and the joint assembly is completed. This process requires that the spaced relation of the segments, as established at the factory, be maintained during shipping to permit insertion of the pipe elements during eventual installation. However, potential exists for some coupling segments to be inadvertently displaced toward each other (compressed), due to contact with other couplings in the shipping container. Thus, at the point of use, some couplings may no longer be in the required spaced relation as established at the factory to ensure that the pipe element or elements may be easily inserted into the factory preassembled coupling. In such cases the installer may have to manually pull the housings apart to return the coupling segments to their intended spaced relation. This action by the installer may remedy the handling issue, but it is advantageous to avoid this step in the assembly process.

Summary

According to a first aspect of the present invention, there is provided a coupling for joining pipe elements, said coupling comprising:

a plurality of segments attached to one another end to end surrounding a central space for receiving said pipe elements, each said segment comprising a casting having:

a back wall;

first and second sidewalls attached to said back wall on opposite sides thereof, said back wall and said sidewalls defining a channel, said back wall defining a back surface facing said central space, said sidewalls defining respective first and second side surfaces facing said channel, each said side surface comprising:

a capture surface adjacent to said back surface and configured to engage a gasket positioned within the channel, each said capture surface having an orientation angle of 10˚ or less measured from a reference line extending radially from a longitudinal axis arranged coaxially with said segments through said central space, and

each said segment further comprising first and second adjustable attachment assemblies located at opposite ends of said segments for adjustably attaching said segments to one another in end to end relation,

wherein each said capture surface comprises a first and a second portion, said first capture surface portions being positioned proximate to said first adjustable attachment assembly, said second capture surface portions being positioned proximate to said second adjustable attachment assembly.

According to a second aspect of the present invention, there is provided a coupling for joining pipe elements, said coupling comprising:

a plurality of segments attached to one another end to end surrounding a central space for receiving said pipe elements, each said segment comprising a casting having:

a back wall;

first and second sidewalls attached to said back wall on opposite sides thereof, said back wall and said sidewalls defining a channel, said back wall defining a back surface facing said central space, said

sidewalls defining respective first and second side surfaces facing said channel, each said side surface comprising:

a capture surface adjacent to said back surface and configured to engage a gasket positioned within the channel, each said capture surface having an orientation angle of 10˚ or less measured from a reference line extending radially from a longitudinal axis arranged coaxially with said segments through said central space, and

each said segment further comprising first and second adjustable attachment assemblies located at opposite ends of said segments for adjustably attaching said segments to one another in end to end relation,

wherein each said segment comprises a relief surface contiguous with said capture surface, said relief surface having an orientation angle greater than 5˚ measured from a reference line extending radially from said longitudinal axis.

According to a third aspect of the present invention, there is provided a coupling for joining pipe elements, said coupling comprising:

a plurality of segments attached to one another end to end surrounding a central space for receiving said pipe elements, each said segment comprising a casting having:

a back wall;

first and second sidewalls attached to said back wall on opposite sides thereof, said back wall and said sidewalls defining a channel, said back wall defining a back surface facing said central space, said sidewalls defining respective first and second side surfaces facing said channel, each said side surface comprising:

a capture surface adjacent to said back surface and configured to engage a gasket positioned within the channel, each said capture surface having an orientation angle of 10˚ or less measured from a reference line extending radially from a longitudinal axis arranged coaxially with said segments through said central space, and

each said segment further comprising:

first and second adjustable attachment assemblies located at opposite ends of said segments for adjustably attaching said segments to one another in end to end relation,

a first contact surface positioned adjacent to said first attachment assembly;

a second contact surface positioned adjacent to said second attachment assembly,

wherein said first contact surface on a first segment of said plurality of segments is in facing relation with said first contact surface on a second segment of said plurality of segments, and said second contact surface on said first segment is in facing relation with said second contact surface on said second segment; wherein

said first and second contact surfaces are angularly oriented and have opposite slopes such that contact between said first and second contact surfaces causes said segments to rotate in opposite directions to one another about a rotation axis perpendicular to said longitudinal axis.

According to a fourth aspect of the present invention, there is provided a coupling for joining pipe elements, said coupling comprising:

a plurality of segments attached to one another end to end surrounding a central space for receiving said pipe elements, each said segment comprising a casting having:

a back wall;

first and second sidewalls attached to said back wall on opposite sides thereof, said back wall and said sidewalls defining a channel, said back wall defining a back surface facing said central space, said sidewalls defining respective first and second side surfaces facing said channel, each said side surface comprising:

a capture surface adjacent to said back surface and configured to engage a gasket positioned within the channel, each said capture surface having an orientation angle of 10˚ or less measured from a reference line extending radially from a longitudinal axis arranged coaxially with said segments through said central space, and

each said segment further comprising first and second adjustable attachment assemblies located at opposite ends of said segments for adjustably attaching said segments to one another in end to end relation,

said coupling further comprising a gasket, said gasket comprising:

a web forming a circular loop received within said channel;

a first bulbous rim extending circumferentially around a first side of said web, said first bulbous rim projecting toward said back wall and said first sidewall;

a second bulbous rim extending circumferentially around a second side of said web opposite to said first side, said second bulbous rim projecting toward said back wall and said second sidewall;

a first lobe attached to said first side of said web, said first lobe extending circumferentially around said loop and projecting toward said central space, said first lobe defining a first sealing surface at a free end thereof, said first sealing surface being engageable with one of said pipe elements received within said central space;

a second lobe attached to said second side of said web, said second lobe extending circumferentially around said loop and projecting toward said central space, said second lobe defining a second sealing surface at a free end thereof, said second sealing surface being engageable with one of said pipe elements received within said central space; wherein

said first bulbous rim engages said capture surface on said first side surface and said second bulbous rim engages said capture surface on said second side surface thereby supporting said segments in a factory preassembled state such that said segments are supported in spaced relation from one another sufficient to permit insertion of said pipe elements into said central space while said segments are attached to one another end to end surrounding said central space.

The invention concerns a coupling for joining pipe elements. In an example embodiment the coupling comprises a plurality of segments attached to one another end to end surrounding a central space for receiving the pipe elements. In this example each segment comprises a casting having a back wall, first and second sidewalls attached to the back wall on opposite sides thereof, the back wall and the sidewalls defining a channel, the back wall defining a back surface facing the central space, the sidewalls defining respective first and second side surfaces facing the channel. Each side surface comprises a capture surface adjacent to the back surface. By way of example each capture surface has an orientation angle of 10˚ or less measured from a reference line extending radially from a longitudinal axis arranged coaxially with the segments through the central space. Each segment may further comprise first and second adjustable attachment assemblies located at opposite ends of the segments for adjustably attaching the segments to one another in end to end relation.

In an example embodiment each segment comprises a relief surface contiguous with the capture surface. The relief surface has an orientation angle greater than 5˚ measured from a reference line extending radially from the longitudinal axis. Further by way of example the orientation angle of the capture surfaces ranges from 10˚ to 1˚. In a particular example embodiment the orientation angle of the capture surface is 5˚. Further by way of example the orientation angle of the relief surface ranges from 5˚ to 10˚. In an example embodiment the capture surface comprises from 50% to 100% of a depth of each of the first and second sidewalls. In a specific example, the capture surface comprises 50% of a depth of each of the first and second sidewalls. In a further example the relief surface comprises from 75% to 0% of a depth of each of the first and second sidewalls. In another example the relief surface comprises 50% of a depth of each of the first and second sidewalls.

An example embodiment may comprise, at most, a first and a second of the segments. The first adjustable attachment assembly on the first segment is in facing relation with the first adjustable attachment assembly on the second segment and the second adjustable attachment assembly on the first segment is in facing relation with the second adjustable attachment assembly on the second segment.

What is claimed is:

1. A coupling for joining pipe elements, said coupling comprising:

a plurality of segments attached to one another end to end surrounding a central space for receiving said pipe elements, each said segment comprising a casting having:

a back wall;

first and second sidewalls attached to said back wall on opposite sides thereof, said back wall and said sidewalls defining a channel, said back wall defining a back surface facing said central space, said sidewalls defining respective first and second side surfaces facing said channel, each said side surface comprising:

a capture surface adjacent to said back surface and configured to engage a gasket positioned within the channel, each said capture surface having an orientation angle of 10˚ or less measured from a reference line extending radially from a longitudinal axis arranged coaxially with said segments through said central space, and

each said segment further comprising first and second adjustable attachment assemblies located at opposite ends of said segments for adjustably attaching said segments to one another in end to end relation,

wherein each said capture surface comprises a first and a second portion, said first capture surface portions being positioned proximate to said first adjustable attachment assembly, said second capture surface portions being positioned proximate to said second adjustable attachment assembly.

2. A coupling for joining pipe elements, said coupling comprising:

a plurality of segments attached to one another end to end surrounding a central space for receiving said pipe elements, each said segment comprising a casting having:

a back wall;

first and second sidewalls attached to said back wall on opposite sides thereof, said back wall and said sidewalls defining a channel, said back wall defining a back surface facing said central space, said sidewalls defining respective first and second side surfaces facing said channel, each said side surface comprising:

a capture surface adjacent to said back surface and configured to engage a gasket positioned within the channel, each said capture surface having an orientation angle of 10˚ or less measured from a reference line extending radially from a longitudinal axis arranged coaxially with said segments through said central space, and

each said segment further comprising first and second adjustable attachment assemblies located at opposite ends of said segments for adjustably attaching said segments to one another in end to end relation,

wherein each said segment comprises a relief surface contiguous with said capture surface, said relief surface having an orientation angle greater than 5˚ measured from a reference line extending radially from said longitudinal axis.

3. The coupling according to claim 1, wherein said orientation angle of said capture surfaces ranges from 10˚ to 1˚.

4. The coupling according to claim 1, wherein said orientation angle of said capture surface is 5˚.

5. The coupling according to claim 2, wherein said orientation angle of said relief surface ranges from 5˚ to 10˚.

6. The coupling according to claim 1, wherein said capture surface comprises from 50% to 100% of a depth of each of said first and second sidewalls.

7. The coupling according to claim 1, wherein said capture surface comprises 50% of a depth of each of said first and second sidewalls.

8. The coupling according to claim 2, wherein said relief surface comprises from 75% to 0% of a depth of each of said first and second sidewalls.

9. The coupling according to claim 2, wherein said relief surface comprises 50% of a depth of each of said first and second sidewalls.

10. The coupling according to claim 1, comprising at most a first and a second of said segments, wherein said first adjustable attachment assembly on said first segment is in facing relation with said first adjustable attachment assembly on said second segment and said second adjustable attachment assembly on said first segment is in facing relation with said second adjustable attachment assembly on said second segment.

11. The coupling according to claim 10, wherein each said attachment assembly comprises:

a respective lug defining an opening;

a respective adjustable fastener received within said openings; wherein

said fasteners extend between said lugs for adjustably attaching said segments to one another.

12. A coupling for joining pipe elements, said coupling comprising:

a plurality of segments attached to one another end to end surrounding a central space for receiving said pipe elements, each said segment comprising a casting having:

a back wall;

first and second sidewalls attached to said back wall on opposite sides thereof, said back wall and said sidewalls defining a channel, said back wall defining a back surface facing said central space, said sidewalls defining respective first and second side surfaces facing said channel, each said side surface comprising:

a capture surface adjacent to said back surface and configured to engage a gasket positioned within the channel, each said capture surface having an orientation angle of 10˚ or less measured from a

reference line extending radially from a longitudinal axis arranged coaxially with said segments through said central space, and

each said segment further comprising:

first and second adjustable attachment assemblies located at opposite ends of said segments for adjustably attaching said segments to one another in end to end relation,

a first contact surface positioned adjacent to said first attachment assembly;

a second contact surface positioned adjacent to said second attachment assembly,

wherein said first contact surface on a first segment of said plurality of segments is in facing relation with said first contact surface on a second segment of said plurality of segments, and said second contact surface on said first segment is in facing relation with said second contact surface on said second segment; wherein

said first and second contact surfaces are angularly oriented and have opposite slopes such that contact between said first and second contact surfaces causes said segments to rotate in opposite directions to one another about a rotation axis perpendicular to said longitudinal axis.

13. A coupling for joining pipe elements, said coupling comprising:

a plurality of segments attached to one another end to end surrounding a central space for receiving said pipe elements, each said segment comprising a casting having:

a back wall;

first and second sidewalls attached to said back wall on opposite sides thereof, said back wall and said sidewalls defining a channel, said back wall defining a back surface facing said central space, said sidewalls defining respective first and second side surfaces facing said channel, each said side surface comprising:

a capture surface adjacent to said back surface and configured to engage a gasket positioned within the channel, each said capture surface having an orientation angle of 10˚ or less measured from a reference line extending radially from a longitudinal axis arranged coaxially with said segments through said central space, and

each said segment further comprising first and second adjustable attachment assemblies located at opposite ends of said segments for adjustably attaching said segments to one another in end to end relation,

said coupling further comprising a gasket, said gasket comprising:

a web forming a circular loop received within said channel;

a first bulbous rim extending circumferentially around a first side of said web, said first bulbous rim projecting toward said back wall and said first sidewall;

a second bulbous rim extending circumferentially around a second side of said web opposite to said first side, said second bulbous rim projecting toward said back wall and said second sidewall;

a first lobe attached to said first side of said web, said first lobe extending circumferentially around said loop and projecting toward said central space, said first lobe defining a first

sealing surface at a free end thereof, said first sealing surface being engageable with one of said pipe elements received within said central space;

a second lobe attached to said second side of said web, said second lobe extending circumferentially around said loop and projecting toward said central space, said second lobe defining a second sealing surface at a free end thereof, said second sealing surface being engageable with one of said pipe elements received within said central space; wherein

said first bulbous rim engages said capture surface on said first side surface and said second bulbous rim engages said capture surface on said second side surface thereby supporting said segments in a factory preassembled state such that said segments are supported in spaced relation from one another sufficient to permit insertion of said pipe elements into said central space while said segments are attached to one another end to end surrounding said central space.

14. The coupling according to claim 13, further comprising a leg positioned between said first and second lobes, said leg projecting from said web toward said central space.

15. The coupling according to claim 14, wherein said leg further comprises a plurality of discrete tabs positioned on an inner perimeter of said leg and projecting toward said central space, said tabs being arranged in spaced relation from one another along said inner perimeter.

16. The coupling according to claim 15, wherein said tabs have a curved profile.

17. The coupling according to claim 13, wherein said web has a perimetral surface facing away from said central space, said perimetral surface being concave.

18. The coupling according to claim 13, further comprising first and second glands extending respectively from said first and second lobes.

19. The coupling according to claim 13, wherein said first and second bulbous rims extend continuously about said first and second sides of said web respectively.

20. The coupling according to claim 1, wherein said first capture surface portion subtends an angle ranging from 25˚ to 45˚ and said second capture surface portion subtends an angle ranging from 25˚ to 45˚ measured about said longitudinal axis.

21. The coupling according to claim 1, wherein each said first and second side surface further comprises respective first and second support surfaces adjacent to said back surface, said first support surface being positioned between said first and second capture surface portions on said first side surface, said second support surface being positioned between said first and second capture surface portions on said second side surface, said first support surface having an orientation angle different from said orientation angles of said first and second capture surface portions on said first side surface, said second

support surface having an orientation angle different from said orientation angles of said first and second capture surface portions on said second side surface.

22. The coupling according to claim 21, wherein said first and second support surfaces each have an orientation angle ranging from 15˚ to 30˚ measured from respective first and second reference lines extending radially from said longitudinal axis.

23. The coupling according to claim 22, wherein said first support surface subtends an angle ranging from 90˚ to 110˚ measured about said longitudinal axis and said second support surface subtends an angle ranging from 90˚ to 110˚ measured about said longitudinal axis.

24. The coupling according to claim 21, further comprising a gasket, said gasket comprising:

a web forming a circular loop received within said channel;

a first bulbous rim extending circumferentially around a first side of said web, said first bulbous rim projecting toward said back wall and said first sidewall;

a second bulbous rim extending circumferentially around a second side of said web opposite to said first side, said second bulbous rim projecting toward said back wall and said second sidewall;

a first lobe attached to said first side of said web, said first lobe extending circumferentially around said loop and projecting toward said central space, said first lobe defining a first sealing surface at a free end thereof, said first sealing surface being engageable with one of said pipe elements received within said central space;

a second lobe attached to said second side of said web, said second lobe extending circumferentially around said loop and projecting toward said central space, said second lobe defining a second sealing surface at a free end thereof, said second sealing surface being engageable with one of said pipe elements received within said central space.

25. The coupling according to claim 24, wherein, when said coupling is in a factory preassembled state:

said web and said first and second bulbous rims engage said back surfaces of said segments along said first and second capture surface portions; and

said first lobe and said first bulbous rim engages said first support surface and said second lobe and said second bulbous rim engages said second support surface; wherein

engagement between said gasket and said segments supports said segments in said factory preassembled state such that said segments are maintained in spaced relation from one another sufficient to permit insertion of said pipe elements into said central space while said segments are attached to one another end to end surrounding said central space.

26. The coupling according to claim 21, wherein said first capture surface portion subtends an angle ranging from 25˚ to 45˚ and said second capture surface portion subtends an angle ranging from 25˚ to 45˚ measured about said longitudinal axis.