July 23, 1940. J. M. MINCHER ET AL 2,208,801

FLOATING AND TROWELING MACHINE

Filed March 17, 1939 2 Sheets-Sheet 1

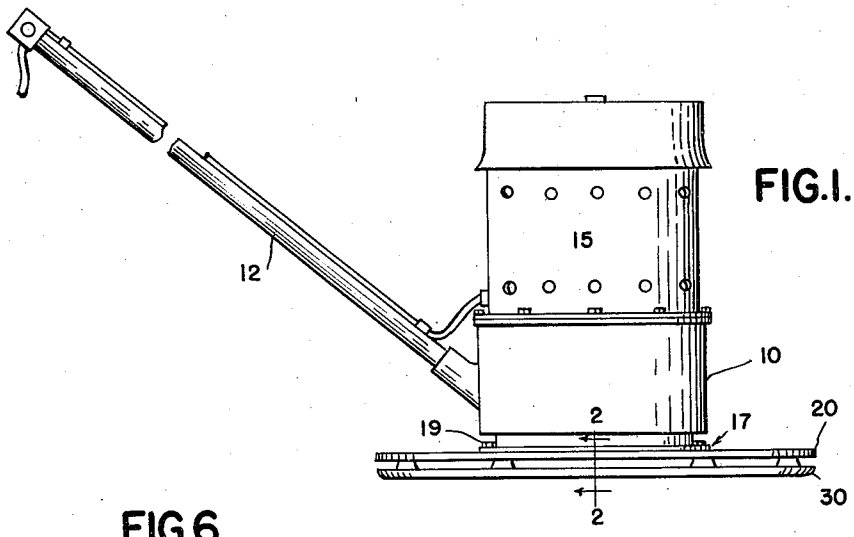
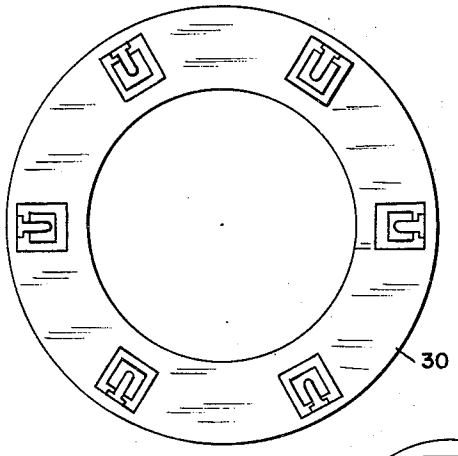
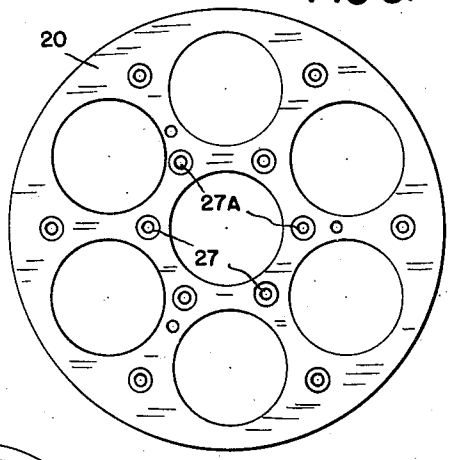


FIG.1.

FIG.6.

FIG.5.





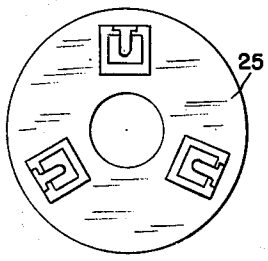


FIG.7.

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FIG.3.

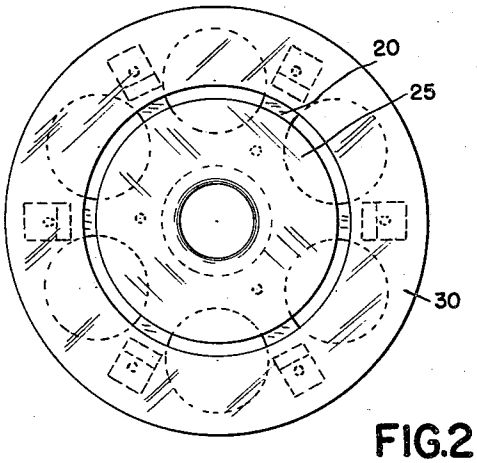


FIG.4.

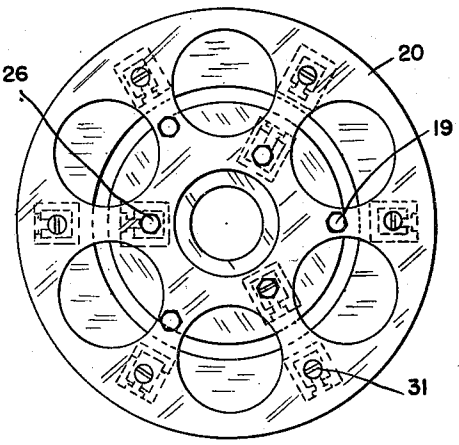


FIG.2.

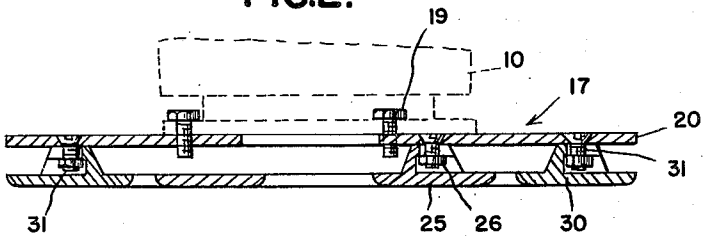


FIG.8.

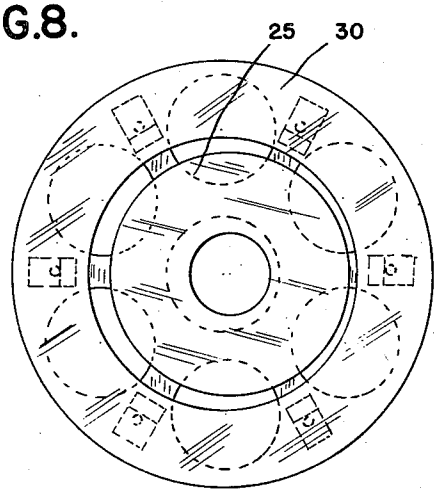
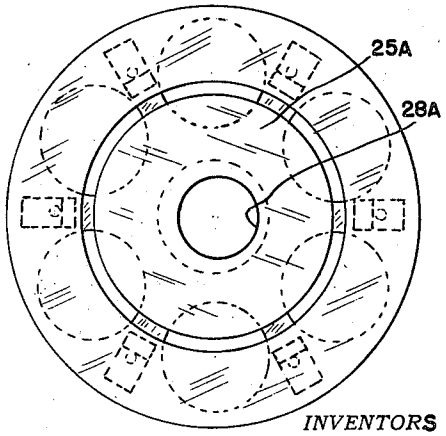


FIG.9.



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FLOATING AND TROWELING MACHINE

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Application March 17, 1939, Serial No. 262,340

9 Claims. (Cl. 72—136)

This invention relates to improvements in methods and apparatus for constructing floors of concrete, asphalt mastic, and other initially plastic materials.

Various methods and procedures have been used in the laying of concrete floors, but generally speaking, the density of the finished floor, and the quality or smoothness of its finish, depends upon the amount and character of the working to which the surface is subjected after the concrete has been laid. Where the working is done by hand, many separate operations must be performed if all voids are to be filled and if a smooth top surface is to be secured. With more widespread recognition of the fact that higher quality of finished concrete is secured with dry mixes, and consequent use of lower water-cement ratios, hand working has become more and more difficult. It is also recognized that a better wearing floor is secured if coarse aggregates are employed, and if coarse aggregates, rather than "fines" are located at the surface. There is a definite limit, however, to the coarseness of dry mixtures which can be worked in a practical manner by hand. In other words, if it is impossible for the workman to force down the very coarse aggregates in the dry mix, without considerable tamping, the process is simply too slow and expensive to be practicable in the laying of floors. When mixes which are workable by hand in a practicable manner are used, moreover, the working, floating and troweling bring the fines to the surface and spread them over the top, where they provide a smooth surface, but one which will not resist hard wear as well as it would if coarse aggregates were present in the surface to take the wear. To assist in the floating of the coarse, dry mixes, power driven floating machines have been used. These consist of a relatively large flat disc, usually from eighteen inches to two feet in diameter, carrying a motor and adapted to be guided over the floor by means of a handle while the motor spins the disc. The weight of the assembly and the rotation of the disc work and float the still-plastic concrete, forcing down the aggregates and compacting and smoothing the mass, and bringing fines to the surface sufficiently to allow a final troweling thereof by hand to secure a fine finish. Such machines do not impart a sufficiently fine finish to do away with hand troweling, however, and the tendency of the machine to bring fines to the surface, and the necessity for hand troweling thereafter, frequently results in an undesirable top surface of low wearing quality incorporating only fine aggregates. It is also to be noted that such machines, while they provide a better, easier and quicker way of performing the floating operation, do not actually eliminate any steps in the laying of a floor.

With the foregoing considerations in mind, the present invention aims to so combine the floating and troweling operations as to eliminate certain steps and save considerable time and expense in the laying of concrete floors, and to provide power driven finishing means of such character as to eliminate the hard manual labor which is now involved in cement finishing.

Another object is to provide an improved cement finishing device comprising a plurality of interposed rings having substantially coplanar bottom surfaces and adapted to be rotated by a motor or the like similarly to the aforementioned floating machines, but which acts both to float and to trowel the surface, the troweling operation being performed so efficiently as to completely eliminate the necessity for hand troweling as well as hand floating.

Another object is to provide such a device which enables the compacting and smooth finishing of much coarser aggregates, in a dry mix, than it has heretofore been practicable to use, and which enables, when desired, the firm bonding of a thin "topping" or finish coating to a hardened base, even though such topping contains only coarse aggregates and is, as stated, a mix of low water-cement ratio.

A further object is to provide means whereby concrete floors may be finished with absolute uniformity, regardless of differences in the skill of workmen, and whereby differences in flooring due to unequal skill of workmen may be eliminated.

Still another object is to provide such means which effects an extremely smooth finish, definitely superior to that obtainable by hand troweling.

Other objects and advantages will be apparent from the following description, wherein reference is made to the accompanying drawings illustrating preferred embodiments of our invention and wherein similar reference numerals designate similar parts throughout the several views.

In the drawings:

Figure 1 is a side elevational view of an electrically driven machine incorporating the principles of this invention.

Figure 2 is a vertical section taken substantially on the line 2—2 of Figure 1.

Figure 3 is a bottom plan view.

Figure 4 is a top plan view of the working portions removed from the remainder of the machine.

Figure 5 is a plan view of the sub-frame which supports the working rings.

Figures 6 and 7 are individual plan views of the working elements, Figure 6 showing the outer ring and Figure 7 the inner ring.

Figure 8 is a bottom plan view, similar to Figure 3 showing the inner ring mounted in an eccentric position to increase the troweling action thereof; and

Figure 9 shows a somewhat modified inner ring having a concentric outer edge and eccentric inner opening.

Referring now to our improved process, and to the drawings, which show a machine used in carrying out the same:

It should first be explained that the laying of the floor may be carried out in any suitable or usual way, insofar as the type of floor and the general order of the steps are concerned. It may be of monolithic construction, or provided with an after-applied topping, the present process being concerned with the working, floating and troweling after initial laying of the concrete. A mix of low water to cement ratio is preferred, and relatively coarse graded aggregate is used, in order to obtain the highest possible strength and the best wearing qualities. When the material is ready for floating, our improved combined floating and troweling device is applied directly thereto, and acts both to bring the surface to a proper level condition, and to trowel the surface to a very smooth finish, superior, in fact, to that secured when a steel trowel is applied by hand in finishing such floors in the manner now customary. Much coarser aggregates may be used than it is now possible to work by known methods, and although it is forced down sufficiently to give a smooth finish, such aggregate stays at the top to give great strength and wearing quality to the surface.

In general, the machine resembles the power driven floating machines which have been used for many years in connection with the construction of cement floors, and the driving motor and framework may in fact be identical, and may comprise the driving portion of such a conventional machine, from which the floating disc has been removed. Our improved working portion consists of a plurality of rings arranged one within another, having rounded edges and adapted to be secured to the driving portion in place of the customary floating disc, and to be driven in like manner by the motor of the machine.

The casing of the machine is designated **10** in the drawings, and a handle **12** is provided by which it may be guided over the floor. The electric motor which serves as the source of power is denominated **15**, and acts to drive the coupling plate **17**, through reducing gear (unshown) housed in casing **10**. The working parts are removably secured to the coupling plate by cap screws **19**.

A circular sub-frame **20** is attached to the bottom of the coupling plate, and serves to carry the operating elements **25, 30**, comprising rings having coplanar bottom surfaces, attached to the sub-frame **20** by means of nuts and bolts **26, 31**. The edges of the rings are rounded, and as shown in Figures 2, 3 and 4, they may be mounted concentrically, and with a slight gap therebetween.

In view of its greater peripheral speed, the ring **30** is preferably formed of somewhat harder material than the ring **25**, the difference in the hardness of the rings being sufficient to insure substantially uniform wear of the rings and maintain their bottom surfaces in approximately level, coplanar condition. When the device is applied to the partly dry concrete in the manner described, it acts both to level the surface and smooth it to a very fine finish.

The outer edges of the rings, like the outer edge of the conventional disc of a power floating machine, does not act to shear off projecting uneven portions of the floor surface, but rather, such outer edges have a smoothing, spreading action. The inner edges of the rotating rings, however, have an entirely different action, tending to confine the surface material rather than to spread it out. Such inner edges also have a slight shearing or cutting action, tending to remove uneven projections bodily, and to collect any readily flowable material, such as fines, which may be present. Such material is rolled up, works its way on top of the rings, and is then thrown outward away from the machine by centrifugal force. Such fines are thus collected and effectively removed from the sphere of action of the machine. The quantity of fines in the surface being worked is thus positively reduced. Although it is not possible to determine the precise action of all of the parts of the rings by watching the operation of the machine, the inner ring apparently functions principally as a floating agency, while the outer ring, and probably the outer edges of both rings, assist in the troweling action which imparts the fine finish to the surface. The working of the floor tends to compact and eliminate any voids which may exist, force down the aggregate and level the surface, as previously stated.

In Figures 2, 3 and 4 both rings are mounted concentrically. An additional set of screw holes **27A** is provided, however, displaced laterally, so that the inner ring may be mounted in an eccentric position, as shown in Figure 8. When mounted in this position the floating action is increased. Such action may also be increased by slightly displacing the center opening only of the inner disc, as shown in Figure 9, in which the disc is designated **25A** and the eccentric opening therein **28A**.

It will be apparent that by varying the curvature of the edges of the rings and their proportions, action may be varied further. This is a simple engineering matter which will be understood to be governed by such practical considerations as the weight of the machine and the character of the concrete to be worked with.

We are aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and we therefore desire to present embodiments to be considered in all respects as illustrative and not restrictive; reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

We claim:

1. In a combined floating and troweling machine for finishing plastic floors, in combination with power-driving means for rotating desired elements, a plurality of rings arranged one within another and drivable by said means and having substantially coplanar bottom surfaces adapted to engage the surface to be treated.

2. In a machine for treating plastic floors to finish the surface thereof before final setting, in combination with power-driving means, a plurality of annular working elements rotatable thereby having substantially smooth and coplanar working surfaces adapted to engage the

surface to be treated, said elements being spacedly arranged one within another.

3. Means as set forth in claim 2 in which the inner and outer edges of all of said working elements are concentrically disposed with respect to their center of rotation.

4. Means as set forth in claim 2 in which an outer working element is harder than an inner element to such extent as substantially to equalize the wear of their surfaces, whereby the substantially coplanar relation of such surfaces may be maintained throughout the lift of the working elements.

5. Means as set forth in claim 2 including a sub-frame for supporting said working elements, and means for securing one of said elements to said sub-frame in either of two positions, in both of which it is substantially coplanar with and surrounds the other element.

6. Means as set forth in claim 2 in which one of said working elements is disposed eccentrically, and others arranged concentrically with respect to their center of rotation.

7. Means as set forth in claim 2 in which the inner opening of one of said working elements is disposed eccentrically, and other edges of said working elements are concentric with respect to each other and their center of rotation.

8. Means as set forth in claim 2 in which at least the inner edges of said working elements are beveled.

9. In a machine for treating plastic floors to finish the surface thereof before final setting, in combination with rotary driving means, a working element rotatable thereby having a substantially smooth and planar working surface adapted to engage the surface to be treated, a second working element of substantially annular form surrounding and spaced from the first mentioned working element and having a working surface substantially coplanar therewith and rotatable by said same driving means.

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