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CROSS REFERENCE EXAMINER

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MECHANICAL RENDERING OF SURFACES AND POINTING OF BRICKWORK

Filed June 22, 1960

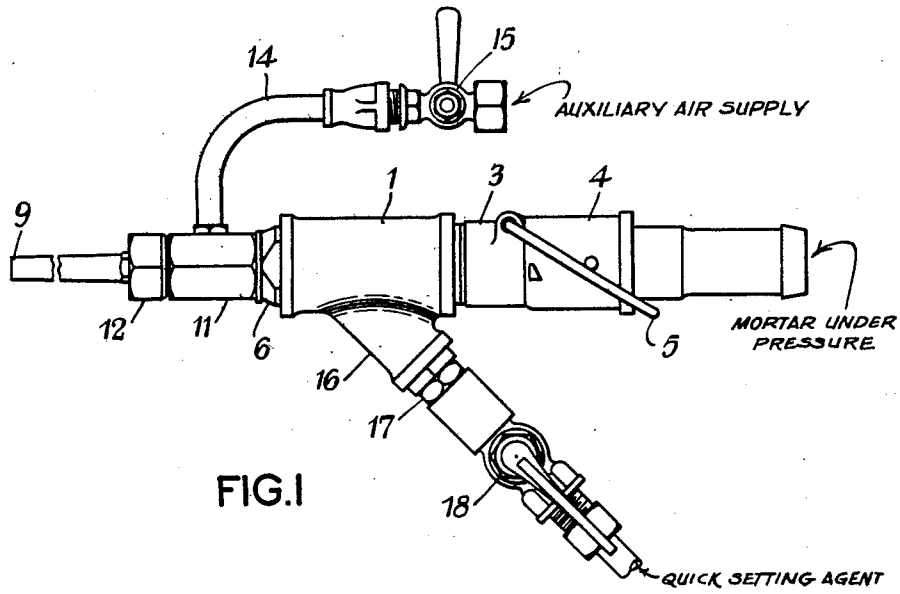


FIG.1

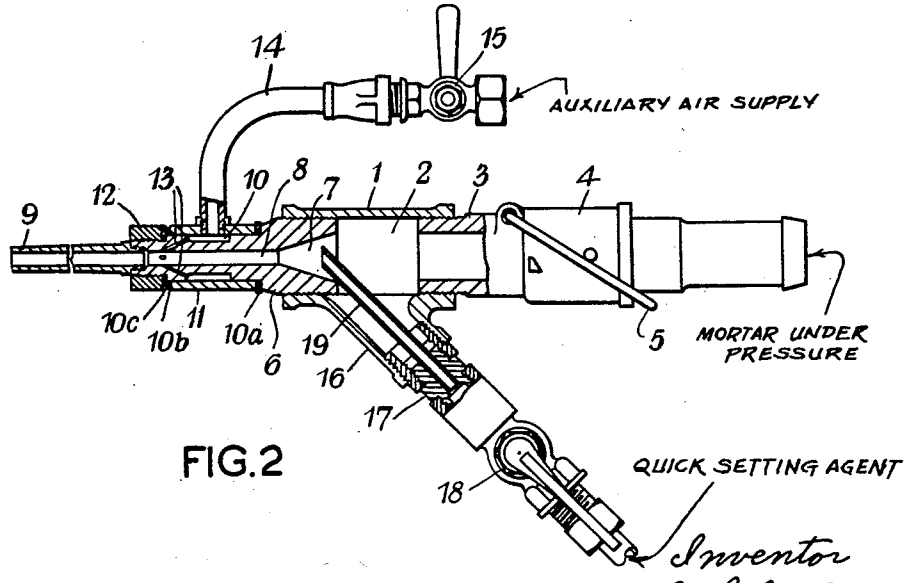


FIG.2

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MECHANICAL RENDERING OF SURFACES AND POINTING OF BRICKWORK

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The invention relates to mechanical rendering of surfaces and pointing of brickwork and is particularly concerned with methods of rendering and pointing using an air-operated pointing gun, and to a gun for use in such methods.

According to the invention, in a method of rendering surfaces or of pointing brickwork, a flowable mortar is introduced under pressure into a chamber of an air-operated pointing gun, the speed of flow of the mortar is accelerated by passing it through a single conically reduced passage into a smooth cylindrical bore of uniform diameter, through which it is passed without any substantial turbulence, and an auxiliary air supply is then directed on to the mortar so as to subject it to turbulence and to eject it from the gun through a nozzle, in the form of slugs, on to the surface or brickwork. This method is particularly advantageous where a rapid set of the mortar is required. In this case, a quick-setting agent, e.g. sodium silicate, is introduced into the middle of the flow of mortar where the flow is accelerated by passing through the conically reduced passage, and the quick-setting agent is subsequently mixed with the mortar by the turbulence caused by the auxiliary air supply. The acceleration of the flow caused by the conically reduced passage draws out the supply of the quick-setting agent into a narrow stream passing down the axis of the gun, and the lack of turbulence in the cylindrical bore ensures that the quick-setting agent is not mixed with the mortar until the latter meets the auxiliary air supply. Thus stiffening of the mortar in the gun and consequent blockages are largely avoided.

The method of the present invention may be used with a non-aerated cementitious mortar made flowable by incorporation of a surface active agent, preferably a non-ionic surface active agent of low foaming power. Alternatively a plastic bituminous mortar may be used, particularly where a high sulphate resistance is required.

According to a further aspect of the invention, a gun for rendering surfaces or for pointing brickwork comprises a chamber for containing a flowable mortar under pressure, a mortar inlet leading into the chamber, a single conically reduced passage leading from the chamber into a smooth cylindrical bore which is of uniform diameter and extends from the end of the conically reduced passage to an ejection nozzle, and auxiliary air inlets opening into the cylindrical bore adjacent the nozzle at an oblique angle in the direction of the nozzle. Preferably a tube for introduction of a quick-setting agent terminates in the middle of the conically reduced passage, facing towards the nozzle.

Preferred embodiments of the invention will now be described in more detail by way of example and with reference to the accompanying drawing, in which:

FIGURE 1 shows an elevation of a pointing gun, and FIGURE 2 is a partial sectional view of the gun.

The gun shown in the drawings comprises a Y-piece 1, the main body of which forms a chamber 2 for containing mortar under pressure. A mortar inlet tube 3 is screwed into the right-hand horizontal arm of the Y-piece and carries a quick-release coupling 4 of known type, with a sprung bail clip 5, for attaching the gun to a mortar supply line.

The main body part or barrel 6 of the gun is screwed into the left-hand end or base of the Y-piece 1. The

barrel 6 has formed therein a conically reduced passage 7 leading into a smooth cylindrical bore 8, which is of uniform diameter, considerably smaller than that of the chamber 2 or the inlet tube 3, and which has no interruptions or constrictions along its length. An ejection nozzle 9, having the same bore as the bore 8, screws into an internal thread at the end of the barrel 6. Interchangeable nozzles of different lengths may be provided.

Around the outer surface of the barrel 6 is formed a depression 10 which is closed off from the atmosphere by a sleeve 11 fitting closely over it. The sleeve 11 is held in place by a nut 12, and sealing washers 10*a*, 10*b*, 10*c* are provided so that the depression 10 form an air-tight chamber. A ring of small inclined bores 13, extending from the depression 10 and opening into the bore 8 in the direction of the nozzle 9, are provided as auxiliary air inlets. An air inlet tube 14 with a cock 15 is screwed into the sleeve 11.

In the lower inclined arm 16 of the Y-piece 1 is screwed a plug 17 carrying a valve 18 and a tube 19 for introduction of a quick-setting agent. The tube 19 terminates on the axis of the barrel 6 in the middle of the conically reduced passage 7, with its mouth facing towards the nozzle 9.

The quick-release coupling 4 and the single conically reduced passage 7 enable the gun to be easily dismantled and cleaned out when necessary, without uncovering the bores 13.

When rendering a surface or pointing brickwork, a flowable mortar is supplied to the gun, or to a number of similar guns, from a pressure pot in which the mortar is stored under air pressure. The mortar enters from the supply line through the coupling 4 and inlet tube 3 into the chamber 2. It then passes through the conically reduced passage 7, where its speed of flow is considerably accelerated due to the reduction in cross-section, and then through the bore 8.

The operator adjusts the valve 18 so as to introduce the desired proportion of quick-setting agent through the tube 19. Due to the acceleration of the mortar flow caused by the passage 7 and the smooth uninterrupted flow of the mortar through the bore 8, the quick-setting agent is drawn out as a narrow stream passing along the axis of the gun. The area of contact between the quick-setting agent and the mortar is comparatively small and no appreciable mixing takes place, due to this small contact area and to the lack of turbulence in the mortar flow.

These conditions persist until the mortar reaches the end of the barrel 6, where the auxiliary air supply from the pipe 14 is directed on it through the ring of bores 13. The auxiliary air supply causes turbulence in the mortar so as to mix it with the quick-setting agent, and then ejects the mixed mortar through the nozzle 9 in the form of slugs.

The nozzle 9 is directed so as to apply the slugs of mortar to the surface to be rendered or into the interstices of the brickwork to be pointed, where it hardens rapidly. By using long or short nozzles, the degree of stiffening of the mortar before application can be controlled.

The absence of any appreciable mixing of the mortar and quick-setting agent until the end of the barrel 6 is reached means that there is little tendency for the mortar to stiffen in the barrel of the gun and clogging is reduced to a minimum.

The method of rendering or pointing which has just been described may advantageously be carried out using a non-aerated cementitious mortar made flowable by incorporation of a non-ionic surface active agent of low foaming power. Suitable surface active agents are an octyl cresol condensate sold under the trade name "Lis-

sapol N," an octyl phenyl condensate sold under the trade name "Nonidet" and a vinsol resin or resin soap sold under the trade name "Feb." An example of a flowable mortar having some pozzolanic qualities can be made from a mix using the first of these agents, as follows:

200 lbs. sand
50 lbs. ordinary Portland cement
40 lbs. pulverised fuel ash
About 55 pints water, depending on the moisture content of the sand
½ pint "Lissapol N"

To enhance the plasticising action, about ¼ lb. of sodium hexametaphosphate may be added to prevent flocculation of individual particles of the mortar. As a quick-setting agent, sodium silicate is used.

Such a mortar, applied by the method described, has the advantages of an excellent resistance to sulphate attack, and tests have shown a gradual increase of crushing strength on ageing over periods of one year. It also has an advantage over conventional aerated mortars, which have previously been used in mechanical rendering or pointing, in that the setting reaction with sodium silicate is quicker. A short nozzle can therefore be used on the gun. Further it is not necessary to use a sodium silicate of high silica/sodium oxide ratio in order to obtain a rapid set. Addition of about 1 or 2 percent by volume of sodium silicate of a comparatively low SiO_2/Na_2O ratio, say about 2, produces a very rapid set. The setting time can be varied from several minutes after application of the mortar to less than $\frac{1}{50}$ second, by using sodium silicates having SiO_2/Na_2O ratios varying between ½ and 3. In the latter case, the setting and the accompanying setting shrinkage occur so rapidly that there is no time for a large volume of mortar to be built up before the initial setting shrinkage of the first deposit of mortar is complete, so that shrinkage stresses are minimised. The mortar can even be successfully applied on brickwork with running water.

An alternative example of a mortar for use in the method of the invention can be made from the following mix:

120 lbs. sand
60 lbs. ordinary Portland cement
40 lbs. pulverised fuel ash
30 lbs. hydrated lime
1 pint vinsol resin
40–50 pints water, depending on the moisture content of the sand

The inclusion of lime in the mortar improves the reaction between the sodium silicate and the mortar, which would otherwise depend for such improvement upon the mortar being mixed at least 10 minutes before use to allow the Portland cement to produce lime as a hydration product. Calcium chloride may also be added to accelerate the hydration of the Portland cement and to react with the sodium silicate.

As an alternative to sodium silicate a slurry of high alumina cement (calcium aluminate) may be introduced into the gun as a quick-setting agent, in the proportion

of from 10% to 50% by volume (i.e. from 30% to 70% of calcium aluminate cement by weight of Portland cement), the exact proportions depending on the freshness of the Portland and high alumina cements used.

A further alternative type of mortar which may be used is a flexible plastic bituminous mortar, made by mixing an anionic aqueous bituminous emulsion with sand and Portland cement. The mix may be as follows:

70 lbs. sand
10 lbs. ordinary Portland cement
80 lbs. anionic aqueous bituminous emulsion (bitumen content 30% to 60%)
10 lbs. mineral wool

This mix is viscous and can be pumped. The addition of sodium silicate as described above causes the Portland cement to react and dessicate the emulsion, coating the cement and sand particles with bitumen. After several minutes the bituminous mortar formed is quite firm.

The method of pointing described above has proved successful in pointing wet brickwork with fast running water on the surface or with slow seepage of water from behind.

I claim:

1. A method of applying mortar, comprising the steps of introducing a wet flowable mortar under pressure into a chamber of an air-operated pointing gun, accelerating the speed of flow of the mortar by passing it through a single conically reduced passage into a smooth cylindrical bore of uniform diameter, introducing a quick-setting agent into the middle of the mortar flow where it is being accelerated by the conically reduced passage, the said acceleration of flow drawing out the supply of quick-setting agent into a narrow stream passing along the axis of the said passage, passing said mortar and quick-setting agent through said cylindrical bore without any substantial turbulence, and then directing an auxiliary air supply on to the mortar so as to subject it to turbulence, thus mixing said mortar with the said quick-setting agent, and to eject said mortar from the gun through a nozzle.

2. A method according to claim 1, wherein the mortar is a non-aerated cementitious mortar made flowable by incorporation of a surface active agent.

3. A method according to claim 2, wherein the surface active agent is a non-ionic surface active agent of low foaming power.

4. A method according to claim 1, wherein the mortar is a plastic bituminous mortar.

5. A method according to claim 1, wherein the quick-setting agent is sodium silicate.

6. A method according to claim 1, wherein the quick-setting agent is a high alumina cement.

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