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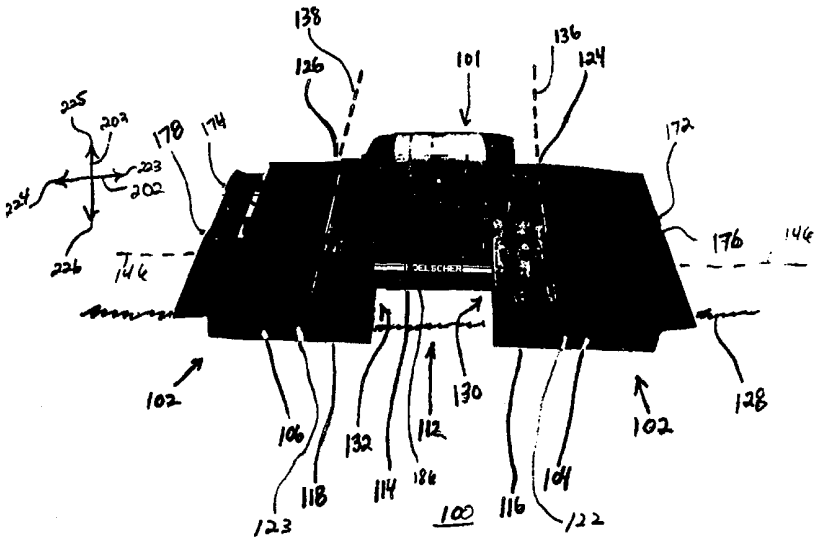
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(54) Title: AGRICULTURAL BALE ACCUMULATOR HAVING A LOAD BED EXTENSION MODULE



(57) Abstract

An agricultural bale accumulator (100) comprises a load bed extension module (102) including at least one extension table (104) pivotally connected to a side (124) of a load bed (113) by a hinge (122) and moveable relative to the load bed (113) between a stowed position and an unstowed, bale accumulating, position which is co–planar with a load bed (113) and adjacent to the side (124) of the load bed (113). An extension table support system (130) connected to a main frame (120) and/or the extension table (104). The extension table support system (130) contacts the extension table (104) at a location beyond the side (124) of the main frame (120) and contacts the main frame (120) and/or the ground surface (128) to directly support the extension table (104) from the main frame (120) and/or the ground surface (128), respectively, on and/or off a pivot axis (146) when the extension table (104) is in the unstowed position and when the load bed (113) pivots about the pivot axis (146) relative to the main frame (120) to a bale accumulating position and/or a bale discharging position.

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AGRICULTURAL BALE ACCUMULATOR HAVING A LOAD BED EXTENSION MODULE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to agricultural machinery for harvesting crop material such as hay, straw, grass or the like, and more particularly the present invention relates to an agricultural bale accumulator having a load bed extension module.

Description of the Prior Art

A continuing trend to achieve an efficient farming operation and to decrease manual labor provides the need for efficient and capable agricultural machinery. One type of agricultural machinery is used to harvest crop material such as hay, straw, grass or the like.

An agricultural baler (hereinafter referred to as a "baler") is a widely used piece of mobile equipment which collects and compresses the crop material as it travels over the ground to produce a compact unit of crop, commonly referred to as a bale. The baler may comprise a motorized machine driven by an operator or, alternatively, may comprise a wheeled frame adapted for traveling alongside or behind a tractor. Typically, a baler is a wheeled chassis adapted for hitched connection to a tractor to be towed in tandem behind the tractor. After the baler forms a bale, a cord, such as wire or twine, is tied around the bale to hold the bale together in its compressed form. The baler ejects the tied bales periodically from a bale chamber of a baler as the baler travels over the ground. Each ejected bale may be directly discharged either to a bale accumulator or to the ground for later pick up by a bale collector in order to make the harvesting of the crop material more efficient and to decrease manual labor. Bales provided by either the bale accumulator or the bale collector may then be deposited on a vehicle, such as a tractor trailer, for hauling to another location for storage.

A bale accumulator is a widely used piece of mobile equipment which may comprise a part of a baler or, alternatively, may comprise a wheeled chassis adapted for traveling alongside

or behind a baler. Typically, a bale accumulator is a wheeled chassis adapted for hitched connection to a baler to be towed in tandem behind the baler. Examples of conventional bale accumulators are disclosed in U.S. Patent Nos. 3,272,352, 4,310,275, 4,215,964 and 4,961,679. A bale accumulator is normally arranged to receive a plurality of successive bales as they eject from the bale chamber of the baler and to accumulate the received bales into a group or parcel of accumulated bales for temporary storage. The group of accumulated bales may then be discharged onto the ground in an ordered array permitting mechanical recovery thereof or, otherwise, be mechanically removed from the bale accumulator.

A bale collector is a widely used piece of mobile equipment which may comprise a motorized machine driven by an operator or, alternatively, may comprise a wheeled chassis adapted for traveling alongside or behind a tractor. Typically, a bale collector is a motorized machine driven by an operator. The bale collector is normally arranged to pick up individual bales from the ground and to accumulate the retrieved bales into a group or parcel of collected for temporary storage. The group of collected bales may then be discharged onto the ground in an ordered array permitting mechanical recovery thereof or, otherwise, be mechanically removed from the bale collector.

Since the phrases "bale accumulator" and "bale collector" are sometimes referred to interchangeably in the agricultural industry, the present invention generally refers to both pieces of equipment as a bale accumulator in the sense that both pieces of equipment receive and store bales. Therefore, it is contemplated that the present invention may be used on a bale collector as well as the bale accumulator, as described hereinabove.

Bales vary in size and shape according to the type of baler used to form the bales. The types of balers generally include rectangular balers and round balers. Some rectangular balers form so-called small-sized bales measuring about 36 cm x 46 cm x 31 cm to 132 cm and weighing 18 kg to 27 kg. Other rectangular balers form so-called medium-sized bales measuring about 80 cm x 87 cm x up to 249 cm and weighing 300 to 600 kg. An example of a rectangular baler forming medium-sized bales is disclosed in U.S. Patent No. 4,525,991. Still other rectangular balers form so-called large-sized bales measuring about 118 cm x 127 x up to 274 cm and weighing up to 1000 kg. Examples of rectangular balers forming large-sized bales are disclosed in U.S. Patent Nos. 4,034,543 and 4,307,528. Some round balers form so-called cylindrical-sized bales measuring about 1.75 m in diameter x 1.75 m long and weighing 450 kg to 675 kg.

The bale accumulator of the present invention is particularly well-suited for use in conjunction with rectangular balers producing the medium-sized bales. However, it will be apparent from the description and claims which follow that the principles of the present invention are not limited to bale accumulators for rectangular balers producing medium-sized bales. The present invention may be utilized with great effectiveness in conjunction with rectangular balers producing the large-sized bales, rectangular balers producing the small-sized bales as well as round balers producing the cylindrical-sized bales.

U.S. Patent Nos. 4,961,679 and 4,955,774 each disclose an agricultural bale accumulator having a bale-transfer and bale-turning mechanism attached to one side of a chassis and an extension table pivotally attached to an opposite side of the chassis. The extension table is moveable between a horizontal bale accumulating position and a vertical transport position. The extension table and a main bale-receiving table, supported by the chassis, form a load bed for accumulating thereon up to four medium sized bales. The extension table can accommodate one bale when located in the horizontal operative position. When the extension table is attached to the chassis, an additional castor wheel is provided on a main axle supporting the chassis in order to accommodate the extra load that can be accumulated on the extension table. Bales received on one side of the load bed are turned 90 degrees and transferred across the load bed. The bales are discharged using a bale-discharge conveyor which pushes the bales accumulated on the load bed off the load bed to the ground.

However, U.S. Patent Nos. 4,961,679 and 4,955,774 do not disclose a support system which contacts the extension table at a location beyond a side of a chassis to which the extension table is attached. Therefore, the extension table does not have any direct support for a bale accumulated thereon from either the chassis or the ground. A lack of direct support for the extension table places all the stress due to the weight of a bale on the hinge which may weaken or break over time under normally rigorous field conditions. These patents also do not disclose attaching the extension table to the main bale-receiving table. These patents also do not disclose a bale discharge module for moving the main bale-receiving table between a bale accumulating position and bale discharging position, wherein the main bale-receiving table is in a horizontal position and an inclined position, respectively, relative to the chassis. Therefore, these patents do not teach or suggest a need for supporting an extension table, at a location beyond a side of the load bed to which the extension table is attached, when the extension table is in the unstowed

position and when the load bed is in a bale accumulating position and/or a bale discharging position relative to a main frame.

U.S. Patent No. 4,844,675 discloses an agricultural bale accumulator having a center table, a right table and a left table. The center table receives large-sized bales from a bale chamber of a baler. A push bar pushes a bale on the center table to the right or left table. The right and left tables are provided with associated extensions which appear to have a width dimension approximately equal to one third a width dimension of each of the right and left tables. A hinge connects each extension to its associated table so that it may be moved between a transport and storage position on a top surface of its associated table and an unfolded position coplanar with its associated table. When an extension is in its transport and storage position, a sensor is actuated to give a false indication that a bale in on its associated table. The sensor provides a control signal to the push bar to prevent movement of the push bar toward that table thereby preventing damage to the push bar that would result if a bale were moved onto a table whose extension is folded to the transport and storage position. The right and left tables are pivotally mounted on their frames between a bale accumulating position and a bale discharging position so that when the tables are unlatched they tilt downwardly at the rear of the tables under the weight of the bale to permit a bale carried thereon to slide to the ground as the bale accumulator continues its forward movement. When the weight of the bale is removed from a table a spring pulls the table back to its latched position.

However, U.S. Patent No. 4,844,675 does not disclose a purpose for the extensions when unfolded to a position coplanar with the associated tables. Since the extensions appear to have a width dimension approximately equal to one third a width dimension of each of the right and left tables, it is clear that each of the extensions cannot accumulate an additional large bale. This patent also does not disclose a support system which contacts the extension at a location beyond the side of the table to which the extension is attached. Therefore, the extension does not have any direct support for a partial bale which may be accumulated thereon from either a main frame or the ground. A lack of direct support for the extension places all the stress due to the weight of a partial bale on the hinge which may weaken or break over time under normally rigorous field conditions. Further, this patent does not teach or suggest a need for supporting the extension, at a location beyond the side of the table to which the extension is attached, when

the extension is in the unstowed position and when the table is in the bale accumulating position and/or the bale discharging position.

Hoelscher, Inc., located at 312 S. Main, P.O Box 195, Bushton, Kansas, U.S.A., 67427, manufactures a bale accumulator Model 1030 having a load bed pivotally mounted to a main frame. The load bed includes a center table and two side tables on opposite sides of the center table. The bale accumulator bale has a carrying capacity of three total bales on each of the three tables and a bale dumping capacity of two of the three total bales from the two side tables. The center table continuously receives bales from a bale chamber of a baler during while baling and is not permitted to dump any bales. The two side tables dump the two bales by pivoting about a pivot axis between a bale accumulating position and a bale discharging position, wherein the two side tables are in a horizontal position and an inclined position, respectively, relative to the main frame.

However, Holescher's bale accumulator Model 1030 is limited to a bale accumulation capacity of three bales and to a bale discharge capacity of two bales. Holescher's bale accumulator does not have an extension table connected to a load bed and moveable relative to the load bed between a stowed position and an unstowed position, wherein the extension table is substantially co-planar with the load bed and adjacent to the side of the load bed when the extension table is in the unstowed position to permit the extension table to accumulate thereon an additional bale. Therefore, Holescher's bale accumulator Model 1030 cannot accumulate more than three bales.

Recently, Case IH Corporation, located at 700 State Street, Racine, Wisconsin, Illinois, 53404, U.S.A., introduced a bale accumulator Model 8576 having a load bed pivotally mounted to a main frame. The load bed includes a center table and two side tables on opposite sides of the center table. The two side tables each have an extension table pivotally attached a longitudinal side thereof and moveable between a stowed, road transport position and an unstowed, bale accumulating position The bale accumulator Model 8576 has a bale has a carrying capacity of five total bales on each of the three tables and the two extension tables and a bale dumping capacity of four of the five total bales from the two side tables and the two extension tables. The center table continuously receives bales from a bale chamber of a baler during while baling and is not permitted to dump any bales. The two side tables and the two extension tables dump the two bales by pivoting, about a pivot axis mounted on the main frame,

from a bale accumulating position to a bale discharging position, wherein the two side tables are in a horizontal position and an inclined position, respectively, relative to the main frame.

However, Case IH Corporation's bale accumulator Model 8576 does not disclose a support system which contacts the extension table, at a location beyond the side of the load bed to which the extension table is attached, when the extension table is in the unstowed position and when the load bed is in the bale accumulating position and/or the bale discharging position. Therefore, the extension table does not have any direct support for a bale which may be accumulated thereon from either a main frame or the ground. A lack of direct support for the extension table places all the stress due to the weight of a bale on a hinge which may weaken or break over time under normally rigorous field conditions.

U.S. Patent Nos. 4,961,679, 4,955,774 and 4,844,675 and Case IH Corporation's bale accumulator Model 8576 each teach only one extension table pivotally attached to one side of the chassis, load bed and load bed, respectively. These references do not teach or suggest attaching additional extension tables to the one extension table or supporting the one extension table in combination with any additional extension tables. Further, each of these references only teach a hinged connection between the extension table and the load bed.

Accordingly, there is a need for an agricultural bale accumulator having a load bed extension module that overcomes the disadvantages of the prior art described hereinabove.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGs. 1 and 2 illustrate, in a top, rear and right side perspective view, an agricultural bale accumulator having a first embodiment of a load bed extension module including a first extension table and a second extension table each being located in an unstowed position and a stowed position, respectively, and a portion of the load bed being located in a bale accumulating position.

FIGs. 3 and 4 illustrate, in a top, front and right side perspective view and a top, rear and right side perspective view, respectively, the agricultural bale accumulator of FIG. 1 having the first embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in a bale discharging position.

FIG. 5 illustrates, in a top, front and right side perspective view, the agricultural bale accumulator of FIG. 1 having the first embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale accumulating position.

FIG. 6 illustrates, in a top, front and right side perspective view, a magnified view of a portion of FIG. 5 having the first embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale accumulating position.

FIG. 7 illustrates, in a top, front, and left side perspective view, the agricultural bale accumulator of FIG. 2 having the first embodiment of the load bed extension module including the first extension table and the second extension table each being located in the stowed position and the portion of the load bed being located in the bale accumulating position.

FIG. 8 illustrates, in a top, front, and left side perspective view, a magnified view of a portion of FIG. 7 having the first embodiment of the load bed extension module including the first extension table and the second extension table each being located in the stowed position and the portion of the load bed being located in the bale accumulating position.

FIG. 9 illustrates, in a bottom, rear and right side perspective view, the agricultural bale accumulator of FIG. 1 having the first embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale accumulating position.

FIG. 10 illustrates, in a bottom, front and right side perspective view, the agricultural bale accumulator of FIGs. 3 and 4 having the first embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale discharging position.

FIGs. 11 and 12 illustrate, in a top, rear and right side perspective view, an agricultural bale accumulator having a second embodiment of a load bed extension module including a first extension table and a second extension table each being located in an unstowed position and a stowed position, respectively, and a portion of the load bed being located in a bale accumulating position.

FIGs. 13 and 14 illustrate, in a top, front and right side perspective view and a top, rear and right side perspective view, respectively, the agricultural bale accumulator of FIG. 11 having

the second embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in a bale discharging position.

FIG. 15 illustrates, in a top, front and right side perspective view, the agricultural bale accumulator of FIGs. 13 and 14 having the second embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale discharging position.

FIG. 16 illustrates, in a top, front and right side perspective view, a magnified view of a portion of FIG. 15 having the second embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale discharging position.

FIG. 17 illustrates, in a top, front and right side perspective view, a magnified view of a portion of FIG. 16 having the second embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale discharging position.

FIG. 18 illustrates, in a top, rear and left side perspective view, a magnified view of a portion of FIGs. 15 and 16 having the second embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale discharging position.

FIG. 19 illustrates, in a top, front and right side perspective view, the agricultural bale accumulator of FIG. 12 having the second embodiment of the load bed extension module including the first extension table and the second extension table each being located in the stowed position and the portion of the load bed being located in the bale accumulating position.

FIG. 20 illustrates, in a top, rear and right side perspective view, the agricultural bale accumulator of FIGs. 12 and 19 having the second embodiment of the load bed extension module including the first extension table and the second extension table each being located in a partially stowed position and the portion of the load bed being located in the bale accumulating position.

FIG. 21 illustrates, in a top, rear and right side perspective view, a magnified view of a portion of FIG. 12. 19 and 20 having the second embodiment of the load bed extension module including the first extension table being located in a partially stowed position and the portion of the load bed being located in the bale accumulating position.

FIG. 22 illustrates, in a bottom, front and right side perspective view, the agricultural bale accumulator of FIG. 11 having the second embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale accumulating position.

FIG. 23 illustrates, in a bottom, rear and right side perspective view, the agricultural bale accumulator of FIGs. 11 having the second embodiment of the load bed extension module including the first extension table and the second extension table each being located in the unstowed position and the portion of the load bed being located in the bale accumulating position.

FIGs. 24 and 25 illustrate, in a rear and right side elevation view, an agricultural bale accumulator having a third embodiment of a load bed extension module including a first extension table and a third extension table each being located in an unstowed position and a stowed position, respectively, and a load bed being located in a bale accumulating position.

FIGs. 26 and 27 illustrate, in a rear and right side elevation view, an agricultural bale accumulator having a fourth embodiment of a load bed extension module including a first extension table and a third extension table each being located in an unstowed position and a stowed position, respectively, and a load bed being located in a bale accumulating position.

FIGs. 28 and 29 illustrate, in a rear and right side elevation view, an agricultural bale accumulator having a fifth embodiment of a load bed extension module including a first extension table and a third extension table each being located in an unstowed position and a stowed position, respectively, and a load bed being located in a bale accumulating position.

FIGs. 30 and 31 illustrate, in a rear and right side elevation view, an agricultural bale accumulator having a sixth embodiment of a load bed extension module including a first extension table and a third extension table each being located in an unstowed position and a stowed position, respectively, and a load bed being located in a bale accumulating position.

FIGs. 32 and 33 illustrate, in a rear and right side elevation view, an agricultural bale accumulator having a sixth embodiment of a load bed extension module including a first extension table and a third extension table each being located in an unstowed position and a stowed position, respectively, and a load bed being located in a bale accumulating position.

FIGs. 34 and 35 illustrate, in a rear and right side elevation view, an agricultural bale accumulator having a seventh embodiment of a load bed extension module including a first extension table and a third extension table each being located in an unstowed position and a stowed position, respectively, and a load bed being located in a bale accumulating position.

FIGs. 36 and 37 illustrate, in a rear and right side elevation view, an agricultural bale accumulator having an eighth embodiment of a load bed extension module including a first extension table and a third extension table each being located in an unstowed position and a stowed position, respectively, and a load bed being located in a bale accumulating position.

FIGs. 38, 39 and 40 illustrate, in a rear and right side elevation view, an agricultural bale accumulator having a tenth, eleventh and twelfth embodiment, respectively, of a load bed extension module including a first extension table and a third extension table each being located in an unstowed position and a stowed position and a load bed being located in a bale accumulating position.

FIG. 41 illustrates a schematic diagram of a hydraulic system for use with the agricultural bale accumulator of FIGs. 1 and 23.

FIG. 42 illustrates a table having thirty six embodiments of an extension table support system for a load bed extension module for use on and/or off a pivot axis for one or more extension tables.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

I. Overview

Generally referring to all the figures, for the sake of convenience and facilitating a better understanding the preferred embodiments, the figures include a reference diagram illustrating three dimensions and should not limit the scope of the present invention. The reference diagram includes a first axis 201, a second axis 202 and a third axis 203. The reference diagram used in conjunction with the agricultural bale accumulator 100 and/or components thereof is determined with reference to the orientation of agricultural bale accumulator 100. The first axis 201 lies along a longitudinal axis of the agricultural bale accumulator 100. The second axis 202 lies along a lateral axis of the agricultural bale accumulator 100 and is transverse to the first axis 201. A third axis 203 lies in a vertical relationship to the agricultural bale accumulator 100 and is transverse to both the first axis 201 and the second axis 202.

Arrows on the ends of each of the first axis 201, the second axis 202 and the third axis 203 are numbered to indicate direction along each of the three axis. On the first axis 201, arrows 221 and 222 represent a forward direction and a rearward direction, respectively. On the second axis 202, arrows 223 and 225 represent a right direction and a left direction, respectively. On the third axis 203, arrows 225 and 226 represent an upward direction and a downward direction, respectively. For example, the direction of forward operative travel of the agricultural bale accumulator is in the forward direction represented by arrow 221 along the first axis 201.

Generally referring to all the figures, FIGs. 1-10 illustrate an agricultural bale accumulator 100 having a first embodiment of a load bed extension module 102. FIGs. 11-23 illustrate an agricultural bale accumulator 100 having a second embodiment of the load bed extension module 102. FIGs. 24-40 illustrate an agricultural bale accumulator 100 having third through twelfth embodiments of the load bed extension module 102. FIG. 41 illustrates a schematic diagram of a hydraulic system for use with the agricultural bale accumulator 100 of FIGs. 1 and 40. FIG. 42 illustrates a table 212 having thirty six embodiments of an extension table support system for the load bed extension module 102 for use on and/or off a pivot axis for one or more extension tables. The table 212 includes the twelve embodiments of the load bed extension module 102 illustrated in FIGs. 1-40.

II. Base Module

FIGs. 1 and 2 illustrate, in a top, rear and right side perspective view, an agricultural bale accumulator 100 (hereinafter referred to as "bale accumulator") having a first embodiment of a load bed extension module 102 including a first extension table 104 and a second extension table 106 each being located in an unstowed position and a stowed position, respectively, and a portion 116 and 118 of the load bed 113 being located in a bale accumulating position. FIGs. 11 and 12 illustrate, in a top 109, rear 119 and right 124 side perspective view, an agricultural bale accumulator 100 having a second embodiment of a load bed extension module 102 including a first extension table 104 and a second extension table 106 each being located in an unstowed position and a stowed position, respectively, and a portion 116 and 118 of the load bed 113 being located in a bale accumulating position.

The bale accumulator 100 has a modular construction and generally comprises a base module 112, the load bed extension module 102, a bale transfer module 186, and a bale discharge module 116, 118, 190. In the preferred embodiments, the base module 112 comprises a main

frame 102 for supporting a load bed 113 and a pair of ground engaging castor wheels 108 and 109 for supporting the main frame 102 above a ground surface 128.

The load bed 113 is substantially planar and successively receives a plurality of bales from a bale chamber 103 of an agricultural bale accumulator 101 along the first axis 201 in a rearward direction 222 essentially opposite to a direction of travel 221 of the baler 101 to accumulate the bales on load bed 113. The load bed includes a center load bed 114, a right load bed 116 and a left load bed 118. As will be described with reference to FIGs. 3, 4, 11 and 12, the portion 116 and 118 of the load bed 113 moves between a bale accumulating position and a bale discharging position while the center load bed 114 remains in a fixed position relative to the main frame 120.

The base module 112 supports the load bed extension module 102 which is operative to receive and accumulate additional bales, the bale-transfer module 186 which is operable to displace bales transversely on the load bed 113 and bale-discharge module 116, 118, 190 which is operative to discharge bales to the ground. Each of the load bed extension module 102, the bale-transfer module 186 and the bale-discharge module 116, 118, 190 will be described in detail hereinbelow.

As shown in FIGs. 1 and 11, each of the first 104 and second 106 extension tables are substantially co-planar with the load bed 113 and adjacent to a first side 124 and a second side 126, respectively, of the load bed 113 when each of the first 104 and second 106 extension tables are in the unstowed position to permit each of the first 104 and second 106 extension tables to accumulate thereon at least one of the plurality of bales received on the load bed 113. As shown in FIG. 2, each of the first 104 and second 106 extension tables are substantially raised to an inclined position relative to the load bed 113 when each of the first 104 and second 106 extension tables are in the unstowed position to permit the bale accumulator 100 to be stored or to be transported on a public roadway.

In the preferred embodiment, the bale accumulator 100 has a lateral width dimension 161 of approximately 548 cm when each of the first 104 and second 106 extension tables are in the unstowed position and a lateral width dimension 160 of approximately 335 cm when each of the first 104 and second 106 extension tables are in the stowed position. Therefore, a lateral width dimension of the load bed 113 is increased by 213 cm. With these lateral width dimensions, the bale accumulator 100 is permitted to accumulate up to five medium sized bales on the load bed

113 across the lateral axis 202 of the load bed 113 when each of the first 104 and second 106 extension tables are in the unstowed position.

By contrast, U.S. Patent Nos. 4,961,679 and 4,955,774 teaches the accumulation of up to only four bales across a lateral axis of the load bed, U.S. Patent No. 4,844,675 teaches the accumulation of up to only three bales across a lateral axis of the center, right and left tables, and Holescher's bale accumulator Model 1030 teaches the accumulation of up to only three bales across a lateral axis of load bed. Therefore, the bale accumulator 100 of the present invention increases the bale accumulating capacity along a lateral axis of a bale accumulator by one or two additional bales over that provided by the bale accumulators described in these references to increase the bale accumulator's bale accumulating efficiency by 25% and 66%, respectively.

As shown in FIGs. 1 and 2, the portion 116 and 118 of the load bed 113 is located in a bale accumulating position which is a horizontal position relative to the main frame 120 to permit the load bed 113 and the first 104 and second 106 extension tables to accumulate thereon the plurality of bales.

The bale accumulator 100 is hitched or attached to the agricultural baler 101, which is partially shown in FIGs. 1-5, 11-15, and 19 of the drawings, by a coupling device comprising, on one hand, a ring or eye bolt attached to a main frame 120 of the bale accumulator 100 and disposed to enter in to a socket coupled to the main frame 120 and to receive a coupling pin therethrough and, on the other hand, a pair of transversely spaced apart tie rods provided at opposite ends of the eye bolt. Each tie rod is attached at its opposite ends to the baler 101 and the main frame 120 by ball joints. In an alternative arrangement only one such tie rod is provided. With this form of hitching or connection, the bale accumulator 100 cannot move in yaw relative to the baler 101 on the one hand while limited movement in the two other main connections is allowed on the other hand. Indeed, the bale accumulator 100 and the baler 101 can move relative to each other to a limited degree in pitch about the ball joints and the eye bolt and in addition thereto the coupling device allows the accumulator and the baler to move relative to each other about a longitudinal, fore-and-aft axis of the two components. The inability of the baler 101 and the bale accumulator 100 to move relative to each other in yaw requires that the two ground-engaging-wheels 108 and 110 of the bale accumulator 100 are castor wheels which are pivotable about generally vertical axes. The foregoing arrangement is necessary to guarantee that, in use, the bales emerging from a bale chamber 103 of the baler 101 are always received at

precisely the same location on the bale accumulator 100 by virtue of the bale accumulator 100 always having a bale receiving portion a load bed 114 properly aligned with the bale chamber 103. However, for transport purposes, the bale accumulator 100 should be able to assume, when seen in a horizontal plane, an angled position relative to the pulling baler 101. To this end, the tie rods are removed and the castor wheels are secured in their fixed positions relative to the main frame 120 whereby the bale accumulator 100 becomes a conventional trailed unit.

III. Bale Transfer Module

The bale transfer module distributes a plurality of bales received on the load bed 113 across the load bed 113 and the first and second extension tables 104 and 106 to accumulate the plurality of bales on the load bed 113 and the first and second extension tables 104 and 106 in a side by side relationship when the first and second extension tables 104 and 106 are each in the unstowed position and when the portion 116 and 118 of the load bed 113 is in the bale accumulating position.

In the preferred embodiments, the bale transfer module 186 comprises a push bar 186 operable to alternately transfer bales transversely across the load bed 113 along the second axis 202 as they are received onto the load bed 113 from the bale chute 103 of the baler 101. The push bar 186 and its associated drive mechanism is known in the bale accumulator art as shown in U.S. Patent Nos. 4,961,679, 4,955,774 and 4,844,675, herein incorporated by reference, Holescher's bale accumulator Model 1030, and Case IH Corporation's bale accumulator Model 8576, for example, referred to hereinabove in the background section.

Alternatively, other types of bale transfer modules may be implemented the bale accumulator 100 without departing from the spirit of the present invention. Such other bale transfer modules may include for example, a robotic arm assembly as shown in U.S. Patents 4,961,679, 4,955,774 or a moveable platform as shown in U.S. Patents 4,710,086 and 4,710,087, each of which is herein incorporated by reference.

IV. Bale Discharge Module

FIGs. 3 and 4 illustrate, in a top, front and right side perspective view and a top, rear and right side perspective view, respectively, the agricultural bale accumulator 100 of FIG. 1 having the first embodiment of the load bed extension module 102 including the first extension table 104 and the second extension table 106 each being located in the unstowed position and a portion 116 and 118 of the load bed 113 being located in a bale discharging position. FIGs. 13 and 14

illustrate, in a top 109, front 117 and right 124 side perspective view and a top 109, rear 119 and right 124 side perspective view, respectively, the agricultural bale accumulator 100 of FIG. 11 having the second embodiment of the load bed extension module 102 including the first extension table 104 and the second extension table 106 each being located in the unstowed position and the portion 116 and 118 of the load bed 113 being located in a bale discharging position.

In the preferred embodiments, the bale discharge module comprises the portion 116 and 118 of the load bed 113 and a hydraulic cylinder 190. The portion 116 and 118 of the load bed 113 is pivotally connected to the main frame 120 about a pivot point 188 disposed on a horizontal pivot axis 146 and moveable relative to the main frame 120 between the bale accumulating position and the bale discharging position. The portion 116 and 118 of the load bed 113 is in a horizontal position relative to the main frame 120 when the portion 116 and 118 of the load bed 113 is in the bale accumulating position to permit portion 116 and 118 of the load bed 113 and the first extension table 104 to accumulate thereon the plurality of bales. The portion 116 and 118 of the load bed 113 is in an inclined position relative to the main frame 120 when the load bed 113 is in the bale discharging position to permit the portion 116 and 118 of the load bed 113 and the first 104 and second 106 extension tables to discharge the plurality of bales accumulated thereon to the ground surface 128.

Alternatively, other types of bale transfer modules may be implemented the bale accumulator 100 without departing from the spirit of the present invention. Such other bale discharge modules may include for example, conveyor chains having push plates which push the accumulated bales off a horizontal load bed to the ground as shown in U.S. Patents 4,961,679 and 4,955,774, each of which is herein incorporated by reference. An advantage of this embodiment for a bale discharge module is that the load bed is rigidly fixed to the main frame to provide a stable support for the accumulated bales during the bale accumulating and bale discharging operations.

Still an other bale discharge modules may include, for example, a load bed pivotally mounted on to a main frame and moveable between a bale accumulating position and a bale discharging position so that when the load bed is unlatched the load bed tilts downwardly at the rear of the load bed under the force of gravity action on the weight of the bales to permit the bales carried thereon to slide to the ground as the bale accumulator continues its forward

movement. When the weight of the bales is removed from the load bed a spring pulls the load bed to its latched position. An advantage of this embodiment for a bale discharge module is that a hydraulic dump cylinder is not needed to forcibly raise the load bed and the bales accumulated thereon to its bale discharging position.

V. Load Bed Extension Module

With continuing reference to the first and second embodiments shown in FIGs. 1-4 and 11-14, the load bed extension module 102 generally includes a first extension table 104, a first extension table attachment mechanism 122 and a first extension table support system 130. While the following description of the load bed extension module 102 will be given with reference to the first, right side 124 of the load bed 113, the load bed extension module 102 is also intended to apply to the second, left side 126 of the load bed 113 in a similar manner as that described for first, right side 124 of the base module 112. However, while use of the load bed extension module 102 on each side of the load bed 113 is preferred, the load bed extension module 102 is not required to be used on both sides of the base module at the same time.

A. Extension Table Attachment Mechanism

The first extension table attachment mechanism connects the first extension table 104 to the base module 112 to permit the first extension table 104 to be moveable relative to the base module 112 between the stowed position and the unstowed position. The stowed and unstowed positions are described hereinabove.

In the preferred embodiment, the first extension table attachment mechanism is a hinge 122 located on a first hinge axis 136. Likewise, the second table is connected to the second side 126 of the base module 112 with a hinge 123 disposed along a second hinge axis 138. Alternatively, the first extension table attachment mechanism may be a telescoping mechanism as shown in FIG. 40 and described in further detail herein below.

In the preferred embodiment, the first extension table 104 is connected to the right load bed portion 116 of the load bed 113 and permitted to move with the right load bed portion 116 of the load bed 113 moves between the bale accumulating position and the bale discharging position. This arrangement permits the bale accumulator 100 to discharge any bales located on the right 116 and left 118 portions of the load bed 113 and the first 104 and second 106 extension tables at the same time by moving the right 116 and left 118 portions of the load bed 113 to the bale discharging position relative to the main frame 120. Alternatively, the load bed

extension module 102 is equally well suited for use with a bale discharge module wherein a load bed does not tilt relative to a main frame, such as the chain driven push plates described hereinabove. In this alternative case, the first 104 and second 106 extension tables can be attached directly to the main frame, as opposed to the load bed, if so desired.

B. Extension Table Support System

The first extension table support system 130 is connected to at least one of the base module 112 and the first extension table 104. The first extension table support system 130 contacts the first extension table 104 at a location beyond the first side 124 of the load bed 113 and contacts at least one of the base module 112 and the ground surface 128 to support the first extension table 104 from at least one of the base module 112 and the ground surface 128, respectively, when the first extension table 104 is in the unstowed position.

Generally, the first extension table support system 130 comprises five embodiments which will be described in detail below. The first embodiment of the first extension table support system 130 utilize a support wheel 164. The second, third, fourth and fifth embodiments of the first extension table support system 130 utilize a first 140, second 150, third 154 and fourth 192 frame extension members, respectively. For the sake of convenience and to facilitate a better understanding of the present invention, embodiments of the first 140, second 150, third 154 and fourth 192 frame extension members comprise a truss member, a collapsible cylinder, a fixed frame member and a moveable frame member, respectively, which should not limit the spirit and scope of the present invention.

The support wheel 164 will be described in further detail with reference to the first, third, fourth, sixth, seventh, eleventh, and twelfth embodiments of the load bed extension module 102, as shown in FIGs. 1-10, 24 and 25, 26 and 27, 30 and 31, 32 and 33, 39, and 40, respectively. The truss member of the first frame extension member 140 will be described in further detail with reference to the first, second, fifth, seventh, eight and ninth embodiments of the load bed extension module 102, as shown in FIGs. 1-10, 11-23, 28 and 29, 32 and 33, 34 and 35, and 36 and 37, respectively. The collapsible cylinder of the second frame extension member 150 is described with reference to the first, second, and ninth embodiments of the load bed extension module 102, as shown in FIGs. 1-10, 11-23, and 36 and 37, respectively. The fixed frame member of the third frame extension member 154 will be described in further detail with reference to the second, fourth, and fifth, embodiments of the load bed extension module 20, as

shown in FIGs. 11-23, 26 and 27, and 28 and 29, respectively. The moveable frame member of the fourth frame extension member 192 will be described in further detail with reference to the fourth, sixth, seventh, eleventh and twelfth embodiments of the load bed extension module 20, as shown in FIGs. 26 and 27, 30 and 31, 32 and 33, 39, and 40, respectively.

The first extension table support system 130 contacts the first extension table 104 at a location beyond the first side 124 of the load bed 113. Likewise, a second extension table support system contacts the second extension table 106 at a location beyond the second side 126 of the load bed 113. For the first extension table 104, the location where the contact is made is further described as being beyond the first hinge axis 136 where the first extension table 104 is attached to the load bed 133. Preferably, a location of contact on the first extension table 104 between a center portion and a distal side of the first extension table 104 is optimal.

By contrast, U.S. Patent Nos. 4,961,679, 4,955,774 and 4,844,675 and Case IH Corporation's bale accumulator Model 8576 do not disclose a support system which contacts an extension table at a location beyond a side of a base module to which the extension table is attached. Each of these references merely show an extension table hinged to the base module without any support beyond the hinge area.

When used alone, the support wheel 164 supports the first extension table 104 from the ground surface 128 when the first extension table 104 is in the unstowed position. When used alone, each of the first 140, second 150, third 154 and fourth 192 frame extension members support the first extension table 104 from the base module 112 when the first extension table 104 is in the unstowed position. When used in combination, the support wheel 164 and one of the first 140, second 150, third 154 and fourth 192 frame extension members support the first extension table 104 from the ground surface 128 and the base module 112 when the first extension table 104 is in the unstowed position.

In the preferred embodiment, the first extension table support system 130 further supports the first extension table 104 from at least one of the base module 112 and the ground surface 128 the when the portion 116 and 118 of the load bed 113 is at least one of the bale accumulating position and the bale discharging position. It is especially important to note that when the portion 116 and 118 of the load bed 113 is moved to the bale discharging position about the pivot axis 146, as shown in FIGs. 3, 4, 13 and 14, there is a large amount of space between the portion 116 and 118 of the load bed 113 and the main frame 120. In the bale

discharging position, the portion 116 and 118 of the load bed 113 is supported from the main frame 120 with the hydraulic cylinder 190 which is used to forcibly tilt the portion 116 and 118 of the load bed 113 relative to the main frame 120. However, according to the present invention, the first 104 and second 106 extension tables attached to the portions 116 and 118 of the load bed 113, respectively, also need support when the portion 116 and 118 of the load bed 113 is located in at least one of the bale accumulating position and the bale discharging position. During the operation of the bale accumulator 100 in a field, the bale accumulator 100 is subject to a normally present, rough and varying ground surface causing the weight of the bales to bounce or shift on the first 104 and second 106 extension tables. Without the extension table support system 130 of the present invention, such bouncing and shifting will cause wear and fatigue on the hinges 122 and 123 connecting the first 104 and second 106 extension tables to the load bed 113. An abnormal amount of wear and fatigue on the hinges 122 and 123 will inhibit proper movement of the first 104 and second 106 extension tables between their stowed and unstowed positions or cause permanent damage to the hinges 122 and 123, the load bed 113 and/or the first 104 and second 106 extension tables.

The first extension table support system 130 of the present invention can support the first extension table 104 "on" the horizontal pivot axis 146, "off" the horizontal pivot axis 148, or both "on" and "off" the horizontal pivot axis 146. The first extension table support system 130 provides support "on" pivot axis 146 when the first extension table support system 130 supports the first extension table 104 about the horizontal pivot axis 146 when the first extension table 104 is in the unstowed position and when the at least a portion 116 and 118 of the load bed 113 is moves between the bale accumulating position and the bale discharging position. A pivot point 188 at the connection between the load bed 113 and the main frame 120 forms the horizontal pivot axis 146. The support "on" the pivot axis is described with reference to each of the twelve embodiments of the load bed extension module 20, as shown in FIGs. 1-40, respectively. Note that the third through twelfth embodiments of the load bed extension module 20, as shown in FIGs. 24-40 may be implemented either "on" the pivot axis 146 or "off" the pivot axis 148.

The first extension table support system 130 provides support "off" the pivot axis 148 when the first extension table support system 130 supports the first extension table 104 at a location between a front side 117 of the load bed 113 where the plurality of bales are received on

the load bed 113 and the horizontal pivot axis 146 when the first extension table 104 is in the unstowed position and when the portion 116 and 118 of the load bed 113 is in the bale accumulating position. The support "off" the pivot axis is described with reference to each of the twelve embodiments of the load bed extension module 20, as shown in FIGs. 1-40, respectively.

The first extension table support system 130 of the present invention can support more that one extension table disposed on the same side of the load bed. The extension table support system 130 of the present invention becomes even more important in this case because the multiple extension tables and any bales accumulated thereon are located at a position far away from the main frame 120. Without the extension table support system 130 of the present invention, the weight of multiple bales on multiple tables extending away from the main frame 120 greatly increases the amount of stress on the hinges 122 and 123. If there are two or more extension tables disposed on the same side of the load bed, the extension table support system 130 of the present invention may even be considered essential to meet minimum standards of durability and usefulness while the bale accumulator is being used in a field over the useable life time of the bale accumulator 100. The application of the extension table support system 130 to multiple extension tables disposed on the same side of the load bed 113 will be described in further detail with reference to FIGs. 24-40.

The need for extension table support system 130 of the present invention is dependent on the construction of the base module 112. In each of the first and second embodiments of the load bed extension module 102, as shown in FIGs. 1-23, the load bed extension module 102 is adapted to a bale accumulator Model 1030, manufactured by Hoelscher, Inc., 312 S. Main, P.O Box 195, Bushton, Kansas, U.S.A., 67427. The main frame 120 and the load bed 113 of the base module 112 of Hoelscher's bale accumulator Model 1030 is not built of construction materials durable enough to support the weight of a load bed extension table 104 and any bales accumulated thereon without the assistance of the extension table support system 130 of the present invention. Therefore, the extension table support system 130 of the present invention becomes essential to providing a durable bale accumulator 100 having the load bed extension module 102 when the load bed extension module 102 is retrofitted to an existing bale accumulator which was not manufactured with the expectation that the load bed extension module 102 would be attached.

The need for extension table support system 130 of the present invention is also dependent on the manufacturing cost of the bale accumulator 100. As shown on Case IH Corporation's bale accumulator Model 8576, extension tables are provided without any support contacting the extension table beyond the hinge connecting the extension table to the load bed. On Case IH Corporation's bale accumulator Model 8576, the only support for the extension table is where a side of the extension table contacts a side of the load bed below the hinge when the extension table is folded down to be coplanar with the load bed. The lack of support for the extension tables is overcome by constructing the main frame, the load bed and the extension tables with very heavy duty materials. However, disadvantages associated with building a heavy duty bale accumulator include increasing the cost of the bale accumulator, increasing the amount of fuel used to pull the bale accumulator, etc. The extension table support system 130 of the present invention is advantageous because it cost less to implement than using heavy duty materials and it weighs less than the heavy duty materials while providing a durable design. Further, even if heavy duty materials are used, the extension table support system 130 of the present invention is advantageous for multiple extension tables disposed on the same side of the load bed.

1. Support Wheel

The support wheel 164 is described with reference to the first, third, fourth, sixth, seventh, eleventh, and twelfth embodiments of the load bed extension module 20, as shown in FIGs. 1-10, 24 and 25, 26 and 27, 30 and 31, 32 and 33, 39, and 40, respectively.

In the first and third embodiment of the load bed extension module 102, as shown in FIGs. 1-10, 24 and 25, respectively the first extension table support system 130 includes a first support wheel 164 connected to the first extension table 104 and moveable with the first extension table 104 when the first extension table 104 moves between the stowed position and the unstowed position. The first support wheel 164 contacts the ground surface 128 to support the first extension table 104 from the ground surface 128. The first support wheel 164 advantageously provides support along the vertical axis 203 in the upward direction 225 relative to the extension table.

In the fourth, sixth, seventh, eleventh, and twelfth embodiments of the load bed extension module 20, as shown in FIGs. 26 and 27, 30 and 31, 32 and 33, 39, and 40, respectively, the

support wheel is connected to the moveable frame member of the fourth frame extension member 192 and will be described in further detail hereinbelow.

In the preferred embodiment, the first wheel 108, the second wheel 110, the first support wheel 164, as well as the second support wheel 166 on the second extension table 106 share a common axis of rotation 134 to encourage a smooth ride for the bale accumulator 100 across a field.

2. First Frame Extension Member (ex: truss)

The truss member of the first frame extension member 140 is described with reference to the first, second, fifth, seventh, eight and ninth embodiments of the load bed extension module 20, as shown in FIGs. 1-10, 11-23, 28 and 29, 32 and 33, 34 and 35, and 36 and 37, respectively.

The first extension table support system 130 further comprises a first frame extension member 140 connected to the first extension table 104 and moveable with the first extension table 104 when the first extension table 104 moves between the stowed position and the unstowed position. An end surface of the first frame extension member 140 contacts an end surface of the base module 112 to support the first extension table 104 from the base module 112.

In the first embodiment of the load bed extension module 20, FIGs. 7-10 are particularly well suited for illustrating a truss member of the first frame extension member 140 providing support "on" the pivot axis 146. FIG. 7 shows the truss member of the first frame extension member 140 attached to a bottom side of the left side extension table 106 near the left side support wheel 166. FIGs. 8, 9 and 10 show the truss member of the first frame extension member 140 attached to the bottom side of the left side extension table 106, the pivot point 188 of the base module 112 disposed on the pivot axis 146, and a pivot point spacer 162.

In the first embodiment of the load bed extension module 102 the truss member of the first frame extension member 140 contacts the base module 112 at the pivot point 162 to support for the second extension table 106 when the second extension table 106 is located in the unstowed position and when the portion 116 of the load bed 113 is located in the bale accumulating position. The pivot point spacer 162 is used to fill a gap between the pivot point 188 on Holescher's bale accumulator Model 1030 and an end of the truss member of the first frame extension member 140. Such a spacer would not be required on a new design for a bale accumulator.

In the first embodiment of the load bed extension module 102 the truss member of the first frame extension member 140 contacts the base module 112 at the pivot point 162 to support for the second extension table 106 when the second extension table 106 is located in the unstowed position and when the portion 116 of the load bed 113 is located in the bale discharging position. It is critical to note in this view that the truss member of the first frame extension member 140 is the only support for the first extension table 104 beyond the first hinge 122. Supporting the first extension table from the pivot point 162 on the pivot axis 146 is important to reduce wear and fatigue on the hinge 122 when the first extension table is moved to the bale discharging position. Therefore, supporting the extension table from the pivot point using the truss member of the first frame extension member 140 provides a significant advantage over that presently available in the prior art.

In the first embodiment of the load bed extension module 20, FIGs. 5-7 are particularly well suited for illustrating a truss member of the first frame extension member 140 providing support "off" the pivot axis 148.

In FIG. 5 the general area of interest showing the truss member of the first frame extension member 140 is at the front, right corner of the bale accumulator 100.

FIG. 6 shows the truss member of the first frame extension member 140 contacting the main frame 120 from "off" the pivot axis 148. Preferably, the "off" axis is located near the front 117 of the bale accumulator 100 to provide even support in combination with the truss member of the first frame extension member 140 contacting the base module 112 at the pivot point 162. Preferably, the truss member of the first frame extension member 140 contacts the main frame 120.

FIG. 6 also appropriately shows a mating contact between an end surface 142 of the first frame extension member 140 an end surface 144 on the base module 112. The end surface 142 of the first frame extension member 140 has a downward angle relative to a horizontal axis when the first extension table 104 is in the unstowed position. The end surface 144 on the base module 112 has an upward angle relative to the horizontal axis which is complementary to the downward angle. The end surface 142 the first frame extension member 140 contacts the end surface 144 on the base module 112 to translate an upward force through the first frame extension member 140 to support the first extension table 104 from the base module 112. The

complimentary angles advantageously direct a larger component of force from the base module 112 to the first extension table 104.

FIG. 7 shows a separation between the end surface 142 of the first frame extension member 140 the end surface 144 on the base module 112 when the second, left side extension table is in the stowed position.

In the second embodiment of the load bed extension module 20, FIGs. 15-20, and 22 are particularly well suited for illustrating a truss member of the first frame extension member 140 providing support "off" the pivot axis 148. FIGs. 15-20, and 22 show the first frame extension member 140 having three truss members. Each of the three truss members contact the fixed frame member of the third frame extension member 154 which will be described in further detail hereinbelow. Each of the three truss members contacts the fixed frame member of the third frame extension member 154 in a similar manner to the way the truss member contacts that main frame 120 as described hereinabove with the first embodiment of the load bed extension module 102. Although three truss members are shown which provide superior support along the length first extension table 104, only one truss member near the front 117 of the bale accumulator 100 can be used to provide adequate support "off" the pivot axis.

The truss member of the first frame extension member 140 is described with reference to the fifth, seventh, eight and ninth embodiments of the load bed extension module 102, as shown in FIGs. 32 and 33, 34 and 35, and 36 and 37, respectively. In FIGs. 32 and 33, the truss member of the first frame extension member 140 is attached to a third extension table 105 and contacts the moveable frame member of the fourth frame extension member 192. This embodiment is advantageous in reducing the distance traveled by the moveable frame member of the fourth frame extension member 192. In FIGs. 34 and 35, a truss member of the first frame extension member 140 is attached to each of the first extension table 104 and the third extension table 105 to build a continuous truss support for each of the first extension table 104 and the third extension table 105 when each of the first extension table 104 and the third extension table 105 are in the unstowed position. This embodiment is advantageous because no moveable parts are needed to support the extension tables. In FIGs. 36 and 37, the truss member of the first frame extension member 140 is attached to a third extension table 105 and contacts a lower part of the first extension table 104. This embodiment is advantageous in reducing the travel of the cylinder 150 which would support a wider extension table.

3. Second Frame Extension Member (ex: cylinder)

The collapsible cylinder of the second frame extension member 150 is described with reference to the first, second, and ninth embodiments of the load bed extension module 102, as shown in FIGs. 1-10, 11-23, and 36 and 37, respectively.

The first extension table support system 130 further comprises a second frame extension member 150 having a first end connected to the base module 112 and a second end connected to the first extension table 104 and being moveable between a collapsed position and an expanded position. The second frame extension member 150 is in the collapsed position when the first extension table 104 is in the unstowed position, wherein the second frame extension member 150 is in the expanded position when the first extension table 104 is in the stowed position. The second frame extension member 150 is connected to the first extension table 104 and the base module 112 to support the first extension table 104 from the base module 112.

In the first, second, and ninth embodiments of the load bed extension module 102, as shown in FIGs. 1-10, 11-23, and 36 and 37, respectively, the second frame extension member 150 further comprises a first hydraulic cylinder 150 for moving the first extension table 104 between the stowed position and the unstowed position responsive to receiving pressurized hydraulic fluid from a hydraulic fluid source 115. FIG. 41 shows the hydraulic fluid source 115. Alternatively, the second frame extension member 150 can be a telescoping frame member which provides equivalent support as the hydraulic cylinder 150 for the first extension table 104 but does not permit assistance from the hydraulic fluid source. In this case the extension table would require manual assistance.

In the second and ninth embodiments of the load bed extension module 102, as shown in FIGs. 15-17, 19-21-23; and 36 and 37, respectively, the second frame extension member 150 is connected to the main frame 120 of the base module 112 "on" the pivot axis 146. These embodiments advantageously provide a combination of support for the extension table and hydraulic assistance. In the first embodiment of the load bed extension module 102, the second frame extension member 150 is connected to the load bed 113 of the base module 112 "off" the pivot axis 148. The embodiment advantageously provides additional support for the extension table 104 from above the extension table 104 in addition to the support on the pivot point 162 provided by the truss member of the first frame extension member 140.

In the first and second embodiments of the load bed extension module 102, as shown in FIGs. 1-10 and 11-23, respectively, the agricultural bale accumulator 100 further comprises the second hydraulic fluid cylinder 190 having a first end connected to the main frame 120 and a second end connected to the portion 116 and 118 of the load bed 113. The second cylinder 190 moves the portion 116 and 118 of the load bed 113 relative to the main frame 120 between the bale accumulating position and the bale discharging position responsive to receiving pressurized hydraulic fluid from the hydraulic fluid source 115, as shown in FIG. 41. FIG. 41 illustrates a schematic diagram of a hydraulic system for use with the agricultural bale accumulator of FIGs. 1 and 23. A hydraulic valve 214, as shown in FIG. 41, selectively routes the pressurized hydraulic fluid from the hydraulic fluid source 115 to one of the first hydraulic cylinder 150 and the second hydraulic cylinder 190 responsive to an electric control signal 216. This embodiment advantageously permits hydraulic power to be used to move the extension table 104 when there are a limited number of hydraulic sets of ports available from a tractor carrying the hydraulic fluid source 115. In the preferred embodiment, the tractor used to pull the baler 101 and the bale accumulator 100 only has three hydraulic sets of ports: a first set is used to by the baler 101 to bale the crop into bales, a second set is used by the bale accumulator 100 to operate the bale transfer module 186, a third set to operate the bale discharge module 116, 118, and 190. Therefore, one set is lacking to move the extension tables between their stowed and unstowed positions. Therefore, the third set of hydraulic ports is advantageously shared between the bale discharge module 116, 118, and 190 and the load bed extension module 102.

In the first and second embodiments of the load bed extension module 102, as shown in FIGs. 1-10 and 11-23, respectively, the second frame extension member 150 further comprises at least one spring member 152, connected to at least one of the base module 112, the first extension table 104 and the second frame extension member 150, for exerting a bias force on the first extension table 104 when the first extension table 104 is moved to at least one of the stowed position and the unstowed position. This embodiment advantageously pulls the collapsible frame member over its center point when moving the extension table 104 to the stowed position. In the first embodiment of the load bed extension module 102, the spring is connected to a front, top side of the first extension table 104 and to a distal end of the hydraulic cylinder 150. In the second embodiment of the load bed extension module 102, the spring is connected to a bottom side of the first extension table 104 and to a distal end of the hydraulic cylinder 150.

4. Third Frame Extension Member (ex: fixed frame)

The fixed frame member of the third frame extension member 154 is described with reference to the second, fourth, and fifth, embodiments of the load bed extension module 20, as shown in FIGs. 11-23, 26 and 27, and 28 and 29, respectively.

In the second, fourth, and fifth, embodiments of the load bed extension module 20, as shown in FIGs. 11-23, 26 and 27, and 28 and 29, respectively, the first extension table support system 130 further comprises a third frame extension member 154 having a proximal end 156 and a distal end 158. The proximal end 156 of the third frame extension member 154 is connected to the main frame. The distal end 158 of the third frame extension member 154 extends beyond the main frame 120 in a direction transverse to a traveling direction of the agricultural bale accumulator 100 at a fixed position which is located inside a road travel width dimension 160 of the agricultural bale accumulator 100 to permit safe traveling of the agricultural bale accumulator 100 on a public roadway when the first extension table 104 is in the stowed position. A first portion of the first extension table 104 is positioned inside the distal end 158 of the third frame extension member 154 and a second portion of the first extension table 104 is positioned outside the distal end 158 of the third frame extension member 154 when the first extension table 104 is in the unstowed position to permit the third frame extension member 154 to contact the first extension table 104 between the first portion of the first extension table 104 and the second portion of the first extension table 104 to support the first extension table 104 from the main frame 120.

These embodiments advantageously provide support for the extension table 104 with no moving parts. Further, the third frame extension member 154 is positioned directly beneath the extension table 104 to provide a component of force along the vertical axis 203 in an upward direction 225.

5. Fourth Frame Extension Member (ex: moveable frame)

The moveable frame member of the fourth frame extension member 192 is described with reference to the fourth, sixth, seventh, eleventh and twelfth embodiments of the load bed extension module 102, as shown in FIGs. 26 and 27, 30 and 31, 32 and 33, 39, and 40, respectively.

In the fourth, sixth, seventh, eleventh and twelfth embodiments of the load bed extension module 102, as shown in FIGs. 26 and 27, 30 and 31, 32 and 33, 39, and 40, respectively, the

first extension table support system 130 further comprises a fourth frame extension member 192 and a frame attachment mechanism 218. The fourth frame extension member 192 has a proximal end 156 and a distal end 158. The frame attachment mechanism 218 is connected to the proximal end 156 of the fourth frame extension member 192 and the main frame 120 to permit the distal end 158 of the fourth frame extension member 192 to be moveable relative to the main frame 120 between a stowed position and an unstowed position. The distal end 158 of the fourth frame extension member 192 moves towards the main frame 120 when the fourth frame extension member 192 is in the stowed position, wherein the distal end 158 of the fourth frame extension member 192 moves away from the main frame 120 when the fourth frame extension member 192 is in the unstowed position, wherein the distal end 158 of the fourth frame extension member 192 contacts the first extension table 104 to support the first extension table 104 from the main frame 120 when the fourth frame extension member 192 is in the unstowed position.

In the fourth, sixth, seventh, eleventh and twelfth embodiments of the load bed extension module 102, as shown in FIGs. 26 and 27, 30 and 31, 32 and 33, 39, and 40, respectively, the frame attachment mechanism 218 further comprises a telescoping mechanism for telescopically connecting the proximal end 156 of the fourth frame extension member 192 to the main frame 120 along a horizontal axis 146 or 148 relative to the main frame 120. Preferably, the frame attachment mechanism 218 telescopes from the main frame along the pivot axis 146 to provide support for the extension tables when moved to at least one of the bale accumulating position and the bale discharging position. Alternatively, the frame attachment mechanism 218 may telescope from the main frame "off" the pivot axis 148. Alternatively, the frame attachment mechanism 218 further comprises a pivoting mechanism for pivotally connecting the proximal end 156 of the fourth frame extension member 192 to the main frame 120 about a vertical axis 198 relative to the main frame.

In the fourth, sixth, seventh, eleventh and twelfth embodiments of the load bed extension module 102, as shown in FIGs. 26 and 27, 30 and 31, 32 and 33, 39, and 40, respectively, the first extension table support system 130 further comprises a first support wheel 164 connected to the distal end 158 of the fourth frame extension member 192 and moveable with the fourth frame extension member 192 when the fourth frame extension member 192 moves between the stowed position and the unstowed position. The first support wheel 164 contacts the ground surface 128 to support the first extension table 104 from the ground surface 128 when the fourth

frame extension member 192 is in the unstowed position. The support wheel 164 advantageously provides additional support for the extension tables.

In the twelfth embodiment of the load bed extension module 102, as shown in FIG. 40, the first support wheel 164 provides a sole support for a first side 124 of the base module 112 from the ground surface 128 to permit the agricultural bale accumulator 100 to be transported across the ground surface 128 when the first extension table 104 is in the stowed position and when the fourth frame extension member 192 is in the stowed position. The first support wheel 164 provides the sole support for the first side of the base module 112 and the first extension table 104 from the ground surface 128 to permit the agricultural bale accumulator 100 to be transported across the ground surface 128 when the first extension table 104 is the unstowed position and when the first extension table 104 is in the unstowed position and when the fourth frame extension member 192 is in the unstowed position. In this embodiment, the main wheels 108 and 110 on the bale accumulator 100 are eliminated. Preferably, the frame attachment mechanism 218 telescopes from the main frame along the pivot axis 146 to provide support for the extension tables when the load bed 113 moves to at least one of the bale accumulating position and the bale discharging position as well as the sole support for the one side of the base module 112 when the frame attachment mechanism 218 moves to the stowed position.

In the fourth, sixth, seventh, and eleventh embodiments of the load bed extension module 102, as shown in FIGs. 26 and 27, 30 and 31, 32 and 33, and 39, respectively, the agricultural bale accumulator 100 further comprises a first wheel 108 and a second wheel 110 coupled to the main frame. The first wheel 108 and the second wheel 110 contact the ground surface 128 to support the base module 112 from the ground surface 128 and to permit the agricultural bale accumulator 100 to be transported across the ground surface 128 when the first extension table 104 is in the stowed position and the unstowed position and when the fourth frame extension member 192 is in the stowed position and the unstowed position. The first support wheel 164 contacts the ground surface 128 to support the first extension table 104 from the ground surface 128 when the first extension table 104 is the unstowed position and when the fourth frame extension member 192 is in the unstowed position. The first wheel 108, the second wheel 110 and the first support wheel 164 share a common axis of rotation 134 when the fourth frame extension member 192 is in at least the unstowed position. Preferably, the frame attachment mechanism 218 telescopes from the main frame along the pivot axis 146 to provide support for

the extension tables when the load bed 113 moves to at least one of the bale accumulating position and the bale discharging position as well as the additional support for the one side of the base module 112 when the frame attachment mechanism 218 moves to the stowed position.

C. Load Bed Alignment Mechanism

In the first and second embodiments of the load bed extension module 102, as shown in FIGs. 1-10 and 11-23, respectively, the agricultural bale accumulator further comprises an alignment mechanism 206 for aligning the portion 116 and 118 of the load bed 113 with the main frame 120 when the portion 116 and 118 of the load bed 113 moves from the bale discharging position to the bale accumulating position.

In the first embodiment of the load bed extension module 102, as shown in FIGs. 1-10, the alignment mechanism 206 includes first and second alignment members, in the shape of an inverted "V", connected to the main frame 120 and the portion 116 and 118 of the load bed 113, respectively, on a front side 117 of the bale accumulator 100. The first alignment member cooperatively engages the second alignment member to align the portion 116 and 118 of the load bed 113 with the main frame 120 when the portion 116 and 118 of the load bed 113 is in the bale accumulating position. The first alignment member cooperatively disengages the second alignment member when the portion 116 and 118 of the load bed 113 is in the bale discharging position.

In the second embodiment of the load bed extension module 102, as shown in FIGs. 11-23, the alignment mechanism 206 includes two guide posts attached to the fixed frame member of the third frame extension member 154. The guide posts are positioned to fall between a side of the load bed 113 and the extension table to channel the load into a home position on the main frame 120 when the load bed is returning from the bale discharging position to the bale accumulating position.

The alignment mechanism 206 reduces the strain on the pivot point 188 when the load bed 113 moves between the bale discharging position to the bale accumulating position. Under new design considerations the alignment mechanism 206 may not be necessary if heavy duty construction materials are used, especially on the pivot point 188 and the load bed 113.

D. Load Bed Latch Mechanism

In the second embodiment of the load bed extension module 102, as shown in FIGs. 11-23, the agricultural bale accumulator further comprises a latch mechanism 208 for latching the

portion 116 and 118 of the load bed 113 to the main frame 120 when the portion 116 and 118 of the load bed 113 is in the bale accumulating position and for unlatching the portion 116 and 118 of the load bed 113 from the main frame 120 when the portion 116 and 118 of the load bed 113 is in the bale discharging position.

The latch mechanism 208 advantageously secures the portion 116 and 118 of the load bed 113 to the main frame 120 when the extension tables have bales accumulated thereon. Without the latch mechanism 208, the weight of the bales on one side of the portion 116 and 118 of the load bed 113 could cause the front end of the portion 116 and 118 of the load bed 113 on the other side of the portion 116 and 118 of the load bed 113 to twist in an upward direction away from the main frame 120. Under new design considerations the latch mechanism 208 may not be necessary if heavy duty construction materials are used, especially on the pivot point 188 and the load bed 113.

In the second embodiment of the load bed extension module 102, the latch mechanism 208 is shown in shown in FIGs. 13, 15, 16 and 18. The latch mechanism 208 includes a hook member, connected to a front end of the main frame 120 and a bar member, adapted to engage the hook member and attached to a front side of the right side portion 116 of the load bed 113. A control bar is connected between the hook member and the hydraulic cylinder 190 which is used for tilting the portion 116 and 118 of the load bed 113. When the hydraulic cylinder 190 begins to cause the portion 116 and 118 of the load bed 113 to move to the bale discharging position, an end of the hydraulic cylinder 190 moves along a slot formed in the main frame 120 where the hydraulic cylinder 190 is attached. Such movement, pulls the control bar to cause the latch to disengage the bar member thereby permitting the hydraulic cylinder 190 to pivot the portion 116 and 118 of the load bed 113 to the bale discharging position. When the portion 116 and 118 of the load bed 113 returns to the bale accumulating position from the bale discharging position, the hydraulic cylinder move the opposite direction to cause the hook member to engage the bar member thereby securing the portion 116 and 118 of the load bed 113 to the main frame 120.

E. Bale Position Sensors

In the first and second embodiment of the load bed extension module 102, as shown in FIGs. 1-10 and 11-23, respectively, each of the first 104 and second 106 extension tables include bale position sensors 176 and 178, respectively, for sensing bales disposed on each of the first 104 and second 106 extension tables, respectively. Bale position sensors 170, 172 and 174 are

also located on the center table 114, right table 116 and left table 118 of load bed 113, respectively.

F. Multiple Extension Tables

In the third through twelfth embodiments of the load bed extension module 102, as shown in FIGs. 24-41, the agricultural bale accumulator further comprises a third extension table 105, a third extension table attachment mechanism 125 and a third extension table support system. The third extension table attachment mechanism 125 is connected to the third extension table 105 and the first extension table 104 to permit the third extension table 105 to be moveable with the first extension table 104 relative to the base module 112 when the first extension table 104 moves between the stowed position and the unstowed position. The third extension table 105 is moveable between a stowed position and an unstowed position relative to the first extension table 104. The third extension table 105 is substantially co-planar with the load bed 113 and the first extension table 104 and adjacent to the first extension table 104 when the first extension table 104 and the third extension table 105 are each in their unstowed positions to permit the third extension table 105 to accumulate thereon at least one of the plurality of bales.

The third extension table support system connects at least one of the base module 112, the first extension table 104 and the third extension table 105. The third extension table support system contacts the third extension table 105 at a location beyond the first extension table 104 and contacts at least one of the base module 112, the first extension table 104 and the ground surface 128 to support the third extension table 105 from at least one of the base module 112, the first extension table 104 and the ground surface 128, respectively, when the first extension table 104 and the third extension table 105 are each in their unstowed positions.

In the tenth embodiment of the load bed extension module 102, as shown in FIGs. 38, the first extension table attachment mechanism further comprises a first hinge 122 for pivotally connecting the first extension table 104 to the base module 112, at the load bed 113, about a first hinge axis 136. The third extension table attachment mechanism further comprises a third hinge 125 for pivotally connecting the third extension table 105 to the first extension table 104 about a third hinge axis 137. The first extension table 104 pivots upwards towards the base module 112 about the first hinge axis 136 when the first extension table is in the stowed position. The third extension table 105 pivots upwards towards the base module 112 and the first extension table 104 about the third hinge axis 137 when the third extension table 105 is in the stowed position.

This embodiment advantageously permits the first 104 and third 105 extension tables to fold up on top of the load bed 113.

In the eleventh embodiment of the load bed extension module 102, as shown in FIGs. 39, the first extension table attachment mechanism further comprises a first hinge 122 for pivotally connecting the first extension table 104 to the base module about a first hinge axis 136. The third extension table attachment mechanism further comprises a third hinge 125 for pivotally connecting the third extension table 105 to the first extension table 104 about a third hinge axis 137. The first extension table 105 pivots upwards towards the base module 112 about the first hinge axis 136 when the first extension table 104 is in the stowed position. The third extension table 105 pivots downwards towards the base module 112 and the first extension table 104 about the third hinge axis 137 when the third extension table 105 is in the stowed position. This embodiment advantageously permits the first 104 and third 105 extension tables to collapse in an accordion fashion next to the side of the load bed.

In the twelfth embodiment of the load bed extension module 102, as shown in FIGs. 40, the first extension table attachment mechanism further a first telescoping mechanism 220 for telescopically connecting a proximal end of the first extension table 104 to the base module 112 along a horizontal axis relative to the base module 112. The third extension table attachment mechanism further comprises a first telescoping mechanism 220 for telescopically connecting a proximal end of the third extension table 105 to a distal end of the first extension table 104 along the horizontal axis relative to the base module 112. The first extension table 104 telescopes along the horizontal axis to a first position substantially inside the base module 112 when the first extension table 104 is in the stowed position. The third extension table 105 telescopes along the horizontal axis to a first position substantially inside the first extension table 104 when the third extension table 104 is in the stowed position. The first extension table 104 telescopes along the horizontal axis to a second position substantially outside the base module 112 when the first extension table 104 is in the unstowed position. The third extension table 105 telescopes along the horizontal axis to a second position substantially outside the first extension table 104 when the third extension table 105 is in the unstowed position. This embodiment advantageously permits the first 104 and third 105 extension tables to collapse inside or underneath the load bed 113.

In the twelfth embodiment of the load bed extension module 102, as shown in FIGs. 40, a top surface of the first extension table 104 is lower than a top surface of the load bed 113 by a first predetermined distance 204 when the first extension table 104 is in the unstowed position. A top surface of the third extension table 105 is lower than the top surface of the first extension table 104 by a second predetermined distance 204 when the third extension table 105 is in the unstowed position. This embodiment advantageously permits bales dispose on the first 104 and third 105 extension tables from sliding back toward the center of the bale accumulator 100.

In the eleventh and twelfth embodiment of the load bed extension module 102, as shown in FIGs. 39 and 40, the moveable frame member of the fourth frame extension member 192 is connected to the third extension table 105 to move the first 104 and third 105 extension tables between their stowed and unstowed positions in cooperation with the moveable frame member of the fourth frame extension member 192 its stowed and unstowed positions. In FIG. 39 a bias spring causes the first 104 and third 105 extension tables to pop upward about the hinge axis 225. Spacers support the tables on the moveable frame member of the fourth frame extension member 192.

G. Modular Attachment/Detachment

Preferably, the load bed extension module 102 of the present invention is attachable to and detachable from the base module 112 as a modular unit independently of any other module on the agricultural bale accumulator 100. In each of the first and second embodiments of the load bed extension module 102, as shown in FIGs. 1-23, the load bed extension module 102 is adapted to a bale accumulator Model 1030, manufactured by Hoelscher, Inc., 312 S. Main, P.O Box 195, Bushton, Kansas, U.S.A., 67427. With a modular construction, conventional bale accumulators presently used in the field may be upgraded with the load bed extension module 102 to increase the bale carrying capacity of the conventional bale accumulators. Alternatively, the modular construction of the load bed extension module 102 may offered as an option on newly manufactured bale accumulators to vary the bale carrying capacity of the bale accumulator according to the desires of the manufacturer, wholesaler, retailer or purchaser of the bale accumulator.

While the preferred embodiments describe a modular construction for the load bed extension module 102, the present invention is not limited to only a modular construction. The load bed extension module 102 may also be incorporated in to mechanical designs for bale

accumulators such that it is not possible, difficult or inconvenient to detach the load bed extension module 102 from the base module 112.

H. Combination of Extension Table Support Systems

FIG. 42 illustrates a table 212 having thirty six embodiments of the extension table support system 130 for a load bed extension module for use on and/or off a pivot axis for one or more extension tables. The twelve embodiments of the load bed extension module 102 are represented as individual combinations in the table 212. The table 212 shows each of the five embodiments for extension table support system 130 along each side of the table plus one category on each side indicating no support for an extension table. In the first and second embodiments of the load bed extension module 102, the table 212 is applied to one extension table disposed on a side of the base module 112. In the third through twelfth embodiments of the load bed extension module 102, the table 212 is applied to more than one extension table disposed on a side of the base module 112. In all twelve embodiments of the load bed extension module 102, the table 212 is applied to on and/or off a pivot axis. Thus, from the combinations in the table 212 and from the preferred embodiments described hereinabove numerous design alternatives can be achieved without departing from the spirit and scope of the present invention.

While the present invention has been described with reference to various illustrative embodiments thereof, the present invention is not intended that the invention be limited to these specific embodiments. Those skilled in the art will recognize that variations and modifications can be made without departing from the spirit and scope of the invention as set forth in the appended claims.

We claim:

CLAIMS

1. An agricultural bale accumulator comprising:

a base module including:

a load bed which is substantially planar for receiving and accumulating thereon a plurality of bales; and

a main frame for supporting the load bed above a ground surface; and

a load bed extension module including:

a first extension table which is substantially planar;

a first extension table attachment mechanism connected to the first extension table and the base module to permit the first extension table to be moveable relative to the base module between a stowed position and an unstowed position, wherein the first extension table is substantially co-planar with the load bed and adjacent to a first side of the load bed when the first extension table is in the unstowed position to permit the first extension table to accumulate thereon at least one of the plurality of bales; and

a first extension table support system connected to at least one of the base module and the first extension table, wherein the first extension table support system contacts the first extension table at a location beyond the first side of the load bed and contacts at least one of the base module and the ground surface to support the first extension table from at least one of the base module and the ground surface, respectively, when the first extension table is in the unstowed position.

2. An agricultural bale accumulator according to claim 1 wherein the first extension table support system further comprises:

a first support wheel connected to the first extension table and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface.

3. An agricultural bale accumulator according to claim 2 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface

and to permit the agricultural bale accumulator to be transported across the ground surface, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation.

4. An agricultural bale accumulator according to claim 1 wherein the first extension table support system further comprises:

a first frame extension member connected to the first extension table and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein an end surface of the first frame extension member contacts an end surface of the base module to support the first extension table from the base module.

5. An agricultural bale accumulator according to claim 4:

wherein the end surface the first frame extension member has a downward angle relative to a horizontal axis when the first extension table is in the unstowed position,

wherein the end surface on the base module has an upward angle relative to the horizontal axis which is complementary to the downward angle, and

wherein the end surface the first frame extension member contacts the end surface on the base module to translate an upward force through the first frame extension member to support the first extension table from the base module.

6. An agricultural bale accumulator according to claim 1 wherein the first extension table support system further comprises:

a second frame extension member having a first end connected to the base module and a second end connected to the first extension table and being moveable between a collapsed position and an expanded position, wherein the second frame extension member is in the collapsed position when the first extension table is in the unstowed position, wherein the second frame extension member is in the expanded position when the first extension table is in the stowed position, and wherein the second frame extension member is connected to the first extension table and the base module to support the first extension table from the base module.

7. An agricultural bale accumulator according to claim 6 wherein the second frame extension member further comprises:

a first hydraulic cylinder for moving the first extension table between the stowed position and the unstowed position responsive to receiving pressurized hydraulic fluid from a hydraulic fluid source.

8. An agricultural bale accumulator according to claim 6 wherein the second frame extension member further comprises:

at least one spring member, connected to at least one of the base module, the first extension table and the second frame extension member, for exerting a bias force on the first extension table when the first extension table is moved to at least one of the stowed position and the unstowed position.

9. An agricultural bale accumulator according to claim 1 wherein the first extension table support system further comprises:

a third frame extension member having a proximal end and a distal end, wherein the proximal end of the third frame extension member is connected to the main frame, wherein a distal end of the third frame extension member extends beyond the main frame in a direction transverse to a traveling direction of the agricultural bale accumulator at a fixed position which is located inside a road travel width dimension of the agricultural bale accumulator to permit safe traveling of the agricultural bale accumulator on a public roadway when the first extension table is in the stowed position, and

wherein a first portion of the first extension table is positioned inside the distal end of the third frame extension member and a second portion of the first extension table is positioned outside the distal end of the third frame extension member when the first extension table is in the unstowed position to permit the third frame extension member to contact the first extension table between the first portion of the first extension table and the second portion of the first extension table to support the first extension table from the main frame.

10. An agricultural bale accumulator according to claim 1 wherein the first extension table support system further comprises:

a fourth frame extension member having a proximal end and a distal end; and

a frame attachment mechanism connected to the proximal end of the fourth frame extension member and the main frame to permit the distal end of the fourth frame extension member to be moveable relative to the main frame between a stowed position and an unstowed position, wherein the distal end of the fourth frame extension member moves towards the main frame when the fourth frame extension member is in the stowed position, wherein the distal end of the fourth frame extension member moves away from the main frame when the fourth frame extension member is in the unstowed position, wherein the distal end of the fourth frame extension member contacts the first extension table to support the first extension table from the main frame when the fourth frame extension member is in the unstowed position.

11. An agricultural bale accumulator according to claim 10 wherein the frame attachment mechanism further comprises:

a pivoting mechanism for pivotally connecting the proximal end of the fourth frame extension member to the main frame about a vertical axis relative to the main frame.

12. An agricultural bale accumulator according to claim 10 wherein the frame attachment mechanism further comprises:

a telescoping mechanism for telescopically connecting the proximal end of the fourth frame extension member to the main frame along a horizontal axis relative to the main frame.

13. An agricultural bale accumulator according to claim 10 wherein the first extension table support system further comprises:

a first support wheel connected to the distal end of the fourth frame extension member and moveable with the fourth frame extension member when the fourth frame extension member moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface and when the fourth frame extension member is in the unstowed position.

14. An agricultural bale accumulator according to claim 13:

wherein the first support wheel provides a sole support for a first side of the base module from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the stowed position and when the fourth frame extension member is in the stowed position, and wherein the first support wheel provides the sole support for the first side of the base module and the first extension table from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the unstowed position and when the fourth frame extension member is in the unstowed position.

15. An agricultural bale accumulator according to claim 13 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the stowed position and the unstowed position and when the fourth frame extension member is in the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface when the fourth frame extension member is in the unstowed position, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation when the fourth frame extension member is in at least the unstowed position.

16. An agricultural bale accumulator according to claim 1 wherein the load bed extension module further comprises:

a second extension table which is substantially planar;

a second extension table attachment mechanism connected to the second extension table and the base module to permit the second extension table to be moveable relative to the base module between a stowed position and an unstowed position, wherein the second extension table is substantially co-planar with the load bed and adjacent to a second side of the load bed when the second extension table is in the unstowed position to permit the second extension table to accumulate thereon at least one of the plurality of bales; and

a second extension table support system connected to at least one of the base module and the second extension table, wherein the second extension table support system contacts the second extension table at a location beyond the second side of the load bed and contacts at least one of the base module and the ground surface to support the second extension table from at least one of the base module and the ground surface, respectively, when the second extension table is in the unstowed position.

17. An agricultural bale accumulator according to claim 1 further comprising:

a third extension table which is substantially planar;

a third extension table attachment mechanism connected to the third extension table and the first extension table to permit the third extension table to be moveable with the first extension table relative to the base module when the first extension table moves between the stowed position and the unstowed position, wherein the third extension table is moveable between a stowed position and an unstowed position relative to the first extension table, wherein the third extension table is substantially co-planar with the load bed and the first extension table and adjacent to the first extension table when the first extension table and the third extension table are each in their unstowed positions to permit the third extension table to accumulate thereon at least one of the plurality of bales; and

a third extension table support system connected to at least one of the base module, the first extension table and the third extension table, wherein the third extension table support system contacts the third extension table at a location beyond the first extension table and contacts at least one of the base module, the first extension table and the ground surface to support the third extension table from at least one of the base module, the first extension table and the ground surface, respectively, when the first extension table and the third extension table are each in their unstowed positions.

18. An agricultural bale accumulator according to claim 17:

wherein the first extension table attachment mechanism further comprises a first hinge for pivotally connecting the first extension table to the base module about a first hinge axis,

wherein the third extension table attachment mechanism further comprises a third hinge for pivotally connecting the third extension table to the first extension table about a third hinge axis,

wherein the first extension table pivots upwards towards the base module about the first hinge axis when the first extension table is in the stowed position, and

wherein the third extension table pivots upwards towards the base module and the first extension table about the third hinge axis when the third extension table is in the stowed position.

19. An agricultural bale accumulator according to claim 17:

wherein the first extension table attachment mechanism further comprises a first hinge for pivotally connecting the first extension table to the base module about a first hinge axis,

wherein the third extension table attachment mechanism further comprises a third hinge for pivotally connecting the third extension table to the first extension table about a third hinge axis,

wherein the first extension table pivots upwards towards the base module about the first hinge axis when the first extension table is in the stowed position, and

wherein the third extension table pivots downwards towards the base module and the first extension table about the third hinge axis when the third extension table is in the stowed position.

20. An agricultural bale accumulator according to claim 17:

wherein the first extension table attachment mechanism further a first telescoping mechanism for telescopically connecting a proximal end of the first extension table to the base module along a horizontal axis relative to the base module,

wherein the third extension table attachment mechanism further comprises a first telescoping mechanism for telescopically connecting a proximal end of the third extension table to a distal end of the first extension table along the horizontal axis relative to the base module,

wherein the first extension table telescopes along the horizontal axis to a first position substantially inside the base module when the first extension table is in the stowed position, and wherein the third extension table telescopes along the horizontal axis to a first position

substantially inside the first extension table when the third extension table is in the stowed position, and

wherein the first extension table telescopes along the horizontal axis to a second position substantially outside the base module when the first extension table is in the unstowed position, and wherein the third extension table telescopes along the horizontal axis to a second position substantially outside the first extension table when the third extension table is in the unstowed position.

21. An agricultural bale accumulator according to claim 20:

wherein a top surface of the first extension table is lower than a top surface of the load bed by a first predetermined distance when the first extension table is in the unstowed position, and

wherein a top surface of the third extension table is lower than the top surface of the first extension table by a second predetermined distance when the third extension table is in the unstowed position.

22. An agricultural bale accumulator according to claim 1 wherein the load bed extension module is attachable to and detachable from the base module independently of any other module on the agricultural bale accumulator.

23. An agricultural bale accumulator according to claim 1 further comprising:

a first bale position sensor for sensing that at least one of the plurality of bales is disposed on the first extension table.

24. An agricultural bale accumulator according to claim 1 wherein the first extension table attachment mechanism further comprises:

a first hinge for pivotally coupling the first extension table to the base module about a first hinge axis.

25. An agricultural bale accumulator according to claim 1 wherein the load bed receives the plurality of bales in a first direction along a first axis, the agricultural bale accumulator further comprising:

a bale transfer module operable to displace the plurality of bales received on the load bed across the load bed and the first extension table in a second direction along a second axis transverse to the first axis to accumulate the plurality of bales on the load bed and the first extension table in a side-by-side relationship when the first extension table is in the unstowed position.

26. An agricultural bale accumulator according to claim 1:

a bale discharge module operable to discharge the plurality of bales accumulated on the load bed and the first extension table to the ground surface.

27. An agricultural bale accumulator according to claim 26 wherein the bale discharge module further comprises:

at least a portion of the load bed pivotally connected to the main frame about a pivot point disposed on a horizontal pivot axis and moveable relative to the main frame between a bale accumulating position and a bale discharging position, wherein the at least a portion of the load bed is in a horizontal position relative to the main frame when the at least a portion of the load bed is in the bale accumulating position to permit the at least a portion of the load bed and the first extension table to accumulate thereon the plurality of bales, and wherein the at least a portion of the load bed is in an inclined position relative to the main frame when the load bed is in the bale discharging position to permit the at least a portion of the load bed and the first extension table to discharge the plurality of bales accumulated thereon to the ground surface,

wherein the first extension table attachment mechanism connects the first extension table to the at least a portion of the load bed to permit the first extension table to be moveable with the at least a portion of the load bed when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position, and

wherein the first extension table support system contacts the first extension table and contacts at least one of the base module and the ground surface to support the first extension table from at least one of the base module and the ground surface, respectively, when the first

extension table is in the unstowed position and when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position.

28. An agricultural bale accumulator according to claim 27 wherein the first extension table support system further comprises:

a first support wheel connected to the first extension table at a location on the horizontal pivot axis and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface about the horizontal pivot axis.

29. An agricultural bale accumulator according to claim 28 further comprising:

a first wheel and a second wheel coupled to the main frame on the horizontal pivot axis, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation when the first extension table is in the unstowed position and when the at least a portion of the load bed is in at least the bale accumulating position.

30. An agricultural bale accumulator according to claim 27 wherein the first extension table support system further comprises:

a first frame extension member connected to the first extension table and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein an end surface of the first frame extension member contacts an end surface of the base module at the pivot point to support the first extension table from the pivot point on the base module.

31. An agricultural bale accumulator according to claim 30:

wherein the end surface the first frame extension member has a downward angle relative to a horizontal axis when the first extension table is in the unstowed position,

wherein the end surface on the base module has an upward angle relative to the horizontal axis which is complementary to the downward angle, and

wherein the end surface the first frame extension member contacts the end surface on the base module at the pivot point to translate an upward force through the first frame extension member to support the first extension table from the pivot point on the base module.

32. An agricultural bale accumulator according to claim 27 wherein the first extension table support system further comprises:

a second frame extension member having a first end connected to the base module at the pivot point and a second end connected to the first extension table and being moveable between a collapsed position and an expanded position, wherein the second frame extension member is in the collapsed position when the first extension table is in the unstowed position, wherein the second frame extension member is in the expanded position when the first extension table is in the stowed position, and wherein the second frame extension member is connected to the first extension table and the base module to support the first extension table from the pivot point on the base module.

33. An agricultural bale accumulator according to claim 32 wherein the second frame extension member further comprises:

a first hydraulic cylinder for moving the first extension table between the stowed position and the unstowed position responsive to receiving pressurized hydraulic fluid from a hydraulic fluid source.

34. An agricultural bale accumulator according to claim 33 further comprising:

a second hydraulic fluid cylinder having a first end connected to the main frame and a second end connected to the at least a portion of the load bed, wherein the second cylinder moves the at least a portion of the load bed relative to the main frame between the bale accumulating position and the bale discharging position responsive to receiving pressurized hydraulic fluid from the hydraulic fluid source; and

a hydraulic valve for selectively routing the pressurized hydraulic fluid from the hydraulic fluid source to one of the first hydraulic cylinder and the second hydraulic cylinder responsive to an electric control signal.

35. An agricultural bale accumulator according to claim 32 wherein the first extension table support system further comprises:

at least one spring member, connected to at least one of the base module, the first extension table and the second frame extension member, for exerting a bias force on the first extension table when the first extension table is moved to at least one of the stowed position and the unstowed position.

36. An agricultural bale accumulator according to claim 27 wherein the first extension table support system further comprises:

a third frame extension member having a proximal end and a distal end, wherein the proximal end of the third frame extension member is connected to the main frame, wherein a distal end of the third frame extension member extends beyond the main frame in a direction transverse to a traveling direction of the agricultural bale accumulator at a fixed position on the horizontal pivot axis which is located inside a road travel width dimension of the agricultural bale accumulator to permit safe traveling of the agricultural bale accumulator on a public roadway when the first extension table is in the stowed position, and

wherein a first portion of the first extension table is positioned inside the distal end of the third frame extension member and a second portion of the first extension table is positioned outside the distal end of the third frame extension member when the first extension table is in the unstowed position to permit the distal end of the third frame extension member to contact the first extension table at the fixed position on the horizontal pivot axis between the first portion of the first extension table and the second portion of the first extension table to support the first extension table from the main frame about the horizontal pivot axis.

37. An agricultural bale accumulator according to claim 27 wherein the first extension table support system further comprises:

a fourth frame extension member having a proximal end and a distal end; and

a frame attachment mechanism connected to the proximal end of the fourth frame extension member and the main frame to permit the distal end of the fourth frame extension member to be moveable relative to the main frame between a stowed position and an unstowed position, wherein the distal end of the fourth frame extension member moves towards the main frame when the fourth frame extension member is in the stowed position, wherein the distal end of the fourth frame extension member moves away from the main frame to a position on the horizontal pivot axis when the fourth frame extension member is in the unstowed position, wherein the distal end of the fourth frame extension member contacts the first extension table at the position on the horizontal pivot axis to support the first extension table from the main frame about the horizontal pivot axis when the fourth frame extension member is in the unstowed position.

38. An agricultural bale accumulator according to claim 37 wherein the frame attachment mechanism further comprises:

a pivoting mechanism for pivotally connecting the proximal end of the fourth frame extension member to the main frame about a vertical axis relative to the main frame.

39. An agricultural bale accumulator according to claim 37 wherein the frame attachment mechanism further comprises:

a telescoping mechanism for telescopically connecting the proximal end of the fourth frame extension member to the main frame along a horizontal axis relative to the main frame.

40. An agricultural bale accumulator according to claim 37 wherein the first extension table support system further comprises:

a first support wheel connected to the distal end of the fourth frame extension member and moveable with the fourth frame extension member when the fourth frame extension member moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface when the fourth frame extension member is in the unstowed position.

41. An agricultural bale accumulator according to claim 40:

wherein the first support wheel provides a sole support a first side of the base module from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the stowed position and when the fourth frame extension member is in the stowed position, and wherein the first support wheel provides the sole support the first side of the base module and the first extension table from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the fourth frame extension member is in the unstowed position.

42. An agricultural bale accumulator according to claim 40 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface when the first extension table is in the unstowed position, when the fourth frame extension member is in the unstowed position and when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation.

43. An agricultural bale accumulator according to claim 27 further comprising:

an alignment mechanism for aligning the at least a portion of the load bed with the main frame when the at least a portion of the load bed is in the bale accumulating position.

44. An agricultural bale accumulator according to claim 27 further comprising:

a latch mechanism for latching the at least a portion of the load bed to the main frame when the at least a portion of the load bed is in the bale accumulating position and for unlatching the at least a portion of the load bed from the main frame when the at least a portion of the load bed is in the bale discharging position.

45. An agricultural bale accumulator according to claim 27 wherein the load bed extension module further comprising:

a second extension table which is substantially planar;

a second extension table attachment mechanism connected to the second extension table and the base module to permit the second extension table to be moveable relative to the base module between a stowed position and an unstowed position, wherein the second extension table is substantially co-planar with the load bed and adjacent to a second side of the load bed when the second extension table is in the unstowed position to permit the second extension table to accumulate thereon at least one of the plurality of bales when the at least a portion of the load bed is in the bale accumulating position; and

a second extension table support system connected to at least one of the base module and the second extension table, wherein the second extension table support system contacts the second extension table at a location beyond the second side of the load bed and contacts at least one of the base module and the ground surface to support the second extension table from at least one of the base module and the ground surface, respectively, when the second extension table is in the unstowed position and when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position.

46. An agricultural bale accumulator according to claim 27 further comprising:

a third extension table which is substantially planar;

a third extension table attachment mechanism connected to the third extension table and the first extension table to permit the third extension table to be moveable with the first extension table relative to the base module when the first extension table moves between the stowed position and the unstowed position, wherein the third extension table is moveable between a stowed position and an unstowed position relative to the first extension table, wherein the third extension table is substantially co-planar with the load bed and the first extension table and adjacent to the first extension table when the first extension table and the third extension table are each in their unstowed positions to permit the third extension table to accumulate thereon at least one of the plurality of bales when the at least a portion of the load bed is in the bale accumulating position; and

a third extension table support system connected to at least one of the base module, the first extension table and the third extension table, wherein the third extension table support system contacts the third extension table at a location beyond the first extension table and contacts at least one of the base module, the first extension table and the ground surface to support the third extension table from at least one of the base module, the first extension table and the ground surface, respectively, when the first extension table and the third extension table are each in their unstowed positions and when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position.

47. An agricultural bale accumulator according to claim 46:

wherein the first extension table attachment mechanism further comprises a first hinge for pivotally connecting the first extension table to the base module about a first hinge axis,

wherein the third extension table attachment mechanism further comprises a third hinge for pivotally connecting the third extension table to the first extension table about a third hinge axis,

wherein the first extension table pivots upwards towards the base module about the first hinge axis when the first extension table is in the stowed position, and

wherein the third extension table pivots upwards towards the base module and the first extension table about the third hinge axis when the third extension table is in the stowed position.

48. An agricultural bale accumulator according to claim 46:

wherein the first extension table attachment mechanism further comprises a first hinge for pivotally connecting the first extension table to the base module about a first hinge axis,

wherein the third extension table attachment mechanism further comprises a third hinge for pivotally connecting the third extension table to the first extension table about a third hinge axis,

wherein the first extension table pivots upwards towards the base module about the first hinge axis when the first extension table is in the stowed position, and

wherein the third extension table pivots downwards towards the base module and the first extension table about the third hinge axis when the third extension table is in the stowed position.

49. An agricultural bale accumulator according to claim 46:

wherein the first extension table attachment mechanism further a first telescoping mechanism for telescopically connecting a proximal end of the first extension table to the base module along a horizontal axis relative to the base module,

wherein the third extension table attachment mechanism further comprises a first telescoping mechanism for telescopically connecting a proximal end of the third extension table to a distal end of the first extension table along the horizontal axis relative to the base module,

wherein the first extension table telescopes along the horizontal axis to a first position substantially inside the base module when the first extension table is in the stowed position, and wherein the third extension table telescopes along the horizontal axis to a first position substantially inside the first extension table when the third extension table is in the stowed position, and

wherein the first extension table telescopes along the horizontal axis to a second position substantially outside the base module when the first extension table is in the unstowed position, and wherein the third extension table telescopes along the horizontal axis to a second position substantially outside the first extension table when the third extension table is in the unstowed position.

50. An agricultural bale accumulator according to claim 46:

wherein a top surface of the first extension table is lower than a top surface of the load bed by a first predetermined distance when the first extension table is in the unstowed position, and

wherein a top surface of the third extension table is lower than the top surface of the first extension table by a second predetermined distance when the third extension table is in the unstowed position.

51. An agricultural bale accumulator according to claim 27 wherein the load bed extension module is attachable to and detachable from the base module independently of any other module on the agricultural bale accumulator.

52. An agricultural bale accumulator according to claim 27 further comprising:

a first bale position sensor for sensing that at least one of the plurality of bales is disposed on the first extension table.

53. An agricultural bale accumulator according to claim 27 wherein the first extension table attachment mechanism further comprises:

a first hinge for pivotally coupling the first extension table to the base module about a first hinge axis.

54. An agricultural bale accumulator according to claim 27 wherein the load bed receives the plurality of bales in a first direction along a first axis, the agricultural bale accumulator further comprising:

a bale transfer module operable to displace the plurality of bales received on the load bed across the load bed and the first extension table in a second direction along a second axis transverse to the first axis to accumulate the plurality of bales on the load bed and the first extension table in a side-by-side relationship when the first extension table is in the unstowed position and when the at least a portion of the load bed is in the bale accumulating position.

55. An agricultural bale accumulator comprising:

a base module including:

a load bed which is substantially planar for receiving a plurality of bales to accumulate thereon the plurality of bales; and

a main frame for supporting the load bed above a ground surface;

a bale discharge module including at least a portion of the load bed pivotally connected to the main frame about a pivot point disposed on a horizontal pivot axis and moveable relative to the main frame between a bale accumulating position and a bale discharging position, wherein the at least a portion of the load bed is in a horizontal position relative to the main frame when the at

least a portion of the load bed is in the bale accumulating position to permit the at least a portion of the load bed to accumulate thereon the plurality of bales, and wherein the at least a portion of the load bed is in an inclined position relative to the main frame when the load bed is in the bale discharging position to permit the at least a portion of the load bed to discharge the plurality of bales accumulated thereon to the ground surface;

a load bed extension module including:

a first extension table which is substantially planar;

a first hinge for pivotally connecting the first extension table to the at least a portion of the load bed about a first hinge axis to permit the first extension table to be moveable relative to the at least a portion of the load bed between a stowed position and an unstowed position and to permit the first extension table to be moveable with the at least a portion of the load bed when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position, wherein the first extension table is substantially co-planar with the at least a portion of the load bed and adjacent to a first side of the at least a portion of the load bed when the first extension table is in the unstowed position to permit the first extension table to accumulate thereon at least one of the plurality of bales when the at least a portion of the load bed is in the bale accumulating position; and

a first extension table support system connected to at least one of the base module and the first extension table, wherein the first extension table support system contacts the first extension table at a location beyond the first side of the load bed and contacts at least one of the base module and the ground surface to support the first extension table from at least one of the base module and the ground surface, respectively, when the first extension table is in the unstowed position and when the at least a portion of the load bed is in at least one of the bale accumulating position and the bale discharging position; and

a bale transfer module operable to distribute the plurality of bales received on the load bed across the load bed and the first extension table to accumulate the plurality of bales on the load bed and the first extension table when the first extension table is in the unstowed position and when the at least a portion of the load bed is in the bale accumulating position.

56. An agricultural bale accumulator according to claim 55 wherein the first extension table support system supports the first extension table at a location between a front side of the load bed where the plurality of bales are received on the load bed and the horizontal pivot axis when the first extension table is in the unstowed position and when the at least a portion of the load bed is in the bale accumulating position.

57. An agricultural bale accumulator according to claim 56 wherein the first extension table support system further comprises:

a first support wheel connected to the first extension table and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface.

58. An agricultural bale accumulator according to claim 57 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation.

59. An agricultural bale accumulator according to claim 56 wherein the first extension table support system further comprises:

a first frame extension member connected to the first extension table and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein an end surface of the first frame extension member contacts an end surface of the base module to support the first extension table from the base module.

60. An agricultural bale accumulator according to claim 59:

wherein the end surface the first frame extension member has a downward angle relative to a horizontal axis when the first extension table is in the unstowed position,

wherein the end surface on the base module has an upward angle relative to the horizontal axis which is complementary to the downward angle, and

wherein the end surface the first frame extension member contacts the end surface on the base module to translate an upward force through the first frame extension member to support the first extension table from the base module.

61. An agricultural bale accumulator according to claim 56 wherein the first extension table support system further comprises:

a second frame extension member having a first end connected to the base module and a second end connected to the first extension table and being moveable between a collapsed position and an expanded position, wherein the second frame extension member is in the collapsed position when the first extension table is in the unstowed position, wherein the second frame extension member is in the expanded position when the first extension table is in the stowed position, and wherein the second frame extension member is connected to the first extension table and the base module to support the first extension table from the base module.

62. An agricultural bale accumulator according to claim 61 wherein the second frame extension member further comprises:

a first hydraulic cylinder for moving the first extension table between the stowed position and the unstowed position responsive to receiving pressurized hydraulic fluid from a hydraulic fluid source.

63. An agricultural bale accumulator according to claim 62 further comprising:

a second hydraulic fluid cylinder having a first end connected to the main frame and a second end connected to the at least a portion of the load bed, wherein the second cylinder moves the at least a portion of the load bed relative to the main frame between the bale accumulating position and the bale discharging position responsive to receiving pressurized hydraulic fluid from the hydraulic fluid source; and

a hydraulic valve for selectively routing the pressurized hydraulic fluid from the hydraulic fluid source to one of the first hydraulic cylinder and the second hydraulic cylinder responsive to an electric control signal.

64. An agricultural bale accumulator according to claim 61 wherein the second frame extension member further comprises:

at least one spring member, connected to at least one of the base module, the first extension table and the second frame extension member, for exerting a bias force on the first extension table when the first extension table is moved to at least one of the stowed position and the unstowed position.

65. An agricultural bale accumulator according to claim 56 wherein the first extension table support system further comprises:

a third frame extension member having a proximal end and a distal end, wherein the proximal end of the third frame extension member is connected to the main frame, wherein a distal end of the third frame extension member extends beyond the main frame in a direction transverse to a traveling direction of the agricultural bale accumulator at a fixed position which is located inside a road travel width dimension of the agricultural bale accumulator to permit safe traveling of the agricultural bale accumulator on a public roadway when the first extension table is in the stowed position, and

wherein a first portion of the first extension table is positioned inside the distal end of the third frame extension member and a second portion of the first extension table is positioned outside the distal end of the third frame extension member when the first extension table is in the unstowed position to permit the third frame extension member to contact the first extension table between the first portion of the first extension table and the second portion of the first extension table to support the first extension table from the main frame.

66. An agricultural bale accumulator according to claim 56 wherein the first extension table support system further comprises:

a fourth frame extension member having a proximal end and a distal end; and

a frame attachment mechanism connected to the proximal end of the fourth frame extension member and the main frame to permit the distal end of the fourth frame extension member to be moveable relative to the main frame between a stowed position and an unstowed position, wherein the distal end of the fourth frame extension member moves towards the main

frame when the fourth frame extension member is in the stowed position, wherein the distal end of the fourth frame extension member moves away from the main frame when the fourth frame extension member is in the unstowed position, wherein the distal end of the fourth frame extension member contacts the first extension table to support the first extension table from the main frame when the fourth frame extension member is in the unstowed position.

67. An agricultural bale accumulator according to claim 66 wherein the frame attachment mechanism further comprises:

a pivoting mechanism for pivotally connecting the proximal end of the fourth frame extension member to the main frame about a vertical axis relative to the main frame.

68. An agricultural bale accumulator according to claim 66 wherein the frame attachment mechanism further comprises:

a telescoping mechanism for telescopically connecting the proximal end of the fourth frame extension member to the main frame along a horizontal axis relative to the main frame.

69. An agricultural bale accumulator according to claim 66 wherein the first extension table support system further comprises:

a first support wheel connected to the distal end of the fourth frame extension member and moveable with the fourth frame extension member when the fourth frame extension member moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface when the fourth frame extension member is in the unstowed position.

70. An agricultural bale accumulator according to claim 69:

wherein the first support wheel provides a sole support for a first side of the base module from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the stowed position and when the fourth frame extension member is in the stowed position, and wherein the first support wheel provides the sole support for the first side of the base module and the first extension table from the ground surface to permit the agricultural bale accumulator to be transported across the

ground surface when the first extension table is the unstowed position and when the first extension table is in the unstowed position and when the fourth frame extension member is in the unstowed position.

71. An agricultural bale accumulator according to claim 69 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the stowed position and the unstowed position and when the fourth frame extension member is in the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface when the first extension table is the unstowed position and when the fourth frame extension member is in the unstowed position, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation when the fourth frame extension member is in at least the unstowed position.

72. An agricultural bale accumulator according to claim 55 wherein the first extension table support system supports the first extension table about the horizontal pivot axis when the first extension table is in the unstowed position and when the at least a portion of the load bed is moves between the bale accumulating position and the bale discharging position.

73. An agricultural bale accumulator according to claim 72 wherein the first extension table support system further comprises:

a first support wheel connected to the first extension table at a location on the horizontal pivot axis and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface about the horizontal pivot axis when the first extension table is in the unstowed position and when the at least a portion of the load bed is moves between the bale accumulating position and the bale discharging position.

74. An agricultural bale accumulator according to claim 73 further comprising:

a first wheel and a second wheel coupled to the main frame on the horizontal pivot axis, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation.

75. An agricultural bale accumulator according to claim 72 wherein the first extension table support system further comprises:

a first frame extension member connected to the first extension table and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein a proximal end surface of the first frame extension member contacts an end surface of the base module at the pivot point to support the first extension table from the pivot point on the base module.

76. An agricultural bale accumulator according to claim 75:

wherein the proximal end surface the first frame extension member has a downward angle relative to a horizontal axis when the first extension table is in the unstowed position,

wherein the end surface on the base module has an upward angle relative to the horizontal axis which is complementary to the downward angle, and

wherein the proximal end surface the first frame extension member contacts the end surface on the base module at the pivot point to translate an upward force through the first frame extension member to support the first extension table from the pivot point on the base module.

77. An agricultural bale accumulator according to claim 72 wherein the first extension table support system further comprises:

a second frame extension member having a first end connected to the base module at the pivot point and a second end connected to the first extension table and being moveable between a collapsed position and an expanded position, wherein the second frame extension member is in the collapsed position when the first extension table is in the unstowed position, wherein the

second frame extension member is in the expanded position when the first extension table is in the stowed position, and wherein the second frame extension member is connected to the first extension table and the base module to support the first extension table from the pivot point on the base module.

78. An agricultural bale accumulator according to claim 77 wherein the second frame extension member further comprises:

a first hydraulic cylinder for moving the first extension table between the stowed position and the unstowed position responsive to receiving pressurized hydraulic fluid from a hydraulic fluid source.

79. An agricultural bale accumulator according to claim 78 further comprising:

a second hydraulic fluid cylinder having a first end connected to the main frame and a second end connected to the at least a portion of the load bed, wherein the second cylinder moves the at least a portion of the load bed relative to the main frame between the bale accumulating position and the bale discharging position responsive to receiving pressurized hydraulic fluid from the hydraulic fluid source; and

a hydraulic valve for selectively routing the pressurized hydraulic fluid from the hydraulic fluid source to one of the first hydraulic cylinder and the second hydraulic cylinder responsive to an electric control signal.

80. An agricultural bale accumulator according to claim 77 wherein the first extension table support system further comprises:

at least one spring member, connected to at least one of the base module, the first extension table and the second frame extension member, for exerting a bias force on the first extension table when the first extension table is moved to at least one of the stowed position and the unstowed position.

81. An agricultural bale accumulator according to claim 72 wherein the first extension table support system further comprises:

a third frame extension member having a proximal end and a distal end, wherein the proximal end of the third frame extension member is connected to the main frame, wherein a distal end of the third frame extension member extends beyond the main frame in a direction transverse to a traveling direction of the agricultural bale accumulator at a fixed position on the horizontal pivot axis which is located inside a road travel width dimension of the agricultural bale accumulator to permit safe traveling of the agricultural bale accumulator on a public roadway when the first extension table is in the stowed position, and

wherein a first portion of the first extension table is positioned inside the distal end of the third frame extension member and a second portion of the first extension table is positioned outside the distal end of the third frame extension member when the first extension table is in the unstowed position to permit the distal end of the third frame extension member to contact the first extension table at the fixed position on the horizontal pivot axis between the first portion of the first extension table and the second portion of the first extension table to support the first extension table from the main frame about the horizontal pivot axis.

82. An agricultural bale accumulator according to claim 72 wherein the first extension table support system further comprises:

a fourth frame extension member having a proximal end and a distal end; and

a frame attachment mechanism connected to the proximal end of the fourth frame extension member and the main frame to permit the distal end of the fourth frame extension member to be moveable relative to the main frame between a stowed position and an unstowed position, wherein the distal end of the fourth frame extension member moves towards the main frame when the fourth frame extension member is in the stowed position, wherein the distal end of the fourth frame extension member moves away from the main frame to a position on the horizontal pivot axis when the fourth frame extension member is in the unstowed position, wherein the distal end of the fourth frame extension member contacts the first extension table at the position on the horizontal pivot axis to support the first extension table from the main frame about the horizontal pivot axis when the fourth frame extension member is in the unstowed position.

83. An agricultural bale accumulator according to claim 82 wherein the frame attachment mechanism further comprises:

a pivoting mechanism for pivotally connecting the proximal end of the fourth frame extension member to the main frame about a vertical axis relative to the main frame.

84. An agricultural bale accumulator according to claim 82 wherein the frame attachment mechanism further comprises:

a telescoping mechanism for telescopically connecting the proximal end of the fourth frame extension member to the main frame along a horizontal axis relative to the main frame.

85. An agricultural bale accumulator according to claim 82 wherein the first extension table support system further comprises:

a first support wheel connected to the distal end of the fourth frame extension member and moveable with the fourth frame extension member when the fourth frame extension member moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface when the fourth frame extension member is in the unstowed position.

86. An agricultural bale accumulator according to claim 85:

wherein the first support wheel provides a sole support a first side of the base module from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the stowed position and when the fourth frame extension member is in the stowed position, and wherein the first support wheel provides the sole support the first side of the base module and the first extension table from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the fourth frame extension member is in the unstowed position.

87. An agricultural bale accumulator according to claim 85 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface,

wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface when the first extension table is in the unstowed position, when the fourth frame extension member is in the unstowed position and when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation when the fourth frame extension member is in at least the unstowed position.

88. An agricultural bale accumulator according to claim 55:

wherein a first part of the first extension table support system supports the first extension table at a location between a front side of the load bed where the plurality of bales are received on the load bed and the horizontal pivot axis when the first extension table is in the unstowed position and when the at least a portion of the load bed is in the bale accumulating position, and

wherein a second part of the first extension table support system supports the first extension table about the horizontal pivot axis when the first extension table is in the unstowed position and when the at least a portion of the load bed is moves between the bale accumulating position and the bale discharging position.

89. An agricultural bale accumulator according to claim 88 wherein at least one of the first part of the first extension table support system and the second part of the first extension table support system further comprises:

a first support wheel connected to the first extension table and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface.

90. An agricultural bale accumulator according to claim 89 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface, and

wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation.

91. An agricultural bale accumulator according to claim 88 wherein at least one of the first part of the first extension table support system and the second part of the first extension table support system further comprises:

a first frame extension member connected to the first extension table and moveable with the first extension table when the first extension table moves between the stowed position and the unstowed position, wherein an end surface of the first frame extension member contacts an end surface of the base module to support the first extension table from the base module.

92. An agricultural bale accumulator according to claim 91:

wherein the end surface the first frame extension member has a downward angle relative to a horizontal axis when the first extension table is in the unstowed position,

wherein the end surface on the base module has an upward angle relative to the horizontal axis which is complementary to the downward angle, and

wherein the end surface the first frame extension member contacts the end surface on the base module to translate an upward force through the first frame extension member to support the first extension table from the base module.

93. An agricultural bale accumulator according to claim 88 wherein at least one of the first part of the first extension table support system and the second part of the first extension table support system further comprises:

a second frame extension member having a first end connected to the base module and a second end connected to the first extension table and being moveable between a collapsed position and an expanded position, wherein the second frame extension member is in the collapsed position when the first extension table is in the unstowed position, wherein the second frame extension member is in the expanded position when the first extension table is in the stowed position, and wherein the second frame extension member is connected to the first extension table and the base module to support the first extension table from the base module.

94. An agricultural bale accumulator according to claim 93 wherein the second frame extension member further comprises:

a first hydraulic cylinder for moving the first extension table between the stowed position and the unstowed position responsive to receiving pressurized hydraulic fluid from a hydraulic fluid source.

95. An agricultural bale accumulator according to claim 94 further comprising:

a second hydraulic fluid cylinder having a first end connected to the main frame and a second end connected to the at least a portion of the load bed, wherein the second cylinder moves the at least a portion of the load bed relative to the main frame between the bale accumulating position and the bale discharging position responsive to receiving pressurized hydraulic fluid from the hydraulic fluid source; and

a hydraulic valve for selectively routing the pressurized hydraulic fluid from the hydraulic fluid source to one of the first hydraulic cylinder and the second hydraulic cylinder responsive to an electric control signal.

96. An agricultural bale accumulator according to claim 93 wherein the second frame extension member further comprises:

at least one spring member, connected to at least one of the base module, the first extension table and the second frame extension member, for exerting a bias force on the first extension table when the first extension table is moved to at least one of the stowed position and the unstowed position.

97. An agricultural bale accumulator according to claim 88 wherein at least one of the first part of the first extension table support system and the second part of the first extension table support system further comprises:

a third frame extension member having a proximal end and a distal end, wherein the proximal end of the third frame extension member is connected to the main frame, wherein a distal end of the third frame extension member extends beyond the main frame in a direction transverse to a traveling direction of the agricultural bale accumulator at a fixed position which is located inside a road travel width dimension of the agricultural bale accumulator to permit safe

traveling of the agricultural bale accumulator on a public roadway when the first extension table is in the stowed position, and

wherein a first portion of the first extension table is positioned inside the distal end of the third frame extension member and a second portion of the first extension table is positioned outside the distal end of the third frame extension member when the first extension table is in the unstowed position to permit the third frame extension member to contact the first extension table between the first portion of the first extension table and the second portion of the first extension table to support the first extension table from the main frame.

98. An agricultural bale accumulator according to claim 88 wherein at least one of the first part of the first extension table support system and the second part of the first extension table support system further comprises:

a fourth frame extension member having a proximal end and a distal end; and

a frame attachment mechanism connected to the proximal end of the fourth frame extension member and the main frame to permit the distal end of the fourth frame extension member to be moveable relative to the main frame between a stowed position and an unstowed position, wherein the distal end of the fourth frame extension member moves towards the main frame when the fourth frame extension member is in the stowed position, wherein the distal end of the fourth frame extension member moves away from the main frame when the fourth frame extension member is in the unstowed position, wherein the distal end of the fourth frame extension member contacts the first extension table to support the first extension table from the main frame when the fourth frame extension member is in the unstowed position.

99. An agricultural bale accumulator according to claim 98 wherein the frame attachment mechanism further comprises:

a pivoting mechanism for pivotally connecting the proximal end of the fourth frame extension member to the main frame about a vertical axis relative to the main frame.

100. An agricultural bale accumulator according to claim 98 wherein the frame attachment mechanism further comprises:

a telescoping mechanism for telescopically connecting the proximal end of the fourth frame extension member to the main frame along a horizontal axis relative to the main frame.

101. An agricultural bale accumulator according to claim 98 wherein the first extension table support system further comprises:

a first support wheel connected to the distal end of the fourth frame extension member and moveable with the fourth frame extension member when the fourth frame extension member moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground surface when the fourth frame extension member is in the unstowed position.

102. An agricultural bale accumulator according to claim 101:

wherein the first support wheel provides a sole support for a first side of the base module from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the stowed position and when the fourth frame extension member is in the stowed position, and wherein the first support wheel provides the sole support for the first side of the base module and the first extension table from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is the unstowed position and when the first extension table is in the unstowed position and when the fourth frame extension member is in the unstowed position.

103. An agricultural bale accumulator according to claim 101 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the stowed position and the unstowed position and when the fourth frame extension member is in the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the first extension table from the ground

surface when the first extension table is the unstowed position and when the fourth frame extension member is in the unstowed position, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation when the fourth frame extension member is in at least the unstowed position.

104. An agricultural bale accumulator according to claim 55 further comprising:

a third extension table which is substantially planar; and

a third hinge for pivotally connecting the third extension table to the first extension table to permit the third extension table to be moveable with the first extension table relative to the base module when the first extension table moves between the stowed position and the unstowed position, wherein the third extension table is moveable between a stowed position and an unstowed position relative to the first extension table, wherein the third extension table is substantially co-planar with the load bed and the first extension table and adjacent to the first extension table when each of the first extension table and the third extension table are in the unstowed position to permit the third extension table to accumulate thereon at least one of the plurality of bales when the at least a portion of the load bed is in the bale accumulating position.

105. An agricultural bale accumulator according to claim 104 further comprising:

a third extension table support system connected to at least one of the base module, the first extension table and the third extension table, wherein the third extension table support system contacts the third extension table at a location beyond the first extension table and contacts at least one of the base module, the first extension table and the ground surface to support the third extension table from at least one of the base module, the first extension table and the ground surface, respectively, when each of the first extension table and the third extension table are in the unstowed position and when the at least a portion of the load bed is moves between the bale accumulating position and the bale discharging position.

106. An agricultural bale accumulator according to claim 105:

wherein the third extension table support system supports the third extension table at a location between a front side of the load bed where the plurality of bales are received on the load bed and the horizontal pivot axis when each of the first extension table and the third extension

table are in the unstowed position and when the at least a portion of the load bed is in the bale accumulating position, and

wherein the third extension table support system supports the third extension table about the horizontal pivot axis when each of the first extension table and the third extension table are in the unstowed position and when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position.

107. An agricultural bale accumulator according to claim 106 wherein the third extension table support system further comprises:

a first support wheel connected to the third extension table and moveable with the third extension table when the third extension table moves between the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the third extension table from the ground surface.

108. An agricultural bale accumulator according to claim 107 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation.

109. An agricultural bale accumulator according to claim 106 wherein the third extension table support system further comprises:

a first frame extension member connected to the third extension table and moveable with the third extension table when the third extension table moves between the stowed position and the unstowed position, wherein an end surface of the first frame extension member contacts an end surface of at least one of the base module and the first extension table to support the third extension table from at least one of the base module and the first extension table.

110. An agricultural bale accumulator according to claim 109:

wherein the end surface the first frame extension member has a downward angle relative to a horizontal axis when the first extension table is in the unstowed position,

wherein the end surface on at least one of the base module and the first extension table has an upward angle relative to the horizontal axis which is complementary to the downward angle, and

wherein the end surface the first frame extension member contacts the end surface on at least one of the base module and the first extension table to translate an upward force through the first frame extension member to support the third extension table from at least one of the base module and the first extension table.

111. An agricultural bale accumulator according to claim 106 wherein the third extension table support system further comprises:

a second frame extension member having a first end connected to at least one of the base module and the first extension table and a second end connected to the third extension table and being moveable between a collapsed position and an expanded position, wherein the second frame extension member is in the collapsed position when the third extension table is in the unstowed position, wherein the second frame extension member is in the expanded position when the third extension table is in the stowed position, and wherein the second frame extension member is connected to the third extension table and at least one of the base module and the first extension table to support the first extension table from at least one of the base module and the first extension table.

112. An agricultural bale accumulator according to claim 111 wherein the second frame extension member further comprises:

a first hydraulic cylinder for moving the third extension table between the stowed position and the unstowed position responsive to receiving pressurized hydraulic fluid from a hydraulic fluid source.

113. An agricultural bale accumulator according to claim 112 further comprising:

a second hydraulic fluid cylinder having a first end connected to the main frame and a second end connected to the at least a portion of the load bed, wherein the second cylinder moves the at least a portion of the load bed relative to the main frame between the bale accumulating position and the bale discharging position responsive to receiving pressurized hydraulic fluid from the hydraulic fluid source; and

a hydraulic valve for selectively routing the pressurized hydraulic fluid from the hydraulic fluid source to one of the first hydraulic cylinder and the second hydraulic cylinder responsive to an electric control signal.

114. An agricultural bale accumulator according to claim 111 wherein the second frame extension member further comprises:

at least one spring member, connected to at least one of the base module, the first extension table, the third table, and the second frame extension member, for exerting a bias force on the third extension table when the third extension table is moved to at least one of the stowed position and the unstowed position.

115. An agricultural bale accumulator according to claim 106 wherein the third extension table support system further comprises:

a third frame extension member having a proximal end and a distal end, wherein the proximal end of the third frame extension member is connected to the main frame, wherein a distal end of the third frame extension member extends beyond the main frame in a direction transverse to a traveling direction of the agricultural bale accumulator at a fixed position which is located inside a road travel width dimension of the agricultural bale accumulator to permit safe traveling of the agricultural bale accumulator on a public roadway when each of the first extension table and the third extension table are in the unstowed position, and

wherein a first portion of the third extension table is positioned inside the distal end of the third frame extension member and a second portion of the third extension table is positioned outside the distal end of the third frame extension member when the third extension table is in the unstowed position to permit the third frame extension member to contact the third extension

table between the first portion of the third extension table and the second portion of the third extension table to support the third extension table from the main frame.

116. An agricultural bale accumulator according to claim 106 wherein the third extension table support system further comprises:

a fourth frame extension member having a proximal end and a distal end; and

a frame attachment mechanism connected to the proximal end of the fourth frame extension member and the main frame to permit the distal end of the fourth frame extension member to be moveable relative to the main frame between a stowed position and an unstowed position, wherein the distal end of the fourth frame extension member moves towards the main frame when the fourth frame extension member is in the stowed position, wherein the distal end of the fourth frame extension member moves away from the main frame when the fourth frame extension member is in the unstowed position, wherein the distal end of the fourth frame extension member contacts the third extension table to support the third extension table from the main frame when the fourth frame extension member is in the unstowed position.

117. An agricultural bale accumulator according to claim 116 wherein the frame attachment mechanism further comprises:

a pivoting mechanism for pivotally connecting the proximal end of the fourth frame extension member to the main frame about a vertical axis relative to the main frame.

118. An agricultural bale accumulator according to claim 116 wherein the frame attachment mechanism further comprises:

a telescoping mechanism for telescopically connecting the proximal end of the fourth frame extension member to the main frame along a horizontal axis relative to the main frame.

119. An agricultural bale accumulator according to claim 116 wherein the third extension table support system further comprises:

a first support wheel connected to the distal end of the fourth frame extension member and moveable with the fourth frame extension member when the fourth frame extension member moves between the stowed position and the unstowed position, wherein the first support wheel

contacts the ground surface to support the third extension table from the ground surface when the fourth frame extension member is in the unstowed position.

120. An agricultural bale accumulator according to claim 119:

wherein the first support wheel provides a sole support for a first side of the base module from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the third extension table is in the stowed position and when the fourth frame extension member is in the stowed position, and wherein the first support wheel provides the sole support for the first side of the base module and the first extension table from the ground surface to permit the agricultural bale accumulator to be transported across the ground surface when the first extension table is in the unstowed position, when the third extension table is the unstowed position and when the fourth frame extension member is in the unstowed position.

121. An agricultural bale accumulator according to claim 119 further comprising:

a first wheel and a second wheel coupled to the main frame, wherein the first wheel and the second wheel contact the ground surface to support the base module from the ground surface and to permit the agricultural bale accumulator to be transported across the ground surface when each of the first extension table and the third extension table are in the stowed position and the unstowed position and when the fourth frame extension member is in the stowed position and the unstowed position, wherein the first support wheel contacts the ground surface to support the third extension table from the ground surface when each of the first extension table and the third extension table are in the unstowed position and when the fourth frame extension member is in the unstowed position, and wherein the first wheel, the second wheel and the first support wheel share a common axis of rotation when the fourth frame extension member is in at least the unstowed position.

122. An agricultural bale accumulator according to claim 104:

wherein the first extension table pivots upwards towards the base module about the first hinge axis when the first extension table is in the stowed position, and

wherein the third extension table pivots upwards towards the base module and the first extension table about the third hinge axis when the third extension table is in the stowed position.

123. An agricultural bale accumulator according to claim 104:

wherein the first extension table pivots upwards towards the base module about the first hinge axis when the first extension table is in the stowed position, and

wherein the third extension table pivots downwards towards the base module and the first extension table about the third hinge axis when the third extension table is in the stowed position.

124. An agricultural bale accumulator according to claim 55 further comprising:

an alignment mechanism for aligning the at least a portion of the load bed with the main frame when the at least a portion of the load bed is in the bale accumulating position.

125. An agricultural bale accumulator according to claim 55 further comprising:

a latch mechanism for latching the at least a portion of the load bed to the main frame when the at least a portion of the load bed is in the bale accumulating position and for unlatching the at least a portion of the load bed from the main frame when the at least a portion of the load bed is in the bale discharging position.

126. An agricultural bale accumulator according to claim 55 wherein the load bed extension module further comprising:

a second extension table which is substantially planar;

a second extension table attachment mechanism connected to the second extension table and the base module to permit the second extension table to be moveable relative to the base module between a stowed position and an unstowed position, wherein the second extension table is substantially co-planar with the load bed and adjacent to a second side of the load bed when the second extension table is in the unstowed position to permit the second extension table to accumulate thereon at least one of the plurality of bales; and

a second extension table support system connected to at least one of the base module and the second extension table, wherein the second extension table support system contacts the second extension table at a location beyond the second side of the load bed and contacts at least one of the base module and the ground surface to support the second extension table from at least one of the base module and the ground surface, respectively, when the second extension table is in the unstowed position and when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position.

127. An agricultural bale accumulator according to claim 55 wherein the load bed extension module is attachable to and detachable from the base module independently of any other module on the agricultural bale accumulator.

128. An agricultural bale accumulator according to claim 55 further comprising:

a first bale position sensor for sensing that at least one of the plurality of bales is disposed on the first extension table.

129. An agricultural bale accumulator comprising:

a base module including:

a load bed which is substantially planar for receiving a plurality of bales to accumulate thereon the plurality of bales; and

a main frame for supporting the load bed above a ground surface;

a bale discharge module including at least a portion of the load bed pivotally connected to the main frame about a pivot point disposed on a horizontal pivot axis and moveable relative to the main frame between a bale accumulating position and a bale discharging position, wherein the at least a portion of the load bed is in a horizontal position relative to the main frame when the at least a portion of the load bed is in the bale accumulating position to permit the at least a portion of the load bed to accumulate thereon the plurality of bales, and wherein the at least a portion of the load bed is in an inclined position relative to the main frame when the load bed is in the bale discharging position to permit the at least a portion of the load bed to discharge the plurality of bales accumulated thereon to the ground surface;

a load bed extension module including:

a first extension table which is substantially planar;

a first hinge for pivotally connecting the first extension table to the at least a portion of the load bed about a first hinge axis to permit the first extension table to be moveable relative to the at least a portion of the load bed between a stowed position and an unstowed position and to permit the first extension table to be moveable with the at least a portion of the load bed when the at least a portion of the load bed moves between the bale accumulating position and the bale discharging position, wherein the first extension table is substantially co-planar with the at least a portion of the load bed and adjacent to a first side of the at least a portion of the load bed when the first extension table is in the unstowed position to permit the first extension table to accumulate thereon at least one of the plurality of bales when the at least a portion of the load bed is in the bale accumulating position; and

a first extension table support system connected to at least one of the base module and the first extension table, wherein the first extension table support system contacts the first extension table at a location beyond the first side of the load bed and contacts at least one of the base module and the ground surface to support the first extension table from at least one of the base module and the ground surface, respectively, when the first extension table is in the unstowed position and when the at least a portion of the load bed is in at least one of the bale accumulating position and the bale discharging position,

wherein a first part of the first extension table support system supports the first extension table at a location between a front side of the load bed where the plurality of bales are received on the load bed and the horizontal pivot axis when the first extension table is in the unstowed position and when the at least a portion of the load bed is in the bale accumulating position, and

wherein a second part of the first extension table support system supports the first extension table about the horizontal pivot axis when the first extension table is in the unstowed position and when the at least a portion of the load bed is moves between the bale accumulating position and the bale discharging position;

a third extension table which is substantially planar;

a third hinge for pivotally connecting the third extension table to the first extension table to permit the third extension table to be moveable with the first extension table relative to the base module when the first extension table moves between the stowed position

and the unstowed position, wherein the third extension table is moveable between a stowed position and an unstowed position relative to the first extension table, wherein the third extension table is substantially co-planar with the load bed and the first extension table and adjacent to the first extension table when each of the first extension table and the third extension table are in the unstowed position to permit the third extension table to accumulate thereon at least one of the plurality of bales when the at least a portion of the load bed is in the bale accumulating position; and

a third extension table support system connected to at least one of the base module, the first extension table and the third extension table, wherein the third extension table support system contacts the third extension table at a location beyond the first extension table and contacts at least one of the base module, the first extension table and the ground surface to support the third extension table from at least one of the base module, the first extension table and the ground surface, respectively, when each of the first extension table and the third extension table are in the unstowed position and when the at least a portion of the load bed is in at least one of the bale accumulating position and the bale discharging position,

wherein a first part of the third extension table support system supports the third extension table at a location between a front side of the load bed where the plurality of bales are received on the load bed and the horizontal pivot axis when each of the first extension table and the third extension table are in the unstowed position and when the at least a portion of the load bed is in the bale accumulating position, and

wherein a second part of the third extension table support system supports the third extension table about the horizontal pivot axis when each of the first extension table and the third extension table are in the unstowed position and when the at least a portion of the load bed is moves between the bale accumulating position and the bale discharging position; and

a bale transfer module operable to distribute the plurality of bales received on the load bed across the load bed, the first extension table and the third extension table to accumulate the plurality of bales on the load bed, the first extension table and the third extension table when each of the first extension table and the third extension table are in the unstowed position and when the at least a portion of the load bed is in the bale accumulating position.

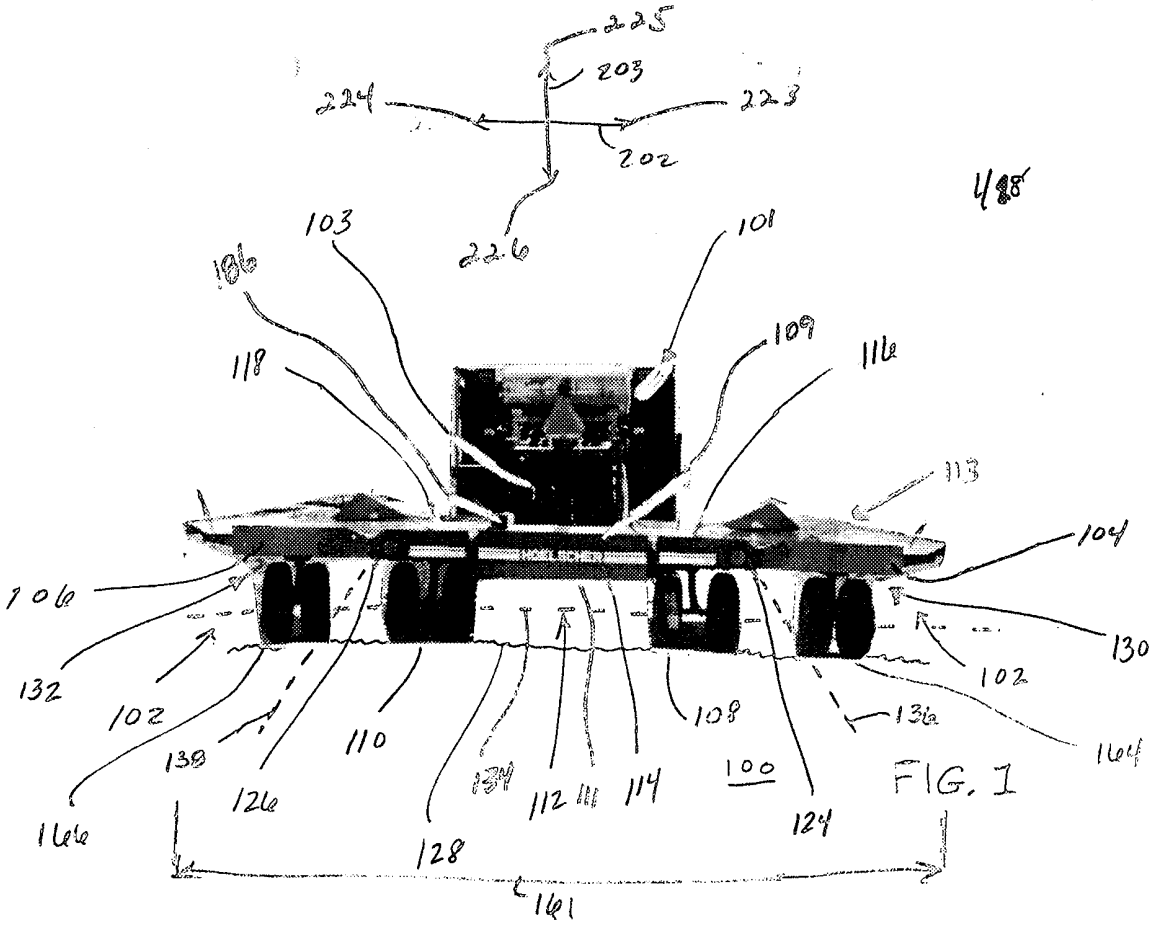

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FIG. 1

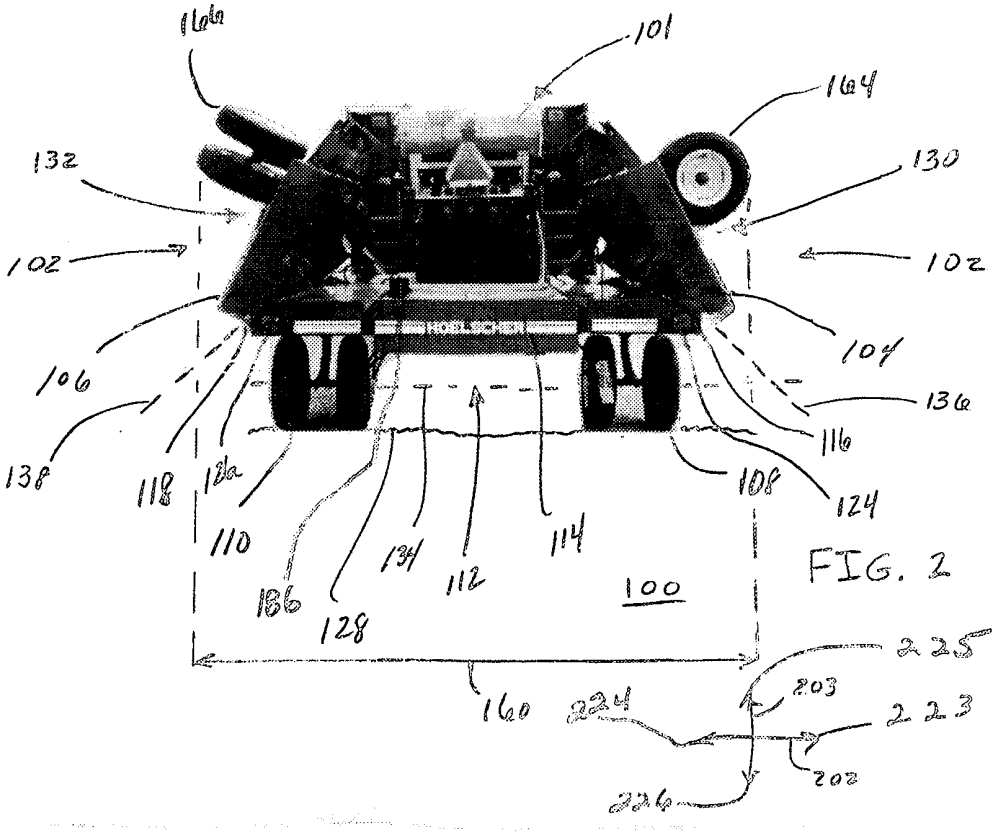

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FIG. 2

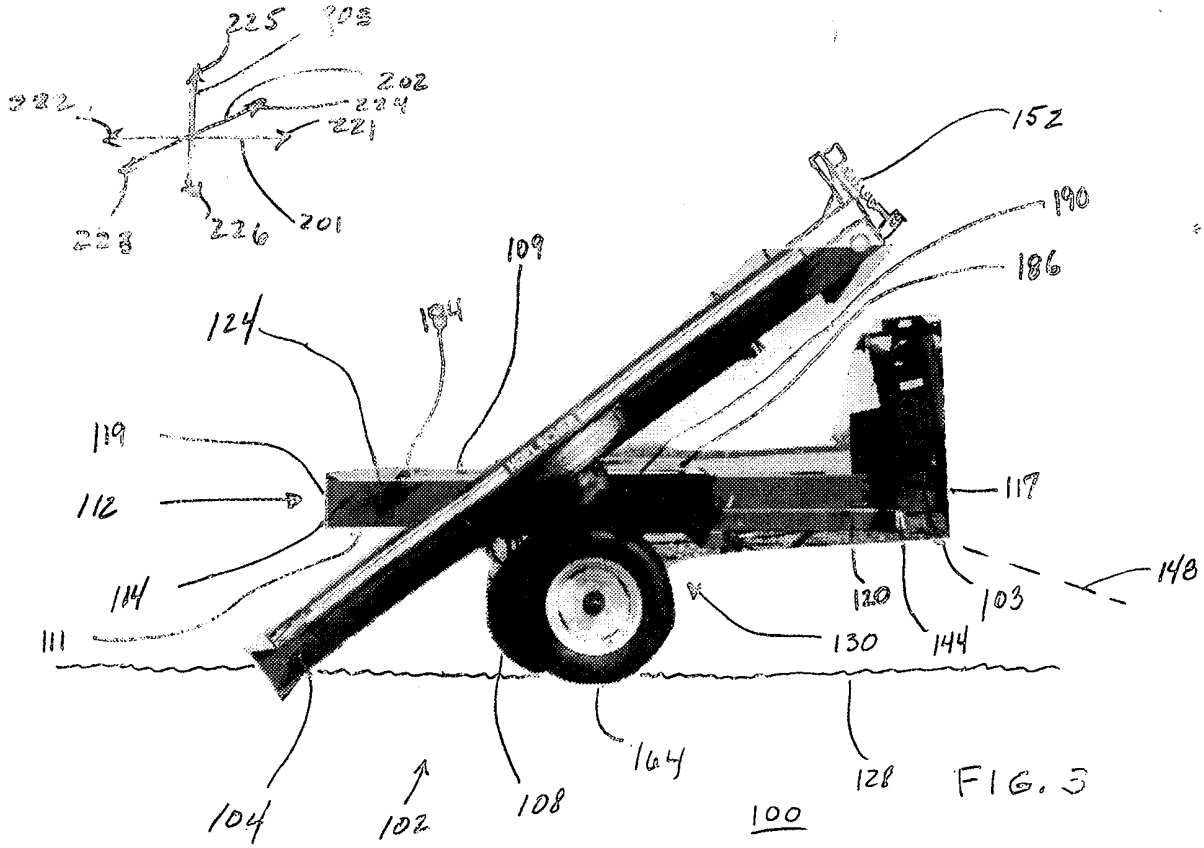

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FIG. 3

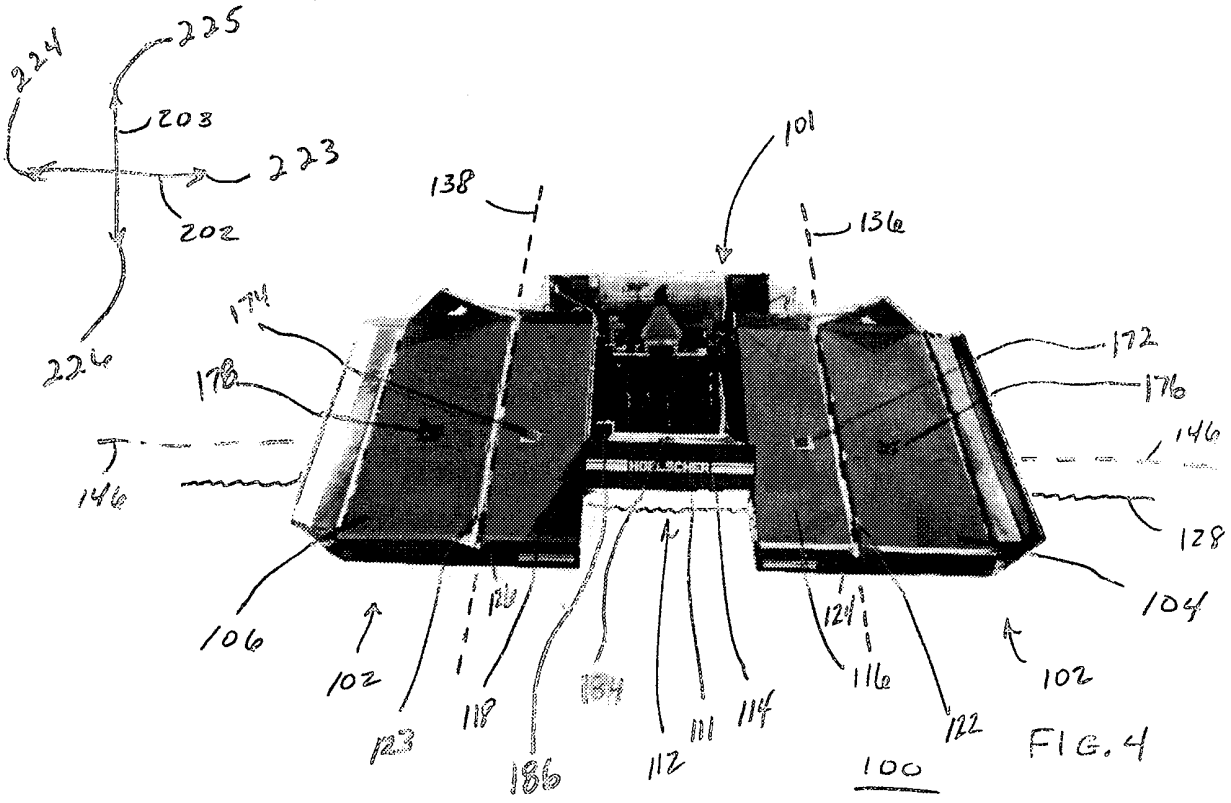

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FIG. 4

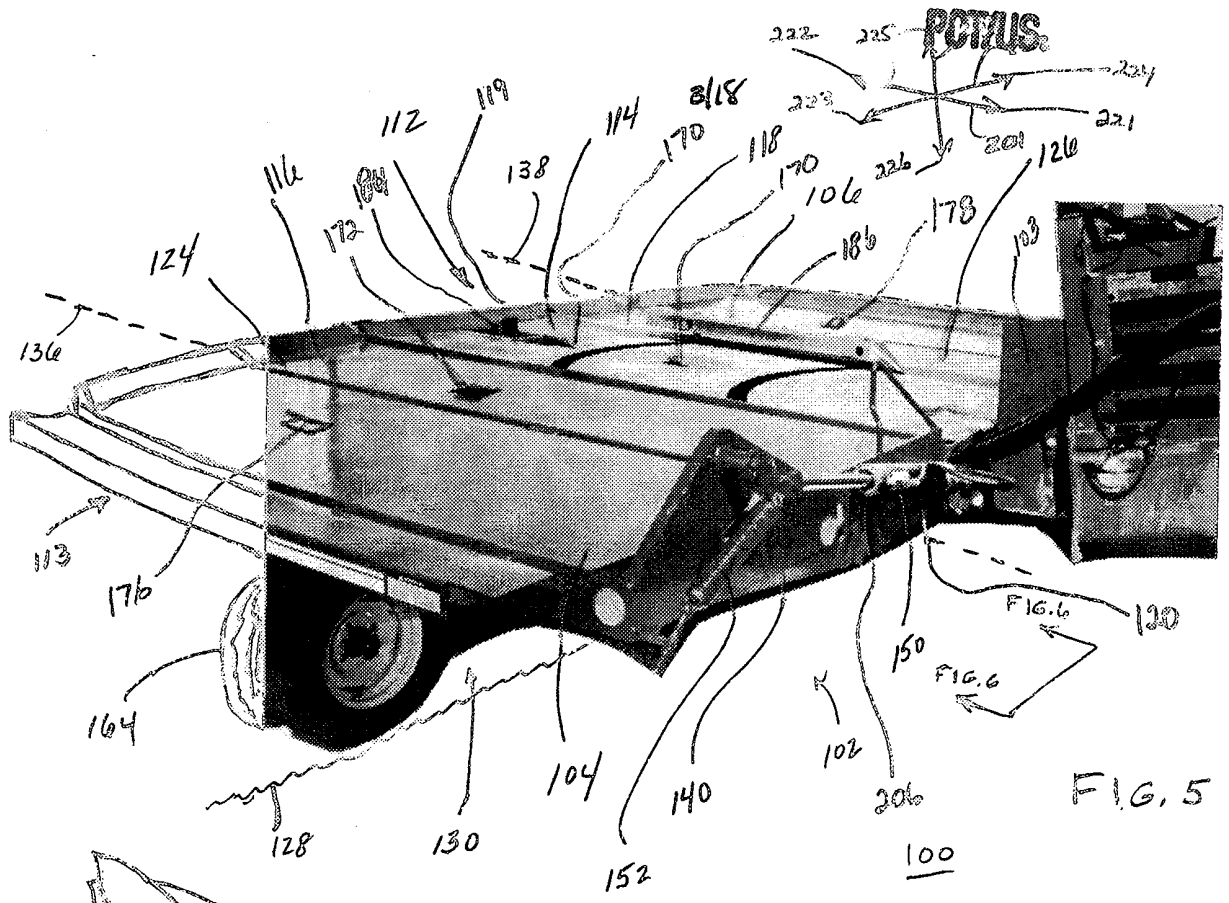

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FIG.6
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FIG. 5

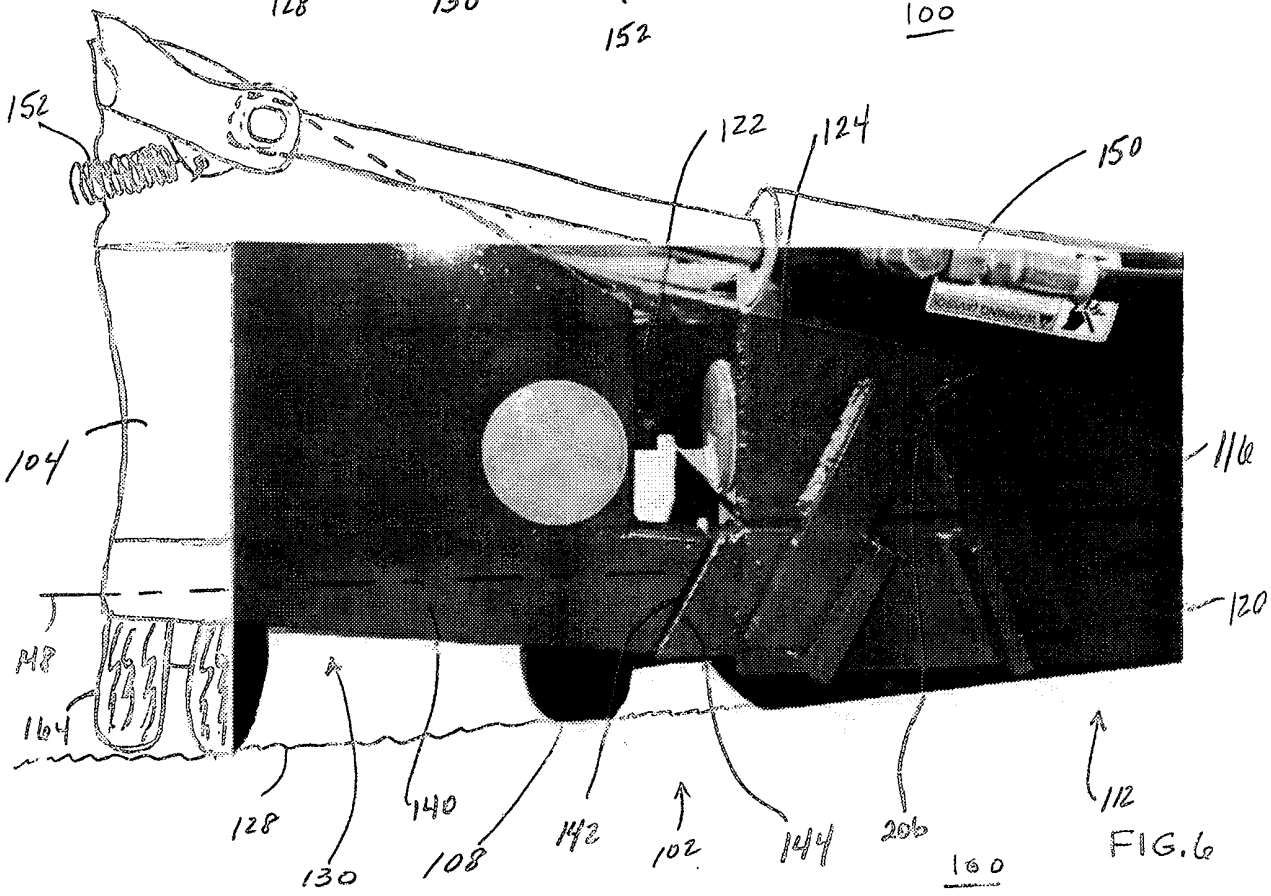
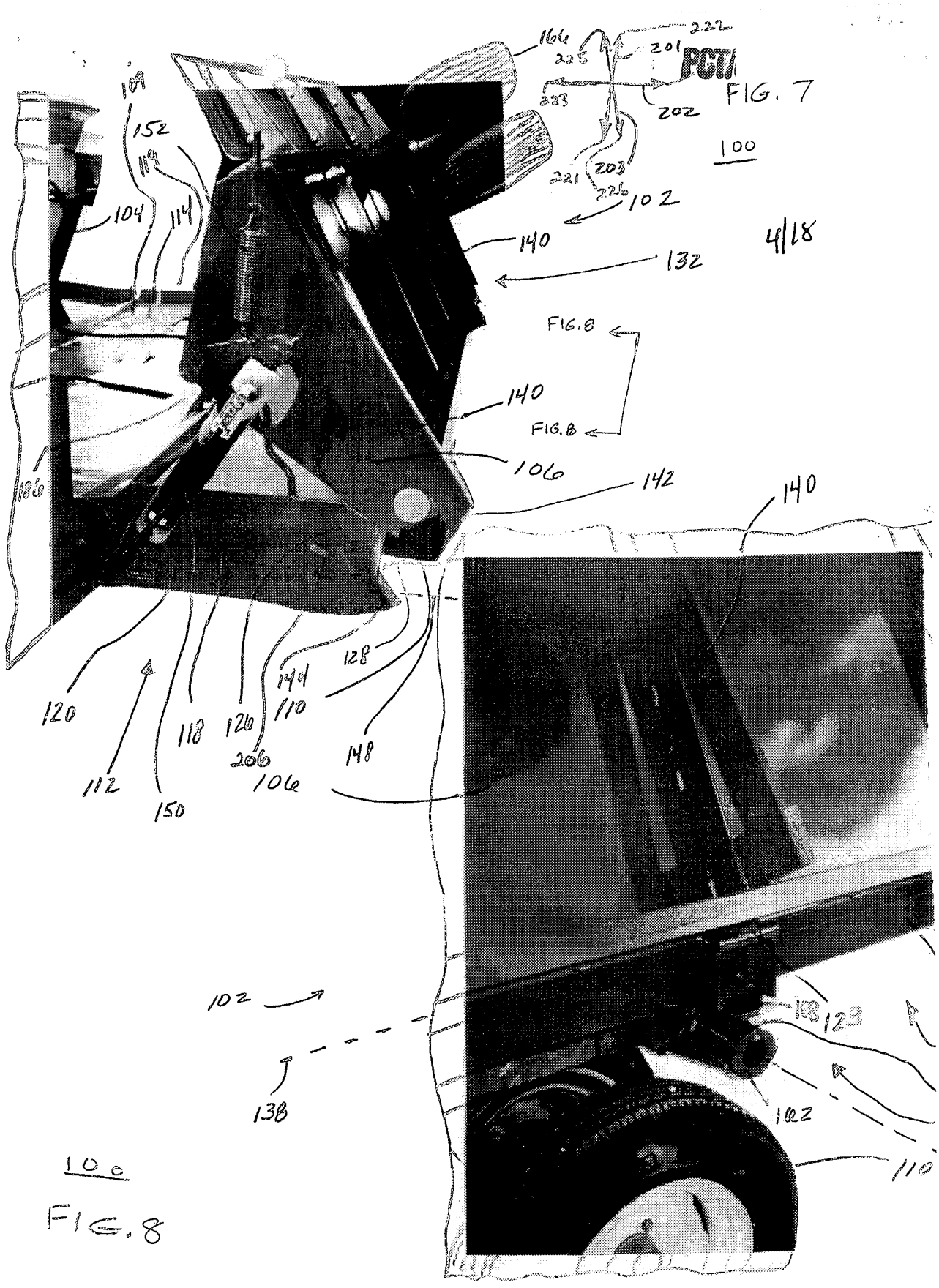

152
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FIG. 6


164
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FIG. 7
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FIG. 8
FIG. 8
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FIG. 8
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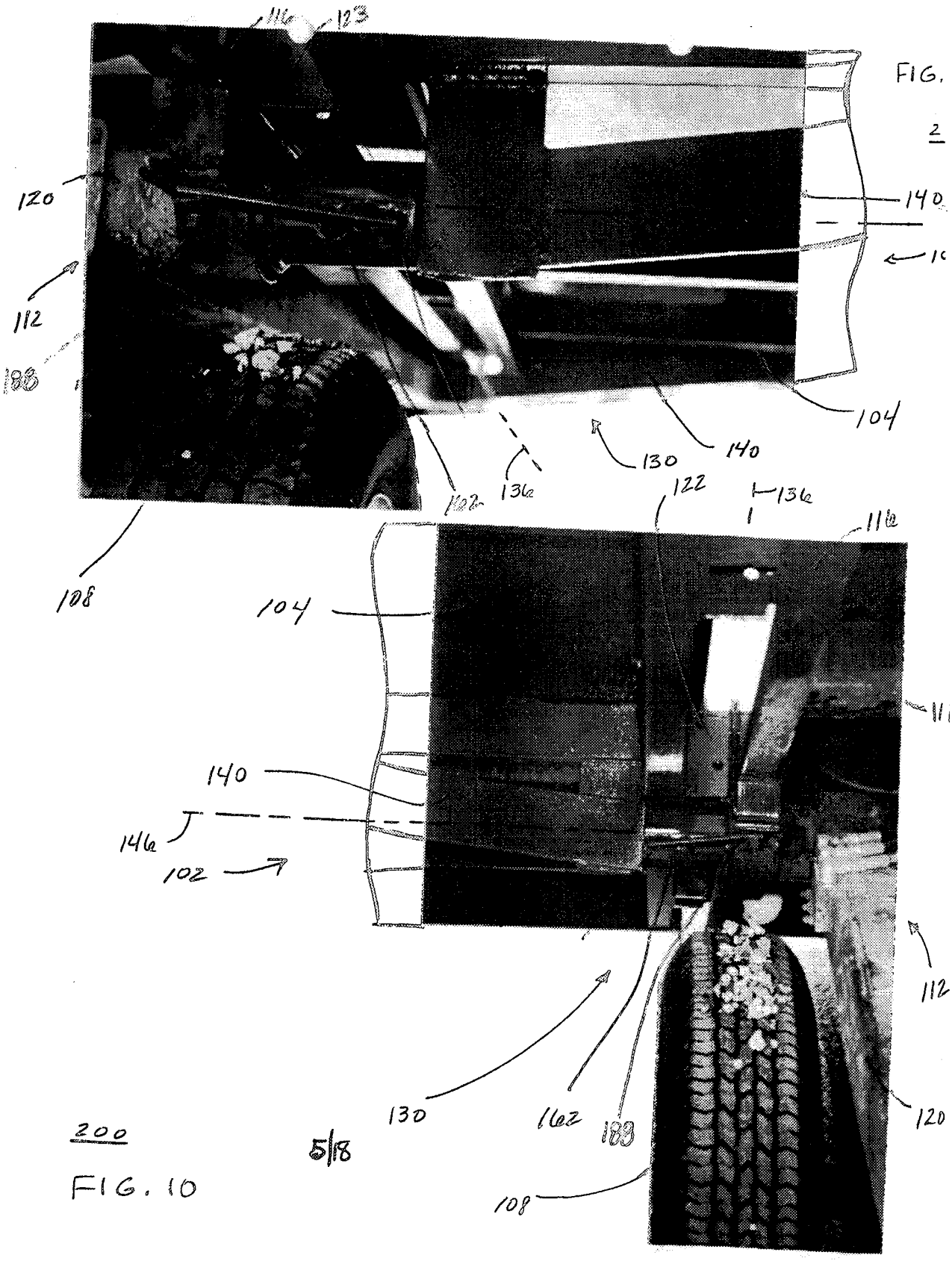
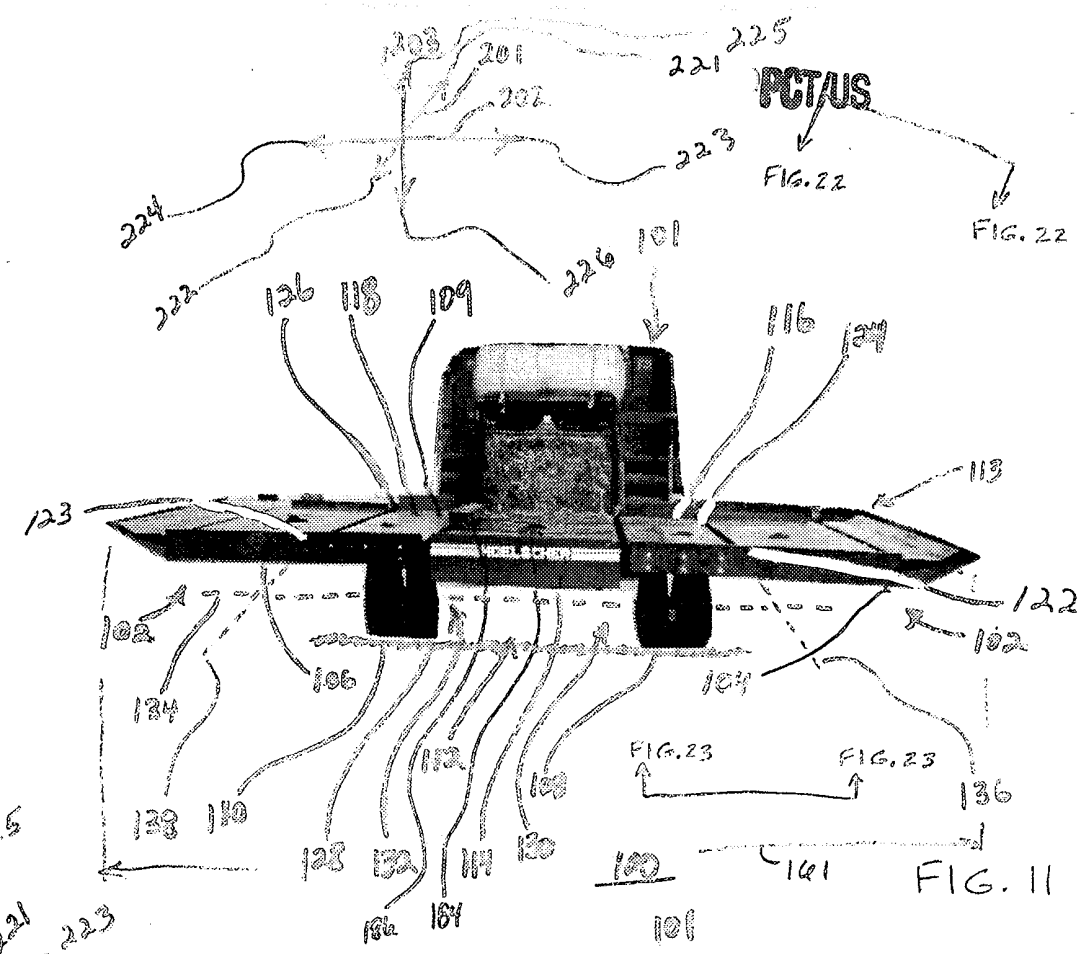
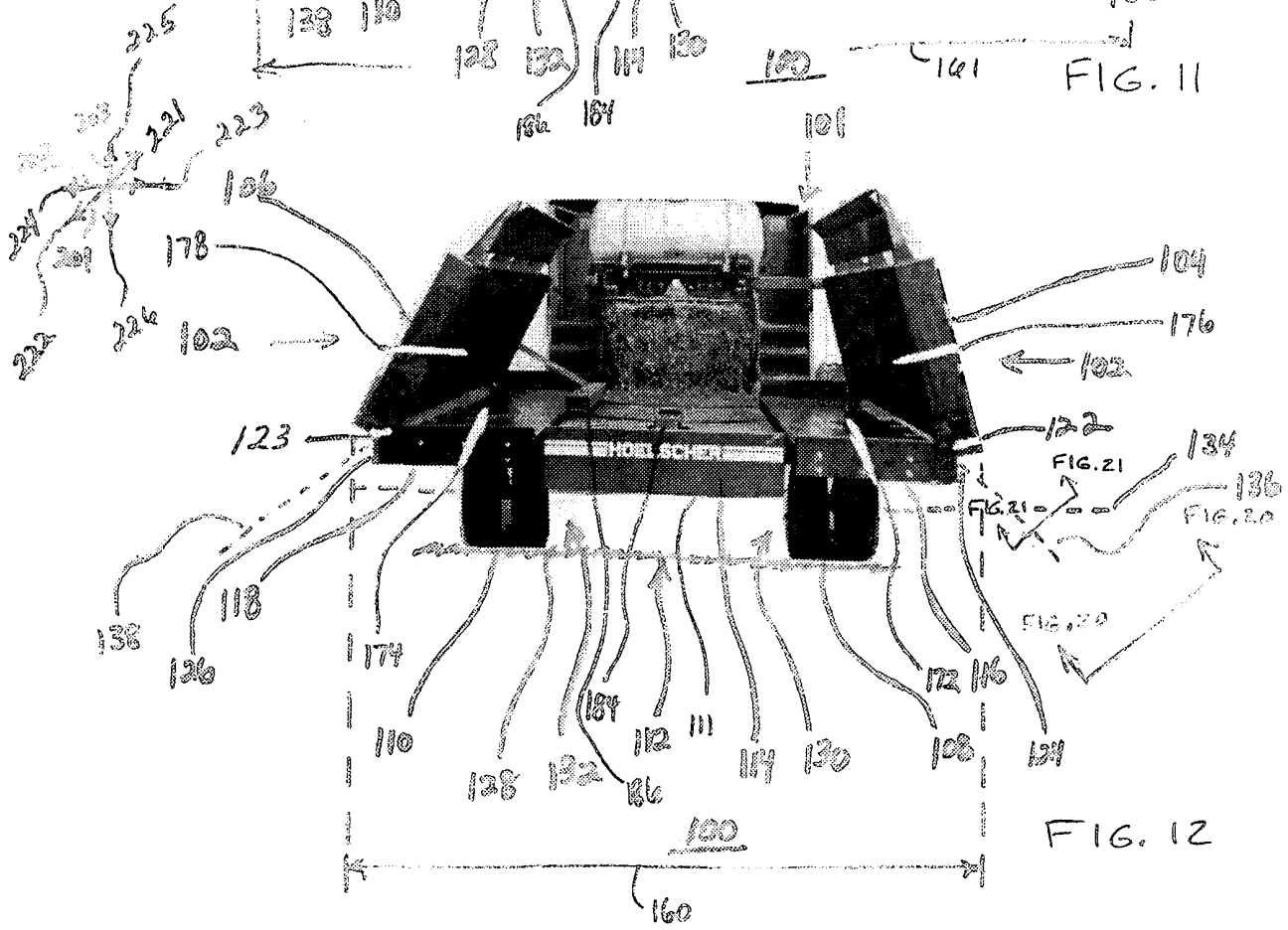

116a
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FIG. 10


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FIG. 22
FIG. 22
FIG. 23
FIG. 23
FIG. 11


FIG. 21
FIG. 21
FIG. 20
FIG. 20
FIG. 12

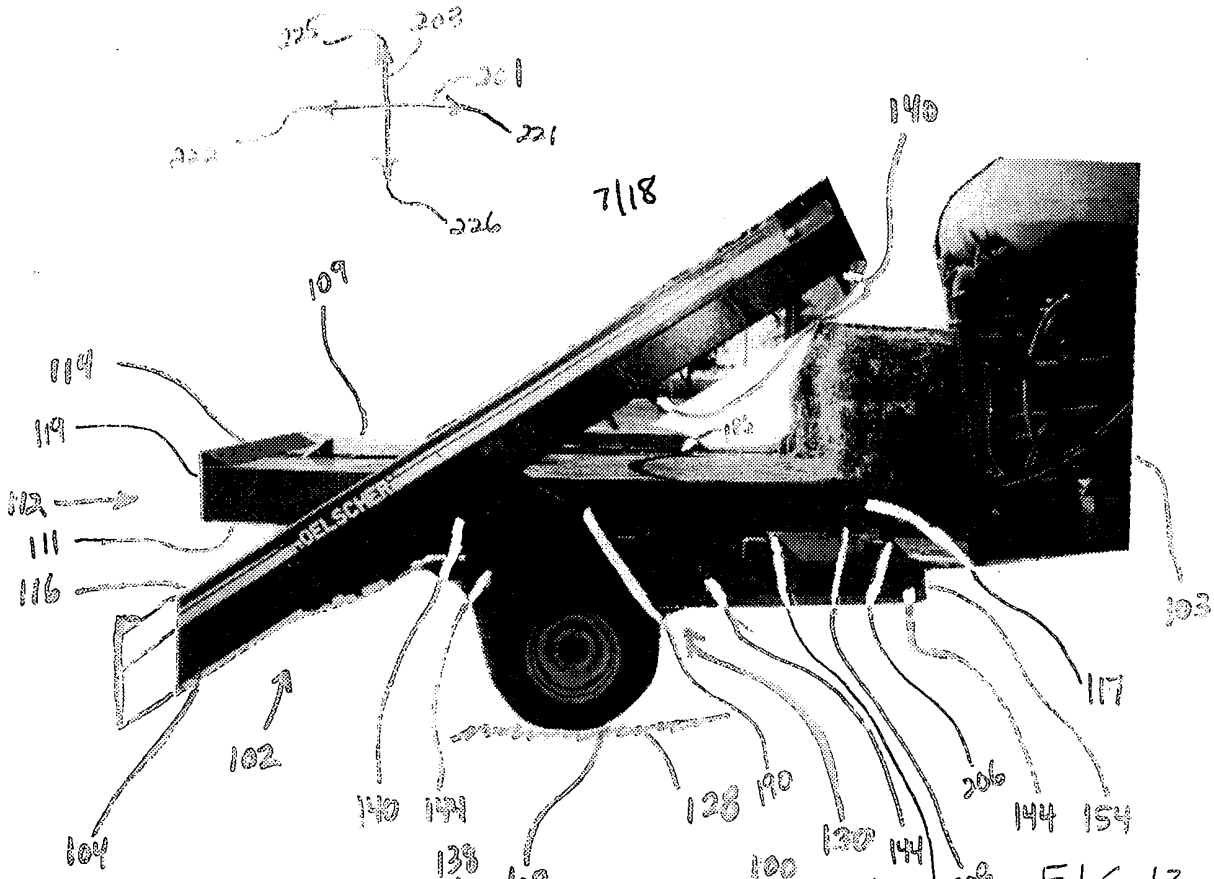

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FIG. 13

FIG. 14

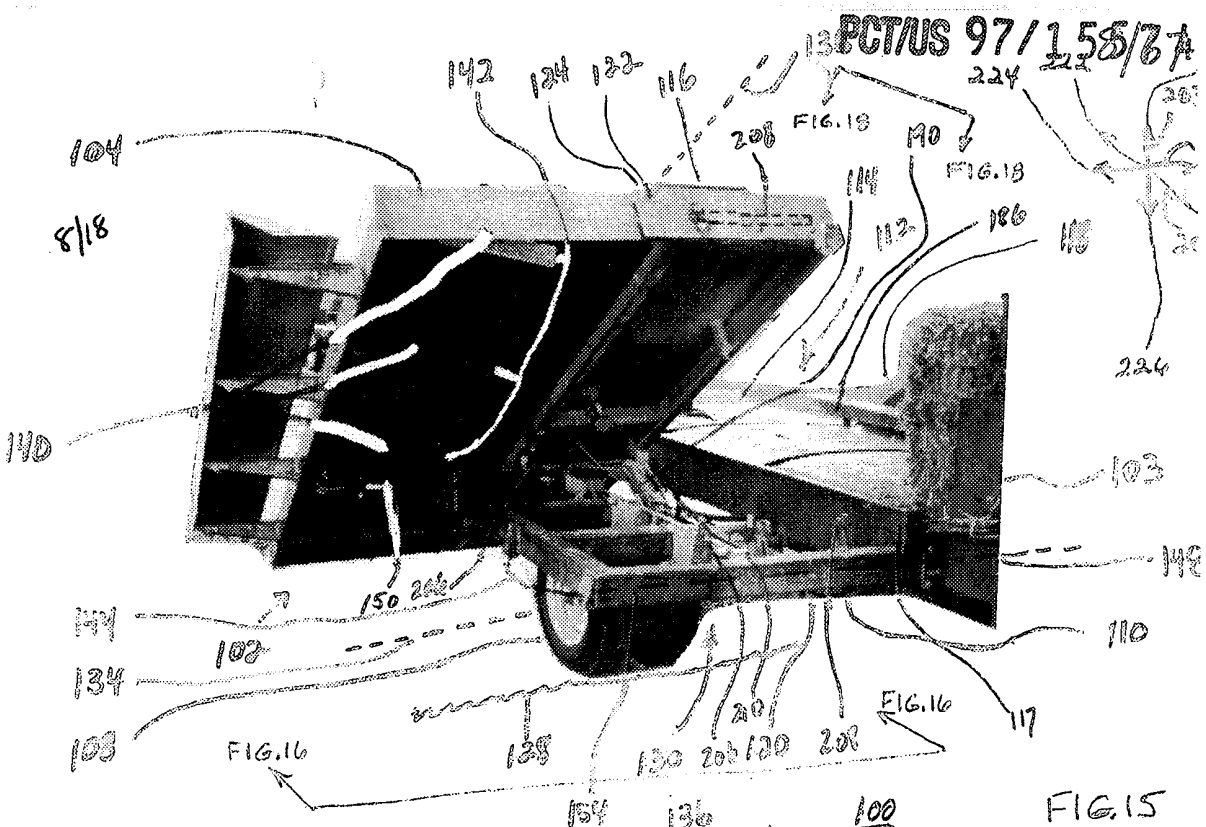

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FIG. 18
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FIG. 18
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FIG. 16
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FIG. 15

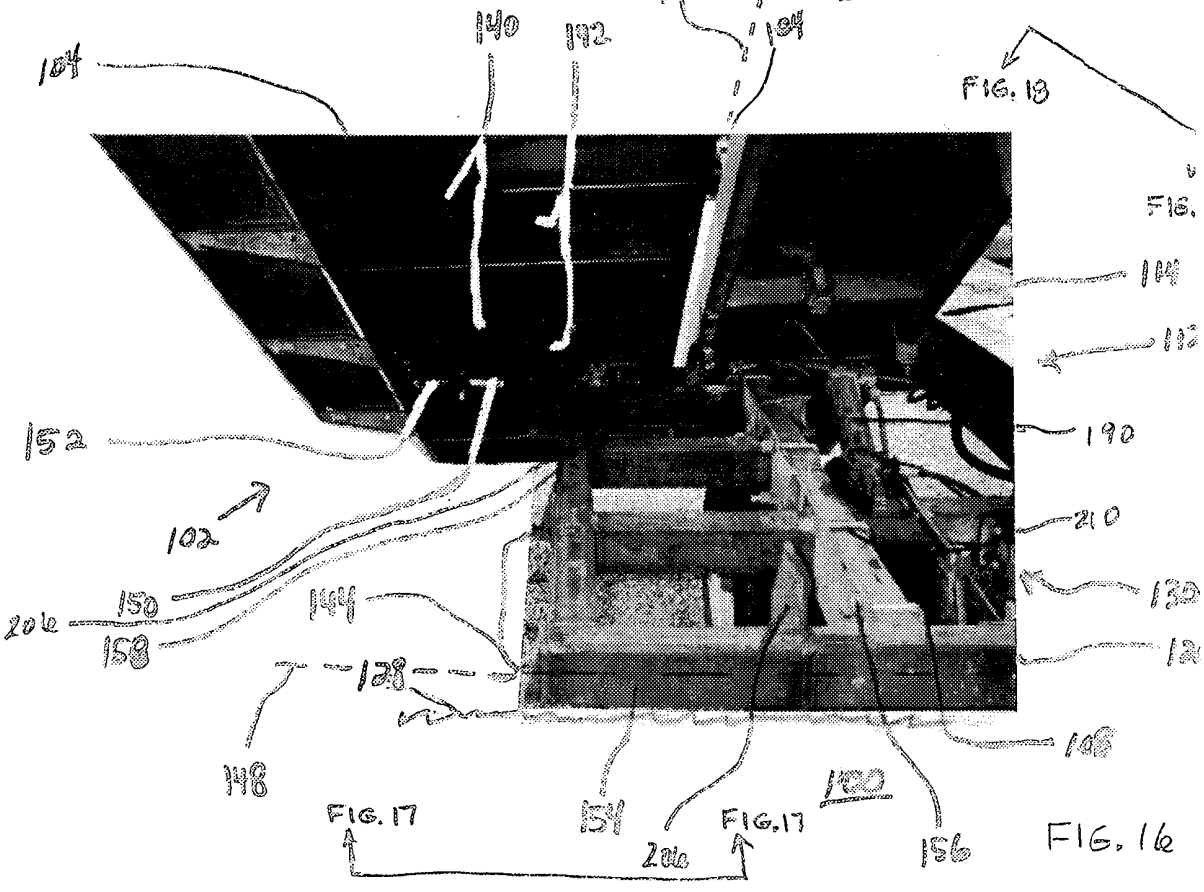

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FIG. 18
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FIG. 17
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FIG. 16

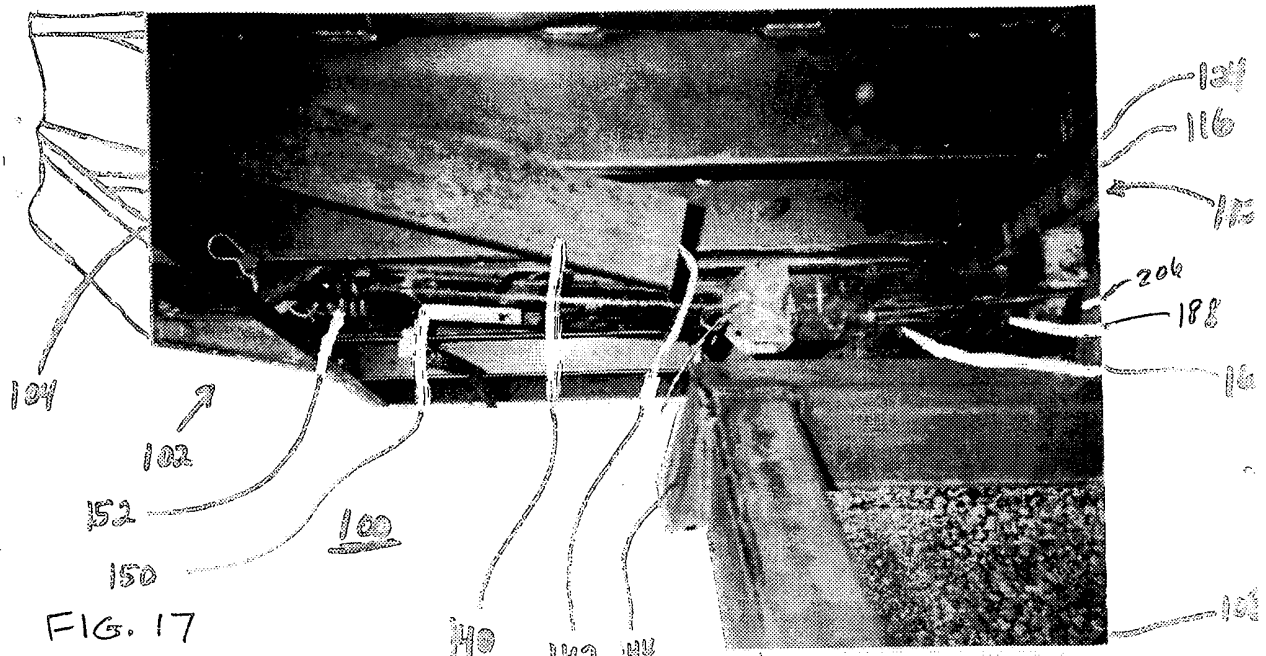
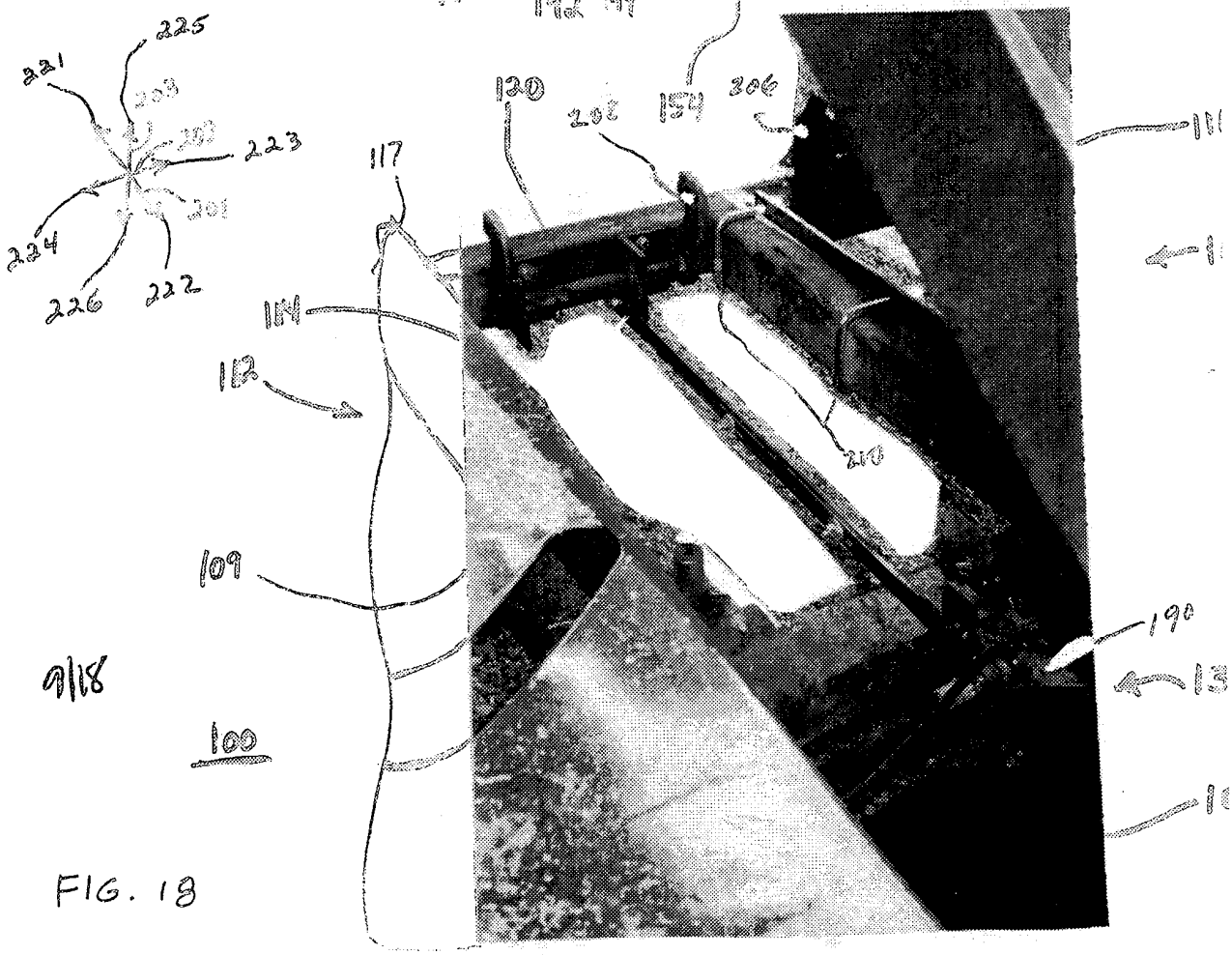
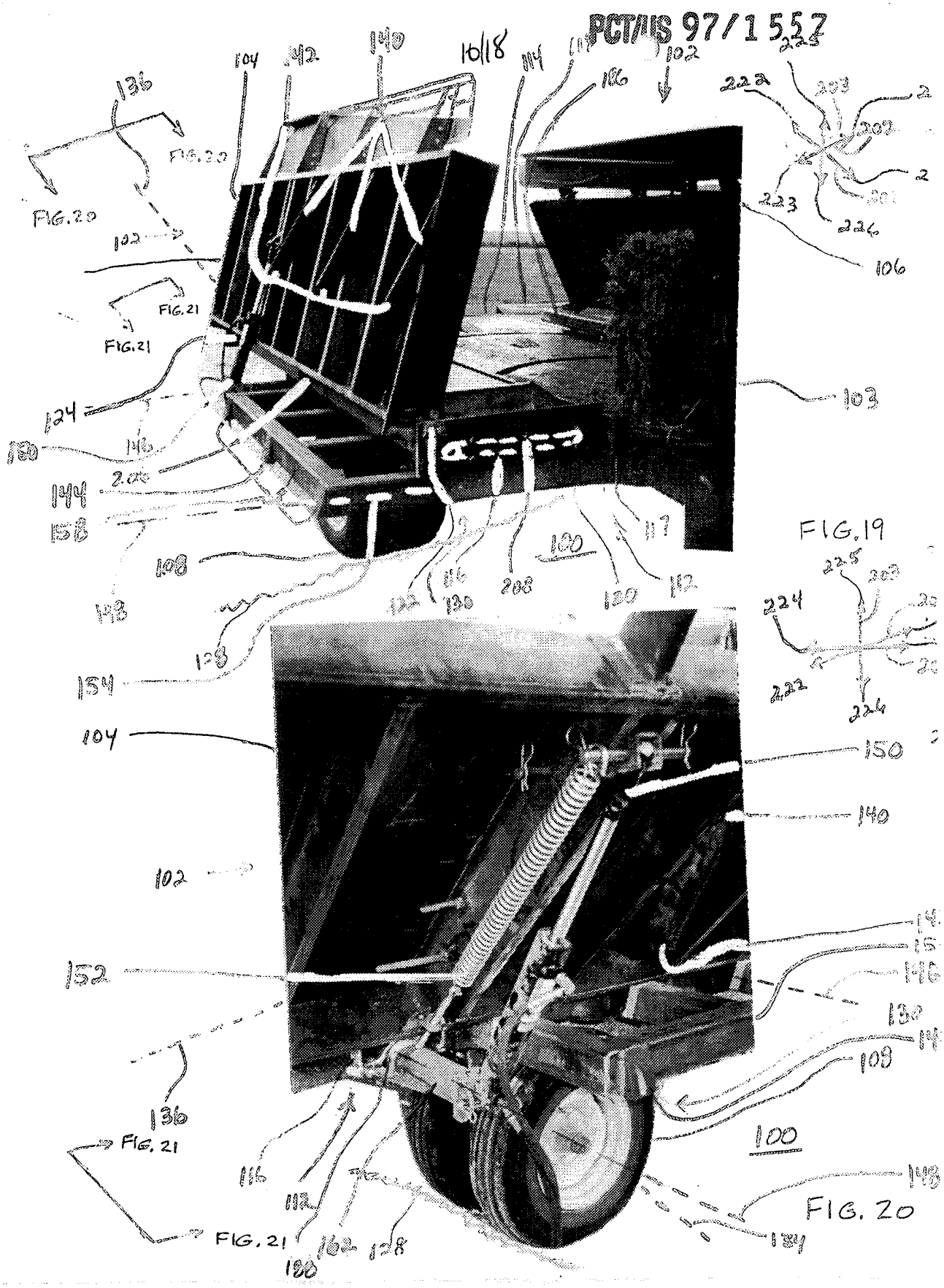


FIG. 17



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FIG. 18


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FIG. 19
FIG. 20
FIG. 21
FIG. 21
FIG. 21
FIG. 20
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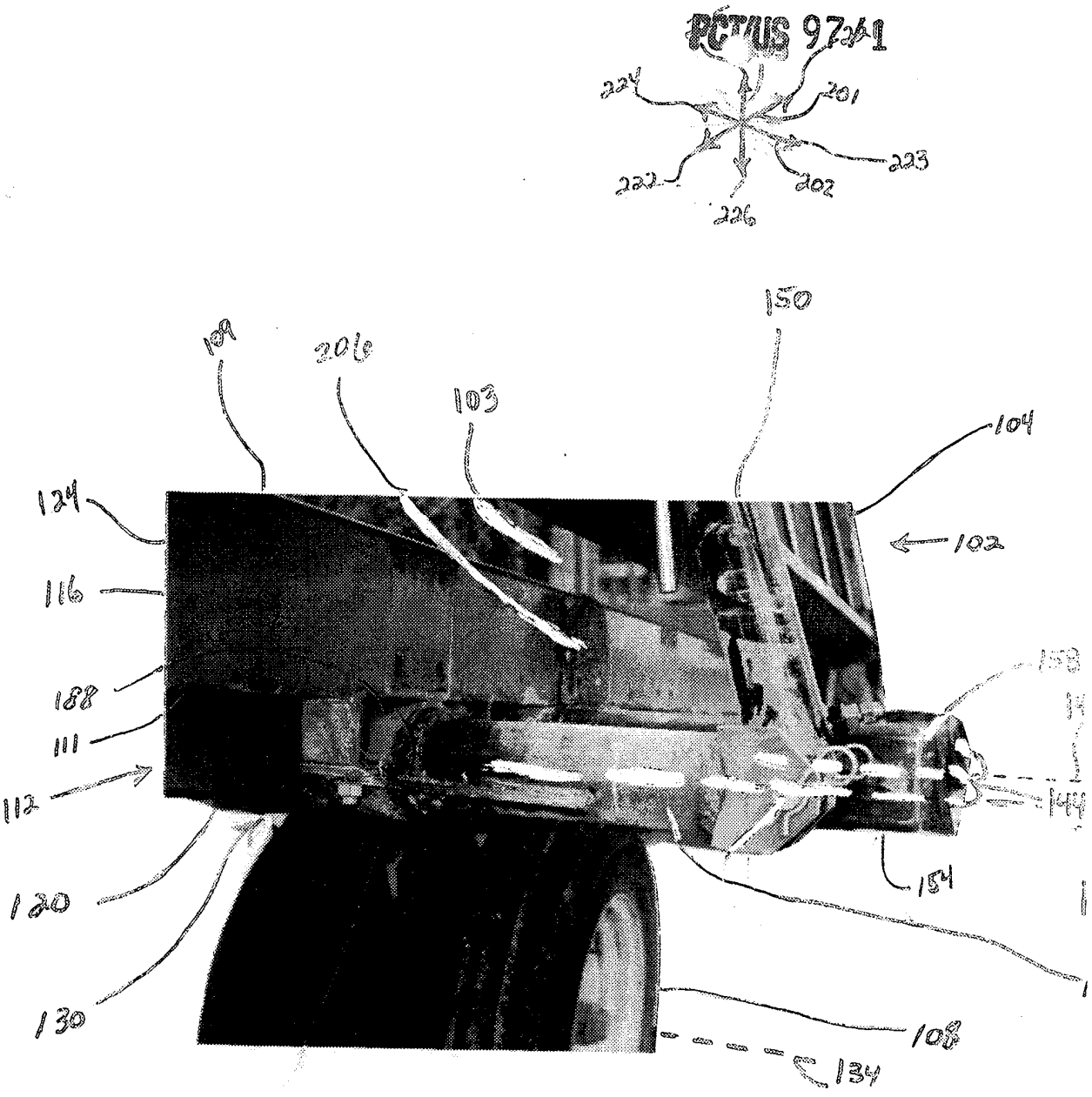

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FIG. 21

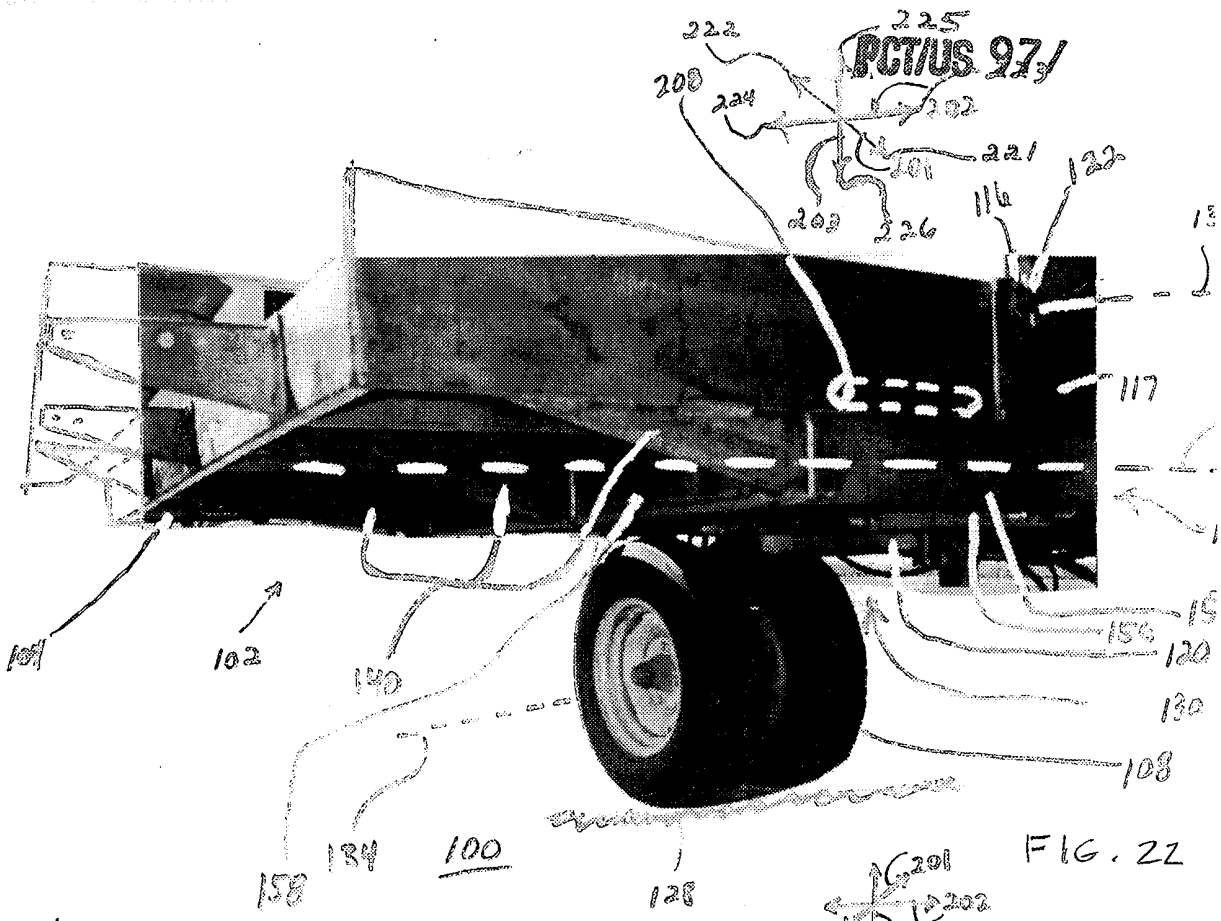

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FIG. 22

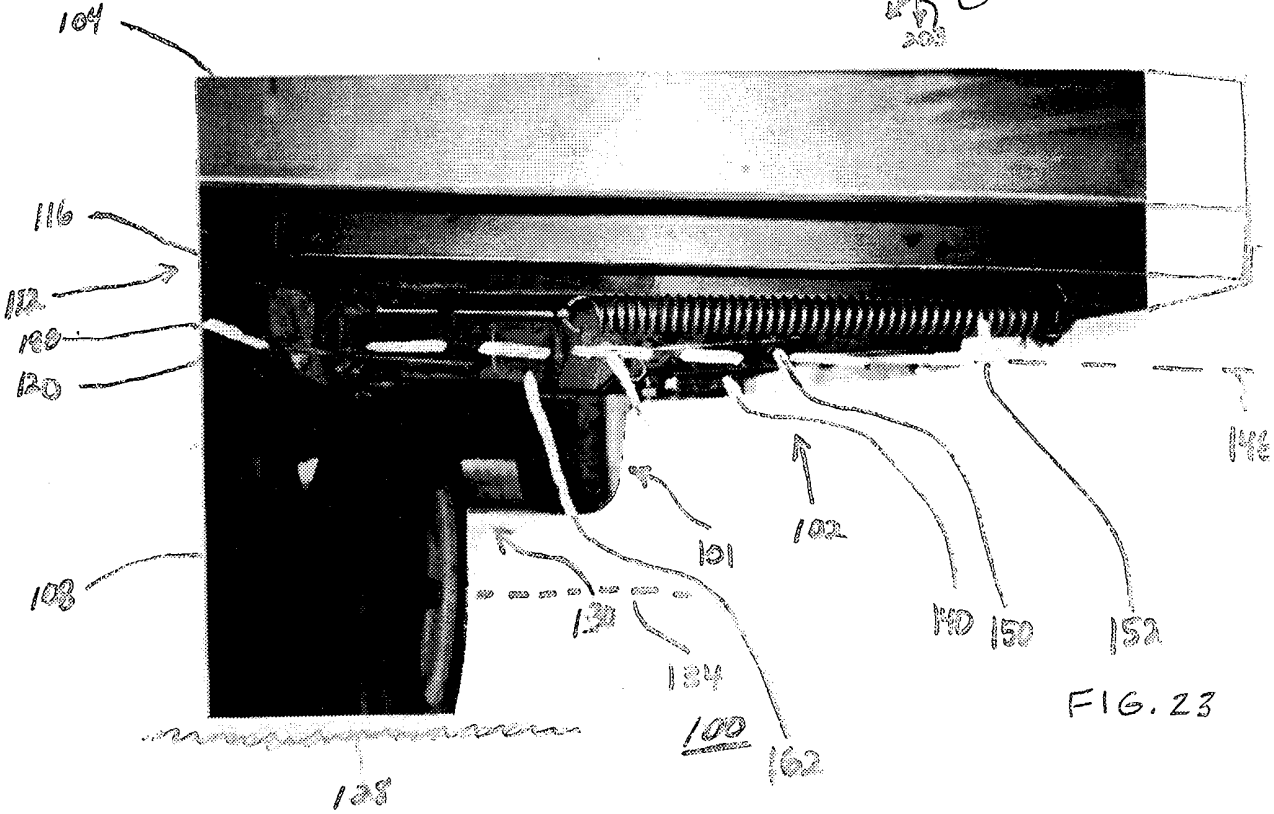
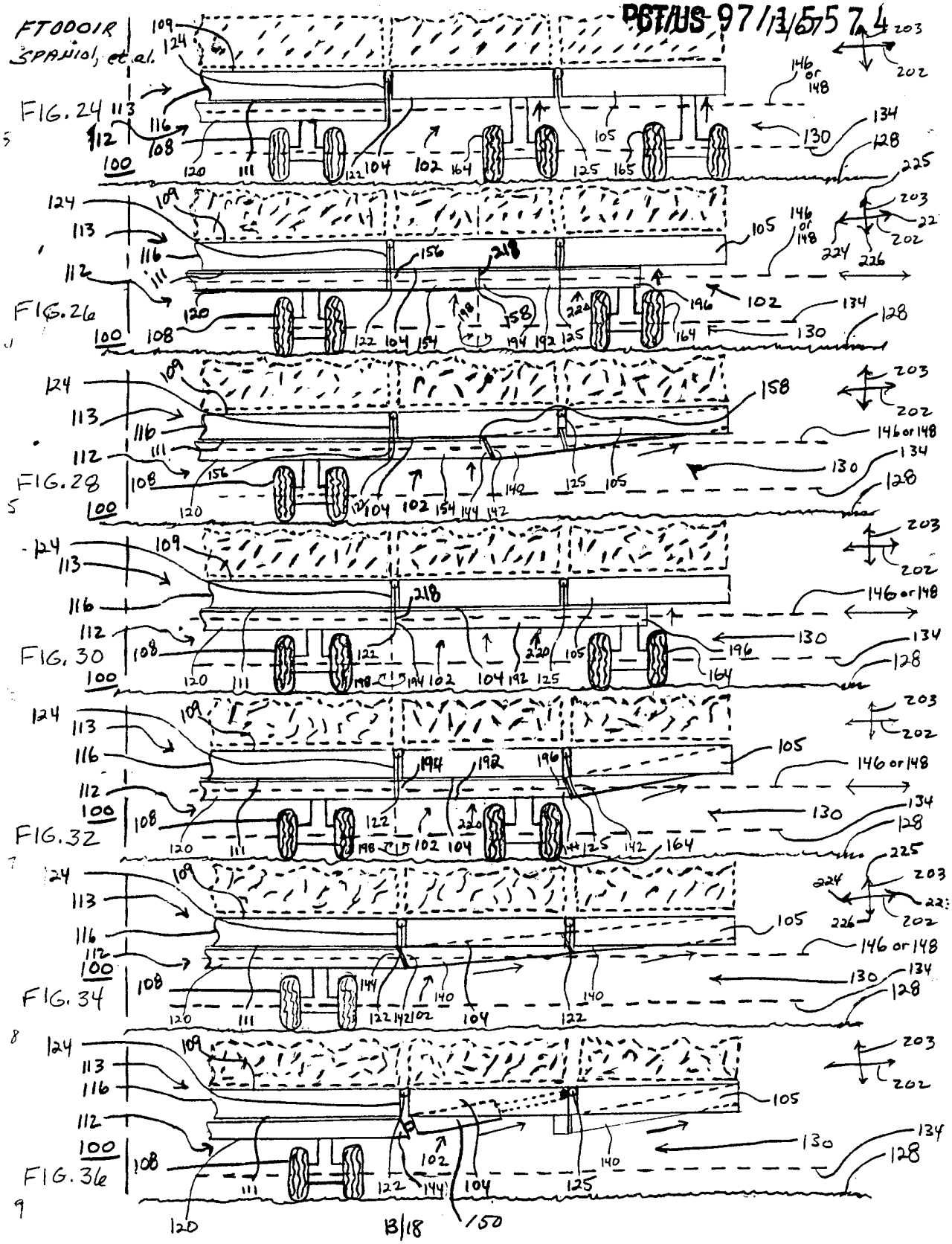
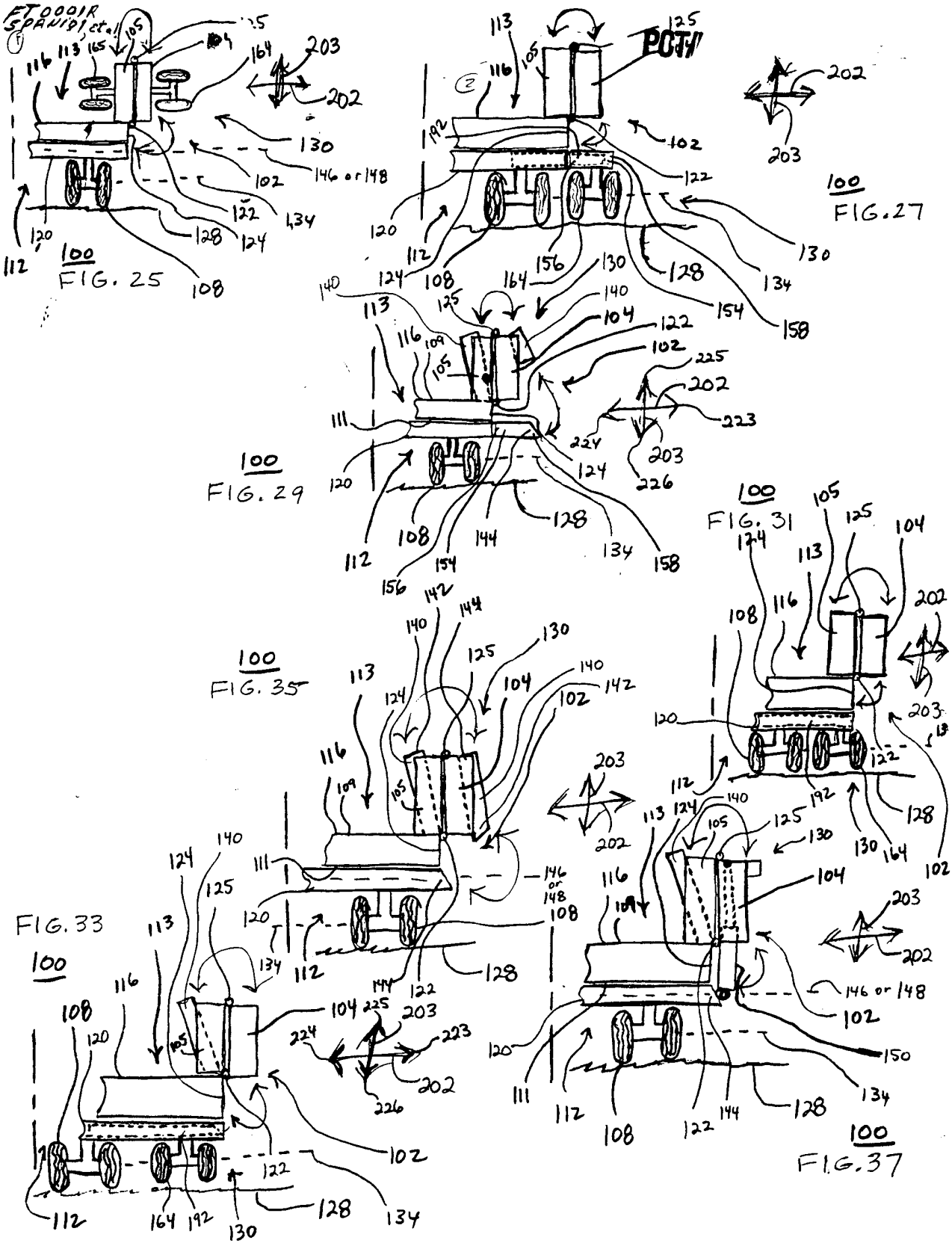

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FIG. 23


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PCT/US 97/13574
FIG. 24
FIG. 26
FIG. 28
FIG. 30
FIG. 32
FIG. 34
FIG. 36
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FIG. 25
FIG. 27
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FIG. 37
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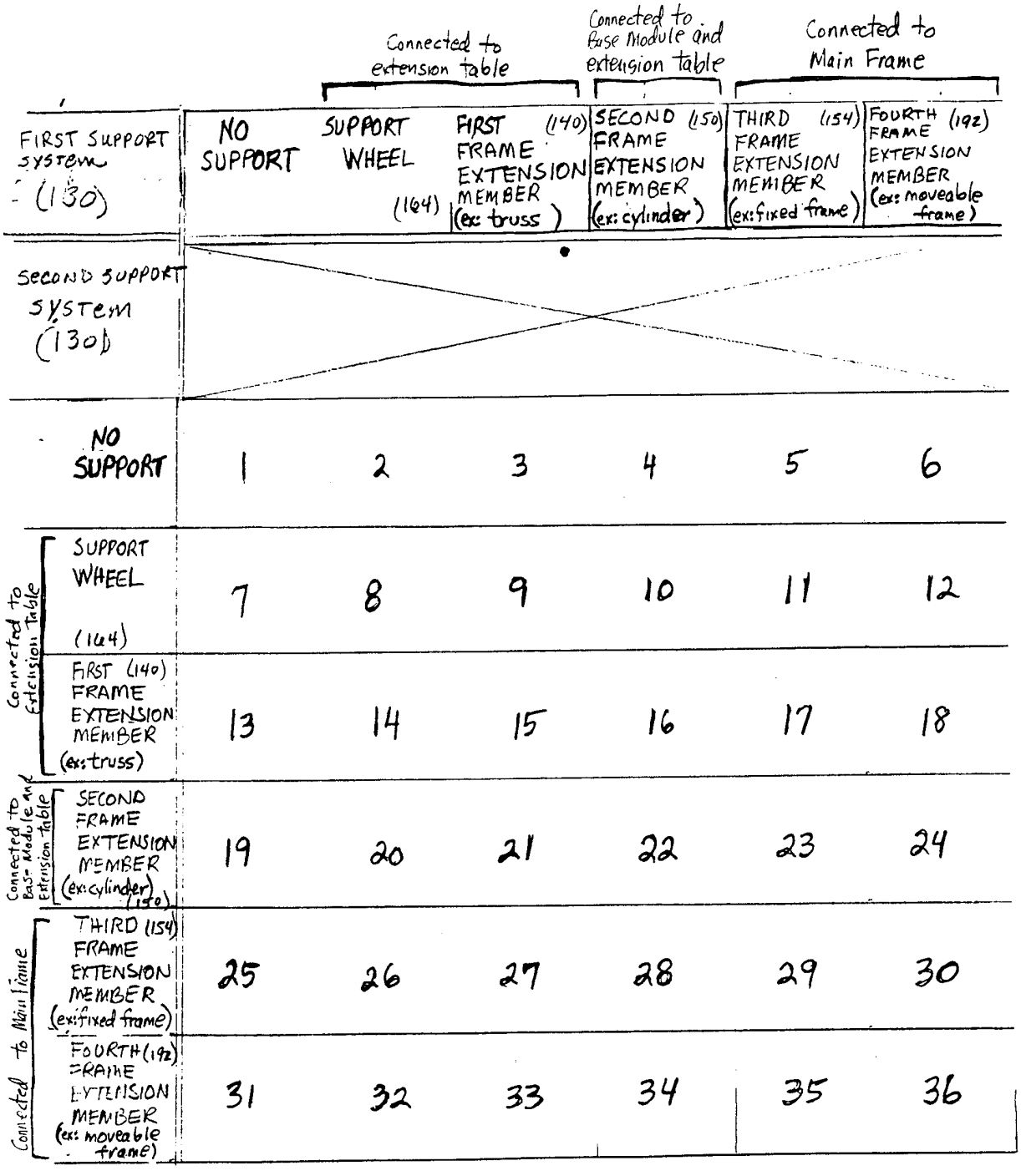

Connected to extension table
Connected to Base Module and extension table
Connected to Main Frame
FIRST SUPPORT SYSTEM (130)
NO SUPPORT
SUPPORT WHEEL (164)
FIRST (140) FRAME EXTENSION MEMBER (ex: truss)
SECOND (150) FRAME EXTENSION MEMBER (ex: cylinder)
THIRD (154) FRAME EXTENSION MEMBER (ex: fixed frame)
FOURTH (192) FRAME EXTENSION MEMBER (ex: moveable frame)
SECOND SUPPORT SYSTEM (130)
NO SUPPORT
Connected to Extension Table
SUPPORT WHEEL (164)
FIRST (140) FRAME EXTENSION MEMBER (ex: truss)
Connected to Base Module and Extension Table
SECOND FRAME EXTENSION MEMBER (ex: cylinder) (150)
Connected to Main Frame
THIRD (154) FRAME EXTENSION MEMBER (ex: fixed frame)
FOURTH (192) FRAME EXTENSION MEMBER (ex: moveable frame)
1 2 3 4 5 6
7 8 9 10 11 12
13 14 15 16 17 18
19 20 21 22 23 24
25 26 27 28 29 30
31 32 33 34 35 36
212

FIG. 4z

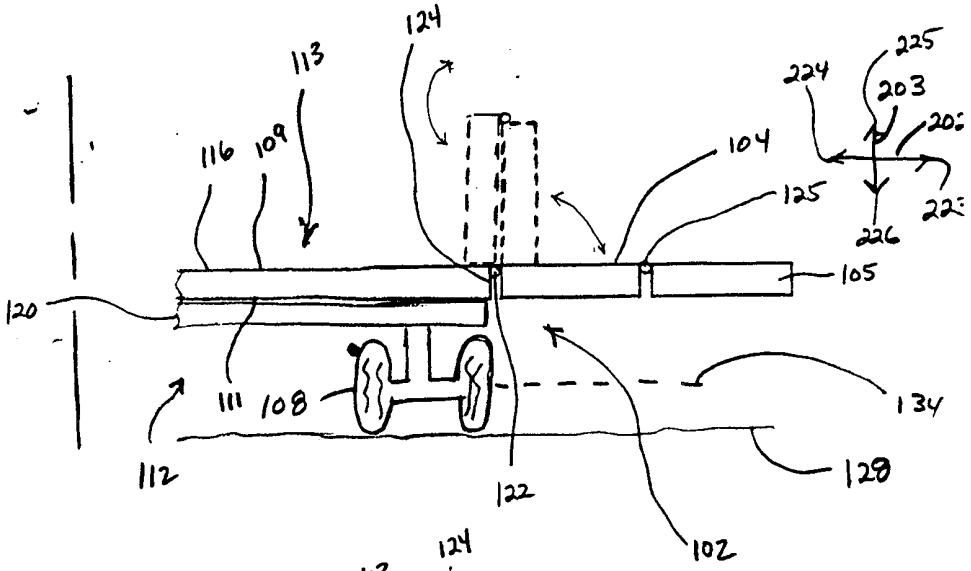


FIG. 38

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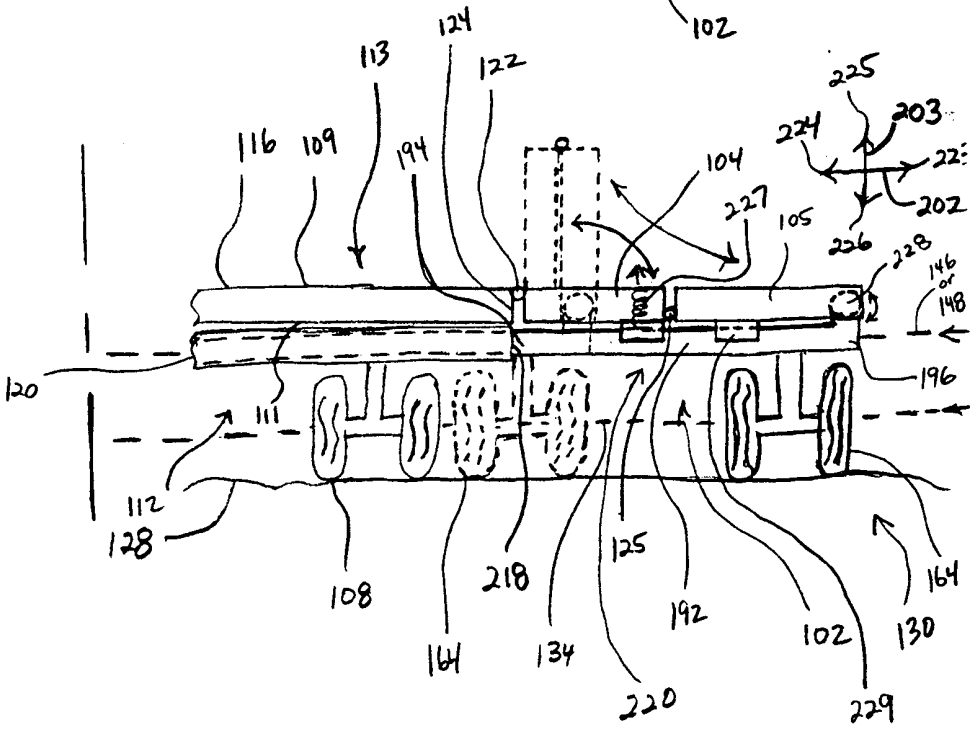


FIG. 39

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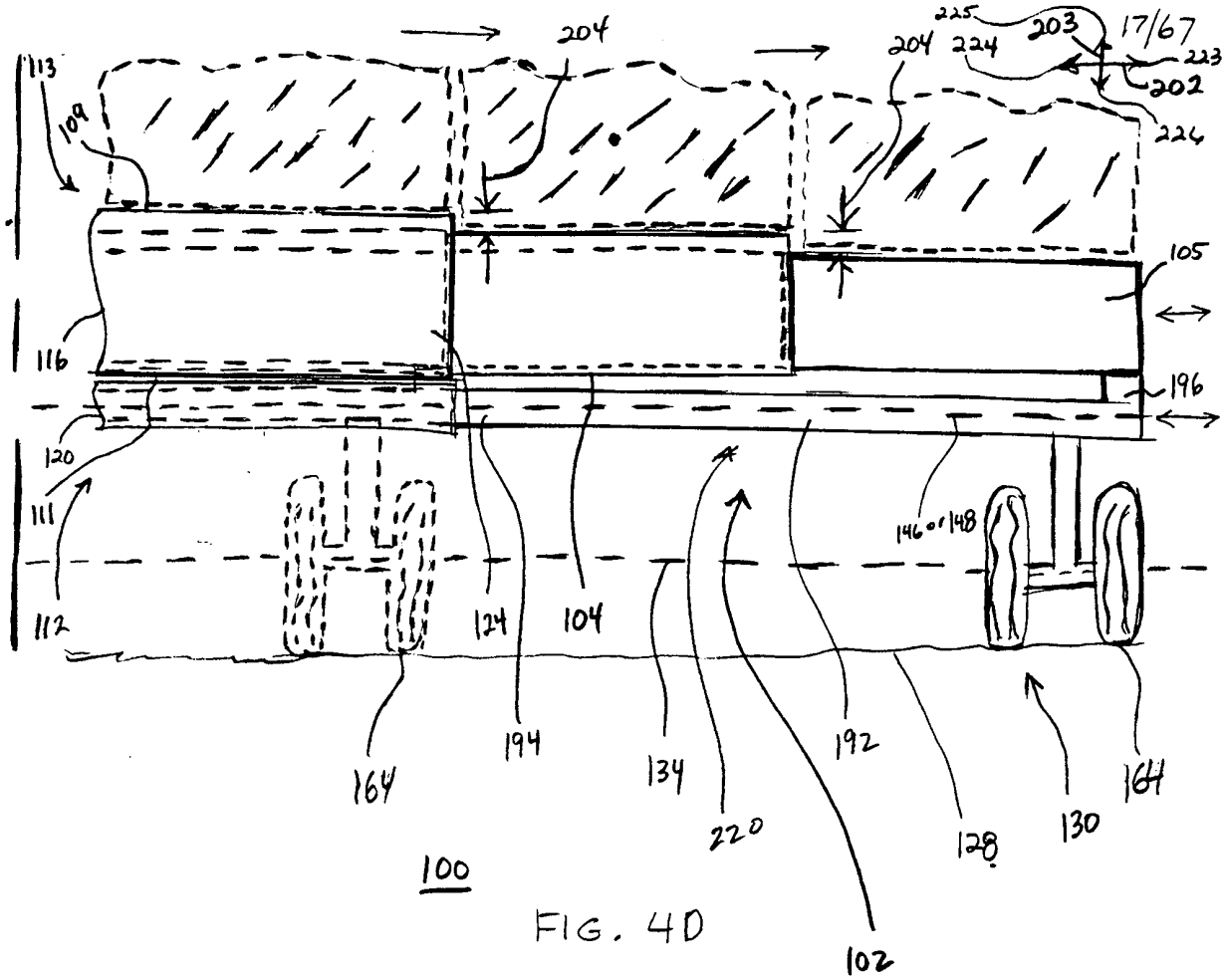

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FIG. 4D

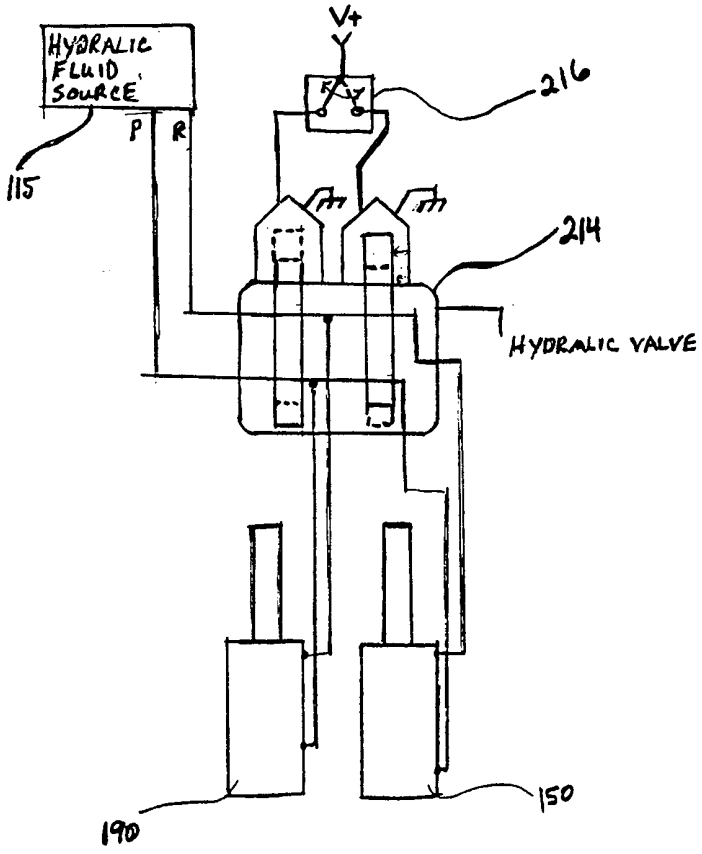

HYDRALIC FLUID SOURCE
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R
115
V+
216
214
HYDRALIC VALVE
190
150

FIG. 41

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/15574

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A01D 87/12
US CL :56/ 473.5, 480 ; 414/111
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 56/ 473.5, 480 ; 414/ 111
56/ 341, 343, 474, 476 ; 414/ 24.5, 24.6, 501, 502, 780, 781

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,215,964 A (SCHRAG et al) 05 AUGUST 1980 (05-08-80), SEE FIGURES 1, 3 AND 7.	1-4,16,22-26,55-58,72-74,88-90,124-128
A	US 4,844,675 A (STROSSER et al) 04 JULY 1989 (04-07-89), SEE FIGURES 1 AND 5.	1,55,129
A	US 4,955,774 A (VAN EECKE et al) 11 SEPTEMBER 1990 (11-09-90), SEE FIGURES 1, 2 AND 4.	1,55,129
A	US 5,560,191 A (FINNEY et al) 01 OCTOBER 1996 (01-10-96), SEE FIGURES 1 AND 2.	1,55,129

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
03 DECEMBER 1997

Date of mailing of the international search report
09 JAN 1998

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Authorized officer
Terry Lee Melius
Telephone No. (703) 308-2168

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