

GRATING AND METHOD OF MANUFACTURING A GRATING**PRIORITY DETAILS**

[0001] The present application claims priority from Application No. 2021901991, filed in Australia on 30 June 2021, the entirety of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates generally to field of sanitation; and more specifically to a drainage grating and a method of manufacturing a drainage grating.

BACKGROUND

[0003] Gratings are utilised in several application areas, such as construction (for example, as panels used for decks on bridges, footbridges, roadways, and the like), sanitation (for example, for draining fluids), and the like. They are widely utilised for draining liquids as water drainage gratings in both residential and commercial installations. It is also common for grating to be used in air ventilation and air conditioning systems.

[0004] Presently, there are several types of gratings in use, but one of the most popular types of grating in use is a wedge wire grating, which was initially developed in the 1920s. Examples of the prior art wedge wire gratings are shown in the drawings and identified as prior art. As shown in those drawings, prior art wedge wire gratings are manufactured by resistance welding V-shaped wires on support rods. However, the wedge wire gratings suffer from several limitations.

[0005] Firstly, structural features of the wedge wire gratings sub-optimally limit fluid drainage therethrough. As an example, the wedge wire gratings are

susceptible to an overflow of the fluid and collection of impurities within gaps of the wedge wire gratings. The fluid often does not enter the wedge wire gratings and keeps skipping on a surface of the wedge wire gratings, causing the overflow of the fluid. Secondly, manufacturing processes for manufacturing the wedge wire gratings are complex and relatively expensive. Thirdly, the wedge wire gratings are designed in a manner that they are unable to conceal dirt, debris and grit flowing in a channel arranged below the gratings. An observer is able to easily view such undesirable substances, and as a result, such gratings can appear quite dirty in use. Fourthly, as wedge wire gratings are hard to clean, this issue of dirt and debris being visible is exacerbated. A further limitation of wedge wire gratings are that they are not typically suitable for installations that require anti-ligature applications. An anti-ligature requirement refers to a solution or product that prevents a ligature from staying secured or provides a fixing point for a ligature to be attached thereto.

[0006] Prior attempts at solving the issue of the buildup of visible dirt and the difficulty in cleaning wedge wire gratings typically involve additional components to screen a view below the wedge wire gratings. These attempts have not been successful as the additional components end up blocking due to debris (mostly hair, for example) very quickly, and are hard to clean.

[0007] Therefore, in light of the foregoing discussion, there exists a need to overcome the aforementioned drawbacks associated with the conventional gratings as well as conventional methods for manufacturing the conventional gratings.

DISCLOSURE OF THE INVENTION

[0008] The present disclosure seeks to provide a longitudinal grating plate or sanitary grating. The present disclosure also seeks to provide a method of manufacturing a longitudinal grating plate or sanitary grating. An aim of the present disclosure is to provide a solution that overcomes at least partially the problems encountered in prior art.

[0009] In a first aspect, the present invention relates to a longitudinal grating plate for conduction of a fluid, said plate comprising a top portion and a bottom portion; the top portion including a plurality of longitudinally extending apertures, the bottom portion including a plurality of laterally extending apertures, and which cross below and at least partially overlap with the longitudinally extending apertures thereby forming a fluid flow path, which passes from the top surface of the grating plate through the longitudinally extending apertures and the laterally extending apertures; and wherein the top portion and the bottom portion are formed from substantially one contiguous piece of material without welds or joins.

[0010] Preferably, the grating plate is further provided with a first longitudinal sidewall connected to a second longitudinal sidewall, the two sidewalls being connected by the grating plate which extends therebetween, and wherein the laterally extending apertures at least partially extend between the first and second sidewalls, such an arrangement forming a channel between the first and second sidewalls and below the grating plate whereby the fluid flow path can extend into the channel.

[0011] Preferably, the plurality of longitudinally extending apertures have a curved shape that comprises a bulbous portion whereby the bulbous portion is shaped to promote a flow of a fluid therethrough.

[0012] Preferably, the plurality of longitudinally extending apertures are angled, and the angle of the longitudinally extending apertures is such that debris positioned below the grating plate is not readily visible through the apertures when the grating is installed in a floor and viewed from above.

[0013] Preferably, the longitudinally extending apertures are at least partly formed by an extrusion process, and the laterally extending apertures are substantially formed by a machining process.

[0014] Preferably, each of the plurality of laterally extending apertures are joined together by connecting apertures that extend in the longitudinal direction of the grating plate.

[0015] Preferably, the plurality of laterally extending apertures and the connecting apertures form a continuous and repeating S-shaped aperture in the bottom portion of the grating plate.

[0016] Preferably, the S-Shaped aperture is a curved zig-zag pattern.

[0017] Preferably, the repeating S-shaped aperture is formed by continuous computer numerical control (CNC) machining process.

[0018] Preferably, the continuous computer numerical control (CNC) machining process is by way of CNC router.

[0019] Preferably, the longitudinal grating plate is formed of a single piece construction of extruded aluminum.

[0020] Most preferably, the aluminum is anodised.

[0021] Preferably, the first and second sidewalls and the grating plate are formed by continuous extrusion process.

[0022] Preferably, the first and second longitudinal sidewalls are adapted to sit within a gutter.

[0023] Preferably, the gutter is manufactured from an inert material, and the first and second longitudinal sidewalls are made of aluminum.

[0024] Preferably, the gutter is made of plastic, and when the grating and the gutter are installed in a floor, the plastic gutter shields the first and second aluminum longitudinal sidewalls from contacting any concrete in the floor.

[0025] In accordance with a second aspect, the present invention relates to a method of manufacturing a longitudinal grating plate comprising the steps of:

extruding a substantially one contiguous piece of material without welds or joins to form a top portion and a bottom portion, the top portion including a plurality of longitudinally extending apertures, which are shaped to induce flow of a fluid therethrough; removing an amount of the material from the bottom portion to create a plurality of laterally extending apertures, which cross below and at least partially overlap with the longitudinally extending apertures of the top portion, thereby forming a fluid flow path, which passes from the top surface of the grating plate through the longitudinally extending apertures and the laterally extending apertures; and anodizing at least one of the top and bottom portions.

[0026] Preferably, the method of manufacturing a longitudinal grating plate further comprising the step of extruding a first longitudinal sidewall connected to a second longitudinal sidewall, the two sidewalls being connected by the grating plate, which extends therebetween, and wherein the laterally extending apertures at least partially extend between the first and second sidewalls, such an arrangement forming a channel between the first and second sidewalls and below the grating plate whereby the fluid flow path can extend into the channel.

[0027] Preferably, the method of manufacturing a longitudinal grating further comprising the step of anodizing at least one of the first and second sidewalls.

[0028] Preferably, the method of manufacturing a longitudinal grating plate further comprising the step of forming a continuous and repeating S-shaped aperture in the bottom portion of the grating plate.

[0029] Preferably, the method of manufacturing a longitudinal grating plate further comprising the step of forming a curved zig-zag pattern by continuous computer numerical control (CNC) machining process.

[0030] Embodiments of the present disclosure substantially eliminate or at least partially address the aforementioned problems in the prior art, and enables superior fluid drainage such that the fluid effectively enters the sanitary grating

and drains quickly from the sanitary grating, while also providing a simple and cost-effective method of manufacturing the sanitary grating.

[0031] Additional aspects, advantages, features and objects of the present disclosure would be made apparent from the drawings and the detailed description of the illustrative embodiments construed in conjunction with the appended claims that follow.

[0032] It will be appreciated that features of the present disclosure are susceptible to being combined in various combinations without departing from the scope of the present disclosure as defined by the appended claims.

DESCRIPTION OF FIGURES

[0033] The summary above, as well as the following detailed description of illustrative embodiments, is better understood when read in conjunction with the appended drawings. For the purpose of illustrating the present disclosure, exemplary constructions of the disclosure are shown in the drawings. However, the present disclosure is not limited to specific methods and instrumentalities disclosed herein. Moreover, those skilled in the art will understand that the drawings are not to scale. Wherever possible, like elements have been indicated by identical numbers.

[0034] Embodiments of the present disclosure will now be described, by way of example only, with reference to the following diagrams wherein:

FIG. 0a & 0b are depictions of prior art gratings:

FIG. 1 is an exemplary schematic illustration of a top perspective view of a grating, in accordance with an embodiment of the present disclosure;

FIG. 2 is an exemplary schematic illustration of an end perspective view of a grating, in accordance with an embodiment of the present disclosure;

FIG. 3 is an exemplary illustration of an end perspective view of a partially formed grating, in accordance with an embodiment of the present disclosure;

FIG. 4 is an exemplary illustration of an end perspective view of a partially formed grating, in accordance with an embodiment of the present disclosure,

showing the detail of the laterally extending apertures formed in the underside thereof;

FIG. 5 is an exemplary schematic illustration of a bottom perspective view of a grating, in accordance with an embodiment of the present disclosure;

FIG. 6 is an exemplary schematic illustration of a bottom perspective view of a grating arranged within a gutter, in accordance with an embodiment of the present disclosure; and

FIG. 7 is a flowchart depicting steps of a method for manufacturing a grating, in accordance with an embodiment of the present disclosure.

[0035] In the accompanying drawings, an underlined number is employed to represent an item over which the underlined number is positioned or an item to which the underlined number is adjacent. A non-underlined number relates to an item identified by a line linking the non-underlined number to the item. When a number is non-underlined and accompanied by an associated arrow, the non-underlined number is used to identify a general item at which the arrow is pointing.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0036] The following detailed description illustrates embodiments of the present disclosure and ways in which they can be implemented. Although some modes of carrying out the present disclosure have been disclosed, those skilled in the art would recognize that other embodiments for carrying out or practising the present disclosure are also possible.

[0037] The present disclosure relates to a grating and a method of manufacturing a grating, and most specifically to a drainage grating. Structural features of the grating such as the plurality of longitudinal apertures and the plurality of laterally extending apertures that at least partially extend between the first and second sidewalls, and which cross below and at least partially overlap with the longitudinal apertures provide superior fluid drainage through the grating, and improved drainage performance.

[0038] The fluid effectively enters the top surface of the grating, passes therethrough and effectively drains from the underside of the grating, thereby avoiding an overflow of the fluid. Moreover, the grating is designed in a manner that it effectively conceals dirt, debris and grit flowing in a channel arranged below the grating. An observer is unable to easily view these undesirable substances located within the channel, and as a result, the grating of the present invention appears quite clean in use, especially when compared with prior art gratings. Furthermore, the grating of the present invention is easy to clean. Moreover, the aforesaid method of manufacturing the grating is simple and cost-effective in terms of implementation. Therefore, such a method is well-suited for mass manufacturing of gratings described herein.

[0039] Throughout the present disclosure, the term "*grating*" refers to an apparatus which allows drainage of fluids therethrough, for sanitation purposes. The grating may be utilised for draining various fluids including, but not limited to liquids (such as water, contaminated water, liquid chemicals, and the like) or gases (such as oxygen, smoke, natural gas, and the like). The grating may be utilised in various real-world environments including but not limited to, commercial kitchens, residential installations, town installations for storm-water drainage, vet clinics, air registers of air conditioning systems, air ventilation systems, industrial properties, water fountain boundaries, chemical plants, poultry farms, and food manufacturing factories. Furthermore, the grating may be made of a material including but not limited to metals and plastics. It is particularly desirable for the grating to be made of an extrudable material, which includes aluminium.

[0040] Optionally, the grating may be installed in a gutter. The grating may be embedded within the gutter or may be removably used in the gutter. The grating may be considered as an inlet for the fluid to flow into the gutter. The gutter may provide a route for the fluid to reach a drainage outlet, such as a water pipe. Optionally, the gutter may be manufactured from a number of various materials such as stainless steel, aluminium, plastic, and so forth, although plastic is particularly preferred as it is inert when installed within a concrete floor. The gutter may be designed to snugly accommodate the grating therein,

thereby preventing leakage of the fluid, and facilitate easy installation of the grating within a floor.

[0041] From the gutter, the fluid flows through a drainage system towards the drainage outlet and is finally expelled from the outlet. The drainage system may refer to a network of pipes and plumbing elements which lead to the drainage outlet. The drainage outlet may refer to an opening which may release the fluid into another environment, such as a storm water or waste water system, which may be connected to a water body (such as a canal, a river, a lake, a reservoir, a sea, an ocean, and so forth) a fluid treatment plant, and so forth.

[0042] For example, a storm-water discharge grating device may be installed on a road in a town. Storm water would enter the grating from the top portion of the grating plate, trickle down the plurality of longitudinal apertures and out of the grating into the channel, and if present, then into the gutter. The fluid may then eventually flow through a drainage system to be discharged from the outlet into a canal.

[0043] In the present grating, the two longitudinal sidewalls provide support to the grating plate, and may be arranged longitudinally along the length of the grating. It will be appreciated that a thickness of the two longitudinal side plates may be selected to be such that they provide requisite support to the grating plate without making the sanitary grating too heavy.

[0044] The grating plate may refer to a longitudinal plate-like element having the plurality of longitudinal apertures on its top portion and the plurality of laterally extending apertures on its bottom portion. A remaining portion of the top portion of the grating plate (excluding the plurality of longitudinal apertures) is substantially flat.

[0045] The two longitudinal sidewalls contact with the grating plate on parallel and opposite longitudinal ends of the grating plate. Additionally, the two longitudinal sidewalls may be arranged at an angle of 90 degrees with the grating plate. In such a case, the two longitudinal sidewalls are arranged in a manner parallel to each other, on opposite longitudinal ends of the grating plate. Such an arrangement of the two longitudinal sidewalls and the grating plate enables in providing a sturdy, simple, and ergonomic design of the grating. It

will be appreciated that the two longitudinal sidewalls may have a length equal to a length of the grating plate. In other words, the two longitudinal sidewalls may extend along an entirety of the length of the longitudinal grating plate. It may be noted that the two longitudinal sidewalls may have a width in accordance with a width of the gutter.

[0046] It may be noted that the top portion of the grating plate has the plurality of longitudinal apertures that enable the flow of the fluid into the grating. A longitudinal aperture may refer to a longitudinal gap or recess, which allows passage of the fluid therethrough into the grating. The longitudinal aperture provides a fluid flow path for the fluid to flow into the grating. The longitudinal apertures extend along the length of the grating plate. Since the grating is longitudinal and the plurality of longitudinal apertures are also longitudinal, there is provided a considerably-sized passage for swift flow of the fluid into the grating. It will be appreciated that a shape of the plurality of longitudinal apertures is such that the fluid may easily pass through the plurality of longitudinal apertures. As an example, the plurality of longitudinal apertures are shaped to be wider at their openings and to include a restriction or narrowing of the diameter of the aperture in a middle portion thereof, which extends between the openings.

[0047] The shape of the plurality of longitudinal apertures is complex and is provided by extruding the top portion of the grating plate. Throughout the present disclosure, the term "*extruding*" refers to a process used to shape a given material by forcing the given material into a die, in order to obtain a fixed cross-sectional profile. Extruding beneficially creates a complex cross-sectional profile of the top portion of the grating plate, thereby creating the plurality of longitudinal orifices in the top portion. Herein, the top portion of the grating plate may be extruded from the given material. The given material may be a single material or a combination of several materials including but not limited to stainless steel, aluminium, plastic, and wood. Furthermore, extruding also provides a required solid underside of the grating plate, this underside corresponding to the bottom portion of the grating plate. In this regard, the solid underside is created, via extrusion, in a manner that there are also formed the two longitudinal sidewalls of the grating in the underside of the grating plate.

[0048] Optionally, the openings of the plurality of longitudinal apertures are shaped to induce a venturi effect in the fluid flow passing therethrough. Such a 'venturi shape' may refer to a constriction in a passage which may control a flow of the fluid through the passage. The openings of the plurality of longitudinal apertures are constricted in order to control the flow of the fluid into the grating. Optionally, the 'venturi shape' of the openings of the plurality of longitudinal apertures leads to a venturi effect being produced during the passage of the fluid therethrough and into the grating. The venturi effect may relate to a reduction in fluid pressure that results when the fluid flows through the (constricted) venturi-shaped openings of the plurality of longitudinal apertures.

[0049] It may be appreciated that the 'venturi shape' of the openings of the plurality of longitudinal apertures, along with a surface tension of the fluid, increases an intake flow (namely, a flow rate) of the fluid into the grating. Surface tension may refer to a tendency of fluid surfaces to shrink into a minimum surface area. Depending on the shape and size of the openings of the plurality of longitudinal apertures and the surface tension of the fluid, the fluid pressure may be effectively controlled through the openings, eventually controlling the intake flow of the fluid into the grating. Optionally, the shape and size of the openings forces molecules of the fluid to shrink into their minimum surface area for easily passing the fluid through the plurality of longitudinal apertures and into the channel formed adjacent to the underside of the grating plate. Since the fluid quickly passes through the plurality of longitudinal apertures, in part, because of the venturi effect, there is created a suction force at the top portion of the grating, which induces the fluid into the grating.

[0050] Additionally, the shape of the openings of the plurality of longitudinal apertures beneficially limits (i.e., minimises) a person to have a viewing path through the grating plate, thereby ultimately reducing visibility of (namely, concealing) dirt, debris and grit present in the channel of the grating or the gutter within which the grating is positioned when installed in a floor. The dirt, debris and grit that may be present in an underside of the grating plate are filthy and unpleasant to look at. The shape of the openings of the longitudinal apertures does not allow the underside of the grating plate to be visible to an observer (such as a person) where the grating is installed. Therefore, such a

design of the openings of the longitudinal apertures improves a usage experience of the grating, as the grating appears to be clean when viewed by the observer, and may require less frequent cleaning.

[0051] Optionally, the plurality of longitudinal apertures are angled and have a curved shape. When the openings of the plurality of longitudinal apertures are venturi-shaped, it may be appreciated that the curved shape of the plurality of longitudinal apertures may provide a bulbous shape in the middle portion of the plurality of longitudinal apertures. Therefore, the openings provide constrictions at ends of the plurality of longitudinal apertures and the middle portion of the plurality of longitudinal apertures may be bulged to provide a wide passage for facilitating swift flow of the fluid. The bulged shape of the plurality of longitudinal apertures may assist in increasing the intake flow of the fluid into the grating.

[0052] Optionally, the curved shape of the plurality of longitudinal apertures may be such that there are formed hourglass-shaped elements on the remaining portion of the top portion of the grating plate (excluding the plurality of longitudinal apertures). These hourglass-shaped elements have wide ends and a constriction in their centre. These hourglass-shaped elements limit the view through the grating plate, ultimately reducing the visibility of dirt, debris and grit that may be present in the grating or in the gutter. Moreover, the wide ends of the hourglass-shaped elements may be flat.

[0053] It may be appreciated that a flat profile of the hourglass-shaped elements forms a substantially flat profile of the remaining portion of the top portion of the grating plate, thereby providing comfort when an object is placed/arranged on the grating plate and avoiding imbalance of the object. Herein, the object may pertain to a utensil, a part, an animal, a human, a vegetable, and so forth. As an example, even a child with wet bare feet may comfortably stand on top of the sanitary grating (and specifically, on the exposed of the top portion of the grating plate) without loss of his/her balance, and without discomfort to the underside of their exposed feet from the upper surface of the grating plate. This is in contrast to prior art gratings, and especially wedge wire gratings, where the contact surface of the top surface of the wire grating with the underside of a person's foot standing thereon is concentrated, which can cause discomfort.

[0054] It may be appreciated that the plurality of longitudinal apertures are angled in manner that a given longitudinal aperture forms an angle with respect to a vertical axis of the grating plate, the vertical axis being an imaginary axis extending along the width of the two longitudinal sidewalls of the grating. Optionally, in this regard, said angle is an acute angle. The angled design of the plurality of longitudinal apertures limits the view through the grating plate, ultimately reducing the visibility of dirt, debris and grit that may be present in the grating or in the gutter. Moreover, the angled design also assists in catching the fluid to flow into the grating, regardless of a natural direction of flow of the fluid across the grating plate.

[0055] The bottom portion of the grating plate may be exposed to the gutter accommodating the grating. The required amount of the given material may be removed from the bottom portion of the grating plate in order to create the plurality of laterally extending apertures that at least partially extend between the first and second sidewalls. It may be appreciated that these laterally extending apertures expose the plurality of longitudinal apertures in the top portion to the channel formed between the first and second sidewalls and below the grating plate, in order to provide a passage for the fluid.

[0056] In some cases, the laterally extending apertures may overlap with an entirety of the plurality of longitudinal apertures. Alternatively, in other cases, the laterally extending apertures may overlap with only a portion of the plurality of longitudinal apertures. In an example, the laterally extending apertures may selectively overlap with at least one of the longitudinal apertures amongst the plurality of longitudinal apertures. In another example, the laterally extending apertures may selectively overlap with only some portions of each of the plurality of longitudinal apertures.

[0057] It may be noted that the laterally extending apertures may be a geometrical pattern (such as a polygonal pattern, a circular pattern, and the like), a wave pattern, a linear pattern, a zig-zag pattern, an alphabetical pattern and/or a numeric pattern, and so forth. The patterned cavity of the bottom portion is differently shaped and oriented with respect to the plurality of longitudinal apertures of the top portion.

[0058] Optionally, the laterally extending apertures form a zig-zag pattern. The zig-zag pattern may relate to a pattern made up of small corners or curves present at variable angles constantly within the pattern, wherein the pattern traces a path between the two parallel longitudinal sidewalls of the grating.

[0059] Notably, the laterally extending apertures may be formed by removing the required amount of the given material from the bottom portion of the grating plate, using a cutting means. The cutting means may have a sharp surface acting as a blade which cuts through the given material of the grating plate. Furthermore, the cutting means used for removing the patterned cavity may be part of a die cutting machine, a punch press, a shop press, a computer numerical control (CNC) router, and the like. It is preferred that the laterally extending apertures form continuous and repeating S-shaped aperture in the bottom portion of the grating plate, which is formed by a continuous machining process, ideally a continuous computer numerical control (CNC) router.

[0060] Next, the at least one surface of the grating plate and the two longitudinal sidewalls of the grating is anodised. Throughout the present disclosure, the term "*anodising*" refers to an electrolytic passivation process used to provide an oxide coating on the at least one surface of the sanitary grating. This process is called anodizing because the at least one surface of the grating forms an anode electrode of an electrolytic cell. Anodising the at least one surface of the grating may provide improved surface resistance to wear and corrosion, while also serving as a decorative layer on the at least one surface of the grating. Additionally, the at least one surface of the grating may be anodised using an anodising machine. It will be appreciated that the at least one surface may be anodised to provide a matte finish, a glossy finish, a textured finish, or similar, at the at least one surface. Moreover, anodising of the at least one surface may be performed in any requisite colour (such as a black colour, a silver colour, a white colour, and the like). As an example, the exposed surface of the top portion of the grating plate may be anodised.

[0061] Moreover, the present description also relates to the method for manufacturing the grating as described above. The various embodiments and variants disclosed above apply *mutatis mutandis* to the method.

[0062] Optionally, the grating may be manufactured from a block of the given material using the method of manufacturing. It may be appreciated that the method of manufacturing the grating is implemented in-line. This means that the steps of extruding of the top portion of the grating plate, removing the required amount of the given material from the bottom portion of the grating plate, and anodising of the at least one surface of the grating are performed in-line using the aforesaid method of manufacturing. Manufacturing the grating using the aforesaid method of manufacturing in-line considerably reduces manufacturing costs in comparison to manufacturing costs incurred for manufacturing conventional gratings. As an example, a manufacturing cost incurred using the method of manufacturing the sanitary grating is one-fourth to one-third of a manufacturing cost incurred for manufacturing a conventional grating. Additionally, the method of manufacturing the grating as implemented in-line is suitable for mass manufacturing of gratings.

[0063] It will be appreciated that various other manufacturing techniques and/or processes could also be employed to manufacture the grating described herein. Some of these techniques are described herein below.

[0064] Optionally, a rod or a bar may be cold-rolled into venturi shapes in order to achieve a desired shape of the openings of the plurality of longitudinal apertures on the top portion of the grating plate. Furthermore, a plurality of such rods or bars may be arranged to form the top portion of the grating plate. Additionally, another plurality of rods or bars may be arranged to form the bottom portion of the grating plate. The plurality of rods or bars may undergo resistance welding and may be welded together for achieving a desired shape of the grating plate. The grating may optionally further comprise a baffle, wherein the baffle may be fabricated to fit between the grating plate and the gutter. The baffle may further assist in limiting the view through the grating plate, ultimately reducing the visibility of dirt, debris and grit that may be present in the grating or in the gutter.

[0065] Alternatively, optionally, the grating may be manufactured using injection moulding. Injection moulding refers to a manufacturing process which melts the given material and injects the given (melted) material into a mould for forming the grating. Herein, the mould may have a requisite design for obtaining

the plurality of longitudinal apertures in the top portion and the laterally extending apertures in the bottom portion of the grating plate. A portion of the mould corresponding to the top portion of the grating plate may be shaped to attain 'venturi-shape' openings of the plurality of longitudinal apertures. Another portion of the mould corresponding to the bottom portion of the grating plate may be shaped to obtain the laterally extending apertures. Yet another portion of the mould corresponding to the two longitudinal sidewalls may be shaped in order to obtain the two longitudinal sidewalls.

[0066] Yet alternatively, optionally, the grating may be formed using additive manufacturing. Additive manufacturing relates to a process facilitating formation of a three-dimensional structure (herein, the grating) from a digital three-dimensional model of the three-dimensional structure. In additive manufacturing, the grating is built in a layered manner using the given material. The given material is released for a given layer in a desired shape and is allowed to be solidified before building a subsequent layer upon the given layer. Additive manufacturing may be performed by using a three-dimensional printer, a three-dimensional printing pen, and the like.

[0067] Still alternatively, optionally, the grating may be formed using a five-axis computer numerical control (CNC) machine. The five-axis CNC machine relates to a machine having an ability to move a tool in five different axes simultaneously. It may be noted that basic machining operates on three primary axes, X, Y and Z; however, a five-axis CNC machine can rotate on two additional axes, A and B, which provides the five-axis CNC machine with a multidirectional approach. The tool of the five-axis CNC machine may easily and quickly extrude the top portion of the grating plate, remove the required amount of the given material from the bottom portion, and may also shape the two longitudinal sidewalls from the given material for manufacturing the grating.

[0068] Optionally, the method further comprises forming openings of the plurality of longitudinal apertures to be 'venturi-shaped'.

[0069] Optionally, the method further comprises forming the plurality of longitudinal apertures to be angled and to have a curved shape.

[0070] Optionally, the method further comprises forming the laterally extending apertures to have a zig-zag pattern.

[0071] The grating and the method for manufacturing the grating enables efficient fluid action of the grating, and efficient mass manufacturing of gratings, respectively. The openings of the plurality of apertures provide the venturi effect, and a combined effect of fluid flow dynamics according to the venturi effect and the surface tension of the fluid creates the suction force, which induces the fluid to flow through the grating. This effectively reduces fluid skipping and overflowing across the grating.

[0072] FIG. 1 is an exemplary schematic illustration of a top perspective view of a grating 100, in accordance with an embodiment of the present disclosure. The sanitary grating 100 comprises a grating plate 102 connectedly joining two longitudinal sidewalls (not shown). A top portion of the grating plate 102 is extruded to create a plurality of longitudinal apertures 104. The plurality of longitudinal apertures 104 allow passage of a fluid (not shown) through the grating 100.

[0073] FIG. 2 is an exemplary schematic illustration of an end perspective view of a grating 200, in accordance with an embodiment of the present disclosure. As shown, the grating 200 comprises a grating plate 202 and two longitudinal sidewalls 204 and 206. The two longitudinal sidewalls 204 and 206 are arranged in a manner that the grating plate 202 perpendicularly contacts ends 208 and 210 of the two longitudinal sidewalls 204 and 206, respectively. Further, the grating plate 202 comprises a top portion 212 and a bottom portion 214. The two longitudinal sidewalls 204 and 206 and the bottom portion 214 form a channel 220 therebetween. The top portion 206 of the grating plate is extruded to create a plurality of longitudinal apertures 216. Openings of the plurality of longitudinal apertures 216 are shown to be 'venturi-shaped', and middle portions of the plurality of longitudinal apertures 216 are shown to be bulbous-shaped. The plurality of longitudinal apertures 216 have a curved shape. There is also shown a vertical axis X-X' as a reference for depicting how the plurality of longitudinal apertures 216 are angled. It will be appreciated that this arrangement of the longitudinal apertures 216 reduces the ability of a person to pass a cord or wire through the grating 200, and the machined underside of the

bottom portion 214 (discussed in more detail below) will assist in cutting any such cord or wire that may be extended through the longitudinal apertures 216.

[0074] As can be seen in FIG 2, when viewed in end view, the two longitudinal sidewalls 204 and 206 of the grating 200 include rebated sections (where the thickness of the sidewalls is reduced). These rebated sections are adapted to have a plastic barrier (a U-shaped plastic extrusion) fitted thereto, which stays in place when the grating 200 is installed. However, the barrier is adapted such that it can be easily removed for cleaning, and is not visible when the grating 200 is viewed from above. Where the grating 200 (being formed of an aluminium extrusion) is to be installed in a metallic gutter made of a dissimilar metal (i.e. stainless steel, for example), the aluminium grating must be insulated from the dissimilar metal material in order to avoid unwanted chemical reactions between the two metals, and catalyzed by the cementitious materials such as grout, tile glue, cement and the like in which the grating and gutter are installed.

[0075] FIG. 3 is an exemplary illustration of an end perspective view of a partially formed grating 100, in accordance with an embodiment of the present disclosure. As shown, the top surface of the grating plate includes a plurality of longitudinal apertures 104 therein. The shape of the plurality of longitudinal apertures 104 is complex and is provided by extruding the top portion of the grating plate. The grating 100 is formed by extruding a material, optionally aluminium to create the grating having a complex cross-sectional profile of the top portion of the grating plate, and thereby creating the plurality of longitudinal apertures 104 in the top portion. Furthermore, extruding the aluminium also provides a solid underside of the grating plate, and there are also formed the two longitudinal sidewalls of the grating, all of which are shown in the drawing. This solid underside, which is created via extrusion, is formed as part of an intermediate step in the manufacturing process of the grating of the present disclosure, and must be modified in order to create the fluid flow path and make the grating fit for purpose.

[0076] As shown in FIG. 4, which is an exemplary illustration of an end perspective view of a partially formed grating, in accordance with an embodiment of the present disclosure, the laterally extending apertures 314 are

subsequently formed in the solid underside of the grating plate during a subsequent manufacturing step.

[0077] The required amount of the given material may be removed from the bottom portion of the grating plate in order to create the plurality of laterally extending apertures 314 that at least partially extend between the first and second sidewalls. It may be appreciated that these laterally extending apertures expose the plurality of longitudinal apertures 104 in the top portion to the channel formed between the first and second sidewalls and below the grating plate, in order to provide a passage for the fluid.

[0078] As is seen in the drawings, the laterally extending apertures 314 are formed from a zig-zag pattern machined in the solid underside of the grating plate. The zig-zag pattern may relate to a pattern made up of small corners or curves present at variable angles constantly within the pattern, wherein the pattern traces a path between the two parallel longitudinal sidewalls of the grating.

[0079] Notably, the laterally extending apertures 314 may be formed by removing the required amount of the given material from the bottom portion of the grating plate, using a cutting means. The cutting means may have a sharp surface acting as a blade which cuts through the given material of the grating plate. Furthermore, the cutting means used for removing the patterned cavity may be part of a die cutting machine, a punch press, a shop press, a computer numerical control (CNC) router, and the like. As shown in the drawings, it is preferred that the laterally extending apertures form continuous and repeating S-shaped aperture in the bottom portion of the grating plate, which is formed by a continuous machining process, ideally a continuous computer numerical control (CNC) router. It is envisaged, that these laterally extending apertures 314 may include a curved edge, which would increase water flow of fluid passing through the laterally extending apertures and increase the load capacity of the grating 200.

[0080] FIG. 5 is an exemplary schematic illustration of a bottom perspective view of a grating 300, in accordance with an embodiment of the present disclosure. As shown, the grating 300 comprises a grating plate 302 and two

longitudinal sidewalls 304 and 306. The two longitudinal sidewalls 304 and 306 are arranged in a perpendicular manner with respect to the grating plate 302. Further, the grating plate 302 comprises a top portion 308 and a bottom portion 310. The top portion 308 of the grating plate 302 is extruded to create a plurality of longitudinal apertures 312. Additionally, the bottom portion 310 has a plurality of laterally extending apertures 314 that at least partially extend between the first and second sidewalls 304 and 306, and which cross below and at least partially overlap with the longitudinal apertures 312 thereby forming a fluid flow path from the top surface 308 of the grating plate 302. The laterally extending apertures 314 are joined together by a number of connecting apertures 318 that extend in the longitudinal direction of the grating plate 302.

[0081] As shown, the plurality of laterally extending apertures 314 and the connecting apertures 318 form a continuous and repeating S-shaped aperture in the bottom portion 310 of the grating plate 302. The S-shaped aperture is a curved zig-zag pattern.

[0082] FIG. 6 is an exemplary schematic illustration of an end perspective view of a grating 400 arranged within a gutter 402, in accordance with an embodiment of the present disclosure. As shown, the grating 400 comprises a grating plate 404 and two longitudinal sidewalls 406 and 408, which are arranged in a perpendicular manner with respect to the grating plate 404. The two longitudinal sidewalls 406 and 408 assist in arranging the grating 400 within the gutter 402, and also form the channel 220 therebetween. Further, a top portion of the grating plate 404 is extruded to create a plurality of longitudinal apertures 410. The plurality of longitudinal apertures 410 allow passage of a fluid (not shown) through the grating 400 into the gutter 402.

[0083] FIG. 7 is a flowchart depicting steps of a method for manufacturing a grating, in accordance with an embodiment of the present disclosure. The grating is manufactured using a given material. At step 502, a top portion of a grating plate is extruded to create a plurality of longitudinal apertures. At step 504, a required amount of the given material is removed from a bottom portion of the grating plate to create a plurality of laterally extending apertures, which cross below and at least partially overlap with the longitudinal apertures thereby forming a fluid flow path from the top surface of the grating plate. At step 506,

at least one surface of the grating plate and two longitudinal sidewalls of the grating is anodized.

[0084] The steps 502, 504, and 506 are only illustrative and other alternatives can also be provided where one or more steps are added, one or more steps are removed, or one or more steps are provided in a different sequence without departing from the scope of the claims herein.

[0085] Modifications to embodiments of the present disclosure described in the foregoing are possible without departing from the scope of the present disclosure as defined by the accompanying claims. Expressions such as "including", "comprising", "incorporating", "have", "is" used to describe and claim the present disclosure are intended to be construed in a non-exclusive manner, namely allowing for items, components or elements not explicitly described also to be present. Reference to the singular is also to be construed to relate to the plural.

[0086] While the invention has been described with reference to preferred embodiments above, it will be appreciated by those skilled in the art that it is not limited to those embodiments, but may be embodied in many other forms, variations and modifications other than those specifically described. The invention includes all such variation and modifications. The invention also includes all of the steps, features, components and/or devices referred to or indicated in the specification, individually or collectively and any and all combinations or any two or more of the steps or features.

[0087] In this specification, unless the context clearly indicates otherwise, the word "comprising" is not intended to have the exclusive meaning of the word such as "consisting only of", but rather has the non-exclusive meaning, in the sense of "including at least". The same applies, with corresponding grammatical changes, to other forms of the word such as "comprise", etc.

[0088] Other definitions for selected terms used herein may be found within the detailed description of the invention and apply throughout. Unless otherwise defined, all other scientific and technical terms used herein have the same

meaning as commonly understood to one of ordinary skill in the art to which the invention belongs.

[0089] Any promises made in the present document should be understood to relate to some embodiments of the invention, and are not intended to be promises made about the invention in all embodiments. Where there are promises that are deemed to apply to all embodiments of the invention, the applicant/patentee reserves the right to later delete them from the description and they do not rely on these promises for the acceptance or subsequent grant of a patent in any country.

CLAIMS

1. A longitudinal grating plate for conduction of a fluid, said plate comprising a top portion and a bottom portion;
the top portion including a plurality of longitudinally extending apertures, the bottom portion including a plurality of laterally extending apertures, and which cross below and at least partially overlap with the longitudinally extending apertures thereby forming a fluid flow path, which passes from the top surface of the grating plate through the longitudinally extending apertures and the laterally extending apertures; and
wherein the top portion and the bottom portion are formed from substantially one contiguous piece of material without welds or joins.
2. The longitudinal grating plate according to claim 1 wherein the grating plate is further provided with a first longitudinal sidewall connected to a second longitudinal sidewall, the two sidewalls being connected by the grating plate which extends therebetween, and wherein the laterally extending apertures at least partially extend between the first and second sidewalls,
such an arrangement forming a channel between the first and second sidewalls and below the grating plate whereby the fluid flow path can extend into the channel.
3. The longitudinal grating plate according to claim 1 wherein the plurality of longitudinally extending apertures have a curved shape that comprises a bulbous portion whereby the bulbous portion is shaped to promote a flow of a fluid therethrough.
4. The longitudinal grating plate according to claim 1 wherein the plurality of longitudinally extending apertures are angled, and the angle of the longitudinally extending apertures is such that debris positioned below the

grating plate is not readily visible through the apertures when the grating is installed in a floor and viewed from above.

5. The longitudinal grating plate according to claim 1 wherein the longitudinally extending apertures are at least partly formed by an extrusion process, and the laterally extending apertures are substantially formed by a machining process.
6. The longitudinal grating plate of claim 1 wherein each of the plurality of laterally extending apertures are joined together by connecting apertures that extend in the longitudinal direction of the grating plate.
7. The longitudinal grating plate of claim 6 wherein the plurality of laterally extending apertures and the connecting apertures form a continuous and repeating S-shaped aperture in the bottom portion of the grating plate.
8. The longitudinal grating plate of claim 7 wherein the S-Shaped aperture is a curved zig-zag pattern.
9. The longitudinal grating plate of claim 8 wherein the repeating S-shaped aperture is formed by continuous computer numerical control (CNC) machining process.
10. The longitudinal grating plate of claim 9 wherein the continuous computer numerical control (CNC) machining process is by way of CNC router.
11. The longitudinal grating plate of claim 1 formed of a single piece construction of extruded aluminum.

12. The longitudinal grating plate of claim 11 wherein the aluminum is anodised.
13. The longitudinal grating plate of claim 2 wherein the first and second sidewalls and the grating plate are formed by continuous extrusion process.
14. The longitudinal grating plate of claim 2 wherein the first and second longitudinal sidewalls are adapted to sit within a gutter.
15. The longitudinal grating plate of claim 14 wherein the gutter is manufactured from an inert material, and the first and second longitudinal sidewalls are made of aluminum.
16. The longitudinal grating plate of claim 15 wherein the gutter is made of plastic, and when the grating and the gutter are installed in a floor, the plastic gutter shields the first and second aluminum longitudinal sidewalls from contacting any concrete in the floor.
17. A method of manufacturing a longitudinal grating plate comprising the steps of:

extruding a substantially one contiguous piece of material without welds or joins to form a top portion and a bottom portion,
the top portion including a plurality of longitudinally extending apertures,
which are shaped to induce flow of a fluid therethrough;

removing an amount of the material from the bottom portion to create a plurality of laterally extending apertures, which cross below and at least partially overlap with the longitudinally extending apertures of the top portion, thereby forming a fluid flow path, which passes from the top surface of the grating plate through the longitudinally extending apertures and the laterally extending apertures; and

anodizing at least one of the top and bottom portions.

18. The method of manufacturing a longitudinal grating plate of claim 17 further comprising the step of extruding a first longitudinal sidewall connected to a second longitudinal sidewall, the two sidewalls being connected by the grating plate, which extends therebetween, and wherein the laterally extending apertures at least partially extend between the first and second sidewalls,
such an arrangement forming a channel between the first and second sidewalls and below the grating plate whereby the fluid flow path can extend into the channel.
19. The method of manufacturing a longitudinal grating plate of claim 18 further comprising the step of anodizing at least one of the first and second sidewalls.
20. The method of manufacturing a longitudinal grating plate of claim 17 further comprising the step of forming a continuous and repeating S-shaped aperture in the bottom portion of the grating plate.
21. The method of manufacturing a longitudinal grating plate of claim 20 further comprising the step of forming a curved zig-zag pattern by continuous computer numerical control (CNC) machining process.