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(54) **RAPIDLY ENGAGING FEMALE THREADED COUPLER**

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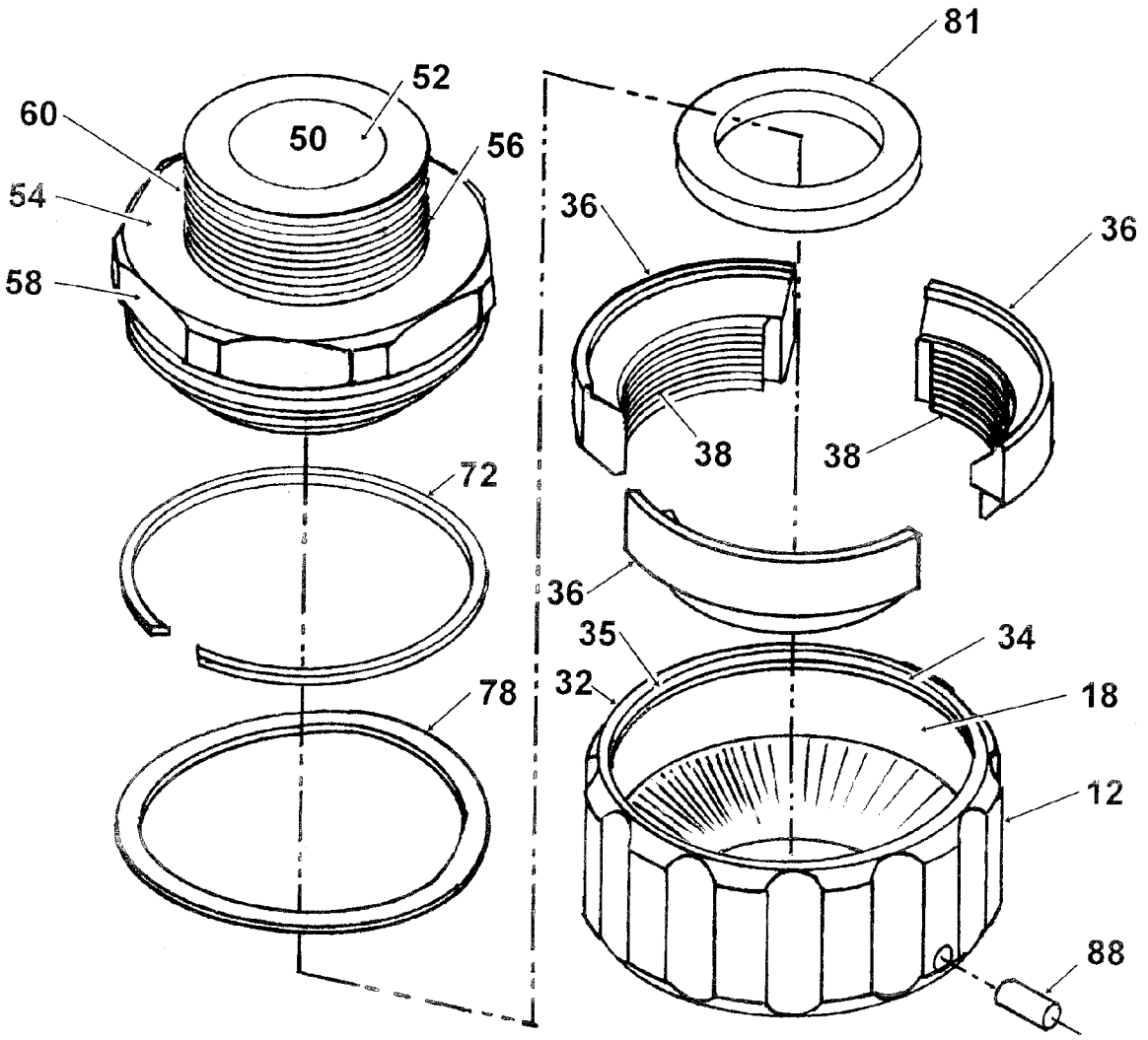
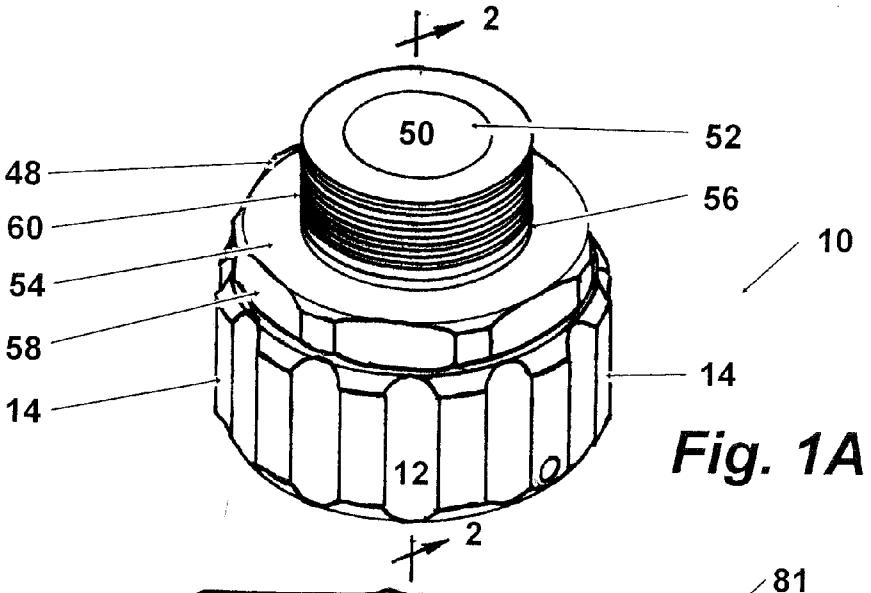
(52) **U.S. Cl.** **285/330**

(57) **ABSTRACT**

A threaded coupler includes a plurality of circumferentially distributed internally threaded segments arranged to create a bore for inserting an externally threaded member. A casing surrounds the threaded segments. The casing includes a first inclined surface of revolution extending at an acute angle to an axis of the coupler. A spring resiliently urges the segments radially inward to the axis of the coupler. Each of the plurality of segments includes an inclined surface which defines a second inclined surface of revolution co-acting with the first inclined surface of revolution of the casing.

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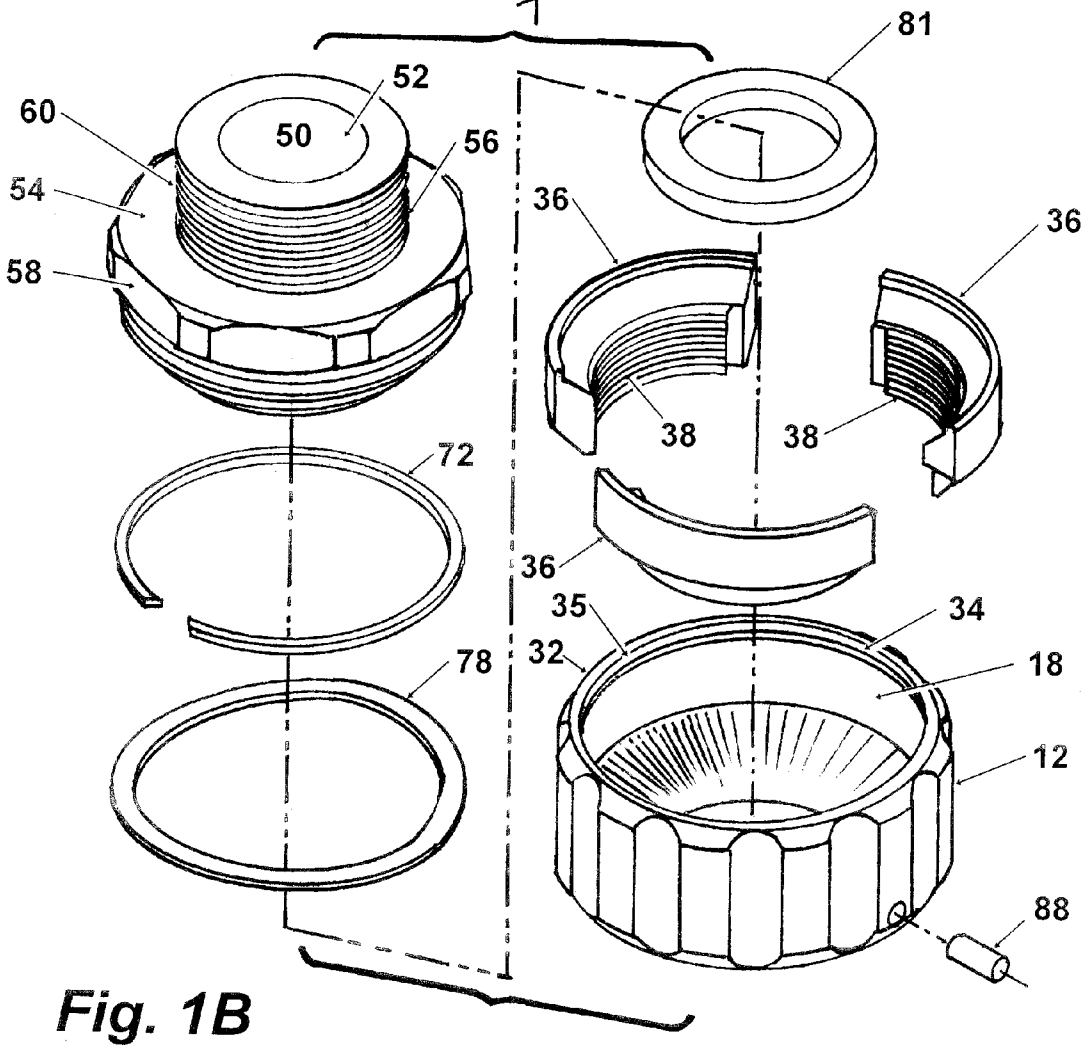
12
2

Fig. 1A


81
52
60
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72
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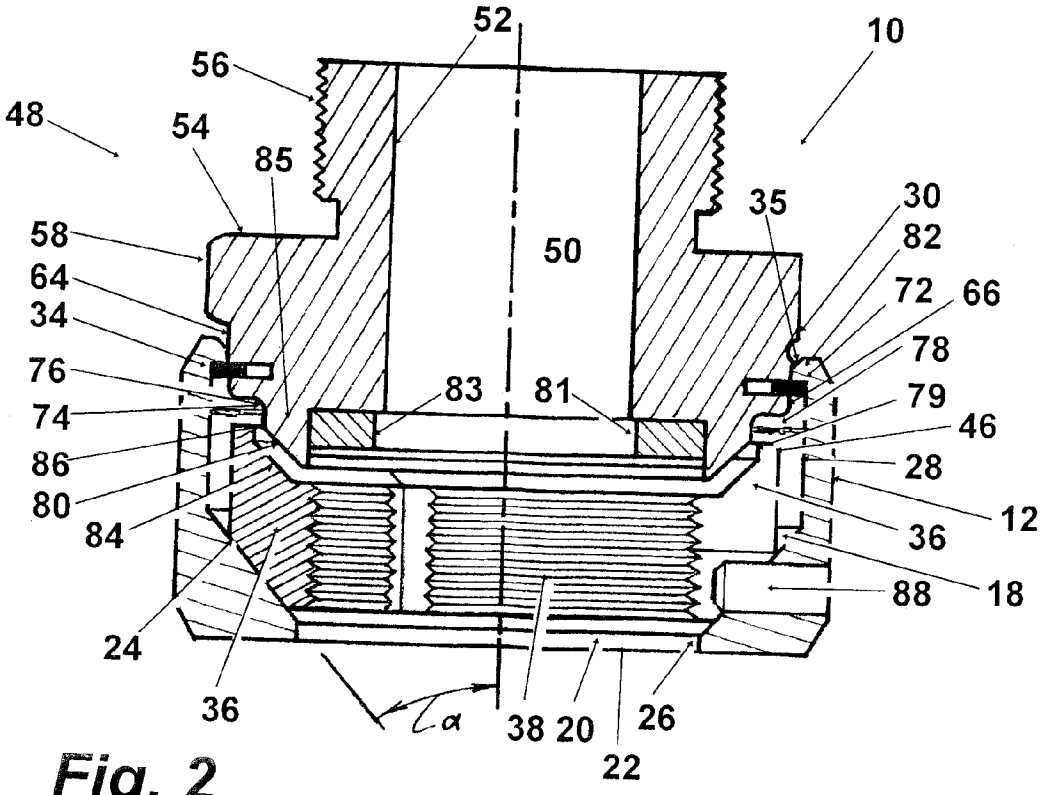
Fig. 1B


52
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82
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28
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12
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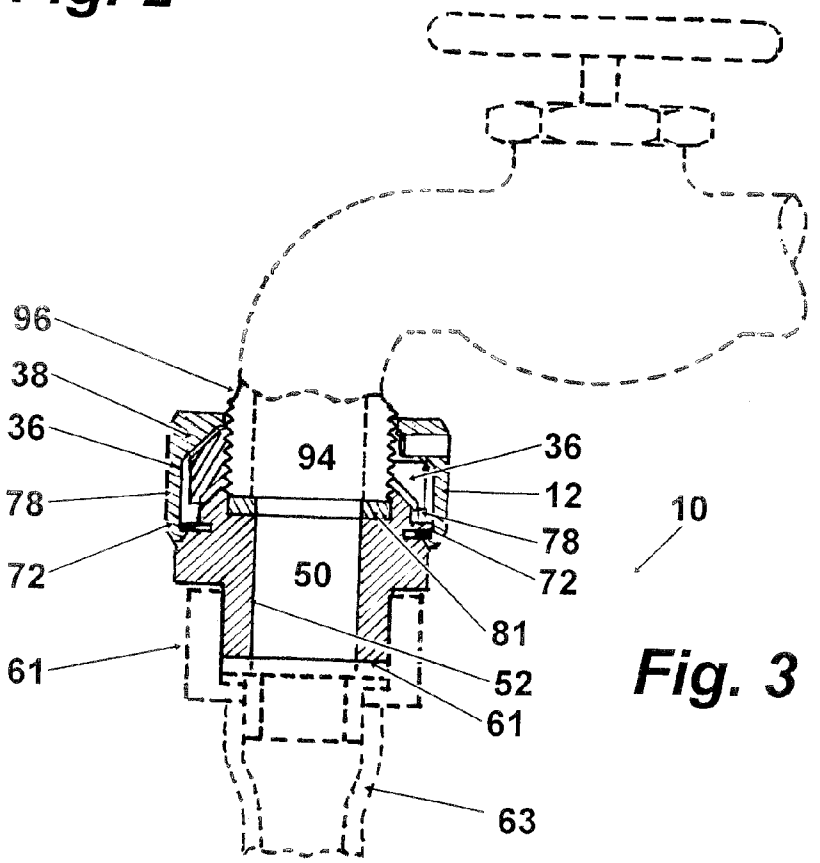
Fig. 2


96
38
36
94
36
78
12
10
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72
50
72
81
61
52
61
63

Fig. 3

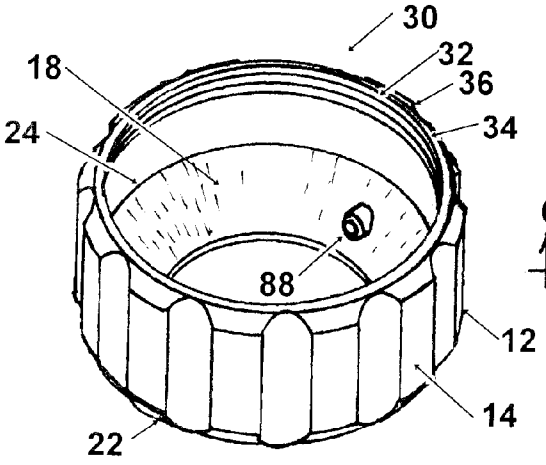

Fig. 4

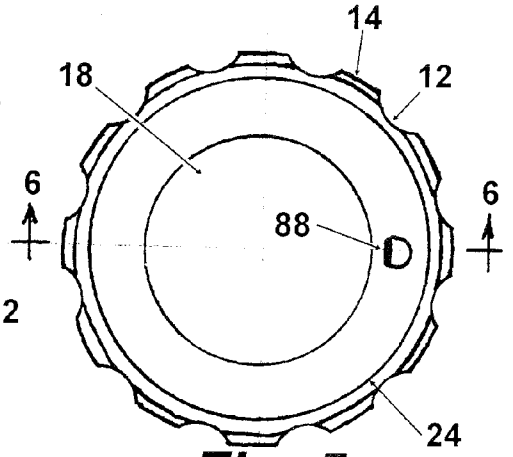

Fig. 5

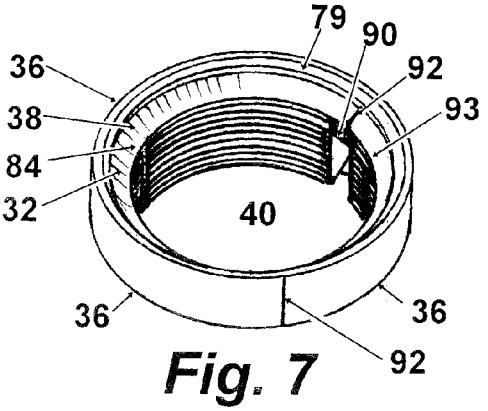

Fig. 7

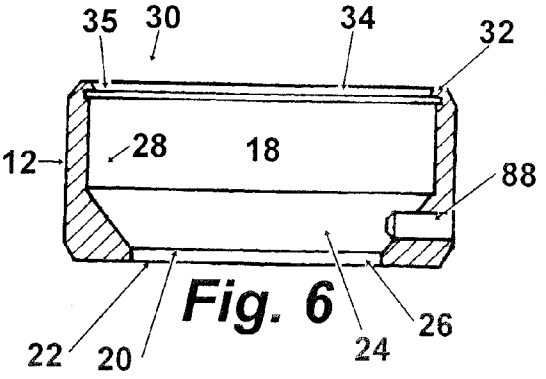

Fig. 6

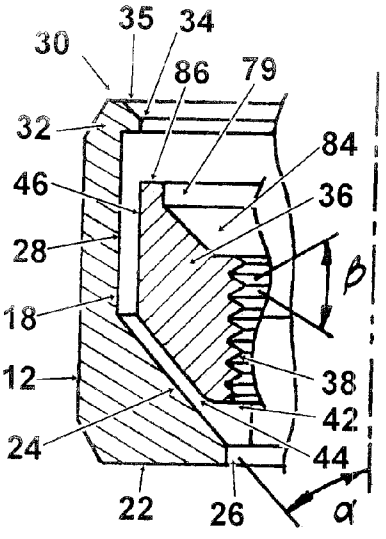

Fig. 8

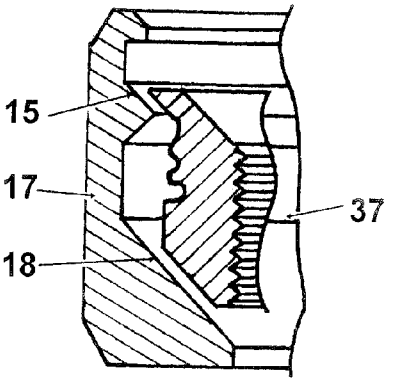

Fig. 9
(Prior Art)

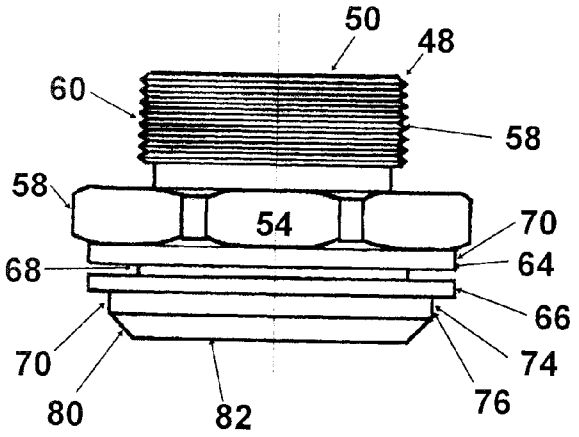

Fig. 10

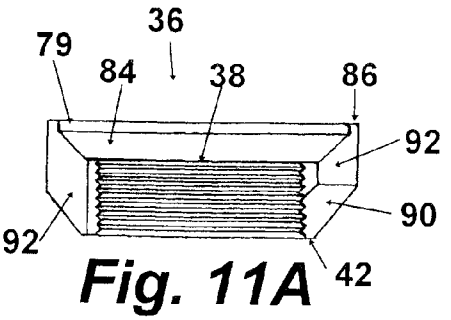

Fig. 11A

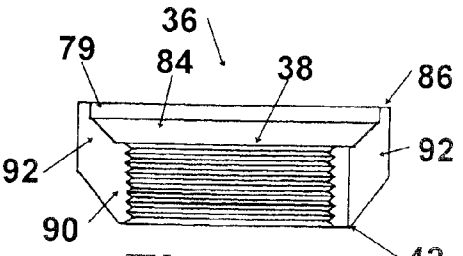

Fig. 11B

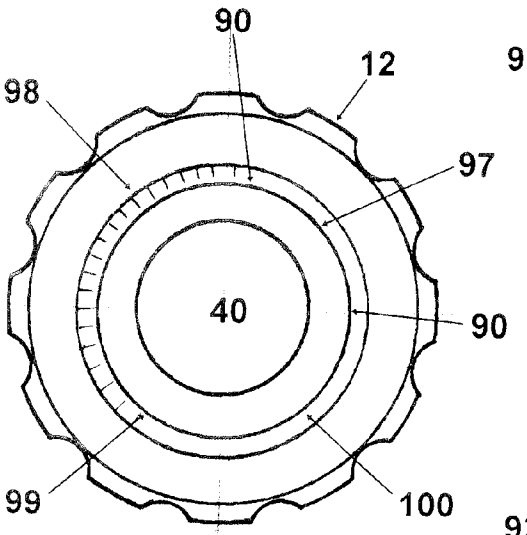

Fig. 12

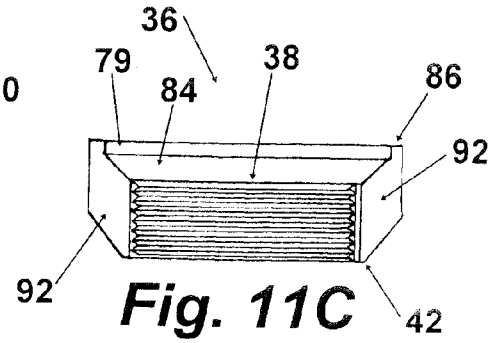

Fig. 11C

RAPIDLY ENGAGING FEMALE THREADED COUPLER

RELATED APPLICATION SECTION

[0001] This application claims priority to U.S. Provisional Patent Application Ser. No. 60/887,195, filed Jan. 30, 2007, entitled "Rapidly Engaging Female Threaded Coupler Nut", the entire application of which is incorporated herein by reference.

[0002] The section headings used herein are for organizational purposes only and should not to be construed as limiting the subject matter described in the present application.

BACKGROUND

[0003] This invention relates generally to female threaded coupling devices (nuts) or adaptors, and in the one embodiment, to a hose coupler, which can be rapidly engaged upon a threaded nozzle.

[0004] One embodiment of the present invention relates to a hose coupler, which can rapidly engage upon threaded spigot nozzles, such as common garden hose spigot nozzles. However, the invention could be applied to numerous applications, such as threaded fire hydrant nozzles. The ability of this invention to rapidly engage upon threaded spigot nozzles shortens the otherwise tedious task of turning a threaded hose coupler multiple revolutions to tighten a hose upon a spigot nozzle. This task can be especially tedious and painful for arthritic individuals who have a limited range of motion in their hands. Furthermore, situations such as fire emergencies require fast action to save lives and structures. Time wasted in threading common fire hose adaptors to a hydrant can mean the difference between life and death.

[0005] Efforts have been made to design threaded coupling devices, which may be assembled by rapid axial movement upon an externally threaded member such as a bolt. Examples of such devices are present in U.S. Pat. Nos. 4,378,187; 5,580,200 and 6,361,260. These devices depend upon a plurality of threaded segments located inside an external casing. The interior diameter of the threaded segments defines a threaded bore for inserting an externally threaded member. Each threaded segment has two axially spaced upper and lower frustoconical surfaces which co-act with two axially spaced annular upper and lower frustoconical surfaces cut into the inside diameter of the casing. Generally, a garter spring expandably encircling the segments or a wave spring for forcing the segments downward, provides the necessary force for urging the segments together and allowing the expansion and contraction of the segments as they move along the frustoconical surfaces of the casing. The threaded segments are held within the casing by various arrangements of segment pins which typically are positioned near the top of the casing, far from the end in which the externally threaded member is inserted.

[0006] A problem with the known designs is that if the segments are designed with loose tolerances between the adjoining surfaces, especially along their upper inclined edges, the threaded segments can roll into and out of the casing, even after assembly. Furthermore, the existence of a second, top, inclined surface protruding into the casing and/or the top positioning of segment pins in the casing can obstruct the path of the threaded segments during assembly, and thereby makes only hand assembly of the prior art devices possible, leading to increased labor costs. Also, with the prior art dual inclined surface assembles, the axial distance tolerances between the inclined surfaces on the casing versus the segments have to match extremely close. Otherwise the load of a large pulling force on a threaded member is distributed almost entirely upon the lower inclined surfaces of the casing and segments, causing the assembly to fail, and the threaded member to pull out.

[0007] Furthermore, the prior art devices fail to solve the problem of "thread segment identity" which is where a thread segment must be identified and properly placed in the fastener assembly so that mismatches between the threads of adjacent thread segments are avoided. As a result, if threads segments are not identified properly, this can lead to the wrong segments being placed side-by-side during assembly. This can result in mismatch between adjacent threads of the thread segments, thereby making it impossible to properly engage the fastener upon an externally threaded member, such as a bolt.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The aspects of this invention may be better understood by referring to the following description in conjunction with the accompanied drawings, in which like numerals indicate like structural elements and features in various figures. The drawings are not necessarily to scale. A skilled artisan will understand that the drawings, described below, are for illustration purposes only. The drawings are not intended to limit the scope of the present teachings in any way.

[0009] FIG. **1**A is a perspective view of the hose coupler.

[0010] FIG. **1**B is an exploded view of the hose coupler of FIG. **1**A.

[0011] FIG. **2** is a cross-sectional view of the hose-coupler of FIG. **1**A taken through line **2-2** of FIG. **1**A.

[0012] FIG. **3** is a cross-sectional view showing the hose coupler of FIG. **1**A, mounted on a garden hose spigot nozzle, with a garden hose attached.

[0013] FIG. **4** is a perspective view of a casing in accordance with the invention of FIG. **1**A.

[0014] FIG. **5** is a top plan view of the casing of FIG. **4**.

[0015] FIG. **6** is a cross-sectional view of the casing of FIG. **4** taken along line **6-6** of FIG. **5**.

[0016] FIG. **7** is a perspective view of three-segments arranged, as they would be in the coupler of FIG. **1**A.

[0017] FIG. **8** is a cross-sectional view of a segment co-acting with a partial cross sectional side of a casing in accordance with the invention.

[0018] FIG. **9** is a cross-sectional view of a prior art fastener segment co-acting with a partial cross sectional side of a prior art casing.

[0019] FIG. **10** is a close-up side view of the top cover in accordance with the invention.

[0020] FIG. **11**A is a front elevational view of a segment having a grooved right side in accordance with the invention.

[0021] FIG. **11**B is a front elevational view of a segment having a grooved left side in accordance with the invention.

[0022] FIG. **11**C is a front elevational view of a segment having no grooves in accordance with the invention.

[0023] FIG. **12** is an insertion end view of four segments assembled into the coupler.

DETAILED DISCLOSURE OF THE INVENTION

[0024] Reference in the specification to the word "embodiment" means that a particular feature, structure, or character-

istic described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of the word "embodiment" in various places in the specification are not necessarily all referring to the same embodiment.

[0025] It should be understood that the individual steps of the methods of the present invention may be performed in any order and/or simultaneously as long as the invention remains operable. Furthermore, it should be understood that the apparatus and methods of the present invention can include any number or all of the described embodiments as long as the invention remains operable.

[0026] The present invention will now be described in more detail with reference to exemplary embodiments thereof as shown in the accompanying drawings. While the present teachings are described in conjunction with various embodiments and examples, it is not intended that the present teachings be limited to such embodiments. On the contrary, the present teachings encompass various alternatives, modifications and equivalents, as will be appreciated by those of skill in the art. Those of ordinary skill in the art having access to the teachings herein will recognize additional implementations, modifications, and embodiments, as well as other fields of use, which are within the scope of the present disclosure as described herein.

[0027] The present invention relates to a quickly engageable hose-coupling device. The hose-coupling device includes a casing, a plurality of individually identifiable threaded segments having a single inclined surface design, the single inclined surface co-acting with a single inclined surface on the casing. A single segment pin holds the threaded segments within the casing. A spring, such as a wave spring, is included to bias the segments toward the insert opening of the device.

[0028] Referring now to the drawings and particularly to FIGS. **1**A, **1**B, and **2**, therein is illustrated a coupler **10** in accordance with one embodiment of the invention, comprised of an outer casing **12** having a plurality of axial projections **14** for rotating the casing by hand. The interior walls of the casing define a cavity **18** extending there through. The lower end of the cavity terminates in a hole **20** extending axially through an insertion end **22** of the casing **12**. The hole **20** can be round with a diameter slightly greater than the outside diameter of threaded hose spigot nozzle **94** (shown in FIG. **3**) that is inserted into the insertion end **22** of the casing **12**.

[0029] Turning additionally to FIGS. **4**-**6**, the cavity **18** is defined partially by a frustoconical surface **24** i.e. an inclined surface of revolution extending at an acute angle α to the axis of the casing **12**, radially outward from the interior of the cavity **18** in the direction toward the insertion end **22** of the casing **12**. The minimum diameter of the inclined surface **24** is preferably the same as that of hole **20** and this surface may be spaced from the end of the casing **12** by a cylindrical surface **26**.

[0030] The wall of the cavity extends in a wall section **28** from the maximum diameter of the inclined surface **24**, toward the other end **30** of the casing **12** opposite to the insertion end **22**. Wall section **28** extends generally axially and terminates at lip **32**. Lip **32** includes a wall section **34**, which extends axially until terminating at inclined surface **35**, which extends to the end **30** of the casing **12**.

[0031] FIG. **7** illustrates a plurality of internally threaded segments **36** having accurate cross sections in planes perpendicular to the axis of the coupler **12**. In one embodiment, the number of thread segments **36** should be at least three, or more, as is further discussed herein. As FIGS. **1**B and **2** show, these segments **36** are positioned within cavity **18**, the segments preferably (although not necessarily) defining generally equal arcs. The segments **36** have internal threads **38** coaxial with the casing **12**, and when arranged together, the segments **36** define a bore **40** into which is inserted a threaded spigot nozzle **94**. The threads **38** have an apex angle β as illustrated in FIG. **8**.

[0032] Still referring to FIG. **8**, the ends **42** of the segments, which are placed nearest the insertion end **22** of the casing **12** each have a frustoconical surface **44** extending at the acute angle α to the axis of the casing **12**. The inclined surface **44** is adapted to abut and slide on the frustoconical surface **24** of the casing **12**. The inclined surface **44** extends radially outward in the direction away from the insertion end **22** of the casing **12**, and terminates generally axially extending actuate wall **46** having length approximate to that of the wall section **28** of the cavity **18**. Actuate wall **46** extends axially until terminating at the substantially planer ends **86** of the segments **36**.

[0033] The coupler's employment of a single frustoconical surface **24** of revolution in casing **12** co-acting with the frustoconical revolution surfaces **44** of the segments **36** eliminates the use of dual frustoconical surfaces present in the prior art. Consequently, the coupler is simpler in design and stronger in resisting larger pulling forces, which could separate the coupler **10** from a hose spigot nozzle **94**. FIG. **8** shows the width of a single frustoconical surface **24** of casing **12** compared to FIG. **9**, which shows the width of a dual-frustoconical surface **13**, **15** and casing **17** of the prior art. Here, if the single surface **24** width is equal to the combined dual surface **13**, **15** widths, it has been found that a coupler employing the single surface design is more resistant to pulling forces than the dual surface design. It is believed that the single surface design results in a coupler being up to four times more resistant to pulling forces than the dual surface design. This added strength is important in situations where the threaded member and coupler are likely to be placed under significant pulling force strain.

[0034] The dual surface design of the prior art fasteners also inhibits their machine assembly. The upper frustoconical surface **15** shown in the prior art fastener casing **17** of FIG. **9** creates an obstruction to easy loading of the casing with segments **37** during manufacture. As a result, only labor-intensive hand manufacture was practical as machinery can not easily negotiate the upper surface **15** in the prior art casings **17**. The elimination of this upper frustoconical surface in the present invention makes for easy machine loading of the segments during manufacture.

[0035] Referring again to FIGS. **1**A-**1**B and now to FIG. **10**, the segments **36** are axially retained in the casing **12** at end **30** by a cap or cover **48**. Inclined surface **35** of lip **32** on casing helps to center and guide the cover **48** during assembly. Cover **48** has a central hole **50** extending there-through, preferably of a smaller diameter than hole **20** to reduce to reduce fluid turbulence. A circular inner wall section **52** defines hole **50** and exterior to hole. The top cap **48** is comprised of turning flange **54** and hose flange **56**. Turning flange **54** may have an octagonal axial outer wall section **58**, for example, to allow turning by a wrench. The axial circular exterior wall section **60** of hose flange **56** is threaded to allow male connection with the female threaded nozzle-connecting end **61** of a garden hose **63**, for example, as shown in FIG. **3**. In this way, a

common garden hose **63** can be connected to the coupler **10**, to allow quick engagement of the hose **63** to any spigot nozzle **94** of standard diameter.

[0036] Referring to FIGS. **10** and **2**, the side of the cover positioned toward the lip **32** of the casing **12** has a first ring portion **64**, which abuts against wall section **34** of lip **32**. A second ring portion **66** has a diameter that is approximately equal to the first ring portion **64** and is axially spaced from the first ring portion. In between the two ring portions **64**, **66** there is an axial gap **68** which extends radially inward of the cover **48** to terminate at exterior wall section **70**. A snap ring **72** (see FIG. **6**) is placed in the gap **68**, or similar device to allow the cover **45** to be snapped into casing **12** and retained therein. The snap ring **72** allows the cover **48** to rotate in relation to the casing **12**, while being held in the casing **12** due to its expansion beneath lip **32**. An exterior circular wall section **74** having a diameter less than ring portions **64**, **66** extends from second ring portion **66**.

[0037] The junction at the second ring portion **66** and the wall section **74** forms a corner area **76** with a frustoconical surface **80** that is undercut with an angle less than the angle α to the axis of the coupler **10**. This undercut with respect to the angle α provides extra clearance to accommodate for radius mismatch. The radially inner end of the frustoconical surface **80** terminates at hole **82**, which has wall section **85** defining a washer cavity **83**. Washer cavity **83** is circular, having a diameter for snugly retaining a standard rubber hose washer **81** against the wall section **85**. When a washer **81** is placed within washer cavity **83**, the washer has an inside diameter that is approximate equal to the diameter of hole **50**. Upon insertion of spigot nozzle **94** (see FIG. **3**), the washer seats against the end of nozzle **94**, thereby directing any flow of fluid into hole **50**.

[0038] Referring again to FIGS. **2** and **3**, it is seen how threaded segments **36** have a frustoconical surface **84** inclined at the angle α to the axis of the casing **12** and facing and adapted to slide on the inclined surface **80** of the cover **48**. Frustoconical surface **84** extends radially from threads **38** and terminates at wall section **79**, which proceeds axially until reaching end **86**. The hose coupler **10** is further provided with a means for resiliently biasing the threaded segments **36** in the radially inward direction of the coupler **10**. For example, a wave spring **78** may be positioned at the confluence of corner area **76** of cover **48** and substantially planar ends **86** of segments **36**.

[0039] The wave spring **78** exerts pressure between the relatively unyielding cover **48** and movable segments **36**, forcing the segments to naturally move radially inward of the casing **12**. When a spigot nozzle **94** is inserted into the insertion end **22** of the casing, the segments **36** move radially outward as the inner threads **38** of the segments **36** ride over the high points of the threads on the spigot nozzle **94**, and likewise the segments **36** move radially inward as the high points of the threads **38** of the segments **36** settle in the valleys of threads **96** of the spigot nozzle **94**. Upon insertion of the spigot nozzle **94**, the wave spring **78** biases both the inward and outward radial action as the segments **36** slide along frustoconical surface **24** of the casing **12**.

[0040] In the hose coupler **10** of FIG. **2**, it is also necessary to provide a means for inhibiting the relative rotation between the casing **12** and the segments **36**. For this purpose, a single segment pin **88** presses into the frustoconical surface **24** of the casing **12** and projects radially outward into the cavity **18** to prevent segment rotation (see FIG. **6**). As shown in FIG. **7**, in a three-segment arrangement, two of the adjacent threaded segments **36** are each grooved **90** at their adjoining surfaces **92** to allow clearance for one half of the segment pin **88**. When the adjoining surfaces **92** meet, a keyway **93** is formed for allowing the through-passage of segment pin **88**.

[0041] The placement of the segment pin **88** near the insertion end **22** of the casing **12** as seen in FIG. **2**, allows for the unobstructed loading of the segments into the casing **12** from end **80**. This allows for simpler assembly of the coupler **10** during manufacture when compared to prior art couplers and fasteners which position multiple segment pins at opposite upper end of casing, thereby causing an obstructed and more complicated assembly of segments into the casing. Furthermore, the segment pin **88** helps prevent the thread segments **36** from rolling downward into the casing **12** and partially covering the insertion end **22** where the spigot nozzle **94** enters the coupler **10**.

[0042] Referring to FIGS. **11**A-C, a further reason for grooving the adjacent segments can be described. The adjacent grooves **90** insure that two segments **36** (see FIGS. **11**A-**11**B) having matching threads **38** are placed adjacent to the keyway **93**. The third segment **36** (see FIG. **11**C) has no groove and is matched to the non-grooved segments to form the three-segment arrangement shown in FIG. **7**. In this way, matching segments **36** can be easily identified during manufacture and quickly assembled in proper order into the casing **12** of the coupler **10**. This segment identifying means further facilitates machine assembly of the coupler. The grooves **90** allow the segments **36** shown in FIGS. **11**A-C to be identified and separated out by an assembly machine using a laser scanner. The two grooved **90** segments **36**, not being mirror images, are easily identifiable, and the non-grooved segment **36** is readily identifiable from the two grooved segments. Upon identification, these segments **36** can be segregated from plurality of segments by well-known mechanical means and assembled into coupler **10** in the proper order.

[0043] In the arrangement of the invention, illustrated in FIG. **3**, it is apparent that, when a threaded spigot nozzle **94** is inserted into the coupler **10** via hole **20**, engagement of the threads **38** of the segments **36** cause an axial force to be applied to the segments, thereby resulting in the axial as well as the radial outward movement of the segments **36** due to sliding contact between the frustoconical surface **44** of the segments **36** and the adjacent single frustoconical **24** surface of the casing **12**. This radial outward movement of segments **36** permits the nozzle **94** to be rapidly inserted into the coupler **10** without the necessity of threading the coupler into the nozzle. The frustoconical surfaces **44**, **84** on the segments **36** are guided during axial movement by the frustoconical surface **80** of the cover **48**, which also inhibits inward pivotal movement of the segments **36** so they do not roll into the casing cavity **18**.

[0044] Upon rotation of the casing **12** to tighten the coupler **10**, following the initial axial insertion of the spigot nozzle **94**, the threads **38** of the segments **36** engage the threads **96** of the spigot nozzle **94** and are forced axially toward the insertion end **22** of the coupler **10**. This results in the segments **36** being guided by the single frustoconical surface **24** of the casing **12** to move radially inward and hence to be forced radially inward against the threads **96** of the nozzle **94**.

[0045] In accordance with one embodiment of the invention, the acute angle α of the frustoconical surfaces of the casing, cover and segments **24**, **80**, **44**, **84** with respect to the axis of the coupler **10** is less than the apex angle β of the

threads **38** of the segments **36**. It has been found that this relationship improves the holding power of the coupler. That is, this relationship renders the release of the coupler **10** from the spigot nozzle **94** more difficult. In other words, the inclined thread surfaces, in an axial place of the coupler, extend at greater acute angles to the axis of the coupler than the frustoconical surfaces of the casing, cover, and segments. As an example, when a spigot nozzle has threads with an apex angle β of 60°, it has been found advantageous to form frustoconical surfaces on the casing, cover, and segments **24**, **80**, **44**, **84** with angles α of about 45° to the axis of the coupler **10**.

[0046] While three segments are provided in the coupler illustrated so far, the invention is not limited to this number. For example, FIG. **12** shows a coupler **10** with four segments **97**, **98**, **99** **100** of substantially equal are length. It is generally advisable to increase the number of segments as a function of the diameter of the spigot nozzle **94** that is to be accommodated therein. Also, couplers having even-numbered segments can be used on spigot nozzles having entirely different thread pitches. For example in FIG. **12**, opposing thread segments **97**, **99** could adapt to standard threads, while thread segments **98**, **100** could adapt to metric threads.

[0047] The structures and methods herein illustrate the principles of the present invention. The invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects as exemplary and illustrative rather than restrictive. Therefore, the appended claims rather than the foregoing description define the scope of the invention. All modifications to the embodiments described herein that come within the meaning and range of equivalence of the claims are embraced within the scope of the invention.

What is claimed is:

1. A threaded coupler comprising:

a) a plurality of circumferentially distributed internally threaded segments arranged to create a bore for inserting an externally threaded member;

b) a casing surrounding the threaded segments, the casing having a first inclined surface of revolution extending at an acute angle to an axis of the coupler; and

b) a spring that resiliently urges the segments radially inward to the axis of the coupler, each of the plurality of segments having an inclined surface which defines a second inclined surface of revolution co-acting with the first inclined surface of revolution of the casing.

2. The coupler of claim **1** wherein the first and second inclined surfaces of revolution are positioned proximate an insertion end of the coupler.

3. The coupler of claim **1** wherein each of the plurality of segments have a substantially planar end that is axially spaced from the inclined surface of the segment.

4. The coupler of claim **3** wherein the spring that resiliently urges the segments comprises a wave spring that is seated upon and co-acting with the substantially planar end of the plurality of segments.

5. The coupler of claim **3** wherein the spring that resiliently urges the segments radially inward comprises a spring that is radially biased against the substantially planar ends of the plurality of segments.

6. The coupler of claim **5** further comprising a cover that retains the casing, wherein the spring is positioned between the cover and the substantially planar ends of the segments.

7. The coupler of claim **1** further comprising a segment pin protruding from the casing in a radially inward direction.

8. The coupler of claim **7** wherein the segment pin protrudes from the first inclined surface of revolution.

9. The coupler of claim **7** wherein the segment pin is positioned to co-act with an end of the segment nearest an insertion end of the coupler.

10. The coupler of claim **9** wherein two adjacent threaded segments are each grooved at ends nearest the insertion end the coupler so as to allow a predetermined clearance around one-half of the segment pin.

11. The coupler of claim **1** wherein an inside diameter of the bore is substantially equal to an outside diameter of a threaded household spigot nozzle.

12. A threaded coupler comprising:

a) a plurality of circumferentially distributed internally threaded segments arranged to create a bore for inserting an externally threaded member;

b) a casing surrounding the segments, the casing having a first inclined surface of revolution extending at an acute angle to an axis of the coupler;

c) a means for resiliently urging the segments radially inward to the axis of the coupler, wherein each of the plurality of segments includes an inclined surface that defines a second surface of revolution co-acting with the first inclined surface of revolution of the casing; and

d) a means for identifying individual thread segments and ordering them within the coupler.

13. A threaded coupler comprising:

a) at least three circumferentially distributed internally threaded segments arranged to create a bore for inserting an externally threaded member;

b) a means for resiliently urging the segments radially inward to an axis of the coupler; and

c) a means for identifying individual thread segments and ordering them within the coupler.

14. The coupler of claim **13** further comprising a casing, wherein the segments are in a desired order within the casing, the casing having a first incline surface of revolution extending at an acute angle to the axis of the coupler, each of the segments having an inclined surface which defines a second surface of revolution co-acting with the first inclined surface of revolution of the casing.

15. The coupler of claim **14** wherein the first and second inclined surfaces of revolution are located proximate to an insertion end of the coupler.

16. The coupler of claim **14** wherein each of the threaded segments have substantially planar ends axially spaced from the inclined surface of the segment.

17. The coupler of claim **16** wherein the means for resiliently urging the segments comprises a wave spring seated upon and co-acting with the substantially planar ends of the segments.

18. The coupler of claim **13** wherein the means for resiliently urging the segments radially inward comprises a spring radially biasing against the planar ends of the segments.

19. The coupler of claim **18** further comprising a cover for retaining the segment within the casing, the spring being positioned between the cover and the substantially planar surfaces of the segments.

20. The coupler of claim **13** further comprising a segment pin protruding from the casing in a radially inward direction.

21. The coupler of claim **20** wherein the segment pin protrudes from the first inclined surface of revolution.

22. The coupler of claim **20** wherein the segment pin is positioned to co-act with an end of the segment proximate to an insertion end of the coupler.

23. The coupler of claim **13** wherein the means for identifying thread segments includes two adjacent thread segments being grooved to allow clearance around one-half of the segment pin.

24. The coupler of claim **23** wherein the two adjacent threaded segments are grooved at their ends proximate to the insertion end of the coupler.

25. The coupler of claim **13** wherein an inside diameter of the bore is substantially equal to an outside diameter of a threaded household spigot nozzle.

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