

97 Patented Dec. 24, 1940

Coated aggregate

2,226,348

UNITED STATES PATENT OFFICE

2,226,348

PRODUCTION OF LIGHT CONCRETE BODIES

Josef Raab, Stuttgart-Bad Cannstatt, Germany

No Drawing. Application May 19, 1937, Serial
No. 143,621. In Germany September 19, 1936

2 Claims. (Cl. 106-31) 96

It has hitherto not been possible to make pumice concrete or any similar light concrete having a porous structure with sufficient compressive strength for the purposes of road-making or the like, as the porous structure of the grain of light material, for instance of the grain of pumice, collapses under any considerable loads. In spite of the low weight of paving blocks of light concrete, which is of prime importance for the roadways of bridges, and in spite of the excellent grip provided by a road surface of light concrete and its very great freedom from ice formation, its adoption in practice for road-making purposes has therefore not been possible. The grain of pumice or like is ground to powder and corresponding openings or depressions remain, which result in a rapid further destruction of the light concrete body.

This applies both in cases where the light concrete is made simply in the usual way of granulated pumice or similar light grains of porous structure and cement or the like, with or without the additional use of other suitable added materials, and in cases in which, as has been already suggested, pumice concrete bodies are treated first in a vacuum and then under pressure with hot tar or bitumen. Moreover, these saturating substances cannot penetrate into the grain of pumice.

The invention is based on the recognition of the fact, that in order to enable natural or artificial pumice or equivalent substances having a porous structure to be used in the form of concrete bodies (blocks, slabs or other shapes) the cavities of the light grains, such as pumice grains, which are closed in themselves, must be opened without destroying the coherence and the characteristic structure of the grain, so that the hot saturating agent, such as tar, bitumen or the like can penetrate into the interior of the grain and through the filling out of the cavities a suitable compression strength and at the same time a rigid anchoring of the grain in the shaped body results. In this way a pumice concrete body of great strength to resist pressure and wear may be obtained, which is highly suitable for road-making purposes.

The invention consists in this, that the cavities of the light grain are burst open by water, in the case of natural pumice by the water contained in it or in the case of artificial pumice or similar light grains, (frothed blast-furnace slag from iron works) by artificially introduced water. The water converted for this purpose into vapour form is however not vaporized by heating, for instance in a drying drum, as for this purpose extremely

high and uneconomical quantities of heat would be required, but the heat content of the saturating binding agent is used. With this object in view, the concrete bodies are saturated with the binding agent under a pressure of at least 3 atmospheres above the saturation pressure of the water vapour, corresponding to the temperature of the binding agent, whereupon the pressure is lowered for a short period below the said saturating pressure and is then restored again. The pressure drop varies according to the density of the concrete and the size of the pumice grain and can be ascertained by the expert without difficulty through experiments. On the one hand it must not be too high, so that the whole grain as it were explodes, while on the other hand it must not be too low, because of the pressure loss in the pores of the concrete body. It may be of advantage in some cases, for instance in the case of a coarse pumice grain, to repeat this process several times.

The effect of this procedure is as follows:

In the first place, the binding agent is in a known manner forced into the pores of the concrete body, which is bound with cement or the like, and is brought to the concrete grains, being heated in this way through the pressure employed. The water contained in the cavities of the pumice grains is thus caused partly to evaporate and the saturated water vapour produced presses from within against the walls of the pore with the saturation pressure corresponding to its temperature. The pressure which acts from the outside and which lies above the saturation pressure prevents the cavities from being burst open by the internal vapour pressure, so that in this state of equilibrium a thorough heating of all the pumice grains right into the core is brought about. Through the lowering of the external pressure, which is preferably brought about suddenly, the saturated water vapour contained in the cavities bursts the wall of the particular cavity at the weakest place and opens for itself a path into the atmosphere. The water vapour produced by the re-evaporation of the water, owing to the sudden drop in pressure, also flows away in this manner. The vapour bubbles rise to the surface of the fluid bitumen or the like and the vapour escapes. On the pressure being re-established, the binding agent is then forced into the now open cavities which are thereby converted into pores and completely fills these pores. The lowering and re-establishing of the pressure may have to be repeated several times until all the water has left the cavities and an intimate binding between the binding agent and the wall of the pores can take place.

The pressure is suitably produced by air forced in over the surface of the fluid saturating and binding agent.

According to the length of time, during which the pressure is lowered, and according to the amount of effective pressure drop more or less water vapour will escape, (that is to say remaining water is used up). If however this removal of the water by the drop in pressure during the saturation be not carried to the extreme, that is up to complete removal of the water, the water still remaining may be used for shortening and cooling the blocks.

If for instance, the pressure be lowered to such an extent and for so long that for instance 75% of the residual water is evaporated, then the cavities will become filled to about 75% with bitumen in the next pressure period. Even such a road covering may have sufficient resistance, according to the amount of traffic. Owing to the smaller absorption of bitumen, in other words owing to a small part of the cavities remaining, the weight per unit of volume will be reduced (means for varying the weight per unit volume). If, thereupon, after thorough saturation, that is at the end of the working process, the saturating material be removed out of the drum, the high pressure and the temperature in the drum being maintained, and after the removal of the saturating agent the air pressure be then lowered to atmospheric pressure, the residual water (that is the remaining 25%) is converted into vapour and forces a portion of the superfluous bitumen out of the bodies again, more particularly at the outer surface. (Advantage: the bodies will no longer be sticky to the touch. Shortening.) At the same time the vapour withdraws the heat of evaporation from the saturated bodies, whereby the latter are cooled, so that they can be sooner packed for transport.

As already stated above, natural pumice, owing to its having been deposited thousands of years ago, of itself already has the necessary moisture within the cavities for enabling the process according to the invention to be carried out. In the case of artificially produced substances having a porous structure, such as frothed blast-furnace slag from iron works, termed "artificial pumice," this moisture in the porous cavities is normally too small. According to the invention it has therefore to be increased if necessary by keeping the pumice grains for a time under water. The absorption of water can be accelerated for instance by employing pressure. For this purpose the artificial pumice must be placed in a drum with water under pressure.

What I claim is:

1. A method of producing light concrete bodies from granulated pumice and a binding agent consisting in saturating the said bodies with a hot bituminous impregnating agent under a pressure of at least 3 atmospheres above the saturation pressure of water vapour, corresponding to the temperature of the bituminous impregnating agent, reducing the pressure for a short period below the said saturation pressure and thereupon restoring the pressure again.

2. A method of producing light concrete bodies from granulated pumice and cement, consisting in saturating the said bodies with a hot bituminous impregnating agent under a pressure of at least 3 atmospheres above the saturation pressure of water vapour, corresponding to the temperature of the bituminous impregnating agent, reducing the pressure for a short period below the said saturation pressure and thereupon restoring the pressure again.

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