United States Patent

[11] **3,547,014**

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[54] **CONCRETE FINISHING APPARATUS**
10 Claims, 13 Drawing Figs.

[52] **U.S. Cl.** 94/45
[51] **Int. Cl.** E01c 19/22
[50] **Field of Search** 94/45, 39, 48, 46, 44

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ABSTRACT: A compact, lightweight, portable apparatus for finishing concrete by vibrating the latter as the apparatus is manually moved thereover. The apparatus includes an elongate, rearwardly extending handle adapted to be adjusted to a convenient angle for the height of a particular operator, and by rotation of the handle, one or more float assemblies forming a part of the apparatus may be adjusted to a desired tilt relative to the surface of the concrete with which they are in sliding contact.

Due to vibrations imparted to the float assemblies, the concrete is in turn subjected to a vibration which causes fines contained in the concrete to be brought to the surface for easier and faster troweling, and also provides a surface zone in the concrete that is denser than the concrete lying thereunder.

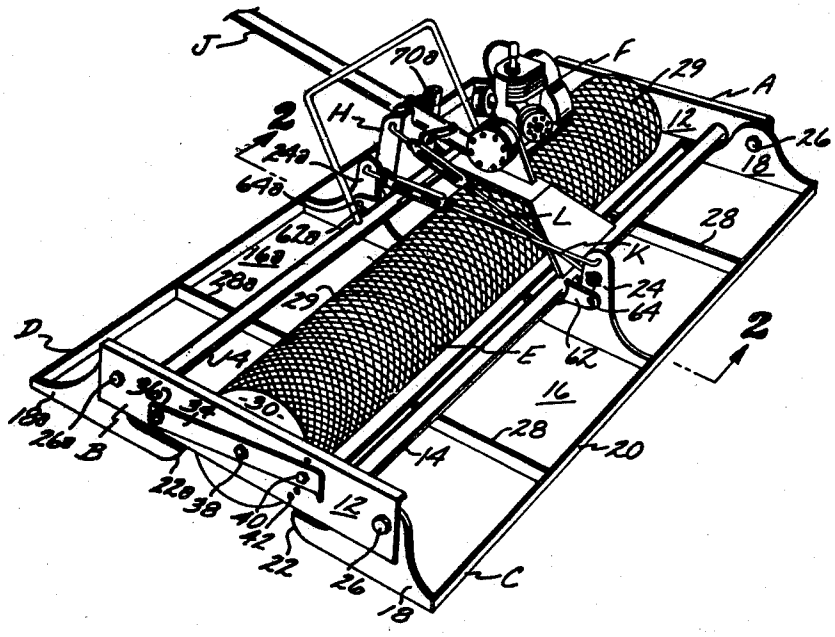


FIG. 1

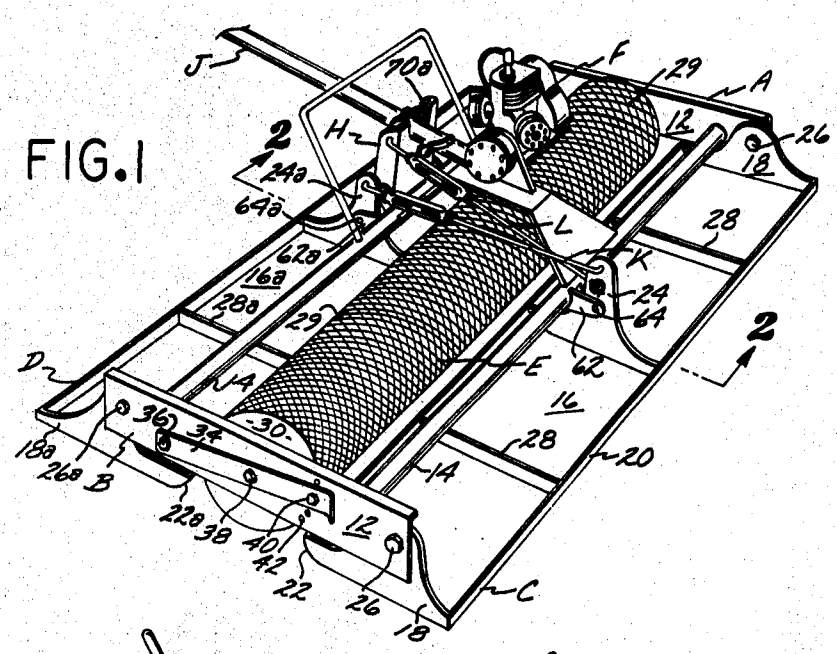


FIG. 2

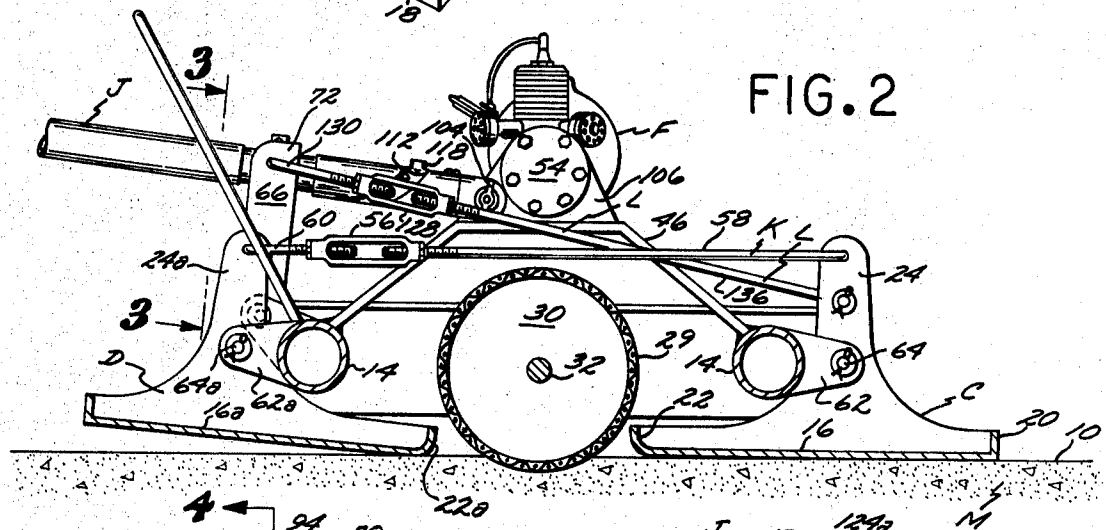
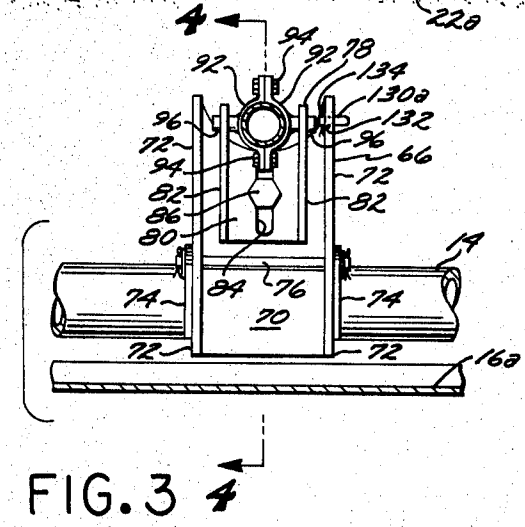
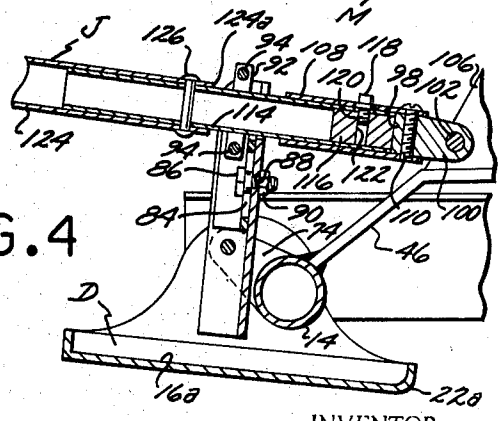


FIG. 3



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FIG. 4



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FIG.5

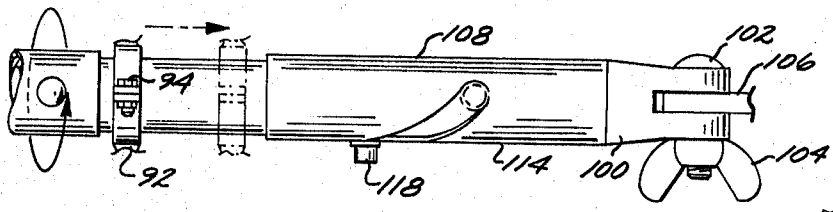


FIG.6

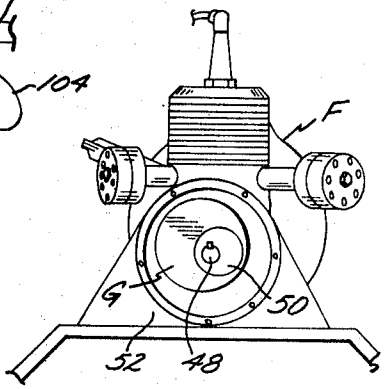
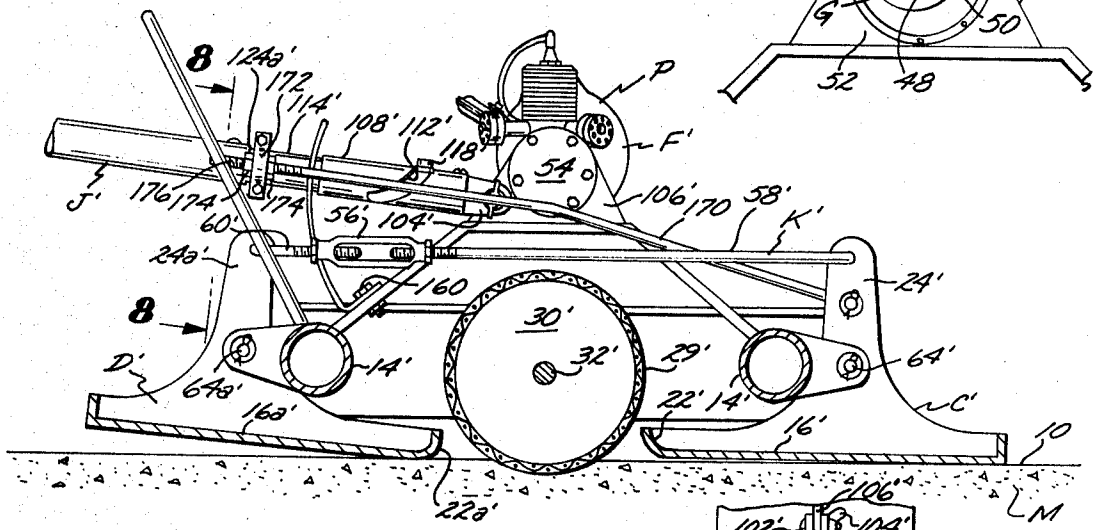


FIG.7



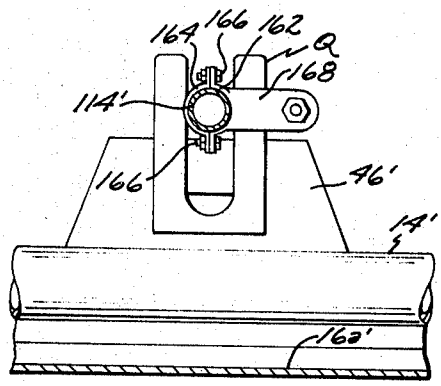


FIG.8

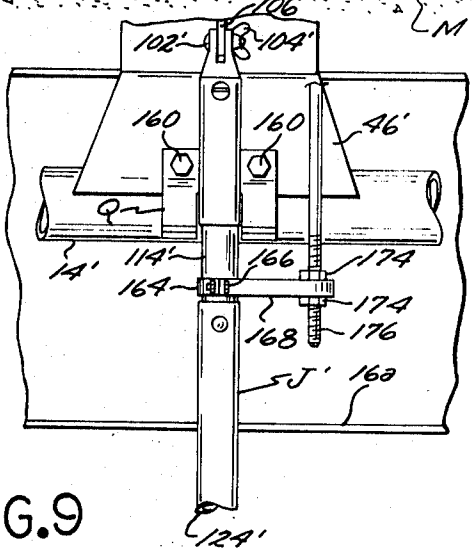


FIG.9

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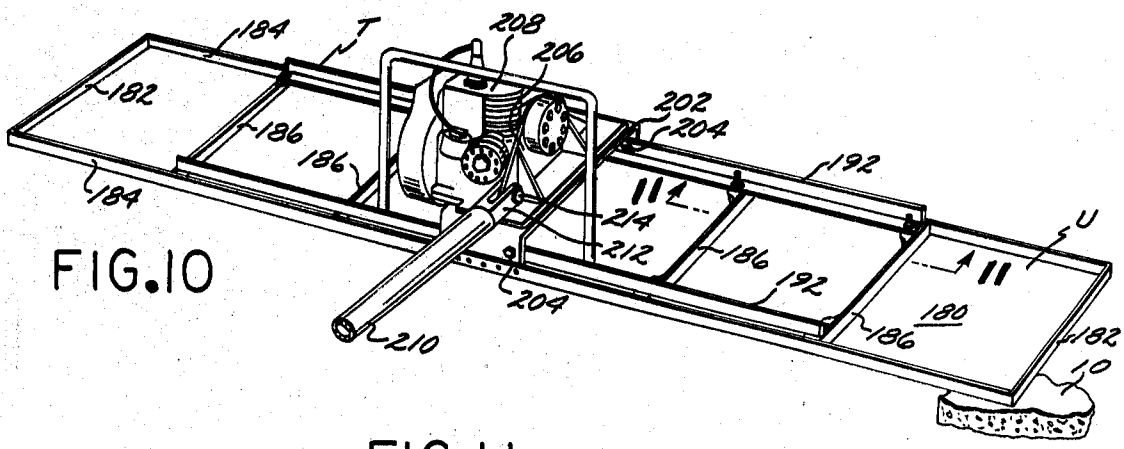
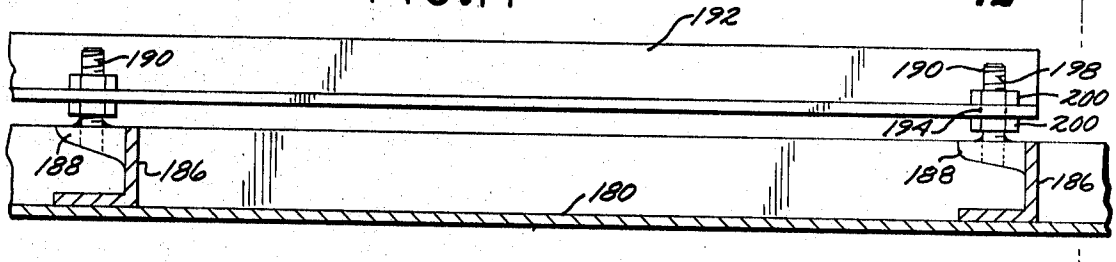


FIG.10

FIG.11



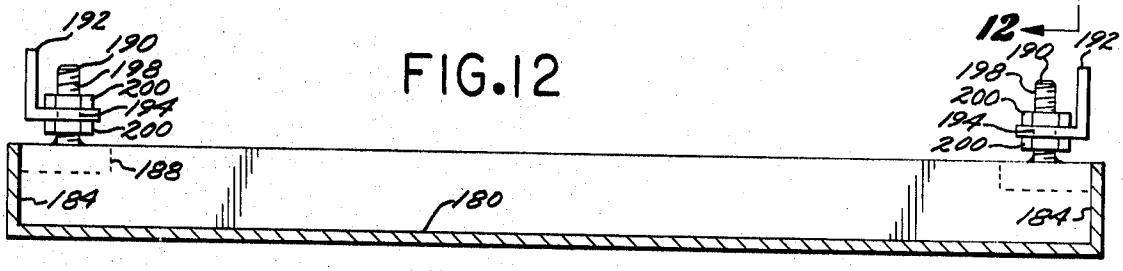


FIG.12

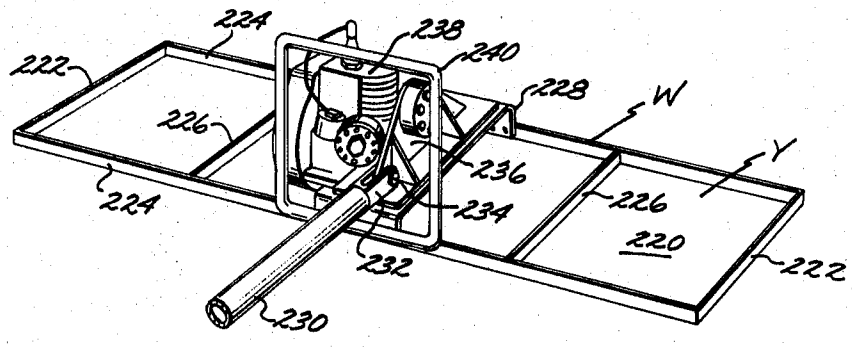


FIG.13

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CONCRETE FINISHING APPARATUS

CROSS REFERENCES TO RELATED APPLICATIONS

Concrete Vibrating and Finishing Machine filed Oct. 14, 1968 under application Ser. No. 767,103, and

Concrete Compacting and Finishing Apparatus filed Feb. 6, 1969 under application Ser. No. 797,150.

BACKGROUND OF THE INVENTION

1. Field of the Invention

An apparatus for concurrently compacting and finishing the surface of a freshly poured body of concrete to a desired texture as the apparatus is moved thereover.

2. Description of the Prior Art

Prior to devising the invention disclosed in copending applications Ser. No. 767,103 and Ser. No. 797,150 it was common practice to compact freshly poured concrete by manually tamping the same and then finishing the surface of the tamped concrete to a desired texture. From an operational standpoint, such tamping has been found to be not only slow and thereby expensive, but at no time has there been any assurance that aggregate in the concrete would be forced downwardly therein a predetermined distance from the surface, or that fines and water in low water content concrete would rise to the surface to the extent that a smooth surface could be imparted to the finished concrete surface.

The present invention overcomes the disadvantages found in earlier tamping methods by providing a portable, lightweight apparatus adapted for use in concurrently vibrating and compacting freshly poured concrete to eliminate voids present therein, but which finishes the concrete to a desired texture.

In addition, the present invention provides an apparatus that is more convenient to use than prior concrete finishing apparatus available heretofore, includes an upwardly and rearwardly extending handle which not only may be adjusted to an angle that is convenient for the height of a particular operator, but by rotation of the handle, float assemblies forming a part of the present apparatus may be adjusted to a selected angle relative to the surface of the concrete being worked.

SUMMARY OF THE INVENTION

A lightweight, portable, concrete finishing apparatus that may be used by a single operator to concurrently tamp and finish the surface of a freshly poured body of concrete to a desired degree of smoothness.

The apparatus includes a power-driven unit which imparts vibrations to at least one float unit as the latter is moved across a body of freshly poured concrete, with the apparatus being moved and guided by a rearwardly extending handle that may be angularly adjusted to the height of a particular operator, and with the handle by selective rotation controlling the tilt of the float assembly relative to the concrete surface with which a portion of the assembly is in sliding contact.

A major object of the invention is to provide a manually operable concrete finish apparatus that includes a rearwardly extending elongate handle that can be adjusted to an angle convenient for the height of a particular operator, which when rotated, tilts a float unit also forming a part of the apparatus to an angle relative to the concrete to permit a desired finish to be imparted thereto.

A further object of the present invention is to provide an apparatus, which when moved over the surface of a freshly poured body of concrete, compacts the same, forces aggregate therein to a desired distance below the surface thereof, and causes fines and water in the concrete to rise to the surface to thereby impart a desired texture thereto.

Another object of the invention is to furnish an apparatus for rapidly and conveniently compacting and finishing concrete without resorting to hand tamping.

Yet another object of the invention is to provide an apparatus by which concrete can be compacted and finished more uniformly than by previously available equipment and methods, with a substantial saving in manpower.

Yet another object of the invention is to provide an apparatus by which concrete can be compacted and finished more uniformly than by previously available equipment and methods, with a substantial saving in manpower.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a first form of the concrete finishing apparatus;

FIG. 2 is a transverse cross-sectional view of the apparatus shown in FIG. 1, taken on the line 2–2 thereof;

FIG. 3 is a combined end elevational and vertical cross-sectional view of the apparatus shown in FIG. 1, taken on the line 3–3 thereof;

FIG. 4 is a longitudinal cross-sectional view of the apparatus, taken on the line 4–4 of FIG. 3;

FIG. 5 is a fragmentary top plan view of the forward portion of the handle provided on the first form of the apparatus;

FIG. 6 is a side elevational view of the power-operated vibration imparting unit mounted on the first form of the apparatus;

FIG. 7 is a side elevational view of a second form of the concrete finishing apparatus;

FIG. 8 is a fragmentary end elevational and vertical cross-sectional view of the second form of the apparatus, taken on the line 8–8 of FIG. 7;

FIG. 9 is a fragmentary top plan view of the second form of apparatus;

FIG. 10 is a perspective view of a third form of the concrete finishing apparatus;

FIG. 11 is a fragmentary, longitudinal cross-sectional view of the third form of apparatus, taken on the line 11–11 of FIG. 10;

FIG. 12 is a transverse cross-sectional view of the third form of apparatus, taken on the line 12–12 of FIG. 11; and

FIG. 13 is a perspective view of a fourth form of the concrete finishing apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The first form of concrete finishing apparatus A, as may best be seen in FIG. 1, includes an open frame B that pivotally supports a forward float assembly C and rear float assembly D. A vertically adjustable, hollow, perforated roller E is rotatably supported from the frame B between the float assemblies C and D.

A power-operated unit F, such as a small internal combustion engine or electric motor, is rigidly secured to frame B, and rotates an eccentrically loaded body G, which is illustrated in FIG. 6. When the body G is rotated, the frame B, float assemblies C and D, and roller E are concurrently vibrated.

A control assembly H for determining positions of the float assemblies C and D relative to the surface 10 of a body M of freshly poured concrete is pivotally supported on the first form A of the apparatus, rearwardly of the power-operated unit F. An elongate handle J is operatively associated with control assembly H and extends rearwardly therefrom. Float assemblies B and C are pivotally connected by a first elongate member K. A second elongate member L connects the forward float assembly C to control assembly H.

Control assembly H and handle J are so operatively associated, as will be explained in detail later, that it is not only possible to angularly position the handle to suit the height of a particular operator (not shown), but by rotating the handle, the float assemblies C and D may be disposed at desired positions relative to the surface 10.

The detailed structure of the apparatus A is described as follows. Frame B includes two parallel, laterally spaced sidepieces 29 12 that are connected by two spaced crossmembers 14, as may best be seen in FIG. 1. An elongate rectangular sheet 16 is incorporated in the forward float assembly C, and

two supports 18 project upwardly from the ends of this sheet. A lip 20 projects upwardly from the forward edge of sheet 16, and is connected to the supports 18. The rear of sheet 16 develops into an upwardly and rearwardly curved lip 22. An arm 24 projects upwardly from substantially the center of sheet 16, as best shown in FIGS. 1 and 2.

The rear float assembly D is of the same structure as that of float assembly C. The elements comprising assembly D are identified herein by the same identifying numerals used for like elements in the float assembly C, but to which the letter *a* has been added.

The supports 18 and 18*a* are pivotally connected to sidepieces 12 by pins or bolts 26 and 26*a*, respectively. The rear float assembly D (FIG. 2) occupies a position on frame B, which is the reverse of that occupied by the forward float assembly C. Due to this reverse positioning, the lips 22 and 22*a* are adjacently disposed. The upper sheets 16 and 16*a* are reinforced by a number of ribs 28 and 28*a* (FIG. 1).

Roller E is defined by a cylindrical shell of rigid material in which spaced openings 29 are formed. Reticulated metal may be conveniently used for the roller E, if desired. The openings 29 are smaller in transverse cross section than that of the aggregate (not shown) used in the body M of concrete so that the aggregate will be forced downwardly a predetermined distance from the concrete surface 10 as the apparatus A is moved thereover.

Two circular plates 30 are mounted in the ends of the shell, which rotatably engage a shaft 32. The ends of shaft 32 are exteriorly threaded (not shown). The ends of shaft 32 extend through vertical slots (not shown) provided in sidepieces 12, and then through bores (not shown) formed in two roller-adjusting levers 34 that are pivotally supported from sidepieces 12 by bolts 36, as illustrated in FIG. 1. The threaded ends of the shaft 32 project from the adjusting levers 34, and are engaged by nuts 38.

A bore (not shown) is provided in the forward portion of each adjusting lever 34 through which a bolt or pin 40 may be extended to engage any desired one of a number of vertically spaced openings 42 formed in the sidepiece 12 most adjacent thereto. The bolts 40 are used to hold the levers 34 at positions where the lower extremity of roller E is disposed a desired distance below the sheets 16 and 16*a* when the sheets are substantially parallel, in the manner shown in FIG. 2.

An inverted U-shaped bracket 46 is secured to, and extends between crossmembers 14. Bracket 46 serves as a support for the engine F. Engine F may be a small internal combustion engine as illustrated in the drawings, or an electric motor (not shown), if preferred. Engine F includes a drive shaft 48 on which an eccentrically weighted body G is mounted (FIG. 3). The eccentric G is preferably disposed within a housing 52 provided with a cover plate 54, which is removably secured thereto. When the engine F is in operation, vibrations therefrom are transmitted through bracket 46 to frame B, and from the frame to the roller E and float assemblies C and D.

The first connecting member K includes a turnbuckle 56 to which forward and rear rods 58 and 60, respectively, are threadedly connected. The rods 50 and 60 are also pivotally connected to the upper portions of arms 24 and 24*a*, respectively, as shown in FIGS. 1 and 2. Rotation of the turnbuckle 56 permits angular adjustment of the float assemblies C and D relative to one another. Two brackets 62 and 62*a* project from the crossmembers 14 (FIG. 2), and support pins 64 and 64*a*. The pins 64 and 64*a* pivotally support the arms 24 and 24*a*, and are in coaxial alignment with the sets of bolts 26 and 26*a*.

Control assembly H includes a first channel-shaped member 66 that is positioned above sheet 16*a*, rearwardly of bracket 46, as may best be seen in FIG. 4. Member 66 includes a web 70 and two laterally spaced flanges 72 (FIG. 3). Two rearwardly extending lugs 74 are secured to the rear crosspiece 14, and are disposed adjacent to flanges 72, as also shown in FIG. 3. The first member 66 is pivotally supported from lugs 74 by a transverse shaft that extends through aligned openings in the flanges 72 and lugs 74.

A second channel-shaped member 78 is longitudinally disposed within the first member 66. Second member 78 includes a web 80, and laterally spaced flanges 82. A longitudinally extending slot 84 is formed in web 80, which slidably engages a bolt 86 that projects through a bore 88 in web 70. The webs 70 and 80 are in abutting slidable contact. By tightening a nut 90 which engages bolt 86, the second member 78 may be adjustably supported at a desired height relative to the first member 66.

Two semicircular supports 92 are provided for handle J that are clamped together by bolts 94, as illustrated in FIG. 3. Stub shaft 96 project in opposite directions from the supports 92, with the shafts being pivotally supported in aligned openings (not shown) in flanges 82.

Handle J (FIG. 4) includes a cylindrical plug 98, the forward end portion 100 of which is pivotally supported by a bolt 102 and engaging wingnut 104 from a flange 106 that extends upwardly from bracket 46. A tubular sleeve 108 secured to the plug 98 extends rearwardly therefrom. A curved cam slot 102 is formed in sleeve 108 (FIG. 2).

A first tubular sleeve 114 is rotatably and slidably mounted in supports 92, as may be seen in FIGS. 3 and 4. An insert 116 is provided in the forward end of tubular sleeve 114, and this sleeve projects through a recessed upper portion 70*a* of web 70 in the manner shown in FIG. 1. A cam follower 118 slidably engages slot 112. The cam follower 118 is held in a fixed position on the forward end of sleeve 114 by a screw 120, which engages tapped bores formed in the insert 116 and member 114. A second elongate tubular member 124 engages the rear portion of first sleeve 114, and is rigidly secured thereto by a rivet 126, or the like.

The second elongate member L includes a turnbuckle 128 that engages the threaded end of a first rod 130, which in turn extends rearwardly to develop into a short leg 130*a*. Leg 130*a* projects through an opening formed in the upper portion of one of the flanges 72. Inadvertent disengagement of leg 130*a* from flange 72 is prevented by a cotter pin 134 (FIG. 3).

Turnbuckle 128 also engages the rear threaded end of a forwardly extending second rod 136 which is pivotally connected to the upper end of arm 24 in the same manner in which the first rod 130 is connected to flange 72. An inverted U-shaped handle N projects upwardly from the rearwardly disposed crosspiece 14 for convenience in moving the apparatus A from place to place.

The first form A of the apparatus is most easy to use in finishing the surface 10 of a body M of freshly poured concrete. The nut 90 is first loosened to permit the handle J to be so angularly disposed that it is convenient for the height of the particular operator (not shown) using the apparatus. Nut 90 is tightened to maintain the handle J at the desired angle. Thereafter, the second channel-shaped member 78 moves relative to the first channel-shaped member 66, and the supports 92 pivot relative to the flanges 82.

Power unit F is then actuated, and by means of the handle J the apparatus A may be moved across the body M of freshly poured concrete. Vibrations generated by rotation of the eccentric G are transmitted to the concrete through the float assemblies C and D and roller E. The vibrations serve to compact the body M of concrete by causing air entrained in bubbles therein to escape from the concrete. The vibrations also cause fines and water to rise to the surface of the concrete body M. The roller E extends downwardly below the float assemblies C and D, and as a result, aggregate near the surface 10 is forced downwardly into the concrete a predetermined distance. This distance is determined by the setting of the roller adjustment levers 34.

When the second tubular member 124 is rotated in an appropriate direction, the forward edge 124*a* thereof pressure contacts supports 92 due to the movement of the cam follower 118 relative to cam slot 112. Such pressure contact results in pivotal movement of the channel-shaped member 66 on shaft 76, and this pivotal movement is transferred to the float assemblies C and D through the first and second members K and

L. Thus, the float assemblies C and D may be so positioned as to impart a desired finish to the surface **10** when the apparatus is moved thereover.

A second form P of the concrete finishing apparatus is shown in FIGS. **7—10** inclusive that is of the same structure as the first form A, except for the control assembly H and second connecting member L. Elements in the second form P common to the first form A are identified by the same numerals and letters, but to which a prime has been added.

In the second form P of the apparatus the control unit H is replaced by a bifurcated member Q that is rigidly secured to the rear portion of bracket **46'** and slidably engages second sleeve **114'**. Member Q serves both as a guide and support for the handle J', prevents lateral movement of the handle relative to form P of the apparatus, as well as limits the degree to which the handle can pivot downwardly towards the surface **10**. The member Q, as may be seen in FIG. **7**, is secured to bracket **46'** by bolts **160**, or other suitable fastening means.

First and second semicircular members **162** and **164** encircle sleeve **114'**, and are removably held together by bolts **166**. An arm **168** extends outwardly from first member **162**. The forward end of a rod **170** is pivotally connected to arm **24'**. The rear end portion of rod **170** is threaded, and extends through an opening **172** in arm **168**. Two lock nuts **174** engage the rear threaded end **176** of rod **170** and hold the rod at a desired adjusted position relative to arm **168**.

Rotation of the handle J' causes movement of follower **118'** relative to cam slot **112'**, with the end **124*a'*** of second tubular member **124'** being brought into pressure contact with members **162** and **164** as a result thereof. Such pressure contact results in movement of rod **170** to tilt float assembly C', with the pivotal movement of float assembly C' being transferred to float assembly D' through the first rod K', as may be seen in FIG. **7**. The second form P of the apparatus operates in substantially the same manner and accomplishes the same results as the first form A of the device.

A third form T of the concrete finishing apparatus is shown in FIGS. **10—12**, which may be used as a primary tamp in restricted areas that cannot be reached by the first and second forms of the apparatus described herein. The third form T of the apparatus includes but a single float assembly U that rests on the surface **10** of the body M of freshly poured concrete to be finished.

Float assembly U includes an elongate rectangular sheet **180**, from the edges and sides of which flanges **182** and **184** extend upwardly. A number of laterally spaced, parallel, first reinforcing channels **186** extend between flanges **184**, with the channels being in abutting contact with the upper surface of sheet **180**, as shown in FIG. **11**.

The first channels **186** support lugs **188** at the ends thereof from which stud bolts **190** project upwardly (FIG. **11**). Openings **194** are formed in two second longitudinally extending channels **192**, through which the bolts extend, and the threaded ends **198** of the bolts **190** are engaged by lock nuts **200** to secure the second channels to the bolts.

An inverted U-shaped support **202** is transversely positioned relative to second channels **192** and secured thereto by bolts **204**, or other suitable fastening means. A flange **206** extends upwardly from support **202**. A vibration imparting power unit **208** of the same type as previously described unit F is secured by conventional means (not shown) to the support **202** and flange **206**. An elongate tubular handle **210** having a bifurcated end **212** is provided, with the bifurcated end being pivotally connected to flange **206** by a bolt or pin **214**. An inverted U-shaped handle **216** extends upwardly from the rear **192** of the apparatus, as shown in FIG. **10**, to permit the third form T of the apparatus to be carried from place to place.

When the power-driven vibration imparting unit **208** is operating, and the third form T of the apparatus is operating, the apparatus may be moved and guided over a surface **10** of a body M of freshly poured concrete by means of handle **210** to compact the concrete and finish the surface thereof to a desired degree of smoothness.

A fourth form W of the concrete finishing apparatus is shown in FIG. **13** that also includes but a single float assembly Y. The float assembly Y includes a rectangular sheet **220**, from the ends and sides of which flanges **222** project upwardly, as well as a number of transverse reinforcing ribs **226** that extend between the flanges **224**. An inverted U-shaped support **228** extends between the central portions of flanges **224** and is secured thereto by conventional means (not shown). A tubular handle **230** is provided that has a bifurcated end **232**, and this end of said handle is pivotally connected by a pin or bolt **234** to a flange **236** which extends upwardly from support **228**.

A power-driven vibration imparting unit **238** is mounted on support **228** by conventional means (not shown). A square handle **240** is secured to the central portion of rear flange **224**. Handle **240** is used in moving the fourth form W of the apparatus from place to place. The fourth form W is used in the same manner and serves the same purpose as the third form T of the apparatus, but is of lighter weight and simpler construction than the latter.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is simply illustrative. Also, since the scope of the invention is defined by the appended claims, all changes falling within the metes and bounds of the claims, or that provide their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by these claims.

I claim:

1. In a lightweight portable apparatus for compacting a body of freshly poured concrete containing aggregate and fines, which apparatus is of the type that includes an elongate perforated roller, an open frame in which said roller is rotatably supported in a position to extend therebelow, forward and rear float assemblies pivotally supported from said frame on opposite sides of said roller, a first rod assembly that pivotally connects said forward and rear float assemblies, power-operated means for concurrently vibrating said roller and said forward and rear float assemblies, the improvement for manually moving and guiding said apparatus over said body whereby said roller forces aggregate adjacent said surface a predetermined distance therebelow, with vibrations imparted to said body by said float assemblies causing said fines to rise to the surface of said concrete where they assist in forming a smooth finish on said surface by contact with said float assemblies as said apparatus is moved relative to said body, which improvement comprises:

a. a first sleeve that extends rearwardly from said frame, in which sleeve a curved cam slot is formed;

b. first means pivotally connecting a forward end of said sleeve to said frame;

c. a second sleeve slidably and rotatably mounted in said first sleeve;

d. a cam follower on said second sleeve that slidably engages said cam slot;

e. an elongate tubular handle provided with a forward edge which extends over a rear portion of said second sleeve and is rigidly secured thereto;

f. second means supported from said frame and extending about said second sleeve to permit said handle to be angularly adjusted to a position convenient to the height of the particular operator using said apparatus, with said second means also tending to prevent lateral movement of said second sleeve relative to said frame;

g. third means in slidable and rotatable contact with said second sleeve, which third means is moved when pressure contacted by said forward edge of said handle as said handle, second sleeve and cam follower are rotated to move said cam follower relative to said cam slot; and

h. fourth means connecting said third means to said forward float assembly to pivot the latter to a desired position relative to said surface, which forward float assembly as it pivots, moves said rear float assembly concurrently

therewith due to said first rod assembly extending therebetween.

2. An improved apparatus as defined in claim 1 which further includes:

i. a support that extends upwardly from said frame and on which said power-operated means is rigidly mounted; and

j. a flange extending upwardly from said support to which said first means is pivotally connected.

3. An improved apparatus as defined in claim 1 wherein said first means further includes:

k. a bifurcated end formed on the forward portion of said second sleeve; and

l. a pin that extends through aligned openings in said flange and bifurcated end.

4. An apparatus as defined in claim 1 wherein said second means comprises a bifurcated rigid sheet secured to said frame, which sheet limits the degree to which said handle may pivot downwardly relative to said frame.

5. An apparatus as defined in claim 4 wherein said third means comprises a collar, and said fourth means is a second rod assembly extending between said collar and said forward float assembly.

6. An apparatus as defined in claim 1 wherein said second means includes:

i. a first member pivotally supported from said frame;

j. a second member adjustably supported for longitudinal movement on said first member;

k. a collar that slidably and rotatably engages said second sleeve; and

l. shaft means that rotatably support said collar from said second member.

7. An improved apparatus as defined in claim 6 wherein said third means comprises said first and second members, said collar, and said shaft means.

8. An improved apparatus as defined in claim 7 wherein said fourth means comprises a rod assembly that extends between said first member and said forward float assembly.

9. A lightweight portable apparatus for finishing the surface of a body of freshly poured concrete to a desired texture and for compacting said body of concrete, including:

a. a flat, rectangular sheet, from the sides and ends of which first flanges extend upwardly;

b. an inverted U-shaped support transversely positioned on the upper center portion of said sheet and rigidly secured thereto;

c. a power-operated vibration imparting unit mounted on said support;

d. a second flange extending upwardly from said support;

e. an elongate, rearwardly extending handle; and

f. means for pivotally connecting the forward portion of said handle to said second flange, which sheet when moved across said surface and in contact therewith vibrates said concrete to force fines and air bubbles in said concrete to the surface thereof, compact said concrete, and impart a desired texture to said surface.

10. An improved apparatus as defined in claim 9 which further includes: handle means secured to said sheet by which said apparatus may be moved from place to place.