Feb. 16, 1954

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2,669,364

ROTATABLE SUPPORT FOR CYLINDERS

Filed June 9, 1950

5 Sheets-Sheet 1

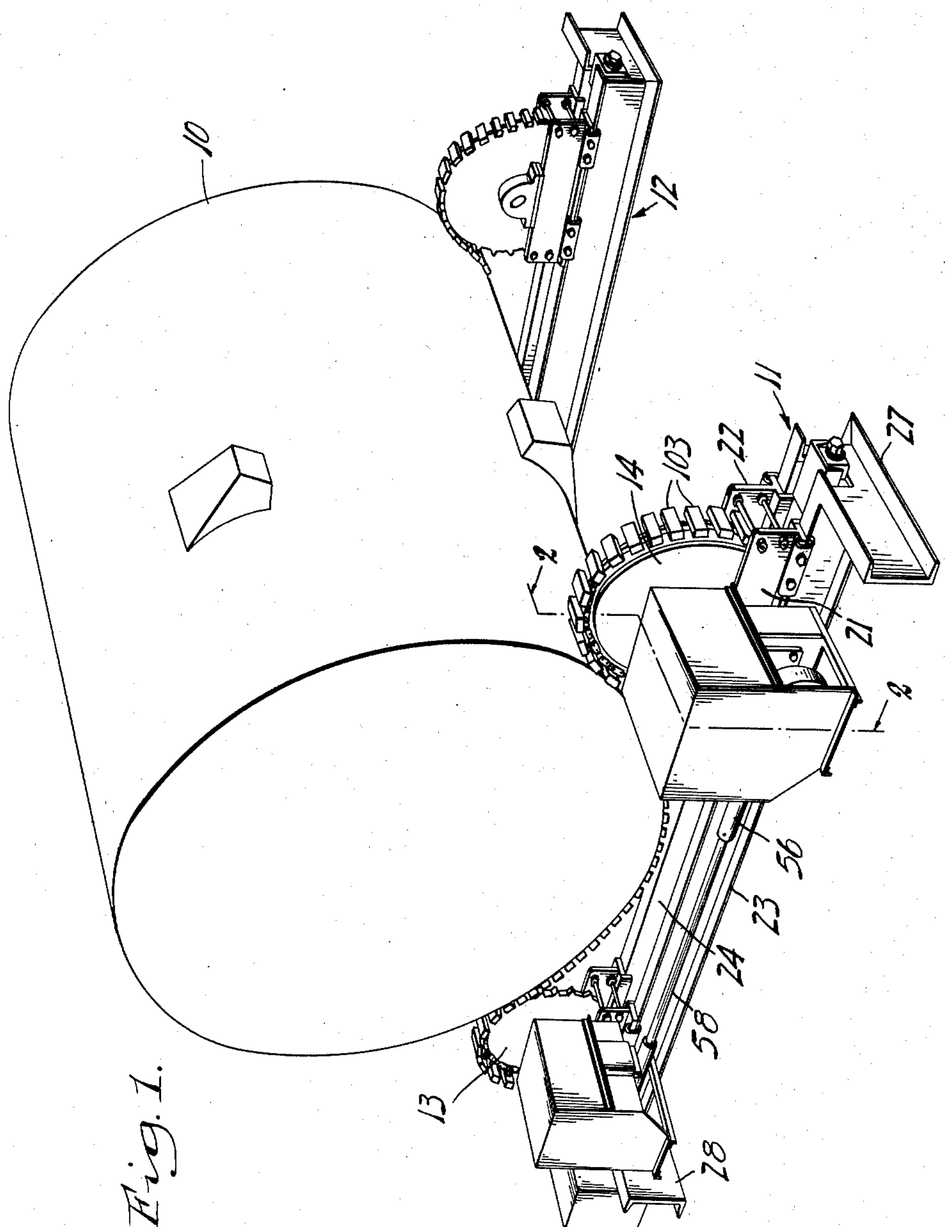

Fig. 1.

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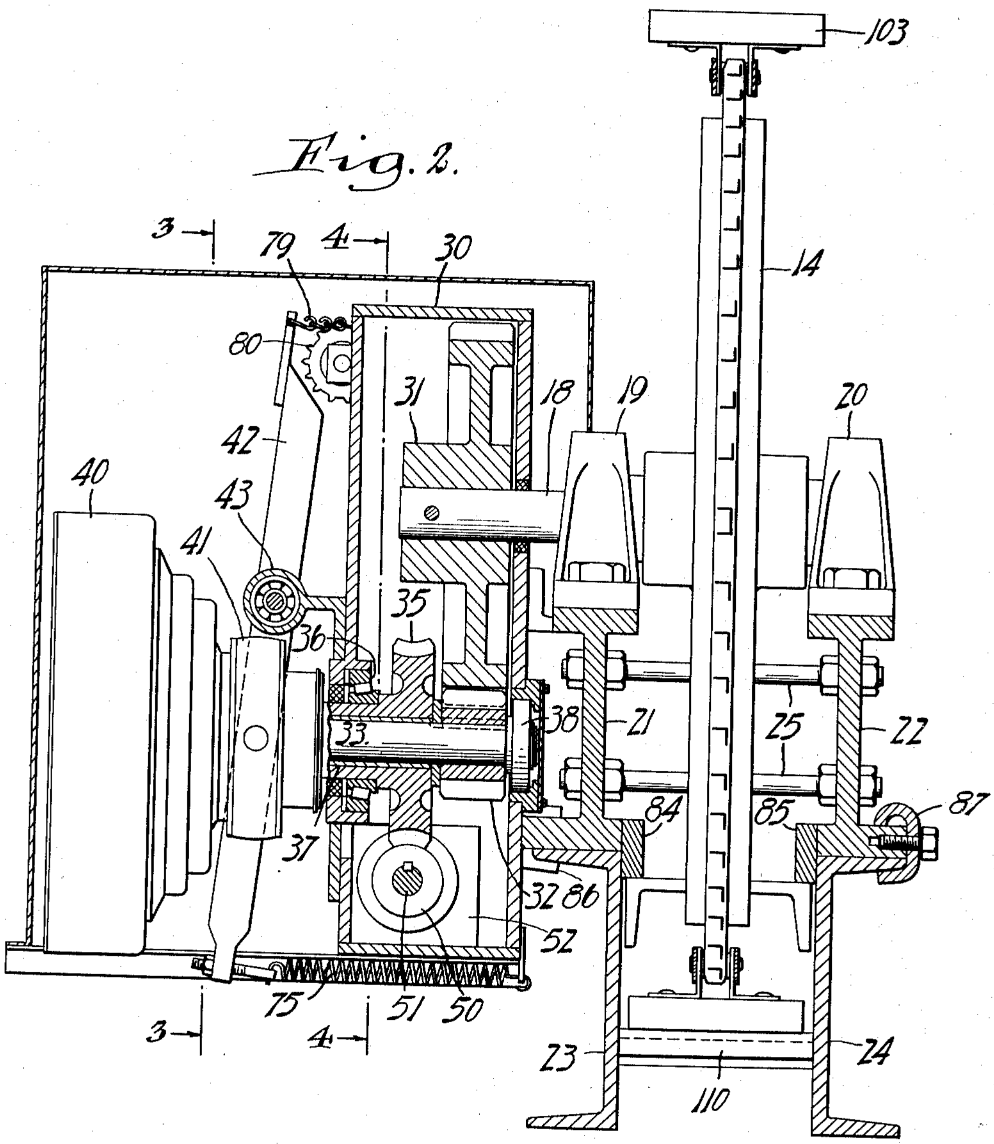
Fig. 2.



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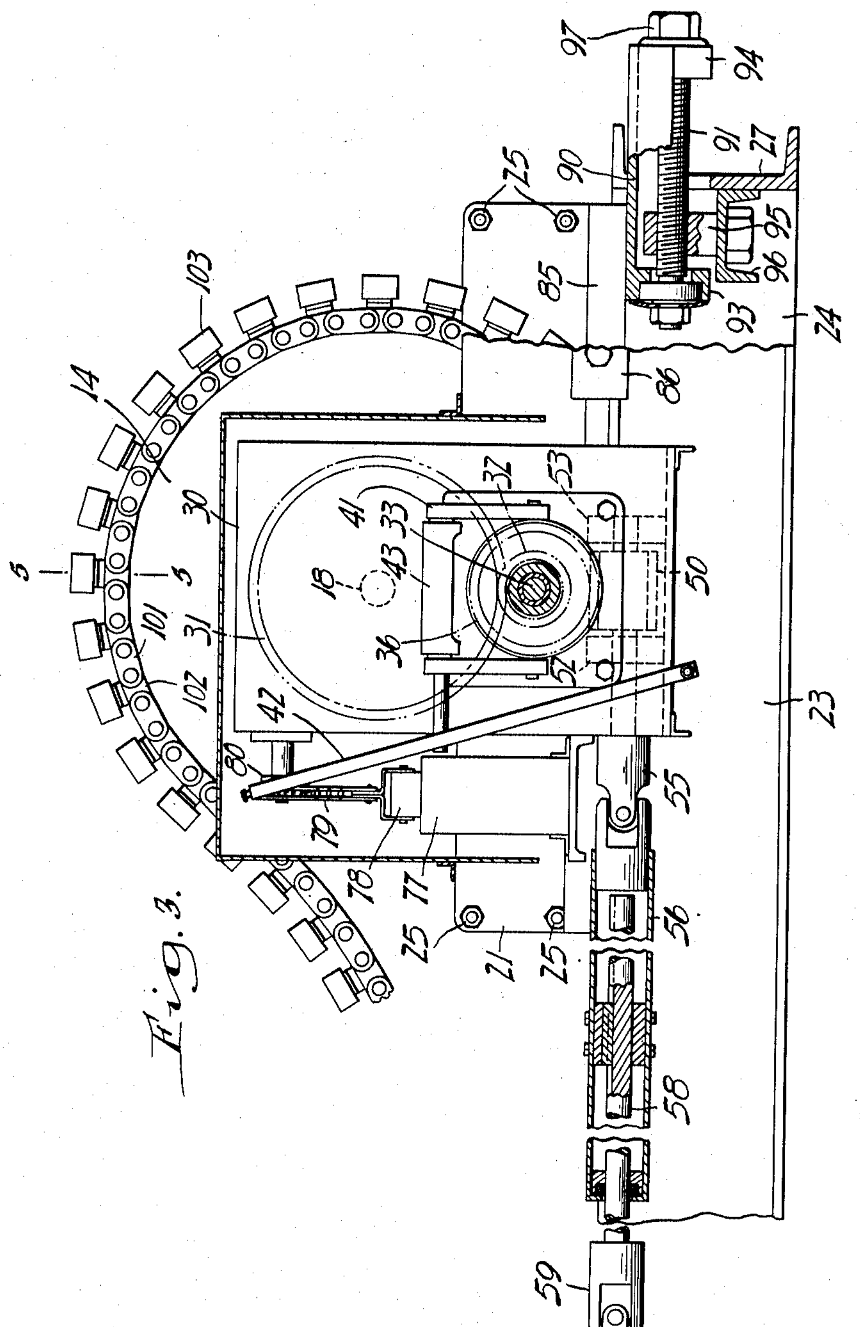

Fig. 3.

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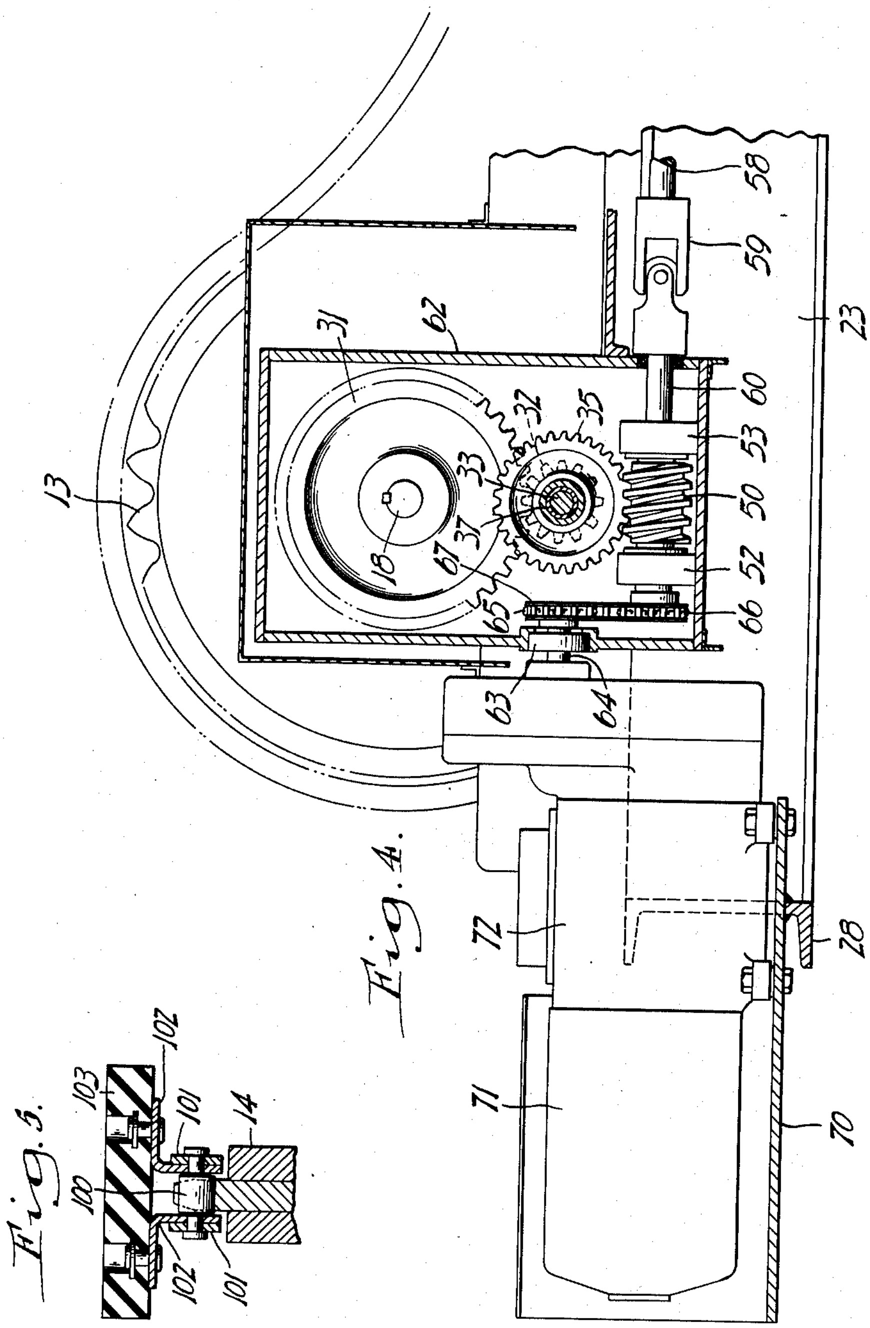
5 Sheets-Sheet 4



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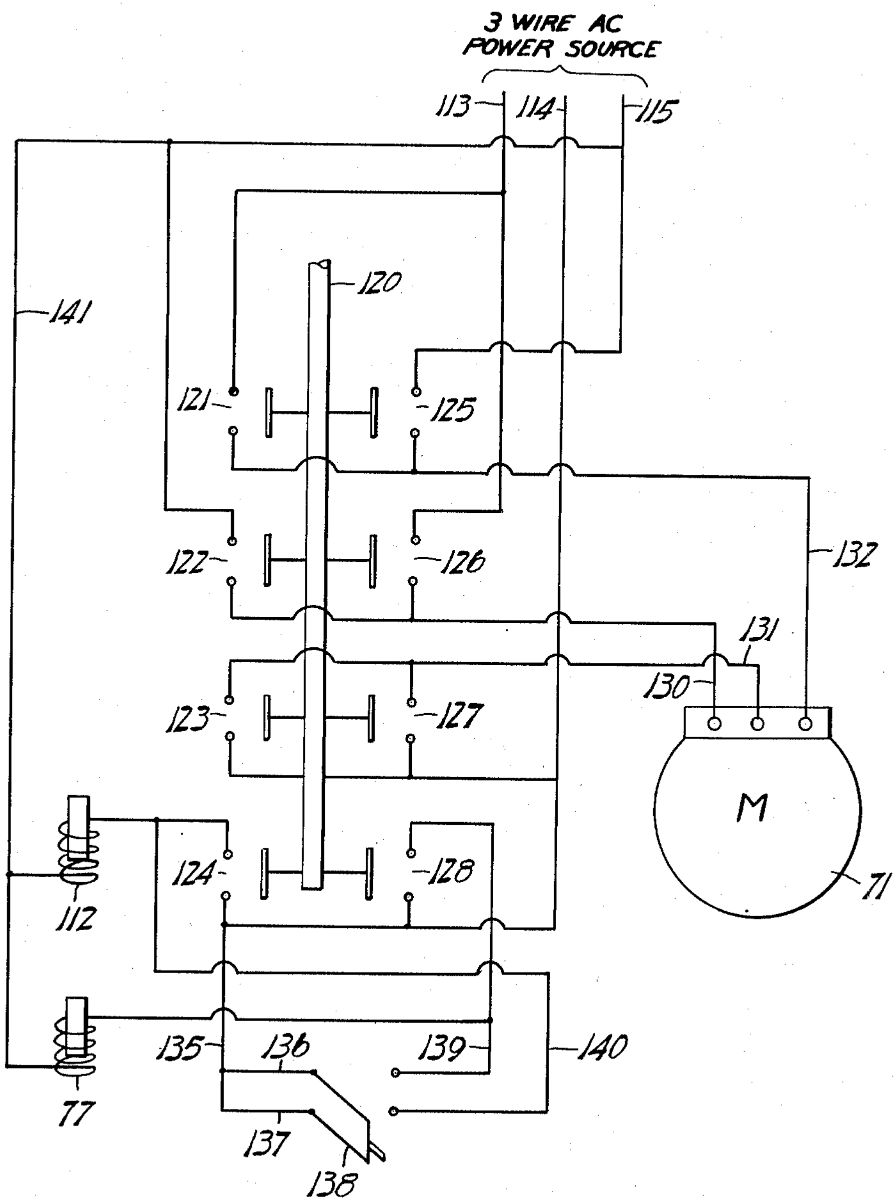

Fig. 6.

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ROTATABLE SUPPORT FOR CYLINDERS

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Application June 9, 1950, Serial No. 167,232

5 Claims. (Cl. 214—1)

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This invention relates to work supporting and rotating apparatus and particularly to means for supporting a cylindrical or partially cylindrical drum or tank or the like for rotation generally about its axis.

A fairly common problem in the fabrication of large sheet metal cylinders, drums or tanks is encountered in supporting them during various fabricating steps as, for instance, when welding about or along the periphery of such a drum or cylinder. It is essential that the support provide for rotation of the drum or cylinder to bring various portions thereof to desired working zones.

The walls of cylindrical workpieces of this general nature are frequently so thin in relation to their size and general bulk as to be readily dented by any localized pressure and accordingly the provision of suitable and proper supporting means must take this factor into account. A common method of supporting such cylinders or drums is to provide a pair of spaced parallel horizontal shafts or rotatable rolls and cradle the periphery of the drum upon and between such shafts or rolls. In many cases this expedient is inadequate and denting, cavitation or buckling of the workpiece results.

In fact it is conventional practice in many instances to provide an extra supporting or reinforcing ring secured to the tank or cylinder for the sole purpose of providing extra strength to avoid denting. After the cylinder or tank has been operated upon in the conventional parallel roll apparatus referred to above, this supporting or reinforcing ring is removed. The waste of time, effort, and material involved in this procedure is obvious.

The present invention provides a support for a cylinder or drum wherein the weight of the workpiece is proportionately distributed across a large supporting area and wherein, despite this distribution, the rotary workpiece is so supported that it is constrained against rocking or swaying or any movement other than mere rotation about its own or a predetermined axis.

According to the present invention a pair of rolls in the nature of sprocket wheels are provided with special roller chains which provide a link belt or chain belt with the axes of the sprocket wheels parallel and in horizontal alignment but adjustable to permit ready variation in their spacing. In this way a support is provided whereby a drum or other cylindrical workpiece of considerable size is supported along a considerable portion of the lower part of its periphery while at the same time it is positively

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cradled between the portions of the link belt or chain belt where the drum or cylinder is substantially in tangential contact with the sprocket wheels. The arrangement is such that by accurately adjusting the spacing of the pairs of sprocket wheels the forces exerted against the peripheral wall of the workpiece may be substantially the same at the sprocket wheels as at the intermediate portions where only the arcuate chain belt loop itself is engaging against the drum periphery in supporting relationship.

Further, the apparatus of the present invention provides a support of the foregoing general description wherein the cooperating driving sprocket wheels may be selectively rotated or locked against rotation and, in either case, the drive is imparted to the chain belt or link belt through its lower, generally straight side, so that the driving impulse has no tendency to lift the workpiece by reason of a tightening of the upper portion of the chain belt or link belt when driving force is applied.

The apparatus of the present invention is such that the lightest gauge tanks may be supported and worked upon without damage thereto and the capacity of the apparatus is at the same time ample to support heavy wall tanks. The available tractive force for both driving and braking is such that the unbalanced loads due to heavy overhanging or eccentric parts on the workpiece, which are frequently met with, are handled without difficulty. The combined sprocket wheel and chain belt support afford up to 105° of continuous peripheral contact with the workpiece. Once the apparatus is adjusted for a workpiece of a particular size any number of duplicate workpieces may be handled without further adjustment. The roller chain arrangement of the support is subject to no appreciable stretch which would, of course, upset the adjustment.

Various mechanical modifications and departures may be made without departing from the spirit of the invention. It is to be understood that the specific form illustrated in the drawings is described in detail in the following specification and is by way of example only, and that the invention is limited only as defined in the appended claims.

In the drawings:

Fig. 1 is a general perspective view of one form of the apparatus of the present invention;

Fig. 2 is a cross-sectional view taken on the line **2—2** of Fig. 1;

Fig. 3 is a cross-sectional view taken generally on the line **3—3** of Fig. 2;

Fig. 4 is a cross-sectional view taken generally on the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary cross-sectional view on the line 5—5 of Fig. 3; and

Fig. 6 is a schematic electrical diagram of the control circuits of the apparatus.

Throughout the several figures of the drawings like characters of reference denote like parts, and, referring to the general perspective view, Fig. 1, the numeral 10 designates a cylindrical workpiece or drum supported near its opposite ends in a pair of supports designated generally by the numerals 11 and 12, the supports being spaced in the direction of the axis of tank 10. The support 11 is a driving support, and the support 12 is merely an idler support. In the form shown, support 11 includes drive and brake means which cooperate to impart controlled rotative movement to tank 10 or hold the latter against rotation in any desired angular position. The support 12 is identical with the support 11, excepting for the omission of the means for driving the sprockets, and, accordingly, a detailed description of the support 11 will suffice for both. There is no reason why more than one idler support may not be used with one driving support in the case of long tanks and, under special circumstances, the use of two driving supports may be desirable.

The driving support designated generally 11 is shown in detail in Figs. 2 through 5 and includes a pair of sprocket wheel elements 13 and 14. The sprocket 13 and its general supporting means is shown in detail in Fig. 4, while the sprocket 14 and its general supporting and driving arrangement is shown in detail in Fig. 3. Fig. 2 is a cross-sectional view through the driving and control arrangement for sprocket 14 but exemplifies the driving arrangement for both of the sprockets 13 and 14, excepting that the sprocket 14 of Figs. 2 and 3 and its driving means are mounted for adjustment toward and away from sprocket 13 while the latter need not be adjustably supported.

Referring to Figs. 2 and 3, sprocket 14 has a drive shaft 18 which is journaled in a pair of bearings 19 and 20 which are supported, respectively, on a pair of I-beam members 21 and 22, which rest upon a pair of base channels 23 and 24. I-beams 21 and 22 are held in fixed parallel spaced relation by means of tie rods 25, and channels 23 and 24 are held in fixed, spaced, parallel relation with respect to each other by end channels 27 and 28, which may be welded thereto.

A transmission casing 30 is fixed to I-beam 21, and an extension of sprocket shaft 18 extends into casing 30, where it has fixed thereto a driving gear 31. Gear 31 meshes with a drive pinion 32, which is fixed to a stub shaft 33. A worm wheel 35 has anti-friction bearing in one wall of casing 30 as at 36 and is fixed to a sleeve 37 in which stub shaft 33 is free to rotate. The right-hand end of stub shaft 33 as viewed in Fig. 2 has anti-friction bearing in the opposite wall of casing 30, as at 38.

In Fig. 2 the numeral 40 designates a clutch which may be a conventional single plate dry disc clutch of the kind commonly used in automotive vehicles, and shaft 33 and sleeve 37 extend into the clutch casing for driving engagement with the driving and driven elements, respectively, of the clutch. It is believed that the design and construction of such clutches is well-known to those skilled in the mechanical arts and requires no further illustration. In Fig. 2 the numeral 41 designates the usual clutch shifting yoke, and a control lever 42 for the yoke 41 has anti-friction bearing in an extension of transmission casing 30 as at 43.

A driving worm 50 for worm wheel 35 is fixed to a drive shaft element 51 which has bearings 52 and 53 fixed within casing 30 and which extends outwardly of casing 30 as shown in Fig. 3, where it connects with one end of a universal joint 55, the other end of which is connected to one end of a tube 56. Tube 56 contains an internally splined collar or sleeve 57, and an externally splined shaft 58 is axially slidable therein. Shaft 58 extends to the left as viewed in Figs. 3 and 4 where it terminates in a universal joint 59, by means of which it is connected to a worm shaft 60.

In Fig. 4 the numeral 62 designates a transmission casing for the driving and braking mechanism of sprocket 13, which is the same as transmission casing 30 of Figs. 2 and 3, excepting that it includes in addition an anti-friction bearing 63, in which is journaled a drive shaft 64 carrying a sprocket 65. A mating sprocket 66 is fixed to worm shaft 60, and a driving chain 67 connects the sprockets. In Fig. 4 the drive, including worm 50 and the other transmission parts leading to sprocket 13 are identical with those described in connection with Fig. 2, and, accordingly, like characters of reference have been applied thereto.

A supporting plate 70 is welded or otherwise rigidly secured to end channel 28, see Fig. 4, and preferably also to one or both of the side channels 23 and 24 for supporting driving means, including an electric driving motor 71 and an infinitely variable speed reducing gear box 72. The latter may comprise an infinitely variable transmission well-known in the art as a Graham transmission. In Fig. 4 the drive shaft 64 comprises the output shaft of the Graham transmission. It will be seen from the foregoing that either or both of the sprocket wheels 13 and 14 may be driven from motor 71 if its associated clutch 40 is engaged.

Referring to Figs. 2 and 3, an extension coil spring 75 acting between the lower end of clutch operating lever 42 and a fixed part of transmission casing 30 urges lever 42 in a counterclockwise direction as viewed in Fig. 2, or to a position of clutch disengagement. In Fig. 2 the lever 42 is shown in a position in which clutch 40 is engaged, and this is brought about by means of an electromagnet, designated 77 in Fig. 3, whose armature 78 may engage the lower end of a flexible transmission chain 79 which passes over an idler sprocket 80 supported by casing 30, the other end of chain 79 being connected to the upper end of lever 42. Energization of electromagnet 77 pulls the upper end of clutch operating lever 42 to the right, as viewed in Fig. 2, to engage the clutch and establish driving connection between worm wheel 35 and sprocket drive pinion 32.

As stated previously herein, sprocket 14 and its entire driving transmission, including clutch 40, are mounted for joint longitudinal adjusting movement along channels 23 and 24. To this end the lower flanges of I-beam members 21 and 22 are provided with inner guide rails 84 and 85, and flanged bars 86 and 87 which engage beneath the upper flanges of base channels 23 and 24 to prevent upward movement of the sprocket drive assembly from channels 23 and 24 and guide the former for movement along the channels.

Such adjusting movement is attained by means illustrated in Fig. 3, which includes a bearing bracket 90 which may be welded to the under sides of inner guide bars 84 and 85. A screw element 91 has anti-friction bearing at its opposite ends in bearing lugs 93 and 94 fixed to bracket 90, the anti-friction bearings being recessed as illustrated to prevent axial movement of screw 91 relative to bracket 90. An internally threaded lug 95 is fixed to a bracket 96, which, in turn, is fixed to end channel 27 of the lower supporting structure.

The screw 91 has a head portion 97 for engagement by means of a wrench or crank, and it will be clear from the foregoing that rotation of screw 91 by manipulation of head portion 97 will cause the screw 91 to move longitudinally relative to fixed lug 95 and, accordingly, adjust the I-beam members 21 and 22 along the tops of channels 23 and 24. This longitudinal adjusting movement does not interfere with the drive to both of the worm wheels of the sprockets 13 and 14 by reason of the telescoping spline connection between shaft 58 and tube 56, as previously described. Only about four inches of lineal adjustment are found necessary to accommodate a range of cylindrical tanks varying in diameter from five to ten feet.

The chain belt or link belt proper which directly supports the tank is shown in transverse section in Fig. 5 and is further illustrated in Fig. 3. The chain comprises conventional links 100 and side plates 101 pivoted in end-to-end relation. Between the side plates 101 and the links 100 are pivoted angle brackets 102 which are generally co-extensive with links 100 in a direction longitudinally of the chain. The upper portions of brackets 102 diverge to provide a pair of co-planar seats for a rubber block or pad 103 which may be riveted thereto, as shown in Fig. 5. The rubber blocks 103 are of sufficient resilience to avoid denting or otherwise marring the work and to provide a high degree of frictional tractive driving and braking engagement therewith.

As shown in Fig. 2 a plate 110 is welded between channels 23 and 24 and extends along for substantially the distance between the centers of sprocket wheels 13 and 14 to support the lower portion of the link belt or chain belt, the opposite ends of the plate 110 being flared downwardly to permit the pads 103 of the link belt or chain belt to smoothly engage the top surface of plate 110. The upper surface of plate 110 preferably has secured thereto a layer of canvas coated with graphite to reduce friction.

Reference will now be had to Fig. 6, which shows schematically the electrical control circuits for driving motor 71 and the solenoids for operating the clutches. In the present example a reversible three-phase alternating current motor is employed. The solenoid for operating clutch 40 of sprocket wheel 14 is designated 77, as previously noted, and in Fig. 6 the solenoid for operating the clutch for sprocket wheel 13 is designated 112.

The numerals 113, 114, and 115 in Fig. 6 designate the three leads of a conventional three-wire alternating current power source, and the application of power to the controls and to electric motor 71 is generally by means of what is known in the art as a rotary drum switch, which has forward and reverse positions and an intermediate "off" position. For convenience of illustration and understanding, this rotary drum switch is shown schematically in Fig. 6 as comprising a switch bar 120 for controlling two groups of four

switches each. The switches of one group are designated 121, 122, 123, and 124 in Fig. 6, and the switches of the second group are designated 125, 126, 127, and 128.

When switch operating bar 120 is in the intermediate "off" position illustrated in Fig. 6, all of the aforesaid eight switches are open. When it is moved to the left, as shown in Fig. 6, the switches 121 through 124 are closed, and when it is moved to the right as shown in Fig. 6, the switches 125 through 128 are closed. The three motor leads are designated 130, 131, and 132 in Fig. 6. When switch bar 120 is moved to the left, it is in the forward driving position wherein, with the clutch for sprocket wheel 13 engaged, sprocket wheel 13 will be driven in a clockwise direction, as viewed in Fig. 1, to rotate drum 10 in a counterclockwise direction.

In this position of the switch bar 120, conductor 113 of the power supply is connected to motor lead 132 through switch 121; conductor 114 of the power supply is connected to the motor lead 131 through switch 123; and conductor 115 of the power supply is connected to motor lead 130 by way of switch 122. At the same time supply conductor 114 is connected to one side of electromagnet 112 through switch 124, and the other side of the electromagnet is permanently connected directly to supply conductor 115 so that the clutch for sprocket wheel 113 will be engaged. In normal use the clutch for sprocket wheel 14 will be disengaged under these conditions.

If the position of switch control bar 120 be reversed and the switches 125 through 128 be closed, then conductor 113 will be connected to motor lead 130 through switch 126; conductor 114 will be connected to motor lead 131 by means of switch 127; and conductor 115 will be connected to motor lead 132 by way of switch 125. At the same time the electromagnet 77 for engaging clutch 40 of sprocket wheel 14 will be energized by way of conductor 114 and switch 128, the other side of electromagnet 77 being likewise permanently connected directly to supply conductor 115.

In Fig. 6 the electromagnets 77 and 112 have alternative energizing circuits whereby both are simultaneously energized regardless of the direction of operation of motor 71 and even if the latter be at rest with the switch bar 120 in the position illustrated in Fig. 6. Motor lead 114, in addition to connecting with switches 123, 124, 127 and 128, has a branch conductor 135 which divides into conductors 136 and 137 which lead to the terminals at one side of a double pole knife switch 138.

The terminals at the other side of this switch have conductors 139 and 140 which lead to one side of the electromagnets 77 and 112, respectively, the other side of each of the electromagnets, as previously stated, being permanently connected to power supply conductor 115 by a conductor 141 which serves the electromagnets 77 and 112 regardless of whether they are energized through the switches 124 and 128 or through manual switch 138.

From the foregoing it will be seen that, with knife switch 138 open, the energization of motor 71 to drive sprocket wheel 13 in a clockwise direction automatically engages its clutch by energization of electromagnet 112, the clutch 40 of sprocket wheel 14 being disengaged. Energization of motor 71 in the opposite direction to rotate sprocket wheel 14 in a counterclockwise direction automatically engages its clutch 40 through electromagnet 71, the clutch of sprocket wheel 13 remaining disengaged.

If the two clutches be simultaneously engaged through closure of switch 138 with switch bar 120 in a neutral position and motor 71 de-energized, then the clutches serve as an effective locking brake, by reason of the irreversible worm drives leading to the clutches. If both clutches be closed simultaneously with the motor 71 operating in either direction, then both sprocket wheels will be synchronously driven to impart extra driving force. Both the braking and the double driving function are important in properly supporting and controlling tanks having heavy overhang or other substantial and considerable eccentric masses or forces tending to produce undesired rotation or to resist desired rotation.

What is claimed is:

1. Apparatus for supporting and rotating cylindrical workpieces comprising a pair of aligned, horizontally spaced driving wheels, a belt-like element looped about the driving wheels with sufficient slack to provide an arcuate upper extent between the driving wheels, means for adjusting one of the driving wheels toward and away from the other whereby said upper extent of the belt-like element forms an arc conforming to the radius of the workpiece and substantially tangent to the driving wheels, and power means for selectively driving either of the driving wheels, said means including an electric motor and transmission means extending therefrom to both of said driving wheels, and a clutch in said transmission means for each of said driving wheels.

2. Apparatus for supporting and rotating cylindrical workpieces comprising a pair of aligned, horizontally spaced driving wheels, a belt-like element looped about the driving wheels with sufficient slack to provide an arcuate upper extent between the driving wheels, means for adjusting one of the driving wheels toward and away from the other whereby said upper extent of the belt-like element forms an arc conforming to the radius of the workpiece and substantially tangent to the driving wheels, and power means for selectively driving either of the driving wheels, said means including a reversible electric motor and transmission means extending therefrom to both of said driving wheels, a normally disengaged clutch in said transmission means for each of said driving wheels, and means operable automatically upon operation of the motor in one direction for engaging one of said clutches and upon operation of the motor in the opposite direction for engaging the other of said clutches.

3. Apparatus for supporting and rotating cylindrical workpieces comprising a pair of aligned, horizontally spaced driving wheels, a belt-like element looped about the driving wheels with sufficient slack to provide an arcuate upper extent between the driving wheels, means for adjusting one of the driving wheels toward and away from the other whereby said upper extent of the belt-like element forms an arc conforming to the radius of the workpiece and substantially tangent to the driving wheels, and power means for selectively driving either of the driving wheels, said means including an electric motor and transmission means extending therefrom to both of said driving wheels, clutch-brake means in said transmission means for each of said driving wheels, control means for said clutch-brake means for engaging the same during motor operation for rotating the workpiece and for selectively engaging the same when the motor is inoperative to act as a brake on the driving wheels.

4. Apparatus for supporting and rotating cylindrical workpieces comprising a pair of aligned, horizontally spaced driving wheels, a belt-like element looped about the driving wheels with sufficient slack to provide an arcuate upper extent between the driving wheels, means for adjusting one of the driving wheels toward and away from the other whereby said upper extent of the belt-like element forms an arc conforming to the radius of the workpiece and substantially tangent to the driving wheels, and power means for selectively driving either of the driving wheels, said means including a reversible electric motor and transmission means extending therefrom to both of said driving wheels, a clutch in said transmission means for each of said driving wheels, and clutch operating means operable automatically upon operation of the motor in either direction for engaging the clutch of the driving wheel which will rotate with its upper portion moving toward the arc portion of the belt-like element.

5. Apparatus for supporting and rotating cylindrical workpieces comprising a pair of supports spaced in the direction of the axis of the workpieces and each comprising a pair of aligned, horizontally spaced driving wheels, a belt-like element looped about the driving wheels of each support with sufficient slack to provide an arcuate upper extent between the driving wheels, means for adjusting corresponding driving wheels of each support toward and away from its related driving wheel whereby said upper extents of the belt-like elements form arcs conforming to the radius of the workpiece and substantially tangent to the driving wheels, and power means associated with one of said supports for selectively driving either of the driving wheels of said support, said power means including an electric motor and transmission means extending therefrom to both of said driving wheels, and a clutch in said transmission means for each of the driving wheels of said one support.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,766,963	Strupe	June 24, 1930
1,777,089	Jansen	Sept. 30, 1930
1,802,917	Kennedy	Apr. 28, 1931
1,871,430	Snow	Aug. 9, 1932
1,905,387	Kirkwood	Apr. 25, 1933
2,463,383	Hokanson	Mar. 1, 1949
2,514,293	Rumsey, Jr.	July 4, 1950