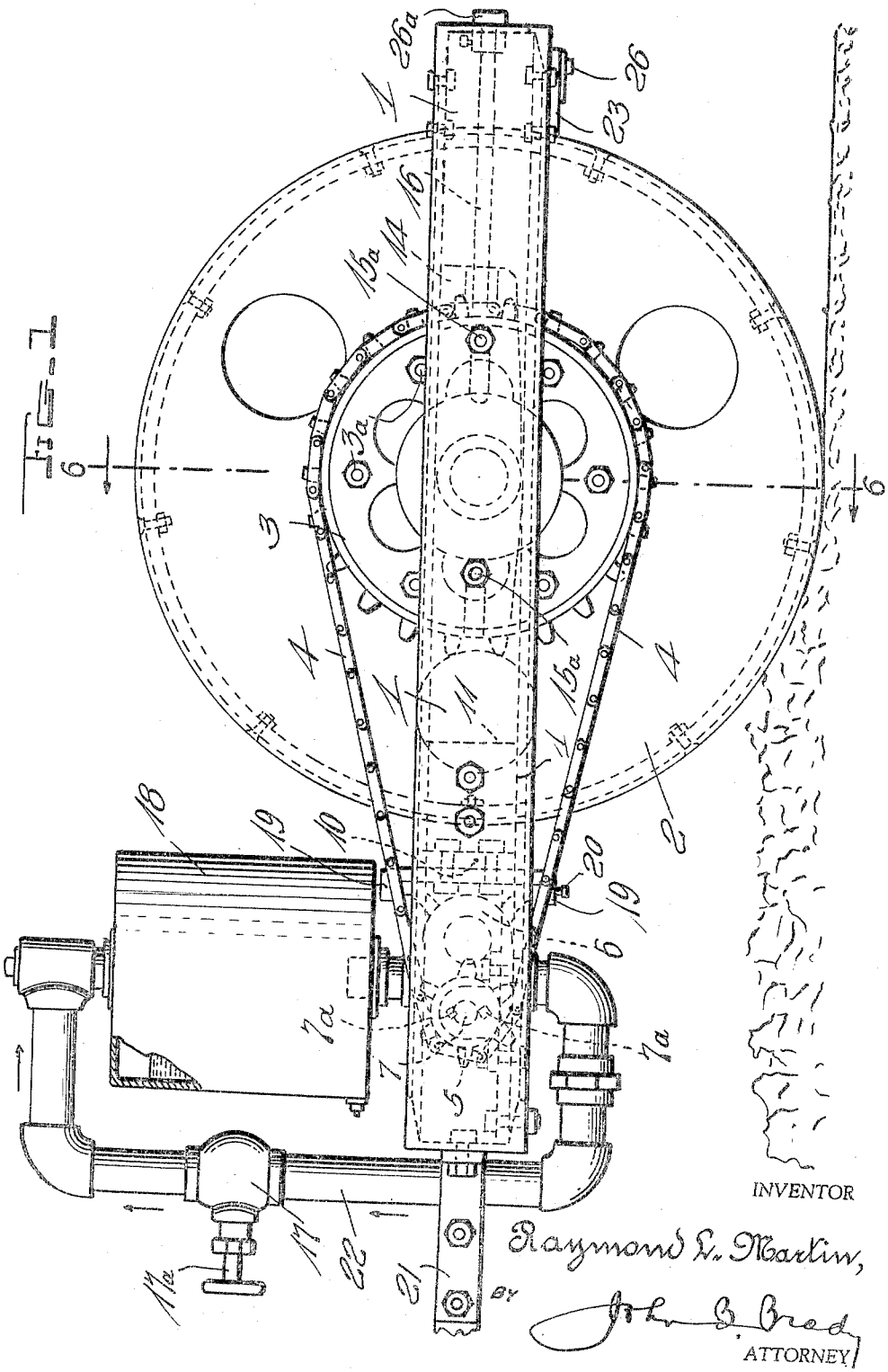
Sept. 25, 1956 R. L. MARTIN 2,763,974

CONTROL MECHANISM FOR ROTARY EQUIPMENT

Filed Dec. 19, 1951

4 Sheets-Sheet 1



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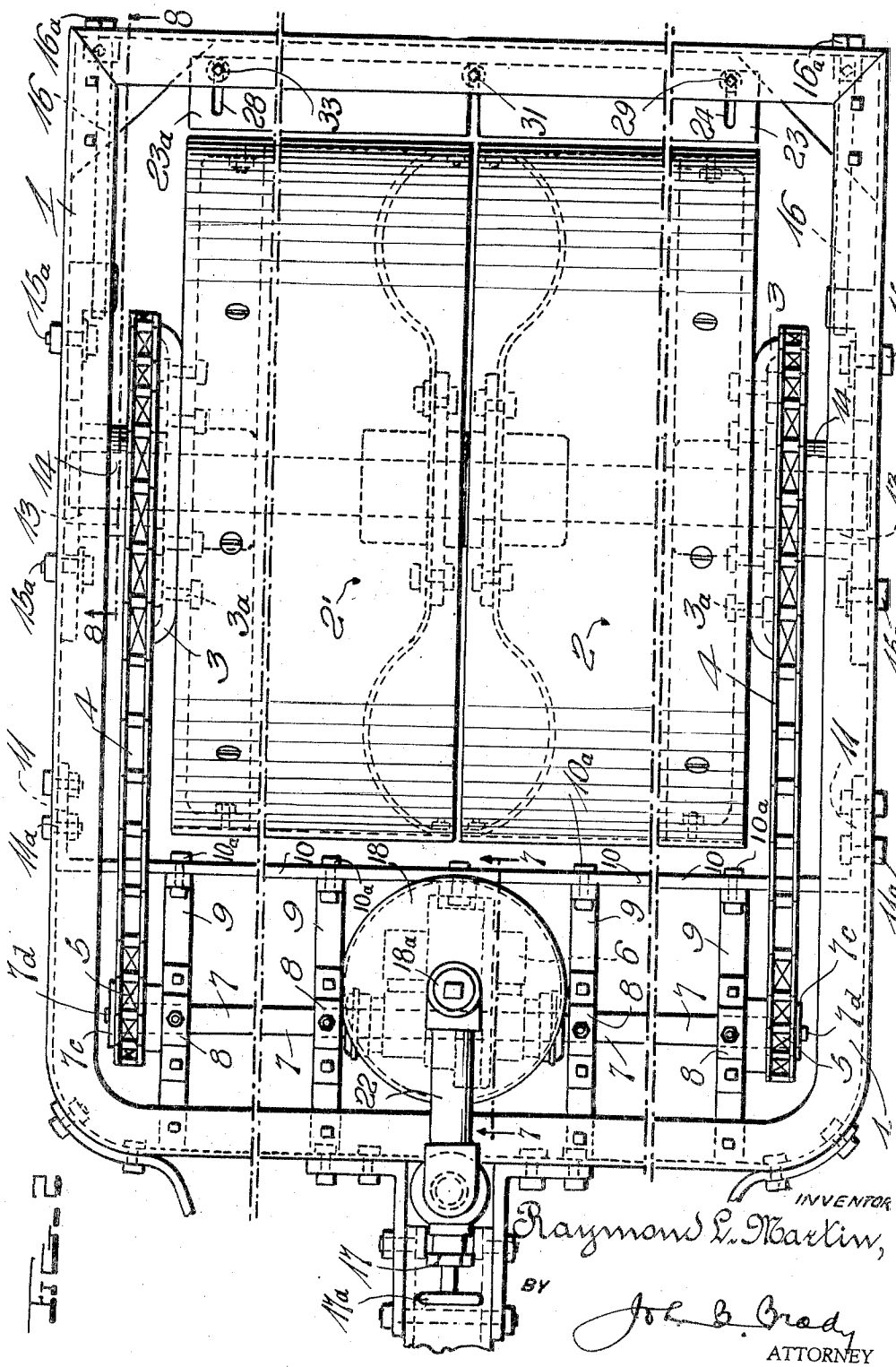
4 Sheets-Sheet 2



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4 Sheets-Sheet 3

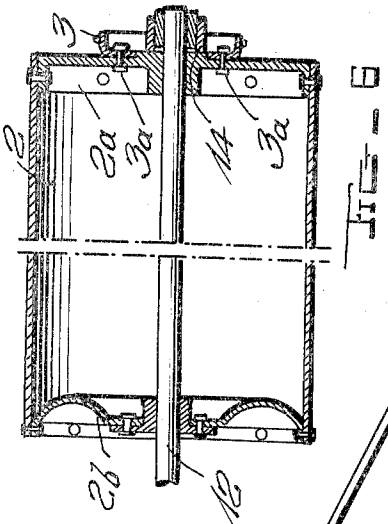

FIG. 6

FIG. 3

FIG. 5

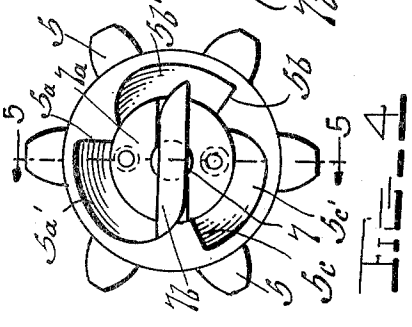

FIG. 4

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4 Sheets-Sheet 4

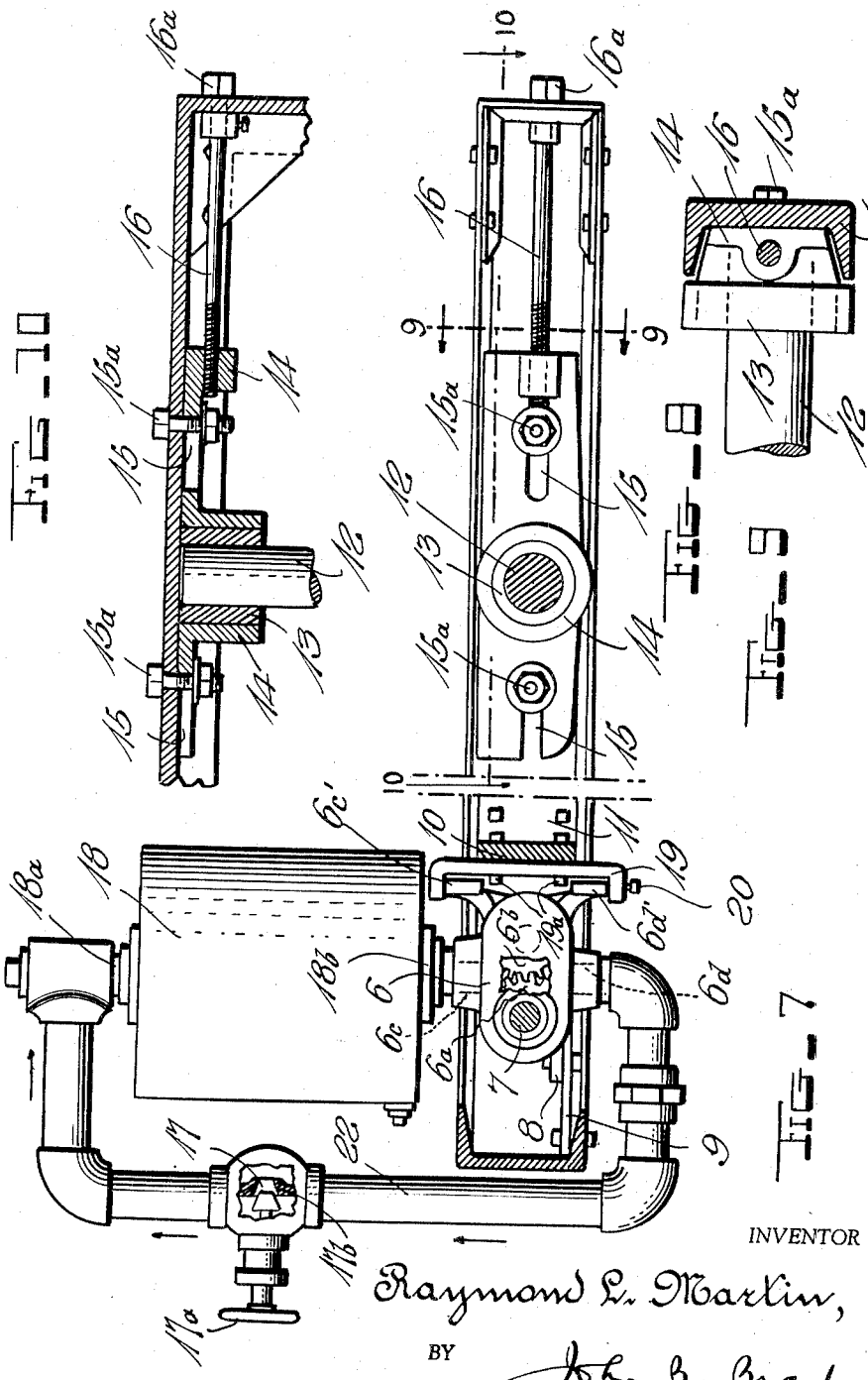

FIG. 10

FIG. 8

FIG. 9

FIG. 7

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United States Patent Office 2,763,974 Patented Sept. 25, 1956

2,763,974

CONTROL MECHANISM FOR ROTARY EQUIPMENT

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Application December 19, 1951, Serial No. 262,371

5 Claims. (Cl. 55—6)

My invention relates broadly to tractor operated land rollers and more particularly to a method of controlling the operation of land rollers and a control mechanism for land rollers for governing the rollers speed thereof.

One of the objects of my invention is to provide a method of controlling the velocity of rotation of a land roller by driving a fluid pumping unit by the rotation of the land roller and variably loading the pumping unit selectively for correspondingly controlling the velocity of rotation of the land roller.

Another object of my invention is to provide a construction of land roller having hydraulic means for variably controlling the speed of rotation of the roller.

A further object of my invention is to provide an attachment for land rollers which may be readily applied to existing types of land rollers with slight modifications for accurately controlling the speed of rotation of the roller.

Still another object of my invention is to provide a construction of land roller which employs a small rotary gear pump in association therewith for applying a retarding action to the roller which may be readily varied to enable the roller to operate in a free rolling condition or with a dragging action.

A still further object of my invention is to provide an arrangement of pump which is coupled with a land roller and arranged to supply a shunt line including a throttle valve for variably controlling the rate at which fluid may be pumped through the shunt line and correspondingly controlling the velocity at which the land roller may be rotated.

Another object of my invention is to provide an arrangement of fluid pumping unit which may be coupled with a land roller and driven simultaneously therewith, where the fluid pumping unit operates into a selectively variable load, the control of which determines the velocity at which the land roller operates.

Other and further objects of my invention reside in a method of controlling the operation of a land roller as set forth more fully in the specification hereinafter following by reference to the accompanying drawings, in which:

Figure 1 is a side elevational view of the land roller of my invention showing the speed control mechanism associated therewith; Fig. 2 is a plan view of the roller and associated control mechanism arranged in accordance with my invention, the view being foreshortened in order to illustrate the parts on sufficiently large scale to show the coaction of the pumping unit with the roller mechanism; Fig. 3 is a full view plan assembly of the roller and control mechanism arranged in accordance with my invention; Fig. 4 is a detail view of one of the clutch sprocket assemblies with the cover plate removed to illustrate the clutch sprocket interposed between each end of the pump operating shaft and the roller mechanism; Fig. 5 is a fragmentary cross sectional view taken on line 5—5 of Fig. 4 with the cover plate shown in juxtaopposed relation to the end of the clutch sprocket;

Fig. 6 is a transverse sectional view on a reduced scale taken on line 6—6 of Fig. 1 and illustrating the sprocket and roller assembly, the roller again being foreshortened in order to illustrate the coacting parts with sufficient clarity; Fig. 7 is a side elevational view of the pumping unit and the mounting means therefor with certain of the parts broken away and illustrated in section substantially on line 7—7 of Fig. 2 for the purpose of explaining the operation of the rotary pump and the throttle valve for variably controlling the loading applied to the roller; Fig. 8 is a fragmentary sectional view taken substantially on line 8—8 of Fig. 2 and illustrating the means for adjusting the chain tension and also the position of the bearings for the rollers; Fig. 9 is a fragmentary transverse sectional view taken substantially on line 9—9 of Fig. 8; and Fig. 10 is a fragmentary longitudinal sectional view taken substantially on line 10—10 of Fig. 8.

My invention is directed to a construction of tractor operated land roller and/or an attachment for land rollers whereby the rotation of the land roller may be variably and selectively controlled. The control of roller action on different acids in agriculture operations is very important, in order to compress and crush cloddy ground for pulverizing the ground to a level even surface ready for seeding or planting. The condition of the soil which is produced by roller action is proportional to roller-speed. The structure of my invention provides means for retarding the normal roller-speed for creating a semi-rolling and dragging effect which I have found to be more effective in compressing and crushing cloddy ground. I obtain accurate control of the velocity of the roller by coupling a pumping unit with the roller so that the roller drives the pumping unit. I then provide means for variably loading the pumping unit which proportionally controls the velocity at which the rollers operate for accurately controlling the roller's speed. I have found that different speeds are desirable for earths of different moisture content and inasmuch as very accurate control of speed is obtainable by the method of my invention as described herein, it has been found to be versatile and efficient in properly surfacing the soil.

Referring to the drawings in detail, reference character 1 designates the main frame of the land roller attachment adapted to be connected through tongue 21 with a tractor. The main frame 1 supports longitudinally adjustable bearing plates 14 which are slidable along the opposite interior sides of main frame 1 and longitudinally controllable in position by screws 16 operated from wrench engageable heads 16*a* at the rear end of the main frame 1, whereby adjustable bearing plates 14 are shiftable with the slots 15 therein engageable by bolts 15*a* adjustable from the exterior sides of the main frame. Thus the position of the roller shaft 12 which is journaled in the oilless bearings 13 carried by the adjustable bearing plates 14 is laterally adjustable with respect to the main frame 1, which also compensates for chain 4 tension.

The rollers 2 are formed by a multiplicity of sections represented at 2 and 2' where the exterior end plate which supports each roller is substantially flat as represented at 2*a* in Fig. 6 and the interior end plate is shaped to provide an annular reinforced support as represented at 2*b* in Fig. 6. The flat end of each roller represented at 2*a* in Fig. 6 provides a support for the sprocket 3 which is secured thereto by bolt members 3*a*. The sprocket teeth of sprocket 3 engage sprocket chain 4 which extends over the teeth of the clutch sprocket 5 carried by the end of rotary pump shaft 7 which extends from pump 6.

The pump 6 constitutes a rotary retarding means in the assembly shown. Inasmuch as the equipment is symmetrically constructed the same reference characters have been applied to the coacting parts for each of the rollers

2 and 2', so that it will be understood that there are portions of shaft 7 extending in opposite directions from the central position occupied by pump 6. The shaft 7 is double-ended and is rotatably journaled in spaced bearings 8 which are mounted on longitudinally extending spaced bridge bars 9 forming part of an internally disposed frame structure mounted within said main frame 1, the shaft 7 extending from spaced positions along the front of the main frame 1 and spaced positions on cross-bar 10 as represented at 10*a*. The cross-bar 10 is provided with angular portions 11 at opposite ends thereof of which are secured by bolts 11*a* to the sides of the main frame 1. Thus a solid support is provided for pump shaft 7.

The pump 6 in the arrangement illustrated is a rotary gear pump having a pair of intermeshed toothed rotors 6*a* and 6*b* mounted in the flow path for oil through casing 6 entering at intake port 6*c* and discharging at discharge port 6*d*. The intake port 6*c* connects with the reservoir 18 through which oil flows in a closed path through the loop 22 from the intake end 18*a* of the reservoir to the discharge end 18*b* of the reservoir. The direction of flow for the oil is indicated by the arrows. The closed loop 22 includes the throttle valve 17 which is manually adjustable at control handle 17*a* for controlling the rate of flow of the oil through the gear pump and through the loop 22. By adjusting the throttle valve 17 to a very small opening set 17*b* the load on the gear pump 6 is very greatly increased, so that pump operates as a drag on pump shaft 7 as clutch sprockets 5 are revolved under control of sprocket chains 4 driven by sprockets 3 as roller 2 and 2' revolve. The clutch sprockets 5 are shown more clearly in Figs. 4 and 5 and include a sleeve 7*a* attached to pump shaft 7. The sleeve 7*a* carries a clutch member 7*b* which revolves within the interior of the housing of clutch sprocket 5 which is provided with clutch faces 5*a*, 5*b* and 5*c* which engage the clutch member 7*b* for driving pump shaft 7. Sufficient lost motion and clearance is provided to allow clutch member 7*b* to slide transversely within sleeve 7*a* and within the limits of recesses 5*a'*, 5*b'* and 5*c'* by the clutch faces 5*a*, 5*b* and 5*c* to insure the driving of pump shaft 7 from rollers 2 and 2' while allowing sufficient play in the drive system to insure against breakage of any of the driving components. A cover plate 7*c* is secured to the end face of the sleeve 7*a* by bolt members indicated more clearly at 7*d* in Figs. 1 and 2.

The pumping unit is supported on cross-bar 10 by means of a clamp 19 which grips the casing of pump 6 as represented more clearly in Fig. 7. The casing of the pump 6 is shown as having opposite projections 6*c'* and 6*d'* thereon which are engageable by clamp 19 and the set screw 20 therein. Clamp 19 is substantially U-shaped and extends vertically and is fastened by bolts 19*a* to the cross-bar 10 with opposite side portions extending substantially horizontally and embracing the opposite projections 6*c'* and 6*d'* on the casing 6 of the pump 6 as shown. Set screw 20 secures the casing 6 in a firm position centrally of the front of the main frame 1. By reason of this construction the entire pumping unit may be readily attached and detached with respect to a conventional land roller for controlling the rolling action. Moreover, the adjustable clamp 19 facilitates the installation of the pumping unit on original equipment on a production line so that the entire apparatus is ready for operation upon delivery to a customer.

The fact that the rotary gear pump may be variably loaded by adjusting the oil flow through throttle valve 17 in closed loop 22 insures the precision control of the velocity of rollers 2 and 2'. The entire pumping unit is dust-proof and oil may be fed by gravity from reservoir 18 directly above the pump 6 and pumped vertically through the closed loop 22 and throttle valve 17 where it is returned to reservoir 18 through intake connection 18*a* for recycling through the pumping system. The retarding effect upon the oil flow path produces a proportional dragging effect on the rollers 2 and 2'. Thus by

loading the rotary gear pump a braking effect is applied to rollers 2 and 2' creating greater crushing effect on cloddy ground surfaces. The degree of drag which is impressed upon rollers 2 and 2' is controlled with exactitude by controlling the position of throttle valve 17.

The clutch sprockets 5 illustrated in Figs. 4 and 5 insure the differential action of the rollers 2 and 2' upon the pump shaft 7 for compensating for the movement of the rollers while proceeding in curves or making short turns over the ground. The differential action is imparted to the pump shaft 7 by virtue of the fact that each drum or roller 2, 2' is individually rotatably journaled on the supporting shaft 12.

It will be understood that any form of hydraulic pumping unit may be employed to produce the selective control and braking effect required for the operation of the equipment and of my invention, and I have referred to oil as the fluid medium merely for illustrative purposes.

The main frame 1 of the rolling equipment of my invention constitutes a chassis formed by front and end horizontally extending members interconnected by side members where the sections 2 and 2' of the rollers are journaled adjacent the rear of the chassis while the variably controlled pumping unit is supported adjacent the front of the chassis. This arrangement enables the rear frame member of the chassis to provide a support for adjustable scraper or doctor blades shown at 23 and 23*a*. The blades are provided with slots shown at 24, 25 27 and 28. The slots 24, 25 and 32—33 coact with adjustable bolts 29, 30, 32 and 33 which extend through the end frame member of the chassis to enable the scraper blades to be advanced or retracted with respect to the surface of the rollers. The inner ends of blades 23 and 23*a* terminate adjacent each other, as shown at 26 where they are supported by bolt 31. I may provide one continuous blade for both rollers instead of sectionalizing the blade.

The apparatus as described herein has been found very practical and efficient in operation, but I realize that modifications in detail and arrangement of the mechanism may be made and I desire that it be understood that no limitations upon my invention are intended other than may be imposed by the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is as follows:

1. Rolling equipment comprising a chassis forming a main frame, bearings mounted interiorly of each side of said main frame, a roller shaft journaled in said bearings, a hydraulic pump supported adjacent the front of said main frame in a central position aligned with the longitudinal axis thereof, said hydraulic pump including coacting rotary elements, each revolving on axes parallel with the axis of said roller shaft, input and output connections for said pump, a closed circuit fluid load connected with said input and output connections, a laterally extending rotatably journaled shaft projecting on opposite sides of said pump from the central position thereof, roller means carried by said roller shaft, and symmetrically disposed means for differentially driving opposite ends of said laterally extending rotatably journaled shaft from said roller means.

2. Rolling equipment as set forth in claim 1, which includes an internally disposed frame structure mounted adjacent the forward end of said main frame, said frame structure including, a cross-bar extending transversely of said main frame and longitudinally extending spaced bridge bars secured between said transversely extending cross-bar and the forward end of said main frame, said spaced bridge bars carrying means for journaling said laterally extending rotatably journaled shaft.

3. Rolling equipment as set forth in claim 1, which includes an internally disposed front frame structure mounted adjacent the forward end of said main frame, said frame structure including a cross-bar extending transversely between the side members of said main

frame and a clamp embracing a portion of said hydraulic pump and connected with said cross-bar at substantially the center thereof for supporting said hydraulic pump with respect to said main frame in symmetrical relation to said roller means.

4. Rolling equipment as set forth in claim 1 wherein said hydraulic pump is housed in a casing which has a pair of oppositely extending projections thereon and wherein there is an internally disposed frame structure mounted adjacent the forward end of said main frame, said frame structure including a cross-bar extending transversely between the side members of said main frame and a substantially U shaped bracket secured centrally of said cross-bar and having end portions extending horizontally in positions embracing the projections on said casing and adjustable means associated with one of said end portions for adjustably clamping said casing in position centrally of the forward end of said main frame.

5. Rolling equipment comprising a chassis forming a main frame, an internally disposed frame structure mounted adjacent the front of said main frame, shaft members journaled laterally of said frame structure, means for applying differential rotary forces to said shaft members, a rotary pump detachably mounted centrally of said frame structure interiorly of said main frame and adjacent the front thereof said rotary pump including a pair of coacting revolving elements operating on axes transversely of said main frame, said pump having an upwardly extending intake connection and a downwardly

extending discharge connection, a reservoir having a discharge connection supported on said intake connection and extending on a vertical axis above said pump an intake connection adjacent the top of said reservoir in vertical alignment with said discharge connection, and a conduit extending in a closed path from the discharge connection of said pump around the exterior of the front of said main frame and connected with the intake connection at the top of said reservoir, and an adjustable valve included in said conduit for controlling the rate of flow of fluid through said pump and around said conduit and through said reservoir for corresponding controlling the rotative resistance of said pump to the differential forces applied thereto from said shaft members.

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