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Cox

[11] **3,847,266**

[45] **Nov. 12, 1974**

[54] **ENSILAGE LOADER WITH AUTOMATICALLY POSITIONED CUTTER REEL**

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[73] Assignee: **Butler Manufacturing Company,** Kansas City, Mo.

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[52] **U.S. Cl.** **198/9,** 198/36

[51] **Int. Cl.** **B65g 65/06**

[58] **Field of Search** 198/9, 36; 212/54

[56] **References Cited**

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2,696,375	12/1954	Huff	198/9
2,724,481	11/1955	Oswalt	198/9
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FOREIGN PATENTS OR APPLICATIONS

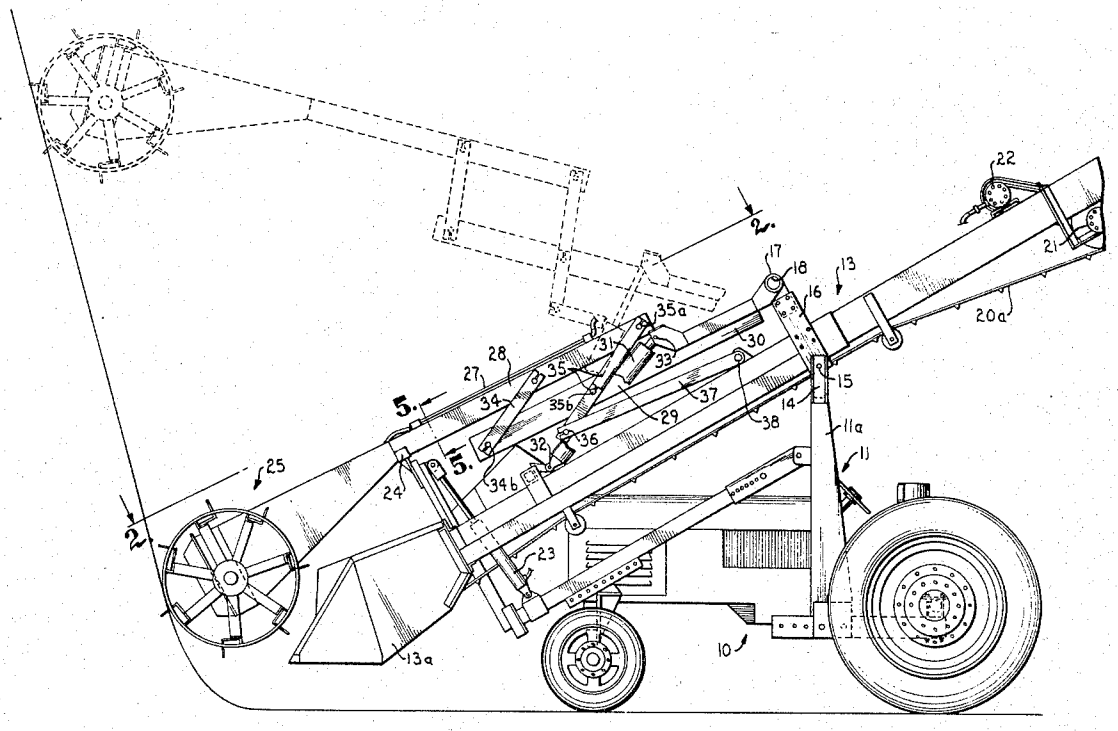
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Primary Examiner—Richard A. Schacher
Assistant Examiner—Richard K. Thomson
Attorney, Agent, or Firm—Lowe, Kokjer, Kircher, Wharton & Bowman

[57] **ABSTRACT**

A boom swingable in a vertical plane acts to move a cutter reel down the wall of a pile of ensilage or similar material. The reel is mounted on an extension carried by the boom, and the extension is interconnected with the boom by a mechanical linkage that acts to automatically change the radial distance of the reel from the bottom pivot axis in response to movement of the boom thereby to maintain the plane of the cuts substantially vertical.

2 Claims, 5 Drawing Figures



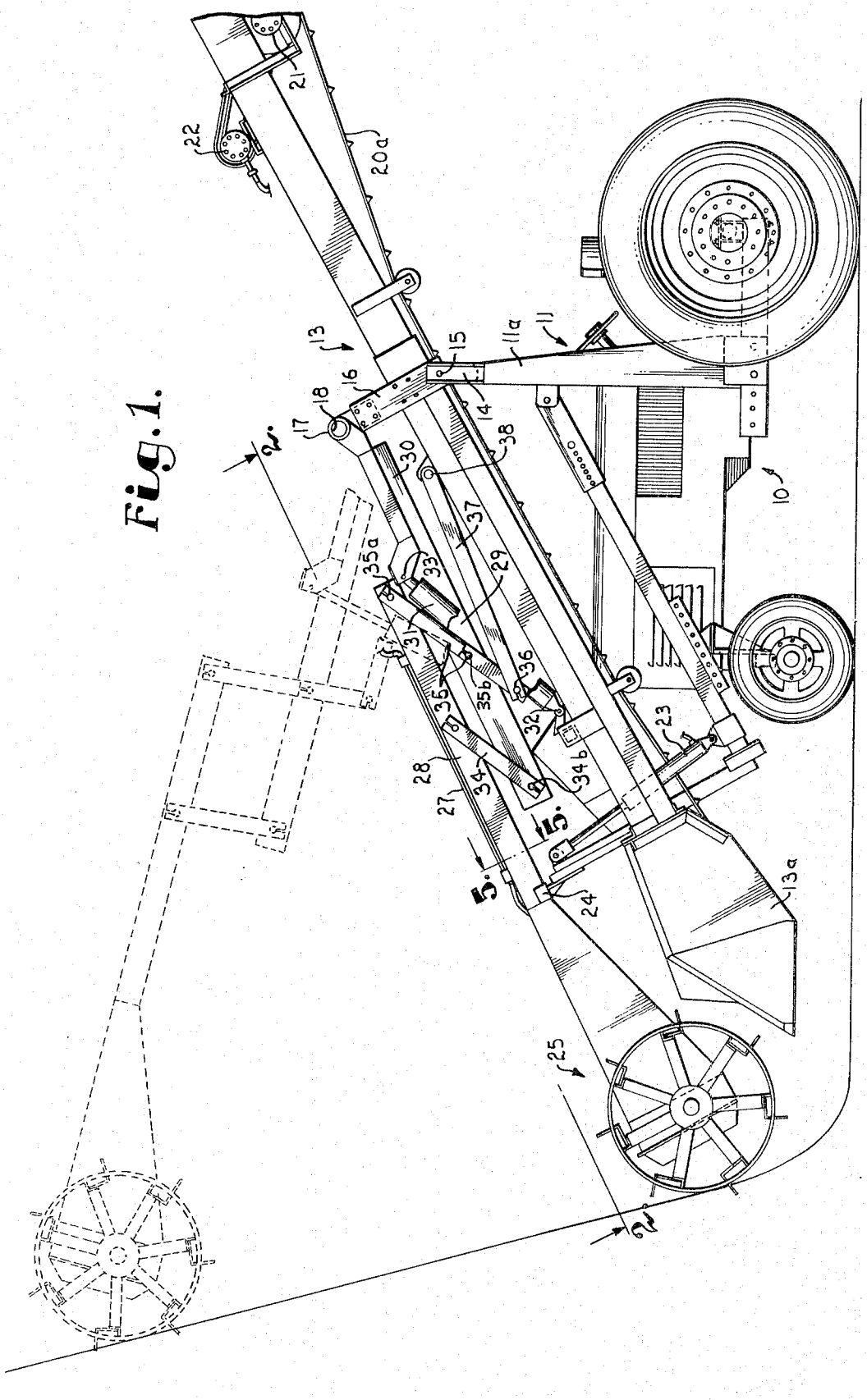

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Fig. 1.

Fig. 2.

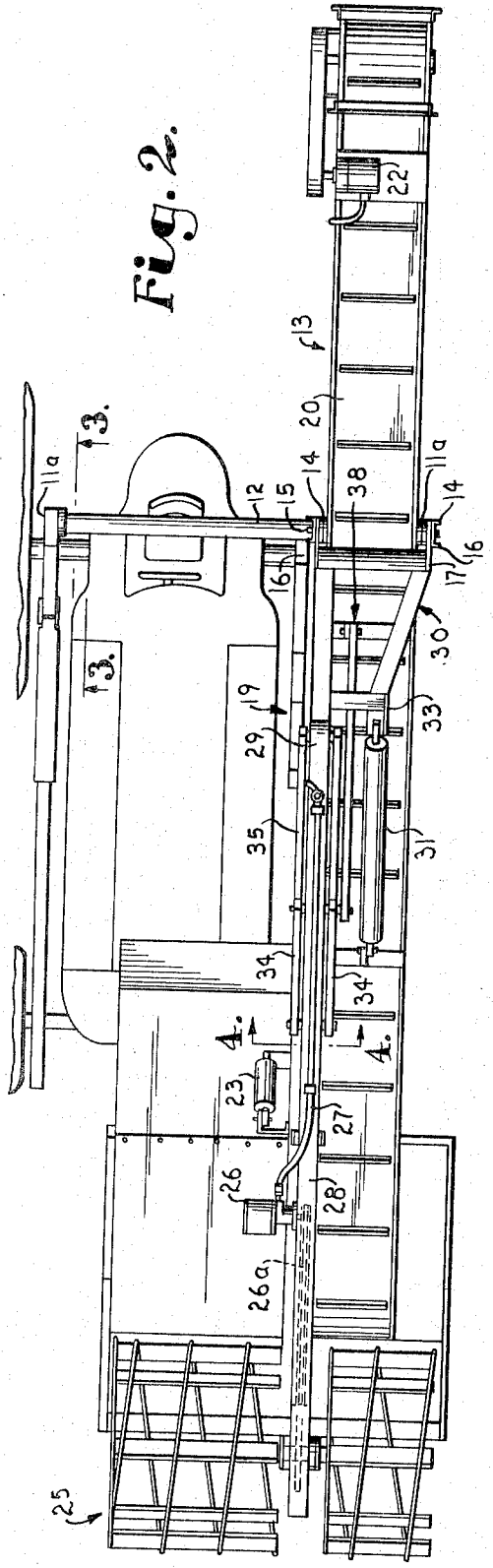


Fig. 5.

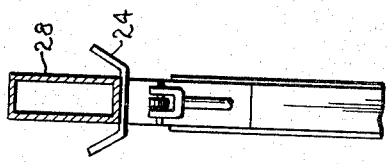


Fig. 4.

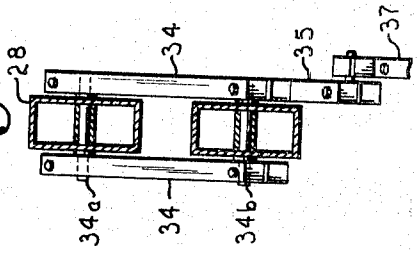
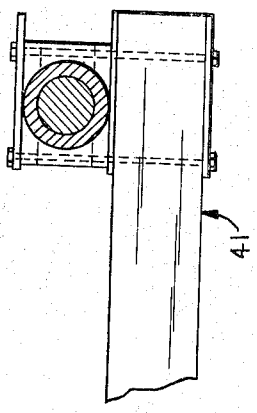


Fig. 3.



ENSILAGE LOADER WITH AUTOMATICALLY POSITIONED CUTTER REEL

BACKGROUND AND SUMMARY OF THE INVENTION

Cutters for removing silage from a stack or pile of ensilage and loading it into a truck or other carrier have been known. As a particular example of equipment of this type, reference is made to Oswalt U.S. Pat. No. 2,724,481, issued Nov. 22, 1955. The patented unit comprises in general a cutter mounted at the outer end of a pivotal arm, the arm operable to swing the cutter up and down with respect to the wall of the stack so as to cut ensilage from the wall. The cutter is associated with a conveyor having a receiver positioned near the base of the stack which receives the silage and enables it to be conveyed from the vicinity of the stack to an appropriate receptacle.

One of the drawbacks inherent to the construction of the apparatus just described is that the cutter reel moves about a fixed pivot and therefore tends to establish an arcuate cut in the wall of the silage. In particular, the cutter tends to produce an overhang at the upper limit of the stack, which in some circumstances may fall free with possible danger to those in the vicinity and also creating handling problems.

Several methods have been tried in the past to achieve a more nearly vertical cut on the face of the material being loaded. Apparatus shown in U.S. Pat. No. 2,877,057 uses a vertical derrick support to guide the cutter down the cut in the wall. However, there are disadvantages to this arrangement in that the overall structure is rather cumbersome and creates problems in transportation. Also, the cut height is limited by the height of the support derrick.

Efforts have been made to hydraulically move the combination boom and conveyor longitudinally by the use of a hydraulic cylinder. However the cylinder was under manual control and positioning was left up to the operator. As a result, it was difficult to achieve a uniform cut and the operation required a great deal of skill.

A modification of the unit disclosed in the aforementioned U.S. Pat. No. 2,724,481, has also been provided, the modification comprising a telescoping boom which extends longitudinally by a hydraulic cylinder actuated in a slave cylinder arrangement. However, because of the substantial amount of side thrust that is exerted on the cylinder rods, the cylinder seals soon start to leak in this type of arrangement. Also, the telescoping portion of the boom requires constant lubrication and moreover, the exposed portion is always exposed to contact with silage which tends to interfere with freedom of telescopic movement.

In general terms, the device of the present invention is intended to serve the same general purpose as the devices noted above, but it does so in a way which avoids the problems noted in connection with those devices. By virtue of a unique means of interconnecting the reel with the main pivotal boom, the reel is self-extending and retracting as the boom pivots, and no special operator skills are required in order to assure of a proper path of movement for the reel. The reel maintains a nearly vertical cut upon the face of the material. There are no additional hydraulic cylinders to maintain or add to the cost of the equipment. The number of moving parts are few, and lubricated areas not exposed to foreign material. The stability of the unit during transport is vastly improved over the vertical derrick machines.

DETAILED DESCRIPTION

In the accompanying drawings which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals indicate like parts in the various views:

FIG. 1 is a side elevational view of an ensilage cutter and loader constructed in accordance with a preferred embodiment of the invention, parts being broken away for purposes of illustration;

FIG. 2 is a generally top plan view taken generally along the line 2—2 of FIG. 1 in the direction of the arrows;

FIG. 3 is a sectional view, on an enlarged scale, taken along line 3—3 of FIG. 2 in the direction of the arrows;

FIG. 4 is a fragmentary sectional view, on an enlarged scale, taken along line 4—4 of FIG. 2 in the direction of the arrows; and

FIG. 5 is a fragmentary sectional view, on an enlarged scale, taken along line 5—5 of FIG. 1 in the direction of the arrows.

Referring now to the drawings, in the preferred embodiment illustrated, the entire loader structure is carried by a tractor **10** of conventional construction. The loader is supported on the tractor toward the rearward end thereof by an upright frame structure **11** secured to the tractor rear axle and frame.

The upright frame structure includes two spaced uprights **11***a*, the upper ends of which provide support for a horizontal structural tube **12.** Tube **12** serves as the main support mounting for a conveyor **13,** being connected thereto by arms **14** which are secured to and project radially upwardly from tube **12** on opposite sides of the conveyor. The arms **14** respectively carry bearings through which extends a pin **15.**

The pin **15** passes through and extends outwardly from plates **16** which are secured to opposite sides of the conveyor as by bolting or otherwise. There is thus provided a pivotal interconnection between the frame **11** and the conveyor, the pivot axis being the axis of the pin **15.**

The plates **16** have connected to their upper ends bearings **17.** The bearings **17** cooperate with stub axles **18** connected with and forming a part of the boom assembly **19** to provide a horizontal pivot therefor. More will be said of this later.

The conveyor **13** is a conventional endless belt conveyor, the upper flight of the belt being indicated at **20** (FIG. 2) and the lower flight at **20***a* (FIG. 1). The belt is trained about rollers or drums at the opposite ends of the conveyor structure, the upper drum being shown at **21.** The belt is driven by a hydraulic motor **22** drivingly connected with the drum **21.** The lower drum (not shown) is located within the receptacle portion **13***a* at the lower end of the conveyor, where the belt receives silage for delivery to the upper end of the conveyor where it can be discharged.

The lower end of the conveyor is supported by an operating and support assembly including the hydraulic cylinder **23.** The cylinder **23** is capable of raising and lowering the conveyor and receiver **13***a* about the pivot axis **15.** A saddle **24** supports the boom in its stored po-

sition. However, the details of this arrangement play no part in my present invention and will not be further described.

The boom assembly **19** is located above and runs generally longitudinally of the conveyor **13.** It carries at its outer end the silage disengaging reel **25.** The reel is driven by an appropriate drive means, for example, another hydraulic motor shown schematically at **26** in FIG. **2.** Motor **26** is supplied by a line **27** and drives the reel through chain **26***a*.

The boom **19** is made up essentially of two components, which for purposes of illustration will be identified as the upper boom portion **28** and the lower boom portion **29.** The reel **25** is carried at the outer end of the upper boom portion **28.** As can be best seen in FIG. **4,** each of the boom portions is preferably in the form of a rectangular tube.

The boom portion **29** has associated with it the stub axles **18** providing a pivotal mounting for the boom. The stub axles are carried by a frame portion **30** connected with and extending rearwardly of the lower boom portion **29.** The pivotal motion of the boom is under the control of a hydraulic cylinder **31** which is pinned to a stationary pivot **32** on the conveyor **13** and at **33** to the frame **30.** Appropriate hydraulic supply lines (not shown) are provided with the cylinder **31.**

The upper and lower boom portions are interconnected by links **34** and **35.** There are two of each of the links **34, 35,** one on each side of the boom portions. The links are pivotally connected with the boom portions, link **34** at **34**a and **34**b and link **35** at **35***a* and **35***b*. In the preferred embodiment, the distance between pivot points **34***a*, **34***b* and **35***a*, **35***b* are the same and the links are parallel, as is evident from the drawings. Link **35** has an extension which is pivoted at **36** to a control link **37.** The control link **37** is pivoted at **38** to a relatively stationary pivot on the conveyor **13.**

It will be understood, of course, that hydraulic controls and a hydraulic circuit are provided for controlling the various cylinders and hydraulic motors. These controls however are conventional and, inasmuch as their interconnection with the various components would be obvious to an engineer in this art, further description is believed unnecessary.

In operation, it is desirable to raise the reel sufficiently to clear the top of the silage pile, position the receptacle portion **13***a* of the conveyor until it is just adjacent the bottom of the silo and then advance the tractor against the silage. Of course, the receiving truck or wagon (not shown) will be located under the discharge end of the conveyor **13** prior to cutting of the silage. The conveyor and reel are then set in motion.

The boom is raised, of course, by extending the hydraulic cylinder **31.** As the cylinder pivots the lower boom portion **29** about its axis **18,** the link **37** will be pivoted about its pivot axis **38.** Accordingly, the link **35** in conjunction with link **34** will serve to control the relative positions of the upper boom **28** and lower boom **29.** Obviously, as boom section **29** is pivoted upwardly, the relative length of the entire boom is increased and the boom is at its longest when it is at its uppermost position.

With the reel above the stack, the boom is then lowered so that the reel comes into contact with the silage. The basic path followed by the reel as it moves downwardly through the silage is a somewhat curved, although essentially vertical path with the slope of the face of the cut such that there is no overhang. In other words, the radial distance of the reel from the boom pivot is shortened enough relative to the radial movement to insure that the reel at the midpoint of its travel from the top of the stack will be closer to the pivot axis than it was at the time the cut commenced.

Silage loosened by the reel is, of course, delivered into the receptacle **13**a where is is picked up by the conveyor and moved to the discharge.

Obviously, in order to produce a cut that has no overhang, it is necessary that the overall length of the loader boom and maximum elevation in relation to arc of swing be such that the cutter strikes the top of the stack while at its most extended position with respect to the boom pivot.

It will also be evident that the path of the cutter can be changed by using links like links **34** and **35,** but which are of differing lengths between the pivot points rather than of equal length. This is encompassed in and contemplated by the claims.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention I claim:

1. In apparatus for removing ensilage from a stack of ensilage, the combination with a conveyor having a receiver adjacent and near the bottom of the stack and a pivotal main boom movable to different elevations above the conveyor, of

an extension boom associated with and forming an extension of said main boom,

an ensilage cutter mounted at the outer end of said extension boom, and

link means interconnecting said extension boom and said main boom for interrelated relative movement therebetween, said link means effecting movement of said extension boom relative to said main boom to vary the radial distance of said cutter from the main boom pivot axis in response to pivotal movement of said main boom.

2. The combination as in claim **1,** wherein said main and extension booms are parallel,

said link means including a pair of parallel links pivoted to said main and extension booms at fixed points thereon to form a parallelogram arrangement therewith, one of said links having an extension projecting beyond the parallelogram and

a control link pivotally connected at one end with said extension, the other end of said control link pivoted to a relatively sationary mounting offset from the pivot axis of said main boom.

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