

Cross Reference to Related Applications

This application is based upon and claims benefit of priority to US Provisional Application No. 62/935,785, filed November 15, 2019, which application is hereby incorporated by reference.

10 Field of the Invention

This invention relates to couplings for joining pipe elements

Background

This invention concerns segmented mechanical couplings which have arcuate projections, known as keys, which engage grooves in pipe elements in order to mechanically couple those pipe elements in end to end relationship, and which further have a sealing element which ensures the leak tightness of the mechanical joint provided by the coupling. Such couplings comprise segments which have bolting lugs, and bolt and nut assemblies are disposed within through holes in those lugs. These couplings are typically assembled by tightening of the bolts, which bring the segments toward one another, compressing the seal and bringing the inner faces of the segments, in particular, the faces on the lugs, to bear against one another, with the abutting contact between those inner faces serving as a “stop” which signals to the installer that the coupling is fully assembled when no visual gap between the faces remains. This visual gap is particularly noticeable at the inboard of the fasteners where the gasket may be visualized through the gap. While this planar face-to-face state may often signal appropriate tightening of the bolt, there are some conditions under which it is desirable or unavoidable for a coupling to be fully and properly assembled in a condition such that the inner faces of the segments are in partial or line contact, but are not fully in planar face to face contact. Such conditions may be unavoidable such as when pipe that is grooved incorrectly, is out of round, or out of specification; or such conditions may be desirable, such as when it is intended that the keys firmly engage and

5 deform about the pipe element in all cases, requiring that some tolerance exist on the gap between the bolting faces such that they may not be able to reach planar face-to-face contact. In either of such conditions, it is preferable that the installer not misuse the coupling by continuing to tighten the bolts to attempt to achieve planar face-to-face contact as such excessive tightening may create unintended
10 high stresses within the bolt and nut assemblies. The propensity to create high stresses in the bolt and nut assemblies may be exacerbated by the common availability of battery powered impact wrenches that can apply very high torque to the nut and bolt assemblies but with very little physical feedback to the installer of the torque that is being achieved (in contrast to a simple wrench that provides the
15 installer a direct indication of the amount of torque they are applying). Thus, it is desirable to improve mechanical couplings such that an installer will be provided with a visual indication of tightening that removes the ability to see the gasket between the bolting lugs, even in conditions that are not fully planar face to face contact of the inner faces of the lugs.

20 Summary

The invention concerns a coupling for joining pipe elements in end to end relation. An example embodiment of a coupling according to the invention comprises first and second segments attached to one another end to end surrounding a central space for receiving the pipe elements. A first attachment
25 member extends from a first end of the first segment. The first attachment member defines a first face. A second attachment member extends from a first end of the second segment. The second attachment member defines a second face. The first and second faces are in facing relation. A first shroud is positioned on the first attachment member and extends along at least a portion of the first face. The first
30 shroud projects toward the second attachment member. A first recess is positioned on the second attachment member and extends along at least a portion of the second face. The first recess receives the first shroud when the first and second attachment members are drawn toward one another. An adjustable first fastener

5 extending between the first and second attachment members for drawing the first and second attachment members toward one another.

An example coupling may further comprise a second shroud positioned on the second attachment member. The second shroud extends along at least a portion of the second face. The second shroud projects toward the first attachment member. A second recess is positioned on the first attachment member and extending along at least a portion of the first face. The second recess receives the second shroud when the first and second attachment members are drawn toward one another. By way of example the second shroud is positioned on an opposite side of the second attachment member from the first recess and the second recess is positioned on an opposite side of the first attachment member from the first shroud.

In an example embodiment a third attachment member extends from a second end of the first segment. The third attachment member defines a third face. A fourth attachment member extends from a second end of the second segment. The fourth attachment member defines a fourth face. The third and fourth faces are in facing relation. A third shroud is positioned on the third attachment member and extends along at least a portion of the third face. The third shroud projects toward the fourth attachment member. A third recess is positioned on the fourth attachment member and extends along at least a portion of the fourth face. The third recess receives the third shroud when the third and fourth attachment members are drawn toward one another. An adjustable second fastener extends between the third and fourth attachment members for drawing the third and fourth attachment members toward one another.

In a further example a fourth shroud is positioned on the fourth attachment member. The fourth shroud extends along at least a portion of the fourth face. The fourth shroud projects toward the third attachment member. The fourth recess is positioned on the third attachment member and extends along at least a portion of

5 the third face. The fourth recess receives the fourth shroud when the third and fourth attachment members are drawn toward one another.

By way of example the third shroud is positioned on an opposite side of the third attachment member from the fourth recess and the fourth shroud is positioned on an opposite side of the fourth attachment member from the third
10 recess. A further example embodiment according to the invention comprises a hinge positioned at a second end of each of the first and second segments. The first and second segments pivot about the hinge when the first and second segments are drawn toward one another. In an example embodiment a second shroud is positioned on the second attachment member. The second shroud
15 extends along at least a portion of the second face. The second shroud projects toward the first attachment member. A second recess is positioned on the first attachment member and extends along at least a portion of the first face. The second recess receive the second shroud when the first and second attachment members are drawn toward one another. In an example embodiment the second
20 shroud is positioned on an opposite side of the second attachment member from the first recess and the second recess is positioned on an opposite side of the first attachment member from the first shroud.

By way of example the hinge comprises a first boss projecting from the second end of the first segment. A second boss projects from the second end of the
25 second segment and is positioned adjacent to the first boss. A first fulcrum is positioned on the first boss and contacts the second boss. The segments pivot about the first fulcrum. A link extends between and captures the first and second bosses. An example embodiment comprises a second fulcrum positioned on the second boss. The second fulcrum contacts the first fulcrum. By way of example, a
30 first land is positioned contiguous with the first fulcrum on the first boss and a second land is positioned contiguous with the second fulcrum on the second boss. The first and second lands are oriented angularly with respect to a plane defining an interface between the first and second segments. Further by way of example, a first head projects from the first boss and a second head projects from the second

5 boss. The link engages the first and second heads for retaining the link to the bosses. In an example embodiment the link comprises a ring encircling the first and second bosses.

In an example embodiment according to the invention the first attachment member comprises a first lug defining a first hole for receiving the first fastener
10 and the second attachment member comprises a second lug defining a second hole for receiving the first fastener. In a specific example a portion of the first face surrounds the first hole and a portion of the second face surrounds the second hole. In a further example embodiment the first attachment member comprises a first lug defining a first hole for receiving the first fastener, the second attachment
15 member comprises a second lug defining a second hole for receiving the first fastener, the third attachment member comprises a third lug defining a third hole for receiving the second fastener and the fourth attachment member comprises a fourth lug defining a fourth hole for receiving the second fastener. A portion of the first face surrounds the first hole, a portion of the second face surrounds the
20 second hole, a portion of the third face surrounds the third hole and a portion of the face surrounds the fourth hole in an example embodiment.

An example embodiment of a coupling according to the invention may further comprise a first index mark positioned on the first attachment member and a second index mark positioned on the second attachment member. The first and
25 second index marks align with one another when the first and second segments are drawn toward one another. By way of example, the first and second index marks may be integrally formed with the first and second attachment members respectively. Additionally by way of example, a coupling according to the invention may comprise a first index mark positioned on the first attachment
30 member, a second index mark positioned on the second attachment member, a third index mark positioned on the third attachment member and a fourth index mark positioned on the fourth attachment member. The first and second index marks align with one another, and the third and fourth index marks align with one another when the first and second segments are drawn toward one another in an

5 example embodiment. In a particular example embodiment the first, second, third and fourth index marks are integrally formed with the first, second, third and fourth attachment members respectively.

An example embodiment may further comprise a first tooth positioned at the first end of the first segment. The first tooth projects toward the second
10 segment. A first socket is positioned at the first end of the second segment. The first socket receives the first tooth when the first and second segments are drawn toward one another. Further by way of example, a second tooth may be positioned at the first end of the second segment. The second tooth projects toward the first segment. A second socket may be positioned at the first end of the first segment.
15 The second socket receives the second tooth when the first and second segments are drawn toward one another.

In an example coupling embodiment each first and second segments comprises first and second arcuate projections on opposite sides of each segment. Each arcuate projection extends between the first and second ends of the
20 segments. Each arcuate projection is engageable with one of the pipe elements when the first and second segments are drawn toward one another. An example embodiment further comprises a seal positioned between the segments. By way of example the seal may comprise a ring. The ring supports the first and second segments in space relation sufficient to insert the pipe elements into the central
25 space. In a specific example embodiment the first fastener comprises a threaded bolt and nut.

Brief Description of the Drawings

Figure 1 is a side view of an example embodiment of a coupling according to the invention shown in a factory assembled configuration;

30 Figure 2 is an isometric view of a component of the coupling shown in Figure 1;

5 Figure 3 is an end view of the coupling shown in Figure 1;

Figure 4 is an isometric view of the coupling shown in Figure 1 as it would appear when engaging pipe elements (not shown);

Figure 5 is a side view of another example embodiment of a coupling according to the invention shown in a factory assembled configuration;

10 Figure 6 is an isometric view of a component of the coupling shown in Figure 5;

Figure 7 is an end view of the coupling shown in Figure 5;

Figure 8 is an end view of the coupling shown in Figure 5 showing the end opposite from that of Figure 7; and

15 Figure 9 is an isometric view of the coupling shown in Figure 5 as it would appear when engaging pipe elements (not shown).

Detailed Description

Figure 1 shows an example coupling 10 for joining pipe elements (not shown) in end to end relation. Coupling 10 comprises first and second segments 12 and 14 attached to one another end to end surrounding a central space 16 for receiving the pipe elements. A first attachment member 18 extends from a first end 20 of the first segment 12. As shown in Figure 2, attachment member 18 defines a first face 22. In this example embodiment the attachment member 18 comprises a first lug 24. Lug 24 defines a first hole 26 for receiving a first fastener 28 as shown in Figure 1. A portion of the first face 22 surrounds the hole 26 in this embodiment.

As further shown in Figure 1, a second attachment member 30 extends from a first end 32 of the second segment 14. Second attachment member 30 defines a second face 34. The first and second attachment members 18 and 30 are arranged such that the first and second faces 22 and 34 are in facing relation with

5 one another. Similar to the first attachment member, the second attachment member 30 comprises a second lug 36 which defines a second hole 38 for receiving the fastener 28. A portion of the second face 34 on second attachment member 30 surrounds the second hole 38.

10 As shown in Figures 2 and 3, a first shroud 40 is positioned on the first attachment member 18. First shroud 40 extends along at least a portion of the first face 22. The first shroud projects toward the second attachment member 30. A first recess 42 is positioned on the second attachment member 30 and extends along at least a portion of the second face 34. As shown in Figure 4, the first recess 42 receives the first shroud 40 when the first and second attachment
15 members 18 and 30 are drawn toward one another to engage the pipe elements (not shown) and form a joint. In this example embodiment, fastener 28, comprising a threaded bolt 44 and nut 46, is adjustably tightenable to draw the attachment members 18 and 30 toward one another and into engagement as described below.

20 As shown in Figure 3, a second shroud 48 is positioned on the second attachment member 30. Second shroud 48 extends along at least a portion of the second face 34 and projects toward the first attachment member 18. A second recess 50 is positioned on the first attachment member 18. Second recess 50 extends along at least a portion of the first face 22. The second recess 22 receives
25 the second shroud 50 when the first and second attachment members 18 and 30 are drawn toward one another when the fastener 28 is tightened.

It is advantageous to design segments 12 and 14 as reverse mirror images of one another with respect to their attachment member interfaces including faces 22 and 34, shrouds 40 and 48 and recesses 42 and 50 so that only one type of
30 segment needs to be manufactured. This is ensured by having the second shroud 48 positioned on an opposite side of the second attachment member 30 from the first recess 42 and positioning the second recess 50 on an opposite side of the first attachment member 18 from the first shroud 40. It is further advantageous to use

5 indicia on the segments 12 and 14 which direct attention to inspection points
which may be used to visually confirm when a satisfactory joint has been
achieved. By way of example, Figure 1 shows a first index mark 52 positioned on
the first attachment member 18 and a second index mark 54 positioned on the
second attachment member 30. As shown in Figure 4, the first and second index
10 marks 52 and 54 align with one another when the first and second segments 12
and 14 are drawn together and point to a position where the first and second faces
22 and 34 on respective attachment members 18 and 30 contact one another when
a satisfactory joint has been achieved. If the faces 22 and 34 are not in contact at
the point indicated by index marks 52 and 54 the coupling has not been properly
15 installed. As shown in Figure 3, it is convenient to position index marks 52 and
54 on both sides of both attachment members 18 and 30 in case one of the sides of
the coupling 10 is not conveniently visible when installed. Index marks 52 and 54
are integrally cast with the segments 12 and 14, although other forms of index
marks, such as machined markings or decals are also feasible.

20 To aid in proper inspection of the installed coupling and avoid distracting
false indicators of a satisfactory joint, the engagement between the shrouds 40 and
48 and their respective receiving recesses 42 and 50 blocks the line of sight
toward the central space 16, where visible gaps between the segments, often
highlighted by a color contrast between the segments and a seal for example, have
25 been traditionally used as indicators, albeit in some cases insufficient indicators,
of a satisfactory joint (see Figure 4).

As shown in Figures 1 and 4, example coupling 10 comprises a hinge 56
positioned at respective second ends 58 and 60 of the first and second segments 12
and 14. The first and second segments 12 and 14 pivot about the hinge 56 when
30 they are drawn toward one another as shown in a comparison of Figures 1 and 4.
Although many hinge types are feasible, in this embodiment the hinge 56
comprises a first boss 62 projecting from the second end 58 of the first segment
12. A second boss 64 projects from the second end 60 of the second segment 14
and is positioned adjacent to the first boss 62. First and second fulcrums 66 and

5 68 are respectively positioned on the first and second bosses 62 and 64. The fulcrums contact one another to permit the segments 12 and 14 to pivot as shown in Figures 1 and 4. Fulcrums 66 and 68 may be at least partially defined by respective first and second lands 70 and 72. First land 70 is positioned contiguous with the first fulcrum 66 on the first boss 62 and second land 72 is positioned
10 contiguous with the second fulcrum 68 on the second boss 64. The first and second lands 70 and 72 are oriented angularly with respect to the first and second faces 22 and 34 of the first and second segments 12 and 14 whose intersection defines the interface between the segments.

Example hinge 56 further comprises a first head 74 projecting from the
15 first boss 62 and a second head 76 projecting from the second boss 64. Heads 74 and 76 engage and retain a link 78 to the bosses 62 and 64 which holds the segments 12 and 14 together. In this example the link 78 comprises a ring 80 encircling the first and second bosses.

As shown in Figure 2, the example coupling 10 according to the invention
20 may further comprise a first tooth 82 positioned at the first end 20 of the first segment 12. As shown in Figure 3, the first tooth 82 projects toward the second segment 14 and is received within a first socket 84 positioned at the first end 32 of the second segment 14. The first socket 84 receives the first tooth 82 when the first and second segments 12 and 14 are drawn toward one another. A second
25 tooth 86 may also be positioned at the first end 32 of the second segment 14. The second tooth 86 projects toward the first segment 12 and is received within a second socket 88 (see Figure 2) positioned at the first end 20 of the first segment 12. The second socket 88 receives the second tooth 86 when the first and second segments 12 and 14 are drawn toward one another. Engagement between the teeth
30 82 and 86 and their respective receiving sockets 84 and 88 strengthens the joint formed by the coupling 10. As with the shrouds and their receiving recesses, the teeth and sockets of the first and second segments 12 and 14 are positioned as reversed mirror images of one another.

5 As shown in Figure 2, when coupling 10 is used with grooved end pipe elements, each of the first and second segments comprises first and second arcuate projections 90 and 92 on opposite sides of each segment 12 and 14 (12 shown). Each arcuate projection 90, 92 extends between the first (20, 32) and second (58, 60) ends of the segments 12 and 14. Each arcuate projection is engageable with
10 one of the pipe elements when the first and second segments are drawn toward one another. As shown in Figure 1, a seal 94 is positioned between the segments 12 and 14. In this example embodiment the seal comprises a ring 96. Advantageously, the ring 96 may be used to support the first and second segments 12 and 14 in spaced relation sufficient to permit insertion of the pipe elements into
15 the central space 16. This is known as the “factory assembled” configuration (see Figure 1), the coupling 10 being supplied to the end user in this configuration, ready for installation without the need to disassemble and then reassemble the coupling. The installer merely inserts the pipe elements into the central space 16 and then tightens the fastener 28. A proper joint is confirmed by inspection of the
20 contacting faces 22 and 34 at the index marks 52 and 54 (see Figure 4).

Figure 5 shows another example coupling embodiment 98 according to the invention for joining pipe elements. Coupling 98 comprises first and second segments 100, 102, attached to one another end to end surrounding a central space 104 for receiving the pipe elements (not shown). A first attachment member 106
25 extends from a first end 108 of the first segment 100; a second attachment member 110 extends from a first end 112 of the second segment 102, a third attachment member 114 extends from a second end 116 of the first segment 100 and a fourth attachment member 118 extends from a second end 120 of the second segment 102. Each attachment member defines a face. As shown by way
30 of example in Figure 6, the first attachment member 106 defines a first face 122. As shown in Figure 7, the second attachment member 110 defines a second face 124. The first and second faces 122 and 124 are in facing relation. Figure 8 shows the third attachment member 114 which defines a third face 126, and the fourth attachment member 118 which defines a fourth face 128. The third and fourth

5 faces 126 and 128 are in facing relation. As shown in Figure 5, first and second fasteners 130 and 132 join the segments 100 and 102 via the attachment members at opposite ends of each segment. As shown in Figure 6, the first attachment member 106 comprises a first lug 134 which defines a first hole 136 for receiving the first fastener 130. Figure 7 shows the second attachment member 110 which
10 comprises a second lug 138 defining a second hole 140 which also receives the first fastener 130. As shown in Figure 8, the third attachment member 114 comprises a third lug 142 which defines a third hole 144 and the fourth attachment member 118 comprises a fourth lug 146 defining a fourth hole 148. The third and fourth holes receive the second fastener 132. Faces 122, 124, 126 and 128 on the
15 first and second segments 100 and 102 have portions which surround the hole defined by the lug on which the face resides. An example of this configuration is shown in Figure 6 wherein a portion of the first face 122 surrounds the first hole 136 defined by the first lug 134 at the first end 112 of the first segment 100. The second, third and fourth faces 124, 126 and 128 on the second, third and fourth
20 lugs 138, 142 and 146 are similarly arranged.

As shown in Figure 6, a first shroud 150 is positioned on the first attachment member 106. First shroud 150 extends along at least a portion of the first face 122 and, as shown in Figure 7, projects toward the second attachment member 110. A first recess 152 is positioned on the second attachment member
25 110 and extends along at least a portion of the second face 124. First recess 152 receives the first shroud 150 when the first and second attachment members 106 and 110 are drawn toward one another as shown in Figure 9. As further shown in Figure 7, a second shroud 154 is positioned on the second attachment member 110 and extends along at least a portion of the second face 124. The second shroud
30 154 projects toward the first attachment member 106 and is received within a second recess 156 positioned on the first attachment member 106. Second recess 156 extends along at least a portion of the first face 122.

As shown in Figure 8, a third shroud 158 is positioned on the third attachment member 114. Third shroud 158 extends along at least a portion of the

5 third face 126 and projects toward the fourth attachment member 118. A third recess 160 is positioned on the fourth attachment member 118 and extends along at least a portion of the fourth face 128. Third recess 160 receives the third shroud 158 when the third and fourth attachment members 114 and 118 are drawn toward one another. As further shown in Figure 8, a fourth shroud 162 is positioned on
10 the fourth attachment member 118 and extends along at least a portion of the fourth face 128. The fourth shroud 162 projects toward the third attachment member 114 and is received within a fourth recess 164 positioned on the third attachment member 114. Fourth recess 164 extends along at least a portion of the third face 126.

15 It is advantageous to design segments 100 and 102 as reverse mirror images of one another with respect to their attachment member interfaces including faces 122, 124, 126 and 128, shrouds 150, 154, 158 and 162 and recesses 152, 156, 160 and 164 so that only one type of segment needs to be manufactured. This is ensured by having the second shroud 154 positioned on an
20 opposite side of the second attachment member 110 from the first recess 152 and positioning the second recess 156 on an opposite side of the first attachment member 106 from the first shroud 150. Likewise, the third shroud 158 is positioned on an opposite side of the third attachment member 114 from the fourth recess 164 and the fourth shroud 162 is positioned on an opposite side of the
25 fourth attachment member 118 from the third recess 160.

It is further advantageous to use indicia on the segments 100 and 102 which direct attention to inspection points which may be used to visually confirm when a satisfactory joint has been achieved. By way of example, Figures 7 and 8 show a first index mark 166 is positioned on the first attachment member 106, a
30 second index mark 168 is positioned on the second attachment member 110, a third index mark 170 is positioned on the third attachment member 114 and a fourth index mark 172 is positioned on the fourth attachment member 118. As shown in Figure 9, the index marks 166 and 168 align with one another when the first and second segments 100 and 102 are drawn together and point to a position

5 where the first and second faces 122 and 124 on respective attachment members
106 and 110 contact one another when a satisfactory joint has been achieved.
Figure 9 also shows the third and fourth index marks 170 and 172 aligning with
one another when the first and second segments 100 and 102 are drawn together.
Index marks 170 and 172 point to a position where the third and fourth faces 126
10 and 128 on respective attachment members 114 and 118 contact one another when
a satisfactory joint has been achieved. If the faces 122 and 124 are not in contact
at the point indicated by index marks 166 and 168, and if the faces 126 and 128
are not in contact at the point indicated by index marks 170 and 172, then the
coupling 98 has not been properly installed. As shown in Figures 7 and 8, it is
15 convenient to position index marks 166, 168, 170 and 172 on both sides of the
attachment members 106, 110, 114 and 118 in case one of the sides of the
coupling 98 is not conveniently visible when installed. Index marks 166, 168, 170
and 172 are integrally cast with the segments 100 and 102, although other forms
of index marks, such as machined markings or decals are also feasible.

20 To aid in proper inspection of the installed coupling and avoid distracting
false indicators of a satisfactory joint, the engagement between the shrouds 150,
154, 158 and 162 and their respective receiving recesses 152, 156, 160 and 164
blocks the line of sight toward the central space 104, where visible gaps between
the segments, often highlighted by a color contrast between the segments and a
25 seal for example, have been traditionally used as indicators, albeit in many cases
false indicators, of a satisfactory joint.

As shown in Figure 6, a first tooth 174 is positioned at the first end 108 of
the first segment 100. As shown in Figure 7, the first tooth 174, when present,
projects toward the second segment 102 where it is received within a first socket
30 176 positioned at the first end 112 of the second segment 102. The first socket
176 receives the first tooth 174 when the first and second segments 100, 102 are
drawn toward one another. As further shown in Figure 7, a second tooth 178 may
be positioned at the first end 112 of the second segment 102. The second tooth
178, when present, projects toward the first segment 100 and is received within a

5 second socket 180 positioned at the first end 108 of the first segment 100 (see also Figure 6). The second socket 180 receives the second tooth 178 when the first and second segments 100, 102 are drawn toward one another.

As shown in Figure 8, a third tooth 182 may be positioned at the second end 116 of the first segment 100. The third tooth 182 projects toward the second
10 segment 102 where it is received within a third socket 184 positioned at the second end 120 of the second segment 102. The third socket 184 receives the third tooth 182 when the first and second segments 100, 102 are drawn toward one another. As further shown in Figure 8, a fourth tooth 186 may be positioned at the second end 120 of the second segment 102. The fourth tooth 186 projects toward
15 the first segment 100 and is received within a fourth socket 188 positioned at the second end 116 of the first segment 100. The fourth socket 188 receives the fourth tooth 186 when the first and second segments 100, 102 are drawn toward one another.

Engagement between the teeth 174, 178, 182 and 186 and their respective
20 receiving sockets 176, 180, 184 and 188 strengthens the joint formed by the coupling 98. As with the shrouds and their receiving recesses, the teeth and sockets of the first and second segments 100 and 102 are positioned as reversed mirror images of one another.

As shown in Figure 6, when coupling 98 is used with grooved end pipe
25 elements, each of the first and second segments comprises first and second arcuate projections 90 and 92 on opposite sides of each segment 100 and 102 (100 shown). As shown in Figures 5 and 9, each arcuate projection 90, 92 extends between the first (108, 112) and second (116, 120) ends of the segments 100 and 102. Each arcuate projection is engageable with one of the pipe elements (not
30 shown) when the first and second segments are drawn toward one another. As shown in Figure 5, a seal 94 is positioned between the segments 100 and 102. In this example embodiment the seal comprises a ring 96. Advantageously, the ring 96 may be used to support the first and second segments 100 and 102 in spaced

5 relation sufficient to permit insertion of the pipe elements into the central space
104. This is known as the “factory assembled” configuration, the coupling 98
being supplied to the end user in this configuration, ready for installation without
the need to disassemble and then reassemble the coupling. The installer merely
inserts the pipe elements into the central space 104 and then tightens the fasteners
10 130 and 132. A proper joint is confirmed by inspection of the contacting faces
122, 124, 126 and 128 at the index marks 166, 168, 170 and 172.

It is expected that couplings 10 and 98 according to the invention will
improve the installation of mechanical pipe couplings.

5 What is claimed is:

1. A coupling for joining pipe elements in end to end relation, said coupling comprising:

first and second segments attached to one another end to end surrounding a central space for receiving said pipe elements;

10 a first attachment member extending from a first end of said first segment, said first attachment member defining a first face;

a second attachment member extending from a first end of said second segment, said second attachment member defining a second face, said first and second faces being in facing relation;

15 a first shroud positioned along a first outwardly facing side surface of said first attachment member and extending along at least a portion of said first face, said first shroud projecting toward said second attachment member;

20 a first recess positioned along a first outwardly facing side surface of said second attachment member and extending along at least a portion of said second face, said first recess receiving said first shroud when said first and second attachment members are drawn toward one another; and

an adjustable first fastener extending between said first and second attachment members for drawing said first and second attachment members toward one another; wherein

25 said first attachment member comprises a first lug defining a first hole for receiving said first fastener,

said second attachment member comprises a second lug defining a second hole for receiving said first fastener, and

5 a portion of said first face surrounds said first hole and a portion of
said second face surrounds said second hole.

2. The coupling according to claim 1, further comprising:

 a second shroud positioned on said second attachment member and
extending along at least a portion of said second face, said second shroud
10 projecting toward said first attachment member;

 a second recess positioned on said first attachment member and
extending along at least a portion of said first face, said second recess receiving
said second shroud when said first and second attachment members are drawn
toward one another.

15 3. The coupling according to claim 2, wherein:

 said second shroud is positioned on an opposite side of said second
attachment member from said first recess; and

 said second recess is positioned on an opposite side of said first
attachment member from said first shroud.

20 4. The coupling according to claim 3, further comprising:

 a third attachment member extending from a second end of said
first segment, said third attachment member defining a third face;

 a fourth attachment member extending from a second end of said
second segment, said fourth attachment member defining a fourth face, said third
25 and fourth faces being in facing relation;

 a third shroud positioned on said third attachment member and
extending along at least a portion of said third face, said third shroud projecting
toward said fourth attachment member;

5 a third recess positioned on said fourth attachment member and
extending along at least a portion of said fourth face, said third recess receiving
said third shroud when said third and fourth attachment members are drawn
toward one another; and

 an adjustable second fastener extending between said third and
10 fourth attachment members for drawing said third and fourth attachment members
toward one another.

5. The coupling according to claim 4, further comprising:

 a fourth shroud positioned on said fourth attachment member and
extending along at least a portion of said fourth face, said fourth shroud projecting
15 toward said third attachment member;

 a fourth recess positioned on said third attachment member and
extending along at least a portion of said third face, said fourth recess receiving
said fourth shroud when said third and fourth attachment members are drawn
toward one another.

20 6. The coupling according to claim 5, wherein:

 said third shroud is positioned on an opposite side of said third
attachment member from said fourth recess; and

 said fourth shroud is positioned on an opposite side of said fourth
attachment member from said third recess.

25 7. The coupling according to claim 1, further comprising a hinge
positioned at a second end of each of said first and second segments, said first and
second segments pivoting about said hinge when said first and second segments
are drawn toward one another.

8. The coupling according to claim 7, further comprising:

5 a second shroud positioned on said second attachment member and
extending along at least a portion of said second face, said second shroud
projecting toward said first attachment member;

 a second recess positioned on said first attachment member and
extending along at least a portion of said first face, said second recess receiving
10 said second shroud when said first and second attachment members are drawn
toward one another.

9. The coupling according to claim 8, wherein:

 said second shroud is positioned on an opposite side of said second
attachment member from said first recess; and

15 said second recess is positioned on an opposite side of said first
attachment member from said first shroud.

10. The coupling according to claim 7, wherein said hinge comprises:

 a first boss projecting from said second end of said first segment;

 a second boss projecting from said second end of said second
20 segment and positioned adjacent to said first boss;

 a first fulcrum positioned on said first boss and contacting said
second boss, said segments pivoting about said first fulcrum;

 a link extending between and capturing said first and second
bosses.

25 11. The coupling according to claim 10, further comprising a second
fulcrum positioned on said second boss, said second fulcrum contacting said first
fulcrum.

12. The coupling according to claim 11, further comprising:

5 a first land positioned contiguous with said first fulcrum on said first boss;

 a second land positioned contiguous with said second fulcrum on said second boss, said first and second lands being oriented angularly with respect to a plane defining an interface between said first and second segments.

10 13. The coupling according to claim 11, further comprising:

 a first head projecting from said first boss;

 a second head projecting from said second boss, said link engaging said first and second heads for retaining said link to said bosses.

15 14. The coupling according to claim 13, wherein said link comprises a ring encircling said first and second bosses.

 15. The coupling according to claim 4, wherein:

 said first attachment member comprises a first lug defining a first hole for receiving said first fastener;

20 said second attachment member comprises a second lug defining a second hole for receiving said first fastener;

 said third attachment member comprises a third lug defining a third hole for receiving said second fastener;

 said fourth attachment member comprises a fourth lug defining a fourth hole for receiving said second fastener.

25 16. The coupling according to claim 15, wherein a portion of said first face surrounds said first hole, a portion of said second face surrounds said second hole, a portion of said third face surrounds said third hole and a portion of said fourth face surrounds said fourth hole.

- 5 17. The coupling according to claim 1, further comprising:
- a first index mark positioned on said first attachment member;
- a second index mark positioned on said second attachment member; wherein
- said first and second index marks align with one another when said
- 10 first and second segments are drawn toward one another.
18. The coupling according to claim 17, wherein said first and second index marks are integrally formed with said first and second attachment members respectively.
19. The coupling according to claim 4, further comprising:
- 15 a first index mark positioned on said first attachment member;
- a second index mark positioned on said second attachment member;
- a third index mark positioned on said third attachment member;
- a fourth index mark positioned on said fourth attachment member;
- 20 wherein
- said first and second index marks align with one another, and said third and fourth index marks align with one another when said first and second segments are drawn toward one another.
20. The coupling according to claim 19, wherein said first, second, third
- 25 and fourth index marks are integrally formed with said first, second, third and fourth attachment members respectively.
21. The coupling according to claim 1, further comprising:

5 a first tooth positioned at said first end of said first segment, said
first tooth projecting toward said second segment;

 a first socket positioned at said first end of said second segment,
said first socket receiving said first tooth when said first and second segments are
drawn toward one another.

10 22. The coupling according to claim 21, further comprising:

 a second tooth positioned at said first end of said second segment,
said second tooth projecting toward said first segment;

 a second socket positioned at said first end of said first segment,
said second socket receiving said second tooth when said first and second
15 segments are drawn toward one another.

 23. The coupling according to claim 1, wherein each said first and second
segments comprises first and second arcuate projections on opposite sides of each
said segment, each said arcuate projection extending between said first and second
ends of said segments, each said arcuate projection being engageable with one of
20 said pipe elements when said first and second segments are drawn toward one
another.

 24. The coupling according to claim 1, further comprising a seal
positioned between said segments.

 25. The coupling according to claim 24, wherein said seal comprises a
25 ring, said ring supporting said first and second segments in space relation
sufficient to insert said pipe elements into said central space.

 26. The coupling according to claim 1, wherein said first fastener
comprises a threaded bolt and nut.

5 27. A coupling for joining pipe elements in end to end relation, said coupling comprising:

 first and second segments attached to one another end to end surrounding a central space for receiving said pipe elements;

 a first attachment member extending from a first end of said first
10 segment, said first attachment member defining a first face;

 a second attachment member extending from a first end of said second segment, said second attachment member defining a second face, said first and second faces being in facing relation;

 a first shroud positioned along a first outwardly facing side surface
15 of said first attachment member and extending along at least a portion of said first face, said first shroud projecting toward said second attachment member;

 a first recess positioned along a first outwardly facing side surface of said second attachment member and extending along at least a portion of said second face, said first recess receiving said first shroud when said first and second
20 attachment members are drawn toward one another;

 an adjustable first fastener extending between said first and second attachment members for drawing said first and second attachment members toward one another; and

 a hinge positioned at a second end of each of said first and second
25 segments, said first and second segments pivoting about said hinge when said first and second segments are drawn toward one another;

 wherein said hinge comprises:

 a first boss projecting from said second end of said first segment,

5 a second boss projecting from said second end of said
second segment and positioned adjacent to said first boss,

 a first fulcrum positioned on said first boss and contacting
said second boss, said segments pivoting about said first fulcrum, and

 a link extending between and capturing said first and
10 second bosses.

28. A coupling for joining pipe elements in end to end relation, said coupling
comprising:

 first and second segments attached to one another end to end
15 surrounding a central space for receiving said pipe elements;

 a first attachment member extending from a first end of said first
segment, said first attachment member defining a first face;

 a second attachment member extending from a first end of said
second segment, said second attachment member defining a second face, said first
20 and second faces being in facing relation;

 a first shroud positioned along a first outwardly facing side surface
of said first attachment member and extending along at least a portion of said first
face, said first shroud projecting toward said second attachment member;

 a first recess positioned along a first outwardly facing side surface
25 of said second attachment member and extending along at least a portion of said
second face, said first recess receiving said first shroud when said first and second
attachment members are drawn toward one another;

5 an adjustable first fastener extending between said first and second
attachment members for drawing said first and second attachment members
toward one another;

 a first index mark positioned on said first attachment member; and

 a second index mark positioned on said second attachment

10 member; wherein

 said first and second index marks align with one another when said
first and second segments are drawn toward one another.

29. A coupling for joining pipe elements in end to end relation, said coupling

15 comprising:

 first and second segments attached to one another end to end
surrounding a central space for receiving said pipe elements;

 a first attachment member extending from a first end of said first
segment, said first attachment member defining a first face;

20 a second attachment member extending from a first end of said
second segment, said second attachment member defining a second face, said first
and second faces being in facing relation;

 a first shroud positioned along a first outwardly facing side surface
of said first attachment member and extending along at least a portion of said first

25 face, said first shroud projecting toward said second attachment member;

 a first recess positioned along a first outwardly facing side surface
of said second attachment member and extending along at least a portion of said
second face, said first recess receiving said first shroud when said first and second
attachment members are drawn toward one another;

- 5 an adjustable first fastener extending between said first and second attachment members for drawing said first and second attachment members toward one another;
- a first tooth positioned at said first end of said first segment, said first tooth projecting toward said second segment; and
- 10 a first socket positioned at said first end of said second segment, said first socket receiving said first tooth when said first and second segments are drawn toward one another.