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BEARING ASSEMBLY FOR BRIDGE STRUCTURES

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2 Sheets-Sheet 1

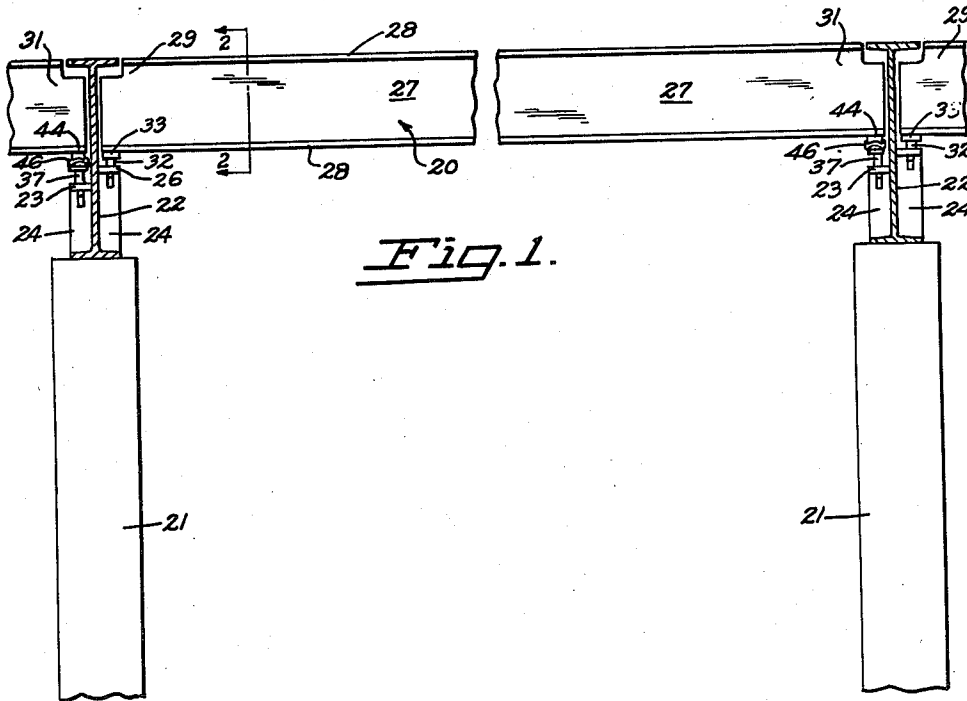


Fig. 1.

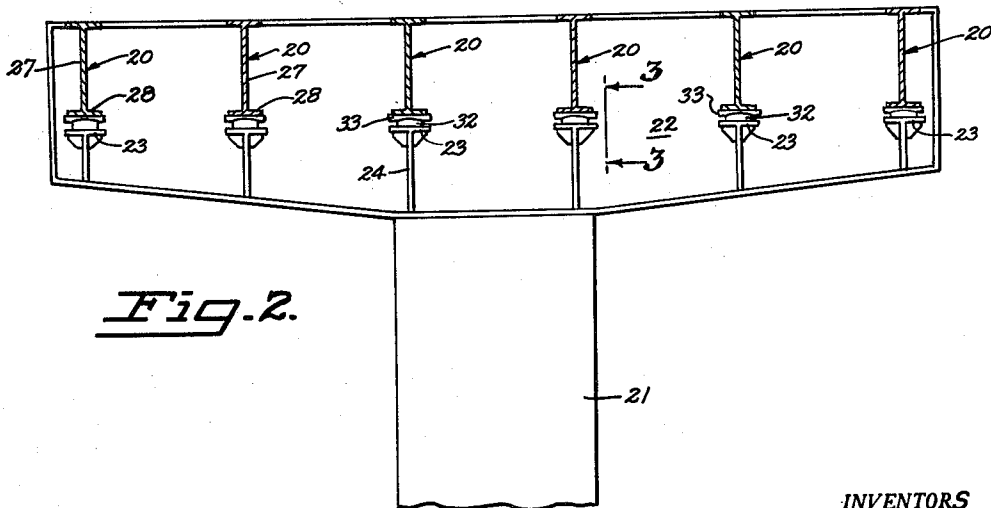


Fig. 2.

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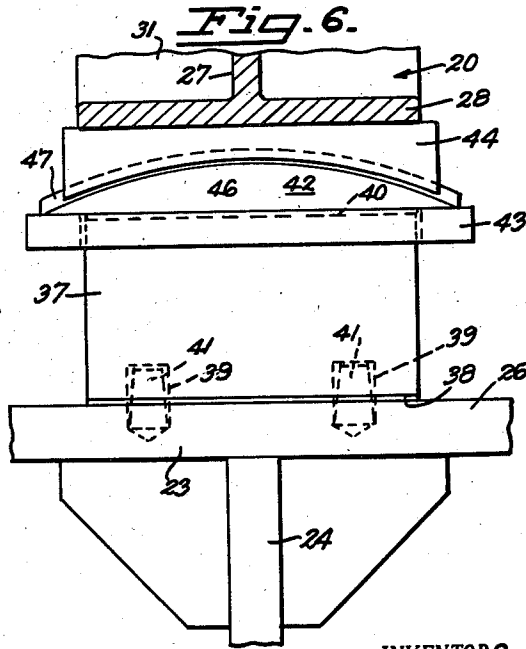
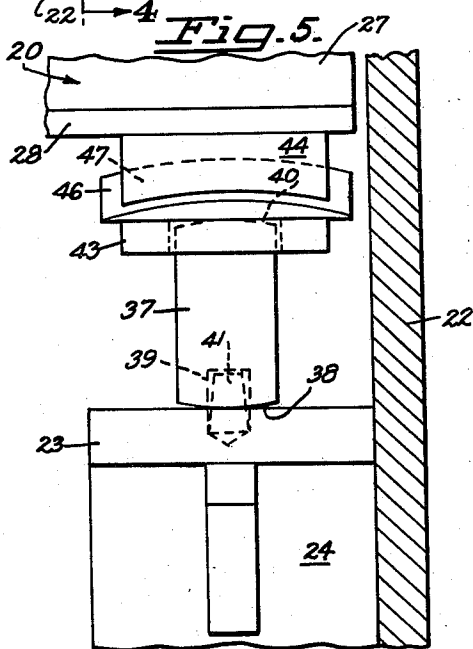
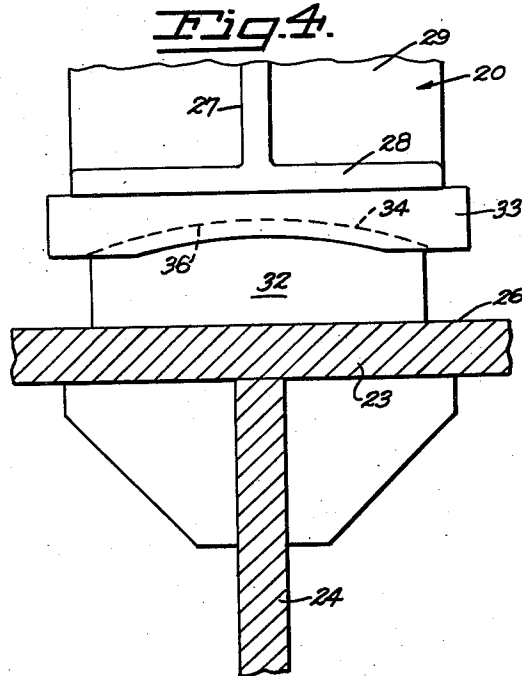
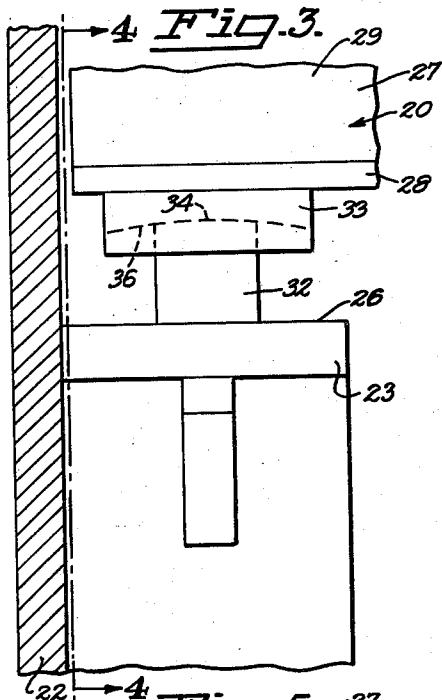
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BEARING ASSEMBLY FOR BRIDGE STRUCTURES

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This invention relates to new and improved bearing structure for bridge assemblies. More particularly the invention is concerned with the problem of securing more adequate bearing surfaces to support the ends of stringers in bridge structures and the like. Such bridge structures comprise a plurality of longitudinally extending stringers, the opposite ends of which are supported on pillars or columns. Adequate support of the stringers on the pillars or columns is an essential for proper construction, but is difficult to accomplish because of the size and mass of the members involved, the relatively large tolerances generally employed in the fabrication of such structures, and the fact that fabrication is frequently conducted remote from the point of erection.

The stringers necessarily must be positioned on their supports in such manner that they are level, but when this is accomplished, it is sometimes extremely difficult to provide a level area on the stringer and on its support which will adequately bear the load over a wide surface area. Accordingly, it has been found necessary in the past to employ wedges between the stringers and their supports, or to mill or plane, or otherwise level the bottom flange of the stringer or girder. Milling, planing or machining the elements is time-consuming and expensive by reason of the fact that the fabrication is performed in a shop which may be located a great distance from the point of erection and further, by reason of the cost of lifting the girder in position, then checking the leveling and then moving the girder for further machining as required.

Accordingly, the present invention provides a pair of sole plates, one of which is associated with the girder or stringer and the other with the support therefor. One of the plates has a concave spheroidal surface and the other plate has a mating convex spheroidal surface. The provision of the mating spheroidal surfaces on the sole plates affords automatic alignment of the stringer with its support and yet provides a full and complete bearing between the two members.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings in which similar characters of reference represent corresponding parts in each of the several views.

In the drawings:

Fig. 1 is a side elevation of a bridge structure in which the present invention is employed, partly broken away to conform with space requirements;

Fig. 2 is an enlarged sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional view taken substantially along the line 3—3 of Fig. 2 of the fixed end of the stringer.

Fig. 4 is a sectional view taken substantially along the line 4—4 of Fig. 3;

Fig. 5 is a view similar to Fig. 3 of the free end of the stringer; and

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Fig. 6 is a view similar to Fig. 4 of the structure of Fig. 5.

As shown in Fig. 1, a common bridge structure employs a pair of columns or pillars 21 of concrete, steel, or other conventional construction, which support the opposite ends of a stringer or girder 20. The stringer 20 is fabricated in a shop, located remote from the site, and then lifted into position and leveled relative to the columns 21. The present invention is concerned with securing adequate bearing of the opposite ends of the stringer 20 on the supporting columns 21. In common construction, a cap 22 is mounted on the top of the column 21 extending transversely of the direction of the stringers 20 and supporting a plurality of said stringers 20 (see Fig. 2). The shape of the cap 22 and the number of stringers 20 varies widely, depending upon the size and design of the structure in which the present invention is incorporated. As illustrated in the accompanying drawings, six such stringers 20 are supported by a single cap 22 on the top of a single pillar 21, it being understood that this arrangement is subject to wide modification. For each of the stringers 20 there is provided a pad 23 which extends horizontally and which may be reinforced by a vertical supporting leg 24, the pad 23 and leg 24 being sometimes referred to as a "stool." The top surface 26 of the pad 23 is the bearing seat for the stringer 20. The stringer 20 comprises a vertical web 27 and a pair of horizontal flanges, the bottom flange 28 being supported by the bearing seat 26 with certain members interposed, as hereinafter appears.

To provide for thermal expansion, it is common practice to anchor one end of the stringer 20 and to allow the opposite end to move in accordance with the expansion and contraction of the stringer. Thus one end is denominated the fixed end 29 and the opposite end is denominated the free end 31. On the fixed end side of the cap 22, the bearing seat 26 is provided with a bearing bar 32 which is welded, or otherwise suitably secured thereto. The bottom surface of the bottom flange 28 of the fixed end 29 of the stringer 20 is provided with a sole plate 33. The top surface of the bearing bar 32 is machined spheroidal convex. The bottom surface of the sole plate 33 is machined spheroidal concave, the same radius of curvature being employed in both instances. The spheroidal top surface of the bearing bar is denominated in the accompanying drawing by reference numeral 34 and the spheroidal concave surface of the sole plate 33 by reference numeral 36. It is readily apparent that the stringer 20 may be adjusted so that it is level, or at any inclination with respect to the horizontal, and that thereupon, regardless of these adjustments, the entire spherical surface 34 of the bearing bar 32 engages the spheroidal surface 36 of the sole plate 33 and complete bearing is accomplished. Further, if desired, one or both members 33 or 32 may be welded to its stringer or seat at the site rather than at the shop and prior to such welding the members may be moved longitudinally with respect to each other for proper adjustment of position. This result is not accomplished in any other structure without difficult machining operations being employed.

In Figs. 5 and 6 the free end 31 of the stringer 20 is shown. Provision is made, as has been mentioned, for thermal expansion. A conventional means for compensating for such thermal expansion is the employment of a rocker block 37 having a curved bottom surface 38, which fits on top of the bearing seat 26. Optionally, to secure the bearing block 37 against displacement, a hole 39 is bored into the bottom surface of the rocker block 37 and a tapered pin 41 is secured in the pad 23 and fits in the hole 39, but permits rocking of the block 37 relative to the bearing seat 26. As shown in the accompanying drawings, two such taper pins 41 are em-

ployed, but the use of any such pins is optional. The upper surface 40 of the rocker block 37 is also curved and fits against the bottom surface of the lower sole plate 42. To prevent displacement of the rocker block 37 relative to the sole plate 42, a keeper 43, which is a hollow, rectangular member, surrounds the upper end of the rocker block 37 without interfering with movement thereof. Upper sole plate 44 rests upon lower sole plate 42 and the bottom flange 28 of the free end 31 of the girder 20 rests upon the top surface of the upper sole plate 44. The upper surface of the lower sole plate 42 is spheroidal convex and the lower surface of the upper sole plate 44 is spheroidal concave, with the same radius of curvature being employed for both curved surfaces. The employment of the spheroidal surfaces permits the same adjustment of the free end 31 as of the fixed end 29 of the girder 20. In addition, thermal expansion is accommodated by conventional means, inasmuch as the girder 20 expands or contracts with temperature changes, the entire structure rocks about the bottom surface 38 of the rocker block 37.

It will further be understood that after the girder has been set in place and leveled, and hence after the complete bearing surface of each end is accomplished, the sole plate 33 may be welded to the bearing bar 32 on the fixed end 29 and the sole plates 42 and 44 may be welded together on the free end 31, as required.

It is further apparent that whereas in the accompanying drawing the lower member 32 or 42 is convex and the upper member 33 or 44 is concave, nevertheless, the arrangement may be reversed, as required.

The foregoing arrangement permits the erection of stringers to be accomplished rapidly and with a minimum of labor, and enables the stringers to be set level or at any desired inclination, and yet to be supported adequately rather than partially as in prior constructions. Machining of the bottom web 28 of the girder is eliminated and wedges and other means heretofore employed are likewise eliminated. Hence the cost of fabrication and erection of bridges is greatly reduced and adequate bearing support is afforded.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be practiced within the spirit of the invention and scope of the appended claims.

What is claimed is:

1. A method of erecting a bridge structure comprising, providing a girder and bearing supports for each end of said girder, fixing a bearing bar having a spheroidal top surface on the top of one bearing support, fixing a sole plate having a spheroidal bottom surface on the bottom of one end of said girder, one said spheroidal surface being concave and the other convex and said spheroidal surfaces having the same radius and a common center, adjustably supporting said spheroidal surface of said sole plate on said spheroidal surface of said bearing bar, providing a rocker block having rounded top and bottom surfaces resting the bottom surface of said rocker block on the other of said bearing supports with the axis of curvature of said rocker block transverse to said girder, providing a second sole plate having a flat bottom surface resting

ing on the top surface of said rocker block and a spheroidal top surface, fixing a third sole plate to the opposite end of said girder having a spheroidal bottom surface, the spheroidal surfaces of said second and third sole plates having the same radius and a common center and one being concave and the other convex, adjustably supporting said spheroidal surface of said third sole plate on said spheroidal surface of said second sole plate, and adjustably turning said girder to the desired inclination relative to said bearing supports by moving the spheroidal surfaces about their centers as focal points for adjustment and alignment to provide proper bearing for said girder, whereby the one end of said girder may rock on said rocker block to permit longitudinal movement of said girder.

2. The method of claim 1 which further comprises the steps of welding said first mentioned sole plate to said bearing bar and said second and third sole plates to each other after adjustment and alignment of said girder.

3. In a bridge structure, a girder, a first support means to support a first end of said girder, a horizontal first pad fixed to said first support means and providing a bearing surface for said first end of said girder, a bearing bar having a flat bottom surface resting on said first pad and a spheroidal top first surface, a first sole plate fixed to the underside of said first end of said girder, said first sole plate having a spheroidal bottom second surface of the same curvature as said top surface of said bearing bar, said first sole plate resting on said first surface and supported by said bearing bar, one of said first and second surfaces being concave and the other convex, second support means to support a second end of said girder, a horizontal second pad fixed to said second support means and providing a bearing surface for said second end of said girder, said second pad having a top flat horizontal bearing seat, a rocker block having rounded top and bottom surfaces with their axes of curvature transverse to said girder, the rounded bottom surface of said rocker block resting on said bearing seat, a second sole plate having a flat under surface resting on the top surface of said rocker block and having a spheroidal top third surface, and a third sole plate fixed to the underside of said second end of said girder and having a spheroidal bottom fourth surface of the same curvature as said third surface resting on said third surface, one of said third and fourth surfaces being concave and the other convex.

References Cited in the file of this patent

UNITED STATES PATENTS

154,644	Burneson	Sept. 1, 1874
480,863	Westwood et al.	Aug. 16, 1892
592,852	Westwood	Nov. 2, 1897
2,014,643	Bakker	Sept. 17, 1935
2,208,872	Ropp	July 23, 1940
2,281,364	MacDonald	Apr. 28, 1942
2,680,259	Milk	June 8, 1954
2,722,040	Ludowici	Nov. 1, 1955

FOREIGN PATENTS

14,080	Great Britain	1898
258,683	Italy	May 25, 1928
506,597	Belgium	Nov. 14, 1951
296,591	Switzerland	May 1, 1954