

PATENT SPECIFICATION

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(54) A BEARING SHOE FOR TRENCH SHORING APPARATUS

- (71) I, JOSEF KRINGS of 23 Hans-Boeckler Strasse, D-5138 Heinsberg Oberbruch, Federal Republic of Germany; a German National do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:-
- 10 This invention relates to a bearing shoe engageable against a guide member in a trench shoring installation, the bearing shoe including a frame guided within the member for sliding movement and a hinge pin extending transversely to the direction of movement of the bearing shoe within the member and serving to connect an end piece for a bracing strut to the frame for relative pivoting.
- 15 20 British patent specification No. 1 393 051 discloses bearing shoes of this general type with there being compression or leaf springs carried by an end piece of a bracing strut and resting within the frame to prevent excessive deflection of the end piece with respect to the frame. With respect to the bearing shoe arrangement of Fig. 3 of the said British patent specification, one end of a leaf spring, which has a center portion thereof fastened to the bracing system end piece, resting on one side of a clearance in the frame, while the other end of the leaf spring is supported by the bearing surface or bearing wall of the guide member. The purpose of the bearing shoes of these prior patents is to prevent the bracing system from deflecting more than 5-6 degrees from the horizontal. It is not intended that the bearing shoes effect an automatic return of the bracing strut to the horizontal.
- 30 35 40 The bracing strut should be prevented from deviating by more than 5-6 degrees from the horizontal because otherwise the cross-sectional geometry of the propped sheeting equipment would change to an inadmissible one. This is especially true in the case where the bearing shoes move in tightly guided relation within the guide members which have a generally C-shaped cross-sectional contour.

High loads are imposed on the bearing shoe arrangement of German patent 22 58 588 because of the small lever arm effecting the spring compressive force. On the other hand, the leaf spring used in the bearing shoe arrangement of German patent 23 17 872 and U.S. patent 3,881,679 frequently proved insufficient for the very high forces involved and could break.

This invention, therefore, is directed to the creation of a bearing shoe on the general basis of the earlier bearing shoes, but which is so constructed to sustain the high loads while providing for a limitation as to the pivoting of the bracing structure relative to the guide stud. At the same time the bearing shoe is of a simple construction so as to be easily and inexpensively manufactured.

This invention solves the prior problems by providing a bearing shoe engageable against a guide member in a trench shoring installation, comprising a frame slidable in the guide member and having a pivot pin arranged transversely to the direction of sliding and an end piece of a bracing member pivotably connected thereto, the end piece having a base plate the dimensions of which are less than the inside width of the frame, provided at its face remote from the bracing member on each side of the pin with at least one block which serves as a guide for a compression spring supported against a bearing plate and is characterised in that the inner clearance between the free end of the block and the associated bearing plate is selected so that the deflection of the base plate from the normal position does not exceed 6 degrees of arc. The spacing between free ends of the bearing blocks and the associated bearing plate or plates is advantageously so selected that the deflection of the base plate relative to the frame and from the horizontal does not exceed a predetermined angle on the order of 5-6 degrees.

In preferred apparatus in accordance with the invention a locating bearing shoe, which is mounted on the end of a bracing device, is slidably guided within a support member of a generally C-shaped cross-section. The

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bearing shoe includes a generally rectangular frame glidingly received within the support member and having pivotally connected thereto by means of a pivot pin an end piece which is engageable with an end of the bracing member. The end piece includes a bearing plate having a pair of bearing members extending therefrom, one on each side of the pivot pin, and compression springs being telescoped over the bearing members and engaging the bearing plate. The compression springs react against the bearing plates which bear against a bearing wall of the support member. The base plate is of a width less than the longitudinal opening in the support member and the bearing members are engageable with the bearing plates to limit the pivoting of the base plate about the pivot pin. The glide plates may be in the form of a single plate and a retainer may be provided for retaining the bearing plate or plates against separation from the box plate.

Therefore the play provided between the bearing plate or plates and the blocks acting as stops limit the allowed pivoting deflection while the springs progressively resist the deflection of the end piece in a dampening manner and thus eliminate sudden shifting of the bracing relative to the guide member. Simultaneously the danger of fracture of the springs is minimized.

In accordance with this invention, there is no bracing of the end piece directly against the frame. Also, aside from the customary bracing, there is no additional bracing of the end piece relative to the guide member for the purpose of eliminating deflection. The deflection is limited solely by the inside stop element.

According to one embodiment of the invention, each guide plate may be fastened by a threaded bolt passing through its associated block so as to maintain the guide plates associated with the base plate and limiting the play between the plates.

It has also been found advantageous that there be a single guide plate with which all of the blocks are associated.

When there is a single bearing plate common to all the blocks, it is feasible that the bearing plate be hingedly carried by the hinge pin so as to retain its relative position with respect to the base plates as opposed to the use of threaded bolts. This arrangement provides for the better fastening of the bearing plate with respect to the end piece so that the insertion of the bearing shoe into the guide channel is facilitated. Also, because of the problem of rusting, bolts may be undesirable in certain environments and thus can be eliminated. Furthermore, manufacture and assembly are easier and more economical with this arrangement. It is also to be understood that this arrangement can

be utilized with guide studs of a U-shaped cross-section.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims, and the several views illustrated in the accompanying drawings.

IN THE DRAWINGS:

Figure 1 is a schematic fragmentary vertical sectional view through a trench shoring installation in accordance with this invention.

Figure 2 is a fragmentary frontal elevational view of one of the guide channels with parts broken away, and showing therein one embodiment of a bearing shoe.

Figure 3 is a fragmentary vertical sectional view taken along the line III-III of Figure 2, and shows specifically the construction of the bearing shoe with a bracing strut attached thereto.

Figure 4 is a horizontal sectional view taken along the line IV-IV of Figure 3, and shows further details of the bearing shoe.

Figure 5 is a fragmentary elevational view similar to Figure 2, showing a modified form of bearing shoe.

Figure 6 is a fragmentary vertical sectional view taken along the line VI-VI of Figure 5, and shows further details of the bearing shoe.

Figure 7 is a horizontal sectional view taken along the line VII-VII of Figure 6, and shows further details of the bearing shoe.

Referring now to the drawings in detail, there is illustrated in Figure 1 components of trench shoring equipment illustrated in schematic form. The trench shoring installation includes vertical shoring members or panels 1 which are placed on opposite sides of a trench against the trench walls (not shown). The shoring members 1 are maintained by vertical guide channels 2 which may be selectively detachably or fixedly secured to the shoring members 1 and hold them in place. The guide channels are urged apart by horizontal bracing struts 3 extending between opposite guide studs. Each bracing strut 3 may be formed of telescoping pipes, shafts, etc., and carry a bearing shoe 4 to their free ends with the bearing shoe 4 being guidingly and slidably positioned within associated guide channels 2. In the illustrated assembly, the guide channel is of a C-shaped cross-section. However, it is feasible in conjunction with at least one embodiment of the invention that the guide channel be of a U-shaped cross section. When the guide channel 2 is of a C-shaped cross-section, it includes two terminal flanges 19 which lie in a common plane and are spaced from one another to define a

longitudinally extending slot 20 through which there extends an end piece 7 of the bracing strut.

Each bearing shoe 4 is pivotally connected by a horizontal hinge pin 5 to the end piece 7 of the respective bracing strut 3, whereby each bracing strut 3 may be pivoted with respect to the associated guide channel and slanted to the horizontal through an angle up to an angle α . This slanting of the bracing strut 3 may occur, for example, when adjusting the height of the bracing system or when pulling or putting into place the sheetings 1 or the guide studs 15 2.

For reasons of safety, the angle α between the horizontal and the deflected position should not exceed 5-6 degrees because otherwise the cross-sectional geometry of the shoring installation would vary excessively to the point where it would not be sufficiently stable.

In Figures 2-4 there is illustrated a first embodiment of the bearing shoe 4 which is so constructed so as to restrict deflection to the predetermined angle α on the order of 5-6 degrees. The bearing shoe 4 includes a frame 6 which is generally rectangular in outline and is of a width to be guided and slidably received between the side flanges of the guide channel 2. The frame 6 is provided with bearings for the hinge pin 5, the hinge pin 5 also being carried by bearings of the end piece 7. The end piece 7 swings about the hinge pin 5 and includes a base plate 9 rigidly connected with a tubular sleeve 8 into which an end of a bracing strut 3 may be positioned. The sleeve 8 is suitably braced relative to the base plate 9 and the base plate 9 is of a size to be received within the frame 6. When the guide channel 2 is of a C-shaped cross-section and has opposed flanges 19 defining the longitudinal opening 20, the base plate 9 is of a width less than the width of the opening.

The hinge pin 5 projects through a bearing 10 welded to the rear surface of the base plate 9 and into the frame 6. Blocks 11 extend from the rear face of the base plate 9 on opposite sides of the hinge pin 5, as shown in Figure 3. Each bearing block 11 is surrounded by a compression spring 12 with each compression spring 12 having its end remote from the bearing plate 9 resting against a further plate in the form of a slide plate 13. Each slide plate 13 is retained relative to the bearing plate 9 by a threaded bolt 14 which extends loosely through a bore 15 in the associated bearing block 11 and the bearing plate 9. The end of the bolt 14 extending through the bore 15 is provided with a retaining nut 16.

The slide plates 13 rest upon the main wall or web of the guide stud 19, which wall 65 is a bearing wall and is identified by the

numeral 17. The bearing blocks 11 are of a length wherein there is a predetermined space between each slide plate 13 and its associated bearing block 11 so as to permit limited tilting of the bearing plate 9 and thus the end piece 7 relative to the frame 6 and the guide stud 2. The spacing between the slide plates 13 and the blocks 11 determine the magnitude of the permissible angle of tilt, angle α . The blocks 11 thereby act as limit stops while the springs 12 act to prevent abrupt transitions of the bearing shoe 4 into jammed positions. The springs 12 also absorb impact stresses.

While in the embodiment of Figures 2-4 separate slide plates 13 have been illustrated, it is to be understood that a single slide plate may be advantageously utilized in that such a slide plate prevents twisting and provides for improved guidance of the slide plate.

Reference is now made to Figures 5-7 wherein a modified form of bearing shoe is illustrated. The bearing shoe includes the same frame 6 which is pivotally connected to the base plate 9 by the hinge pin 5. The end piece is designated by the numeral 18 in view of the fact that it is of slightly different construction, particularly in that the bearing 10 is much shorter than the like bearing of the end piece 7. Also, the base plate 9 carries blocks 21 which are free of through bores. Each block 21 carries a compression spring 12 and the compression springs 12 bear against a single slide plate 23. The slide plate 23 is provided with bearings 22 which receive the hinge pin 5 and thus retain the slide plate 23 relative to the base plate 9, eliminating the need for restraining bolts.

The bearing shoe arrangement of Figures 5-7 provides for a compact unit. If the bracing strut 3 is deflected from the horizontal, one of the bearing blocks 21 will come to rest against the bearing plate 23 without the slide plate 23 requiring excessive support from the support surface of the bearing wall 17. Threaded bolts are no longer required, this being a particular advantage in view of the difficulty of removing the bolts which may have become locked in place. Further, the arrangement of Figures 5-7 permits the glide shoe to be encapsulated or housed and the assembly thereof is simple, merely requiring the insertion of the unit into the end of the guide channel in the case of a C-shaped channel or directly into the face of the guide channel in the case of a U-shaped guide channel.

Although only preferred embodiments of the slide shoe have been specifically illustrated and described, it is to be understood that minor variations may be made in the glide shoe construction without departing from the scope of the invention as defined by the appended claims.

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WHAT I CLAIM IS:-

1. A bearing shoe engageable against a guide member in a trench shoring installation, comprising a frame slidable in the
5 guide member and having a pivot pin arranged transversely to the direction of sliding and an end piece of a bracing member pivotably connected thereto, the end piece having a base plate, the dimensions of which are less than the inside width
10 of the frame, provided at its face remote from the bracing member on each side of the pin with at least one block which serves as a guide for a compression spring supported against a bearing plate and is characterised in that the inner clearance between the free end of the block and the associated bearing plate is selected so that the deflection of the base plate from the normal position does not exceed 6 degrees of arc.
20 2. A bearing shoe according to Claim 1, wherein the bearing plate is secured by a threaded bolt held loosely in a bore of the associate bearing block and the bearing
25 plate.
3. A bearing shoe according to claim 1 or 2, wherein a separate bearing plate is

associated with the or each bearing block.

4. A bearing shoe according to claim 3, characterised in that the bearing plate is
30 pivotably connected in the centre also to the pivot pin of the bearing plate.

5. A trench shoring installation including a bearing shoe according to claim 1, 2 or
4 wherein said bearing plate or plates is/are
35 restrained against separation from said base plate by pivotal connection with said pivot pin.

6. An installation according to claim 5, wherein said guide member is of C-shaped
40 cross-section and said opening is defined by two spaced apart terminal flanges.

7. A bearing shoe substantially as described with reference to and as illustrated in the accompanying drawings.
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8. Trench shoring apparatus incorporating a bearing shoe as claimed in any of the preceding claims.

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