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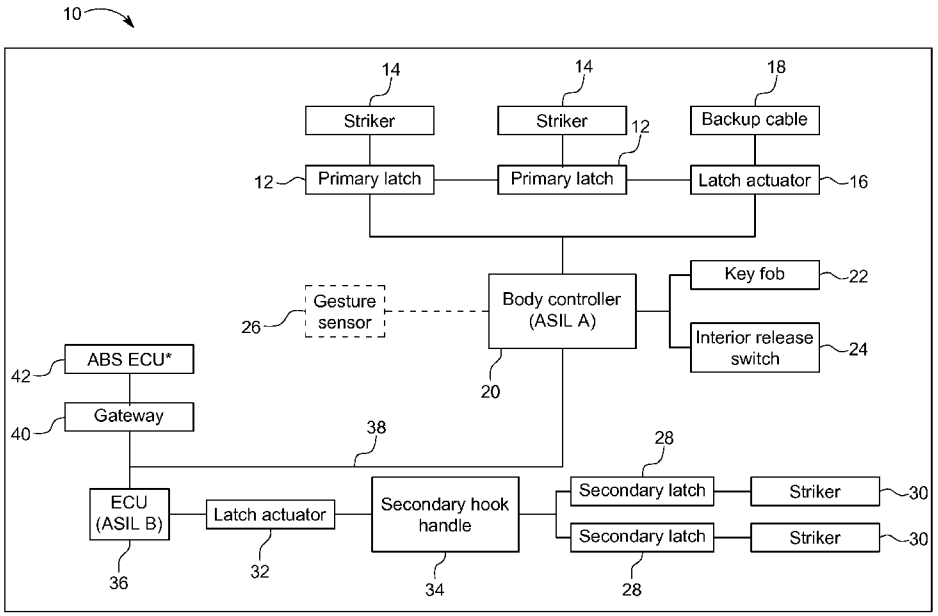


FIG. 1

(57) Abstract: A vehicle (110) with a bonnet release system (10) to selectively permit the bonnet (112) to be opened, the bonnet release system (10) including first and second latch arrangements (12, 28) with first and second controllers (20, 36) to open the respective latch arrangements (12, 28). Opening of the first latch arrangement (12) moves the bonnet to an unlocked but unreleased condition, and opening of the second latch arrangement (28) moving the bonnet to a released condition. The second latch arrangement (28) can only be opened after the first latch arrangement (12) has been opened if one or more required conditions are met, such as a particular time interval occurring between opening of the first and second latch arrangements (12, 28), and the vehicle (10) is not moving.

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A CONTROL SYSTEM FOR A VEHICLE BONNET RELEASE SYSTEM

TECHNICAL FIELD

The present disclosure relates to a control system for a vehicle bonnet release system. In particular, but not exclusively it relates to a vehicle bonnet release system for cars or Sport Utility Vehicle's (SUVs).

Aspects of the invention relate to a control system for a vehicle bonnet release system, the combination of a vehicle bonnet release system for a vehicle and a control system, the combination of a bonnet, a vehicle bonnet release system and a control system, a vehicle with a vehicle bonnet release system and a control system, and a method of controlling a vehicle bonnet release system.

BACKGROUND

The term "bonnet" when used in this specification is to be understood as referring to a closure for an opening at the front of a vehicle. In practice, and for instance in the US, the term "hood" is often used rather than the term "bonnet", and in this specification when the term "bonnet" is used this is intended to also cover a "hood" when this has the same meaning.

In many vehicles the front opening with a bonnet closure provides a space which locates the vehicle's engine, and may also or alternatively locate batteries for the vehicle and/or provide storage space useable for instance for luggage. In a large number of vehicles the bonnet is pivotally mounted to the remainder of the vehicle at a rear edge of the bonnet. One or more latching arrangements will usually be provided along a side edge or edges, and/or along a front edge, of the bonnet, for retaining the bonnet closed.

Particular safety requirements are necessary on a bonnet to prevent inadvertent or unsafe opening. This is especially the case as forwards movement of a vehicle will urge a bonnet with rearwards hinges to an open position, which inter alia can obstruct a driver's vision, producing a hazardous situation.

It is therefore usual to have a dual latching arrangement for bonnets which have to both be released for the bonnet to be opened. Conventionally these were often provided by mechanical arrangements, one operable from within the vehicle, and the other operable from externally of the vehicle, usually adjacent the front edge of the bonnet.

In modern vehicles and especially cars and SUV's, there is a move to make more functions remotely operable, for instance using a key fob, a control in the vehicle, and/or gesture recognition.

SUMMARY OF THE INVENTION

Aspects and embodiments of the invention provide a control system for a vehicle bonnet release system, a vehicle with a bonnet release system, a bonnet release system for a vehicle, and a method of controlling release of a bonnet, a control system for a vehicle bonnet release system, the combination of a vehicle bonnet release system for a vehicle and a control system, the combination of a bonnet, a vehicle bonnet release system and a control system, a vehicle with a vehicle bonnet release system and a control system, and a method of controlling a vehicle bonnet release system, as claimed in the appended claims.

According to an aspect of the invention there is provided a control system for a bonnet release system to selectively permit a bonnet to be opened, the bonnet release system including first and second latch arrangement, with opening of the first latch arrangement moving the bonnet from a first locked condition to a second unlocked but unreleased condition, and with opening of the second latch arrangement moving the bonnet from the second condition to a third released condition in which the bonnet can be opened, the control system includes a first controller to open the first latch arrangement to move the bonnet from the first condition to the second condition, the control system being configured such that the second latch arrangement can only be opened if following actuation of the first controller all of one or more required conditions are detected by the control system.

According to another aspect of the present invention, there is provided a control system for a bonnet release system to selectively permit a bonnet to be opened, the bonnet release system comprising a first latch arrangement and a second latch arrangement such that a

bonnet to which the latch arrangements are applied can be allowed to move between a first, locked, condition and a second, unlocked but unreleased, condition on operation of the first latch arrangement, and between the second condition and a third, released, condition in which a bonnet can be opened on operation of the second latch arrangement, wherein, on receiving a request to allow movement of the bonnet into the third condition, the control system is arranged to operate the second latch arrangement to allow a bonnet to move from the second condition to the third condition only if one or more required conditions are detected by the control system, a required condition being that a request to allow movement of the bonnet to the third condition is received by the control system within a required time period after the control system has operated the first latch arrangement to allow movement of the bonnet from the first condition to the second condition.

This provides the advantage of a secure bonnet release system with built in safety features, and provides the advantage that the bonnet can only be released by a controlled timely operation.

The required time period may have minimum and maximum levels.

A required condition may be that the control system detects that the vehicle is not moving.

This provides the advantage of preventing potentially dangerous opening of the bonnet in a moving vehicle.

The control system may be configured such that if the control system detects that the vehicle is moving and the bonnet is in an unlocked condition, an alarm signal is given.

This provides an indication to a driver that the bonnet is not fully closed.

According to an aspect of the invention there is provided a control system for a bonnet closure–release system for a vehicle to selectively permit the bonnet to be opened and closed, the bonnet closure–release system comprising first and second latch arrangements, wherein operation of the latch arrangements causes a bonnet to be moved between a first locked condition, and a second unlocked but unreleased condition by operation of the first latch arrangement, and between the second condition and a third released condition in

which the bonnet can be opened, by operation of the second latch arrangement, wherein, the control system is arranged to operate at least the first latch arrangement to move the bonnet from the second condition to the first condition, and the control system is arranged to operate the first latch arrangement to cause the bonnet to move from the second condition to the first condition when one or more soft-close conditions are detected.

According to another aspect of the present invention, there is provided a control system for a bonnet closure–release system for a vehicle to selectively permit a bonnet to be opened and closed, the bonnet closure–release system comprising a first latch arrangement and a second latch arrangement such that a bonnet to which the latch arrangements are applied can be moved between a first, locked, condition and a second, unlocked but unreleased, condition by operation of the first latch arrangement, and between the second condition and a third, released, condition in which a bonnet can be opened by operation of the second latch arrangement, wherein, the control system is arranged to operate the first latch arrangement to move a bonnet from the second condition to the first condition when one or more soft-close conditions are detected.

This provides the advantage of a secure bonnet release system with built in safety features.

One of the soft-close conditions may be that the control system has detected that the vehicle is moving.

This provides the advantage of automatic closing of the bonnet if the vehicle is moving.

One of the soft-close conditions may be that the amount of time the bonnet has been in the second condition has exceeded a threshold.

This provides the advantage that the bonnet can only be released by a controlled timely operation.

One of the soft-close conditions may be that the bonnet has moved from the third condition to the second condition.

This prevents the necessisity for slamming the bonnet, or pushing it to the third condition.

The control system may be operable by any of a control on a key fob, a control in the vehicle, or a gesture recognition system.

An alarm signal may be given when one or more soft-close conditions are detected.

A first controller may be provided to operate the first latch arrangement and a second controller provided to operate the second latch arrangement.

The bonnet release system may include a lift arrangement for selectively moving the bonnet between a released condition and a fully open position. The control system may be configured such that upon opening of the second latch arrangement the lift arrangement automatically moves the bonnet to a fully open position.

This provides for remote opening of the bonnet without manual intervention.

The control system may be arranged to receive a close signal and on receiving the close signal the control system is arranged to control the lift arrangement to move the bonnet to the second condition.

This provides for remote closing of the bonnet without manual intervention.

The control system may be configured such that if an obstruction is detected as the lift arrangement is moving the bonnet between the third released condition and a fully open position, the lift arrangement will stop moving the bonnet.

This prevents a person's hand, other part of their body or another item being trapped by the closing bonnet, or the bonnet being forced against a person or other obstruction.

According to a further aspect of the invention there is provided a combination of a bonnet closure-release system for a vehicle, for selectively permitting a bonnet to be opened,

the bonnet closure-release system comprising a first latch arrangement, and a second latch arrangement, wherein a bonnet to which the latch arrangements are applied can be allowed to move between a first, lock, condition, and a second, unlocked but

unreleased, condition by operation of the first latch arrangement, and between the second condition and a third, released, condition in which the bonnet can be opened, by operation of the second latch arrangement,

and a control system according to any of the preceding paragraphs.

Separate electronic control units may be provided for the first and second controllers.

According to a further aspect of the present invention, there is provided the combination of a bonnet and a bonnet closure-release system according to the preceding paragraphs.

According to a further aspect of the present invention, there is provided a vehicle comprising one or more of the control system of any preceding paragraph, and the combination of the preceding paragraphs.

Manual back-up systems may be provided for the first and/or second latch arrangements.

This provides the advantage that the bonnet can still be opened in the event of a loss of power or other vehicle failure.

The first and second latch arrangements may be provided by one or more single latch units. The or each latch unit may include a latching member selectively moveable between three positions, namely in which an associated bonnet would be in a first, locked, condition, a second, unlocked but unreleased, condition, or a third, release, condition.

According to a yet further aspect of the invention there is provided a method of controlling release of a vehicle bonnet, the method comprising after opening of a first latch arrangement, only permitting opening of a second latch arrangement if all of one or more required conditions are detected.

According to a further aspect of the present invention, there is provided a method of controlling selective release of a vehicle bonnet by a bonnet release system, the bonnet release system comprising a first latch arrangement and second latch arrangement such that a bonnet to which the latch arrangements are applied can be allowed to move between a first, locked, condition and a second, unlocked but unreleased, condition on operation of the

first latch arrangement, and between the second condition and a third, released, condition in which a bonnet can be opened on operation of the second latch arrangement, the method comprising permitting operation of the second latch arrangement to allow a bonnet to move from the second condition to the third condition only if one or more required conditions are detected, a required condition being that the request is received within a required time period after operation of the first latch arrangement to allow movement of a bonnet from the first condition of the second condition.

The required time period may have minimum and maximum levels.

The method may comprise monitoring whether the vehicle is moving, and a required condition being that it had been detected that the vehicle is not moving.

According to a yet further aspect of the invention there is provided a method of controlling selective closure of a vehicle bonnet by a bonnet closure-release system,

the bonnet closure-release system comprising a first latch arrangement and a second latch arrangement such that a bonnet to which the latch arrangement are applied can be allowed to move between a first, locked, condition and a second, unlocked but unreleases, condition on operation of the first latch arrangement, and between the second condition and a third, released, condition in which a bonnet can be opened on operation of the second latch arrangement,

the method comprising operating the first latch arrangement to move a bonnet from the second condition to the first condition when one or more soft-close conditions are detected.

The method may comprise monitoring whether the vehicle is moving, and wherein one of the soft-close conditions is that it has been detected that the vehicle is moving.

The method may comprise determining the amount of time the bonnet has been in the second condition, wherein one of the soft-close conditions is that the amount of time the bonnet has been in the second condition has exceeded a threshold.

The method may comprise determining whether the bonnet has been moved from the third condition to the second condition, and wherein one of the soft-close conditions is that the bonnet has moved from the third condition to the second condition.

According to an additional aspect of the invention there is provided a vehicle with a hood closure release system, the system including first and second latching means, such that unlatching of the first latching means moves the hood to an unlocked condition, and unlatching of the second opening means moves the hood to a released condition in which the hood can be opened, first control means being provided to open the first latching means, the system including verification means which detects whether all of one or more required conditions have been met, and if so permits the second latching means to be opened subsequent to opening of the first latching means.

Within the scope of this application it is expressly intended that the various aspects, embodiments, examples and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings, and in particular the individual features thereof, may be taken independently or in any combination. That is, all embodiments and/or features of any embodiment can be combined in any way and/or combination, unless such features are incompatible. The applicant reserves the right to change any originally filed claim or file any new claim accordingly, including the right to amend any originally filed claim to depend from and/or incorporate any feature of any other claim although not originally claimed in that manner.

BRIEF DESCRIPTION OF THE DRAWINGS

One or more embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a block diagram of an embodiment of the invention;

Fig. 2 is a similar view to Fig. 1 but of a further embodiment of the invention;

Fig. 3 is a similar view to Fig. 1 but of a still further embodiment of the invention;

Fig. 4 is an activity diagram illustrating operation of the embodiment of Fig. 1;

Fig. 5 is an activity diagram illustrating operation of a yet further embodiment of the invention;

Fig. 6 is a diagrammatic view of the front part of a vehicle with an open bonnet;

Fig. 7 is a similar view to Fig. 6 but with the bonnet closed;

Figs. 8, 9 and 10 are diagrammatic cross sectional views through a latch arrangement respectively in locked, unlocked and released conditions; and

Figs. 11 to 14 are diagrammatic cross sectional views through part of a latch arrangement respectively in locked, unlocked and moving back to a locked condition in two forms.

DETAILED DESCRIPTION

The Figures illustrate a bonnet release system 10 to selectively permit the bonnet 112 to be opened, the bonnet release system 10 including first and second latch arrangements 12, 28, with opening of the first latch arrangement 12 moving the bonnet 112 to an unlocked condition, and with opening of the second latch arrangement 28 moving the bonnet from an unlocked condition to a released condition in which the bonnet 112 can be opened, with a first controller 20, to open the first latch arrangement 12, the system 10 being configured such that the second latch arrangement 28 can only be opened if following actuation of the first controller 20 all of one or more required conditions are detected by the system 10.

Fig. 1 shows a bonnet release system 10. The system 10 includes two first latches 12 with strikers 14. A back up manual primary latch actuator 16 is provided with a cable 18, which could for instance be operable from within a vehicle. A first controller 20 in the form of an electronic control unit is provided. The first controller 20 can receive a signal to open the first latches 12 from any of a key fob 22, interior release switch 24 or gesture sensor system 26.

Two second latches 28 are provided each with a striker 30. The second latches 28 are connected to a manual actuator 32 with for instance a handle 34 accessible under the lip of

a bonnet once the first latches 12 have been released. A second controller 36 in the form of a further electronic control unit is connected to the second latches 28 and also has a connection 38 to the first controller 20. The second controller 36 is connected to a vehicle gateway 40 and to the anti-lock braking system electronic control unit 42 which can detect the vehicle's speed.

Fig. 4 shows an activity diagram illustrating operation of the system 10. Moving downwards from the top 44 of the activity diagram, a user actuates 46 the first controller 20 with any of a key fob 22, interior release switch 24 or gesture sensor system 26. A check 48 is made as to whether the first latch arrangement 12 is in a locked condition, which would indicate that the bonnet is in a first, locked, condition. If not 50, i.e it is open, no system input is provided. If the first latch arrangement 12 is locked 52, the first controller 20 causes the first latches 12 to open or disengage 54, and the bonnet moves from the first condition to a second, unlocked, condition.

A check 56 is then made by the second controller 36 interrogating the ABS electronic control unit 42 to see if the vehicle is moving. If the vehicle is moving a user will receive a warning signal 58 that the bonnet is not in a fully closed/locked condition. The secondary latches 28 will remain engaged 60, and the bonnet will remain 62 in an unlocked condition 64. If a request is made to move the bonnet from the second condition to the first condition, it will not be carried out as a required conditions (i.e. the vehicle not moving) has not been detected by the system.

If it is detected 66 within a set time period or interval after actuation of the first latches 12 that a signal 68 is provided to actuate the secondary latches 28, again provided from a key fob 22, interior release switch 24 or by a gesture sensor system 26, then the secondary latches 22 will be disengaged 70 and the bonnet moved from the second condition to a third, released, condition 72 such that it can be opened 74. If no such signal is received within the required time period, the secondary latches 28 will remain engaged 76 and the bonnet will be retained 78 in the unlocked condition 80. The time period may include a minimum and maximum level. Detection within a set time period is thus a further required condition to allow the second latch to be operated to allow movement of the bonnet from the second condition to the first condition.

A further system 82 is shown in Fig. 2 which is similar to the system 10 except in two aspects, and the same reference numerals are used for similar parts. In the first aspect a soft close arrangement is provided on the first latches 84. This means that in addition to the first latches 84 being electrically operable to move the bonnet to an unlocked condition, the soft close arrangement can move the bonnet back to a locked condition.

The second different aspect is that in this instance the second latches are manually operable by use of the manual handle 34. It is to be realised though that for some instances the second latches could also be operated electrically as per the first system described above.

Fig. 5 is a similar activity diagram to Fig. 4 but illustrating operation of a system similar to the system 10 except that the primary latches have soft close arrangements as described above in relation to the further system 82.

This system will operate in a similar way to the system 10 except in relation to the soft close arrangement, as described in relation to Fig. 5.

There follows a description of a number of soft close conditions which, if detected, will lead to the control system operating the first latch arrangement to move the bonnet from the second condition to the first condition, i.e. to operate the soft-close arrangement automatically.

If it is detected 86 by the first controller 20 from a signal from the anti-lock braking system electronic control unit 42 via the gateway 40, or by some other suitable means, that the vehicle is moving, the soft close arrangement will automatically be actuated 88 to move the first latches 84 back to a locked condition 90.

If the second latches 28 are not actuated within a predetermined time period 92, i.e. the amount of time that the bonnet has been in the second condition exceeds a threshold, then the soft close arrangement will automatically operate 94 reverting the first latches 84 back to a locked condition 96.

The soft close arrangement also means that when the bonnet is being closed it can be lowered from the third condition to the second condition where the second latches 28

engage. The soft close arrangements will then cause the first latches 84 to engage. This means that it is not necessary for the bonnet to be slammed or dropped as conventionally can occur, which can lead to injury and/or damage to the bonnet. Thus another soft close condition is that it is detected that the bonnet has moved from the third condition to the second condition or that the second latch has been operated such that the bonnet would be expected to have been moved from the third condition to the second condition.

If it is detected 86 by the first controller 20 from a signal from the anti-lock braking system electronic control unit 42 via the gateway 40, or by some other suitable means, that the vehicle is moving, the soft close arrangement will automatically be actuated 88 to move the first latches 84 back to a locked condition 90.

There follows a description of a number of power lock conditions which, if detected, will lead to the control system operating the first latch arrangement to move the bonnet from the second condition to the first condition.

If the second latches 28 are not actuated within a predetermined time period 92, then the soft close arrangement will automatically operate 94 reverting the first latches 84 back to a locked condition 96.

The soft close arrangement also means that when the bonnet is being closed it can be lowered from the third condition to the second condition where the second latches 28 engage. The soft close arrangements will then cause the first latches 84 to engage. This means that it is not necessary for the bonnet to be slammed or dropped as conventionally can occur, which can lead to injury and/or damage to the bonnet.

Fig. 3 shows a still further system 98 which is similar to a combination of the systems 10 and 82 in having electrically operated first 84 and second 28 latches, with soft close arrangements on the first latches 84. In this arrangement a lift arrangement or power struts 100 connected to the bonnet and vehicle with a spindle drive 102 and operated by a further electronic control unit 104 are provided. The further electronic control unit 104 is connected to the first control unit 20 and first latches 84. This system 98 will operate in a similar way to the system 82, but if a signal is provided to open the second latches 28, and the vehicle is detected as not moving and this second signal is provided within the required interval after

the first signal, then immediately after the second latches 28 have been released moving the bonnet to a released condition, the spindle drive 102 will be actuated moving the bonnet, by the power struts 100, to a fully open condition.

A close switch 106 is also provided which is connected to the further electronic control unit 104 such that if a close signal or control is given by the close switch 106 or by an appropriate gesture sensor, or another appropriate means, the spindle drive 102 and power struts 100 will close the bonnet, causing the secondary latches 28 to close, and the soft close arrangement will close the first latches 84. Anti-pinch strips 108 are provided to cause the spindle drive 102 to stop and be reversed if it is detected that there is an obstruction in the way of the closing bonnet, such as a person's fingers or another part of their body.

The time interval during which the system will allow the second latches to open may be chosen as required, and may be 40 seconds. A minimum time interval may also be required for instance to enable the first latch arrangements to fully open.

Figs. 6 and 7 show the front of a vehicle 110 with a bonnet 112 in which a latch unit 114 is shown, retaining the bonnet 112 closed in Fig. 7. A single latch unit 114 could be provided, or in many instances two latch units 114 are provided, one on each side of the bonnet 112.

Figs. 8, 9 and 10 diagrammatically show a combined latch unit 116 which provides the first and second latch arrangements. The unit 116 includes a latch member 118 which extends from the bonnet 112 and an inner first hook 120 which provides the first latch arrangement, and an outer second hook 122 which provides the second latch arrangement. The first and second hooks 120, 122 are slidable laterally as shown between a locked condition towards the left as shown in the drawings, and an unlocked condition towards the right as shown in the drawings.

Fig. 8 shows the position where the latch unit 114 is fully closed, with both hooks 120, 122 engaging with the latch member 118. In Fig. 9 the first latch arrangement has been opened by the first hook 120 moving to the right, meaning that the latch member 118 which is sprung away from the hooks 120, 122 has sprung such that only the outer second hook 122 engages with the latch member 118. Fig. 10 shows the condition where the second hook 122 has also been disengaged moving the bonnet 112 to a released condition.

To lock the bonnet 112, the latch unit 114 will be moved downwardly as shown such that the first and second hooks 120, 122 again engage with the latch member 118. Where a soft close arrangement is provided, the latch member 118 and hence bonnet 112 will be pulled downwardly from for instance the position shown in Fig. 9 to the position shown in Fig. 8 to fully lock the bonnet 112 closed.

Figs. 11 to 14 show part of a soft close arrangement 130 with a second hook 112 extending through an opening 132 in part of the vehicle bodywork, and arranged such that in a fully closed position as shown in Fig. 11 the lower end 134 of the hook 122 is located beneath a part 136 of the bodywork. When the bonnet moves to an unlocked but unreleased condition, the bonnet will move upwardly but the hook 122 will engage with the part 136 of the bodywork as shown in Fig. 12 to prevent full opening of the bonnet. To fully open the bonnet a release lever (not shown) for the second hook 122 will be pulled, aligning the hook 122 with the opening 132 in the bodywork such that the bonnet can be fully opened.

Fig. 13 shows the second hook 122 being pulled downwardly by a pivoted cranked operating arm 138 such that the bonnet will move to a fully closed condition, thereby providing a soft close for the bonnet. The arm 138 is pivotally moved by a cable 140 pulled by an actuator 142. The cable connects to a control arm 144 which is coaxially pivoted with the operating arm 138, with a spring 146 engaging between the operating arm 138 and the control arm 144.

Fig. 14 shows a position where an obstruction such as a person's fingers is located between the vehicle bodywork and the bonnet. In this instance during a potential soft close of the bonnet, rather than crushing the person's fingers the spring will be compressed such that the control arm 144 pivots further but the operating arm 138 does not. This therefore provides an anti-pinch arrangement.

There are thus described systems which provide for improved and safer opening and closing of bonnets, whilst maintaining a secure arrangement to prevent inadvertent or dangerous opening of the bonnet. The soft close arrangement means that the bonnet can be locked and closed mechanically without the requirement for manual pushing, or for slamming to take place. This soft close arrangement also means that if the secondary latches are not opened

the bonnet can be fully locked. The soft close arrangement also permits safe remote opening and closing of the bonnet to take place.

Although embodiments of the present invention have been described in the preceding paragraphs with reference to various examples, it should be appreciated that modifications to the examples given can be made without departing from the scope of the invention as claimed. For example it may only be necessary to provide a single first and/or second latch, or more than two of such latches may be provided. Different control arrangements for the systems could be provided. Latch arrangements may be provided which operate to allow a bonnet to move into different conditions, not by opening and closing, but by other retaining and release mechanisms.

An alarm signal may be given to indicate that a required condition for operating the second latch to allow the bonnet to move from the second condition the third condition has not been detected, e.g. an alarm signal may be given if the vehicle is moving or if a request to operate the second latch arrangement is not received within a set time period.

Features described in the preceding description may be used in combinations other than the combinations explicitly described.

Although functions have been described with reference to certain features, those functions may be performable by other features whether described or not.

Although features have been described with reference to certain embodiments, those features may also be present in other embodiments whether described or not.

Whilst endeavoring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

CLAIMS

1. A control system for a bonnet release system to selectively permit a bonnet to be opened,

the bonnet release system comprising a first latch arrangement and a second latch arrangement such that a bonnet to which the latch arrangements are applied can be allowed to move between a first, locked condition and a second, unlocked but unreleased, condition on operation of the first latch arrangement, and between the second condition and a third, released, condition in which a bonnet can be opened on operation of the second latch arrangement,

wherein, on receiving a request to allow movement of the bonnet into a third condition, the control system is arranged to operate the second latch arrangement to allow a bonnet to move from the second condition to the third condition only if one or more required conditions are detected by the control system, a required condition being that a request to allow movement of the bonnet to the third condition is received by the control system within a required time period after the control system has operated the first latch arrangement to allow movement of the bonnet from the first condition to the second condition.

2. A control system according to claim 1, in which the required time period has minimum and maximum levels.

3. A control system according to any of the preceding claims, in which a required condition is that the control system detects that the vehicle is not moving.

4. A control system according to claim 3, in which if the control system detects that the vehicle is moving and the bonnet is in the second condition, an alarm signal is given.

5. A control system for a bonnet closure-release system for a vehicle to selectively permit the bonnet to be opened and closed, the bonnet closure-release system comprising first latch arrangement and a second latch arrangement such that a bonnet to which the latch arrangements are applied can be moved between first, locked, condition and a second, unlocked but unreleased, condition by operation of the first latch arrangement, and between the second condition and a third, released, condition in which a bonnet can be opened by operation of the second latch arrangement.

wherein, the control system is arranged to operate the first latch arrangement to move a bonnet from the second condition to the first condition when one or more soft-close conditions are detected.

6. A control system according to claim 5, wherein one of the soft-close conditions is that the control system has detected that the vehicle is moving.

7. A control system according to claims 5 or 6, in which one of the soft-close conditions is that the amount of time the bonnet has been in the second condition has exceeded a threshold.

8. A control system according to any of claims 5 to 7, in which one of the soft-close conditions is that the bonnet has moved from the third condition to the second condition.

9. A control system according to any of claims 5 to 8, in which an alarm signal is given when one or more soft-close conditions are detected.

10. A control system according to any of the preceding claims, operable by any of a control on a key fob, a control in the vehicle, or a gesture recognition system.

11. A control system according to any of the preceding claims, in which a first controller is provided to operate the first latch arrangement and a second controller is provided to operate the second latch arrangement.

12. A control system according to any of the preceding claims, in which the bonnet closure-release system comprises a lift arrangement for selectively moving the bonnet between the third condition and a fully open position, wherein the control system is arranged to control the lift arrangement such that upon operation of the second latch arrangement to allow movement of the bonnet from the second condition to the third condition, the lift arrangement is automatically controlled to move the bonnet to a fully open position.

13. A control system according to claim 12, in which the control system is arranged to receive a close signal and on receiving the close signal the control system is arranged to control the lift arrangement to move the bonnet to the second condition.

14. A control system according to claims 12 or 13, such that if an obstruction is detected as the lift arrangement is moving the bonnet between the third condition and a fully open condition, the control system is arranged to control the lift arrangement to stop moving the bonnet.

15. The combination of a bonnet closure-release system for a vehicle, for selectively permitting a bonnet to be opened,

the bonnet closure-release system comprising a first latch arrangement, and a second latch arrangement, wherein a bonnet to which the latch arrangements are applied can be allowed to move between a first, lock, condition, and a second, unlocked but unreleased, condition by operation of the first latch arrangement, and between the second condition and a third, released, condition in which the bonnet can be opened, by operation of the second latch arrangement,

and a control system according to any preceding claim.

16. A bonnet closure-release system according to claim 15 when dependent on claim 11, in which separate electronic control units are provided for the first and second controllers.

17. The combination of a bonnet and the combination of claims 15 or 16.

18. A vehicle comprising one or more of the control system of any of claims 1 to 14, the combination of claims 15 or 16, and the combination of claim 17.

19. A vehicle according to claim 18, in which manual back-up systems are provided for the first and second latch arrangements.

20. A vehicle according to claims 18 or 19, in which the first and second latch arrangements are provided by one or more single latch units.

21. A vehicle according to claim 20, in which the or each latch unit includes a latching member selectively moveable between three positions, namely in which an associated bonnet would be in a first, locked, condition, a second, unlocked but unreleased, condition, or a third, release, condition.

22. A method of controlling selective release of a vehicle bonnet by a bonnet release system, the bonnet release system comprising a first latch arrangement and second latch arrangement such that a bonnet to which the latch arrangements are applied can be allowed to move between a first, locked, condition and a second, unlocked but unreleased, condition on operation of the first latch arrangement, and between the second condition and a third, released, condition in which a bonnet can be opened on operation of the second latch arrangement,

the method comprising permitting operation of the second latch arrangement to allow a bonnet to move from the second condition to the third condition only if one or more required conditions are detected, a required condition being that the request is received within a required time period after operation of the first latch arrangement to allow movement of a bonnet from the first condition of the second condition.

23. A method according to claim 22, in which the required time period has minimum and maximum levels.

24. A method according to claims 22 or 23, comprising monitoring whether the vehicle is moving, and a required condition being that it had been detected that the vehicle is not moving.

25. A method of controlling selective closure of a vehicle bonnet by a bonnet closure-release system,

the bonnet closure-release system comprising a first latch arrangement and a second latch arrangement such that a bonnet to which the latch arrangement are applied can be allowed to move between a first, locked, condition and a second, unlocked but unreleases, condition on operation of the first latch arrangement, and between the second condition and a third, released, condition in which a bonnet can be opened on operation of the second latch arrangement,

the method comprising operating the first latch arrangement to move a bonnet from the second condition to the first condition when one or more soft-close conditions are detected.

26. A method according to claim 25, comprising monitoring whether the vehicle is moving, and wherein one of the soft-close conditions is that it has been detected that the vehicle is moving.

27. A method according to claims 25 or 26, comprising determining the amount of time the bonnet has been in the second condition, wherein one of the soft-close conditions is that the amount of time the bonnet has been in the second condition has exceeded a threshold.

28. A method according to any of claims 25 to 27, comprising determining whether the bonnet has been moved from the third condition to the second condition, and wherein one of the soft-close conditions is that the bonnet has moved from the third condition to the second condition.

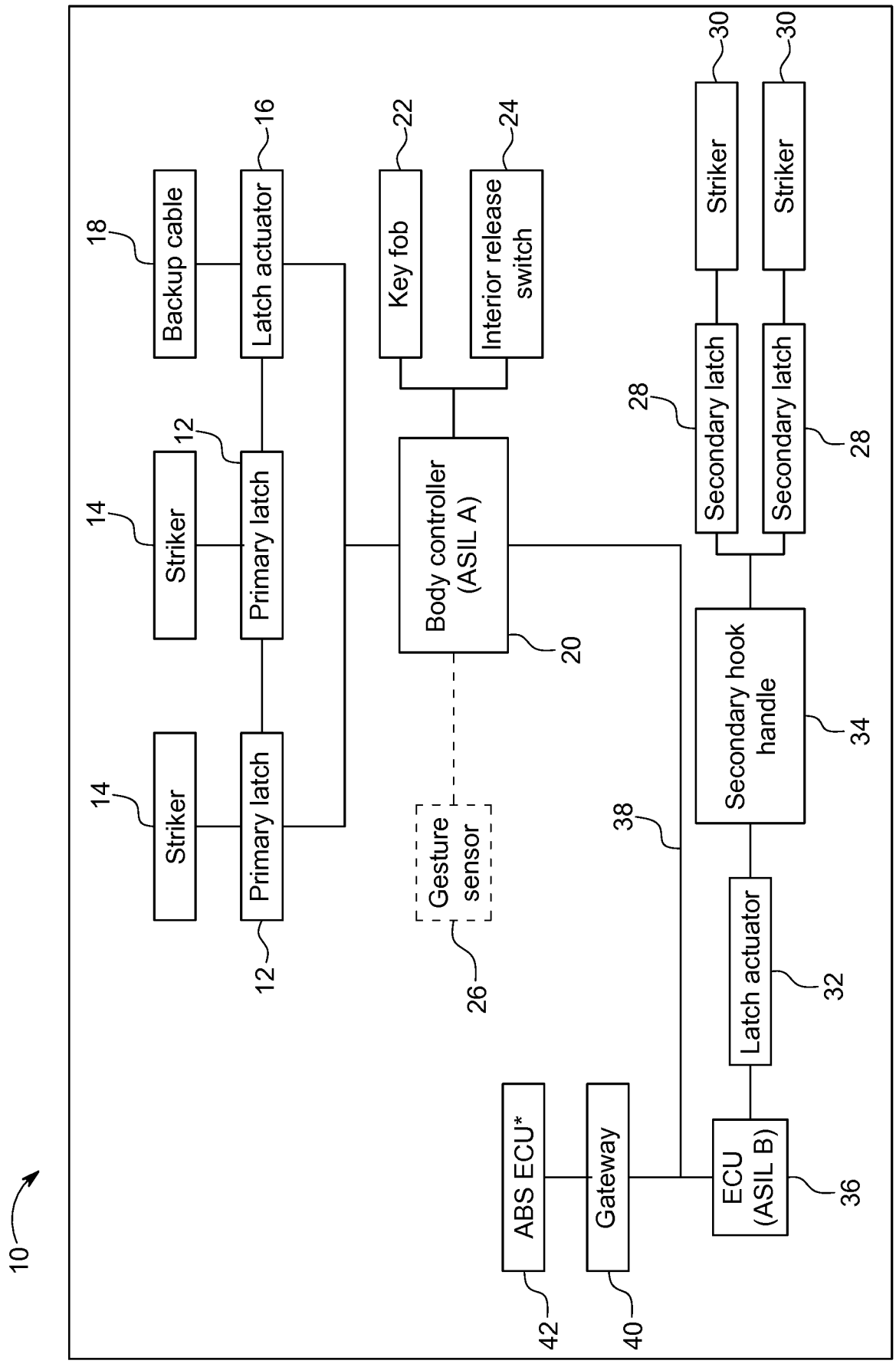

10
Backup cable
18
Latch actuator
16
Key fob
22
Interior release switch
24
Striker
30
Striker
30
Striker
14
Primary latch
12
Striker
14
Primary latch
12
Body controller (ASIL A)
20
Secondary latch
28
Secondary latch
28
Gesture sensor
26
Secondary hook handle
34
38
Latch actuator
32
ABS ECU*
42
Gateway
40
ECU (ASIL B)
36

FIG. 1

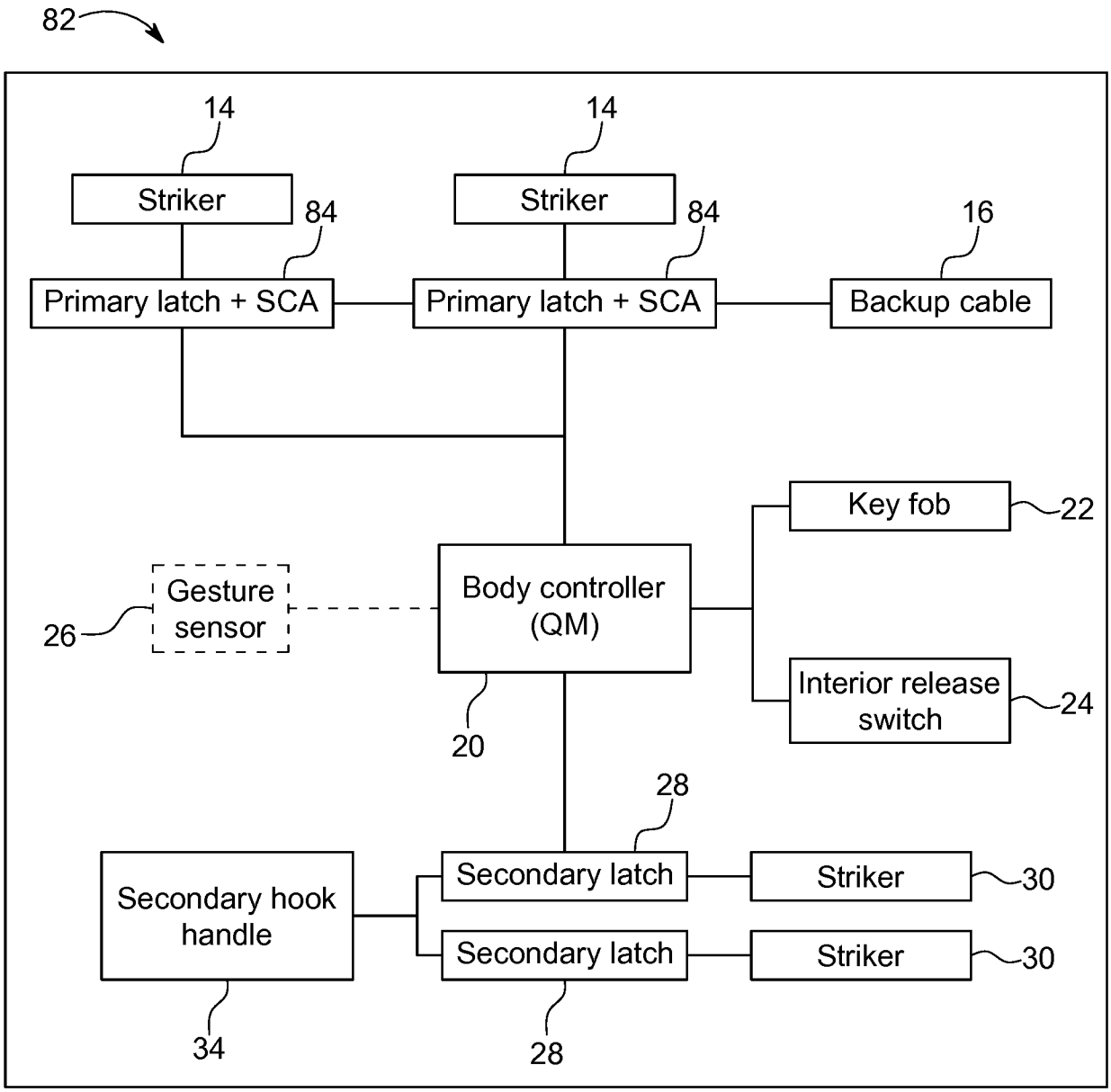

82
14
Striker
84
Primary latch + SCA
14
Striker
84
Primary latch + SCA
16
Backup cable
Key fob
22
Gesture sensor
26
Body controller (QM)
20
Interior release switch
24
28
Secondary hook handle
34
Secondary latch
Striker
30
Secondary latch
28
Striker
30

FIG. 2

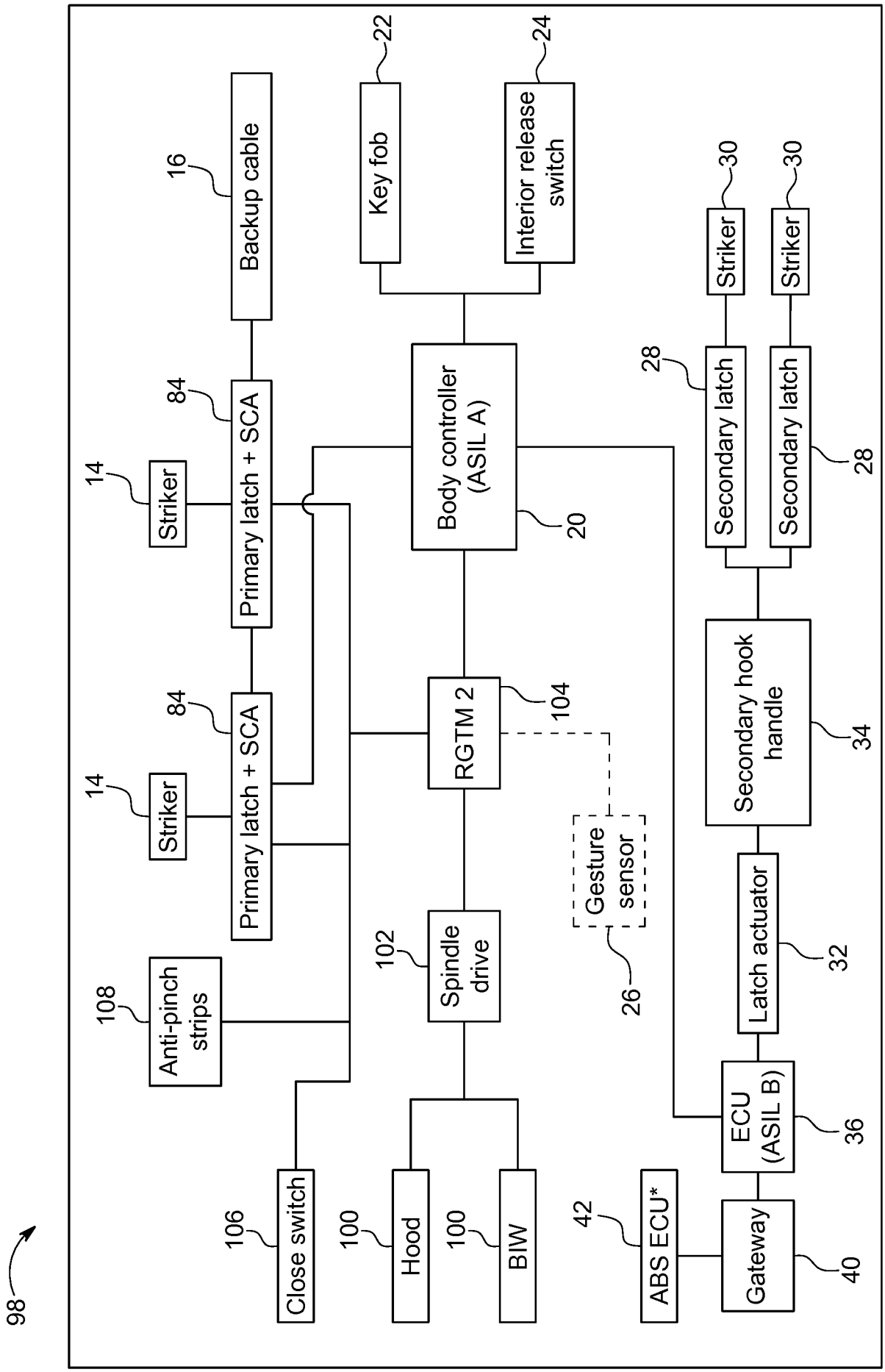

98
Backup cable
16
Key fob
22
Interior release switch
24
Striker
30
Striker
30
Secondary latch
28
Secondary latch
28
Body controller (ASIL A)
20
84
Primary latch + SCA
14
Striker
84
Primary latch + SCA
14
Striker
RGTM 2
104
Secondary hook handle
34
Gesture sensor
26
Latch actuator
32
Anti-pinch strips
108
Spindle drive
102
ECU (ASIL B)
36
Close switch
106
Hood
100
BIW
100
ABS ECU*
42
Gateway
40

FIG. 3

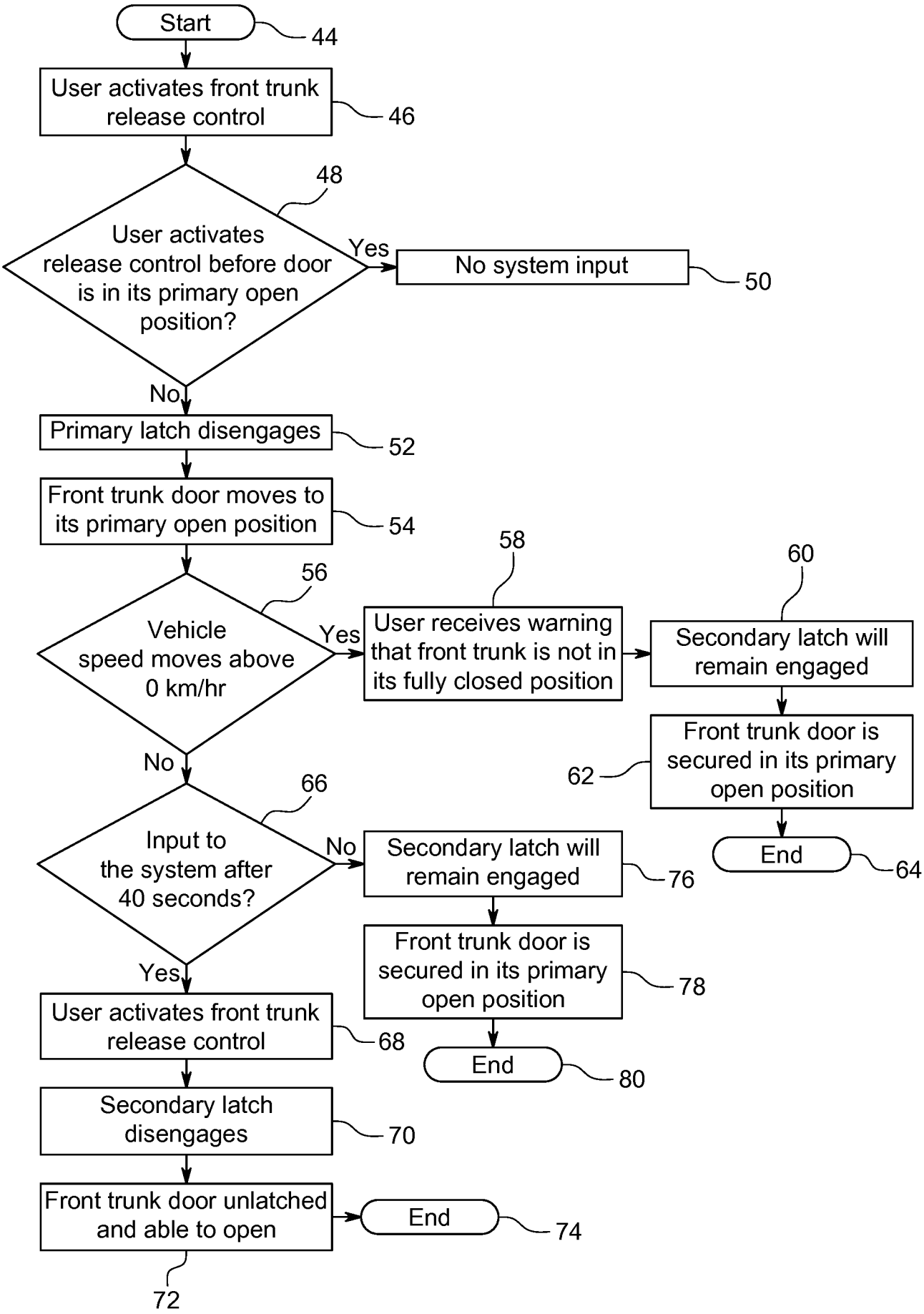

Start
44
User activates front trunk release control
46
48
User activates release control before door is in its primary open position?
Yes
No system input
50
No
Primary latch disengages
52
Front trunk door moves to its primary open position
54
56
Vehicle speed moves above 0 km/hr
Yes
58
User receives warning that front trunk is not in its fully closed position
60
Secondary latch will remain engaged
Front trunk door is secured in its primary open position
62
End
64
No
66
Input to the system after 40 seconds?
No
Secondary latch will remain engaged
76
Front trunk door is secured in its primary open position
78
End
80
Yes
User activates front trunk release control
68
Secondary latch disengages
70
Front trunk door unlatched and able to open
End
74
72

FIG. 4

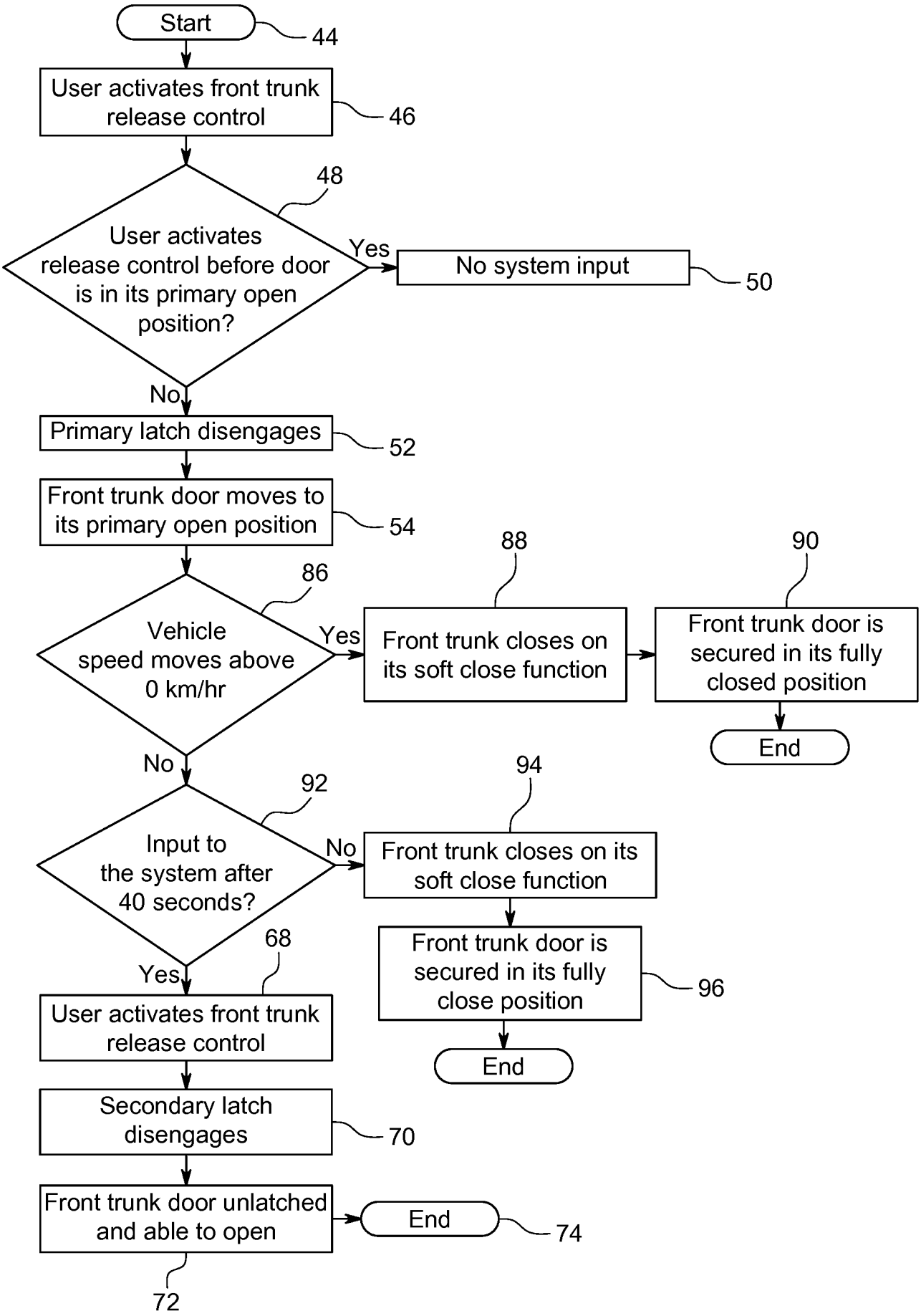

Start
44
User activates front trunk release control
46
48
User activates release control before door is in its primary open position?
Yes
No system input
50
No
Primary latch disengages
52
Front trunk door moves to its primary open position
54
86
Vehicle speed moves above 0 km/hr
Yes
88
Front trunk closes on its soft close function
90
Front trunk door is secured in its fully closed position
End
No
92
Input to the system after 40 seconds?
No
94
Front trunk closes on its soft close function
Front trunk door is secured in its fully close position
96
End
Yes
68
User activates front trunk release control
Secondary latch disengages
70
Front trunk door unlatched and able to open
End
74
72

FIG. 5

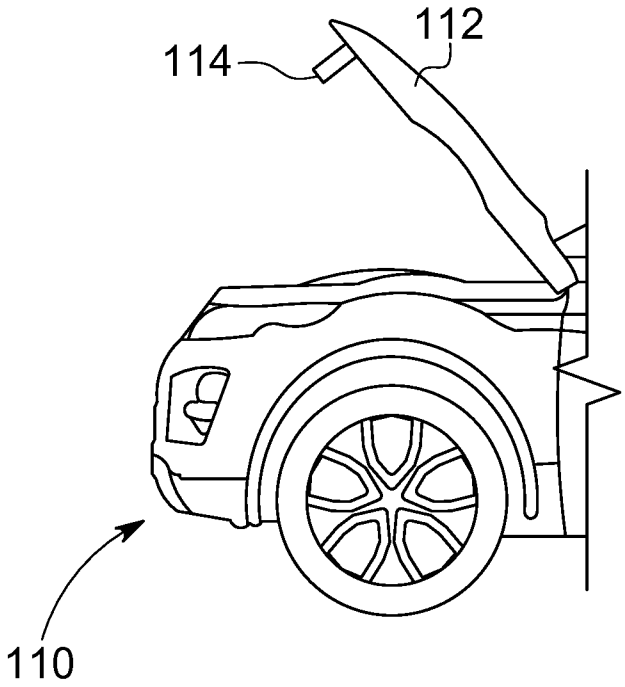


FIG. 6

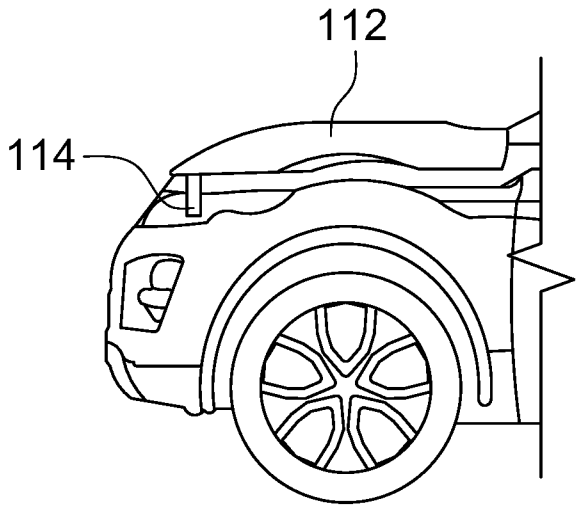


FIG. 7

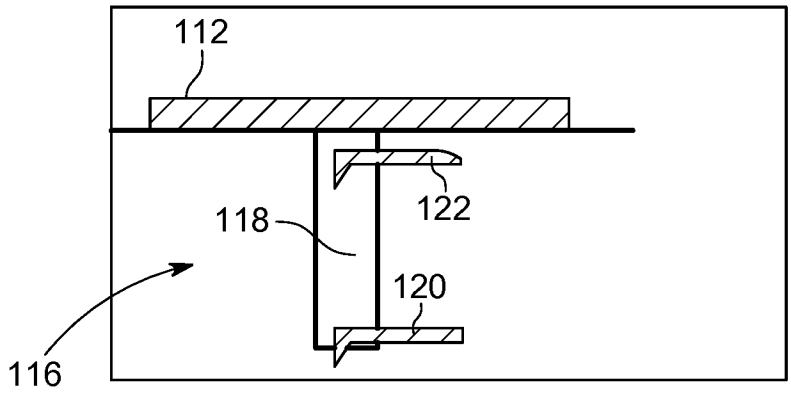


FIG. 8

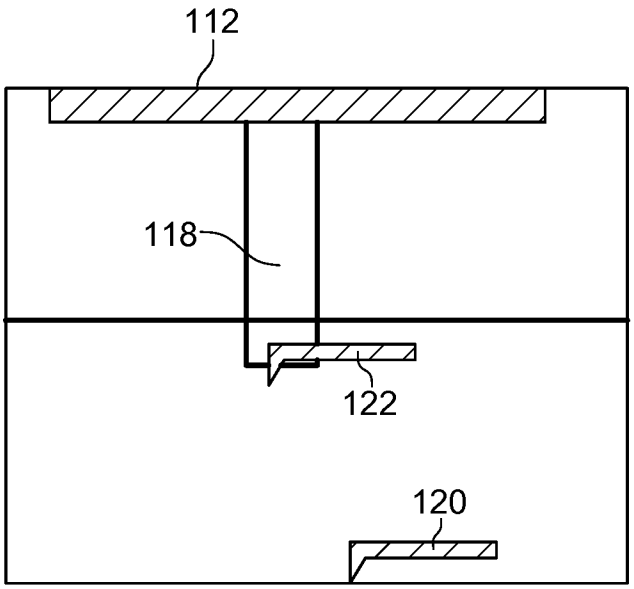


FIG. 9

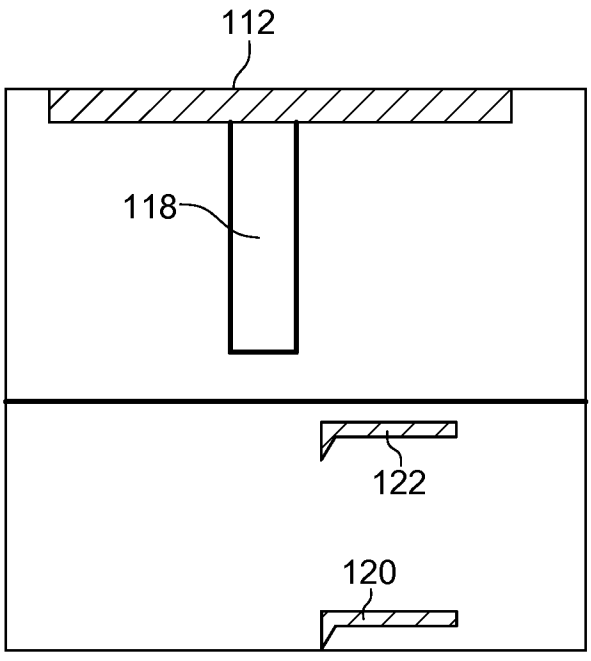


FIG. 10

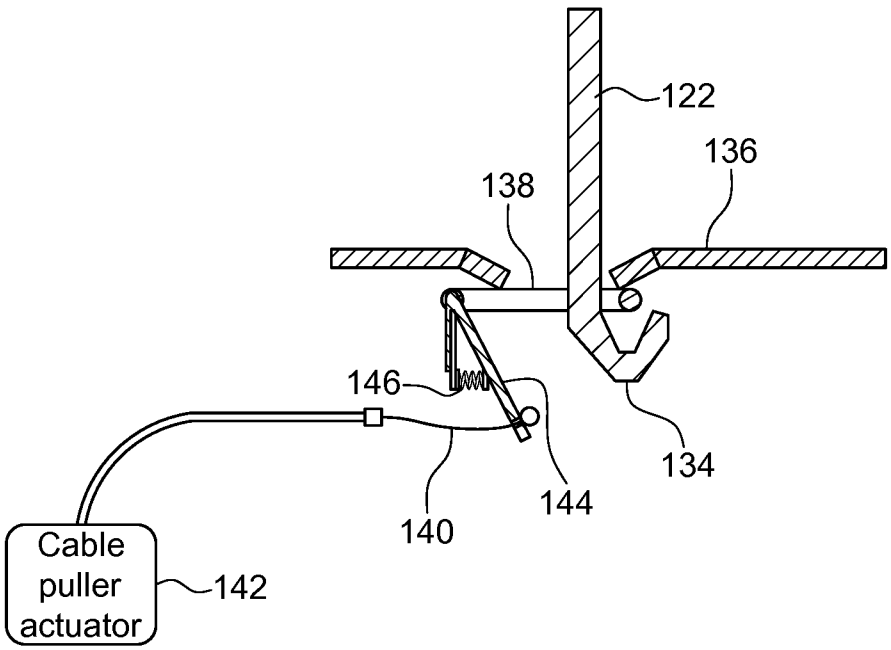


FIG. 11

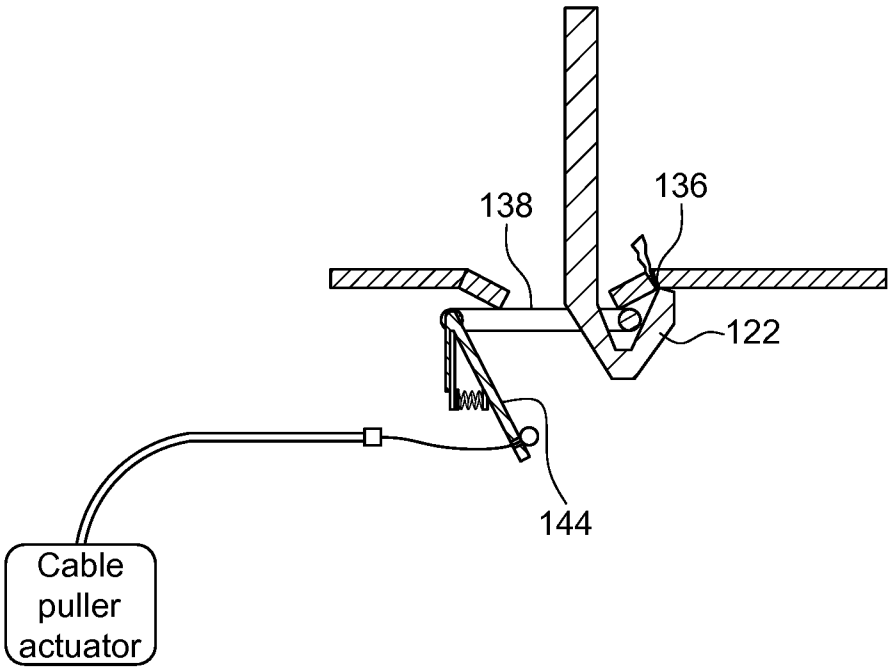


FIG. 12

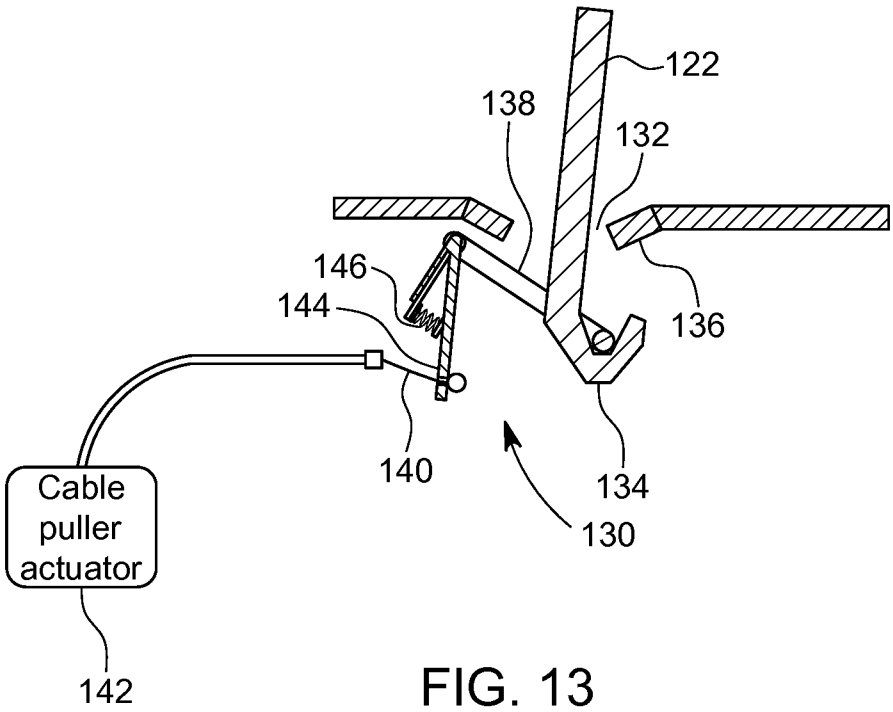


FIG. 13

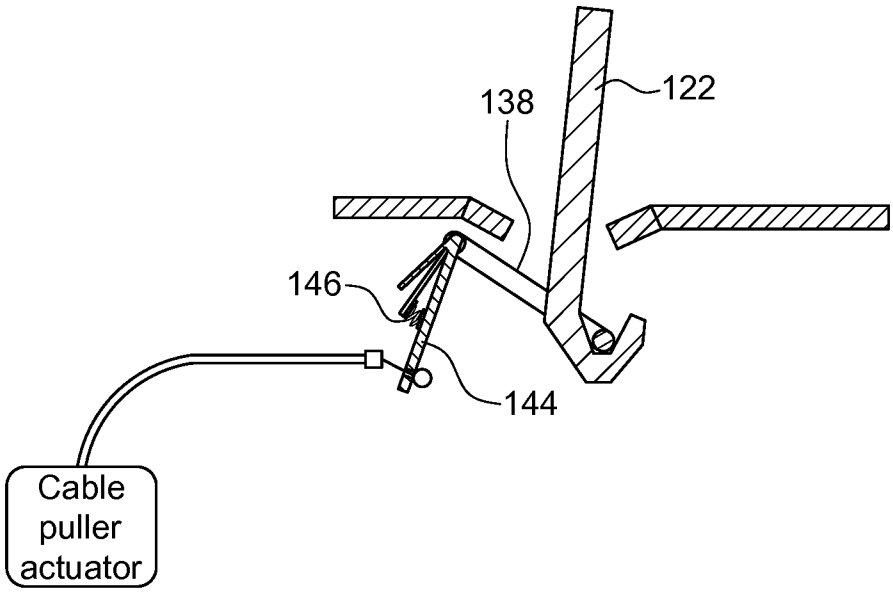


FIG. 14