Fig. 1.

Fig. 2.

INVENTOR
Sidney Carl Ohlhausen

BY Lawrence L. Colbert

ATTORNEY
CUTTERS FOR HYDRAULIC DREDGES
Sidney Carl Ohlhausen, Rte. 2, Box 455, Alvin, Tex.
Filed Feb. 29, 1960, Ser. No. 11,622
5 Claims. (Cl. 37—67)

This invention relates to cutters or cutter heads, as they are sometimes called, for use in connection with hydraulic or suction dredges.

It is well known in the art to which this invention relates, to employ rotary cutters on the intake end of the suction conduit of hydraulic dredges to break up and spread the earth or other materials being excavated. In accordance with modern design, these cutters are rotated by a shaft connecting the cutter to some power source on the dredge. The mouth of the suction conduit, mounted in association with the cutter, water and earth excavated by the cutter is drawn into the suction conduit by a pump on the dredge.

This type of machinery presents a number of difficulties which have heretofore not been alleviated. A primary difficulty resides in the fact that a dredge operation may encounter different strata as it moves along the to-be-excavated channel. Oftentimes the strata the cutter encounters necessitates changing the cutter head. Another difficulty is in the fact that floating materials such as logs, stumps or debris become clogged between the cutter blades and the suction intake. In excavating marsh land or swamps, a particular difficulty has resulted from the fact that logs float between the blades of the cutter, pass through the suction conduit and enter the pump. When this occurs damage to the pump and a shut down of the dredge is inevitable. Even if logs or stumps do not pass through the spaces between the cutter blades, they sometimes become stuck or lodged in the cutter, making it unbalanced and interfering with its operation, thus requiring a shut down.

The cutters used in the dredging operation are subject to considerable wear along their cutting surfaces. It is these surfaces that wear out long before any other portion of the cutter needs replacement. The cutters of the prior art have been usually constructed of single units which do not make for easy disassembly so that only the worn portions of the cutting device need be replaced.

Accordingly, it is a primary object of the present invention to remedy these and like defects resulting from the use of a rotary cutter. By devising means which will effectively prevent a cutter from becoming clogged with logs, stumps or debris and which will prevent such foreign material from passing through the cutter into the suction conduit and into the pump, while at the same time, not interfering with the normal operation of the cutter insofar as the excavation of the earth is concerned.

It is another object of the invention to provide means for removing the cutting teeth of the cutter without undue difficulty and replacing them with new teeth as desired.

It is yet another object of the invention to provide an ingenious arrangement for replacing a cutter assembly and the cutter assembly while maintaining the supporting structure therefor.

It is still another object of the present invention to provide a cutter for hydraulic dredges having ingenious connecting webs between annular members holding the teeth whereby loosened material is impelled away from the working surface.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout and in which:

FIGURE 1 is a perspective view of the supporting frame of the cutting device of the present invention.
FIGURE 2 is a perspective view of the cutting cage.
FIGURE 3 is an end view of the cutting cage mounted on the supporting frame.
FIGURE 4 is a cross-sectional view taken along lines 4—4 of FIGURE 2.

Referring to the drawings in detail, and in particular to FIGURE 1, reference numeral 10 indicates, in general, the supporting frame upon which a cutting cage is mounted. The supporting frame 10 has an inverted hub 11 at one end thereof. At the other end is a flanged annular member 12 having a flange 13 which extends towards the hub. A plurality of struts 14 connect the annular member 12 with hub 11 at substantially its outer periphery. It will be observed that annular member 12 has a diameter greater than hub 11. The supporting frame has the appearance of a truncated cone. Upon closer inspection of FIGURE 1 it will be observed that struts 14 are fitted into recesses 15 in upwardly extending flange 13 thereby affording a secure position. Suitable welds at these points retain the structure. At the same time it will also be observed that the struts 14 are recessed into the upper peripheral portions of hub 11 for the same reason. Suitable welds at these points provide extreme rigidity under all conditions of operations. Hub 11 has a concentric opening at its apex portion so that a suitable shaft may be positioned therethrough and a securing member theretofore fastened on the shaft so that the cutter supporting frame is retained thereby. By employing an inverted or concave type hub it will be observed that the securing member will be retained in the concavity so that it is not easily dislodged from the shaft. It is also pointed out that struts 14 are of differing lengths so that every other strut projects beyond hub 11 as at 16. More about this will be discussed in connection with cross-sectional view FIGURE 4.

Now, attention is directed to FIGURE 2 for a view of the cutting cage 20. The cutting cage 20 is constructed of a plurality of annular members shown generally as 21. It will be observed that the diameters of the annular members vary so that the smallest annular member is at the top and that the largest is at the bottom as shown in the figure. The annular members 21 have a series of teeth positioned in suitable recesses therein. These teeth 22 are shown as square edged elements. They may take the form of any suitable, desirable configuration. Furthermore, it is pointed out that these teeth are retained in the recesses by a conventional welding operation. They may, therefore, be dislodged from the annular members and replaced with new teeth as required. They may be retained in the annular members permanently by building up worn teeth through suitable welding deposition. It will be observed that all the teeth 22 on each annular member 21 are in longitudinal alignment, thereby affording the greatest biting power against a working surface.

The annular members 21 are each interconnected by web portions 23. The web portions assume an angular configuration with the cutting cage in a manner and direction somewhat similar to the cutting teeth themselves. It is pointed out that the webs 23 have depressed or concave areas 24. The webs 23, of course, provide a suitable connecting element between the annular members 21 and at the same time, due to the unique concave configuration thereof, provide the necessary hydraulic movement to the area associated with the working zone so that as particles of material are chewed away from the worked face, they are given an impelled force by the webs 23 so that they are forcibly removed from the vicinity of the working face.

The unit is easily assembled by positioning a cutting cage 20 over the supporting frame 10. FIGURE 3 is an
end view in a direction from the widest annular member towards the hub showing cage 20 in position on supporting frame 10. Each of the annular members 21 have recesses or grooves 25 therein as shown in FIGURE 4. The number of grooves correspond to the number of struts of the supporting frame and also correspond to the number of connecting webs 23 shown in cross-section at FIGURE 4. These struts are situated in the grooves when the cage is assembled on the supporting frame. In FIGURE 3 it will be noted that the web portion 23 extends inwardly at one side sufficiently so that one side of strut 14 is appurtenant the end portion of web 23 thereby giving secure movement to the entire unit as it is rotated in a clockwise direction.

From FIGURE 3 it can be seen that the lowermost portion of annular member 21 has its outer side in confrontation with the inner side of annular member 12. Suitable recessed type rivets 31 may be employed in positioning and securing the cage to the supporting frame. These rivets may be easily cut out by the use of an acetylene torch so that the cutting cage may be removed from the supporting frame with ease once the rivets have been dislodged. It has been discovered that it is more practical in the use of the present invention to employ such rivets rather than to rely upon nuts and bolts which cannot as easily be positioned in a recessed condition.

For greater clarification of the annular members 21, attention is directed to FIGURE 4, which shows a cross-sectional view taken along lines 4—4 of FIGURE 2. It will be seen therefrom, that the annular member 21 has a plurality of grooves 30 positioned on one edge portion of web 23. In this uppermost annular member shown, it will be noted that there are only 4 grooves even though the supporting frame has 8 struts. In the use of the instant device it has been found that it is not necessary for the uppermost annular member 21 to have eight grooves as is provided for all the other annular members. Extending portions 16 of four of the struts 14 extend through the 4 grooves provided, therefore the struts which are flush at the end portion with hub 11, as shown in FIGURE 1, merely confront the inner surface of the uppermost annular member 21.

Another interesting feature of the present invention can be found in connection with the structure of the members 21. It will be seen particularly from FIGURES 3 and 4 that the inner portion of the annular member is circular in configuration. The outer periphery, however, does not possess such a circular configuration but has inclined portions 32 so that the width of the annular member 21 is at its minimum directly opposite the frontal portion of a tooth 22. It is at its maximum width directly on the opposite side of the tooth. In this manner, the cutter presents the greatest cutting area possible to the working surface while at the same time presents the greatest rigidity possible by having the widest portion of the annular member 21 directly behind each cutting tooth.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed is:

1. A cutter comprising a supporting frame including a hub adapted to be rotated about an axis at the center thereof, a plurality of struts extending therefrom and diverging from each other, the ends of said struts being secured to an annular base member, a cutting cage positioned to substantially envelop the supporting frame, said cutting cage including a plurality of annular spaced members being connected by a plurality of web members, said annular members having outwardly extending cutting teeth, the inner portion of said annular members having recessed portions in which said struts of the supporting frame are positioned.

2. A cutter comprising a supporting frame including an inwardly extending concave hub adapted to be rotated about an axis at the center thereof, a plurality of struts extending therefrom and diverging from each other, the ends of said struts being secured to an annular base member, a cutting cage positioned to substantially envelop the supporting frame, said cutting cage including a plurality of annular spaced members being connected by a plurality of web members, each of said web members facing in the same direction at an angle with an imaginary radial line, said annular members having outwardly extending cutting teeth, the inner portion of said annular members having recessed portions in which said struts of the supporting frame are positioned.

3. The cutter of claim 2 wherein the recessed portions of the annular members are in juxtaposition with the longitudinal end portion of the web members.

4. The cutter of claim 3 wherein the struts have a rectangular cross-sectional configuration and the recessed portions have two right angle corners.

5. The cutter of claim 1 wherein the annular members have its narrowest width at the front portion of each of the cutting teeth and its greatest width at the rearward portion of each of the cutting teeth and a width intermediate between the rearward portion of one tooth and front portion of the next tooth directly therebehind.

References Cited

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Inventor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>318,859</td>
<td>Bowers</td>
<td>May 26, 1885</td>
</tr>
<tr>
<td>331,861</td>
<td>Bolles</td>
<td>Dec. 8, 1885</td>
</tr>
<tr>
<td>365,140</td>
<td>Lynch</td>
<td>June 21, 1887</td>
</tr>
<tr>
<td>526,514</td>
<td>Bates</td>
<td>Sept. 25, 1894</td>
</tr>
<tr>
<td>545,762</td>
<td>Bates</td>
<td>Sept. 3, 1895</td>
</tr>
<tr>
<td>2,029,816</td>
<td>Ewing</td>
<td>Feb. 4, 1936</td>
</tr>
</tbody>
</table>