

DIAMOND GRILLE SYSTEM

TECHNICAL FIELD

[0001] The present invention generally relates to window grilles, balconies, fences, and similar structure assembly, and more specifically, to a frame using mono core wires that does not requires any plastic membrane, for fixed and movable safety barriers used in buildings or structural for fall prevention.

BACKGROUND

[0002] Due to the high-rise residential buildings in Singapore, the risk of a person falling out a building or structure will likely lead to fatality, especially for young children.

[0003] The installation of window grilles has been around in the market, and the earlier generation of window grilles started with heavy fixed mill steel window grilles, and later developed into metal window grilles using thick metal alloy tubes and invisible grilles.

[0004] The mill steel window grilles and metal window grilles gave a robust structure protection. However, the mill steel window grilles will rust when its protective coating is damaged. Whereas, the metal window grilles in turns obstructed the view of the outside environment, due to its thick metal alloy tubes.

[0005] Recently in the 2000s, the invisible grilles have been available in the market.

[0006] The invisible grilles use multi-core steel wires with a membrane to protect its wires from corrosion, and risk of injuries if it has exposed wire splinters. The membrane of the wires tends to harden when exposed to ultraviolet rays, and may have a tendency to crack. Due to the characteristic of the multi-core steel wires, it's structural property are very flexible,

thus the gaps between the multi-core steel wires can be widened when 2 wires are pulled apart. The multi-core steel wires can be cut off by using kitchen scissors, garden scissors or handheld sized wire cutters, thus does not provide security features. Some of the membrane used in covering these multi-core steel wires are not fireproof, thus creating a fire hazard.

[0007] During the installation process of the invisible grilles, as a market practise, one continuous multi-core steel wire with membrane is usually used for the installation of the entire window grille, the tightness of the multi-core steel wires will be dependent on the strength of the installer.

[0008] In the situation if one line of the multi-core steel wire breaks, the holding strength of the rest of the multi-core steel wires will rest on its plastic clips and tightening nuts. The strength of the multi-core steel wires in preventing people from falling out will be greatly reduced.

[0009] For example, US. Patent No. US8528279B1 describes a security grille and frame which can be connected to a building around a window. While providing security and/or safety barrier, the security grille and frame will provide relatively ready access for emergency responding personnel.

[0010] The traditional grilles and invisible grilles in the market have its limitation in terms of either safety factors, or are aesthetically less pleasing. Thus, there is a need for an improved grille system that provides higher safety factors, maintenance free, and yet is aesthetically pleasing at the same time.

SUMMARY

[0011] The main purpose of the Diamond Grille System is to act as a protective frame structure that provides higher safety factors, maintenance free, and yet is aesthetically pleasing, to prevent people from accidentally falling out a building or structure, as well as prevent unauthorised entry.

[0012] The mono core wires of the Diamond Grille System, due to its small outer diameters, provides a clearer view of the outside environment as compared to traditional metal window grilles.

[0013] The mono core wires, unlike the Invisible Grille in the market, do not require any plastic membrane to protect the wires from environmental corrosion nor to prevent wire splitters from injuring the consumers. The mono core wires does not burn in an open flame, thus it will not create a fire hazard.

[0014] The mono core wires have a smooth surface finish and is made from corrosion-resistant alloy that prevent it from rusting even in severe environment corrosion, unlike the traditional mill steel window grilles.

[0015] The construction of the Diamond Grille System provides an independent grille system. All the mono core wires are connected to their respective lock nut(s)/screw(s) and lock washer(s). In the situation if one of the mono core wire breaks, it will not have any effects on the rest of the mono core wires. Unlike the Invisible Grille, the repairs will only need to be carried out on the individual mono core wires.

[0016] Due to its Hooked Ends construction on both the end of the mono core wires, this construction act as a redundancy failure prevention system in case the lock nut(s)/screw(s) are loosened due to thermal expansion or vibration, thus preventing people from accidentally falling out a building or structural even if with the lock nut(s)/screw(s) loosened. The Hooked End configurations will hook onto the lock nut(s)/screw(s) even if the lock nut(s)/screw(s) are loosened. Thus repairs can be carried out afterward, without risking a fall injury or fatality.

[0017] The invention recognises the need for a durable window grille that's able to provide an aesthetic view of the outside environment. As compared to the rest of the window grille system in the market, the Diamond Grille System provides a high strength, maintenance free, see through and safety redundancy window grille system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The drawings described are for illustrative purposes only of selected embodiments, which will be described in details, by way of example only, with reference to the accompanied drawings, and are not intended to limit the scope of the present disclosure.

[0019] **Figure 1** shows a two-dimensional view of the fixed vertical frame Diamond Grille System.

[0020] **Figure 2** shows a two-dimensional view of the fixed horizontal frame Diamond Grille System.

[0021] **Figure 3** shows a two-dimensional view of the movable sliding Diamond Grille System A, in which the mono core wires **101** are positioned in horizontal direction.

[0022] **Figure 4** shows a two-dimensional view of the movable sliding Diamond Grille System B, in which the mono core wires **101** are positioned in vertical direction.

[0023] **Figure 5** shows a two-dimensional view of the openable casement frame Diamond Grille System A, fixed with mono core wires **101** in horizontal direction.

[0024] **Figure 6** shows a two-dimensional view of the openable casement frame Diamond Grille System B, fixed with mono core wires **101** in vertical direction.

[0025] **Figure 7** shows a two-dimensional view of the openable bi-fold frame Diamond Grille System A, fixed with mono core wires **101** in horizontal direction.

[0026] **Figure 8** shows a two-dimensional view of the openable bi-fold frame Diamond Grille System B, fixed with mono core wires **101** in vertical direction.

[0027] **Figure 9** shows a two-dimensional view of the typical metal profile **100A**, which is part of the typical metal profile and metal cover **100**.

[0028] **Figure 10** shows a two-dimensional view of the typical metal cover **100B**, which is part of the typical metal profile and metal cover **100**.

[0029] **Figure 11** shows a two-dimensional view of the typical metal profile and metal cover **100**.

[0030] **Figure 12** shows a two-dimensional view of the mono core wires **101** with both Hooked Ends **104** in horizontal & vertical directions.

[0031] **Figure 13** shows a two-dimensional view of the typical metal lock screw, which is part of the typical metal lock nut/screw and lock washer **105**.

[0032] **Figure 14** shows a two-dimensional view of the typical metal lock nut, which is part of the typical metal lock nut/screw and metal lock washer **105**.

[0033] **Figure 15** shows a two-dimensional view of the typical metal lock washer, which is part of the typical metal lock nut/screw and metal lock washer **105**.

[0034] **Figure 16** shows a two-dimensional view of the typical metal profile with the track slide **103**.

[0035] **Figure 17** shows a two-dimensional view of the typical hollow metal bar **102** for the movable sliding, openable casement & bi-fold frame Diamond Grille System A & B.

[0036] **Figure 18** shows a two-dimensional view of the typical frame bar **106** for the movable sliding Diamond Grille System A & B.

[0037] **Figure 19** shows a two-dimensional view of the typical folding window hinge **108** for the openable casement & bi-fold frame Diamond Grille System A & B.

[0038] **Figure 20** shows a two-dimensional view of the typical bi-fold frame bar **110** for the openable bi-fold frame Diamond Grille System A & B.

DETAILED DESCRIPTION OF THE INVENTION

[0039] The preferred embodiments of the present invention relate to an improvement of the window grille system in the market. This invention is not only for use in residential building, but also for use in business and commercial environments.

[0040] The Diamond Grille System uses mono core wires **101**. Due to its small outer diameter, it provides a clearer view of the outside environment as compared to the traditional metal window grilles.

[0041] The mono core wires **101**, unlike the Invisible Grille in the market, do not require any plastic membrane to protect the wires from environmental corrosion nor to prevent wire splitters from injuring the consumers.

[0042] The mono core wires **101** have a smooth surface finish and is made from corrosion-resistant alloy that prevent it from rusting even in severe corrosive environment. The mono core wires **101** in the Diamond Grille System do not have any membrane protection, and it will not catch fire. Unlike the Invisible Grille in the market, the mono core wires **101** in the Diamond Grille System cannot be cut by any kitchen scissors, garden scissors, handheld sized wire cutters, thus enhancing the safety features from the outside environment.

[0043] The configuration of the mono core wires **101** provide an independent fail safe system. In the event if a mono core wire **101** is loose or even breaks, unlike the invisible grille system, it will not affect the rest of the mono core wires **101**.

[0044] The Hooked Ends **104** construction on both the end of the mono core wires **101**, this special construction act as a redundancy failure prevention system in case the metal lock nut(s)/screw(s) and metal lock washer(s) **105** are loosened due to thermal expansion or vibration. The Hooked Ends **104** will be hooked onto the metal lock nut(s)/screw(s) and metal lock washer(s) **105**, prevent the mono core wires **101** from falling off entirely.

Assembly Process

[0045] The Diamond Grille System can be either a fixed or movable system, and includes of either a fixed grille frame as shown in **Figure 1** and **Figure 2**, a movable sliding grille frame in **Figure 3** and **Figure 4**, openable casement grille frame in **Figure 5** and **Figure 6**, and openable bi-fold frame **Figure 7** and **Figure 8**.

[0046] In **Figure 1**, this is the fixed vertical frame Diamond Grille System. Two sides of the metal profile and metal cover **100** are fixed onto the walls or vertical supports of the required barrier location. Holes are drilled into both walls or vertical supports and metal profile **100A**, which will be secured together by conventional metal screws and wall plugs. The length of the metal profile and metal cover **100B** will be customised accordingly to the area of barrier, and multiple lengths of the metal profile and metal cover **100** may be added onto to cover the area of barrier.

[0047] In **Figure 1**, during assembly of the product, x numbers of the mono core wires **101** are installed across the fixed grille frame shown in **Figure 1**. The distance between each mono core wires **101** will ranges, depending on the End User's requirements. X numbers of holes are made onto the metal profile **100A**, running parallel to each hole.

[0048] In **Figure 1**, both ends of the mono core wires **101** are bent into a hooked shape. Both ends of the Hooked Ends **104** on the mono core wires **101** will be clamped with metal lock nut(s)/screw(s) and metal lock washer(s) **105**, the metal lock nut(s)/screw(s) and metal lock washer(s) **105** will be secured onto the metal profile **100A**.

[0049] In **Figure 1**, after the installation of all the required mono core wires **101** onto the metal profile **100A**, the same length of metal covers **100B** are installed onto the metal profile **100A**. The metal covers **100B** will prevent public access to the metal lock nut(s)/screw(s) and metal lock washer(s) **105**.

[0050] In **Figure 2**, this is the fixed horizontal frame Diamond Grille System. Two sides of the metal profile and metal cover **100** are fixed onto the ceiling, floor or horizontal supports of the required barrier location. Holes are drilled into the ceiling, floor or horizontal supports

and metal profile **100A**, which will be secured together by conventional stainless screws and wall plugs. The length of the metal profile and metal cover **100B** will be customised accordingly to the area of barrier, and multiple lengths of the metal profile and metal cover **100** may be added onto to cover the area of barrier.

[0051] In **Figure 2**, during assembly of the product, x numbers of the mono core wires **101** are installed across the fixed grille frame shown in **Figure 2**. The distance between each mono core wires **101** will ranges, depending on the End User's requirements. X numbers of holes are made onto the metal profile **100A**, running parallel to each hole.

[0052] In **Figure 2**, both ends of the mono core wires **101** are bent into a hooked shape. Both ends of the Hooked Ends **104** on the mono core wires **101** will be clamped with metal lock nut(s)/screw(s) and metal lock washer(s) **105**, the metal lock nut(s)/screw(s) and metal lock washer(s) **105** will be secured onto the metal profile **100A**.

[0053] In **Figure 2**, after the installation of all the required mono core wires **101** onto the metal profile **100A**, the same length of metal covers **100B** are installed onto the metal profile **100A**. The metal covers **100B** will prevent public access to the metal lock nut(s)/screw(s) and metal lock washer(s) **105**.

[0054] In **Figure 3**, the movable sliding Diamond Grille System A, in which the mono core wires **101** are positioned in horizontal direction. The movable sliding Diamond Grille System A can be open by sliding the grilles apart. The metal profile with the track slide **103** sit onto the frame bar **106** to achieve sliding motion.

[0055] In **Figure 3**, the length and height of the frame bar **106** will be customised accordingly to the area of the barrier, and number of grille frames will be calculated accordingly to cover the area of the barrier. The grille frames will be lockable using the window grille lock **107**. Location of the window grille lock **107** can be customised accordingly to the End User's preference.

[0056] In **Figure 3**, during assembly of the product, the metal profile with the track slides **103** are fixed up onto the hollow metal bars **102** to form the frame. The metal profiles **100A** are secured on the hollow metal bars **102**

[0057] In **Figure 3**, x numbers of the mono core wires **101** are installed across the grille frame shown in **Figure 3**. The distance between each mono core wires **101** will ranges, depending on the End User's requirements. X numbers of holes are made onto the metal profile **100A**, running parallel to each hole.

[0058] In **Figure 3**, both ends of the mono core wires **101** are bent into a hooked shape. Both ends of the Hooked Ends **104** on the mono core wires **101** will be clamped with metal lock nut(s)/screw(s) and metal lock washer(s) **105**, the metal lock nut(s)/screw(s) and metal lock washer(s) **105** will be secured onto the metal profile **100A**.

[0059] In **Figure 3**, after the installation of all the required mono core wires **101** onto the metal profile **100A**, the same length of metal covers **100B** are installed onto the metal profile **100A**. The metal covers **100B** will prevent public access to the metal lock nut(s)/screw(s) and metal lock washer(s) **105**.

[0060] In **Figure 3**, the movable sliding Diamond Grille System A will be secured onto the area of barrier required.

[0061] In **Figure 4**, the movable sliding Diamond Grille System B, in which the mono core wires **101** are positioned in the vertical direction. The movable sliding Diamond Grille System B can be open by sliding the grilles apart. The metal profile with the track slide **103** sit onto the frame bar **106** to achieve sliding motion.

[0062] In **Figure 4**, the length and height of the frame bar **106** will be customised accordingly to the area of the barrier, and number of grille frames will be calculated accordingly to cover the area of the barrier. The grille frames will be lockable using the window grille lock **107**. Location of the window grille lock **107** can be customised accordingly to the End User's preference.

[0063] In **Figure 4**, during assembly of the product, the metal profile with the track slides **103** are fixed up onto the hollow metal bars **102** to form the frame. The metal profiles **100A** are secured on the hollow metal bars **102**

[0064] In **Figure 4**, x numbers of the mono core wires **101** are installed across the grille frame shown in **Figure 4**. The distance between each mono core wires **101** will ranges, depending on the End User's requirements. X numbers of holes are made onto the metal profile **100A**, running parallel to each hole.

[0065] In **Figure 4**, both ends of the mono core wires **101** are bent into a hooked shape. Both ends of the Hooked Ends **104** on the mono core wires **101** will be clamped with metal lock nut(s)/screw(s) and metal lock washer(s) **105**, the metal lock nut(s)/screw(s) and metal lock washer(s) **105** will be secured onto the metal profile **100A**.

[0066] In **Figure 4**, after the installation of all the required mono core wires **101** onto the metal profile **100A**, the same length of metal covers **100B** are installed onto the metal profile **100A**. The metal covers **100B** will prevent public access to the metal lock nut(s)/screw(s) and metal lock washer(s) **105**.

[0067] In **Figure 4**, the movable sliding Diamond Grille System B will be secured onto the area of barrier required.

[0068] In **Figure 5**, the openable casement frame Diamond Grille System A, fixed with mono core wires **101** in horizontal direction. The openable casement frame Diamond Grille System A can be open by opening the grilles apart through the window hinge **108**. The window hinges **108** connect the hollow metal bars **102** to archive opening motion. Multiple window hinges **108** will be used depending on the area of barrier.

[0069] In **Figure 5**, the length and height of the hollow metal bars **102** will be customised accordingly to the area of the barrier, and number of grille frames will be calculated accordingly to cover the area of the barrier. The grille frames will be lockable using the window grille lock **109**. Location of the window grille lock **109** can be customised accordingly to the End User's preference.

[0070] In **Figure 5**, during assembly of the product, multiple hollow metal bars **102** are fixed up to form the frames. The metal profiles **100A** are secured on the hollow metal bars **102**.

[0071] In **Figure 5**, x numbers of the mono core wires **101** are installed across the grille frame shown in **Figure 5**. The distance between each mono core wires **101** will ranges, depending on the End User's requirements. X numbers of holes are made onto the metal profile **100A**, running parallel to each hole.

[0072] In **Figure 5**, both ends of the mono core wires **101** are bent into a hooked shape. Both ends of the Hooked Ends **104** on the mono core wires **101** will be clamped with metal lock nut(s)/screw(s) and metal lock washer(s) **105**, the metal lock nut(s)/screw(s) and metal lock washer(s) **105** will be secured onto the metal profile **100A**.

[0073] In **Figure 5**, after the installation of all the required mono core wires **101** onto the metal profile **100A**, the same length of metal covers **100B** are installed onto the metal profile **100A**. The metal covers **100B** will prevent public access to the metal lock nut(s)/screw(s) and metal lock washer(s) **105**.

[0074] In **Figure 5**, the openable casement frame Diamond Grille System A will be secured onto the area of barrier required.

[0075] In **Figure 6**, the openable casement frame Diamond Grille System B, fixed with mono core wires **101** in vertical direction. The openable casement frame Diamond Grille System B can be open by opening the grilles apart through the window hinge **108**. The window hinges **108** connect the hollow metal bars **102** to archive opening motion. Multiple window hinges **108** will be used depending on the area of barrier.

[0076] In **Figure 6**, the length and height of the hollow metal bars **102** will be customised accordingly to the area of the barrier, and number of grille frames will be calculated accordingly to cover the area of barrier. The grille frames will be lockable using the window grille lock **109**. Location of the window grille lock **109** can be customised accordingly to the End User's preference.

[0077] In **Figure 6**, during assembly of the product, multiple hollow metal bars **102** are fixed up to form the frames. The metal profiles **100A** are secured on the hollow metal bars **102**.

[0078] In **Figure 6**, x numbers of the mono core wires **101** are installed across the grille frame shown in **Figure 6**. The distance between each mono core wires **101** will ranges, depending on the End User's requirements. X numbers of holes are made onto the metal profile **100A**, running parallel to each hole.

[0079] In **Figure 6**, both ends of the mono core wires **101** are bent into a hooked shape. Both ends of the Hooked Ends **104** on the mono core wires **101** will be clamped with metal lock nut(s)/screw(s) and metal lock washer(s) **105**, the metal lock nut(s)/screw(s) and metal lock washer(s) **105** will be secured onto the metal profile **100A**.

[0080] In **Figure 6**, after the installation of all the required mono core wires **101** onto the metal profile **100A**, the same length of metal covers **100B** are installed onto the metal profile **100A**. The metal covers **100B** will prevent public access to the metal lock nut(s)/screw(s) and metal lock washer(s) **105**.

[0081] In **Figure 6**, the openable casement frame Diamond Grille System B will be secured onto the area of barrier required.

[0082] In **Figure 7**, the openable bi-fold frame Diamond Grille System A, fixed with mono core wires **101** in horizontal direction. The openable bi-fold frame Diamond Grille System A can be open by opening the grilles apart through the window hinge **108** and bi-fold track catch **111**. The window hinges **108** connect the hollow metal bars **102** to archive opening motion. The openable bi-fold frame Diamond Grille System A will be able to open fully by pushing the bi-fold frames apart. Multiple window hinges **108** will be used depending on the area of barrier. Accordingly to End User's preference, the Bi-fold openable bi-fold frame Diamond Grille System A can be combine with openable casement frame Diamond Grille System A.

[0083] In **Figure 7**, the length and height of the hollow metal bars **102** and bi-fold track frame **110** will be customised accordingly to the area of the barrier, and number of grille

frames will be calculated accordingly to cover the area of barrier. The grille frames will be lockable using the window grille lock **109**. Location of the window grille lock **109** can be customised accordingly to the End User's preference.

[0084] In **Figure 7**, during assembly of the product, multiple hollow metal bars **102** are fixed up to form the frames. The metal profiles **100A** are secured on the hollow metal bars **102**.

[0085] In **Figure 7**, x numbers of the mono core wires **101** are installed across the grille frame shown in **Figure 7**. The distance between each mono core wires **101** will ranges, depending on the End User's requirements. X numbers of holes are made onto the metal profile **100A**, running parallel to each hole.

[0086] In **Figure 7**, both ends of the mono core wires **101** are bent into a hooked shape. Both ends of the Hooked Ends **104** on the mono core wires **101** will be clamped with metal lock nut(s)/screw(s) and metal lock washer(s) **105**, the metal lock nut(s)/screw(s) and metal lock washer(s) **105** will be secured onto the metal profile **100A**.

[0087] In **Figure 7**, after the installation of all the required mono core wires **101** onto the metal profile **100A**, the same length of metal covers **100B** are installed onto the metal profile **100A**. The metal covers **100B** will prevent public access to the metal lock nut(s)/screw(s) and metal lock washer(s) **105**

[0088] In **Figure 7**, the bi-fold track catches **111** are installed in the drilled and tapped holes on hollow metal bars **102**. The window hinges **108** are installed on the hollow metal bars **102** combining multiple window grilles frames as per required.

[0089] In **Figure 7**, the bi-fold track frame **110** will be cut and connected to the required length and height, the bi-fold window frames will be connected by the bi-fold track catch **111** onto the bi-fold track frame **110**. The ends of the bi-fold window frames will be connected onto the hollow metal bars **102** by the window hinges **108**, the hollow metal bars **102** will have drilled and tapped holes and secure using screws.

[0090] In **Figure 7**, the openable bi-fold frame Diamond Grille System A will be secured onto the area of barrier required.

[0091] In **Figure 8**, the openable bi-fold frame Diamond Grille System B, fixed with mono core wires **101** in vertical direction. The openable bi-fold frame Diamond Grille System A can be open by opening the grilles apart through the window hinge **108** and bi-fold track catch **111**. The window hinges **108** connect the hollow metal bars **102** to archive opening motion. The openable bi-fold frame Diamond Grille System B will be able to open fully by pushing the bi-fold frames apart. Multiple window hinges **108** will be used depending on the area of barrier. Accordingly to End User's preference, the Bi-fold openable bi-fold frame Diamond Grille System B can be combine with openable casement frame Diamond Grille System B.

[0092] In **Figure 8**, the length and height of the hollow metal bars **102** and bi-fold track frame **110** will be customised accordingly to the area of the barrier, and number of grille frames will be calculated accordingly to cover the area of barrier. The grille frames will be lockable using the window grille lock **109**. Location of the window grille lock **109** can be customised accordingly to the End User's preference.

[0093] In **Figure 8**, during assembly of the product, multiple hollow metal bars **102** are fixed up to form the frames. The metal profiles **100A** are secured on the hollow metal bars **102**.

[0094] In **Figure 8**, x numbers of the mono core wires **101** are installed across the grille frame shown in **Figure 8**. The distance between each mono core wires **101** will ranges, depending on the End User's requirements. X numbers of holes are made onto the metal profile **100A**, running parallel to each hole.

[0095] In **Figure 8**, both ends of the mono core wires **101** are bent into a hooked shape. Both ends of the Hooked Ends **104** on the mono core wires **101** will be clamped with metal lock nut(s)/screw(s) and metal lock washer(s) **105**, the metal lock nut(s)/screw(s) and metal lock washer(s) **105** will be secured onto the metal profile **100A**.

[0096] In **Figure 8**, after the installation of all the required mono core wires **101** onto the metal profile **100A**, the same length of metal covers **100B** are installed onto the metal profile **100A**. The metal covers **100B** will prevent public access to the metal lock nut(s)/screw(s) and metal lock washer(s) **105**

[0097] In **Figure 8**, the bi-fold track catches **111** are installed in the drilled and tapped holes on hollow metal bars **102**. The window hinges **108** are installed on the hollow metal bars **102** combining multiple window grilles frames as per required.

[0098] In **Figure 8**, the bi-fold track frame **110** will be cut and connected to the required length and height, the bi-fold window frames will be connected by the bi-fold track catch **111** onto the bi-fold track frame **110**. The ends of the bi-fold window frames will be connected onto the hollow metal bars **102** by the window hinges **108**, the hollow metal bars **102** will have drilled and tapped holes and secure using screws.

[0099] In **Figure 8**, the openable bi-fold frame Diamond Grille System B will be secured onto the area of barrier required.

[0100] The Hooked Ends **104** of the mono core wires **101** act as a redundancy failure prevention system in case the metal lock nut(s)/screw(s) and metal lock washer(s) **105** are loosened due to thermal expansion or vibration, thus preventing people from accidentally falling out a building or structure even if with the metal lock nut(s)/screw(s) loosened.

[0101] The fixed vertical frame Diamond Grille, fixed horizontal frame Diamond Grille ,the movable sliding Diamond Grille System A & B, openable casement frame Diamond Grille System A & B, or openable bi-fold frame Diamond Grille System A & B will be fixed onto the wall, floor, ceiling and any other building structures if required. This is to ensure that there are enough support and strength to counteract any outward force of a person and prevent people from accidentally falling out a building or structure, as well as prevent unauthorised entry.

CLAIMS

What is claimed is:

1. The Diamond Grille System relates to the technical field in windows, balconies, fences and similar structure assembly, in particular to a fixed and movable safety barriers or protective grilles use in buildings or structural for fall prevention. The Diamond Grille System can be either a fixed or movable system, and includes of either a fixed grille frame or a movable (sliding, casement or bi-fold) grille frame. Each fixed grille frame consists of 2 vertical frames or 2 horizontal frames, and each movable (sliding, casement or bi-fold) grille frame consists of 2 vertical frames and 2 horizontal frames in its outer frame. Each grille uses mono core wires as a safety barriers or protective grilles, and are used in buildings or structural for fall prevention. All the above mentioned Diamond Grille Systems use mono core wires as the medium for safety barriers or protective grilles.
2. The characteristics of the Diamond Grille System described to claim 1, are: The Hooked End configurations of the mono core wires act as a redundancy failure prevention system. Both ends of the mono core wires are bent in Hooked End configurations, and both ends of the Hooked End configurations mono core wires will be clamped with metal lock nut(s)/screw(s) and metal lock washer(s) onto the fixed grille frame or the movable (sliding, casement or bi-fold) grille frame to stabilise the mono core wire into position. In case the metal lock nut(s)/screw(s) and metal lock washer(s) are loosened due to thermal expansion or vibration, the Hooked End configurations will hook onto the lock nut(s)/screw(s) even if the lock nut(s)/screw(s) are loosened, thus preventing people from accidentally falling out a building or structural even if with the lock nut(s)/screw(s) loosened.
3. The characteristics of the Diamond Grille System described to claim 1, are: During the assembly of the product, the x numbers of the mono core wires are installed across the

fixed grille frame or movable (sliding, casement or bi-fold) grille frame independently instead of a continuous length. In the situation if one of the mono core wires loosen or breaks, it will not have any effects on the rest of the mono core wires. The repair(s) will only need to be carried out on the individual mono core wire(s).

4. The characteristics of the Diamond Grille System described to claim 1, are: Each Hooked End configurations of the x numbers of the mono core wires will have metal lock nut(s)/screw(s) and metal lock washer(s) to secure the ends to the fixed grille frame or the movable (sliding, casement or bi-fold) grille frame.
5. The characteristics of the Diamond Grille System to claim 2, are: Each mono core wire comes with Hooked End configurations at both ends that are secured to the grille system independently, and thus each mono core wire has a pulling force transmitted axially toward both ends which tighten the tension of the mono core wire individually.
6. The characteristics of the Diamond Grille System are: The mono core wires used in the Diamond Grille System are corrosion resistance alloy. The mono core wires do not require any plastic membrane to protect the wires from environmental corrosion, nor to prevent wire splitters from injuring the consumers.
7. The characteristics of the Diamond Grille System to claim 6, are: The mono core wires used in the Diamond Grille System do not have any membrane protection, and the mono core wires will not catch fire, thus there is no fire hazard issue.
8. The characteristics of the Diamond Grille System to claim 6, are: The mono core wires are made from high strength alloy and cannot be cut by any kitchen scissors, garden scissors, handheld sized wire cutters, thus enhancing the safety and security features from the outside environment.

9. The characteristics of the Diamond Grille System to claim 6, are: The mono core wires do not require any plastic membrane to protect the wire, unlike the wire used in the Invisible Grille System in the market. The Diamond Grille System provides better savings down the road, due to this maintenance free characteristic.
10. The characteristics of the Diamond Grille System are: The Diamond Grille System uses mono core wires with small outer diameters, it provides an aesthetic view of the outside environment

Claim Tree

