A luggage system for use in a vehicle luggage compartment having a luggage compartment floor, includes a movable luggage shelf (26) defining a substantially horizontal luggage carrying surface, and means for moving the luggage shelf between a first shelf position in which the shelf is at a first lower height and a second shelf position in which the shelf is at an elevated height above the first height. Luggage can be placed conveniently on the luggage carrying surface of the shelf in both the first and second shelf positions. Luggage may also be placed on the compartment floor below the shelf when it is in an elevated position. A pivoting mechanism (34) allows movement between the first and second positions. The shelf may also be removed from the luggage compartment by detaching from the pivoting lingage (34).
LUGGAGE SYSTEM FOR A VEHICLE

The invention relates to a luggage system for use in a vehicle and, in particular, a luggage system which provides a vehicle user with two alternative luggage carrying configurations.

The rear luggage compartment (e.g. the boot or trunk) of a vehicle is that volume located immediately behind the most rearward passenger seats. Typically, the rear luggage compartment is accessible by means of an up-and-over door. In larger vehicles, the luggage compartment extends between the floor of the compartment and the ceiling of the vehicle interior so that a significant height is available for carrying relatively tall items of luggage (e.g. furniture or suitcases). However, there are often circumstances in which a user wishes to carry smaller items of luggage, so that it becomes necessary to stack individual items on top of one another to maximise use of the available volume.

In order to accommodate different luggage carrying requirements, it has been proposed to provide the vehicle with a removable luggage shelf which partitions the luggage compartment into two. However, in order to adapt the boot space so as to enable the taller luggage to be carried, it is necessary to remove the luggage shelf from the vehicle altogether. The removal and re-installation processes are inconvenient and, ideally, also require the separable shelf to be stored elsewhere when not in use.

It is a further problem in many vehicles that the loading and unloading of large and heavy items is inconvenient, particularly due to the need to lower luggage onto the luggage compartment floor over the rear compartment sill (often referred to as the ‘plate luggage rear’).
It is an object of the present invention to provide a luggage system for a vehicle which removes or alleviates at least one of the aforementioned problems.

According to a first aspect of the present invention, there is provided a luggage system for use in a vehicle luggage compartment having a luggage compartment floor, the luggage system including:

a movable luggage shelf defining a substantially horizontal luggage carrying surface, and

means for moving the luggage shelf between a first shelf position in which the shelf is at a first lower height and a second shelf position in which the shelf is at an elevated height above the first height, whereby luggage can be placed on the luggage carrying surface of the shelf in both the first and second shelf positions wherein the means for moving the shelf includes a pivot means upon which the shelf is mounted to allow both tilting and lateral movement of the shelf relative to the luggage compartment floor.

Conveniently, when in the first position the movable shelf rests upon the luggage compartment floor. When in the first position the movable shelf is said to be at floor height (i.e. the first lower height). Thus, when in the second position the movable shelf is at an elevated height above floor height.

The invention provides the advantage that a vehicle user can change conveniently between two different luggage carrying configurations, depending on his or her luggage carrying requirements, by moving the luggage shelf relative to the compartment floor but without having to remove the luggage shelf from the luggage compartment altogether. In both the lowered and elevated positions, the
shelf provides a surface upon which luggage can be placed. When it is required to carry taller objects in the luggage compartment the luggage shelf is moved into the first shelf position so that the shelf defines a surface for carrying luggage which is at the same height as the luggage compartment floor (floor height). In this case an increased height is available for luggage within the compartment. When it is required to carry luggage which does not require such a great height, the luggage shelf can be moved into the second position so as to provide a luggage carrying surface which at the elevated height above the luggage compartment floor. Furthermore, it is another advantage of the luggage system that when the luggage shelf is at the elevated height, it can rest or be supported upon the rear luggage compartment sill. In this luggage carrying configuration it is convenient to slide luggage into and/or out of the luggage compartment without having to lift luggage over the rear sill. It is particularly advantageous if the rear seat(s) of the vehicle is lowered to adopt a horizontal position, so that the usually rear-facing surface of the rear seat back defines, together with the luggage shelf, a part of an enlarged luggage carrying surface area.

If required, the luggage system can be adapted so that the luggage compartment floor defines an additional luggage carrying surface when the luggage shelf is at the elevated height, therefore providing two surfaces upon which luggage can be placed i.e. the compartment floor and the luggage carrying surface of the shelf. In one embodiment, for example, the luggage shelf may be provided with one or more hatched openings to allow access to the additional luggage carrying surface of the compartment floor in circumstances when the luggage shelf is in the elevated position.

The shelf may be moved to the elevated height through a sequence of events including, relative to the luggage compartment floor, (i) lifting a rear edge of the
shelf to tilt the shelf rear-edge-upwards, (ii) moving the shelf laterally rearwards, (iii) lifting a front edge of the shelf to tilt the shelf front-edge-upwards, (iv) moving the shelf laterally forwards, and (v) lowering the front edge of the shelf to realign the shelf substantially horizontally at the elevated height.

In one embodiment, the pivot means includes a pivot bar having a first end in pivotal connection with a fixed part of the vehicle luggage compartment, for example a pivot mount attached to the sidewall of the luggage compartment, and a second end which co-operates with the luggage shelf. Preferably, the pivot means comprises only two such pivot bars, each pivot bar being associated with a respective side of the shelf and in co-operation with a corresponding sidewall of the luggage compartment.

Typically, the shelf may be provided with at least one support member, for example a laterally extending pin, which co-operates with the pivot bar, in use, to support the shelf within the luggage compartment so as to allow tilting movement of the shelf relative to the luggage compartment floor. The support member may be removably attached to the pivot bar so as to allow complete removal of the shelf from the vehicle luggage compartment, if desired.

Advantageously, the support member may be disposed at or adjacent a side edge region of the shelf at a distance from a front edge of the shelf. In one embodiment, a pin extends laterally from each side of the shelf at a distance from the front edge of the shelf of approximately \( \frac{1}{4} \) the length of the side edge of the shelf.

In another embodiment, the shelf may be provided with a support member for co-operation with an opening in a sidewall of the vehicle luggage compartment.
Movement of the luggage shelf into the second shelf position results in the luggage compartment being divided into an upper luggage compartment and a lower luggage compartment, wherein the lower luggage compartment has an additional luggage carrying surface defined by the luggage compartment floor. Thus, when the luggage shelf is deployed at the elevated height there are two surfaces provided for carrying luggage i.e. the surface of the luggage compartment floor and the luggage carrying surface of the shelf. In one embodiment, for example, the luggage shelf may be provided with one or more hatched openings to allow access to the lower luggage compartment in circumstances in which the luggage shelf is at the elevated height.

According to a second aspect of the invention, there is provided a vehicle including a luggage system in accordance with the first aspect of the invention.

Typically, the vehicle has a luggage compartment sidewall provided with a mount in pivotal connection with a pivot bar of the luggage system. The pivot bar is coupled to the shelf so as to allow the shelf to tilt during movement between the first and second shelf positions. The vehicle is preferably also provided with a support arrangement in the form of at least one support plate or shelf upon which a front edge of the movable shelf is supported when at the elevated height.

The vehicle may alternatively be provided with one or more openings in a sidewall of the luggage compartment for co-operation with a support member of the shelf so as to guide movement of the shelf between the first and second shelf positions (i.e. from the first position to the second position, and from the second position to the first position). Typically, for example, the shelf is movable
between the first and second shelf positions so as to stay substantially horizontal at all stages of said movement.

The invention will now be described, by way of example only, with reference to the accompanying drawings in which;

Figures 1 to 5 are schematic views of a luggage system of an embodiment of the invention during various stages of movement between a first luggage carrying configuration in which a luggage shelf of the system is at a lower height and a second luggage carrying configuration in which the luggage shelf is at an elevated height,

Figure 6 is a schematic view of the luggage system in Figures 1 to 5, to illustrate one means by which the rear seat can be folded out of the way to provide an increased space for luggage within the luggage compartment,

Figures 7 and 8 show a pivot arrangement of the luggage system in Figures 1 to 6, in first and second positions respectively,

Figures 9 to 11 illustrate an alternative means by which the rear seat can be folded out of the way to provide an increased space for luggage within the luggage compartment, and

Figure 12 shows a part of an alternative arrangement to that shown in Figures 7 and 8 for permitting movement of the shelf between the first and second positions.
Referring to Figure 1, a vehicle includes a rear passenger seat assembly 10 behind which a compartment, referred to generally as 11, is available for carrying luggage. The rear seat assembly 10 includes first and second passenger seats, each of which includes a seating member 12 (or seat cushion) and a seat back 14. The seat back 14 defines a front facing surface 16 (i.e. facing towards the front of the vehicle) against which a passenger rests his or her back when seated on the associated seating member 12. A rear-facing seat back surface 18 is defined on the reverse side of the seat back 14 so that it faces away from the front of the vehicle in normal use.

The luggage compartment 11 has a luggage compartment floor 20, a luggage compartment ceiling, luggage compartment side walls 22 (only one of which is shown) and a rear sill 24. In the views shown in Figures 1 to 6 the compartment ceiling is not visible. The compartment floor 20 is barely visible in Figure 1 due to it being covered by a movable luggage shelf 26 which forms part of the luggage system. The rear sill 24 includes a generally horizontal section 24a, or ‘plate luggage rear’ which meets, at a front edge thereof, with a generally vertical section 24b of the sill 24. The vertical section 24b of the sill 24 extends downwardly from the upper section 24a so that a base end thereof meets the compartment floor 20 at its rearmost edge. The luggage shelf 26 has an upwardly facing surface which defines a carrying surface for luggage. A reverse, downwardly facing surface of the shelf 26 is able to rest upon the compartment floor 20 when the system is in a first luggage carrying configuration, as shown in Figure 1.

The luggage shelf 26 is provided with a handle 28 on its upper, luggage carrying surface to enable a user to move the shelf 26 between first and second shelf positions. A support arrangement (not shown) is provided in the vehicle upon
which the luggage shelf 26 may be supported at its front edge when an elevated shelf position is adopted, as described further below. Typically, the support means take the form of first and second shelf plates, one being arranged on each luggage compartment side wall.

The luggage shelf 26 is mounted upon a pivot arrangement 30 so as to permit the shelf 26 to be tilted relative to the compartment floor 20. A pivot arrangement 30 is provided for each side of the shelf 26, but as both are identical only the arrangement 30 on one shelf side will be described in detail. Referring to Figure 7, each side of the luggage shelf 26 is provided with a support pin 32 (only one of which is shown) which projects laterally from the shelf surface to co-operate with the associated pivot arrangement 30. In the illustrated embodiment, the pin extends from the shelf at a position distanced from the front edge of the shelf. The distance between the front edge of the shelf and the point at which the pin projects from the side thereof is approximately \( \frac{1}{4} \) of the length of the shelf.

The pivot arrangement 30 includes a pivot bar 34, one end of which is in pivotal connection with a pivot mount 36 fixed to the luggage compartment side wall 22. The other end the pivot bar 34 is shaped to define a recess 38, having an internal surface of generally circular form, within which the support pin 32 is received.

As will become clear from the following description, during movement of the luggage system between the first and second luggage carrying configurations, each support pin 32 remains within the recess of its respective pivot bar 34. In the event that it is required to remove the shelf 26 from the vehicle altogether, it is possible to lift each support pin 32 out of the associated pivot bar recess 38 altogether.
There now follows a description of the method steps involved in moving the luggage system between the first luggage carrying configuration, in which the shelf 26 is in its first shelf position, at a first height level with the luggage compartment floor 20 (i.e. floor height), and the second luggage carrying configuration in which the shelf 26 is in its second shelf position, at an elevated height above the compartment floor 20.

In Figure 1, the luggage system is in the first luggage carrying configuration in which the luggage shelf 26 rests upon the compartment floor 20 so that a front edge of the shelf 26 abuts against the rear surface 18 of the passenger seat back 14 and a rear edge of the shelf 26 abuts against the base end of the vertical sill section 24b. In this configuration the shelf 26 is at floor height. Luggage within the compartment 11 can be placed upon the luggage carrying surface of the shelf 26 and an accommodation space of relatively large height is made available for luggage. In particular, taller items of luggage (e.g. suitcases or furniture) can be accommodated within the full height of the luggage compartment 11 between the shelf 26 at floor height and the luggage compartment ceiling. In this configuration, the pivot bar 34 adopts a downwardly inclined position (i.e. front-end downwards) relative to the pivot mount 36, so that the recessed end of the bar 34 is in contact with, or in near contact with, the compartment floor 20.

In order to move the luggage system into the second luggage carrying configuration, the luggage shelf 26 is moved through the sequence of steps shown in Figures 2 to 5. In Figure 2, the rear edge of the luggage shelf 26 is lifted by pulling upwardly on the shelf handle 28 (as indicated by arrow X) to tilt the shelf 26 rear-end upwards relative to the floor 20. As the shelf is tilted, the bar 34 is caused to pivot rearwards, or anti-clockwise, about the mount 36, moving from a position in which the recessed end of the bar 34 is lower than the pivot mount 36
(as shown in Figure 7) to a position in which the recessed end is higher than the pivot mount 36 (as shown in Figure 8). It will be appreciated that such tilting of the shelf, which facilitates single-handed operation thereof, is achieved through the use of a single bar 34 on each side of the shelf.

Referring to Figure 3, once the rear edge of the shelf 26 has been raised above the compartment floor 20 through lifting, the user pulls on the handle 28 of the shelf 26 in a rearward direction (as indicated by arrow Y), moving the shelf 26 laterally across the floor 20 and causing a gap 35 to open up between the rear-facing seat back surface 18 and the front edge of the shelf 26. Such rearward movement of the shelf 26 causes the bar 34 to pivot further rearwards (i.e. anti-clockwise) about the pivot mount 36. It will be appreciated that the creation of the gap 35, which permit the front edge of the shelf to clear the inclined rear seat back when it is lifted as described below, is possible by virtue of the distance between the front edge of the shelf and the position of the support pin.

The shelf 36 is then tilted rear-edge downwards, for example by pushing on the handle 28. As the shelf 26 has previously been pulled rearwards to open up the gap 35, tilting the shelf 26 rear-edge downwards allows the lifting front edge of the shelf 26 to clear the support shelf plates (not shown) on the compartment sidewalls 22.

Referring to Figure 4, once the front edge of the shelf 26 has cleared the support shelf plates, the shelf 26 can be pushed back towards the rear side of the seat back 14 to close the gap 35 (as indicated by arrow Z). Referring to Figure 5, the shelf 26 is then tilted front-edge downwards so as to engage with the support plates on the compartment sidewalls 22 and subsequently the rear edge of the shelf 26 is lowered onto the upper section 24a of the rear sill 24 to align the shelf
substantially horizontally. During forward movement of the shelf 26 to engage its front edge with the support plates, and lowering of the rear shelf edge to engage with the rear sill 24, the pivot bar 34 is caused to pivot forwards (i.e. clockwise) about the pivot mount 36. When in this second position, the shelf 26 is elevated above the floor 20 so as to partition the luggage compartment 11 into two separate volumes: an upper luggage compartment 11a above the shelf 26 and a lower luggage compartment 11b beneath the shelf 26.

It will be appreciated from the foregoing description that during the rear-edge tilting and front-edge tilting actions required to move the shelf 26 from floor height to the elevated height, the bar 34 is caused to pivot, or ‘rock’, back and forth about the pivot mount 36. Also, it will be appreciated that at all stages of movement the shelf 26 remains coupled to the vehicle through the pivot arrangement 30. The sequence of shelf movements therefore requires little effort on the part of the user manipulating the shelf 26.

In order to move the shelf 26 back into the lower position in which it rests upon the luggage compartment floor 20, a similar sequence of events to those described previously is followed in reverse. In brief, the shelf 26 is (i) pulled rearwards to move it laterally relative to the luggage compartment floor 20, (ii) tilted front-edge-downwards to engage the front edge of the shelf 26 with the luggage compartment floor 20, (iii) pushed forwards to close the gap 35 and then (iv) tilted rear-edge-downwards to lower the shelf 26 into a substantially horizontal position in which it rests upon the floor 20. One difference between moving the shelf 26 from the elevated height back to floor height is that one less tilting operation is required. This is because a clear path is created to tilt the shelf 26 front-edge-forwards to engage with the floor 20 (step (ii)) simply by pulling the shelf 26 rearwards away from the rear-facing seat back surface 18 (step (i)).
With the luggage shelf 26 in the elevated position, luggage can be conveniently moved into and out of the upper luggage compartment volume 11a by sliding luggage over the surface of the shelf 26, but without having to navigate the rear sill 24. This may be particularly advantageous if heavy items of luggage need to be removed from and/or placed into the upper luggage compartment 11a. It will be appreciated that when the elevated luggage shelf height is adopted, a reduced head space is available for luggage within the upper volume. As a modification, therefore, the shelf 26 may be provided with one or more hatched openings (not shown). In this way, when the shelf 26 is in the elevated position the opening of the hatch or hatches enables a user to place luggage items into the lower luggage compartment 11b to rest on the luggage compartment floor 20 itself. In this case, the available luggage carrying volume of the compartment 11 is maximised as luggage can be carried in both the upper and lower compartments 11a, 11b, without the requirement for stacking luggage and with ease of loading for heavy or large items.

It is a further advantage that switching between the first and second luggage carrying configurations can be achieved conveniently and simply without the requirement to remove the luggage shelf 26 from the compartment 11 altogether. In particular, it is only necessary for the user to use one hand to operate the shelf handle 28 so as to change between the two luggage carrying configurations.

If desired, it is possible for the shelf 26 to be removed from the vehicle altogether (for example, for cleaning purposes) by tilting the shelf 26 sufficiently to dislodge the support pins 32 from the recesses 38 in the pivot bar 34. However, it will be appreciated that for the purpose of the luggage system performing its function (i.e. allowing interchange between the first and second luggage carrying configurations), the shelf 26 remains within the vehicle.
A third luggage carrying configuration is provided by providing the rear seat assembly 10 with a means for collapsing the seat backs 14 onto the seating members 12, as is already known in vehicles. As shown in Figure 6, with the seat backs 14 in their collapsed positions, in which the usually front-facing seat back surface rests against the seating member 12, an enlarged area is available for luggage within the upper luggage compartment 11a. Luggage can therefore be pushed deeper into the vehicle interior to rest on the seat back surface 18, if required.

In Figure 6, the means by which the rear seat backs 14 are collapsed involves moving the upper edges of the seat backs 14 forward so that the usually front-facing seat back surfaces rest against the seating members 12. In this configuration, it is the usually rear facing surfaces 18 of the seat backs 14 which define the luggage support surface, together with the luggage shelf 26 at its elevated height.

Figures 9 to 11 show an alternative sequence of steps for collapsing the seat backs 14 so that their rear-facing surfaces 18 define, together with the luggage shelf 26, a luggage carrying surface of enlarged area. Initially, the rear seat assembly 10 is in the position shown in Figure 9. The front edges of the seating members 12 are hinged to the underlying seat support frame (not shown) so as to allow the rear edge of each seating member 12 to be lifted upwards and forwards, exposing the seat support frame. This step in the sequence is shown in Figure 10. The seat backs 14 can then be lowered so that the rear facing surfaces 18 thereof lie substantially flush with the elevated shelf 26 to define an enlarged luggage carrying area at the elevated height. This final step in the sequence is shown in Figure 11. The collapsing of the rear seat back 14 is particularly advantageous as
an enlarged area is made available for luggage, namely that area defined by the rear facing surfaces 18 of the seat backs 14 and the surface of the shelf 26. As the shelf 26 rests on the plate luggage rear 24a, relatively large items of luggage, such as furniture for example, can be slid easily onto the enlarged area of the surface 18, 26.

In another embodiment, the pivot arrangement 30 may be replaced with slots or grooves 40 in the luggage compartment sidewalls 22. Each slot 40 includes a ramp section 40a, upwardly inclined in a rearward direction, and a downwardly inclined end section 40b. For clarity, the shelf 26 is not shown in Figure 12. Each of the sidewall slots 40 co-operates with a support pin on the luggage shelf 26 (i.e. item 32 in the previous figures), which serves to guide movement of the shelf 26 as it is caused to move rearwards across the compartment floor 20 by a user pulling on the handle 28. As the shelf 26 is pulled rearwards, the support pins 32 ride up the ramp sections 40a and the shelf 26 is lifted from floor height to the elevated height (i.e. through an amount $\Delta H$). The support pin 32 rides up the ramp section 40a until it passes over the highest points thereof and locates within the downwardly depending slot end sections 40b, in which position the shelf 26 rests upon the upper section 24a of the rear sill 24. At all stages through this sequence of movements the shelf 26 remains substantially horizontal (i.e. parallel with the luggage compartment floor 20).

As the shelf 26 is pulled in a rearward direction, its front edge 26 will be displaced relative to the rear facing surfaces 18 of the seat backs 14 to open up a gap therebetwenn. By providing the downwardly depending end sections 40b in the slots 40, the support pins 32 are not cause to ride back down the ramp sections 40a should any forward force be applied to the shelf 26 when loading luggage. Instead, in order to move the shelf 26 out of the elevated position, it is
first necessary to raise the height of the shelf 26 slightly through lifting, to
dislodge the support pins 32 from the end sections 40b of the slots 40. As before,
a handle 28 may be provided on the shelf 26, to allow a user to move the shelf 26
conveniently between the floor and the elevated heights in a convenient one-
handed operation.
CLAIMS

1. A luggage system for use in a vehicle luggage compartment having a luggage compartment floor, the luggage system including:

   a movable luggage shelf defining a substantially horizontal luggage carrying surface, and

   means for moving the luggage shelf between a first shelf position in which the shelf is at a first lower height and a second shelf position in which the shelf is at an elevated height above the first height, whereby luggage can be placed on the luggage carrying surface of the shelf in both the first and second shelf position,

   characterised in that the means for moving the shelf includes a pivot means upon which the shelf is mounted to allow tilting and lateral movement of the shelf relative to the luggage compartment floor.

2. A luggage system as claimed in claim 1, whereby the shelf rests upon the luggage compartment floor when in the first shelf position.

3. A luggage system as claimed in claim 2, whereby the shelf is, in use, moved into the elevated position through a sequence of events including, relative to the luggage compartment floor; (i) lifting a rear edge of the shelf to tilt the shelf rear-edge-upwards, (ii) moving the shelf laterally rearwards, (iii) lifting a front edge of the shelf to tilt the shelf front-edge-upwards, (iv) moving the shelf laterally forwards, and
(v) lowering the front edge of the shelf to realign the shelf substantially horizontally at the elevated height.

4. A luggage system as claimed in claim 2 or claim 3, wherein the pivot means includes a pivot bar having a first end in pivotal connection with a part of the vehicle luggage compartment and a second end which co-operates with the luggage shelf.

5. A luggage system as claimed in claim 4, wherein the shelf is provided with at least one support member which co-operates with the pivot bar to support the shelf within the luggage compartment so as to allow tilting movement of the shelf relative to the luggage compartment floor.

6. A luggage system as claimed in claim 5, wherein the pivot means comprises only two pivot bars, each pivot bar being pivotally connected to a respective side region of the shelf at a position distanced from a front edge of the shelf.

7. A luggage system as claimed in claim 6, wherein the support member is removably attached to the pivotal bar so as to permit complete removal of the shelf from the vehicle luggage compartment.

8. A luggage system as claimed in claim 1 or claim 2, wherein the shelf is provided with a support member for co-operation with an opening in a wall of the vehicle luggage compartment.

9. A luggage system as claimed in any one of claims 1 to 8, whereby
movement of the luggage shelf into the second shelf position divides the luggage compartment into an upper luggage compartment and a lower luggage compartment, whereby the lower luggage compartment has an additional luggage carrying surface defined by the luggage compartment floor.

10. A luggage system as claimed in claim 9, wherein the shelf is provided with at least one opening to permit access to the lower luggage compartment.

11. A luggage system as claimed in claim 10, wherein the or each opening in the shelf is provided with a door.

12. A vehicle including a luggage system as claimed in any one of claims 1 to 11.

13. The vehicle as claimed in claim 12, wherein the luggage compartment has a luggage compartment sidewall provided with a fixed mount in pivotal connection with a pivot bar of the luggage system.

14. The vehicle as claimed in claim 13, wherein the vehicle is further provided with a support arrangement upon which a front edge of the movable shelf is supported when at the elevated height.

15. The vehicle as claimed in claim 14, wherein the support arrangement takes the form of one or more support plates attached to the luggage compartment sidewall.

16. The vehicle as claimed in any one of claims 13 to 15, wherein the luggage compartment sidewall is provided with an opening for co-operation with a
support member of the shelf so as to guide movement of the shelf between the first and second shelf positions so that the shelf remains substantially horizontal during all stages of said movement.
**Patents Act 1977: Search Report under Section 17**

**Documents considered to be relevant:**

<table>
<thead>
<tr>
<th>Category</th>
<th>Relevant to claims</th>
<th>Identity of document and passage or figure of particular relevance</th>
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<tr>
<td>X,Y</td>
<td>X: 1, 2, 4-6, 8, 9, 12 Y:3, 10</td>
<td>US6050202 A (THOMPSON) See esp. figure 3</td>
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<tr>
<td>Y</td>
<td>3</td>
<td>US5727836 A (HOSOYA) See figure 5</td>
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<td>GB2329623 A (PIRAULT) See figure 3</td>
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<td>X</td>
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<tr>
<td>Y</td>
<td>Document indicating lack of inventive step if combined with one or more other documents of same category.</td>
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| A        | Document indicating technological background and/or state of the art.       |
| P        | Document published on or after the declared priority date but before the filing date of this invention. |
| E        | Patent document published on or after, but with priority date earlier than, the filing date of this application. |

**Field of Search:**

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

| B7B; B7J |

Worldwide search of patent documents classified in the following areas of the IPC:

| B60R |

The following online and other databases have been used in the preparation of this search report:

Online: EPODOC, WPI