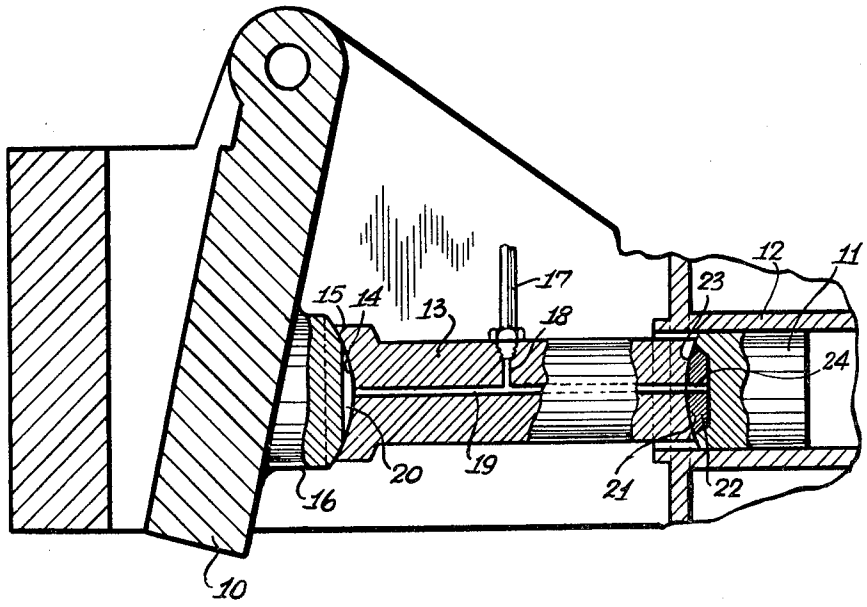
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THRUST TRANSMITTING APPARATUS FOR JAW CRUSHERS

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THRUST TRANSMITTING APPARATUS FOR JAW CRUSHERS

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This invention relates to thrust transmitting apparatus for use in hydraulically-operated jaw crushers of the type comprising a power driven reciprocating plunger and a jaw-propelling ram.

In prior United States Patent 2,986,345, means are described for the hydraulic transmission of thrust from the ram to the jaw by liquid pressure developed by the plunger in the ram cylinder and applied to a bearing surface on the jaw. It is desirable in some instances to develop liquid pressure for thrust transmission from a source independent of the hydraulic system of the crusher. It will be apparent that by developing pressure from an independent source, accurate and effective control of such pressure is possible.

It is an object of this invention to provide a thrust transmitting apparatus for hydraulically-operated jaw crushers wherein thrust is transmitted by liquid pressure, in which such pressure is developed from an independent source, and in which accurate and effective control of such liquid pressure is possible.

The present invention contemplates, in a hydraulically-operated jaw crusher having a jaw, a reciprocating ram and a hydraulic system for operating the jaw through the ram, the provision of means for transmitting thrust from the ram to the jaw comprising a thrust bearing interposed between said ram and said jaw and having mating surfaces, and means for delivering between said mating surfaces fluid under pressure from a source independent of said jaw-operating hydraulic system.

This source may be a small positive pump delivering at low but more-or-less constant rate to the thrust bearing and separating its mating surfaces by a thin film of fluid escaping between them. In such case, the pressure developed by the pump and transmitting force hydraulically to the jaw would be more-or-less proportional to the thrust transmitted by the ram.

The continually changing pressure developed by the pump may be applied to another bearing in the thrust system. Should the effective diameter of the latter bearing be less than that of the former, the fluid pressure exerted between its mating surfaces would be insufficient to force them apart, in which case part of the thrust would be transmitted by direct mechanical contact between these surfaces. One of these surfaces may be of porous material through which fluid pressure would be propagated and which would also transmit thrust by direct contact between the mating surfaces.

Alternatively, the oil may be delivered to the bearing from a source of more-or-less constant pressure through a throttling resistance to limit the rate of its flow.

The single figure of the drawing illustrates, in sectional side elevation, one embodiment of the invention.

Referring to the drawing, **10** is the moving jaw of a hydraulically-operated jaw crusher having a ram **11** mounted for reciprocation in a ram cylinder **12**. The ram is driven in conventional manner by means of fluid pressure in the ram cylinder as delivered by the hydraulic system of the crusher.

Force is transmitted from the ram to the jaw by means of a thrust link **13** having one end engaged by the ram and its opposite end surface **14** of part-spherical configuration (concave as shown) mating with a complementary surface **15** of part-spherical form (convex as shown) of a bearing **16** carried by the jaw **10**.

Fluid under pressure is delivered from any suitable source independently of the hydraulic system of the crusher through a connection **17** to a passage **18** in the thrust link and thence through a duct **19** to recess **20** formed in bearing **16**, whence it escapes radially as a thin film of oil or other fluid flowing between the mating surfaces **14** and **15**. This film maintains these surfaces out of contact with each other.

It will be appreciated that the pressure at any instant of the oil or fluid delivered to the bearing will, of course, depend on and bear a definite relation to the force being transmitted at that instant from the ram to the jaw. Should the fluid delivery pump be of the reciprocating kind, it is preferable that its active stroke should coincide with the forward stroke of the jaw.

As illustrated in the drawing, the thrust from the ram may be transmitted to the thrust link **13** through another bearing comprising a part-spherical (concave as shown) surface **21** on the adjacent end of the thrust link and an element **22** of porous material seated in the end of the ram and having a part-spherical surface **23** (convex as shown) mating with surface **21**. Duct **19** communicates with a recess **24** in the bearing element **22**. The material of bearing element may be any suitable sintered porous bearing metal.

The instantaneous pressure in the duct **19** is transmitted to and through the porous bearing element **22** to the concave mating surface **21**.

As shown in the drawing, the diameter of the mating surfaces **21** and **23** of the bearing is less than that of the mating surfaces **14** and **15** of the other bearing on the jaw. The same thrust is, however, transmitted through both bearings whence it follows that the corresponding pressure intensity under which fluid escapes between the mating surfaces **14** and **15** is insufficient to separate the mating surfaces **21** and **23**. The latter surfaces remain, therefore, in contact, fluid in appreciable volume does not escape from that bearing, and a proportion of the thrust is transmitted by direct contact between its mating surfaces.

The fluid delivered through connection **17** may be from a source of constant pressure and the rate of its flow may be limited by a throttling resistance, such as a small orifice. In such case, if the pressure were high enough, leakage between the mating surfaces would be continuous but at varying rate. If, however, the pressure were insufficient to carry the whole thrust the mating surfaces would come into contact if the excessive thrust continued for long enough for the fluid film to be squeezed out, and part of the thrust would be transmitted by direct mechanical pressure between the mating surfaces.

While the bearing surfaces have been shown as concave-convex, that is, part-spherical, they may of course be of other configuration, such as cylindrical. Any fluid under pressure such as water or air, may be used as the thrust-transmitting agent.

I claim:

The combination with a hydraulically-operated jaw crusher having a jaw, a reciprocating ram, and a hydraulic system for operating the jaw through the ram, of means for transmitting thrust from the ram to the jaw comprising a thrust link interposed between said ram and said jaw and having a circular concave bearing surface at each end thereof, said jaw and said ram each having a circular convex bearing surface mating and in engagement with one of said concave bearing surfaces, the diameter of each said concave bearing surface being smaller than said convex bearing surface with which it is in contact, each of said convex bearing surfaces having a recess

axially arranged therein, said thrust link having an axial duct communicating with each of said recesses and a passage communicating with said duct, and a conduit independent of said hydraulic system connected to said passage for supplying fluid under pressure to said surfaces through said passage, duct, and recesses.

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