July 4, 1961 R. W. GOODE 2,991,024

CONSTANT TORQUE VARIABLE SPEED DRIVE

Filed Sept. 3, 1957 2 Sheets-Sheet 1

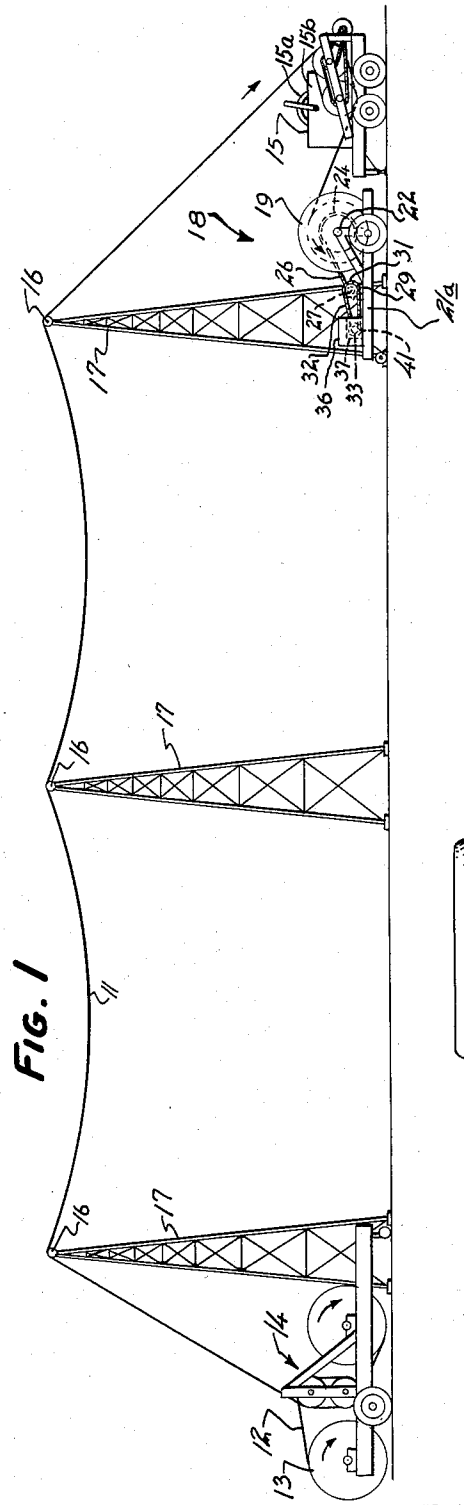


FIG. 1

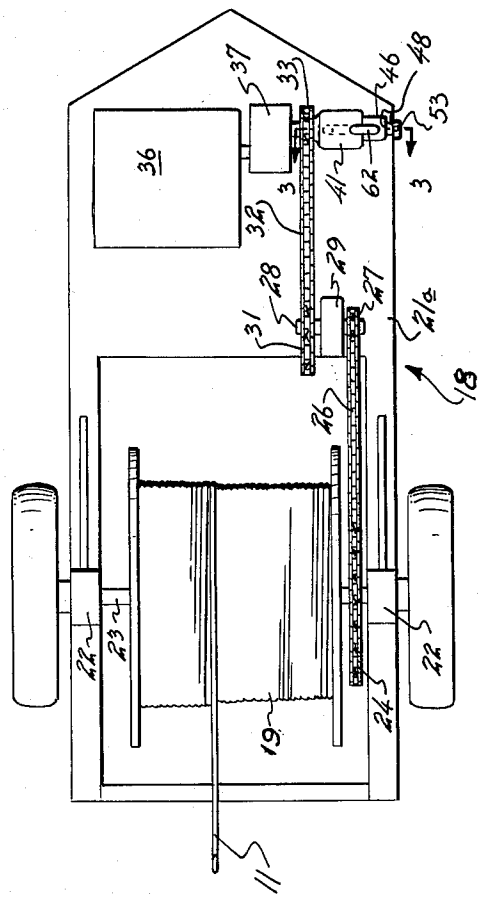


FIG. 2

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CONSTANT TORQUE VARIABLE SPEED DRIVE

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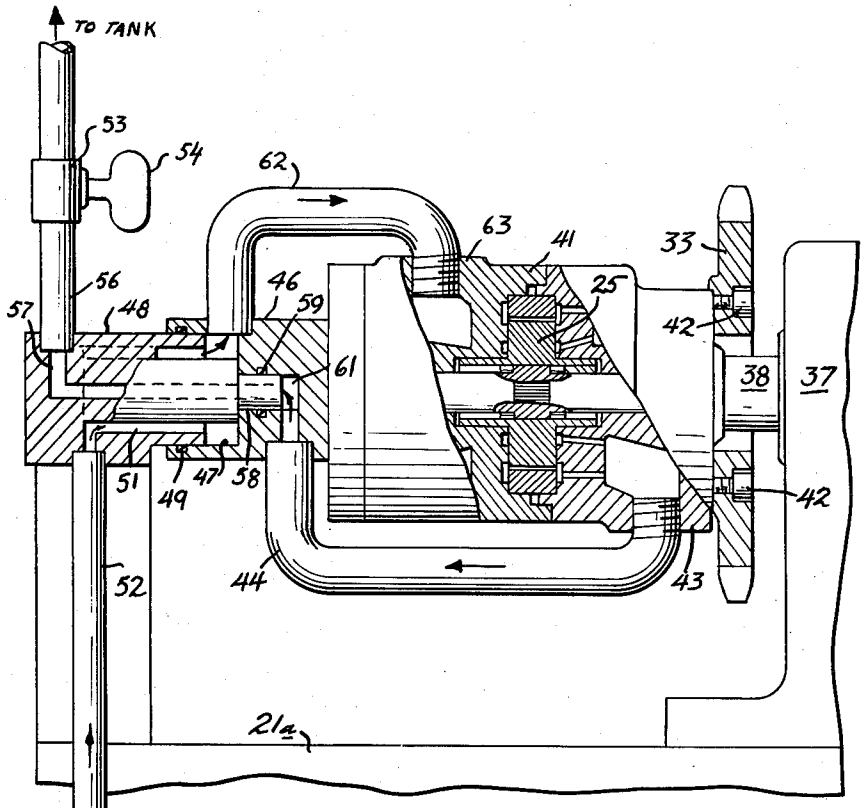
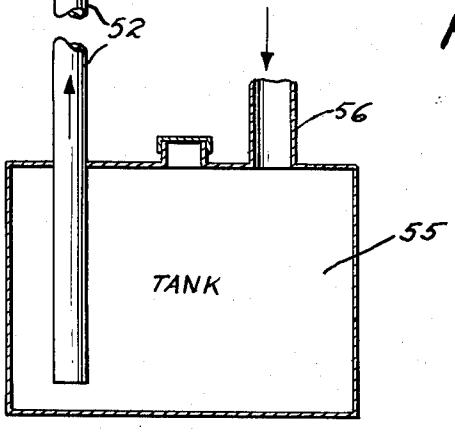


FIG. 3.



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CONSTANT TORQUE VARIABLE SPEED DRIVE

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This invention relates to a new and improved constant torque variable speed drive. A particular application of the invention is in stringing wire and cable, wherein cable is wound on a reel driven by a constant speed motor, the desirable characteristic of such a reel winder being the application of constant torque regardless of the speed at which the reel is being wound. It is a feature of this invention that the constant torque is applied even when the reel is being reversed, as sometimes occurs in normal cable-stringing operations.

Heretofore constant torque has been applied by the use of an air compressor, compressed air tank pressure regulator and air motor, the air compressor being driven by a gasoline engine. The present invention replaces the tank, compressor and controls and thus reduces the initial cost of the equipment and also the space occupied.

An important feature of the invention is the fact that a constant torque is applied regardless of the speed or the direction of winding or unwinding, and such torque is even applied when the device is stationary. When the device is stationary or when it is reversing, it functions as a brake, which is another advantage of the invention.

In the description of the invention which follows, the device is shown driving a sprocket which is connected through chains and other sprockets to a cable reel. However, it will be understood that the application of the invention is not thus limited, inasmuch as it may be employed for many other purposes.

The embodiment of the invention described herein employs hydraulic fluid and a hydraulic pump, but the invention is adaptable to pneumatic compressors, as will readily appear to one skilled in the art, and hence the term "fluid" is employed herein to include both hydraulic and pneumatic drives.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings in which similar characters of reference represent corresponding parts in each of the several views.

In the drawings:

FIG. 1 is a schematic view of a wire-stringing operation in which the present invention finds application;

FIG. 2 is a schematic top plan of a reel winder to which the invention is applied;

FIG. 3 is an enlarged fragmentary sectional view taken substantially along the line 3—3 of FIG. 2.

A preferred embodiment of this invention is in connection with stringing cable. For such purpose a steel cable 11 is connected to the end of an electrical conductor cable 12 installed on a reel 13 mounted on a tension wire stringer 14. The cable 11 is reeved through sheaves 16 attached to the cross-arms of towers 17. At the end of the series of towers 17 is located a cable puller 15 which draws cable 11 through sheaves 16 and thence to reel winder 18 which functions to wind the steel cable 11 onto a reel 19 for reuse. Proper functioning of the stringing operation makes it desirable that a constant torque be applied to the reel 19 as the cable 11 pulls the cable 12 into place suspended from the towers 17. The embodiment of the invention herein illustrated functions to apply such constant torque to reel 19. Such constant torque is applied regardless of the speed of cable puller 15, which is controlled by conventional means such as throttle lever 15*a* of an internal combustion engine prime mover 15*b*.

Reel winder 18 comprises a trailer body 21*a* having side frame members 22 which support the opposite ends of shaft 23, which turns reel 19. Likewise mounted on shaft 23 is a large diameter sprocket 24 which is connected by chain 26 to small-diameter sprocket 27 on countershaft 28 likewise mounted by bearing 29 on body 21*a*. Countershaft 28 carries a large-diameter sprocket 31 driven by chain 32 and sprocket 33. Application of constant torque to sprocket 33 is thus an important feature of the invention.

The prime mover for the device may be a constant speed gasoline engine 36 mounted on body 21*a* connected to a reversing gear box 37 which drives shaft 38 concentric with, but not directly connected to, sprocket 33.

Sprocket 33 may be fixed for rotation with a hydraulic pump 41, the means herein illustrated consisting of screws 42 fastening the sprocket 33 to the casing of motor 41. A variety of different types of pumps 41 may be employed, and the details of such pumps form no part of the present invention. In order to eliminate the necessity of a complete description of such a pump, reference is made to Rosen Patent No. 2,393,223, of January 15, 1946, which is an example of the type of hydraulic pump suitable for carrying out this invention. Pump 41 has a driving element or rotor 25 (corresponding to rotor 25 of the motor of Patent No. 2,393,223) and fixed for rotation with shaft 38. It will be understood, however, that the precise details of the hydraulic pump are not essential to the invention. In fact, as has heretofore been mentioned, a pneumatic compressor may be employed. Shaft 38 is connected to the shaft designated 31B of Rosen. Two of the ports of hydraulic pump 41 are employed, which correspond to the upper right hand corner and lower left hand corner ports 21 of Rosen. The outlet port 43 herein is connected by a pipe 44 to a fitting 46 mounted on the housing of pump 41 concentric with the shaft 31A of Rosen. Fitting 46 is formed with an inwardly extending bore 47 on its outer end and a reduced-diameter bore 61 inwardly of bore 47. Plug 48 fits into bore 47 and a seal 49 is employed between fitting 46 and plug 48 to permit rotation of fitting 46. Pipe 62 extends between port 63 and bore 47 which communicates with annular passageway 51 in plug 48 and in turn communicates with a pipe 52. Pipe 52 leads from a hydraulic fluid storage tank 55. Leading to the storage tank is a pipe 56 which communicates with a duct 57 in plug 48, which extends down through the center of the plug and through a reduced-diameter projection 58 thereof extending into bore 61 in fitting 46. A seal 59 seals off the projection 58 in the reduced-diameter bore 61 of fitting 46. Pipe 44 extends to bore 61 from port 43 of hydraulic pump 41. Pipe 56 has an adjustable pressure regulator valve 53 which can be adjusted by handle 54.

In operation, handle 54 of valve 53 is adjusted to produce the desired torque and thereafter no further adjustment is required. When engine 36 is started, it turns shaft 38 which drives the rotor of pump 41 to draw hydraulic fluid from inlet port 63 out through discharge port 43 and thence to valve 53 and to the storage tank. A constant torque is applied by the pump because of the constant pressure held by valve 53 and, since sprocket 33 is directly connected to the casing 41, a constant torque is applied to sprocket 33.

When the reel is being wound, sprocket 33 rotates in clockwise direction, as viewed in FIG. 1, the casing of the pump 41 turning with the sprocket. When operating conditions in the cable-stringing operation slow down or stop the reel-winding, the same constant torque is applied regardless of speed. Even if the cable 11 is unwound, as is sometimes necessary during the stringing operation, the

sprocket **33** may reverse and the hydraulic pump **41** then functions as a constant torque brake.

Thus, the present invention provides means whereby a constant torque is applied to a rotatable member such as the sprocket **33** regardless of the direction of rotation thereof or the speed of rotation thereof, while the prime mover engine **36** revolves at constant speed. The application of the invention extends beyond reel-winding operations; and, further, the invention has application to any fluid pump instead of the hydraulic pump illustrated herein.

In the accompanying claims, duct **57** and passageway **51** are sometimes referred to as the first and second chambers respectively, and bore **61** and bore **47** as the third and fourth chambers respectively. Pipe **44** and pipe **62** are referred to as the first and second conduits respectively, and pipe **56** and pipe **52** as the third and fourth conduits respectively.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be practiced within the spirit of the invention and scope of the appended claims.

What is claimed is:

1. In a system for stringing conductors, a cable puller, means for driving said cable puller at varying speeds; a reel winder, said reel winder comprising a frame, and means mounted on said frame for driving said reel, said last-mentioned means comprising a reel shaft, means rotatably mounting said reel shaft on said frame, a substantially constant speed prime mover on said frame, a fluid pump having a casing drivingly connected to said reel shaft, a drive shaft rotatable in said casing and drivingly connected to said prime mover, a fluid inlet port in said casing, a fluid outlet port in said casing and driving element in said pump driven by said drive shaft and fixed for rotation within said casing, and valve means controlling discharge of fluid through said discharge port, said valve means controlling the torque applied to said reel regardless of the velocity of said reel shaft, said reel being fixed for rotation with said reel shaft; and a cable passing through said cable puller and on to said reel whereby said cable is wound on said reel at constant torque and at varying velocities corresponding to the velocities of said means for actuating said cable puller.

2. In a system for stringing conductors, a cable puller, means for driving said cable puller at varying speeds; a reel winder, said reel winder comprising a frame, and means mounted on said frame for driving said reel, said last-mentioned means comprising a reel shaft, means rotatably mounting said reel shaft on said frame, a fluid pump having a casing drivingly connected to said reel shaft, a drive shaft rotatable in said casing and drivingly connected to said prime mover, a fluid inlet port in said casing, a fluid outlet port in said casing and a driving element in said pump driven by said drive shaft and fixed for rotation within said casing, a stationary member on said frame formed with first and second chambers, a rotatable member on said casing formed with third and fourth chambers, said first and third chambers communicating with each other as said pump revolves, said second and fourth chambers communicating with each other, a first conduit between said discharge port and said third chamber, a second conduit between said inlet port and fourth chamber, a tank, a third conduit extending from said first chamber to said tank, an adjustable valve in said third conduit, and a fourth conduit from said tank to said second chamber, said valve controlling the torque applied to said reel shaft to produce a constant torque on said reel regardless of the velocity of said reel shaft, said reel being fixed for rotation with said reel shaft; and a cable passing through said cable puller and on to said reel whereby said cable is wound on said reel at constant torque and at varying velocities corresponding to the velocities of said means for actuating said cable puller.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 22,577	Thomas	Dec. 12, 1944
966,858	Prather	Aug. 9, 1910
980,220	Eastman	Jan. 3, 1911
1,568,395	Arkin	June 5, 1926
1,748,436	Arkin	Feb. 25, 1930
1,878,078	Walton	Sept. 20, 1932
1,935,400	Junkers	Nov. 14, 1933
2,146,717	Berger	Feb. 14, 1939
2,516,461	Gleasman	July 25, 1950