Feb. 17, 1948. J. NOVELLO 2,436,176

MACHINE FOR MOLDING CONCRETE SLABS

Filed June 7, 1946 2 Sheets-Sheet 1

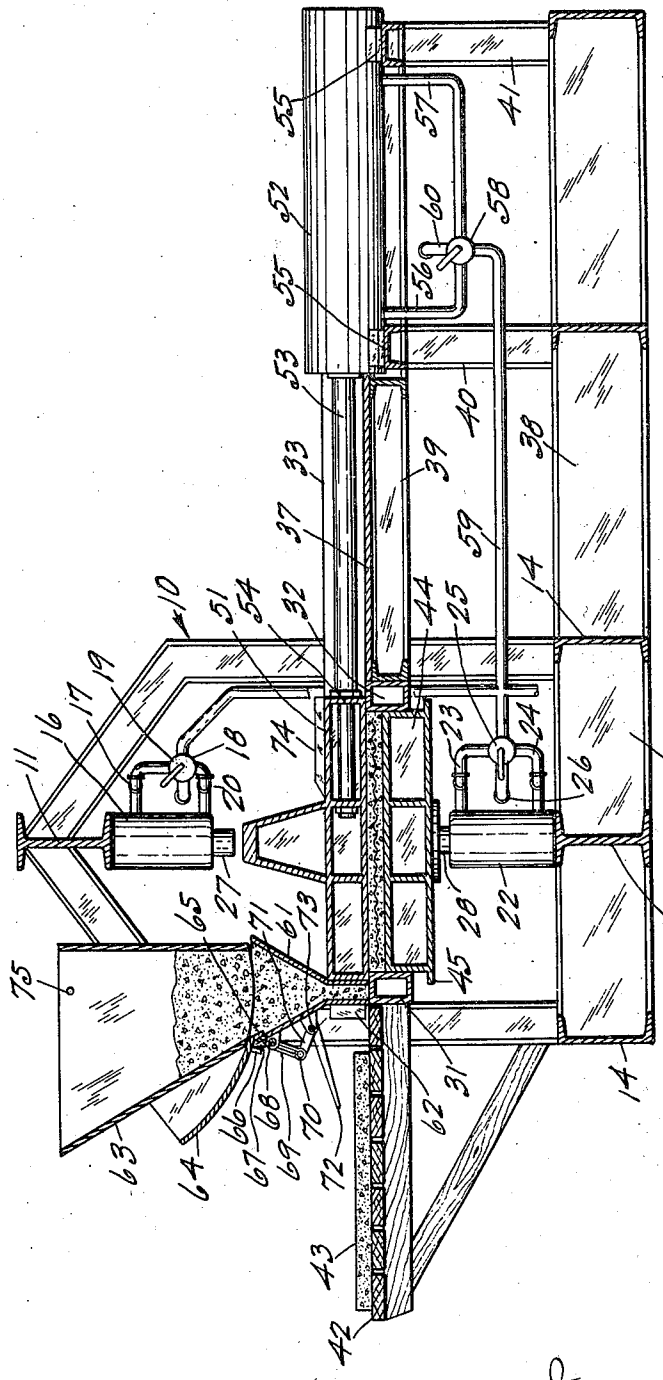


FIG. 1.

Inventor
Joseph Novello
By Philip A. Friedell
Attorney

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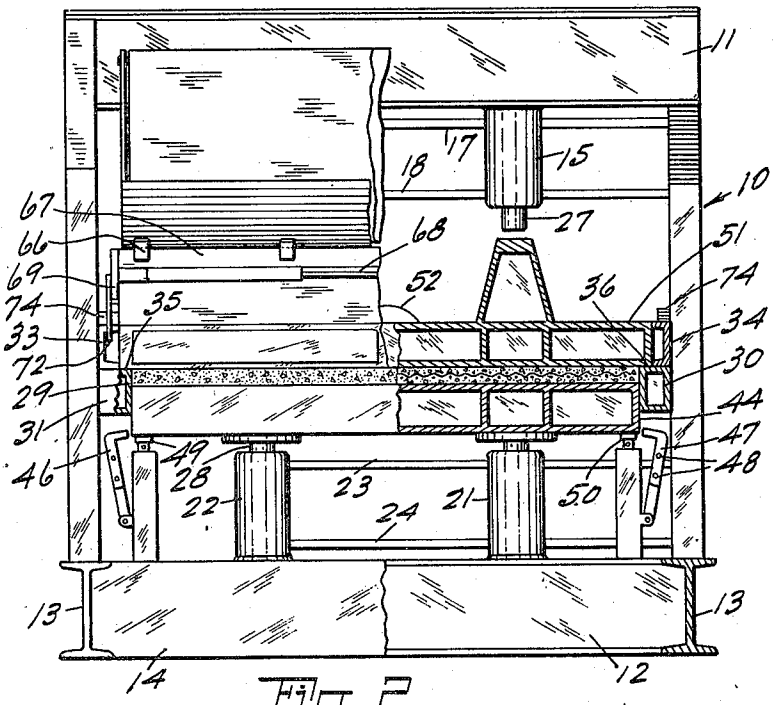


Fig. 2.

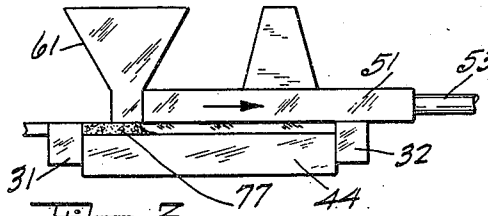


Fig. 3.

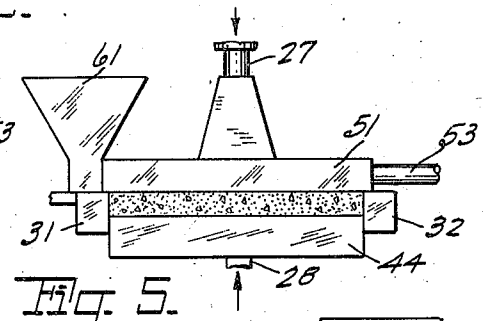


Fig. 5.

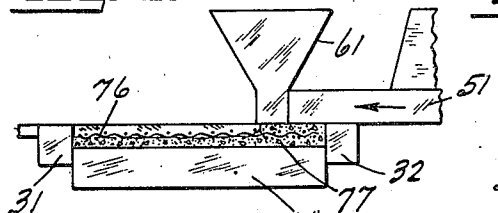


Fig. 4.

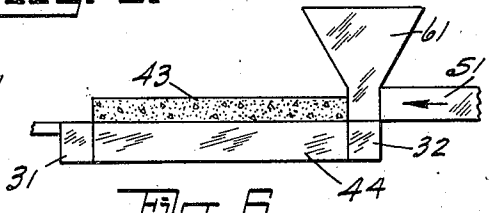


Fig. 6.

Inventor
Joseph Novello
By Philip A. Friedell
Attorney

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MACHINE FOR MOLDING CONCRETE SLABS

Joseph Novello, San Francisco, Calif.

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6 Claims. (Cl. 25—42)

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This invention relates to improvements in machines for making slabs and panels from relatively dry binder-containing aggregates which require only pressure for binding the various materials together into a compact and solid mass.

The conventional building or structural slab or panel of the mineral type is made from a wet mixture of aggregates and cement or calcium oxide, in some cases with the admixture of hair or fibrous materials and in others with reinforcing metal, the material being poured or spread and leveled and then allowed to dry, usually in molds, but sometimes are dried under heat.

My invention uses an aggregate consisting chiefly of pumice and a binder of any suitable type, one such binder being sodium silicate which is admixed in its syrupy state generally referred to as water glass. In this condition the waterglass will have practically no wetting effect on the material, the material will be actually dry to touch and in appearance, yet will form a firm bond if the material is suitably compressed. Obviously there are many other types of binders which are suitable and in some cases result in even a dryer aggregate than when waterglass is used. The percentage of waterglass required is so minute as to produce no noticeable wetting effect yet provides a very firm bond and simultaneously waterproofs the material.

As is well known, pumice is a mineral of extremely low specific gravity, is very porous, and therefore can be made to form a very efficient heat insulating material and is therefore ideally suited for various structural and utility purposes, making, when properly combined with suitable materials which will form a binder without wetting and thus avoid filling or clogging the pores, and, provided with suitable reinforcing when necessary to develop suitable resistance to stresses, excellent wall board or paneling, insulating panels for refrigerating units, outside walls or paneling for houses and other buildings, and other like products.

My invention is designed to use material of this type and form it into panels or slabs of any desired thickness and of suitably large dimensions when desired so that the panels or slabs will be suitable for the various purposes and structures to which it is suited and to permit the inclusion of reinforcing materials or elements, and to carry out the process semi-automatically so that the finished panels or slabs can be manufactured and discharged at a relatively high rate of speed and with absolute uniformity in area, thickness, strength, and homogeneity.

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The objects and advantages of the invention are as follows:

First, to provide a machine for forming the slabs or panels as outlined and which will provide even distribution of the raw material and form the raw material to a predetermined thickness and limited to a predetermined area, and which will compress the material into a compact and bound mass without destruction of the porosity of the material.

Second, to provide a slab or panel forming machine which will apportion the material for forming a slab or panel of predetermined thickness and area and compress the material to a finished thickness, and discharge the formed slab or panel immediately after completion of the product.

Third, to provide a machine as outlined which distributes the material within the predetermined area in two passes to permit introduction of reinforcing elements intermediate the thickness of the slab or panel.

Fourth, to provide a machine as outlined which will remove the product upon completion and clear the machine for further production.

Fifth, to provide a machine as outlined which is relatively simple in construction and which operates with the highest efficiency and uniformity.

In describing the invention reference will be made to the accompanying drawings, in which:

Fig. 1 is a longitudinal sectional elevation through the invention showing the machine at the time of completing its forward and return passes for distribution of the material to a predetermined thickness.

Fig. 2 is a front elevation with one-half shown in section.

Fig. 3 is a diagrammatic view showing the distributor operating through the first pass and laying the lower layer of mix.

Fig. 4 is a diagrammatic view showing the distributor operating through the return pass and laying the top layer of mix.

Fig. 5 shows the top layer completed and the hydraulic apparatus compressing the layers into a compact slab.

Fig. 6 shows the ejection of the finished slab from the machine.

The slab and panel forming machine includes a suitable frame 10 having a crown 11 at the top and a base 12 at the bottom to function as reactance elements for the hydraulic pressure apparatus, together with suitable base stringers 13 and cross-members 14.

Supported by the crown 11 is a plurality of hy-

draulic cylinders 15 and 16 which have their respective ends simultaneously served by the same fluid lines 17 and 18 which are controlled by a suitable valve 19 preferably of the four-way type with a discharge 20.

An equal number of hydraulic cylinders 21 and 22 is supported by the base member 12 and also have mutual connections 23 and 24 to the respective ends and controlled by another valve 25 having a discharge 26. Each of the cylinders has a plunger, respectively 27 and 28 for the upper and lower cylinders. Thus the upper and lower plungers are controllable at will, with equalization between the respective lower plungers and respective upper plungers effected through the common connections.

Longitudinal beams 29 and 30 and transverse beams 31 and 32 are supported by the uprights of the frame 10 and together form a rectangular frame. Supported on the longitudinal beams 29 and 30 are two guides 33 and 34 which extend only part way inwardly from the outside edges of the beams 29 and 30 thus leaving a supporting surface on each beam as indicated at 35 and 36.

Supporting members 37 extend rearwardly from the rear transverse beam 30 and are supported by a rearwardly extending frame 38—39 formed as an extension of the main frame 10, with the members 38 and 39 suitably spaced by uprights 40 and 41. Another extension in the form of a table 42 extends from the front end of the machine to receive and support the finished slabs or panels 43; the top of the table 42, beams 29, 30, 31 and 32, and table 37 being all in the same plane.

Vertically adjustable within the rectangular frame formed by the beams 29 to 32 is a bed 44 which has projecting flanges 45 to limit the upward movement with the top of the bed in the same plane as the top of the beams when in its uppermost position in which case a plane surface extends throughout the length of the machine including the table 42.

This bed is supported by the plungers 28, and downward movement limiting means is indicated for selective limitation to two steps, such as the levers 46 and 47 which are adjustable as indicated at 48, and which when swung inward will limit the downward movement to a predetermined degree, and when swung out as shown will permit the lowering of the bed to the adjustable stops 49 and 50, thus providing for the two layer bedding of the composition for forming the slabs or panels. Adjustment of these stops provides for forming the slabs or panels to any desired thickness and with absolute duplication of thickness.

Slidably supported on the beams 29 and 30 and between the guides 33 and 34 is a combined press head, distributor and ejector 51 and which is provided with suitable reciprocal driving means such as a cylinder 52 having a piston rod 53 which is connected to the head 51 as indicated at 54; this cylinder being suitably supported by the rear extension of the frame as indicated at 55 and having fluid connections 56 and 57 at its opposite ends controlled by a suitable valve 58 having connection with a fluid supply line 59 and with a discharge 60.

Mounted on the forward end of the head 51 is an apportioning hopper and distributor 61 the lower end of which opens at the level of the surfaces 35, 36 so that the cross-members 31 and 32 function as a gate at both ends of the stroke of the head, and a screed 62 is mounted on the forward end of the apportioning hopper for even

distribution and leveling of the material. Though shown on the forward end, the screed is not limited to this position but may be located within the mouth of the hopper, or directly back of the hopper, or both, as may be necessary to obtain a level surface with each pass of the head.

This apportioning hopper has a capacity equal to the volume of material required to provide the desired thickness of slab and receives its portion of material from a feed hopper 63 which is provided with a gate 64 which is automatically controlled by the apportioning hopper for filling the apportioning hopper and closing the gate, and controlled manually for initiating this automatic control.

The control means consists of a lip 65 on the rearward end of the gate and a shoulder 66 slightly forward thereof to leave a recess therebetween, for cooperation with a tongue 67 on the forward end of the hopper which normally engages in the recess between the elements 65 and 66, but which tongue is pivotally mounted on a shaft 68 and has a slotted lever 69 in which a pin 70 on a lever 71 is slidable and which lever 71 includes a control arm 72 and being pivoted at 73. A cam 74 is mounted on each of the guides 33 and 34 and the control unit is duplicated on the other side of the machine for control from either or both sides.

At the start of a slab forming operation the head 51, hopper 61, lever 72 and plunger 27 are in the positions shown in Fig. 1, and the bed has been lowered through manual control of the valve 25 to the position shown in Fig. 3 or half way down to rest on the stops 46 and 47 which are swung inward to engage the bottom of the bed, valve 58 being adjusted to pass fluid through the head line 56 and discharge through 57, to retract the head 51 as indicated in Fig. 3.

As the head moves back the tongue 67 pulls the gate 64 to a closed position about its pivot 75, and after full closure the arm 72 rides up on the cam 74 swinging lever 71 back and with it lever 69 and thereby swinging the tongue 67 forward and down so it will not engage with the members 65 and 66 on the gate, and the tongue 67 is sufficiently heavy or is suitably counterweighted to overcome the leverage of the member 72 so that the lever 72 will not drop of its own accord to again raise the tongue.

At this point the gate is closed and the hopper is discharging and leveling its contents as indicated in Fig. 3 and stops with the mouth of the hopper over and closed by the beam 32.

The valve 25 is now manually operated to slightly raise the bed to free the stops 46 and 47 so that they can be swung out to the position shown in Fig. 2, and the valve is then re-adjusted to lower the bed to rest on the stops 49 and 50.

If reinforcing is desired, a screen 76 or other suitable reinforcing material is now laid on top of the material 77 distributed in the first pass. The valve 58 is next adjusted to drive the head forward as indicated in Fig. 4, distributing another layer of material on top of the first layer or on top of the reinforcing, moving forward to the position shown in Figs. 1 and 5, lever 72 remaining in its raised position and the tongue being in a lowered position so that the tongue does not engage the member 66 on the gate and the gate remains closed so that no fresh material is fed to the apportioning hopper. This completes bedding of the material.

Valve 19 is now adjusted to secure the head against the rectangular frame 29 to 32, the pres-

sure for the specific aggregate considered being about 60 pounds per square inch and this pressure is maintained while the valve 25 is adjusted to raise the bed and compress the material against the head to form and bind the material into a slab or panel, as indicated in Fig. 5.

The valve 19 is next adjusted to raise the plunger 27 to free the head and next the valve 58 is adjusted to retract the head as indicated in Fig. 6 followed by adjustment of valve 25 to raise the bed until stopped by cooperation of the flange 45 with the bottom of the rectangular frame, at which time the entire top surface including the bed are at the same level.

Valve 58 is next adjusted to drive the head forward and lever 72 is manually urged to depress as the head moves forward so that after passing the end of the cam manual depression of the lever 72 will raise the tongue 67 to operative position and engage the member 66, opening the gate for another charge of material while the formed and completed slab or panel is pushed out of the machine as indicated in Fig. 6 to its ejected position shown in Fig. 1.

The next operation is started by lowering the bed to the stops 46 and 47. Thus the machine makes four passes for forming, compressing, and ejecting the finished product, and the apportioning hopper only operates the gate during the respective final and initial stages.

I claim:

1. A machine for forming slabs and panels from a relatively dry, binder-containing aggregate comprising; a horizontally mounted slide and guiding and driving means therefor and manual control means for said driving means; a hopper for aggregates mounted on the forward end of said slide; a frame having its top surface in a plane with the bottom surface of the slide and forming a supporting surface for the slide; a bed vertically slidable in said frame and movable to three positions respectively with the top surface in the same plane as the top of the frame and in two different lowered positions to form recesses of two different depths within the frame; means operable at will for immovably securing said slide against the top of said frame, and means operable at will for forcing said bed upward against the resistance of said slide to compress aggregates therebetween to compress and bind the aggregates into a panel or slab; said hopper comprising an apportioning hopper; a feed hopper having a gate, and cooperative means on said apportioning hopper and said gate for opening said gate when said slide is moved forwardly to the limit of its movement and to close said gate upon return movement of the slide, and means limiting opening and closing of said gate to the last movement of one cycle and the initial movement of the next cycle of operations of said slide.

2. A machine for forming slabs and panels from a relatively dry, binder-containing aggregate comprising; a horizontally mounted slide and guiding and driving means therefor and manual control means for said driving means; a hopper for aggregates mounted on the forward end of said slide; a frame having its top surface in a plane with the bottom surface of the slide and forming a supporting surface for the slide; a bed vertically slidable in said frame and movable to three positions respectively with the top surface in the same plane as the top of the frame and in two different lowered positions to form recesses of two different depths within the frame; means operable at will for immovably securing said slide against the top of said frame, and means operable at will for forcing said bed upward against the resistance of said slide to compress aggregates therebetween to compress and bind the aggregates into a panel or slab; means for limiting movement of said bed to three positions consisting of first stop means on said bed for cooperation with said frame, and second and third stop means manually controllable for limiting movement to the two lowered positions, and means for adjusting said second and third stop means for adjusting the depths of the recesses formed thereby.

3. A machine for forming slabs and panels from a relatively dry, binder-containing aggregate comprising; a horizontally mounted slide and guiding and driving means therefor and manual control means for said driving means; a hopper for aggregates mounted on the forward end of said slide; a frame having its top surface in a plane with the bottom surface of the slide and forming a supporting surface for the slide; a bed vertically slidable in said frame and movable to three positions respectively with the top surface in the same plane as the top of the frame and in two different lowered positions to form recesses of two different depths within the frame; means operable at will for immovably securing said slide against the top of said frame, and means operable at will for forcing said bed upward against the resistance of said slide to compress aggregates therebetween to compress and bind the aggregates into a panel or slab; said hopper comprising an apportioning hopper; a feed hopper having a gate, and cooperative means on said apportioning hopper and said gate for opening said gate when said slide is moved forwardly to the limit of its movement and to close said gate upon return movement of the slide, and means limiting opening and closing of said gate to the last movement of one cycle and the initial movement of the next cycle of operations of said slide; means for limiting movement of said bed to three positions consisting of first stop means on said bed for cooperation with said frame, and second and third stop means manually controllable for limiting movement to the two lowered positions, and means for adjusting said second and third stop means for adjusting the depths of the recesses formed thereby.

4. A machine for forming slabs and panels from a relatively dry, binder-containing aggregate, comprising; a horizontal slideway and a slide operable therein and means for driving said slide in opposite directions at will; a frame for supporting said slide and functioning partly as a part of said slide-way; a bed vertically slidable in said frame, and power means manually controllable for raising and lowering said bed to a plurality of positions in one of which the top of the bed is co-planar with the top of the frame and bottom of the slide and in another of which a recess of predetermined depth is formed within the frame; a hopper carried by said slide for distributing and leveling aggregates to fill the recess; means for locking said slide against the top of said frame; said power means being manually controllable to operate said bed to compress the aggregates against the bottom of said slide, and to raise the undersurface of the compressed aggregates to the level of the top of said frame when said slide is released and retracted for ejection of the finished product through advance movement of said slide; said hopper comprising

an apportioning hopper; a feed hopper having a gate, and cooperative means on said apportioning hopper and said gate for opening said gate when said slide is moved forwardly to the limit of its movement and to close said gate upon return movement of the slide, and means limiting opening and closing of said gate to the last movement of one cycle and the initial movement of the next cycle of operations of said slide.

5. A machine for forming slabs and panels from a relatively dry, binder-containing aggregate, comprising; a horizontal slideway and a slide operable therein and means for driving said slide in opposite directions at will; a frame for supporting said slide and functioning partly as a part of said slide-way; a bed vertically slidable in said frame, and power means manually controllable for raising and lowering said bed to a plurality of positions in one of which the top of the bed is co-planar with the top of the frame and bottom of the slide and in another of which a recess of predetermined depth is formed within the frame; a hopper carried by said slide for distributing and leveling aggregates to fill the recess; means for locking said slide against the top of said frame; said power means being manually controllable to operate said bed to compress the aggregates against the bottom of said slide, and to raise the undersurface of the compressed aggregates to the level of the top of said frame when said slide is released and retracted for ejection of the finished product through advance movement of said slide; means for limiting movement of said bed to three positions consisting of first stop means on said bed for cooperation with said frame, and second stop means manually controllable for limiting movement to an intermediate position, and third stop means for limiting movement to the lowermost position, and means for adjusting said second and third stop means for adjusting the depths of the recesses formed thereby.

6. A machine for forming slabs and panels from a relatively dry, binder-containing aggregate, comprising; a horizontal slideway and a slide operable therein and means for driving said slide in opposite directions at will; a frame for supporting said slide and functioning partly as

a part of said slide-way; a bed vertically slidable in said frame, and power means manually controllable for raising and lowering said bed to a plurality of positions in one of which the top of the bed is co-planar with the top of the frame and bottom of the slide and in another of which a recess of predetermined depth is formed within the frame; a hopper carried by said slide for distributing and leveling aggregates to fill the recess; means for locking said slide against the top of said frame; said power means being manually controllable to operate said bed to compress the aggregates against the bottom of said slide, and to raise the undersurface of the compressed aggregates to the level of the top of said frame when said slide is released and retracted for ejection of the finished product through advance movement of said slide; said hopper comprising an apportioning hopper; a feed hopper having a gate, and cooperative means on said apportioning hopper and said gate for opening said gate when said slide is moved forwardly to the limit of its movement and to close said gate upon return movement of the slide, and means limiting opening and closing of said gate to the last movement of one cycle and the initial movement of the next cycle of operations of said slide; means for limiting movement of said bed to three positions consisting of first stop means on said bed for cooperation with said frame, and second and third stop means manually controllable for limiting movement to respective lowered positions, and means for adjusting said second and third stop means for adjusting the depths of the recesses formed thereby.

JOSEPH NOVELLO.

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