Dec. 31, 1935. R. W. BAILY ET AL 2,025,703

APPARATUS FOR CONSOLIDATING PLASTIC MATERIALS BY MEANS OF A VIBRATING ROLLER

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Fig. 1.

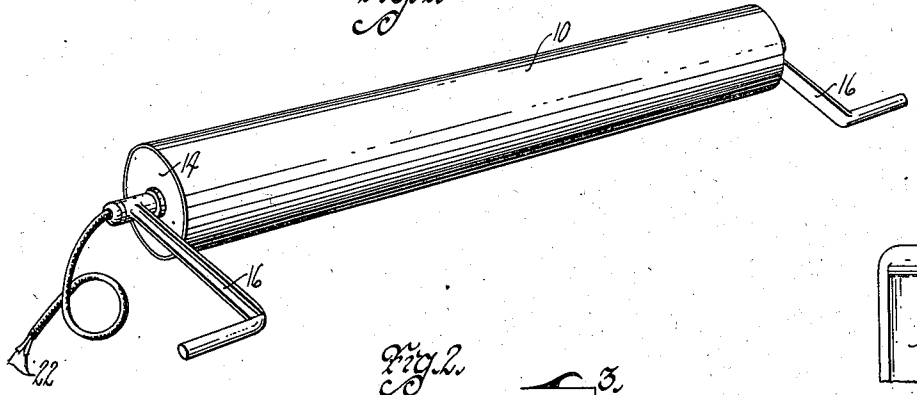


Fig. 2.

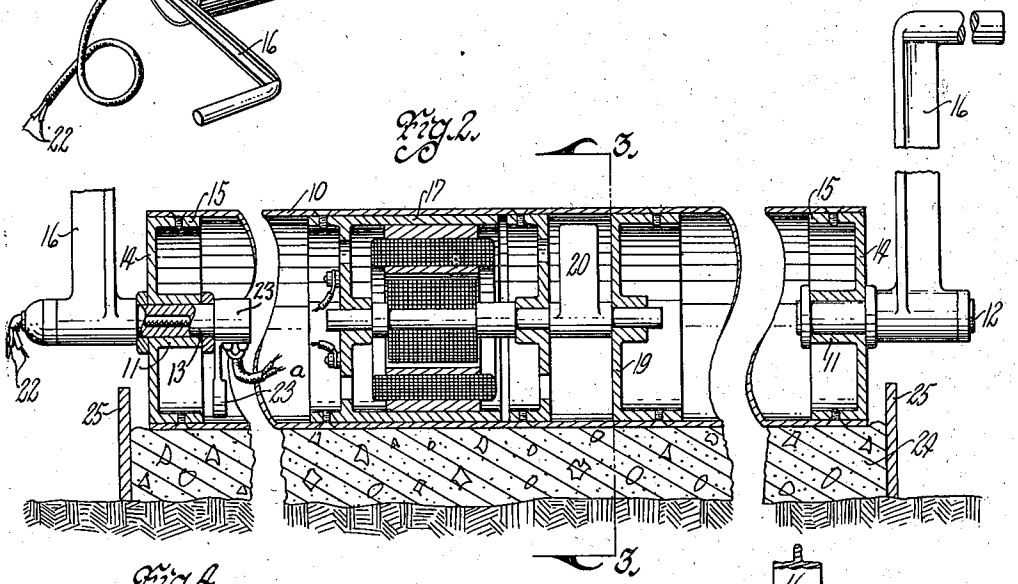


Fig. 4.

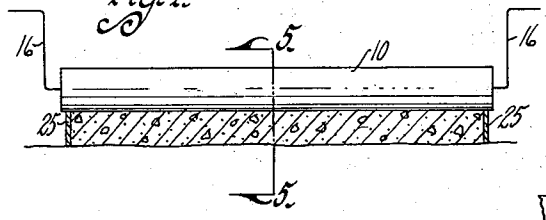


Fig. 3.

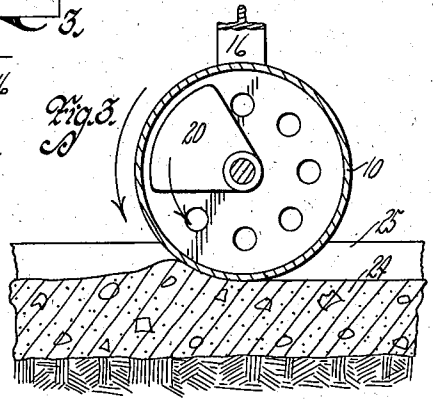
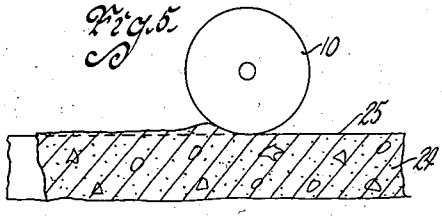


Fig. 5.



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Fig. 6.

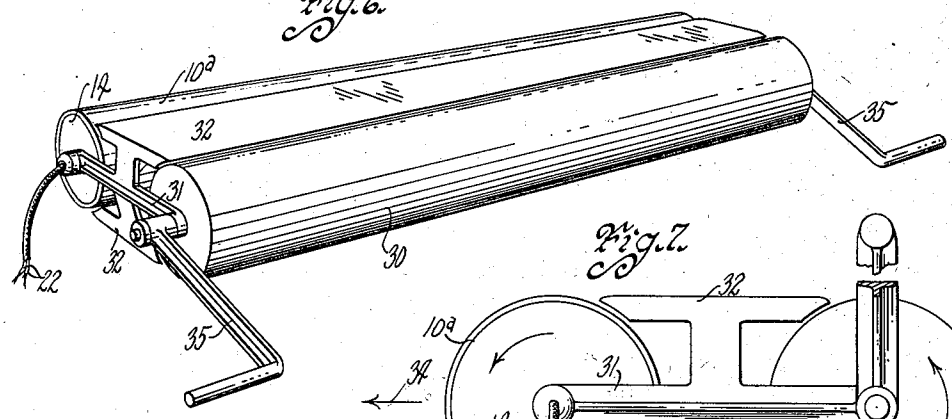


Fig. 7.

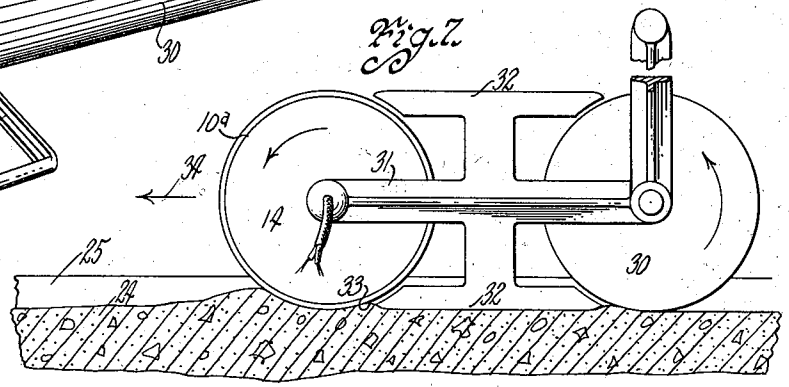


Fig. 12.

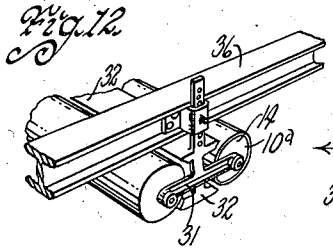


Fig. 8.

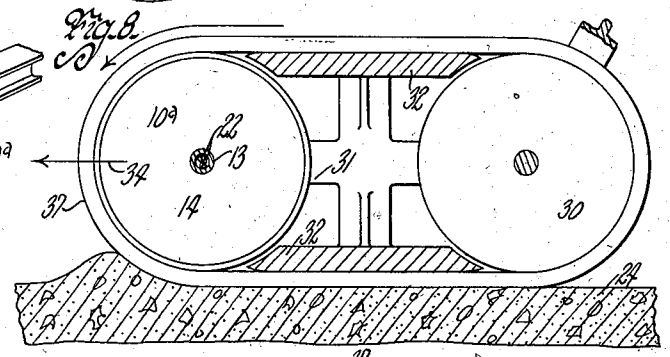


Fig. 9.

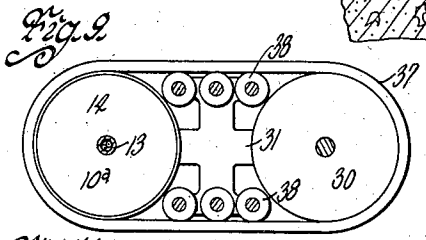


Fig. 10.

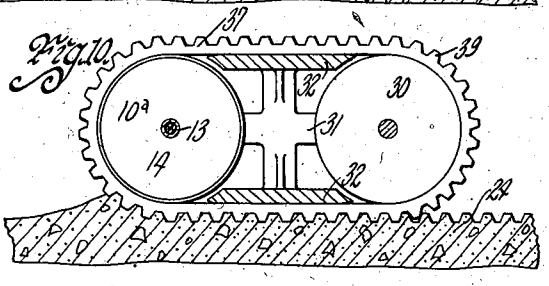
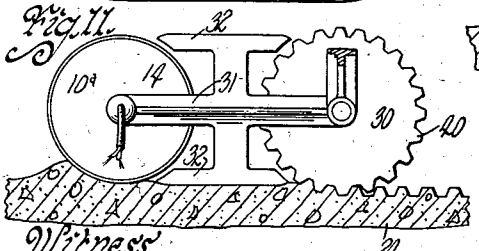


Fig. 11.



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Patented Dec. 31, 1935 2,025,703

UNITED STATES PATENT OFFICE

2,025,703

APPARATUS FOR CONSOLIDATING PLASTIC MATERIALS BY MEANS OF A VIBRATING ROLLER

Robert William Baily, Philadelphia, Pa., and Robert B. Gage, Trenton, N. J.

Application March 5, 1932, Serial No. 597,074

11 Claims. (Cl. 94—48)

The object of our invention is to provide a method and apparatus for consolidating plastic materials by means of a vibrating roller.

More particularly, it is our purpose to provide a method for treating plastic material used for pavement and various other purposes, by subjecting the plastic slab or mass to the operation of a vibrating member rolling over the surface thereof.

Another particular object is to provide suitable apparatus including a member adapted to roll over the surface of a plastic mass and to provide means for imparting vibration to such member during its rolling or traveling movement.

With these and other objects in view, our invention consists in the construction, arrangement and combination of the various parts of our apparatus and in the practice of our method, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in our claims, and illustrated in the accompanying drawings, in which:

Figure 1 shows a perspective view of a simple roller comprising an apparatus embodying our invention and adapted to be used for carrying out our method.

Figure 2 is a vertical, longitudinal, sectional view through the roller shown in Figure 1, illustrating the vibrating apparatus and the means for mounting it in the roller.

Figure 3 is a detail, sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a front elevation, diagrammatic in nature, illustrating the operation of the roller when traveling on forms.

Figure 5 is a diagrammatic view taken on the line 5—5 of Figure 4.

Figure 6 is a perspective view of another form of apparatus in which two rollers are connected together and employed for the purpose.

Figure 7 is an end elevation of the apparatus shown in Figure 8.

Figure 8 is a transverse, vertical, sectional view through an apparatus, such as that shown in Figures 6 and 7 equipped with an endless tread member in the form of a flexible element.

Figure 9 is a view similar to that shown in Figure 8 illustrative of a modified form of the structure shown in Figure 8.

Figures 10 and 11 are similar views of other modifications; and

Figure 12 is a perspective view, parts being broken away, illustrating the manner in which our apparatus may be supported on a carriage or the like.

In making concrete pavement foundations and concrete surface pavements, concrete is ordinarily placed on the sub-grade to such a depth that when struck off or consolidated, its surface will have the elevation and contour desired.

Various methods have been employed for removing the surplus material at the top surface. Frequently a screed with a substantially vertical face is drawn over the slab. The screed may be moved by hand or by a finishing machine. The usual practice is to slide the screed on forms at the sides of the slab. The screed may be given advancing movement and reciprocating movement in various directions. The use of such a screed does not properly condense and consolidate the concrete, and, frequently produces a porous surface by detaching and pulling pieces of the coarse aggregate forwardly.

We have found that the concrete in the bottom part of a pavement or pavement foundation is not properly compacted and consolidated by the methods now in use of striking off and finishing such surfaces with either a hand operated screed or a screed operated by a finishing machine. The top inch or two of the pavement may thus be consolidated but the center and lower part is not properly consolidated.

We have found that if a vibratory force is applied to the surface of a concrete pavement or foundation, the concrete in the center or lower half of such a pavement or foundation will be consolidated and freed of all porosity in the same manner as that in the upper part. The surface thus consolidated can then be brought to the required elevation and given the desired contour by either machine or hand operated screeds.

The devices that have been used to date for consolidating concrete by vibratory method, all require the use of an intermediate device placed between the concrete surface and the vibrating element. This intermediate device or platform was considered necessary to permit the escape of the inclosed water or gases also to provide a support upon which the vibrating element could travel or be attached. The method which we have perfected does not require any such a supporting device or means to permit the escape of the entrained water or gases. When the vibrating element is in the shape of a platform or apron, its elevation must be constantly adjusted to the surface of the concrete, otherwise, it will not function properly, being above the concrete or else would immediately embed itself in the concrete.

When the vibrating element is a roller as here-

in described, entrained water and gases can easily escape from the concrete on each side of the roller as it is slowly advanced over the surface of the concrete. It cannot embed itself in the concrete since its position is constantly changing. Also, the weight of such rollers when vibrated is sufficient to properly consolidate the concrete for the full depth of the pavement or foundation and at the same time form a dense, smooth, homogeneous surface on the concrete.

In this respect the methods which we have perfected differ from any of the others now in use and is a distinct improvement over the others, due to the fact that no intermediate member is required and the entire vibratory force of the vibrating element can be applied directly to the surface of the concrete.

By our method, it is also possible to conveniently roughen and corrugate the lower or base course for the purpose of subsequently adding and bonding an upper course of a different kind of concrete or of bituminous material.

We shall now describe illustrative types of apparatus, which may be used for our purpose, and shall then explain in somewhat greater detail the manner of practicing our method.

In Figures 1 to 5 inclusive, we have shown a hollow roller indicated generally by the reference numeral **10**. Such a roller is preferably provided with the bearings **11** at its ends. In these bearings are journaled the spindle shafts **12** and **13**. The bearings **11** may be carried by end discs **14** provided with annular flanges **15** telescoped into the roller **10**.

The roller may be propelled by means of handles **16** connected with the spindle shafts **12** or may be supported on some sort of a carriage as hereinafter again referred to.

We provide means for imparting vibration to the roller as it is advanced over the concrete mass. Fixed to the interior of the roller **10** is the case of an electric motor **17**. The motor shaft **18** projects from the case **17** and it is extended and is journaled in a spider **19** fixed on the inside of the roller **10**. On the shaft **18** is an eccentric weight **20** for vibrating the roller when the motor is operated.

Electric wires **22** are extended through the shaft **13** which is hollow and thence by any known means to the motor. We show a collector ring **23** journaled on the inner end of the shaft, and thence to the motor. The collector ring is weighted as at **23a** to hold it against rotation.

In Figure 2, we have shown the roller traveling on a plastic slab or pavement **24** between side forms **25**.

In Figure 4, we have shown the roller traveling on the side forms **25**.

Figures 3 and 5 illustrate the manner in which the roller condenses and smooths the top surface of the plastic mass.

In Figure 6, we have shown a slightly different form of our invention. In this form, the roller **10a** is substantially the same as the roller **10** already described. Spaced from the roller **10a** is a second roller **30**. The axles of the respective rollers are connected by the horizontal bars **31**, which rigidly support the horizontal plates **32** arranged with their edges almost in contact with the rollers and with their outer faces in planes slightly above and below respectively the extreme upper parts and the extreme lower parts of the rollers as illustrated in Figure 7.

It will be obvious that both the rollers **10a** and **30** might be vibrated if that were desirable. We prefer, however, to make the front roller the vibrating roller, or by vibrations applied to bars **31** and plates **32**, and through them to the rollers.

When vibration is applied to plastic concrete, the material flows rather easily and has some of the characteristics of a fluid in that it tends to seek its level.

In working some kinds of concrete, the material tends to flow up and behind the vibrating roller as indicated for instance at **33** in Figure 7, and thus to some extent nullify the object of the roller which is to consolidate and level off the fresh plastic material.

By using the double roller arrangement, this tendency of the material to rise behind the vibrating roller can be taken care of and counteracted.

Assuming that the device travels in the direction indicated by the arrow **34**, it will be seen that the plate **32** and roller **30** will smooth and level the surface behind the vibrating roller.

By making the structure device as shown, it is made reversible, so that it may be turned over and either of the plates **32** may be used at the bottom of the structure.

In Figures 6 and 7, we have shown handles **35** connected with the axle or axles of the roller **30**.

In Figure 12, we have shown the vibrating roller mechanism supported from a carriage frame **36**.

It will be understood that any illustrated form of the vibrating roller may be so carried from a carriage or from a larger machine.

In Figure 8, we have shown a slightly modified form of arrangement in which a flexible belt **37** is extended around the rollers **10a** and **30**.

In Figure 9, we have shown another slightly modified form of structure in which instead of the plates **32**, we have provided series of rollers **38**.

In Figure 10 is another modification in which the structure is similar to that of Figure 8, except that the flexible belt **37** is provided with transverse cleats **37** or ribs **39**, which are preferably slightly tapered toward their outer portions.

In Figure 11 is still another modification of the structure shown for instance in Figure 7. In this later modification, the rear roller **30** is provided with transverse ribs or cleats **40**.

There are frequent occasions as where a bituminous wearing surface is to be applied to the concrete when it is desirable to roughen or corrugate the lower or base course.

The cleats are shown as illustrating apparatus by which this corrugation may be done. They may be placed directly on a roller or otherwise.

It will, of course, be understood that the form of the invention in which two rollers are employed may be used directly on the surface of the concrete or may be caused to travel on the forms.

It is obvious from the foregoing that a great variety of structures may be employed embodying the general idea of using a vibrating rolling member. Where such apparatus is employed, the plastic mass can be subjected to weight and vibration at the same time for thus taking out surplus air and water and condensing and consolidating the concrete. Any known means, such as rheostat may be used for controlling the speed of the motor.

This method has numerous advantages.

It is efficient and eliminates certain disadvantages of sliding or dragging a screed over the concrete. It reduces the number of operations that would otherwise be necessary and effects the vibration and condensing, the reduction of the

surface to proper level and contour and in many instances the surface finishing.

It is our intention to cover by our claims any modifications or apparatus or variations in the practice of the method which may come within the scope of our invention.

We claim as our invention:

1. An apparatus of the kind described, the combination of a pair of spaced rollers, means for connecting the rollers together, a plate carried by the rollers and extending close to their faces with its lower face approximately level with the lowermost parts of the rollers and means for circularly vibrating at least one of said rollers.

2. In an apparatus of the class described, a hollow roller, a mechanism inside the roller for transmitting vibrations thereto, comprising an electric motor having a stator fixed to the roller, a rotor, and a vibrator, operatively connected with the rotor and mounted to rotate around the axis of the roller.

3. In an apparatus of the kind described, a pair of parallel horizontally spaced rollers, a frame supported on the rollers, having a plate between the rollers approximately level with their lower faces, and a vibrating mechanism in one of the rollers.

4. In an apparatus of the kind described, a pair of parallel horizontally spaced rollers, a frame supported on the rollers, an endless track device extended around the rollers, and a vibrating device in one of the rollers.

5. In an apparatus of the kind described, a pair of parallel horizontally spaced rollers, a frame supported on the rollers, an endless track device extended around the rollers having means on its exterior for forming grooves in a plastic surface over which the apparatus may travel and a vibrating device in one of the rollers.

6. In an apparatus of the kind described, a pair of parallel horizontally spaced rollers, a frame supported on the rollers, a vibrating mechanism in one of the rollers, one roller having a smooth surface and the other having on its outer face means for forming grooves in a plastic surface over which the apparatus may travel.

7. In an apparatus of the kind described, the combination of a pair of spaced cylindrical surfaces with a plate between the lowest points of said surfaces and means for circularly vibrating said surfaces and said plate in approximately vertical planes perpendicular to the axes of said cylindrical surfaces.

8. In an apparatus of the kind described, the combination of a pair of spaced cylindrical surfaces with a plate between the lowest points of said surfaces, means for circularly vibrating said surfaces and said plate in approximately vertical planes perpendicular to the axes of said cylindrical surfaces and means for determining the elevation of said surfaces and said plate.

9. An apparatus of the kind described comprising the combination of a cylindrical surface with a plate substantially tangent thereto and trailing the lowest point of said surface and means for circularly vibrating said surface and plate in approximately vertical planes approximately perpendicular to the axis of said cylindrical surface.

10. In a device of the class described, a roller adapted to roll over the surface of a material to be vibrated, an eccentric weight supported by the roller to rotate around the axis of the roller, and means for imparting rapid rotation to the weight in the direction of the rotation of the roller on its axis in its rolling travel, for imparting vibration to the roller and to the material over which it rolls.

11. In a device of the class described, a vibration transmitting member having a surface partly cylindrical and partly plane, adapted to travel over the surface of a material to be vibrated, an eccentric weight supported by the member to rotate around an axis approximately parallel to the linear elements of the cylindrical portions of the surface, and means for imparting rapid rotation to the weight in the direction of the travel of the member for imparting vibrations to the surface and to the material over which it travels.

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