



Mine hydrojack hoisting and drainage HJHD

New ropeless hydrojack hoisting and pumping is developed. It includes (fig. 1,2,3) the boxes (lifting cages) 1, conductors 2 put in the shaft, hydraulic advancing jack HJ 3 mounted on baseline stations BS 4, which uniformly are located along shaft (20-50 m from each other depending on HJHD parameters). Retractable rods HJ 3 are supplied with rotary detent pins 5, which contact with edges 6 of boxes 1.

The box 1 is made as rigid vessel, which bottom has edges 6 and lug 7 limited on altitude, which is capable to enter hollow 8 located below boxes and to fix the nearest boxes. Box volume can be fixed as about 1 m^3 . Boxes 1 are located in shaft in two columns 4 continuously moving through baseline stations: cargo 14, moving up, and waste 15, moving down.

Baseline stations 4 are supplied with power cross bars 16, timbered in walls of shaft at the bottom, and with stretched wire strands 9 with turnbuckles 10, which are fixed in rock massif using the pasted anchors 11.

Hydraulic advancing jacks (HJ) 3 are connected through valve system to pressure and drain hydro-turnpikes 12. They, in its turn, are connected to the stationary hydraulic pump mounted on a surface. For transportation of materials, equipment and people the elevator 13 is foreseen in the shaft.

So, each pair of HJ 3 lifts a column of boxes 1 between BS 4 on height of 1 m per cycle. Due to serial operation of HJ 3 column moves continuously with a speed 0,2 ... 0,3 m/s, providing a continuous principle of operation.

Parallel connection of hydromains of cargo lines 14 and waste lines 15 of boxes gives well counterbalanced lifting scheme when for lifting of "dead" weight of boxes the available capacity is not consumed.

Productivity and design features of HJHD do not depend on a hoisting depth, it is necessary only to increase proportionally for depth the capacity of pumping plant on the surface.

HJHD works constantly 22-23 hours a day. This considerably exceeds productivity of known existing rope hoisting systems. HJHD output per hour when mass of cargo in boxes is 1 ton, and their speed is 0,3 m/s is 1080 t/hour. High efficiency of hoisting allows to successfully use it for pumping of mining water, filling empty boxes, having replaced in that way a traditional trumpet drainage and having refused from complex system of the pipelines, expensive pumps of main mine drainage, underground drainage chambers, that considerably simplifies a configuration of a pit bottom and decreases its volume. Required power of HJHD for shaft with 1000 m depth is equal 3750 kWt. Comparing HJHD with modern multirope hoisting installation CSh5×8 is presented in the table.

Refusal from complex and expensive hoisting engines and head gears considerably (in 3-5 times) decreases the charges on mine hoisting, reduces a diameter of shafts in 1,5-2 times, reduces the price and speeding up the periods of their construction in 2-3 times. Its generalized parameter of engineering efficiency λ , indicating in the form as the rationed simplex a relationship of the most significant intensive and extensive data of the equipment, attains value 2,5. Obviously, ropeless hydrojack hoisting can be considered as a new perspective scientific direction in the field of stationary machines.

Table – Comparison of engineering parameters of HJHD and hoisting engine CSh5×8

Parameters of hoisting	Analog MK3,25×4	HJHD DonSTU	HJHD refers to analog
1. Limited hoisting depth, m	1600	Anyone	+
2. Productivity, t/hour	1000	1080	1,08
3. Installed capacity, MWt	10	6	0,6
4. Weight of the equipment, t	250	140	0,55
5. Weight of metal constructions, t	2500	1200	0,48
6.Generalized parameter of efficiency, λ	0,56	1,44	2,50

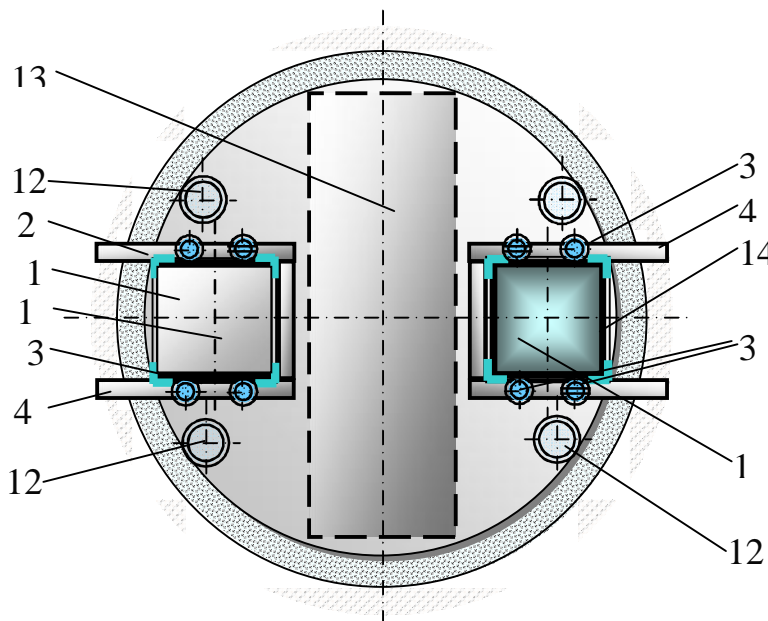


Fig. 1 - Variant of equipment arrangement of shaft by hydrojack hoisting HJHD

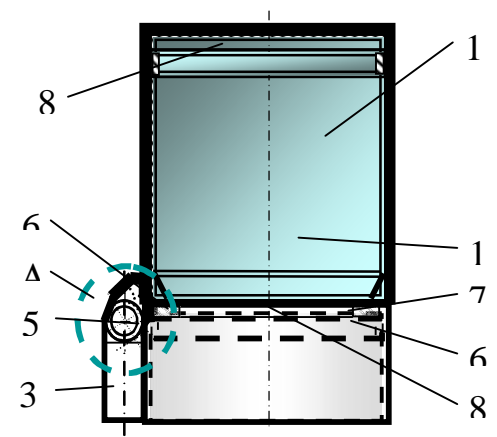


Fig. 2 – Interaction of rods of hydrojacks with box edges

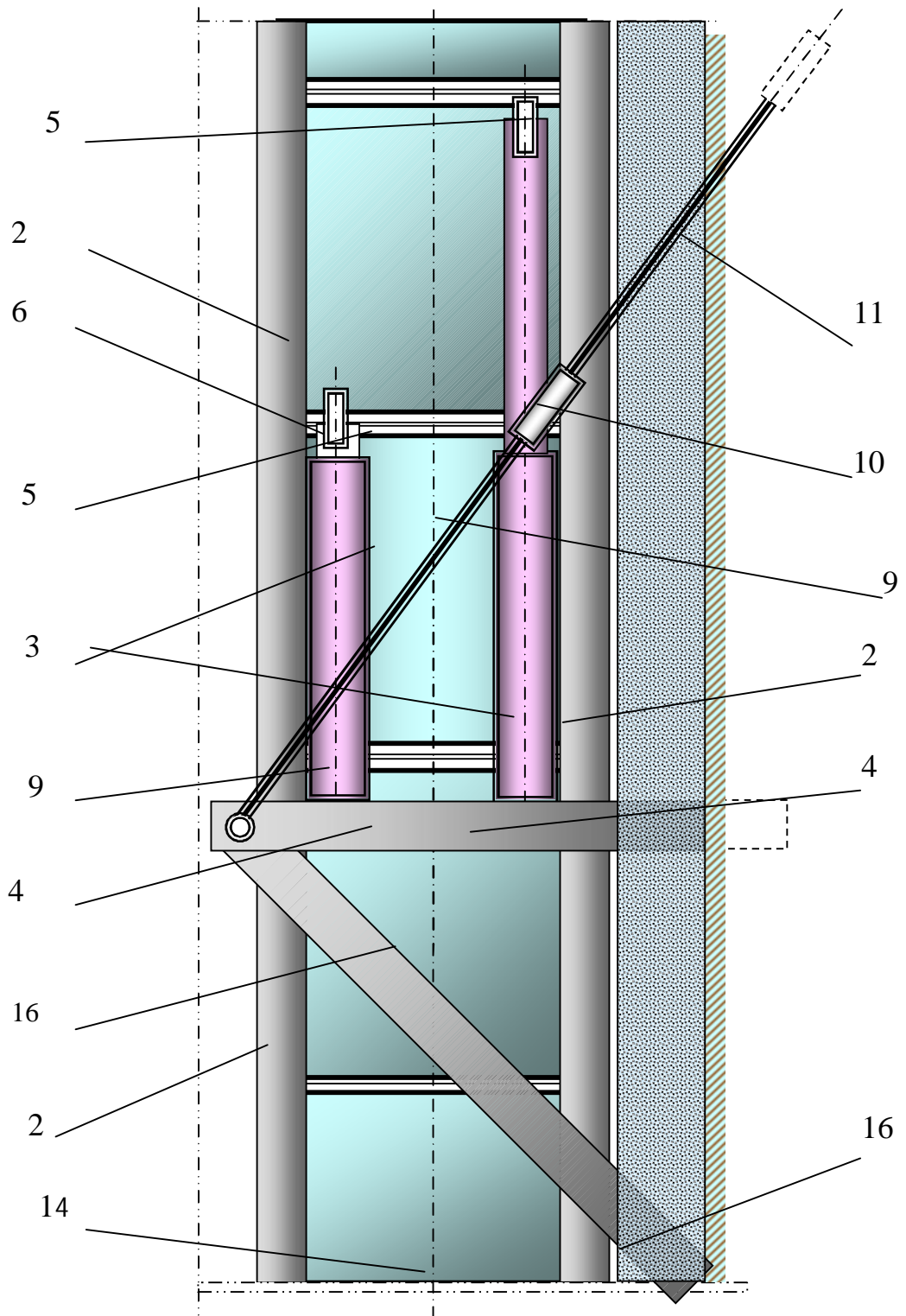


Fig. 3 – Principal station of HJHD with guides and hydrojacks