Title: FOLDABLE DURABLE PATIENT AID PRODUCT SUCH AS A COMMODE AND METHOD OF FORMING SAME

Abstract: The present invention provides a commode comprising first and second side frames, each including front and rear legs interconnected at their respective first ends thereof by a handle. A rear cross brace interconnects the rear legs of the first and second side frames. A rear support tube assembly secures the rear cross brace to each rear leg. A portion of the rear support tube assembly encompasses an entire circumferential extent of both the rear cross brace and the rear leg without any seam. At least one of a commode seat and commode lid is pivotally secured to the rear cross brace member.
Published:
without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
FOLDABLE DURABLE PATIENT AID PRODUCT
SUCH AS A COMMODE AND METHOD OF FORMING SAME

CROSS REFERENCE TO RELATED APPLICATIONS
[0001] This application claims priority from U.S. Provisional Patent Application Serial No. 60/571,838 filed May 17, 2004 and is incorporated herein by reference.

BACKGROUND OF THE INVENTION
[0002] This invention relates generally to a patient aid product, and more particularly to a foldable product, such as a commode, and the method of forming same. The invention is particularly applicable to a composite assembly for construction and use with foldable products of this type.
[0003] The prior art is well-developed in the area of commodes, and particularly foldable commodes. Generally, these structures include first and second side frame assemblies that are joined by front and rear support tube members. The side frame assemblies are often constructed as inverted U-shaped structures in which each U-shaped side frame assembly defines first and second legs. Moreover, the side frame assemblies are adapted for selective folding or collapsing relative to the support tube members for storage purposes.
[0004] Commodes, in general, are used to assist persons who are, for example, elderly, infirm, have a disability, or are in rehabilitation in meeting basic toiletry needs. The commode is placed either near a bed or over an existing toilet. When placed near a bed, it assists the person to more easily transfer from the bed onto the commode. When placed over a toilet, the commode acts as a safety frame, keeping the patient from falling to either side and also providing assistance when seating and standing.
[0005] Conventional commode designs have four legs in contact with the ground to provide stability, and yet are sufficiently light-weight for ease of use. Traditionally, these commodes have been fabricated from light-weight hollow or tubular material such as steel, aluminum, etc. It is common to fabricate each side frame so that the first and second legs and a handle portion are formed from a single, unitary bent tubular member, i.e., the inverted U-shaped structure, where the terminal ends define first (front) and second (rear) legs of the structure and the central interconnecting portion defines the handle. Likewise, it is common to incorporate a handgrip such as a hard
plastic, PVC, or closed cell foam pad that is secured to a horizontal portion of the side frame assembly with fasteners such as screws.

[0006] It is also common to employ adjustable height legs that allow the height of the commode to be selectively increased or decreased for customized use. For example, each leg receives a sleeve member formed with a series of longitudinally spaced openings adapted to selectively register with similarly spaced openings formed in the lower ends of the legs. A spring-biased pin is mounted within the lower ends of the legs and biased outwardly through aligned openings in the legs and leg extensions to select the desired height of the adjustable leg. It is also common to mount rubber tips to the ends of the leg extensions to resist slipping and undesired movement.

[0007] Collapsible or folding commodes are desirable because they fold in a compact manner so that the commode is easily stored or transported during travel. As previously noted, front and rear support tube assemblies typically span and interconnect the first and second side frame assemblies. Again, it is common to use a light-weight metal tubular structure because of the desired strength and minimum weight as a support tube member. Interconnection of the support tube members with the side frame assemblies, particularly in a foldable or selectively hinged arrangement, usually requires a large number of components. There is also an attendant cost associated with the labor-intensive steps to manufacture and assemble the foldable commode.

[0008] Between the side frames and connected to the rear support tube is a commode or toilet seat and lid. The commode seat provides the seating surface when using the commode. The lid provides a finished look when the commode is not in use but can also be used as a seating surface for a user to rest or get dressed. The seat and lid usually rotate about the rear support tube allowing for easy cleaning. Some commodes also have a rear backrest tube that provides support to the lid and allows the user to lean back while using the commode. Commodes have a removable pail that is mounted on the underside of the seat to catch the waste.

[0009] More recently, foldable or collapsible commodes have been developed that incorporate plastic molded components into the assembly. For example, some have developed a plastic front and rear cross bar members, while others additionally include molded side frame assemblies in conjunction with the front and rear cross bar member. Even with these various designs, a trade-off exists among strength, weight, and cost to manufacture and assemble. Moreover, maintaining the features and
benefits available in existing commercially available designs while trying to enhance the product design in one of the other areas is also a particular challenge.

Accordingly, a need exists to develop a commode that requires fewer components to manufacture, sub-assemble, and assemble to yield a final product that can be produced at a much lower total cost, while still maintaining the benefits and features of known arrangements.

SUMMARY OF THE INVENTION

A foldable durable patient aid product, such as a commode, is provided and a method of forming same.

In accordance with one aspect of the present invention, a method of manufacturing a commode generally comprises the steps of providing first and second side frames, each side frame including first and second legs having adjacent first ends interconnected by a handle, and a cross brace member. A first polymer member is molded over a first portion of one of the first and second legs of the first side frame and an end portion of the cross brace member. A second polymer member is molded over a first portion of one of the first and second legs of the second side frame and an opposing end portion of the cross brace member. The first polymer member is rotated relative to the first side frame after the polymer has cured and the second polymer member is rotated relative to the second side frame after the polymer has cured.

In accordance with another aspect of the present invention, the commode comprises first and second side frames having front and rear legs interconnected at their first ends by a mid-portion. A polymer member interconnects each rear leg of each side frame to a cross brace member whereby, after curing of the polymer, the polymer member rotates relative to the respective rear leg.

In accordance with yet another aspect of the present invention, the commode comprises first and second side frames, each including front and rear legs interconnected at their respective first ends thereof by a handle. A rear cross brace interconnects the rear legs of the first and second side frames. A rear support tube assembly secures the rear cross brace to each rear leg. A portion of the rear support tube assembly encompasses an entire circumferential extent of both the rear cross brace and the rear leg without any seam. At least one of a commode seat and commode lid is pivotally secured to the rear cross brace member.
A primary benefit of the present invention resides in the ability to reduce manufacturing costs.

Another benefit of the invention resides in the ability to eliminate a number of manufacturing processes and components of a conventional commode (it is believed that eighty percent of the assembly steps can be eliminated over known arrangements). The present invention allows for various components of the commode to be assembled in one plastic molding operation.

Foldability is still another benefit to both a dealer and the user. The dealer will no longer have to assemble the commode when it is received and if the dealer buys the commodes pre-assembled, they will reduce the amount of warehouse space for stocking these units. The benefit for the user is that the commode can be placed out of the way when not in use and the can be easily transported.

Other features and benefits of the invention include strength, weight, appearance, ease of use, integrity of the frame legs, lack of seams, and cleanliness.

Still other aspects and benefits of the present invention will become apparent to those skilled in the art upon reading and understanding the following detailed description.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The present invention may take physical form in certain parts and arrangements of parts, preferred embodiments of which will be described in detail in this specification and illustrated in the accompanying drawings which form a part of the invention.

FIGURE 1 is a front perspective view of a commode formed in accordance with a first embodiment of the present invention.

FIGURE 2 is a rear perspective view of the commode of FIGURE 1.

FIGURE 3 a front perspective view of the commode of FIGURE 1.

FIGURE 4a is a front perspective view of the commode of FIGURE 1 unfolded and as received in a press mold including a rear cross brace assembly in accordance with a second embodiment of the present invention.

FIGURE 4b is a front view of a dimple or recess provided along a portion of a leg of the commode.

FIGURE 5 is an enlarged perspective of a front support tube assembly, a rear support tube assembly of FIGURE 1, and a rear support member of the commode.
[0027] FIGURE 6 is an enlarged perspective view of a left front support member of the commode of FIGURE 5.

[0028] FIGURE 7 is an enlarged perspective view of a right front support member of the commode.

[0029] FIGURE 8 is a perspective view of a front support tube of the commode.

[0030] FIGURE 9 is an enlarged perspective view of a left front tube connector of the commode of FIGURE 5.

[0031] FIGURE 10 is an enlarged perspective view of a right front tube connector of the commode.

[0032] FIGURE 11 is a perspective view of the front support tube assembly of the commode.

[0033] FIGURE 12 is a perspective view of the rear support member of the commode of FIGURE 5.

[0034] FIGURE 13 is a perspective view of a rear support tube of the commode.

[0035] FIGURE 14 is a perspective view of a rear tube connector of the commode of FIGURE 4a.

[0036] FIGURE 15 is a perspective view of the rear support tube assembly of the commode of FIGURE 4a.

[0037] FIGURE 16 is a front perspective view of a commode formed in accordance with a third embodiment of the present invention.

[0038] FIGURE 17 is a front perspective view of the commode of FIGURE 16 in a fully folded position.

[0039] FIGURE 18 is a bottom perspective view of the commode of FIGURE 16.

[0040] FIGURE 19 is an enlarged perspective view of a front support tube assembly of the commode of FIGURE 16.

[0041] FIGURE 20 is an enlarged perspective view of a front support member of the commode of FIGURE 19.

[0042] FIGURE 21 is an enlarged perspective view of a rear support tube assembly of the commode of FIGURE 16.

[0043] FIGURE 22 is an enlarged perspective view of a rear support member of the commode of FIGURE 21.

[0044] FIGURE 23 is a perspective view of a commode seat of the commode of FIGURE 16.
FIGURE 24 is a perspective view of a commode lid of the commode of FIGURE 16.

DETAILED DESCRIPTION OF THE INVENTION

The description and drawings herein are merely illustrative of several embodiments of the invention. Various modifications and changes can be made to the components and arrangement(s) of components without departing from the spirit of the invention. Like numerals refer to like parts throughout the several views.

With reference to FIGURES 1-3, a durable patient aid product, such as a commode C, includes a pair of side frames SF1 and SF2 interconnected by a front support tube assembly CB1 and a rear support tube assembly CB2. The side frames are configured, as will be described below, to selectively pivot or rotate relative to the rear support tube assembly to allow the commode to be collapsed or folded for storage or shipment. FIGURES 1-3 illustrate the commode C in the assembled, operative position where the side frames SF1 and SF2 are disposed in generally parallel relation and extend generally perpendicularly from the front and rear support tube assemblies CB1 and CB2. As will be appreciated, when folded or collapsed, the side frames are rotated inwardly, generally about the longitudinal axes of the rear, second legs thereof, for positioning in planes generally parallel to that of the rear support tube member.

With continued reference to FIGURES 1-3, and additional reference to FIGURE 4a, the structure, operation, and description of side frame SF1 is applicable to the other side frame SF2 unless particularly noted otherwise. Preferably, side frame SF1 includes a one-piece, inverted generally U-shaped side frame member 20 having leg portions 22, 24 extending outwardly from a handle portion 26. As will be appreciated, the legs 22, 24 extend in a generally diverging, angled relation relative to one another as they proceed outwardly from the handle portion 26. Outer, or lower ends 28, 30 of the legs each include an opening (not illustrated) formed through a side wall. The opening cooperates with a slidable sleeve or leg extension 32 (FIGURES 1-3) to selectively adjust the height of the commode.

A handgrip 34 is provided on the handle portion 26 of the side frame member 20. Preferably, the handgrip 34 is a hard plastic member that is fastened to the generally horizontal handle portion and provides a handle for the user. In one preferred arrangement, the handgrip is a molded component that is assembled by fastening the handgrip 34 to the side frame member 20 into position along the handle
portion 26, for example with a pair of screws. Alternatively, and as will become more apparent below, the handgrip 34 may be molded to the side frame member 20 during the main molding operation. This latter approach allows a more efficient assembly of the handgrip and also allows the manufacturer to create a more ergonomic profile of the handgrip.

With continued reference to FIGURE 4a, and additional reference to FIGURES 6 and 7, provided on each side frame leg portion 22 is a front support member 40. The front support member 40 is molded about the leg 22 (as will be further described below) to provide a circumferentially continuous structure without a seam.

As illustrated in FIGURE 4b, a dimple or recess 36 is provided along a portion of the leg 22 to form a locking or anti-rotation means for front support member 40. As will be appreciated, the dimple is formed in each leg (in the molding press prior to actual molding) during molding of the front support member so that the molded material fills the recess. For example, the dimple or recess is formed as the mold press is closed, or in response to cam movement of the injection molding process. Therefore, when cured, the radial extent of the material extending into the dimple resists relative translation or rotation (torsional forces) of the front support member 40 relative to the leg 22.

With continued reference to FIGURES 6 and 7, the front support member 40 includes a first tubular portion 42 received over the front leg 22 of the side frame 20. The first tubular portion 42 has a generally tubular conformation and is received over the outer diameter of the front leg 22. Adjacent to and parallel to the first tubular portion 42 is a second tubular portion 44 which has a similar generally tubular conformation. The inner diameter of the second tubular portion 44 is dimensioned for slidable insertion of a front tube connector 60, 62 (FIGURES 9 and 10). Disposed at a generally right angle or perpendicularly from one end of the second tubular portion 44 is a radial flange portion 46 that extends outward toward the other side frame. The radial flange portion 46 is adapted to receive one end of the front support tube assembly CB1. A reinforcing member or gusset 47 is provided to add further strength and stability to the front support member 40. Particularly, the reinforcing member 47 extends between the second tubular portion 44 and radial flange portion 46. This provides additional stability against vertical deflecting forces and maintains the generally perpendicular relationship between the second tubular portion 44, radial flange portion 46, and front support tube assembly CB1. An opposing end of the second tubular portion 44 preferably includes a
notch 48 located on the outer surface dimensioned to receive a front tube connector locking means 65 (as will be further described below).

[0053] With reference to FIGURES 8 and 13, the front support tube assembly CB1 and a rear support tube assembly CB2 include respective front and rear support tubes 50 and 52. Each support tube is preferably a hollow member such as steel or aluminum tube, although it will be appreciated that alternative profiles such as a custom extruded aluminum profile can be used. Extruded profiles are desirable because of the ease in manufacture and reduced cost. It will be appreciated, however, that different profiles may be desired to aid in retention of the front and rear support tubes 50, 52 to the front tube connectors 60, 62 and rear tube connectors 80 (FIGURE 14).

[0054] With reference to FIGURES 9-11, the front tube connectors 60 and 62 can be molded over the front support tube 50. This molding method is similar to the method described above with respect to the front support member 40 to provide a circumferentially continuous structure without a seam and to resist relative translation or rotation (torsional forces) of the front tube connectors 60, 62 relative to the front support tube 50. Although the front tube connectors can be molded in the same operation, the front tube connectors can be attached to the front support tube in a secondary operation using conventional fasteners, such as rivets or a bolt and a nut.

[0055] Each front tube connector 60 and 62 includes a first tubular portion 63 which has a generally tubular conformation and is diametrically dimensioned to receive opposing ends of the front support tube 50. Each front tube connector 60 and 62 further includes a second tubular portion 64 which also has a generally tubular conformation and is diametrically dimensioned for slidable insertion in the second tubular portions 44 of the front support members 40. Front tube connector 60 further includes the locking means 65 to secure the front support tube assembly CB1 to the front support members 40.

[0056] With particular reference to FIGURE 9, the locking means includes a locking flange 66 that extends downwardly from the outer surface of the second tubular portion 64. To facilitate the insertion of the locking flange 66 in the second tubular portion 44, the second tubular portion 64 is provided with two slits 67 along its longitudinal length which allow the locking flange to be pushed inward. The locking flange 66 includes an outward extending shelf 68 perpendicular to and adjacent to the outer surface of the second tubular portion 64. To insert the second tubular portion 64 in the second tubular portion 44, an inward force is applied to the locking flange 66.
which biases the locking flange inward. As the locking flange moves downward past the notch 48, the locking flange 66 springs outward and the shelf 68 engages the notch thereby releasably securing the front tube connectors 60 to the front support member 40. This engagement further locks the front tube connectors to the front support member thereto into a secure relationship relative to the side frames 20.

[0057] With reference now to FIGURE 12, and additional reference to FIGURE 4a, a rear support member 70 is shown and described in greater detail. Specifically, the rear support member 70 is molded over the rear leg 24 of the side frame 20 (similar to the method described above) to provide a circumferentially continuous structure without a seam and to resists relative translation or rotation (torsional forces) of the rear support member 70 relative to the leg 24. The rear support member has a generally tubular portion 72 that extends about the entire perimeter or circumference of the rear leg. The rear support member further includes a ledge or flange 74 extending generally radially outward from the tubular portion 72. The ledge or flange limits longitudinal movement of the rear support tube assembly CB2.

[0058] With reference to FIGURE 14, and additional reference to FIGURES 4a and 15, provided on each side frame leg portion 24 is a rear tube connector 80. The rear tube connector 80 is molded about the leg 24 and the rear support tube 52 (as will be further described below) to provide a circumferentially continuous structure without a seam. The rear tube connector 80 includes a first tubular portion 82. The first tubular portion has a generally tubular conformation and is received over the outer diameter of the rear leg 24 of the side frame 20. Extending generally perpendicular from the first tubular portion 82 is a second tubular portion 84 which has a similar generally tubular conformation adapted to receive one end of the rear support tube 52. Reinforcing members or gussets 85, 86 extend between the first tubular portion 82 and the second tubular portion 84. This provides additional stability against vertical deflecting forces and maintains the generally perpendicular relationship between the first tubular portion 82, the second tubular portion 84 and the rear support tube assembly CB2. The first tubular portion 82 further includes a flange 88 extending generally radially outward, the flange abutting against flange 74 which further limits longitudinal movement of the rear support tube assembly CB2.

[0059] A dimple or recess (not illustrated, refer to FIGURE 4b) is not provided along a portion of the leg 24 but is provided along a portion of the rear support tube 52 to form a locking or anti-rotation means for the rear tube connector 80 (second tubular
portion 84) relative to the rear support tube 52 (similar to the method described above to resist relative translation or rotation (torsional forces) of the rear tube connector 80 relative to the rear support tube 52). By not providing a dimple or recess along a portion of the leg 24 and because the polymer or plastic shrinks, the rear tube connector 80 (first tubular portion 82) can be torqued or rotated relative to the rear leg 24 after the assembly has been removed from the molding operation. This allows the rear leg to maintain a close fit with the rear tube connector 80, yet pivot relative thereto to allow the side frame 20 to fold.

[0060] With reference again to FIGURES 1-4a, molded on the rear support tube assembly CB2 are a commode seat 100 and a commode lid 110. The commode seat 100 includes generally tubular flanges 102, 104 at one end which are molded about the rear support tube 52 to provide a circumferentially continuous structure without a seam. The tubular flanges 102, 104 are received over the outer diameter of the rear support tube 52. The commode seat is dimensioned such that in its horizontal position, its second end contacts the front support tube 50. The commode lid 110 includes generally tubular flanges 112, 114 at one end which are molded about the rear support tube 52 to provide a circumferentially continuous structure without a seam. The tubular flanges 112, 114 are received over the outer diameter of the rear support tube 52.

[0061] In molding the commode seat 100 and commode lid 110 to the rear support tube 52, a dimple or recess is not provided along a portion of rear support tube. By not providing a dimple or recess and because the polymer or plastic shrinks, the commode seat 100 and commode lid 110 (specifically, the tubular flanges 102, 104 and tubular flanges 112, 114) can be torqued or rotated relative to the rear support tube 52 after the assembly has been removed from the molding operation. This allows the flanges to maintain a close fit with the rear support tube, yet rotate relative thereto to allow the side frames 20 to fold. This is advantageous over prior art arrangements in which the commode seat and commode lid are molded in a separate operation and assembled to the rear support tube using conventional fastening snaps and/or clips.

[0062] The above molded components (e.g. hand grip 34, front support member 40, left front tube connector 60, right front tube connector 62, rear support member 70, rear tube connector 80, commode seat 100 and commode lid 110) of the commode C are preferably formed in a single molding operation. In particular, a mold cavity (not illustrated) receives the side frame members 20 and front and rear support tubes 50, 52 therein so that the above molded components are molded about the tube components.
It is not necessary that the entire support tube member, nor the entire side frame member, be received in the mold; however, such an arrangement is not precluded either. When the front and rear support tubes 50, 52 and side frame members 20 are positioned therein, the plastic fills the mold cavity and thereby adopts/molds into the form of the molded components. By injection molding these components, the disadvantages of multiple manufacturing processes and components used to assemble these individual components or subassemblies together of the prior art are avoided.

[0063] FIGURE 4a illustrates how the entire patient aid or commode C is received in a mold or press. The side frames SF1 and SF2 are situated as shown, along with the front (not shown) and rear support tubes 50, 52. Again, the dimple/recess is formed, for example, by a cam that is advanced as movement of a plastic injection ram begins. The cam completes the dimple(s) and is separated from engagement with the side frames SF1, SF2, or the front and rear support tubes (or wherever else it is desired that the plastic be immovably received around the metal) prior to introduction of the plastic around the dimpled region. As will be appreciated, therefore, the formation of the dimple will preferably occur in the press. However, it is also contemplated that the dimple/recess could be separately formed, although that may not be as desirable because of the added manufacturing cost.

[0064] Traditionally, the front and rear support tubes are attached to the side frames by forming the support tubes at the appropriate angle of the side frame and deforming the support tubes so that same would lie flush in line with the legs of the side frames. Another traditional method of assembly of the front and rear support tubes was to use plastic tube connectors that received a screw that that went through the side frames and expands plastic inside the support tubes. Both of these methods require the legs of the side frame to be pierced through both walls and the support tubes to be manually assembled using mounting hardware. Further, when the front and rear support tubes assemblies are assembled to the side frames, prior art arrangements also require the use of an anti-rattle device to minimize play between the assembled parts. Further, as it relates to the hand grip, with prior art arrangements, the hand grips are molded in a separate operation. The handle portion is pierced through both walls and the hand grip is then assembled to the handle portion using mounting hardware.

[0065] Therefore, with prior art arrangements, the legs and handle portions of each side frame must be pierced through both walls. This results in a reduced tube cross-section in the area and, thus, a weakened tube as opposed to an unpierced,
circumferentially continuous wall. Potential fatigue can result during use. The components of the prior art also do not encompass the side frame leg around the entire 360° without a seam or opening which allows for torsional and lateral movement of the side frame when in use. Further, the use of fasteners and mounting hardware raises the issue of the fasteners and mounting hardware loosening during use and thereby requiring that same be tightened on a periodic basis.

[0066] The design of the present application, however, attaches the rear support tube assembly CB2 to the side frames SF1, SF2 while creating the front support members 40, rear support members 70, and front support tube assembly CB1 in one operation. By molding the front and rear support tube assemblies on the side frames, the need for any additional anti-rattle devices is eliminated. In addition, the present invention advantageously eliminates the need for any additional processes or attachment hardware.

[0067] As previously noted, each of the legs included a dimple (not illustrated) to resist torsional forces between the front support member 40, rear support member 70 and the legs 22, 24 of the side frame 20. The rear tube connector 80, on the other hand, desirably rotates relative to the rear leg 24. By integrally molding the front and rear support members around the legs, the plastic shrinks when cured, and a perfect mating relation is achieved which eliminates any play or tolerance difference between them.

[0068] A second embodiment of the rear tube connector 80′ is illustrated in FIGURES 1-4a. The most noticeable difference is a third tubular portion 120 adjacent to the first tubular portion 82′. The third tubular portion 120 has a generally tubular conformation adapted to receive one end of a rear back support tube 122. The rear back support tube 122 is a one-piece, inverted generally U-shaped member having leg portions 124, 126 extending outwardly from a top portion 128. As will be appreciated, the legs 124, 126 extend in a generally diverging, angled relation relative to one another as they proceed outwardly from the top portion 128. The rear back support tube 122 has a vertical height lower than the commode lid 110 such that the back surface of the commode lid in its upright position rests against the rear back support.

[0069] The third tubular portion 120 is molded over the respective legs 124, 126 of the back support tube 122. This molding method is similar to the method described above to provide a circumferentially continuous structure without a seam and to resist
relative translation or rotation (torsional forces) of the rear back support tube 122 relative to the leg portions 124, 126.

[0070] Similar to the aforementioned embodiments of the commode, a third embodiment is shown in FIGURES 16-25. The most noticeable differences are the front support tube assembly CB1" and the rear support tube assembly CB2".

[0071] With continued reference to FIGURE 16, and additional reference to FIGURES 19 and 20, provided on each side frame leg portion 22 is a front support member 140. The front support member is molded about the leg 22 (similar to that of the front support member 40 of the previous embodiment) to provide a circumferentially continuous structure without a seam.

[0072] The front support member 140 includes a first tubular portion 142 received over the front leg 22 of the side frame. The first tubular portion 142 has a generally tubular conformation received over the outer diameter of the front leg 22. Adjacent to and generally parallel to the first tubular portion 142 is a second tubular portion 144 which has a similar generally tubular conformation. The inner diameter of the second tubular portion 44 is dimensioned for slidable insertion of an end of the front support tube 150. The second tubular portion includes a cut-out 152 which facilitates the insertion of the front support tube 150. Similar to the previous embodiments, reinforcing members or gussets 154 are provided to add further strength and stability to the front support member 140.

[0073] With reference to FIGURE 16, the front support tube 150 includes approximately 90° bends at each end that are received in respective second tubular portions 144 of each front support member 140. In this embodiment, the weight of the user maintains the front support tube in the front support members. To fold the commode, and as illustrated in FIGURE 17, the user can simply remove the front support tube 150 from the front support members 140.

[0074] With reference now to FIGURES 21 and 22, provided on each side frame leg 24 is a rear tube connector 180. The rear tube connector 180 is molded about the leg 24 and the rear support tube 52 in a method similar to that of the previous embodiments of the rear tube connector to provide a circumferentially continuous structure without a seam and to resist relative translation or rotation (torsional forces) of the leg and the rear support tube relative to the rear tube connector. The rear tube connector 180 includes a body 182 having parallel first and second openings 184 and 186. The first opening 184 has an inner diameter dimensioned to receive the rear leg
24 of the side frame 20. The first opening includes a cut-out 188 which can facilitate the rotation of the rear leg in the opening during folding of the commode. The second opening 186 has an inner diameter dimensioned to receive a leg of a rear back support tube 190 (FIGURE 16) similar to the rear back support tube 122. The rear tube connector 180 is molded over the rear back support tube 122 similar to the method described above.

[0075] With continued reference to FIGURE 22, extending generally perpendicular from the body 182 is a tubular portion 196 having a generally tubular conformation adapted to receive one end of the rear support tube 52. Reinforcing members or gussets 200 and 202 extend between the body 182 and the tubular portion 196. This provides additional stability against vertical deflecting forces and maintains the generally perpendicular relationship between body and the tubular portion. A flange 204 extends generally radially outward from a bottom of the body 182 adjacent the first opening 184. The flange abuts against the rear support member 70 which limits longitudinal movement of the rear support tube assembly CB2".

[0076] With reference again to FIGURE 16, and additional reference to FIGURES 23 and 24, molded on the rear support tube assembly CB2" are a commode seat 210 and a commode lid 110. The commode seat 210 includes generally tubular flanges 212, 214 at one end which are molded about the rear support tube 52 to provide a circumferentially continuous structure without a seam. The commode lid 212 includes generally tubular flanges 218, 220 at one end which are also molded about the rear support tube 52 to provide a circumferentially continuous structure without a seam. Similar to the previous embodiments, the commode seat 210 and commode lid 212 can rotate relative to the rear support tube 52 after the assembly has been removed from the molding operation. This allows the flanges to maintain a close fit with the rear support tube, yet rotate relative thereto to allow the side frames 20 to fold.

[0077] As is evident from the foregoing, fewer components are required with the present commode, and likewise fewer assembly and sub-assembly operations yield a final product for a substantially lower total cost. The main components of the commode are created in one injection molding operation and as a result of the significant reduction in component numbers and assembly operations required to build the present invention, the overall cost is substantially lower.

[0078] Although different types of plastic may be used to achieve the desired relative rotation of the molded components relative to the metal components
post-molding, the subject invention in one embodiment uses a glass filled or reinforced nylon in which the melt flow and shrinkage characteristics of the plastic are controlled. A silicone additive comprising approximately 1/2%-2% of the total provides the desired lubricity of the plastic. Alternatively, the desired post-molding, relative rotation could be accomplished by molding over a thin sleeve positioned over the side frame leg prior to molding. In still other instances, no silicone additive or thin sleeve may be required in order to achieve relative rotation between the cured polymer component and the metal.

[0079] The invention has been described with reference to preferred embodiments. Obviously, modifications and alterations will occur to others upon reading and understanding the preceding detailed description. For example, only selected aspects of the invention may be used and this invention should not be limited to an embodiment that incorporates all of the inventive features. It is intended that the exemplary embodiments be construed as including all such modifications and alterations insofar as they come within the scope of the appended claims or the equivalents thereof.
What is claimed is:

1. A method of manufacturing a commode comprising the steps of:
   providing first and second side frames, each side frame including first and
   second legs having adjacent first ends interconnected by a handle;
   providing a cross brace member;
   molding a first polymer member over a first portion of one of the first and
   second legs of the first side frame and an end portion of the cross brace member;
   molding a second polymer member over a first portion of one of the first
   and second legs of the second side frame and an opposing end portion of the cross
   brace member;
   rotating the first polymer member relative to the first side frame after the
   polymer has cured; and
   rotating the second polymer member relative to the second side frame
   after the polymer has cured.

2. The method of claim 1 comprising the further step of inserting the first and
   second side frames and the cross brace member in a mold press before the molding
   step.

3. The method of claim 1 comprising the further step of deforming the end
   portions of the cross brace member prior to the molding step.

4. The method of claim 3 wherein the deforming step is completed in the
   mold press prior to the molding step and is responsive to one of closing of the mold
   press and movement of a piston associated with injection molding of the first and
   second polymer members.

5. The method of claim 1 wherein the deforming step is separate from a mold
   press.

6. The method of claim 1 comprising the further step of incorporating a
   silicone in the polymer for lubricity.
7. The method of claim 1 wherein the molding step includes introducing the polymer around an entire peripheral portion of the first and second legs of the first and second side frames and an entire peripheral portion of the cross bar member whereby a portion of the first and second legs of the first and second side frames and the cross bar member is entirely encapsulated by the polymer without a seam.

8. The method of claim 1 comprising the further step of molding a third polymer member around a second portion of one of the first and second legs of one of the first and second side frames whereby, after curing of the polymer, the third polymer member does not rotate relative to the respective side frame.

9. The method of claim 8 wherein the molding step of the third polymer member includes the further step of deforming the second portion of one of the first and second legs of the respective side frame prior to molding.

10. The method of claim 1 comprising the further step of molding a fourth polymer member around a third portion of one of the first and second legs of one of the first and second side frames whereby, after curing of the polymer, the fourth polymer member does not rotate relative to the respective side frame.

11. The method of claim 10 wherein the molding step of the fourth polymer member includes the further step of deforming the third portion of one of the first and second legs of the respective side frame prior to molding.

12. The method of claim 1 comprising the further step of molding a portion of at least one of a commode seat and a commode lid over the cross bar member whereby, after curing of the polymer, the commode seat and the commode lid rotate relative to the cross bar member.

13. A commode comprising:
first and second side frames having front and rear legs interconnected at their first ends by a mid-portion; and
a polymer member interconnecting each rear leg of each side frame to a cross brace member whereby, after curing of the polymer, the polymer member rotates relative to the respective rear leg.

14. The commode of claim 13 further including a second polymer member interconnecting the respective front leg to a front cross brace member.

15. The commode of claim 13 wherein each rear leg includes a polymer support member located below the polymer member for limiting longitudinal movement of the polymer member.

16. The commode of claim 13 further including at least one of a commode seat and a commode lid pivotally secured to the rear cross brace member.

17. A commode comprising:
   first and second side frames, each including front and rear legs interconnected at their respective first ends thereof by a handle;
   a rear cross brace interconnecting the rear legs of the first and second side frames;
   a rear support tube assembly securing the rear cross brace to each rear leg, a portion of the rear support tube assembly encompasses an entire circumferential extent of both the rear cross brace and the rear leg without any seam; and
   at least one of a commode seat and commode lid pivotally secured to the rear cross brace member.

18. The commode of claim 17 further comprising a support member received over each rear leg of the first and second side frames, the support member limiting longitudinal movement of the rear support tube assembly.

19. The commode of claim 18 wherein each rear support tube assembly allows the respective rear leg to selectively rotate therein.
20. The commode of claim 17 further comprising a front support tube assembly over each front leg of the first and second side frames for interconnecting the front legs to a front cross brace member, a portion of which encompassing the entire circumferential extent of the front leg without any seam.
Fig. 2