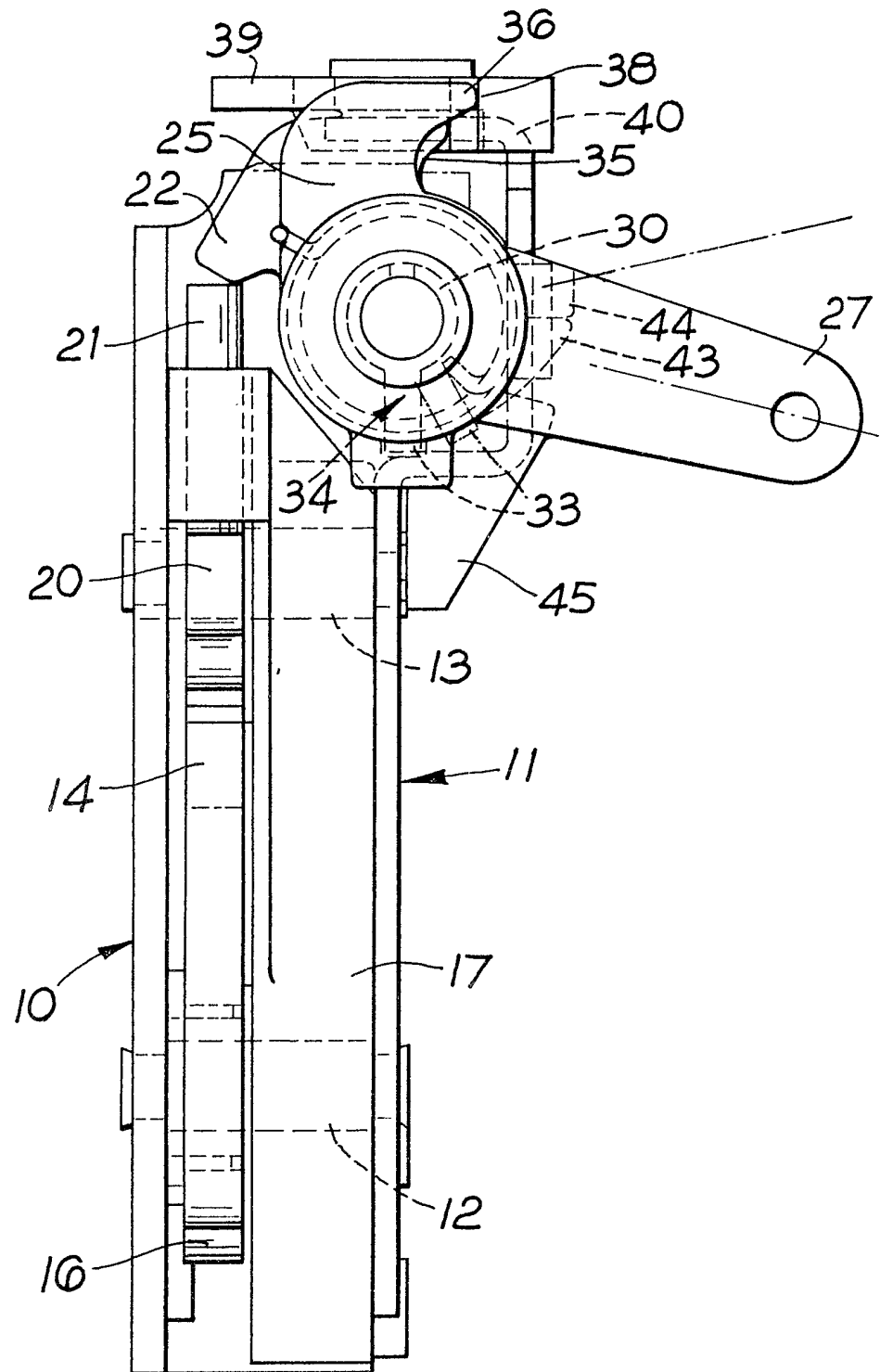


Fig. 2

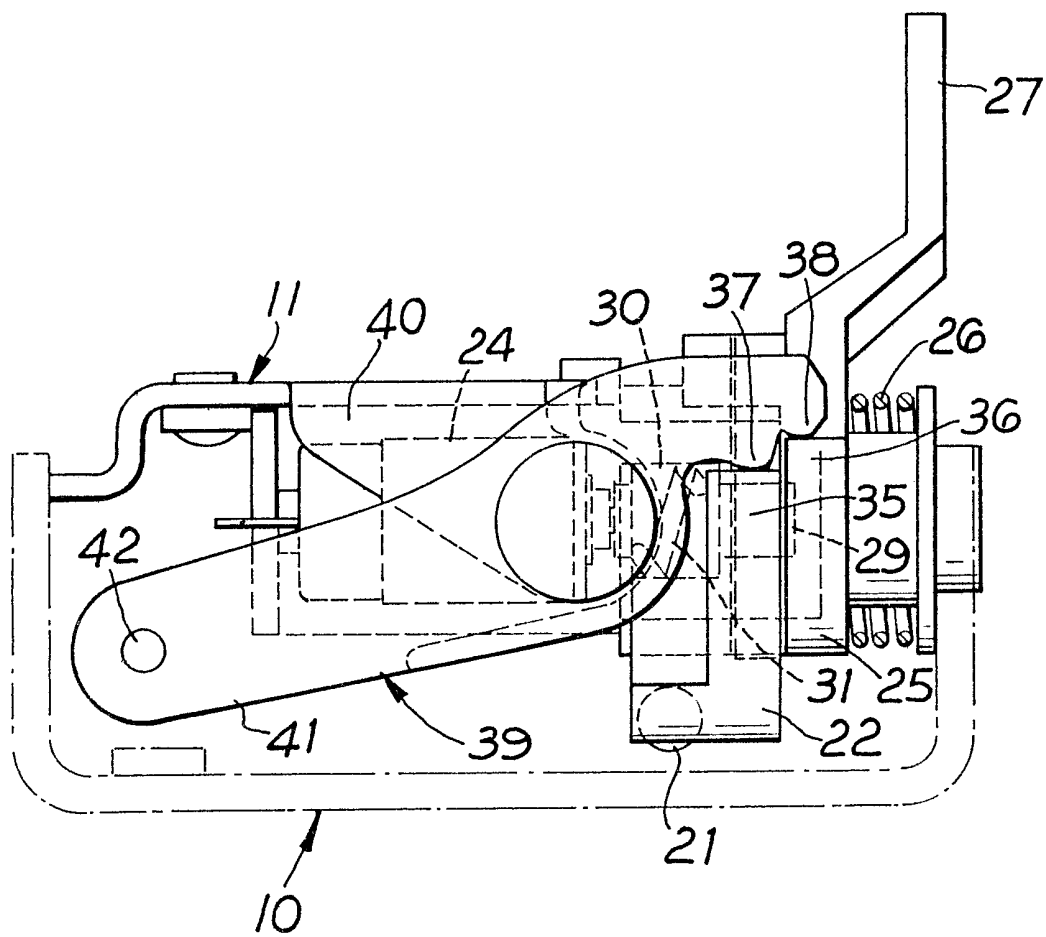


Fig. 3

SPECIFICATION

Electrically-operated vehicle door latch

5 This invention relates to door latches for motor vehicles and has for its object the provision of an improved form of door latch.

More particularly the invention relates to a motor vehicle door latch of the kind which includes a latch bolt for engagement with a striker, a pawl which cooperates with the latch bolt when engaged with the striker to hold the latch bolt in its latching condition, a release lever having means for connection to an outside handle of the vehicle door, and a locking element which is displaceable electrically between a locking position in which drive cannot be transmitted from the outside handle release lever to the pawl and a release position in which drive can be transmitted from the outside handle release lever to the pawl. A latch of the kind referred to above will hereinafter be referred to as an electrically operated latch of the kind specified.

In many existing forms of electrically operated latch of the kind specified, displacement of the locking element is effected by means of a solenoid or motor mounted on a bracket attached to the latch with a linkage interconnecting the solenoid plunger or motor output element and the locking element for displacement of the locking element between its locking and release positions. A disadvantage of this arrangement is that the space requirements for mounting the solenoid or motor are substantial so that, because of the restrictions on availability of space in the region of the latch, it may be necessary to mount the solenoid or motor remote from and separately of the latch thereby involving the use of extended linkages and additional installation operations. A further disadvantage is that the weight of the latch and its electrical actuator is substantial thus having an adverse effect on fuel economy.

It is accordingly an object of the present invention to provide an improved form of electrically operated latch of the kind specified, which offers space and weight-saving advantages as compared to existing latches.

In accordance with the invention there is provided an electrically operated latch of the kind specified in which the outside handle release lever and a pawl operating lever are arranged for rotation about a common axis and the locking element is in the form of a locking dog displaceable between a release position in which the two levers are coupled together and a locking position in which the two levers are not coupled together.

The common axis of rotation of the two levers is preferably the axis of rotation of the output shaft of an electric motor, the motor being contained within a moulded plastics housing which includes a generally cylindrical portion surrounding the motor output shaft and providing bearing mountings for the two levers.

The locking dog preferably includes a generally cylindrical portion which fits over the motor output shaft and is formed with a helical slot which receives a pin projecting radially of the output shaft such that

rotation of the pin is effective to produce axial movement of the dog. In addition to the generally cylindrical portion, the locking dog preferably also includes a blade portion which projects radially for engagement within inwardly facing channels formed in the outside handle release lever and the pawl operating lever, the blade being arranged so that it is continuously disposed within the channel in the pawl operating lever but is movable between a release position in which it projects into the channel in the outside handle release lever and a locking position in which it does not so project.

In addition to the outside handle release lever for effecting movement of the pawl to release the latch when the locking dog is in its release position, movement of the pawl can preferably also be effected by an internal door handle, the latch including a remote control lever connectible by a linkage to the internal handle with the remote control lever positioned in abutting engagement with the pawl operating lever.

The outside handle release lever is preferably acted upon by a return spring to bias it into its normal, non-operated position, the outside handle release lever and the pawl operating lever being provided with cooperating abutments which ensure that, when the operating lever is rotated by means of the remote control lever, the outside handle release lever will also be rotated and the three levers will be returned together to their original positions.

The invention will now be described by way of example with reference to one embodiment thereof which is illustrated in the accompanying drawings in which:-

Figure 1 is a front view of a motor vehicle door latch,

Figure 2 is a side view of the door latch, and
Figure 3 is a plan view of the door latch.

The latch shown in the drawings includes a front cover plate 10 and a back plate 11 between which first and second pivot pins 12 and 13 extend, the first pivot pin 12 providing a mounting for a U-shaped latch bolt 14 and the second pivot pin 13 providing a mounting for a pawl 15. The latch bolt 14 is shaped for engagement with the pawl 15 in either its fully latched position (as shown) or in its first safety position in which the pawl 15 engages the other arm of the U-shaped bolt 14. The bolt 14 is also formed with a lobe 16 which cooperates with electrical contact means to generate an electrical signal when the latch is in its fully latched condition.

The latch bolt 14 and pawl 15 are mounted within a moulded plastics housing 17 which includes cooperating guide wall portions 18 which together define a channel to receive the head of a striker for engagement with the bolt 14 between the two arms of the U-shape of the bolt 14.

The pawl 15 is in the form of a two-armed lever, one arm terminating in a hook formation 19 and the other arm terminating in a nose formation 20 on which rests a moulded plastics plunger 21, the plunger 21 being located within a guide passage formed in the housing 17. The plunger 21 acts as a thrust-transmitting element acting on the nose formation 20 of the pawl 15 for application of forces

generated by rotation of a lever 22. The lever 22 is one of a pair of moulded plastics levers mounted on a generally cylindrical portion of a housing 23 for a small D.C. motor 24. The pawl operating lever 22 is mounted adjacent the motor 24 and the other lever of the pair, namely an outside handle release lever 25, is acted upon by a return spring 26 which surrounds the end of the cylindrical portion of housing 23. The release lever 25 is provided with a projecting arm 27 formed with an aperture 28 for connection by a link (not shown) to the outside handle of the vehicle door.

The output shaft 29 of the motor 24 carries a sleeve 30 in which a helical slot 31 is formed, the slot 31 receiving a radial pin 32 such that, when the output shaft 29 is rotated with the sleeve 30 held against rotation, the sleeve 30 is moved axially of the shaft 29. The sleeve 30 is formed integrally with a blade 33, the sleeve 30 and blade 33 together forming a locking dog 34. When the dog 34 is in one of its limit positions, the blade 33 is contained within a channel in the pawl operating lever 22, this being the locking condition of the latch. When, however, the motor 24 is energised to turn the output shaft 29 through one revolution, the locking dog 34 is moved axially into its other limit position in which the blade 33 is contained partly within the channel in the pawl operating lever 22 and partly within an aligned channel in the outside handle release lever 25. This is the release condition of the latch in which the locking dog 34 couples the two levers 22 and 25 together.

When the locking dog 34 is positioned to couple the two levers 22 and 25 together, rotation of the outside handle release lever 25, an operation of the vehicle outside door handle, is transmitted to the pawl operating lever 22. The plunger 21 transmits movement of the operating lever 22 to the nose portion 20 of the pawl 15 to effect rotation of the pawl in the clockwise direction whereby the hook formation 19 of the pawl 15 is moved clear of the adjacent arm of the U-shaped latch bolt 14 to permit opening of the latch.

The pawl operating lever 22 is formed with a projecting lug 35 and the outside handle release lever 25 is formed with a projecting lug 36, the two lugs 35 and 36 being positioned for engagement by abutment formations 37 and 38 of a remote control lever 39 pivotally mounted on an extension 40 of the back plate 11.

The remote control lever 39 is formed as a plastic moulding and has an arm 41 formed with an aperture 42 for connection by means of a link to the inside door handle. Thus, when the inside door handle is operated to rotate the remote control lever 39, such rotation is transmitted to the pawl operating lever 22 and then, via the plunger 21, to the pawl 15 to release the latch bolt 14. It is to be noted that, as the rotation of the remote control lever 39 is transmitted directly to the pawl operating lever 22 and not via the outside handle release lever 25, rotation of the remote control lever 39 will always be transmitted to the pawl 15 to release the latch regardless of the position of the locking dog 34. Thus the vehicle door can be opened from inside the

vehicle, regardless of whether or not the door has been locked by operation of the motor 24.

The pawl operating lever 22 and the outside handle release lever 25 are provided with cooperating abutments 43 and 44 to ensure alignment of the channels in which the blade 33 of the locking dog 34 is received, the release lever 25 also including a projecting limb 45 which, in the at rest condition of the lever 25, bears against the back plate 11. The spring 26 biases the lever 25 into the position shown in the drawings in which the levers 22 and 25 are positioned with the channels vertically oriented.

The part which is moved by the motor 24 to effect the locking/unlocking action is a small locking dog 34. This is in contrast with prior arrangements in which complete linkage systems are operated by a solenoid or motor. This means that a very small motor can be employed, the motor being contained between the two plates 10 and 11 of the latch. Space and weight-saving is thus achieved and installation of the latch in a vehicle is simplified.

CLAIMS

1. An electrically operated latch of the kind soecified in which the outside handle release lever and a pawl operating lever are arranged for rotation about a common axis and the locking element is in the form of a locking dog displaceable between a release position in which the two levers are coupled together and a locking position in which the two levers are not coupled together.

2. A latch as in Claim 1 wherein a portion of the locking dog is in surrounding relationship to the common axis, the dog being displaceable therealong.

3. A latch as in Claim 1 or 2 including an electric motor having a rotatably driven output shaft, the common axis being the axis of the shaft.

4. A latch as in Claim 3 including a housing of the motor having a generally cylindrical portion surrounding the output shaft, the two levers being pivoted on said portion.

5. A latch as in Claim 2 or 3 wherein the locking dog includes a generally cylindrical portion carried on the output shaft and formed with a helical formation coacting with a radially projecting formation of the shaft whereby rotation of the latter causes axial movement of the dog along the shaft.

6. A latch as in Claim 5 wherein the locking dog includes a blade portion projecting radially from the cylindrical portion to engage inwardly facing channels formed in each lever, the blade portion being continuously engaged in the channel of the pawl operating lever but engaging the channel of the outside handle release lever only when axially moved to the release position.

7. A latch as in any preceding claim including a remote control lever positioned to actuate the pawl operating lever independently of the positioning of the locking dog.

8. A latch as in any precding claim including resilient means acting to bias the outside handle release lever to a normal non-operated position.

9. A latch as in Claim 8 so far as dependent on

Claim 7 wherein the outside handle release lever and the pawl operating lever are provided with cooperating abutments arranged to ensure that when the operating lever is actuated by the remote control

5 lever the outside handle release lever will also be displaced and that the three levers will be returned together to their original positions.

10 10. A motor vehicle door assembly including a latch as in Claim 7, 8 or 9, an outside door handle linked to the outside handle release lever, and an inside door handle linked to the remote control lever.

11. An electrically operated latch substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

15 12. A motor vehicle including a latch as in any of Claims 1 to 9 or 11, or a door assembly as in Claim 10.