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United States Patent [19]

Birsel et al.

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[45] Date of Patent: Sep. 16, 1997

[54] **TOILET ATTACHMENT WITH EASILY DETACHABLE SEAT**

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[73] Assignee: **Toto Ltd.**, Fukuoka, Japan

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§ 371 Date: **Feb. 28, 1996**

§ 102(e) Date: **Feb. 28, 1996**

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PCT Pub. Date: **Aug. 17, 1995**

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[6] **A47K 13/12**

[52] **U.S. Cl.** **4/236**; 4/447; 4/420.4; 4/420.2; 4/DIG. 6

[58] **Field of Search** ..... 4/447, 240, 236, 4/237, DIG. 6, 420.2, 420.4, 486, 469, 473

[56] **References Cited**

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Primary Examiner—David J. Walczak

Attorney, Agent, or Firm—Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.

[57] **ABSTRACT**

A toilet accessory (**10**) having readily detachable toilet seat (**14**) and toilet lid (**16**). A hinge shaft (**74**) is supported by a pair of posts (**72**) to protrude away from the housing (**12**). The hinge portions of the toilet seat and the toilet lid are provided with elastic collars (**84**) of C-shaped cross-section and are snap-fitted on the hinge shaft (**74**). When the toilet seat and the toilet lid are to be removed for washing or cleaning, they can be readily dismounted only by pulling with hands. To re-install, the hinge portions readily snap-fit on the hinge shaft by bringing the elastic collars (**84**) in contact with the hinge shaft (**74**) and by pressing down the hinge portions. Since the hinge shaft (**74**) and the posts (**72**) are exposed out of the housing (**12**), they can be easily accessed for cleaning.

22 Claims, 14 Drawing Sheets

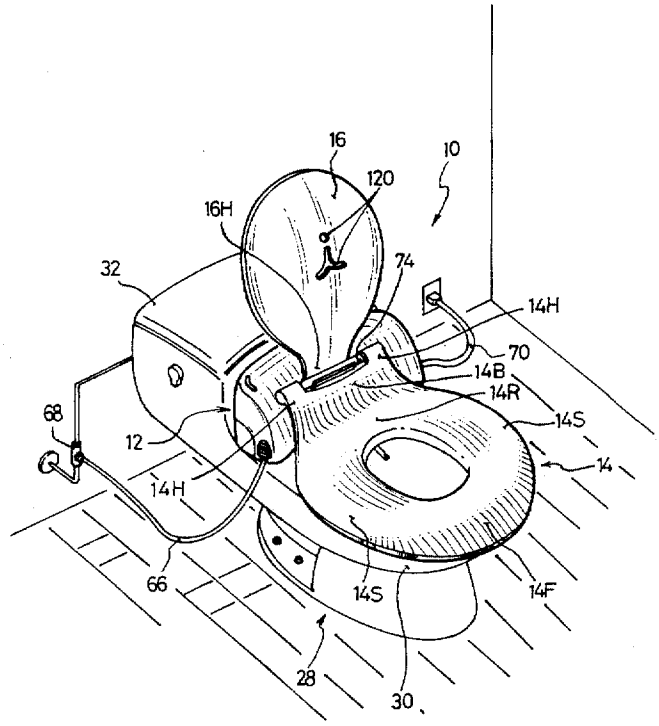


FIG. 1

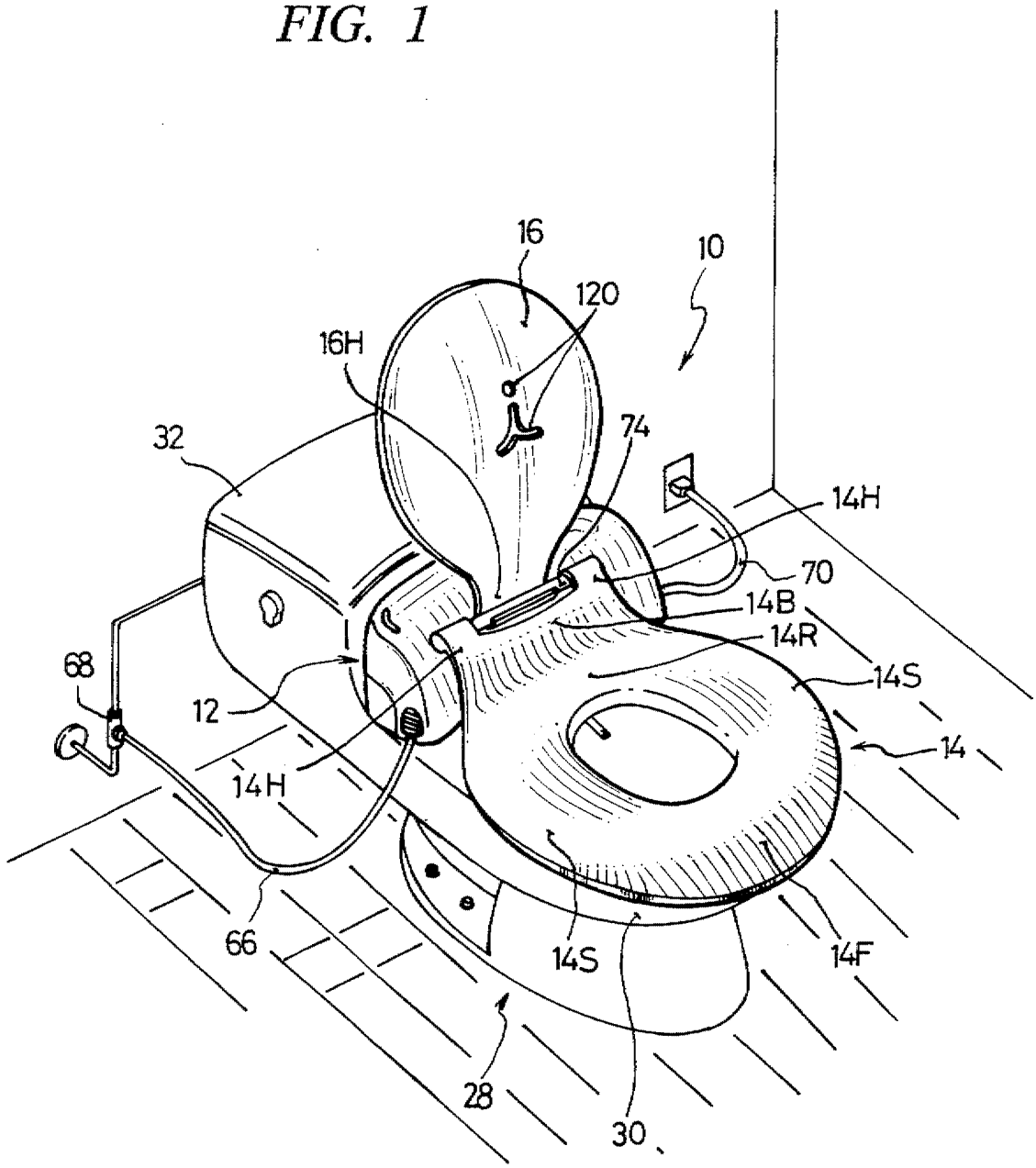


FIG. 2

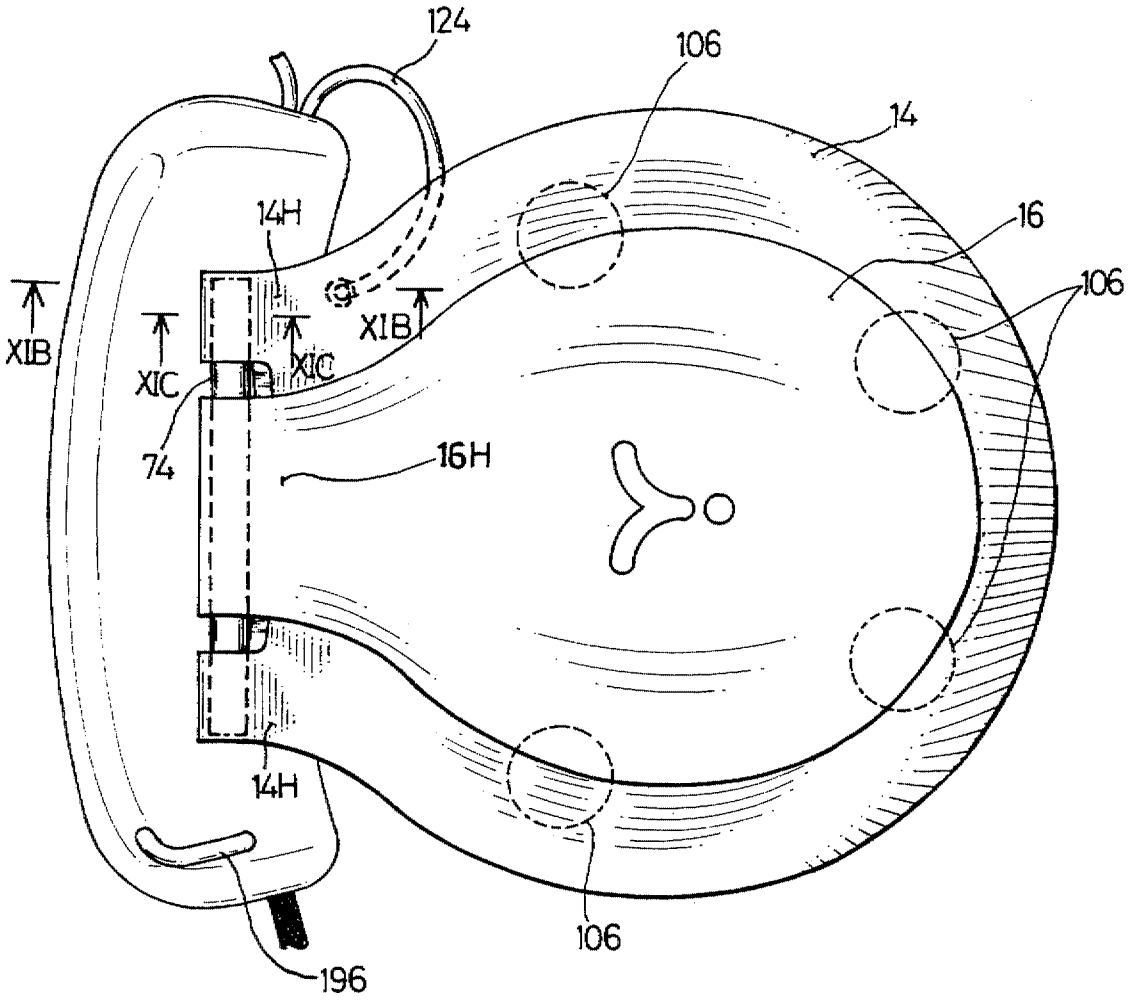

124
106
14
16
106
14H
XIB
XIB
XIC
XIC
74
16H
14H
106
196

FIG. 3

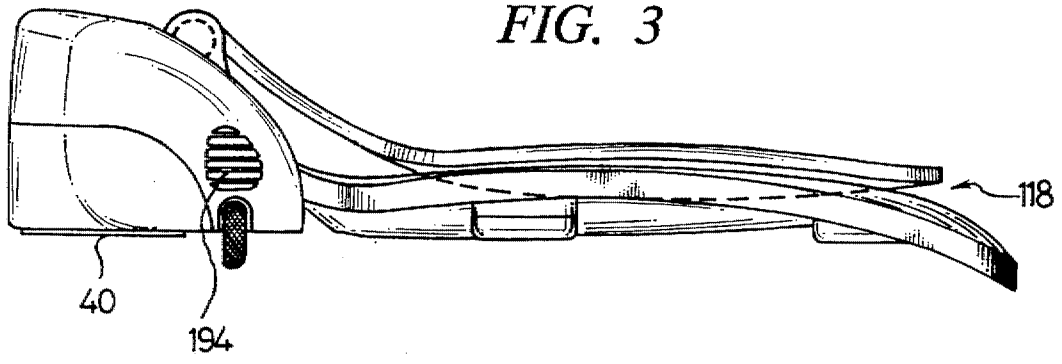
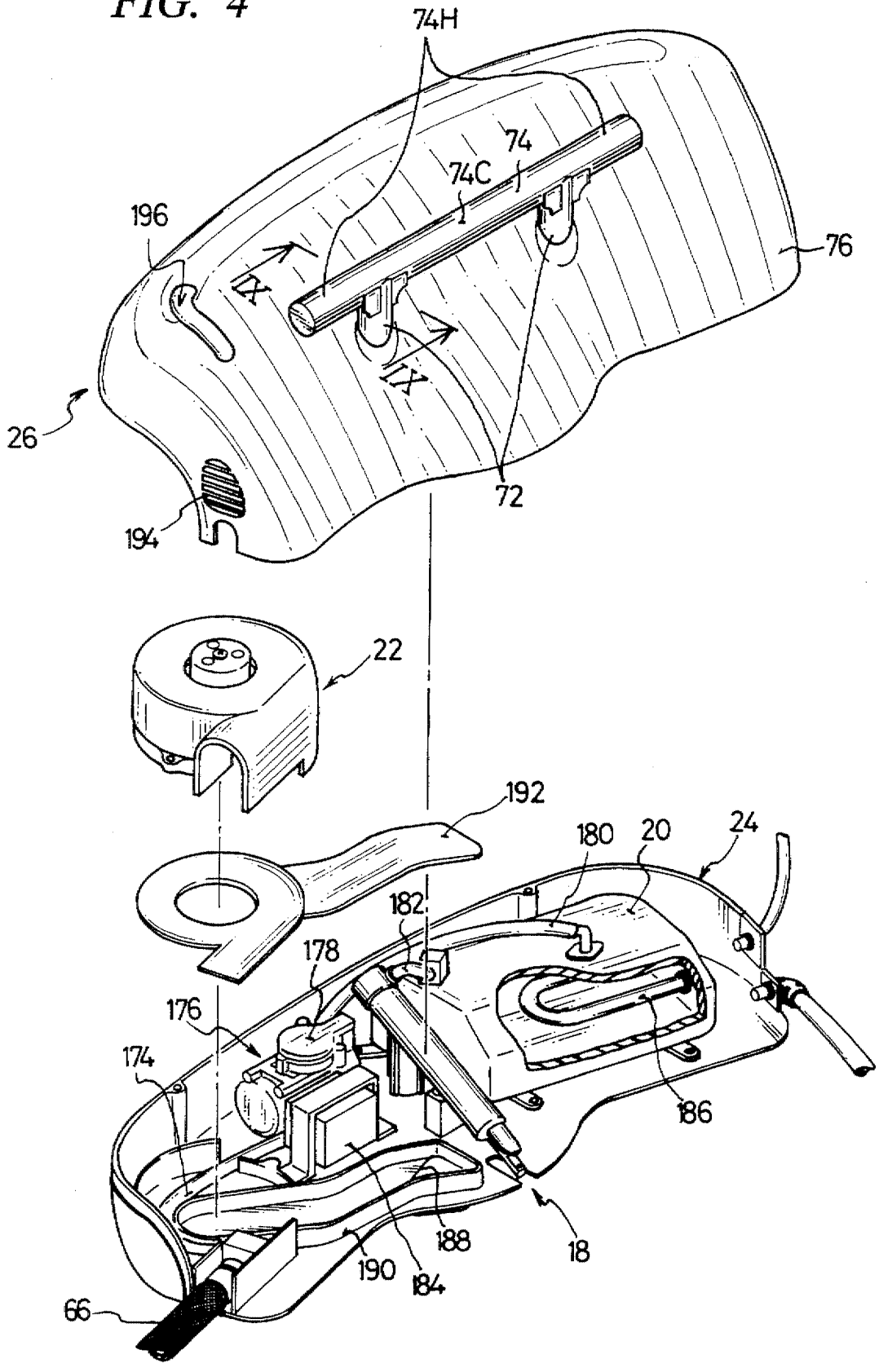

118
40
194

FIG. 4


74H
74
74C
196
IX
IX
76
26
72
194
22
192
180
20
24
182
178
176
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186
188
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184
66

FIG. 5

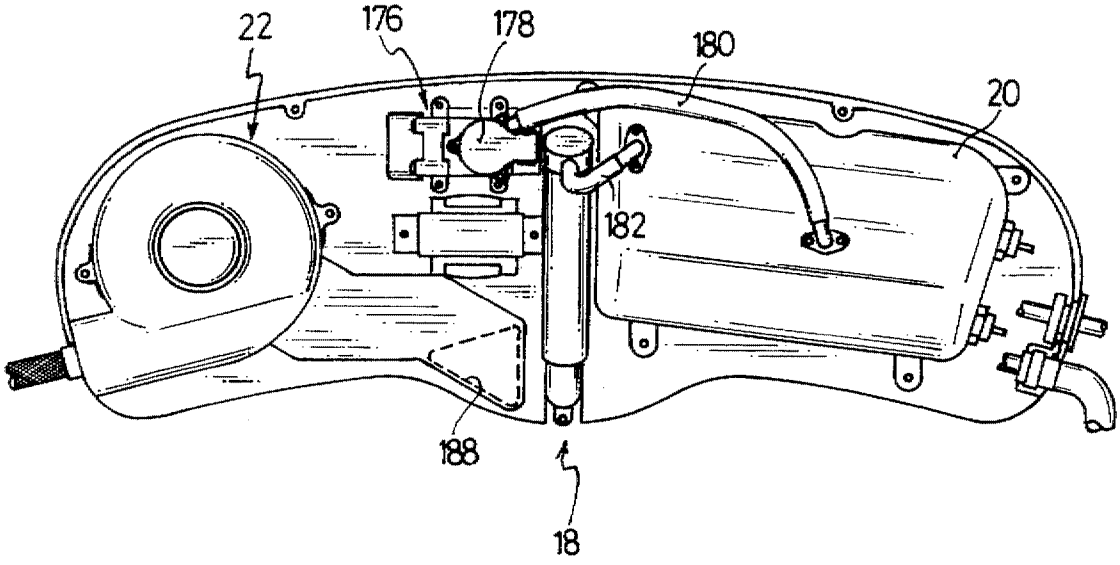


FIG. 6

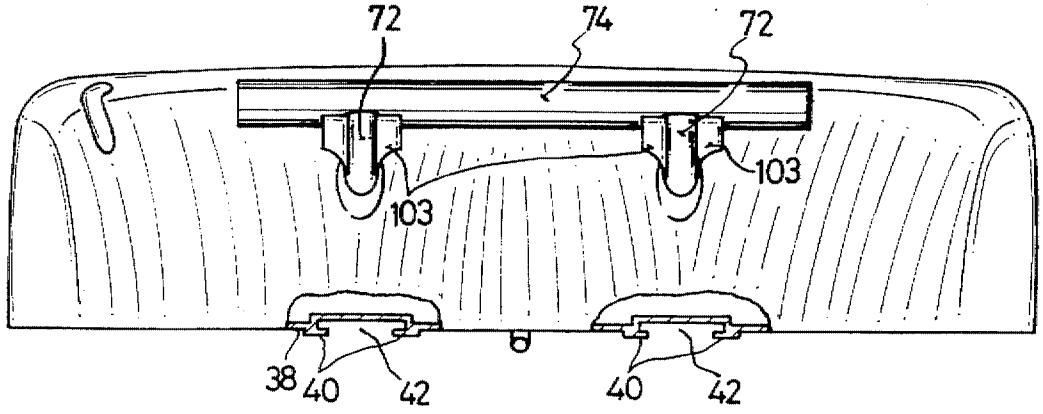


FIG. 7

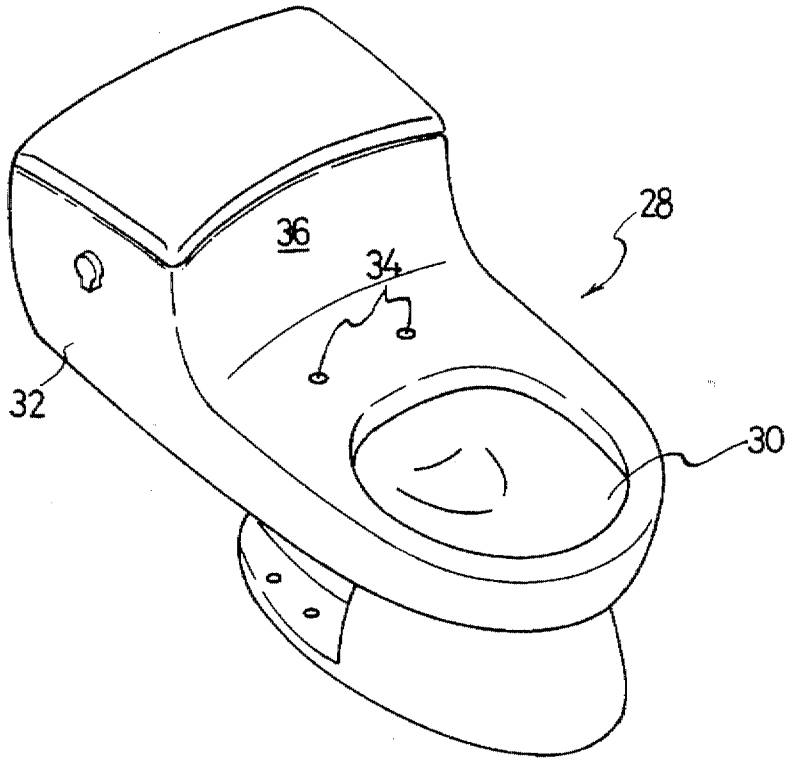


FIG. 9

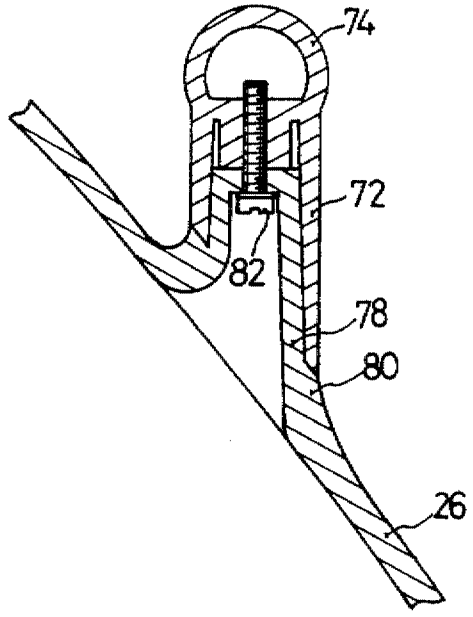


FIG. 8A

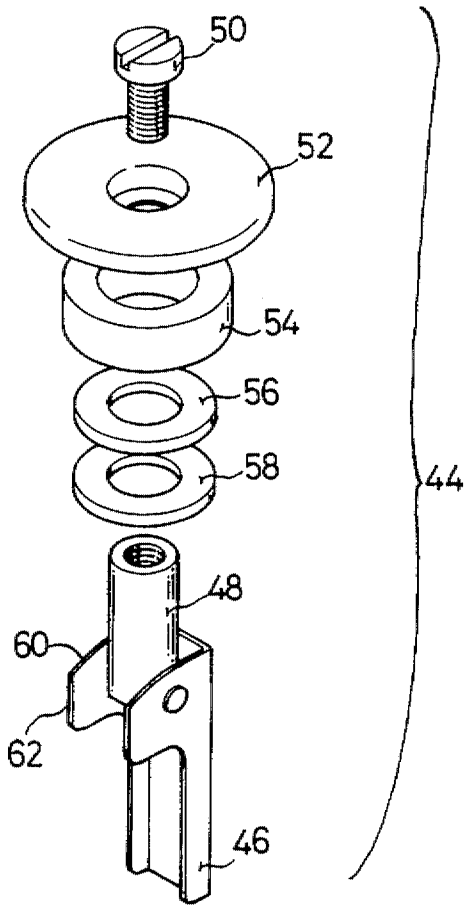


FIG. 8B

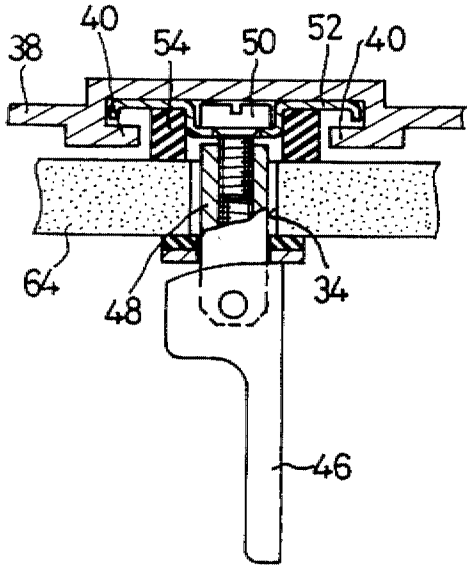


FIG. 8C

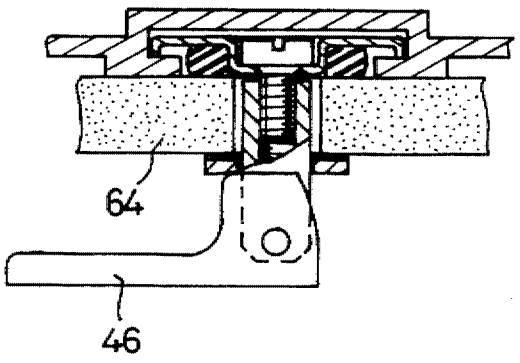


FIG. 10

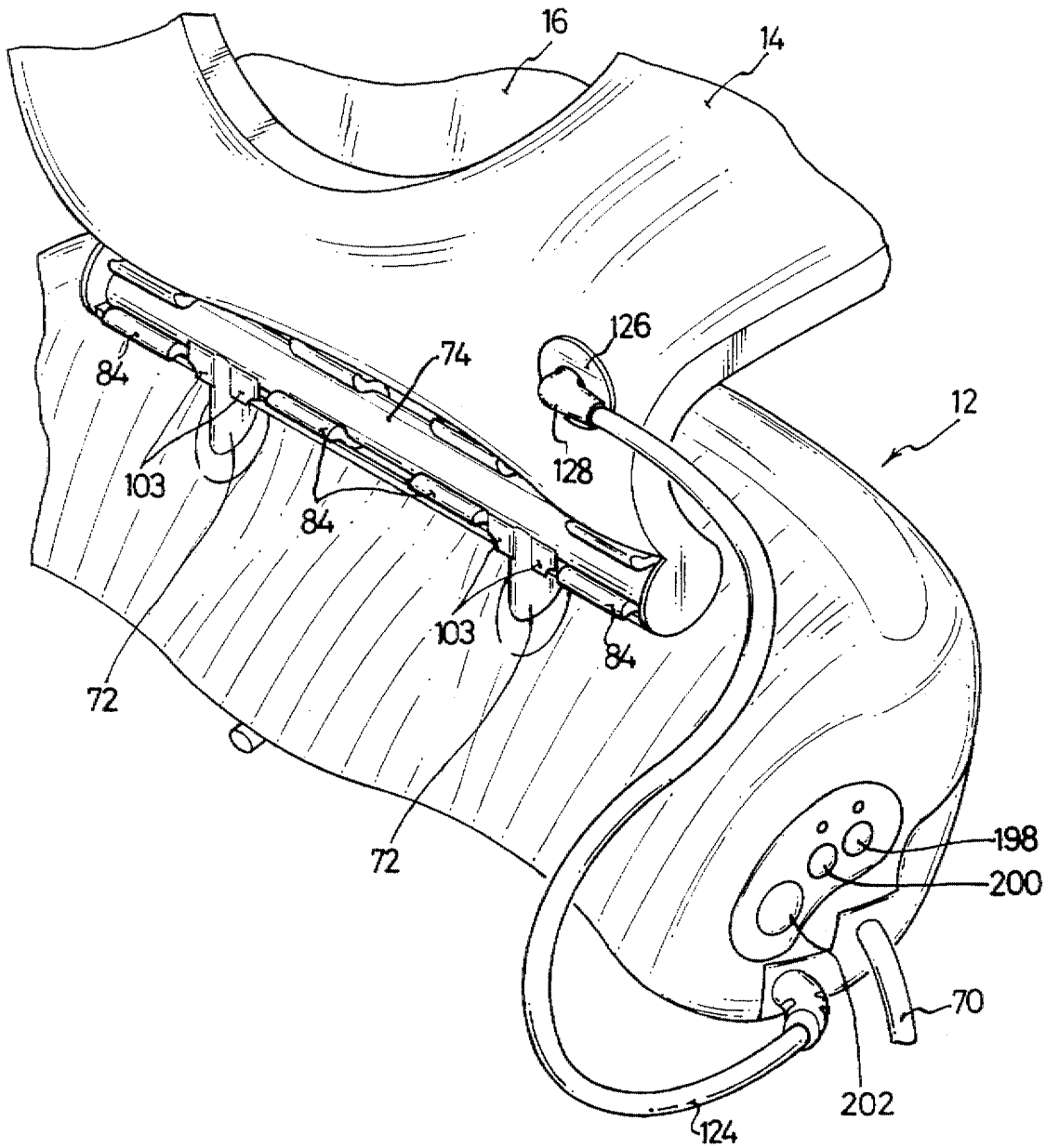


FIG. 11A

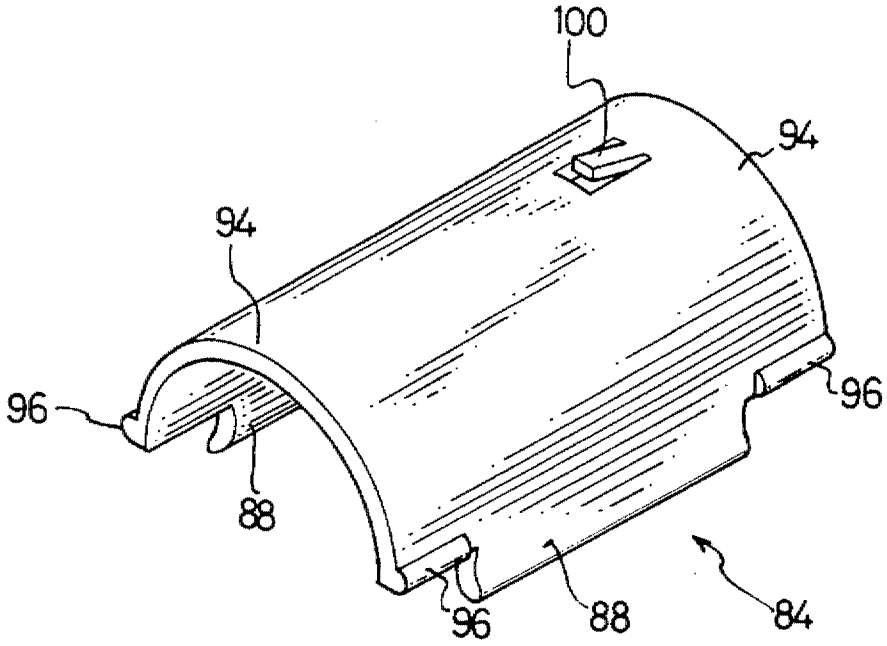


FIG. 11B

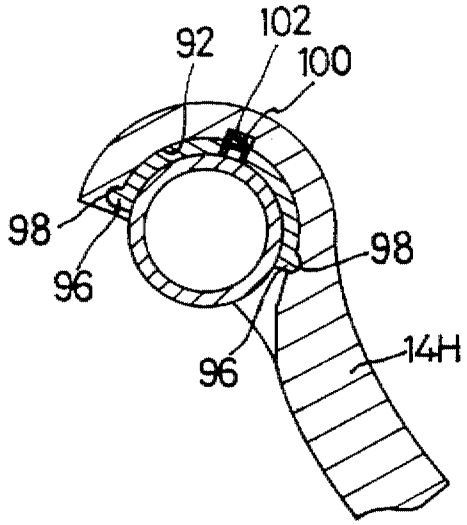


FIG. 11C

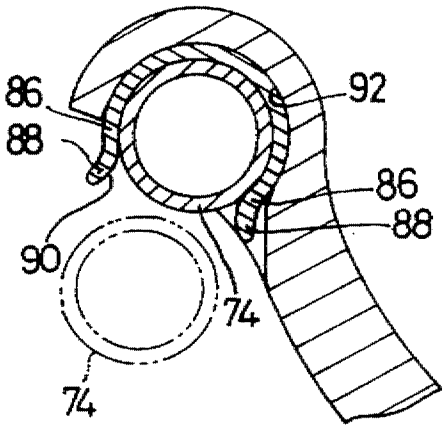


FIG. 12A

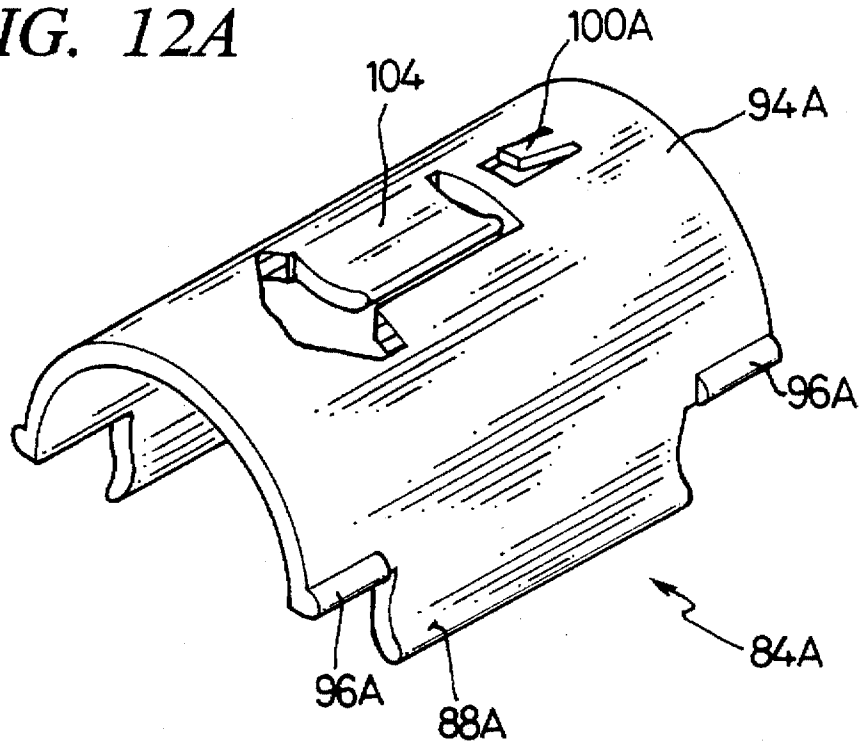


FIG. 12B

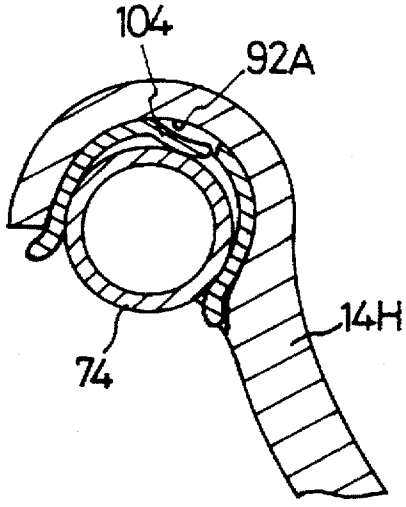


FIG. 12C

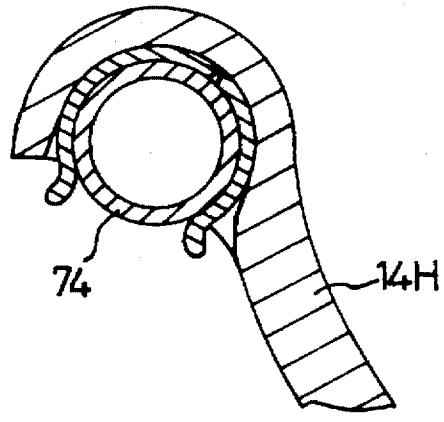


FIG. 13

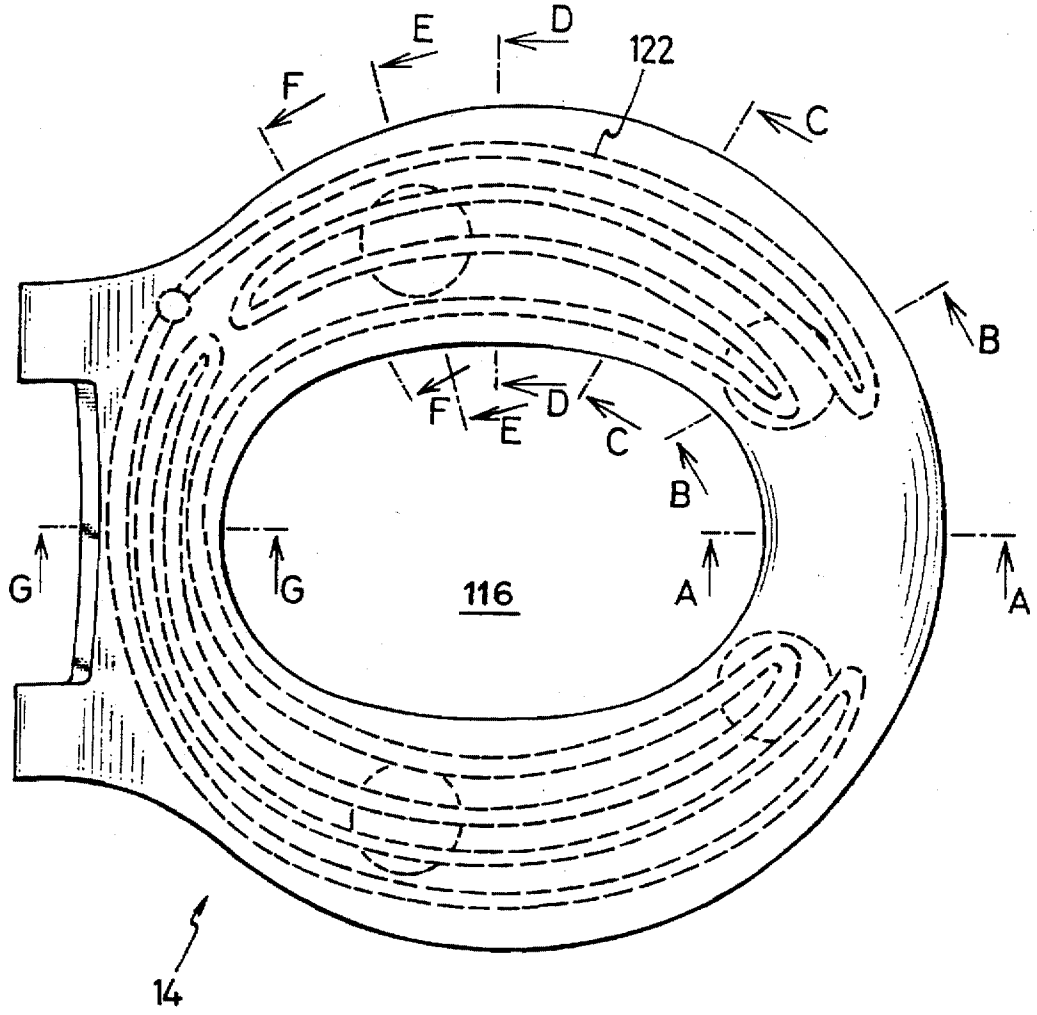


FIG. 14

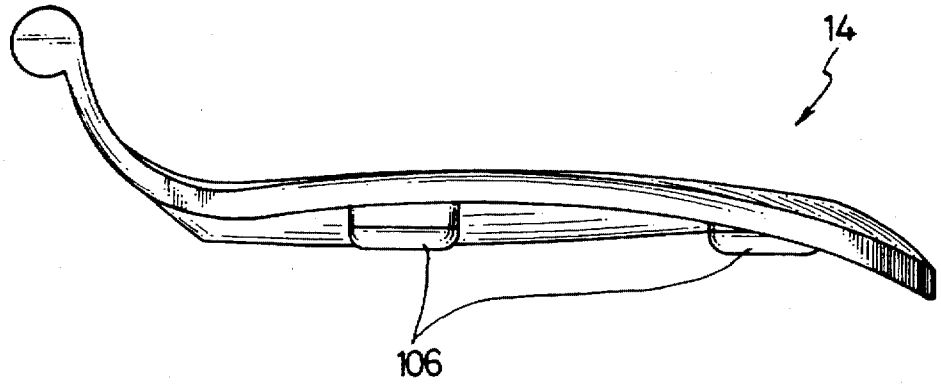


FIG. 15A

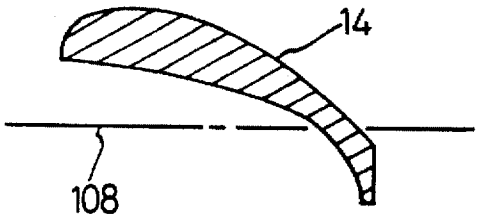


FIG. 15B

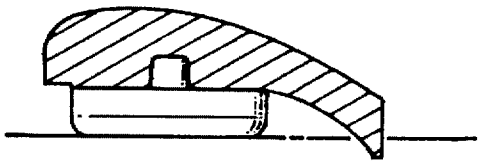


FIG. 15C

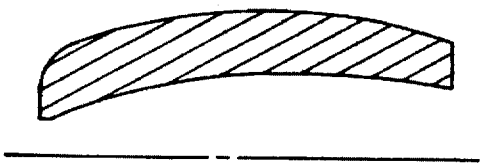


FIG. 15D

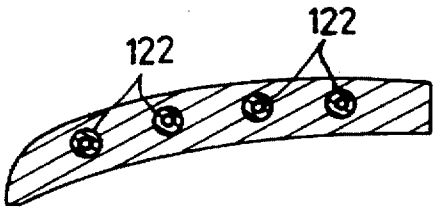


FIG. 15E

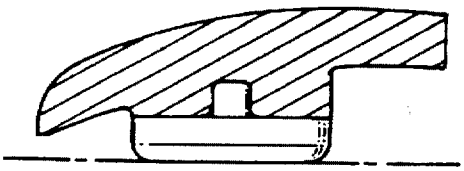


FIG. 15F

FIG. 15G

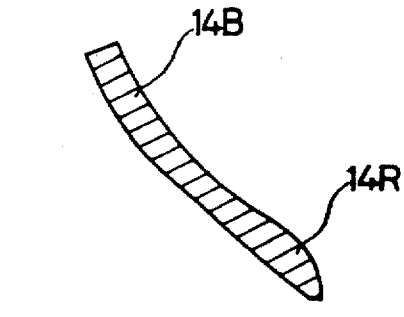


FIG. 16

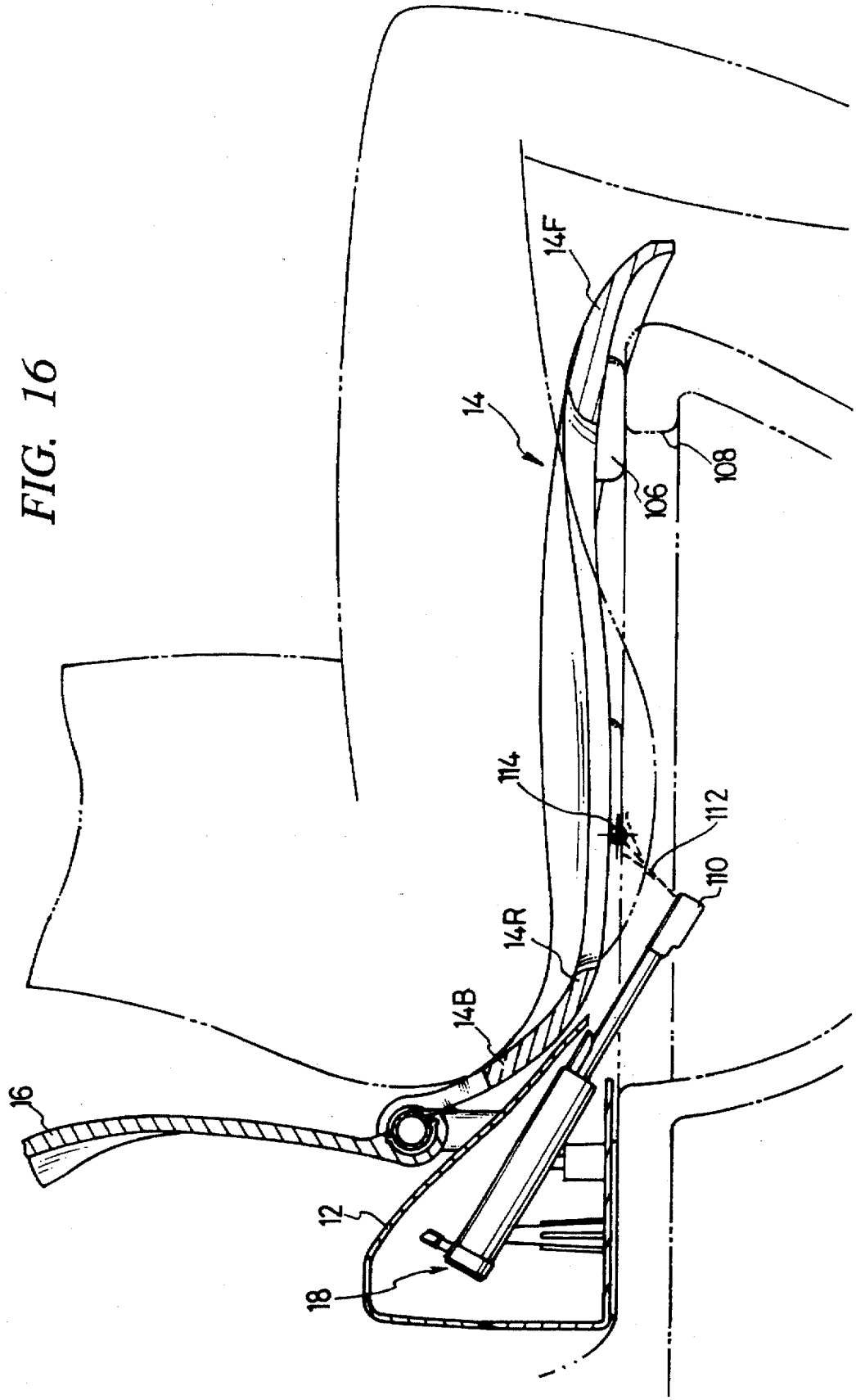


FIG. 17

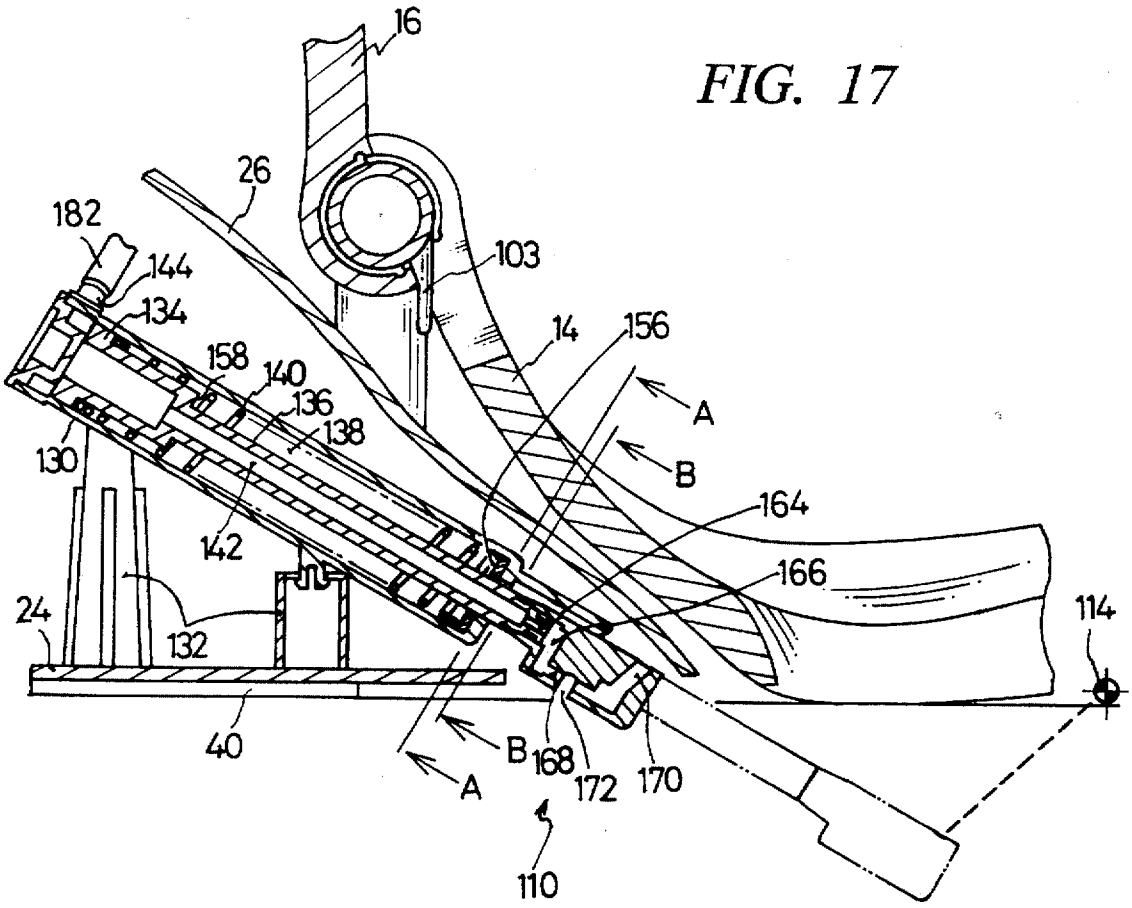


FIG. 17A

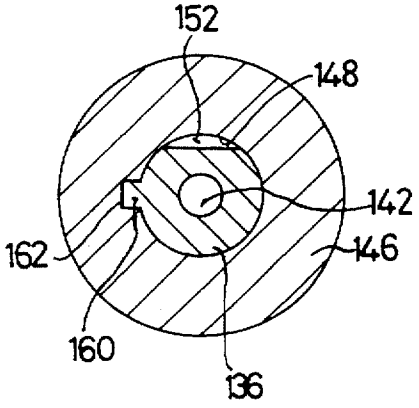


FIG. 17B

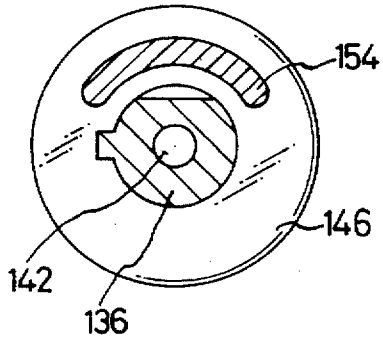
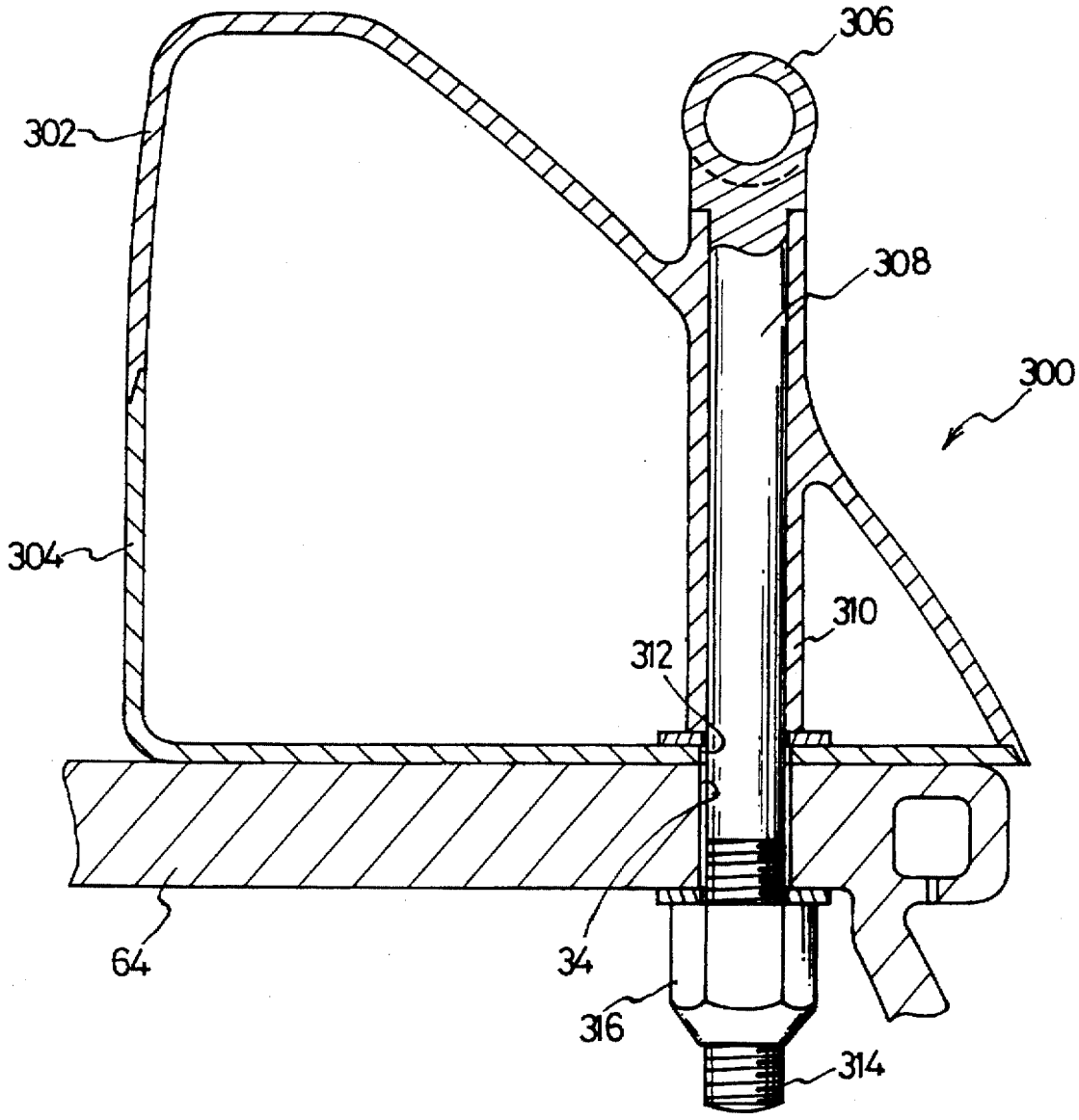


FIG. 18



TOILET ATTACHMENT WITH EASILY DETACHABLE SEAT

TECHNICAL FIELD

The present invention relates to a combination of a toilet accessory, such as a bidet system, bowl ventilation equipment and deodorizing device, and a toilet seat and a toilet lid hinged to the housing of the accessory. More specifically, this invention relates to a toilet accessory having a toilet seat and a toilet lid which may be readily detached from the accessory for cleaning and easily re-installed.

BACKGROUND ART

Hitherto, various toilet accessories have widely been used to add sanitary and/or electric functions to the conventional toilets thereby to provide comfortable toilets. Such accessories include bidet systems, warmed water forming devices therefor, hot air blowers, bowl ventilation devices, deodorizers, heated toilet seats, and toilet room heaters.

Typically, a housing for the accessory is mounted on the upper surface of a toilet bowl fixture between a bowl section of the fixture and a flushing water supply section located rearwardly of the bowl and one or more toilet accessories are arranged in the housing. For example, in a toilet described in U.S. Pat. No. 4,628,548 to Kurosawa et al, a bidet system having a movable nozzle is arranged in the housing to eject a spray of water toward the perineal part of the user seated on the toilet seat so as to wash the anus and/or the vagina after defecation or urination. The housing also receives a warmed water reservoir for supplying warmed water to the nozzle, a hot air blower for drying the perineal part after use of the bidet system, a power source for the accessories and an electric control device.

A toilet seat and a toilet lid are pivoted to the accessory housing by associated hinge mechanisms. Generally, a hinge mechanism is designed in such a manner that the toilet seat and the lid may be removed from the housing for the purpose of cleaning. To this end, the hinge pin is removably press-fitted in a bore of the housing. However, removal of the hinge pin in an attempt to detach the toilet seat and lid requires use of a tool such as a screw driver and pliers so that it is difficult, if not possible at all, for an ordinary user, such as a housewife, to remove the hinge pin in the course of routine household affairs. Furthermore, in many instances, the hinge pin is coupled to the housing by means of a pivoting movement control mechanism to prevent an abrupt closure of the toilet seat and lid, as described in U.S. Pat. No. 5,010,601 to Kobayashi et al. In these instances, even a fairly skilled user would be discouraged from attempting to remove the hinge pin. In order to bravely dismount the toilet seat and lid, the hinge pin must be carefully pulled out with reference to a user's manual. If it is not clear how to remove the hinge pin, the toilet seat and lid may be detached only with a potential risk of damaging the component parts.

U.S. Pat. No. 3,471,874 to Dixon discloses a hinge structure designed to enable even a housewife to easily remove the toilet seat and lid. In this structure, a pair of seat posts each having U-shaped jaws are mounted to the bowl fixture. The toilet seat has a pair of hinge pins which has a unique cross section defined by two flat sides and two circular sides to ensure that the hinge pins may be disengaged from the U-shaped jaws of the seat posts and re-engaged when the toilet seat is rotated at a prescribed angle coincident with the apertures of the U-shaped jaws. The brackets of the toilet lid are also provided with the U-shaped jaws which are removably engaged with the hinge pins of the toilet seat.

This hinge structure enjoys the advantage that the toilet seat and the lid may readily be removed whenever desired without using a tool such as a screw driver and a wrench. However, one of the disadvantages is that the inner surface of the U-shaped jaws of the seat posts is not readily accessible from the outside. In the event that the seat posts are fouled by urine splashed too far during urination by a male, it is difficult to wipe and clean the inner surface of the jaws of the seat posts. Another shortcoming is that the toilet seat and the toilet lid cannot be dismounted separately but, instead, the seat and the lid as combined together can be dismounted from the seat posts only jointly, the seat and the lid being then separable from each other. Accordingly, it will be discouraging for a user of weak muscle such as a housewife or a handicapped to dismount the toilet seat and the lid for routine cleaning of the toilet. Furthermore, two steps of operations, i.e., rotation and pull, are required in order to dismount the toilet seat and the lid. If the toilet seat is carelessly rotated when the two flat sides of the hinge pin of the seat are engaged within the slot formed between the jaws of the seat posts or of the toilet lid, there is a risk that the jaws are damaged or broken.

Accordingly, the primary object of the invention is to provide a combined toilet seat and accessory assembly having a hinge mechanism which is simple in structure and which is easy to clean.

Another object of the invention is to provide a hinge structure for the assembly, which permits the toilet seat and the toilet lid to be dismounted from the housing and re-installed thereto separately from each other.

A still another object of the invention is to provide a hinge structure for the assembly, by which the toilet seat and/or the toilet lid may be readily detached from the housing and readily re-installed thereto by a single operation.

A further object of the invention is to provide a hinge structure which enables the toilet seat and/or the toilet lid to be readily removed from and re-installed to the housing regardless of the angular position thereof.

DISCLOSURE OF THE INVENTION

One of the features of the present invention is that a hinge shaft of the hinge mechanism is supported on the housing by a pair of spaced posts so as to be spaced upwardly away from the outer surface of the housing to a level higher than the upper surface of the side portions of the toilet seat, the hinge portions of the toilet seat and the toilet lid being snap-fitted on the hinge shaft.

Since in this way the hinge shaft is exposed upwardly of the housing so that the presence of the hinge shaft is readily perceived by the user, and because the hinge portions of the toilet seat and the toilet lid are snap-fitted on the hinge shaft, the user may readily recognize that the toilet seat and the toilet lid are designed detachable and may visually and easily understand how they can be dismounted. Accordingly, the user is encouraged to remove the toilet seat and the toilet lid for cleaning.

Furthermore, as the hinge portions of the toilet seat and the toilet lid are snap-fitted on the hinge shaft, the toilet seat and the toilet lid may readily be dismounted from the hinge shaft by a single action of application of force regardless of the angular position thereof and may be re-attached to the shaft in an equally simple manner. The toilet seat and the toilet lid may be detached separately where required.

As the hinge shaft and the posts are simple in outer configuration, it is easy to clean the outer surface thereof even though fouled by urine and the like. Since the hinge

shaft is exposed upwardly of the housing, it can be readily accessed for cleaning once the toilet seat and the toilet lid have been dismounted. The hinge shaft is less susceptible to fouling by urine because it is located at a high level.

Preferably, the posts supporting the hinge shaft are arranged to extend only outwardly of the housing, without projecting inwardly into the inner space of the housing. With this arrangement, the inner space of the housing may effectively be used to accommodate various toilet accessories so that the housing may be made small and compact yet receiving more items of accessories.

In a preferred embodiment of the invention, the toilet seat is provided with a backrest inclined rearwardly and upwardly to support the pelvis of the user and the side portions of the toilet seat are provided with rearwardly and downwardly inclined support surfaces. With this arrangement, the perineal part of the user as seated on the toilet seat is properly located with respect to a spray nozzle of the bidet system so that the perineal part is effectively washed.

Another feature of the invention is that the toilet seat is ergonomically designed to ensure that the user may sit down with ease. The toilet seat has a generally circular outer periphery and an elongated seat opening, the side portions of the toilet seat having wide support surfaces to better support the thighs of the user. Preferably, the toilet seat is provided with a forwardly and downwardly inclined frontal portion to facilitate the user seated on said seat to open the legs.

In a preferred embodiment, the toilet lid has a concave upper surface to ensure that the user in a bath room may conveniently sit thereon for any purposes. The toilet lid rests upon the toilet seat by way of a surface contact so that a sufficient mechanical strength necessary to support the weight of the user is provided.

In another preferred embodiment, each of the hinge portions of the toilet seat and the toilet lid comprises an elastic member of a C-shaped cross-section. The elastic member has a pair of opposite free ends adapted to resiliently grip the hinge shaft. Preferably, the elastic member is supported by a bearing surface of a semicircular cross-section formed in the hinge portion in such a manner that a spring action is developed by the opposite free ends of the elastic member. The elastic member is preferably provided with a pair of skirts flaring out from the associated opposite free ends to ensure that the elastic member is guided with respect to the hinge shaft when the hinge portion is snap-fitted on the hinge shaft to re-install the toilet seat or the toilet lid.

Preferably, the housing is designed such that it is manually and simply secured to the toilet bowl fixture without using a tool such as a wrench or spanner.

These features and advantages of the invention as well as other features and advantages thereof will become apparent from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the combined toilet seat and accessory assembly according to the invention as mounted to a toilet bowl fixture, with the toilet seat being shown as being in its operative position and the toilet lid in its inoperative position;

FIGS. **2** and **3** are top plan and side elevational views, respectively, of the assembly shown in FIG. **1**, with the toilet lid being shown as being in the closed position;

FIG. **4** is an exploded perspective view of the housing of the assembly shown in FIG. **1**, with a water reservoir being partly cut away to show an electric heater;

FIG. **5** is a plan view of a lower housing shown in FIG. **4**;

FIG. **6** is a front elevational view of the housing shown in FIG. **1**, with parts of the housing being cut away to show slide rails;

FIG. **7** is a perspective view of a conventional toilet bowl fixture;

FIG. **8A** is an exploded perspective view of a fastening mechanism of the housing shown in FIG. **1**;

FIGS. **8B** and **8C** are enlarged cross-sectional views of the slide rails shown in FIG. **6** and showing the manner in which the housing is fixed to the toilet bowl fixture by the fastening mechanism shown in FIG. **8A**;

FIG. **9** is an enlarged cross-sectional view taken along the line IX—IX of FIG. **4**;

FIG. **10** is a perspective view of a part of the assembly shown in FIG. **1**, with the toilet seat and the toilet lid being shown as being in their swung-up positions;

FIG. **11A** is a perspective view of the elastic collar of the hinge mechanism of the toilet seat and the toilet lid shown in FIG. **1**;

FIGS. **11B** and **11C** are cross-sectional views taken along the lines XIB—XIB and XIC—XIC Of FIG. **2**, respectively;

FIGS. **12A**, **12B** and **12C** are views similar to FIGS. **11A**, **11B** and **11C**, respectively, but showing a modified version of the elastic collar;

FIGS. **13** and **14** are top plan and side elevational views, respectively, of the toilet seat shown in FIG. **1**;

FIGS. **15A** through **15G** are cross-sectional views taken along the lines A—A, B—B, C—C, D—D, E—E, F—F, and G—G of FIG. **13**, respectively, with the electric heater wire being omitted in figures other than FIG. **15D**;

FIG. **16** is a cross-sectional view, taken along the central plane, of the assembly shown in FIG. **1**, with the bidet system being shown as being in the operative position;

FIG. **17** is a cross-sectional view of the bidet system shown in FIG. **16**, with a plunger being shown as being in its inoperative position;

FIGS. **17A** and **17B** are cross-sectional views taken along the lines A—A and B—B of FIG. **17**, respectively; and,

FIG. **18** is a view similar to FIG. **9** but showing the modified forms of the hinge shaft, the posts thereof and the housing.

BEST MODE FOR CARRYING OUT THE INVENTION

Referring to the drawings, the toilet accessory assembly **10** according to the invention includes a housing **12** as well as a toilet seat **14** and a toilet lid **16** hinged to the housing. In the illustrated embodiment, the housing **12** receives a bidet system **18**, a warmed water reservoir **20** therefor, and a deodorizer and ventilation fan unit **22**, as best shown in FIG. **4**.

As will be understood from FIG. **4**, the housing may conveniently be comprised of a lower housing **24** and an upper housing **26**, which are made by molding of an impact resistive plastic such as an acrylonitrile-butadiene-styrene (ABS) resin. The lower housing **24** and the upper housing **26** are joined together by screws and the like, not shown, to form an integral rigid housing **12**.

The housing **12** is designed to be adaptive to the commercially available, conventional toilet bowl fixtures. As shown in FIG. **7**, a conventional toilet bowl fixture **28** includes a bowl section **30** and a flushing water supply

section such as a cistern **32**. A pair of seat mounting holes **34** spaced apart by a standardized predetermined distance are formed between these sections. The housing **12** is mounted on the upper surface of the toilet bowl fixture **28** by making use of these holes **34** as described later. Typically, the popular toilet bowl fixture is made in the form of a single piece earthenware provided with a bowl section **30** and a cistern **32** integral therewith and the front surface **36** of the cistern is curved along the rear contour of the bowl **30**, as shown. In the illustrated embodiment, therefore, the housing **12** is provided with an overall configuration which is curved along the curved front surface **36** of the cistern and, hence, along the rear contour of the bowl **30**, so as to be adapted to the toilet bowl fixture **28** of the popular design. However, the housing **12** may be made in a more straight form. Also, the housing **12** may equally be mounted to almost any type of the conventional toilet bowl fixture having a separate cistern or a flushing valve.

The housing **12** is designed to be readily secured to the toilet bowl fixture by a pair of levered fastening mechanisms in a manner adjustable in the fore-and-aft direction. To this end, as shown in FIGS. **6**, **8B** and **8C**, the bottom plate **38** of the lower housing **24** is provided with two pairs of slide rails **40** extending for a predetermined length in the longitudinal direction of the bowl fixture, each pair of the slide rails **40** forming a slot **42** of a T-shaped cross-section. The distance between the two slots **42** is equal to the standardized distance between the seat mounting holes **34**. As best shown in FIG. **8A**, each of the fastening mechanisms **44** may be comprised of a pull rod **48** having a lock lever **46** pivoted thereto and provided with a threaded bore, a screw **50** engageable with the pull rod **48**, a dish-shaped retainer **52** of sheet metal having an enlarged diameter and engageable with the slide rails **40**, an elastomeric ring **54**, a packing **56** and a washer **58**. The lock lever **46** has a curved cam surface **60** and a flat locking surface **62**.

To install the housing **12** onto the bowl fixture **28**, each of the pull rods **48** loaded with the packing **56** and washer **58** is first inserted from the underside of a flange **64** of the bowl fixture upwardly into the associated seat mounting hole **34** and, after placing the elastomeric ring **54** and the retainer **52** on the upper surface of the flange **64**, the screw **50** is then screwed into the pull rod **48** to the degree that the elastomeric ring **54** is not compressed, as shown in FIG. **8B**. In this state, the retainer **52** is spaced by the elastomer ring **54** upwardly away from the flange **64**. Then the housing **12** is held and moved to bring the retainers **52** into engagement with the slots **42** as shown in FIG. **8B**. As the housing **12** is slid rearwards until it is brought in an appropriate position on the bowl fixture **28**, the levers **46** are then rotated as shown in FIG. **8C**, whereupon the retainers **52** are pulled downwards by the pull rods **48** to compress the elastomeric ring **54** until the slide rails **40** are brought into tight contact with the flange **64** thereby to fix the housing on the bowl fixture.

As in this manner the housing **12** is secured to the bowl fixture **28** by a single-touch manual operation of the levers **46** without using a tool such as a wrench and spanner, it is easy for an ordinary user to install the housing. To bring the bidet system **18** in an operable condition, it will then suffice to connect a water supply hose **66** to a branch adapter **68** in a water line and to connect a plug of an electric cord **70** to a plug socket, as shown in FIG. **1**.

As best shown in FIGS. **4** and **10**, at a level roughly equal to the level of the top of the housing, a horizontal hinge shaft **74** is supported on the housing **12** by a pair of rigid posts or supports **72**. In the illustrated embodiment, the housing **12** has a rearwardly and upwardly inclined front surface **76** from which the posts **72** extend upright. As shown in FIG. **9**, the hinge shaft **74** and the posts **72** are integrally formed by molding of an ABS resin. Alternatively, they may be made separately and firmly joined together by bolt and nut or adhesives. Similarly, the hinge shaft **74**, the posts **72** and the upper housing **26** may all be molded to form a single piece.

As shown in FIG. **9**, the upper housing **26** is provided with a pair of tubular supports **78** reinforced by respective bosses **80**. The posts **72** are firmly joined with the supports **78** by press-fitting the posts **72** over the supports **78** and by screwing associated screws **82**. The mating faces of the posts **72** and the supports **78** may be tapered upwardly so as to establish a close fit.

The hinge shaft **74** has a cylindrical outer periphery. The toilet seat **14** and the toilet lid **16** are pivotally and detachably hinged to the hinge shaft by means of a plurality of elastic collars **84**. The toilet seat **14** has a pair of spaced hinge portions **14H**, as best shown in FIGS. **1** and **2**, which are snap-fitted respectively over the ends **74H** (FIG. **4**) of the hinge shaft by the associated elastic collars **84** at locations outwardly of the posts **72**, as shown in FIG. **10**. The toilet lid **16** has a single central hinge portion **16H** which is snap-fitted over the central portion **74C** of the hinge shaft by a pair of elastic collars **84** at a location inwardly of the two posts **72**.

As the snap-fit arrangements of the hinge portions **14H** of the toilet seat and the hinge portion **16H** of the toilet lid are basically the same, only the arrangement related to one of the hinge portions **14H** of the toilet seat will be described. Referring to FIGS. **11A**, **11B** and **11C**, the elastic collar **84** is made of a plastic material such as polypropylene and has a generally C-shaped cross-section. The elastic collar **84** has an inner diameter equal to the outer diameter of the hinge shaft **74** and has a pair of opposite jaws **86**. The ends of the jaws **86** are connected respectively to a pair of skirts **88** which are provided with tapered guide surfaces **90**.

The hinge portion **14H** of the toilet seat is formed with a bearing surface **92** of a semicircular cross-section having an inner diameter equal to the outer diameter of the collar **84** to support the collar **84** by the bearing surface **92**. The collar **84** may be fixed to the bearing surface **92** by means such as adhesives. Preferably, however, the collar **84** is replaceably and detachably mounted to the hinge portion **14H**. For this purpose, the collar **84** is provided at its ends with extensions **94** having a semicircular cross-section, the opposite ends of each extension **94** being formed with beads **96**, respectively. Each bead **96** is adapted to engage a corresponding notch **98** formed on the bearing surface **92** of the hinge portion **14H**. The elastic collar **84** is also provided with an outwardly biased stopper **100** which is adapted to engage a notch **102** on the bearing surface **92** to prevent the axial displacement of the collar **84**. As will be understood from FIG. **11C**, when the elastic collar **84** is mounted to the hinge portion **14H**, the jaws **86** and the skirts **88** of the collar are protruded downwards beyond the bearing surface **92** so as not to interfere with the hinge portion **14H**.

With this arrangement, whenever it is desired to dismount the toilet seat **14** and/or the toilet lid **16** for cleaning, it will be sufficient for the user to engage the hands under the hinge portion **14H** or **16H** and to simply pull them upwards whereupon the hinge shaft **74** will spread the jaws **86** apart against the spring action so that the hinge portion is readily disengaged from the hinge shaft as shown by the ghost line in FIG. **11C**. As the hinge shaft **74** as well as the posts **72**

have simply cylindrical outer surfaces, they can be easily cleaned such as by wiping once the toilet seat **14** and the toilet lid **16** have been removed. To re-install the toilet seat **14** and/or the toilet lid **16**, the skirts **88** of the elastic collar **84** are brought into engagement with the hinge shaft **74** and the hinge portion **14H** or **16H** is then pressed down by hands. The hinge shaft **74** will urge the skirts **88** and the jaws **86** to be spaced apart on entering into the inside of the elastic collar **84**. Finally, the jaws **86** will resiliently grip the hinge shaft **74** under the spring-back action so that the elastic collar **84** is snap-fitted on the hinge shaft **74** as shown by the solid line.

In this manner, the toilet seat **14** and the toilet lid **16** may be easily dismounted by anyone only by a single manual operation and may be equally easily re-installed. As the snap action of the C-shaped elastic collars is readily understood by anyone at a glance, the user will quickly recognize that the toilet seat and the toilet lid are detachable and how they can be detached. The removal and re-installation of the toilet seat **14** and the toilet lid **16** may be carried out mostly without regard to the angular position thereof. In general, however, it will be convenient to dismount and re-attach them when they are in the horizontal position. As will be apparent from FIG. **10**, the posts **72** and the hinge shaft **74** may be provided with stoppers **103** against which the end faces of the hinge portions of the toilet seat **14** and the toilet lid **16** are brought into abutment to limit the angle of rotational movement of the toilet seat **14** and the toilet lid **16**.

In FIGS. **12A**, **12B** and **12C**, there is shown a modified embodiment of the elastic collars and the associated hinge portions. Parts and members similar to those of the foregoing embodiment are indicated by like reference numerals with a suffix A and will not be described again. In the modified embodiment, the elastic collar **84A** has a slightly elongated cross-section and the bearing surface **92A** of the hinge portion has a correspondingly elongated cross-section. The central portion of the elastic collar **84A** is provided with a C-shaped cut out to form a cushioning portion **104** which is bulged radially inwardly. When the toilet seat **14** and the toilet lid **16** are unloaded, the elastic collar **84A** will engage the hinge shaft **74** by a three point contact as shown in FIG. **12B** so that a small clearance will be secured between the top of the bearing surface **92A** of the hinge portion and the hinge shaft. As the user sits down so that the toilet seat **14** or the toilet lid **16** is loaded, the cushioning portion **104** undergoes elastic deformation as shown in FIG. **12C** thereby to subdue or cushion the impact of loading.

Referring to FIGS. **1**, **13** and **14**, the toilet seat **14** may include a pair of side portions **14S**, a rear portion **14R**, a front portion **14F** and a backrest **14B**. A plurality of rubber bumpers **106**, numbering four for example, are affixed to the underside of the toilet seat to support the toilet seat on the upper surface of the rim **108** of the toilet bowl fixture **28** as shown in FIG. **16**.

As will be apparent from FIGS. **1**, **14**, **15G** and **16**, the backrest **14B** of the toilet seat extends rearwardly and upwardly at a steep angle from the rear portion **14R** so as to support and locate the pelvis of the user. In addition, as shown in FIGS. **14**, **15C–15F** and **16**, the side portions **14S** of the toilet seat are inclined rearwardly and downwardly toward the rear portion **14R** so as to bias and locate the buttocks of the user rearwardly toward the backrest **14B**. With this arrangement, whenever the user is to be seated on the toilet seat, the user is assisted to easily occupy such a position that the perineal part of the user is properly positioned with respect to a protracted nozzle **110** of the bidet system **18**, as shown in FIG. **16**, thereby assuring a spray **112** of water ejected from the nozzle to hit on the target point **114** at the perineal part to effectively wash that part.

As best shown in FIG. **13**, the side portions **14S** of the toilet seat are designed to provide wider support surfaces for supporting the thighs of the user. To this end, the toilet seat **14** has a generally circular outer periphery and the inner periphery defining a seat opening **116** has an elongated contour. As after excretion the perineal part is washed by the bidet system **18**, normally it would not be necessary to wipe the perineal part. Accordingly, it is preferable to design the seat opening **116** as narrow as possible in order to widen the support surface at the side portions **14S** thereby to improve the support for the thighs. The side portions **14S** of the toilet seat has a transverse width of about 9 cm and the seat opening **116** has a transverse width of about 15 cm.

The front portion **14F** of the toilet seat is inclined forwardly and downwardly as best shown in FIGS. **15B**, **15A** and **16**. Consequently, the user is assisted in opening the legs to assume an easy posture. The downward inclination of the front portion **14F** also serves to form a gap or clearance **118** between the front portion of the toilet seat and the front portion of the toilet lid as shown in FIG. **3**. The user may easily lift the toilet lid **16** by inserting the fingers into the gap to grip the toilet lid.

The toilet seat **14** and the toilet lid **16** may be manufactured by molding of an impact resistive plastic such as an ABS resin. As will be understood from FIGS. **1** and **3**, the toilet lid **16** has a concave upper surface to ensure that the user may sit down for any purposes like a chair. The toilet lid **16** has a thickness and a mechanical strength sufficient to withstand the weight of the user and is adapted to rest, by a surface contact, upon the side portions **14S** and the front part **14F** of the toilet seat when in use. As shown in FIG. **1**, the toilet lid **16** is provided with through-openings **120** which represent the symbol of a fountain. The symbol of fountain appeals the presence of the bidet system **18** to the user who uses the assembly **10** for the first time so that the user is reminded of the use of the bidet system. Furthermore, when water is accumulated on the toilet for any reasons such as the use of a shower, the through-openings **120** permit water to be drained into the bowl.

In the illustrated embodiment, the toilet seat **14** is adapted to be heated by an electric heater to heat the user seated thereon in the cold season. As shown in FIGS. **13** and **15D**, a sinusoidal heater wire **122** is embedded in the toilet seat **14**. The heater wire **122** is omitted in the other drawings for simplicity. The electric power to the heater wire **122** is supplied from an electric cord **124**. As shown in FIG. **10**, an electric receptacle **126** connected to the heater wire **122** is arranged on the lower side of the toilet seat **14** and a connector plug **128** disposed at an end of the cord **124** is connected to the receptacle **126**. The electric cord **124** preferably has such a length that, when the toilet seat is swung up, an adequate slack remains in the cord to permit a smooth rotation of the toilet seat. A temperature sensor such as a thermistor, not shown, is embedded in the toilet seat **14** in the conventional manner. The power supply to the heater is controlled by a control unit, described later, in response to the signal from the sensor in such a manner that the toilet seat is heated at a desired appropriate temperature.

As shown in FIGS. **4** and **5**, the bidet system **18** is arranged at the center of the housing **12**. The bidet system may be the conventional one. However, a simple form of the bidet system which can be manufactured at low costs and which is suitable to be incorporated into the assembly **10** according to the invention will be described below by way

of an example with reference to FIG. **17**. The bidet system **18** includes a cylinder **130** which is secured to supports **132** extending from the lower housing **24**. A plunger **136** having an integral piston **134** is clearance fitted within the cylinder **130** in a slidable manner. Formed between the cylinder **130** and the plunger **136** is a spring chamber **138** in which a compression spring **140** is arranged to bias the plunger **136** to a retracted position shown by the solid line.

An axial passage **142** is formed to extend through the piston **134** and the plunger **136** and is in constant communication with a water inlet **144** of the cylinder **130**. The inlet **144**, in turn, is in communication with the spring chamber **138** via a small radial clearance between the cylinder **130** and the piston **134**. Accordingly, when water under pressure is supplied to the inlet **144**, water will flow into both the passage **142** and the spring chamber **138**.

As shown in FIG. **17A**, the end wall **146** of the cylinder **130** is formed with a circular opening **148** in which the forward part of the plunger **136** is slidably guided. A nozzle head **110** is mounted to the forward end of the plunger **136**. As will be apparent from FIG. **17A**, the upper part of the plunger **136** is chamfered substantially throughout the entire length thereof so that a water outlet **152** is formed between the circular opening **148** of the end wall **146** and the outer periphery of the plunger **136** throughout the stroke of the plunger **136**. As a result, when water under pressure is supplied to the water inlet **144**, water entering the spring chamber **138** will be ejected from the outlet **152** to wash the nozzle head **110**. As shown in FIG. **17B**, a cover **154** of a semicircular cross-section is arranged to project from the end wall **146** of the cylinder **130** so as to direct water ejected from the outlet **152** to flow along the nozzle head **110** thereby to effectively wash the nozzle head **110**.

A packing **156** is arranged inwardly of the end wall **146** of the cylinder **130**. When the plunger **136** is fully stroked as shown by the imaginary line in FIG. **17**, the shoulder **158** of the plunger **136** abuts against the packing **156** to shut off the flow of water through the outlet **152**. As shown in FIG. **17A**, the side of the plunger **136** is provided with a spline **160** which is slidably engaged with a notch **162** formed in the end wall **146**. By the splined engagement, the plunger **136** is held in a predetermined angular position during the telescoping movement.

The passage **142** of the plunger **132** is in communication with the inner passage of the nozzle head **110** through a restriction **164** of a reduced diameter. Due to the presence of the restriction **164**, the water pressure acting on the piston **134** becomes higher than the atmospheric pressure prevailing in the spring chamber **138** when water under pressure is supplied to the water inlet **144**, thereby causing the plunger **132** to stroke against the action of the return spring **140**.

In the illustrated embodiment, the nozzle head **110** is designed to form and eject a frothed spray. The nozzle head **110** may be made for example in a cylindrical form and includes a radial passage **166** communicated with the orifice **164**, an axial passage **168** having a reduced diameter to provide a venturi effect, and an outlet port **170**. An air intake port **172** opens into the venturi passage **168** to introduce by the venturi effect air bubbles into the water flow flowing through the passage **168**.

Warmed water is supplied from the warmed water reservoir **20** to the bidet system **18**. Referring to FIGS. **1**, **4** and **5**, tap water may be fed to the reservoir **20** via the water hose **66**, a hose **174** extending within the housing, a conventional valve unit **176**, a conventional vacuum breaker **178**, and a hose **180**. The warmed water reservoir **20** is connected to the inlet **144** of the bidet system through a hose **182**. To facilitate connection to the branch adapter **68**, the water hose **66** is preferably made of a flexible hose sheathed with a metal mesh. The valve unit **176** may comprise a pressure reduction valve, a solenoid operated shut-off valve and a flow rate control valve in the conventional manner, with the shut-off valve being controlled by a control unit **184** having a power source circuit and a microcomputer. As shown in FIG. **4**, a heat exchanger **186** incorporating an electric heater controlled by the control unit **184** is arranged in the warmed water reservoir **20** to heat water in the reservoir.

In the illustrated embodiment, the housing **12** further receives the conventional deodorizer and ventilation fan unit **22** to ventilate the bowl **30** and to deodorize the ventilated air during use of the toilet. As shown in FIGS. **4** and **5**, the bottom plate **38** of the lower housing **24** is provided with an opening **188** facing the bowl **30**, the opening being communicated with the ventilation unit **22** through a duct formed by a vertical enclosing wall **190** and a cover **192** therefor. The deodorizer and ventilation fan unit **22** may be of the conventional one having an air passage charged with activated carbon and deodorizing catalyst and is adapted to draw and deodorize air within the bowl and to circulate processed air into the ambient atmosphere. The deodorizer and ventilation fan unit **22** is automatically controlled by the control unit **184**. To this end, the upper housing **26** is provided with an opaque sensor window **196** permeable to an infrared ray to ensure that an infrared ray is transmitted upwardly from a conventional infrared sensor, not shown, to detect the presence of the user in accordance with the ray reflected by the user. The control unit automatically operates the deodorizer and ventilation fan unit **22** as long as the user as seated on the toilet seat **14** is detected by the signal from the infrared sensor.

As shown in FIG. **10**, the housing **12** is provided at the side thereof with a control switch **198** for the bidet system **18**, a switch **200** for operating the electric heater of the reservoir **20**, and a switch **202** for operating the heater **122** of the heated seat **14**, these switches being connected to the control unit **184**.

Once the housing **12** is mounted to the toilet bowl fixture **28** in a manner described before, and upon connecting the hose **66** to the branch adapter **68** with the plug of the cord **70** connected to the plug socket, the bidet system **18** will be ready for use. As the user is seated on the toilet seat **14** and presses on the switch **198**, the solenoid valve of the valve unit **176** of the bidet system **18** is opened to allow tap water under pressure to flow into the warmed water reservoir **20** so that warmed water in the reservoir is displaced toward the inlet **144** of the bidet system **18**. This causes warmed water under pressure to flow into the spring chamber **138** and the passage **142** whereby the plunger **136** commences its forward stroke and, at the same time, water in the spring chamber **138** is delivered from the outlet **152** to wash the nozzle head **110**.

When the plunger **136** has fully stroked, the outlet **152** is closed by the plunger shoulder **158** abutting against the packing **156** whereupon warmed water is permitted to flow out only through the nozzle head **110** thereby forming a frothed spray **112** as shown in FIG. **16**. Since the user is located by the toilet seat **14** such that the perineal part of the user is brought at the target point **114** as described before, the frothed spray hits on the perineal part to effectively wash that part.

To terminate use of the bidet system **18**, it is sufficient to press on the switch **198** again. The solenoid valve is then

slowly closed so that the water pressure in the cylinder **130** gradually drops. As a result, the plunger **136** commences its return stroke under the action of the spring **140**. As soon as the shoulder **158** of the plunger **136** is moved away from the packing **156** to open the outlet **152**, water is forced to flow out mainly through the outlet **152** due to the presence of the restriction **164**. The nozzle head **110** will be washed with water substantially throughout the return stroke of the plunger **136** until the water pressure disappears.

FIG. **18** illustrates the modified forms of the accessory housing, the hinge shaft and the posts therefor. In the modified form, the housing **300** is formed of the upper housing **302** and the lower housing **304**, similar to the foregoing embodiment. The hinge shaft **306** is supported on the housing by a pair of integrally molded posts, only one of which is indicated by the reference numeral **308**. For each of the posts **308**, the upper housing **302** is formed with an integral tubular support **310** and the bottom plate of the lower housing **304** is provided with an opening **312**. Each post **308** has a length sufficient to extend through the support **310** and to protrude beyond the lower face of the flange **64** of the toilet bowl fixture, the lower end of the post being threaded as shown at **314**.

To mount the housing **300** on the toilet bowl fixture, the supports **310** of the upper housing and the openings **312** of the lower housing are aligned with the seat mounting holes **34** of the bowl fixture, respectively, and the posts **308** are then passed through the supports **310** and the holes **34** as shown and are fastened by associated nuts **316**. The toilet seat **14** and the toilet lid **16** may be snap-fitted on the hinge shaft **306** in the same manner as the foregoing embodiment. As in the modified form the support **308** are used to fasten the housing, the fastening structure is simplified. However, as the supports **308** are arranged to extend within the housing, some restrictions must be imposed on the arrangement of the components of the toilet accessories.

While the present invention has been described herein with reference to the specific embodiments thereof, it is contemplated that the invention is not limited thereby and various modifications and alterations may be made therein without departing from the scope of the invention. For example, while the housing has been described as receiving the bidet system **18**, the water reservoir **20** and the deodorizer and ventilation unit **22**, other toilet accessories may be housed therein in lieu of or in addition to these accessories. Furthermore, the structure and arrangement of the bidet system **18** may be changed as required.

We claim:

1. In a combined toilet seat and accessory assembly having a housing adapted to be mounted on an upper surface of a toilet bowl fixture between a bowl section thereof and a flushing water supply section located rearwardly of said bowl section, a toilet seat hinged for pivoting movement to said housing, and toilet accessory equipment disposed in said housing, the improvement comprising:

a pair of posts spaced apart, secured to said housing, and extending substantially upright from said housing; and

a horizontal hinge shaft supported by said posts and spaced upwardly away from an outer surface of said housing to a level higher than an upper surface of side portions of said seat, said posts being spaced apart a distance less than a width of the toilet seat, said seat comprising a hinge portion extending rearwardly and upwardly from a rear portion of said seat for engagement with said hinge shaft, said hinge portion of said seat being snap-fitted on said hinge shaft for detachment therefrom and for re-installation thereon by a single action of application of force.

2. The assembly according to claim **1**, wherein said toilet seat comprises a pair of transversely spaced hinge portions snap-fitted respectively on the ends of said hinge shaft, said assembly further comprising a toilet lid hinged to said hinge shaft, said toilet lid having a hinge portion snap-fitted on the central portion of said hinge shaft for detachment therefrom and for re-installation thereon by a single action of application of force.

3. The assembly according to claim **1** or **2**, wherein said hinge portion comprises an elastic member of a C-shaped cross-section having a pair of opposite ends for resiliently gripping said hinge shaft.

4. In a combined toilet seat and accessory assembly having a housing adapted to be mounted on an upper surface of a toilet bowl fixture between a bowl section thereof and a flushing water supply section located rearwardly of said bowl section, a toilet seat hinged for pivoting movement to said housing, and toilet accessory equipment disposed in said housing,

the improvement comprising a horizontal hinge shaft supported on said housing by a pair of transversely spaced, substantially upright posts and spaced upwardly away from an outer surface of said housing to a level higher than an upper surface of side portions of said seat, said seat comprising a hinge portion extending rearwardly and upwardly from a rear portion of said seat for engagement with said hinge shaft, said hinge portion of said seat being snap-fitted on said hinge shaft for detachment therefrom and for re-installation thereon by a single action of application of force,

wherein said hinge portion comprises an elastic member of a C-shaped cross-section having a pair of opposite ends for resiliently gripping said hinge shaft, and

wherein said hinge portion has a bearing surface of a semicircular cross-section, said C-shaped elastic member being engaged in said bearing surface in such a manner that said opposite ends thereof are projected outwardly from said bearing surface.

5. The assembly according to claim **4**, wherein said C-shaped elastic member comprises a pair of guide surfaces flaring out from said opposite ends so as to guide said elastic member with respect to said hinge shaft as said hinge portion is snap-fitted on said hinge shaft for re-installation.

6. The assembly according to claim **4**, wherein said elastic member comprises cushioning means for resiliently supporting a load applied on said hinge shaft as the user is seated on said toilet seat or lid.

7. The assembly according to claim **1**, **2**, **4**, **5**, or **6**, wherein said posts extend only outwardly of said housing without projecting into an inner space of said housing.

8. The assembly according to claim **1**, **2**, **4**, **5**, or **6**, wherein said toilet accessory equipment comprises a bidet equipment having a movable spray nozzle supported by said housing for movement between an operative position in which a spray of water ejected from said nozzle is directed to a perineal part of a user seated on said seat to wash said part after excretion and an inoperative position in which said nozzle is retracted therefrom, said hinge portion of said toilet seat having a backrest surface inclined rearwardly and upwardly to support a pelvis of the user as seated on said toilet seat in such a manner as to locate the perineal part of the user with respect to said nozzle held in said operative position.

9. The assembly according to claim **8**, wherein said housing has a front surface inclined forwardly and downwardly.

10. The assembly according to claim 9, wherein said housing has an overall configuration which is curved along the inner periphery of the rear part of the bowl.

11. The assembly according to claim 8, wherein the side portions of said toilet seat have rearwardly and downwardly inclined support surfaces for supporting thighs of the user, said support surfaces being operable to bias the buttocks of the user toward said inclined backrest surface to locate the perineal part of the user with respect to said nozzle held in said operative position.

12. The assembly according to claim 11, wherein said toilet seat has a forwardly and downwardly inclined frontal portion to permit legs of the user to open.

13. The assembly according to claim 8, wherein said toilet seat is provided with a generally circular outer periphery and an inner periphery defining an elongated seat opening, said side portions of said seat having a maximum transverse width of about 9 cm, said seat opening having a maximum transverse width of about 15 cm.

14. The assembly according to claim 2, wherein said toilet lid has a concave upper surface to permit the user to be seated thereon with ease.

15. The assembly according to claim 14, wherein said toilet lid is supported in an operative position thereof by said toilet seat through a surface contact.

16. In a combined toilet seat and accessory assembly having a housing adapted to be mounted on an upper surface of a toilet bowl fixture between a bowl section thereof and a flushing water supply section located rearwardly of said bowl section, a toilet seat hinged for pivoting movement to said housing, and toilet accessory equipment disposed in said housing,

the improvement comprising a horizontal hinge shaft supported on said housing by a pair of transversely spaced, substantially upright posts and spaced upwardly away from an outer surface of said housing to a level higher than an upper surface of side portions of said seat, said seat comprising a hinge portion extending rearwardly and upwardly from a rear portion of said seat for engagement with said hinge shaft, said hinge portion of said seat being snap-fitted on said hinge shaft for detachment therefrom and for re-installation thereon by a single action of application of force,

wherein said toilet seat comprises a pair of transversely spaced hinge portions snap-fitted respectively on the ends of said hinge shaft, said assembly further comprising a toilet lid hinged to said hinge shaft, said toilet lid having a hinge portion snap-fitted on the central portion of said hinge shaft for detachment therefrom and for re-installation thereon by a single action of application of force,

wherein said toilet lid has a concave upper surface to permit the user to be seated thereon with ease, and is supported in an operative position thereof by said toilet seat through a surface contact,

wherein said toilet seat has a forwardly inclined frontal portion so that a gap is defined between said frontal portion of said seat and the frontal portion of said lid to permit the user to readily engage the finger with said frontal portion of said lid to open the lid.

17. In a combined toilet seat and accessory assembly having a housing adapted to be mounted on an upper surface of a toilet bowl fixture between a bowl section thereof and a flushing water supply section located rearwardly of said bowl section, a toilet seat hinged for pivoting movement to said housing, and toilet accessory equipment disposed in said housing,

the improvement comprising a horizontal hinge shaft supported on said housing by a pair of transversely spaced, substantially upright posts and spaced upwardly away from an outer surface of said housing to a level higher than an upper surface of side portions of said seat, said seat comprising a hinge portion extending rearwardly and upwardly from a rear portion of said seat for engagement with said hinge shaft, said hinge portion of said seat being snap-fitted on said hinge shaft for detachment therefrom and for re-installation thereon by a single action of application of force,

wherein said toilet seat comprises a pair of transversely spaced hinge portions snap-fitted respectively on the ends of said hinge shaft, said assembly further comprising a toilet lid hinged to said hinge shaft, said toilet lid having a hinge portion snap-fitted on the central portion of said hinge shaft for detachment therefrom and for re-installation thereon by a single action of application of force,

wherein said toilet lid has a concave upper surface to permit the user to be seated thereon with ease, and is provided at the center thereof with one or more through-openings to permit water on said lid to be drained into the bowl.

18. The assembly according to claim 17, wherein said through-openings of said lid are shaped in the form of a symbol representing a fountain.

19. The assembly according to claim 1, 4, 16 or 17, wherein said housing is adapted to be secured by fastening means to the toilet bowl fixture in a manner adjustable in a fore-and-aft direction.

20. The assembly according to claim 19, wherein said fastening means comprises transversely spaced two pairs of slide rails provided on the lower surface of said housing, a pair of pull rods adapted to be inserted, respectively, through a pair of seat mounting holes formed in said toilet bowl fixture, each of said pull rods having a head of an enlarged diameter engaging each pair of said slide rails, and a pair of levers for axially displacing said pull rods, respectively.

21. The assembly according to claim 1 or 4, wherein said posts are arranged to extend through said housing and through a pair of seat mounting holes in said toilet bowl fixture to protrude beyond a lower surface of a rear flange of said bowl fixture and wherein said housing is secured to said bowl fixture by engaging fastening means, which engages lower extensions of said posts with the lower surface of the rear flange of said bowl fixture.

22. In a bidet system having a housing adapted to be mounted on an upper surface of a toilet bowl fixture between a bowl section thereof and a flushing water supply section located rearwardly of said bowl section, a toilet seat hinged for pivoting movement to said housing, and a movable spray nozzle supported by said housing for movement between an operative position in which a spray of water ejected from said nozzle is direct to a perineal part of a user seated on said seat to wash said part after excretion and an inoperative position in which said nozzle is retracted therefrom, the improvement comprising:

a pair of posts spaced apart, secured to said housing, and extending substantially upright from said housing; and

a horizontal hinge shaft supported by said posts and spaced upwardly away from an outer surface of said housing to a level higher than an upper surface of side portions of said seat, said posts being spaced apart a distance less than a width of the toilet seat, said seat comprising a hinge portion extending rearwardly and upwardly from a rear portion of said seat for engagement with said hinge shaft, said hinge portion of said seat being snap-fitted on said hinge shaft for detachment therefrom and for re-installation thereon by a single action of application of force.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 5,666,672
DATED : September 16, 1997
INVENTOR(S) : Ayse BIRSEL et al.

It is certified that error appears in the above-indentified patent and that said Letters Patent is hereby corrected as shown below:

Claim 11, column 13, line 7, after "bias" delete "the".

Signed and Sealed this

Thirteenth Day of January, 1998

Attest:

BRUCE LEHMAN

Attesting Officer

Commissioner of Patents and Trademarks