This invention relates to artificial stone facing plaques and particularly to a new and improved artificial stone facing plaque which is adapted for both interior and exterior use, such as for walls, ceilings, floors, roofs and the like.

This application is a continuation-in-part of my copending application Serial No. 810,475, filed May 1, 1959, now abandoned.

More particularly, the present plaque is one which is relatively thin and light in weight, yet is strong with a high resistance to fracture. The plaque is sufficiently flexible so that it can be bent or flexed to fit walls which are somewhat bowed or distorted. Furthermore, the plaque is one which may be made and handled readily in any and all practical commercial sizes desired, and particularly in large sheets.

Specifically, the plaque is one which can be made in limited thickness either in small or very large size sheets, the thickness remaining constant, if desired, for any particular size. Further, the plaque is one which can be readily fastened to a surface which it is to adorn by means of a suitable ordinary commercial adhesive alone, the usual ties, anchor bolts, and the like required for securing the heavier cement or concrete facing plaques and natural stone plaques being unnecessary.

Other advantages of the plaques of the invention are that they have high heat resistant properties, good thermal insulating properties, are substantially waterproof and are, to a high degree, fungicidal in their natural condition. Further, they can be readily installed by unskilled labor and can be easily manufactured by inexpensive equipment.

Various other objects and advantages of the present invention will become apparent from the following examples, wherein reference is made to the drawings, in which:

FIG. 1 is a perspective view of a form of plaque embodying the principles of the present invention;

FIG. 2 is a cross sectional view taken on the line 2-2 of FIG. 1;

FIG. 3 is a perspective view of a plaque showing a slightly modified arrangement;

FIG. 4 is a cross sectional view taken on the line 4-4 of FIG. 3;

FIG. 5 is a perspective view of another modification of the plaque;

FIG. 6 is a view taken on the line 6-6 of FIG. 5;

FIG. 7 is a perspective view of a plaque using heavy and fine aggregates;

FIG. 8 is a cross sectional view taken on the line 8-8 in FIG. 7;

FIG. 9 is a perspective view of a form of plaque such as illustrated in FIGS. 7 and 8 but illustrating a different finishing operation;

FIG. 10 is a cross sectional view taken on a line 10-10 of FIG. 9;

FIG. 11 is a top plan view of a modified form of plaque;

FIG. 12 is a bottom plan view of the plaque shown in FIG. 11;

FIG. 13 is a cross sectional view taken on the line 13-13 of FIG. 11;

FIGS. 14 and 15 are a top plan view and bottom plan view, respectively, of another modified form of plaque;

FIG. 16 is a cross sectional view taken on the line 16-16 of FIG. 14.

Referring to the drawings, the plaque comprises essentially a thin body 1, with a decorative upper or forward face 2, and composed of a settable synthetic organic plastic material in which are embedded, at least partially, a plurality of pieces of relatively coarse aggregate 3. The aggregate is firmly bonded to the plastic and embedded puttyway therein in a manner such that the individual pieces of aggregate each has a substantial portion extending outwardly or upwardly from the forward decorative face 2 of the body 1. If desired, the plastic plaque may be bonded to a suitable backing strip 4, which may be formed of any suitable material such as, for example, asbestos cement board. The backing strip is preferably one which can readily be secured by ordinary adhesives to a surface to be covered.

It is often desirable to have the top portion of the individual aggregate 3 partially ground off to form the polished surfaces 5a, as illustrated in FIGS. 3, 4 and 5. Preferably, these aggregate surfaces 5a are polished off so that they lie in a common plane, such plane being spaced from the forward or top face 2 of the plastic body.

Referring to FIGS. 5 and 6, in some instances it is desirable to have the exposed forward or top decorative face of the plaque smooth and polished. In such instances, the protruding portions of the aggregate and also a portion of the plastic face or surface are ground away so that the final exposed surface 7 of the plaque is slightly below that of the original forward surface of the plastic body 8. In such a plaque, the plastic body 8 has embedded therein the aggregate 9, the faces 10 of which are formed to define with the forward face 7 of the plaque a continuous and uninterrupted surface which preferably is planar but, if desired, may have a non-planar yet regular and continuous pattern of smoothness. In those instances in which the body is to be ground down, the aggregate may originally be fully embedded as well as partially embedded.

Again, in many instances, the aggregate is coarse and of such size that there are considerable spaces between the individual pieces of aggregate and it is desired to have these spaces filled with some form of decorative means. Such a structure is illustrated in FIGS. 7 and 8 wherein the plaque body 12 has embedded therein coarse pieces of aggregate 13 in the manner heretofore described. The spaces therebetween are filled with a filler of finer aggregate, indicated at 15, which is bonded to the plastic body 12. This may be accomplished either by applying the finer aggregate to the body 12 at the same time that the coarse aggregate is applied, at which time the plastic body 12 is in unset or uncurled condition, or by applying the coarse aggregate and, before the body has set, applying additional plastic on the top exposed surface of the body and sprinkling the fine aggregate thereon, or by mixing the additional plastic with the fine aggregate and applying such mixture to the exposed surface of the body so that all of the components bond together in a unitary structure. The bonding material for the fine aggregate may be organic synthetic plastic of the same type as that used for the body, or of a different type. Also, for certain effects, it may be inorganic bonding material, such as white Portland cement.

On the other hand, it sometimes is desirable to have the exposed forward or top decorative face of the plaque made of a material different from the rest of the body 12 for purposes of decoration, waterproofing, thermal resistance, soundproofing and the like. In this instance, the strata forming the forward exposed face of the plaque...
may be of a different plastic than the stratum forming
the main body 12, but having the special characteristics
desired. In such case, the strata forming the decorative
face and the stratum forming the body are bonded to-
together to form a substantially unitary structure in which
the stratum blend into each other at their junction.

Again, for a highly decorative surface, a plaque, such
as illustrated in FIGS. 7 and 8, may be ground down as
illustrated in FIGS. 9 and 10, wherein the body, indi-
cated generally at 16, contains both the coarse aggregate
17 and the fine aggregate 18. Both of the aggregates and
a portion of the plastic on the forward or upper exposed
face are ground down so that only polished surface areas
are exposed at the forward faces. Usually the aggregate is
so thinly packed that the only visible feature is fine
lines of plastic between the particles or pieces of aggregate.

A number of plastics may be used. However, the
preferred plastic is a polyester alkyd styrene monomer,
such being one of the polyester resins which cures at
room temperature, but does not air cure. Such plastic
material is usually in liquid or viscous state and the set-
ing or curing reaction is started by introducing a catalyst.
Once the setting reaction starts, it continues to comple-
tion with a resultant permanent setting of the plastic,
there being a concurrent liberation of heat. Methyl
ethyl ketone peroxide has been found to be a suitable
catalyst. It appears that in the plastics of this character
which are thermal setting plastics, the unsaturated mole-
cules react as a result of the introduction of the methyl
ethyl ketone peroxide. Other suitable organic thermal-
setting resins may be used, such as, for example, epoxy
resins and phenolic resins.

The specific plastic above identified, however, is one
that is readily cast and sets rapidly at room temperature
and thus lends itself readily to the manufacture of the
present artificial stone plaque. Once having set, such
plastic will stand an extremely wide range of tempera-
tures, since, in particular such resin has an elongation of about
two percent and, therefore, is to some extent, resilient
and flexible so that in sheets of substantial size it can be
bent and warped readily to a limited extent without frac-
ture or without loosening its bond with the aggregate. If
slightly more flexibility is desired, such may be obtained
by adding a small amount of a more flexible type of resin.

The aggregate used is dependent upon the effect de-
sired. Generally, the aggregate is of natural stone frag-
ments of different selected grades and sizes and colors.
However, other types of aggregates may be used; for ex-
ample, fragments of glass, whole or crushed shells, frag-
ments of metal, and other like compositions, may be
used. In fact, the choice of aggregate depends upon the
appearance and type and quality of the surface desired
before or after grinding, as the case may be. Further-
more, the plastic material may be colored by the addi-
tion of pigments to bring out the desired color relations
in the surface thereof.

Since color pigment is expensive, it is introduced only
into a thin layer of plastic or cement at the forward face
of the plaque body of sufficient thickness so as not to
be ground away if the plaque is to have a polished sur-
face. Again, if desired, the aforementioned filler to be
used in the spaces between the coarse aggregate, instead
of being of plastic of the same or a different type than
that used for the body, may be a Portland cement base
with fine aggregate disburshed therethrough, such latter
filler being suitably bonded to the coarse aggregate and
to the body and held in place thereby.

It is to be noted that the present artificial stone plaque
may be made in any size desired, but need not be thick.
The finished sheet may be from ⅛" of an inch thick for
finer aggregate up to ⅜" of an inch for the coarser aggregate.
In the latter case, this may include also the backing strip
which preferably is of artificial asbestos cement board
or the like, or at least a material which can be readily caused to adhere to a surface which it is
to cover by the usual commercial adhesives such as used
for applying ceramic tile, plastic bathroom tile, asbestos
flooring, and the like to surfaces to be covered.

A number of distinct advantages result from the use
of plastic aggregate. For example, in the case of the usual
plaster or cement artificial stones or plaques, such
stones or plaques must be at least ¾" of an inch thick for
blocks up to 8 x 8 inches in size and 1 inch thick for
blocks 12 x 12 inches in size. For larger sizes or panels,
the cement must be reinforced. If extremely large ag-
gregate is used, then the thickness must be even greater.
An example of the type of plaque employing both the
coarse and fine aggregate is one in which coarse aggregate of
preselected colors and ranging from three quarters of an
inch to two inches in the largest face dimension and from
one-quarter to one and one-half inches in thickness are
bonded to the body.

The body thickness for aggregates of this size, ex-
cluding the backing strip, is about ¾" of an inch in
thickness and the backing strip, if used, is about the
same thickness so that the body is ¾" of an inch in
thickness. The fine aggregate used ranges from very
course sand or fine gravel of about ⅛" of an inch diameter
down to very fine sand. The fine aggregate is used to a
depth such that the coarse aggregate protrudes above
the surface of the fine aggregate. For example, the fine ag-
gregate may be just sufficient to completely cover and
conceal the underlying plastic body.

Furthermore, the cement plaques must be secured to
the wall by suitable mechanical ties in addition to any
adhesives used. They are very difficult to install, cannot
be warped in the least to fit any irregularities or bowing
in the wall structure, and require skilled operators for
their installation.

Furthermore, such prior cement plaques have extremely
low resistance to fracture and the losses from fracture
during manufacture, storage, shipping and installation
are extremely high. Again, such prior plaques add greatly
to the overall weight of the building, something which is
highly undesirable because of the cost involved in con-
structing the building supporting structure.

The present plaque can be made in a limited thick-
ness, such thickness depending to some extent upon the
thickness of the aggregate used and the amount of bond
required. However, a maximum thickness of about ⅜
of an inch can be used for plaques of several feet long
and two or three feet wide, such as used for panels.

The particular readily cast polyester plastic, described
herein, is desired as it lends itself easily to manufac-
ture of the product. For this purpose, a suitable mold
having a cavity with a bottom is figured to provide the
desired contour on the back face of the plaque for ready
adhesion and bonding to the wall may be provided. Often
the cavity is lined with a paper liner and parting ma-
terial. The fluid plastic is poured into the cavity and
spreads to a given depth and the catalyst is added for
casting the setting or curing thereof. The aggregates
are promptly added so that they can sink into the fluid
plastic and become thoroughly bonded thereto over the
embedded portion. The resulting plastic composition is
permitted to continue to react, whereupon the plaque is
complete. The plaque is desired to have a polished sur-
face. If additional fine aggregate is to be added, it may
be added directly with the coarse aggregate, or it may
be mixed with a cement and added before the body sets,
or it may be mixed with a different cement and added
over the surface of the original plastic after the former
has set.

After the complete plaque has set, the surface may
be finish ground by using the conventional grinding me-
thods, preferably with a coolant so as to prevent any de-
terioration of the plastic or cement. Both the entire
surface of combined aggregate and plastic may be ground
by the same grinding media.

Such modification of the invention is shown with a
backing strip such as the asbestos cement board backing strip shown in FIG. 1; however, such backing strip is not, in all instances, necessary and, in such instances, the plaque is formed with two exposed decorative faces, such double-faced plaque now to be described.

Referring next to FIGS. 11 through 13, another modification of the invention is disclosed. In this form of the invention, there is shown a plaque 29 in which the aggregate 21 is partially embedded in the body of the plaque and protrudes from the end surface thereof, as shown in FIG. 11. However, the aggregate is spaced slightly from the opposite end face 23. The surface layer of plastic of the body, commencing from such opposite face 23 and extending to a point at least partway toward the face 22, is of translucent plastic so that the aggregate 21 embedded in the body can be discerned through the plastic of such opposite face. The thickness of this translucent plastic layer of the opposite face may be varied, depending upon the effect desired, but by spacing the aggregate from the face and observing it through that face in spaced relation to the surface, very pleasing visual effects in depth are obtained. With such a plaque, either of the faces 22 and 23 can be applied to a wall or surface to be faced, the other of the two being exposed outwardly. Thus, a double-faced plaque is provided. In FIG. 13, the upper face 22 is shown as the face through which the aggregate 21 extends and the face 23 is the face from which it is spaced and through which it is discerned. Generally, the face 23 is the face formed by the inside or bottom surface of the mold used in the molding method hereinbefore discussed. If desired, the face 23 may be used as a decorative face with its surface that resulting from the molding operation, or it may be polished to a high degree in the same manner that marble or other stone is polished if a more highly finished surface is desired.

Referring now to FIGS. 14 through 16, a further modification is illustrated in which a plaque 25 is shown as formed of a body of translucent or transparent synthetic organic plastic with aggregate 26 embedded therein. In this form, the aggregate is embedded entirely within the body of the plastic plaque. Some individual pieces of aggregate are sufficiently thick so that part of the surface of each can be discerned readily at both faces. Other particles of the aggregate are arranged so that they are visible or discernible only at one face. With this plaque, a number of advantages are obtained, the principal one of which is that the like aggregate can be used to provide plaques of the same general color scheme and the like, but with varied patterns such that either face of each plaque can be faced outwardly as a decorative face and the other face bonded to the wall. Thus, each plaque can be rotated to four different positions about an axis normal to its face with one face exposed forwardly for providing proper continuity of pattern with plaques next to it, or it can be turned to dispose the opposite face forwardly and again rotated to four different positions. Thus, a much greater possibility of obtaining a pleasing correlation between the design of each plaque and those adjacent to it is obtained.

Another distinct advantage resides in using the translucent and transparent plastics, in that the plaque can be laid over surfaces of different colors. With this arrangement, the background colors on the surfaces to which the plaques are applied are diffused and reflected through the body and exposed surface of the plaques to provide a common background tone or hue which aesthetically binds all of the plaques together. This background color may be obtained by coloring the plaster of the wall, for example, to which the plaque is to be affixed, or by coloring the cement by which the plaques are affixed to a wall surface. Furthermore, by providing designs of variegated color on the background in rough outline, variegated effects can be obtained in the overall appearance of the wall. Further, the thickness or depth of the plastic plaque along with the aggregates' reflective colors, tends to soften and diffuse any design over which the plaques are laid and thus provide a unique and pleasing appearance.

All of the variations and modifications of color, aggregate size and mixture, pigment, and layers of plastic, positioning and spacing and grinding of the aggregate aforedescribed with respect to the plaque having the backing strip, apply equally well to the double-faced plaque. Also, each of the decorative or exposed faces of the double-faced plaque is formed for ready adherence or bonding to the surface of a walkway or the wall of a building. In addition, the use of a fine perlite aggregate or with or without other of the aforementioned aggregates is highly effective.

In all forms of construction above described, there is provided an artificial stone facing plaque that is light in weight, has unusual strength characteristics, and has excellent insulating and fireproofing properties in addition to its unique and effective appearance.

Having thus described my invention, I claim:

The method of making artificial stone facing plaques comprising providing a relatively thin self-supporting strip of polyester resin material and pieces of coarse aggregate embedded partway therein and protruding from one face thereof with spaces between the protruding portions, setting the material, applying a mixture of fine aggregate and inorganic cementitious material in said spaces in contact with said portions and said face, setting the inorganic cementitious material, and then polish grinding the coarse and fine aggregate to a depth to present a continuous polished surface at said face.

References Cited in the file of this patent

UNITED STATES PATENTS

1,486,208 Weber March 11, 1924
1,580,114 Pence May 25, 1926
1,646,667 Tobin Oct. 25, 1927
1,812,134 Bragger et al. June 30, 1931
1,857,856 Medina May 10, 1932
2,636,542 Humphries April 28, 1953
2,729,770 Robbins --- Jan. 9, 1956
2,835,996 De Paoli May 27, 1958
2,871,152 Tobin Jan. 27, 1959
2,951,001 Rubenstein Aug. 30, 1960