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G. J. SAFFERT

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METHOD OF MOLDING CONCRETE PRODUCTS

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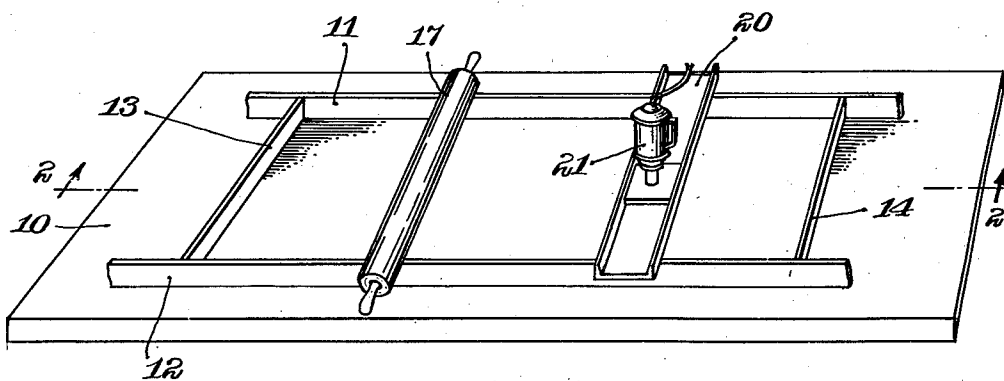


Fig. 1

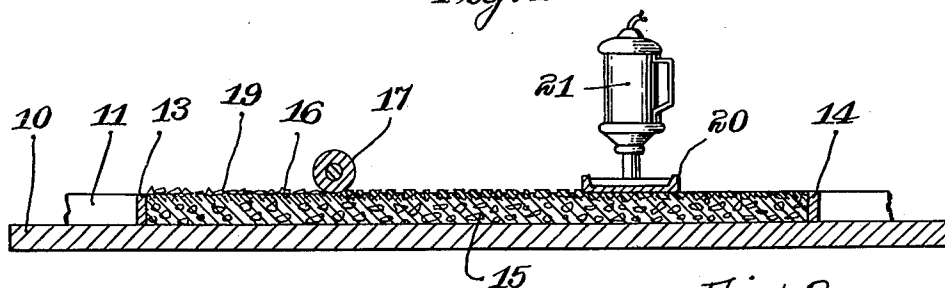


Fig. 2

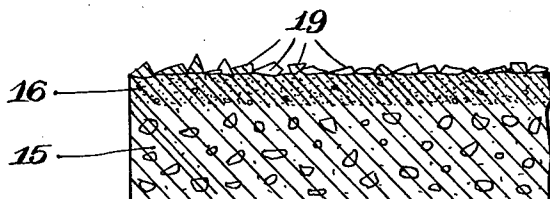


Fig. 3

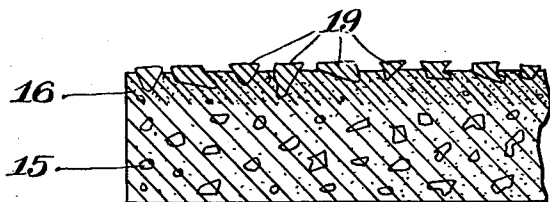


Fig. 4

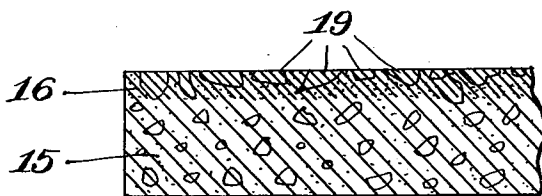


Fig. 5

Inventor
George J. Saffert

By

A. S. Johnson
Attorney

UNITED STATES PATENT OFFICE

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METHOD OF MOLDING CONCRETE PRODUCTS

George J. Saffert, New Ulm, Minn.

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9 Claims. (Cl. 25—155)

My invention relates to an improvement in a method for producing concrete products; and relates more particularly to the formation of concrete products having exposed aggregate on the surface thereof.

In the formation of concrete slabs and the like with exposed aggregate on the surface, which slabs are commonly known as architectural cast stone, or architectural concrete slabs, the slabs are usually formed with the decorative surface thereof against the mold. In other words, the face of the slab is usually formed against a surface of the mold, such as the bottom or side of the mold. The concrete is placed in the mold, and cast, tamped, or vibrated to harden the soft concrete material in the form of the mold. After the concrete is set sufficiently to permit handling, the slabs must be turned to expose the face thereof. The cement film is then removed by brushing, scrubbing, or tooling the surface to expose the aggregate which was mixed with the cement for facing.

This method has several disadvantages. In the first place it is necessary that the concrete set sufficiently to permit handling of the slab before the cement film can be removed. Usually the slabs are permitted to remain in the molds overnight to permit the concrete to set. Obviously, the cement film on the surface sets to such an extent that it is difficult to remove. Accordingly it is extremely difficult to finish the slab to expose the aggregate.

Another method sometimes used in the production of slabs of this type requires the gluing of the selected facing aggregate to the surface of the mold. Wet concrete is then poured into the mold. The glue holds the aggregate in place during the pouring operation, but is gradually dissolved by the water in the concrete. Thus, when the concrete has set, the slabs may be easily removed from the molds, leaving the aggregate exposed without further treatment.

This gluing on process does not lend itself to using as large a size aggregate as is desirable for certain work. A size aggregate over $\frac{1}{8}$ inch is too heavy and will fall off from the sides of the molds. It is a feature of my invention that the aggregate may be of any desired size.

It is the object of the present invention to provide a method of forming concrete slabs having exposed aggregate, which is simple to accomplish, and which will permit the casting of the slabs with their face uppermost in the mold. Such a method is of extreme benefit, as the slabs need not be turned over before the cement film on the face thereof can be removed. This simplifies the film removal to such an extent that the process is much cheaper and quicker than other methods which have been used.

It is a feature of my invention that through

the use of my method a concrete slab may be formed which is harder and firmer than others with which I am familiar. In actual test the slabs constructed in accordance with my invention have proven to be stronger and harder than slabs formed in the manners previously employed.

It is a feature of my invention that the molds in which the slabs are cast may easily be made any desired size to fit each individual requirement. As the rear surface of the slab is cast against the mold, the mold may be more inexpensively made than would otherwise be the case. In the preferred embodiment of my method, the mold is made by securing strips the width of the finished slab on edge to define the desired shape.

It is a further feature of my invention to fill the mold to a point near the top thereof with concrete, and to then place over this concrete a coating of a softer mortar-like mix. The aggregate of the desired size is then sprinkled on the coating. The aggregate is positioned within the coating by rolling the surface thereof with a heavy roller. This roller does not force the aggregate particles entirely into the concrete, but positions the particles with a flat surface uppermost, projecting slightly from the surface of the coating. This step in the process holds the aggregate particles in their proper position during the vibrating step of the process which follows the rolling of the aggregate as described.

A feature of my invention resides in the fact that my method also offers opportunity to check and inspect the closeness and uniformity of the spread on aggregate so any defects or percentage of surface covering can be corrected and regulated at will before the aggregate is vibrated down and completely embedded out of sight. By my method I thus avoid finding any defective place or spots after removing the film that might be costly to correct and touch up.

After the aggregate has been partially rolled into the soft mortar-like mass at the top of the slab it is pressed firmly with a board, preferably equipped with vibrating means, which acts to vibrate the aggregate into proper position with the upper surface thereof flush with the surface of the slab. This is accomplished by working the relatively soft cement up through the aggregate and pressing the aggregate particles until they extend substantially flush with the surface of the slab.

It is common knowledge to the trade, that additional water or moisture in some form, applied to the product after molding, is necessary to cure the product to develop its full strength for high quality and, that the greatest benefit will be derived if water is applied to the newly molded surface of the product as soon as possible after molding. The earlier this is done the better will be the final results. My process of mold-

ing the finished surface exposed, permits to do this watering during any stage of the hardening process of the cement which tends to result in highest possible quality.

These and other objects and novel features of my invention will be more clearly and fully set forth in the following specification and claims.

In the drawing forming a part of my specification:

Figure 1 is a perspective view of a mold in which the slab can be formed.

Figure 2 is a sectional view through the mold after it has been filled with the material and showing the aggregate as it would appear when first applied, after it has been molded, and after the vibrating step of the process has been completed.

Figure 3 is an enlarged section through a portion of the slab showing the aggregate first applied thereto.

Figure 4 is a view similar to Figure 3 showing the position of the aggregate after the rolling step of the process.

Figure 5 is a sectional view through the finished slab.

In accomplishing the present invention a work bench 10 is provided which forms the base of the mold. Any suitable flat rigid base may be employed for this purpose. Upon the bench surface 10 I provide a pair of longitudinally extending strips 11 and 12, usually arranged in parallel relationship, which are designed to form two opposed edges of the slab. A pair of strips 13 and 14 are provided between the strips 11 and 12 to define the ends of the slab. The strips 11, 12, 13, and 14 are of equal width in preferred form and the width of these strips is equal to the desired thickness of the finished slab. The frame strips are secured together and to the base 10 in any desired manner.

The space defined by the strips 11, 12, 13, and 14 is filled to a level slightly below the upper edges of the strips with a suitable concrete mass to form the body of the slab. It is usual practice to fill up the molds to a point about one-quarter of an inch from the upper edges of the strips but this distance varies with the thickness and size of the aggregate used and may differ in different types of construction and surface finishes.

The mold is then substantially filled with a softer mortar-like mix. This mix extends almost to the top of the strips forming the frame of the mold. As indicated in the drawing, the body of the slab is illustrated in general by the numeral 15, while the upper layer thereof, which is of a softer mix, is indicated by the numeral 16. As will be clearly understood there is no definite line of division between the body 15 and the coating or layer 16, as these two bodies intermingle as the coating is applied.

After the mold is substantially filled with the mortar-like mix 16, I then spread selected aggregate materials on the top surface of the coating or mix 16. This aggregate material, which is generally crushed rock, covers the entire surface or any desired part of the surface. The aggregate extends partly above the top of the side frames of the mold and extends slightly into the soft material forming the upper coating 16 of the slab.

After the aggregate has been spread in the desired manner upon the surface of the slab I roll this aggregate material with a heavy metal roller so as to press the aggregate down into the soft cement mixture nearly even with the sides of the

mold. The rolling action is accomplished through the use of a roll 17, which is operated in the manner of a rolling pin and which engages the aggregate illustrated at 19 and presses the same partly into the cement. This rolled action tends to flatten the upper surface of the aggregate or to move the aggregate in such a manner that a flat side thereof is uppermost and a projecting portion extends down into the cement.

After the rolling operation the aggregate still projects slightly above the sides of the mold but the flat sides of the particles of aggregate are, in general, uppermost.

After the aggregate has been rolled in the manner described, and the aggregate positioned, as best illustrated in Figure 4, an iron plate is placed over the mold and the upper surface of the slab is smooth with this plate. The plate is preferably sufficiently long to extend between the opposed edge strips 11 and 12 of the mold and by sliding the plate 20 longitudinally of the mold the upper surface thereof is pressed or ironed flat. One or more vibrators 21 are attached to the upper surface of the plate 20 so as to vibrate this plate. The vibration of this ironing plate on the top of the previously rolled down aggregate acts to embed the particles of aggregate in the relatively soft mixture 16 on the top surface by drawing the mortar-like mix between the particles of aggregate. The vibrating action acts to force the aggregate particles down until the flat top surface thereof is flush with the surface of the slab and flush with the sides of the mold. This vibrating plate also acts to flatten out the particles so as to leave the surface true, with the aggregate uniformly flush with the surface of the slab providing a very dense and extremely firm and hard slab. The vibrator acts to compact the top slab and to form an extremely firm and dense surfaced slab. This is a hammering sort of vibration.

The vibrating step of the process might, in some instances, be eliminated by pressing the aggregate into the cement with some other means. However, I have found that the vibrating or ironing plate produces a construction which is advantageous and which provides a truer uniform dense outer surface than would otherwise be possible.

The rolling step of the process holds the particles of aggregate firmly so that these particles do not move or jump around when the vibrating step is started. The vibration caused by the vibrator tends to cause other portions of the mold to move slightly and unless the aggregate particles are partially embedded in the relatively soft mortar prior to the ironing and vibrating operation, these particles would have a tendency to move about.

After the ironing and vibrating steps of the process, the surface looks all cement. I then allow the surface to reach the desired step of hardening and then wash off the cement film on the surface while the same remains in its original position in the mold. Accordingly it is obvious that the cement film may be washed off at any desired stage during the hardening operation and need not be postponed until the slab has set sufficiently to permit movement thereof. It will be understood that the cement film can be washed off at a time considerably previous to the time when the slab may be moved in its entirety.

This process will chiefly be employed in making what is ordinarily referred to as thin facing slabs averaging perhaps 3 to 5 feet square and larger.

Such slabs require steel reinforcing embedded therein in order to permit safe handling of the slabs and to prevent the slabs from cracking when in the wall. In making these slabs under the present commonly known method, in which the face of the slab is cast against the bottom of the mold, it is of advantage that they be turned over at the earliest possible stage of hardening, in order to start the process of removing the cement film from the surface of the slab while it is still in the softest hardening stage. Before being turned, these slabs must, of course, be hard enough to permit handling without cracking.

The reinforcing ordinarily used in these slabs is a welded wire mesh. The heavier the wire mesh used, the quicker the slab can be turned. However, the softer the slab may be when the cement film is washed from the surface, the easier this washing process will be.

Under the present known method it is customary to use a Number 3 or Number 4 wire mesh welded four inches on center. This is a much heavier wire reinforcing than is necessary for the slab to give satisfactory performance in the wall. This heavy reinforcing, however, makes it possible to turn the slab at an earlier stage of hardening and thus permits the surface cement to be washed off at an early stage of hardening. Thus the increased cost of the heavy reinforcing in the previous methods more than offsets the cost of the extra work required, in removing the film at a later and more hardened stage.

Under my method it has been described that there is no necessity for early handling of the slab. The surface of the slab is cast uppermost in exposed position. This permits me to start the washing operation at any time and at any desired stage of hardening. By varying the time of hardening varied desired surface effects may be obtained. It is, therefore, important that the surface of the slab be exposed during all stages of hardening.

I have found that with my method the heavy reinforcing which weighs approximately 13½ lbs. per 100 lineal feet is unnecessary to provide its desired function once the slab has been hardened. Accordingly I am able to obtain the same results by using a Number 6 wire made in a mesh with the wire six inches apart. To accomplish this result, therefore, saves more than half of the weight per square foot in the reinforcing. For these additional reasons I have found my method extremely desirable.

In accordance with the patent statutes I have described the methods and apparatus for accomplishing my invention and while I have endeavored to set forth the best embodiment thereof, I desire to have it understood that obvious changes may be made within the scope of the following claims without departing from the spirit of my invention.

I claim:

1. The method of forming a concrete product in a mold consisting in pouring into the mold the concrete mixture, sprinkling aggregate on the concrete mixture before the same has set, rolling the aggregate material partially into the concrete, and pressing the aggregate particles into the concrete to extend flush with the upper surface thereof.

2. The method of forming concrete products in a mold consisting in placing plastic concrete into the mold, spreading aggregate material onto

the upper surface of the concrete before the same has set, rolling the concrete particles into the concrete before the same has set, and pressing the rolled particles into the concrete material.

3. A process for forming concrete products in a mold consisting in placing plastic concrete material in a mold, spreading aggregate material on the upper surface of the concrete in the mold, forcing the aggregate partially into the unset concrete and ironing and vibrating the upper surface of the concrete to press the aggregate flush and to increase the density of the concrete.

4. A process for forming concrete products in a mold consisting in placing plastic concrete in the mold, spreading aggregate on the surface of the concrete, rolling the aggregate partially into the unset concrete and smoothing the surface of the unset concrete by ironing and vibrating the same to press the aggregate flush with the surface of the concrete product being formed.

5. A method of forming concrete products in a mold having an open top, the method consisting in placing plastic concrete material in the mold substantially flush with the top thereof, placing aggregate material on the unset concrete, pressing the aggregate material partially into the concrete and then ironing the aggregate material flush with the surface of the mold.

6. A method of forming concrete products in a mold having an open top, the method consisting in placing plastic concrete in the mold substantially flush with the upper surface thereof, placing aggregate on the surface of the unset concrete, rolling the aggregate particles into the unset concrete and ironing and vibrating the upper surface of the concrete to iron the aggregate particles flush with the surface of the mold.

7. The method of forming concrete products in a mold having an open top, the method consisting in filling the mold to a point substantially flush with the surface thereof with unset concrete, placing aggregate on the surface of the unset concrete, rolling the aggregate partially into the unset concrete with a roller which extends beyond the confines of the mold, and surfacing the concrete product by pressing and ironing the upper surface thereof with a vibrating plate which extends across the top of the mold to press the aggregate flush with the surface of the mold.

8. The method of forming a concrete product in a mold having an open top consisting in filling the mold partially full of concrete, covering the concrete with a surface of softer mortar-like material substantially to the surface of the top of the mold, placing aggregate on the relatively soft material, pressing the aggregate partially into said material and ironing and vibrating the aggregate to press the same flush with the surface of the relatively softer mortar.

9. A method of forming a concrete product in a mold having an open top, the method consisting in filling the mold partially full of concrete, covering the concrete with a softer mortar-like material substantially to the upper surface of the mold, placing aggregate material upon the softer material, pressing the aggregate partially into the softer material and ironing and vibrating the upper surface of the softer material to press the aggregate flush with the upper surface of the softer material.

GEORGE J. SAFFERT.