(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 504 753 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **92104357.6**

(22) Date of filing: **13.03.92**

(51) Int. Cl.5: **E01D 19/12**, E01B 1/00, E01F 8/00

Priority 220391 ITU MI91000245.

(30) Priority: **22.03.91**

(43) Date of publication of application:
23.09.92 Bulletin 92/39

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR LI LU MC NL PT SE

(71) Applicant: **I.P.A. S.P.A. - INDUSTRIA PREFABBRICATI AFFINI**
Via Don Pietro Bonetti 15
I- 24060 Gorlago (Bergamo)(IT)

(72) Inventor: **Tognoli, Pietro**
Via Ada Negri, 34
I-24020 Gorle (Bergamo)(IT)
Inventor: **Bono, Giancarlo**
Via Strada Consorziale del Castello, 3
I-22048 Oggiono (Como)(IT)

(74) Representative: **Rapisardi, Mariacristina,**
Brevetti S.r.l., Largo V Alpini 15
I-20145 Milano(IT)

(54) Railroad viaduct structure.

(57) The railroad viaduct structure comprises at least one box-like viaduct beam (2) for supporting at least one railroad line (3); the beam has at least one depressed region (4) for accommodating at least one prestressed reinforced concrete platform (5) for supporting the rails (6); the depressed region has means (7) for retaining the platform to the box-like viaduct beam.

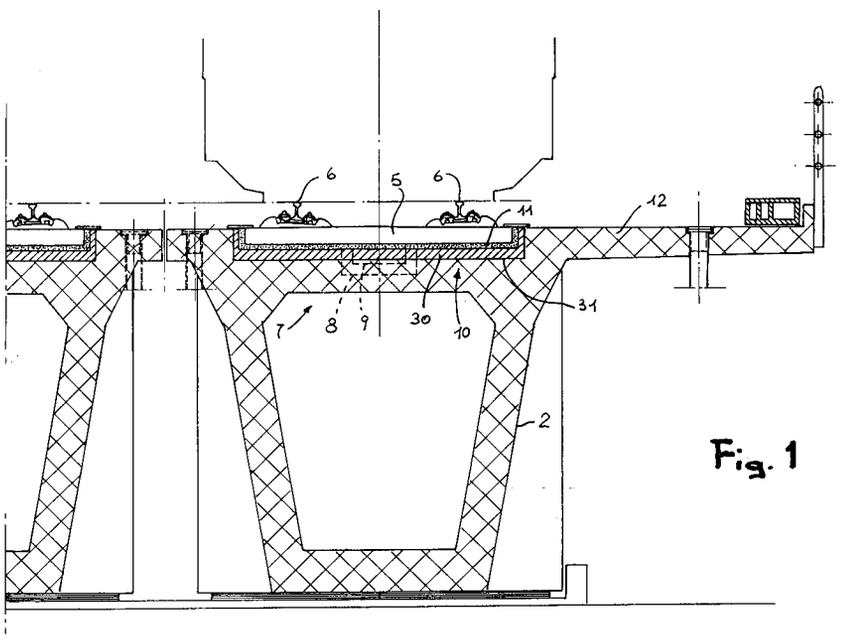

Fig. 1

EP 0 504 753 A2

The present invention relates to a railroad viaduct structure.

As is known, current conventional railroad bridge and viaduct structures generally entail the on-site execution of abutments and intermediate supports and then the forming of conventional girders, possibly using prefabricated components.

The function of girders in viaducts is to support the ballast and the wood or cement ties to which the rails are anchored or, according to a recent practice, possible prefabricated rail-supporting plate-like elements which rest on the girders by means of a foundation which is cast in place.

Technical solutions are furthermore known which provide the arrangement of the ties directly on the girders, without creating the ballast, in particular in bridges having an iron structure, with the consequence, however, of no longer having, as is evident, the conventional elastic characteristics required by the railroad line, with a consequent reduction in comfort conditions for the passengers and the surrounding environment.

In view of the fact that the particular morphological conditions of some geographic areas and especially of Italy, together with railroad routing constraints, in particular for high-speed lines, have required the execution of a large portion of the railroad lines on bridges and viaducts, it is evident that the conventional type of superstructure adopted by railroads, in which the rail-supporting wood or cement ties rest on the girders, entails on one hand a considerable increase in the height and weight of the structures and on the other hand requires the periodic execution of maintenance work which is particularly difficult and onerous also due to the difficulty of working vehicles in gaining access.

The aim of the present invention is to provide a railroad viaduct structure which advantageously reduces the distance of the rail plane from the intrados of the structural girders, that is to say wherein the sum of the space occupied by the railroad substructure (girder) and superstructure (ballast and ties plus rail) is considerably reduced.

Within the scope of this aim, an important object of the invention is to provide a railroad viaduct structure which allows to reduce railway line construction costs, since it is possible to decrease the level of said lines measured at the top of the rails, by virtue of the possibility of minimizing the distance between the intrados of the structural girders, generally considered at a fixed preset level both in the case of an underlying road and in the case of a waterway, and the level of said rails.

Another object of the invention is to provide a railroad viaduct structure over which tire-fitted vehicles can travel, thus facilitating the transport of material and of any other item required for its maintenance, as well as the possible access of rescue and assistance vehicles such as ambulances and fire-fighting vehicles.

Not least object of the invention is to provide a railroad viaduct structure in which it is possible to waterproof the girders of the box-like viaduct beam, increasing its resistance to weather and chemical agents and simultaneously allowing the use of sound-deadening barriers.

It is furthermore possible to check and also perform operations for maintaining and reapplying the impermeable layer without interrupting or slowing down the normal traffic of railroad operation.

This aim, these objects and others are achieved by a railroad viaduct structure which comprises at least one box-like viaduct beam for supporting at least one railroad line, characterized in that said box-like viaduct beam comprises at least one depressed region for accommodating at least one prestressed reinforced concrete-platform for supporting the rails, said depressed region having means for retaining said platform to said box-like viaduct beam.

Further characteristics and advantages will become apparent from the detailed description of a railroad viaduct structure according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a transverse sectional front elevation view of a viaduct according to the invention;

figure 2 is a view of the viaduct of figure 1 equipped with the sound-deadening barrier according to the present invention; and

figure 3 is a longitudinal sectional side elevation view of the upper part of the viaduct according to the invention.

With reference to the above figures, the railroad viaduct structure according to the invention, generally designated by the reference numeral 1, comprises at least one box-like viaduct beam 2 for supporting at least one railroad line, generally designated by 3.

The box-like beam 2 comprises a depressed region 4 inside which at least one platform 5, made of prestressed reinforced concrete and suitable for supporting the rails 6, is accommodated.

The depressed region 4 is furthermore provided with means, generally designated by 7, for retaining the platform 5 to the box-like viaduct beam 2.

More in particular, said retention means 7 are defined by at least one substantially cylindrical seat 8 defined in the body of the box-like beam 2, inside which two semicylindrical expansions 9 engage; said expansions extend respectively from the ends of two mutually facing and contiguous platforms 5.

Conveniently, the platform 5, once it is accom-

modated within the depressed region 4, defines, together with the walls of the box-like beam 2, an interspace 10 which is filled with elastic material so as to provide a continuous support for the platform 5.

More precisely, the elastic material can be composed of a layer of cement-asphalt mortar 11 injected during the laying of the platforms and of a layer of waterproof roughcast 30 with compensated shrinkage which grips the surface of the box-like beam for example by means of epoxy resin 31, with the function of leveling the girders.

In the same manner, the seat 8 inside which the two semicylindrical expansions 9 are inserted, can also be filled with further elastic material, constituted for example by cement-asphalt mortar.

Advantageously, the surface of the platform 5 is substantially co-planar with respect to the girders 12 of the box-like beam so as to allow for example tire-fitted vehicles to travel along the viaduct.

Above, the girders 12 comprise waterproofing means 32 which are suitable for protecting both the girders 12 and the elastic material provided inside the interspace 10 against possible weathering and chemical aggressions.

Sound-deadening means may furthermore be provided on the edge of the girders; said means comprise at least one sound-deadening barrier, generally designated by 13, which has a supporting element 14 which supports an element 15 for interfering with and refracting sound waves.

The end surface 16 of the supporting element 14 is advantageously directed toward the platform 15, is inclined and blends with the surface 17 of the sound wave interference and refraction element 15.

In this manner, any structural interference is eliminated in order to allow to optimize noise reduction.

The supporting element 14 is provided, on the side directed toward the platform 5, with at least one first sound-deadening plate-like element 20 which has a plurality of small mutually interconnected acoustic chambers 21, and with at least one second sound-deadening plate-like element 22 which is comprised between the first plate-like element 20 so as to integrate its sound-deadening ability by acting specifically in a different frequency range.

The second plate-like element 22 furthermore separates the first plate-like element 20 from the supporting element 14, which is normally made of concrete, avoiding resonance phenomena and increasing its sound-deadening abilities.

In practice it has been observed that the railroad viaduct structure according to the invention is particularly advantageous, in that it allows to reduce the thickness due to the sum of the space occupied by the substructure (girders) and by the railroad superstructure (ballast and ties plus rail), so as to reduce construction costs, furthermore obtaining a significant reduction in the structural load of the viaduct.

The sound-deadening barrier furthermore allows a considerable noise reduction, like conventional high barriers but without their known disadvantages, such as for example environmental impact both inside and outside the railroad line as well as the unpleasant feeling of oppression due to travel along long stretches delimited by high walls.

In practice, the materials employed, as well as the dimensions, may be any according to the requirements and the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Railroad viaduct structure, comprising at least one box-like viaduct beam (2) for supporting at least one railroad line (3), characterized in that said box-like viaduct beam (2) comprises at least one depressed region (4) for accommodating at least one prestressed reinforced concrete platform (5) for supporting the rails (6), said depressed region (4) having means (7) for retaining said platform to said box-like viaduct beam.

2. Structure according to claim 1, characterized in that the surface of said platform (5) accommodated in said depressed region (4) is substantially co-planar with respect to the girders (12) of said box-like beam.

3. Structure according to claim 1, characterized in that it comprises means (32) for waterproofing said girders (12) and the interspace (10) defined by said platform inside said depressed region.

4. Structure according to claim 1, characterized in that said retention means comprise at least one substantially cylindrical seat (8) inside which two semicylindrical expansions (9) engage, said expansions being respectively rigidly associated with two ends of two facing platforms.

5. Structure according to claim 3, characterized in

that said interspace (10) and said cylindrical seat (8) comprise at least one layer of elastic material (11) for providing a continuous support of said platform.

6. Structure according to claim 1, characterized in that it comprises sound-deadening means (13, 14, 15) which are connected on the edge of said girders (12) of said box-like beam.

7. Structure according to claim 6, characterized in that said sound-deadening means comprise at least one sound-deadening barrier (13) which has a supporting element (14) which supports a sound wave interference and refraction element, the end surface (16) of said supporting element (14) being directed toward said platform, inclined and blended with the surface (17) of said sound wave interference and refraction element (15).

8. Structure according to claim 7, characterized in that said supporting element (14) is provided, on the side directed toward said platform, with at least one first sound-deadening plate-like element (20) which has a plurality of small mutually interconnected acoustic chambers (21) and with at least one second sound-deadening plate-like element (22) which is internal to said supporting element and cooperates with said first plate-like element in a different frequency range in order to increase sound-deadening.

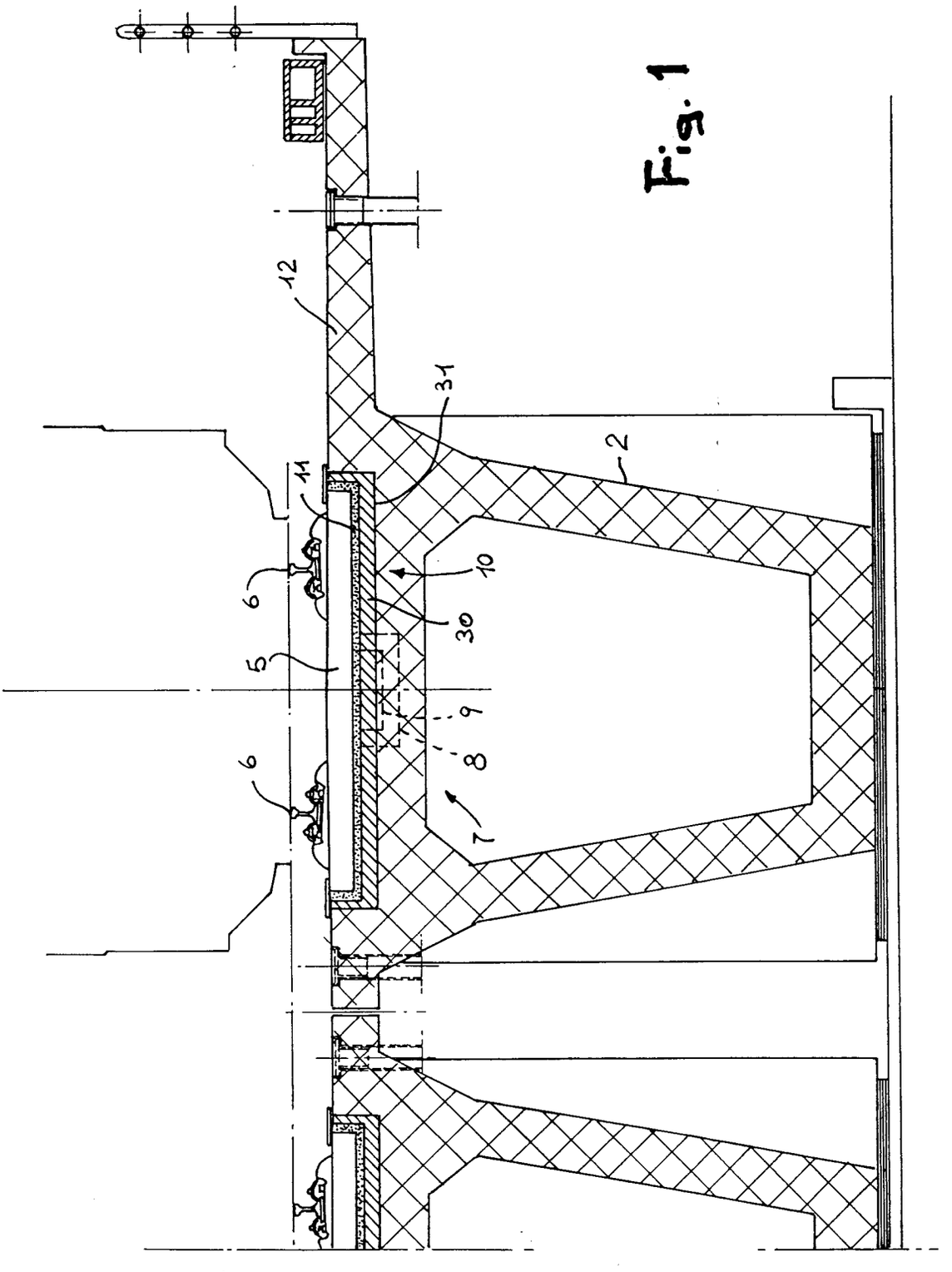

Fig. 1

Fig. 2

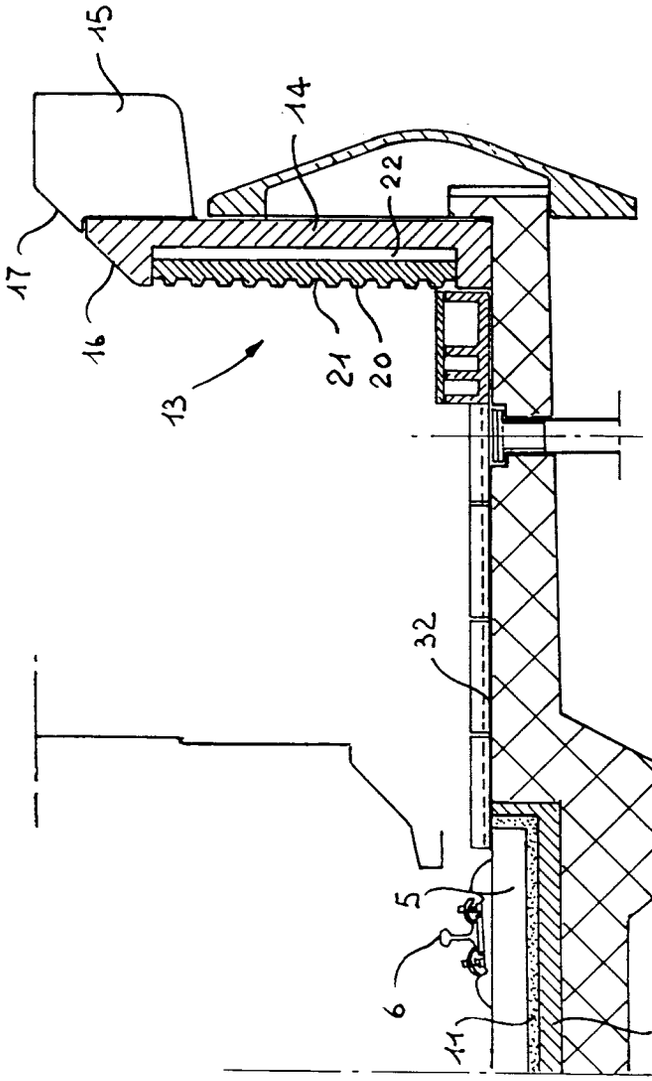

Fig. 3