



DEVICE FOR THE ASSEMBLY OF BALUSTERS TO A BALUSTRADE RAIL

The present invention relates to a device for
5 the assembly of balusters to a balustrade rail,
enabling them to be joined directly to the latter,
without the use of intermediate components or of a
special clamping member, simply by fitting each
baluster in succession by snapping it into
10 accommodation openings provided in the rail, making a
rapid, reliable and effective connection.

Known solutions used in the prior art to join
the top and bottom rails of a balustrade together by
means of a plurality of balusters, spaced apart from
15 each other by a defined maximum distance, so as to form
the front part of such a balustrade, this front part
being supported vertically in line with a balcony, a
terrace, a staircase or other similar construction by
vertical stiffeners or posts fixed into the ground,
20 generally employ a keying system which requires these
balusters and these rails to be machined beforehand.

In particular, these rails include accommoda-
tion openings for the top and bottom ends of the
balusters in the corresponding rail, these balusters
25 then being drilled transversely for the engagement of a
locking key, the rails subsequently being covered with
a finishing section before being fastened to the
vertical support stiffeners.

Generally, the rails are horizontal and the
30 balusters vertical. However, in order to form a stair-
case guardrail for example, the rails may make a given

angle, usually about 30° or more, with the vertical direction of the suitably spaced parallel balusters in order to follow the slope of the staircase. In this case, the web of each rail is suitably deformed in order to allow passage of the corresponding end of the balusters, the linking key possibly being replaced by a suitable deformation of the wall of the baluster in its housing inside the rail which it passes through, so as to immobilize it in the suitable position with respect to the rail with the inclination desired for the latter.

Finally, and in another conventional variant, the rail and balusters may be linked together by means of a plastic end-piece forcibly mounted at the end of the baluster and fastened to the rail by a linkage bolt passing through an internal rib in the rail and engaged in an open groove in the end-piece, this fitting arrangement allowing relative rotation of the rail with respect to the baluster about the axis of the bolt so as to obtain the desired inclination.

All these solutions have drawbacks because of a fitting arrangement which requires several components and the need to carry out a series of successive operations in order to install the balusters in the rails, to engage the fixing keys or bolts through the projecting parts of these balusters and finally to attach the finishing sections, all of which takes up a not insignificant amount of time which puts up the cost of the installation. Moreover, these solutions adversely affect the mechanical strength of the system, the rails, consisting of sections which are open for passage of the balusters and fitting of the keys for immobilizing the latter, requiring extra sections to be added in order to make the rails continuous; finally, they are unsatisfactory from an aesthetic standpoint, leaving, as the case may be, the linkage means visible, in particular in the case of plastic components.

The subject of the present invention is a linkage device, linking the balusters and the top and



bottom rails of a balustrade directly, which avoids these drawbacks.

For this purpose, the device in question, for the assembly of parallel and spaced-apart balusters to
5 a rail for supporting these balusters, extending transversely to the longitudinal direction of the latter, is characterized in that the rail includes a plurality of adjacent openings, preferably equally spaced and each suitable for accommodating the end of a
10 baluster, and a flexible internal strip embedded in the inner wall of the rail, extending over the entire length of the latter and having a plane surface inclined to the vertical, capable, for each baluster, of acting in conjunction with a recess delimited by
15 edges, these also being inclined and having the same profile as the strip, which are provided at the end of the baluster which enters the corresponding opening in the rail, or in the opening made in a support member carried by this end of the baluster, the strip
20 including a transverse return, substantially perpendicular to its plane, capable of being progressively engaged in an open housing provided in the bottom of the recess until it snaps into this housing, fastening the rail and baluster together.

25 By fitting any baluster into the corresponding opening in the rail provided for accommodating it, the recess made directly at the end of this baluster or in the support member carried by the latter thus comes into engagement on the strip which slides along the
30 inclined edges of this recess or of this member as the baluster advances into the rail until, at the end of travel, the transverse return of the strip enters the open housing in order to be immobilized therein, thus fastening the baluster and rail together in a
35 particularly effective manner.

According to one particular characteristic of the device in question, the strip includes, at the end of its transverse return, a foot for bearing against the bottom of the housing in the recess at the end of

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snap-in travel, suitable for making the strip work in tension in the event of the baluster being bent due to the effect of an accidental transverse blow.

Advantageously, the rail includes, in the vicinity of its junction with the strip, an internal stop limiting the extent of engagement of the baluster into the rail. Furthermore, the inclined edges of the recess have, in the vicinity of the end of the baluster, a projection preferably forming a point of bearing close to the region of embedment of the strip so as to stiffen the rail and baluster assembly in the event of an accidental transverse blow to the baluster.

When the vertical bars are linked to two rails, respectively a top rail and bottom rail, extending horizontally, the openings made in these rails, accommodating the ends of the balusters which are fastened in these rails because of the conjoint action of their respective recesses and the plane transverse strip provided inside each of the latter, have a profile which corresponds exactly with the cross-section of these balusters, with only sufficient clearance for the engagement of the latter into the rail.

In an alternative embodiment, where each of the two rails makes a given angle with the vertical direction of the balusters, especially in a balustrade forming the guard rail of a staircase, each of the openings made in the rails has a cross-section significantly greater than that of the baluster which engages therein, the latter being solely retained in the central part of the opening by an internal rib for bearing on the external wall of this baluster, guiding it as its end engages in the opening and guaranteeing the spacing of one baluster to another along the length of the rail.

In this same alternative embodiment, the support member carried by each vertical baluster, provided with the recess acting in conjunction with the strip of the rail, has the shape of a cylindrical stud,



the axis of which lies horizontally, this stud being mounted so as to pivot to some extent about this axis inside the baluster, so as to simplify the fitting arrangement and especially to allow relative excursions of the rail, fastened to the stud by its strip, with respect to the baluster.

According to one particular characteristic, the cylindrical stud includes a front end whose cross-section, having a diamond-shaped profile, is engaged in a groove or slot in the baluster extending from its end, the stud coming at most into abutment against the sides of this slot and tolerating the relative excursions of the rail, fastened to the stud, with respect to the baluster.

Other characteristics of the device according to the invention, for the assembly of vertical balusters of a balustrade to the top or bottom rails of the latter, will also appear in the description which follows of several embodiments, given by way of indication but implying no limitation, with reference to the appended drawings in which:

- Figure 1 is a perspective view of a balustrade in which the rails are equipped with a baluster assembly device according to the invention;

- Figure 2 is a sectional view, in elevation, on a larger scale, of the top and bottom rails of the balustrade according to Figure 1, making it easier to explain the details of the construction of the means for assembling the vertical balusters to these rails;

- Figure 3 is a top view of the bottom rail of the balustrade, showing the profile of one of the openings for accommodating a baluster;

- Figure 4 represents, in four successive views identified respectively by a to d, the bottom rail of the balustrade and the baluster which engages into one of the openings in this rail, illustrating the various phases in the installation of this baluster until it is finally snapped into the rail;



- Figure 5 is a diagrammatic view, in elevation, of the balustrade, illustrating an alternative form for the construction of the top rail of the balustrade;

5 - Figure 6 illustrates the position of a baluster of the balustrade in the event of an accidental frontal blow and the behaviour of the assembly device in such a case;

10 - Figure 7 is a view similar to Figure 1, but in which the top and bottom rails of the balustrade make a given angle with the vertical direction of the balusters, in particular when the balustrade forms a staircase guard rail;

15 - Figure 8 is a longitudinal sectional view, on a larger scale, of a baluster and the rails of the balustrade according to Figure 7;

20 - Figures 9, 10 and 11 are detail views, respectively in cross-section, on the line marked X-X in Figure 9, and in longitudinal section, of part of a baluster involved in the construction of the balustrade according to Figures 7 and 8;

25 - Figure 12 is a view in cross-section, on the line XII-XII in Figure 8, of a baluster, illustrating, from above, the opening made in the bottom rail of the balustrade, to accommodate the baluster in question;

- Figure 13 is a longitudinal sectional view of the lower part of a baluster, shown engaged in the bottom rail of the balustrade.

30 In Figures 1 and 2, the reference 1 denotes a balustrade as a whole, for a balcony, terrace or other similar construction, which includes a plurality of vertical posts or stiffeners 2, each comprising means by which it bears on and is fastened to the ground 5 by means of a mounting plate 4.

35 These vertical stiffeners 2 are linked to horizontal outside rails, respectively a bottom rail 6, lying slightly above the plane of the ground 5, and a top rail 7 which, in the example in question, also constitutes a handrail for the balustrade.



Lying between the bottom rail 6 and the handrail 7, in the top part of the balustrade, are parallel and vertical balusters 8 which may, depending on the case, be solid or tubular, either in part or completely, and each of them is provided at its ends with a device for assembly to these rails, in accordance with the invention, the constructional details of which will be explained later.

Conventionally in this kind of balustrade, the bottom rail 6 is held against the external surface of the stiffeners 2 by means of fixing members, the constructional details of which are of little importance with regard to the invention but which, as illustrated by way of example in Figure 5, may include bolts 9 for holding an end-piece 10 for locking the rail against the corresponding stiffener.

It should be noted that in the alternative form illustrated diagrammatically in this Figure 5, the balustrade 1 includes not only a bottom rail 6 as in the example in Figures 1 and 2, but also a top rail 11 which runs below the handrail 7, this top rail also being fixed against the stiffeners 2 by means of locking end-pieces 12 similar to the end-pieces 10 and immobilized, like the latter, by bolts 9, the vertical balusters 8 being, in this example, fitted between the parallel rails 6 and 11.

Figure 2 illustrates in detail the structure of the two rails and the balusters assembled to the latter.

In particular, each rail 6 or 7 includes, in line with the ends of each of the balusters 8, an opening 13 allowing these ends to enter each of the these rails, the latter being for this purpose in the form of sections, preferably metal sections, these openings 13 being shaped, as shown in Figure 3 in particular, so as to correspond substantially to the cross-section of the balusters, these consisting also of metal elements. In the example illustrated in Figures 2 and 3, the cross-section of the balusters 8



is substantially in the form of a curvilinear triangle with rounded angles; of course, such a profile in itself is of no concern in the invention and could be modified in the widest possible way according to the aesthetic appearance chosen for the construction of the balustrade and the various parts of it.

Each rail 6 and 7 includes a front wall 14 and, embedded in the bottom of the rail opposite the corresponding opening 13 which accommodates any baluster, against the internal surface of the section constituting this rail, a plane strip 15 which extends over the entire length of the rail and which has a wall inclined to the vertical.

At its end opposite its region of embedment against the bottom of the rail, the strip 15 includes a transverse return 16, terminating in a foot 17, the function of which will be defined hereinbelow. Furthermore, on its internal surface, the front wall 14 has one or more inwardly projecting ribs 18 arranged in such a way that they come into contact with the external surface of the baluster 8 when the latter engages in the corresponding rail so as to guide it as it moves during the inward movement.

The bottom rail 6, and, where appropriate, the top rail 7 moreover include, on their rear surface 19, facing the front wall 14, a bearing stop 20 which projects towards the inside of the rail on the opposite side from the opening 13, so as to stop the movement of the baluster 8 into the rail through this opening.

Each baluster 8 moreover includes, at each of its ends, a recess 21, the edges 22 of which are inclined to the vertical, substantially at the same angle as the strip 15, each recess including an open terminal housing 23 and, on the opposite side, in the vicinity of the corresponding end of the baluster, a projection 24 which forms a bearing stop for the strip when the baluster is engaged in the associated rail.

A point of bearing 25 is advantageously provided in the bottom of each rail behind the strip



15. Finally, the bottom rail 6 and, where appropriate, the top rail 11 in the case where the latter is separate from the handrail 7, include a catching hook 26 for immobilizing these rails with respect to the end-pieces 10 and 12 for holding them against the stiffeners 2.

Figures 2 to 4 illustrate the way in which the assembly device according to the invention is used to fix the balusters 8 with respect to the rails 6 and 7 (or 6 and 11), Figure 4 in particular showing how the inclined strip 15 of each rail acts in conjunction with the recesses 21 in the balusters installed in succession in the rails and snapped thereinto.

Figure 4a shows any baluster 8 engaged by its lower end in the opening 13 in the bottom rail 6, this opening having substantially the same profile as the baluster, with a clearance just sufficient to allow vertical sliding of the baluster. In this movement, the latter is guided, on the one hand, by the ribs 18 provided on the internal surface of the front wall 14 of the rail, and, on the other hand, by the opposite face of the rear wall.

At a given instant during this movement, the plane strip 15, which is engaged in the recess 21, encounters the inclined edges 22 of this recess and, due to the effect of the movement of the baluster, causes the strip to bend [sic] slightly about its point of embedment in the internal surface of the rail, the foot 17 provided on the end of the transverse return 16 of the strip sliding progressively along the edges 22 (Figure 4b) until this foot is in line with the open housing 23 in the bottom of the recess 21 (Figure 4c).

With the baluster 8 continuing its movement, the strip 15, because of its intrinsic elasticity, then is snapped into the bottom of this housing (Figure 4d), with abutment of the foot 17, the strip itself bearing at its opposite end on the projection 24 in the vicinity of the end of the recess 21, thereby improving the retention of the thus immobilized strip. In this



position, the extreme edge of the baluster bears substantially on the bearing rib 20 provided for this purpose in the rear face 19 of the rail.

Figure 6 shows how the preceding dispositions not only enable the various balusters to be simply and easily engaged in the rails of the balustrade and to snap in automatically at the end of travel, but provide an effective anchoring of the ends of these balusters, in particular in the event of a frontal blow applied at the centre of gravity of the baluster, such a blow possibly being particularly powerful since the applicable standards require the balusters to withstand a load of about 600 joules without their assembly to the rails failing.

In this figure, f diagrammatically denotes the direction of the impact exerted on any baluster 8 and the local bending of the latter which results therefrom. However, it may be immediately observed that, because of the orientation of the strip 15 and, in particular, of the engagement of its transverse end return 16 in the open housing 23 in the recess 21, this strip works in tension, being braced against the corresponding side of the housing in such a way that the baluster cannot be unfastened from the assembly, because furthermore its application against the internal ribs 18 of the wall 14 and the projection 24 against on the edges of the recess. Simultaneously, the ends of the strip and, in particular, the transverse edge 16 and the foot 17, work in shear.

It should be noted that the limited pivoting of the strip brought about in this way is easily absorbed by the corresponding rail, in particular because of the reinforcement of the embedment of the strip by the point of bearing 25 provided for this purpose behind the strip.

Figures 7 to 13 relate to an alternative embodiment more particularly suitable for the case where the balustrade serves for protecting a staircase or the like, the supporting stiffeners 2 and the



balusters 8 remaining vertical, but the bottom and top rails 6 and 7 having a given inclination to the horizontal, in order in particular to follow the slope of this staircase.

5 In these figures, identical reference numbers have been adopted to denote members similar to those already described in the foregoing.

10 In order to allow the relative inclination of the rails 6 and 7 with respect to the balusters 8, provision is made for these balusters, at their ends which engage in the openings in these rails, to connect with a stud 27, of cylindrical general shape and preferably made of plastic, having, on the one hand, a
15 teat 28, fitted into a vertical groove or slot 29 in such a way that this stud can be forcibly fitted into the baluster but be capable of undergoing, with respect to the latter, a limited relative rotation, allowing the said inclination of each rail with respect to the vertical direction of the balusters, and moreover a
20 surface 30 for bearing against the internal surface of the baluster 8.

Each of the studs 27 includes, as previously, a recess 21 capable of acting in conjunction with the plane flexible strip 15 provided transversely in each
25 rail, these balusters snapping into the rails in exactly the same way as was described in relation to the first embodiment.

However, in order to limit the angular excursion of the stud during fitting, the teat 28 has,
30 seen in cross-section (Figure 10), a diamond-shaped profile, the ends 31 and 32 of which are capable of coming into contact with the faces of the groove or slot 29 in which the teat is engaged.

On the opposite side, in line with the bearing
35 surface 30 of the stud 27, the baluster 8 has, in its corresponding surface 33, a groove 34 into which may be engaged, from outside the baluster, a guiding rib 35 made in the top or bottom rail, depending on the case, in line with the opening 36 via which the baluster in



question enters the latter. As Figures 12 and 13 illustrate, this opening has, transversely, a profile which is substantially wider than the cross-section proper of the baluster 8 which enters it, so as to
5 allow the relative excursion of the rail, fastened to the stud, with respect to the baluster carrying the latter.

Thus a device is produced for the assembly of the vertical balusters of a balustrade to the top and
10 bottom rails of the latter, it being possible for these rails to be horizontal or to have a relative inclination.

The whole system is particularly simple to install, the balusters automatically snapping into the
15 openings made in the rails and the dimensions of which are precisely adapted to the profile of these balusters and, where appropriate, to the necessary excursions of the rails with respect to these balusters. Such a fitting arrangement is reliable and effective, requires
20 no specific tooling and leaves no piece visible, thereby improving the appearance of the whole system and the aesthetic aspect of the mounting management. Furthermore, the use of hollow metal sections to form the rails and the balusters makes it possible to ensure
25 maximum strength for a minimum weight, the arrangement of the assembly device itself being designed so as to enable the balusters and rails to be linked reliably together, even in the event of a frontal blow corresponding to the value of the required standard.

30 Of course, it goes without saying that the invention is not limited to the exemplary embodiments more especially described hereinabove with reference to the appended drawings; on the contrary, it embraces all variants thereof.

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1. Device for the assembly of parallel and spaced-apart balusters to a rail for supporting these
5 balusters, extending transversely to the longitudinal direction of the latter, characterized in that the rail (6, 7, 11) includes a plurality of adjacent openings (13, 36), preferably equally spaced and each suitable for accommodating the end of a baluster (8), and a
10 flexible internal strip (18) embedded in the inner wall of the rail, extending over the entire length of the latter and having a plane surface inclined to the vertical, capable, for each baluster, of acting in conjunction with a recess (21) delimited by edges (22),
15 these also being inclined and having the same profile as the strip, which are provided at the end of the baluster which enters the corresponding opening in the rail, or in the opening made in a support member (27) carried by this end of the baluster, the strip
20 including a transverse return (16), substantially perpendicular to its plane, capable of being progressively engaged in an open housing (23) provided in the bottom of the recess until it snaps into this housing, fastening the rail and baluster together.

25 2. Device according to Claim 1, characterized in that the strip (15) includes, at the end of its transverse return (16), a foot (17) for bearing against the bottom of the housing (23) in the recess (21) at the end of snap-in travel, suitable for making the
30 strip work in tension in the event of the baluster being bent due to the effect of an accidental transverse blow (Figure 6).

3. Device according to Claim 2, characterized in that the rail (6, 7, 11) includes, in the vicinity of
35 its junction with the strip, an internal stop (20) limiting the extent of engagement of the baluster into the rail.

4. Device according to any one of Claims 1 to 3, characterized in that the inclined edges (22) of the



recess (21) have, in the vicinity of the end of the baluster (8), a projection (24) preferably forming a point of bearing close to the region of embedment of the strip (15) so as to stiffen the rail and baluster assembly in the event of an accidental transverse blow to the latter.

5. Device according to any one of Claims 1 to 4, in which the vertical balusters (8) are linked to two rails (6 and 7, 11), respectively a top rail and bottom rail, extending horizontally, characterized in that the openings (13) made in these rails, accommodating the ends of the balusters, have a profile which corresponds exactly with the cross-section of these balusters, with only sufficient clearance for the engagement of these into the rail.

6. Device according to any one of Claims 1 to 4, in which each of the two rails (6 and 7, 11) makes a given angle with the vertical direction of the balusters (8), characterized in that each of the openings (36) made in the rails has a cross-section significantly greater than that of the baluster which engages therein, the latter being solely retained in the central part of the opening by an internal rib (35) for bearing on the external wall of this baluster, guiding it as its end engages in the opening and guaranteeing the spacing of one baluster to another along the length of the rail.

7. Device according to Claim 6, characterized in that the support member carried by each vertical baluster (8), provided with the recess (21) acting in conjunction with the strip (15) of the rail (6, 7, 11), has the shape of a cylindrical stud (27), the axis of which lies horizontally, this stud being mounted so as to pivot to some extent about this axis inside the baluster.

8. Device according to Claim 7, characterized in that the cylindrical stud (27) includes a front end (28) whose cross-section, having a diamond-shaped profile, is engaged in a groove or slot (29) in the



baluster (8) extending from its end, the stud coming at
most into abutment against the sides of this slot and
tolerating the relative excursions of the rail (6, 7,
11), fastened to the stud, with respect to the
5 baluster.

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