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HYDRAULIC EXCAVATOR

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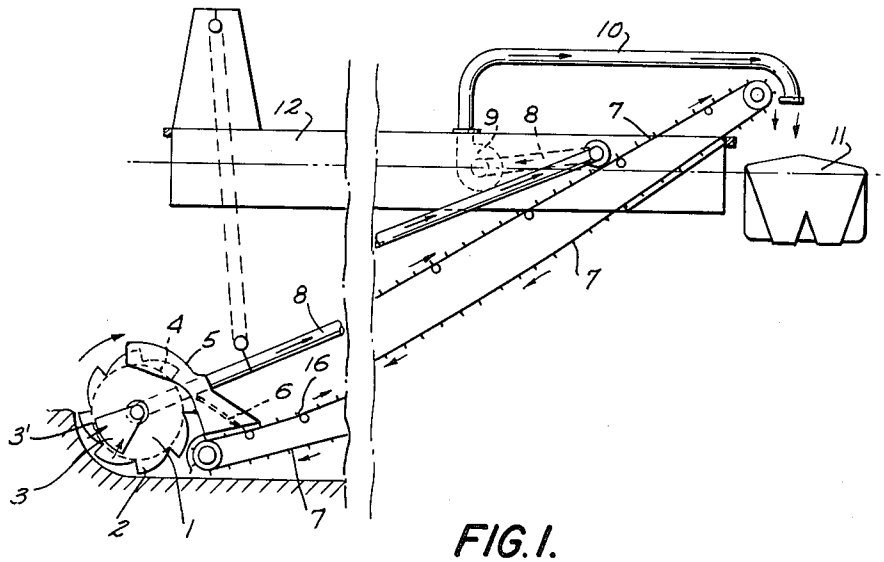


FIG. 1.

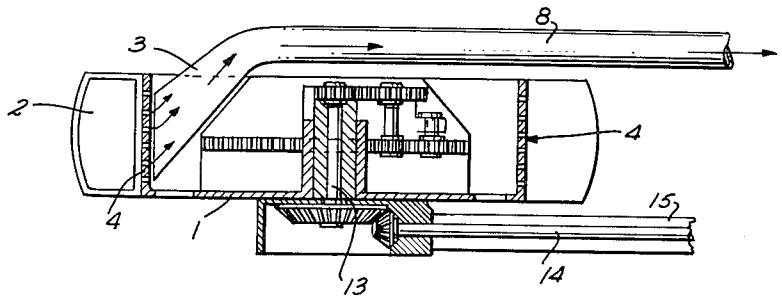


FIG. 2.

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HYDRAULIC EXCAVATOR

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2 Claims. (Cl. 37—66)

The present invention relates to important novel features in subaqueous excavators, particularly in those intended to be used in connection with the conservation of sea-ways and sea-coasts.

The two groups of subaqueous excavators, more commonly used, are quite different from each other, this difference being directly depending upon the nature of the materials to be removed: the flushing or suction dredgers serve the purpose of removing mud, clayish compositions, sandy mire and the like, and are characterized by the simplicity of the unit, the very good efficiency and the possibility of being attended to satisfactorily; on the contrary, the bucket dredgers, of which a larger use is made owing to their possibility of treating materials of a more compact nature, lose in efficiency as they approach the sphere of suction dredgers, since only a single digging and conveying apparatus is provided and, consequently, they have the disadvantage of presenting a great number of movable parts, which is rendered still worse through the high prime cost, through the great consumption of energy and through considerable wear.

In order to join together the advantages of these two types and to do away with the drawbacks due to the diversity of the materials to be treated, a subaqueous excavator has been devised, capable of being adjusted to the nature of the materials to be removed, and in which the very strong digging apparatus is independent from the devices for conveying the materials to the discharging place, it being possible to obtain said conveyance in two separate, but simultaneous manners, prior to an automatic selection of the material removable through suction.

An excavating apparatus according to the present invention mainly comprises: supporting means; a hollow drum supported on the supporting means rotatable about a horizontal axis and having a cylindrical perforated wall provided with a plurality of holes and constituting a sieve; a plurality of dredging bucket means fixed on the cylindrical wall outwardly projecting therefrom and having digging edges adapted to scoop material in the dredging bucket means when the same move upwardly and forwardly during rotation of the hollow drum, the interior of the dredging bucket means communicating through the perforated cylindrical wall with the interior of the hollow drum; drive means rotating the drum; suction means mounted on the supporting means and including pipe means having one end thereof located in the interior of the hollow drum and having the other end thereof located at a level higher than the level of the drum, the one end of the pipe means having a stationary suction opening bounded by two opposite edges extending in axial direction of the drum and by two opposite arcuate edges, the edges being closely spaced from the inner surface of the perforated wall so that the suction opening covers the upwardly and forwardly moving segment of the drum so as to suck fine submerged material scooped up by the upwardly and forwardly moving dredging bucket means through the perforated cylindrical wall

and into the pipe means for being conveyed to the higher level; and inclined conveyor means having a higher end portion located at the higher level, and a lower end portion located under dredging buckets moving downwardly during rotation of the drum so that coarse material collected in the dredging buckets drops onto the lower end portion of the conveyor means, the conveyor means moving upwardly to the higher level and being adapted to convey coarse material deposited on the lower end portion thereof to the higher level.

A way of carrying into effect the object of the present invention is shown, by way of example, in a form of embodiment represented in the annexed drawing, in which:

Fig. 1 shows a side elevation of the whole unit, while Fig. 2 is a top plan view, partly in section of the digging and selecting apparatus.

The unit is built up and works as follows:

The shaft 14, Fig. 2, suitably driven by the engine located in the hull 12, is arranged in one of the longitudinal supporting members 15 which are mounted on the floating member 12 of the digging apparatus pivotally about a horizontal axis. The drum 1 is, by means of spur gears provided in the water tight chamber, caused to rotate around a pin 13 integral with the longitudinal member 15. The outer cylindrical wall 4 of said drum 1 is perforated and constitutes a sieve and upon this wall are fastened a suitable number of changeable buckets 2. The material forming the bottom to be dredged is scooped-up and disintegrated by the edges of the buckets 2 and in this condition it undergoes the flushing action produced by the water sucked up by the pump 9 through the pipe 8 and the funnel 3. The small pieces of the material pass through the sieve 4 and into the suction orifice of the funnel 3, then they are sucked through the pipe 8 which is mounted on the floating member 12 pivotally about a horizontal axis into the pump 9 and from there they are caused to flow through the pipe 10 into the container 11, or they are discharged outside.

In order to flush the filled buckets containing scooped-up material and located on the upwardly and forwardly moving segment of the drum 4, the suction opening of funnel 3 has a shape corresponding to the contour of the inner drum surface. The suction opening has two opposite edges extending in axial direction of the drum 1 and two opposite arcuate edges 3'. The edges of the suction opening are closely spaced from the inner surface of the perforated wall 4 so that a stream of water passes through the filled buckets and flushes fine material out of the same into the pipe 8.

The coarse portion remains in the buckets 2 and, owing to the rotary motion, it is caused to drop through the hopper 5 down upon the conveying band 7; a shaking grate 6, which, if necessary, may be interposed, will prevent the direct dropping down of big stones upon the band conveyor. The speed of the conveyor may be mechanically controlled in such a way as to regularly convey into the container 11 the whole of the residual part of material.

By varying the peripheral speed and the penetrating power of the digging tool it will obviously be possible to reach the most suitable subdivision of the material in each specific case, and the variation of the speed of the pump and of that of the band conveyor, within the limits allowed, will from time to time permit of a high efficiency being achieved.

The band conveyor is preferably made of metal, and in order to be able to work with inclinations near the limiting angle of the sliding action of the material, said band will be provided with transversal projections 16 which give the material a terrace-like arrangement.

The simplicity of the unit and the ease of performing the several operations may also offer the convenience of

saving expensive labour by assigning appropriate housings in the hull to the dredged material, which will then be conveyed to the discharging place by the means existing on board.

What I claim is:

1. An excavating apparatus comprising, in combination, supporting means including a floating member and a supporting arm mounted thereon and downwardly extending from the higher level of said floating member to a lower level; a hollow drum supported on the lower end of said supporting arm at said lower level, said hollow drum being rotatable about a horizontal axis and having a cylindrical perforated wall provided with a plurality of holes and constituting a sieve; a plurality of dredging bucket means fixed on said cylindrical wall outwardly projecting therefrom and having digging edges adapted to scoop material in said dredging bucket means when the same move upwardly and forwardly during rotation of said hollow drum, the interior of said dredging bucket means communicating through said perforated cylindrical wall with the interior of said hollow drum; drive means rotating said drum; suction means mounted on said supporting means and including pipe means having one end thereof located in said interior of said hollow drum and having the other end thereof located at said higher level; a funnel shaped member secured to said one end of said pipe means and being located underneath the axis of rotation of said drum and forwardly in the direction of rotation of the same, said funnel shaped member having a stationary suction opening bounded by two opposite edges extending in axial direction of said drum and by two opposite arcuate edges, said edges being closely spaced from the inner surface of said perforated wall so that said suction opening covers the upwardly and forwardly moving segment of said drum so as to suck fine submerged material scooped up by said upwardly and forwardly moving dredging bucket means through said perforated cylindrical wall and into said pipe means for being conveyed to said higher level; and inclined conveyor means having a higher end portion located at said higher level, and a lower end portion located under dredging buckets moving downwardly during rotation of said drum so that coarse material collected in said dredging buckets drops onto the lower end portion of said conveyor means, said conveyor means moving upwardly to said higher level and being adapted to convey coarse material deposited on said lower end portion thereof to said higher level.

2. An excavating apparatus comprising, in combination, supporting means; a hollow drum supported on said supporting means rotatable about a horizontal axis and having a cylindrical perforated wall provided with a plurality of holes and constituting a sieve; a plurality of dredging bucket means fixed on said cylindrical wall outwardly projecting therefrom and having digging edges adapted to scoop material in said dredging bucket means when the same move upwardly and forwardly during rotation of said hollow drum, the interior of said dredging bucket means communicating through said perforated cylindrical wall with the interior of said hollow drum; drive means rotating said drum; suction means mounted on said supporting means and including pipe means having one end thereof located in said interior of said hollow drum and having the other end thereof located at a level higher than the level of said drum, said one end of said pipe means having a stationary suction opening bounded by two opposite edges extending in axial direction of said drum and by two opposite arcuate edges, said edges being closely spaced from the inner surface of said perforated wall so that said suction opening covers the upwardly and forwardly moving segment of said drum so as to suck fine submerged material scooped up by said upwardly and forwardly moving dredging bucket means through said perforated cylindrical wall and into said pipe means for being conveyed to said higher level; and inclined conveyor means having a higher end portion located at said higher level, and a lower end portion located under dredging buckets moving downwardly during rotation of said drum so that coarse material collected in said dredging buckets drops onto the lower end portion of said conveyor means, said conveyor means moving upwardly to said higher level and being adapted to convey coarse material deposited on said lower end portion thereof to said higher level.

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