

Grandstand

The invention concerns a grandstand, in particular, a transportable grandstand, with step elements which, in accordance with the preamble of Claim 1, can be pulled apart, telescope-like, from an essentially parallel piped supporting frame, in which they are arranged in a transporting position, in a horizontal pulling-out direction into the usage position.

Such a transportable grandstand is known from DE74 11 654 U, wherein various variants of pulling-out devices are disclosed. The main attention is directed thereby at a C-shaped profile, into which mesh, rollers of the row of seats underneath, laterally supported, and roll into grooves. In the other developments also, the bearing surfaces are not protected against soiling or moisture; in part, at least the inevitable torsion stresses are avoided. On the whole, all variants are sturdily built, without thereby, being mechanically stable.

Such a grandstand is also described in the applicant's DE 198 11766 C and has proved to be good, essentially, but it has become evident, especially after a frequent assembly and dismantling and with great stresses, in particular, dynamic stresses, as they are exerted by the public in various ways at sports events and also open-air concerts and the like, that deformations arise in the area of the telescopic pulling-out operations, which make expensive repairs necessary. These problems also require increased attention to the state of the grandstand and thus increased maintenance costs.

The invention aims to provide a remedy here and to indicate a grandstand of the type mentioned in the beginning, which is clearly more stable mechanically and has a greater stress capacity, without causing a noticeable increase in weight or complexity. Here too, the bearing surfaces are to be better protected against soiling and the penetration of moisture than in the state of the art. To this end, one also has to explain that the lifting device, which was provided in the grandstand, in accordance with DE-C, has proved not to be necessary in actual practice and, moreover, is susceptible to malfunctions, so that the actually implemented transportable grandstands for the most part do not correspond to DE-C; also, the grandstand, in accordance with the invention under consideration, does not provide--at least in accordance with the standard--a lifting device.

In accordance with the invention, these goals are attained in that the telescope profile or supporting profile is designed, in its cross-section, in the shape of a U which is essentially inverted; thus it is open below and has leg ends which are retracted inwards toward the slit, and that at least four supporting rollers of the step element underneath, arranged in pairs, run in this supporting profile; they are arranged on both sides of an essentially vertical crossbar, which protrudes through the slit; and that the crossbar, in turn, has a supporting profile projecting in the pull-out direction.

In this way, the load is, on the one hand, distributed on more rollers than in the state of the art; on the other hand, due to the essentially closed supporting profile, a greater profile rigidity is attained so that deformations of all types will meet with a greater resistance than was the case with grandstands of the state of the art, and finally, for the cases of overloading or handling contrary to instructions during the pulling-out operations (cases were already documented, wherein the pulling out of the individual step elements was done with a chain which was affixed to a dredge), the supporting rollers are reliably prevented from sliding laterally out of the supporting profiles.

The invention is explained in more detail below with the aid of the drawing. Figure 1 shows a grandstand, set up in accordance with the invention, in a perspective view;

Figure 2, a step element, equipped in accordance with the invention, in perspective view;

Figure 3, some step elements, partially move out and partially pushed in;

Figure 4, a front view of part of Figure 3; and

Figure 5, a pull-out element in a detailed perspective view.

Figure 1 shows a transportable tribune 1 in its entirety. The step elements 2 are recognizable; they consist of a supporting frame 5, which, in general, has the form of a container and preferably has the outside dimensions and fixtures, such as a 20-foot container or a 40-foot container. This makes possible an easy transporting and shipping. From container 5, the individual drawer-like elements 2 can be pushed out telescope-like. Blocking devices for the grandstand and step elements, which have steps, are also drawn in Figure 1, in order to show the variability.

Figure 2 shows a step element 2 in its entirety. The pull-out direction is indicated with F; parallel to this direction, there is a supporting track 3 at the border or in the border area of each step element, beneath the actual stepping surface 4, and parallel to the supporting profiles 3 and preferably firmly connected with them, in the upper, rear area, viewed in the pull-out direction F, a supporting roller arrangement 6. As can be seen from Figure 2, each supporting roller arrangement 6 consists of four rollers 14; they are arranged in pairs to the left and right of a crossbar 7, a front roller pair 8 and a rear roller pair 9. The roller pairs 8, 9 and the crossbar 7 are shoved into the supporting profile 3 of the next higher step element 2, as can be seen from Figures 3 and 4.

Figure 3 shows, in a purely schematic manner, several connected step elements 2 with the individual supporting profiles 3 and the cross bar 7, visible only in the topmost step element 2, and the front roller pair 8 and the rear roller pair 9.

Figure 4 is a representation along the arrow IV in Figure 3 and shows the supporting profile 3 in alignment--therefore, only the front roller pair 8 and the crossbars 7. In Figure 4, one can also see lateral vanes 10, which are useful for the assembly of the individual step elements 2, which are not depicted in Figure 4.

From Figure 4, one can see, in particular, the stable setup of the supporting profiles 3, which have a high area of moment of inertia in the cross-section, in particular, if the connection between the actual supporting profile 3 and the crossbar 7 is made firm and massive.

Figure 5 also shows, in a purely schematic manner and dispensing with the representation of various stops, tracking limiting elements, stiffening ribs, and assembly elements for the step elements, a supporting profile 3, together with a crossbar 7, placed firmly thereon, and the two roller pairs 8, 9, wherein the rollers 14 are alluded to purely schematically, therefore without bearings, etc.

By the introduction of the roller pairs 8, 9 into the supporting profile 3, in which they move on the two bearing surfaces 11, 12, whereas the crossbar 7 protrudes downwards through the slit 13 lying in between, an excellent guiding of the rollers 14 of the two roller pairs 8, 9 is attained on the one hand, and simultaneously, reliably prevents any danger of a derailment, even with a very strong deformation of the step element 2 and thus a strong tilting of the supporting track 3 around its longitudinal axle (this runs parallel to the pull-out direction F). Even if there might be excessively

large remaining (plastic) deformations in this area, the largest damage that can be expected is a jamming or sticking of the roller pairs in the supporting track, without there occurring a crashing of the step element; the safety of the device is very essentially increased and will not be compromised even with an improper handling of the system.

The invention is not limited to the depicted embodiment example, but rather can be modified in different ways. Thus, the profile can assume another form and need not have the depicted slopes at the side of the bearing surfaces 11, 12 in the lower area. It is possible to provide more than two roller pairs, in order to also attain a uniform a distribution of the loading in the case of greater tolerances or incipient deformation. It is, in particular, possible to provide, instead of one or two roller pairs, a double roller pair on a see-saw, so that with a loading by swivelling the see-saw around a see-saw axle, which runs parallel to the roller axles, as uniform as possible a distribution of the load takes place.

Measures can be taken, which make it possible to set up, "behind" a grandstand, as shown by Figure 1, another grandstand, but elevated by one container, and to connect it, in a suitable manner, with the grandstand shown in Figure 1 and to support it thereon, etc. The grandstands, in accordance with the invention, can also be "firmly" incorporated--for example, in large halls, so as to perhaps free space for special events. Then, the container is not an object, in itself, but rather, if desired, the uppermost, firm step elements are anchored, in a correspondingly massive manner, in the surrounding masonry; the container mutates to a kind of cover against dust, to stop undesired access, and for optical beautifying.

The explained arrangement of roller pairs with rollers, to the left and right of a crossbar, which roll on bearing surfaces within an almost closed profile, is essential in all cases, so as to prevent a derailment. Of course, the uppermost bearing profiles are developed without the crossbars and rollers arranged over them and the lowermost, without supporting profiles, since they do not need them.

It is not absolutely necessary for the rollers 14 to be arranged in pairs, so that they sit on aligned and continuous axles; they can be slightly staggered in direction F, without leaving the arrangement in pairs, but this aligned arrangement is particularly preferred mechanically.

Patent claims

1. Grandstand, in particular, a transportable grandstand (1) with step elements (2), which can be pulled from one another, from an essentially parallelepiped supporting frame, in which they are arranged in a transporting or resting position, in a horizontal pull-out direction (F) into the usage position, telescope-like, along supporting profiles (3), which are arranged in the lateral end area of the step elements, characterized in that at least one supporting profile (3) is designed, in the cross-section, in an essentially inverted U shape, is thus open below, and has leg ends, retracted inwards, toward the slit (13), whose upper, thus interior, surfaces serve as bearing surfaces (11, 12), and that in this supporting profile (3), at least four supporting rollers (14), arranged in pairs, of the underlying step element (2) run on the bearing surfaces (11, 12), which are arranged on both sides of an essentially vertical crossbar (7), which projects through the slit (13), and that the crossbar (7), on its underside, is once again connected, in turn, with a supporting profile (13), projecting in the pull-out direction (F).
2. Grandstand according to Claim 1, characterized in that at least one roller pair (8, 9) sits on a common axle.
3. Grandstand according to Claim 1, characterized in that at least one roller pair is constructed as a double pair, whose two axles are placed on a common see-saw, which is affixed so it can swivel on the crossbar (7).