

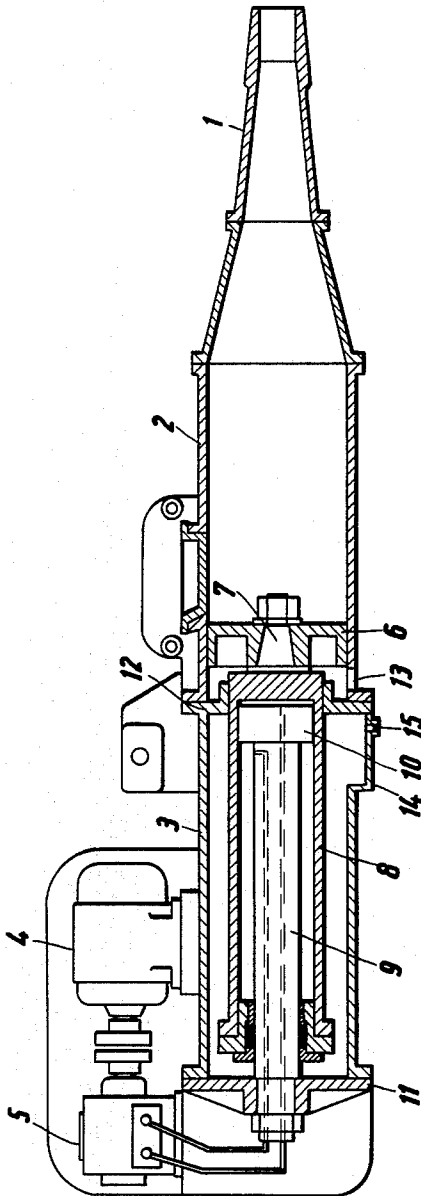
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TAPHOLE GUN WITH MOVING CYLINDER

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TAPHOLE GUN WITH MOVING CYLINDER

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4 Claims. (Cl. 222—389)

In taphole guns, the piston which forces the plugging compound out of the cylinder is moved either mechanically or hydraulically. Of these two types of drive, the hydraulic drive comprising a hydraulic cylinder and piston has the advantage of greater efficiency and easier control.

Its disadvantage is that it is very adversely affected by particles of the plugging compound which reach the drive because of inevitable leaks around the compound piston. Since the compound contains ceramic constituents which have an action similar to that of emery, the exactly ground fit and running surfaces of the hydraulic drive wear out in a relatively short time if compound reaches them and in some cases are very severely damaged. The result of this is that the hydraulic drive leaks and hydraulic fluid escapes and may mix with the plugging compound, which is very undesirable.

The object of the invention is to provide a hydraulically driven taphole gun in which the hydraulic mechanism is not susceptible to any danger of contamination by particles of the plugging compound despite the inevitable leaks between the compound cylinder and the piston.

Contrary to known hydraulic taphole guns in which the hydraulic drive piston is movable in a stationary cylinder and is rigidly connected to the compound piston, according to this invention, the hydraulic cylinder is slidable on its piston which is carried on a stationary piston rod and the compound piston is fixed to the hydraulic cylinder at its end remote from the piston rod.

The rod of the driving piston thus extends away from the compound piston and compound cylinder to a position where it is not directly accessible to particles of plugging compound leaking around the compound piston. At the same time, a simple rugged construction is obtained without any need for movable conduits; instead, the hydraulic liquid can be fed through ducts in the piston rod of the stationary driving piston, and rigid pipelines can be connected to the rear end face of this piston.

Even with a taphole gun of this construction, plugging compound may, after some hours of operation, move towards the piston rod of the hydraulic drive, and to prevent it reaching this piston rod, and hence the interior of the hydraulic cylinder, according to a further feature of the invention, a stationary housing surrounds the hydraulic drive and is separated from the compound cylinder by means of an end wall which has a seal through which the driving cylinder moves. This end wall shuts off the hydraulic drive from the compound cylinder thus making it practically impossible for particles of plugging compound to pass through to the drive.

The second seal at the end wall also gives much greater security against any escape of hydraulic oil, since this is very dangerous in a machine operating under high temperature and in a dust-laden atmosphere. An incipient oil leak usually due to damage to the seal of the piston rod of the hydraulic drive, usually increases in magnitude rapidly with a high-pressure hydraulic drive. This results in a continuous power drop and the machine and its surroundings are fouled by leaking oil, which constitutes a fire hazard.

The housing surrounding the hydraulic drive, may be

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provided with a sump with a closable drain aperture, the sump being arranged to receive leakage oil. With a high-pressure hydraulic cylinder drive an eventual slight escape of oil is inevitable despite careful sealing, for example by means of ground and chromium-plated piston rods, lipped rings and oil wipers. The above-mentioned sump with a closable drain aperture allows for this so that the dangers otherwise accompanying the escape of leakage oil, and particularly the access of oil to the channel for the pig-iron melt, is prevented.

With the passage of time an increasing quantity of plugging compound may still accumulate at the back of the compound piston in the gun and, although the end wall prevents it from passing to the hydraulic drive, is undesirable in large quantities. To obviate this disadvantage as well, an aperture is preferably provided in the wall of the compound cylinder on the side of the compound piston remote from the outlet nozzle, the compound which passes behind the compound piston dropping out through this aperture.

An example of a gun constructed in accordance with the invention is illustrated in the accompanying drawing which is a longitudinal section through the gun.

The gun comprises a compound cylinder 2 provided with a nozzle 1. Behind the cylinder 2 is a cylindrical housing 3 which surrounds the hydraulic drive and also forms the bearer for an electric motor 4 for a hydraulic pump 5. A compound piston 6 is slidable in the compound cylinder 2 and is connected by a conical pin 7 to the end wall of a cylinder 8 which forms part of the hydraulic drive. A piston rod 9 of this drive, carrying a piston 10 at its free end which divides the cylinder 8 into two working chambers, is secured to a cover 11 which closes the housing 3. The rod 9 contains ducts in the form of longitudinal bores which extend to the rear end of the rod where they are connected to conduits leading from the pump 5. The hydraulic liquid is fed through the conduits to one or the other of the working chambers in the cylinder 8. The housing 3 is separated from the cylinder 2 by an end wall 12 formed with a central bore or opening through which the movable cylinder 8 slides and in which it is a sealing fit. To improve the seal, this bore may be provided with a gland (not shown) and a wiper ring (not shown). The cylinder 2 has an aperture 13 at the bottom immediately next to the end wall 12. A leakage oil sump 14 with a closeable drain aperture 15 is formed in the housing 3.

Plugging compound, which during operation escapes from the working chamber of the compound cylinder 2 and passes behind the piston 6, is prevented from reaching the interior of the housing 3 by the end wall 12. Compound particles lodging on the outer surface of the cylinder 8, which extends through the wall 12 into the cylinder 2, are removed by the wiper ring (not shown) and drop out through the aperture 13. The ground moving surfaces of the hydraulic drive are protected against any damage from plugging compound particles. Any leakage oil escaping from the drive and reaching the housing 3 collects in the sump 14 and can occasionally be removed through the drain aperture 15 and cannot therefore enter the working chamber of the compound cylinder 2.

We claim:

1. A taphole gun comprising a cylinder for holding a plugging compound, an impervious piston in the cylinder for ejecting the compound therefrom, a stationary housing axially aligned with the cylinder and having an end wall separating said housing from the cylinder, hydraulic drive means located in said housing and comprising a hydraulic cylinder and a hydraulic piston within said hydraulic cylinder, said hydraulic piston being fixed to a stationary piston rod extending coaxially to said hydraulic cylinder, said

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hydraulic cylinder being slidable on said hydraulic piston and through an opening in said end wall of said housing, the compound-ejecting piston being fixed to said hydraulic cylinder at an end thereof remote from said stationary piston rod and being movable with said hydraulic cylinder as it slides through said opening.

2. A taphole gun as claimed in claim 1, further comprising a sump in said housing for receiving leakage oil from said hydraulic drive means.

3. A taphole gun as claimed in claim 1, wherein said compound cylinder has an aperture on the side of said piston for ejecting plugging compound remote from the outlet of said compound cylinder, said aperture being so

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arranged that compound which passes behind said piston drops out therethrough.

4. A taphole gun as claimed in claim 1, further comprising means in said piston rod defining conduits there-through leading to said hydraulic cylinder.

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