United States Patent

[11] **3,543,656**

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[21] Appl. No. **795,884**
[22] Filed **Feb. 3, 1969**
[45] Patented **Dec. 1, 1970**

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[54] **SOIL COMPACTING MACHINE**
6 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **94/50**
[51] **Int. Cl.** **E01c 19/24**
[50] **Field of Search** ..... 94/50, 50(U)

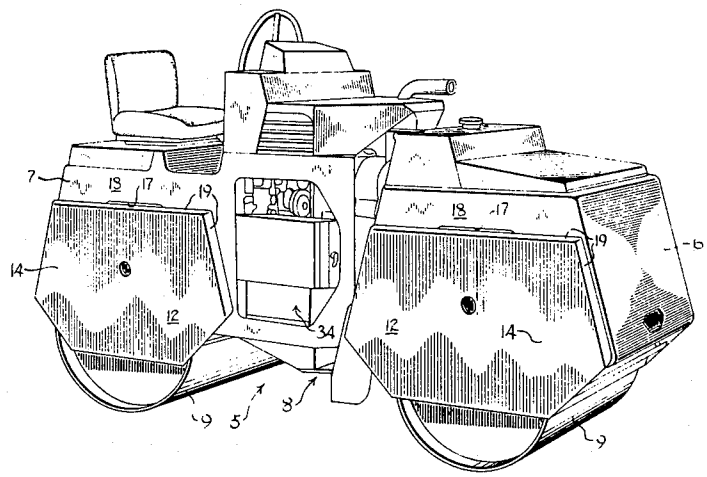
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ABSTRACT: A soil compacting machine in which tandem arranged ground engaging drums are journaled in yokes, each of which is connected with one of two articulately joined frame sections, solely through cushioned shock absorbing pads. An eccentric mass rotatably mounted on each yoke rotates about a horizontal axis above the associated drum so that vibration imparted to the yokes and the drums journaled therein by the rotating eccentric masses, causes the yokes to rock about horizontal axes located between the axes of the rotating mass and the drum and imparts fore and aft oscillation to the drums. Both drums are power driven.



Patented Dec. 1, 1970

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FIG. 1.

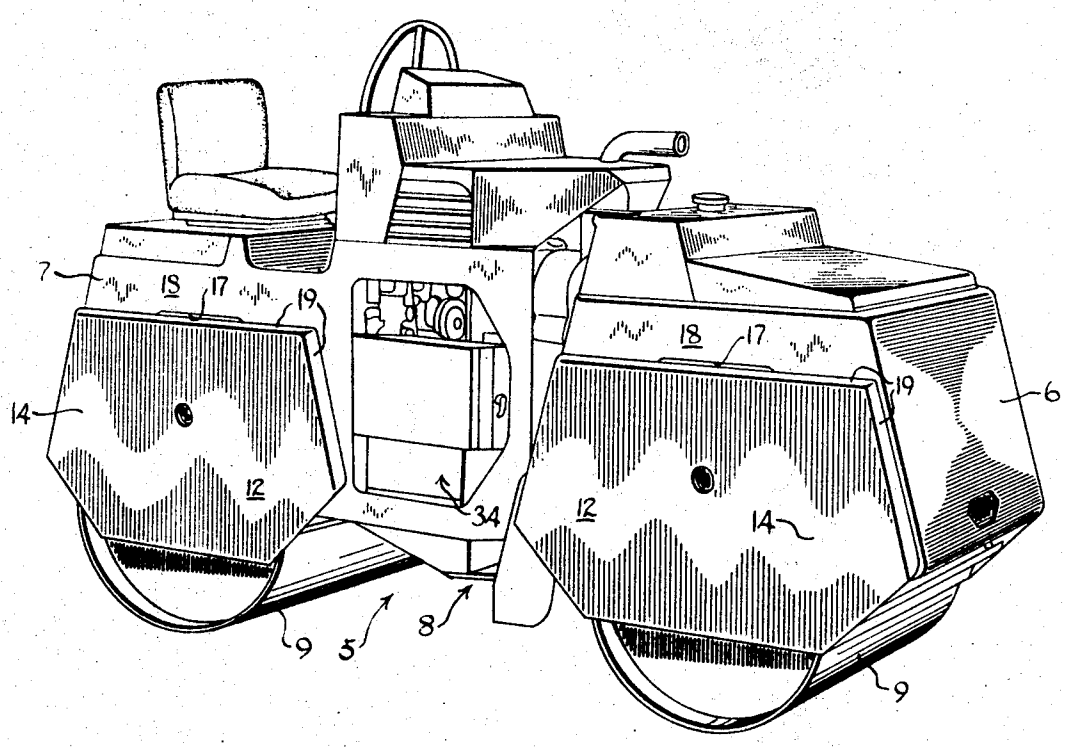
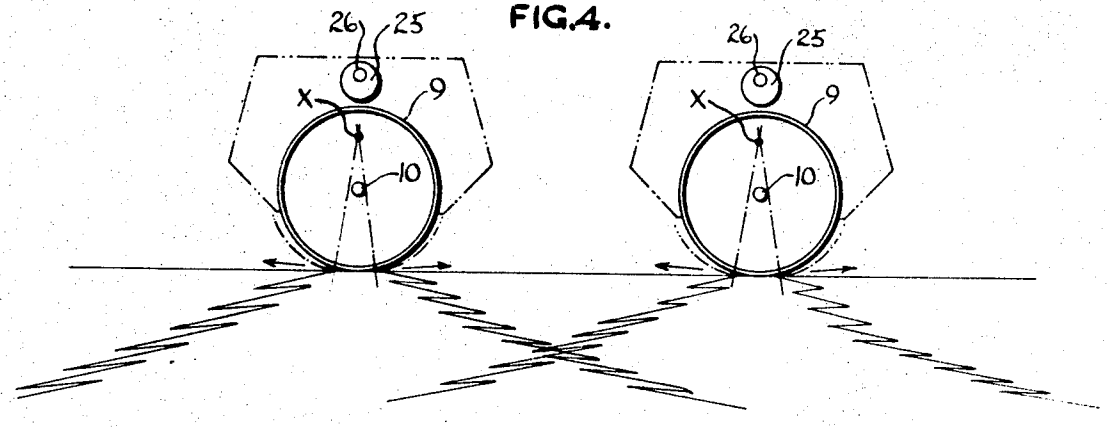


FIG. 4.



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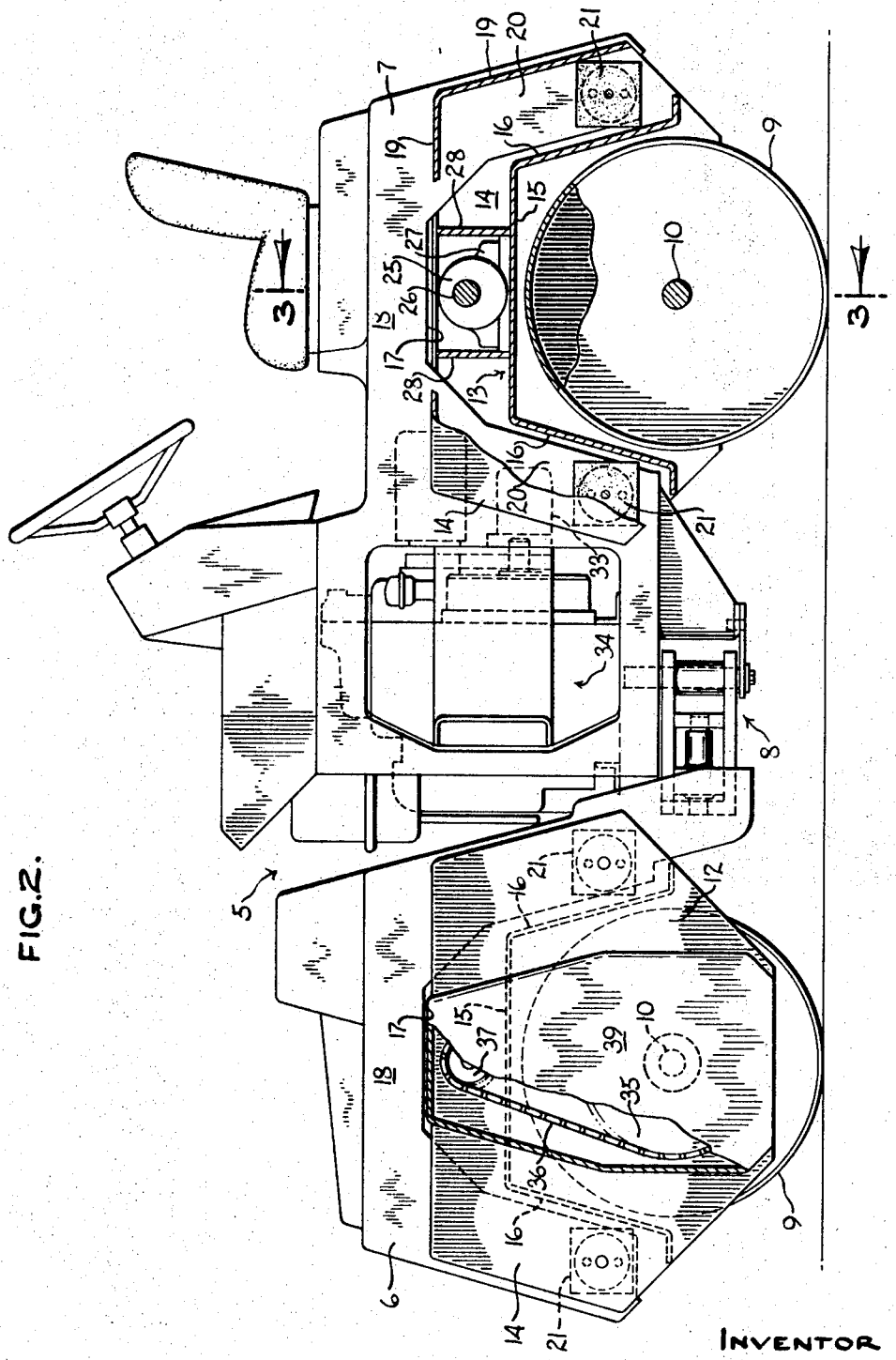


FIG. 2.

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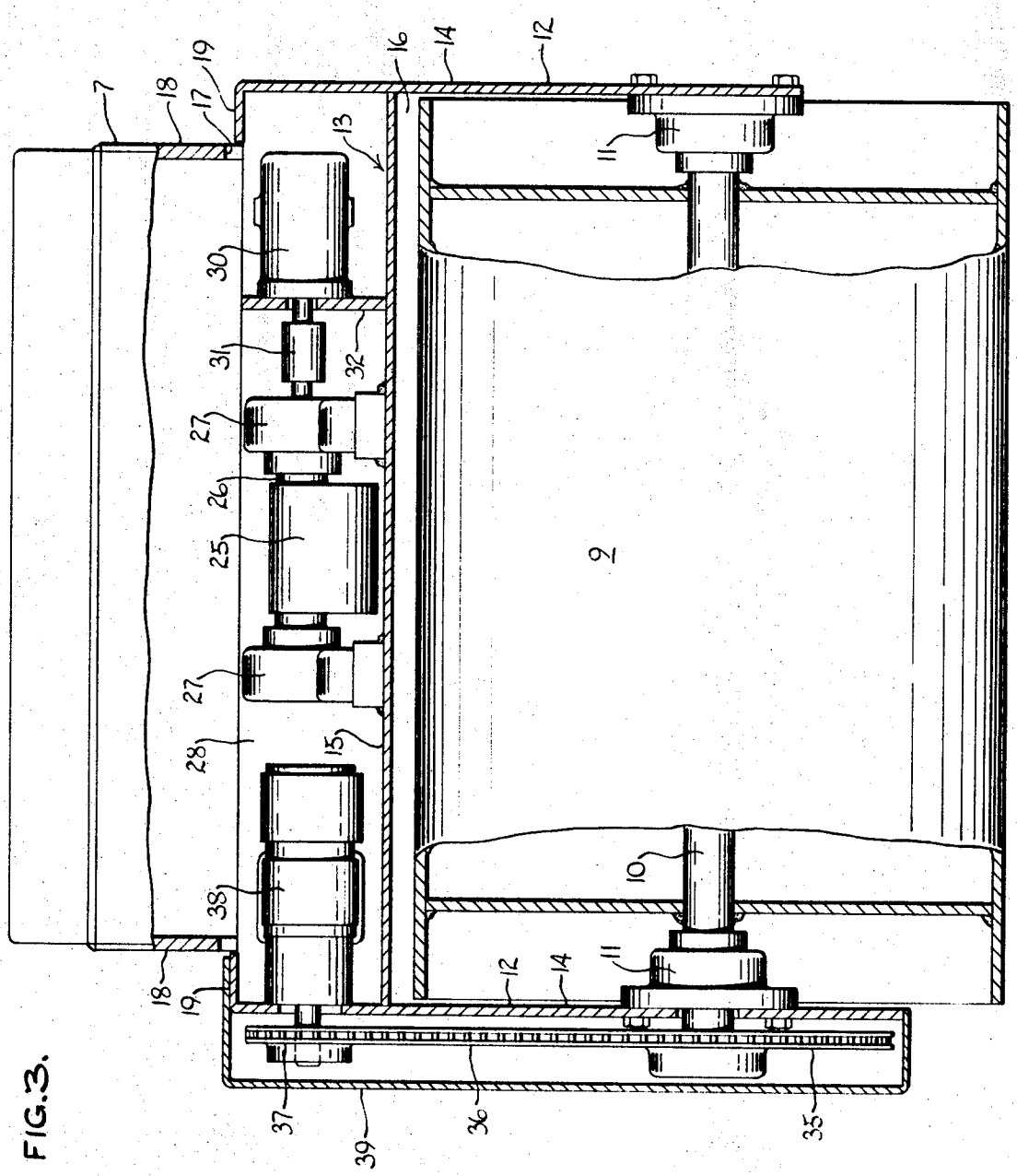


FIG. 3.

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SOIL COMPACTING MACHINE

This invention relates to soil compacting machines of the type in which the desired compaction is produced not only by traverse of a heavy drum or roller over the soil but also by imparting vibration to the drum. The Garis et al. U.S. Pat. No. 3,395,626 and the Canadian Pat. No. 740,192, illustrate examples of the vibratory drum type soil compacting machines heretofore available.

The soil compacting machine of this invention is self propelled, which, of course, is not new. What is significantly different about the machine is that it has two equal diameter tandem arranged drums each of which is power driven and each of which vibrates. The vibration imparted to the drums, as in prior vibratory soil compacting machines, is produced by rapidly rotating eccentric masses, but the way in which this is done and particularly the nature of the vibratory action produced thereby achieves a more effective utilization of the vibration with the result that per unit of weight of the machine—better compaction of the soil is obtained.

With these observations and objects in mind, the manner in which the invention achieves its purpose will be appreciated from the following description and the accompanying drawings. This disclosure is intended merely to exemplify the invention. The invention is not limited to the particular structure or method disclosed, and changes can be made therein which lie within the scope of the appended claims without departing from the invention.

The drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof and in which:

FIG. 1 is a perspective view of a soil compacting machine embodying this invention;

FIG. 2 is a side view of the machine with parts thereof broken away and in section;

FIG. 3 is a cross sectional view through FIG. 2 on the plane of the line 3–3; and

FIG. 4 is a diagrammatic view illustrating how the tandem arranged drums of the machine of this invention coact to improve compaction.

Referring to the drawings, the numeral 5 designates generally the chassis or frame of the machine, which consists of front and rear sections or units 6 and 7, articulately connected, as at 8. The connection 8 provides for relative motion of the two frame sections about vertical and horizontal axes which enables steering of the machine by articulation of the frame sections about the vertical axis and independent accommodation of the sections to variations in terrain.

Each frame section or unit is supported by a ground engaging drum 9. These drums are alike in size and construction, and each has a shaft 10 extending axially therethrough, the end portions of which provide trunnions by which the drum is journaled in bearings 11 fixed to the legs 12 of a yoke 13. The yokes 13 are weldments each consisting of a pair of flat parallel side plates 14 which constitute the legs of the yoke, and transverse plates 15 and 16 rigidly connecting the side plates. These plates together form an open bottomed housing for the drum, having a flat horizontal top wall provided by the plate 15.

To accommodate the yokes and the drums embraced thereby, the frame sections or units 6—7 have downwardly opening transverse wells 17 which extend fully across the frame sections or units, so that the sidewalls 18 of the frame sections have the cutout shape best seen in the right-hand portion of FIG. 2.

The side plates 14 of the yokes project beyond their junctions with the plates 15 and 16, and have inwardly directed flanges 19 at their top, front and back edges. The margins of these flanges lie in a common plane which is contiguous to but spaced from sidewalls 18 of the frame sections or units 6, 7. This results in the formation of hollow spaces 20 at the opposite sides of the frame sections or units.

Since the bearings 11 in which the drum is journaled are rigidly fixed to the side plates 14, i.e. to the legs of the yoke, it follows that the only relative motion possible between the yoke and its drum is rotation of the latter. Accordingly, the drum will partake of any vibration imparted to the yoke so that the yoke and drum journaled therein can—and in fact does—constitute a vibratory system or structure.

Each vibratory structure or system is connected with its respective frame section or unit solely through shock absorbing rubber blocks or pads 21 located in the hollow spaces 20 and connected to and extending between the side plates 14 and the underlying portions of the sidewalls 18.

There are four of these resilient shock absorbing blocks or pads connecting each yoke with its frame section or unit, two at each side of the machine, one ahead of and the other to the rear of the drum. It is important to note that these blocks or pads 21 constitute the only connection between each yoke and its frame section or unit. The yokes and the drums journaled therein are thus free to move in any and all directions with respect to the frame sections or units, to the extent the blocks or pads are resiliently deformable. The manner in which the rubber blocks or pads are fixed to the side plates 14 and the side walls 18 is not important and can follow conventional practice.

Vibration is imparted to each of the vibratory structures or systems by the rotation of an eccentric mass 25. This eccentric mass is fixed to a shift 26 that is journaled in bearings 27 rigidly secured to the horizontal cross bar or plate 15 of the yoke between a pair of upstanding stiffening ribs 28, the bottom edges of which are welded to the plate 15 and the ends of which are welded to the side plates 14. The space above the eccentric mass is open to accommodate the throw of the eccentric.

As seen in FIG. 3, the bearings 27 are equispaced from the vertical median plane of the machine, and the eccentric mass is located between the bearings and hence its vibration imparting effect is centered with respect to the length of the drum.

The eccentric mass 25 is driven by a hydraulic motor 30, the shaft of which is coupled to the shaft 26 through a suitable coupling 31. The motor 30 is mounted by being secured to a partition wall 32 extending between the ribs 28. Fluid power is delivered to the motor 30 from a pump 33 driven by a prime mover 34 mounted on the rear frame section 7, the conduits connecting the pump and motor and the controls for the motor, which are not shown, may be of any conventional type.

Each of the drums is not only vibrated, but also driven to provide propulsion for the machine. For this purpose, each drum has a large sprocket wheel 35 fixed to its shaft and overlying one of the side plates 14, it being understood that the shaft of the drum protrudes through the adjacent bearing to have the hub of the wheel secured thereto. A sprocket chain 36 drivingly connects the wheel 35 with a driving pinion 37 which is fixed to the shaft of another hydraulic motor 38. Preferably the motor 38 is vertically adjustably mounted on one of the rib plates 28 so that the tension of the chain can be adjusted.

A shell or cover 39 removably secured to the side plate 14 encloses the chain drive.

Fluid power is delivered to the motor 38 by a hydraulic system (not shown) that is independent of the system that drives the eccentric mass; and another hydraulic system, also not shown, is provided for power steering which is done by articulating the front and rear units about the vertical axis of the connection 8.

As depicted in the diagrammatic view FIG. 4, the rotation of the eccentric mass (of each unit) about an axis spaced a substantial distance above the axis of the drum, and the fact that the vibratory structure—namely, the drum and the yoke in which it is journaled—can move in any and all directions with respect to the frame of the machine (at least to the extent that the resilience of the cushioned shock absorbing connections between the yoke and the machine frame permit) results in the vibratory structure rocking about an instantaneous axis

"X" which lies between the axes of rotation of the eccentric mass and the drum axis. Because of the rocking of the vibratory structure about the axis "X", the drum and more especially the bottom thereof, oscillates or shifts for and aft. This produces a smoothing or kneading action on the soil that greatly enhances its compaction.

The fore and aft displacement of the drum will of course alternately accelerate and decelerate the propulsive effect of the driven drum which it is believed also contributes to the exceptionally good results obtained with the machine of this invention.

Finally, as also depicted in FIG. 4, the proximity of the two drums to one another—the spacing therebetween being but slightly greater than the common diameter of the two drums—results in their zones of influence merging with one another. This again improves the compaction obtained with the machine.

From the foregoing description and the accompanying drawings, it should be apparent to those skilled in the art that this invention provides a soil compacting machine which possesses many significant advantages over vibratory soil compacting machines heretofore available.

I claim:

1. In a soil compacting machine having a frame with a prime mover thereon, a vibratory system which comprises:

A. a ground-engaging drum;

B. a yoke embracing the drum from above and having a pair of legs depending from and connected by a transverse member;

C. bearings on the legs of the yoke in which the drum is journaled;

D. resilient cushion means fixed to the yoke and frame and constituting the sole connection therebetween,

the resilience of said cushion means allowing limited motion to the same extent both horizontally and vertically of the yoke with respect to the frame;

E. an eccentric mass rotatably mounted on the yoke for rotation about an axis parallel to that of the drum and above the drum; and

F. power means driven by the prime mover and drivingly connected with the eccentric mass to impart rotation thereto,

such rotation of the eccentric mass because of the freedom of the yoke to move horizontally with respect to the frame and the location of the eccentric mass above the drum, causing the vibratory system to rock about an axis located above and parallel to the axis of the drum, whereby the drum moves back and forth on the ground.

2. In a soil compacting machine, the structure set forth in claim 1 further characterized in that the transverse member of the yoke provides a substantially horizontal platform extending lengthwise of the drum at a distance thereabove, and the rotatable mounting for the eccentric mass comprises bearings on said platform at equal distances from a median plane transversely bisecting the drum, and oppositely projecting shaft means fixed with respect to the eccentric mass, journaled in said bearings and keeping the eccentric mass centered with respect to the length of the drum.

3. In a soil compacting machine, the improvement set forth in claim 1, further characterized by power transmission means energized by the prime mover and drivingly connected with the drum to drive the same and provide propulsion for the machine so that the back and forth motion of the drum alternately decelerates and accelerates the propulsive effect of the drum.

4. In a soil compacting machine, the improvement set forth in claim 1, further characterized in that the frame comprises two articulated units one of which has the prime mover mounted thereon, and each of which has a vibratory system connected therewith, as defined in claim 1, so that the machine has two drums, both of which have back and forth motion imparted thereto, and power transmission means energized by the prime mover and drivingly connected with one of the drums to provide propulsion for the machine.

5. In a soil compacting machine, the improvement set forth in claim 4, wherein said power transmission means is duplicated and each one thereof is mounted on one of the yokes and drivingly connected with the drum embraced thereby so that both drums drive the machine.

6. In a soil compacting machine, the improvement set forth in claim 5, further characterized in that the two drums are of the same diameter and are arranged in tandem and spaced apart a distance only slightly greater than the diameter of the drums, so that the zones of influence of the drums upon the soil being compacted merge with one another.