

## WINDOW GRILLE ASSEMBLY AND METHOD OF INSTALLING THEREOF

### **Technical Field**

5 [0001] Embodiments relate generally to a window grille assembly and a method of installing a window grille assembly.

### **Background**

[0002] Window grilles are a framework or a screen of parallel and/or crossed bars or wires placed in front of the window to prevent access through the window opening  
10 while permitting ventilation, light penetration as well as allowing one to still look through or observe through the window. Typically, in high rise apartments, window grilles are added on to the original windows of the apartments by the owners or occupants for safety and security reasons, such as prevention of fall through the window etc. Typically, these conventional window grilles are installed from the  
15 interior of the apartments. Thus, the window grilles will usually obstruct cleaning of the windows or make the process of cleaning the window cumbersome. Further, these conventional window grilles are bulky and occupy quite a substantial amount of space around the window area.

[0003] Accordingly, example embodiments seek to provide a window grille  
20 assembly and a method of installing a window grille assembly that addresses at least some of the issues identified above.

### **Summary**

[0004] According to various embodiments, there is provided a window grille assembly for an existing window frame according to various embodiments, the  
25 window grille assembly may include a first elongated unitary component coupled to a base surface of the window frame. The window grille assembly may include a second elongated unitary component coupled to a head surface of the window frame. The head surface of the window frame may be facing the base surface of the window frame. The window grille assembly may further include a grille removably retained  
30 between the first elongated unitary component and the second elongated unitary component. In the assembled window grille assembly installed to the window frame, the first elongated unitary component, the second elongated unitary component and the grille may be within a volume of space bound by the window frame.

[0005] According to various embodiments, there is provided a method of installing a window grille assembly to an existing window frame. The method may include coupling a first elongated unitary component to a base surface of the window frame. The method may further include coupling a second elongated unitary component to a head surface of the window frame. The method may include inserting a grille between the first elongated unitary component and the second elongated unitary component to removably retain the grille between the first elongated unitary component and the second elongated unitary component, wherein the first elongated unitary component, the second elongated unitary component and the grille may be within a volume of space bound by the window frame.

[0006] According to various embodiments, there is provided a kit for a window grille assembly to be installed to a window frame. The kit may include a first elongated unitary component configured to be coupled to a base surface of the window frame. The kit may further include a second elongated unitary component configured to be coupled to a head surface of the window frame. The head surface of the window frame may be facing the base surface of the window frame. The kit may further include a grille configured to be removably retained between the first elongated unitary component and the second elongated unitary component. The first elongated unitary component, the second elongated unitary component and the grille may be further configured to fit within a volume of space bound by the window frame upon installation to the window frame.

### **Brief description of the drawings**

[0007] In the drawings, like reference characters generally refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention. In the following description, various embodiments are described with reference to the following drawings, in which:

FIG. 1A shows a schematic diagram of a window grille assembly for an existing window frame according to various embodiments;

FIG. 1B shows a schematic diagram of a window grille assembly for an existing window frame according to various embodiments;

FIG. 2 shows a method of installing a window grille assembly to an existing window frame according to various embodiments;

FIG. 3A shows an exploded view of a window grille assembly and a window according to various embodiments;

5        FIGs. 3B to 3E show an assembled view, a front view, a cross-sectional side view and enlarged portions of the cross-sectional side view respectively of the window grille assembly of FIG. 3A installed to the window of FIG. 3A according to various embodiments;

10        FIG. 3F shows enlarged portions of the cross-sectional side view 311 of the first elongated unitary component and the second elongated unitary component of the window grille assembly of FIG. 3A installed to the window of FIG. 3A according to various embodiments; and

15        FIGs. 4A to 4D show respective cross-sectional view of the border member of the grille of the window grille assembly of FIG. 3A, the elongated link member of the grille of the window grille assembly of FIG. 3A, the second elongated unitary component of the window grille assembly of FIG. 3A, and the first elongated unitary component of the window grille assembly of FIG. 3A according to various embodiments.

## 20        **Detailed description**

[0008]        Embodiments described below in context of the apparatus are analogously valid for the respective methods, and vice versa. Furthermore, it will be understood that the embodiments described below may be combined, for example, a part of one embodiment may be combined with a part of another embodiment.

25        [0009]        It should be understood that the terms “on”, “over”, “top”, “bottom”, “down”, “side”, “back”, “left”, “right”, “front”, “lateral”, “side”, “up”, “down” etc., when used in the following description are used for convenience and to aid understanding of relative positions or directions, and not intended to limit the orientation of any device, or structure or any part of any device or structure. In  
30        addition, the singular terms “a”, “an”, and “the” include plural referents unless context clearly indicates otherwise. Similarly, the word “or” is intended to include “and” unless the context clearly indicates otherwise.

**[0010]** High rise apartments may come with different types of windows, for example, fixed window, casement window, sliding window, awning window, single-hung window, double-hung window, etc. Typically, the high rise apartments are built such that the window frames of the windows are flushed with the walls of the apartments. Accordingly, in adding conventional window grilles to the existing window from the interior of the apartment, the installer has to typically drill into the original window frame or the wall in order to attach the conventional window grilles to the window frame or the walls. Further, the conventional window grilles will also intrude into the living space of the apartment by protruding from the window frame or the wall of the apartment. Such conventional window grilles may weaken the structural integrity of the original window frame, and may pose as safety hazard to the occupants, especially young children, who may knock against the protruding window grilles and may sustain injury.

**[0011]** Accordingly, various embodiments seek to provide a safety window grille assembly that may be installed to the existing window. Various embodiments also seek to provide a safety window grille assembly that may allow ease of cleaning and may eliminate or reduce the safety hazard, such as protruding hazard, to the occupant. Various embodiments also seek to provide a safety window grille assembly that may be reliable and strong, as well as aesthetically appealing. Various embodiments also seek to provide a safety window grille assembly that may be easy to be maintained by the occupant after installation. Various embodiments also seek to provide a safety window grille assembly that may be installed into the existing window frame without tampering the structural integrity of the original window frame. Various embodiments also seek to provide a method of installing the safety window grille assembly.

**[0012]** FIG. 1A shows a schematic diagram of a window grille assembly 110 for an existing window frame according to various embodiments. The window grille assembly 110 may include a first elongated unitary component 120 coupled to a base surface of the window frame. The window grille assembly 110 may further include a second elongated unitary component 120 coupled to a head surface of the window frame. The head surface of the window frame may be facing the base surface of the window frame. The window grille assembly 110 may further include a grille 140 removably retained between the first elongated unitary component 120 and the second elongated unitary component 130. In the assembled window grille assembly 110

installed to the window frame, the first elongated unitary component 120, the second elongated unitary component 130 and the grille 140 may be within a volume of space bound by the window frame.

**[0013]** In other words, the window grille assembly 110 may include a first single long component which is a complete part by itself. The first single long component may be connected or joined to a bottom surface of the window frame. The window frame may include four interior surfaces that define the opening of the window. The bottom surface of the window frame may be one of the four interior surfaces of the window frame that defines the bottom boundary of the opening of the window. The window grille assembly 110 may further include a second single long component which is also a complete part by itself. The second single long component may be connected or joined to a top surface of the window frame. The top surface of the window frame may be another one of the four interior surfaces of the window frame that defines the top boundary of the opening of the window. Accordingly, the top surface of the window frame may be directly facing the bottom surface of the window frame. The window grille assembly 110 may further include an integral set of regularly spaced elongated elements that may be parallel and/or crossed. The integral set of regularly spaced elongated elements may be held in place between the first single long component and the second single long component such that the integral set of regularly spaced elongated elements may be capable of being removed. When assembled in the window frame, the first single long component, the second single long component and the integral set of regularly spaced elongated elements may be inside a space confined or defined by the window frame.

**[0014]** FIG. 1B shows a schematic diagram of a window grille assembly 160 for an existing window frame according to various embodiments. The window grille assembly 160 may, similar to the window grille assembly 110 of FIG. 1A, include a first elongated unitary component 120 coupled to a base surface of the window frame. The window grille assembly 160 may, similar to the window grille assembly 110 of FIG. 1A, include a second elongated unitary component 120 coupled to a head surface of the window frame. The head surface of the window frame may be facing the base surface of the window frame. The window grille assembly 160 may, similar to the window grille assembly 110 of FIG. 1A, further include a grille 140 removably retained between the first elongated unitary component 120 and the second elongated

unitary component 130. In the assembled window grille assembly 160 installed to the window frame, similar to the window grille assembly 110 of FIG. 1A, the first elongated unitary component 120, the second elongated unitary component 130 and the grille 140 may be within a volume of space bound by the window frame.

5 **[0015]** According to various embodiments, the grille 140 may include a first elongated border member 142, a second elongated border member 144, and at least one elongated link member 146. A first end of the at least one elongated link member 146 may be coupled to the first elongated border member 142. A second end of the at least one elongated link member 146 may be coupled to the second elongated border member 144. According to various embodiments, the at least one elongated link member 146 may be at least substantially perpendicular to the first elongated border member 142 and the second elongated border member 144. According to various embodiments, the at least one elongated link member 146 may include a circular hollow cross-section. According to various embodiments, the at least one elongated link member 146 may include at least one ridge extending lengthwise along an interior surface of the at least one elongated link member 146 with the circular hollow cross-section. According to various embodiment, the first end of the at least one elongated link member 146 may coupled to the first elongated border member 142 via a screw driven into the at least one ridge, and the second end of the at least one elongated link member 146 may be coupled to the second elongated border member 144 via another screw driven to the at least one ridge.

**[0016]** According to various embodiments, a shortest distance apart between a tip of the first elongated unitary component 120 furthest from the base surface of the window frame and a tip of the second elongated unitary component 130 furthest from the head surface of the window frame may be shorter than a height of the grille 140.

**[0017]** According to various embodiments, the first elongated unitary component 120 may be configured or shaped to define a gap to receive a border of the grille 140, and the second elongated unitary component 130 may be configured or shaped to define another gap to receive an opposing border of the grille 140. According to various embodiments, the border of the grille may be the first elongated border member 142 of the grille 140. The opposing border of the grille may be the second elongated border member 144 of the grille 140. According to various embodiments, a depth of the gap defined by the first elongated unitary component 120 may be

shallower than a depth of the gap defined by the second elongated unitary component 130.

**[0018]** According to various embodiments, the first elongated unitary component 120 may include a seat portion 122 and a retaining flange portion 124. The retaining flange portion 124 of the first elongated unitary component 120 may be projecting at least substantially perpendicularly away from the seat portion 122. According to various embodiments, the seat portion 122 may include a hollow cross-section. According to various embodiments, the seat portion 122 may be configured to receive the first elongated border member 142 of the grille 140 such that the first elongated border member 142 of the grille 140 may be received and seated on the seat portion 122.

**[0019]** According to various embodiments, the second elongated unitary component 130 may include a plate portion 132 and a retaining flange portion 134. The retaining flange portion 134 of the second elongated unitary component 130 may be projecting at least substantially perpendicularly away from the plate portion 132. According to various embodiments, the second elongated unitary component 130 may include an L-shaped cross-section.

**[0020]** According to various embodiments, the window grille assembly 160 may include a locking mechanism 170 to lock the grille 140 in place with respect to the first elongated unitary component 120 and the second elongated unitary component 130, which are coupled to the window frame. According to various embodiments, the locking mechanism 170 may be configured to bias the grille 140 against the second elongated unitary component 130. According to various embodiments, the locking mechanism 170 may include a screw mechanism or a spring mechanism configured to bias the grille 140 against the second elongated unitary component 130.

**[0021]** According to various embodiments, the window grille assembly 150 may include the window frame.

**[0022]** FIG. 2 shows a method 200 of installing a window grille assembly to an existing window frame according to various embodiments. The method may include, at 202, coupling a first elongated unitary component to a base surface of the window frame. The method may further include, at 204, coupling a second elongated unitary component to a head surface of the window frame. The method may include, at 206, inserting a grille between the first elongated unitary component and the second

elongated unitary component to removably retain the grille between the first elongated unitary component and the second elongated unitary component, wherein the first elongated unitary component, the second elongated unitary component and the grille may be within a volume of space bound by the window frame.

5   **[0023]**   According to various embodiments, the method may further include cutting a first elongated raw material to form the first elongated unitary component with a predetermined length, wherein the predetermined length is a length of the window frame.

10   **[0024]**   According to various embodiments, the method may further include cutting a second elongated raw material to form the second elongated unitary component with a predetermined length, wherein the predetermined length is a length of the window frame.

15   **[0025]**   According to various embodiments, the method may further include assembling the grille. According to various embodiments, assembling the grille may include coupling a first end of at least one elongated link member of the grille to a first elongated border member, and coupling a second end of the at least one elongated link member of the grille to a second elongated border member. According to various embodiments, the at least one elongated link member of the grille may be coupled at least substantially perpendicular to the first elongated border member and  
20   the second elongated border member.

25   **[0026]**   According to various embodiments, the method may further include cutting a third elongated raw material to form the at least one elongated link member.

30   **[0027]**   According to various embodiments, the method may further cutting a fourth elongated raw material to form the first elongated border member and the second elongated border member.

35   **[0028]**   According to various embodiments, coupling may include coupling via adhesion, mechanical fastening, bonding, or a combination thereof. According to various embodiments, coupling may include coupling via screws.

40   **[0029]**   According to various embodiments, inserting the grille may include sliding a border of the grille into a gap of the second elongated unitary component, and placing an opposing border of the grille into a gap of the first elongated unitary component.

**[0030]** According to various embodiments, the method may further include locking the grille in place. According to various embodiments, locking the grille may include biasing the grille against the second elongated unitary component.

**[0031]** According to various embodiments, various components of the window grille assembly installed by the method may be configured according to the various embodiments as described herein.

**[0032]** According to various embodiments, there may be provided a kit for a window grille assembly to be installed to an existing window frame. The kit may include a first elongated unitary component configured to be coupled to a base surface of the window frame. The kit may further include a second elongated unitary component configured to be coupled to a head surface of the window frame. The head surface of the window frame may be facing the base surface of the window frame. The kit may further include a grille configured to be removably retained between the first elongated unitary component and the second elongated unitary component. The first elongated unitary component, the second elongated unitary component and the grille may be further configured to fit within a volume of space bound by the window frame upon installation to the window frame.

**[0033]** According to various embodiments, various components of the window grille assembly provided by the kit may be configured according to the various embodiments as described herein.

**[0034]** FIG. 3A shows an exploded view 301 of a window grille assembly 310 and a window 300 according to various embodiments. FIG. 3B shows an assembled view 303 of the window grille assembly 310 installed to the window 300 according to various embodiments. FIG. 3C shows a front view 305 of the window grille assembly 310 installed to the window 300 according to various embodiments. FIG. 3D shows a cross-sectional side view 307 of the window grille assembly 310 installed to the window 300 according to various embodiments. FIG. 3E shows enlarged portions of the cross-sectional side view 309 of the window grille assembly 310 installed to the window 300 according to various embodiments. FIG. 3F shows enlarged portions of the cross-sectional side view 311 of the first elongated unitary component and the second elongated unitary component of the window grille assembly 310 installed to the window 300 according to various embodiments.

**[0035]** According to various embodiments, the window grille assembly 310 may be installed to the existing window 300 of an apartment. As shown, the window 300 that the window grille assembly 310 is installed to may be a fixed window. According to various embodiments, the window 300 may be other types of windows, for example, casement window, sliding window, awning window, single-hung window, double-hung window, etc. Regardless of the type of window, the window 300 may include a window frame 302 and an inwardly protruding flange portion 306. The window frame 302 may be configured to provide the structural framework for the window. The window frame 302 may define the space for containing window glass panels 304. The window frame 302 may also define the opening of the window. The window frame 302 may include a base member 313, a head member 315 and two side members 317. Accordingly, the window frame 302 may be at least substantially quadrilateral in shape. According to various embodiments, for example in the fixed type window, the inwardly protruding flange portion 306 may be projecting from the frame members of the window frame 302 toward a centre of the window frame 302. Accordingly, the inwardly protruding flange portion 306 may be the portion of the window frame that is configured to receive the window glass panel 304 so as to support or hold the window glass panel 304 in place. In other types of windows, the inwardly protruding flange portion may be a blind stop configured to stop a movable window sash or screen that holds the window glass panels. According to various embodiments, the inwardly protruding flange portion 306 may be along at least the base member 313 and the head member 315.

**[0036]** As shown in FIG. 3A, the window grille assembly 310 may include a first elongated unitary component 320 configured to be coupled to a base surface 312 of the window frame 302. The first elongated unitary component 320 may be a single part, which is complete by itself. The first elongated unitary component 320 may be configured to function as a first retaining bracket to retain a grille. Further, the base surface 312 of the window frame 302 may be an inward facing surface of the base member 313 of the window frame 302. The base member 313 may be a bottom of the window frame. Accordingly, the base surface 312 of the window frame 302 may be one of the four interior surfaces of the window frame 302 that defines a bottom boundary of the opening of the window. The window grille assembly 310 may further include a second unitary component 330 configured to be coupled to a head surface

314 of the window frame 302. Similarly, the second elongated unitary component 330 may be a single part, which is complete by itself. The second elongated unitary component 330 may be configured to function as a second retaining bracket to retain the grille. The head surface 314 may be an inward facing surface of the head member 315 of the window frame 302. The head member 315 may be a top of the window frame. Accordingly, the head surface 314 may be another of the four interior surfaces of the window frame 302 that defines a top boundary of the opening of the window. Thus, the head surface 314 of the window frame 302 may be facing the base surface 312 of the window frame 302.

10 **[0037]** The window grille assembly 310 may also include a grille 340 configured to be removably retained between the first elongated unitary component 320 and the second elongated unitary component 330 when the first elongated unitary component 320 and the second elongated unitary component 330 are coupled to the window frame 302. The first elongated unitary component 320, the second elongated unitary component 330 and the grille 340 may be further configured to fit within a volume of space bound by the window frame 302, for example bound by the base surface 312 and the head surface 314 of the window frame 302. According to various embodiments, when the window grille assembly 310 is installed into the window 300, the first elongated unitary component 320, the second elongated unitary component 330 and the grille 340 may be within the volume of space bound by the window frame 302. Accordingly, each of the first elongated unitary component 320, the second elongated unitary component 330 and the grille 340 may be entirely contained within the space defined or enclosed by the base surface 312 of the base member 313 of the window frame 302, the head surface 314 of the head member 315 of the window frame 302, and side surfaces 316 of the side members 317 of the window frame 302.

25 **[0038]** FIG. 3B shows the assembled window grille assembly 310 in the window frame 300 according to various embodiments. As shown, the assembled window grille assembly 310 may include the first elongated unitary component 320 coupled to the base surface 312 of the window frame 302. The assembled window grille assembly 310 may include the second elongated unitary component 330 coupled to the head surface 314 of the window frame 302. The head surface 314 of the window frame 302 may be facing the base surface 312 of the window frame 302. Further, the assembled window grille assembly 310 may include the grille 340 removably retained between

the first elongated unitary component 320 and the second elongated unitary component 330. Accordingly, the grille 340 may be retained or held in place by the first elongated unitary component 320 and the second elongated unitary component 330 by inserting or slotting the grille 340 between the first elongated unitary component 320 and the second elongated unitary component 330 such that the grille 340 may not fall off from the window frame 302 once the grille 340 is being positioned between the first elongated unitary component 320 and the second elongated unitary component 330. The grille 340 may be inserted or slotted between the first elongated unitary component 320 and the second elongated unitary component 330 by maneuvering the grille 340 according to a predetermined or planed movement. For example, by sliding a top border of the grille 340 upwards into the second elongated unitary component 330 and subsequently inserting a bottom border of the grille 340 downwards into the first elongated unitary component 320.

**[0039]** Further, after the grille 340 is inserted or slotted between the first elongated unitary component 320 and the second elongated unitary component 330, the grille 340 as a whole may be removed from the window grille assembly 310 by maneuvering the grille 340 according to a predetermined or planed movement. For example, by sliding the top border of the grille 340 upwards into the second elongated unitary component 330 and subsequently tilting the bottom edge of the grille 340 outwards away from the first elongated unitary component 320 to remove the grille 340 entirely from the window grille assembly 310. With the grille 340 being removable, cleaning and maintenance of the window 300 and the window grille assembly 310 may be achieved easily.

**[0040]** As shown in FIGs. 3B, 3D and 3E, in the assembled window grille assembly 310, each of the first elongated unitary component 320, the second elongated unitary component 330 and the grille 340 may be entirely within a volume of space bound by the window frame 302, for example bound by the base surface 312 and the head surface 314 of the window frame 302. Accordingly, the first elongated unitary component 320, the second elongated unitary component 330 and the grille 340 may be contained within the space defined or enclosed by the base surface 312 of the base member 313 of the window frame 302, the head surface 314 of the head member 315 of the window frame 302, and side surfaces 316 of the side members 317 of the window frame 302.

**[0041]** According to various embodiments, the first elongated unitary component 320, the second elongated unitary component 330 and the grille 340 may be configured or dimensioned such that the assembled window grille assembly 310 may be at least substantially flushed with the window frame 302 and in turn be at least substantially flushed with the walls around the window frame. Accordingly, the assembled window grille assembly 310 may not protrude from the window frame 302 or the wall surrounding the window frame 302. According to various embodiments, the first elongated unitary component 320, the second elongated unitary component 330 and the grille 340 may be configured or dimensioned such that the assembled window grille assembly 310 may be at least substantially recessed into the window frame 302. Similarly, the assembled window grille assembly 310 may not protrude from the window frame 302 or the wall surrounding the window frame 302.

**[0042]** Referring to FIG. 3A, the grille 340 of the window grille assembly 310 may include a first elongated border member 342, a second elongated border member 344 and at least one elongated link member 346. Accordingly, the grille 340 may be an integral set of regularly spaced elongated elements that may be parallel and/or crossed. As shown, a first end 348 of the at least one elongated link member 346 may be coupled to a side 352 of the first elongated border member 342. A second end 350 of the at least one elongated link member 346 may be coupled to a side 354 of the second elongated border member 344. According to various embodiments, the at least one elongated link member 346 may be coupled to the first elongated border member 342 and the second elongated border member 344 such that the at least one elongated link member 346 may be at least substantially perpendicular to the first elongated border member 342 and the second elongated border member 344. In this configuration, when the grille 340 is retained by the first elongated unitary component 320 and the second elongated unitary component 330 in the assembled window grille assembly 310, the first elongated border member 342 and the second elongated border member 344 of the grille 340 may be received in the first elongated unitary component 320 and the second elongated unitary component 330 respectively such that the first elongated border member 342 and the second elongated border member 344 of the grille 340 may be parallel to the base member 311 and the head member 313 of the window frame 302. Accordingly, the elongated link member 346 of the grille 340 may be perpendicular to the base member 311 and the head member 313 of

the window frame 302. Thus, when assembled in the window frame 302, the elongated link member 346 may be vertical while the first elongated border member 342 and the second elongated border member 344 may be horizontal. Advantageously, the vertical elongated link member 346 may span across the glass panel 304 of the window 300. Accordingly, cleaning of the glass panel 304 may also be easily achieved without removing the grilles 340 via an up and down cleaning motion along the at least one vertical elongated link member 346.

**[0043]** According to various embodiments, the at least one elongated link member 346 may be coupled to the first elongated border member 342 and the second elongated border member 344 via adhesion, or mechanical fastening, or bonding, or any suitable fastening means, or a combination thereof. According to various embodiments, the at least one elongated link member 346 may be coupled to the first elongated border member 342 and the second elongated border member 344 via screws. For example, a screw or a self-tapping screw may be put through a hole in a body of the first elongated border member 342 and then be screwed into an opening in an end profile of the at least one elongated link member 346. In this manner, the body of the first elongated border member 342 may be tighten against the end of the at least one elongated link member 346. Similarly, another screw or another self-tapping screw may be used to tighten a body of the second elongated border member 344 against another end of the at least one elongated link member 346.

**[0044]** According to various embodiments, in the assembled window grille assembly 310, a shortest distance apart between a tip 326 of the first elongated unitary component 320 furthest from the base surface 312 of the window frame 302 and a tip 336 of the second elongated unitary component 320 furthest from the head surface 314 of the window frame 302 may be shorter than a height of the grille 340. The height of the grille 340 may be measured from an outer edge 356 of the first elongated border member 342 to an outer edge 358 of the second elongated border member 342. Accordingly, the grille 340 may not fall through between the first elongated unitary component 320 and the second elongated unitary component 330 when the grille 340 is at least substantially laying flat against the first elongated unitary component 320 and the second elongated unitary component 330.

**[0045]** According to various embodiments, the first elongated unitary component 320 may be configured or shaped to define a gap 328 (see FIG. 3F) to receive a border

of the grille 340, for example the first elongated border member 342 of the grille 340. According to various embodiments, the second elongated unitary component 330 may be configured or shaped to define a gap 338 (see FIG. 3F) to receive an opposing border of the grille 340, for example the second elongated border member 344 of the grille 340. According to various embodiments, a depth of the gap 328 defined by the first elongated unitary component 320 may be shallower than a depth of the gap 338 defined by the second elongated unitary component 330.

**[0046]** Accordingly, to insert the grille 340 between the first elongated unitary component 320 and the second elongated unitary component 330, the grille 340 may be tilted to slide the second elongated border member 344 of the grille 340 into the gap 338 of the second elongated unitary component 330. The depth of the gap 338 of the second elongated unitary component 330 may be configured such that when the second elongated border member 344 of the grille 340 is inserted all the way in, the first border member 342 may be above and may clear the tip 326 of the first elongated unitary component 320. After clearing the tip 326 of the first elongated unitary component 320, the first elongated border member 342 of the grille 340 may be inserted into the gap 328 of the first elongated unitary component 320. The depth of the gap 328 of the first elongated unitary component 320 may be configured such that when the first elongated border member 342 of the grille 340 is resting in the gap 328 of the first elongated unitary component 320 due to gravity, the second elongated border member 344 of the grille 340 may be still within the gap 338 of the second elongated unitary component 330. In this manner, the grille 340 may be retained or held by the first elongated unitary component 320 and the second elongated unitary component 330.

**[0047]** To remove the grille 340 entirely from the window grille assembly 310, the grille 340 may be slide upwards such that the second elongated border member 344 of the grille 340 may be inserted all the way into the gap 338 of the second elongated unitary component 330. When the second elongated border member 344 of the grille 340 is inserted all the way in, the first border member 342 may be moved out of the gap 328 of the first elongated unitary component 320 such that the first elongated border member 342 may be above and may clear the tip 326 of the first elongated unitary component 320. The grille 340 may then be tilted to move the first elongated border member 342 away and out from the first elongated unitary

component 320. Subsequently, the grille 340 may be moved to slide the second elongated border member 344 of the grille 340 out of the gap 338 of the second elongated unitary component 330 to remove the grille 340 entirely from the second elongated unitary component 330.

5 **[0048]** FIG. 4A shows a cross-section of the first elongated border member 342 of the grille 340, which is the same as the cross-section of the second elongated border member 344 of the grille 340, according to various embodiments. As shown, the first elongated border member 342 and the second elongated border member 344 may include a rectangular hollow tubular cross-section 443. According to various  
10 embodiments, the rectangular hollow tubular cross-section 443 may have a width of 12.5mm and a height of 8.2mm. According to various embodiments, the first elongated border member 342 and the second elongated border member 344 may include a square hollow tubular cross-section, a circular hollow cross-section, a solid rectangular cross-section, a solid square cross-section, a solid circular cross-section or  
15 any suitable cross-sectional shape. According to various embodiments, the first elongated border member 342 and the second elongated border member 344 may be extruded aluminum pieces.

**[0049]** FIG. 4B shows a cross section of the at least one elongated link member 346 of the grille 340. As shown, the at least one elongated link member 346 may  
20 include a circular hollow cross-section 445. According to various embodiments, the circular hollow cross-section 445 may have an outer diameter of 12mm. According to various embodiments, the at least one elongated link member may include a rectangular hollow tubular cross-section, a square hollow tubular cross-section, a solid rectangular cross-section, a solid square cross-section, a solid circular cross-section or  
25 any suitable cross-sectional shape. As shown, the at least one elongated link member 346 may include at least one ridge 447. The at least one ridge may extend lengthwise along an interior surface 449 of the at least one elongated link member 346. According to various embodiments, the at least one elongated link member 346 may be coupled to the first elongated border member 342 and the second elongated border  
30 member 344 via adhesion, or mechanical fastening, or bonding, or any suitable fastening means, or a combination thereof. According to various embodiments, the at least one elongated link member 346 may be coupled to the first elongated border member 342 and the second elongated border member 344 via screws or self-tapping

screws. The screws or the self-tapping screws may be driven into the at least one ridge 447 for fastening. According to various embodiments, the at least one elongated link member 346 may be a single extruded aluminum piece.

**[0050]** FIG. 4C shows a cross section of the second elongated unitary component 330 of the window grille assembly 310. As shown, the second elongated unitary component 330 of the window grille assembly 310 may include a plate portion 432 and a retaining flange portion 434. The retaining flange portion 434 of the second elongated unitary component 330 may project at least substantially perpendicularly away from the plate portion 432. The plate portion 432 may be configured to be coupled to the head surface 314 of the window frame 302. Accordingly, the retaining flange portion 434 of the second elongated unitary component 330 may project at least substantially perpendicularly away from the head surface 314 of the window frame 302. According to various embodiments, the plate portion 432 may be coupled to the head surface 314 of the window frame 302 via adhesion, or mechanical fastening, or bonding, or any suitable fastening means, or a combination thereof. When coupled to the head surface 314 of the window frame 302, the retaining flange portion 434 of the second elongated unitary component 330, the plate portion 432 of the second elongated unitary component 330 and the inwardly protruding flange portion 306 of the head member 315 of the window frame 302 may define the gap 338 for receiving the second elongated border member 344 of the grille 340. According to various embodiments, the plate portion may have a width of 12.5mm and the retaining flange portion may have a height of 19.5mm. The second elongated unitary component 330 may have a thickness of 1.0mm. According to various embodiments, the second elongated unitary component 330 may include an L-shaped cross-section. According to various embodiments, the second elongated unitary component 330 may be a single extruded aluminum piece.

**[0051]** FIG. 4D shows a cross section of the first elongated unitary component 320 of the window grille assembly 310. As shown, the first elongated unitary component 320 of the window grille assembly 310 may include a seat portion 422 and a retaining flange portion 424. The retaining flange portion 424 of the first elongated unitary component 320 may project at least substantially perpendicularly away from the seat portion 422. The seat portion 422 may be configured to be coupled to the base surface 312 of the window frame 302. A bottom surface 425 of the seat portion 422

may be coupled to the base surface 312 of the window frame 302 via adhesion, or mechanical fastening, or bonding, or any suitable fastening means, or a combination thereof. Accordingly, the retaining flange portion 424 of the first elongated unitary component 320 may project at least substantially away from the base surface 312 of the window frame 302. When the first elongated unitary component 420 is coupled to the base surface 312 of the window frame 302, the retaining flange portion 424 of the first elongated unitary component 320, a top surface 427 of the seat portion 422 of the first elongated unitary component 320 and the inwardly protruding flange portion 306 of the base member 313 of the window frame 302 may define the gap 328 for receiving the first elongated border member 342 of the grille 340. According to various embodiments, the seat portion 422 may serve as a spacer between the first elongated border member 342 of the grille 340 and the base member 313 of the window frame 302 such that, when the first elongated border member 342 of the grille 340 is seated on the seat portion 422 due to gravity, the second elongated border member 344 of the grille 340 may be within the gap 338 of the second elongated unitary component 330 of the window grille assembly 310. According to various embodiments, the seat portion 422 of the first elongated unitary component 320 may include a hollow cross-section. According to various embodiments, the seat portion 422 of the first elongated unitary component 320 may include a rectangular hollow tubular cross-section, a square hollow tubular cross-section, a circular hollow cross-section, a solid rectangular cross-section, a solid square cross-section, a solid circular cross-section or any suitable cross-sectional shape. According to various embodiments, the seat portion 422 of the first elongated unitary component 320 may include a rectangular hollow tubular cross-section with a width of 12.5mm and a height of 11.3mm. According to various embodiments, the retaining flange portion 424 of the first elongated unitary component 320 may have a height of 9.2mm and a thickness of 1.1mm.

**[0052]** According to various embodiments, the grille 340 of the window grille assembly 310 may include a locking mechanism to lock the grille 340 in place with respect to the first elongated unitary component 320 and the second elongated unitary component 330, which are coupled to the window frame 302. According to various embodiments, the locking mechanism may be configured to bias the grille 340 against the second elongated unitary component 330. For example, the locking mechanism

may bias the second elongated border member 344 of the grille 340 against the plate portion 432 of the second elongated unitary component 330. According to various embodiments, the locking mechanism may include a screw attached to the second elongated border member 344 of the grille 340. The screw may be screwed through a hole in the body of the second elongated border member 344 and towards the plate portion 432 of the second elongated unitary component 330 such that an end of the screw may push against the plate portion 432 of the second elongated unitary component 330 to bias the second elongated border member 344 of the grille 340 against the second elongated unitary component 330. According to various embodiments, the locking mechanism may include a spring mechanism attached to the outer edge 358 of the second elongated border member 344 of the grille 340. The spring mechanism may be configured to bias the second elongated border member 344 of the grille 340 against the second elongated unitary component 330. According to various embodiments, the spring mechanism may include a compression spring, a helical spring, a leaf spring, a parabolic spring, or any suitable type of spring.

**[0053]** According to various embodiments, there may be provided a method of installing the window grille assembly 310 to the existing window frame 302. The method may include coupling the first elongated unitary component 320 to the base surface 312 of the window frame 302. The method may further include coupling the second elongated unitary component 330 to the head surface 314 of the window frame 302. The head surface 314 of the window frame 302 may be facing the base surface 312 of the window frame 302. The method may further include inserting the grille 340 between the first elongated unitary component 320 and the second elongated unitary component 330 to removably retain the grille 340 between the first elongated unitary component 320 and the second elongated unitary component 330. Accordingly, the grille 340 may be retained or held in place by the first elongated unitary component 320 and the second elongated unitary component 330. Further, the first elongated unitary component 320, the second elongated unitary component 330, and the grille 340 may be installed such that the first elongated unitary component 320, the second elongated unitary component 330, and the grille 340 may be contained entirely within a volume of space bound by the window frame 302, for example bound by the base surface 312 and the head surface 314 of the window frame 302.

**[0054]** According to various embodiments, coupling the first elongated unitary component 320 and the second elongated unitary component 330 to the window frame may be via adhesion, or mechanical fastening, or bonding, or any suitable fastening means, or a combination thereof. For example, the first elongated unitary component  
5 320 and the second elongated unitary component 330 may be coupled to the window frame 302 via adhering using suitable adhesive such as epoxy adhesive or other suitable adhesive for metal. Advantageously, using suitable adhesive may avoid tempering the structural integrity of the window frame 302.

**[0055]** According to various embodiments, the method may further include  
10 cutting a first elongated raw material to form the first elongated unitary component 320 with a predetermined length. The predetermined length may be a length of the window frame 302. According to various embodiments, the first elongated raw material may include a cross-sectional profile of the first elongated unitary component 320, for example a cross-sectional profile having a seat portion 422 and a retaining  
15 flange portion 424 as shown in FIG. 4D. According to various embodiments, the first elongated raw material may include an extruded aluminum with the desired cross-sectional profile, for example the profile as shown in FIG. 4D.

**[0056]** According to various embodiments, the method may further include  
20 cutting a second elongated raw material to form the second elongated unitary component 330 with a predetermined length. The predetermined length may be a length of the window frame 302. According to various embodiments, the second elongated raw material may include a cross-sectional profile of the second elongated unitary component 330, for example an L-shaped cross-sectional profile as shown in FIG. 4C. According to various embodiments, the second elongated raw material may  
25 include an extruded aluminum with the desired cross-sectional profile, for example the L-shape profile as shown in FIG. 4C.

**[0057]** According to various embodiments, the method may further include  
assembling the grille 340. According to various embodiments, assembling the grille 340 may include coupling the first end 348 of the at least one elongated link member  
30 346 of the grille 340 to the side 352 of the first elongated border member 342 of the grille 340, and coupling the second end 350 of the at least one elongated link member 346 of the grille 340 to the side 354 of the second elongated border member 344. According to various embodiments, the at least one elongated link member 346 may

be coupled such that the at least one elongated link member 346 of the grille 340 may be at least substantially perpendicular to the first elongated border member 342 and the second elongated border member 344 of the grille 340.

**[0058]** According to various embodiments, coupling the at least one elongated link member 346 to the first elongated border member 342 and the second elongated border member 344 may be via adhesion, or mechanical fastening, or bonding, or any suitable fastening means, or a combination thereof. According to various embodiments, coupling the at least one elongated link member 346 to the first elongated border member 342 and the second elongated border member 344 may be via screw. For example, a screw or a self-tapping screw may be put through a hole in a body of the first elongated border member 342 and then be screwed into an opening in an end profile of the at least one elongated link member 346. In this manner, the body of the first elongated border member 342 may be tighten against the end of the at least one elongated link member 346. Similarly, another screw or another self-tapping screw may be used to tighten a body of the second elongated border member 344 against another end of the at least one elongated link member 346.

**[0059]** According to various embodiments, the method may further include cutting a third elongated raw material to form the at least one elongated link member 346 with a predetermined length. The predetermined length may be the shortest distance apart between the tip 326 of the first elongated unitary component 320 furthest from the base surface 312 of the window frame 302 and the tip 336 of the second elongated unitary component 320 furthest from the head surface 314 of the window frame 302. According to various embodiments, the third elongated raw material may include a cross-sectional profile of the at least one elongated link member 346, for example a circular hollow cross-section 445 as shown in FIG. 4B. The circular hollow cross-section 445 may include ridges 447 as shown in FIG. 4B. According to various embodiments, the third elongated raw material may include an extruded aluminum with the desired cross-sectional profile, for example the profile as shown in FIG. 4B.

**[0060]** According to various embodiments, the method may further include cutting a fourth elongated raw material to form the first elongated border member 342 and the second elongated border member 344. Each of the first elongated border member 342 and the second elongated border member 344 may have a predetermined

length equivalent to the length of the window frame 302. The fourth elongated raw material may include a cross-sectional profile of the elongated border members 342, 344, for example the rectangular hollow cross-section as shown in FIG. 4A. According to various embodiments, the fourth elongated raw material may include an  
5 extruded aluminum with the desired cross-sectional profile, for example the profile as shown in FIG. 4A.

**[0061]** According to various embodiments, inserting the grille 340 between the first elongated unitary component 320 and the second elongated unitary component 330 may include sliding a border of the grille 340, for example the second elongated  
10 border member 344 of the grille 340, into the gap 338 of the second elongated unitary component 330, and placing an opposing border of the grille 340, for example the first elongated border member 342 of the grille 340, into the gap 328 of the first elongated unitary component 320.

**[0062]** According to various embodiments, the method may further include  
15 locking the grille 340 in place with respect to the first elongated unitary component 320 and the second elongated unitary component 330. According to various embodiments, locking the grille 340 may include biasing the grille 340 against the second elongated unitary component 330. For example, biasing the second elongated border member 344 of the grille 340 against the plate portion 432 of the second  
20 elongated unitary component 330. The second elongated border member 344 of the grille 340 may be biased against the plate portion 432 of the second elongated unitary component 330 via a screw being screwed through a hole in the body of the second elongated border member 344 and towards the plate portion 432 of the second elongated unitary component 330 such that an end of the screw may push against the  
25 plate portion 432 of the second elongated unitary component 330. According to various embodiments, the second elongated border member 344 of the grille 340 may be biased against the plate portion 432 of the second elongated unitary component 330 via a spring mechanism attached to the outer edge 358 of the second elongated border member 344 of the grille 340. The spring mechanism may be a compression  
30 spring, a helical spring, a leaf spring, a parabolic spring, or any suitable type of spring.

**[0063]** According to various embodiments, a kit for the window grille assembly 310 to be installed to the existing window frame 302 may include the first elongated

unitary component 320 configured to be coupled to the base surface 312 of the window frame 302. The kit may further include the second elongated unitary component 330 configured to be coupled to the head surface 314 of the window frame 302. The head surface 314 of the window frame 302 may be facing the base surface 312 of the window frame 302. The kit may further include the grille 340 configured to be removably retained between the first elongated unitary component 320 and the second elongated unitary component 330. The first elongated unitary component 320, the second elongated unitary component 330 and the grille 340 may be further configured to fit within a volume of space bound by the window frame 302 upon installation to the window frame 302.

**[0064]** Various embodiments have provided a safety window grille assembly that may be installed to an existing window frame of a window. Various embodiments have also provided a safety window grille assembly that may allow ease of cleaning and may eliminate or reduce the safety hazard to the occupant. Various embodiments have also provided a safety window grille assembly that may be reliable and strong, as well as aesthetically appealing. Various embodiments have also provided a safety window grille assembly that may be easy to be maintained by the occupant after installation. Various embodiments have also provided a safety window grille assembly that may be installed in existing window frame without tampering the structural integrity of the original window frame. Various embodiments have also provided a method of installing the safety window grille assembly.

**[0065]** While the invention has been particularly shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the scope of the invention as defined by the appended claims. The scope of the invention is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

## Claims

1. A window grille assembly for an existing window frame, the window grille assembly comprising:
  - 5 a first elongated unitary component coupled to a base surface of the window frame,
  - a second elongated unitary component coupled to a head surface of the window frame, the head surface of the window frame facing the base surface of the window frame; and
  - 10 a grille removably retained between the first elongated unitary component and the second elongated unitary component,
  - wherein the first elongated unitary component, the second elongated unitary component and the grille are within a volume of space bound by the window frame.
- 15 2. The window grille assembly as claimed in claim 1, wherein the grille comprises:
  - a first elongated border member;
  - a second elongated border member; and
  - at least one elongated link member,
  - 20 wherein a first end of the at least one elongated link member is coupled to the first elongated border member and a second end of the at least one elongated link member is coupled to the second elongated border member.
- 25 3. The window grille assembly as claimed in claim 2, wherein the at least one elongated link member is at least substantially perpendicular to the first elongated border member and the second elongated border member.
4. The window grille assembly as claimed in claim 2 or 3, wherein the at least one elongated link member comprises a circular hollow cross-section.
- 30 5. The window grille assembly as claimed in claim 4, wherein the at least one elongated link member comprises at least one ridge extending lengthwise along an interior surface of the at least one elongated link member.

6. The window grille assembly as claimed in any one of claims 3 to 5, wherein the first end of the at least one elongated link member is coupled to the first elongated border member via a screw and the second end of the at least one elongated link member is coupled to the second elongated border member via another screw.

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7. The window grille assembly as claimed in any one of claims 1 to 6, wherein a shortest distance apart between a tip of the first elongated unitary component furthest from the base surface of the window frame and a tip of the second elongated unitary component furthest from the head surface of the window frame is shorter than a  
10 height of the grille.

8. The window grille assembly as claimed in any one of claims 1 to 7, wherein the first elongated unitary component is configured to define a gap to receive a border of the grille, and the second elongated unitary component is configured to define  
15 another gap to receive an opposing border of the grille.

9. The window grille assembly as claimed in claim 8, wherein a depth of the gap defined by the first elongated unitary component is shallower than a depth of the gap defined by the second elongated unitary component.

20

10. The window grille assembly as claimed in any one of claims 1 to 9, wherein the first elongated unitary component comprises:

a seat portion; and

a retaining flange portion projecting at least substantially perpendicularly

25 away from the seat portion.

11. The window grille assembly as claimed in claim 10 wherein the seat portion comprises a hollow cross-section.

30 12. The window grille assembly as claimed in any one of claims 1 to 11, wherein the second elongated unitary component comprises:

a plate portion; and

a retaining flange portion projecting at least substantially perpendicularly away from the plate portion.

13. The window grille assembly as claimed in any one of claims 1 to 12, further  
5 comprising a locking mechanism to lock the grille in place.

14. A method of installing a window grille assembly to an existing window frame,  
the method comprising:

coupling a first elongated unitary component to a base surface of the window  
10 frame;

coupling a second elongated unitary component to a head surface of the  
window frame, the head surface of the window frame facing the base surface of the  
window frame;

inserting a grille between the first elongated unitary component and the second  
15 elongated unitary component to removably retain the grille between the first  
elongated unitary component and the second elongated unitary component,

wherein the first elongated unitary component, the second elongated unitary  
component and the grille are within a volume of space bound by the window frame.

20 15. The method as claimed in claim 14, further comprising cutting a first  
elongated raw material to form the first elongated unitary component with a  
predetermined length, wherein the predetermined length is a length of the window  
frame.

25 16. The method as claimed in claim 14 or 15, further comprising cutting a second  
elongated raw material to form the second elongated unitary component with a  
predetermined length, wherein the predetermined length is a length of the window  
frame.

30 17. The method as claimed in any one of claims 14 to 16, further comprising  
assembling the grille.

18. The method as claimed in claim 17, wherein assembling the grille comprises coupling a first end of at least one elongated link member of the grille to a first elongated border member, and coupling a second end of the at least one elongated link member of the grille to a second elongated border member.

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19. The method as claimed in claim 18, wherein the at least one elongated link member of the grille is coupled at least substantially perpendicular to the first elongated border member and the second elongated border member.

10 20. The method as claimed in claim 18 or 19, further comprising cutting a third elongated raw material to form the at least one elongated link member.

21. The method as claimed in any one of claims 18 to 20, further comprising cutting a fourth elongated raw material to form the first elongated border member and  
15 the second elongated border member.

22. The method as claimed in any one of claims 14 to 21, wherein coupling comprises coupling via adhesion, mechanical fastening, bonding, or a combination thereof.

20

23. The method as claimed in any one of claims 18 to 21, wherein coupling is via screws.

24. The method as claimed in any one of claims 14 to 23, wherein inserting the  
25 grille comprises:

sliding a border of the grille into a gap of the second elongated unitary component; and

placing an opposing border of the grille into a gap of the first elongated unitary component.

30

25. The method as claimed in any one of claims 14 to 24, further comprising locking the grille in place.

26. The method as claimed in claim 25, wherein locking the grille comprises biasing the grille against the second elongated unitary component.

27. A kit for a window grille assembly to be installed to an existing window  
5 frame, the kit comprising:
- a first elongated unitary component configured to be coupled to a base surface of the window frame,
  - a second elongated unitary component configured to be coupled to a head surface of the window frame, the head surface of the window frame facing the base  
10 surface of the window frame; and
  - a grille configured to be removably retained between the first elongated unitary component and the second elongated unitary component,
  - wherein the first elongated unitary component, the second elongated unitary component and the grille are further configured to fit within a volume of space bound  
15 by the window frame upon installation to the window frame.