The drum on which the tagline is wound is actuated by a fluid motor, the input side of which is connected by a conduit to a continuously operated pump. The conduit is provided with a relief valve. The fluid motor is capable of reverse rotation to function as a pump to return fluid to the conduit and the fluid motor is operated in reverse to wind the tagline in response to excessive rise in tension in the tagline. When the tagline is under normal tension, the fluid motor is idle and the output of the continuously operating pump is delivered to the relief valve. When the tension of the tagline drops below normal, the fluid motor acts to wind in the tagline. When the tension of the tagline rises excessively, the tagline reverses the fluid motor to cause the fluid motor to function as a pump and the output of both the reversed fluid motor and the continuously operated pump is released through the relief valve.

The present invention relates to tagline rewind mechanisms and more particularly to such a mechanism which is hydraulically operated.

In the operation of certain material handling equipment such as clamshells, grapples, and magnets, or the like, suspended on hoisting cables from a boom, it is the practice to employ a tagline which is connected to the material handling implement and wound upon a reel mounted on the implement supporting boom so as to maintain a steadying effect on the material handling implement. Typically, such tagline rewind devices are spring loaded so as to maintain a spring tension on the tagline, the spring being tensioned progressively as the material handling implement is lowered or swung away from the end of the boom, and such spring tension being effective to cause the reel to rewind the tagline as the implement is recovered or moved toward the boom. Such spring-loaded tagline rewind devices have generally proved quite satisfactory though periodical service is required in the event of a broken spring or other moving part which requires that the material handling equipment as a whole be idle during the period of repairation.

The present invention contemplates the provision of a tagline rewind mechanism which is hydraulically operated.

An object of the invention is to provide an hydraulically operated tagline rewind mechanism which will maintain a constant tension or restraint on the tagline as it is being stripped from the rewind drum or reel and which also will apply a substantially constant force to cause rewinding of the tagline upon the drum so that the steadying effect of the tagline remains substantially constant, this being a characteristic distinct from the functioning of a progressively tensioned and relieved spring as employed in the above mentioned spring-loaded tagline rewind devices.

Another object of the invention is to provide an hydraulically operated tagline rewind mechanism in accordance with the preceding object and wherein the tension or restraint of the tagline while being substantially constant during use may be adjusted or varied as may be required under varying circumstances of use and as may be required by virtue of application of the rewind device to booms supporting different types of material handling implements.

More specifically, it is an object of the invention to provide an hydraulically operated tagline rewind device including operating and control mechanism all adapted to be installed on material handling equipment such as a truck mounted boom wherein the material handling implement is adapted to be power operated by a power source carried in the cab of the truck and wherein the rewind drum is driven by an hydraulic motor supplied with power fluid from a pump driven by the just mentioned power source, the pump deriving fluid from a truck or reservoir and wherein the motor which drives the drum in a rewinding direction will be caused to act as a pump as the tagline is being stripped from the drum, and there being a by-pass provided whereby the fluid pumped by the drum motor under such circumstances will be by-passed back to the reservoir, the by-pass means including a check valve which may be variably loaded to adjust the resistance to such pumping action by the drum motor, thus maintaining on the tagline a predetermined but substantially constant tension.

Other objects and advantages of the invention will be hereinafter described or will become apparent to those skilled in the art, and the novel features of the invention will be defined in the appended claims.

In the accompanying drawings:

FIG. 1 is a fragmentary view in side elevation and with certain of the parts broken away illustrating the hydraulically operated tagline rewind mechanism as applied to a truck mounted boom;

FIG. 2 is a diagrammatic view illustrating the tagline rewind mechanism of FIG. 1; and

FIG. 3 is a view in section as taken on the line 3—3 of FIG. 1.

Like reference characters in the several views of the drawings and in the following description designate corresponding parts.

Referring to FIG. 1, there is shown a material handling implement in the form of a clamshell 1 suspended on a cable 2 from a boom 3, the boom being mounted on a truck 4 having a cab 5 which is normally occupied by the operator. Typically, such clamshells and the cable therefrom is operated by a source of power or engine 6 mounted in the cab and the tagline rewind mechanism of the present invention including a drum D and tagline T is illustrated as being driven by the engine 6 by means of a power take-off belt 7.

The belt 7 is adapted to drive a pump 8 continuously so long as the engine 6 is in operation. Also disposed in the cab is an oil tank or reservoir 9 and a conduit 10 leads from the reservoir to the inlet of the pump 8. A conduit 11 leads from the pump outlet to the hydraulic motor 12. The conduits 10 and 11 jointly constitute fluid supply conduit means connecting the pump to the motor and to the reservoir. Leading from the pump back to the reservoir 9 is a conduit 13 constituting fluid return conduit means connecting said motor to said reservoir so that the pump will supply fluid to the motor from the reservoir and fluid will return to the reservoir to cause the motor to rotate in one direction, namely, a direction to cause winding of the tagline on the drum. The motor 12 may be any suitable type of positive displacement hydraulic motor such as a gear motor, vane motor, or the like.

Therefore, upon rotation of the motor in the other or reverse direction, the motor will function as a pump and tend to displace fluid through supply conduit 11 in the direction of the pump 8.

By-pass means are provided for connecting the fluid
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3. supply conduit 11 to the fluid return conduit 13 so as to permit unidirectional fluid flow from said fluid supply conduit means to said fluid return conduit means. Such by-pass means is shown as comprising a by-pass conduit 14 in which is a control valve in the form of a relief valve 15. Valve 15 comprises a cylindrical body 16 having therein a ball check valve 17 adapted when seated to close off communication between a section 19 of the by-pass conduit, the ball 17 being loaded by means of a spring 18 into engagement with the ball seat. Adjutator screw means 20 are provided for varying the spring loading and therefore varying the pressure required to unseat the ball 17.

It will now be understood that fluid pumped by motor 12 upon reverse rotation of the motor will by-pass through the by-pass conduit and through the check valve 15, but the loading of the ball valve 17 will impose a restraint upon the by-pass flow of fluid and, therefore, a restraint on such reverse rotation of the motor.

With particular reference to FIG. 3, it will be noted that the motor 12 is supported on a bracket or plate 21, the plate 21 being disposed in spaced relation to a second plate 22, these plates cooperating to provide means for mounting the drum D on the boom 3. Accordingly, at the upper end of each of the plates 21 and 22 is a bearing block designated 23 and 24 respectively. Jointly mounted in the bearing blocks is a drum shaft 25 and on the shaft 25 there is suitably mounted for rotation with the shaft a hub 26 of the drum D.

Means are provided for interconnecting the drum D and the motor 12 in driving relation and in the illustrative embodiment such means includes a sprocket 27 mounted on shaft 25 and keyed as at 28 to the shaft so as to rotate therewith as a unit. Motor 12 has an output shaft 29 on which is keyed as at 30 a sprocket 31. A drive chain 32 is disposed about the sprockets 27 and 31 to establish a drive connection therebetweent. Thus, rotation of the motor 12 in one direction will cause clockwise rotation of the drum D (as viewed in FIG. 1) so as to effect winding of the tagline T upon the drum D, and also when the clamshell 1 is lowered or swung away from the boom the tagline T will be stripped from the drum D causing reverse rotation of the drum and reverse rotation of the motor 12.

It will also be noted with respect to the by-pass means that inasmuch as the pump 8 is driven by the belt 7 from the constantly running engine 6, the adjustment of check valve spring 19 imposes a pressure on ball check valve 17 which serves to determine the pressure at which fluid in the fluid supply conduit means leading to the motor 12 will force the ball valve 17 off its seat. Thus, the steadying effect of the tagline 7 on the clamshell 1 or other material handling implement may be adjusted as necessary to more or less tension the tagline T when the boom 3 and clamshell 1 are being swung jointly, for example, as between material pickup and material discharge locations.

It will now be understood that inasmuch as the tension applied to tagline T is a function of the pressure in the hydraulic system which in turn is a function of the loading of the by-pass valve 15, there will be maintained on the tagline during all stages of its operation a predetermined maximum tension which remains substantially constant as distinguished from the constantly varying tension applied to taglines which are rewound on drums which are spring loaded.

While specific structural details have been shown and described, it should be understood that changes and alterations may be resorted to without departing from the spirit of the invention as defined in the appended claims.

1 claim:
1. In a tagline rewind mechanism, the combination of: a drum to wind in and pay out the tagline; means to support said drum on a boom of material handling equip-
ment; a fluid motor to actuate the drum in the direction to wind in the tagline; a conduit connected to the normally input port of the fluid motor, the fluid motor being capable of rotation in reverse to function as a pump to deliver pressurized fluid to said conduit; a relief valve in communication with the conduit to release fluid therefrom when the pressure therein rises to a predetermined magnitude; and a pump to deliver fluid to said conduit to operate the fluid motor, whereby the pump operates the fluid motor to wind in the tagline when slack occurs in the tagline and excessive tension in the tagline reverses the motor to pump fluid into said conduit to cause the fluid output of both the reversed motor and the pump to be released through the relief valve.

2. A tagline rewind mechanism as defined in claim 1 in which the pump delivers pressurized fluid at a rate to operate both the fluid motor and the relief valve.

3. A tagline rewind mechanism as defined in claim 1 which includes a reservoir for hydraulic fluid, said reservoir being connected to the relief valve, the input side of the pump, and the normally output side of the fluid motor.

4. A tagline rewind mechanism as defined in claim 3 in which the material handling equipment includes a cab and in which means is provided in the cab for adjusting said relief valve.

5. A tagline rewind mechanism as defined in claim 3 in which said relief valve is a spring-loaded check valve.

6. A tagline rewind mechanism as defined in claim 5 which includes means to vary the spring loading on the check valve.

7. A tagline rewind mechanism as defined in claim 1, wherein said by-pass means includes check valve means for permitting unidirectional fluid flow from said fluid supply conduit means to said fluid return conduit means.

8. A tagline rewind mechanism as defined in claim 1, wherein said by-pass means includes check valve means for permitting unidirectional fluid flow from said fluid supply conduit means to said fluid return conduit means; said check valve means including means for varying the fluid flow resistance of said check valve means to retard said unidirectional fluid flow and to resist turning of said drum in said other direction.

9. A tagline rewind mechanism as defined in claim 1, wherein said fluid motor is a positive fluid motor.

10. A tagline rewind mechanism as defined in claim 1, wherein said fluid motor is a positive fluid motor; and including means for effecting continuous operation of said pump.

11. A tagline rewind mechanism as defined in claim 1, wherein sprocket and chain means operatively connects the motor to the drum.

12. A tagline rewind mechanism as defined in claim 1, wherein said means for supporting said drum on a boom comprises a pair of spaced support members; said drum including a shaft journaled on said support members; and said motor being carried by one of said support members.

13. A tagline rewind mechanism as defined in claim 1, wherein said means for supporting said drum on a boom comprises a pair of spaced support members; said drum including a shaft journaled on said support members; said motor being carried by one of said support members; and said means for interconnecting said drum and said motor including a driving relation including a sprocket carried by said motor, a sprocket carried by said shaft, and a chain interconnecting said sprockets.

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