A trim system includes aesthetic trim components adapted for interconnected attachment to painted exterior vehicle body panels. The first and second trim components have edge flanges that define a joint line between their outer surfaces but that overlap to prevent see-through between the trim components. The first and second trim components include a recess and a hook frictionally engaging the recess to retain the first and second trim components closely together to minimize a width of the joint line. The first and second trim components also include an alignment flange portion and a clamping flange engaging the alignment flange portion to maintain an optimal flushness of the outer surfaces. At least one of the edge flanges has a reduced thickness to minimize a thickness of the assembly, with the hook and clamping flanges also being designed to minimize total thickness.
INTERCONNECTED TRIM COMPONENTS WITH LIGHT-BLOCKING OVERLAP FLANGES

BACKGROUND

[0001] The present invention relates to interconnected trim components, such as automotive exterior trim components, where appearance, minimal thickness, ease of assembly, and also security of the interconnected assembly are important.

[0002] Automotive exterior trim components are often interconnected to each other in an effort to improve uniformity of the gap between the trim components, and to improve flushness of their outer surfaces. However, the attachment mechanisms for interconnecting trim components sometimes are too thick, which causes the trim components to protrude outward from a vehicle body more than is desired, or forces vehicle designers to make additional room under the trim components on the body panels at a location where space is at a premium.

[0003] Another problem is “see-through” and also non-uniformity along a joint line between the abutting trim components. People entering a vehicle are positioned very close to the exterior trim components, such that any defect or non-uniformity is highly visible. In particular, any gap between abutting edges will allow a person to “see through” the gap and see body color of the vehicle. This is objectionable, even if there is no rust or other problem, since it looks bad and gives the impression of poor quality of assembly. Also, variations in the width of gaps are easily seen and look bad.

[0004] Another problem is the cost of attachment mechanisms and their poor reliability. Attachment mechanisms that utilize multiple parts and pieces tend to be expensive, both because of the cost of individual components, but also because of manual labor to sub-assemble and connect them. Further, every additional piece adds to dimensional variation, making it difficult to provide a highly consistent assembly in terms of high uniformity of gap along a joint line and high uniformity of flushness at abutting edges. Still further, dimensional variations can increase the variation of insertion forces for assembly and can increase the variation of retention forces once the components are interconnected.

[0005] Accordingly, a connection system and trim component system solving the aforementioned problems and having the aforementioned advantages is desired.

SUMMARY OF THE PRESENT INVENTION

[0006] In one aspect of the present invention, a trim system for aesthetic components, such as exterior automotive trim, includes first and second trim components with edge flanges that define a joint line between their outer surfaces but that overlap to prevent see-through between the trim components. One of the first and second trim components includes a recess, and the other includes a retainer for frictionally engaging the recess to retain the first and second trim components closely together to minimize a width of the joint line. One of the first and second trim components includes an alignment flange portion, and the other includes at least one clamping flange for engaging the alignment flange portion to maintain an optimal flushness of the outer surfaces.

[0007] In another aspect of the present invention, a trim system for aesthetic components, such as exterior automotive trim, includes first and second trim components with edge flanges that define a joint line between their outer surfaces. One of the first and second trim components includes a recess, and the other includes a retainer for frictionally engaging the recess to retain the first and second trim components closely together to minimize a width of the joint line. One of the first and second trim components includes a pair of alignment flange portions, and the other includes a pair of clamping flanges for engaging the alignment flange portions to maintain an optimal flushness of the outer surfaces and to maintain engagement of the hook with the recess. The hook and recess are located between the alignment flange portions and the clamping flanges.

[0008] In another aspect of the present invention, a trim system for aesthetic components, such as exterior automotive trim, includes first and second trim components with edge flanges that define a joint line between their outer surfaces. One of the edge flanges includes a reduced-thickness lip, and the other includes an overlapping lip that overlaps the reduced-thickness lip to prevent see-through between the trim components. The first and second trim components include retainers that frictionally engage to retain the first and second trim components closely together to minimize a width of the joint line while maintaining a constant gap and an optimal flushness of the outer surfaces.

[0009] In another aspect, a trim system includes first and second trim components with edge flanges that define a joint line between their outer surfaces, retainers integral with the first and second trim components that secure the edge flanges together, and alignment features extending perpendicular to the edge flanges. One of the alignment features includes resilient tabs defining a tapered chute, and the other of the alignment features defines at least one mating surface fitting into the chute and engaging the resilient tabs. The alignment features permit some lateral adjustability of the first and second trim components but bias the first and second trim components toward a predetermined relative location along the joint line.

[0010] These and other aspects, objects, and features of the present invention will be understood and appreciated by those skilled in the art upon studying the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0011] FIG. 1 is a perspective view of a passenger vehicle with trim components embodying the present invention;

[0012] FIG. 2 is a perspective view of an inside surface of the trim components of FIG. 1;

[0013] FIG. 3 is a fragmentary view of the circled area III in FIG. 2 showing the connection arrangement of the present trim components;

[0014] FIG. 4 is an exploded view of FIG. 3;

[0015] FIGS. 5-6 are exploded plan and side views of FIG. 4;

[0016] FIG. 7 is a cross sectional view taken along the line VII-VII in FIG. 5; and

[0017] FIGS. 8-12 are views of a modified trim connection arrangement, the views being similar to the FIGS. 3-7.
A trim system 20 (FIG. 1) embodying the present invention includes first and second 25 aesthetic trim components 21 and 22 (FIGS. 2-3) adapted for interconnected attachment to each other and to an outside of painted exterior vehicle body panels 23 (FIG. 1). As shown in FIGS. 2-4, which are perspective views looking at an inside "non-show" surface of the trim components (i.e. the surface that abuts the body panel), first and second trim components 21 and 22 have edge flanges 24 and 25 (FIG. 2) with adjacent features that define a narrow but uniform joint line 26 that is visible between their outer surfaces. However, the flanges 24 and 25 overlap to prevent "see-through" between the trim components, as discussed below. The first and second trim components 21 and 22 also include a recess 29 (FIG. 3) and a retainer hook 30 that, when assembled, frictionally engages the recess 29 to retain the first and second trim components 21 and 22 closely together to minimize a width of the joint line 26. The first and second trim components 21 and 22 still further include a pair of alignment flange portions 31 on opposite sides of the recess 29 and hook 30, and a pair of mating clamping flanges 32 engaging the alignment flange portions 31 to maintain an optimal flushness of the outer surfaces 27 and 28. The alignment flange portions 31 are formed integrally with the edge flange 24, and have a reduced thickness defining a lip 33 shaped to minimize a thickness of the assembly along the joint line. The hook 30 and clamping flanges 32 are also designed to minimize a total thickness of the assembly at the connection area, which permits the same time permitting some lateral adjustment of the two trim components 21 and 22 in a direction parallel the joint line 26.

The illustrated trim component 21 (FIG. 4) includes the edge flange 24, the recess 29, a ramp 33' leading to recess 29, and the clamping flanges 32, while the illustrated trim component 22 includes the edge flange 25 with lip 33, the hook 30, the alignment flange portions 31, and lip 33. Nonetheless, it is contemplated that a scope of the present invention includes variations where one or more of these features are "reversed" and placed on the other trim component 21 and 22.

The trim components 21 and 22 are generally characterized by long, thin, and shiny sections that are adapted for attachment to an outer surface of a painted body panel, such as to a quarter panel of a vehicle. For example, they can be chromed stamped sheet metal parts or chromed molded plastic parts. The trim components 21 and 22 are intended to improve an appearance of the vehicle, by covering joints and seams, but also by providing a shiny and jewel-like appearance on the vehicle. It is important that the trim components 21 and 22 be basically defect-free when positioned on a vehicle's quarter panel, since in this location, they are close to a vehicle driver's eye level or to a passenger's eye level when entering the vehicle. The trim components 21 and 22 must preferably hide not only joint lines and surface defects (such as may occur when body panels are blended together), but also must hide paint color at their joint line, must be secure, and must provide a gap/joint line that is very uniform in width and flushness.

The edge flange 24 (FIG. 4) of trim component 21 includes an inclined surface or ramp 33' beginning at an edge of the flange 24 and extending "upwardly" toward a blind locking surface 34 at a front edge of the recess 29. The ramp 33' and recess 29 can be any width desired, but are shown to be about equal to a width of the clamping flanges 32, and extend completely between one clamping flange 32 to the other. The width of the retainer hook 30 is somewhat narrower than the recess 29 and ramp 33', so that the hook 30 can adjust laterally between the clamping flanges 32. Nonetheless, the size and shape of the hook 30 does provide an alignment function during assembly as the hook 30 travels up the ramp 33' into the recess 29.

The clamping flanges 32 (FIG. 4) are L-shaped, and include a first leg 35 that extends perpendicularly to the flange 24, and a second leg 36 that extends parallel the flange 24. The first and second legs 35 and 36 define a good-sized throat for initially receiving flange portions 31, and include a ramp surface 36 that is shaped to closely receive and align in a "vertical" direction alignment flange portions 31 of the flange 25 on the trim component 22. Specifically, the undersurface of the parallel leg 36 includes an angled surface 36' adjacent to and close to the first leg 35, so that at an end of its travel, as the flange 25 is pressed against the clamping flange 24, the flange 25 is forcibly clamped by the clamping flanges 32 into a closely controlled flush-exterior-surface condition. Also, the undersurface on the perpendicular leg 35 is shaped to permit a sure assembly, but also provides only a minimum amount of clearance so that the hook 30 has enough overtravel to assure that it snaps into place in the recess 29 when pressure in an installation direction, but so that when the installation pressure on the hook 30 is removed and the overtravel eliminated, the gap of the joint line 26 does not become too large. For example, by tuning the present arrangement, the gap can be controlled to a uniform width of less than 1-mm and to a surface flushness of less than 0.5-mm.

The retainer hook 30 on the edge flange 22 is defined by a pair of slots 38 that extend perpendicularly into the edge flange 22, with the slots 38 separating the retainer hook 30 from the alignment flange portions 31. By shortening the slots 38, the stem 39 of the retainer hook 30 becomes shorter, thus making the stem 39 structurally stronger and stiffer. In turn, as the stem 39 becomes stiffer, it becomes more difficult to press the retainer hook 30 up the ramp 33, thus increasing installation pressure required for assembly. Also, the stem 39 can be made wider, which stiffens stem 39. As stem 39 is increasingly widened, it begins to approach the clamping flanges 32, such that it limits the lateral adjustability of one trim component 21 to the other trim component 22 along the joint line 26.

The trim components 21A and 22A (FIGS. 8-12 and in particular FIG. 9) are very similar to trim components 21 and 22, but are modified to include wing flanges or resilient locator tabs 40 to further control lateral adjustability. The illustrated tabs 40 are integrally formed as part of the clamping flanges 32, and are located on an outboard edge of the clamping flanges 32. Mating arcuate surfaces 41 are formed along the edge of flange portions 31 for engaging the resilient tabs 40. The arcuate surfaces 41 are shaped to define a throat or chute that angles the trim component 21A toward a center location on the trim component 22A as the trim components 21A and 22A are assembled together. The resilient tabs 40 are adapted to flex and provide some lateral adjustability as the trim components 21A and 22A are
assembled together. Depending upon the shape and size of the features 40 and 41, more or less lateral adjustability is provided by the arrangement. The illustrated arrangement provides less than 2-mm of lateral adjustability, and more preferably provides less than 1-mm of lateral adjustability, and still more preferably provides less than 0.5 mm of lateral adjustability. Nonetheless, the resilient tabs 40 are intended to and do clearly provide some lateral adjustability, which lateral adjustability is not provided simply by clearance or looseness, but instead is taken up by a biasing and flexing of the resilient tabs 40.

[0025] The present trim components 21 and 22 (and also 21A and 22A) are designed so that it is relatively easy to adjust the installation force required for assembly, and so that it is relatively easy to adjust the surface flushness of the exterior surface of the two trim components 21 and 22 and (21A and 22A), the gap uniformity and size along the joint line 26 of the two trim components 21 and 22 (and also 21A and 22A), while still permitting lateral adjustability and relative movement between the two trim components 21 and 22 (and also 21A and 22A). Specifically, where trim components are molded plastic parts, metal on the molding dies can be ground to: increase hook strength (e.g. by shortening the slots 38 to in turn shorten the stem 39), reduce installation force by improving the surface smoothness and angle of the ramp 33 or by improving the angle of the hook 30, improve ease of assembly by increasing a width of the stem 39 for improved accuracy and alignment during assembly of the two trim components 21 and 22 (and also 21A and 22A), increase the clamping force of the clamping flanges 32 as ramps 33 engage the alignment flange portions 31 (which affects both force of insertion during assembly as well as affecting surface flushness). It is noted that surface flushness of the exterior surfaces of the edge flanges on the trim components 21 and 22 (and also 21A and 22A) can also be affected by the thickness and shape of the edge flanges 24 and 25. Notably, the exterior surfaces of the trim components 21 and 22 (and also 21A and 22A) do not necessarily need to be perfectly flush. Instead, it is possible to achieve an excellent appearance (and potentially even a better appearance) by making the exterior surfaces of a lower one of the edge flanges 24 and 25 to be not quite flush, but instead to have the lower exterior surface of the edge flanges 24 and 25 define a slight step inward such that a person looking downward on the joint line does not see any gap at all. This can be done by varying a thickness of lip 33 and/or by varying a portion of flange 24 that engages lip 33.

[0026] It is to be understood that variations and modifications can be made on the aforementioned structure without departing from the concepts of the present invention, and further it is to be understood that such concepts are intended to be covered by the following claims unless these claims by their language expressly state otherwise.

I claim:

1. A trim system for aesthetic components, such as exterior automotive trim components, comprising:

   first and second trim components with edge flanges that define a joint line between their outer surfaces, but that overlap to prevent see-through between the trim components, one of the first and second trim components including a recess and the other including a retainer for frictionally engaging the recess to retain the first and second trim components closely together to minimize a width of the joint line, one of the first and second trim components including an alignment flange portion and the other including a clamping flange for engaging the alignment flange portion to maintain an optimal flushness of the outer surfaces.

   2. The trim system defined in claim 1, wherein the retainer includes a hook having a flexible stem that extends along line parallel the outer surfaces.

   3. The trim system defined in claim 1, including a second retainer on the one trim component having the first-mentioned retainer, and a second clamping flange on the one trim component having the first-mentioned clamping flange, the first-mentioned retainer and the second retainer being on opposing outboard sides of the second clamping flange and the first-mentioned clamping flange.

   4. The trim system defined in claim 1, wherein the retainer and the recess and also the clamping flange and the alignment flange portion are configured to allow lateral adjustment in a direction parallel the joint line.

   5. The trim system defined in claim 1, including a ramp in the one trim component having the recess, the ramp providing an angled path into recess for the retainer and being configured to flex the retainer as the retainer moves toward the recess during assembly.

   6. The trim system defined in claim 1, wherein the alignment flange portion is integrally formed as part of one of the edge flanges.

   7. The trim system defined in claim 1, wherein the first and second trim components are molded parts that characteristically do not have blind surfaces such that the first and second trim components can be molded using molding dies not having sliding and undercut mechanisms for forming blind surfaces.

   8. The trim system defined in claim 1, wherein one of the first and second trim components includes a resilient alignment feature shaped to engage a mating alignment feature on the other of the first and second trim components.

   9. The trim system defined in claim 8, wherein the resilient alignment feature includes an arcuately-shaped tab that flexes laterally to permit some relative adjustment movement of the first and second trim components in a lateral direction parallel the joint line.

10. A trim system for aesthetic components, such as exterior automotive trim components, comprising:

    first and second trim components with edge flanges that define a joint line between their outer surfaces, one of the first and second trim components including a recess and the other including a retainer for frictionally engaging the recess to retain the first and second trim components closely together to minimize a width of the joint line, one of the first and second trim components including an alignment flange portion and the other including a clamping flange for engaging the alignment flange portion to maintain an optimal flushness of the outer surfaces and to maintain engagement of the hook with the recess, the hook and recess being located between the alignment flange portions and the clamping flanges.

11. A trim system for aesthetic components, such as exterior automotive trim components, comprising:

    first and second trim components with edge flanges that define a joint line between their outer surfaces, one of
the edge flanges including a reduced-thickness lip and the other including an overlapping lip that overlaps the reduced-thickness lip to prevent see-through between the trim components, the first and second trim components including retainers that frictionally engage to retain the first and second trim components closely together to minimize a gap width of the joint line while also maintaining a constant gap and an optimal flushness of the outer surfaces.

12. A trim system for aesthetic components, such as exterior automotive trim components, comprising:

first and second trim components with edge flanges that define a joint line between their outer surfaces, retainers integral with the first and second trim components that secure the edge flanges together, and alignment features extending perpendicular to the edge flanges, one of the alignment features including resilient tabs defining a tapered chute and the other of the alignment features defining at least one mating surface fitting into the chute and engaging the resilient tabs, the alignment features permitting some lateral adjustability of the first and second trim components but biasing the first and second trim components toward a predetermined relative location along the joint line.

13. The trim system defined in claim 12, wherein the resilient tabs include arcuately-shaped tabs that extend and flex in a direction parallel the joint line.

14. The trim system defined in claim 12, wherein the resilient tabs include first and second resilient tabs shaped to flex in opposite directions.

15. The trim system defined in claim 12, wherein the resilient tabs are shaped to provide lateral relative adjustability in a range of about 0.5 to 2.0 mm.

16. The trim system defined in claim 12, wherein the retainers include hooks shaped to engage in an assembly direction that is generally perpendicular to the joint line.

17. The trim system defined in claim 12, wherein the edge flanges of the first and second trim components overlap to prevent seeing through the joint line.

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