

Technical field

The invention relates to a thrust pin connection arrangement including a pin element to be anchored in a first construction element and a bearing element to be anchored in a second construction element, in which the pin element is supported for floating in the bearing element with allowance for amplitudes of movement by means of at least one resilient element.

Prior art

The deadening of impact sounds is a very acute problem in many buildings, particularly when it applies to the sound-insulation of staircases and intermediate floors from the supporting vertical walls in concrete, steel, brick or concrete block buildings. Impact sound deadening units of various types with pins and associated sleeves are known for solving this problem and generally involve an iron or steel pin of a certain cross-section which is built firmly into the face of the staircase or intermediate floor, on the one hand, and is supported in a sleeve anchored firmly in the vertical wall, on the other hand. The sleeve is lined with a resilient, sound-deadening material (rubber, plastics material, etc.).

An arrangement of the type mentioned at the beginning is known, for example from CH-PS 596 397. This is a device for absorbing shear forces between a first fixed slab and a second slab lying thereon. A bolt, which is set in concrete in the first slab, projects into a sleeve lined with a resilient body and set in concrete in the second

construction element. Since there is no firm connection between the two slabs, only deadened vibrations are transferred from one slab to the other.

The problem with known thrust pin connections with damping elements is that, with hard knocks or large expansions, the resilient material in the sleeve has to absorb very high pressures locally. As a result, the good deadening effect of these materials becomes worse or is even completely lost in the course of time.

A mounting for steps is known from DE-OS 2 161 840. In this case, a pin is screwed firmly into a socket with the aid of nuts. The inside diameter of the socket corresponds to the outside diameter of the pin. A sleeve of a resilient, flexible material is pushed over the socket. The resilient sleeve is bounded axially by two annular pressure plates. The pressure plates are connected by screws parallel to the axis. The resilient sleeve is pushed radially outwardly by the tightening of the said screws and fixes the pin in a hole in the wall.

Statement of the invention

The object of the invention is to provide a thrust pin connection arrangement of the type mentioned at the beginning which prevents the problems of the prior art and is distinguished by good deadening of impact sounds.

According to the invention, the solution consists of the fact that stop means for limiting the amplitude of movement of the floating pin element are formed on the bearing element and/or on the pin element and are spaced

by a gap of a width less than the thickness of the resilient element so that the at least one resilient element cannot be overloaded.

The essence of the invention is thus that, on the bearing element or on the pin element or on both, means are provided which, with large-amplitude movements (knocks, expansion), prevent the entire excursion from having to be absorbed by the resilient element. Smaller-amplitude movements or sound vibrations can, as before, be absorbed completely by the resilient element so that the sound-deadening effect is fully maintained.

According to a preferred embodiment, the bearing element has an outer sleeve which has a lining of resilient material as the resilient element. Moreover, the bearing element has an axial cavity with an opening in its front for receiving the pin element. The means for limiting amplitudes of movement are formed by at least one preferably annular projection on the front of the bearing element. The resilient material which is responsible for sound deadening with normal amplitudes of movement is not present in the region of the said projection.

A sleeve which defines the cavity for receiving the pin element is provided for supporting the pin element for sliding axially in the bearing element. The resilient element is disposed between the inner and outer sleeves. The means for limiting the amplitudes of movement are formed on the front faces of the two sleeves.

A ring-like, preferably encircling, radial gap is

provided between the means for limiting the amplitudes of movement. The width of the gap is less than the (radial) thickness of the resilient element. The width of the gap defines the maximum possible compression of the resilient element between the inner and outer sleeves. The means for limiting the amplitude of movement preferably include projections or flanges which project radially outwardly and inwardly, respectively, and which abut counterparts (for example, also flanges) upon overloading. A plurality of separate ribs, studs, etc. may also be provided instead of flanges.

According to a particularly preferred embodiment, the inner and outer sleeves are cylindrical and are arranged coaxially one inside the other. A bearing element of this type equally well absorbs and stops vibrations and knocks or expansions, respectively, perpendicular to the longitudinal axis, irrespective of the directions.

In order to fix the bearing element on a shuttering wall for setting in concrete, a nail plate is advantageously provided on the front. This plate may, at the same time, represent one element of the amplitude-limiting means.

According to a particularly preferred embodiment, the pin element comprises a dimensionally stable outer pin sleeve which is at least partially filled with a sound-deadening filling material. A pin element of this type has better internal deadening than a monolithic pin, for example, of steel. Sound waves are thus already at least partially attenuated by the pin element itself. In combination with the floating arrangement in the bearing element, a

particularly good impact sound deadening effect is achieved.

A further effect of the pin construction according to the invention is that the pin has a larger outside diameter than a monolithic construction if it is to suffice for the same shear stress, which results in a larger bearing surface of the pin element in the bearing element and in less local stressing of the resilient element.

Advantageously, a pin core is embedded in the filling element and, in the event of a fracture of the pin sleeve in particular, still holds the pin connection arrangement together in an emergency.

The pin sleeve is preferably composed of stainless steel or a similar material which is durable and can be loaded. The pin core may be composed of iron or steel. It is preferably disposed centrally in the pin sleeve. The annular space between the pin sleeve and the pin core is filled with the filling material, for example, cement.

The pin element according to the invention may naturally also be used independently of the bearing element according to the invention.

Further advantageous embodiments and combinations of features of the invention will become clear from the detailed description and from the claims as a whole.

Brief description of the drawings

Embodiments of the invention will be described in greater

detail below with reference to the drawings. In the drawings:

Fig. 1 is an axial longitudinal section of a pin connection arrangement according to the invention;

Fig. 2 shows a bearing element viewed from the front.

In principle, corresponding parts are given the same reference symbols in the drawings.

Embodiments of the invention

Fig. 1 shows the thrust pin connection arrangement according to the invention in a typical position of use. A bearing element 1 set in concrete, for example, in a wall, houses a pin element 2 which in turn is set in concrete, for example, in a horizontal floor.

The bearing element 1 comprises a tubular outer sleeve 3 which is lined with a resilient element 5, for example, a layer of Neoprene, natural rubber, etc. An inner sleeve 4, coaxial with the outer sleeve 3, is embedded in the resilient element 5. The internal cross-section of the inner sleeve 4 fits the external cross-section of the pin element 2. That is, the pin element 2 is mounted with little clearance and is movable axially in a cavity 6 of the bearing element 1.

The inner sleeve 4 is somewhat shorter than the outer sleeve 3 so that it is also covered axially by the resilient element 5 at the rear end of the bearing

element which is to be set in concrete. The inner sleeve 4, or the pin element mounted therein, is thus mounted for floating in both radial and axial directions. The absence of any sound bridges results in good sound deadening.

A nail plate 7 is provided on the front of the bearing element 1. This is, for example, square, and has nail holes 10 in the corners for the fixing of the bearing element 1 to the inside of the shuttering during setting in concrete.

According to the invention, the bearing element 1 has means for preventing amplitudes of movement which could damage the resilient element 5 in time. These means consist of stop elements mounted in pairs suitably spaced from one another.

In the embodiment in question, an annular plate 8 is fixed to the front of the inner sleeve 4 which is open towards the front. This annular plate 8 has the same inside diameter as the inner sleeve 4. However, it forms an abutment projecting radially outwardly beyond the outside diameter of the inner sleeve 4.

An opposed, spaced abutment is formed by the inner edge 7.1 of the nail plate 7. That is to say, according to a preferred embodiment, the nail plate 7 is provided with a circular opening the diameter of which is somewhat smaller than the inside diameter of the outer sleeve 3, on the one hand, and which is larger than the outside diameter of the annular plate 8 by a predetermined amount, on the other hand. A radial, annular gap 9 is

thus formed between the annular plate 8 and the edge 7.1 of the nail plate 7. Its width is less than the radial thickness of the resilient element 5. The compression of the resilient element 5 cannot therefore be greater than the width of the gap 9. Larger-amplitude movements are thus blocked.

The inner and outer sleeves 4 and 3 are composed, for example, of a suitable steel. In the embodiment in question, the outer sleeve 3 is shown as a tube, that is, without a rear cover (a base). In contrast, the inner sleeve 4 has a base at the rear end, that is, it is formed like a socket. Naturally, the outer sleeve 3 may also be provided with a base of this type if appropriate owing to circumstances. Conversely, the sleeve 4 may be formed without a base.

The resilient element preferably fills the entire space between the inner and outer sleeves 4 and 3. It may be formed, for example, by rubber with small cavities so that a desired resilience or radial spring effect can be defined by the cavities.

The stop elements need not necessarily be formed on the front as an annular plate and a nail plate with a gap between them. The stop elements may, for example, also be provided in other axial positions. For example, longitudinal ribs having opposed stop surfaces and arranged at regular (equidistant) intervals between the inner and outer sleeves are possible but less preferable.

The annular plate 8 may also be omitted if, for example, a correspondingly smaller inside diameter of the opening

of the nail plate 7 is selected so that either the inner sleeve 4, which projects slightly axially, or the pin element 2 itself acts as an amplitude-limiting stop surface.

The outer sleeve 3, the inner sleeve 4, the nail plate 7 and the annular plate 8 are preferably composed of stainless steel.

The pin element 2 is preferably not a monolithic steel element as in the prior art but a composite element with good internal deadening.

A pin core 12 is embedded by means of filling material 13 in a pin sleeve 11. The pin sleeve 11 is, for example, a steel tube of suitable length. An iron rod is disposed coaxially therein as the pin core 12. The space between the pin sleeve 11 and the pin core 12 is filled, for example, with cement as a filling material 13. At the end of the pin element 2 which is to be set in concrete, the pin sleeve 11 is provided with a bung 14, for example, of plastics material, for centring the pin core 12. Amongst other things, this bung 14 keeps the pin core 12 central in the pin sleeve 11 when cement is poured in as a filling material during the production of the pin element according to the invention.

The pin element 2 is typically cylindrical and its length is twice to three times that of the cavity 6 of the bearing element 1. In the position of use, the pin element 2 is typically supported in the bearing element 1 for approximately one third of its length. A small portion of the cavity 6 remains free for axial movements

(expansion movements).

The pin sleeve 11 is advantageously of dimensions such that it can absorb all shear forces acting on the pin element 2. In normal circumstances, only this element, formed, for example, as a steel tube, is then loaded. At the same time, it is advisable for the pin core 12 to have dimensions such that, in the event of a fracture of the pin sleeve 11, it can also absorb all of the shear forces acting on the thrust pin connection. Increased safety in comparison with conventional units is thus achieved.

With a suitably selected method of manufacture, the bung 14 may also be omitted. Instead of cement, another material which can be cast and which sets may also be used. If the additional safety and strength brought about by the pin core 12 is not required, this can also be omitted. The pin sleeve 11 is then filled completely with the deadening filling material 13.

As already mentioned, a larger diameter of the pin element 2 leads to a broader support of the shear loading in the bearing element 1. The resilient material is then subject to less point-loading. For greater loadings a double thrust pin connection may also be appropriate (see EP-0 127 631 B1).

The embodiment described with reference to Figs. 1 and 2 is to a large extent rotationally symmetrical. Naturally other cross-sectional shapes (rectangular, square, hexagonal, etc.) may be selected according to need.

The pin element 2 does not necessarily have to be mounted movably. Correspondingly, the omission of the inner sleeve 4 is not excluded.

In summary, it can be noted that the thrust pin connection arrangement provided by the invention is distinguished by a good sound-deadening effect particularly for impact sounds, by a long life, and by increased mechanical safety.



Claims

1. Thrust pin connection arrangement including a pin element to be anchored in a first construction element and a bearing element to be anchored in a second construction element, in which the pin element is supported for floating in the bearing element with allowance for amplitudes of movement by means of at least one resilient element, characterized in that stop means for limiting the amplitude of movement of the floating pin element (2) are formed on the bearing element (1) and/or on the pin element (2) and are spaced by a gap of a width less than the thickness of the resilient element so that the at least one resilient element (5) cannot be overloaded.
2. Thrust pin connection arrangement according to Claim 1, characterized in that the pin element (2) comprises a dimensionally stable outer pin sleeve (11) at least partially filled with a sound-deadening filling material to achieve good internal deadening.
3. Thrust pin connection arrangement according to Claim 2, characterized in that the pin element (2) comprises a pin core (12), and in that a space formed between the pin sleeve (11) and the pin core (12) is filled with filling material to achieve good internal deadening.
4. Thrust pin connection arrangement according to Claim 3, characterized in that the pin sleeve (11) is composed of stainless steel and the pin core (12) is composed of iron, and in that the filling material (13) is cement.



5. Bearing element for a thrust pin connection arrangement according to Claim 1, including an outer sleeve and an inner sleeve (3 and 4) as well as a resilient element (5) disposed between them, the inner sleeve (4) being designed for supporting the pin element (2) for sliding axially, characterized in that stop means for limiting the amplitude of movement of the floating pin element (2) are formed on the inner and/or the outer sleeve (3 and/or 4) and are spaced by a gap of a width less than the thickness of the resilient element (5) so that the at least one resilient element (5) cannot be overloaded.

6. Bearing element according to Claim 5, characterized in that the stop means for limiting the amplitudes of movement are formed on the front of the bearing element (1) on the inner and/or the outer sleeve (4 and/or 3).

7. Bearing element according to any one of Claims 5 and 6, characterized in that the means for limiting the amplitudes of movement are formed by projections and/or stop elements (7.1, 8) associated with one another and spaced by a ring-like, encircling, radial gap (9).

8. Bearing element according to any one of Claims 5 to 7, characterized in that the means for limiting the amplitudes of movement include flange-like projections (7.1, 8) which project radially outwardly and inwardly on the inner and outer sleeves (4 and 3), respectively, and which abut respective associated counterparts when the resilient element (5) is overloaded.

9. Bearing element according to any one of Claims 5 to 8,



characterized in that the inner and outer sleeves (4 and 3) are cylindrical and are arranged coaxially.

10. Bearing element according to any one of Claims 5 to 9, characterized in that a nail plate (9) is formed on the front.