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(54) Title: METHOD AND APPARATUS FOR LIFTING SOD FROM THE TOP

(57) Abstract: Method and apparatus for lifting sod, in which grass blades of the sod are inserted between one or more clamps. The clamps are closed to grip the grass blades and the clamps are then moved, with the sod suspended therefrom, to a desired location. The clamps can if desired also grip the thatch, and/or a portion of the soil, of the sod slab.

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Title: Method and Apparatus for Lifting Sod from the Top

PRIOR APPLICATION

[0001] This application claims the benefit of U.S. Provisional
5 Application Serial No. 60/448,127, filed February 20, 2003 entitled "SOD
PICKUP MECHANISM" and U.S. Provisional Patent Application Serial No.
60/528,494, filed December 11, 2003 entitled "METHOD AND APPARATUS
FOR LIFTING SOD FROM THE TOP".

FIELD OF THE INVENTION

10 [0002] This invention relates to a method and apparatus for lifting sod
from a position above the sod. More particularly, it relates to a mechanism
and a method of lifting in which the sod is lifted by gripping the sod by
(depending on the properties of the sod) the grass blades of the sod, or by the
grass blades and by the thatch accumulated in the sod, or (in some cases) by
15 the soil portion of the sod.

BACKGROUND OF THE INVENTION

[0003] Practical automatic sod harvesters, in which sod is harvested
from the ground and stacked on a pallet, have existed for about 40 years.
20 Originally, such harvesters formed the cut sod into rolls which were stacked
on pallets, moved to a site where sod was needed, and then laid. However,
there are various disadvantages associated with rolling the sod, and therefore
an alternative method of sod handling became popular, in which the sod was
simply cut into slabs (i.e. flat lengths of sod) which were stacked on pallets
25 and handled in that form. Leaving the cut sod in flat slabs tends to impose
less severe mechanical stresses on the sod, and in addition more sod can be
stored in a smaller space. However, lifting the slabs automatically has proven
difficult.

[0004] Various methods have been suggested for lifting sod slabs and
30 for moving the slabs once lifted. One such method, suggested by the present
applicants, was to pierce the sod slabs with hooks which could then be used

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to lift and move the slabs. However, the hooks, in use, in some cases protrude below the bottom surface of the sod slab and can in some situations create awkwardness in handling the slab. In addition, release of the sod slab from the hooks can sometimes be difficult.

- 5 [0005] In addition, once the sod slabs are stacked on a pallet and have been moved to a worksite where the sod is to be laid, it may not always be practical to employ hooks to lift the sod slabs in order to lay them. Therefore, to date, the sod slabs have usually been handled manually, which is a labor intensive and costly job.

10

BRIEF SUMMARY OF THE INVENTION

- [0006] Therefore, it is an object of the present invention to provide a method and apparatus for lifting a sod slab from above the slab. In one aspect the invention provides a method of handling sod having grass blades
15 projecting upwardly therefrom, comprising gripping at least an upper portion of said sod between opposing portions of a clamp and moving said clamp with said sod suspended from said clamp.

- [0007] In another aspect, the invention provides apparatus for picking up sod of the kind having grass blades projecting upwardly therefrom, said
20 apparatus comprising at least one clamp having an open and a closed condition, and a mechanism for opening and closing said clamp, a support mechanism for moving at least one of said sod and said clamp towards the other at a first location for at least said grass blades to enter into said clamp when said clamp is in its open condition, and a carrying mechanism for
25 moving said clamp, with said sod slab suspended therefrom, to another location.

- [0008] Further objects and advantages of the invention will appear from the following description, taken together with the accompanying drawings.

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BRIEF DESCRIPTION OF DRAWINGS

[0009] In the drawings:

Fig. 1 is a diagrammatic perspective view of simplified apparatus for picking up a sod slab according to the invention;

5

Fig. 2 is an end view of the apparatus of Fig. 1;

Fig. 3 is a perspective view of a modified form of clamp for picking up sod according to the invention;

10

Fig. 4 is a side view of one side of the Fig. 3 clamp;

Fig. 5 is a side view of the other side of the Fig. 3 clamp;

15

Fig. 6 is a perspective view of clamp structure according to the invention, with the clamps open and above the sod;

Fig. 7 is a view similar to that of Fig. 6 but showing the clamps down on the sod and pushed into the grass blades;

20

Fig. 8 is a view similar to that of Fig. 7 but showing the clamps penetrating into the grass blades and thatch of the sod;

Fig. 9 is a view similar to that of Fig. 6 but showing the clamps closed and the sod being lifted;

25

Fig. 10 is a perspective view from above, showing a linkage system for closing and opening all of the clamps together;

30

Fig. 11 is a view from below the clamp apparatus of Fig. 6, showing the structure of the clamps and their teeth;

Fig. 12 is a perspective view from below of the clamp apparatus of Fig. 6, and also showing a sod cut-off;

35

Fig. 12A is a side view showing details of the sod cut-off;

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Fig. 12B is a diagrammatic sectional view showing further details of the sod cut-off;

5 Fig. 13 is a perspective view showing the clamp structure of Fig. 6 and its associated cut-off descending on a sod slab;

Fig. 14 is a diagrammatic view showing apparatus similar to that of Figs. 6 to 13, but in which the sod slab is lifted toward the clamps rather
10 than lowering the clamps onto the sod slab;

Fig. 15 is a diagrammatic view of another embodiment of a clamp design, in which the clamp is hinged;

15 Fig. 16 is a diagrammatic view of yet another embodiment of a clamp design, in which the clamp is hinged;

Fig. 17 is a diagrammatic view showing a modified clamp design;

20 Fig. 18 is a diagrammatic perspective view of another form of clamp which may be used, employing screens;

Fig. 19 is a side view of the apparatus of Fig. 18, showing two
25 screens applying clamping pressure to grass blades;

Fig. 20 is a diagrammatic side view, enlarged, showing portions of the screens of Figs. 18 and 19 gripping grass blades; and

30 Fig. 21 is a view similar to that of Fig. 20 but showing the upper screen replaced by a plate.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0010] Reference is first made to Fig. 1, which shows a sod slab **10** located on a support **12** and having upwardly protruding grass blades **14**. The sod slab **10** also has, as is normal, a soil portion **16** containing grass roots, and thatch **18** immediately above the soil portion **16**.

[0011] Located above the sod slab **10** are two elongated clamps **22**, each consisting of a first side member **24** and a second side member **26** hinged at their tops by hinges **28**. Any conventional mechanism (not shown) may be used for opening and closing the clamps **22** and for lifting them in unison.

[0012] In use, the two clamps **22**, in open position as shown in Fig. 1, are lowered toward the sod slab **10** until grass blades of the sod slab **10** extend between the two side members **24**, **26** of each clamp. The clamps are then closed, as shown in Fig. 2, to grip the sod slab **10** by its grass blades **14**. The clamps **22** may then be lifted, carrying the sod slab **10** with them, and can be moved to move the sod slab **10** to a desired location, e.g. over a pallet, on which the sod slab **10** can be deposited.

[0013] The length of the grass blades **14** which needs to be gripped by the clamps **22** depends on the properties of the sod slab, for example on the length and strength of the grass blades available to be gripped, the strength of the root structure of the sod, and the weight of the sod slab (which varies depending on the thickness of the soil and the moisture content of the soil). Alternatively, the clamps **22** can grip the thatch **18**, or the upper part of the soil portion **16**, or can even extend through a lower part of the soil portion. This will be discussed in more detail later in this application.

[0014] Instead of lowering the clamps **22** onto the sod slab **10** as described, instead, the support **12** on which the sod slab **10** rests can be lifted to move the grass blades **14** into position between the side members of the clamps **22**. Any desired lifting mechanism can be used, e.g. a scissors lift. The clamps **22** can then be closed to grip the sod slab, after which the support **12** can be lowered while the clamps are carrying the sod to a desired

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location. This method can be more efficient than the method previously described, since while the support **12** is being lowered to receive a new sod slab, the clamps **22** are moving to carry the suspended sod slab to a new position. Therefore, with this method, two operations are performed at the same time. (Alternatively, the clamps **22** can be lowered toward the sod slab **10**, and the support **12** can raise the sod slab **10** toward the clamps **22**, both at the same time, and then both these movements can be reversed once the sod slab **10** is gripped.)

[0015] If desired, the bottom inner surfaces of clamp side members **24**, **26** can each be surfaced with a strip of rubber (not shown), for a better grip on the grass blades **14**.

[0016] Reference is next made to Fig. 3 to 13 inclusive, which show another embodiment of the invention. The embodiment there shown includes clamps **30**, best shown in Figs. 3 to 5. Each clamp **30** has two clamping side members **32**, **34**. Side member **32** includes a generally vertical sidewall **36** with a bottom portion **38** extending at an angle inwardly toward the other side member **34** and terminating in a set of serrated teeth **40**. The other side member **34** also has a generally vertical sidewall **41** but has a larger bottom portion **42** extending inwardly and downwardly toward the first side member **36**. Bottom portion **42** also ends in a set of serrated teeth **44**.

[0017] In use, and as will be described, one clamp side member **32** may be held stationary (to simplify the mechanism involved), while the other clamp side member **34** may be moved linearly, in the direction of arrow **46**, towards and away from the first clamp side member **32**. When the two clamp side members **32**, **34** are pressed against each other, they serve to grip anything which extends between them, which can be grass blades **14**, or grass blades **14** and thatch **18** from the sod slab, or even an upper portion of the soil portion **16** of the sod slab.

[0018] In the Figs. 6 through 13 apparatus, which is exemplary only, a sod slab **10** to be lifted is moved on a conveyor **50** beneath a frame **52**. Frame **52** is supported by straps **54** attached to a lifting mechanism, not

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shown, which can raise and lower the frame **52** away from and towards the sod slab **10**. When the frame **52** is lifted, it can be moved (with the sod slab suspended therefrom) to a desired location. (In practice, the straps **54** will usually be eliminated and the lifting and moving mechanism will be directly
5 attached to the frame **52**.)

[0019] The frame **52** supports cross members **56**, **58** which are connected to and carry the clamp side members **32**, **34**. As discussed, the cross members **56** which carry the stationary clamp side members **32** are fixed to the frame **52**. The cross members **58** which carry the moving clamp
10 side members **34** are biased by springs **60** to normally hold the clamps **30** in closed position, each clamp having its two clamp side members **32**, **34** spaced apart as shown.

[0020] The moving clamp side members **34** are supported and opened by a linkage system generally indicated at **62**. Linkage system **62** comprises
15 a pair of long links **64** connected by metal straps **66** to each of the cross members **58** which carry the moveable clamp side portions **34**. The links **64** can be moved back and forth in the direction of arrow **68** hydraulically (the hydraulic mechanism is not shown), or by any other desired mechanism, to open and close the clamps **30**.

20 **[0021]** Fig. 6 shows the clamps **30** in open position and located above the grass blades of the sod slab **10**. Fig. 7 shows the clamps **30** as having been lowered onto the grass blades **14** and pushed into the grass blades. For some types of sod (e.g. those with strong grass blades and thin soil), this degree of penetration is sufficient to lift the sod slab **10**.

25 **[0022]** Fig. 8 is similar to Fig. 7 but shows the clamps **30** as having been pushed downwardly, not only into the grass blades **14**, but also into the thatch **18** which is located just above the soil **16** of the sod slab **10**. For some types of sod, this degree of penetration is needed and will be sufficient to lift the slab. For other types of sod, it may be necessary to push the clamps **30**
30 slightly further, so that they penetrate slightly into the upper portion of the soil

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16 of the sod slab **10**. It is found that none of the positions described above for the clamps **30** damages the sod slab **10**.

[0023] Fig. 9 shows the clamps **30** as having been closed from the position of Fig. 8, and with the frame **52** and the sod slab **10** being lifted by
5 the straps **54**. As shown, the sod slab is being picked up by its grass portion, i.e. from the top of the sod slab.

[0024] In the embodiment shown in Figs. 6 to 13, a 48 inch by 48 inch sod slab is accommodated. This type of sod slab is typically harvested by a large harvester, but it is too large to handle easily. Therefore, and as shown
10 in Fig. 11, a cut-off blade **72** may be provided. To accommodate the cut-off blade **72**, the frame **52** is divided into two portions by a pair of sub-frame members **74** extending lengthwise along one dimension of the frame **52**, adjacent the center of the frame **52**. The sub-frame members **74** are spaced a very short distance apart to define a slot **76** between them through which
15 the cut-off blade **72** protrudes.

[0025] As best shown in Figs. 11, 12 and 12A, the cut-off blade is a flat thin blade having serrated cutting teeth **78** at its bottom, to more easily penetrate the sod slab **10**. The bottom edge of the cut-off blade **72** is linear (apart from the serrated teeth **78**) and slopes at an angle to the plane of the
20 sod slab **10**, as shown in Fig. 12A (where the angle, indicated at **80**, is exaggerated). With the angled mounting of the cut-off blade **72**, then, when the cut-off blade **72** is lowered in the direction of arrows **82**, one end **83a** of the cut-off blade will penetrate and cut the sod before the other end **83b** of the cut-off blade **72** enters the sod. It is found that this angled position of the cut-
25 off blade **72** substantially reduces the force with which the cut-off blade need be pushed into the sod slab **10**, enabling a lighter gauge cut-off blade and a smaller cut-off operating mechanism to be used.

[0026] The sod slab **10** is normally cut into two pieces by the cut-off blade **72** before the sod slab is lifted. The sod slab **72**, now consisting of two
30 pieces, is then lifted by the lifting mechanism described and moved to a desired location such as a pallet for stacking.

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[0027] Where the cut-off blade **72** is used, the conveyor **50** on which the sod slab rests will normally be divided into two conveyor sections **50a**, **50b** as shown in Fig. 12B, so that the cut-off blade **72** may extend into the space between the two conveyor sections.

5 **[0028]** While the cut-off blade **72** is shown as having serrated teeth, it can of course be provided simply with a sharp straight edge or other appropriate cutting configuration, so long as it slopes at an angle to the plane of the sod slab **10**. The angled arrangement alleviates the formerly very difficult problem of how to cut the sod when the sod is no longer in the ground.

10 **[0029]** It will, however, be appreciated that the feature of sloping the cut-off blade at an angle to the plane of the sod slab can also be used in conventional cut-off devices provided in standard sod harvesters, to cut the sod transversely while it is in the ground. It is found that less force is needed for the cut-off mechanism when the cut-off blade is angled as described.

15 **[0030]** As described previously, in connection with Figs. 1 and 2, and as indicated in Fig. 14, instead of lowering the clamps **30** onto the sod slab **10**, the support on which the sod slab **10** rests (shown in Figs. 6 to 13 as conveyors) can be raised (by a scissors lift or other desired operating mechanism) to push the sod up against and into the open clamps **30**. Fig. 14
20 shows conveyor supports **84** mounted on a platform **86** which is raised and lowered by a scissors lift **88**. After the sod has been raised, the clamps **30** are then closed. Then, while the frame **52** with the sod slab **10** suspended therefrom is being moved to a desired location (e.g. to stack the sod slab), the platform **86** can be lowered to receive the next slab of sod as delivered by the
25 conveyors **90**.

[0031] While preferred embodiments have been described, it will be realized that various changes can be made. For example, the shape of the side members **32**, **34** of the clamps **30** can be changed. As an example, and as shown in Fig. 15, one side member **94** can be straight, while only the other
30 side member **96** can be hooked as shown at **98**. The hook **98** can be advantageous in hooking part of the thatch of the sod or the soil portion of the

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slab. As shown in Fig. 16, the hook **98a** can protrude below the bottom of side member **94a**, so that these two points do not touch each other but do grip the upper part of the soil portion **16** between them.

[0032] In addition, the teeth at the bottom of the side members of the
5 clamps can be eliminated, or can be changed in shape, for example as shown at **100** in Fig. 17. Where teeth are used, it is preferred that they interlock, i.e. that the teeth of one side portion of the clamp fit into the spaces between the teeth of the other side portion of the clamp, for better gripping of the sod.

[0033] Figs. 18 to 20 show an embodiment in which two screens are
10 used to engage and pickup slabs of sod positioned with the grass side upper most. Fig. 18 shows a sod slab **110** having grass blades **112**, with a screen **114** pressed down on the upper surface of the slab and with the blades **112** projecting upwardly therethrough. The second screen **116** is moved sideways over the first screen to bend sideways the portions of the grass blades which
15 extend above the first screen. When the second screen **116** is located above the first screen **114**, as shown in Fig. 19, it is then pressed against the first screen to clamp or trap the blades of grass between the two screens, as shown in the enlarged view of Fig. 20 (which shows projecting grass blade portions **118** clamped between the meshes of the two screens). The two
20 screens **114**, **116**, still pressed together, can then be lifted (by a conventional lifting mechanism, not shown), carrying the sod slab with them, and moved to a desired location where the sod slab can be released.

[0034] If desired, and as shown in Fig. 21, the upper screen **116** can be replaced by a flat plate **120**. The plate **120** functions as well as or better than
25 the upper screen **116**, since there is no need for the grass blades to project through the upper screen (only through the lower screen), and the plate **120** effectively clamps the projecting portions **118** of the grass blades against the lower screen **114**.

[0035] While the upper screen **116** or flat plate **120** have been
30 described as being moved sideways to bend over the grass blades before they are clamped against the lower screen **114**, under some conditions the

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upper screen **116** or plate **120** can simply be moved downwardly and will still trap sufficient portions of the grass blades against the lower screen **114** to provide an effective clamping action, so that the sod can be lifted.

[0036] Other changes may be made within the scope of the invention,
5 and all are intended to be included within the invention.

We claim:

1. A method of handling sod having grass blades projecting upwardly therefrom, comprising gripping at least an upper portion of said sod between opposing portions of a clamp and moving said clamp with said sod
5 suspended from said clamp.
2. A method according to claim 1 wherein said clamp clamps said grass blades.
- 10 3. A method according to claim 1 wherein said sod has thatch, and said clamp clamps said thatch.
4. A method according to claim 1 wherein said sod has a base comprising a soil portion containing roots, and said clamp grips an upper part
15 of said soil portion.
5. A method according to any of claim 1 wherein at least two said clamps are used.
- 20 6. A method according to claim 5 and including the steps of lowering said clamps onto said sod with said clamps open, closing said clamps to grip said sod, lifting said clamps to raise said sod, and then moving said clamps to move said sod.
- 25 7. A method according to claim 5 including raising said sod on a support towards said clamps with said clamps open, closing said clamps to grip said sod, lowering said support leaving said sod suspended from said clamps, and then moving said clamps with said sod suspended therefrom.
- 30 8. A method according to claim 5 and including the steps of lowering said clamps toward said sod with said clamps open and raising said sod on a support toward said clamps, closing said clamps to grip said sod, and moving said clamps and said support away from each other with said sod suspended from said clamps.

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9. Apparatus for picking up sod of the kind having grass blades projecting upwardly therefrom, said apparatus comprising at least one clamp having an open and a closed condition, and a mechanism for opening and closing said clamp, a support mechanism for moving at least one of said sod and said clamp towards the other at a first location for at least said grass blades to enter into said clamp when said clamp is in its open condition, and a carrying mechanism for moving said clamp, with said sod slab suspended therefrom, to another location.
10. Apparatus according to claim 9 and including at least two said clamps.
11. Apparatus according to claim 10 wherein each clamp has a pair of side members which are spaced apart in the open condition of said clamps and which have gripping portions which press towards each other when said clamps are closed.
12. Apparatus according to claim 11 wherein the gripping portion of one side member of said clamp slants toward the other side member of said clamp.
13. Apparatus according to claim 11 wherein the gripping portions of both side members of said clamp slant toward the other side member of said clamp.
14. Apparatus according to claim 11 wherein said side members of said clamps are formed of thin metal to facilitate penetration into the thatch and soil of said sod slab.
15. Apparatus according to claim 11 wherein one side member of said clamp is fixed and said mechanism for opening and closing said clamp moves the other side member of said clamp.

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16. Apparatus according to claim 15 and including springs to bias said other side member of said clamp to a closed position.

17. Apparatus according to claim 11 wherein said side members of
5 said clamp are hinged to each other.

18. Apparatus according to claim 15 wherein said other side member of said clamp is mounted for linear movement towards and away from said one side member of said clamp.

10 19. Apparatus according to any of claim 11 wherein each side member of said clamp includes teeth on a lower edge thereof.

20. Apparatus according to claim 9 wherein said clamp comprises a
15 pair of screens.

21. Apparatus according to claim 9 wherein said clamp comprises a screen having openings for said grass blades to project therethrough, and a plate located above said screen to clamp said grass blades between said
20 screen and said plate.

22. Apparatus according to claim 10 and including a cut-off blade to divide said sod slab into at least two pieces, said cut-off blade in use having a cutting edge which is oriented at an angle to said sod slab such that one
25 portion of said cut-off blade enters said sod slab before another portion of said cut-off blade enters said sod slab, thus to reduce the force needed for said cut-off blade to cut said sod.

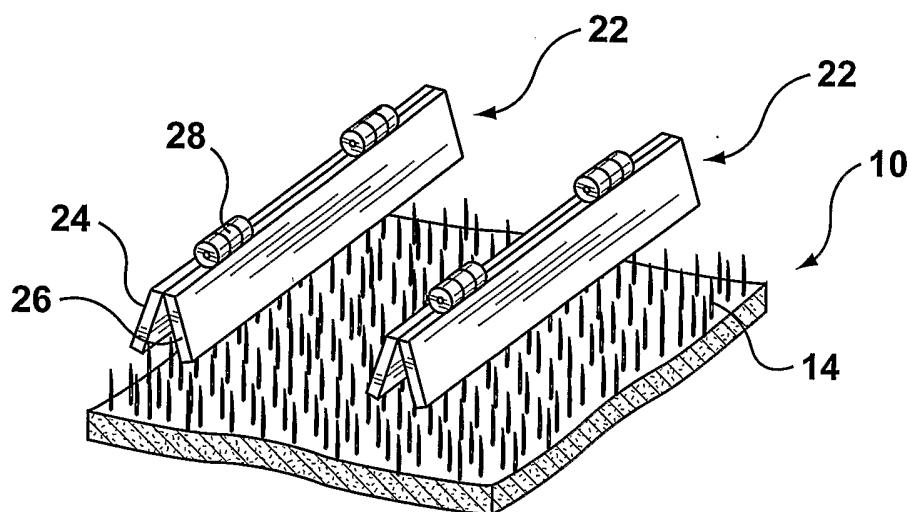
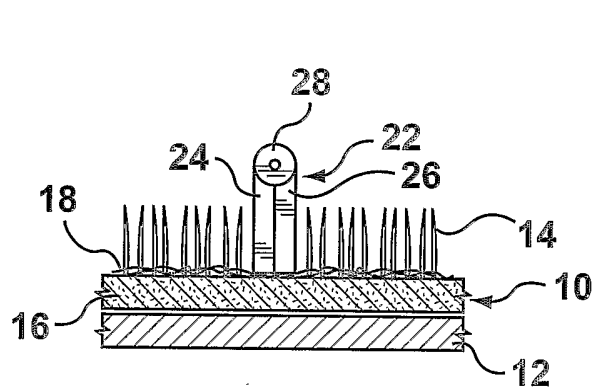
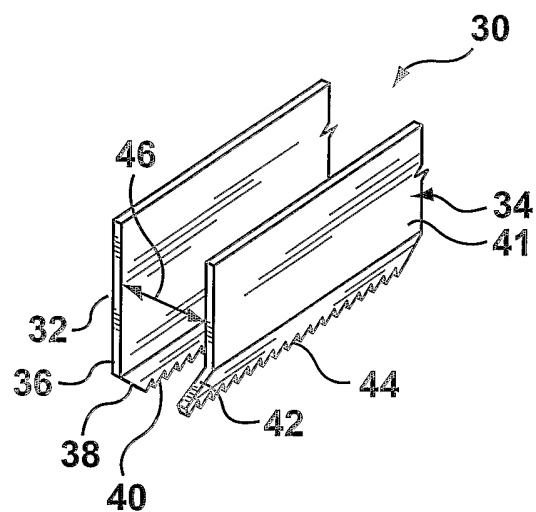
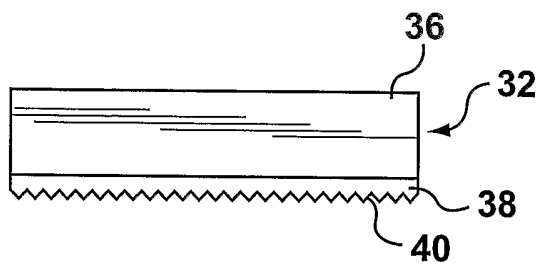
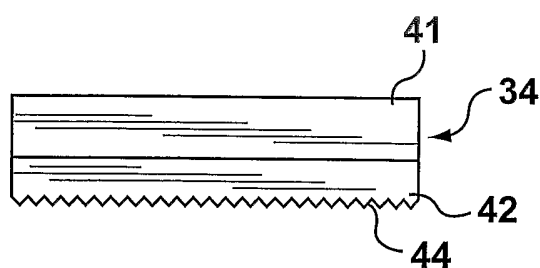
23. A method of cutting sod using a cutting knife having a cutting
30 edge extending from a first end of said cutting knife to a second end of said cutting knife, said method comprising orienting said cutting knife so that said cutting edge is slanted with respect to the sod to be cut, such that said first end of said cutting knife enters said sod before said second end of said

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cutting knife enters said sod, thus to reduce the force needed for said cutting knife to cut said sod.

24. The method according to claim 23 and including supporting said
5 sod to be cut on two conveyors having a space between them, said space being aligned with said cutting knife for said cutting knife in use to enter said space.

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**FIG. 1****FIG. 2****FIG. 3****FIG. 4****FIG. 5**

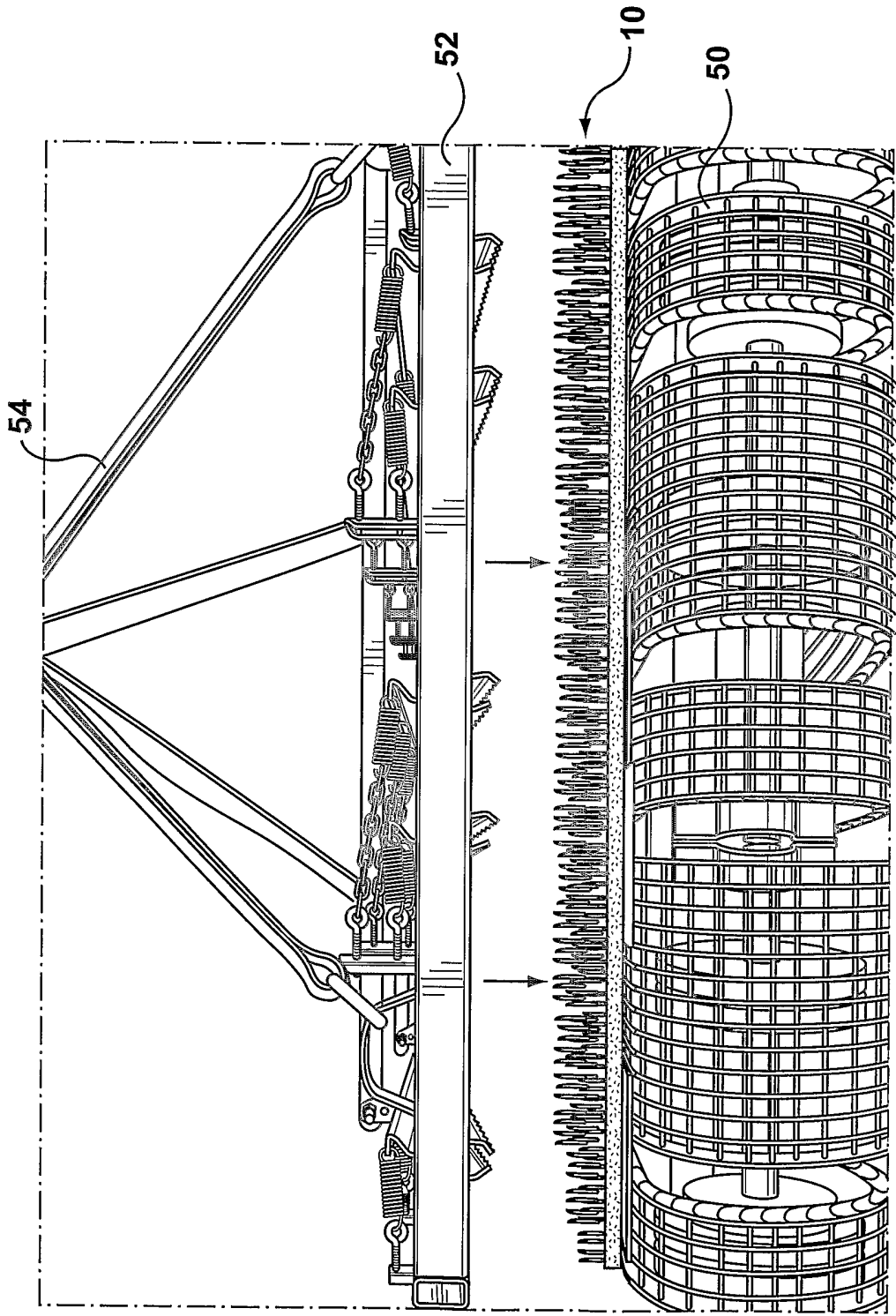


FIG. 6

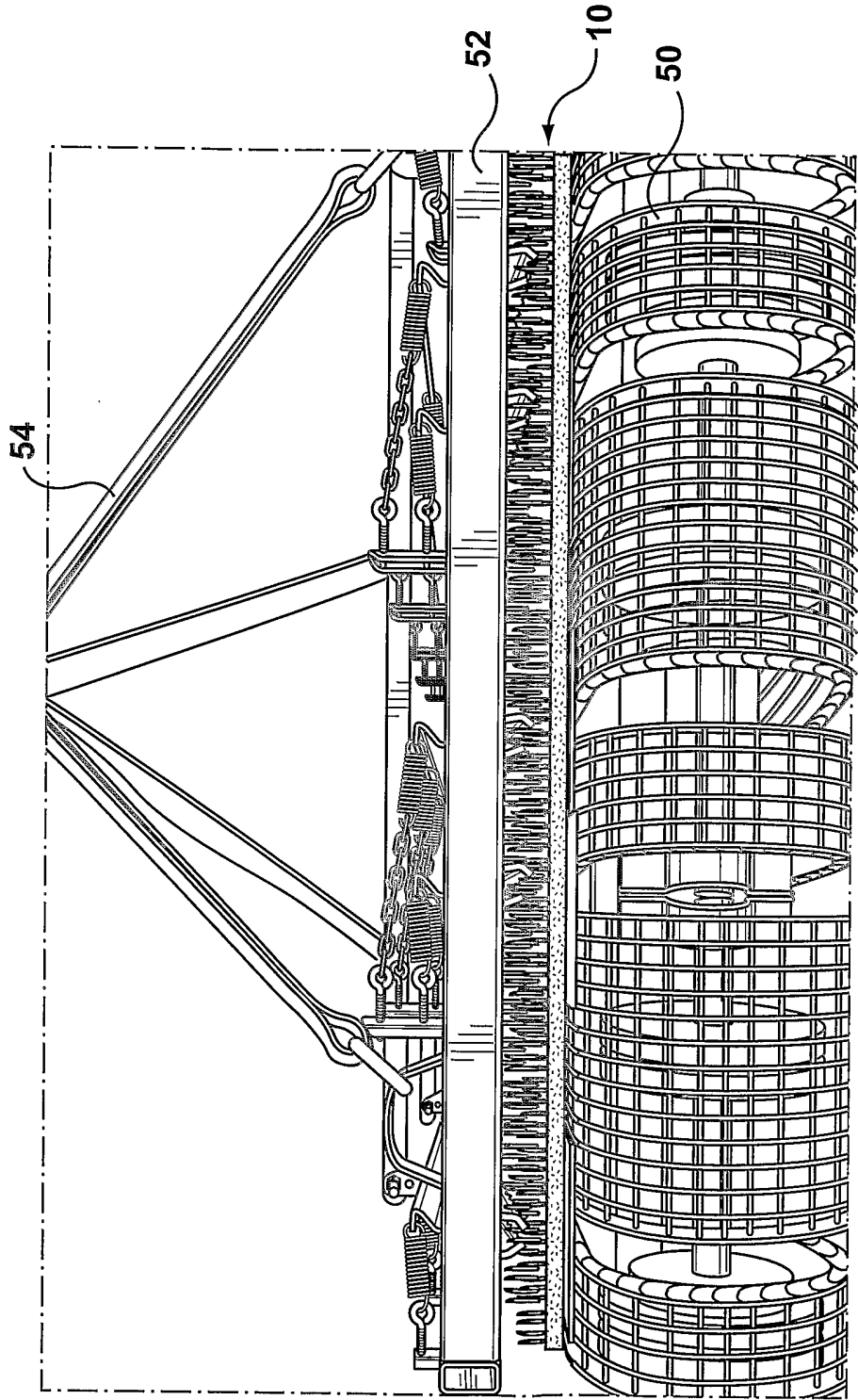


FIG. 7

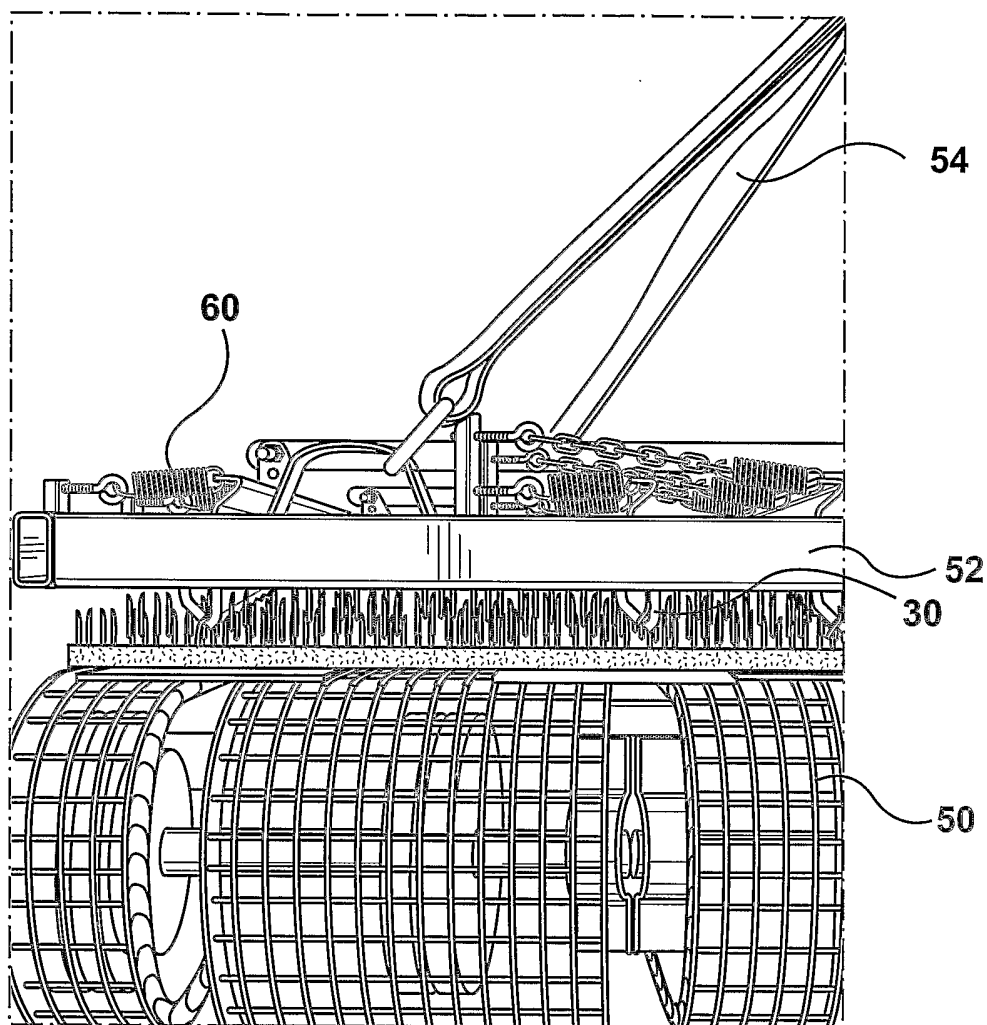


FIG. 8

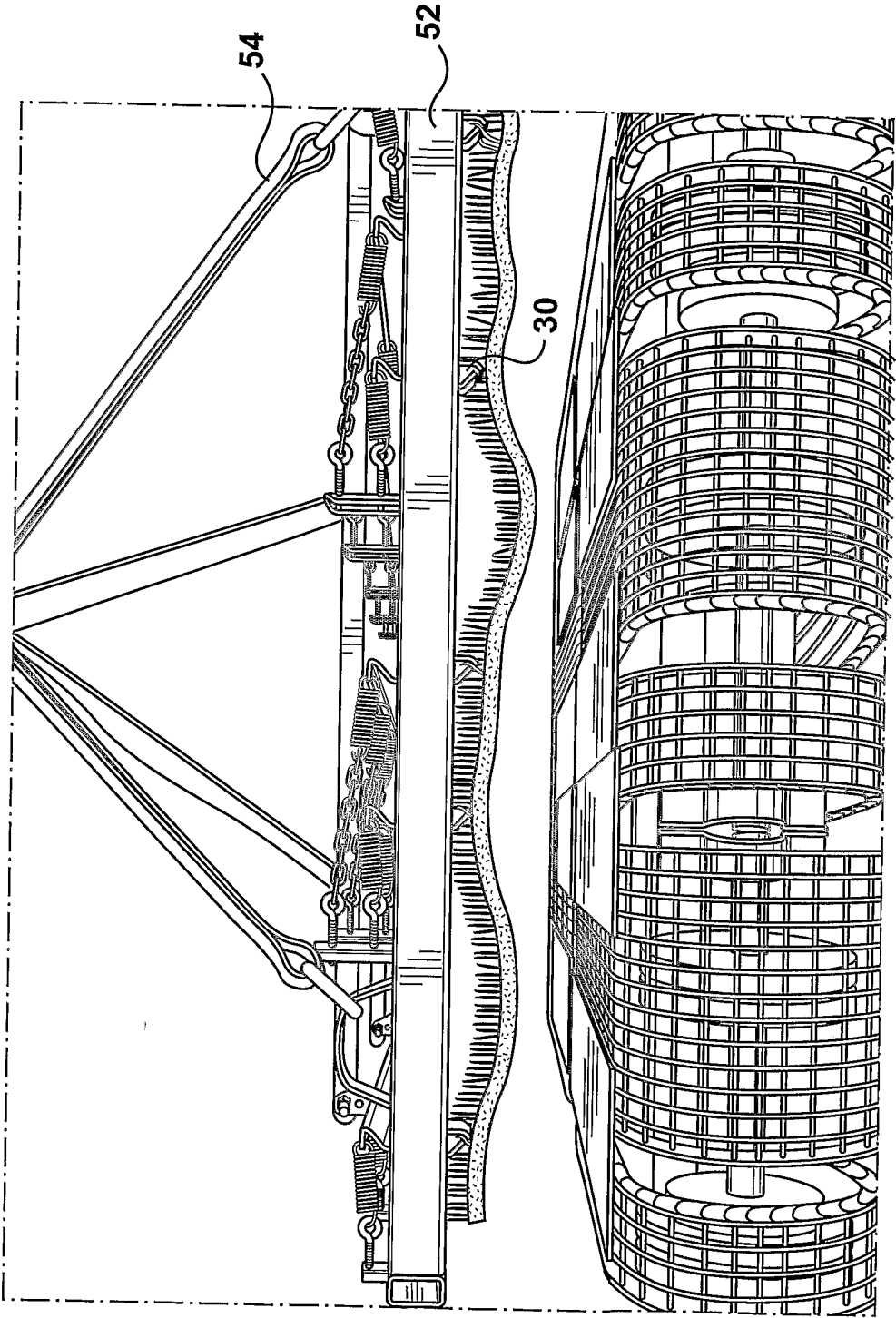


FIG. 9

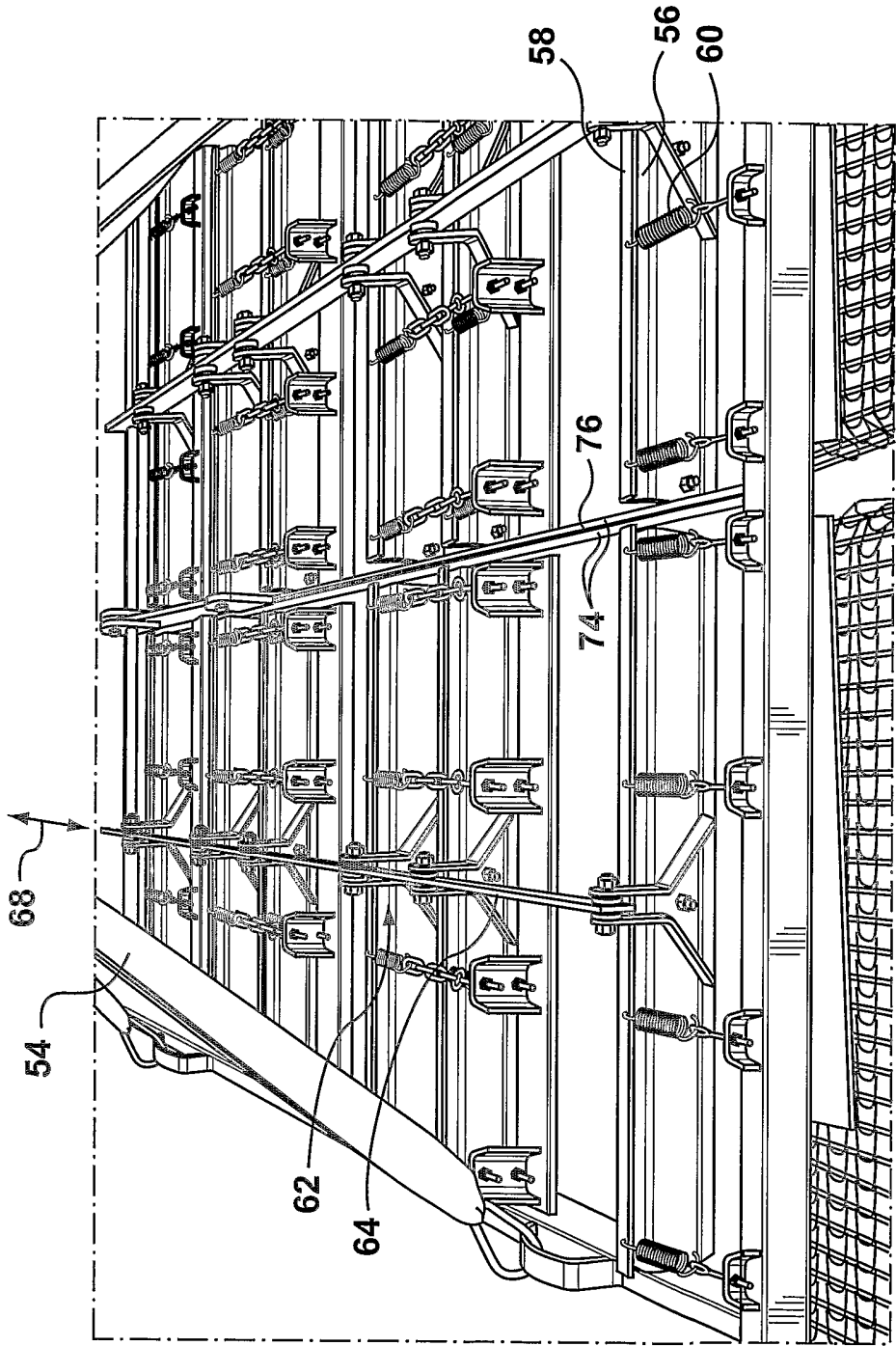
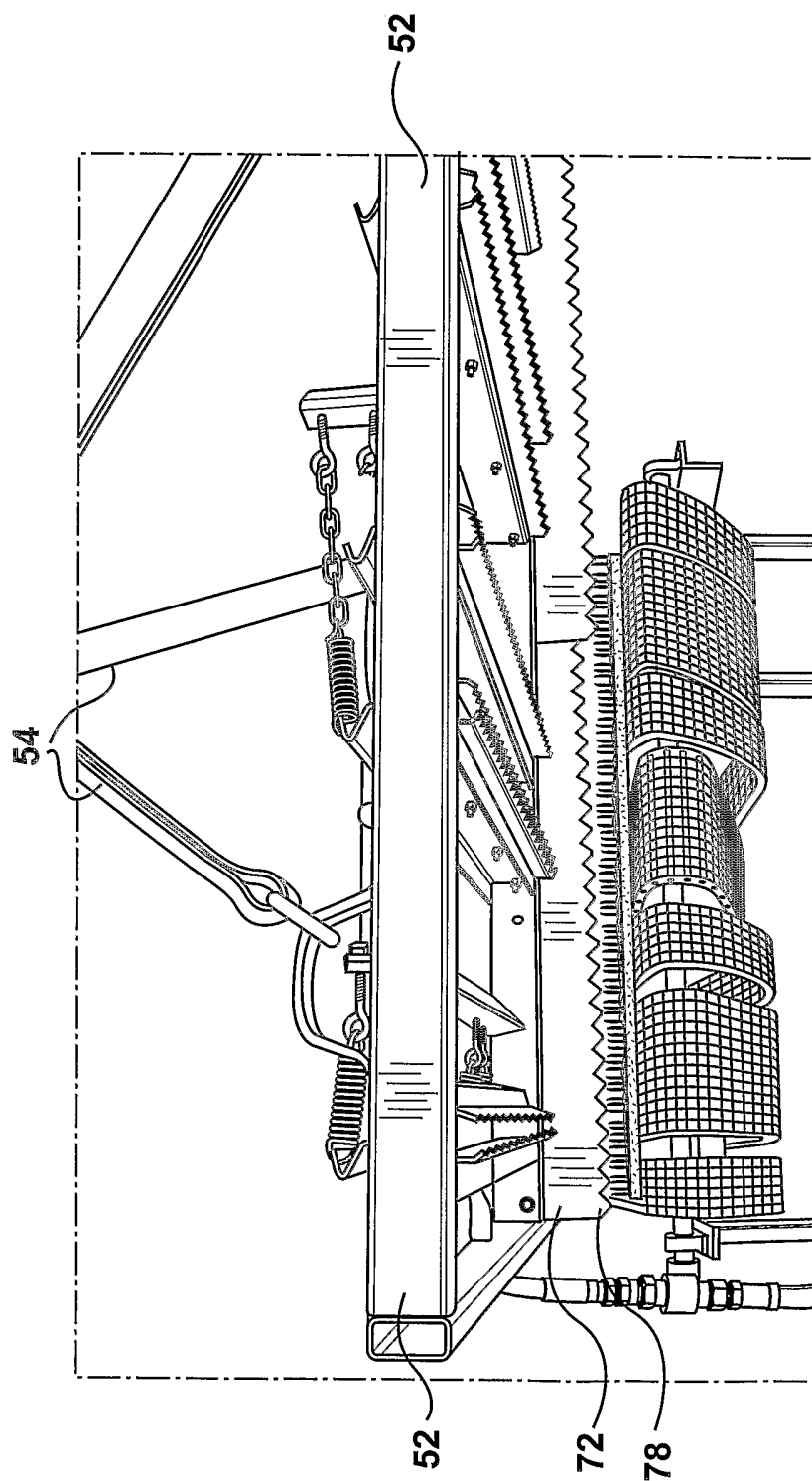


FIG. 10



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14
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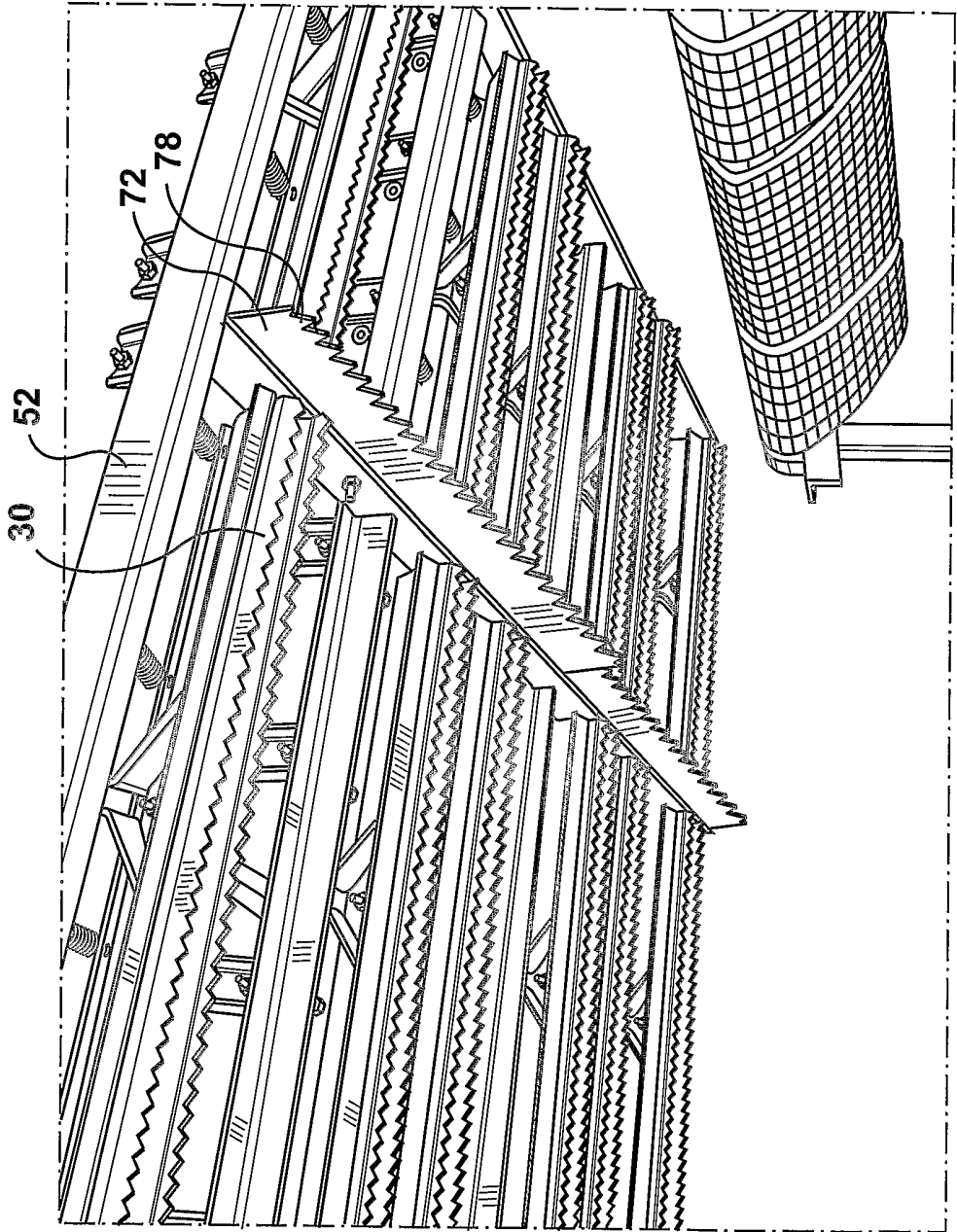


FIG. 12

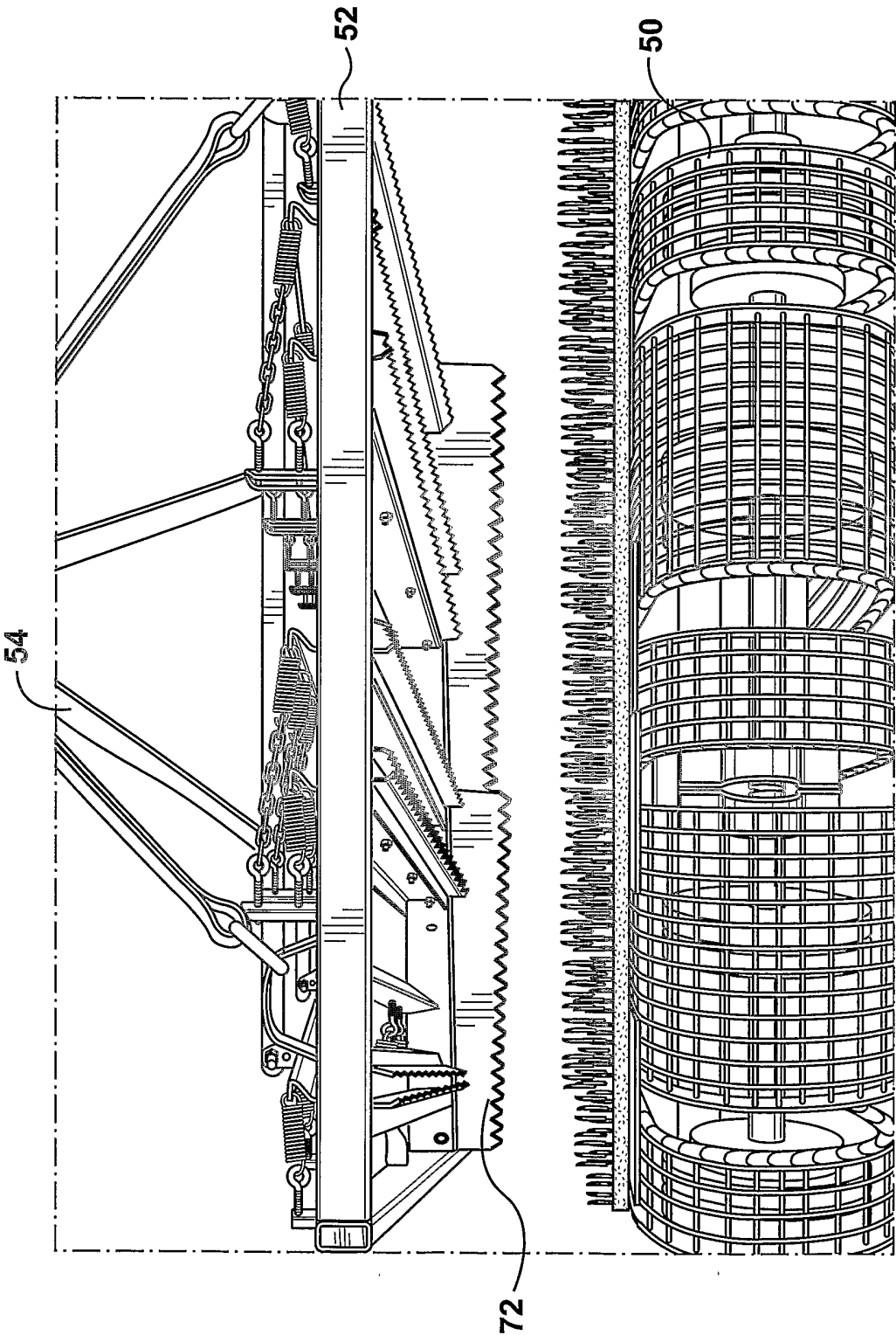


FIG. 13

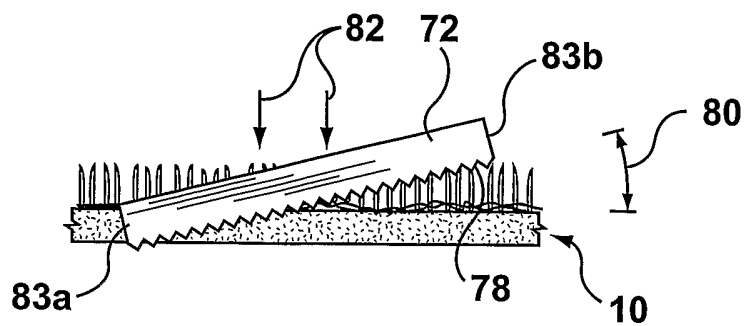


FIG. 12A

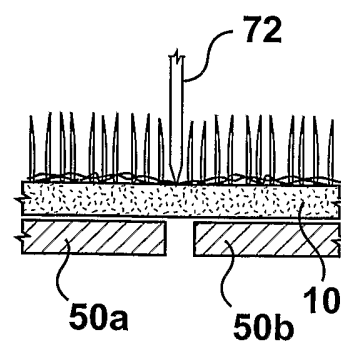


FIG. 12B

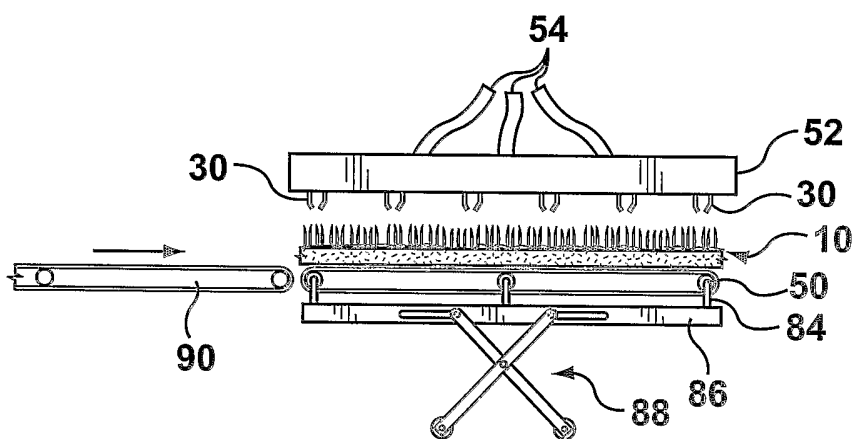


FIG. 14

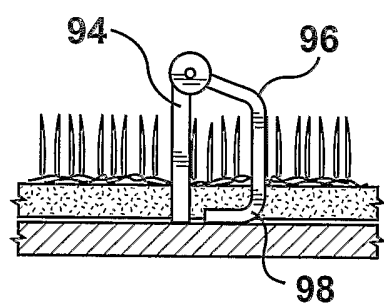


FIG. 15

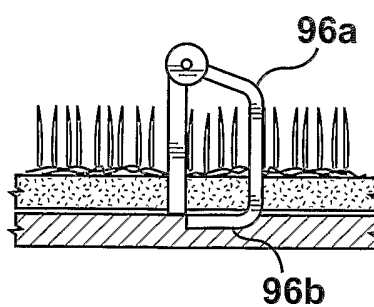


FIG. 16

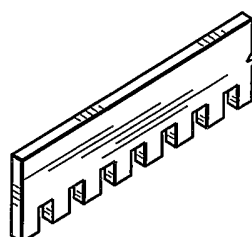


FIG. 17

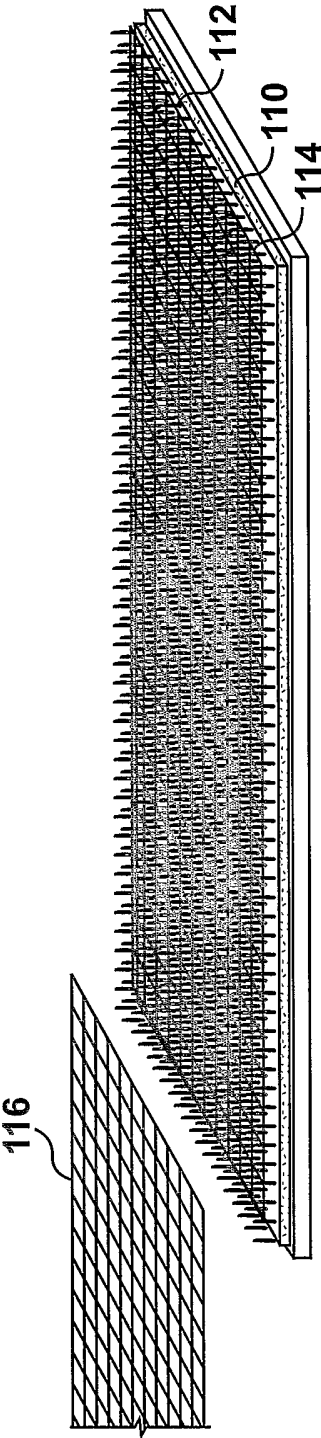


FIG. 18

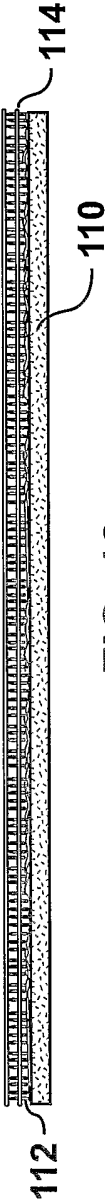


FIG. 19

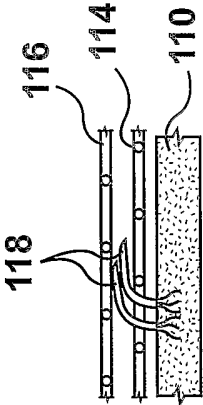


FIG. 20

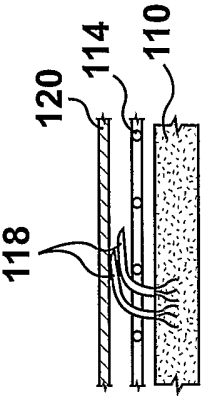


FIG. 21