March 13, 1945. J. KALIX 2,371,174

SUBMARINE EXCAVATING DEVICE

Original Filed Oct. 26, 1943

Fig. 1.

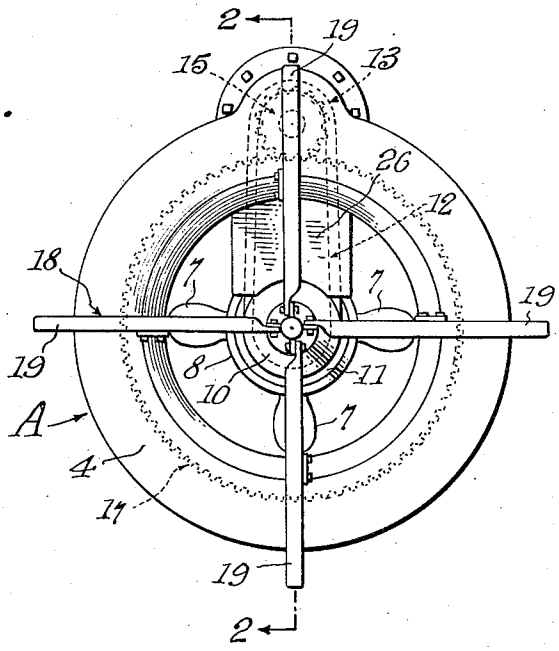
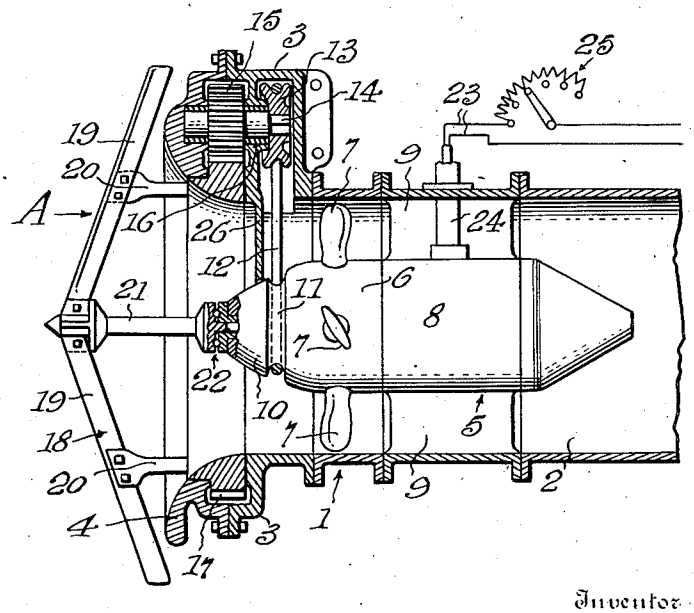


Fig. 2.



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2,371,174

SUBMARINE EXCAVATING DEVICE

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Original application October 26, 1943, Serial No. 507,663, now Patent No. 2,361,404, dated October 31, 1944. Divided and this application September 5, 1944, Serial No. 552,788

5 Claims. (Cl. 37—67)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without payment to me of any royalty thereon.

This invention relates to the art of hydraulic dredging and more particularly it is directed to a submarine excavating device of the type disclosed in copending application Serial No. 507,663, filed October 26, 1943, of which this application is a division, for removing subaqueous material from canals or other waterways.

One of the objects of the invention is to provide a submarine excavating device including a combined suction pump and means for driving the same mounted in the suction mouth end of a suction pipe of a hydraulic dredge, with a cutterhead indirectly connected to be driven by and at a slower speed than the pump.

Another object of the invention is to provide a submarine excavating device including a combined suction pump and electric motor for driving the same mounted in the suction mouth end of the suction pipe, with a cutterhead connected to be driven indirectly by said suction pump, whereby subaqueous material is loosened and broken up by the cutterhead, sucked through the suction mouth end and pumped through the suction pipe by the pump for delivery to any place desired.

Another object of the invention is to provide a submarine excavating device for subaqueous material which is rugged in construction, efficient in use, quickly installed in the suction mouth end of a suction pipe and not liable to get out of order.

With the above and other objects and advantages in view the invention consists of certain features of construction and operation of parts which will hereinafter be described and shown in the accompanying drawing, in which:

Figure 1 is a front end view of the suction mouth end of a suction pipe having an electric motor driven suction pump mounted therein, with a cutterhead indirectly driven by the suction pump; and

Figure 2 is a fragmentary longitudinal sectional view taken on the line 2—2 of Figure 1.

Referring more specifically to the drawing, 1 designates an inlet end of a suction pipe 2 for use on a hydraulic dredge of the suction type (not shown), said inlet end 1 having a housing 3 mounted thereon, with a bell-shaped suction mouth 4 mounted on the outer end of the housing. The improved submarine excavating device indicated generally by A comprises a suction pump 5 preferably of the propeller type including an impeller 6 having blades 7 mounted thereon and operable within the suction pipe 2 adjacent to the suction mouth 4. The pump 5 is driven by an electric motor 8 centrally mounted on ribs 9 within the suction pipe 2. The outer end 10 of the impeller 6 is elongated and provided with a circular groove 11 engaged by a belt 12, which drives a pulley 13 mounted on one end of a shaft 14 for a pinion 15, said shaft 14 being rotatably mounted in bearings 16 formed in the housing 3. The pinion 15 drives a ring gear 17 rotatably mounted within the suction mouth 4. A cutterhead 18 having blades 19 removably mounted thereon is operable in front of the bell-shaped suction mouth 4, said blades 19 of the cutterhead 18 being connected to the ring gear 17 by means of arms 20 and to the motor driven impeller 6 by a central rod 21 rotatably mounted at its inner end on the outer end 10 of impeller 6 by ball bearings 22 or the like. The blades 7 of the impeller 6 may be adjustably mounted to provide a variable pitch by any suitable conventional means. The electric motor 9 is connected by conductors 23 to a suitable source of electrical supply (not shown), which conductors 23 extend through a transversely arranged pipe 24. In order to regulate the speed of operation of the electric motor 8, a rheostat 25 is connected in circuit with the conductors 23. A guard 26 carried by the housing 3 may be provided for protecting the belt 12 from the subaqueous material.

The electric motor 8 employed for driving the impeller 6 is of that class of motors now available for normal operation under water and adequate protection of equipment and personnel from the effects of possible short circuits can be provided. By submerging the electric motor 8 the water has a cooling effect thereon.

In operation, assuming that the suction pipe 2 has been caused to engage subaqueous material within a body of water, upon actuating the rheostate 25, the electric motor 8 may be rotated at any speed desired, thus driving the impeller 6. The cutterhead 18 is rotated at a slower speed than the high velocity motor driven impeller 6 and the reaction of the cutterhead 18 to subaqueous material at its center is taken up by the ball bearings 22 on which the inner end of the central rod 21 is mounted, while the reaction of the cutterhead to the subaqueous material toward the ends of its blades 19 is taken up by the ring gear 17 through the arms 20. The bearings 16 for the pinion shaft 14 are preferably made of bronze and may be provided with any suitable

means to prevent the necessity of oiling the same. The cutterhead 18 is driven in an opposite direction to the motor driven impeller 6, whereby the reaction of the cutterhead to the subaqueous material is counteracted, which results in less vibration. In homogeneous material the available motor torque is divided or split between the cutterhead 18 and the blades 7 of the impeller 6, whereby when a hard layer of subaqueous material is met and more power is necessary, the electric motor 8 will take up the additional load, particularly when a series wound motor is used. Upon the cutterhead 18 being stopped by a boulder or other large object, the belt 12 being driven by the motor driven impeller 6 will slide on the pulley 13, whereby the motor 8 may continue to rotate the impeller 6 without damage thereto.

After the subaqueous material is broken up by the cutterhead 18 it is sucked through the suction pipe mouth 4 by the suction created by the impeller 6, which pumps the subaqueous material through the suction pipe 2 to any place desired.

It will thus be seen that there is herein provided a novel and efficient form of submarine excavating device for subaqueous material, which is well adapted for the purpose intended. Even though there has herein been shown certain features of construction and operation of parts, it is nevertheless to be understood that various changes may be made therein, if the changes do not depart from the spirit or scope of the claims.

Having thus described my invention, what I claim as new and wish to secure by Letters Patent is:

1. The combination of a suction pipe having a suction mouth at one end, of a suction pump operatively positioned within and adjacent to the suction mouth end of the suction pipe, a cutterhead operatively positioned in front of said suction mouth end and means indirectly connected to actuate said cutterhead by said suction pump.

2. The combination of a suction pipe having a suction mouth at one end, of a suction pump operatively positioned within and adjacent to the suction mouth end of the suction pipe, a cutterhead operatively positioned in front of said suction mouth end of the suction pipe and means including a ring gear connected to actuate said cutterhead by the suction pump.

3. The combination of a suction pipe having a suction mouth at one end, of a suction pump operatively positioned within and adjacent to the suction mouth end of the suction pipe and means connected to actuate the cutterhead by the suction pump, said means including a ring gear, a pinion meshing with the ring gear, said pinion connected to be actuated by the suction pump for actuating the ring gear to actuate the cutterhead at a lower speed than said suction pump.

4. The combination of a suction pipe having a suction mouth at one end, of a suction pump operatively positioned within and adjacent to the suction mouth end of the suction pipe, a cutterhead operatively positioned in front of said suction mouth end of the suction pipe, means connected to actuate said cutterhead by said suction pump, said means including a ring gear connected to said cutterhead, a pinion meshing with said ring gear and means including a belt connecting said pinion with the suction pump.

5. The combination of a suction pipe having a suction mouth at one end, of a suction pump operatively positioned within and adjacent to the suction mouth end of the suction pipe, said suction pump comprising an impeller and electrical motor for driving the same, a cutterhead operatively arranged in front of said suction mouth end and means including a ring gear connected to actuate said cutterhead by said suction pump.

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