Dec. 3, 1968 R. OBERREICH 3,413,774

CONSTRUCTION ELEMENT

Filed June 27, 1966 2 Sheets-Sheet 1

Fig.1

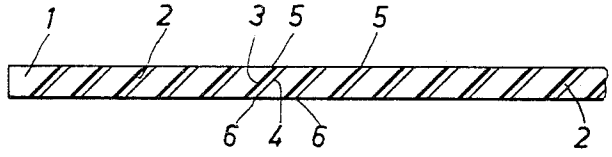


Fig.2

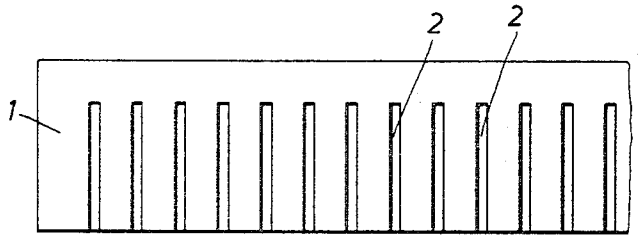


Fig.3

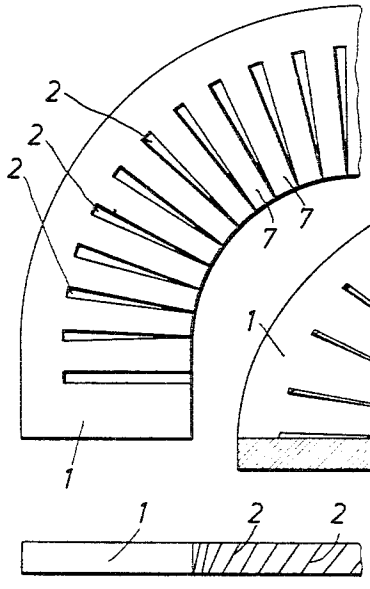
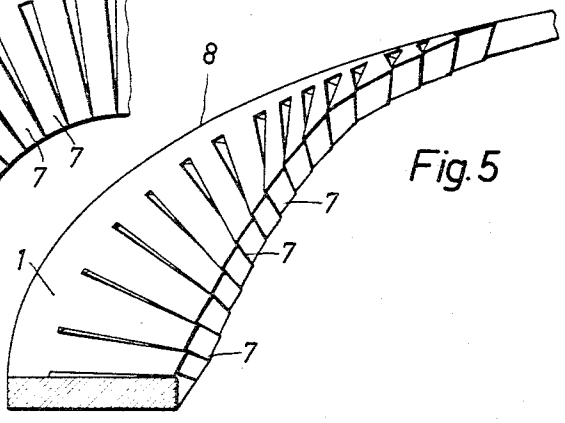


Fig.4

Fig.5



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Dec. 3, 1968 R. OBERREICH 3,413,774

CONSTRUCTION ELEMENT

Filed June 27, 1966 2 Sheets-Sheet 2

Fig.6

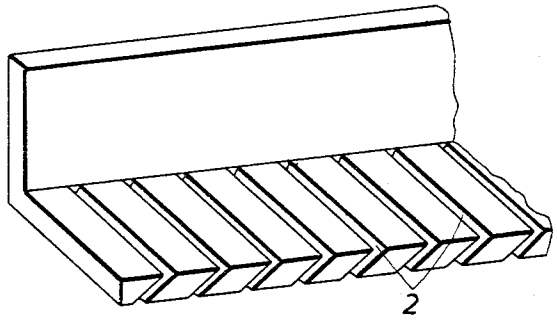


Fig.7

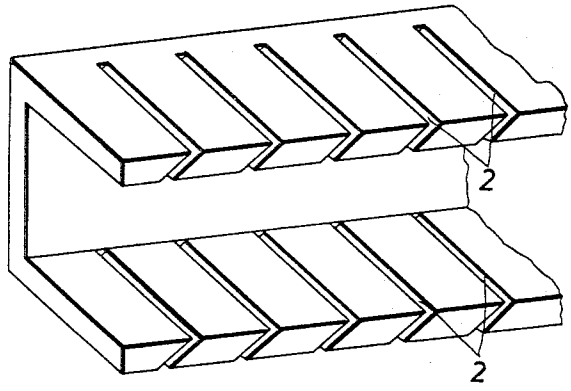
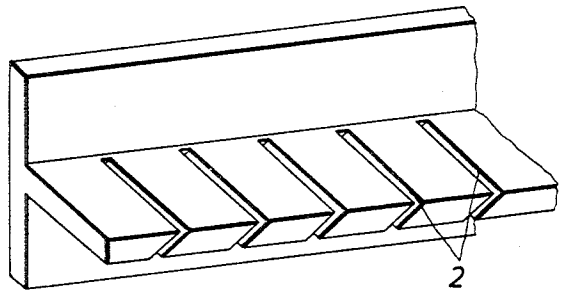


Fig.8



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CONSTRUCTION ELEMENT

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ABSTRACT OF THE DISCLOSURE

A structural element composed of an initially flat, solid bar of rectangular cross section provided with a plurality of regularly spaced lateral notches extending from one narrow longitudinal edge of the element across a substantial portion of its width, each notch being defined by two parallel, substantially planar sides which extend obliquely to the large flat faces of the element for permitting the two sides of each notch, adjacent the open end of the notch, to supportingly bear against one another when the element is bent in a plane perpendicular to the narrow lateral edge and is twisted about its longitudinal axis.

The present invention relates to the field of construction elements and particularly to railings, guard rails and hand rails.

It is known that the rails of various types of railings, such as that of a staircase, are often made of solid metal bars which must be provided with arcuate portions in order to permit the railing to conform to the path of the staircase. The bending of such bars to form these arcuate portions is generally difficult, time-consuming and relatively expensive. It often occurs that the hand rail constituted by the bar, which generally has a rectangular cross section, must be bent sideways to conform to the path of the staircase and simultaneously twisted to conform to the pitch of the staircase. In order to carry out such operations, it is generally necessary to heat these bars, which may have lateral dimensions of 8 x 40 mm., for example, before forming them. Moreover, practical experience has shown that the resulting bends must almost invariably be realigned during installation in order to conform precisely to the path of the staircase and it is necessary to reheat the rail to approximately 500 to 600° C. in order to effect such realignment.

The same problems arise in the bending of metal bars for use in helical supporting frames for conveyor chutes or the troughs of vertical-feed, vibratory conveyors, for example, or in the manufacture of letter frames for advertising displays, etc.

It has already been proposed to reduce these difficulties by providing such a bar with lateral notches extending across a portion of the bar width so as to give the bar a comb-like configuration. These notches are provided in the region where a bend is to be made and are cut into that edge of the bar which will be at the inside of the bend. When the bar is bent, the free ends of the notches will be closed due to the fact that the free ends of the teeth formed by these notches will be brought together.

Although bars constructed in this manner can be bent and twisted into the desired arcuate configuration without heating, such bars still require a prolonged subsequent treatment for the purpose of aligning adjacent teeth in order to produce a hand rail whose inner edge, after the bar has been bent and twisted, follows a relatively smooth curve, so as to give the hand rail an approximately C-shaped configuration which conforms to the path of the staircase.

It is a primary object of the present invention to overcome these drawbacks.

Another object of the present invention is to provide a bar which can be bent and twisted in any desired manner to form a hand rail which does not require any subsequent finishing treatment.

Another object of the present invention is to provide a bar which can be formed into a hand rail having any desired configuration in a rapid and simple manner.

These and other objects according to the present invention are achieved by the provision of a structural member having at least one originally flat element provided with a plurality of lateral notches along at least part of the length thereof, the notches being formed in one lateral edge of the element and extending across a portion of the width of the element, with the sides of the notches being oriented obliquely to the large flat surfaces of the element, for permitting the element to bend in a plane perpendicular to its lateral edge and to be twisted about its longitudinal axis.

It should be understood that the term "flat element" used herein is intended to define an element having a generally rectangular cross section and having a thickness, or minor dimension, which is clearly smaller than the width, or major dimension. It should also be understood that the term "narrow edges" is intended to refer to the edges defining the minor surfaces of the element and the term "large flat surfaces" is intended to refer to the major surfaces of the element.

According to a further feature of the present invention, all of the notches extend parallel to one another and are formed with parallel sides when the element is in its original flat condition.

Additional objects and advantages of the present invention will become apparent upon consideration of the following description when taken in conjunction with the accompanying drawings in which:

FIGURE 1 is an elevational view of a preferred embodiment of the present invention in its original, flat state.

FIGURE 2 is a plan view of the arrangement of FIGURE 1.

FIGURE 3 is a plan view of the element of FIGURE 1, after it has been bent into an arcuate configuration.

FIGURE 4 is an elevational view of the arrangement of FIGURE 3.

FIGURE 5 is an end view of the arrangement of FIGURE 1 after it has been bent into an arcuate configuration and twisted about its longitudinal axis.

FIGURE 6 is a perspective view of another embodiment of the present invention.

FIGURE 7 is a perspective view of yet another embodiment of the present invention.

FIGURE 8 is a perspective view of still another embodiment of the present invention.

FIGURES 1 and 2 show a first embodiment of the present invention prior to its being bent and/or twisted. This embodiment is constituted by a flat bar **1** provided with notches **2** formed in one narrow lateral edge thereof and extending across a portion of its width. Each of the notches **2** is formed with a pair of parallel sides **3** and **4** which extend obliquely to the upper and lower flat surfaces of bar **1**. Thus, each of the notch sides **3** and **4** forms an acute angle with one flat surface of the bar and an obtuse angle with the other flat surface thereof. For example, the edge **5** of the side **3** of each notch forms an acute angle with the upper flat bar surface and the edge **6** of side **4** of each notch forms an acute angle with the lower flat bar surface.

The notches **2** are so formed that the acute-angle forming edge of one notch side is disposed at least in the same cross-sectional plane of the bar **1** as the acute-angle forming edge of the other notch side. In other words, the edges **5** and **6** of a single notch **2** will be disposed at least in the same cross-sectional plane of bar **1**. However, as

is illustrated in FIGURES 1 and 2, it is preferable that the notch sides **3** and **4** overlap one another by some amount, i.e., that, for each notch, the edge **5** project beyond a cross-sectional plane passing through the edge **6**.

The notches **2** are preferably formed so that their sides form angles of approximately 45° with the flat surfaces of the bar.

A bar constructed in the manner described above, is capable of being twisted about its longitudinal axis or bent about an axis perpendicular to its flat surfaces, or both, to form a curved strip which does not require any subsequent finishing operations for giving its inner edge a smooth configuration.

FIGURES 3 and 4 show the bar of FIGURE 1 bent into a flat curve with the free ends of the teeth **7**, which are constituted by the bar portions between notches **2**, disposed to the inside of the resulting curve. As may be seen, when the bar is curved in this manner, the free ends of the teeth **7** are forced together, thereby closing the outer ends of the notches **2**. If the bar is then twisted about its axis to assume the shape shown in FIGURE 5, the contacting notch sides at the inside of the curve will slide along one another by a small amount and will restrain one another so as to cause the free end of each tooth **7** to be slightly offset with respect to the free ends of its adjacent teeth. The free end of each tooth **7** will also be slightly twisted. As a result, the inner edge of the bar **1**, which corresponds to the edge defined by the free ends of teeth **7**, will automatically assume a uniformly curved configuration which approximates the smooth curve of the twisted outer edge **8** of the bar. Because of this interaction between the notch sides, it is not necessary to carry out any subsequent manual alignment of the teeth **7** as was required in the prior art.

Accordingly to a highly advantageous auxiliary feature of the present invention, it is possible to fabricate bars which can be bent into uniform arcuate shapes having an accurately predetermined radius of curvature without requiring the provision of any patterns or subsequent measurements. This as accomplished, according to the present invention, by giving all of the notches the same dimensions and by spacing them a uniform distance apart. The notches are constructed so that the distance between their sides **3** and **4**, taken along the longitudinal axis of the bar, is such that the product of this distance and the total number of notches along the bar portion to be bent is equal to the difference between the lengths of the outer edge and the inner edge of the desired arcuate portion.

When the notches are given these dimensions, it is only necessary to bend the bar into a flat circle or arc until the free ends of the teeth **7** come into contact with one another. The bar portion then has the desired radius of curvature.

It is also possible to construct embodiments of the present invention having configurations other than that shown in FIGURES 1 and 2. For example, the bar may be constructed in the form of an angle iron one leg of which is provided with notches **2**. Such an arrangement is shown in FIGURE 6.

It is also possible to give the bar a C-shaped configuration, such as is shown in FIGURE 7, wherein the two flanges of the bar are provided with notches **2**.

Additionally, the bar may be given a T-shaped configuration, as is shown in FIGURE 8, in which case notches are formed only in the web portion thereof.

It may be noted that in the embodiments of FIGURES 6 to 8, the notches **2** may extend across the entire width of the members in which they are formed or only partly thereacross. In each case, the bars are intended to be bent in a plane parallel to the median plane of the element or elements, in which the slots **2** are provided.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

What is claimed is:

1. A structural member comprising at least one originally flat, solid element provided with a plurality of substantially parallel lateral notches along at least part of the length thereof, said notches being formed in one lateral edge of said element and extending across a major portion of the width of said element, with the sides of each said notch being substantially planar and being oriented obliquely to the large flat surfaces of said element, for permitting said element to be bent in a plane perpendicular to said lateral edge and to be twisted about its longitudinal axis so as to cause the sides of each said notch to bear against each other in a supporting manner at said one lateral edge of said element.

2. An arrangement as defined in claim **1** wherein, when said element is in its original, flat condition, one of said sides of each said notch partially overlaps the other side thereof in a direction parallel to the longitudinal axis of said element.

3. An arrangement as defined in claim **1** wherein each of said sides is disposed at an angle of approximately 45° with respect to said large flat surfaces of said element.

4. An arrangement as defined in claim **1** wherein said notches are equispaced along said element and all have identical dimensions, and wherein the product of the distance between the sides of one of said notches, taken parallel to the longitudinal axis of said element, and the total number of notches is equal to the difference between the external arc length and the internal arc length defined by said element when it has been bent into its desired arcuate configuration.

5. An arrangement as defined in claim **1** wherein the sides of each said notches are parallel to one another when said element is in its original flat condition.

6. An arrangement as defined in claim **1** wherein said member has an L-shaped cross section, one leg of which is formed by said flat element, and wherein said notches extend substantially across the entire width of said element.

7. An arrangement as defined in claim **1** wherein said structural member has a C-shaped cross section and there are provided two originally flat elements constituting the flanges of said member, and wherein said notches extend across substantially the entire width of said elements.

8. An arrangement as defined in claim **1** wherein said member has a T-shaped cross section and said element constitutes the web of said member, and wherein said notches extend across substantially the entire width of said element.

9. An arrangement as defined in claim **1** wherein, in the direction of the length of said element, the distance between the sides of each said notch is less than the distance between adjacent notches.

References Cited

UNITED STATES PATENTS

380,291	3/1888	Kukkuck	144—270
2,634,467	4/1953	Astrella	52—716
2,791,301	5/1957	Proctor	52—468

FOREIGN PATENTS

229,254	6/1925	Great Britain.

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