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(54) **TOILET FASTENING SYSTEM**

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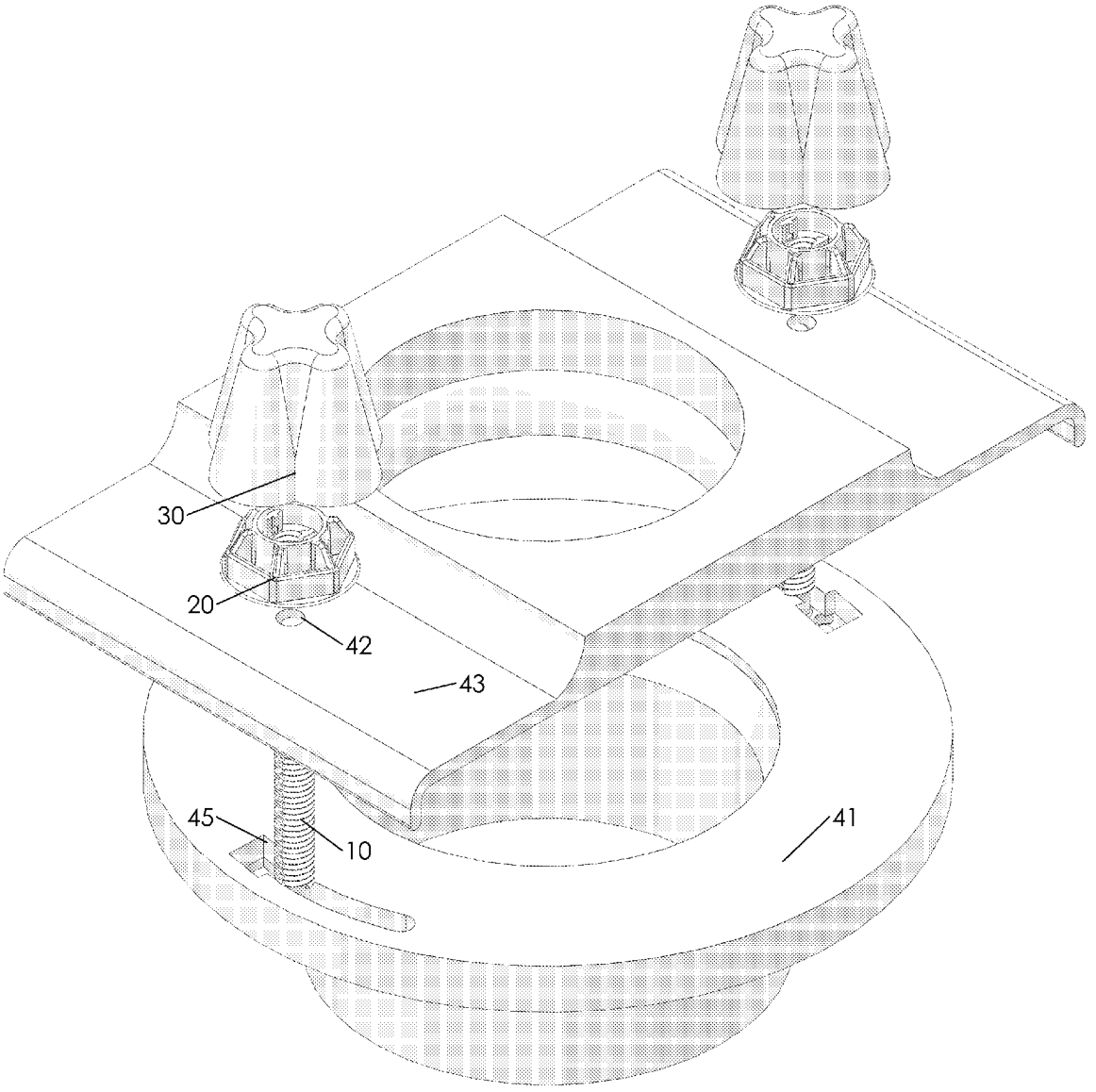
(57) **ABSTRACT**

A toilet fastener is provided that has a bolt with offset anti-spin foot, a locking system that prevents the nut from easily backing off the threaded bolt, and beauty cap that forms to the nut allowing tool-less installation and re-tightening. The fastener is formed of a non-corrosive metal, plastic or any combination thereof. The toilet fastener provides an easier toilet installation and maintenance with less parts and greater resistance to natural or synthetic elements.



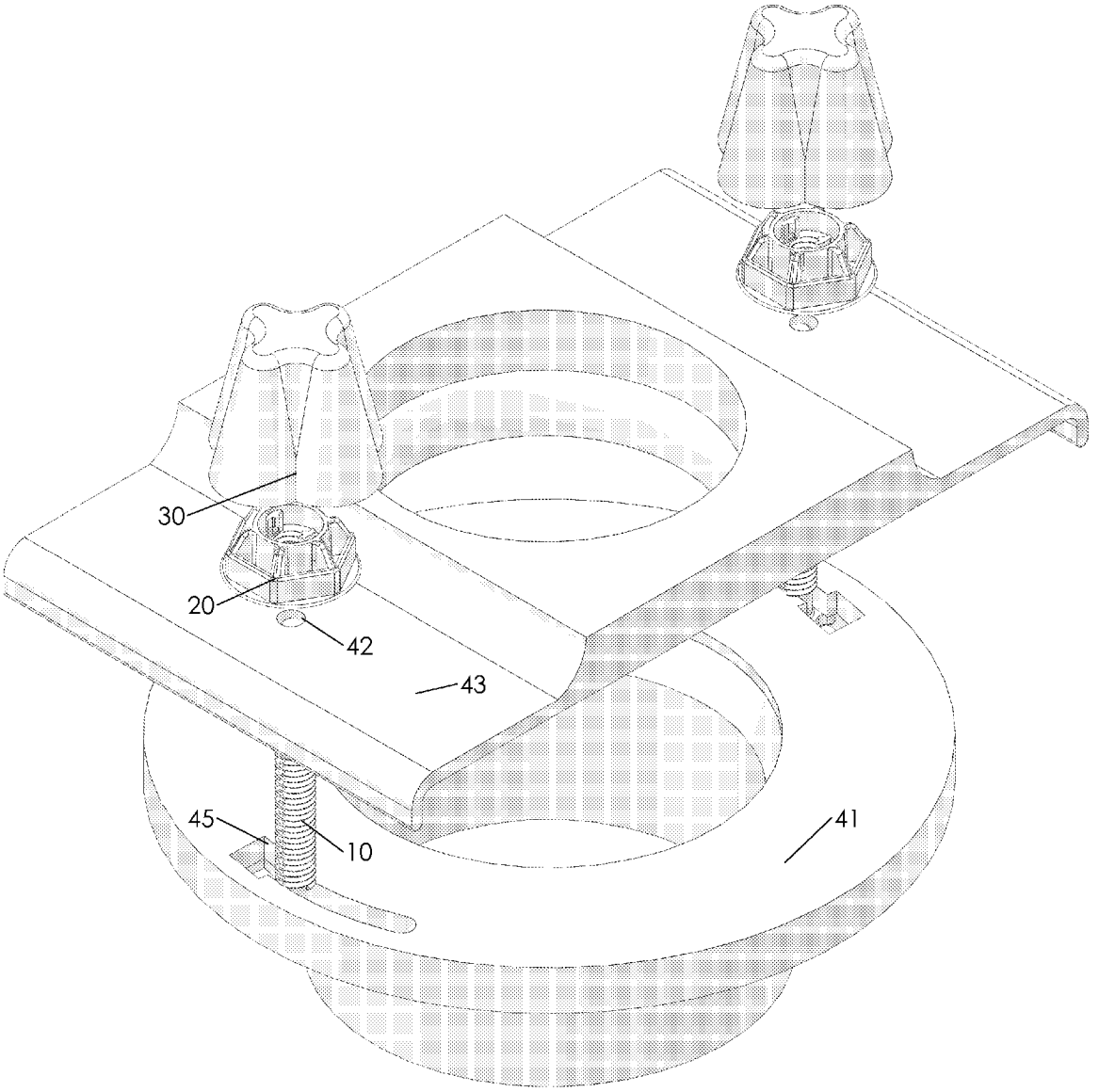


Fig. 1

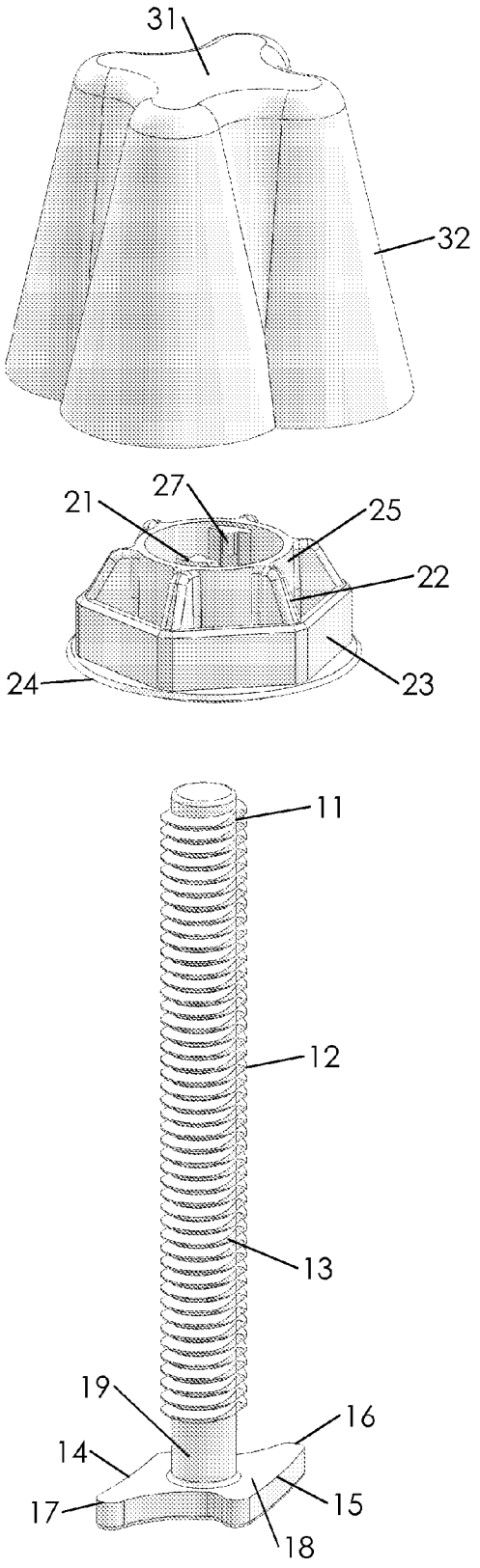


Fig. 2

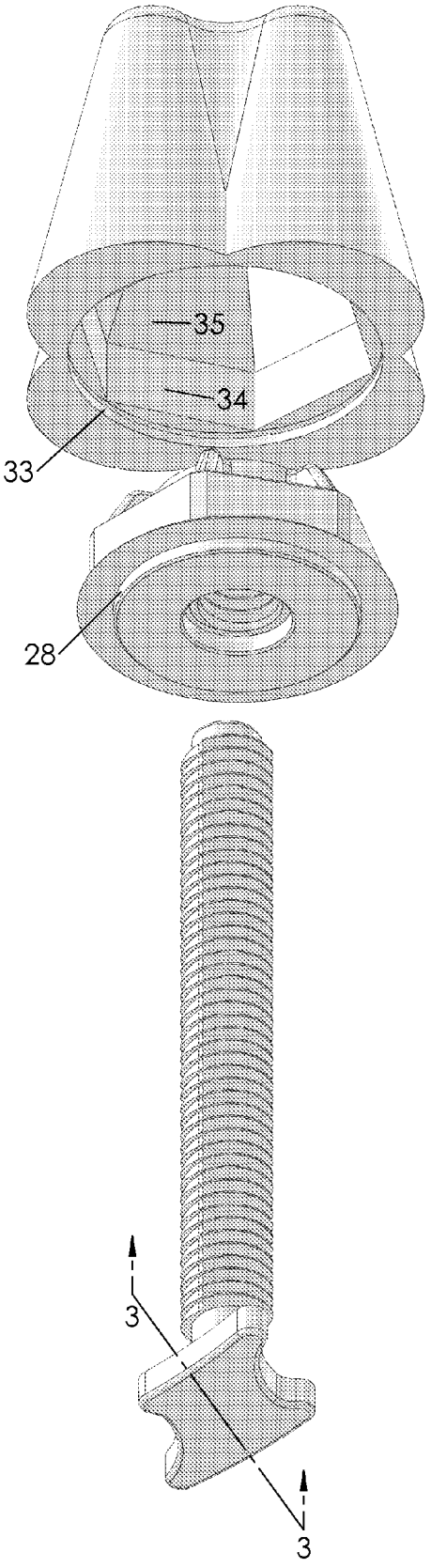


Fig. 3

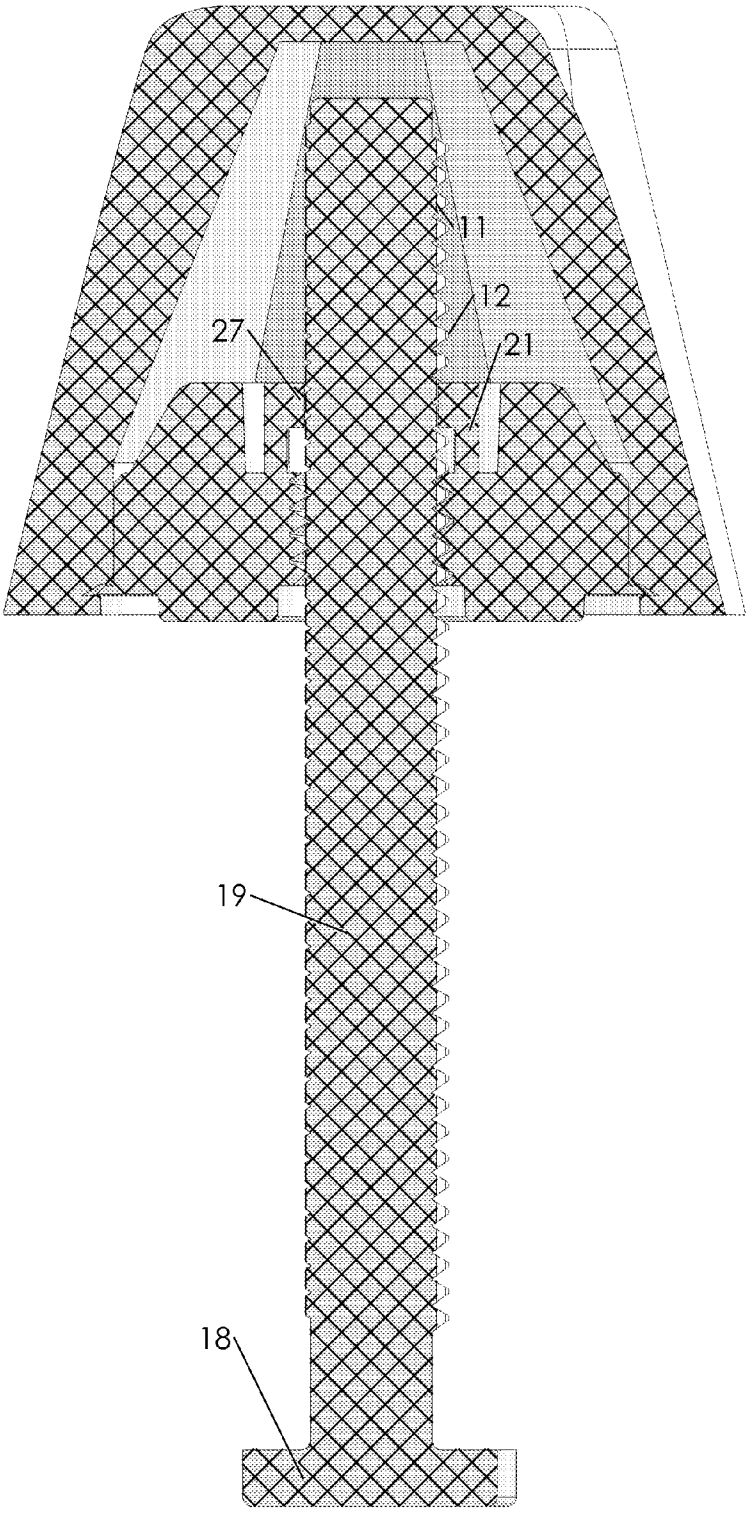


Fig. 4

TOILET FASTENING SYSTEM

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates generally to the field of toilet fasteners between a toilet base and a toilet flange.

[0003] 2. Description of the Prior Art

[0004] A toilet fastener is positioned between the base of a toilet and the upwardly facing toilet flange provided on the floor drain. A standard fastening system consists of a metal bolt with rectangular base that slides into the bolt channel on the toilet flange and protrudes upward through the toilet base, a beauty cap plate, a metal washer, a metal nut, and finally a beauty cap. The object of the toilet fastener is to provide a means to holding the toilet to the flange; however, many of the prior art fasteners become loose or deteriorate and develop leaks allowing fluid waste to escape.

[0005] The standard bolt is produced from various metals. If the bolt comes into contact with moisture and it is made out of a steel it will rust and has to be removed for repair. Further, the bolt is difficult to observe as the bolt is covered with a beauty cap hiding the deteriorating nut and bolt. The base of a standard bolt has a rectangular shaped design for the purpose of keeping the bolt in the flange. However, due to the varying widths and shapes of the bolt channels on flanges the standard bolt can become dislodged due to the design of the base of the bolt. Furthermore, the standard bolt can spin in the channel due to the varying widths and shapes of the bolt channels making it difficult to tighten and untighten the nut on the bolt without the bolt becoming dislodged from the flange.

[0006] The standard nut and bolt configuration allows the nut to loosen by backing up on the threads due to the angle of the thread pattern and the movement and rocking of the toilet base. The standard nut is also made of various metals. If the nut comes into contact with moisture and it is made out of a steel it will rust and has to be removed for repair. The standard nut has a hexagon shape about ⅜" wide and 3/16" tall requiring the use of tools for tightening and a metal washer to keep the nut from going through the toilet base.

[0007] The standard beauty cap plate is installed before the metal washer and nut for the purpose of holding the cap over the washer, nut and cut bolt. Therefore if the metal washer and metal nut become rusted or loose, the cap has to be removed and tools must be used to re-tighten the nut, if the nut and bolt are not too deteriorated. If the nut and or bolt are heavily rusted the use of saws, grinders or other tools would need to be used for removal. Furthermore, the cap keeps the metal nut and metal washer hidden from view obstructing the ability to see if it has become loose or begun to deteriorate.

[0008] What is needed is a toilet to flange fastening system that does not rust or deteriorate, does not allow the nut to back off and become loose, does not allow the foot of the bolt to become dislodged and spin in the flange, does not require tools for tightening and repair, and installs with fewer pieces.

[0009] Currently there are a number of options for a toilet to flange fastening system. Some of these options use a steel bolt, or other metals, a nut, a washer, a cap plate and a cap, but these options fail to meet the need of the industry because the parts can deteriorate/rust, become loose, and remain hidden by the cap allowing the problem to get worse. Other options attempt to use nylon as a bolt and nut material, this is similarly unable to meet the industry needs as it only solves the deterioration/rust problem and are easily loosened by the angle of the threading and the movement of the toilet and the foot can still become loose in the flange and require tools to tighten/repair. Still other options attempt to use a redesigned foot on the bolt, but due to the varying widths and shapes of the bolt channels on flanges they still become dislodged and spin while trying to tighten.

[0010] A number of U.S. patents have been granted on toilet bolts. The U.S. Pat. No. 7,954,179 issued to Johnson discloses a bolt with an oblong foot and male or female notches at the top of the bolts to visualize the direction of the foot and allow the use of tools to prevent spinning. The U.S. Pat. No. 5,222,851 issued to Dickerson discloses a bolt with round foot and protrusion extending vertically from the top face of the foot for preventing spinning in the flange bolt channel. The U.S. Pat. No. 4,530,629 issued to Sakow, discloses a oval foot for preventing spinning in the flange bolt channel.

[0011] The present invention is superior when compared to other known devices and solutions because the present invention provides a superior fastening of the toilet to the flange. Furthermore, the present invention is reusable, non-corrosive, requires no tools to re-tighten, will not allow the foot to spin in the bolt channel in the flange or become dislodged, the nut will not loosen with movement or rocking in the toilet, and is antimicrobial. In addition, the beauty cap joins with the nut and is used for re-tightening without removing the cap and without a wrench or other tools.

[0012] The present invention is unique, due to being made of an non-corrosive material. Other features unique to the present invention are presented and discussed below.

SUMMARY OF THE INVENTION

[0013] A non-corrosive, re-tightenable, tool-less toilet fastening system, used for fastening the toilet to the flange and holding it securely in place. This toilet fastening system is primarily constructed of an non-corrosive material, having a bolt with a off-set design foot on one end and two channels 180 degrees apart running vertical through the threading of the bolt to receive the locking tabs of the locking nut. Also the system has an locking nut, with locking tabs that keep the nut from becoming loose from the tightened position. The tightening cap, which sets on top of the locking nut, once placed in position, then becomes part of the tightening mechanism and does not require removal for re-tightening of the nut to bolt configuration, nor does it require the use of tools.

[0014] The non-corrosive material would preferably be, but not limited to, a plastic or non-metallic material.

[0015] It is an object of the present invention to provide a new and improved toilet fastening system for securing the toilet base to the floor flange.

[0016] A further object of the present invention is to provide an anti-back-off locking system for nut to bolt configuration.

[0017] In addition, it is an object of the present invention to provide a superior foot part on the base of the bolts for the purpose of preventing spinning of the bolt in the flange bolt channel and to prevent dislodging of the bolt from the flange while the installer is tightening the nut onto the bolt.

[0018] In addition, it is an object of the present invention to provide a fastening system where the beauty cap and nut form together during installation to become one part for the purpose of re-tightening; the cap serving two purposes as a tool and as a clean-lined beautification covering over the exposed nut and bolt.

[0019] Related objects and advantages of the present invention will be apparent from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The above mentioned and other features, advantages and objects of this invention, and the manner of attaining them, will become apparent and the invention itself will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

[0021] FIG. **1** is an exploded view of a toilet fastening system according to the principles of the present invention positioned between a toilet base attached to a floor flange and a toilet outlet base;

[0022] FIG. **2** is a top isometric view of a toilet fastening system according to the principles of the present invention;

[0023] FIG. **3** is a bottom isometric view of the combination shown in FIG. **2**; and

[0024] FIG. **4** is a cross-sectional view taken along the line **3-3** of FIG. **2** and viewed in the direction of the arrows.

[0025] Like reference numerals indicate the same or similar parts throughout the several figures.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0026] For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

[0027] Referring now more particularly to the drawings, there is shown a bolt **10** positioned in the bolt channel **45** of a toilet flange **41** protruding upward and through the bolt passage **42** in the toilet base **43**, in turn to be threaded through the nut **20**. There after the cap **30** fits onto the nut. Herein, the use of non-corrosive substances will be deemed to encompass all suitable materials for the toilet fastening system.

[0028] Bolt **10** includes a offset foot **18** with a shaft **19** extending vertically from the upper face of the foot. A threading is attached to or formed to the surface of the shaft **19** and having channels **11** extending vertically through the threading 180 degrees apart from the other. The foot **18** has an inside curved planar surface **14** and an outside curved planar surface **15**, which follow the contour of a flange bolt channel. The inside curved planar surface **14** begins near the front side of the threaded shaft extending horizontally toward the back to form a rear toe **17** and the outside curved planar surface **15** begins near the back side of the threaded shaft extending horizontally toward the front to form a front toe **16** making an offset planar foot while maintaining the ability to fit the foot into the flange bolt channel. The foot **18** is positioned in the bolt channel of the toilet flange with the threaded shaft **10** extending vertically through the bolt passage **42** of the toilet base **43**.

[0029] The nut **20** includes a shelled hexagonal body **23** that extends upwardly from the downwardly facing bottom surface with fins **22** extending inwardly from each corner of the hexagonal shape meeting at the wall of the partially shelled cylinder **25** that extends upwardly from the planar upper surface of the hexagonal body **23**. The cylinder **25** has a height 100% greater than the height of the hexagonal body **23**. The fins **22** are filleted from where they meet the top plane of the hexagon body **23** to the middle of the top plane of the fins **22**. At the center of the cylinder **25** a threaded passage is bored vertically through the nut and having locking tabs **21** extending vertically **180** degrees apart from the edge of the opening of the threaded passage. A protrusion **27** runs vertically along the center of the interior face of each locking tabs **21**. At the base of the hexagonal body **23** is a thin cylinder **24** with a diameter greater than the width of the hexagonal body **23** and a filleted outer edge. At the base of the cylinder **24** is a cylinder **28** with a diameter less than the width of the hexagonal body **23** and a height great enough to allow the cap **30** to join with the nut **20**.

[0030] The nut **20** is placed onto the top of the threaded shaft **19** and turned clockwise direction for tightening. As the nut is turned down the shaft the tab protrusions **27** meet the threading and the locking tabs **21** are deformed outwardly. The tab protrusions **27** then turn over the channel shelf **12** and fall into the channels **11**, returning the locking tabs **21** to their original shape. As the nut is turned further down the threaded shaft **19** the tab protrusions **27** rise over the channel exits **13** deforming the locking tabs **21** outwardly.

[0031] The cap **30** extends upwardly from the planar downwardly facing bottom surface in **4** melded conical shapes **32** to the upwardly facing planar surface **31**. The shape of the cap is not limited to a conical shape and can be a dome, cube, cylinder, or pyramid. The downwardly facing flat or planar surface of the cap **30** is extruded upwardly with a cylindrical shape that is extruded outwardly to create the ledge **33** for accepting the thin cylinder **24** of the nut **20**. The downwardly facing surface thereof is further extruded upwardly with a hexagonal shape **34** a distance equaling the height of the hexagonal body **23** of the nut **20** then narrowing at an angle equal to the fillet of the fins **22** of nut **20** forming the hexagonal pyramid **35** shaped cavity. The cavity thereof receives the hexagonal body **23** of the nut **20** and thereafter receives the thin cylinder **24** of the nut **20** into the circular ledge **33** of the cap **30**, joining them into one part.

[0032] A pair of bolts **10** have offset feet **18** positioned into bolt channels **45** provided **180** degrees apart on flange **41**. A pair of accurate shaped slots extend from each opening of the bolt channels **45** with each slot having a counter bore or enlarged lower opening enabling the foot **18** of each bolt **10** to be extended through the openings of the bolt channels **45** while the threaded shaft **19** of the bolt **10** is extended upwardly. The threaded shafts **19** may be moved along the lengths of the accurate slots to distance the foot **18** apart from openings of the bolt channels **45** preventing accidental disengagement of the bolt from the flange. Each offset foot having an inside curved planar surface **14** and outside curved planar surface **15** following the curvature of the accurate slots with the inside planar surface **14** being offset from the outside planar face **15**. Each threaded shaft **19** then extends through or by the toilet seal. Each threaded shaft **19** then extends through passages **42** located 180 degrees apart on the upper surface of the toilet base **43**.

[0033] Once the bolts **10** pass through the toilet base **43** the nut **20** is screwed on in a clockwise direction for fastening the toilet base **43** to the toilet flange **41**. As the nut **20** is turned clockwise down the threaded shaft **19**, the locking tabs **21** grab at the locking channels **11** running vertically **180** degrees

apart on the threaded shaft **19** preventing unintended counterclockwise turning of the nut **20** on the threaded shaft **19**. The nuts **20** are tightened by hand or tool to a snug position when the toilet base **43** is secured to the toilet flange **41** and then the excess threaded shafts **19** of the bolts **10** extending out of the top of the nuts **20** are removed.

[0034] The caps **30** are then joined onto the nuts **20** by aligning the hexagonal shape **23** on the nuts **20** to the hexagonal cavity **34** of the caps **30**. The caps **30** are then able to be turned in a clockwise direction tightening the nuts **20** down the threaded shafts **19** if the toilet base requires further fastening to the flange without the use of tools.

[0035] The bolt **10**, nut **20** and cap **30** are composed preferably, but not necessarily, throughout of a non-corrosive non-metallic material. The material used may be a steel, brass, aluminum, zinc, Polyoxymethylene (POM), Polystyrene (PS), Polyamide, Poly(vinyl chloride), or other metals or plastics. The bolt and nut may include glass or talc in the materials, which increase structural and impact strength and rigidity, or molybdenum sulfide-filled variants which increase lubricity. Examples of commercial polyamide products are Nylon from DuPont, Technyl from Rhodia, Rilsan and Rilsamid from Arkema. The non-metallic material may be polymer based having BHT (butylated hydroxyl-toluene) providing an anti-microbial construction for the bolt, nut and cap.

[0036] The bolt, nut, and cap can be manufactured by the process of injection molding. The bolt can also be manufactured by the process of machining lengths of metal rods and threading by tap and die and then welding the machined foot to the base of the threaded shafts. Injection molding is a process for producing parts by injecting material into a injection mold. Injection molding can be performed with a host of materials, including metals, glasses, elastomers, confections, and most commonly thermoplastic and thermosetting polymers. Material for the part is fed into a heated barrel, mixed, and forced into a mold cavity where it cools and hardens to the configuration of the cavity. Injection molding utilizes a ram or screw-type plunger to force molten plastic material into a mold cavity; this solidifies into a shape that has conformed to the contour of the mold.

[0037] Thermoplastics are prevalent due to characteristics which make them highly suitable for injection molding, their ability to soften and flow upon heating high pressure injection of the raw material into a mold which shapes the polymer into the desired shape. Molds can be of a single cavity or multiple cavities.

[0038] When thermoplastics are molded, typically pelletized raw material is fed through a hopper into a heated barrel with a reciprocating screw. Upon entrance to the barrel the thermal energy increases and the Van der Waals forces that resist relative flow of individual chains are weakened as a result of increased space between molecules at higher thermal energy states. This reduces its viscosity, which enables the polymer to flow with the driving force of the injection unit. The screw delivers the raw material forward, mixes and homogenizes the thermal and viscous distributions of the polymer, and reduces the required heating time by mechanically shearing the material and adding a significant amount of frictional heating to the polymer. The material feeds forward through a check valve and collects at the front of the screw into a volume known as a shot. Shot is the volume of material which is used to fill the mold cavity, compensate for shrinkage, and provide a cushion the screw to transfer pressure from the screw to the mold cavity. When enough material has gathered, the material is forced at high pressure and velocity into the part forming cavity.

[0039] Once the screw reaches the transfer position the packing pressure is applied, which completes mold filling and compensates for thermal shrinkage. The packing pressure is applied until the gate solidifies. Once the gate solidifies, no more material can enter the cavity; the screw reciprocates and acquires material for the next cycle while the material within the mold cools so that it can be ejected and be dimensionally stable. This cooling duration is dramatically reduced by the use of cooling lines circulating water or oil from a thermolator. Once the required temperature has been achieved, the mold opens and an array of pins, sleeves, strippers, etc. are driven forward to demold the article. Then, the mold closes and the process is repeated.

[0040] For thermosets, typically two different chemical components are injected into the barrel. These components immediately begin irreversible chemical reactions which eventually crosslinks the material into a single connected network of molecules. As the chemical reaction occurs the two fluid components permanently transform into a viscoelastic solid. After the part has solidified valves close, isolating the injection system and chemical precursors, and the mold opens ejecting the molded parts. Then, the mold closes and the process repeats.

What is claimed is:

1. A toilet fastener for securing a toilet base to a toilet flange, the toilet fastener comprising:

a conjoined nut and cap;

an offset foot with a shaft extending from the top of the foot; and

a threading formed to the shaft.

2. The toilet fastener of claim **1**, wherein the threading comprises a pair of channels extending vertically through the threading.

3. The toilet fastener of claim **1**, wherein the nut comprises a pair of tabs extending vertically from the edge of the threaded passage that extends vertically through the center of the nut.

4. The toilet fastener of claim **1**, wherein the nut comprises a body matching that of the cavity of the cap for tool-less installation and maintenance.

5. The toilet fastener of claim **1**, wherein the offset foot has an inside curved planar surface and an outside curved planar surface which follow the contour of a flange bolt channel.

6. The toilet fastener of claim **1**, wherein the body of the offset foot, shaft and threading comprises zinc.

7. The toilet fastener of claim **1**, wherein the body of the offset foot, shaft and threading comprises brass.

8. The toilet fastener of claim **1**, wherein the body of the offset foot, shaft and threading comprises aluminum.

9. The toilet fastener of claim **1**, wherein the body of the offset foot, shaft and threading comprises steel.

10. The toilet fastener of claim **1**, wherein the body of the nut and cap comprises Polystyrene.

11. The toilet fastener of claim **1**, wherein the body of the nut and cap comprises Polyoxymethylene.

12. The toilet fastener of claim **1**, wherein the body of the nut and cap comprises Polyamide.

13. The toilet fastener of claim **1**, wherein the body of the nut and cap comprises PVC.

14. The toilet fastener of claim **1**, wherein the body of the offset foot, shaft and threading comprises Polystyrene.

15. The toilet fastener of claim **1**, wherein the body of the offset foot, shaft and threading comprises Polyoxymethylene.

16. The toilet fastener of claim **1**, wherein the body of the offset foot, shaft and threading comprises Polyamide.

17. The toilet fastener of claim **1**, wherein the body of the offset foot, shaft and threading comprises PVC.

18. The toilet fastener of claim **1**, wherein molybdenum sulfide-filled variants are present in the body of the nut, cap, offset foot, shaft and threading.

19. The toilet fastener of claim **1**, wherein glass is present in the body of the nut, cap, offset foot, shaft and threading.

20. The toilet fastener of claim **1**, wherein talc is present in the body of the nut, cap, offset foot, shaft and threading.

21. The toilet fastener of claim **1**, wherein BHT is present in the body of the nut, cap, offset foot, shaft and threading.

* * * * *