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PATENT SPECIFICATION

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(54) A TRACK-TYPE VEHICLE INCLUDING A
 STEERING CLUTCH

- (71) We, CATERPILLAR TRACTOR CO., a Corporation organised and existing under the laws of the State of California, United States of America of 100 N.E. Adams Street, Peoria, State of Illinois 61602, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

- This invention relates to a track-type vehicle having a steering clutch for selectively discontinuing power transmission to a track of said vehicle.

- Steering of track-type vehicles has traditionally been accomplished by varying the relative speeds of the respective tracks. Such speed variance may be accomplished in several ways as set forth in our copending patent application No. 41100/73 (Serial No. 1,439,053) of even date herewith.

- In the noted copending application a steering system is described wherein separate, manually operated controls for each of the tracks are provided and each control sequentially releases or disengages a steering clutch on one side of the vehicle and then applies a steering brake on the same side. A foot-pedal activated actuating system is described in which one can provide for such sequential actuation of the steering clutches and brakes.

- The present application is directed to the particular actuating system which responds to the aforementioned foot-pedal system, its mounting upon the vehicle and its construction.

- Clutch actuating means in the prior art have included hydro-mechanical systems such as that disclosed by our United States Patent No. 3,448,841. The steering clutch control system described by such patent has previously proved quite effective for use in so called "wet" steering clutch and brake housings. In the said system the fluid

actuating motor includes an extendible hydraulic piston disposed in-line with a clutch yoke member and employs a roller system for actuating the yoke member in response to piston movement. However, because the system is adapted for use in a "wet" clutch housing hydraulic fluid for cooling and relief purposes can be exhausted during use and this is totally unsatisfactory for use in dry clutch and brake systems.

Removal of the fluid-exhausting stroke-limiting feature in the said device would completely change the operation of that system and would require extensive redesign to develop a comparable in-line system which would provide maximum response, minimum adjustment linkage, and a facile accessibility for servicing, such as during air-bleeding operations or the like.

The present invention provides a track-type vehicle having a simple and economically fabricated clutch actuating system which is directly connectable to an externally accessible part of the vehicle, which provides direct, in-line actuation of the clutch yoke member, which is useable in dry clutch and brake systems, and which is readily serviceable during use.

According to the invention we provide a track-type vehicle having a steering clutch for selectively discontinuing power transmission to a track of said vehicle comprising yoke means operatively associated with said clutch for disengaging said clutch when disposed in a first predetermined position and for engaging said clutch when disposed in a second predetermined position, actuator means connected to an externally accessible portion of said vehicle for moving said yoke means toward said first predetermined position, single rod means connected between said yoke means and said actuator means for transmitting actuator forces to said yoke means for movement thereof, said single rod means

being connected between said actuator means and said yoke means by means of spherical joints movably mounted within sockets in said actuator means and in said yoke means.

Other features and advantages of the present invention will become apparent upon reference to the accompanying drawings and the following description.

In the drawings Fig. 1 is a partially cut-away isometric view of the present steering clutch actuating system in a track-type vehicle having two tracks;

Fig. 2 is a developed sectional view of the steering clutch actuating system showing the clutch and actuator operatively connected to the final drive gearing of the tractor;

Fig. 3 is an enlarged view of the clutch actuator system shown in Fig. 2 and

Fig. 4 shows an alternate arrangement for mounting the actuator motor upon the vehicle.

With reference to Fig. 1 of the drawings, left and right-hand, pedal-activated steering clutch and brake control systems are shown generally respectively at 10 and 12. Such pedal control systems are shown pivotally connected to the main frame 14 of the track-type vehicle at 22.

The right-hand pedal control system 12, taken as exemplary, comprises a foot pedal 16 which is pivotally mounted upon a yoke member 18 which is in turn removably secured to the main frame 14 by way of a plurality of bolts 20. The yoke member 18 contains a transversely and horizontally disposed pivot pin 22 upon which the foot pedal 16 is mounted. A floating, upright lever member 24 is also mounted upon the pivot pin 22 between the furcations of the yoke member 18 and inwardly of the foot pedal 16. The lever member 24 fixedly supports a hydraulic fluid control valve, shown generally at 28, on a forward portion thereof.

Disengagement of a steering clutch is provided by a remotely disposed fluid motor 34 which is supplied with hydraulic fluid under pressure through a conduit 36 leading from the valve 28. The fluid motor 34 has a cylinder 38 which is removably secured to the main frame 14 by a plurality of bolts 184 and which has a piston 40 which is disposed therein and is inwardly extendible towards a yoke member 46 with increasing pressure in the conduit 36. Such movement of the piston 40 causes a rod or link 42 to act against a ball joint which is shown generally at 44 to cause rocking movement of the upright yoke member 46 around a ball joint 48 which is associated with and fixed to the main frame 14. Inward movement of the forward portion of the yoke member 46, as shown in Figure 1, causes the steering clutch, shown generally at 50, to be

disengaged and to discontinue power transmission from gearing 52 to the output gear 54 leading to the final drive of the vehicle, shown more particularly in Figure 2.

When the foot pedal 16 is depressed, it acts through the plunger 32 to condition the fluid control valve 28 to supply fluid pressure through the conduit 36. Further movement of the foot pedal 16 in a clockwise direction not only causes the control valve 28 to supply pressure to the fluid motor 34 for clutch actuation, but also causes movement of the housing of the control valve 28 thereby controlling the steering brake as explained hereinafter. The housing of the control valve 28 is interconnected with and moves the lever member 24 in a clockwise direction about the pivot pin 22. This movement causes the brake link 56, which is connected to the lever member at a pivot point 57, to be urged rightwardly as shown in Figure 1. Such movement of the brake link 56 causes a clockwise rotation of a bell crank 58 which is oscillatingly mounted with respect to the main frame 14 by means of a pivot pin 60. Such oscillation of the bell crank 58 causes upward movement of the brake rod 62 with consequent counterclockwise movement of the actuating lever 64 to cause a toggle linkage system, shown generally at 66, to engage a brake band 68 on a drum 70 which drum is integrally secured to the output gear 54. The brake band and drum areas, shown in phantom in Fig. 1, may be of conventional construction.

With reference to Figures 1 and 2 in the drawings, it will be seen that power flow to each of the final drives is by way of the transmission gearing 52, pinion gear 140, bevel gear 142, steering clutch shaft 144, and clutch 50. Steering clutch shaft 144 has a splined outer end portion 145 upon which is mounted a driving drum 146 retained upon the shaft by means of a suitable fastener, such as the nut 148. A plurality of driving clutch discs 150 are disposed within the clutch housing and are engaged by the driving drum and interleaved by a plurality of driven clutch discs 152 which have external tooth portions engaging the driven drum 70.

The clutch discs 150 and 152 are normally held in engagement to permit drive there-through by means of a plurality of springs 153 which act upon the driving drum 146 and a retainer and lock system 154 to urge a corresponding plurality of studs 156 and a plate assembly 158 outwardly towards the right, as shown in Fig. 2. Power is transmitted from the driven drum 70 through splines on the flange 160, to a final drive pinion shaft 162 upon which is formed the pinion 54. A relatively large output gear 164 is driven by the pinion 54 and is removably

secured to an output shaft 166 upon which a conventional track driving sprocket 168 is fixedly mounted by means of splines.

The clutch 50 is disengaged as result of the counterclockwise rotation of the yoke member 46, as shown in Fig. 2, about a ball joint 48 which is disposed within a suitable fixed housing bore 170. A pair of trunnions 172, best seen in Fig. 1, are removably secured to the yoke member and bias a cage member 174, shown in Fig. 2, an antifriction bearing 176 and the plate assembly 158 towards the left so that the springs 153 are compressed and the clutch 50 is disengaged.

The brake band 68 may be sequentially applied after the clutch is disengaged by sufficient movement in a clockwise direction of the foot as pedal 16 against the plunger 32 as discussed hereinabove to provide a more abrupt turn to the right, if such is desired.

The fluid motor 34, in more detail, particularly consists of the cylindrical housing 38 and an integrally formed outer mounted flange 180 which is removably secured to an outer side wall 182 of the vehicle main frame 14 by means of a plurality of threaded retaining bolts 184. The cylindrical housing includes a stepped counter bore 186 which is adapted to receive the extendible piston 40 and a relatively light spring 168. The chamber 191 formed by the counter bore 186 is provided with an inlet port 190 which enables fluid communication from the conduit 36 to the chamber.

The piston 40 has a stepped counter bore 192 which is adapted to receive a spherically formed socketed insert 194 at the proximal end of the rod 42, and the forward actuating extremity of the release yoke member 46 has a stepped bore 196 which is adapted to receive a similar insert 198 at the distal end of the rod 42. With reference to Fig. 3, it will be seen that the rod 42 has a central hexagonally shaped portion 200 and left and right threaded end portions 202 and 204 disposed between the aforementioned spherically socketed inserts. The right-hand, proximal end of the rod 40 includes a lock washer 206 and a spherical nut 208 threadably mounted thereupon in facing engagement with the insert 194. The left-hand, distal end includes a similar spherical nut 210 and a jam nut 211 which is threaded thereupon so that the ends of the rod are essentially provided with self-aligning joints.

The engaged disposition of the release yoke member 46 is generally determined by the disposition of the components of the clutch 50. The rod 42 is readily adjustable to a predetermined extension distance of the piston 40 from the end of the cylindrical housing 38, as designated by the distance d_1 . Extension of the piston 40 in the leftward direction by a distance approximately equal

to that shown at d_1 in the drawings is sufficient to disengage the clutch. Extension in this direction is limited by a stop bolt shown generally at 212. The stop bolt is also adjustable in a convenient manner to prevent unnecessary piston travel such that the end thereof is disposed essentially a similar distance d_1 away from the inwardly disposed, upright housing wall surface 214. It may readily be appreciated that this arrangement allows facile adjustment of piston travel and minimizes a delay generally associated with such adjustment in filling the actuating chamber 191 with fluid via the conduit 36.

When it is necessary to service the track-type vehicle, due to routine maintenance or prolonged periods of inactivity, it is possible for air to become trapped within the conduit 36 or within the actuating chamber 191. To remedy this condition an easily accessible bleed valve 216, of conventional construction, is threadably disposed within the end wall of the cylindrical housing 38.

In the preferred embodiment shown in Figs. 2 and 3, the head portion of the bleed valve is protectively surrounded by an opening 218 in the side wall 182 which opening allows convenient access from without the vehicle. The bleed valve may be provided with a suitable seal 220 so that the partial unthreading thereof will allow air to escape as the foot pedal 16 is manually displaced sufficiently to actuate the control valve 28 to direct fluid to the chamber 191. For servicing and operational checks the bleed valve 216 may be unthreaded and replaced by a pressure gauge (not shown) so that appropriate pressure readings may be taken during trouble shooting of the system.

In the preferred embodiment shown in Figs. 2 and 3, the cylindrical motor housing 38 is shown mounted on the inside of the vehicle side wall in a relatively protected location. It should be appreciated, however, that an externally mounted cylindrical housing 38', as shown in Fig. 4, could be used in those cases where full external servicing of the system is desired. Removal of a plurality of externally exposed bolts 184' would completely free the cylindrical housing of the fluid motor for removal and inspection thereof through the enlarged opening 218' in the side wall 182'.

In view of the foregoing, it should be readily apparent that the subject steering clutch actuating system has few moving parts, is highly serviceable and is effective as an in-line actuator for the clutch release yoke member. The self-aligning joints at either end of the actuating rod prevent any possible cocking of the piston as the yoke member end travels in a slightly arcuate path during the actuation.

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WHAT WE CLAIM IS:—

1. A track-type vehicle having a steering clutch for selectively discontinuing power transmission to a track of said vehicle; comprising yoke means operatively associated with said clutch for disengaging said clutch when disposed in a first predetermined position and for engaging said clutch when disposed in a second predetermined position, actuator means connected to an externally accessible portion of said vehicle for moving said yoke means toward said first predetermined position, single rod means connected between said yoke means and said actuator means for transmitting actuator forces to said yoke means for movement thereof, said single rod means being connected between said actuator means and said yoke means by means of spherical joints movably mounted within sockets in said actuator means and in said yoke means.
2. A vehicle as claimed in claim 1, wherein said actuator means is a fluid motor having a piston which receives a portion of said single rod means therein.
3. A vehicle as claimed in claim 2, wherein said piston is mounted within a fluid-tight cylinder having a pressure chamber therein directly communicating with a portion of said piston and wherein a fluid bleed port is provided in said cylinder which communicates said pressure chamber with

the exterior of said cylinder, said bleed port being so disposed as in use to be accessible from the exterior of said vehicle.

4. A vehicle as claimed in any of claims 1 to 3, wherein adjustable stop means are provided on said yoke means to limit movement of said yoke means toward said first predetermined position.

5. A vehicle as claimed in any of claims 1 to 4, wherein said single rod means include threaded adjustment means for selectively adjusting the effective length of said rod means and the distance between said yoke means and said actuator means.

6. A vehicle as claimed in any of claims 1 to 5, wherein said actuator means include a flange member which is directly connectable to an externally accessible portion of said vehicle by means of readily removable fastening means and wherein upon removal of said fastening means from said flange member said actuator means may be removed from said vehicle.

7. A track-type vehicle substantially as described with reference to the accompanying drawings.

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