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HYDRAULIC PISTON MOTOR

Original Filed May 6, 1938

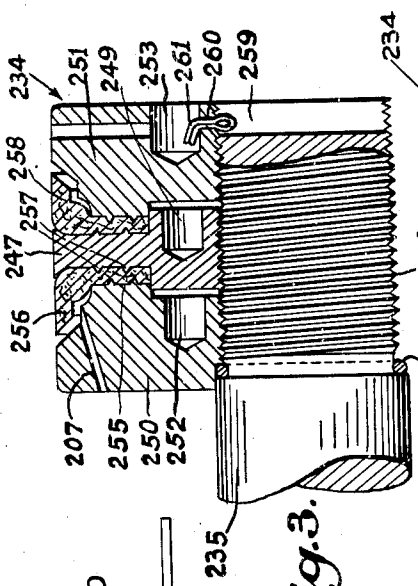


Fig. 3.

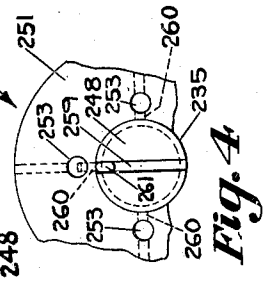


Fig. 4

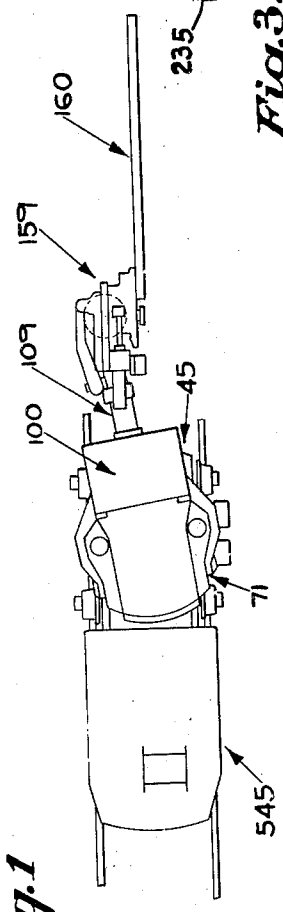


Fig. 1

Fig. 2

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HYDRAULIC PISTON MOTOR

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Original application May 6, 1938, Serial No. 206,448, now Patent No. 2,263,779, dated November 25, 1941. Divided and this application November 4, 1940, Serial No. 364,327

6 Claims. (Cl. 309—4)

This invention relates to a hydraulic piston motor and particularly to the construction of a piston for such a motor.

An object of the invention is to provide an improved piston construction for a hydraulic piston motor which is substantially leak-proof under very high pressures.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

This application is a division of our application Serial No. 206,448 filed May 6, 1938, for an improvement in Mining machines, now Patent No. 2,263,779 dated November 25, 1941.

In the accompanying drawing:

Fig. 1 is a diagrammatic plan view showing a mining machine incorporating the structure of our invention;

Fig. 2 is a longitudinal sectional elevational view through the head mechanism of the mining machine showing the hydraulic piston motor comprising a feature of the invention herein claimed;

Fig. 3 is an enlarged sectional view of half of the piston herein claimed shown attached to the piston rod; and

Fig. 4 is a front view of a fragment of the piston shown in Fig. 3 and the piston rod to which it is connected.

In Fig. 1 of the drawing there is illustrated diagrammatically a mining machine which incorporates the features of the invention herein claimed. The mining machine is disclosed in full detail in our parent application above identified, of which this application is a division, and so no attempt will be made to describe it in detail in its entirety, only those parts forming the subject matter of the invention herein claimed being specifically described.

Said mining machine includes a truck 45 which supports a turntable 71 upon which is mounted for adjustment in a vertical plane a supplementary frame 100 which has a forwardly extending neck 109 carrying a turnover head mechanism 159 which provides for various adjustments of kerf cutting mechanism 160.

Extending rearwardly from and supported by the truck 45 is a platform 545 which carries a considerable amount of mechanism which per se is not pertinent to the invention herein claimed.

Attention is directed particularly to Fig. 2 and to the structure of the turnover head mechanism 159 and to certain of the operating means therefor which are adjustably supported with respect to the supplementary frame 100. As seen in Fig. 2 of the drawing, the previously mentioned elongated neck 109 is provided at opposite ends with spaced apart journal bearings, one of which is seen at 139, upon which is journaled a cylinder 140.

As clearly illustrated in Fig. 2 of the drawing, the forward and lower end of the cylinder 140 is provided with an integral drum 146 within which drum is rotatably mounted a cylindrical shell 148. The shell 148 is provided with a pair of end plates, one of which is seen at 150, which plates are rigidly but removably attached to said shell 148, as by machine screws. It is thus to be seen that the shell 148 provides an enlarged bearing contact with the interior of the drum 146 and is mounted for rotation with respect to said drum 146 about the longitudinal axis of said shell 148 and drum 146.

Adjacent their bottoms the end plates are provided with semi-cylindrical flanges 152 which cooperate with a flanged split ring 153 rigidly attached to a supporting plate or casting 154 as by screws 155, which plate 154 carries a cutter bar 156 with which is associated a cutter chain 157 provided with cutter bits 158.

It is thus evident that the drum 146, shell 148 and end plates 149 and 150 form the turnover head mechanism 159 which is pivotally adjustable with respect to the longitudinal axis of the neck 109, and that the head mechanism 159 swingably supports a kerf cutting mechanism 160 comprising the plate 154, cutter bar 156, cutter chain 157 and bits 158, which kerf cutting mechanism 160 is pivotally adjustable with respect to the head mechanism 159 about a generally transverse axis.

Cutter chain 157 is driven from an electric motor forming part of supplementary frame 100 and through gearing terminating in shaft 179 and sprocket 187 as fully disclosed in our parent application above identified.

To provide for the pivotal movement of the kerf cutting mechanism 160 on the transverse axis of the end plates a hydraulic piston motor 230 (Fig. 2) comprising a cylinder 231 is bolted to the top of cylinder 140 carried on neck 109. The piston motor 230 is of the double acting type and thus the cylinder 231 is provided with inlet ports 232 and 233 adjacent its head and piston rod end, respectively.

Within the cylinder 231 is a piston indicated generally by the reference character 234, the structure of which is illustrated in full detail in Figs. 3 and 4 of the drawing and is described

hereinafter. The piston 234 is mounted upon a piston rod 235 which extends through a stuffing box 236 in the head 237 and is connected to a sliding cross-piece 238 by virtue of an enlarged head 239 cooperating with a threaded socket 240 which is threaded in said cross-piece 238. The cross-piece 238 is adapted to slide upon a horizontal slideway 241 formed on the top of cylinder 140, said slideway 241 and cross-piece 238 having cooperating locking flange means which provides for free sliding movement between them while holding the cross-piece 238 onto said slideway 241. The cross-piece 238 is provided with trunnions which cooperate with a pair of arms, one of which is seen at 244, which are pivotally attached by pins to integral bifurcated brackets carried adjacent the tops of the end plate of the turnover head mechanism 159. It will thus be evident that by controlling the supply of hydraulic pressure to the piston motor 230 the cross-piece 238 may be slid forwardly and rearwardly with a consequent pivotal movement of the kerf cutting mechanism 160 about the axis of the end plates of turnover head mechanism 159.

Attention is now directed particularly to Figs. 2, 3 and 4 and to the detailed construction of the composite piston 234 which has been found very effective to provide a high efficient seal so that the kerf cutting mechanism 160 may be locked in any desired position where it will be held substantially indefinitely due to the fact that there is no leakage of fluid past piston 234.

Said piston 234 is formed by a central plate 247 which is threaded onto the threaded portion 248 of piston rod 235 and is provided with wrench receiving notches 249 to provide for its adjustment. On opposite sides of the plate 247 are plates 250 and 251 which are also threaded upon the threaded portion 248 and are provided with wrench receiving notches 252 and 253, respectively.

To prevent any leakage of hydraulic fluid by the threads between plate 250 and piston rod 235, we provide a copper wire gasket 254 between them which will be compressed when plate 250 is screwed as far as possible against a shoulder provided by virtue of the reduced size of threaded portion 248 with respect to piston rod 235.

Between the plates 247 and 250 we provide a ring-shaped washer or packing cup 255 of composition material having an enlarged peripheral flange 256 which turns in a left-hand direction, as viewed in Fig. 3 of the drawing. The flange 256 is spaced slightly from the plate 250 so that pressure oil extending through the passageway 207 will find its way between said plate 250 and the flange 256 to force said flange 256 outwardly in intimate sliding contact with the interior surface of the cylinder 231. The portion of the cup 255 which is parallel with the plates 247 and 250 is rigidly clamped between them and may be held in place by integral circular projections 257 on said plates 250 and 247. Between the plates 247 and 251 there is provided another ring-shaped washer or packing cup 258 similar in construction to cup 255 except that its peripheral flange is turned in the opposite direction.

In the assembling of the construction the copper wire gasket 254 is placed over the reduced threaded portion 248 of piston rod 235 and the plate 250 is screwed down tightly against it. Cup 255 is then placed on plate 250 and plate 247 is then screwed tightly in place. Cup 258 is then put in place and plate 251 is screwed tightly against it.

To insure the maintenance of the parts in their positions the end of the threaded portion 248 is provided with a diametrical groove 259 and a hole 260 is drilled parallel therewith extending into each of the notches 253 of plate 251. Extending through one of the holes 260 we place a cotter key 261, the head of which extends into the groove 259 and the ends of which are bent over, as clearly illustrated in Fig. 3 of the drawing. This cotter key 261 will, of course, prevent relative movement between the plate 251 and the piston rod 235.

It is evident from the above description that we have provided a simple but very effective piston construction which has been found in practice to be very efficient in operation, particularly in that it is substantially free of leakage even under very high pressures, and consequently the cutter bar 160 will be retained in any position to which it is adjusted and hydraulic fluid on opposite sides of the piston 234 is locked in the cylinder 231 as described in complete detail in our parent application above identified.

It is to be noted that the bore 207 and the plate 250 insures that any compressed fluid on that side of the piston 234 will be transmitted to the inner face of the flange 256 of cup 255.

Furthermore, it is to be noted that said inner face of the cup 255 is spaced slightly from the adjacent surface of the plate 250 and thus any hydraulic pressure to the left of piston 234 is transmitted to push the flange 256 outwardly in contact with the inner surface of the cylinder 251. The relation between the cup 258 and the plate 251 is quite similar to that between cup 255 and plate 250. These cups 255 and 258 are of course reversely positioned and the cup 255 is principally effective to prevent any flow of hydraulic fluid to the right with respect to piston 234 and cup 258 is principally effective to prevent any reverse flow of hydraulic fluid.

There are no passageways or bores in plate 251 similar to bores 207 in plate 250, but the spacing of the periphery of cup 258 or plate 251 at least in a large measure insures the presence of pressure on the inner surface of the peripheral portion of cup 258 to effect the hydraulic seal desired.

It is also to be noted that the leading edge of flange 258 of cup 255 terminates in a relatively sharp point adjacent its outermost peripheral edge which also aids in the insurance of a fluid-tight seal formed thereby. The cup 258 is of course similarly formed.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and we therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of our invention, what we desire to secure by Letters Patent of the United States is:

1. A hydraulic piston motor comprising a cylinder, a piston rod in said cylinder having a threaded portion, a piston on said rod, said piston comprising a central plate, end plates one on each side of said central plate and threaded on said thread portion, wiping washers compressed between said end plates and said central plate, a sealing ring between one of said end plates and said piston rod, and means for locking the other end plate to said rod comprising a cotter key

having a portion extending through an opening in said end plate and another portion extending into a groove in said rod.

2. A hydraulic piston motor comprising a cylinder, a piston rod in said cylinder having a threaded portion, a piston on said rod, said piston comprising a central plate, end plates one on each side of said central plate and threaded on said thread portion, cup-shaped wiping washers compressed between said end plates and said central plate, one of said end plates having a transverse passageway near its periphery in communication with the inside peripheral portion of the adjacent washer, and means for locking the other end plate to said rod.

3. In combination a piston rod and a piston, said piston including a plate threaded on the end of said piston rod, a bore in said plate, a groove in one end of said piston rod, and locking means extending through said bore into said groove.

4. Apparatus of the class described comprising the combination with a piston rod having a transverse groove in one end, of a piston screw-threaded onto such end of the piston rod, and locking means extending through a hole in said piston into said transverse groove to prevent said piston from being unscrewed from said piston rod.

5. Apparatus of the class described comprising the combination with a piston rod having a recess in one end, of a piston screw-threaded onto such piston rod end, and a cotter pin extending from said recess through a hole in said piston to lock the piston against being unscrewed from said piston rod.

6. Apparatus of the class described comprising the combination with a piston rod having a diametrical slot in one end, of a piston screw-threaded onto such end of the piston rod, and means extending radially from one end of said slot into a recess in said piston to lock the latter relative to said piston rod.

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