Nov. 10, 1959 J. O. ARCHIBALD ET AL 2,911,893

EARTH COMPACTING DEVICE

Filed April 29, 1954 3 Sheets-Sheet 1

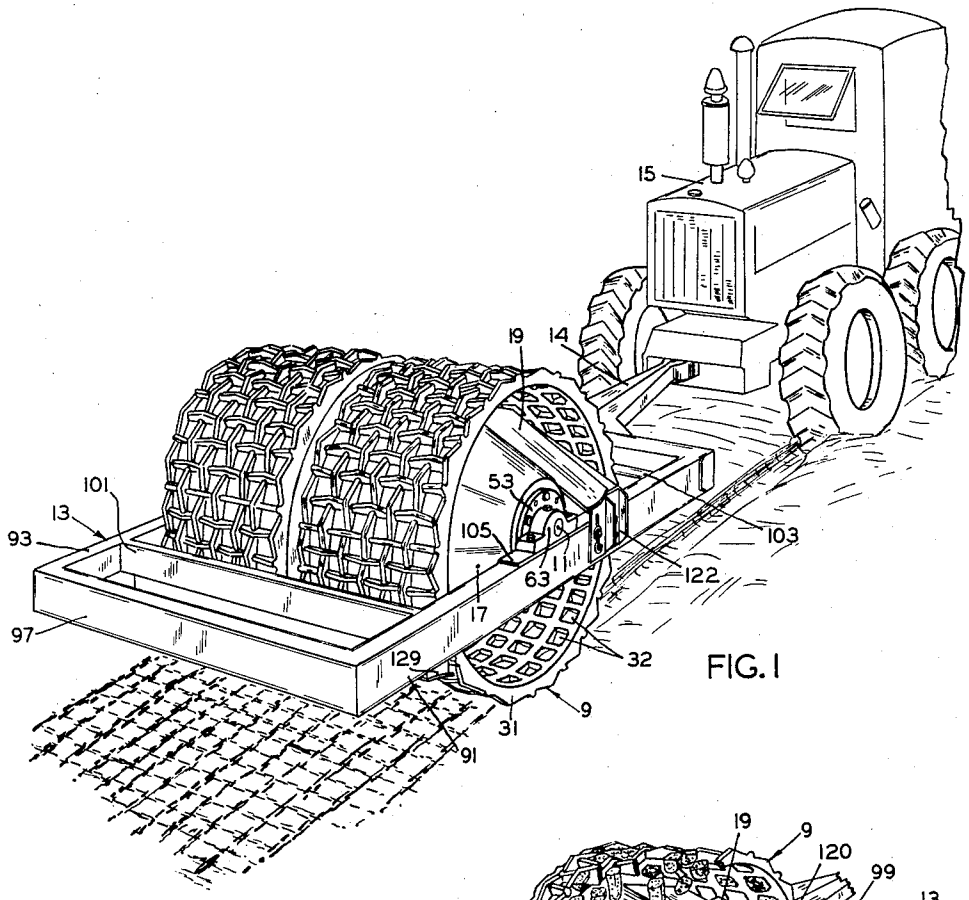

FIG. 1

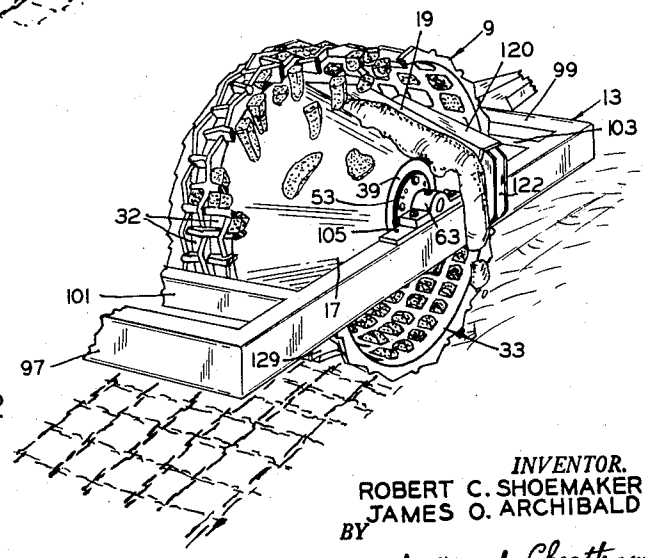

FIG. 2

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EARTH COMPACTING DEVICE

Filed April 29, 1954 3 Sheets-Sheet 2

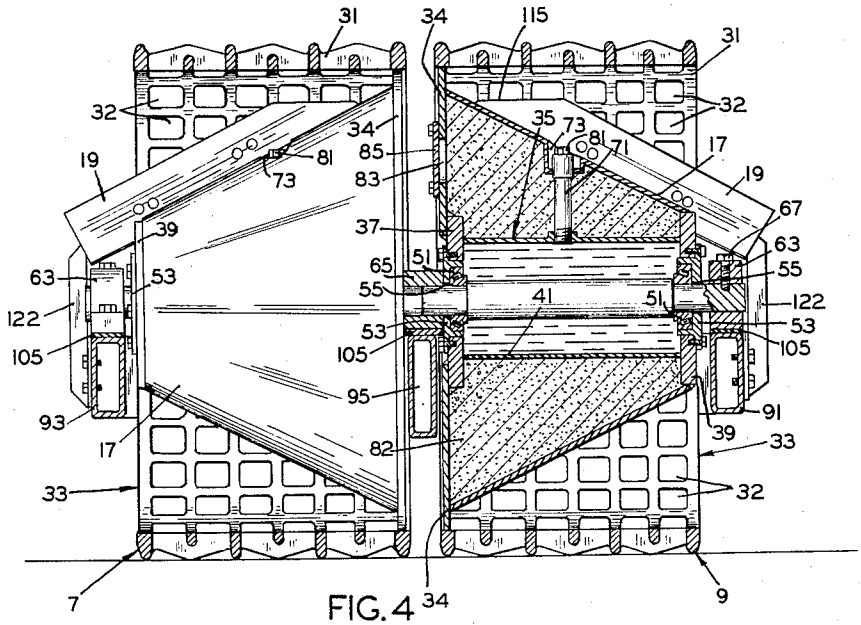

FIG. 4

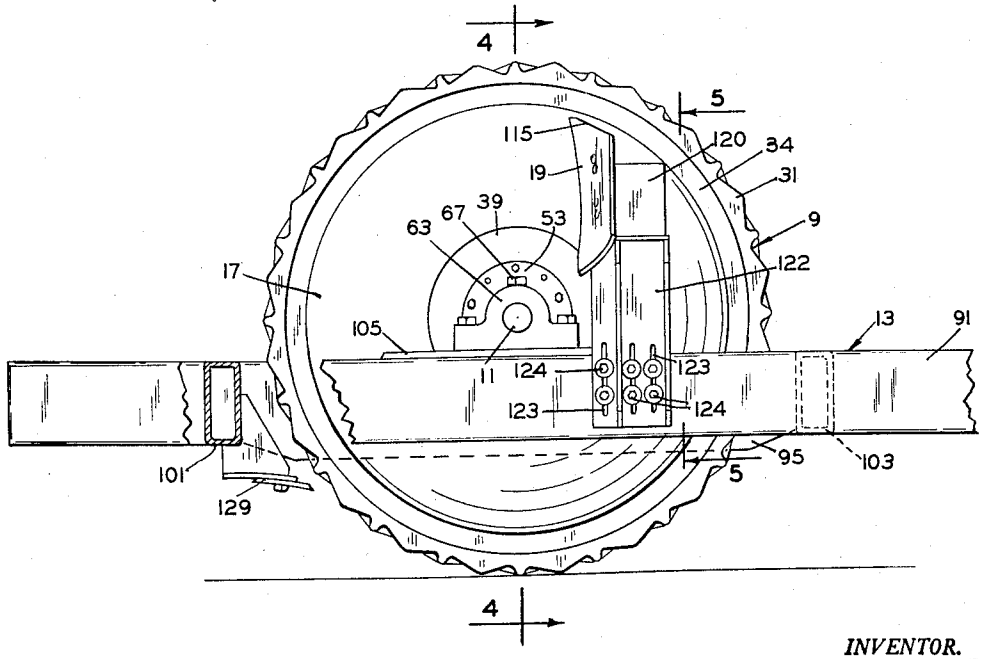

FIG. 3

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EARTH COMPACTING DEVICE

Filed April 29, 1954 3 Sheets-Sheet 3

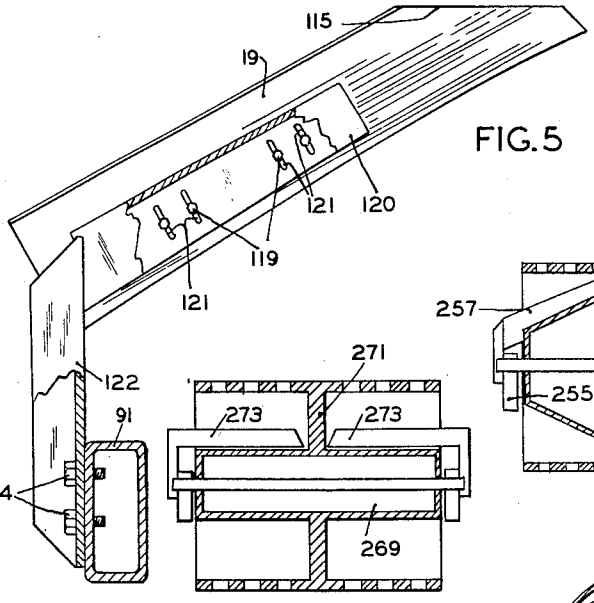

FIG. 5

FIG. 12

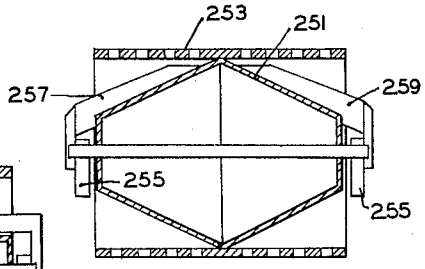

FIG. 11

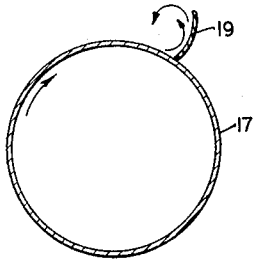

FIG. 6

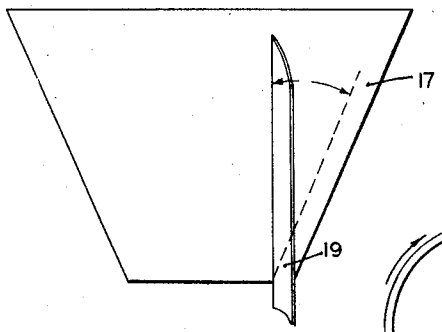

FIG. 7

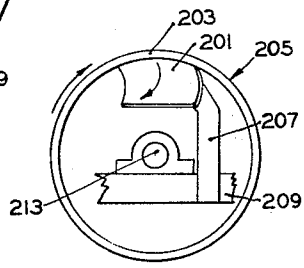

FIG. 8

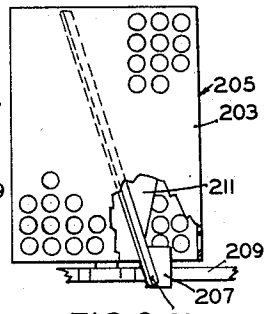

FIG. 9

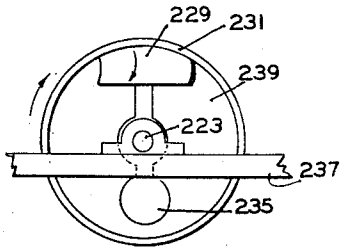

FIG. 10

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Patented Nov. 10, 1959

2,911,893

EARTH COMPACTING DEVICE

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Application April 29, 1954, Serial No. 426,358

17 Claims. (Cl. 94—50)

This invention relates to earth compacting devices of the type including one or more ground-engaging rollers, and particularly to such a device in which the roller has, as a compacting surface, an apertured cylindrical wall or rim.

In preparing a plot of ground for compaction, it must be moistened to obtain maximum compaction and not infrequently too much water is applied to portions thereof, producing patches of mud. Mud is not readily compactible, but an earth compacting device is frequently unavoidably or even intentionally pulled through a patch of mud in the course of compacting a plot of land. This mud, as well as moistened earth, is forced into the openings in the compacting surface of the roller and must be prevented from clogging the openings if continued satisfactory operation of the roller is to be achieved.

Earth compacting devices of the type under present consideration are equipped with cleaning mechanisms which normally function to keep the device from becoming clogged with moistened earth and mud. The patent to Gardner, No. 2,582,199, shows typical cleaning devices for the type of roller under present consideration. With certain kinds of heavy, viscous, adhesive mud, however, the conventional cleaning mechanisms are not capable of doing an entirely satisfactory job, and clogging of the rollers does occur too frequently.

It is a main object of the present invention to provide an earth compacting device of the type including a roller having an apertured cylindrical wall or rim, which device is adapted to keep the roller sufficiently clean of all types of mud, including heavy, viscous, adhesive mud, so as to prevent clogging of the rim apertures.

A more particular object of the present invention is to provide a hollow earth compacting roller having an apertured cylindrical rim, the apertures in the rim being in communcation with the hollow interior of the roller to permit mud and earth to be intruded into said interior, the roller having at least one end open and the device being constructed to cause the intruded mud and earth to be discharged through said open end.

Another object of the present invention is to provide a hollow earth compacting roller having an apertured cylindrical rim, there being fixed within the roller a frusto-conical core arranged so that its inclined surface assists in the discharge of intruded mud and earth through an opening in the end of the roller.

Another object of the present invention is to provide a hollow earth compacting roller having openings in its ground-engaging rim for the intrusion of earth and mud into the roller, there being an ejecting mechanism so supported within the roller that the roller moves relatively thereto to bring mud and earth against the mechanism, the mechanism being operable to eject such material in an axial direction through an opening in the end of the roller.

Various other objects of the present invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view of an earth compacting roller embodying the concepts of the present invention, the same being shown as drawn by a road grader;

Fig. 2 is a view of a portion of Fig. 1, parts being broken away to show how mud is discharged from the roller;

Fig. 3 is a side elevational view of the device of Fig. 1, parts being broken away for convenience in illustration;

Fig. 4 is a sectional view taken along line 4—4 of Fig. 3, showing the internal construction of the rollers;

Fig. 5 is a sectional view taken along line 5—5 of Fig. 3, more fully showing the manner of mounting the ejecting scraper blade;

Fig. 6 is a schematic cross-sectional view showing the relationship of an ejecting scraper blade and a core;

Fig. 7 is a schematic plan view further showing the relationship of an ejecting scraper blade and a core;

Fig. 8 is a schematic end view of a modified form of the invention;

Fig. 9 is a schematic plan view of the device of Fig. 8;

Fig. 10 is a schematic end view of another modified form of the invention;

Fig. 11 is a schematic vertical longitudinal cross section through still another form of the invention; and

Fig. 12 is a schematic vertical longitudinal cross section through a further form of the invention.

General description

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the device of Figs. 1 through 7 includes generally a pair of coaxial rollers **7** and **9**, each having an apertured cylindrical rim and being rotatably mounted on its own shaft **11**, said shafts being carried by an open rectangular frame **13**. In the particular embodiment of the invention shown, the frame has a tongue **14** adapting the frame to be drawn by any suitable vehicle, such as for instance a grader **15**. Each roller has an open outer end and has fixed therewithin a frusto-conical core **17**. The core is dimensioned to provide a space between its exterior and the interior of the rim of the roller into which moistened earth and mud may be intruded through said rim. The inclined surfaces of the cores assist in the discharge of intruded material from the rollers, and, in fact, for some kinds of mud the inclined surfaces may be entirely responsible for the discharge thereof.

Adjustably fixed to frame **13** is an ejecting scraper blade **19**, for each roller, projecting into the roller through the open end thereof in cooperative generally helical relation to the associated core. A blade is thus effective, upon rotation of the associated roller relative to the blade, to scrape from the associated core intruded material adhering thereto and eject it out through the open end of the cylinder. Thus there is established circulation of such material through the rim into said space and out through the open end of the roller. Consequently, excess accumulation of mud and earth within the roller, which would eventually clog the openings in the rim, is prevented. It is pointed out that intruded moistened earth normally will tumble out the open end of the roller, rather than adhere to the core as does the mud. Thus the moistened earth does not present a very difficult cleaning problem. For convenience in description the term "moistened earth" will be understood as not including mud.

Specific description

More particularly, the rollers **7** and **9** are of identical construction and thus the detail construction of only roller **9** will be given. Roller **9** includes a cylindrical rim **31** which is preferably similar in construction to the rim shown fragmentarily in Fig. 18 of the Gardner et al. Patent No. 2,582,199. Thus rim **31** is provided

with a plurality of substantially uniformly distributed apertures or openings **32** therethrough. Roller **9** has an open outer end at **33** to provide for the ready axial discharge of intruded material from the roller and to accommodate the fixed scraper blade **19**. By "open end" it is meant that the end is open continuously at said end along an annular path around the axis of the roller.

The apertured rim **31** is mounted on its shaft **11** by a hub structure which includes an imperforate disc **34** welded or otherwise secured to the inner end of the rim. The hub assembly includes two annular end pieces **37** and **39** held in fixed coaxial relation by a sleeve **41** abutting against and welded to the inner faces of the end pieces. The piece **37** is secured to the inner face of the disk **34**. The sleeve **41** has an internal diameter substantially greater than the external diameter of the associated shaft **11** so as to provide a reservoir for oil which is supplied to such space in a manner to be set forth hereinafter.

Core **17** assumes the form of a hollow frusto-conical member converging in a direction toward the open end **33** of the cylinder and having its larger diameter end abutting against disc **34** adjacent the periphery of said disc and welded to the disc. Reinforcing corner gussets may be provided between the inner end of core **17** and rim **31**. The smaller end of the core **17** is dimensioned to fit around end piece **39** and is welded thereto. It is apparent from the above description that there has been provided between the interior surface of rim **31** and the exterior surface of the core **17** a space into which moistened earth and mud, forced into openings **32**, may be intruded.

The hub assembly **35** is rotatably mounted on shaft **11** by means of axially spaced roller bearings **51** which fit on the shaft and fit within bearing retainers **53**, which in turn fit within end pieces **37** and **39** and are secured to said end pieces by bolts as shown. An oil sealing device, of conventional construction, is provided at **55** between each retainer and the shaft.

Shaft **11** has its outer and inner ends fitting respectively within an outer block **63** and half way into a central block **65**. A bolt **67** threads down into outer block **63** and extends into a bore formed in the outer end of shaft **11** to retain the shaft against rotation. Blocks **63** and **65** are secured to frame **13** in a manner to be presently described.

At present, the attention is directed to the provision of an oil filler pipe **71** threaded into sleeve **41** and projecting through the bottom of a cup **73** fixed within an opening in frusto-conical core **17**. A plug **81** threads into the outer end of the pipe. When the reservoir is to be filled with oil or to be drained, plug **81** may be removed.

The space between hub assembly **35** and core **17** may be filled with a suitable ballast material **82**, such as wet sand, through an opening **83** formed in disc **34**, the opening being normally closed by a removable plate **85** secured in place by bolts, as shown.

Referring to Figs. 1, 3 and 4, frame **13** includes two side members **91** and **93** and a central parallel member **95**, end members **97** and **99** connecting the ends of the side members and the central member, and cross members **101** and **103** connecting the side members and the central member at places adjacent to the rollers **7** and **9**. All the just mentioned members are of hollow rectangular cross section, as shown. Pad strips **105** are provided on and fixed to side members **91** and **93**, and central member **95**. Blocks **63** and **65** are secured, such as by bolts or screws, to said pad strips.

Ejecting scraper blade **19** comprises a longitudinally straight, initially rectangular member curved concavo-convex in cross section, see Fig. 6, and arranged in generally helical relation to core **17**. That is, the blade is arranged at an angle to a generating line of the frusto-conical surface of the core, as best shown in Fig. 7.

It is also disposed forwardly of a vertical line through the axis of rotation of the grid cylinder and has its concave operating face facing rearwardly. The blade could be located beneath the core if desired. The blade has its bottom edge relieved to conform generally to the opposite curved surface of the core. The upper inner end of the blade is relieved at **115** for clearance with respect to the inner surface of the rim.

The blade **19** is removably adjustably secured, such as by bolts **119**, to the inclined portion of a support **120**, which has vertical slots **121** receiving the bolts, see Fig. 5. The support has a depending portion **122** provided with vertical slots **123** through which pass the shanks of cap screws **124**, which are threaded into the associated side member. By loosening screws **124**, the spacing of the blade **19** relative to the core may be adjusted, and by loosening bolts **119**, adjustment for wear of the blade may be obtained.

Provided on rear cross member **101** is a scraper blade device **129**, see Fig. 3, operable to prevent the rollers from picking up a blanket of plastic earth.

Operation

By providing a hollow roller having an apertured rim and at least one end open, discharge of the earth from the roller in an axial direction is facilitated because moistened earth and some kinds of mud will readily tumble out through said open end. The inclined surface of the frusto-conical core assists in the discharge of such material. However, some kinds of mud have such high adhesive qualities that they will not tumble out the open end of a roller and thus provision is made for a positive discharge of such mud. The positive discharging operation is accomplished by means of a scraper blade **19** for each core. These blades are operable to scrape mud from the core and exert an axial force on it to eject it out through the open end of the roller, see particularly Fig. 2. Thus the rollers are kept comparatively free of mud, although some accumulation of mud within the rollers is not objectionable. What is objectionable is the accumulation of mud to an extent to fill the rollers and thus clog the rim openings.

Modified forms of invention

Figs. 8 and 9 disclose schematically a modified form of the invention wherein the scraper blade **201** is arranged in cooperative relationship to the inner surface of the rim **203** of the roller **205**. The scraper blade **201** is supported in fixed relation to a frame **209** by a member **207**, and is arranged helically of the rim **203**. In this form of the invention a frusto-conical core **211** is provided similar to the core in the previous form of the invention, but the core in this second form of the invention is not disposed in cooperative relationship to the blade, but functions to assist in rotatably supporting the roller on a shaft **213**.

The form of the invention disclosed in Figs. 8 and 9 is not believed to be as advantageous as the one disclosed in Figs. 1 through 7, because it is apparent that rocks forced through the openings in rim **203** might be caught between the blade **201** and the inner edges of the openings and thus damage the blade or the rim. In the first form of the invention all portions of the blade are spaced from the interior surface of the rim a distance at least as great as the widest dimension of the openings in the rim. Consequently, rocks passing through the openings in the rim may not be caught between the blade and the rim and cause damage.

Fig. 10 shows schematically an earth compacting roller wherein the scraper blade **229** is arranged next to the rim of the roller **231**, is supported by the roller unit, that is, by the roller shaft **233**, and is maintained by a pendulum weight **235** in substantially fixed relation to a frame **237**. In this form of the invention it is possible for the open end of the roller **239** to be partially closed, such as by

one or more spokes, although preferably the end would be left entirely open.

Although the Fig. 10 form of the invention has considerable advantages over prior earth compaction rollers, it does have the above mentioned disadvantages of the form of the invention disclosed in Figs. 8 and 9, and in addition is more expensive and complicated than the first form of the invention in that the pendulum mounting arrangement is not as simple as the mounting arrangement disclosed in the first form of the invention.

Fig. 11 shows a fourth form of the invention, wherein the core **251** is connected to the medial or center portion of the rim of the roller **253** and converges in opposite directions toward the ends of said roller. Both ends of the roller in this form of the invention are open. The frame **255** carries two fixed scraper blades **257** and **259** arranged in cooperative generally helical relation to the associated core surfaces. Each of blades **257** and **259** is arranged so as to exert an axial force tending to discharge earth and mud, which it contacts, out through the associated open end of the roller.

The device in Fig. 12 is generally similar to the Fig. 11 device, except that the former device has a cylindrical core **269** joined to the rim by a centrally disposed heavy annular web **271**. Thus the core surface does not assist in the discharge of earth and mud, reliance being placed on the scraper blades **273**. It is pointed out that the web could also be located at one end of the roller and core, leaving the opposite end of the roller open.

Having described the invention in what is considered to be the preferred embodiment thereof, it is desired that it be understood that the invention is not to be limited by the specific details shown unless they constitute critical features of the present invention, all of which will be apparent by reference to the following claims.

We claim:

1. An earth compacting mechanism comprising as a first member a ground engaging roller including a rim, said rim being provided with openings through which earth may be intruded, said roller having parts including said rim which define a space next to the major portion of the interior surface of the rim directly communicating with the openings in the rim, said roller having one end thereof provided with an opening communicating with said space and through which intruded earth may be discharged from the roller, a frame for the roller by which movement may be imparted to the roller, said frame constituting a second member, said roller being rotatably connected to the frame for rotation about an axis concentric with respect to the rim of said roller, and an earth ejecting mechanism disposed at least in part within the space within said roller in cooperable relationship to said roller and being supported by one of said members in substantially fixed relation to the frame to have relative motion with respect to said roller upon rotation of said roller, said earth ejecting mechanism being in the form of a blade angularly disposed relative to the axis of said roller to be operable when intruded earth is brought thereagainst by the roller to eject the same through the end opening of the roller whereby to prevent excess accumulation of intruded earth in said space.

2. An earth compacting device comprising a frame, a roller having a rim provided with openings therethrough, said roller being rotatably connected to the frame, said roller having parts including said rim defining a space in direct communication with the openings in said rim whereby to permit earth which is forced into said openings to be intruded into said space, said roller having one end open continuously along an annular path around the axis of the roller, wherein the opening in said one end is in communication with said space, and an ejecting blade anchored to the frame and projecting through the opening in said one end into the space in said roller, said roller adapted upon rotation to bring earth against said ejecting blade, said ejecting blade being arranged at an angle across the path of movement of the earth.

3. An earth compacting device comprising a frame, a roller having a rim provided with openings therethrough, said roller being rotatably connected to the frame, said roller having parts including said rim defining a space within said roller in direct communication with the openings in said rim whereby to permit earth which is forced into said openings to be intruded into the roller, said roller having one end open continously along an annular path around the axis of the roller wherein the opening in said one end is in communication with said space, and an ejecting device anchored to the frame and projecting through the opening in said one end into the space in said roller, said roller having a core member disposed radially inwardly of and in cooperative relation relative to the ejecting device, said core member adapted to have intruded earth fall thereon and upon rotation of the roller to bring such intruded earth against said ejecting device, and said ejecting device being arranged at an angle across the path of movement of the earth thus brought thereagainst to impart movement to such earth in an axial direction toward said one end.

4. A hollow earth compacting roller having a rim provided with openings through which material being compacted may be forced into the roller, said roller having one end open at least continuously along an annular path about the axis of said roller through which material within the roller may be discharged, and a core member within the roller and fixed to said roller rim solely at places spaced from said open end and presenting an endless curved surface entirely spaced from the rim at the open end thereof, said surface extending to said rim continuously therearound at a place spaced from said open end so that material passing through said rim can move only in a direction toward said open end.

5. A compacting device of the class described comprising a frame, a hollow roller including an apertured rim, said roller being journaled to the frame and having an end that is open continuously along an annular path around the axis of said roller, a blade mounted on the frame and projecting into the roller through said open end, and a core fixed to the roller and being disposed radially inwardly of the blade.

6. A compacting device of the class described comprising a frame, an apertured rim roller journaled to the frame and having an end that is open continuously along an annular path around the axis of said roller, a blade fixed to the frame and projecting into the roller through said open end in offset relation to the axis of the roller, and a central core carried by the roller and having its surface spaced from said rim for at least the major portion of said core, said core being disposed radially inwardly of the blade.

7. An earth compacting device comprising a frame, a hollow roller having an apertured rim, said roller being rotatably connected to said frame and having an end which is open continuously along an annular path around the axis of said roller, a frusto-conical core fixed within the roller and converging toward said open end, and an earth ejecting scraper blade fixed to the frame and projecting through said open end into the cylinder in cooperative relation to said core.

8. An earth compacting device comprising a hollow roller having a rim provided with openings through which earth may be intruded into the roller, said roller having one end open continuously along an annular path around the axis of the roller whereby to permit ready discharge of intruded earth from the roller, a central core disposed at least in part within the roller and at least in part generally converging toward said open end of the roller to assist in the discharge of earth from the roller, and means fixedly connecting the core to the roller solely at places inwardly of the smaller end of the core with respect to said open end of the roller.

9. An earth compacting device comprising a roller including an apertured rim through which earth may be intruded into the roller, a frame to which said roller is rotatably journaled, a central core at least in part disposed within and carried by the roller and being spaced at least in part from the inner surface of the rim, said roller having one end formed with an opening which extends continuously along an annular path around the axis of said roller, and an ejecting member mounted on the frame and projecting into the end opening in the roller in cooperative relation to the core, and being arranged so as to have a generally angular relation to a plane having a point in common with said ejecting member and containing the axis of rotation of the roller whereby the ejecting member is operable when the roller is rotated in one direction to exert an axial force against earth on the core as it contacts such earth to urge such earth toward said end opening of the roller.

10. A ground-engaging earth compacting device comprising a hollow roller having a rim provided with openings through which earth may be intruded into the roller, said roller being open at one end continuously along an annular path around the axis of the roller, and means rotatably mounting the roller, said means presenting a solid surface connected to said roller rim solely in spaced relation with respect to said one end of the roller and forming a closure extending completely across the interior of said roller to cause material, which is intruded into said roller through the rim openings located between the place of connection of said surface with said roller and said end, to progress toward said open end as said material accumulates whereby to permit the ready intrusion of earth into and the discharge of earth from the roller.

11. An earth compacting mechanism comprising a hollow ground-engaging roller including an apertured rim through which earth may be intruded into the roller, a frame rotatably connected to the roller, said roller having an end which is open continuously along an annular path around the axis of said roller, an ejecting member supported in fixed relation by the frame and projecting into the hollow roller through said end thereof, the portion of the ejecting member within the roller being arranged angularly across the path of travel of earth carried by the roller so as to exert an axial force component on earth brought thereagainst by the roller to urge the earth toward an end of the roller, the last mentioned end of the roller being provided with an opening through which the earth may be discharged.

12. An earth compacting device comprising a frame, a hollow roller having a perforated rim, said roller being rotatably connected to the frame and having one end open continuously along an annular path around the axis of the roller, wherein the radial depth of the path constitutes at least a major portion of the radius of the roller, a frusto-conical core fixed within the roller and converging toward said open end to provide a space between itself and the rim into which material being intruded may pass, and a scraper device anchored to the frame and projecting through said open annular path into the roller in a position along the top side of the core, said scraper device being disposed in spaced relation from a vertical perpendicular to the axis of rotation of the roller in the direction in which the roller rotates so that a pocket is provided between the scraper and the core to retain material engaged by the scraper in active operative relationship to the scraper and whereby the force of gravity assists in the ejecting operation, the scraper blade presenting a concave curved surface to material brought thereagainst by the core.

13. A device of the class described comprising a frame, a ground engaging roller supporting said frame in spaced relation from the ground and to which said roller is rotatably connected, said roller having a ground engaging rim including solid portions and also open portions through which material over which said rim is rolled may be intruded into the interior of said roller, said roller having an end which is open continuously along an annular path around the axis of said roller, and means carried by said frame and projecting into said end of said roller for causing the intruded material to be ejected through said end of said roller said means being disposed in eccentric relationship with respect to the axis of rotation of said roller and being disposed close to the interior surface of the roller so that the roller will bring intruded material against said means.

14. A device as set forth in claim 13 in which the frame has a fixed shaft on which the roller is rotatably mounted and in which said means has a width less than that of the interior diameter of said rim so as not to span the interior of said rim.

15. A device of the class described comprising a roller, a frame for said roller, said roller having a perforated rim, means for rotatably mounting said rim on the frame including a shaft extending into said roller and connected to said frame, and a hub structure journaled on said shaft and connected to said rim solely at places spaced from said one end of said rim, the perforations in said rim being disposed between said places and said one end of said rim, said hub structure closing the opposite end of said roller to thereby force intruded material toward said one end of said roller, said one end having an opening therein to permit axial exit of intruded material from said roller, said hub structure and said rim providing a straight axial passage within said roller leading to said opening to facilitate movement of intruded material directly to said opening.

16. An earth compacting device comprising a pair of rollers and a frame for said rollers, said rollers being arranged for rotation about a common axis and having certain ends disposed adjacent one another, each roller having a perforated rim through which material being compacted may be intruded into the interior of said roller, said frame having a portion disposed adjacent each end of each of said rollers, means extending through said rollers and connected to said frame portions for rotatably connecting said rollers to said frame, and means closing said adjacent ends of said rollers and projecting toward the remote ends of said rollers so that material intruded into said rollers is forced toward the remote ends of said rollers, each remote end having an opening to permit the axial exit therethrough of intruded material, said rim and said means providing a straight axial passage within each roller for the movement of intruded material through the openings in the remote ends of said rollers.

17. A compacting device of the class described comprising a frame, an apertured rim roller journaled to the frame and having an end that is open continuously along an annular path around the axis of said roller, a smooth continuous frusto-conical core with its base substantially closing the other end of said roller and having its apex approximately in the plane of the first-mentioned end of the roller so that material intruded through the rim will drop onto the core after being carried to the top of the rim by rotation thereof.

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