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(54) **LOG PROCESSING APPARATUS**

(57) A log processing apparatus (1) for both longitudinally splitting and transversely cutting one or more elongated logs (2) into short lengths comprises an elongated bed (3) extending between an upstream end (7) and a downstream end (8) for supporting the logs (2). A splitting element (22) having a main splitting knife (25) and first and second transverse splitting knives (32,34) for longitudinally splitting one or more elongated logs (2) is located adjacent the downstream end (8) of the bed (3). An hydraulically powered main ram (24) located in the bed (3) towards the upstream end (7) thereof urges the logs (2) through the splitting element (22). A first ram (44) selectively urges the splitting element (22) downwardly from a rest state into one of a clamping state for clamping the logs (2) on the bed (3) and a splitting state for splitting the logs (2). A saw disk (50) is located adjacent the downstream end (8) of the bed (3) downstream of the splitting element (22) for transversely cutting the one or more logs (2) into short lengths.

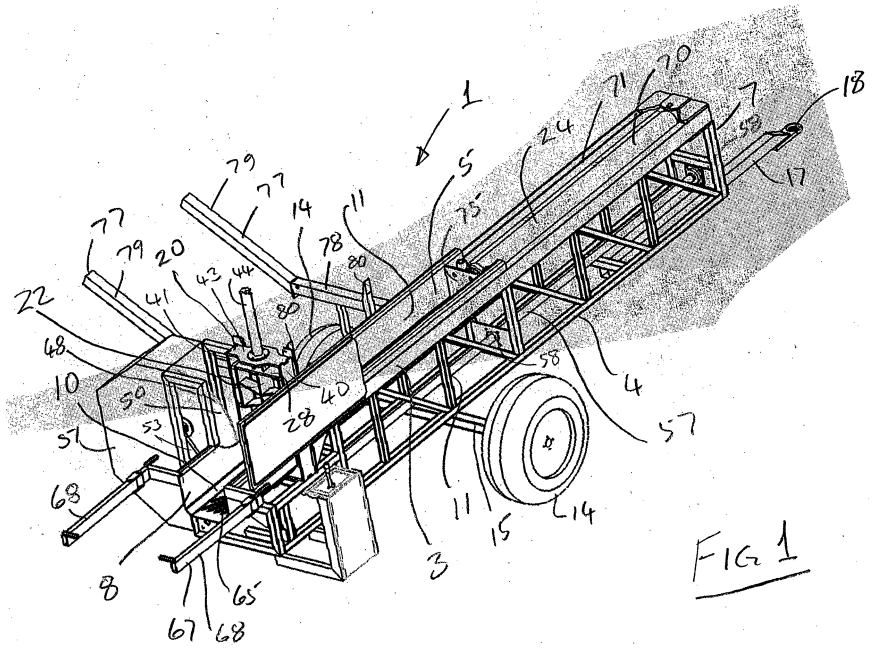

FIG 1

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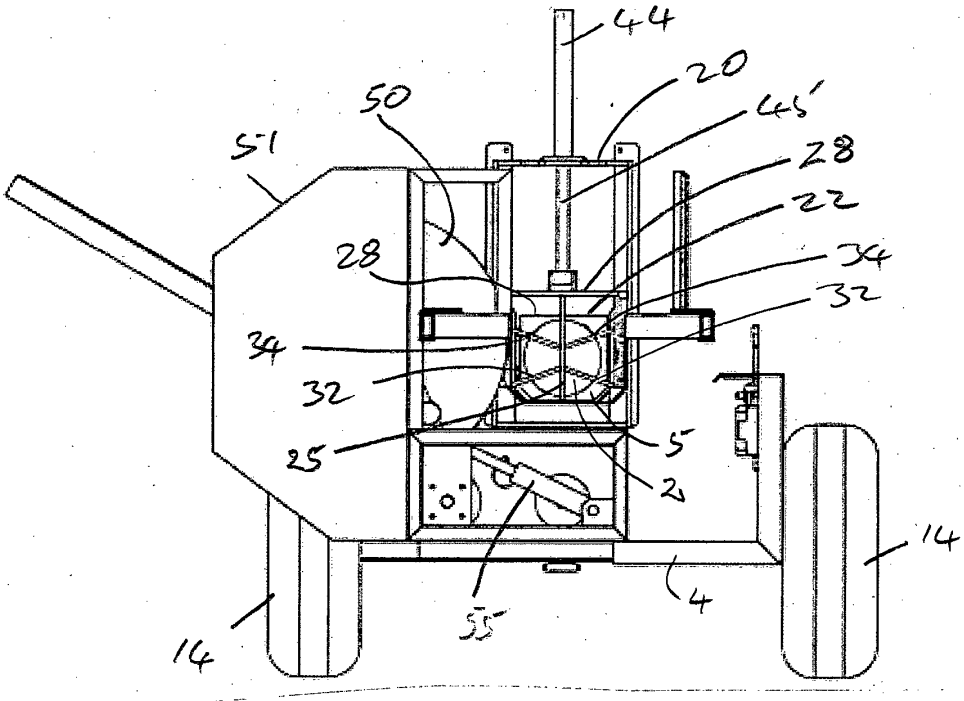

FIG 11

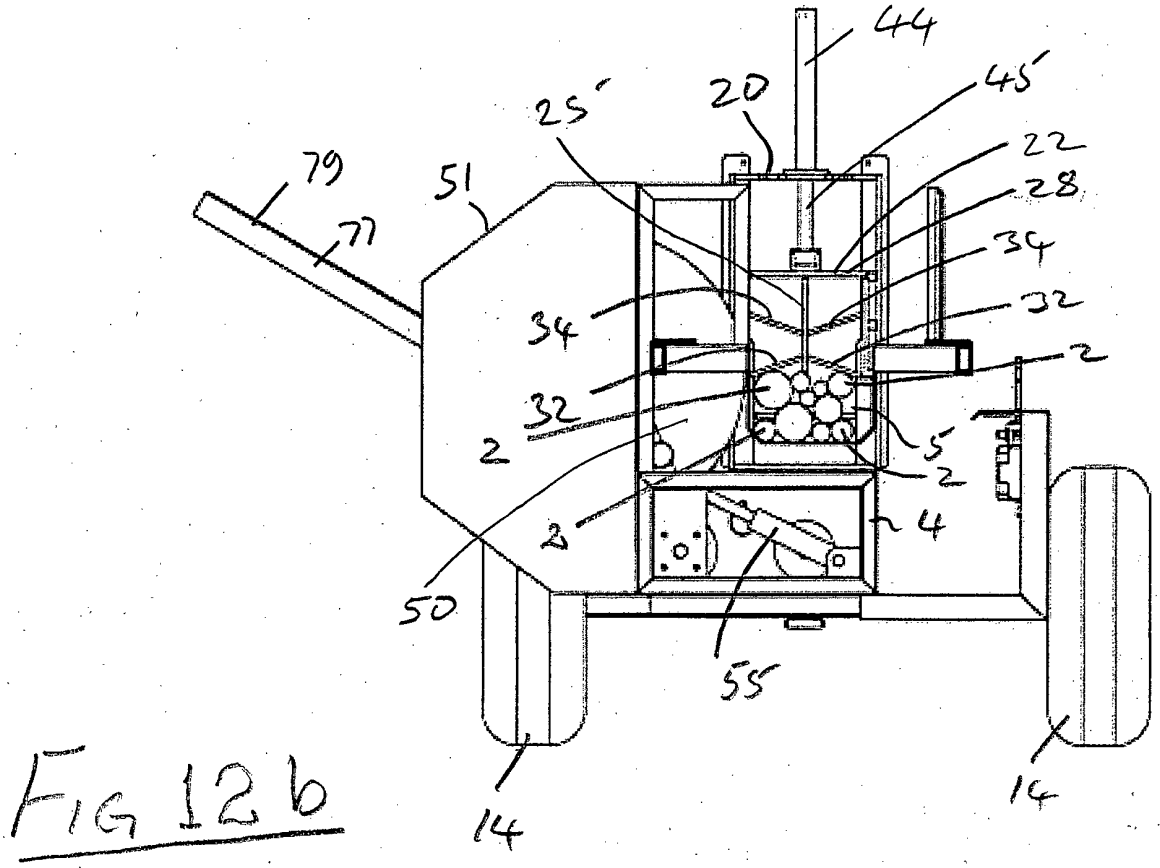

FIG 12b

Description

[0001] The present invention relates to log processing apparatus, and in particular, though not limited to apparatus for splitting and cutting one or more logs. The invention also relates to a method for processing a log, and in particular, though not limited to a method for splitting and cutting one or more logs.

[0002] According to the invention there is provided log processing apparatus comprising an elongated bed extending between an upstream end and a downstream end for supporting at least one elongated log, a cutting means located adjacent the downstream end of the bed and configured to transversely cut the at least one log into short lengths, a splitting means located adjacent the downstream end of the bed upstream of the cutting means, the splitting means being configured to longitudinally split the at least one log, and a main urging means for urging the at least one log through the splitting means and past the cutting means.

[0003] Advantageously, the splitting means is located adjacent the cutting means.

[0004] In one aspect of the invention the splitting means is selectively configurable in one of a splitting state for splitting the at least one log, and a clamping state for clamping the at least one log in the bed adjacent the downstream end thereof. Preferably, the splitting means is urgeable downwardly from the clamping state to the splitting state.

[0005] In one aspect of the invention the splitting means is urgeable from a rest state to a selected one of the clamping state and the splitting state. Preferably, the splitting means is urgeable through the clamping state from the rest state to the splitting state, and advantageously, is urgeable downwardly from the rest state to the one of the clamping state and the splitting state.

[0006] Preferably, the splitting means comprises a log splitting element having a first transverse splitting knife extending generally transversely of the upstream/downstream direction of the bed, the first transverse splitting knife being configurable in the splitting state for splitting the at least one log, and in the clamping state co-operating with the bed for clamping the at least one log between the bed and the first transverse splitting knife.

[0007] In another aspect of the invention the log splitting element comprises a main splitting knife extending generally transversely of the upstream/downstream direction of the bed, the first transverse splitting knife extending outwardly from the main splitting knife on respective opposite sides thereof.

[0008] Preferably, the main splitting knife extends downwardly below the first transverse splitting knife.

[0009] Preferably, the main splitting knife extends generally perpendicularly to the bed, and advantageously, the first transverse splitting knife extends in a generally outwardly downwardly direction from the respective opposite sides of the main splitting knife.

[0010] Preferably, the first transverse splitting knife extends outwardly downwardly from the respective opposite sides of the main splitting knife at an angle to the main splitting knife in the range of 45° to 80°, and preferably, at an angle in the range of 60° to 75°, and ideally, at an angle of approximately 70°.

[0011] In another aspect of the invention the log splitting element comprises a second transverse splitting knife located above the first transverse splitting knife, and extending from the main splitting knife on respective opposite sides thereof. Advantageously, the second transverse splitting knife extends in a generally outwardly upwardly direction from the respective opposite sides of the main splitting knife.

[0012] In one aspect of the invention the second transverse splitting knife extends outwardly upwardly relative to the main splitting knife on respective opposite sides thereof at an angle in the range of 45° to 80°, and preferably, at an angle of 60° to 75°, and ideally, at an angle of approximately 70°. Preferably, the second transverse splitting knife extends from the main splitting knife at a location spaced apart above the first transverse splitting knife.

[0013] In another aspect of the invention a first secondary urging means is provided for urging the splitting means between the splitting state and the clamping state, and preferably, from the rest state to a selected one of the clamping state and the splitting state.

[0014] In another aspect of the invention the first secondary urging means comprises a ram, and preferably, an hydraulic ram.

[0015] In another aspect of the invention the cutting means is urgeable from a rest state to a cutting state for transversely cutting the at least one log. Advantageously, the cutting means is urgeable from the rest state substantially transversely across the bed for transversely cutting the at least one log.

[0016] In another aspect of the invention a second secondary urging means is provided for urging the cutting means from the rest state for cutting the at least one log, -

[0017] In one aspect of the invention the second secondary urging means comprises a ram, and preferably, an hydraulic ram.

[0018] In one aspect of the invention the cutting means comprises a saw blade, and preferably, a disc saw blade, and advantageously, the disc saw blade is rotatably carried on a pivotally mounted arm, which preferably, is pivotal from the rest state for transversely cutting the log.

[0019] In another aspect of the invention the bed comprises a framework defining an elongated channel for accommodating the at least one log, and preferably, the channel defines a base and a pair of spaced apart sides extending upwardly from the base.

[0020] Preferably, the main splitting knife extends substantially upwardly perpendicularly to the base of the bed defined by the framework.

[0021] In another aspect of the invention a support means is provided for supporting and feeding elongated logs into the bed, and preferably, a retaining means is

provided for retaining the logs on the support means. Preferably, the retaining means is urgeable between a retaining state retaining the logs on the support means, and a release state permitting feeding of the logs from the support means to the bed.

[0022] In a further aspect of the invention the main urging means comprises a main ram, which preferably, comprises a main hydraulic ram. Advantageously, the main ram is located in the bed.

[0023] In another aspect of the invention a primary splitting means is provided for splitting a log of relatively large diameter, preferably, the primary splitting means comprising a primary splitter knife and a primary anvil co-operating with the primary splitter knife, one of the primary splitter knife and the anvil being moveable relative to the other one of the primary splitter knife and the anvil for splitting a log supported on the bed.

[0024] Preferably, a primary urging means is provided for urging the moveable one of the primary splitter knife and the primary anvil towards the other one of the primary splitter knife and the primary anvil for splitting the log.

[0025] Advantageously, the primary splitter knife defines a primary cutting edge extending substantially transversely of the direction of motion of the moveable one of the primary splitter knife and the anvil. Advantageously, the primary cutting edge of the primary splitter knife extends in a generally upwardly direction from the bed.

[0026] In one aspect of the invention the primary splitter knife is the moveable one of the primary splitter knife and the primary anvil. Preferably, the primary urging means comprises a primary ram.

[0027] In another aspect of the invention the primary splitter knife and the primary anvil are configured for splitting a relatively long log, and preferably, a log of at least 2 metres in length, and advantageously, a log of at least 3 metres in length.

[0028] Preferably, the travel of the moveable one of the primary splitter knife and the primary anvil is at least 2 metres, and advantageously, at least 3 metres, and ideally, 3.3 metres.

[0029] In another aspect of the invention the retaining means co-operates with the support means for retaining the log on the bed for splitting by the primary splitter knife, and advantageously, the support means is pivotal from a support state for supporting one or more logs to a locating state for co-operating with the retaining means for locating the log on the bed.

[0030] In another aspect of the invention a crane is mounted on the apparatus for transferring a log onto one of the bed and the support means.

[0031] In another aspect of the invention the crane is configured for transferring a bag of logs split by the splitting means from the apparatus to one of a storing area and a truck.

[0032] The invention also provides a method for processing a log, the method comprising locating at least one elongated log in a bed of apparatus for processing the log, urging the log through a splitting means for longitudinally splitting the log as it is urged therethrough, locating a cutting means downstream of the splitting means for transversely cutting the log after the log has been split by the splitting means. Preferably, the cutting means is located adjacent the splitting means.

[0033] Preferably, the splitting means is provided to be selectively configurable as a splitting means and a clamping means, and in one aspect of the invention the splitting means is configurable as a clamping means for clamping the at least one log in the bed adjacent the cutting means, and preferably, the splitting means co-operates with the bed for clamping the at least one log between the bed and the splitting means.

[0034] The invention will be more clearly understood from the following description of an embodiments thereof, which is given by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a log processing apparatus according to the invention,

Fig. 2 is another perspective view of the apparatus of Fig. 1,

Fig. 3 is a top plan view of the apparatus of Fig. 1,

Fig. 4 is another top plan view of the apparatus of Fig. 4 illustrating a portion of the apparatus in a different state to that of Fig. 3,

Fig. 5 is a side elevational view from one side of the apparatus of Fig. 1,

Fig. 6 is a side elevational view of the apparatus of Fig. 1 from the other side to that of Fig. 5,

Fig. 7 is an end view of the apparatus of Fig. 1,

Fig. 8 is an end view of the apparatus of Fig. 1 illustrating a portion of the apparatus in a different state to that of Fig. 7,

Fig. 9 is a side elevational view of a portion of the apparatus of Fig. 1,

Fig. 10 is a side elevational view of the portion of the apparatus of Fig. 9 illustrating a part of the apparatus in a different state to that of Fig. 9,

Fig. 11 is an end elevational view of the apparatus of Fig. 1 illustrating the apparatus in use,

Figs. 12a and 12b are end elevational views of the apparatus of Fig. 1 also illustrating the apparatus in use,

Figs. 13a and 13b are end elevational views of a

detail of the apparatus of Fig. 1 illustrating a portion of the apparatus in two different states,

Fig. 14 is a perspective view of a log processing apparatus according to another embodiment of the invention,

Fig. 15 is another perspective view of the apparatus of Fig. 14,

Fig. 16 is another perspective view of the apparatus of Fig. 14 with a portion of the apparatus in a different state to that of Fig. 14,

Fig. 17 is an end elevational view of the apparatus of Fig. 14,

Fig. 18 is an end elevational view of the apparatus of Fig. 14 with a portion of the apparatus in a different state to that of Fig. 17,

Fig. 19 is a perspective view of a portion of the apparatus of Fig. 14,

Fig. 20 is another perspective view of the portion of Fig. 19 of the apparatus of Fig. 14, and

Fig. 21 is a further perspective view of the portion of Fig. 19 of the apparatus of Fig. 14.

[0035] Referring to the drawings, and initially to Figs. 1 to 13, there is illustrated log processing apparatus according to the invention, indicated generally by the reference numeral 1, for both longitudinally splitting and transversely cutting one or more elongated logs 2 into short lengths. The log processing apparatus comprises an elongated bed 3 formed by an elongated framework 4. The framework 4 forms an elongated channel 5 extending between an upstream end 7 and a downstream end 8 for the elongated log 2 or logs 2, as will be described below. The channel 5 defines a base 10 and a pair of spaced apart sides 11 extending upwardly from the base 10 to form with the base 10 the channel 5. The framework 4 is supported on a pair of spaced apart ground engaging wheels 14 which are rotatably carried on a transversely extending shaft 15 which extends beneath and is secured to the framework 4 for facilitating transporting of the apparatus 1. A hitch arm 17 extends forwardly from the framework 4 and terminates in a hitch eye 18 for hitching the apparatus 1 to a tractor (not shown).

[0036] A sub-framework 20 is mounted on the framework 4 adjacent the downstream end 8 thereof and extends upwardly from the framework 4 for carrying a splitting means, in this embodiment of the invention a splitting element 22 for longitudinally splitting one or more elongated logs 2 in the channel 5 of the bed 3. A main urging means comprising an hydraulically powered main ram 24 is located in the channel 5 towards the upstream end 7 thereof for urging one or more logs 2 in the channel 5 of the framework 4 through the splitting element 22 as will be described in more detail below.

[0037] The splitting element 22 comprises a main splitting knife 25 which is located in a carrier frame 28 and extends centrally downwardly from a top cross-member 30 of the carrier frame 28. The carrier frame 28 comprises a pair of side members 31 extending downwardly from the top cross-member 30. A first transverse splitting knife 32 extends from the main splitting knife 25 on respective opposite sides thereof to the respective side members 31. A second transverse splitting knife 34 extends from the main splitting knife 25 from a location spaced apart above the first transverse splitting knife 32 outwardly from respective opposite sides of the main splitting knife 25 to the side members 31. The first and second transverse splitting knives 32 and 34 are secured to the main splitting knife 25 and to the side members 31 of the carrier frame 28 by welding or other suitable fixing means. The first transverse splitting knife 32 extends outwardly downwardly from the respective opposite sides of the main splitting knife 25 at an angle α in the range of 45° to 80° and in this embodiment of the invention at an angle α of approximately 70°, see Fig. 12a. The second transverse splitting knife 34 extends outwardly upwardly from the respective opposite sides of the main splitting knife 25 at an angle θ in the range of 45° to 80° and in this embodiment of the invention at an angle θ of approximately 70°. The main splitting knife 25 is provided with a main upstream cutting edge 35 which faces in a generally upstream direction towards the upstream end 7 of the bed 3. The first and second transverse splitting knives 32 and 34 are also provided with respective first and second upstream cutting edges 36 and 37, which also face towards the upstream end 7 of the bed 3.

[0038] The sub-framework 20 comprises a pair of spaced apart side members 40 and 41 which extend upwardly from the sides 11 of the framework 4, and a top cross-member 43 extends between and is secured to the side members 40 and 41. The carrier frame 28 of the splitting element 22 is retained between the side members 40 and 41 and is slideably guided by the side members 40 and 41 in a generally upwardly/downwardly direction. A first secondary urging means comprising a single acting first hydraulically powered first secondary ram 44 is mounted on the top cross-member 43. A piston rod 45 of the first secondary ram 44 is secured to the top cross-member 30 of the carrier frame 28 of the splitting element 22 for urging the carrier frame 28 upwardly and downwardly within the sub-framework 20. In this embodiment of the invention the first secondary ram 44 is operable for urging the splitting element 22 downwardly from a rest state illustrated in Fig. 12a through a clamping state illustrated in Fig. 12b to a splitting state illustrated in Fig. 11. In the rest state the splitting element 22 is located withdrawn upwardly in the sub-framework 20 clear of the log or logs in the channel 5. In the splitting state the splitting element 22 is located in the channel 5

for engaging one or more elongated logs 2 as they are urged by the main ram 24 through the channel 5 into engagement with the cutting edges 35, 36 and 37 of the main splitting knife 25 and the first and second transverse splitting knives 32 and 34, respectively, and for longitudinally splitting the one or more logs 2 as they are urged by the main ram 24 through the splitting element 22. In the clamping state of the splitting element 22, the first transverse splitting knife 32 co-operates with the base 10 of the channel 5 for clamping a plurality of elongated logs 2 in the channel 5 tightly between the base 10 of the channel 5 and the first transverse splitting knife 32 for facilitating transverse cutting of the plurality of clamped logs 2 into short logs as will be described below.

[0039] The main splitting knife 25 and the first and second transverse splitting knives 32 and 34 of the splitting element 22 are configured to longitudinally split a large elongated log 2 into six segments defined by the main splitting knife 25 and the first and second transverse splitting knives 32 and 34, see Fig. 11.

[0040] A cutting means, in this embodiment of the invention comprising a saw 48 provided by a rotatably mounted disc saw cutting blade 50 is located in a housing 51 adjacent the downstream end 8 of the framework 4 and downstream of the splitting element 22 but relatively closely to the splitting element 22. The disc saw blade 50 is rotatably carried at a distal end 52 of a pivot arm 53. The pivot arm 53 is pivotally mounted in the housing 51 on a main pivot shaft 54. The pivot arm 53 is configured in the housing 51 so that the disc saw blade 50 is urgeable from a rest state within the housing 51, illustrated in Fig. 13a transversely across the channel 5 in the direction of the arrow A for cutting the one or more elongated logs in the channel 5, see Fig. 13b.

[0041] A second secondary urging means, in this embodiment of the invention an hydraulically powered single acting second secondary ram 55 acting between the pivot arm 53 and the framework 4 urges the pivot arm 53 about the pivot shaft 54 for in turn urging the disc saw blade 50 from the rest state transversely across the channel 5 of the framework 4 for transversely cutting the log or logs 2. A spring (not shown) returns the pivot arm 53 and the disc saw blade 50 to the rest state.

[0042] The disc saw blade 50 is mounted fast on a shaft 56 which is rotatably carried in bearings (not shown) adjacent the distal end 52 of the pivot arm 53. The disc saw blade 50 is powered from the PTO shaft of a tractor (neither of which are shown), to which the apparatus 1 is hitched, through an elongated drive shaft 57 which extends through the framework 4 and is rotatably carried in bearings 58, only two of which are illustrated in the framework 4. A first belt drive transmission 59 transmits drive from a pulley 61 mounted fast on the drive shaft 57 to a pulley 60 rotatably mounted on the pivot shaft 54, and a second belt drive transmission 62 transmits drive from the pulley 60 to a pulley 64 which is fast on the shaft 56 of the disc saw blade 50, for driving the disc saw blade 50, see Fig. 13a.

[0043] An open mesh slatted platform 65 is located downstream of the saw 48 for holding the short logs or short and split logs, as the case may be, having been parted from the elongated log or logs by the saw 48.

[0044] A skip or tote bag holder 67 comprises a pair of spaced apart carrier arms 68 which extend in a generally downstream direction from the downstream end 8 of the framework 4 for supporting a skip or tote bag (not shown). The skip or tote bag holder 67 is located relative to the slatted platform 65 so that the parted off short logs or short split logs are urged along the slatted platform 65 into a skip or tote bag held supported and depending downwardly from the skip or tote bag holder 67 as the main ram 24 urges the elongated log or logs through the channel 5 and in turn urges the parted off short logs along the slatted platform 65 into the skip or tote bag.

[0045] Returning now to the main ram 24, the main ram 24 is a double acting hydraulic ram, and comprises a cylinder 70 which is located in an upstream portion 71 of the channel 5 of the framework 4. The cylinder 70 is secured to the framework 4 adjacent the upstream end 7 thereof. A piston rod 73 extending from the cylinder 70 terminates in a pusher plate 75 which is located in and urgeable through the channel 5 for engaging and urging one or more logs 2 in the channel 5 in a generally downstream direction through the splitter element 22 for longitudinal splitting thereof and for urging the parted off short logs having been parted off by the saw 48 along the skid plate 65 into a skip bag suspended from the skip bag holder 67.

[0046] A support means for supporting a plurality of logs ready to be fed into the channel 5 of the framework 4 comprises a pair of spaced apart support arms 77 extending from the framework 4 downstream of the main ram 24. Each support arm 77 comprises a substantially horizontal arm 78 and an upwardly inclined arm 79 inclining upwardly from the horizontal arm 78 for in turn urging the logs on the support arms 77 towards the channel 5.

[0047] A retaining means comprising a pair of spaced apart upwardly extending retaining members 80 are located adjacent the framework 4 between the support arms 77 for retaining logs on the support arms 77 and preventing the logs on the support arms 77 feeding into the channel 5 until the channel 5 is ready to receive the next one or more logs from the support arms 77. The retaining members 80 are carried on a carrier member 81 and are slideable upwardly and downwardly in guide tubes 82, which are mounted on the framework 4. A third secondary urging means comprising a double acting hydraulically powered third ram 84 acting between the framework 4 and the carrier member 81 operates the retaining members 80 between an upper retaining state illustrated in Fig. 10 for retaining the logs on the support arms 77 and a lower release state illustrated in Fig. 9 for releasing one or more of the logs on the support arm 77 for feeding one or more of the logs on the support arms 77 into the channel 5.

[0048] In this embodiment of the invention the main ram 24 and the first, second and third rams 44, 55 and 84 are operated under the control of an hydraulic circuit (not shown) which is adapted for coupling to the hydraulic system of the tractor. However, if desired, the hydraulic circuit (not shown) could be independently powered by an independent hydraulic power supply which could be powered from the power take-off shaft of the tractor via the drive shaft 57.

[0049] In use, the apparatus 1 is hitched to a tractor by the hitch eye 18 of the hitch arm 17, and the drive shaft 57 is coupled to the power take-off shaft of a tractor through a suitable universal drive shaft. The hydraulic circuit (not shown) of the apparatus 1 is connected to the hydraulic power supply of the tractor.

[0050] With the apparatus 1 so coupled to the tractor, the apparatus 1 is ready for use. The logs 2 are stored on the support arms 77 and are retained thereon by the retaining members 80 in the upper retaining state illustrated in Fig. 10. If the logs 2 are of a relatively large diameter, the logs will require splitting, and the splitting element 22 is operated by the first ram 44 into the splitting state, see Fig. 11. Generally, when the logs are of a diameter to require splitting, depending on the size of the logs, one, two or possibly three logs would be loaded into the channel 5 and urged through the splitting element 22. However, where the logs 2 are of a relatively small diameter and do not require splitting, the splitting element 22 is operated between the rest state and the clamping state during the traversing, cutting and parting off of the logs, see Figs. 12a and 12b. Where the log or logs are to be split, with the splitting element 22 in the splitting state, and retained in the splitting state by the first ram 44, the main ram 24 is operated to urge the log or logs in the channel 5 through the splitting element 22 for longitudinally splitting of the log or logs.

[0051] In this embodiment of the invention the hydraulic circuit is manually operated, and the hydraulic circuit is operated for operating the main ram 24 to incrementally urge the log or logs through the splitting element 22 until the length of the longitudinally split log extending from the splitting element 22 is of length approximately the size to which the logs are to be transversely cut into short logs. At that stage the main ram 24 is temporarily deactivated and the second ram 55 is operated for urging the saw 48 transversely across the channel 5 for parting off the split logs extending on the downstream side of the splitting element 22. The second ram 55 is deactivated, and the saw 48 is returned to the rest state by the spring (not shown), and the main ram 24 is again urged for further incrementally urging the log or logs in the channel 5 a further distance until the length of the split log extending downstream from the splitting element 22 is of length ready to be parted off by the saw 48, and so operation of the apparatus 1 continues until the log or logs in the channel 5 have been entirely passed through the splitting element 22. At that stage the main ram 24 is returned to its rest state, and the third rams 84 are operated for urging the retaining members 80 from the retaining state to the release state, thereby releasing one or more logs from the support arms 77 into the channel 5. Thereafter splitting of the fresh log or logs in the channel 5 continues as already described.

[0052] On the other hand, when the diameter of the logs is such that they do not require splitting, a plurality of logs are fed from the support arms 77 into the channel 5. With the splitting element 22 urged upwardly by the first ram 44 into the rest state. In this case, since splitting of the logs is not required, the splitting element 22 is operated between the rest state and the clamping state for clamping the logs at the downstream end 8 of the channel 5 adjacent the saw 48 for facilitating transverse cutting of the logs by the saw 48. In this case the main ram 24 is incrementally urged for urging the logs along the channel 5 a distance corresponding to the desired length to which the logs are to be cut, and when the appropriate length of the logs has been fed through the channel 5 past the saw 48 on each incremental movement of the main ram 24, the first ram 44 is operated for urging the splitting element 22 from the rest state to the clamping state so that the logs are clamped between the first transverse splitting knife 32 and the base 10 of the channel 5 adjacent the saw 48 so that the saw 48 can transversely cut the logs 2 to the desired length. On completion of transverse cutting of the logs 2, the first ram 44 is operated for urging the splitting element 22 from the clamping state to the rest state to allow the logs to be incrementally urged again through the channel 5 for the next transverse cut by the saw 48.

[0053] Referring now to Figs. 14 to 21, there is illustrated log processing apparatus according to another embodiment of the invention, indicated generally by the reference numeral 90. The apparatus 90 is substantially similar to the apparatus 1, and similar components are identified by the same reference numerals. The main difference between the apparatus 90 and the apparatus 1 is that firstly the apparatus 90 is provided by a primary splitting means, namely, a primary log splitter 91 for splitting relatively large diameter logs prior to being urged through the splitting element 22, and additionally, the apparatus 90 is provided with a crane 92, which is described in more detail below.

[0054] The primary log splitter 91 comprises a primary anvil, which in this embodiment of the invention is formed by a portion 93 of the housing 51, and a primary log splitter knife 94 which is carried on a primary urging means, which in this embodiment of the invention comprises a primary ram 95, which is mounted on the framework 4 of the apparatus 90 and extends parallel with the main ram 24. The primary ram 95 comprises a primary cylinder 96 and a primary piston rod 97 extending from the primary cylinder 96. The primary log splitter knife 94 is carried on the primary piston rod 97 and defines a primary cutting edge 98 which extends generally upwardly relatively to and from the bed 3. The primary log splitter knife 94 is mounted on the primary piston rod 97 of the primary ram

95 so that the primary cutting edge 98 faces the portion 93 of the housing 51 which forms the primary anvil so that as the primary ram 95 is extended, the primary log splitter knife 94 is urged towards the primary anvil 93 for splitting logs of relatively large diameter. The length of travel of the primary splitter knife 94 from the fully retracted state of the primary ram 95 to the fully extended state of the primary ram 95 is approximately 3.3 metres, and the spacing between the primary splitter knife 94 and the primary anvil 93, when the primary ram 95 is fully retracted is approximately 3.3 metres, so that the primary log splitter 91 is suitable for splitting relatively large logs of length up to 3 metres.

[0055] In this embodiment of the invention the support arms 77 are pivotally mounted to the framework 4 and are urgeable between a supporting state illustrated in Figs. 16 and 17 for supporting logs and a locating state illustrated in Figs. 14 and 18 whereby the support arms 77 co-operate with the retaining members 80 when the retaining members 80 are in the upper retaining state for locating a log of large diameter on the bed 3 for splitting by the primary log splitter 91. An hydraulically powered ram 99 operates the support arms 77 between the supporting state and the locating state.

[0056] The crane 92 is mounted on a bridging element 100 which is mounted on the framework 4 and extends over the main ram 24. The crane terminates in a grab 101 for lifting and transferring logs from the ground onto the support arms 77 when the support arms 77 are in the supporting state. Additionally, the crane 92 is configured so that the grab 101 is suitable for gripping a skip bag (not shown) of logs which have been split by the splitting element 22, and for transferring the skip bag from the skip bag holder 67 to one of a storing area or onto the bed of a truck.

[0057] Additionally, in this embodiment of the invention a pair of stabiliser legs 103 extend from respective opposite sides of the framework 4 and are urgeable between a raised rest state (not shown) and an operative state illustrated in Figs. 14 to 18 for stabilising the apparatus 90 on the ground by respective rams 104. The rams 104 act between the stabiliser legs 103 and the framework 4.

[0058] Otherwise, the apparatus 90 is similar to the apparatus 1.

[0059] In use, with the apparatus 90 stabilised by the stabiliser leg 103 in the operative state and the support arms 77 in the support state and the retaining members 80 in the retaining state illustrated in Fig. 16, and with the primary ram 95 retracted with the primary log splitter knife 94 at its maximum distance from the primary anvil 93, the apparatus 90 is ready for use. A log of large diameter is grabbed by the grab 101 of the crane 92 and is transferred onto the support arms 77. The ram 99 is then operated for urging the support arms 77 from the support state to the locating state for urging the log onto the bed 3 and locating the log on the bed 3 between the retaining members 80 and the support arms 77.

[0060] With the log located on the bed 3 between the retaining members 80 and the support arms 77, the primary ram 95 is operated for urging the primary splitter knife 94 towards the primary anvil 93. As the primary splitter knife 94 is urged towards the primary anvil 93, the log of relatively large diameter is split. On the relatively large log having been split, the primary ram 95 is operated for retracting the piston rod 97 into the primary cylinder 96, and in turn for urging the primary splitter knife 94 from the primary anvil 93. The retaining members 80 are urged downwardly below the bed 3 into the lower release state, and one half of the log which has been split by the primary splitter 91 is urged across the bed 3 between the pusher plate 75 of the main ram 24 for urging the log through the splitter element 22. During splitting of the first half of the log by the splitter element 22, the other half of the log is retained by the retaining members 80, which are returned to the upper retaining state after the first half of the split log has been located between the pusher plate 75 and the splitter element 22, and so operation of the apparatus 90 continues. When the skip bag which is supported on the skip bag support 67 is to be transferred from the skip bag holder 67, the crane 92 is operated and the skip bag is grabbed by the grab 101 and transferred to either the storing area or onto the bed of the truck.

[0061] Otherwise, the use of the apparatus 90 is similar to that of the apparatus 1.

[0062] The advantages of the invention are many. A particularly important advantage of the invention is that by virtue of the fact that the saw 48 of the apparatus 1 and 90 is located relatively closely to the splitting element, and downstream thereof, the splitting element when acting to longitudinally split the logs effectively acts as a clamp for clamping the logs as the short logs are being transversely parted off by the saw 48. This is a particularly important advantage of the invention and overcomes problems associated with other log splitters.

[0063] A further and also particularly important advantage of the invention is that the splitting element 22 of the apparatus 1 and 90 is selectively configurable to be operative in a splitting state for longitudinally, splitting one or more logs, and a clamping state for clamping a plurality of logs during transverse parting off thereof. This is a particularly important advantage, since in many cases logs are of a diameter which do not require splitting, and by virtue of the fact that the splitting element can be operated in a clamping state, a plurality of logs can be passed through the channel and clamped by the splitting element for transverse parting off by the saw 48.

[0064] A particularly important advantage of the apparatus 90 is that the apparatus 90 is particularly suitable for splitting relatively large diameter logs, which would be of diameter too great for splitting by the splitting element 22. The relatively large diameter logs on being split into two halves by the primary log splitter 91 can then be transferred into the channel 5 to be split into lengths of smaller cross-section by the splitting element 22. Thus,

the apparatus 90 permits logs of a relatively large range of diameters and lengths to be split.

[0065] While the saw has been described as comprising a disc saw, any type of saw or any other type of transverse cutting means may be provided.

[0066] While a specific shape and construction of splitting element has been described, any other suitable splitting element may be provided. Indeed, it is envisaged that in certain cases the splitting element may comprise a pair of splitting knives configured in a cruciform fashion for splitting a single log into four segments.

[0067] It will be readily apparent to those skilled in the art that the apparatus 1 and 90 may be configured to suit any maximum length of log or logs. This will be achieved by merely providing the rams 24 and 95 with strokes of appropriate length, and altering the length of the framework.

Claims

1. A log processing apparatus comprising an elongated bed (3) extending between an upstream end (7) and a downstream end (8) for supporting at least one elongated log, a cutting means (48) located adjacent the downstream end (8) of the bed (3) and configured to transversely cut the at least one log into short lengths, and a main urging means (24) configured to urge the at least one log past the cutting means (48) **characterised in that** a splitting means (22) is located adjacent the downstream end (8) of the bed (3) upstream of the cutting means (48), the splitting means (22) being configured to longitudinally split the at least one log, and the main urging means (24) is configured to urge the at least one log through the splitting means (22).

2. A log processing apparatus as claimed in Claim 1 **characterised in that** the splitting means (22) is located adjacent the cutting means (48).

3. A log processing apparatus as claimed in Claim 1 or 2 **characterised in that** the splitting means (22) is selectively configurable in one of a splitting state for splitting the at least one log, and a clamping state for clamping the at least one log in the bed (3) adjacent the downstream end (8) thereof.

4. A log processing apparatus as claimed in Claim 3 **characterised in that** the splitting means (22) is urgeable from a rest state through the clamping state to the splitting state.

5. A log processing apparatus as claimed in any preceding claim **characterised in that** the splitting means (22) comprises a log splitting element (22) having a first transverse splitting knife (32) extending generally transversely of the upstream/downstream direction of the bed (3), the first transverse splitting knife (32) being configurable in the splitting state for splitting the at least one log, and in the clamping state co-operating with the bed (3) for clamping the at least one log between the bed (3) and the first transverse splitting knife (32).

6. A log processing apparatus as claimed in Claim 5 **characterised in that** the log splitting element (22) comprises a main splitting knife (25) extending generally transversely of the upstream/downstream direction of the bed (3), the first transverse splitting knife (32) extending outwardly from the main splitting knife (25) on respective opposite sides thereof.

7. A log processing apparatus as claimed in Claim 6 **characterised in that** the first transverse splitting knife (32) extends outwardly downwardly from the respective opposite sides of the main splitting knife (25) at an angle to the main splitting knife (25) in the range of 45° to 80°.

8. A log processing apparatus as claimed in Claim 6 or 7 **characterised in that** the main splitting knife (25) extends downwardly below the first transverse splitting knife (32).

9. A log processing apparatus as claimed in any of Claims 6 to 8 **characterised in that** a second transverse splitting knife (34) is located above the first transverse splitting knife (32) and is configured to extend from the main splitting knife (25) on respective opposite sides thereof in a generally outwardly upwardly direction.

10. A log processing apparatus as claimed in any preceding claim **characterised in that** the cutting means (48) is urgeable substantially transversely across the bed (3) from a rest state for transversely cutting the at least one log located therein.

11. A log processing apparatus as claimed in any preceding claim **characterised in that** a support means (77) is provided for supporting and feeding elongated logs into the bed (3), and a retaining means (80) is provided for retaining the logs on the support means (77), the retaining means (80) being urgeable between a retaining state retaining the logs on the support means (77), and a release state permitting feeding of the logs from the support means (77) to the bed (3).

12. A log processing apparatus as claimed in Claim 11 **characterised in that** the support means (77) is pivotal from a support state for supporting one or more logs to a locating state for co-operating with the retaining means (80) for locating one of the logs on the bed (3).

13. A log processing apparatus as claimed in Claim 11 or 12 **characterised in that** a crane (92) is mounted on the apparatus (1) and is configured to transfer a log onto one of the bed (3) and the support means (77), and to transfer a bag of logs split by the splitting means (22) from the apparatus (1) to one of a storing area and a truck.

14. A log processing apparatus as claimed in any preceding claim **characterised in that** a primary splitting means (91) is located on the bed (3) for splitting a log of relatively large diameter, the primary splitting means (91) comprising a primary splitter knife (94), and a primary anvil (93) being configured to co-operate with the primary splitter knife (94), one of the primary splitter knife (94) and the primary anvil (93) being moveable relative to the other one of the primary splitter knife (94) and the primary anvil (93) for splitting a log supported on the bed (3), and a primary urging means (95) is provided for urging the moveable one of the primary splitter knife (94) and the primary anvil (93) towards the other one of the primary splitter knife (94) and the primary anvil (93) for splitting the log.

15. A log processing apparatus as claimed in Claim 13 **characterised in that** the primary splitter knife (94) and the primary anvil (93) are configured for splitting a relatively long log such that the travel of the moveable one of the primary splitter knife (94) and the primary anvil (93) is at least two metres.

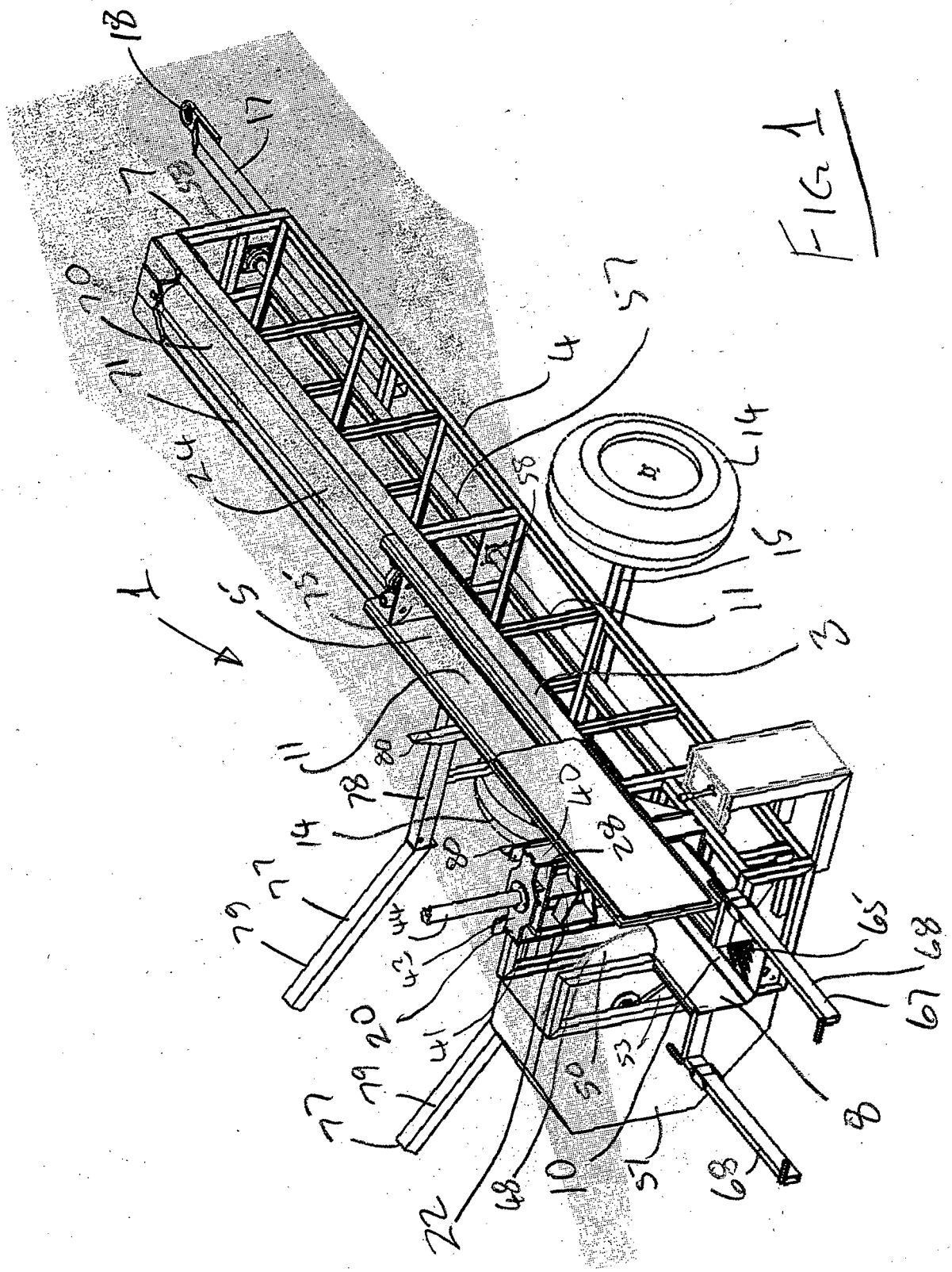

FIG 1

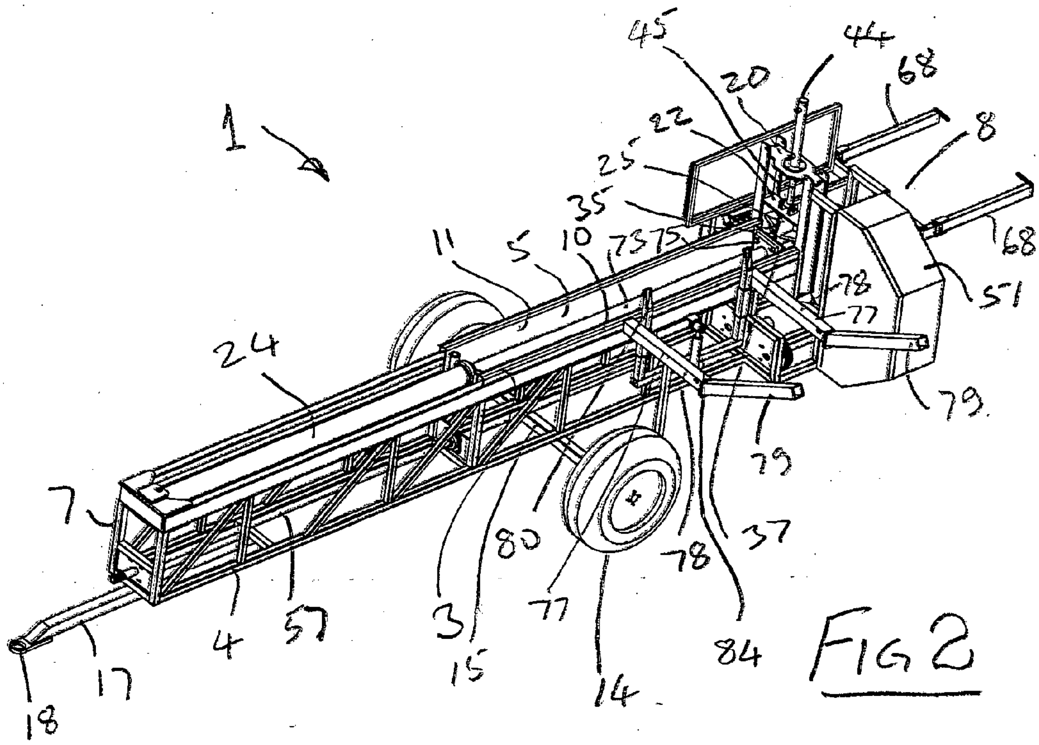
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FIG 2

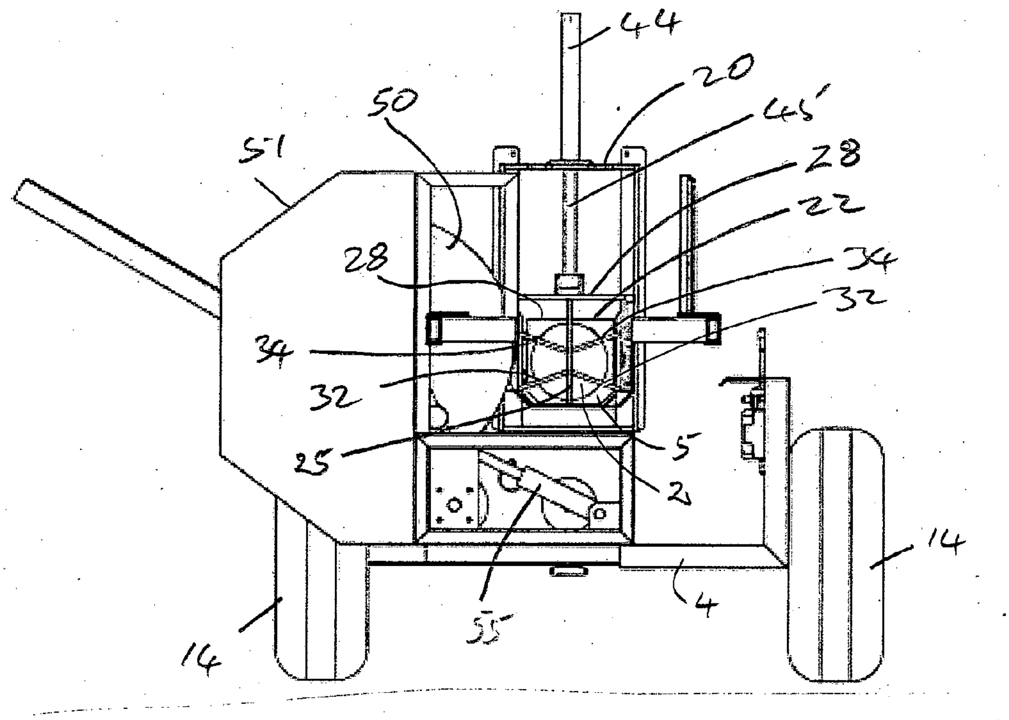
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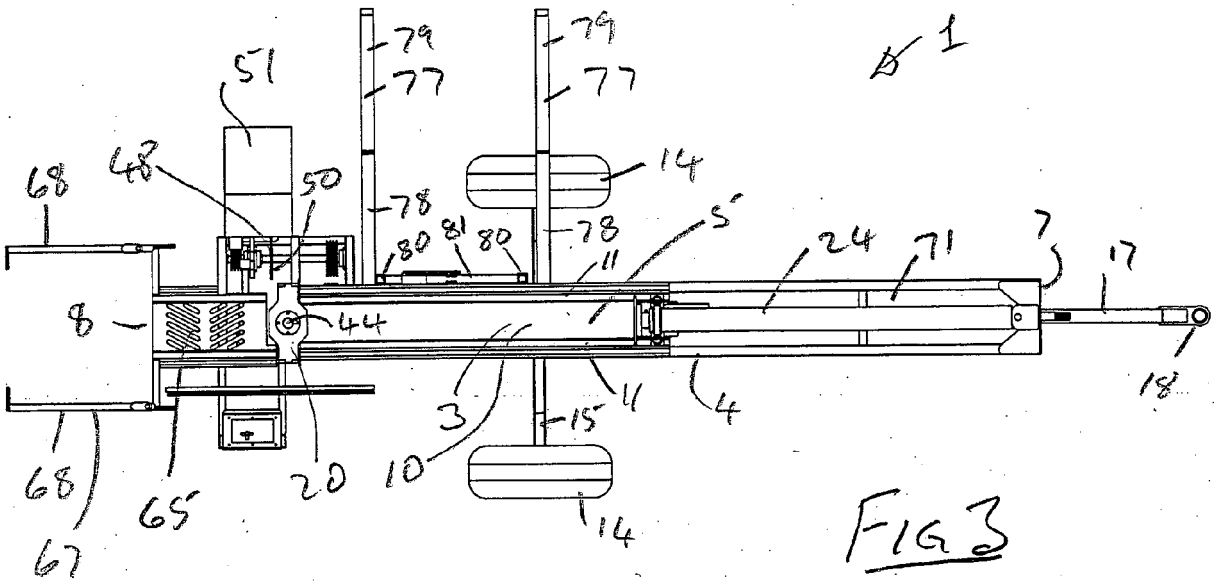
FIG 11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65'
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10
67
14

FIG 3

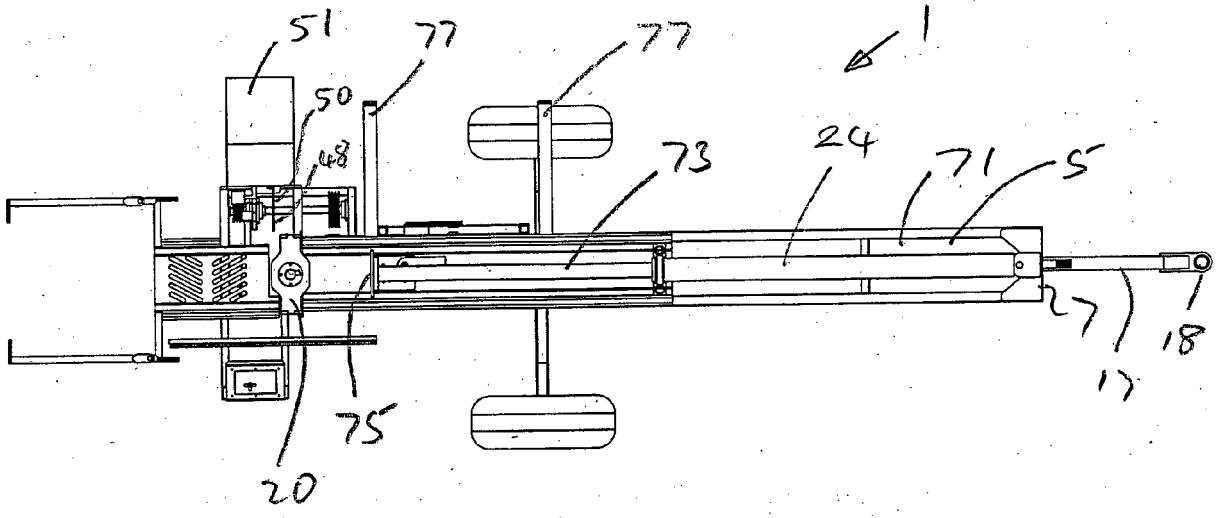
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FIG 4

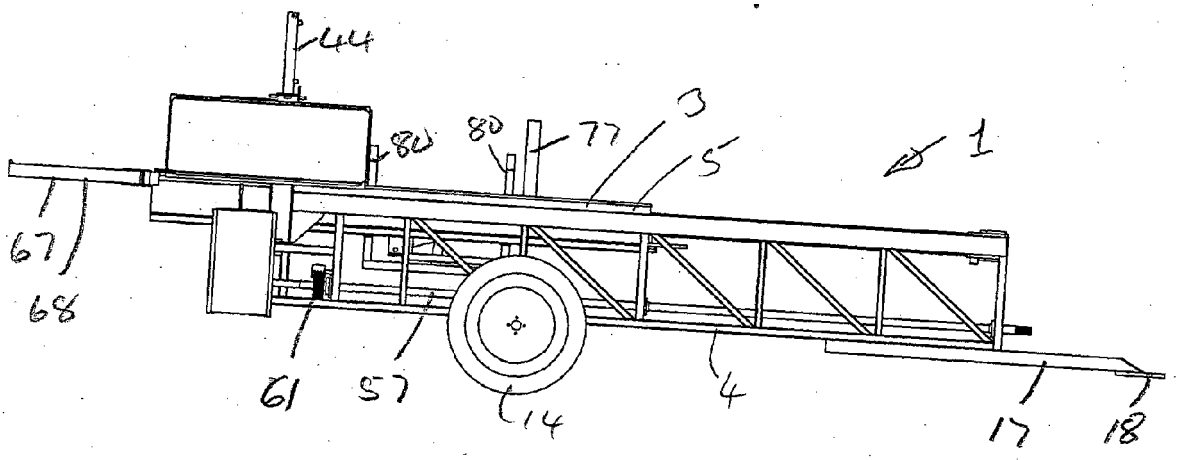
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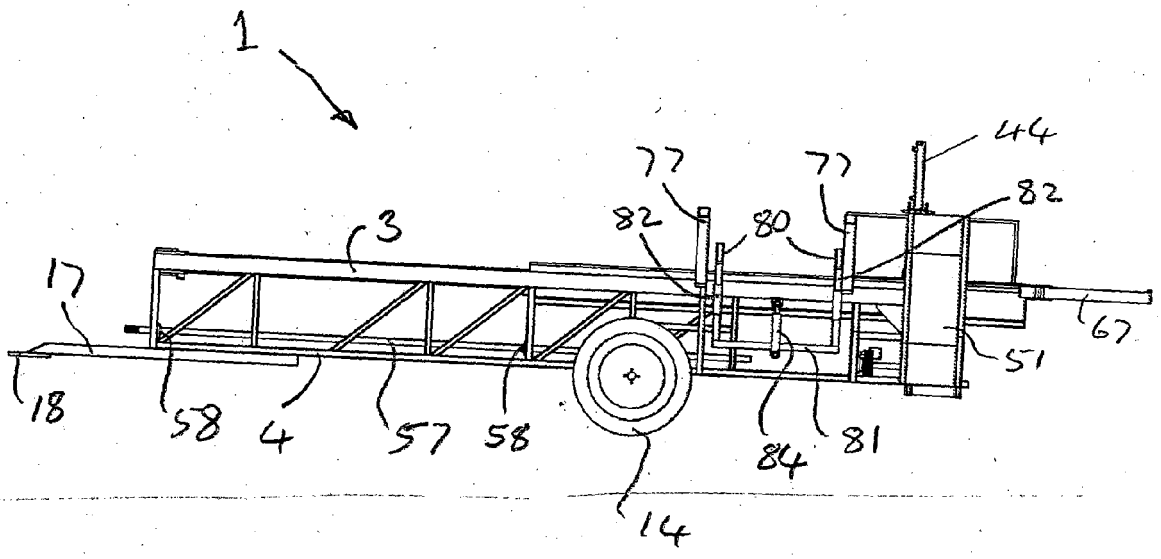
FIG 5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14

FIG 6

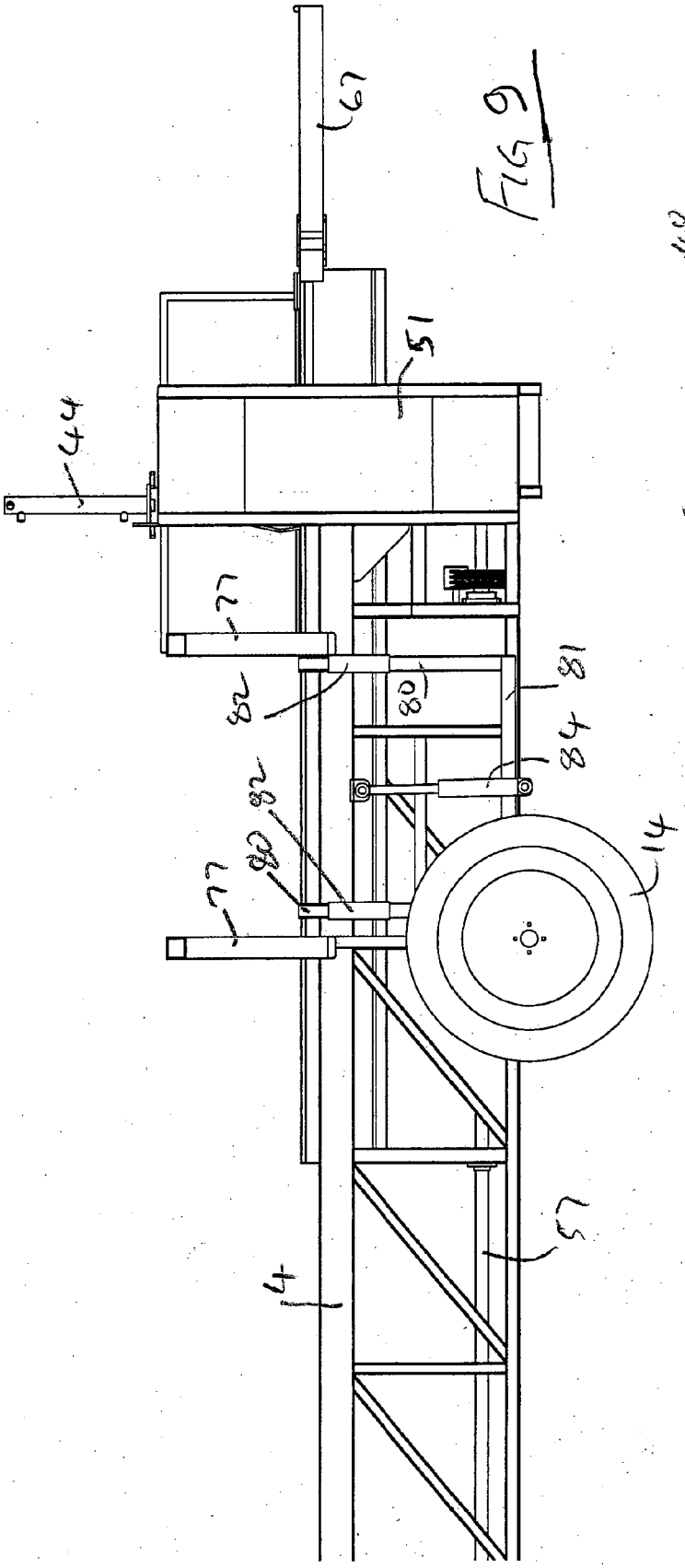

FIG 9

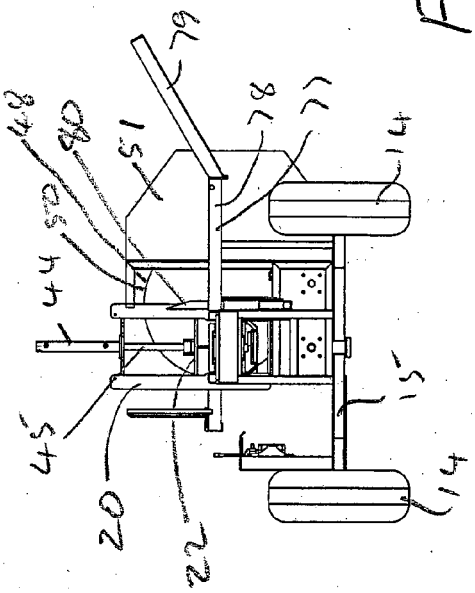

FIG 8

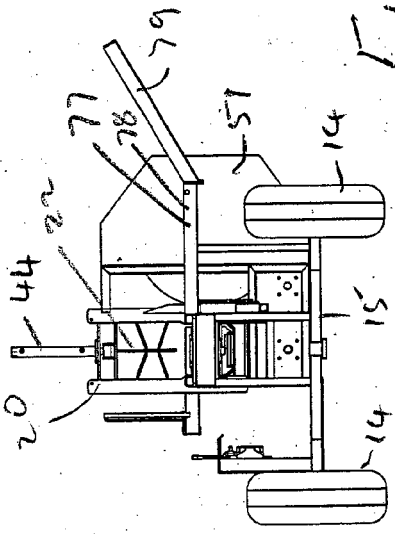

FIG 7

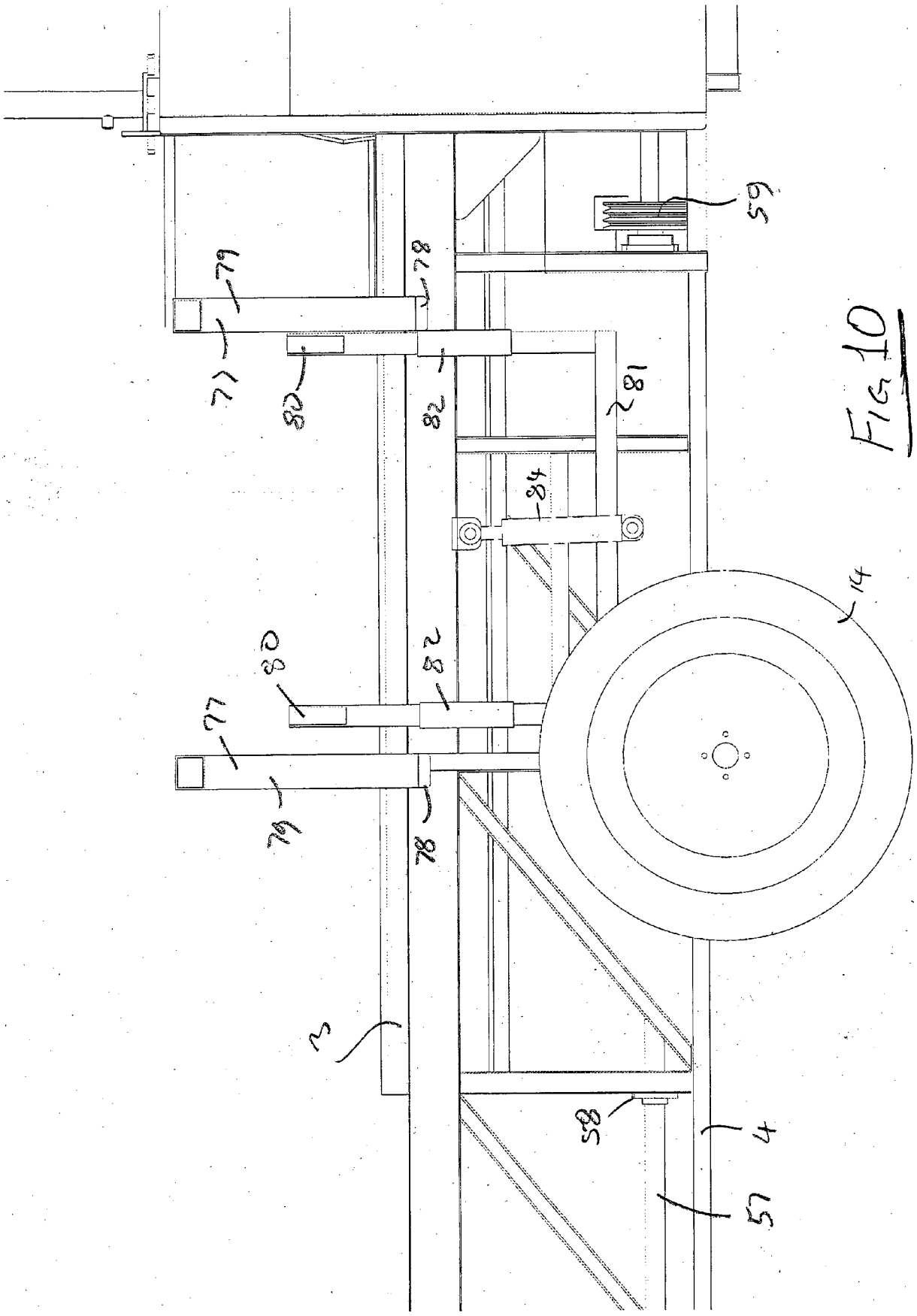

FIG 10

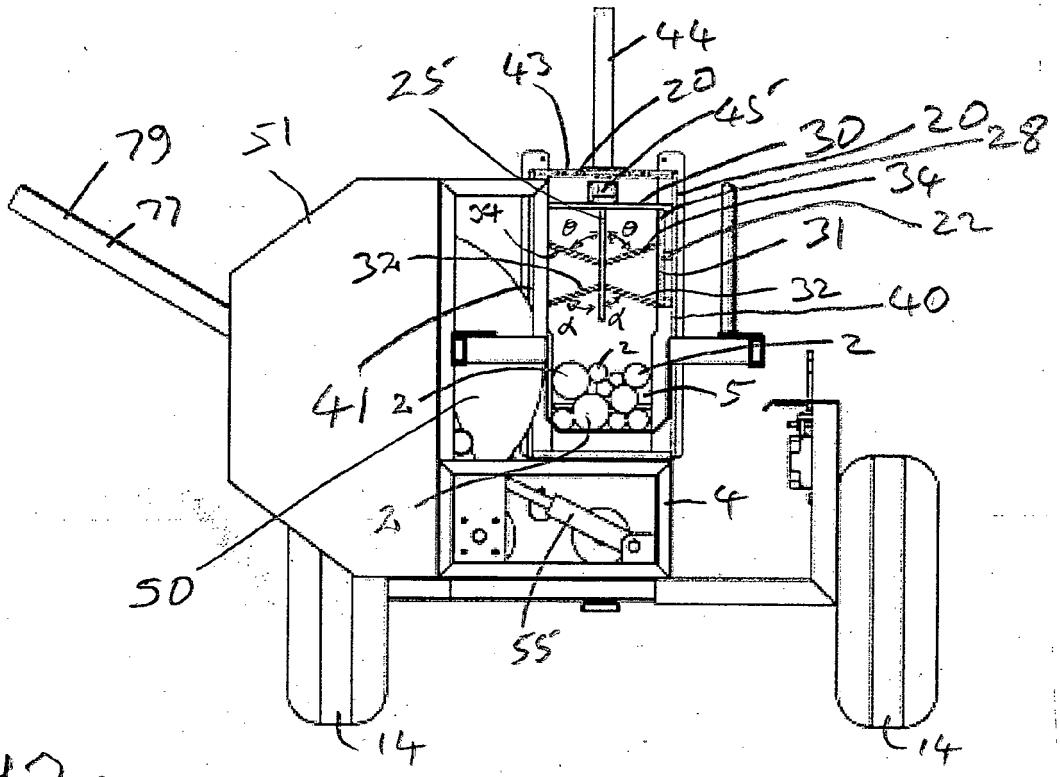

FIG 12a

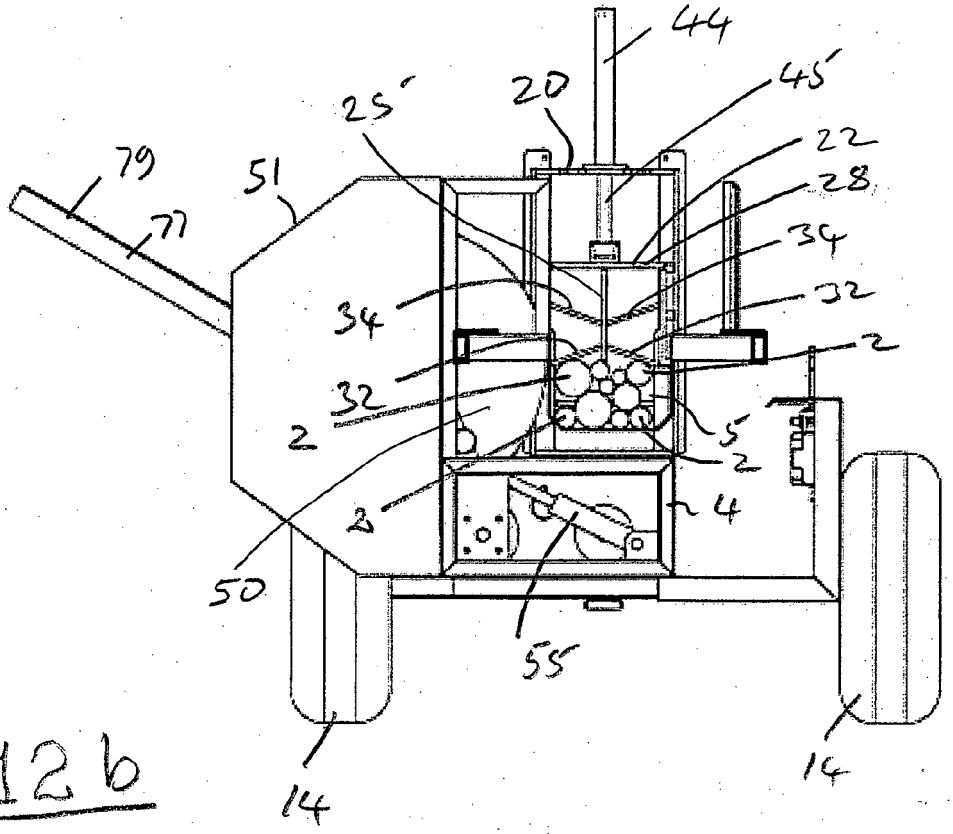

FIG 12b

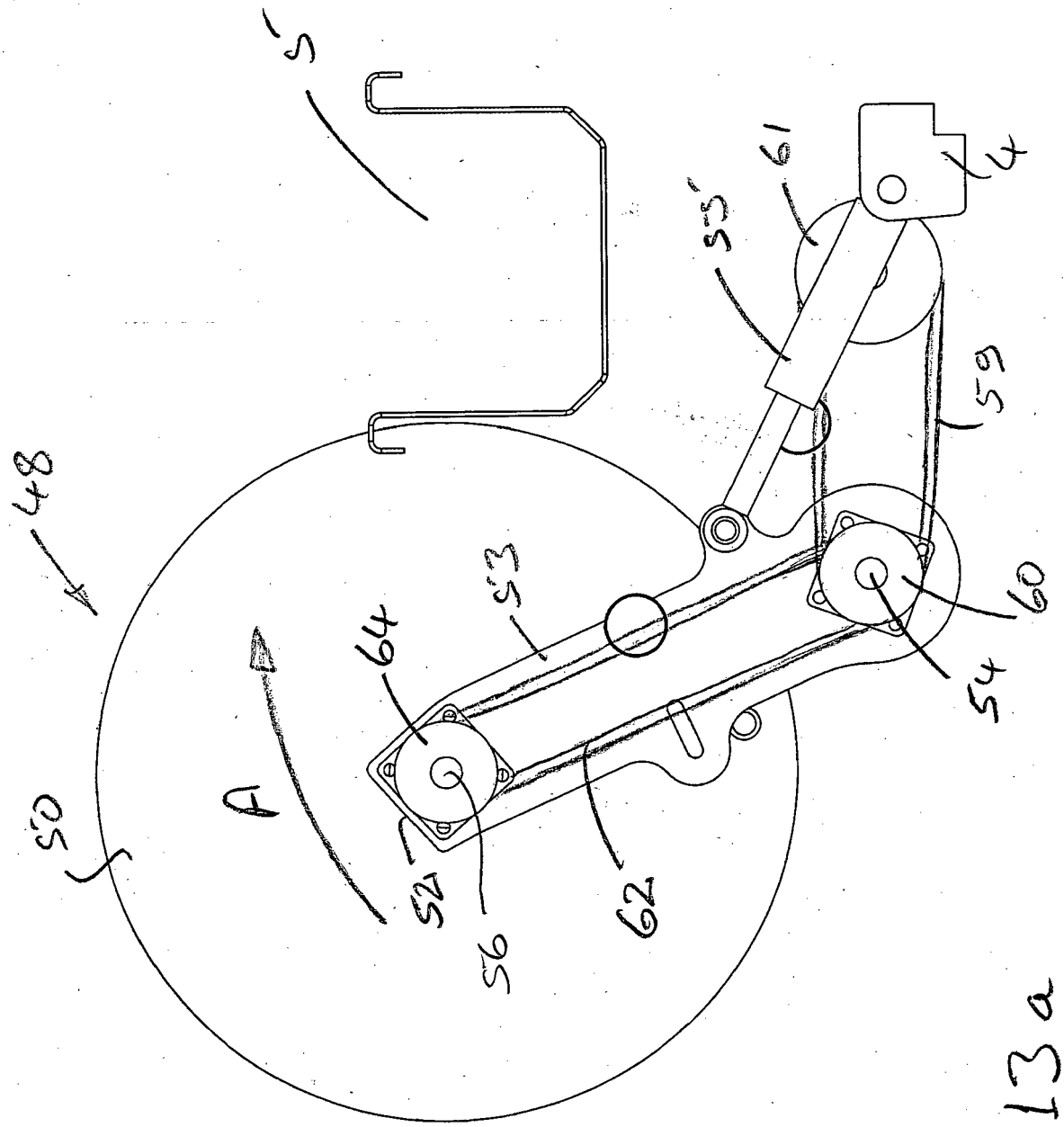

Fig 13a

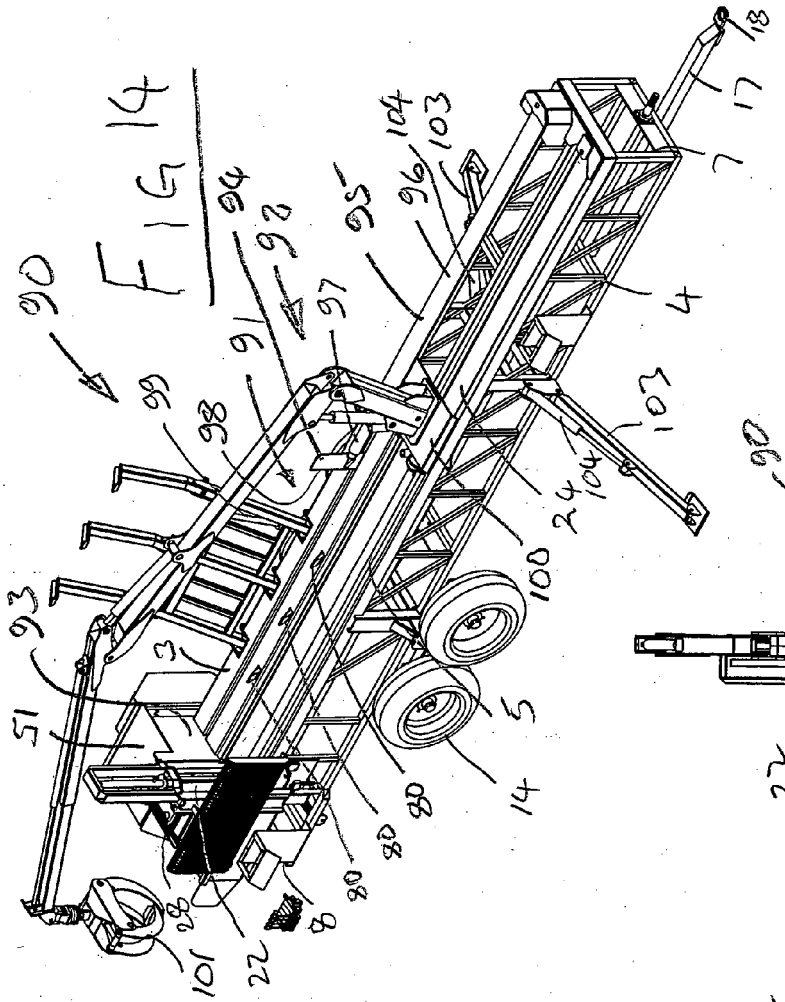

FIG 14

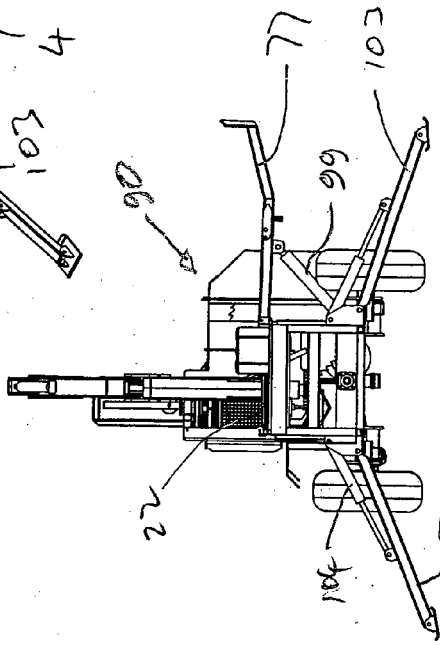

FIG 17

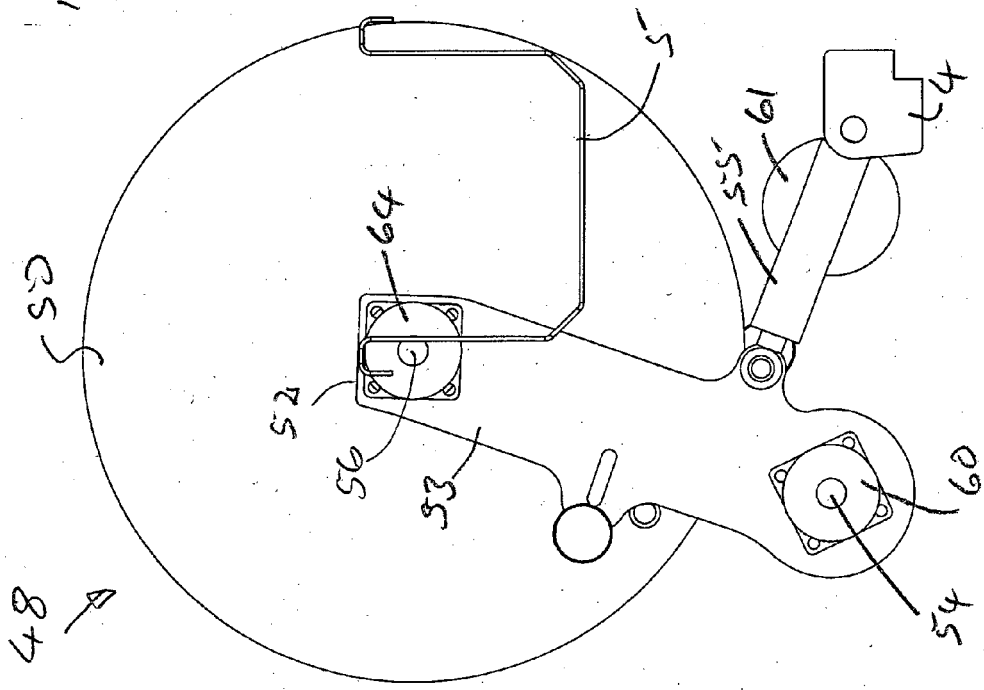

FIG 13b

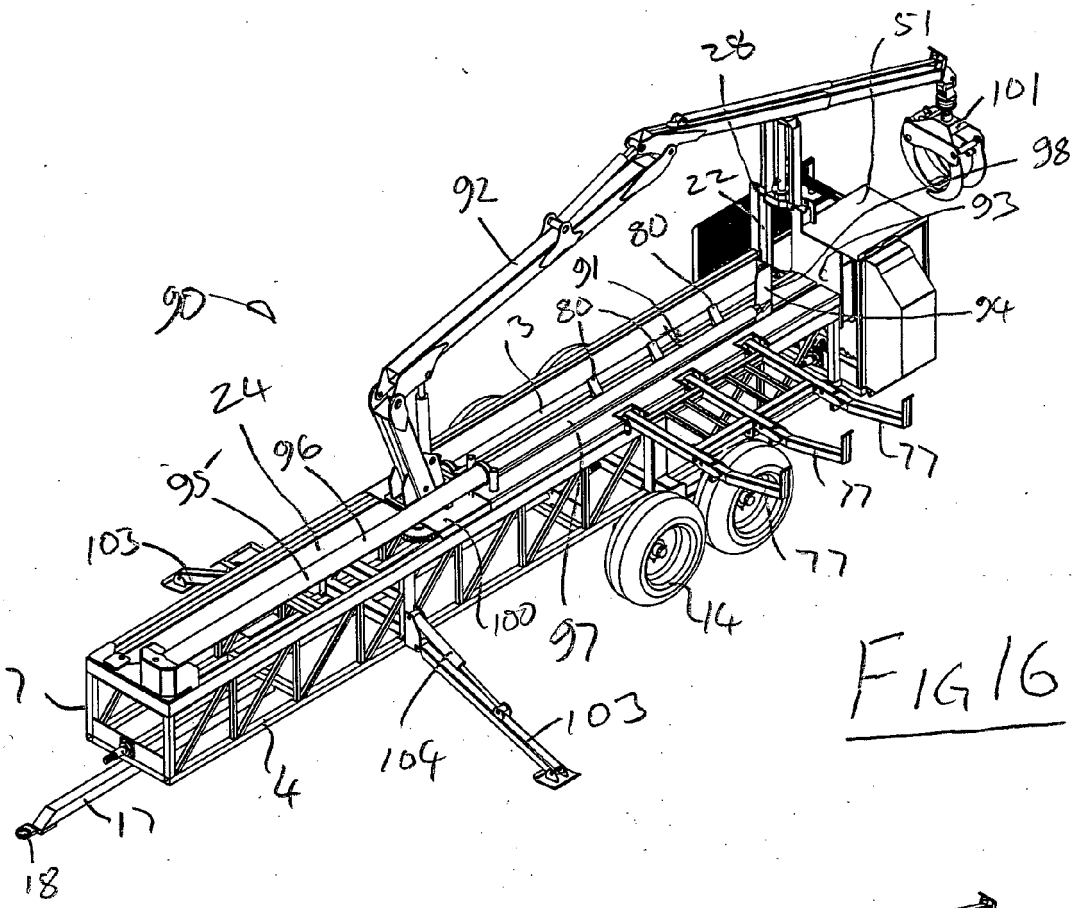
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FIG 16

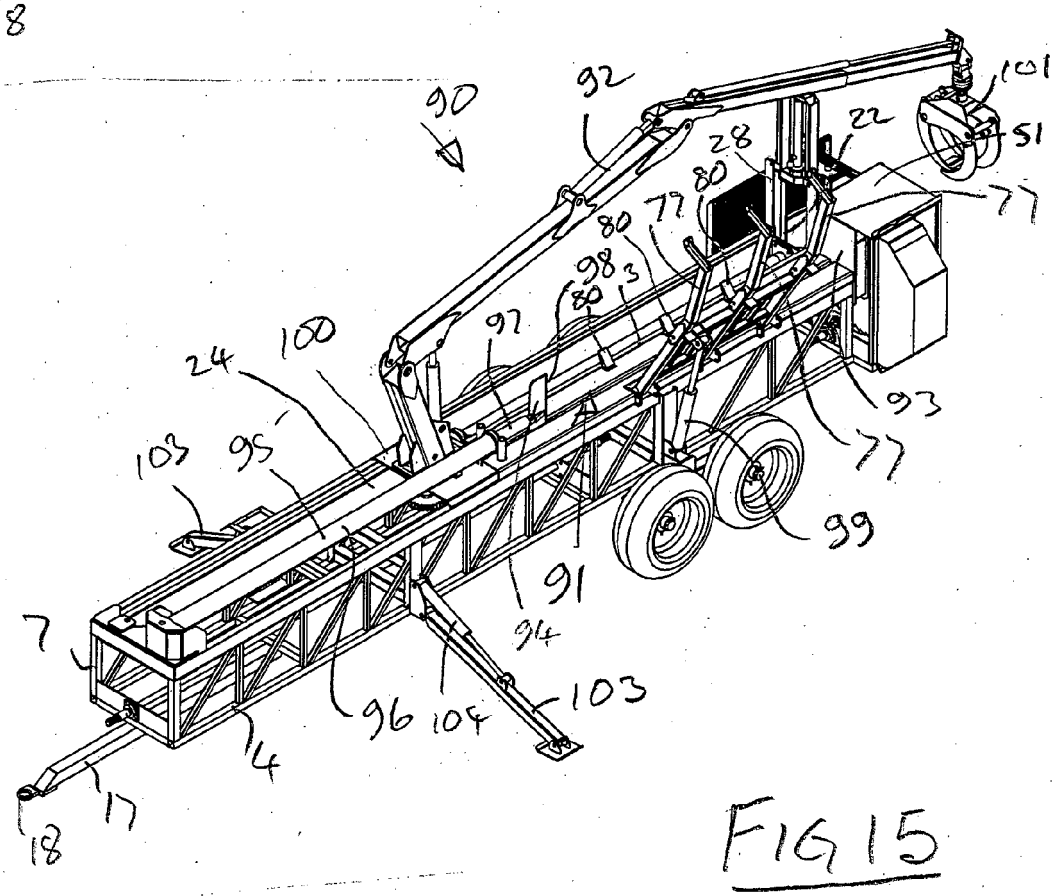
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FIG 15

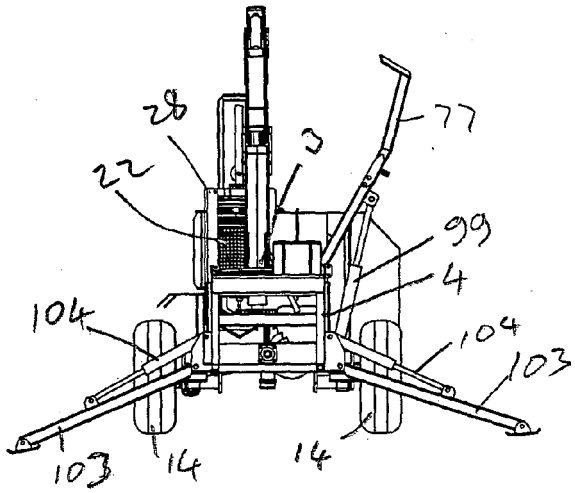

FIG 18

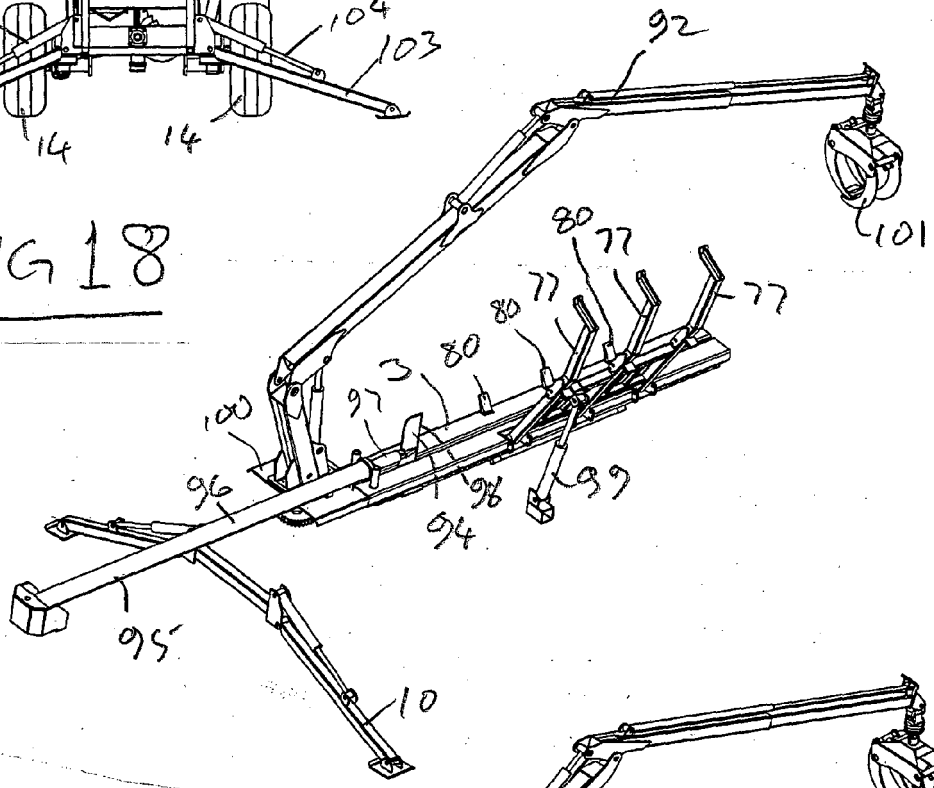

FIG 21

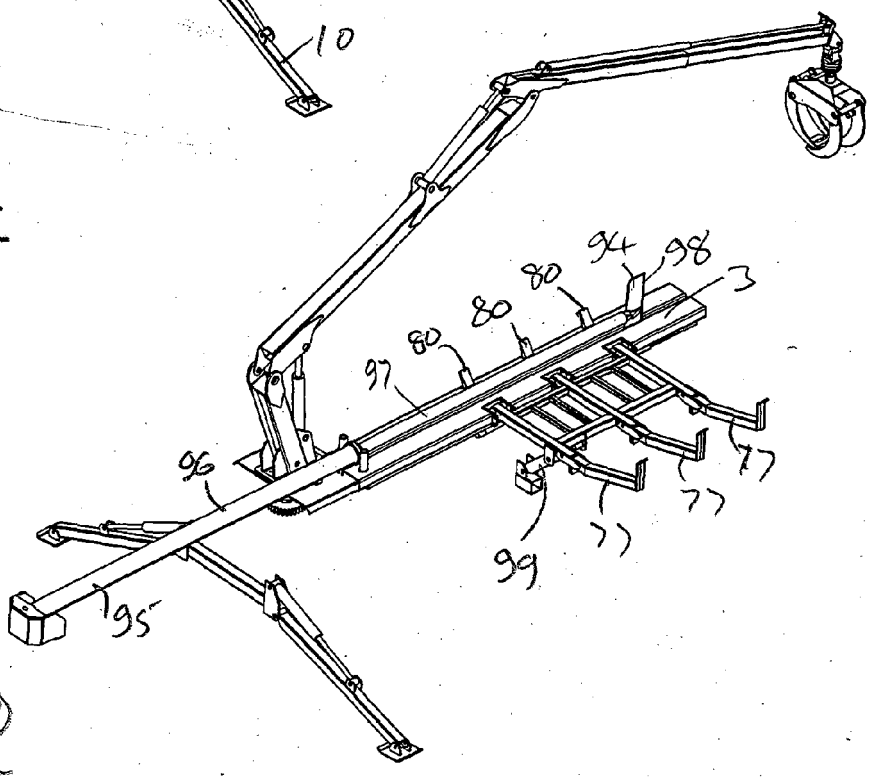

FIG 19

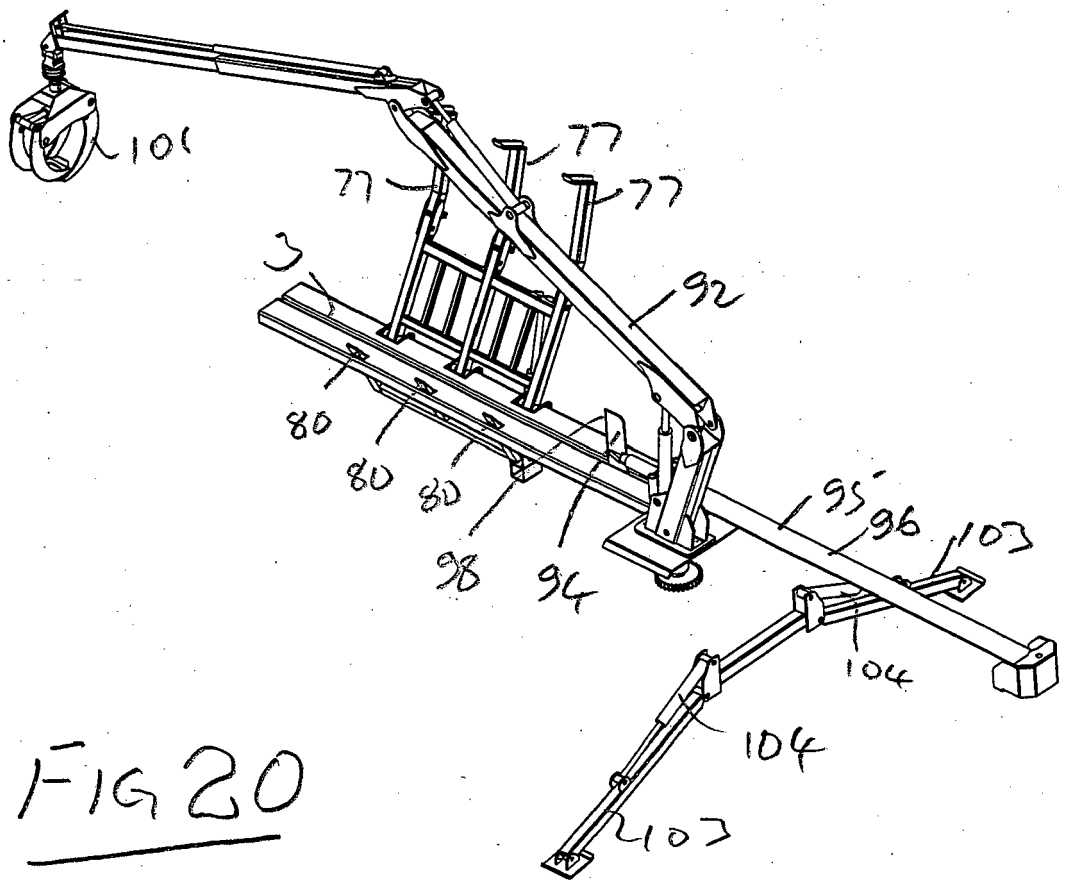

FIG 20

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EUROPEAN SEARCH REPORT

Application Number
EP 16 39 4001

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,P	WO 2015/118224 A1 (AGROMASTER OY [FI]) 13 August 2015 (2015-08-13) * abstract * * page 8, line 27 - page 10, line 20 * * figures *	1-4, 10-12	INV. B27L5/00 B27L5/06
X	EP 2 639 026 A1 (HYTAR OY [FI]) 18 September 2013 (2013-09-18) * abstract * * paragraph [0038] * * figures *	1-4, 10-15	
A	WO 2005/095072 A1 (AFICOR S A [CH]; CORNU DOMINIQUE [CH]) 13 October 2005 (2005-10-13) * abstract * * figures *	14	

TECHNICAL FIELDS SEARCHED (IPC)

B27L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 June 2016	Hamel, Pascal

CATEGORY OF CITED DOCUMENTS

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17-06-2016

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