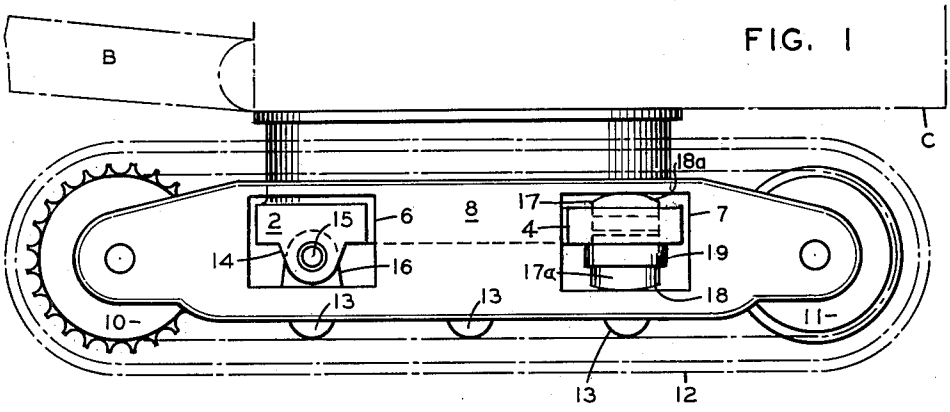
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EQUALIZED CRAWLER DEVICE

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FIG. 1



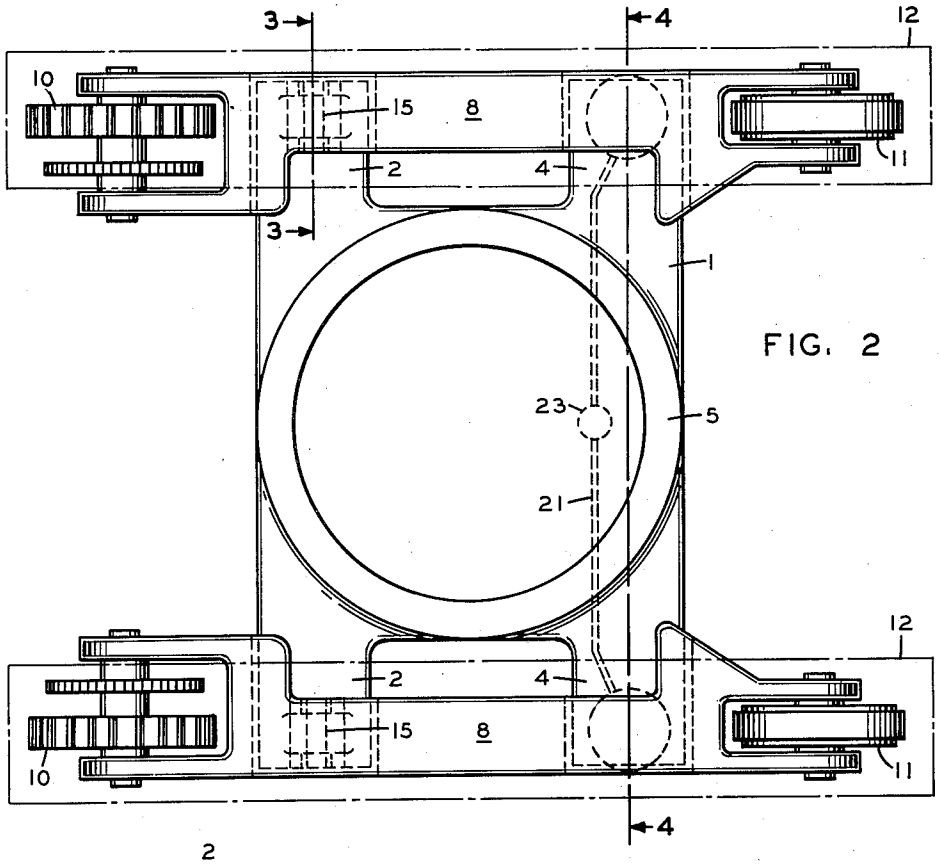


FIG. 2

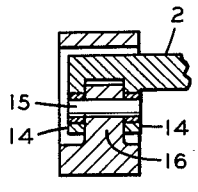


FIG. 3

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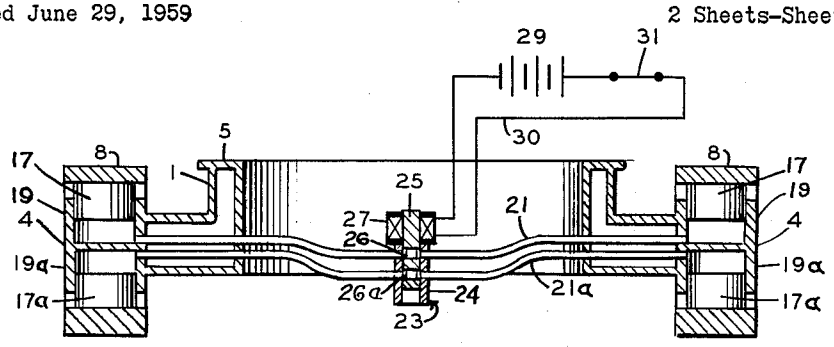


FIG. 4

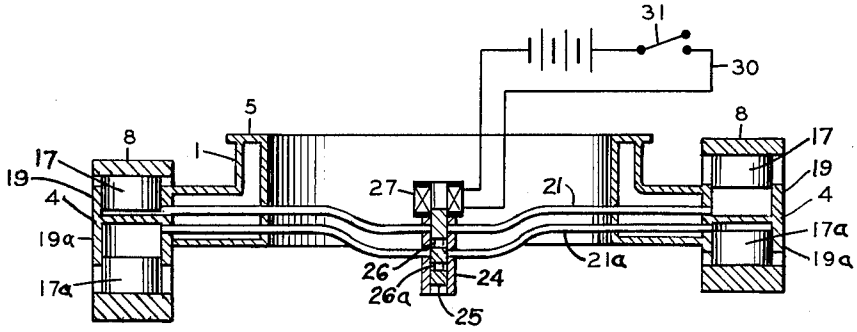


FIG. 5

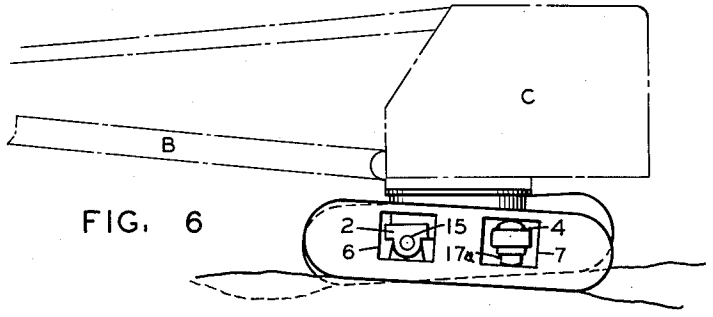


FIG. 6

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EQUALIZED CRAWLER DEVICE

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4 Claims. (Cl. 180—9.5)

The invention relates to crawlers for supporting cranes and shovels and consists particularly in a load equalization system for the crawlers.

In conventional heavy shovels and cranes supported on crawlers, there is no equalization provided between the separate crawlers at each side of the machine so that in traversing irregular terrain, machines of this type may frequently be supported at diagonally opposite points on the crawlers. When this occurs, of course, serious twisting action on the car body structure occurs. Furthermore, when such machines are required to operate on an irregular surface, they frequently tend to rock on the crawlers while stationed for operation.

It is a main object of the invention to provide equalization between the separate crawler frames supporting a crane, or similar machine, whereby twisting action will not be applied to the car body during movement of the crane over irregular terrain, and the car body will be stably supported by the crawlers when in a stationary position regardless of irregularities in the underlying terrian.

It is a further object to provide automatic means for locking the crawler frames in their ground-engaging positions when the machine is stationary and for releasing them for movement.

The foregoing objects are attained by supporting the car body from both crawlers on a common transverse pivot axis at one end of the car body and by a pair of interconnected hydraulic cylinders at the opposite end of the car body so that the separate frames can pivot about their common axis responsive to terrain irregularities, and upward movement of the opposite end of one of the frames will cause a compensating downward movement of the other frame. For locking the separate frames in their relative positions when the machine reaches an operating station, the hydraulic interconnection between the two cylinders is provided with a valve closeable when the crawler drive is engaged and openable upon disengagement of the crawler drive.

In the drawings:

FIGURE 1 is an elevation view of the running gear of a crawler supported crane, embodying the invention.

FIGURE 2 is a plan view of the structure shown in FIGURE 1.

FIGURE 3 is a transverse section of one of the crawler frame pivots, along the line 3—3 of FIGURE 2.

FIGURE 4 is a transverse vertical sectional view through the hydraulic cylinders, along the line 4—4 of FIGURE 2, showing both cylinders in their normal position.

FIGURE 5 is a view similar to FIGURE 4 but showing one of the cylinders in the raised track position and the other cylinder in the lowered track position.

FIGURE 6 is an elevation view showing the separate crawler frames tilted in opposite directions to conform to terrain irregularities.

Referring now to the drawing, the numeral 1 refers to a crane car body of generally rectangular shape, provided at its corners with laterally-extending arms 2 and 4. Car body 1 mounts a turntable 5 for supporting crane cab C and boom B. Arms 2 and 4 terminate in longitudinally spaced rectangular windows in laterally spaced crawler frames 8, from which the car body 1 is supported, as wil be described hereinbelow.

Crawler frames 8 are mounted at their opposite ends

on sprockets 10 and idler wheels 11 which mount ground-engaging tracks 12. Intermediate their ends, frames 8 are supported on the track by the usual rollers 13. For supporting the car body on the crawler frames, car body arms 2 are each provided with a pair of laterally-spaced depending bearing brackets 14 in which are journaled a pin 15, which passes through an upstanding bracket 16 on the bottom of window 6. Car body arms 4 are supported from the crawler frames by pairs of vertically aligned cylinder and piston assemblies comprising pistons 17 and 17*a* having rounded lower and upper surfaces 18 and 18*a*, respectively rockably seated against the top and bottom walls, respectively, of crawler frame windows 7, and co-operating vertically-aligned cylinders 19 and 19*a* preferably formed integral with the end portions of car body arms 4, pistons 17 and 17*a* being slidably received, respectively, in cylinders 19 and 19*a*.

The corresponding hydraulic cylinders at the opposite sides are connected to each other by conduits 21 and 21*a*, as best seen in FIGURES 4 and 5. When the device is on level ground, the pistons 17 and 17*a* of the separate hydraulic systems, comprising cylinders 19, 19, and conduit 21, and cylinders 19*a*, 19*a*, and conduit 21*a*, are positioned as shown in FIGURE 4, each system being filled to capacity with fluid so that any upward movement of a lower piston 17*a* in its cylinder will cause the flow of fluid through the connecting conduit 21*a* to the lower cylinder 19*a* at the opposite side, causing a corresponding downward movement of the piston therein, and any downward movement of an upper piston will cause a corresponding upward movement of the upper piston at the opposite side, so that the upper and lower pistons will be in positive engagement at all times with the upper and lower walls of crawler frame windows 7, as seen in FIGURE 5. Thus, during operation over irregular terrain, the crawler frames will be permitted to pivot about their common transverse pivot axis 15, and when the hydraulically-supported end of one of the crawler frames encounters ground surface which is lower than the surface beneath the corresponding end of the opposite crawler, the upward pressure of the high ground will cause the lower piston 17*a* on that side to move upwardly in its cylinder, forcing the lower piston on the other side a corresponding distance downwardly and urging the crawler on the other side into engagement with the ground surface on that side. Simultaneously, the downward movement of the crawler on the lower side will cause corresponding downward movement of the upper piston 17 on that side, and the displaced hydraulic fluid will cause corresponding upward movement of the upper piston on the high side. This cycle will be repeated in accordance with variations in terrain traversed by the machine.

In order to provide means for stabilizing the crawlers when the machine reaches an operating station, conduits 21 and 21*a* are provided intermediate their ends, with a solenoid-actuated valve 23 comprising casing 24 and vertically slidable gate 25 apertured as at 26 and 26*a*. The upper portion of gate 25 extends through the hollow coil of solenoid 27, so that when the solenoid is energized, by current from a battery 29 passing through circuit 30 the gate 25 will be raised until apertures 26 and 26*a* are in registry with conduits 21 and 21*a*, thus permitting the flow therethrough of hydraulic fluid. For controlling solenoid 27, electrical circuit 30 is provided with a switch 31, which may be manually actuated so that when the crawler is being driven, switch 31 may be closed causing the solenoid to be energized, thus maintaining valve 23 open so as to permit equalizing action of the hydraulic system.

FIGURE 5 shows the system in the stationary position with the crawlers on irregular terrain. Under such conditions, switch 31 is open, breaking the circuit through solenoid 27 and permitting valve gate 25 to drop, closing

valve **23** and preventing the passage of hydraulic fluid between the separate cylinders **19**. Thus the two cylinders at each side will be maintained in the same relative positions reached during movement, so as to stably support the car body **1** and the cab and boom mounted on the turntable **5** thereof.

FIGURE 6 illustrates the action of the crawlers on irregular terrain. Operation of the device is as follows:

Initially, prior to starting the engine and engaging crawler drive clutch, switch **31** would be in the open position as shown in FIGURE 5 and the frame would be stably supported against tilting transversely by the inability of the corresponding hydraulic pistons **17**, **17**, and **17***a*, **17***a*, to move vertically relative to each other. Upon engagement of the drive clutch and closing of switch **31**, valve **23** would be opened, thus permitting intercommunications between the connected hydraulic cylinders. As the crane or shovel traverses even ground, the two crawler frames would pivot about their common pivot axis **15**, but due to the hydraulic inter-connection between the cylinders, each crawler frame would continuously support its associated car body arm **4** as well as the pivot mounting frame arms **2**. Upon arriving at an operating station, switch **31** would be opened, permitting the closing of valve **23** and locking the oppositely disposed hydraulic pistons in the relative positions assumed at the end of travel so as to stably support the machine notwithstanding irregularity of the terrain.

The details of the structure may be modified substantially without departing from the spirit of the invention and the exclusive use of its modifications as come within the scope of the appended claims is contemplated.

What is claimed is:

1. In a crawler device, a pair of laterally spaced endless tracks, a longitudinally-extending crawler frame within each of said tracks and having at its ends pivoted cylindrical members engaging said tracks, said crawler frames each being formed with a pair of longitudinally-spaced substantially rectangular windows, a car body extending transversely between said crawler frames and having arms projecting laterally into a laterally-aligned pair of said windows in opposite crawler frames and pivotally supported on a common transverse axis therein, second arms extending into a second laterally-aligned pair of said windows, vertical hydraulic cylinder and piston assemblies supported on the lower boundary of said second windows and supporting said second arms, second vertical hydraulic cylinder and piston assemblies carried by said second arms and supporting the crawler frames adjacent the upper boundaries of said windows, and separate conduits connecting said first assemblies to each other and said second assemblies to each other.

2. A crawler device according to claim 1 in which there is a valve in each of said separate conduits between said hydraulic assemblies at opposite sides.

3. A crawler device according to claim 1 in which said first hydraulic assemblies are tiltably seated on the lower boundaries of the associated crawler frame windows and said second assemblies tiltably engage the upper boundaries of said windows, whereby to accommodate tilting of said crawler frames about their pivot axes.

4. In a crawler device, a pair of laterally spaced endless tracks, a longitudinally extending crawler frame within each of said tracks and rotatably mounting at its ends cylindrical members engaging said tracks, a car body extending transversely between said crawler frames and having transversely aligned arms projecting laterally therefrom and pivotally supported on a common transverse axis in opposite crawler frames, a window in each said crawler frame and spaced longitudinally thereof from the pivotal supports of said arms, second arms extending into said windows, vertical hydraulic cylinder and piston assemblies within said windows and supported on the crawler frames below said windows and supporting said second arms, second vertical hydraulic cylinder and piston assemblies carried by said second arms within said windows and supporting the crawler frames above said windows, and separate conduits connecting said first assemblies to each other and said second assemblies to each other.

References Cited in the file of this patent

UNITED STATES PATENTS

1,847,252	Miller	Mar. 1, 1932
2,063,035	Fuller	Dec. 8, 1936

FOREIGN PATENTS

598,230	Germany	June 7, 1934
708,870	Great Britain	May 12, 1954