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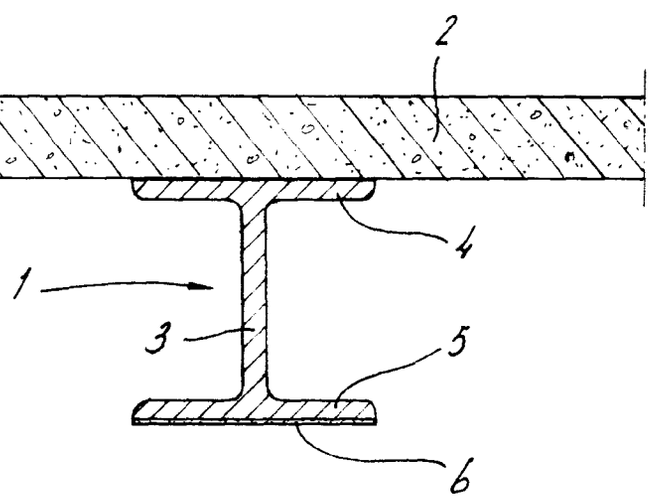
(54) Fire-resistant element

(57) Fire-resistant element, comprising a steel I-section or H-section (1) which is used in building structures. Unlike conventional solutions in which for improvement of the fire resistance such an element is clad with a casing or the like on all sides which are exposed to a possible fire, it is now proposed to provide only one side of the flange with a cladding (6,10). The cladding can comprise a coating (6) or sheet (10), and in the latter case preferably projects slightly beyond the surface of the horizontal flange. The element can be in the form of a beam or a column. In the former instance the fire-resistant cladding is situated on the underside of the bottom flange.

Fig - 1



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Description

The present invention relates to a fire-resistant element according to the preamble of Claim 1.

Such elements are used as columns or beams. In the case of columns they are used for factory buildings and the like, and a wall will be fitted adjacent thereto. In the case of beams they are used in all kinds of building structures and must be provided with a fire-resistant cladding. This is because the steel material from which these beams are made cannot withstand higher temperatures for long periods and, if unprotected, gives way prematurely in the event of fire.

In order to solve this problem, it is proposed in the prior art that sheeting should be fitted around such beams. Such sheeting is made of expensive fire-resistant material, so that the strength of such a structure is retained for the necessary time.

Such enveloping "shuttering" is produced by fitting blocks in the space between the flanges of the beam and fixing the vertical strips of the sheeting thereto, the horizontal sheeting finally being fixed to ends of the vertical strips.

Although such a structure is highly satisfactory, the method of fitting is labour-intensive, and the structure is expensive, owing to the quantity of sheet material used.

The object of the present invention is to provide a fire-resistant beam which retains its strength for a sufficiently long time in the event of a fire.

This object is achieved in the case of a fire-resistant beam of the type described above by the characterizing features of Claim 1.

The invention is based on the idea that only certain parts of the section are subjected to such a great fire load that the entire section gives way prematurely. Where a column is being used, it has been found that if the flange adjacent to the wall which is being used in combination with such a column is clad on the inside, a give-way time which is long enough to meet official regulations can be obtained. If the element is being used as a beam, it has been found that the bottom flange in particular is subjected to the greatest fire load, and absorbs most of the heat and transfers it to the vertical web and the flange situated above it, with the result that giving way ultimately occurs. If then the bottom horizontal surface is less capable of absorbing heat, the heat load of the entire section will be considerably reduced, so that in most cases the time until it gives way meets the relevant international regulations.

The fire-resistant cladding can comprise any cladding known in the prior art. A first possibility is a coating which can be applied in all ways known in the prior art, such as spreading, spraying, injecting or brushing. In the case of such claddings a distinction must be made between intumescent (foaming) and endothermic types. The latter types are characterized by a high heat capacity. In general, such coatings contain fibrous silicates or fibrous cements.

If sheets are used, fire-resistant sheets such as PROMATECT®-H, marketed by applicant, can be used for the purpose. Such a sheet material can be applied directly by gluing or any other known joining technique to the underside of the bottom flange of the beam concerned. The sheet preferably projects at least 5 mm beyond the boundary of the bottom flange of the beam, so that it provides optimum protection against heat radiation. It can be fixed in particular by means of U-brackets.

It is also possible to fit spacer blocks between the fire-resistant sheet and the section. This means that a thinner sheet will suffice, because an insulating air layer is present between the sheet and the beam. The spacer blocks can be fixed to the beam in any manner known in the prior art, and a particularly simple way is to shoot nails through the steel beam. These nails are completely hidden from view by subsequently fitting the fire-resistant sheet.

The thickness of the sheets described above can lie between 6 and 25 mm, and this thickness depends on the required fire resistance and the structure used.

The invention will be explained in greater detail below with reference to exemplary embodiments shown in the drawing, in which:

Fig. 1 shows a first embodiment in cross-section of the fireresistant beam according to the invention;
Fig. 2 shows a second embodiment;
Fig. 3 shows a third embodiment of the fire-resistant beam according to the invention; and
Fig. 4 shows an embodiment in cross-section of a fire-resistant column according to the invention.

The fire-resistant horizontal beam according to the invention is indicated in its entirety by 1 in Fig. 1. It can be an IPE section or an HEA section. This fire-resistant beam supports a building structure 2, not shown in any further detail. The steel beam itself consists of a web 3 provided with a top flange 4 and a bottom flange 5. A fire-resistant coating is applied to the bottom flange 5 by painting. This is a coating which foams up when heated, so that the bottom flange 5 is provided with an insulating layer. Since the temperature of the bottom flange 5 remains limited in the event of fire, it has been found that the entire structure of the beam is substantially protected, so that sufficient time before giving way can be achieved for most applications.

Apart from painting, spraying and spreading, material 6 can be applied in mortar form, but it should be understood that any method known in the prior art for applying fire-resistant coatings can be used, and can be used on any type of fire-resistant coating.

Fig. 2 shows an embodiment of the beam in which the fire-resistant beam is indicated by 9. The bottom flange 11 in this case is provided with a sheet 10 of fire-resistant material fixed thereto in a manner not shown in any further detail. Fixing can be by means of nails, U-brackets, glue and the like.

It can be seen clearly from Fig. 2 that sheet 10 is of greater width than bottom flange 11. The difference is indicated by 'b'. The distance 'b' can lie between 5 and 20 mm, and is preferably approximately 10 mm.

Fig. 3 shows a variant which corresponds to what is illustrated in Fig. 2. The beam here is indicated by 12, and the sheet material by 15. However, a number of spacer blocks 13 are fitted between the sheet material 15, which projects slightly as in the embodiment according to Fig. 2, and the beam. These spacer blocks are fixed to the bottom flange 16 of the beam by means of shot-fired nails 14 before the sheet material is fixed. The rather unattractive appearance occurring at the head of the nails 14 is concealed by subsequently fitting the sheet 15. This sheet can be fixed by any means known in the prior art, such as with shot-fired rivets.

Since it is now no longer necessary to use a complex U-shaped structure made of fire-resistant sheet material, a relatively thin sheet material, for example with a thickness lying between 6 and 25 mm, and more particularly between 15 and 20 mm, can be used, in particular in the case of the embodiment according to Fig. 3. For in the case of a U-shaped structure sufficient thickness of the web of the sheet material is necessary at the corners of the legs in order to permit accommodation therein of (horizontal) rivets extending from the legs.

Fig. 4 shows in cross-section a vertical column 21. This column consists of a steel H-section, for example HEA-300, with web 23 and flanges 24, 25. Adjacent to flange 25 is an insulating wall 22, and factory buildings and the like can be produced in this way. In order to provide sufficient fire resistance, it is proposed that flange 25 should be provided with a fire-resistant cladding 26 on its inside, i.e. on the side facing web 23. Such cladding is fixed by means of strips 28 to wall 22. Fixing is achieved by first fixing the strips 28 by means of screws 29 to wall 22 and then by means of steel nails providing fixing between the strips 28 and fire-resistant sheets 26. In a preferred embodiment the strips 28 can likewise be made of a fire-resistant material.

Although the invention is described with reference to a preferred embodiment, it will be clear to the person skilled in the art that many variations are possible. Other structures known in the art can be used in the above without going beyond the scope of the present application, as described in the appended claims.

Claims

1. Fire-resistant element (1, 9, 12, 21), comprising a steel I-section or H-section with web and flanges, characterized in that only one flange (5, 11, 16, 25) of the element is provided with a fire-resistant cladding (6, 10, 13, 15, 26).

2. Fire-resistant element according to Claim 1, in which said element comprises a beam (1, 9, 12) in which the flanges when in the use position are fitted substantially horizontally, and in which only the bottom horizontal flange (5, 11, 16) is provided with a fire-resistant cladding (6, 10, 13, 15), only on the underside.

3. Fire-resistant element according to Claim 1, in which the element comprises a column (21), adjoining which is a wall (22), and in which only the flange (25) of the element adjoining the wall is provided with such fire-resistant cladding, only at the side facing the web (23) of said element.

4. Fire-resistant beam according to one of the preceding claims, in which said fire-resistant cladding comprises a coating (6) which adheres to the flange.

5. Fire-resistant beam according to one of the preceding claims, in which said fire-resistant cladding comprises fire-resistant sheet material (10, 15), which when fitted on the flange projects at least 5 mm at both sides.

6. Fire-resistant beam according to Claim 5, in which said sheet is fixed directly to the flange.

7. Fire-resistant beam according to Claim 5, in which said fixing comprises clamping brackets.

8. Fire-resistant beam according to one of Claims 5 - 7, in which fire-resistant spacer blocks (13) are fitted between the sheet and the flange.

9. Fire-resistant beam according to Claim 8, in which said blocks are fixed to the flange by shot-fired nails (14) extending through said blocks and the flange.

Fig - 1

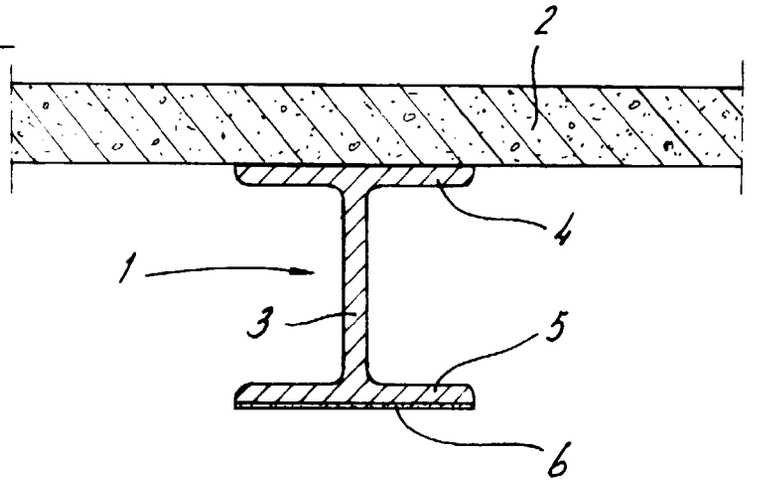


Fig - 2

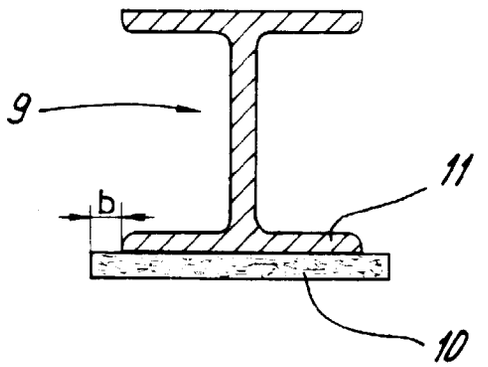


Fig - 3

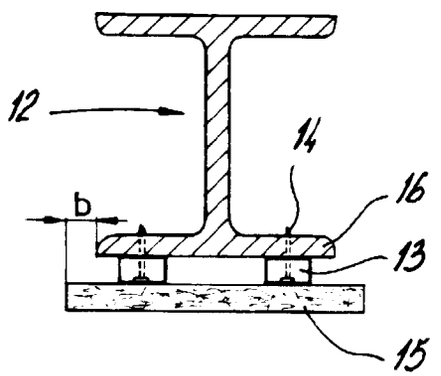
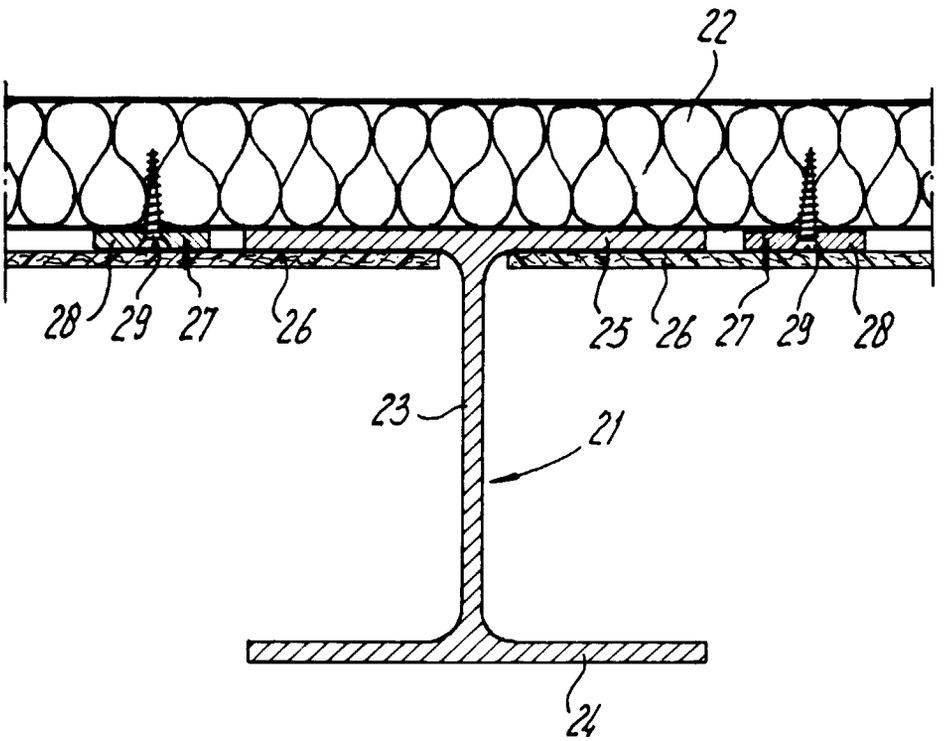


Fig-4



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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 2500

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X A	GB 1 387 141 A (KENYON & SONS LTD WILLIAM) * page 2, line 72 - line 118 * * figures 1,2 *	1 2,5-7	E04B1/94
X A	DE 30 36 012 A (RUDOLF HENSEL KG) * the whole document *	1 2,4	
A	EP 0 011 358 A (TAC CONSTRUCTION MATERIALS LTD) * the whole document *	1,5,8,9	
A	PATENT ABSTRACTS OF JAPAN vol. 96, no. 10, 31 October 1996 & JP 08 144393 A (NKK CORP), 4 June 1996, * abstract *	1-3	
A	PATENT ABSTRACTS OF JAPAN vol. 014, no. 280 (C-0729), 18 June 1990 & JP 02 085336 A (NIPPON STEEL CORP), 26 March 1990, * abstract *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 October 1997	Vrugt, S

CATEGORY OF CITED DOCUMENTS

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