

SPECIFICATION

TITLE OF THE INVENTION: Wall structure and method for constructing wall structure

5

TECHNICAL FIELD

[0001] This invention relates to a wall structure preferable for use in the formation of an outer wall face or an inner wall face of a building construction and a method of constructing the wall structure.

10 RELATED ART

[0002] Heretofore, the wall of the building construction or the like is commonly finished by sticking a finishing material such as a wall paper, tiles, a decorative sheet of wood or metal, or the like onto a base material. In the sticking is used an adhesive, a double-faced tape or the like.

15 **[0003]** If it is necessary to renovate the outer surface of the finishing material due to the deterioration of the finishing material or the like, it is common to perform the renovation by applying a paint onto the outer surface of the finishing material or by replacing the finishing material itself, but significant time and labor are taken in the painting or replacing operation of finishing material.

20 **[0004]** When a thin metallic decorative sheet having a thickness of about 0.3~0.4 mm is used in this type of the working, not only it is unavoidable to scatter the smoothening accuracy of the finished surface by operators, but also once the stuck sheet is peeled off in the sticking onto the finishing material, the decorative sheet is deformed and it may be difficult to re-use the finishing material, and further it is required to again add a pretreatment or the like to the on
25 the worked surface after the peeling off of the finishing material, and hence problems are left in the workability.

[0005] As a prior art relating to this point, Patent Document 1 discloses a wall body formed by detachably attaching a plurality of unit sheets constituting
30 the wall surface onto a wall base material with a permanent magnet to thereby improve the operability.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0006] Patent Document 1: JP-A-H01-125454

SUMMARY OF THE INVENTION

TASK TO BE SOLVED BY THE INVENTION

5 [0007] However, the wall body disclosed in Patent Document 1 has an inconvenience that when a material having a thin thickness is used as a unit sheet, the sheet located between mutual permanent magnets may be locally deformed into a concave or convex form in accordance with the arranging interval of the permanent magnets and it is unavoidable to deteriorate the smoothening accuracy
10 of the finished surface.

[0008] In order to solve such an inconvenience, it is attempted to perform working of adsorbing the whole surface of the sheet with a magnet. The magnet used in the adsorption of the sheet is expensive, therefore, when the adsorption of the whole surface with the magnet is conducted, it is unavoidable to increase the
15 cost. Further, when the whole surface of the sheet is adsorbed with the magnet, since the magnetic force becomes stronger beyond necessity, it is difficult to perform fine adjustment in the working such as position shifting of the sheet or the like, and hence there is still a room for improvement.

[0009] It is, therefore, an object of the invention to propose a wall structure
20 capable of simply and efficiently forming a finished surface having a high smoothening property on an outer wall or an inner wall of a building construction and a method of constructing such a wall structure.

SOLUTION FOR TASK

[0010] The invention is a wall structure comprising a plurality of magnet
25 sheets arranged on a surface of a base material at intervals and fixed thereto, and a plurality of metallic plate materials detachably supported by adsorbing their backside portions with the respective magnet sheets and mutually butted at their flatly formed end faces with each other to form a large-area finished surface, wherein a leveling material having a thickness for filling a gap formed between
30 the backside portion of the metallic plate material and the base material and smoothly holding the finished surface is arranged between the mutual magnet sheets.

[0011] In the wall structure of the above construction, it is desirable as a concrete means for solving the task according to the invention that

(1) the leveling material is used to have a thickness of $-0.2 \sim +0.1$ mm with respect to the thickness of the magnet sheet;

5 (2) the magnet sheet is used to have an adsorbing force higher than a shearing strength between the magnet sheet and the metallic plate material produced by own weight of the metallic plate material and a thickness of not less than 0.3 mm;

(3) the gap formed in the butted portion between the metallic plate
10 materials is not more than 1 mm; and

(4) a joint sealing material is arranged in the butted portion between the metallic plate materials therealong.

[0012] Further, the invention is a method of constructing a wall structure by detachably attaching a plurality of metallic plate materials onto a surface of a
15 base material to form a finished surfaced with outer surfaces of the plate materials, characterized in that a plurality of magnet sheets are arranged on the surface of the base material at intervals and fixed thereto, while a leveling material is arranged between the mutual magnet sheets, and flatly formed end faces of the metallic plate materials are arranged at a butted state and backside
20 portions of the plate materials are adsorbed by the magnet sheets.

EFFECT OF THE INVENTION

[0013] According to the wall structure of the invention having the above constitution, the magnet sheets are arranged on the base material at intervals and fixed thereto, and the leveling material is arranged and stuck between the mutual
25 magnet sheets at a thickness capable of filling a gap produced between the backside portion of the metallic plate material and the base material, so that the leveling material acts to support the metallic plate material and can suppress the local displacement of the metallic plate material between the mutual magnet sheets. Also, it is possible to reduce the adsorbing surface area of the magnet
30 sheets by arranging and fixing the magnet sheets at intervals, and hence the detaching of the metallic plate material is relatively easy and the workability is improved and the amount of expensive magnet sheets used is decreased, whereby

the reduction of the cost can be attained.

[0014] Also, according to the wall structure of the invention, the thickness of the leveling material is set to $-0.2 \sim +0.1$ mm with respect to the thickness of the magnet sheet, so that the smooth finished surface can be maintained when the metallic plate materials are adsorbed by the magnet sheets.

[0015] Further, according to the wall structure of the invention, the adsorbing force of the magnet sheet is set to not less than a shearing force between the magnet sheet and the metallic plate material produced by own weight of the metallic plate material, so that there is no case that the metallic plate material is shifted and fallen down by its own weight or that the detaching or fine adjustment of the metallic plate material becomes difficult since the adsorbing force is too strong.

[0016] Since the thickness of the magnet sheet is not less than 0.3 mm, the handling of the magnet sheet is made easy in the working to improve the workability.

[0017] According to the wall structure of the invention, the gap formed in the butted portion between the metallic plate materials is not more than 1 mm, so that the appearance of the finished surface is not damaged, and also when the finished surface is utilized as a plate writing surface of a blackboard or the like, a writing tool can be passed through the butted portion smoothly, or when the finished surface is utilized as a screen, it is possible to avoid the breaking of an image.

[0018] Further, according to the wall structure of the invention, the joint sealing material is arranged in the butted portion between the metallic plate materials, so that the decorative effect (design property) can be enhanced.

[0019] When the wall structure according to the invention having the above construction is constructed, the plural magnet sheets are arranged on the surface of the base material at intervals and fixed thereto, and the leveling material is arranged between the mutual magnet sheets, and then the metallic plate materials are arranged by butting their end faces and the backside portions thereof are adsorbed by the magnet sheets, so that the finished surface can be formed only by adsorbing the metallic plate materials without any advance preparation (treatment) and the efficient working can be performed.

[0020] Especially, according to the wall structure of the invention, the butted portion between the mutual metallic plate materials can be maintained at a flat state, so that when the finished surface is utilized as a plate writing surface provided with functions such as blackboard or whiteboard, uncomfortable feeling
5 is not caused even in the passing of a writing tool for writing letters or drawing pictures through the butted portion (joint portion) between the metallic plate materials, or when the finished surface is utilized as a screen, it is possible to project images stably.

BRIEF DESCRIPTION OF DRAWINGS

10 [0021] FIG. 1 is a schematic view showing a constitution of a wall structure according to the invention at a decomposition state.

FIG. 2 is a view showing an arranging state of magnet sheets and leveling materials.

FIG. 3 is a view showing a layout example of metallic plate materials.

15 FIG. 4 is a view showing another layout example of metallic plate materials.

EMBODIMENTS FOR CARRYING OUT THE INVENTION

[0022] The invention will be described more concretely with reference to the drawings below.

20 FIG. 1 is a perspective outline view showing the wall structure according to the invention at a decomposition state.

[0023] In this figure, numeral 1 is a base material. The base material 1 is constituted with an outer wall or inner wall of a building construction (mortar, plate material, gypsum board, metal plate or the like).

25 [0024] Further, numeral 2 is each of plural magnet sheets arranged on the surface of the base material 1 at intervals and fixed thereto. The magnet sheet 2 is arranged and fixed to the base material 1 by sizing or a mechanical clamping means (screw, nail or the like) (sizing is useless when the base material 1 is a metal). Although it is shown as a narrow-width elongated band body, the form
30 may be rectangular, circular or triangular, so that the form is not particularly limited.

[0025] The magnet sheet 2 has an adsorbing force larger than a shearing

strength between the magnet sheet 2 and a metallic plate material produced by own weight of the metallic plate material, more preferably an adsorbing force larger than the shearing strength but not more than 20 times of the shearing strength. Basically, the magnet sheets 2 are evenly arranged at equal intervals
5 along at least one of widthwise direction and longitudinal direction of the metallic plate material to be adsorbed starting from an edge part of the plate material. That is, it is desirable that the magnet sheets 2 are positioned in the edge part of the metallic plate material at its backside portion and arranged at equal intervals along either the widthwise direction or longitudinal direction of
10 the metallic plate material or both. Thus, the metallic plate material can be adsorbed over a full region by the magnet sheet 2 approximately equally and held on the base material stably.

[0026] The reason why the adsorbing force of the magnet sheet 2 is not less than the shearing strength between the magnet sheet 2 and the metallic plate
15 material produced by own weight of the metallic plate material but not more than 20 times of the shearing strength is due to the fact that when the adsorbing force of the magnet sheet 2 is less than the shearing strength, the adsorbing strength is too small and there is a fear of shifting and falling down the metallic plate material from the base material, while when the adsorbing force exceeds 20 times
20 of the shearing strength, the adsorbing strength is too strong and the fine adjustment on the position of the metallic plate material becomes difficult to deteriorate the workability.

[0027] For example, when a magnet sheet 2 having a thickness of 0.4 mm and an adsorbing force of 25 gf/cm^2 is used and a total adsorbing area of the magnet
25 sheet 2 is made 20% of a total area of the backside portion of the metallic plate material, the adsorbing force of the magnet sheet 2 is about 6 times (measured value) of the shearing strength produced by own weight of the metallic plate material. On the other hand, when the total adsorbing area of the magnet sheet 2 is 100% of the total area of the backside portion of the metallic plate material, the
30 adsorbing force of the magnet sheet 2 is about 30 times of the shearing strength produced by own weight of the metallic plate material. Therefore, when the adsorbing force of the magnet sheet 2 is set to the above shearing strength (1

times) in the use of the magnet sheet 2 having a thickness of 0.4 mm and an adsorbing force of 25 gf/cm^2 , the total adsorbing area of the magnet sheet 2 is about 3.3% of the total area of the backside portion of the metallic plate material, while when it is set to 20 times of the shearing strength, the total adsorbing area of the magnet sheet 2 is about 66% of the total area of the backside portion of the metallic plate material.

[0028] The proper change of the total adsorbing area of the magnet sheet 2 is advantageous from a viewpoint of the cost reduction because it is possible to decrease the amount of the magnet sheet 2 used as compared with the case of adsorbing the whole surface of the plate material with the magnet sheet.

[0029] In case of adsorbing the metallic plate material of about 0.3~0.4 mm in thickness, it is desirable to use a magnet sheet having an adsorbing force of $20\sim 100 \text{ gf/cm}^2$, a width of 20~100 mm and a thickness of about 0.3~1.0 mm. In this case, it is possible to perform the position adjustment by shifting the metallic plate material as the adsorbed state is kept, whereby the workability is improved.

[0030] Numeral 3 is a metallic plate material having a flatly formed end face and capable of forming a large-area finished surface by mutually butting end faces of the plate materials to each other. Although a transversely sticking type rectangular material constituted with a pair of short sides 3a and a pair of long sides 3b locating the short sides 3a at its both sides is shown as an example of the metallic plate material 3, the form and the sticking type (transversely sticking, vertically sticking) are not particularly limited. Also, the the form and arranging system of the magnet sheets 2 are properly changed in accordance with the difference of the form and sticking type of the metallic plate material.

[0031] As the metallic plate material 3 are used, for example, a galvanized steel sheet, an aluminum-zinc alloy plated steel sheet, an aluminum plated steel sheet, a stainless steel sheet, a coated steel sheet, a film laminated steel sheet and so on, which have a thickness of not more than 0.5 mm, preferably about 0.3~0.4 mm and are capable of being adsorbed onto the magnet sheet 2.

[0032] Also, it is possible to apply a coating of a resin (UV curing type special resin or the like) onto the surface of the metallic plate material 3. In this case, a screen function of projecting images or a function as a plate writing

surface of writing pictures or letters can be given to the finished surface.

[0033] Numeral 4 is a leveling material. The leveling material 4 has a thickness for filling a gap produced between the backside portion of the metallic plate material 3 and the base material 1. Here, a narrow-width elongated band body is shown as an example likewise the magnet sheet 2. Concretely, a paper tape, a vinyl tape or the like can be used, and the form thereof can be changed properly.

[0034] The leveling material 4 used is desirable to have a thickness of not less than -0.2 mm but not more than +0.1 mm with respect to the thickness of the magnet sheet. Because, when the thickness is less than -0.2 mm with respect to the thickness of the magnet sheet 2, there is a fear of generating a level difference between the mutual metallic plate materials 3 when these metallic plate materials 3 are adsorbed, while when it exceeds +0.1 mm, there is a fear of obstructing the adsorption with the magnet sheet 2.

[0035] In the constructing of the wall structure according to the invention, the magnet sheets 2 are arranged on the surface of the base material 1 at equal intervals and fixed thereto, while the leveling material 4 is arranged between the mutual magnet sheets 2 and then the backside portions of the metallic plate materials 3 are adsorbed by the magnet sheets 2 while butting end faces of the plate materials to each other, whereby a finished surface having a high smoothness can be formed efficiently irrespectively of operator's skills.

[0036] As to the magnet sheet 2, the width is preferable to be about 20~100 mm. When the width of the magnet sheet 2 is less than 20 mm, the sheet width becomes too narrow to deteriorate the workability, while when it exceeds 100 mm, it is difficult to equally lay out the arrangement of the sheets.

[0037] Also, the thickness of the magnet sheet 2 is preferably not less than 0.3 mm, more preferably 0.3~1.0 mm. When the thickness is less than 0.3 mm, the sheet is easily influenced by the outer surface of the base material, while when it exceeds 1.0 mm, it is necessary to increase the thickness of the leveling material 4 and hence the increase of the cost is unavoidable.

[0038] When the metallic plate material 3 is cut at a given size, variation in the size of the metallic plate material 3 may be caused, and hence there is a fear

of producing a gap in the butting of the mutual end faces, so that the gap is important to be not more than 1 mm (lateral bending of the metallic plate material 3 should be not more than 1 mm per 10 m), and hence the degradation in the appearance of the finished surface can be avoided.

5 **[0039]** When the gap is made to not more than 1 mm, if the finished surface is used as a plate writing surface or screen, a writing tool such as a marker or the like is passed through the butted portion without catching or an image is not broken in the butted portion when the image is projected.

10 **[0040]** When the metallic plate material 3 is cut with a cutting tool, "burrs" may be caused in the cut surface to generate obstacles in the operation of butting the end faces to each other, so that it is preferable to previously remove these burrs. Especially, in order to prevent the occurrence of burrs in the end portion of the metallic plate material 3 at its front side, it is preferable to cut the metallic plate material 3 from the front surface toward the backside portion thereof.

15 **[0041]** FIG. 2 is a view showing a main part in the arrangement of the leveling materials 4. The length L and width W of the leveling material 4 are desirable to be set to a size for filling a full opening portion S defined by the magnet sheets 2, but may be set to a size smaller than the opening portion S. In the latter case, as far as the leveling material 4 is located in the opening portion S,
20 a certain degree of slope in the arranging posture can be accepted, which is advantageous in the improvement of the workability.

25 **[0042]** When the size of the leveling material 4 is made smaller than the opening portion S, a gap is formed between the magnet sheet 2 and the leveling material 4. Such a gap is preferable to be about 110 mm at maximum. Thus, the generation of local unevenness in the metallic plate material 3 can be avoided.

30 **[0043]** Although an example of a transversely sticking type wall structure using metallic plate materials 3 with the same width and length is shown in FIG. 1, the widths of the metallic plate materials 3 are properly changed so as to be supported on the base material 1 at a layout shown in FIG. 3 or 4. This is not particularly limited.

30 **[0044]** When the finished surface is formed at the layout as shown in FIG. 3 or 4, the magnet sheets 2 adsorbing the respective metallic plate materials 3 are

arranged and fixed at an equal arrangement in accordance with the corresponding size, respectively.

5 [0045] In the constructing of the wall structure according to the invention, a frame material of 10~40 mm in width may be arranged in an outer peripheral edge of the structure (four sides). When the frame material is arranged, even if there is some scattering in the size of the magnet sheet 2 or the metallic plate material 3, such a scattering can be absorbed (covered) by the frame material effectively.

EXAMPLES

10 [0046] As a base material is utilized an inner wall of a building construction, and magnet sheets are attached to the base material to adsorb a plurality of metallic plate materials (steel sheets coated with UV curing type special resin) 3 each having a thickness of 0.4 mm, a width of 1200 mm and a length of 4 m for forming a finished surface by transversely sticking these metallic plate materials
15 from floor toward ceiling, during which the workability, finishing state, strength (retention strength with magnet sheets) and cost are examined. The results are shown in Table 1. In Table 1, the adsorption force of the magnet sheet 2 is represented by multiples of shearing force between the magnet sheet 2 and the metallic plate material produced by own weight of the metallic plate material.

[0047] Table 1

		Examples						Comparative Examples					
		1	2	3	4	5	6	7	8	9	10	11	12
Magnet sheet	width (mm)	40	80	100	40	60	20	10	40	60	40	40	sizing
	thickness (mm)	0.4	0.4	0.6	1.0	0.4	0.4	0.4	1.2	0.1	0.4	0.4	-
	adsorption force	6	9	17	15	9	12	6	27	3	3	21	-
	area ratio (%)	20	30	37	20	30	40	20	30	40	10	70	-
Thickness of leveling material (mm)		0.2	0.3	0.5	0.8	0.3	0.3	0.2	1.0	0	0.2	0.6	-
Examination items	workability	◎	◎	◎	◎	◎	◎	×	×	○	◎	△	△
	finishing state	◎	◎	◎	◎	◎	◎	○	×	◎	○	◎	△
	strength	◎	◎	◎	◎	◎	◎	◎	◎	△	△	◎	○
	cost	○	○	○	○	○	○	○	△	○	◎	×	△
	re-covering property	○	○	○	○	○	○	○	○	○	○	○	×

[0048] As seen from Table 1, the wall structures according to the invention can be confirmed to have good results in all of the examination items.

INDUSTRIAL APPLICABILITY

5 [0049] According to the invention, it is possible to provide a wall structure capable of efficiently forming a large area finished surface with a good smoothness and a method of constructing the same.

DESCRIPTION OF REFERENCE SYMBOLS

10	[0050]	1	base material
		2	magnet sheet
		3	metallic plate material
		3a	short side
		3b	long side
		4	leveling material

CLAIMS

1. A wall structure comprising a plurality of magnet sheets arranged on a surface of a base material at intervals and fixed thereto, and a plurality of metallic plate materials detachably supported by adsorbing their backside portions with the respective magnet sheets and mutually butted at their flatly formed end faces with each other to form a large-area finished surface, wherein a leveling material having a thickness for filling a gap formed between the backside portion of the metallic plate material and the base material and smoothly holding the metallic plate materials is arranged between the mutual magnet sheets.
2. The wall structure according to claim 1, wherein the leveling material is used to have a thickness of $-0.2 \sim +0.1$ mm with respect to the thickness of the magnet sheet.
3. The wall structure according to claim 1 or 2, wherein the magnet sheet is used to have an adsorbing force higher than a shearing strength between the magnet sheet and the metallic plate material produced by own weight of the metallic plate material and a thickness of not less than 0.3 mm.
4. The wall structure according to any one of claims 1~3, wherein the gap formed in the butted portion between the metallic plate materials is not more than 1 mm.
5. The wall structure according to any one of claims 1~4, wherein a joint sealing material is arranged in the butted portion between the metallic plate materials therealong.
6. A method of constructing a wall structure by detachably attaching a plurality of metallic plate materials onto a surface of a base material to form a finished surfaced with outer surfaces of the plate materials, characterized in that a plurality of magnet sheets are arranged on the surface of the base material at intervals and fixed thereto, while a leveling material is arranged between the mutual magnet sheets, and end faces of the metallic plate materials are arranged at a butted state and backside portions of the plate materials are adsorbed by the magnet sheets.