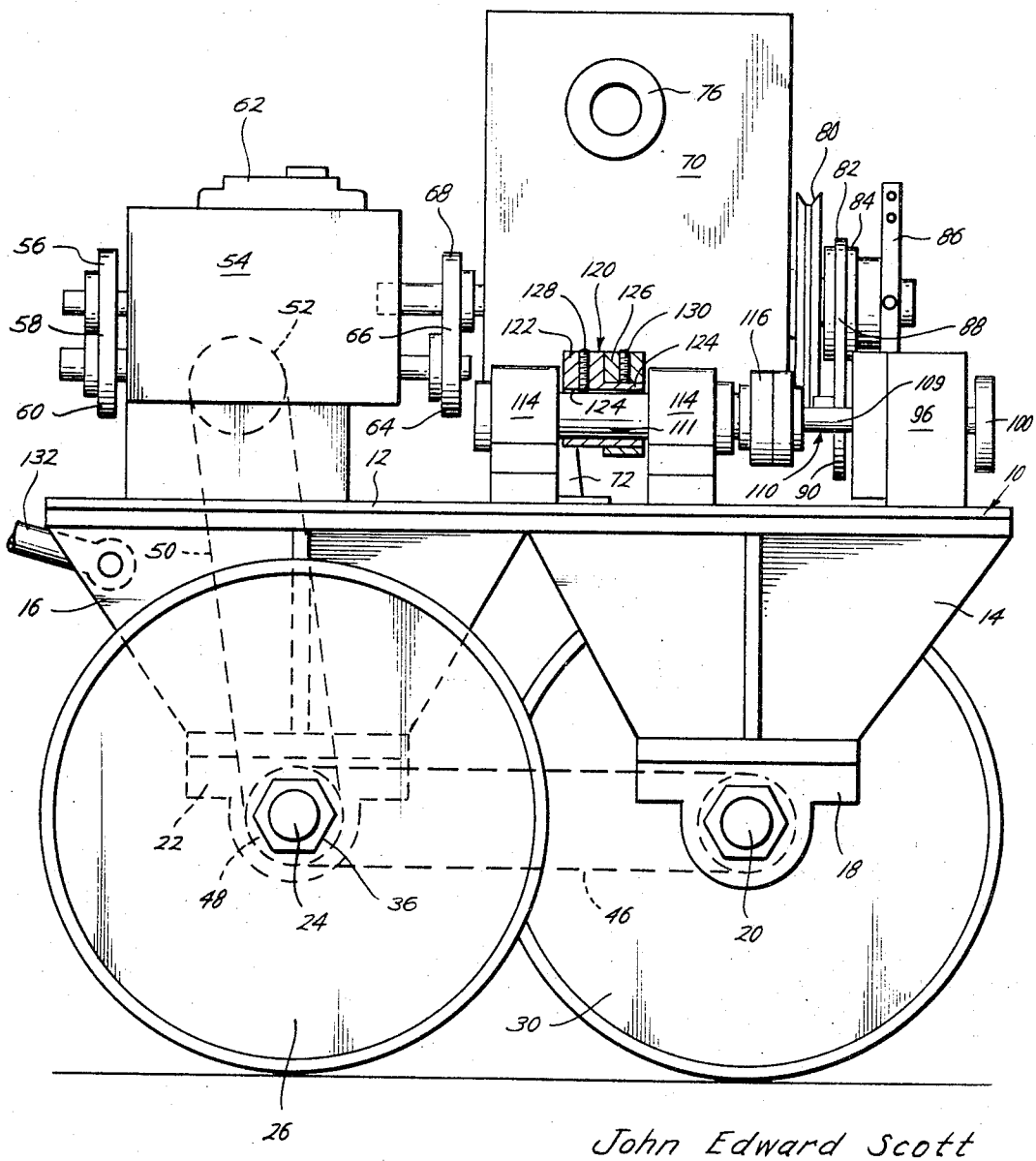
Feb. 11, 1969 J. E. SCOTT 3,426,660

SOIL COMPACTOR

Filed Nov. 2, 1966 Sheet 1 of 4

Fig. 1



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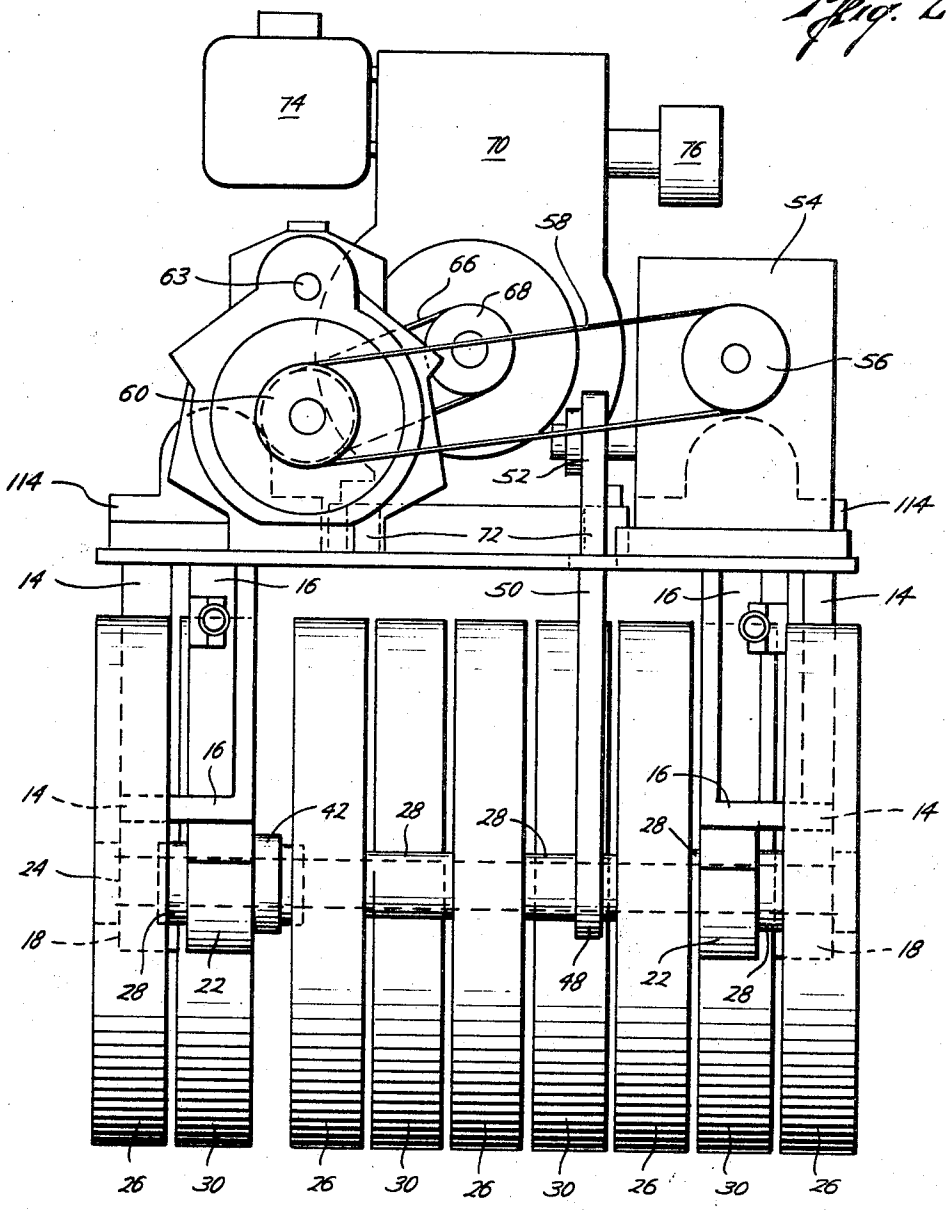
Feb. 11, 1969 J. E. SCOTT 3,426,660

SOIL COMPACTOR

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Fig. 2



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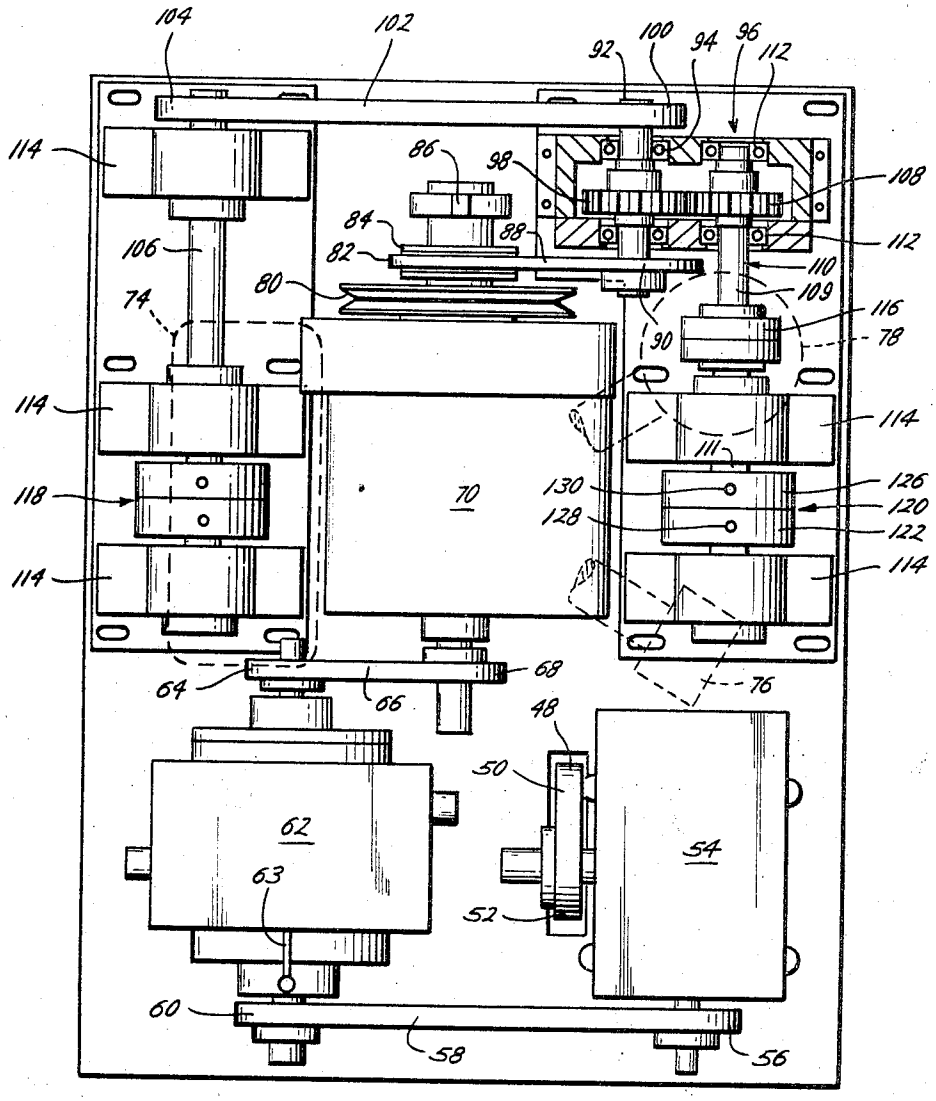
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SOIL COMPACTOR

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Fig. 3



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SOIL COMPACTOR

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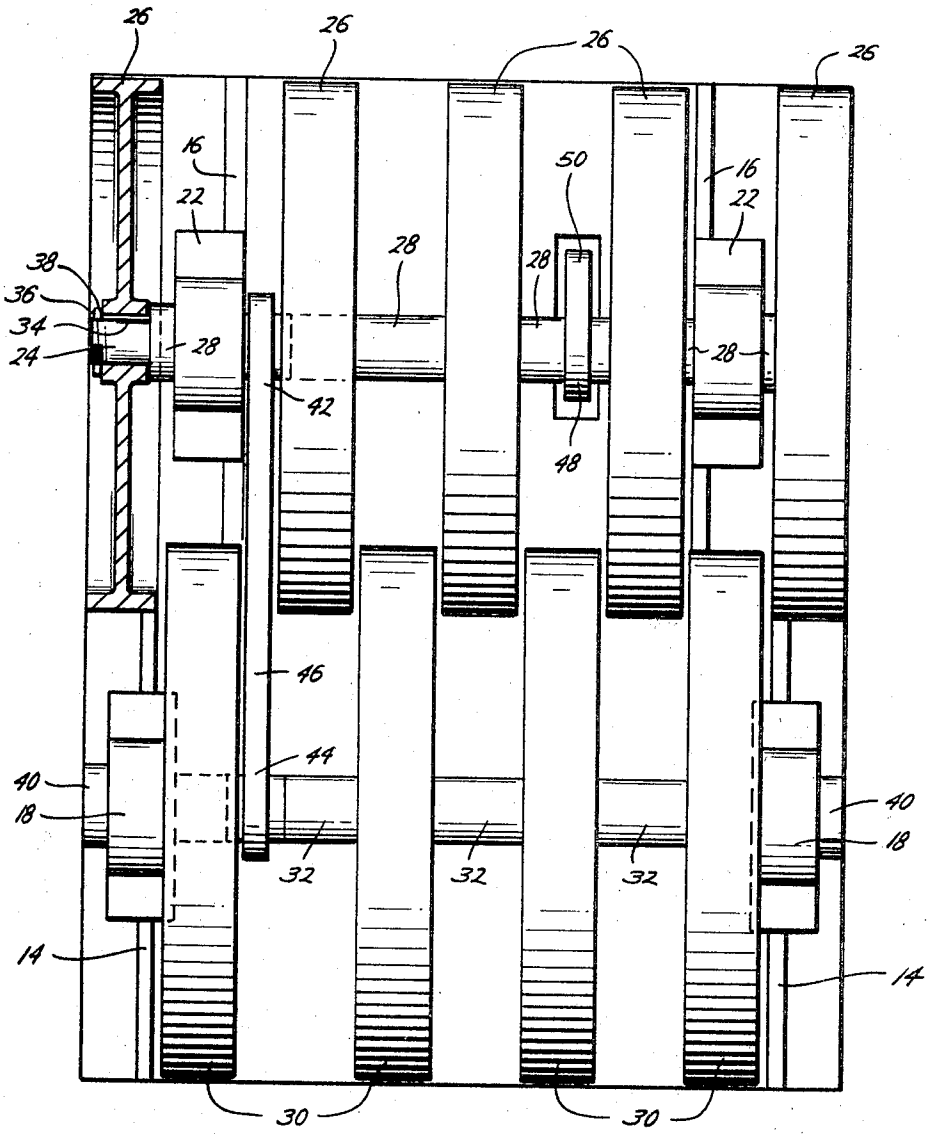


Fig. 4

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3,426,660

SOIL COMPACTOR

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U.S. Cl. 94—50 6 Claims
Int. Cl. E01c 19/26

ABSTRACT OF THE DISCLOSURE

Apparatus is provided for earth compacting, including a couple of parallel axles on a frame, each axle having thereon spaced apart wheels. Wheels on one axle extend into the spaces formed between the wheels of the parallel axle. Eccentrics are provided on the frame for giving vibratory motion to the wheels, such motion being effective only in the vertical direction.

The invention concerns a compactor which is suitable for compacting various materials, such as earth, asphalt, and the like.

Many mechanical devices have been developed for the purpose of compacting soil. Some of the ones which have appeared on the market include wide-iron rollers, multi-wheeled rollers, vibratory flat-plate compactors, and vibratory rollers. Each of the devices has its limitations as to general use, and each is best suited for special duty on a particular soil. For example, no prior art compactor is known to applicant that can compact effectively both cohesive material and granular material.

Briefly, the present invention relates to a compactor suitable for compacting earth, asphalt, etc., which includes a frame having a couple of parallel axles. On each of these axles is mounted wheels in spaced apart relation. The wheels on one axle extend between the wheels on the parallel axles by extending into the spaces between those wheels, in a manner such that coaction of the wheels and kneading of the surface is provided. Desirably included on the frame are eccentrics for imparting vibratory motion the compactor, the construction of the eccentrics being such that the vibratory motion provided is cumulative in the vertical direction but self-cancelling in the horizontal direction.

The invention provides a compactor suitable for compacting material such as earth, which is capable of compacting not only cohesive material such as clay, but also granular material such as sand. A particular advantage of a compactor in accordance with the invention is that it may be designed to compact soil backfills in ditches or trenches where the composition of the soil may vary from place to place within the individual ditch or trench.

In one embodiment of the invention, the compactor comprises a frame, at least two axles mounted on the frame in substantially parallel relationship, and a plurality of compacting wheels mounted on the axles, at least two of the wheels being spaced apart and at least one wheel on the other axle extending between the two spaced wheels sufficiently to permit coaction between the two spaced wheels and the wheel extending therebetween in respect to kneading material to be compacted. Preferably, all of the wheels on one axle are spaced apart to form spaces therebetween and at least one wheel on the other axle extends into each of the spaces, the wheels and spaces being aligned and being of such widths that substantially complete compacting action is provided between the laterally outermost wheel on one side of the compactor and the laterally outermost wheel on the other side when the compactor is moving forward or backward. The compacting wheels are preferably narrow in width, and are preferably spaced apart a distance slightly more than the width

of a wheel, whereby effective kneading action can be achieved.

The compactor preferably includes a means for imparting vertically vibratory motion to the compacting wheels. For example, this means may include at least two eccentrics mounted on the frame of the compactor, the eccentrics being arranged whereby centrifugal forces developed thereby are substantially cumulative vertically and substantially self-cancelling horizontally. Such an arrangement minimizes problems in controlling the compactor during operation.

Theory and experiment indicate that best results are obtained in the compaction of granular and cohesive materials when the compactor is vibrating at the resonant frequency of the material being compacted. Of course, resonant frequencies of different materials vary over a wide range.

To permit ease of use under field conditions, one embodiment in accordance with the invention includes adjustably weighted eccentrics which may be rotated at different speeds such that the proper frequency and amplitude of the vibratory action can be selected under field conditions for compacting either cohesive or granular materials, or both. Faster vibrating frequencies and smaller amplitudes are needed for granular materials, while lower frequencies and larger amplitudes are needed for cohesive materials. The vibratory motion is particularly effective when combined with the kneading action of alternate integrated wheels as described above.

In another embodiment of the invention, a compactor is provided which can operate with equal efficiency both forward and backward so that when lowered into a trench, for example, it can work both forward and backward along the trench without having to be lifted from the trench and turned around. In addition, the compactor for this use is preferably constructed such that no part of the supporting frame extends beyond the laterally outermost wheels on opposite sides of the compactor so that the compactor can operate effectively along a trench wall.

A compactor in accordance with the invention also preferably includes means for driving each of the compacting wheels. This feature permits the compactor to move over rather steep slopes with facility, with a minimum of sliding down slope, and also provides a better kneading action between the integrated wheels located on different axles.

In the drawings:

FIG. 1 is a schematic view of one embodiment of a compactor in accordance with the invention;

FIG. 2 is a schematic end view of the compactor shown in FIG. 1, viewed from the left;

FIG. 3 is a schematic plan view of the compactor shown in FIG. 1; and

FIG. 4 is a schematic bottom view of the compactor shown in FIG. 1.

The following design herein disclosed is contemplated to be approximately 23 inches wide for convenient work in ditches and for preparation of sidewalks, being guided by a walking operator using a long handle. Persons in the art, however, will realize that the features thereof are equally applicable to large, ballasted compactors, self-propelled units, or tractor-pulled units. In such cases, a separate set of forward or rearward wheels, which may or may not carry substantial vertical load, may be added to permit steering if desired. Further, means for heating the compacting wheels may be included if asphalt is the material to be compacted.

For purposes of clarity, bolts and other obvious means of mounting are omitted from the drawings and the following description.

With reference to the drawings, particularly FIG. 1, the compactor there shown comprises a frame **10** includ-

ing a frame base plate **12**, a pair of spaced supports **14** extending downwardly from the base plate **12** near the front of the compactor, and a pair of spaced supports **16** extending downwardly near the rear of the compactor. A pair of pillow blocks **18** connected to the supports **14** have an axle **20** journaled therein, and a pair of pillow blocks **22** connected to the supports **16** and have an axle **24** journaled therein. The axles **20** and **24** are thus maintained in parallel relationship with respect to each other.

Five narrow wheels **26** are mutually spaced along the axle **24**. As shown, the wheels **26** are preferably made of steel with a cylindrical compacting surface, and are preferably narrow in width in order to provide individually a small compacting area. The wheels may be maintained in spaced relationship by means of cylindrical spacers **28** of appropriate lengths.

Four wheels **30** are mutually spaced on axle **20** and are so disposed as to extend into the spaces between the wheels **26**. The wheels **30** may be spaced by means of cylindrical spacers **32** of appropriate lengths. Each of the wheels **26** and **30** are keyed to the axles **24** and **20**, respectively, such as by the key **34** disposed in a suitable keyway. For ease of manufacture and assembly, the keyway of each axle may run the entire length of the axle. The wheels **26** are maintained on the axle **24** by a suitable locknut **36** and lockwasher **38** at each end thereof. Journal end blocks **40** maintain the axle **20** in the pillow blocks **18**.

Thus, the wheels **26** and **30** are integrated with one another in close relationship to effect coaction in kneading of the material being compacted, particularly in the case of granular material. The wheels are also so aligned as to provide substantially complete coverage of the material being compacted, whereby a substantially smooth compacted surface results. The spacers between the wheels **26** and **30** are preferably slightly greater than the width of the wheels themselves such that the wheels on one axle cooperate to substantially fully occupy the spaces between the wheels on the second axle. Of course, the wheels on one axle may extend into the spaces between wheels on the other axle for a greater distance than shown in the drawing, if desired. In addition, one could employ integrated wheels on three or more axles if such was desired.

A sprocket **42** keyed to the axle **24** and a sprocket **44** keyed to the axle **20** are engaged with a driving chain **46** so that all the wheels **26** and **30** revolves together. A sprocket **48** is also keyed to the axle **24** and is engaged with a chain **50** which in turn is engaged with a driving sprocket **52**, whereby all the wheels **26** and **30** can be driven simultaneously.

The driving sprocket **52** is connected with a speed reducing means **54**, such as a worm gear arrangement, which includes a driven sprocket **56**. The sprocket **56** engages drive chain **58** which in turn engages a sprocket **60** connected with a transmission **62**. Transmission **62** preferably includes a reversing feature and may also include gears in which to vary the output speed. The speed reducer **54** of course may also be variable as to output speed. Transmission **62** is driven through sprocket **64** which engages chain **66** which in turn engages a sprocket **68** driven by an internal combustion engine **70** or other suitable power source. The engine **70** is preferably mounted on the frame **10** through vibration isolators **72**. The speed reducer **54** and transmission **62** may be mounted to the frame directly. A shifting lever **63** extends from the transmission **62**.

The engine **70** may include a gasoline tank **74**, a muffler **76**, and an air cleaner **78** located in any convenient position.

The engine **70** includes a starter sheeve attached to its drive shaft, and a drive sprocket **82** attached to its drive shaft through clutch means **84** including clutch shift yoke **86**. The sprocket **82** is engaged with a chain **88** which in turn engages a sprocket **90**. Sprocket **90** is keyed on a shaft **92** which is mounted in bearings **94** in a gear box assembly **96**.

Also mounted on the shaft **92** is a gear **98** and a sprocket **100**, both of which are keyed to the shaft **92**. The sprocket **100** engages a timing chain **102** which engages a sprocket **104** keyed to a shaft **106**. A gear **108** is engaged with the gear **98** in the gear box assembly **96**, and is keyed on a shaft **110** which is mounted in the gear box assembly by bearings **112**. The shaft **106** and **110** are maintained in parallel relationship by means of pillow blocks **114**, which may be connected directly to the frame **10**. The shaft **110** may include a shaft **109** connected to a shaft **111** through a suitable coupling **116** to permit easy assembly of the machine.

Consequently, rotation of the sprocket **82** will cause the shaft **92** and the shaft **106** to rotate in the same rotational direction, and the shaft **110** to rotate in the opposite direction, the rotation being synchronized.

Keyed on the shaft **106** is eccentric means **118**, and keyed on the shaft **110** is eccentric means **120**. The two eccentric means **118** and **120** are disposed such that their centers of gravity lie in the same plane perpendicular to the axes of the shafts **106** and **110**. Further, the eccentric means **118** and **120** are disposed rotationally on the shafts **106** and **110** such that when rotated in opposite directions, the centrifugal forces created thereby are self-cancelling in horizontal direction while being cumulative in vertical direction. The two eccentric means **118** and **120** are also preferably disposed such that they are approximately equidistant from the center of gravity of the compactor along a straight line passing therethrough, whereby the total vertically vibratory effect of the two eccentric means is positioned approximately at the center of gravity of the compactor.

As best shown in FIG. 1, the eccentric means **120** comprises a first eccentric weight **122** keyed to the shaft **111** through key **124** located in a suitable keyway. Eccentric weight **122** includes a shaft portion **125** on which a second eccentric weight **126** is mounted. A set screw **128** in the eccentric weight **122** maintains the weight **122** in positive location on the shaft **111**, and a set screw **130** maintains the eccentric weight **126** in a positive but adjustable position with respect to the eccentric weight **122**. Consequently, the eccentric means **120** is adjustable as to its eccentricity. The eccentric means **118** is also constructed similarly such that, upon proper adjustment, the vertically vibratory motion imparted to the frame **10** and consequently the wheels **26** and **30** is adjustable as to amplitude. Further, since the speed of the engine **70** can be varied, the rotational speed of the eccentric means **118** and **120** can also be varied to obtain varying frequencies of vibratory motion.

In operation, the above-described design provides good compaction of various materials since the wheels **26** and **30** provide both kneading action and adjustable vibratory action to the material to be compacted. Further, the machine may be employed as a ballasted compactor by merely disengaging the clutch means **84** whereby the eccentric means **118** and **120** are inactivated. It should also be noted that the above-described machine can operate in both forward and reverse directions, a characteristic particularly desirable in compacting backfills in trenches.

The compactor may be controlled during operation by a walking operator holding onto the handle **132**. The operator can steer the compactor by putting his own weight upon the rearwardly extending handle **132** and turning the forward end of the compactor upon the rear wheels **26** as a fulcrum. The compactor of course could be made into a self-propelled riding unit or could be attached to a prime mover.

A further advantage of the above design is that it can effect required compaction density and smoothness in a relatively few number of passes over the material to be compacted, as compared with known prior art devices.

What is claimed is:

1. A compactor suitable for compacting material such as earth, said compactor comprising a frame; at least two axles mounted on said frame in substantially parallel relationship; a plurality of compacting wheels mounted

on said axles, all of the wheels on one axle being spaced apart to form spaces therebetween, and at least one wheel on the other axle extending into each of said spaces sufficiently to permit coaction between wheels on the two different axles in kneading the material to be compacted; the wheels and spaces being so aligned and being of such width that substantially complete compacting action is provided between the laterally outermost wheel on one side of the compactor and the laterally outermost wheel on the other side when the compactor is moving forward, and the wheels and spaces being so disposed that said compacting action is at least as wide as the longest width of said frame; means mounted on said frame for driving said compacting wheels in either direction of rotation; and eccentric means mounted on said frame for imparting vertically vibratory motion to said compacting wheels, said eccentric means including at least two eccentrics mounted on said frame, the eccentrics being arranged whereby centrifugal forces developed thereby are substantially cumulative vertically and substantially self-cancelling horizontally, the eccentric means being adjustable to permit adjustment of the amplitude of the vertically vibratory motion.

2. The compactor defined in claim 1 wherein each of said eccentrics comprises a first eccentric weight mounted on a shaft and a second eccentric weight adjustably mounted on said first eccentric weight to permit said adjustment of the amplitude of the vertically vibratory motion.

3. The compactor defined in claim 1 wherein said eccentric means is connected to said means for driving said compacting wheels through a clutch, whereby said eccentric means can be selectively powered thereby.

4. A compactor suitable for compacting material such as earth, said compactor comprising a frame; at least two axles mounted on said frame in substantially parallel relationship; and a plurality of compacting wheels mounted on said axles; at least two wheels being mounted on one axle with a space therebetween; and at least one wheel having a width slightly less than the width of said space, being mounted on the other axle extending between the two spaced wheels sufficiently to permit coaction between the two spaced wheels and the wheel extending therebetween in kneading the material to be compacted, each of said wheels having a relatively smooth outer surface to facilitate kneading of the material; two eccentrics mounted on said frame for imparting vertically vibratory motion to the compacting wheels, the eccentrics being arranged whereby centrifugal forces developed thereby are substantially cumulative vertically and substantially self-cancelling horizontally, each of said eccentrics comprising a first eccentric weight mounted on a shaft and a second eccentric weight adjustably mounted on said first eccentric weight to permit adjustment of the amplitude of the vertically vibratory motion.

5. A compactor suitable for compacting material such as earth, said compactor comprising a frame; at least two axles mounted on said frame in substantially parallel relationship; a plurality of compacting wheels mounted on

said axles, all of the wheels on one axle being spaced apart to form spaces therebetween, and at least one wheel on the other axle extending into each of said spaces, the wheels and spaces being aligned and being of such width that substantially complete compacting action is provided between the laterally outermost wheel on one side of the compactor and the laterally outermost wheel on the other side when the compactor is moving forward; means for driving each of said compacting wheels; at least two eccentrics mounted on said frame for imparting vertically vibratory motion to said compacting wheels, the eccentrics being arranged whereby centrifugal forces developed thereby are substantially cumulative vertically and substantially self-cancelling horizontally, each of said eccentrics comprising a first eccentric weight mounted on a shaft an a second eccentric weight adjustably mounted on said first eccentric weight to permit adjustment of the amplitude of the vertically vibratory motion.

6. A compactor suitable for compacting material such as earth, said compactor comprising a frame; at least two axles mounted on said frame in substantially parallel relationship; a plurality of compacting wheels mounted on said axles, all of the wheels on one axle being spaced apart to form spaces therebetween, and at least one wheel on the other axle extending into each of said spaces sufficiently to permit coaction between wheels on the two different axles in kneading the material to be compacted; the wheels and spaces being so aligned and being of such width that substantially complete compacting action is provided between the laterally outermost wheel on one side of the compactor and the laterally outermost wheel on the other side when the compactor is moving forward, and the wheels and spaces being so disposed that said compacting action is at least as wide as the longest width of said frame; means mounted on said frame for driving said compacting wheels in either direction of rotation; and eccentric means mounted on said frame for imparting vertically vibratory motion to said compacting wheels, said eccentric means including at least two eccentrics mounted on said frame, the eccentrics being arranged whereby centrifugal forces developed thereby are substantially cumulative vertically and substantially self-cancelling horizontally.

References Cited

UNITED STATES PATENTS

1,102,443	7/1914	Schamell	94—50
1,320,533	11/1919	Cull	94—50
1,369,977	3/1921	McLaren	94—50
1,831,116	11/1931	Huntley	94—50
2,728,277	12/1955	McRae	94—50
2,978,967	4/1961	MacDonald	94—50
3,252,389	5/1966	Gardner	94—50 X
3,318,209	5/1967	Schultz	94—50

FOREIGN PATENTS

1,137,400	9/1962	Germany.

NILE C. BYERS, JR., *Primary Examiner.*