US006775969B2

(12) **United States Patent**
**Wuebbels et al.**

(10) **Patent No.: US 6,775,969 B2**
(45) **Date of Patent: Aug. 17, 2004**

(54) **FOLDABLE HARVESTING HEADER**

(75) Inventors: **Richard Wuebbels**, Rhede (DE); **Norbert Wolters**, Gescher (DE)

(73) Assignee: **Schinenfabrik Kemper GmbH & Co KG**, Breul (DE)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/230,031**

(22) Filed: **Aug. 27, 2002**

(65) **Prior Publication Data**

US 2003/0041579 A1 Mar. 6, 2003

(30) **Foreign Application Priority Data**

Sep. 1, 2001 (DE) ..... 101 42 978

(51) **Int. Cl.**[7] ..... **A01D 67/00**
(52) **U.S. Cl.** ..... **56/208**; 56/51; 56/219
(58) **Field of Search** ..... 56/51, 208, 210, 56/219, 220, 221, 228

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 2,636,331 | A | 4/1953 | Price | 56/122 |
| 3,345,808 | A * | 10/1967 | Van Der Lely | 56/208 |
| 3,468,107 | A * | 9/1969 | Van Der Lely | 56/11.9 |
| 4,409,780 | A * | 10/1983 | Beougher et al. | 56/228 |
| 4,446,682 | A | 5/1984 | Jennen et al. | 56/119 |
| 4,487,004 | A * | 12/1984 | Kejr | 56/228 |
| 5,329,753 | A | 7/1994 | Arnold et al. | 56/98 |
| 5,673,543 | A | 10/1997 | Richardson et al. | 56/85 |
| 5,865,019 | A | 2/1999 | Hurlburt et al. | 56/119 |
| 5,911,625 | A * | 6/1999 | von Allworden | 460/119 |
| 2002/0014064 | A1 | 2/2002 | Wubbels et al. | 56/95 |

FOREIGN PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| CH | 440 802 | | 1/1968 |
| DE | 2 026 190 | | 12/1970 |
| DE | 36 14 498 | A1 | 11/1987 |
| DE | 38 28 293 | | 1/1990 |
| DE | 3906456 | A1 * | 9/1990 |
| DE | 41 42 496 | C2 | 6/1993 |
| DE | 199 33 779 | | 2/2001 |
| EP | 0 131 853 | | 1/1985 |
| EP | 0 471 961 | A1 | 2/1992 |
| EP | 0491 405 | A1 | 6/1992 |
| EP | 0 553 506 | A1 | 8/1993 |
| EP | 0992187 | A1 * | 8/1999 |
| EP | 1046329 | A2 * | 4/2000 |

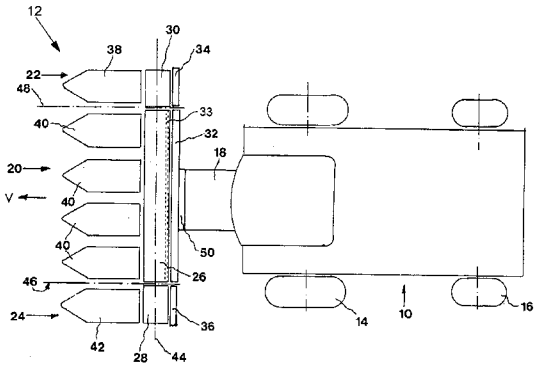
* cited by examiner

*Primary Examiner*—Robert E. Pezzuto
*Assistant Examiner*—Nathan Mammen

(57) **ABSTRACT**

A harvesting header for a self-propelled harvesting machine comprising a center portion and two side portions. The center portion and both side portions are provided with forwardly extending crop processing arrangements. A transversely extending auger is located behind the crop processing arrangements. The crop processing arrangements can be moved between an operating position and a transport position by pivoting them about a transversely extending horizontal pivot axis. In this transport position the center of gravity of the harvesting header is moved rearwardly towards the harvesting machine. The side crop processing arrangements can be pivoted about forwardly extending pivot axes to reduce the width of the harvesting header in its transport position.

**13 Claims, 2 Drawing Sheets**



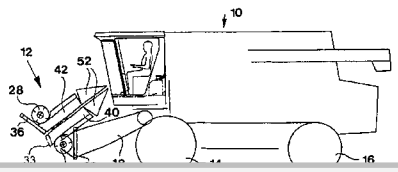



Fig. 1

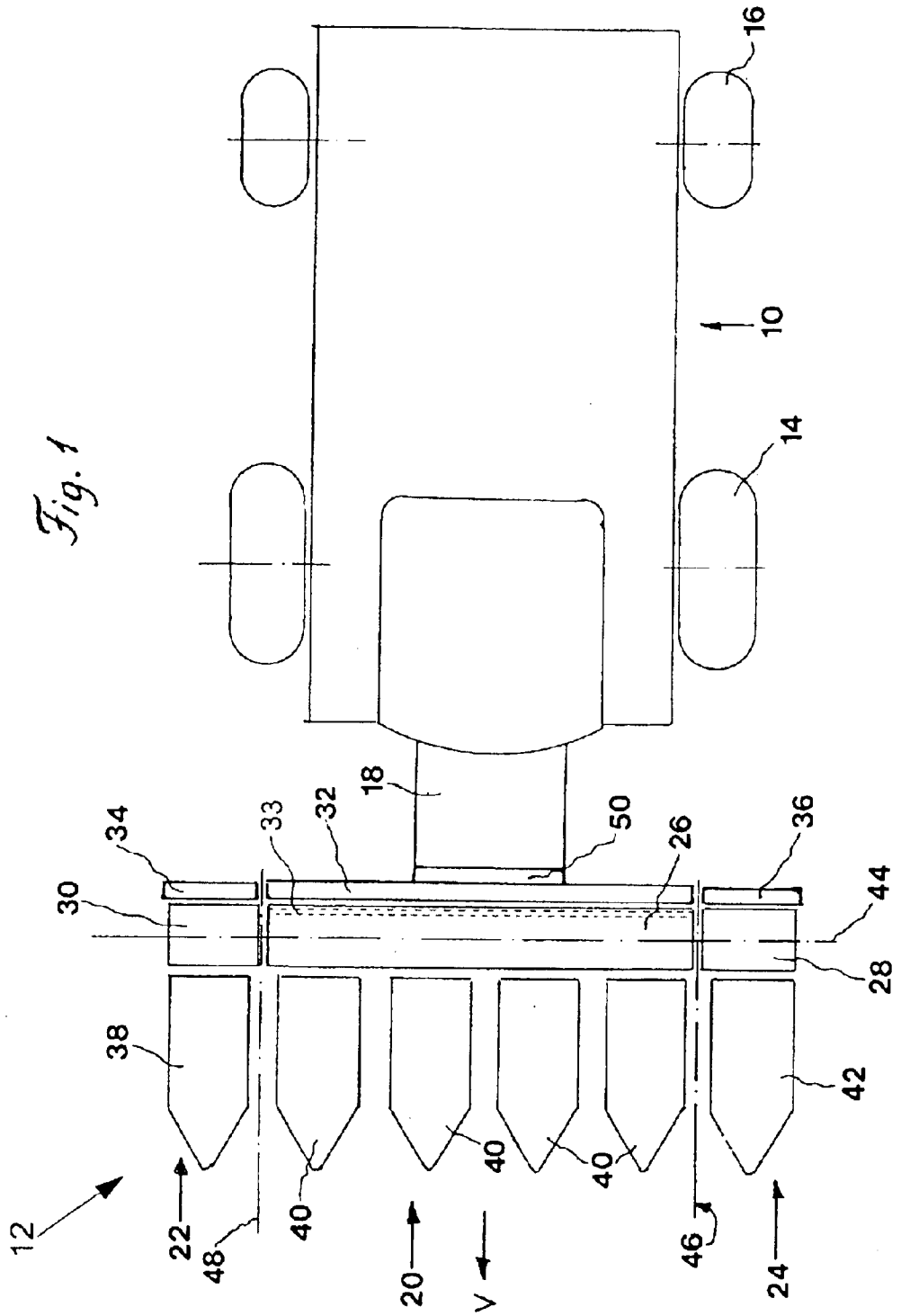


Fig. 2

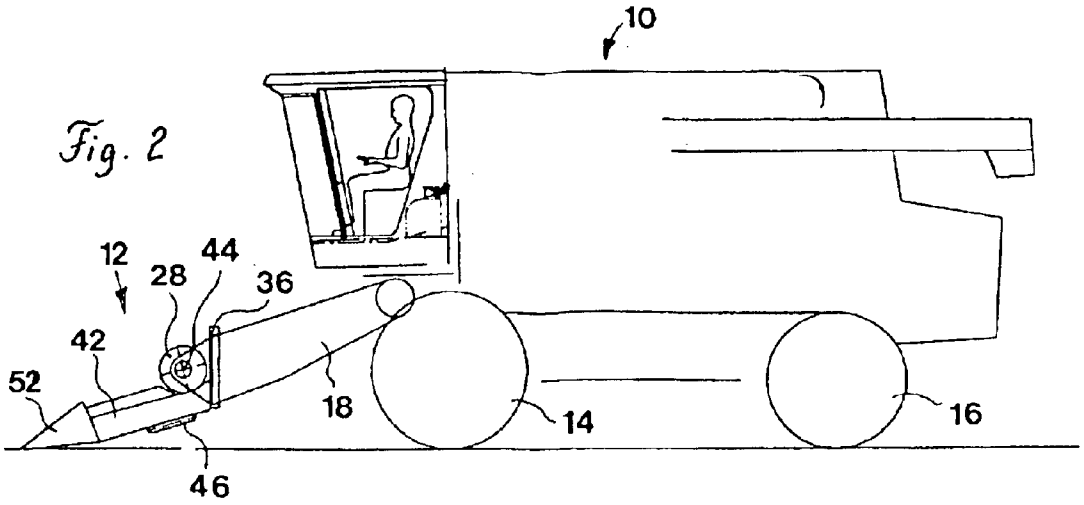



Fig. 3

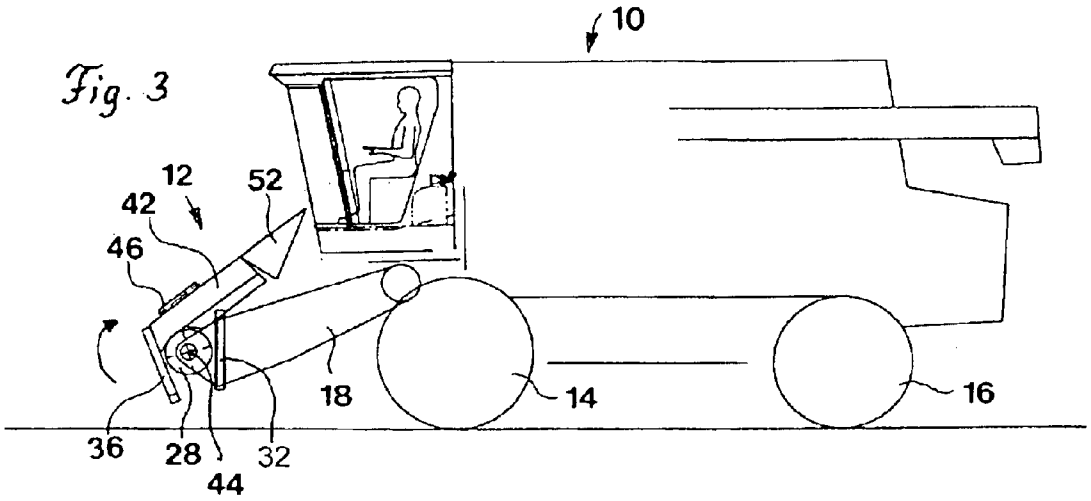
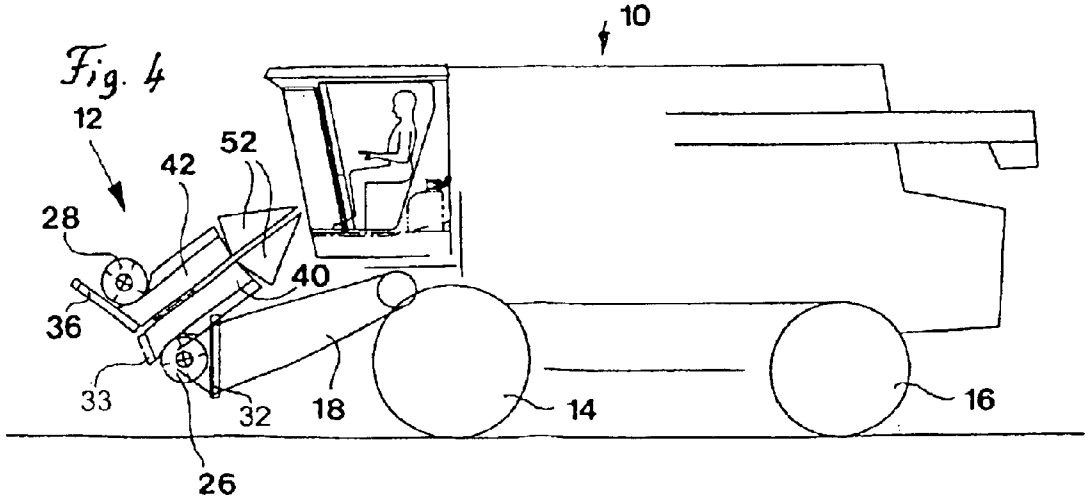



Fig. 4



# FOLDABLE HARVESTING HEADER

## FIELD OF THE INVENTION

The present invention is directed to a foldable harvesting header that can be shifted between an operating position and a transport position by pivoting about a predominantly horizontal pivot axis.

## BACKGROUND OF THE INVENTION

Harvesting headers for self-propelled harvesting machines have been getting wider and wider, permitting farmers to harvest fields in shorter time with fewer passes through the field. However, the maximum width of vehicles operated on public roads is limited by law. For that reason the headers are transported as a rule on a trailer, or folded into a transport position, in which its width is reduced compared to its operating position. Folding a harvesting header has the advantage that the removal and reassembly of the header from or to the harvesting machine is eliminated.

U.S. Pat. No. 5,329,753 discloses a corn head for a forage harvester in which the outer parts of the header can be folded upward about horizontal axes extending in the direction of operation, and are laid over the central part of the corn harvesting implement. This concept can be found relatively often.

DE 199 33 779 C discloses a harvesting header be divided at its center and the outer ends of the halves be folded inward and upward about horizontal axes extending in the direction of operation.

DE 38 28 293 C discloses a harvesting header in which the outer parts are pivoted into a position about an axis extending inclined upward and outward in which they come to lie ahead of and above the center part. In another embodiment the outer parts are positioned by a two-legged pivoting mechanism above the center part.

Furthermore, EP 0 131 853 B describes a corn head in which the intake points without the stripper devices are folded upward about a horizontal axis extending transverse to the direction of operation. The outer parts are pivoted upward about axes extending transverse to the direction of operation, as is described in DE 41 31 491 A.

In the harvesting headers described above, the disadvantage is that the center of gravity during transport is located relatively far forward. Except for the corn head described in EP 0 131 853 B in which the intake points of the plucking devices that have been folded upward that relocate the center of gravity when folded only slightly to the rear, the position of the center of gravity is not changed by the folding of the crop processing arrangement of the harvesting headers. For this reason detrimental high loads develop during transport on public roads that are applied to the front wheels of the harvesting machine carrying the harvesting header.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved foldable harvesting header.

The harvesting header is provided with at least one crop processing arrangement that can be pivoted between an operating position and a transport position about a predominantly horizontal pivot axis. The pivot axis extends transverse to the direction of operation. In the operating position the crop processing arrangement of the harvesting header is



harvesting machine. In the transport position the crop processing arrangement is pivoted upward and to the rear, opposite to the direction of operation.

As such, the center of gravity of the harvesting header in the transport position moves rearwardly closer to the harvesting machine carrying the harvesting header.

The harvesting header is subdivided into a center portion and one or two side portions arranged alongside the center portion in the operating position relative to the direction of forward operation. These side portions are pivotally coupled to the center portion. The side portions can be pivoted about two forwardly extending pivot axes. The side portion can be pivoted upward to reduce the width of the harvesting header in its transport position. In the transport position the side portions extend either approximately vertically upward so that the operator of the harvesting machine can look between them (or past them) to see the road, or they are laid on top of the center portion that has been folded upward and to the rear, so that the side portions extend parallel to the center portion. It would also be conceivable to bring the side portions into the transport position by a pivot linkage of the type disclosed in DE 38 28 293 C. That is the side portions could be pivoted about an axis extending at an angle outward and upward into a position in which it is located above the center portion, or could be pivoted by a two-legged pivoting mechanism above the center portion. Furthermore it would be possible that the side portions are not pivoted upward and rearward with the center portion, but remain in their operating positions until the center portion has been pivoted upward and rearwardly and then the side portions are slid beneath the center portion.

Many types of harvesting headers are equipped with transverse augers or other transverse conveyors, for example, conveyor bands or roll conveyors that are arranged downstream of the crop processing arrangement at the rear of the harvesting header. As a rule these transverse conveyors are not pivoted with crop processing arrangements about a pivot axis into a transport position, but remain stationary. They may be fastened rigidly to the rear frame, which has the advantage that the pivoting drive must move smaller masses and therefore can be dimensioned to a smaller size. In a preferred embodiment of the invention, the pivot axis coincides with the axis of rotation of the transverse auger.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a top view of a harvesting machine with a harvesting header according to the invention in its operating position.

FIG. **2** shows a side view of the harvesting machine of FIG. **1**.

FIG. **3** shows a side view of the harvesting machine with a harvesting header pivoted upward about a horizontal axis extending transverse to the forward direction of operation.

FIG. **4** shows a side view of the harvesting machine with a harvesting header brought into the transport position.

## DETAILED DESCRIPTION

FIG. **1** shows a self-propelled harvesting machine **10** in the form of a combine. It is supported on the field by front driven wheels **14** and rear steerable wheels **16**. The front of the harvesting machine **10** is provided with a feeder house **18** on which a harvesting header **12** is mounted. The harvesting header illustrated in FIG. **1** is a corn head. The

is being harvested. Although the harvesting machine **10** is illustrated as being propelled on wheels, it can also be propelled by a full track assembly or a half track assembly.

The harvesting header **12** comprises a center portion **20** and two side portions **22** and **24**. The side portions **22** and **24** are arranged on both sides of the center portion **20** relative to the forward operating direction V. The center portion **20** is suspended on a pivoting mounting plate **50** that is attached to the front of the feeder house **18**. The center portion **20** is provided with a number of center crop processing arrangements **40**. As illustrated in FIG. **1**, four center crop processing arrangements **40** are arranged alongside each other. Each of the crop processing arrangements **40** would be provided with gathering chains and stripper rolls. It would also be conceivable that gathering and stripping arrangements could be similar to those disclosed in U.S. Publication 2002/0014064 published Feb. 7, 2002, whose disclosure is incorporated herein by reference. Within the framework of the concept of the invention the type of the crop processing arrangement **40** may be any desirable type and could also include cotton picking arrangements, drums of corn heads or other desirable harvesting arrangements. A center transverse auger **26** is located behind the crop processing arrangements **40**. A first rigid frame **32** is supported on the pivoting mounting plate **50**. A second frame **33** is pivotally mounted on the first frame **32**. The frame **32** is provided in its outer region (as seen in the forward operating direction V) with an element on which both ends of the center transverse auger **26** is rotatively supported. At that location the second frame **33**, that can be pivoted, is also connected in a joint, which, in turn, also retains the center crop processing arrangements **40**. The second frame **33** with the crop processing arrangements **40** can be pivoted upward by means of appropriate pivoting devices about the longitudinal axis of the center transverse auger **26** while the first frame **32** is fastened rigidly to the pivoting mounting plate **50**. The first and/or the second frame **32** and/or **33** retain pans that partially enclose the center transverse auger **26**, that make possible the conveying of the crop into the harvesting machine **10** through feeder house **18** by the center transverse auger **26**.

The side portions **22** and **24** arranged on each side of the center portion **20** are each provided with side crop processing arrangements **38** and **42**, respectively. Typically, the side crop processing arrangements **34** and **36** are configured the same as the center crop processing arrangements **40**. The rear of the side crop processing arrangements **38** and **42** communicate with side transverse augers **28** and **30**, respectively. The side transverse augers **28** and **30** extend coaxially to the center transverse auger **26**. The side portions **22** and **24** are supported on side frames **34** and **36**, respectively, located to the rear of the side crop processing arrangements. The side frames **34** and **36** are equipped with elements which rotatively support one or both ends of the side transverse augers **28** and **30**. The side frames **34** and **36** are also provided with pans for conveying the harvested crop to the center portion **20** of the harvesting header **12**. The pans are located beneath and to the rear of the side transverse augers **28** and **30**. The transverse augers **26**, **28** and **30** can be driven to rotate about a common axis **44** and are connected with each other by releasable couplings that transmit torque from one transverse auger to the other. The crop processing arrangements **38**, **40** and **42** and the transverse augers **26**, **28** and **30**, are driven by a drive located on the feeder house **18** of the harvesting machine **10**. In the operating position the

The center crop processing arrangement **40** and the entire side portions **22** and **24** are pivotally supported in bearings. The bearings defining an axis that coincides with the axis **44** of the transverse augers **26**, **28** and **30**. The axis extends in the horizontal direction transverse to the forward operating direction V. Furthermore, the side portions **22** and **24** are pivotally supported in bearings defining forwardly extending axes **46** and **48** that extend in the forward operating direction V—as can be seen in FIG. **2** and parallel to the underside of the crop processing arrangements **38**, **40** and **42**. The forwardly extending axes are inclined forward and downward. The side portions are coupled to pivot joints that are also coupled to the center portion **20**. For the pivoting of the center and side portions **20**, **22** and **24** about axis **44** and the side portions **22** and **24** about the forwardly extending pivot axes **46** and **48**, drives are provided, which are not shown in the figures for reasons of clarity. These drives would typically be formed by hydraulic cylinders or other suitable linear actuators that are driven by the harvesting machine **10**. A hydraulic cylinder can pivot the second frame **33** of the center portion **20** with the crop processing arrangements **40** together with the side portions **22** and **24** coupled to the second frame **33** about the axis **44**. Additional hydraulic cylinders would rotate the side portions **22** and **24** about the forwarding extending pivot axes **46** and **48**.

During a harvesting operation, the harvesting machine **10** moves the harvesting header **12** over the field. The crop processing arrangements **38**, **40** and **42** each harvest six rows of the corn plants standing on the field and separate the corn cobs from the remains of the plants. The remains of the plants are chopped or deposited complete on the field, the corn cobs are conducted by the transverse augers **26**, **28** and **30** to the feeder house **18**. The feeder house **18** conveys the corn cobs into the interior of the harvesting machine, where they are further processed.

FIG. **2** reproduces a side view of the harvesting machine **10** with the harvesting header **12**. The crop processing arrangement **42** of the left side portion **24** that can be seen in the figure extends at an angle from the transverse auger **28** towards the front and downward so that a divider point **52** contacts the ground.

FIG. **3** illustrates a side view of the harvesting machine **10**, in which the center and side portions **20**, **22** and **24** with the crop processing arrangements **38**, **40** and **42** are pivoted in the clockwise direction as indicated by the arrow upward and rearwardly about the horizontal axis **44**. The crop processing arrangements **38**, **40** and **42** now extend from the transverse augers **26**, **28** and **30** and are inclined at an angle upward and to the rear. The center of gravity of the mass of the harvesting header **12** has thereby been repositioned considerably to the rear.

In the position shown in FIG. **3**, the width of the harvesting header **12** has not been changed in comparison with the operating position, as it is shown in FIGS. **1** and **2**. In the configuration illustrated in FIGS. **2** and **3** the harvesting machine would only be transported to a limited degree, for example, across fields or on public roads with no width limitations. In order to reduce the width of the harvesting header **12** the side portions forwardly extending pivot axes **46**, **48** are provided. In FIG. **4** the harvesting header **12** is shown in its transport position, in which the side portions **22** and **24** are folded inwardly approximately 180° and come to rest upon the center portion **20**. The center of gravity of the harvesting header **12** is repositioned forward to a slight degree compared to that of FIG. **3**, but is still located considerably further to the rear compared to harvesting headers in which only the side parts are pivoted upward and

DOCKET ALARM

# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

**LAW FIRMS**
Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

**FINANCIAL INSTITUTIONS**
Litigation and bankruptcy checks for companies and debtors.

**E-DISCOVERY AND LEGAL VENDORS**
Sync your system to PACER to automate legal marketing.