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ABSTRACT

A vehicle roof attachment device (1) comprises a support member (2) shaped or deformable so as to fit the surface of a vehicle roof, and a strap (3) passing through the support member (2) and protruding from opposite ends (4) and (5) thereof. The strap (3) is integrally bonded to the support member (2) by moulding the support member (2) about the strap (3). The strap (3) is fitted with a double ring (6) at one end (7) into which an other end (8) can be inserted and wrapped back to enable optional tension adjustment when the attachment device (1) is fitted to the roof of a vehicle, with the strap (3) passed through the doors or windows of the vehicle. Moreover a load securing device is provided in the form of D-rings (9) and (10) attached to the strap (3) at the opposite ends (4) and (5) of the support member (2).
The following statement is a full description of this invention, including the best method of performing it known to me:
VEHICLE ROOF ATTACHMENT DEVICE AND MANUFACTURING METHOD

TECHNICAL FIELD

The present invention relates to a vehicle roof attachment device for attaching objects to the roof of a vehicle, and a manufacturing method therefor.

BACKGROUND ART

Conventional vehicle roof attachment devices for attaching objects to the roof of a vehicle generally comprise a support member shaped or deformable so as to fit the surface of a vehicle roof, and one or more straps for securing the support member in position on the roof of the vehicle.

In fitting the attachment device, a single strap may be threaded through a slot or slots in the support member or two straps may be used attached to either end of the support member, the end of the strap or straps then being passed through the vehicle door or window on either side of the vehicle and tightened with a connecting device such as a double ring.

Since such attachment devices comprise two or more main components, namely the support member and the strap or straps, in assembling the device the strap or straps must be fitted to the support member and correctly positioned relative thereto. Hence manufacturing and assembly can be time consuming and costly. Moreover, since the strap or straps are separate from the support member, their positioning relative thereto can become displaced, requiring subsequent adjustment. Furthermore, the complexity can detract from customer appeal.

DISCLOSURE OF THE INVENTION

It is an object of the present invention to provide a vehicle roof attachment device which addresses the aforementioned shortcomings of the abovementioned vehicle roof
attachment device, or which at least provides the public with a useful choice.

According to a first aspect of the present invention there is provided a vehicle roof attachment device comprising; a support member shaped or deformable so as to fit the surface of a vehicle roof, and

a strap passing through the support member with opposite ends protruding therefrom, the strap being integrally bonded to the support member by moulding the support member about the strap.

With such a construction, the device can be easily manufactured as a single unit. Hence there is no need for subsequent fitting and positioning of a strap relative to the support member, enabling manufacturing and assembly costs to be reduced.

Moreover, since the strap is integrally bonded to the support member, this cannot become detached or out of position with respect to the support member.

The support member may be made from any suitable material which can be integrally moulded with the strap and which can be shaped or deformed so as to fit the roof of a vehicle. For example the support member may be moulded from polyurethane foam.

The strap may be made from any suitable strap material which can be integrally bonded to the support member and which can secure the support member to the roof of a vehicle by threading though the window or door of the vehicle. For example this may be made from nylon or polyester webbing commonly used for conventional roof attachment devices.

The strap may be fitted with any suitable strap connecting device at at least one end thereof for connecting to an other end of the strap. For example this may comprise a simple buckle at one end and holes in the strap at the other end for enabling adjustment of tension, or may comprise a double ring at one end into which the other end can be inserted and wrapped back to enable optional tension adjustment.
Moreover, the vehicle roof attachment device may further comprise a load securing device for securing a load to the support member.

The load securing device may involve any suitable device whereby a load may be secured to the support member. For example this may comprise at least two ring members attached to the strap at opposite ends of the support member. In the case where the strap is made from a nylon or polyester webbing, then these ring members may be in the form of D-rings which are attached to the webbing of the strap by stitching additional webbing thereto.

Moreover the load securing device may also comprise an elongate rigid member moulded inside the support member with opposite ends protruding therefrom, and fastening means provided at predetermined locations for fastening the elongate rigid member to the strap.

By providing the elongate rigid member as a load securing device the overall rigidity of the roof attachment device is improved, enabling heavier loads to be carried more securely. Moreover, a configuration of two attachment devices each having the elongate rigid member, and mounted on a vehicle roof, is similar to that of a conventional metal roof rack, enabling securing of loads in a similar manner.

The fastening device may involve any suitable device whereby the elongate rigid member can be fastened securely to the strap. For example this may comprise additional webbing to connect the elongate rigid member and the strap. Moreover this may comprise at least two annular members connected to the strap near opposite ends of the support member and with the elongate rigid member passing therethrough.

In addition to the above components the attachment device may further comprise a detachable mount of a shape to locate a load being carried on the attachment device, and comprising a detachable mount attachment device for attaching to the attachment device. Providing a detachable mount enables specific shapes of loads to be catered for, thus improving versatility of the vehicle roof attachment device.
According to another aspect of the present invention there is provided a method of manufacturing a vehicle roof attachment device comprising the steps of:

preparing a mould in a desired shape for a support member for the attachment device;

5 positioning a strap for the support member in the mould so as to span the mould with ends thereof extending from the mould;

introducing a foam material for producing the support member into the mould;

allowing the foam material to foam and set around the strap to integrally bond therewith; and

10 removing a resultant moulded support member and strap from the mould.

Alternatively part or all of the foam material may be first introduced to the mould, and the strap then positioned in the mould.

Moreover, the strap may be provided with at least two annular members connected to the strap at locations near ends of the mould, and after the step of positioning the strap, there may be provided an additional step of positioning an elongate rigid member through the annular members so as to span the mould with ends thereof extending from the mould.

The mould may be of any suitable construction whereby the support member can be moulded about the strap (and elongate rigid member when provided) by introduction of the foam material, and the resultant moulded support member and strap (and elongate rigid member when provided) can be removed from the mould after moulding.

Preferably the mould is of a two part construction, and the step for positioning the strap (and elongate rigid member when provided) in the mould involves spanning the strap (and elongate rigid member when provided) across the length of one part of the mould, and after the step for introducing foam material into the mould, an other part of
the mould is secured to the one part. However, the foam material may of course be introduced into the mould after the mould has been closed with the strap (and elongate rigid member when provided) positioned thereinside.

The foam material may be introduced to the mould by any suitable device. For example this may involve pouring or injecting the foam material into the mould. The foam material may be provided by a two part mixing machine which heats two parts of the foam material and brings these together at a mixing nozzle from which the mixed foam is introduced into the mould.

The foam material may be any suitable material which can be moulded about the strap to produce a durable support member. Preferably this is a flexible polyurethane foam. Having a flexible foam has the advantage that the foam can deform to suit the roof of a vehicle and the shape of the object being carried.

This invention may also broadly be said to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of the parts, elements or features, and where specific integers are mentioned herein which have known equivalents such equivalents are deemed to be incorporated herein as if individually set forth.

Further aspects of the present invention will become apparent from the ensuing description which is given by way of example only and with reference to the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram illustrating an embodiment of a vehicle roof attachment device according to the invention, (A) being an overall elevation view and (B) being a perspective view showing details of a support member.

FIG. 2 is a schematic diagram illustrating another embodiment of a vehicle roof attachment device according to the invention, (A) being a perspective view showing
details of a support member and (B) being a section view on X-X of FIG. 2A.

FIG. 3 is a schematic diagram illustrating details of a detachable mount, (A) being an overall elevation view of two mounts positioned for supporting a canoe, and (B) being a perspective view of one detachable mount holding a canoe paddle.

FIG. 4 is a schematic view of a moulding device used in manufacturing the vehicle roof attachment device of FIG. 1.

BEST MODES FOR CARRYING OUT THE INVENTION

FIG. 1 is a schematic diagram illustrating an embodiment of a vehicle roof attachment device according to the invention generally indicated by arrow 1. As shown in FIG. 1, the device 1 comprises a support member 2 shaped or deformable so as to fit the surface of a vehicle roof, and a strap 3 passing through the support member 2 (as shown by the dotted line) and protruding from opposite ends 4 and 5 thereof. The strap 3 is integrally bonded to the support member 2 by moulding the support member 2 about the strap 3 as described later. In this embodiment, the support member 2 is moulded from a flexible polyurethane foam, and the strap is made from 38mm to 40 mm wide nylon or polyester webbing. However the materials and size are not limited to these and other suitable materials may be used.

With such a construction, the vehicle roof attachment device 1 can be easily manufactured as a single unit. Hence there is no need for subsequent fitting and positioning of a strap relative to the support member as with conventional vehicle roof attachment devices, enabling manufacturing and assembly costs to be reduced.

Moreover, since the strap 3 is integrally bonded to the support member 2, this cannot become detached or out of position with respect to the support member 2.

In this embodiment the strap 3 is fitted with a connecting device in the form of a double ring 6 at one end 7 into which an other end 8 can be inserted and wrapped back to enable optional tension adjustment when the attachment device 1 is fitted to the roof of a vehicle, with the strap 3 passed through the doors or windows of the vehicle. Moreover a
load securing device is also provided in the form of D-rings 9 and 10 attached to the strap 3 at the opposite ends 4 and 5 of the support member 2. These D-rings 9 and 10 are attached to the webbing of the strap 3 by stitching additional webbing thereto (not shown).

As shown more clearly in FIG 1(B), the support member 2 is formed with a flat lower face 11 which is deformable so as to fit against the roof of the vehicle with which the device 1 is used, and a flat upper face 12 which may be narrower than the lower face 11 as required or desired. Having a narrower upper face 12 assists removal from the mould during manufacture, and is thus preferable. Moreover the ends 4 and 5 of the support member 2 are made wider than the central portion to provide a support surface for objects to be carried on the attachment device 1. In this embodiment, the support member 2 is approximately 70 mm thick and 100 mm wide at the centre portion, and the end portions are approximately 200 mm by 100 mm. While not shown in the figure, the upper face 12 of the support member 2 may be formed with recesses, to accommodate certain objects with which the attachment device is to be used. For example recesses to match the bottom of a kayak or surfboard.

FIG. 2 is a schematic diagram illustrating another embodiment of a vehicle roof attachment device according to the invention generally denoted by arrow 100.

In FIG. 2, components having a similar construction and function to those in FIG. 1 are denoted by the same reference symbols and description thereof is omitted. The attachment device 100 of this embodiment further comprises an elongate rigid member 13 serving as a load securing means, moulded inside the support member 2 with opposite ends 14 protruding therefrom. Moreover, as a fastening device for fastening the elongate rigid member 13 to the strap 3, this has, as shown in FIG. 2B being the cross-section on X-X at each end in FIG. 2A, two annular rings 15 connected to the strap 3 near the opposite ends 4 and 5 of the support member 2 and with the elongate rigid member 13 passing therethrough.

In this embodiment, the annular rings 15 are simply passed over the strap 3 and
remain in position due to being slightly narrower than the strap 3. However, these may
of course be attached to the strap 3 by other means such as by stitching additional
webbing to the strap 3. Moreover, as can be seen in FIG. 2B, the elongate rigid member
13 is located against the annular rings 15 at the top, and is spaced slightly apart from the
strap 3. This ensures that mould material can flow around the parts and provide good
bonding. However, moulding the elongate rigid member 13 in contact with the strap 3
may also be satisfactory.

By providing the elongate rigid member 13 in this way, the overall rigidity of the
roof attachment device 100 is improved enable heavier loads to be carried more securely.
Moreover, a configuration of two attachment devices 100 each having the elongate rigid
member 13, and mounted on a vehicle roof, is similar to that of a conventional metal roof
rack, enabling securing of loads in a similar manner.

In this embodiment, since the attachment device 100 is made rigid by the elongate
rigid member 13, then a recess portion is formed in the lower face 11 of the support
member 2 so as to accommodate curvature of the roof of a vehicle. This is more clearly
shown in FIG. 3A. Moreover, while not shown in the figures, in order to better distribute
the load on the roof, the elongate rigid member 13 may be provided with fore and aft
extending portions welded thereto in the vicinity of the ends 4 and 5 of the support
member 2.

FIG. 3 is a schematic diagram illustrating details of detachable mounts
generally denoted by arrows 16. In FIG. 3A, details of the strap 3 have been omitted for
simplicity. As shown in FIG. 3, the detachable mounts 16 are of a shape to locate a load
such as a canoe being carried on the attachment device 100. Moreover, these comprise
detachable mount attachment means in the form of an aperture 17 passing through each
of the detachable mounts 16 for threading with a detachable mount strap 18 (see FIG.
3B). Such an aperture 17 may be formed by positioning a rectangular hollow plastic
member in the mould at the time of moulding the detachable mount 16. With this
construction the detachable mount 16 can be adjusted sideways by simply sliding along
the detachable mount strap 18, thus enabling adjustment to suit the width of a canoe hull.
Moreover by providing adjustable buckles 18a on the detachable mount strap 18, the ends can be pulled tight over the opposite ends 14 of the elongate rigid member 13 to provide a secure attachment. With this detachable mount 16, as well as being formed to accommodate the hull of a canoe, a side part thereof is adapted for carrying one or more handles 19 of a canoe (FIG. 3B).

Other configurations for attachment such as where the detachable mount strap 18 is moulded into the detachable mount 16, for example in a similar manner to the method described below for moulding the support member 2 about the strap 3, are of course also possible depending on requirements.

FIG. 4 shows a schematic view of a moulding device used in manufacturing the vehicle roof attachment device of FIG. 1.

In FIG. 4, a mould 20 is of a two part construction, split along the longitudinal direction to give a lower mould 21 and an upper mould 22. The lower mould 21 is formed with recesses 23 and 24 at opposite ends for accommodating the strap 3, and a large recess section 25 for forming the bottom part of the support member 2. The upper mould 22 is similarly formed with a large recess section 26 (not visible in the figure) for forming the top part of the support member 2 with walls thereof tapered for easy removal of the moulded support member 2. The mould 21 has positioning pins 27 and 28 for engaging in corresponding holes (not shown) in the mould 22 to hold the two moulds 21 and 22 in position.

With this embodiment, the foam material for producing the support member 2 is provided by a two part mixing machine (not shown) which heats and then mixes two parts of the foam material. A suitable mixing machine may be for example a Cannon L5 mixing machine, commonly used for mixing foam materials.

With such a machine, the heated two parts are brought together at a mixing nozzle 30 from which the mixed foam is then poured into the mould 20. A suitable two part mix may comprise polyolefin (2 parts) and isocyanate (1 part) which are warmed to a temperature of 25°C. This mixture gives a flexible polyurethane foam. Preferably the
moulds 21 and 22 are also heated to 30 to 40°C at the time of introducing the foam material.

In manufacturing the vehicle roof attachment device 1 of FIG. 1, at first the mould 20 of FIG. 4 is prepared. Then the strap 3 is positioned in the recesses 23 and 24 of the lower mould 21 so as to span the mould with the ends extending from the mould. Foam material for producing the support member (for example the aforementioned flexible polyurethane foam) is then introduced into the lower mould 21 from the mixing nozzle 30 so as to flow around the strap 3. Alternatively part or all of the foam material may be introduced to the lower mould 21, and the strap 3 then positioned in the recesses 23 and 24 and spanning the mould 21. This may be desirable to ensure that the foam encloses and thus bonds securely with the strap 3. The top mould 22 is then clamped onto the lower mould 21 and the foam material allowed to foam and set around the strap 3 to integrally bond therewith. Once set, the upper mould 22 is removed and the resultant moulded support member 2 and strap 3 are removed from the lower mould 21, giving the finished vehicle roof attachment device 1.

Furthermore, in the case of the embodiment of FIG. 2, the strap 3 is further provided with the two annular rings 15 connected to the strap 3 at locations near ends of the mould, and after positioning the strap 3, the elongate rigid member 13 is positioned through the annular rings 15 so as to span the mould with ends thereof extending from the mould.

Herein the method of manufacturing the vehicle roof attachment device has been described using a two part mould split lengthwise. However the method is not limited to this, and other forms of mould may be used, provided that the support member 2 can be moulded about the strap 3 (and the elongate rigid member 13 when provided) by introduction of the foam material, and the resultant moulded support member 2 and strap 3 (and the elongate rigid member 13 when provided) can be removed from the mould after moulding.

For example the mould may be split transversely or diagonally, depending on
requirements and the shape of the support member to be moulded.

Moreover, the method of manufacturing the vehicle roof attachment device has been described where the step for positioning the strap 3 (and the elongate rigid member 13 when provided) in the mould 20 involves spanning the strap 3 (and the elongate rigid member 13 when provided) across the length of the lower mould 21 of the mould 20, and after the step for introducing the foam into the lower mould 21 from the nozzle 30, the upper mould 22 of the mould 20 is secured to the lower mould 21. However, the invention is not limited to these steps and depending on the moulding technique and equipment, for example the foam material may be injected into the mould 20 after the mould 20 has been closed with the strap 3 (and the elongate rigid member 13 when provided) positioned thereinside.

INDUSTRIAL APPLICABILITY

The vehicle roof attachment device of the invention can be easily manufactured as a single unit. Hence there is no need for subsequent fitting and positioning of a strap relative to the support member as with conventional devices, enabling manufacturing and assembly costs to be reduced. Moreover, since the strap is integrally bonded, this cannot become detached or out of position with respect to the support member. The invention thus has considerable industrial applicability.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope of the invention as defined by the appended claims.
The claims defining the invention are as follows:

1. A vehicle roof attachment device comprising:
   a support member shaped or deformable so as to fit the surface of a vehicle roof,
   and
   a strap passing through said support member with opposite ends protruding
   therefrom, said strap being integrally bonded to said support member by moulding said
   support member about said strap.

2. A vehicle roof attachment device according to claim 1, wherein said support
   member is moulded from polyurethane foam.

3. A vehicle roof attachment device according to either one of claim 1 and claim 2,
   wherein said strap is made from nylon or polyester webbing.

4. A vehicle roof attachment device according to any one of claim 1 through claim
   3, wherein said strap is fitted with a strap connecting device at at least one end thereof for
   connecting to an other end of said strap.

5. A vehicle roof attachment device according to claim 4, wherein said strap
   connecting device comprises a double ring.

6. A vehicle roof attachment device according to any one of claim 1 through claim
   5, further comprising load securing means for securing a load to said support member.

7. A vehicle roof attachment device according to claim 6, wherein said load securing
   means comprises at least two ring members attached to said strap at opposite ends of said
   support member.

8. A vehicle roof attachment device according to claim 6, wherein said load securing
   means comprises an elongate rigid member moulded inside said support member with
   opposite ends protruding therefrom, and fastening means provided at predetermined
locations for fastening said elongate rigid member to said strap.

9. A vehicle roof attachment device according to claim 8, wherein said fastening means comprises at least two annular members connected to said strap near opposite ends of said support member and with said elongate rigid member passing therethrough.

10. A vehicle roof attachment device according to any one of claim 6 through claim 9, further comprising a detachable mount of a shape to locate a load being carried on said attachment device, and comprising detachable mount attachment means for attaching to said load securing means.

11. A vehicle roof attachment device according to claim 10, wherein said detachable mount attachment means comprises a detachable mount strap passing through said detachable mount and moulded thereto.

12. A vehicle roof attachment device according to claim 10, wherein said detachable mount attachment means comprises an aperture passing through said detachable mount for threading with a detachable mount strap.

13. A vehicle roof attachment device according to claim 12, comprising two of said detachable mount attachment means threaded with said detachable mount strap and adapted for supporting opposite side portions of said load.

14. A vehicle roof attachment device according to any one of claim 10 through claim 12, wherein the shape of said detachable mount is adapted for carrying a rod member.

15. A method of manufacturing a vehicle roof attachment device comprising the steps of:

preparing a mould in a desired shape for a support member for said attachment device;

positioning a strap for said support member in said mould so as to span said mould with ends thereof extending from said mould;
introducing a foam material for producing said support member into said mould;

allowing said foam material to foam and set around said strap to integrally bond therewith; and

removing a resultant moulded support member and strap from said mould.

16. A method of manufacturing a vehicle roof attachment device comprising the steps of:

preparing a mould in a desired shape for a support member for said attachment device;

introducing a part or all of a foam material for producing said support member into said mould;

positioning a strap for said support member in said mould so as to span said mould with ends thereof extending from said mould;

introducing any remaining foam material into said mould;

allowing said foam material to foam and set around said strap to integrally bond therewith; and

removing a resultant moulded support member and strap from said mould.

17. A method of manufacturing a vehicle roof attachment device according to either one of claim 15 and claim 16, wherein said strap is provided with at least two annular members connected to said strap at locations near ends of said mould, and after said step of positioning said strap, there is provided an additional step of positioning an elongate rigid member through said annular members so as to span said mould with ends thereof extending from said mould.

18. A method of manufacturing a vehicle roof attachment device according to any one of claim 15 through claim 17, wherein said mould is of a two part construction, and
said step for positioning said strap in said mould involves spanning said strap across the length of one part of said mould, and after said step for introducing foam material into said mould, an other half of said mould is secured to said one part.

19. A method of manufacturing a vehicle roof attachment device according to claim 15 or claim 17 when dependant on claim 15, wherein said mould is of a two part construction and said step for positioning said strap in said mould involves spanning said strap across the length of one part of said mould with an other part of said mould removed, and said foam material is introduced into said mould after said mould has been closed with said strap positioned thereinside.

20. A method of manufacturing a vehicle roof attachment device according to any one of claim 15 through claim 20, wherein said foam material is provided by a two part mixing machine which heats two parts of said foam material and brings these together at a mixing nozzle from which the mixed foam is introduced into said mould.

21. A method of manufacturing a vehicle roof attachment device according to any one of claim 15 through claim 20, wherein said foam material is polyurethane foam.

22. A vehicle roof attachment device substantially as described herein with reference to the appended drawings.

23. A method of manufacturing a vehicle roof attachment device substantially as described herein with reference to the appended drawings.