May 30, 1967 A. VIDA 3,322,609

BUILDING FACING MATERIAL

Filed March 7, 1963

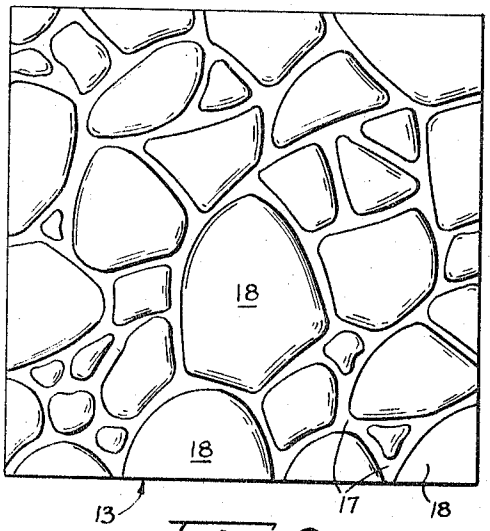


Fig. 2

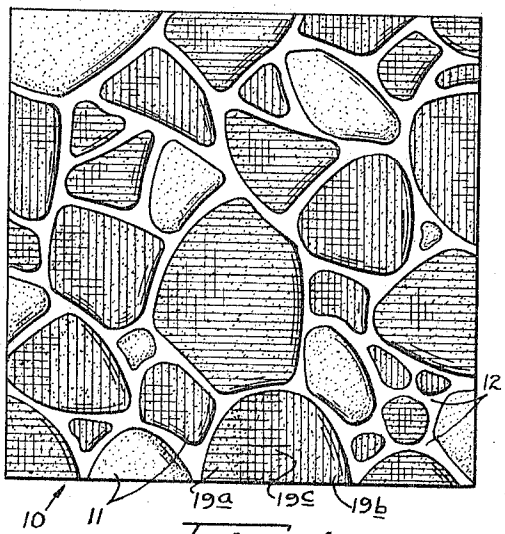


Fig. 1

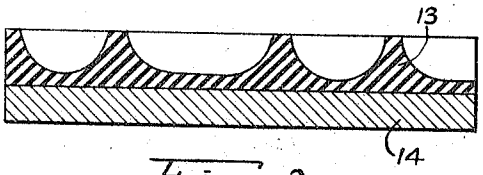


Fig. 3

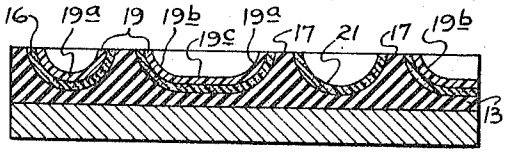


Fig. 6

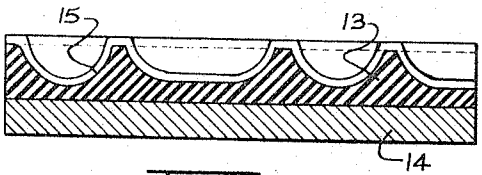


Fig. 4

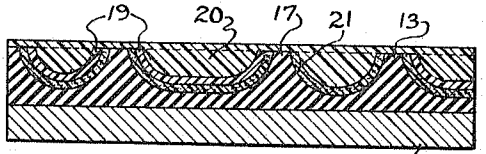


Fig. 7

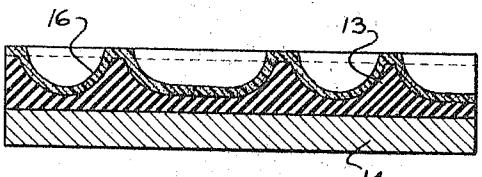


Fig. 5

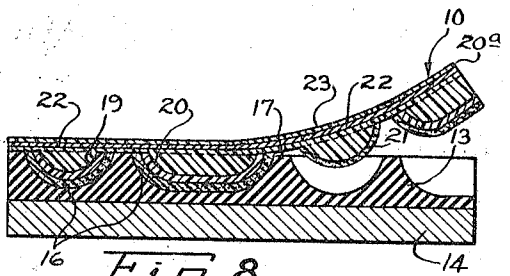


Fig. 8

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BUILDING FACING MATERIAL

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3 Claims. (Cl. 161—5)

The present invention relates to improvements in decorative sheet materials for covering exterior or interior walls and also floors on buildings of all types. It also relates to a unique method for manufacturing such sheet materials which not only have a colorful appearance but which also provide extremely durable and hard wearing surfaces.

Prior to the present invention building facing materials were manufactured in the form of rigid sheets because this rigidity was necessary in order to provide a sheet material with a durable and hard wearing surface. Such rigid sheet materials have never been fully satisfactory because of many inherent disadvantages and problems. For one thing they often warp and are difficult to adhere to buildings without the use of weights or clamps. In their exterior usage on buildings it is often necessary that a decorative facing material be permanently adhered to certain substrate materials. With the rigid type sheet materials this requirement created particularly serious problems. For example, differences in the coefficient of expansion, or the effects of humidity often resulted in the deterioration of the bond between the rigid facing sheets and the substrate materials. Thus, over a period of time these rigid sheets would come loose from the substrate materials. As a result of these and other serious difficulties, the art has long sought after a facing material that was flexible instead of rigid and therefore one that could be readily adhered to various substrate materials while also possessing a durable, hard wearing surface.

It is therefore a major object of the present invention to provide a building sheet material having a hard, extremely durable and wear-resistant surface, and yet one that is flexible enough to enable it to be permanently adhered to commonly used exterior building substrate materials even when they are curved or present uneven surfaces and without the use of weights or clamps.

Another object of the present invention is to provide sheet facing material for buildings having a mosaic-like appearance with a hard and extremely durable embossed surface in combination with a backing that is water-tight, durable, and yet flexible at the depressed grout lines.

Still another object of the invention is to provide a flexible sheet facing material for use on buildings that has a unitary construction as compared with prior art mosaic sheet materials that have porous flexible backings glued in place.

In the prior art mosaic-like building materials, small colored glass or ceramic tiles, pebbles, small cubes of marble, wood or other suitable materials with contrasting colors or textures were grouped and partially embedded into a cementitious mortar or adhered to a suitable support. In some instances a removable paper sheet was first temporarily glued to the face of the mosaic making materials before they were applied to their permanent supports. In other instances a permanent type of perforated or net backings was glued to the back of the small mosaic tiles and this mosaic grouping with permanent backing was subsequently adhered to a suitable rigid support. The permanent type backing was concealed from view by applying a cementitious grout to the openings between the mosaic tiles.

The aforementioned method for producing mosaic-like facing materials had many disadvantages. The sheets produced were necessarily thick and heavy. Also, the cementitious grout between mosaic tiles did not result in water-tight joinings. Moreover, it was practically impossible to glue mesh or perforated backing materials permanently to irregular shaped mosaics such as pebbles. Most ceramic or glass mosaic sheet materials wherein the colored fragments are permanently glued to a backing are usually limited in size to less than two square feet because their weight makes larger sizes too delicate to handle without damage. There are also other limitations to these well known prior art mosaic materials. For example, some have a limited color range and others have low impact resistance.

Thus, another object of the present invention is to provide a method for producing lightweight flexible mosaic-like sheets of facing material having a unitary structure with a hard wearing surface. Using the principles of my invention flexible sheets up to twenty-four square feet or larger can be manufactured, and these sheets can be installed more easily as well as more economically than any other well known mosaic materials.

Another object of my invention is to provide a method for producing flexible sheet facing material having colored rigid facing and different colored grout lines that are flexible. In general, my unique method comprises the steps of applying a layer of a colored and relatively rigid type of thermosetting resin such as polyester or epoxy, to a suitable mold; incorporating into this resin a maximum amount of silicia sand, crystalline alumina or other translucent grains to provide a rigid and extremely hard wearing surface; and then applying a different colored thin backing material of a more flexible type of thermosetting resin mixture with a thin mesh reinforcing member embedded into this mixture so that the sheet when cured and hardened is still flexible at the grout lines. The flexible resin backing mixture is applied before the rigid resin mixture has jelled in order to make a sheet with an integrated structure.

Another object of my invention is to provide a method for accurately reproducing colored mosaic-like sheet materials regardless of the mosaic design or the shape of the individual chips, and using materials that will provide a rigid hard wearing surface and with backing materials that are smooth and flexible at the thin depressed grout lines, the finished product being suitable for adhering to building surfaces and thereby presenting a finished mosaic appearance without additional grouting.

A still further object of my invention is to provide a method for accurately reproducing sheets of decorative material with raised mosaic-like patterns of different designs such as sheets of rectangular tile designs or sheets of pebble designs, and wherein the individual tiles or pebbles within the pattern are colored differently than corresponding tiles or pebbles in other sheets and are separated from each other by smooth watertight depressed grout lines.

A further object of my invention is to provide a colored mosaic-like sheet material wherein the coloring matter is protected from wear or fading by a layer of translucent abrasive grains such as white silica sand embedded in a clear resin binder.

An additional object of my invention is to provide a method for producing pliable or flexible sheets of facing material having multi-colored mosaic-like patterns in which the amount of each color used in the pattern can be easily controlled so that for the same mosaic design the distribution of the colors can be varied on different sheets to avoid monotonous repetition of the color pattern. Previous methods for reproducing mosaic-like patterns on flexible materials such as wallpaper, linoleum, etc., included well known printing or stencil techniques. Such methods produce a monotonous repetition of color pattern on large areas or on subsequent sheets. My invention overcomes this limitation and makes possible a large varia-

tion in color combinations using the same mosaic design pattern. Moreover, it provides a method for producing a mosaic-like sheet with an infinite number of color tones, mottles, and shadings throughout even though a limited number of colors are applied.

Other objects, advantages and features of my invention will become apparent from the following detailed description presented in accordance with 35 USC 112 and with the accompanying drawings, in which:

FIG. 1 is a plan view of a completed piece of flexible sheet material embodying the features of and formed according to the principles of the invention;

FIG. 2 is a plan view showing a portion of a mold having a typical pebble type mosaic design and adapted to be used in making the flexible sheet material shown in FIG. 1;

FIGS. 3, 4, 5, 6 and 7 are transverse views in elevation and in section illustrating progressively the various steps used in the method of manufacturing my flexible sheet material using the mold section shown in FIG. 2;

FIG. 8 is a transverse view in elevation and in section showing the completed sheet material being stripped from the mold.

With reference to the drawings, FIG. 1 shows a small section of a flexible sheet facing material **10** embodying the principles of my invention. Broadly considered, my unique material comprises a series of spaced apart rigid members **11** forming an embossed facing that is raised above continuous depressed grout lines **12** formed by a lower layer of material that is fused integrally with the raised rigid members **11**. The material at the grout lines is relatively thin and thus affords a flexibility to the sheet that enables it to conform and adhere to a wide range of building shapes and surfaces. Further structural details of my material will become apparent as I set forth below the novel method of making it in accordance with the invention.

While I have shown the invention in the drawings in the complex form of a fitted pebble design, other simple forms or shapes, such as squares or other geometric figures arranged in any suitable mosaic pattern can also be made in a like manner.

In manufacturing a flexible sheet of facing material according to my invention the initial step is to device the desired mosaic-like pattern. Once this is done a suitable model can be made from modeling clay, wax or other modeling materials. Since modeling, modelmaking, and casting are well known arts, it is understood that it is possible to make models in any shape or design. It is also possible to make a small model and to increase the size of this by making a mold and taking many castings, then by joining these castings into a large model, a large mold can also be made. In making a mosaic having a fitted pebble design it is preferable to use these well known methods. By using a predetermined design it is possible to increase the original smaller model into a large model without any noticeable joinings. From this larger model a single mold for a very large sheet (e.g. 24 square feet) can be made from a number of materials commonly used for making molds. I prefer to use a flexible mold made from a suitable elastomeric material, and a plan view of a portion of such a mold is designated by the numeral **13** in FIG. 2.

In FIG. 3 the mold **13** is shown in a sectional view and supported or a rigid flat member **14** which can be a suitable flat top table.

With the mold **13** supported on the firm flat surface **14**, the next step of my method as shown in FIG. 4 is to apply a resin coating **15** to the upturned irregular surface of the mold **13**. This coating **15** can be of a rigid type of clear polyester resin with a cobalt napthenate promoter. Additives such as styrene may be used to lower the viscosity of some polyester resins and small amounts of silicone oil can be added to overcome the tendency of some polyesters to crawl. The resin coating **15** can be applied by spraying, brushing, roller coating, with a flat trowel, or by any other suitable means. The amount of additives used in the resin **15** is largely determined by the method used for coating the mold **13**. To resin coat the mold using the paint roller method, I prefer to add 10% styrene and 1% silicone oil to the polyester resin that I have been using. To spray coat the mold, more styrene would be added to lower the viscosity of the resin. A catalyst usually less than 1% of methyl ethyl ketone peroxide is also added to the polyester to promote the jelling and hardening of the resin. The actual time of jelling and hardening of the resin **15** is also greatly influenced by the temperatures to which it is subjected to later. The amount of resin **15** applied to the mold **13** is not critical but I prefer to apply a thickness approximately equal to a heavy coat of paint.

As soon as the mold **13** has been coated with the resin coating **15**, a thin layer of sand is spread over the resin. The sand will sink into and be suspended within the resin coat **15** forming, as shown in FIG. 5, a combined sand-resin coat **16**. I prefer to use a clean sand with a maximum transparency when wetted, for example, a 60 mesh white Ottawa silica sand. The sand can be spread on the back of the resin **15** with a trough type spreader, sieve, or any other means that will distribute it uniformly. Enough sand is applied to the resin coat **15** so that the sand-resin coat **16** appears dry. Any excess sand may be blown from the top by the use of a compressed air nozzle. The reason for applying the sand to the back of the resin coat separately instead of mixing the sand and resin and then applying this mixture in a single coat, is that the aforesaid preferred method enables a maximum amount of sand to be incorporated into the resin. If the sand and resin were mixed together before hand to the desired consistency, the resulting mixture would be very difficult to spread uniformly and the finished article would be pockmarked with pinholes and voids. The use of this sand and resin mixture imparts a smooth, translucent stonelike finish to the completed article that would be difficult to achieve by other means. In instances where a plain colored mosaic-like pattern is required such as a solid black or solid white, suitable color can be added to the resin coating **15** using the methods for coloring resin described later.

After the sand has been applied, the mold **13** is scraped so that the sand-resin coat **16** is removed from the ridges **17** defining the spaced apart depressions **18** of the mold (see FIG. 6). The complete removal of the sand-resin mixture **16** from the top of the ridges **17** is important to the coloring operation that follows. The edge of a flat trowel or a wide scraper blade may be used to scrape the sand-resin coating **16** from the top of the ridges and this can be followed by a wiping action with a cloth pad moistened with dibutyl phthalate or some other equivalent solvent to clean the top of the ridges **17**.

In FIG. 6 I also show a transverse section of a color layer **19** which is applied to the sand-resin coat in the form of drops of colored resin mixtures. The resin mixture is colored with dry color pigments that have been previously ground to a paste in a vehicle such as dibutyl phthalate which is compatible with, and will readily mix with polyester resin. I prefer to mix by volume one part of color paste with ten parts of resin styrene mixture. The resin styrene mixture by volume is one part polyester resin and one and one fourth parts styrene. The proportions given are not critical and can be altered to accommodate polyester resins of different viscosities. By using more or less color paste, different degrees of translucency in the product can be achieved.

To obtain a mosaic-like appearance in the finished article, more than one colored resin mixture is used. I prefer to use four different colored resin mixtures prepared as described above. As mentioned earlier, these colored resin mixtures **19** are applied in the form of drops onto the sand-resin coat **16**.

Various means and methods for applying these drops can be used within the scope of the invention such as a sprinkling can or a sieve device. In some instances a whisk broom may be dipped into the color resin mix and the color thrown from the whisk broom onto the upturned mold in the form of drops. To assure a more even distribution of colored resin drops having a relatively large but uniform size, I prefer to form and dispense the drops by using a rigid plate having a serrated edge along one side. In practice the resin material is made to flow across the plate at a uniform controlled rate, and as it passes over the serrated edge of the plate it is formed into droplets that fall downward into the mold. To provide the desirable uniform flow across the plate I may use an upper flat plate that is parallel to and spaced apart from the lower plate with its lowermost edge set back from the serrated edge of the lower plate. The two spaced apart plates are preferably arranged in an inclined position above the mold with the gap between them at their upper ends being fed by a supply reservoir containing the colored resin material. By controlling the spacing between the plates, the rate of flow of the resin material between them can also be controlled which in turn also controls the size of the drops dispensed therefrom.

The sand which was spread over the resin coated mold **13** to form the sand-resin coating **16** also functions to absorb and spread the drops of resin color mix that fall on the mold. If the drops of the resin color mix were allowed to fall on a non-absorbent surface they would not spread appreciably and the resultant decorative effect would be spotted and spattered. However, by using an absorbent material such as the sand spread over the resin coat, a single drop of colored resin **19** will by itself spread over areas up to one square inch when it falls on the mold. Other absorbent materials such as short asbestos fibres or milled glass fibres can also be used for this purpose although in most instances I prefer to use sand.

Since, as shown in FIG. 6, the sand resin coat **15** has been removed from the top of mold ridges **17** any drops of colored resin mixture **19** falling on the sand-resin coat **16** within a depression **18** will only spread up to the top of the ridges **17**. In this way, a single drop of the colored resin mixture **19** by absorption alone can be made to coat the entire area within a mold depression **18**. By distributing different colored drops shown as **19***a* and **19***b* (FIGS. 1 and 6), over the mold area a mosaic-like pattern will form, with the different colors separated by the ridges **17** of the mold **13**. In some instances different colored drops will fall on the same area or cell; this results in a harmonius blend, mottle, or shading of the different colored drops involved as shown in FIGS. 6 and 1 as **19***c*.

The completed mosaic-like pattern made as described above, with different colored areas of predetermined varying shapes and sizes closely separated from each other as typically illustrated in FIG. 1 is a unique feature of this invention.

After the color resin **19** has been applied the next step in my unique method as shown in FIGS. 7 and 8 is the application of a backing resin mixture **20** which is applied to the mold over the sand-resin coating **16**, and the colored resin mixture **19**. The backing resin mixture is generally a polyester resin with additives, and preferably it comprises one part of a flexible type polyester resin with a catalyst, one and one fifth parts of fillers consisting of one part marble fines and three parts talc, and one seventy fifth part of color paste ground in dibutyl phthalate, all of these measurements being by weight. A flexible type of polyester is indicated, in order to make the completed mosaic-like sheet flexible. However, there is some latitude in selecting the particular type of resin to be used, and blends of rigid and flexible resins will add increased hardness to the sheet. Yet, because of the thin cross section of the grout lines **12** in the finished sheet, they will be flexible enough for most purposes. Different proportions or other fillers can also be used although I prefer a non-combustible type of filler. The backing resin mixture **20** can be poured onto the colored resin mixture **19**, and the sand-resin coating **16**, after which it is then spread and leveled with a flat trowel.

Suitable color may be added to the backing resin mix **20** to color any areas such as designated by numeral **21** in FIGS. 6–8 that have remained uncolored in the drop application of the colored resin mixture **19**. In practical applications the drop method may leave 25% of the surface uncolored.

As shown in FIG. 8, a cloth reinforcing **22** or some suitable woven material is embedded into the backing resin mixture **20** to strengthen the material **10**. There are various types of cloth, perforated paper, or screen materials than can be used for this purpose, however, I prefer to use a woven material with spaced apart fine threads such as a marquisette made from nylon or dacron, which is stronger than a cotton marquisette. The cloth reinforcing **22** is cut slightly larger than required and is placed on the backing resin mixture **20** and then pressed into the backing by using a flat trowel and employing strokes from the center of the mold toward the edges to flatten the cloth and free it from any wrinkles. Any excess cloth **22** is allowed to overlap the edges of the mold. It is advantageous to keep the resin coat **20***a* over the cloth **22** as thin as possible in order to have a more flexible backing.

After the cloth is embedded, a light coat of marble fines **23** can be spread over the cloth **22** and the resin backing mixture **20**. The marble fines **23**, FIG. 8, may be pressed into the backing **20** by using a rubber roller. The purpose of the marble fines **23**, is to provide a flatter and more uniform backing surface and one having a roughened sandpaper like finish in order to furnish a better bond for adhesives that subsequently come in contact with the backing when the sheets **10** are adhered to their permanent supports.

The preceding method steps including the application of the sand resin coat **16**, the colored resin mixture **19**, and the backing resin mixture **20**, are completed before any jelling or hardening of the different resin mixtures has occurred. However, in order to remove the mosaic-like sheet **10** from the mold **13** as rapidly as possible, heat may be used to speed the hardening. The heat can be applied in the form of infra red lamps that reflect heat downward onto the sheet, or a hot plate arrangement can be used with the heat being supplied under the mold. By using either arrangement the sheet can be hardened enough to permit its removal from the mold in less than 25 minutes. The actual time of removal is determined by the amount of catalyst used with the resin mixture and the temperature at which the sheet is cured. The sheets are normally cured at temperatures of between 125° F. and 225° F., the higher temperatures will speed the cure appreciably. However, I have discovered that the lower temperatures produce more uniform results and will lengthen the life of some mold materials.

There are no special requirements to remove the mosaic-like sheet from a flexible mold, the sheet is simply pulled upward as shown in FIG. 8, starting from one corner and will readily part from the flexible mold. After removal from the mold any excess cloth or resin can be trimmed from the edges of the sheet by using shears.

The completed mosaic-like sheets **10**, because of their lightweight (approximately ½ lb. per square foot), can be readily adhered in large sizes to walls without sagging by using well known methods. These include spreading a suitable adhesive on the wall with a notched trowel, positioning the sheet with the back and using a roller to press and flatten the sheet against the wall. When installed, the sheet **10** will present a finished mosaic-like appearance with smooth depressed grout lines **12** and no additional grouting is required.

To those skilled in the art to which this invention re-

lates, many changes in construction and widely differing embodiments and applications of this invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. A decorative sheet building material comprising:

an integral backing layer of plastic material having a plurality of spaced apart raised portions on its upper side arranged in a predetermined pattern, said portions being separated by and extending above simulated grout areas having a substantially uniform layer thickness;

an exposed outer layer of a relatively uniform thickness comprising a hard, relatively clear plastic material covering each of said raised portions but not said grout areas, said clear plastic material having a rough and absorbent interior surface;

and a relatively thin intermediate layer of colored resin material on said rough interior surface between said exposed plastic material and said backing layer distributed on at least some of said raised portions, whereby said building material has a hard durable embossed surface with said raised portion providing

a non-repeating color pattern separated by simulated grout areas of uniform color.

2. The sheet material as described in claim 1 wherein said backing material is a mixture comprising flexible polyester resin material, fines and coloring and said clear plastic material comprises a rigid clear polyester resin.

3. The sheet material as described in claim 1 wherein said relatively clear plastic material is a rigid clear polyester resin and said rough and absorbent interior surface and thereon comprises fine translucent particles embedded in said clear polyester resin.

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