United States Patent [19]

Sugita

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[54] **EASILY REPLACEABLE WALL PANEL STRUCTURE**

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[52] **U.S. Cl.** **52/235,** 52/479, 52/506

[51] **Int. Cl.** **E04b 2/88**

[58] **Field of Search** 52/235, 506, 483, 489, 52/479, 480, 508

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Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

[57] **ABSTRACT**

The present invention relates to freely removable wall panel structure which is attached to the wall surface of concrete buildings, other various constructions, interior walls of houses or the like, and wherein no other member is interposed between unit panels in viewing the surface thereof.

4 Claims, 14 Drawing Figures

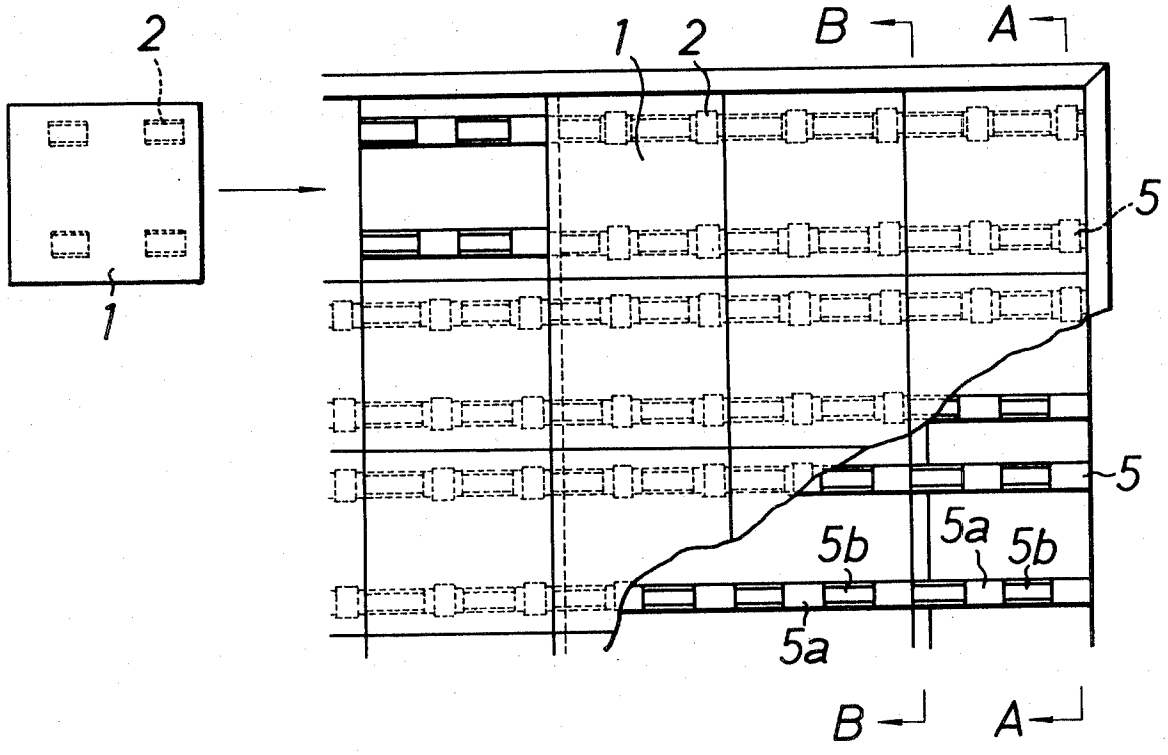


FIG. 1

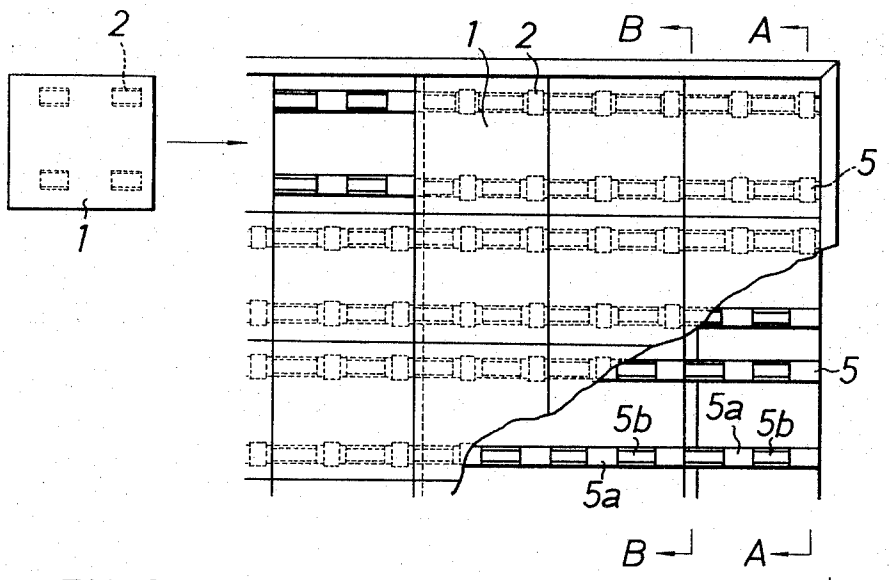


FIG. 2

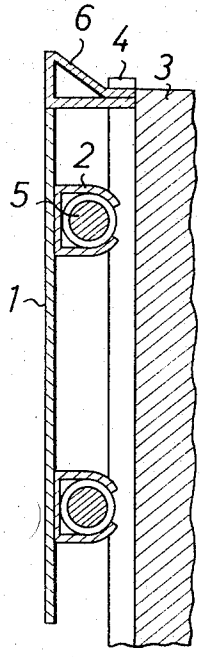


FIG. 3

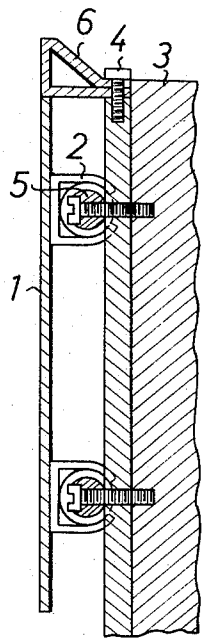


FIG. 5

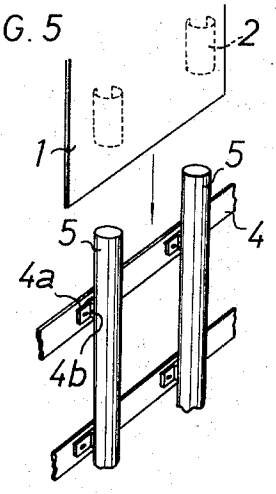


FIG. 4

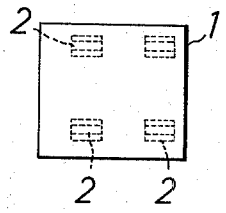


FIG. 6

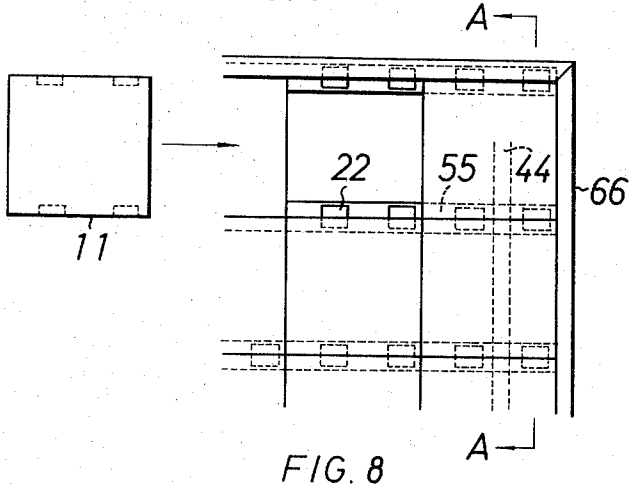


FIG. 7

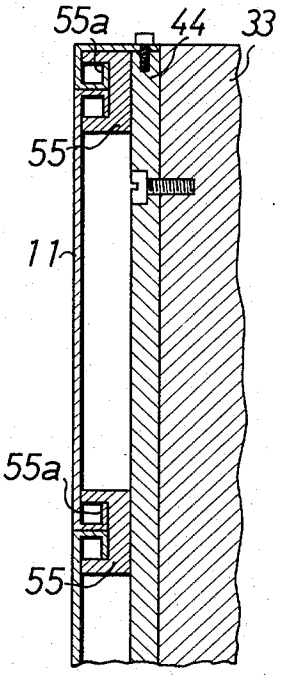


FIG. 8

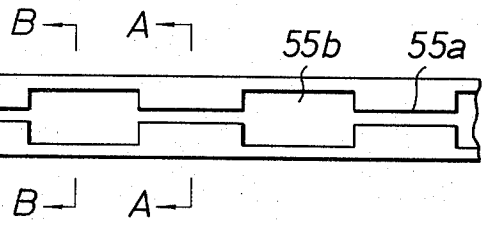


FIG. 9

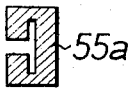


FIG. 10

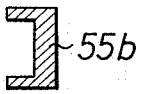


FIG. 11

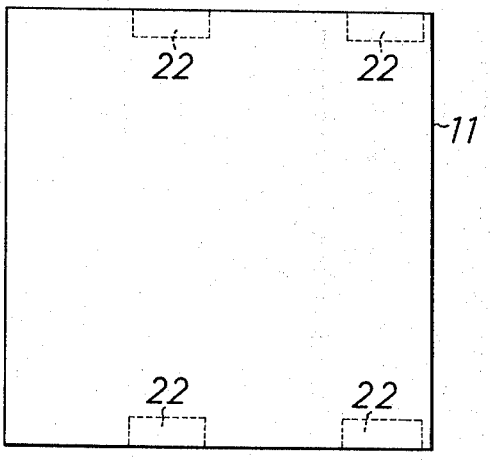


FIG. 12

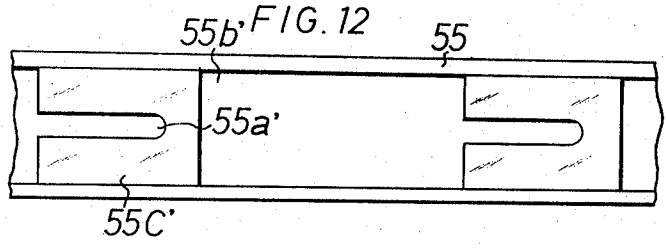


FIG. 13

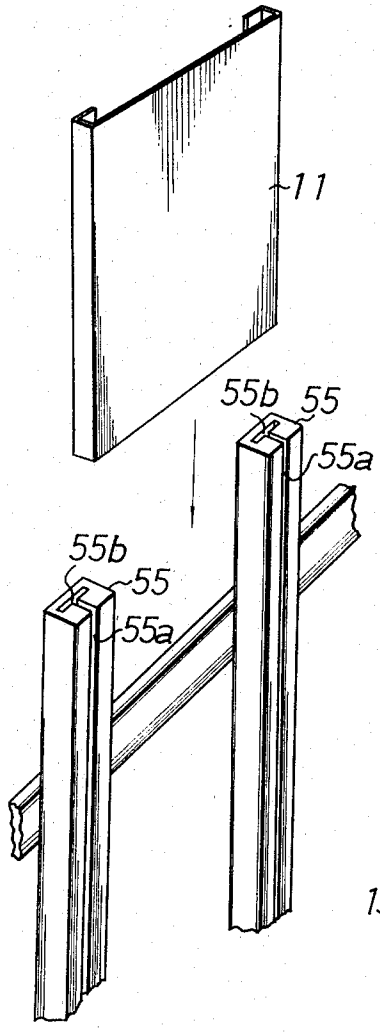
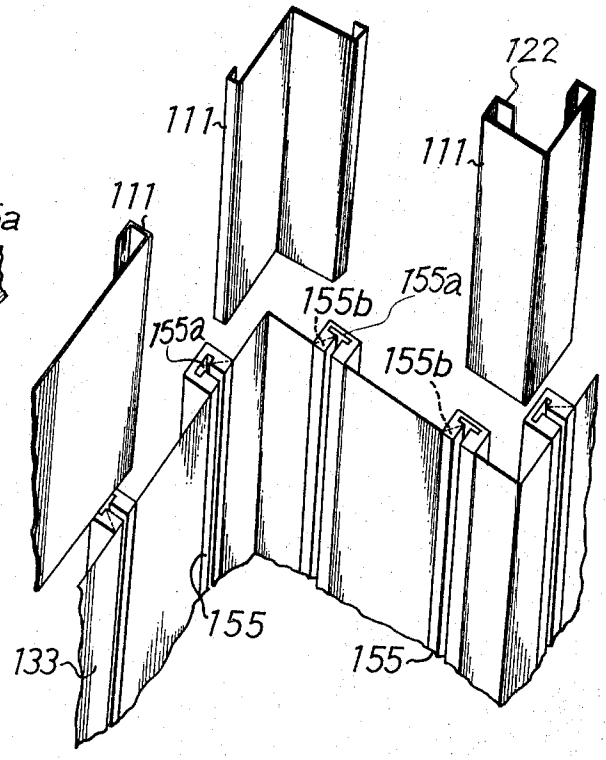


FIG. 14



EASILY REPLACEABLE WALL PANEL STRUCTURE

DESCRIPTION OF THE PRIOR ART

In conventional concrete buildings, the area occupied by windows in the external walls has been extremely reduced due to the installation of air conditioners. Further, the wall surfaces have been becoming dirtier in the atmosphere surrounding cities which is severely polluted. Consequently, the appearance thereof has been extremely defiled, and the durability of the wall surface structure has inevitably deteriorated. For these reasons, even if the inner structure of the building is sturdy, excessive expenses for new construction or reconstruction have been inevitably required simply due to pollution of wall surfaces.

In order to solve the abovegoing defects, several processes or attempts have been proposed heretofore; for example, a process of periodical repainting or an attempt of preventing deterioration of the appearance due to the pollution of the wall surfaces by attaching individual coloured tiles, painted metal or plastic sheets onto the wall surfaces to provide color accent thereto. However, in accordance with the former process, a great deal of labor is required, and when several coats of paint are applied, the aesthetic effect is generally diminished. On the other hand, in accordance with the latter process, once adhered or fixed to the wall surfaces, the colored tiles or painted metal or plastic sheets can not be replaced. Consequently, it is impossible to avoid color fading of the colored surfaces due to sunlight and, pollution. Even if individual colored tile, colored metal or plastic sheet mentioned above is provided with a design of one motif over the entire wall surface, it is impossible to draw one motif over the entire wall surface which is a marvel of order and neatness and gives no impression of unbalance since there are considerably wide spaces present between individual panels.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to eliminate the abovegoing defects and provide wall panels which can be easily and rapidly attached to the wall surfaces of the concrete buildings, and removed therefrom and freely replaced when required wherefore color fading and pollution of the concrete wall surfaces can be prevented, and the entire wall surfaces may contribute to the pictorial artistic effect since on other element is interposed between individual panels.

It is a second object of the present invention to provide wall panels which are applicable not only to the outer circumferences of the concrete buildings but also for use as interior wall decorations.

It is a third object of the present invention to provide wall panels which provide an entirely new wall surface luminous decoration for buildings and the like by housing lighting equipment in individual panels made of transparent synthetic resin materials.

The present invention can be more fully understood from the following description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a partially open front view of the novel wall panel of a round shaft holding type in accordance with the present invention attached onto the wall surface;

FIG. **2** is a sectional view taken along A—A line of FIG. **1**;

FIG. **3** is a sectional view taken along B—B line of FIG. **1**;

FIG. **4** is a front view of the novel panel in accordance with the present invention;

FIG. **5** is a perspective view showing another embodiment of the round shaft for attaching panels;

FIG. **6** is a front view showing the state when the panels of a rectangular shaft holding type are attached onto the wall surface;

FIG. **7** is a sectional view taken along A—A line of FIG. **5**;

FIG. **8** is a front view showing the rectangular shaft for attaching panel;

FIG. **9** is a sectional view taken along A—A line of FIG. **7**;

FIG. **10** is a sectional view taken along B—B line of FIG. **7**;

FIG. **11** is a front view of the panel of a rectangular shaft holding type;

FIG. **12** is a front view showing another embodiment of a rectangular shaft for attaching panels;

FIG. **13** is a front view showing another similar embodiment of a rectangular shaft for attaching panels; and

FIG. **14** is a schematic perspective view showing the state of attaching panels of a rectangular shaft holding type to the corner section of the concrete wall surface.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Hereinafter, the present invention is described in more detail by way of example reference being made to the accompanying drawings. FIGS. **1** through **5** show the first embodiment of the present invention. In the illustrations, reference numeral **1** designates panels made of aluminum alloy, stainless steel, hard plastic or iron stock provided with a coating having a sufficient thickness. The surfaces of said panels are colored by painting or by attaching of plastic foils or the like, and the color fading thereof by sunlight is minimized by the use of enamel finishing and the like. The panels have a square or rectangular shape, and the reverse surfaces thereof have outwardly projecting engaging portions **2** each having a shape for holding a shaft, in parallel at four portions. The engaging portions **2** are fixed to the panel **1** by a process such as welding, screwing, an integration type in case of hard plastic or the like. In the illustration, reference numeral **3** designates a wall surface of concrete or the like. A plurality of stays **4** are screwed to said wall surface in the longitudinal direction. The round shaft **5** is fixed by means of screws in the transverse direction with respect to said stays **4.** In said round shaft **5,** a portion **5***a* is formed with a large diameter for retaining the panel and correspond to the engaging portion **2** of said panel **1** and a portion **5***b* is formed with a small diameter so that the engaging portion **2** of the panel **1** may be easily inserted and slide therein.

The outer frame 6 is fixed to the end surfaces of the stay 4 and round shaft 5 and prevents the panel 1 from moving in the transverse and longitudinal directions.

In the structure mentioned above, when the panel 1 is attached to the wall surface 3, the engaging portion 2 of the panel 1 is first positioned adjacent the portion 5b of the round shaft for fixing the panel and then caused to slide in the transverse direction; whereby four engaging portions 2 of each panel 1 and the portion of the round shaft for fixing the panel are coupled to each other. Consequently, the panel 1 is prevented from sliding and at the same time 1 is removably fixed to the wall surface 3 via the round shaft 5. By a similar process, the panels 1 are successively caused to slide and are fixed to the portions 5*a* of the round shaft 5, surface 3 is constituted by the removable panels 1.

of is also possible to directly press the engaging portion 2 of the panel 1 to the panel fixing portion 5*a* of the round shaft 5 from the front with the use of hard elastic material, for example, hard rubber or the like for coupling.

When the panel 1 is removed, the panel 1 is caused to slide in the opposite direction to the sliding direction at the time of attaching the panel 1, whereby the engaging portions 2 of the panel 1 and the panel fixing portions 5a of the round shaft 5 are uncoupled. Referring now to FIG. 1, in case of the first embodiment, it is possible to attach or remove the panel 1 by moving the panel a distance equal to a quarter of the width of the panel 1. Further in accordance with the first embodiment, the attachment and removal of the panel 1 are conducted by moving the panel 1 in the transverse direction. The attachment and removal of the panel 1 can also be conducted by longitudinal movement of the panel 1 when the stay 4 is provided in the transverse direction and the round shaft 5 is attached to said stay 4 in the longitudinal direction.

Further, as illustrated in FIG. 5, such a process is also applicable when the stay 4 is fixed to the wall surface 3. The plate 4*b* having a plate 4*a* vertically fixed thereto, is fixed to the upper surface of the stay 4 by means of bolts or the like. Plate 4*a* projects upwardly and has the round shaft of uniform diameter fixed to the end portion thereof. Thereafter the engaging portion 2 of the panel 1 is engaged with the round shaft 5, which is exposed on the wall surface 3 through the stay 4, the plates 4*a* and 4*b*. The panels are successively slid toward the end portion having a stopper and the wall surface 3 is thus covered by the panels 1. In this case, the thickness of the abovementioned plate 4a is chosen so that the engaging portion 2 may easily hold the round shaft 5.

Hereinafter, a second embodiment illustrated in FIGS. 6 through 14 is described.

In the illustration, reference numeral 11 designates panels. The panels 11 are subjected to surface treatment similar to that of the panels 1 described in the first embodiment, and are formed as a plane having square or rectangular shape. The fold-up portions are formed at two positions along opposite peripheral portions of the reverse surface thereof and serve as engaging portions 22. Four engaging portions 22 are provided on each panel. The rectangular shaft 55 is fixed to the stay 44 by means of bolts or the like and said stay 44 is screwed to the concrete wall surface. The entire shape of said rectangular shaft is such that the panel attaching grooves 55*a*, which have a cross section of an approximately transverse T shape, are pierced in the transverse direction at the central portion. Further rectangular spaces 55*b* comprising grooves having a larger diameter than that of the grooves 55*a* for attaching the panels, are successively formed at two position for each portion equivalent to the length of the panel. In said rectangular grooves, two of the fold-up portions 22 of the panel (the fold-up portion of the panel 11 at the upper portion and the one thereof at the lower portion) are housed, and said rectangular grooves have a space in which the panel 1 can slide.

Reference numeral 66 designates an outer frame which has a similar structure to the outer frame 6 illustrated in the first embodiment.

The attachment and removal of the panels 11 in the second embodiment are conducted in the following manner. The folded end of the engaging portion 22 of the panel is inserted into the rectangular groove 55*b* of the rectangular shaft and is caused to slide for approximately a quarter length of the panel to the right, whereby the upper and lower engaging portions of the fold-up engaging portion 22 are locked into the panel attaching groove 55*a*, the disengagement of the panel being prevented and the coupling thereof to the rectangular shaft 55 being firmly ensured.

More specifically, the engaging portions 22 of the panel 11 are positioned opposite the lower portion of the rectangular groove 55*b* of the upper rectangular shaft 55*b* and the upper portion of the rectangular groove 55*b* of the lower rectangular shaft, respectively. Thereafter the panels 11 are slid in the transverse direction, the engaging portions 22 of said panels 11 being moved to the panel attaching grooves 55*b*; whereby the panels 11 are inserted into the panel attaching grooves 55*a* of the upper and lower rectangular shafts 55 and into the approximately T-shaped groove of the panel attaching grooves 55*a* together with the engaging portions having a folded shape of other panels 11 located at the upper and lower positions of said panel 11 and are prevented from disengaging from the panel attaching grooves 55*a*. Accordingly, the opening of the groove 55*a* for attaching panels is required to have a diameter, at least, as large as the thickness of two sheets of the panels 11. Further, when the panel 11 is removed, the engaging portions 22 or the panel 11 are moved from the groove 55*a* to the rectangular groove 55*b*, whereby the panel 11 is released.

The stay 44 for holding the rectangular shaft 55 and the wall surface 33 are generally identical with the stay 4 and the wall surface 3 shown in the first embodiment, respectively. Further, it is also possible to attach and remove the panel 11, but longitudinal movement of the panel 11 when the stay 44 is fixed in the transverse direction and the round shaft 55 is fixed to said stay 44 in the longitudinal direction, similarly to the first embodiment.

Another embodiment of the rectangular shaft, illustrated in FIG. 12, is described hereinbelow. Here, the groove 55*b'* is pierced over the entire length of the central portion of the rectangular shaft 55, and two plates 55*c'* having a notch groove 55*a'* at the central portion are connected to each panel by way of screwing, welding or the like, whereby a similar effect can be obtained.

In accordance with this invention, it is possible to eliminate the remarkably precise and complicated manufacturing process of the prior art by the above-

mentioned rectangular shaft wherein the rectangular spaces having a large diameter and the panel attaching grooves having a small diameter must be pierced over the entire length of a single rectangular shaft **55**, and manufacturing efficiency is remarkably improved. Further, as illustrated in FIG. **13**, in the the embodiment wherein the rectangular shaft **55** is exposed on the wall surface **33**, the groove **55***a*, having an opening of the identical diameter with the opening of the panel attaching groove **55***a* may be open over the entire length of the central portion without forming the rectangular spaces **55***b* and the panels **11** are successively fed from one side end portion to the other side end portion. In this case, when a plurality of panels **11** to be fed are drawn out, said plurality of panels **11** may be conveniently connected to each other by means of connecting members such as chains, hook members or the like.

This embodiment with respect to the rectangular shaft **55** may be applied to any of the mechanisms for sliding the panels in the longitudinal direction or of sliding the same in the transverse direction.

Further, as modifications of the structure for attaching the panels in accordance with the present invention, the following arrangements are fully applicable; the stays may be embedded in the wall; the combination of the stay and the rectangular shaft may be embedded in the wall; or the rectangular shafts may be directly embedded in the wall while the distances between the rectangular shafts are accurately maintained. With such structures it is possible to obtain results similar to those achieved in the first and second embodiments.

When the concrete wall has a corner section as illustrated in FIG. **14** and the panels of the present invention are attached thereto, the rectangular shaft **155** (or the combination of the stay and the rectangular shaft **155**) is embedded in the wall **133** the panels **111** having engaging portions **22** are attached to the rectangular shaft **155** comprising the rectangular space **155***b* whose two faces are reduced 45° and the panel attaching grooves **155***a* of a transverse T-shape, whereby the panels **111** can be attached to or removed from the corner sections of the wall by means of an arrangement similar to the panel attaching mechanism shown in the second embodiment.

In the components shown in respective embodiments the panels, stays and shafts are of alluminum alloy, stainless steel, hard plastic, or iron stock provided with a coating of a sufficient thickness.

Thus, for attaching panels to the wall of the present invention, the engaging portions **2**, **22** formed on the reverse surface of the panel are caused to slide in the engaging portions at the rectangular shaft **55** or the round shaft **5** in the transverse or longitudinal direction, whereby the panel can be readily and accurately attached to the wall without the necessity of screws, bolts and the like, or removed therefrom by moving the panel in an opposite direction to the attaching direction. In this way, the wall is always covered by the replaceable panels. Further, it is possible to provide most preferable wall surface having an attractive appearance by subjecting a unit panel to the surface treatment for providing various colors and a design thereon, and it is also possible to draw one motif over the entire wall surface.

Accordingly, it is possible to constantly maintain the fresh appearance of the wall surfaces of the buildings by the replacement of the panels, in contrast to conventional walls of concrete buildings wherein it is difficult to prevent the fading of the colored wall surfaces due to sunlight and pollution. Moreover, it is possible to easily repair a partial color change or damage on the picture by replacing the panels at said portion with the new ones.

Further, the spaces present between respective unit panels are hardly observed since the ends of respective unit panels directly contact each other. One motif drawn over the entire surface of the wall gives no impression of unbalanced appearance, and a unified pictorial design is drawn thereover. Furthermore, the panels of the present invention are applicable not only to concrete walls but also panels made of transparent synthetic resins are applicable to the interior decoration. Moreover, it is possible to provide an entirely new luminous decoration effect by housing lighting equipments in the unit panels. Thus, the present invention is applicable to many purposes and has various uses.

What is claimed is:

1. An improved wall panel structure, comprising:

a plurality of stays screwed to a wall and in parallel relationship;

a plurality of rectangular shafts positioned transversely to said stays and coupled thereto, said shafts being in parallel relationship, each said shaft having a groove therein, said groove extending longitudinally of said shaft and having U-and T-shaped cross-sections at alternating intervals longitudinally of said shaft; and

a panel having four sides, opposite sides thereof being in parallel relationship, a plurality of engaging hooks extending from two opposite sides of said panel and adapted to be inserted into the grooves of two rectangular shafts in the region of the U-shaped cross-sections thereof, said panel thereafter being slidably shifted along said grooves until said engaging hooks are in regions of the grooves having T-shaped cross-sections, whereby said panel may be firmly retained by two rectangular shafts.

2. The improved wall panel structure of claim **1** wherein two engaging hooks are provided on each of said two opposite sides of said panel.

3. An improved wall panel structure comprising:

a plurality of stays screwed to a wall and in parallel relationship;

a plurality of rectangular shafts positioned transversely to said stays and coupled thereto, said shafts being in parallel relationship, each said shaft having a groove therein, said groove extending longitudinally of said shaft and having a U-shaped cross-section, a pair of plates being positioned within said groove and spaced apart, said plates having grooves centrally located therein and extending parallel to said shaft groove, said plate grooves extending from a side of said plates and terminating centrally thereof, said plates being spaced apart a distance equal to approximately one-fourth the width of the panel; and

a panel having four sides, opposite side thereof being in parallel relationship, a plurality of engaging hooks extending from two opposite sides of said panel engaging hooks on each side of said opposite sides and adapted to be inserted into grooves of

said rectangular shafts, said panel thereafter being slidably shifted along said grooves until said engaging hooks are coupled to said plates in said grooves, whereby said panel may be firmly retained.

4. An improved wall panel structure, comprising:

a plurality of stays screwed to a wall and in parallel relationship;

a plurality of round shafts positioned transversely of said stays and coupled thereto, said shafts being in parallel relation, said shafts each having first sections having a first diameter and second sections interposed between said first sections and having a diameter smaller than the diameter of said first sections;

a panel having a front surface and a back surface and having four sides, opposite sides thereof being in parallel relationship, and having four engagement portions on the back surface, said engagement portion being aligned in two rows for engagement with two of said round shafts, said panel sliding freely over the sections of said shafts having a smaller diameter and being firmly retained by said sections having a larger diameter.

* * * * *