April 18, 1944. L. TURZILLO 2,346,879

APPARATUS FOR FILLING CRACKS IN CONCRETE MASONRY STRUCTURES

Filed Sept. 30, 1941

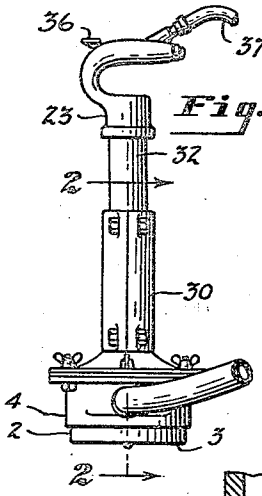


Fig. 1

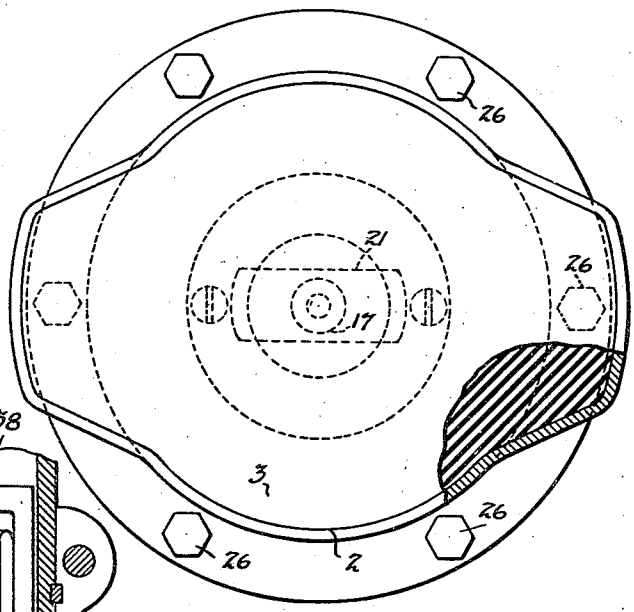


Fig. 3

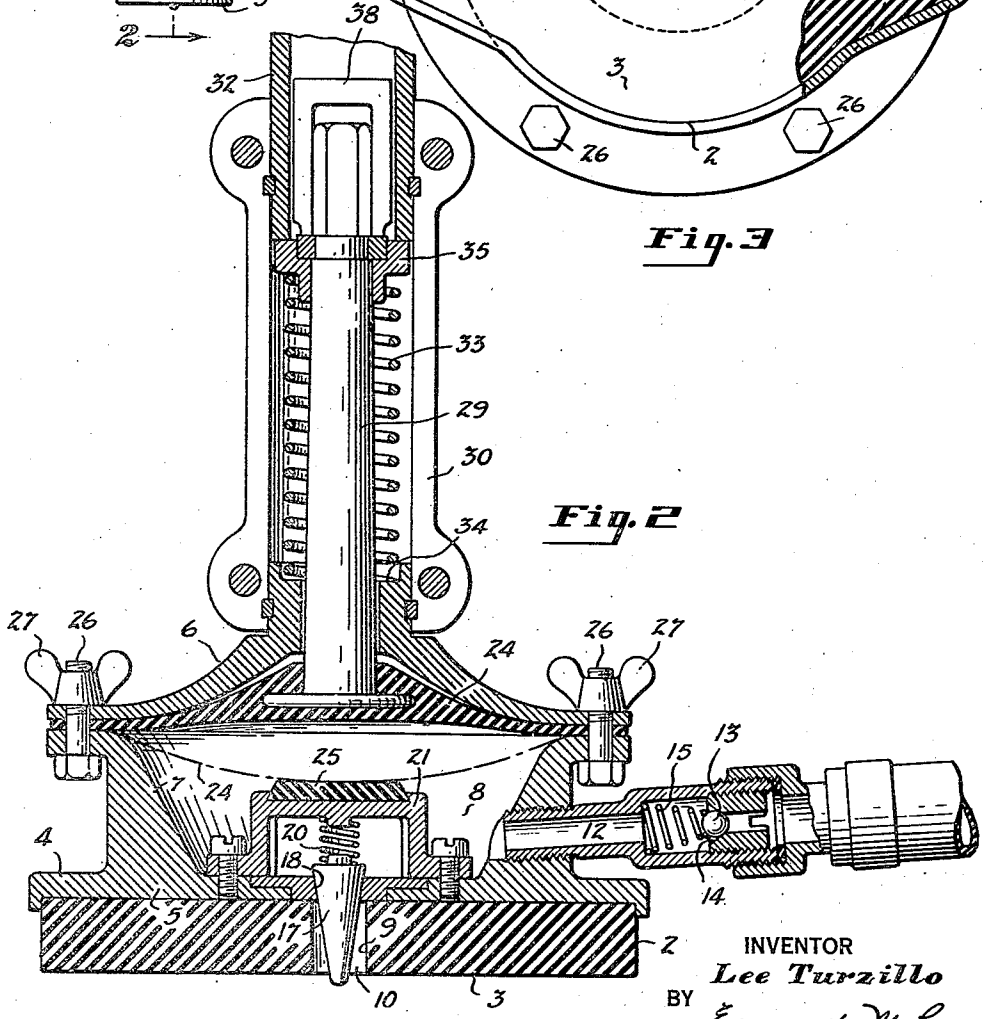


Fig. 2

INVENTOR
Lee Turzillo
BY
Evans & McCoy
ATTORNEYS

Patented Apr. 18, 1944 2,346,879

UNITED STATES PATENT OFFICE

2,346,879

APPARATUS FOR FILLING CRACKS IN CONCRETE MASONRY STRUCTURES

Lee Turzillo, Royal Oak, Mich., assignor to Louis S. Wertz, Cleveland, Ohio

Application September 30, 1941, Serial No. 412,998

5 Claims. (Cl. 72—128)

This invention relates to apparatus for filling cracks and crevices in communication with the surface of concrete structures.

In the application of Louis S. Wertz, Serial No. 309,799, filed December 18, 1939, there is disclosed a method and apparatus for applying fluid, hydraulic cement compositions to a surface and repeatedly impacting such material while on the surface, prior to its hydration, to cause penetration of the material slightly within the surface so as to fill the surface pores and produce a strong, dense surface. The present device is intended for the filling of the deeper cracks and crevices in structures which communicate with the surface.

It is an object of the present invention to provide a device which will function to cause penetration of a flowable slurry containing cement within cracks and crevices communicating with the surface of porous structures so as to substantially completely fill such cracks and crevices.

It is another object of the present invention to provide a method of forcing a hardenable slurry containing Portland cement into cracks and crevices in communication with the surfaces of porous structures, which method is operable to substantially completely fill such cracks and crevices without clogging them adjacent their juncture with said surfaces.

It is a further object of the present invention to provide a device for forcing a cement-containing slurry into cracks and crevices in communication with surfaces of concrete structures and the like, which device is relatively light in weight and may be simply pressed against said surfaces and yet permits the application of relatively high pressure on the slurry within said cracks and crevices.

Other objects will be apparent from the following description of the invention, as illustrated by the accompanying drawing, in which:

Figure 1 is an elevational view of a suitable device embodying the present invention;

Fig. 2 is a sectional view taken on the line 2—2 of a portion of the device illustrated in Fig. 1; and

Fig. 3 is a plan view, with portions broken away, of the device looking at the bottom thereof.

Briefly, the process of the present invention comprises applying a treating material to the cracks and crevices to be treated at the juncture of said cracks and crevices with the surface of the structure, and causing the material to penetrate into the cracks and crevices by applying spurts of relatively high pressure repair fluid to the cracks and crevices at their juncture with the flat surface of the structure.

It has been found that when the pressure adapted to force the material into the cracks and crevices is exerted by intermittently supplying fluid at high pressure against the surface rather than applying intermittent mechanical pressure against the fluid on the surface, that the tendency for separating water from solids within the fluid is substantially eliminated and superior penetration throughout surface cracks and portions in communication with the surface of the structure is obtained. In accordance with the present invention, mechanical impact is imparted to fluid in an enclosed cavity which has no absorbing walls and there is no tendency for separation of liquids and solids. The entire pressure for intrusion of repair material into the porous structure is therefore exerted by additional repair fluid rather than by mechanical impact on fluid at the surface of the structure.

Referring more particularly to the drawing, in which like parts are indicated by like numerals of reference throughout the several views, the device of the present invention comprises a resilient member having a relatively flat face to be placed in contact with the surface of the structure, a passageway through said face for the passage of repair fluid to said structure, a chamber in communication with said passageway, supply means for supplying fluid to said chamber, means operable by contact with said surface for permitting flow of fluid from said chamber through said passageway when said face bears against the flat surface of the structure, and means for suddenly exerting pressure on fluid in said chamber to force it through said passageway and against said surface.

In the device illustrated in the drawing, the resilient member 2, which may be of sponge rubber or the like and which has a face 3 complemental to the surface of the structure to be treated and preferably substantially flat, is solidly attached to the lower portion of a rigid body 4. The body 4 comprises a bottom 5, a cover frame 6, and an annular side wall portion 7, which cooperatively form a chamber 8.

A passageway 9 having an opening 10, preferably centrally of the surface 3 of the resilient member 2, connects the chamber 8 with the surface 3 and is provided for the passage of repair fluid from the chamber 8 to a structure in contact with the surface 3. Supply means, such as a conduit 12, through the wall 7 is provided for supplying the repair fluid to said chamber. The

conduit 12 preferably has means, such as a ball 13 which cooperates with a seat 14 and which is normally held against the seat 14 by a spring 15, for permitting flow of fluid through said conduit into said chamber and preventing flow through said conduit from said chamber.

Means such as a conical valve 17, which cooperates with a suitable annular seat 18 adjacent the juncture of the passageway 9 with the chamber 8, is provided for permitting the flow of fluid through said chamber, through said passageway, only when the face 3 bears against a surface, such as the flat surface of the structure. The conical valve 17 normally protrudes slightly beyond the surface 3 and is operable by contact with the surface of the structure; it is normally held against the seat 18 by a suitable spring 20, which bears against a suitable arch-shaped bumper support 21 on the one side and against the conical valve 17 on the other side.

Controllable means, such as an air hammer or reciprocating device 23, is provided for suddenly exerting pressure on the fluid in the chamber 8 to force the fluid through the passageway 9 to the surface 3 when the passageway 9 is opened. The means 23 preferably actuates a diaphragm 24 which is clamped between side walls 7 and the top 6 of the body portion throughout its entire periphery by suitable means such as bolts 26 and wing nuts 27. The diaphragm 24 is preferably attached to the lower end of a suitable plunger 29 which is slidably carried by a frame 30. The frame 30 is adapted to be rigidly attached to the stationary portion of the air hammer or reciprocating device 23 and to the body 4 so as to carry said body 4 substantially rigidly with respect to the outer portion 32 of the air hammer 23. A spring 33, which surrounds the plunger 29, bears against an upper face 34 of the cover 6 on the one side and against a collar 35 which is attached to the plunger 29 on the other side so as to hold the plunger 29 and the diaphragm 24 normally in its uppermost position.

In the application of the device of the present invention to structures for the filling of cracks and crevices communicating with the surface thereof, the face 3 of the device is pressed strongly against the surface of the structure, so as to depress the conical valve 17 and open the passageway 9. A valve 36 is then depressed, which permits the operating fluid from the air supply, not shown, to flow through a conduit 37 and operate the reciprocating elements within the hammer 23. Impact of the reciprocating piston, not shown, of the device 23 on a hardened, slidable impact seat 38, which fits tightly against the plunger 29, causes downward movement of the diaphragm toward the position illustrated by the dotted line 39, causing sudden pressure on the fluid within the valve 8 and forcing fluid through the passageway 9 into the crevices communicating with the surface of the structure. When the energy due to the impact on the member 38 has been dissipated, the spring 33 causes the diaphragm 24 to move toward its normal position, increasing the volume of the chamber 8 and causing flow of fluid into said chamber from said supply conduit 12. A second blow of the hammer causes a similar spurt of relatively high pressure fluid through the passageway 9 against the surface, causing further migration of fluid into cracks and crevices of the structure.

It has been found that, by using intermittent pressure and intermittent flow of fluid through passageway 9, the fluid may be made to penetrate much farther within the cracks and crevices of the structure than when the fluid is applied to the passageway under constant pressure. This tendency toward increased penetration is thought to be due to rapid pulsations of pressure within the cracks and crevices, which acts to prevent the clogging by agglomerations of finely divided solids which are present in the fluid. The rapid pulsations also are desirable, in that they permit the operator to apply fluid to the structure at higher pressure than would be possible without pulsation.

The material utilized for filling the cracks and crevices and surface pores in accordance with the present invention preferably contains a hydraulic cement, a filling material which comprises a finely divided siliceous substance, such as fly ash, finely ground, water-quenched blast furnace slag, and a lubricant, such as mineral oil or ammonium stearate, together with sufficient water to form a slurry. Suitable slurries are disclosed in the copending application of Louis S. Wertz, Serial No. 370,174, filed December 14, 1940.

Any other flowable densifying and waterproofing material may also be utilized for sealing pores, weatherproofing the structures, etc. Examples of suitable waterproofing solutions are waterproofing liquids containing oils, fats, bitumens, etc., with or without finely divided solid filling materials.

It may be seen that other forms of apparatus may be used to carry out the process of the present invention. For example, the surface to be treated may have offset portions or other irregular changes in contour. It is contemplated that such a surface be treated with apparatus having its resilient face 3 complemental with the surface to be treated. Also, it is contemplated that the portion of the device which serves to suddenly exert pressure on the fluid in the chamber 8 may be substituted for various apparatus, it only being required that such apparatus provide relatively sudden pressure to the fluid within the chamber 8.

It is also to be understood that various other modifications and variations in the process and in the specific device herein shown and described for purpose of illustration may be made without departing from the spirit of the present invention.

What I claim is:

1. A device for filling cracks and crevices in a concrete surface or the like, which comprises a resilient member having a relatively flat face to be placed in contact with said surface, a passageway through said face, a closed chamber of variable volume in communication with said passageway, supply means including a conduit opening into said chamber for supplying fluid material to said chamber, a valve in said passageway having a portion extending outwardly and operable by contact with said surface to permit flow from said chamber through said passageway only when said face bears against said surface, and means for suddenly and periodically exerting hammerlike pressure on fluid in said chamber to force it through said passageway and against said surface, whereby fluid may be forced into cracks and crevices within said surface.

2. A device for filling cracks and crevices in a concrete surface or the like, which comprises a resilient member having a relatively flat face to be placed in contact with said surface, a passageway centrally of said face, a chamber for con-

fining a mass of fluid repair material in communication with said passageway, a conduit connecting with said chamber and opening into said chamber for supplying fluid to said chamber, valve means permitting the flow of fluid through said conduit and into said chamber but preventing flow through said conduit from said chamber, means operable by contact with said surface to open said passageway to permit flow from said chamber through said passageway only when said face bears against said surface, and means for suddenly exerting pressure on fluid in said chamber to force it through said passageway and against said surface, whereby fluid may be forced into cracks and crevices within said surface.

3. A device for filling cracks and crevices in a concrete surface or the like, which comprises a resilient member having a relatively flat face to be placed in contact with said surface, a passageway centrally of said face, a chamber for confining a mass of fluid repair material in communication with said passageway, a conduit in communication with said chamber for supplying fluid to said chamber, valve means permitting the flow of fluid through said conduit and into said chamber but preventing flow through said conduit from said chamber, means extending through said resilient member and operable by contact with said surface to open said passageway and to permit flow from said chamber through said passageway only when said face bears against said surface, and air operable means for suddenly exerting pressure on fluid in said chamber to force it through said passageway and against said surface, whereby fluid may be forced into cracks and crevices within said surface.

4. A device for filling cracks and crevices in a concrete surface or the like, which comprises a resilient member having a relatively flat face to be placed in contact with said surface, a passageway centrally of said face, a chamber in communication with said passageway, a conduit for supplying fluid to said chamber, valve means permitting the flow of fluid through said conduit and into said chamber but preventing flow through said conduit from said chamber, a valve operable by contact with said surface to permit flow from said chamber through said passageway only when said face bears against said surface, and a piston operated diaphragm for suddenly exerting pressure on fluid in said chamber to force it through said passageway and against said surface, whereby fluid may be forced into cracks and crevices within said surface.

5. A device for filling cracks and crevices in a concrete surface or the like, which comprises a resilient member having a relatively flat face to be placed in contact with said surface, a passageway centrally of said face, a chamber in communication with said passageway to confine a volume of repair material, a conduit for supplying fluid to said chamber, valve means associated with said conduit permitting flow of fluid to said chamber, but preventing flow through said conduit from said chamber, means operable by contact with said surface and associated with said passageway for permitting flow from said chamber through said passageway only when said face bears against said surface, and means for exerting hammerlike pressure on fluid in said chamber to force it through said passageway and against said surface, whereby fluid may be forced into cracks and crevices within said surface.

LEE TURZILLO.