United States Patent

[11] **3,581,924**

[72] Inventor **Helmut Marz**
Beilstein, Germany

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[73] Assignee **Erhard Lauster Entwicklungen,**
Gesellschaft mit beschrankter Haftung,
Neckartalstrasse
Stuttgart-Bad Cannstatt, Germany

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[33] **Austria**
[31] **A471/68**

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[54] **DREDGER VESSEL**
6 Claims, 16 Drawing Figs.

[52] **U.S. Cl.** **214/767,**
214/146, 37/117.5
[51] **Int. Cl.** **E02f 3/46**
[50] **Field of Search** 214/767,
146 E, 510, 145, 146; 37/117.5

[56] **References Cited**
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Primary Examiner—Albert J. Makay
Attorney—Walter Becker

ABSTRACT: A dredger vessel for use in connection with a dredger boom which comprises a first tiltable means composed of two sidewalls and a bottom wall and also comprises a second tiltable means composed of a wall member extending transverse to said two sidewalls and having a bottom surface movable over the bottom wall of said first tiltable means while said first and second tiltable means are pivotable relative to each other so that the second tiltable means when occupying one of its extreme positions is located outside of and in angularly spaced relationship to the respective adjacent working edge of said first tiltable means when the latter occupies its respective end position remote from said second tiltable means.

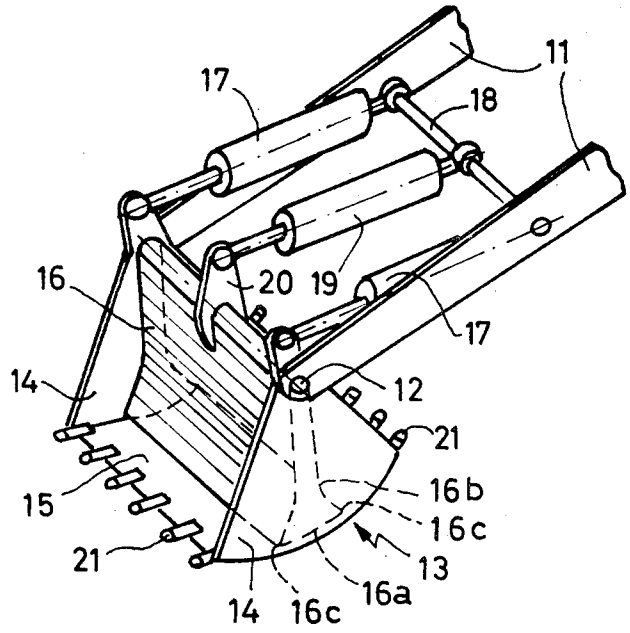
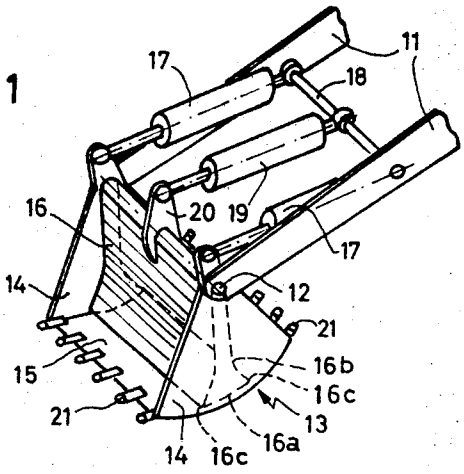


Fig. 1



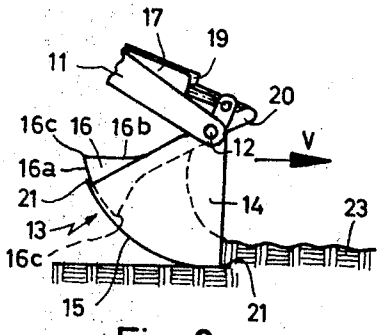


Fig. 2

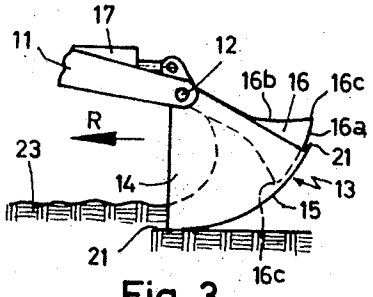


Fig. 3

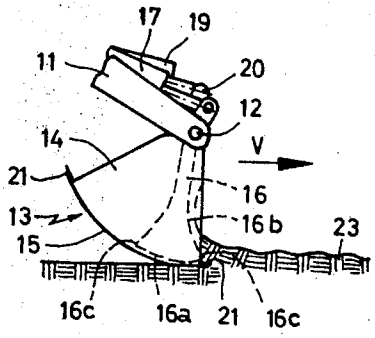


Fig. 4

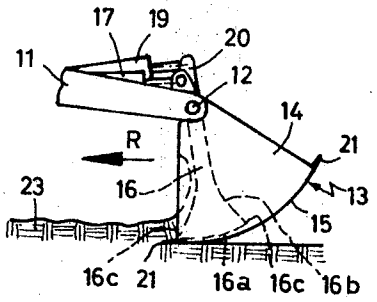


Fig. 5

Inventor:

Helmut März

By Walter Becker

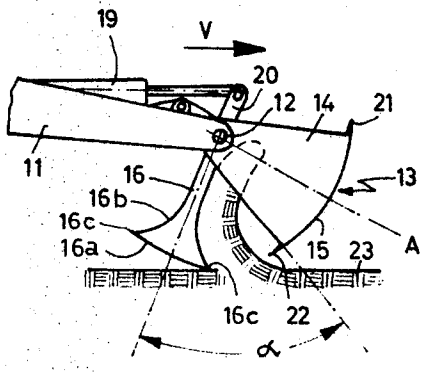


Fig. 6

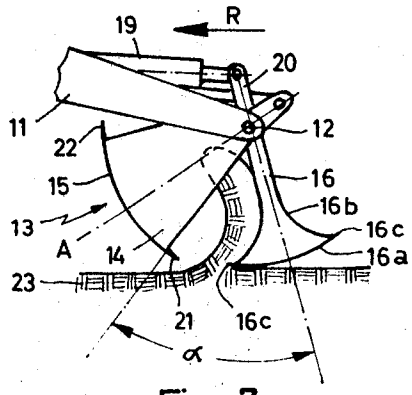


Fig. 7

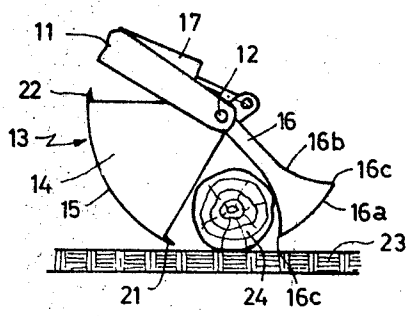


Fig. 8

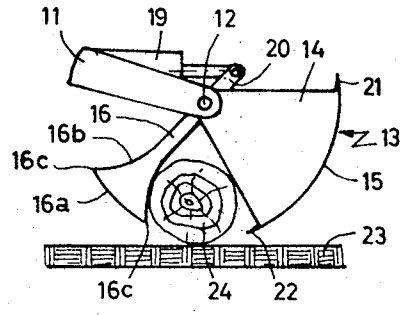


Fig. 9

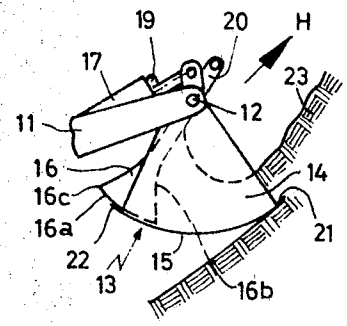


Fig. 10

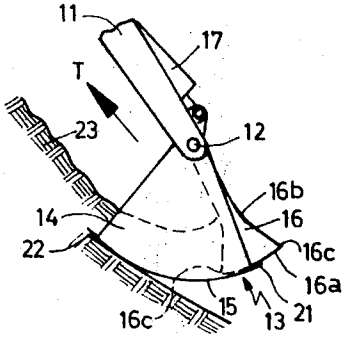


Fig. 11

Inventor:

Helmut Mörz

By

Fig. 12

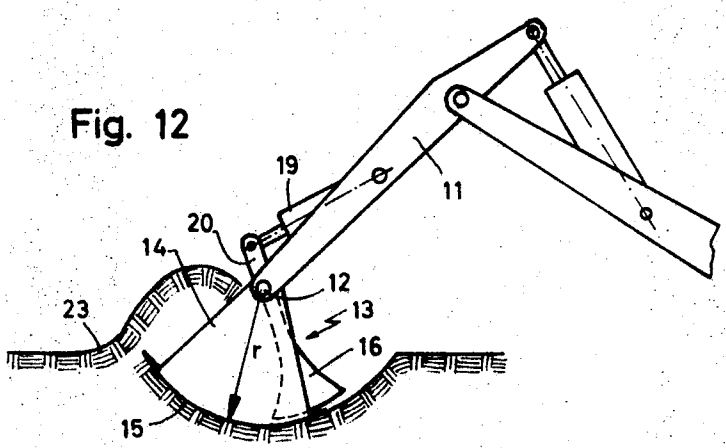


Fig. 13

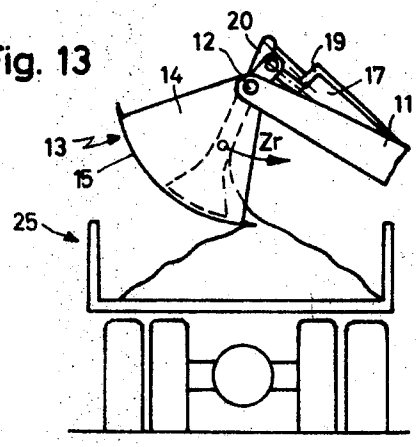


Fig. 14

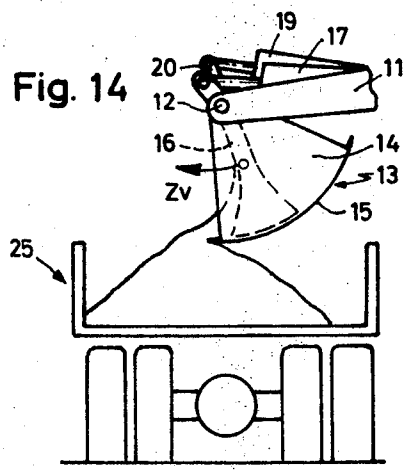


Fig. 15

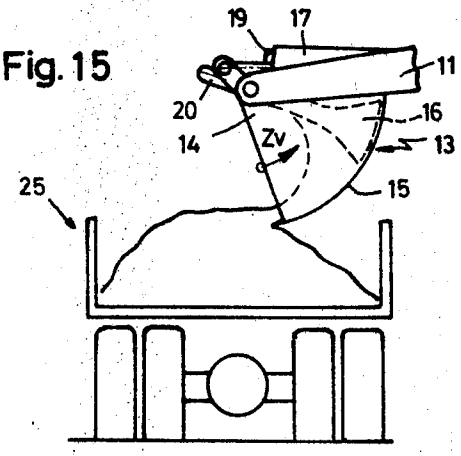
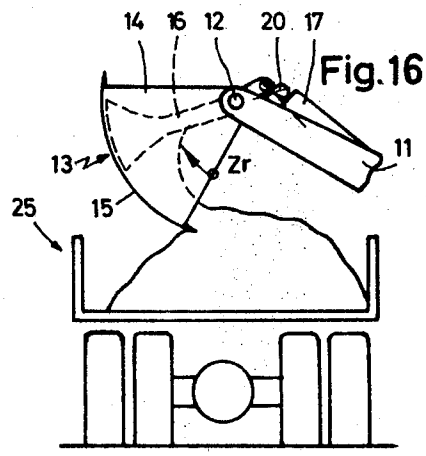


Fig. 16



Inventor:

Helmut März

By

DREDGER VESSEL

The present invention concerns a device and, more specifically, a vessel for a dredger for carrying out various working operations, said vessel comprising two sidewalls, a bottom and a main portion which is pivotable or tiltable about a horizontal axis of the dredger boom. The said vessel furthermore comprises a transverse wall which is pivotable about a horizontal axis through the main portion of said vessel so that the main portion of said vessel and the said transverse wall are pivotable relative to each other.

With movable dredgers (so-called bucket or driving loaders), normally buckets are employed as so-called dredger vessels which with forwardly directed bucket opening are moved forwardly and are thereby loaded. The lower edge of the bucket is designed as cutting or digging edge. With buckets of this type, the loading movement is produced primarily by the driving or moving vehicle. Such bucket is emptied by pivoting the same about a horizontal axis so that its contents drops out of the bucket in a free fall. Such emptying operation is frequently unsatisfactory, particularly when sticky material is involved. In such instances, the operator has to resort to steps which are time consuming and frequently are even harmful to the dredger and the dredger vessel. Moreover, such bucket is, in addition to a shoveling action, limited to only a few other working operations.

In order to assure a safe emptying of a dredger vessel, with the above-mentioned heretofore known type of vessel, with which the present invention starts, there is provided a transverse wall which is tiltable in a tiltable main vessel portion (sidewalls and bottom) and which is tiltable separately from said tiltable main portion. This transverse wall when being tilted through the interior of the main vessel portion serves as additional power operable emptying means for the bucket. With heretofore known dredger vessels of the type involved as described for instance in British Pat. No. 937,543, the tiltable or pivotable transverse wall serves exclusively the said purpose, namely of emptying the bucket.

According to a further heretofore known dredger vessel as described in U.S. Pat. No. 3,268,100, it is possible to use the transverse wall which is pivotable relative to the main vessel portion for additional working operations. In this instance, however, the transverse wall is rigid and is arranged in the extension of a substantially vertically extending portion of the dredger boom. The number of the additional working possibilities for which only the said fixed transverse wall is used while the main portion of the vessel is tilted back is nevertheless rather limited.

In an effort to increase the number of working operations with the tiltable transverse wall, it has been suggested according to a further heretofore known dredger as described in British Pat. No. 1,061,683, to make the transverse wall tiltable relative to the main portion of the dredger vessel by dividing the vessel into evenly sized vessel sections which are pivotable or tiltable relative to each other. This increase in the possible working operations has been created, however, at the expense of serious drawbacks, namely the elimination of a forcible emptying of the vessel portions. MOreover, the dredger vessel can be filled exclusively only by the driving operation of the dredger which in this connection is uneconomical.

It is, therefore, an object of the present invention to provide a dredger vessel of the above-mentioned general type which will overcome the above-mentioned drawbacks.

It is another object of this invention to provide a dredger vessel of the above-mentioned general character which, without reducing and even with increasing the number of the working operations possible in both directions, may be used as bucket while the dredger is at a standstill and which also will permit a forcible emptying of the bucket or vessel.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. 1 illustrates an isometric view of the end of a double boom with a dredger vessel according to the present invention and with the means for actuating the same.

FIGS. 2 and 3 respectively illustrate a side view of the outermost end of the boom with the dredger vessel connected thereto while the individual elements occupy a position corresponding to that of an ordinary bucket, the dredger vessel being shown in two different working positions.

FIGS. 4 and 5 respectively illustrate in two different positions the same side view of the dredger vessel as shown in FIGS. 2 and 3 but with the individual elements occupying a position corresponding to that of a scraper blade.

FIGS. 6 and 7 respectively illustrate the same views as FIGS. 2 and 3 but with the individual elements of the dredger vessel occupying a position corresponding to the working manner of a scraper bucket.

FIGS. 8 and 9 again respectively show a side view similar to that of FIGS. 2 and 3 in which the positions of the individual elements of the dredger vessel correspond to the working manner of a grab bucket.

FIG. 10 shows a side view of a dredger vessel according to the present invention with the individual elements of the vessel occupying a position corresponding to the working manner of a power shovel or elevated scoop.

FIG. 11 shows a dredger vessel according to the invention in side view with the individual element of the vessel occupying a position corresponding to the working manner of a ditcher or depth scoop.

FIG. 12 shows the dredger vessel according to the present invention in side view with a bent boom having said vessel connected thereto, the individual elements of the vessel occupying a position corresponding to the digging of a trench.

FIGS. 13 and 14 respectively illustrate a side view of a boom with a dredger vessel according to the invention connected thereto with the individual elements occupying a position corresponding to the unloading of a dredger vessel toward one or the other side for unloading the contents in said vessel onto a truck.

FIGS. 15 and 16 respectively illustrate a side view of a boom with a dredger vessel connected thereto while the individual elements occupy a position corresponding to the loading of the material onto a truck at one or the other side thereof.

The dredger vessel according to the present invention is characterized primarily in that the end positions of the tilting or pivoting range of the transverse wall of the vessel are at least at the opposite end position of the main portion of the vessel located outside the two end face edges of the main portion of the vessel.

A dredger vessel according to the invention may thus with the aid of a transverse wall which is tiltable within a wide range in conformity with the present invention be employed as grab bucket and also as shovel. This shovel or grab bucket may, if desired, without the heretofore known time consuming resetting be employed as ditcher as well as power shovel. However, also other numerous working possibilities can be realized with the dredger vessel according the invention as will become more evident from the following detailed specification.

In order to make the transverse wall suitable for various working operations, especially for use of the vessel as grab jaw of a grab bucket, it is suggested, in conformity with a further development of the present invention, so to design the transverse wall that its free ends end in two sharp edges respectively directed to both sides. To form these two edges, the bottom surface of the transverse wall is curved in a convex manner in conformity with the convex curvature of the bottom of the main portion of the vessel while the bottom surface of the transverse wall is slidable on the inside of the bottom of the main portion of the vessel and while both said main portion and said transverse wall are pivotable about the same axis. Furthermore, the opposite sides of said transverse wall are at their lower ends curved in a concave manner so as to intersect with the convex bottom of the transverse wall, the lines of intersection of the concave areas with the convex areas forming said edges.

Inasmuch as the main portion of the vessel due to the provided further tiltability of the transverse wall is able at both

end face edges to cooperate with the said transverse wall in the manner of a grab bucket, it is possible to differently shape the two end face edges of the bottom of the main vessel to thereby make available differently acting grab buckets with one and the same vessel. To this end, one free bottom edge of the main portion of the vessel may form a continuous edge whereas the oppositely located edge may be provided with teeth.

If, in conformity with a further development of the present invention, the dredger vessel with a main vessel portion having an arched bottom and with a transverse wall having the same pivot axis as the main portion, driving means are provided for tilting the main portion and the transverse wall about their common axis, which permits a tilting by the same angle to either side of a plane of symmetry passing through the common tilting axis and the center of the main portion of the vessel, it is possible to carry out various working operations of the dredger vessel toward both sides thereof and in the same manner. In this way frequent turning movements of the vessel will not be necessary. Furthermore, the invention will make it possible to carry out working operations when the vehicle pushes as well as when the vehicle pulls. This is particularly advantageous when working in hilly terrain. In this way, during the return drive, the driving force of the vehicle is added downhill to the natural slope so that the scraping or filling force can be considerably increased over the heretofore customary uphill drive.

Referring now to the drawings in detail and, more specifically, FIG. 1 thereof, the arrangement shown therein comprises a double boom **11** having a pivot shaft **12** which connects the two ends and has pivotally mounted thereon the elements of a dredger vessel **13**. The main portion of the dredger vessel comprises two sidewalls **14** and an arched bottom **15** forming a part of a cylinder. The arrangement of FIG. 1 furthermore comprises a transverse wall **16** which is pivotable about the same axis as the main dredger vessel portion **13**. The transverse wall **16** of the vessel may, however, be tilted independently of the main portion **14, 15** of the vessel about the pivot shaft **12**. As will be seen from the drawings, the said transverse wall **16** may while closely slidably engaging the sidewalls **14** be tilted through the interior of the main portion of the vessel **14, 15** in sliding engagement with the bottom of said main vessel portion. Furthermore, the transverse wall **16** is tiltable beyond the end edges of the main vessel portion **14, 15**. This will be explained in greater detail further below. The end positions of the transverse wall **16** when tilted through and beyond the main vessel portion in either direction are with this embodiment located at a distance α from the two end edges of the main portion of the vessel (see FIGS. **6** and **7**).

For purposes of adjusting the main portion of the vessel there are provided two hydraulic drives **17** between a transverse bar **18** and a double boom **11** on one hand and the pivotal connection to the sidewalls **14** of the main portion of the vessel. For driving the transverse wall **16**, there is provided only one single hydraulic drive **19** which is interposed between the transverse bar **18** and a linkage eye **20** on the transverse wall **16**.

The cross section of the transverse wall **16** is so designed that its free end has a mushroom shape when considering the cross section of said transverse wall. The end edge or bottom **16*a*** of the transverse wall **16** which is arched in conformity with the radius of the bottom **15** of the main portion of the vessel forms together with the concave surface areas **16*b*** the end cutting edges **16*c*** of the transverse wall. The main portion of the vessel **14, 15** has teeth **21** at the free edges of the bottom **15**. However, if desired, the free edges may be designed as cutting edges as shown for instance in FIGS. **6** and **7**. In order to have available at one and the same time and with one and the same dredger vessel an edge with teeth as well as a cutting edge, it may be provided that one free edge of the main vessel portion **14, 15** forms a cutting edge **22** whereas the other edge of the bottom of the main vessel portion may be provided with teeth **21**. The dredger vessel of FIG. **1** which has both edges of the bottom **15** provided with teeth **21** has been shown in FIGS. **6** to **16** in various kinds of working operations to show the numerous possibilities of working with the device according to the present invention.

According to the working method shown in FIGS. **2** and **3**, the individual elements of the dredger vessel **13**, namely the main portion **14, 15** on one hand and the transverse wall **16** on the other hand are by means of the hydraulic drives **17** and **19** respectively arranged at the end of the boom **11** so located with regard to each other that they form an ordinary bucket in which the transverse wall **16** forms the rear wall of the vessel remote from the open side thereof. The dredger vessel may in this condition operate as an ordinary bucket and may be employed while the vehicle is at a standstill or is driving. The dredger vessel **13** is adapted to be employed with dredgers at a standstill by tilting the vessel **13** with the transverse wall forming the rear wall thereof about the pivot shaft **12**. Correspondingly, the dredger vessel may be used in connection with moving dredgers as bucket by moving the dredger in either direction.

FIG. **2** shows the employment of the ordinary bucket **13** in connection with a dredger moving in forward direction indicated by the arrow V. During this movement, the edge of the bottom **15** provided with teeth **21** scrapes off an upper layer of soil **23** and the scraped off soil is collected in the bucket or shovel **13**. When employing the shovel or bucket **13** on the boom **11** of a dredger being at a standstill, the boom end can move in the direction of the arrow V. However, it is preferred to tilt or pivot the boom **11** about the pivot shaft **12** in a forward direction indicated by the arrow V. Also in this instance soil is scraped off and deposited into the dredger vessel **13**.

FIG. **3** shows the working of a dredger vessel **13** as ordinary bucket, i.e. with the transverse wall forming the rear wall of the vessel, in connection with a rearwardly moving dredger moving in the direction of the arrow R. The individual elements are, of course, symmetrically reversed with regard to FIG. **2** which means that the transverse wall is at the right-hand edge of the main portion of the vessel. The bucket will be filled when the dredger is moving rearwardly. A similar operation is obtained with a dredger at a standstill and also when the vessel is tilted in the direction of the arrow R.

FIGS. **4** and **5** shown the employment of the dredger vessel **13** according to the invention when said vessel works as scraper blade. Such scraper blade may be employed with a dredger at a standstill and also with a dredger moving in either direction without the necessity of turning the vehicle. When the dredger vessel **13** is employed as scraper blade, the transverse wall **13** is not employed as rear wall but is adjusted relative to the main portion **14, 15** of the vessel in such a way that it will be located at the edge of the bottom **15** which engages the soil **23**. The scraped off layer of soil does not enter the bucket **13** as filling material but will be pushed by the transverse wall acting as scraper blade ahead of said transverse wall or will be pushed into succeeding depressions in the soil so that as an end result a plane surface of the soil will be obtained. The arrow V also in this instance indicates the forward movement of the driving dredger or boom end, whereas the arrow R indicates the rearward movement.

FIGS. **6** and **7** indicate the case of employment of the dredger vessel **13** as scraper bucket which is possible while the dredger is at a standstill or is moving in either direction without the necessity of turning the vehicle and without having to exchange any elements of the dredger. In this instance, while taking advantage of the tilting range of the transverse wall **16** and while simultaneously tilting the main portion **14, 15** of the vessel, the transverse wall is tilted out of the main portion of the vessel and moved into spaced relationship thereto by an angle α from the end edges of the main portion in such a way that between these elements of the dredger vessel a scraper mouth is formed. The edge **16*c*** provided in conformity with the invention on the transverse wall **16** scrapes off a layer from the soil **23**. The soil will in this instance enter the interior of the main portion **14, 15** of the vessel and after

closing the vessel by moving the elements 14, 15 on one hand and 16 on the other hand toward each other will be conveyed into the vessel and can be discharged therefrom at a desired place. Also in this instance it will be evident as indicated by the arrows V and R that merely by adjusting the elements of the dredger vessel 13 to a position of the transverse wall 16 which position is symmetrical with regard to a plane of symmetry A of the main portion 14, 15 of the vessel, it is possible to change from forward drive to rearward drive and vice versa.

FIGS. 8 and 9 show the employment of the individual elements 14 and 15 on one hand and of the transverse wall 16 on the other hand as legs of a grab jaw which legs in this instance are provided for grabbing and holding a tree trunk 24. They can, of course, also be placed on a layer of soil or a pile of sand whereupon the vessel 13 is closed so that said vessel acts in the manner of a customary grab bucket.

FIG. 10 shows the employment of a dredger vessel 13 when forming an ordinary bucket on a steep slope and, more specifically, in the manner of a power shovel working at an upwardly directed incline in the direction of the arrow H. FIG. 11 shows the reverse situation in which the dredger vessel 13 forming an ordinary bucket operates in the manner of a ditcher in the direction of the arrow T and along a steep slope. Also in this instance it is possible instead of moving the boom end in the straight manner indicated by the arrows H or T, to tilt the dredger vessel in a direction indicated by the arrows H or T.

FIG. 12 shows the employment of the dredger vessel 13 as digging vessel and also indicates that in this instance the filling of the vessel with the dredger at a standstill or when in movement is possible in the direction of the arrows V and R indicated in the preceding arrangements. In this instance the dredger vessel 13 adjusted so as to form an ordinary bucket is tilted exclusively about the pivot shaft 12 while the relative position of the individual elements, namely of the main portion 14, 15 on one hand and the transverse wall 16 on the other hand, remains unchanged. This tilting movement about the small radius *r* corresponds to the working operation which recently has been considered the most favorable digging operation. The dredger vessel 13 according to the invention when used as a digging vessel has the advantage that it can be used for filling in connection with a moving dredger which as to its working manner corresponds to that of a dredger at a standstill. In this way the economy, i.e. the digging performance of the movable dredger, can be greatly increased. The filling of the shovel or bucket when the dredger is at a standstill requires considerably less work than when the dredger is moving in which last mentioned instance greater masses have to be moved and a considerably greater wear is encountered.

The customary working during ditching, i.e. the tilting of the boom 11 about its pivot point with the dredger vessel 13 rigidly held thereon and with a large digging radius is nevertheless also possible with the dredger vessel according to the present invention.

FIGS. 13 and 14 indicate how a dredger vessel 13 according to the invention is emptied by means of the transverse wall 16 forming a forcibly moved wall. Depending on whether the dredger vessel 13 used as ordinary bucket has been filled during the working operation according to FIGS. 2 and 3 and 6 to 11, in the working directions indicated by the arrows V and H or in the working directions indicated by the arrows R and T, the vessel will during the emptying movement forcibly be emptied by the movement of the transverse wall 16 either in the direction of the arrow Z*r* or Z*v*. By frequently changing the loading and unloading directions, which is possible without a resetting, during the loading of a truck 25, it is possible to load the truck by completely filling its loading space.

FIGS. 15 and 16 illustrate that during the unloading of a dredger vessel 13 onto a truck 25 the just mentioned unloading operation may be effected toward both sides of the dredger vessel 13 also in such a manner that the main vessel portion 14, 15 is tilted while the transverse wall 16 is at a standstill. More specifically, the unloading of the dredger vessel 13 may be effected in the direction of the arrows Z*v* similar to FIG. 15 and in the direction of the arrow Z*r* similar to FIG. 16.

It is of course, to be understood that the present invention is, by no means, limited to the particular showing in the drawings but also comprises modifications within the scope of the appended claims.

I claim:

1. In combination with a dredger boom: a dredger vessel pivotally supported by said boom and comprising two sidewalls and a bottom wall interconnecting said sidewalls and having two oppositely located working edges extending transverse to said sidewalls, said bottom together with said sidewalls forming first tiltable means, first actuating means supported by said boom and operatively connected to said first tiltable means for tilting the same in either direction up to a first end position and a second end position respectively, pivot shaft means supported by said boom and extending transverse to said sidewalls, tiltable wall means tiltably supported in common by said pivot shaft means and forming second tiltable shaft means, and second actuating means supported by said boom and operatively connected to said second tiltable means for tilting the same in either direction relative to said first tiltable means up to a first and second extreme position respectively, said second tiltable means being provided with two oppositely located working edges substantially parallel to the pivot axis of said second tiltable means, the tilting ranges of said first and second tiltable means being such that the working edge can form together a receiving mouth as well on the one side of the first tiltable means as on the other side of it, the working edges of said second tiltable means then being in both cases located outside of and in angularly spaced relationship to the respective adjacent working edge of said first tiltable means, all the working edges being suitable for a scraping action.

2. An arrangement according to claim 1, in which the inwardly facing surface of the bottom of said first tiltable means is outwardly arched and in which said second tiltable means has an outwardly facing bottom surface arched in conformity with said inwardly facing bottom surface of said first tiltable means and slidable thereover, said first and second tiltable means having a common pivot axis.

3. An arrangement according to claim 2, in which said second tiltable means has its sidewall surfaces concavely shaped near the bottom surface thereof, said concavely shaped sidewall surfaces intersecting with the bottom surface of said second tiltable means so as to form both of the opposite working edges of said second tiltable means.

4. An arrangement according to claim 1, in which one of the working edges on both sides of said first tiltable means is provided with teeth.

5. An arrangement according to claim 1, in which said first actuating means is operable to tilt said first tiltable means to either side of a plane of symmetry extending transverse to the said common pivot axis of both tiltable means and said sidewalls by substantially the same angle.

6. An arrangement according to claim 1, in which said second actuating means is operable to tilt said second tiltable means to either side of a plane of symmetry extending transverse to the said common pivot axis of both tiltable means and said sidewalls by substantially the same angle.