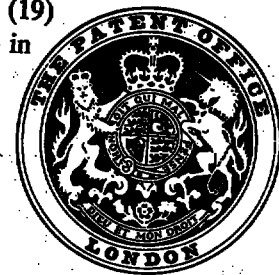


PATENT SPECIFICATION

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(54) IMPROVED DOUBLE-SIGMOID STRUCTURAL PIPE CONNECTOR

(71) We, CHEMETRON CORPORATION, of 111 East Wacker Drive, Chicago, Illinois 60601, United States of America, a Corporation organised and existing under the laws of the State of Delaware, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to a double-sigmoid structural pipe connector, as used to interconnect structural members in a trusswork.

In accordance with the invention, a double-sigmoid structural pipe connector comprises a pair of arcuate pipe elbows having coplanar centrelines and arranged so that their outer peripheral midsections face each other, characterised in that a pipe extends through an opening in the outer peripheral midsection of each elbow and is joined to each elbow; said pipe having a longitudinal central axis and each elbow having opposite ends respectively defining axes which intersect the central axis of said pipe at a point.

The elbows may be disposed along the pipe for a range of geometric configurations. One configuration allows a mutually orthogonal interconnection of four pipes to be made.

Three embodiments of the invention are illustrated by way of example and in elevation in Figures 1, 2 and 3 of the accompanying drawings.

Figure 1 shows a double-sigmoid connector which comprises a pair of arcuate elbows 12 and 14 respectively. Except as noted below, each elbow is identical. Typically, each elbow may be made of forged steel with a 48-inch outer diameter and 1.25-inch wall thickness. Each elbow is shown to have a 90° included angle between its ends. Conventional elbows in these sizes have been

commercially available from Chemetron Corporation, Tube Turns Division, Louisville, Kentucky 40201, for many years.

In the connector 10, the elbows 12 and 14 have coplanar centrelines, and each elbow has opposite ends normal to its centrelines. The connection is symmetrical about an axis through the midpoints of these centrelines.

Opposite ends 16 and 18 of the elbow 12 and opposite ends 20 and 22 of the elbow 14 are adapted to be connected respectively by circumferential weldments (not shown) to structural pipes (not shown) of suitable diameter and wall thickness. The ends 16 and 18 and the ends 20 and 22 may be bevelled in conventional manner as desired to accommodate such weldments.

An opening 70 is provided in the outer peripheral midsection of the elbow 12. An opening 72 similarly is provided in the outer peripheral midsection of the elbow 14. The openings 70 and 72 are sized to accommodate a pipe 74 typically formed with a 36-inch outer diameter and a proportionate wall thickness. The pipe 74 extends through the opening 70, where the pipe 74 is formed to the elbow 12 by circumferential weldment around the opening 70, and similarly extends through the opening 72, where the pipe 74 is joined to the elbow 14 by circumferential weldment around the opening 72, whereby the elbows 12 and 14 are joined to each other at their outer peripheral midsections.

An opening 76 is provided in the inner peripheral midsection of the elbow 12. An opening 78 similarly is provided in the inner peripheral midsection of the elbow 14. The openings 76 and 78 are sized to accommodate the pipe 74 which extends through the opening 76, where the pipe 74 is joined to the elbow 12 by circumferential weldment around the opening 76. Similarly, the pipe 74 extends through the opening 78, where the pipe 74 is joined to the elbow 14 by

circumferential weldment around the opening 78.

5 Opposite ends 80 and 82 of the pipe 74 are adapted to be connected by circumferential weldments (not shown) to structural pipes (not shown) of suitable diameter and wall thickness. These ends 80 and 82 may be bevelled as the ends 16 and 18 or the ends 20 and 22 may be bevelled.

10 If a four-way interconnection is to be made rather than a six-way interconnection, such extension of the pipe through such openings in the inner peripheral midsections of the elbows need not be made. Nonetheless, such extension may make the connector 10 able to sustain greater stresses.

15 In Figures 1, 2 and 3 the ends 16 and 18 of the elbow 12 define two axes A and B (Figure 3) which intersect at point 0 on the longitudinal central axis of the pipe 74. The ends 20 and 22 of the elbow 14 also define two axes C and D (Figure 3) which intersect at point 0' on the central axis of the pipe 74.

20 Axes points 0 and 0' can be made to meet at a single point or to be spaced apart from each other, depending on how the elbows 12 and 14 are disposed along the pipe 74. Figures 1, 2 and 3 depict three types of alignments called central, positive and negative alignment respectively. For example in Figure 1, the elbows 12 and 14 are so arranged as to cause the said axes points to intersect at a single point on the central axis of the pipe 74. In Figure 2, the elbows 12 and 14 are drawn closer to each other than in Figure 1, thus causing axes point 0 to be near the outer peripheral midsection of the elbow 14, and axes point 0' to be near the outer peripheral midsection of the elbow 12. The arrangement shown in Figure 3, in which the elbows 12 and 14 are disposed further from each other along the pipe 74 than in Figures 1 and 2, causes the axes point 0 to intersect the central axis of the pipe 74 at a point which is further from the outer peripheral midsection of the elbow 14, and the axes point 0' to intersect the central axis of the pipe 74 at a point which is further from the outer peripheral midsection of the elbow 12.

50 With suitable openings (not shown) for fluid flow from either end of the elbow 12

through the pipe 74 to the elbow 14 and *vice versa*, and with sound weldments, as and where described above, the connector 10 may be used as a pressure-containing vessel. Although the connector 10 has been described with exemplary dimensions suitable for an offshore drilling platform and other larger-scale structures, such connectors can also be made to smaller scales for smaller structures.

WHAT WE CLAIM IS:-

1. A double-sigmoid structural pipe connector comprising a pair of arcuate pipe elbows having coplanar centrelines and arranged so that their outer peripheral midsections, face each other, characterised in that a pipe extends through an opening in the outer peripheral midsection of each elbow and is joined to each elbow, said pipe having a longitudinal central axis and each elbow having opposite ends respectively defining axes which intersect the central axis of said pipe at a point.

2. A connector according to claim 1 wherein the axes defined by the ends of said elbows intersect the axis of said pipe at a single point.

3. A connector according to claim 1 wherein the axes defined by the opposite ends of one elbow intersect the longitudinal central axis of said pipe at a point located within the other elbow.

4. A connector according to claim 1 wherein the axes defined by the opposite ends of each elbow intersect the central axis of said pipe at points located outside of either elbow.

5. A connector according to claim 1 wherein said pipe also extends through an opening in the inner peripheral midsection of one elbow.

6. A connector according to claim 1 wherein said pipe also extends through an opening in the inner peripheral midsection of each elbow.

7. A double-sigmoid structural pipe connector substantially as hereinbefore described with reference to any of Figures 1 to 3 of the accompanying drawings.

MARKS & CLERK.

For the Applicants.



circumferential weldment around the opening 78.

Opposite ends 80 and 82 of the pipe 74 are adapted to be connected by circumferential weldments (not shown) to structural pipes (not shown) of suitable diameter and wall thickness. These ends 80 and 82 may be bevelled as the ends 16 and 18 or the ends 20 and 22 may be bevelled.

If a four-way interconnection is to be made rather than a six-way interconnection, such extension of the pipe through such openings in the inner peripheral midsections of the elbows need not be made. Nonetheless, such extension may make the connector 10 able to sustain greater stresses.

In Figures 1, 2 and 3 the ends 16 and 18 of the elbow 12 define two axes A and B (Figure 3) which intersect at point 0 on the longitudinal central axis of the pipe 74. The ends 20 and 22 of the elbow 14 also define two axes C and D (Figure 3) which intersect at point 0' on the central axis of the pipe 74.

Axes points 0 and 0' can be made to meet at a single point or to be spaced apart from each other, depending on how the elbows 12 and 14 are disposed along the pipe 74. Figures 1, 2 and 3 depict three types of alignments called central, positive and negative alignment respectively. For example in Figure 1, the elbows 12 and 14 are so arranged as to cause the said axes points to intersect at a single point on the central axis of the pipe 74. In Figure 2, the elbows 12 and 14 are drawn closer to each other than in Figure 1, thus causing axes point 0 to be near the outer peripheral midsection of the elbow 14, and axes point 0' to be near the outer peripheral midsection of the elbow 12. The arrangement shown in Figure 3, in which the elbows 12 and 14 are disposed further from each other along the pipe 74 than in Figures 1 and 2, causes the axes point 0 to intersect the central axis of the pipe 74 at a point which is further from the outer peripheral midsection of the elbow 14, and the axes point 0' to intersect the central axis of the pipe 74 at a point which is further from the outer peripheral midsection of the elbow 14.

With suitable openings (not shown) for fluid flow from either end of the elbow 12

through the pipe 74 to the elbow 14 and *vice versa*, and with sound weldments, as and where described above, the connector 10 may be used as a pressure-containing vessel. Although the connector 10 has been described with exemplary dimensions suitable for an offshore drilling platform and other larger-scale structures, such connectors can also be made to smaller scales for smaller structures.

WHAT WE CLAIM IS:-

1. A double-sigmoid structural pipe connector comprising a pair of arcuate pipe elbows having coplanar centrelines and arranged so that their outer peripheral midsections, face each other, characterised in that a pipe extends through an opening in the outer peripheral midsection of each elbow and is joined to each elbow, said pipe having a longitudinal central axis and each elbow having opposite ends respectively defining axes which intersect the central axis of said pipe at a point.

2. A connector according to claim 1 wherein the axes defined by the ends of said elbows intersect the axis of said pipe at a single point.

3. A connector according to claim 1 wherein the axes defined by the opposite ends of one elbow intersect the longitudinal central axis of said pipe at a point located within the other elbow.

4. A connector according to claim 1 wherein the axes defined by the opposite ends of each elbow intersect the central axis of said pipe at points located outside of either elbow.

5. A connector according to claim 1 wherein said pipe also extends through an opening in the inner peripheral midsection of one elbow.

6. A connector according to claim 1 wherein said pipe also extends through an opening in the inner peripheral midsection of each elbow.

7. A double-sigmoid structural pipe connector substantially as hereinbefore described with reference to any of Figures 1 to 3 of the accompanying drawings.

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