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(54) **STAIR STEP NOSING**

(57) A facing structure for a forward portion of steps of the stair (1) comprises a working member (2) made of a resilient material, a horizontal (4) and a vertical (3) fastening members connected to rearward (6) and lower (5) surfaces of the said working member (2). The thickness **H** of the working member and the modulus of elasticity **E** of a resilient material satisfy the relationships:

$$H > h + h_1, E \leq H \times k,$$

where: **h** - the thickness of a facing material of the horizontal surface of stair steps [m], **h₁** - the thickness of the horizontal fastening member [m], **k** = 10¹¹ [n/m³].

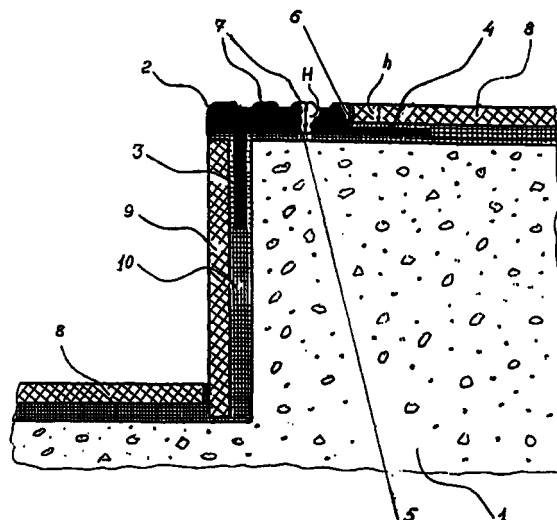


Fig. 1

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to the field of construction and, more particularly, to the structures of edges of faced stair steps.

2. Description of the Prior Art

[0002] An example of a facing structure for a stair step forward portion is described in DE Patent No. 3,907,959; Int. Cl. E04F 11/16, issued 1990. In this disclosed art, said facing structure comprises a Γ -shaped working member and a vertical anchor portion connected to a lower surface of the said working member. In so doing, both the working member and anchor portion are made of a resilient material.

[0003] To secure the known facing structure, the use is made of an additional fastening member fabricated in the form of a metal angle having a longitudinal slot in which the vertical anchor portion of a removable facing structure of the stair step forward portion is located. Moreover, it is necessary that horizontal facing plates of stair steps be provided with a special platform to accommodate the working member of the said facing structure for the stair step forward portion. Thus, the assembly of the known facing structure for the stair step forward portion is rather labor-consuming.

[0004] The drawbacks with this known facing structure for the stair step forward portion reside also in the fact that due to a small thickness of the working member, it is essentially impossible to ensure both a long operation life of the facing structure and conditions of spontaneous decomposition of the ice coating formed on the surface thereof under the action of a pedestrian weight. Besides, the availability of only one vertical fastening member fails to provide a reliable securing of the facing structure.

[0005] Another example of a facing structure for a stair step forward portion is described in FR Patent No. 2,694,585; Int. Cl. E04F 11/16, issued 1994, being the closest prior art with respect to the totality of accomplished operations and structural features in accordance with the present invention. In this disclosed art, said facing structure comprises a Γ -shaped working member, a horizontal and a vertical fastening members all made of a resilient material, said fastening members are interconnected and attached to the working member of the facing structure through an additional connecting member.

[0006] A disadvantage of the known facing structure for the stair step forward portion resides in the fact that it has a complicated cross-section shape necessitating the use of complex attachments when fabricating thereof. Moreover, it is necessary that horizontal facing

plates of stair steps be provided with a special platform to accommodate the working member of the said facing structure for the stair step forward portion, in other words, a strictly defined thickness, which complicates the assembly of the facing structure and increases the cost of works performed.

[0007] Another disadvantage of the known facing structure for the stair step forward portion consists in that due to a small thickness of the working member, it is essentially impossible to ensure both a long operation life of the facing structure and conditions of spontaneous decomposition of the ice coating formed on the surface thereof under the action of a pedestrian weight.

SUMMARY OF THE INVENTION

[0008] It is, therefore, an object of the present invention to provide a facing structure for a stair step forward portion having a working member whose structural accomplishment would enable to achieve not only simplification in the processes of the facing structure manufacture and assembly and hence a decrease in the cost of civil-engineering, but also the increase in the operational parameters at the expense of the provision of both a long operation life and the amount of the "ice - working member" interface stress concentration required to decompose the ice under the action of a pedestrian weight.

[0009] This object is solved in a facing structure for a stair step forward portion in accordance with the present invention, comprising a working member made of a resilient material and a horizontal and a vertical fastening member, wherein the working member is manufactured in the form of a beam with its rearward and lower surfaces being connected to said horizontal and vertical fastening members respectively, the thickness H of the working member and the modulus of elasticity E of a resilient material satisfy the relationships:

$$H > h + h_1, \quad (1)$$

$$E \leq H \times k, \quad (2)$$

where:

h - the thickness of the facing material of the horizontal surface of stair steps [m],

h_1 - the thickness of the horizontal fastening member [m],

k - the coefficient equal to 10^{11} [N/m³].

[0010] It is advisable that fastening members be made of the material of the working member and located, for example, integral therewith.

[0011] It is advantageous that the fastening members be made of the material whose modulus of elastic-

ity is at least by an order of magnitude greater than the modulus of elasticity of a resilient material of the working member.

[0012] Such an accomplishment of the facing structure of the stair step forward portion enables simplification of the process of its manufacture, since connecting members are absent and fastening members are connected not to each other but to a rather massive working member of the facing structure. Besides, the use of the facing structure of the stair step forward portion in accordance with the present invention makes it possible to simplify the process of its assembly, since it is unnecessary to provide the facing material of stair step surfaces with special platforms. In other words, conventional plates of rectangular shape having the same thickness may be used without any special additional working-up of their forward portions.

[0013] A further result attained when using the facing structure in accordance with the present invention consists in that by satisfying the above relationships (1) and (2), the edges of the stair steps acquire springiness. As a consequence, stresses arise on the "working member - ice coating" interface whose amount meets the conditions of the "effect of self-cleaning" of the edges of outdoor stair steps from the ice (ice coating) under the action of a pedestrian weight.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The various objects, advantages and novel features of the present invention will be more readily apparent from the following detailed description when read in conjunction with the appended drawings, in which:

FIG. 1 is a general cross-sectional view of faced stair steps, in accordance with the present invention;

FIG. 2 is a side view of an embodiment of fastening members of a facing structure of a stair step forward portion, said members being made of a resilient material and integral with a working member, in accordance with the present invention;

FIG. 3 is a side view of an embodiment of metal fastening members of a facing structure of a stair step forward portion, in accordance with the present invention.

BEST MODE TO CARRY OUT THE INVENTION

[0015] Referring to FIG. 1, a facing structure for a forward portion of steps of the stair 1 comprises a working member 2 made in the form of a beam, a vertical fastening member 3 and a horizontal fastening member 4, with lower 5 and rearward 6 surfaces of the said working member 2 being connected to said vertical 3 and horizontal 4 fastening members respectively.

[0016] In the preferred embodiment of the present

invention, an upper surface of the working member 2 is provided with teeth 7. The horizontal fastening member 4 is located under a facing material 8 of the surface of a respective step of the stair 1. The vertical fastening member 3 is located under a facing material 9 of the surface of a respective riser of the stair 1. Ceramic, marble and the like plates may be used as the facing material 8 and 9. Attachment of the facing structure of the stair step forward portion to a concrete stair 1 and of the facing material 8 and 9 is accomplished by means of an adhesive 10. In the preferred embodiment of the present invention, a cold-resistant "Atlas Plus" brand adhesive is used.

[0017] Referring again to FIG. 1, it is advisable that the horizontal fastening member 4 be mounted flush with the lower surface 5 of the working member 2, since in this case the process of assembly is simplified.

[0018] Referring to FIGS. 1 and 2, the fastening members 3 and 4 may be made of the same material as that of the working member 2, and in particular integral therewith. However in some cases, it is advisable that the fastening members 3 and 4 be made of more rigid material (FIG. 3), for example aluminium alloy.

[0019] To ensure the "effect of self-cleaning" from the ice and ice coating, the thickness H and the modulus of elasticity E of the material of the working member 2 must satisfy the relationships (1) and (2).

[0020] Inside the working member 2 of the facing structure, there may be provided through holes 11 having a cylindrical, square or triangular cross-section, that imparts a required pliability to the working member to realize the above mentioned "effect of self-cleaning" in case where it is made of the material having the modulus of elasticity failing to satisfy the relationships (1) and (2).

[0021] If the fastening members 3 and 4 are made of more rigid material (whose modulus of elasticity is at least by an order of magnitude greater than the modulus of elasticity of a resilient material of the working member 2), they may have different section, for example an angle Γ -shaped section (FIG. 3).

[0022] Assembly of the facing structure of the stair step forward portion is carried out in the following sequence. The surface of the stair step and riser cleaned from dirt and dust is coated with the layer of an adhesive 10. Thereupon, the facing structure of the rearward stair step portion is mounted. Then an upper surface of the horizontal fastening member 4 and a rearward surface 6 of the working member 2 are coated with the layer of an adhesive 10 followed by the installation of a plate 8 of the facing material of the horizontal step surfaces. The facing of a riser using a facing material 9 is carried out in much the same way. Since the thickness H of the working member 2 exceeds the sum of the thickness h of the facing material 8 and the thickness h_1 of the horizontal fastening member 4, then, by varying the layer thickness of the adhesive 10, a required location of the facing members, for example flush-mounted,

is provided. Connection of the working member **2** and fastening members **3** and **4** of the facing structure of the stair step forward portion directly to the stair **1** imparts more reliability and longevity to the structure.

[0023] While the structure is in use, the ice or ice coating is formed on the surface of the working member **2**. Under the action of a pedestrian weight, elastic strains of the working member **2** take place resulting in stresses on the "working member - ice" interface, the amount of said stresses being sufficient to decompose the ice coating. In this way "self-cleaning" of the most dangerous portion of the stair step from the ice occurs.

INDUSTRIAL APPLICABILITY

[0024] The facing of the stair step forward portion may be used when manufacturing outdoor stairs and that for pedestrian underpasses thus ensuring simplification of the structure and assembly and realizing the "effect of self-cleaning" from the ice (ice coating) while it is in use.

[0025] Although the present invention has been described with reference to preferred embodiments, the invention is not limited to the details thereof and various changes and modifications obvious to one skilled in the art to which the invention pertains are deemed to be within the spirit, scope and contemplation of the invention as further defined in the appended claims.

Claims

1. A facing structure for a stair step forward portion comprising a working member made of a resilient material and a horizontal and a vertical fastening member, *characterized in that* the working member is manufactured in the form of a beam with its rearward and lower surfaces being connected to said horizontal and vertical fastening members respectively, wherein the thickness **H** of the working member and the modulus of elasticity **E** of a resilient material satisfy the relationships:

$$\mathbf{H} > \mathbf{h} + \mathbf{h}_1,$$

$$\mathbf{E} \leq \mathbf{H} \times \mathbf{k},$$

where:

h - the thickness of a facing material of the horizontal surface of stair steps [m],

h₁ - the thickness of a horizontal fastening member [m],

k - the coefficient equal to 10¹¹ [n/m³].

same material as that of the working member and, for example integral therewith.

3. A facing structure as set forth in claim 2, *characterized in that* the fastening members are made integral with the working member.
4. A facing structure as set forth in claim 1, *characterized in that* the fastening members are made of the material whose modulus of elasticity is at least by an order of magnitude greater than the modulus of elasticity of a resilient material of the working member.

2. A facing structure as set forth in claim 1, *characterized in that* the fastening members are made of the

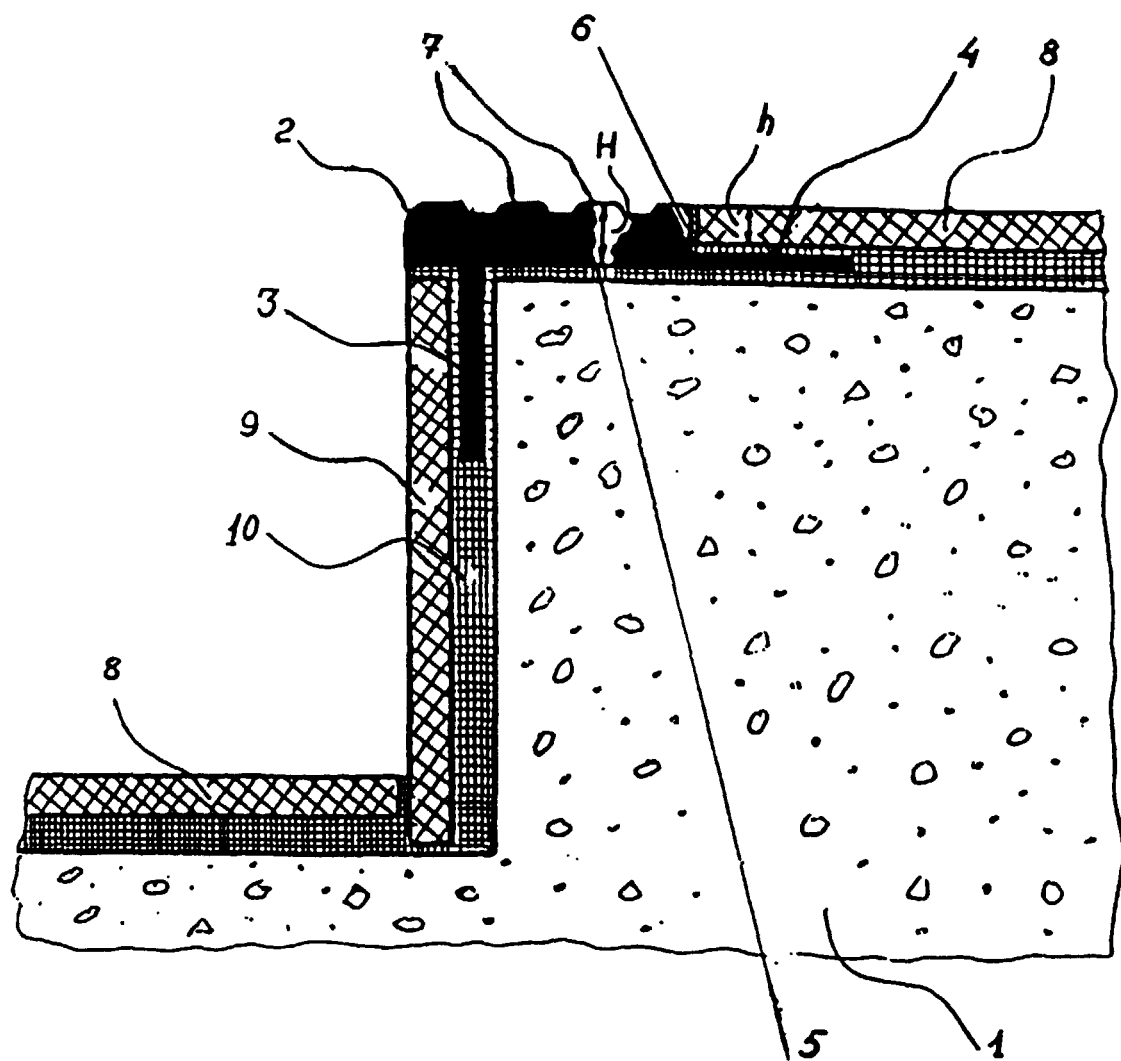


Fig. 1

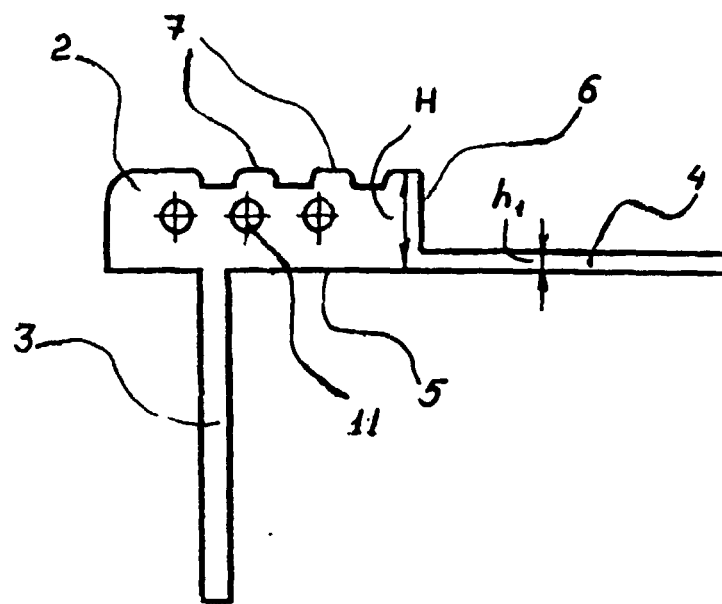


Fig. 2

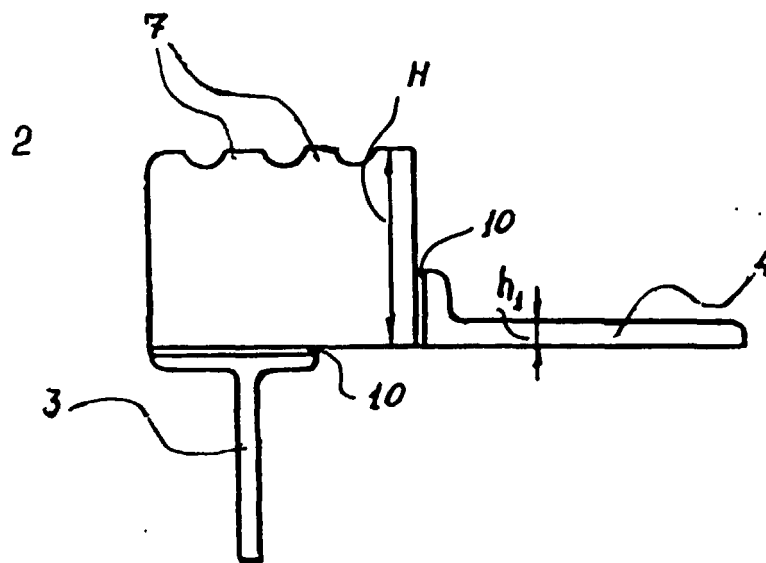


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/RU 98/00192

A. CLASSIFICATION OF SUBJECT MATTER		
IPC6 E04F 11/16 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC6 E04F 11/16; 11/17		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SU 1109062 A (KHIROMITSU NAKA) 15 August 1984 (15.08.84)	1-4
A	FR 2513289 A1 (SCHLUTER WERNER) 25 March 1983 (25.03.83)	1-4
A	EP 0013184 A1 (KABUSHIKI KAISHA NAKA) 9 July 1980 (09.07.80)	1-4
A	DE 1241089 A (FLORENZ MAISCH O.H.G.) 24 May 1967 (24.05.67)	1-4
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier documents but published on or after the international filing date "L" documents which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later documents published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 10 February 1998 (10.02.98)		Date of mailing of the international search report 18 February 1999 (18.02.99)
Name and mailing address of the ISA/ R.U. Facsimile No.		Authorized officer Telephone No.

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