



(51) International Patent Classification:
A01B 49/06 (2006.01)

(21) International Application Number:
PCT/RS2010/000003

(22) International Filing Date:
8 April 2010 (08.04.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
P-2009/0167 10 April 2009 (10.04.2009) RS

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,

KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,
ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

— without international search report and to be republished
upon receipt of that report (Rule 48.2(g))

(54) Title: COMBINED CULTIVATING MACHINE FOR TILLING WITH A ROTARY PLOUGH, SOIL FERTILIZING, PREPARING, STABILIZING AND SOWING OF CROPS

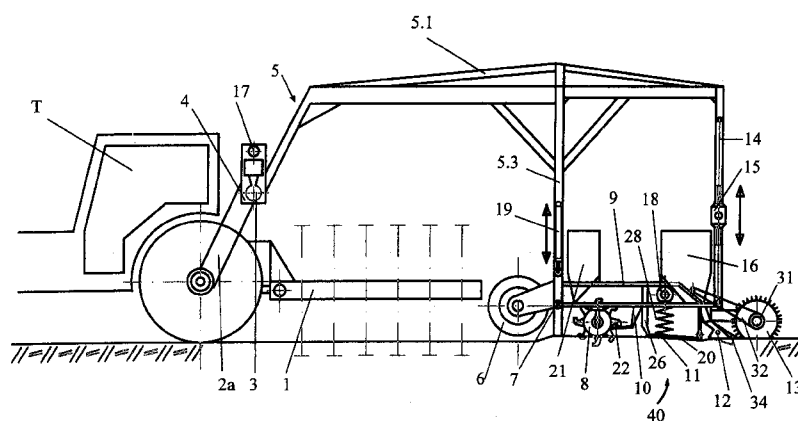


FIG. 1.

(57) Abstract: Present invention relates to the combined soil-working machine for tilling by means of the rotary plough, soil preparing and sowing which consists of rotary plough (1) attached by means of three-point linkage behind the tractor (T), frame (5) with the frame (9) attached to the sleeves of the rear wheels semi-axes of tractor (T) and tools assembly (40). Tools assembly (40), which is placed mainly within the frame (9) consists of big hollow roller (8) with sickle-like teeth (22) for clod crushing and rough grinding of the soil, an artificial fertilizer reservoir (21) placed above and somewhat in front of the roller (8), an array of mutually parallel stripe cleaners (10), vibrational plates (11) for soil stabilization placed behind the soil leveler (26), reservoir (16) of the planter placed above and behind vibrational plates (11) and actuation assembly (35; 29, 30, 33) for driving of the artificial fertilizer reservoir (21) and the eccentric shaft (18). Present invention explains a variant embodiment of a combined soil-working machine for tilling by means of a rotary plough and for soil preparing only.

COMBINED CULTIVATING MACHINE FOR TILLING WITH A ROTARY PLOUGH, SOIL FERTILIZING, PREPARING, STABILIZING AND SOWING OF CROPS

Field of the invention

Present invention generally belongs to the field of human necessities, more precisely to the field of agriculture, even more precisely to the field of soil working in agriculture or forestry; parts, details or accessories of agricultural machines or implements in general, and most precisely to the field of combined machines with two or more soil-working tools of different kind.

According to the International Patent Classification (IPC), present invention is designated and classified by the general classification symbols: **A01B 49/02** which relates to a combined agricultural machine with two or more soil-working tools of different kind, and with **A01B 49/06** which relates to combinations of soil-working tools with non-soil-working tools e.g. planting tools or tools for sowing or fertilizing. Secondly, present invention can be classified with classification symbols: **A01B 5/10** which relates to ploughs with rolling non-driven tools, e.g. discs mounted or partly-mounted on tractors, **A01B 29/02** which relates to rollers with smooth surface, **A01B 31/00** which relates to drags and **A01C 7/00** which relates to sowing.

Technical problem

Technical problem which present invention tries to solve is the following: how to constructionally devise a combined cultivating machine with a rotary plough that can

perform tilling, soil preparation, sowing, fertilizing and treating with protection substances in just one single pass. In other words: how to provide the machine that can perform seven to nine different agro-technical operations simultaneously in order to cut down fuel and lubricant costs, shorten employed machine and human labour time, lower the production cost, decrease soil compacting in order to create more suitable conditions for plant growing and achieving higher crop yields which, all combined, would justify the need for this machine in both economical and ecological terms.

Background of the invention

Vast technical advances of the tools for agricultural cultivation that has been made in the last few decades has enabled modernization and improvement in the field of soil-working. Major goal that new systems for soil cultivation strive to achieve is to ease the process of food production, lower the costs and, thus, increase the profits. Development of the combined tractor mounted or pulled systems is advancing in the direction of achieving the process of so called „direct sowing“. Main aim is to, on the basis of minimal cultivation effort and by using the so called „combined effort“ machinery, achieve technical process of sowing in just a single pass. In order to accomplish such a technical procedure, it is necessary to employ combined aggregates and tractors with which one can form a combined tractor system. One of such systems for soil-working is known as „Conservation system for soil-working“.

Majority of cultivated areas is processed by tilling with ploughs that are used in conventional soil-working. On small grains sown across the harrows for so called „rational cultivation“ are used. Recently, the usage of heavy tractors and machinery for processing and sowing has been applied. Beside using ploughs, soil processing is done by using harrows and combiners. Beside using these tools for sowing of crops that leave small amounts of plant residue, for sowing of small crops the combinations with active and passive tools, double-row grubbers (as means for protective processing of soil) and tools for pre-sowing preparation are used as well.

There exists many combinations and possible solutions for achieving sowing proces in two or, possibly, only one pass. In practical implementation, most common are the following combined systems:

- tilling and earth preparation,
- processing without ploughing with soil preparation,
- soil preparation with fertilizing and sowing,
- soil processing and sowing,
- direct sowing.

Soil processing by using aforementioned tools implies that the soil processing is made in several passes which, in turn, implies that during one year period over twenty tons of load passes over each square meter of processed soil. This, in addition to increased cost for soil-work processing, adds to a significant increase of cost for spent fuel, human work and used working hours.

Current practice in soil-working implies usage of tractors as main actuation means and usage of cultivation tools: ploughs, harrows, tillers, combiners, planters, fertilizers and similar tools. Common technology of earth processing and sowing is mainly conducted by using the following agrotechnical operations:

1. Tilling as a separate agrotechnical operation,
2. Rough preparation of soil; harrowing takes a separate pass upon a tilled soil. In more harsh conditions, it takes even two or three passes of the harrows in order to prepare the soil properly, and this is more frequently the case when the tilling was performed at an earlier time so the soil is more clodded and it takes more passes to properly prepare the earth,
3. Fine preparation of soil by using combiners or similar combined machinery,
4. Sometimes it is necessary to perform rolling in order to stabilize and prepare the soil properly for seeding,
5. Fertilizing by using carried or pulled fertilizers as a separate pass,
6. Treating soil with protective substances as a separate pass,
7. Sowing of crops.

Research of the existing patent documents revealed that the number of similar submitted documents is rather small. For example, document **YU P-643/90** discloses a combined soil-working machine which can, in a single pass of a tractor, perform: tilling by means of a rotary plough, soil preparation for sowing, sowing, rolling and fertilizing with artificial fertilizer. All these tools are attached to the machine frame in a certain order – the fertilizer being the first attached tool and the roller for deep impressing of the seeds being the last. As a means for soil tilling, there is a special rotary tool with low rotation speed which operates on a principle of cutting and milling of soil. This constructional solution implies usage of more shafts that are gradually positioned, where each shaft has several rotary ploughs attached.

Yet another document known from the YU patent application **P-642/90** describes a combination of rotary ploughs with planters for wide-row and four-row planting. This constructional solution achieves that the seeding operation is performed simultaneously with the operation of soil preparation and pre-seeding. A container with seeds and changeable dividing plates is attached on the back of the frame, behind the ploughs, while the pipes for conducting the seeds are raised above the ground, which differs this solution from the previously known ones.

However, cited known solutions are complicated, expensive and they do not deal with the main problem: providing the machine that can in almost single pass perform multiple soil-working operations like tilling, soil preparing, sowing, fertilizing and treating the soil with the protection substances (like herbicides); that is to perform seven to nine different agro-technical operations simultaneously in order to cut down fuel and lubricant costs, shorten the employed machine and human labor hours, lower the production cost, decrease soil compacting in order to create more suitable conditions for plant growing and achieving higher crop yields which, all combined, would justify the need for this machine in both economical and ecological terms.

Summary of the invention

Present invention relates to a combined soil-working machine for tilling by means of rotary plough, pre-seeding soil preparation and sowing which consists of a rotary plough attached to the tractor via so called three-point linkage or three-point hitch, basic frame with the frame for carrying tools attached to the sleeves of the tractor's rear wheels axles and tools assembly. Tools assembly, which is positioned mainly within the rear frame, consists of the large hollow cylinder (roller) with sharp, sickle-like teeth for clod crushing and rough soil grinding, container holding the artificial fertilizer which is positioned above and somewhat in front of the roller, an array of parallelly oriented stripe cleaners which are positioned between the said teeth, rectangular, planar and slightly back-stooped soil leveler which is positioned just behind the row of cleaners, vibrational plates for soil stabilizing which are positioned behind the soil leveler, planter reservoir which is placed above and behind the vibrational panels and actuation assembly for actuation of the artificial fertilizer and eccentric shaft. Invention also discloses a variant of combined soil-working machine for tilling by the means of the rotary plough and for pre-seeding soil preparation.

Combined soil-working machine for tilling by the means of a rotary plough, pre-seeding soil preparation and seeding contains a great deal of new solutions, some of which are:

1. Tow hitch with a tow-ball that are attached to a hydraulic cylinder and enable the machine to attain alterable positions that, in case of equipment usage on the inclined terrain, enable the position to be changed from the far left to the far right,
2. Supporting holders that attach the tractor's differential to the horizontal carrier of the tow-ball which is mounted on a tow hitch that give stability to the frame and the machine by suspending vertical dragging forces of the combined machine,
3. Stripe cleaners that are positioned behind the larger roller for clod crushing and grinding of the soil, and are constructed to prevent clogging of the sickle-like teeth with dirt due to it's construction and larger space between two cleaners,

4. Sickle-like teeth formed on the roller for clod crushing and grinding of the soil have a triangular cross section with blades pointing forward which are designed for crushing and tearing the soil by expanding it,
5. Vibrational plates for soil stabilization on their bottom faces have a shield fabricated out of stainless steel which purpose is to prevent the corrosion of elements and protect the elements from extensive tearing and wearing during usage,
6. Reservoir of the planter, which is of large capacity, is attached to a combined machine in order to relieve the tractor from the excess load and for the purpose of improving soil processing quality,
7. Seed depositors and shutters of the planter are positioned on the frame and are attached to it by means of a hinge joint and adjustable spring loaded bolt, where the seed depositor, when in working position, is positioned with it's top placed below the earth level thus making the furrow in which it deposits the seed while the steel shutter covers the seed with earth,
8. Transportation wheels for manipulation *in situ*, that is for raising and lowering of the machine, to allow pulling of the machine while in transport on the road or field as well as operating the equipment when the tools for soil-work are raised and don't come in contact with the ground. Wheels are positioned in such a manner that the machine's load centre lifts the tractor in order to relieve it's tires from the excess load.
9. Actuation assembly which drives separate tool elements is actuated by the bigger roller for rough soil grinding which has enough energy to drive the chains and sprocket wheels for actuating reservoir for artificial fertilizer and drive of the eccentric shaft for driving vibrational plates.

Present invention – combined soil-working machine for tilling with a rotary plough, pre-sowing soil preparation and sowing, according to this application has multiple advantages, some of which are:

- Reducing the number of required passes per acre of processed land, and, in particular, eliminating the necessity of passing upon an already tilled soil which significantly decreases soil compacting,
- Simultaneous performing of tilling and pre-sowing soil preparation which preserves the soil moisture,
- As the tractor always passes upon the relatively stable soil, the consumption of energy and power used for its self actuation and for so called „empty motion“ (maneuvering while the soil isn't processed) is smaller which, in turn, preserves fuel and machine and personnel labour hours needed,
- Simultaneous processing and sowing provides favorable conditions for plant thriving, development of the roots and other microbiological activities that contribute to greater crop yields and overall quality of the crops,
- By performing seven operations within a single pass, necessary number of tractors and drivers per square meter is decreased thus increasing the productivity,
- Combined soil-working machine is completely assembled out of domestically fabricated parts, so no import of parts and assemblies is necessary,
- From the constructional standpoint, machine is simple and easy for handling, maintaining and overhauling,
- Machine is extremely economical when in exploitation,
- Machine is eco-friendly as the decrease in the number of passes required contributes to environment protection due to the shortened time the tractor's engine is in operation.

Brief explanation of drawings

For the purpose of easier understanding as well as presenting a way of practical implementation, the Applicant refers to the enclosed drawings in which:

- **Figure 1** shows a combined soil-working machine for tilling by means of a rotary plough, soil preparing and sowing, according to the present invention, in general and in vertical projection,
- **Figure 2** shows a combined soil-working machine from the Figure 1, with the roller and plough positioned in the far left position, in horizontal projection,
- **Figure 3** shows a combined soil-working machine from the Figure 2 in cross-sectional view along the A-A line,
- **Figure 4** shows an enlarged view of the tools assembly of a machine from the Figure 1 in vertical projection,
- **Figure 5** shows details of a sickle-like tooth formed on a large cylinder shown on Figure 4 in vertical projection,
- **Figure 5a** shows sickle-like tooth from the Figure 5 in horizontal projection,
- **Figure 6** shows cleaner of the grinding tool from the Figure 4 in vertical projection,
- **Figure 6a** shows cleaner of the grinding tool from the Figure 6 in horizontal projection,
- **Figure 7** shows an assembly of the sliding seed depositor and shutter from the Figure 4,
- **Figure 8** shows a variant embodiment of a combined soil-working machine for tilling with a soil-inverting plough, according to the present invention, only for a step of soil preparation, in general and in vertical projection,
- **Figure 9** shows a combined soil-working machine from the Figure 8 with the roller and plough positioned in the far right position, in horizontal projection,
- **Figure 10** shows an enlarged view of a tools assembly of a machine with an actuation assembly from the Figure 9,

- **Figure 11** shows a carrier frame of a soil-working machine in a horizontal projection.

Detailed description of the invention

A combined soil-working machine for tilling by means of a rotary plough, soil preparation and sowing, according to the present invention and the accompanying Figures 1 and 2, consists of a rotary plough 1 attached via a three-point hitch (three-point linkage) behind the tractor T, frame 5 attached to the sleeves of a semi-axes of rear tractor's T wheels and tools assembly 40 attached to the frame 5 behind the plough 1.

Grated frame 5, on whose rear end tools assembly 40 is attached to, is made out of mutually welded pipes of a circular or rectangular cross section. Said grated frame 5 is on it's front end attached, via two horizontal inclined attaching levers 5.1, 5.2, to a movable tow-ball 3 placed on a tow hitch 4 (Figure 11). Tow hitch 4 with a tow-ball 3 (Figures 1, 2 and 3) is located on a horizontally attached hydraulic cylinder 17, which enables swiveling of the machine in such a way that in case of inclined, steep terrains said position can be adjusted from the far left to the far right position.

By displacing of a tow hitch 4 by means of a hydraulic cylinder 17 to the left or right, the tools assembly 40 is also displaced to the far right or the far left position depending on the working position of the plough 1. Hydraulic cylinder 17 with a tow hitch 4 is positioned on a horizontal carrier 2 which is, at its ends, fixed to the upper ends of vertical carriers 2a placed on the outside of the tractor. Carriers 2a are at it's lower ends placed on sleeves of semi-axes of rear wheels of the tractor T. The carrier 2 is by means of two support holders 2b, which are set on the inner side of tractor's T wheels, attached to the differential. Mounting and dismounting of a combined soil-working machine from the tow-ball 3, that is from the carrier 2 of a tractor T is simple and quick. The role of the supporting holders 2b which connect the tractor's T differential with the horizontal carrier 2 of a tow hitch 4 is to keep the stability of the frame 5 and the

machine itself, by suspending the dragging vertical forces effected on the combined machine.

On the rear end of the frame 5, behind the plough 1 (schematically shown), there are attached vertical carriers 5.3 which bottom ends are fixed to a front of a horizontal frame 9 for carrying of the assembly 40, where the tools assembly 40 is located within the said horizontal frame 9. On the bottom end 7 of the said carrier 5.3 there are attached transportation wheels 6. Also, on the carriers 5.3 there are attached hydraulic cylinders 19 for raising and lowering of the tools assembly 40 and for resting of this machine assembly on the ground on the wheels 6 while transporting and manipulating to/from the acres or even manipulating the machine *in situ* while soil-working. Wheels are placed in such a manner so that the load centre of the assembly 40 lifts the tractor upwards thus lifting the load from the tractor's tires. Rear end of the horizontal frame 9 is centrally attached to the frame 5 via vertically placed lever 14 with the nut 15 which determines the machine's position and the depth of the soil processing.

According to the technological process, that is the optimal agro-technical operations and the present invention (Figures 1 and 4), assembly 40 with an array of tools is placed mainly within the frame 9. Viewed in the direction of moving of the frame during usage, in the front of the frame 9, and behind the holders 7 of the wheels 6, there is attached a large hollow roller 8 with a sickle-like teeth 22. Teeth 22 formed on the roller 8 are dimensionally greater and are positioned wider-apart in order to perform rough soil preparation. Said sickle-like tooth 22 formed on the roller 8 for grinding of the soil have a triangular cross section while the blade 22a is directed in the direction of moving of the tractor T. These teeth crush and tear the soil by spreading it.

Behind the large roller 8, and partly behind its sickle-like teeth 22, there is placed an array of parallel stripe cleaners 10 which are steeped front and downwards and which enter the space inbetween the teeth 22 thus cleaning the roller 8. Above and somewhat in front of said roller 8, which performs grinding of the soil, there is an artificial fertilizer reservoir 21 attached, the so called „dozer“.

Stripe cleaners 10 which by partly entering the space between teeth 22 perform the cleaning (Figures 6 and 6a) consist out of two parts. When viewed in working position (Figure 6), cleaner 10 consists out of a vertically oriented wider part 10a and a thinner part 10b which is horizontally oriented and fixed to the bottom of the part 10a. Said stripe cleaners 10 behind the larger roller 8 for rough soil grinding are constructed in such a way not to allow clogging with plant remains and dirt due to their geometry and larger space between the two neighboring cleaners.

Right behind the row of said cleaners 10 there is placed a rectangular, planar and slightly back-stooped soil leveler 26 whose purpose is to roughly level-out soil unevenness while preventing the soil from being thrown on top of the vibrational plates 11 that are placed right behind him.

Vibrational plates 11 for soil stabilization have, on their bottom faces, attached a shield 20 made out of stainless steel whose purpose is to prevent wear and tear of the plates 11, and this presents a special novelty of the invention. Based on the choice of material used the shield is resistant to corrosion, needs no lubrication so it can operate in very humid soils. Vibrational plates 11 (there are eight plates in the shown embodiment) are mutually identical and of rectangular shape with their front ends (front in respect of the direction of tractor motion) slightly upward inclined. Each vibrational plate 11 has a strong cylindrical spring 28 attached to it's top side. Each spring 28 is on it's top fixed to the housings of the bearings of the eccentric shaft 18. Eccentric shaft 18 receives it's actuation from the sprocket wheel that will be discussed later. Eccentric shaft 18 is placed in the ball bearings to allow rotation, while the cams of the shaft 18 can be adjusted in such a way to achieve alternated „thumping“ of said plates 11 on the ground in order to balance the entire assembly. Said vibrational plates 11 perform the final preparation of the soil for sowing by compacting and leveling.

Above and somewhat behind the vibrational plates 11 (Figure 4) there is placed a sowing aggregate, that is a reservoir 16 of a planter beneath which is a conveyer, that is a sliding seed depositor 12 which conducts the seeds and deposits them in the ground. Planter reservoir 16 which is of large capacity is placed on a combined machine in order

to relieve the tractor and to improve the quality of soil-working. On top of the sliding seed depositor 12 (Figure 7) a shutter 34 is fixed which has a shape of a steel leaf and whose purpose is to close the furrow after the seed has been deposited thus covering the seed with earth. The top of the seed depositor 12 doesn't go into the soil and it is held by a hinge joint 12a thus no earth can get stuck to the depositor 12. Depositor 12 and shutter 34 are attached to the frame 9 by means of a hinge joint 12a and an adjustable spring 12c loaded bolt 12b. Depositor 12 when in working position is such placed that its top is below the earth level and it makes a furrow in which it deposits the seed while the steel shutter 34 closes the furrow thus covering the seed with earth. In order to eject the seed from the reservoir 16 and into the depositor 12, a well known chain transmission is used, which in this case consist of a sprocket chain 32 and a sprocket wheel 31 placed on an actuator wheel 13 of the planter.

Actuation assembly 35, 29, 30, 33 which actuates certain elements of the tools (Figure 4) receives its actuation from the bigger roller 8 for soil grinding and clod crushing which has enough power to drive the chains and sprockets in order to drive the artificial fertilizer reservoir 21 and to drive the eccentric shaft 18 in order to actuate vibrational plates 11. The assembly 35 consists of chain and sprocket for driving the artificial fertilizer reservoir 21. Actuation assembly 29, 30, 33 for driving the eccentric shaft 18 and vibrational plates 11 consists of a junction box 33 within the chains 29 and sprockets 30 are housed.

According to a variant embodiment of the present invention and Figure 8, combined soil-working machine can be made with tilling and with soil-preparation only, while in the autumn a deep ploughing or pre-sowing tilling and fertilizing must be conducted. On the bottom end 7 of the carrier 5.3 there are transport wheels 6 attached while on the said carrier 5.3 itself there are placed hydraulic cylinders 19 for raising/lowering of the assembly 41 and resting of this assembly on the ground on wheels while in transport to and from the acres or during the *in situ* manipulation. Back end of the horizontal frame 9 is centrally connected to the frame 5 by a vertically oriented lever 14 whose height can be adjusted by means of a nut 15.

According to the previous description of a preferred embodiment and according to the specific technological process and embodiment variant, the assembly 41 with an array of tools is placed within the frame 9. Viewed in the direction of the moving of the machine during operation, in front of said frame 9 and behind the end 7 and wheels 6 there is positioned a big hollow roller 8 with sickle-like teeth 22. Above and somewhat in front of said roller 8 for clod crushing and rough soil grinding there is an artificial fertilizer reservoir 21, the so called „dozer“. Behind the said roller 8 and partly between it's sickle-like teeth 22 there is an array of mutually parallel stripe cleaners 10 which are steeped in front and in downward direction and which enter the space between the teeth 22 in order to clean the roller 8.

Right behind the row of said cleaners 10 there is placed a rectangular, planar and slightly back-stooped soil leveler 26 whose purpose is to roughly level-out soil unevenness while preventing the soil from being thrown on top of the vibrational plates 11 that are placed behind. Vibrational plates 11 for soil stabilization on their bottom faces have a shield 20 attached. Said vibrational plates (in this embodiment there are eight of them) are mutually identical and are of rectangular shape with their front ends (front in respect of the direction of tractor motion) slightly upward inclined. Each plate 11 is connected to a strong cylindrical spring 28 which are connected to their appropriate housings of the bearings of the eccentric shaft 18 that receives it's actuation from the sprocket wheel. Eccentric shaft is placed in the ball bearings to allow rotation while the cams of the shaft 18 can be adjusted in such a way to achieve alternated „thumping“ of said plates 11 on the ground in order to balance the entire assembly. Said vibrational plates 11 perform the final preparation of the soil for sowing by compacting and leveling.

What presents a special novelty of the present invention in this embodiment (shown on Figures 8 to 10) is that within the assembly 41 there is a small roller 23 attached on the end for fine soil grinding in order to prepare the soil and prevent crust forming. Roller 23 is fixed by means of the carrier 25 to a frame 9 and is set outside said frame 9. On the roller 23 there is fixed a series of sickle-like teeth 24 that are longitudinally oriented and evenly spaced. Behind the said roller 23 on a special carrier

there are placed cleaners 27 of the small roller which enter the space between said teeth 24 thus cleaning the said roller 23.

The principle of operation of the combined soil-working machine for tilling by means of a rotary plough, soil-preparing and sowing, and according to the present invention, is simple and in an obvious way originates from the previous description and appended drawings so there is no need to further explain it. However, it is worthwhile pointing out that due to the specific constructional solution of the hitching hook 4 with the hydraulic cylinder 17 which are placed on the horizontal carrier 2 and which present yet another special novelty of present invention, it is possible to place combined soil-working machine in a variety of sets of positions, specifically when the soil-working is done on the inclined terrain. These positions can vary from the far left, over the center to the far right position of the rotary plough 1. So, when the said cylinder 17 with the said hook 4 is placed in the far left position, the soil-working machine is also in it's far left position, while the left wheel of the tractor T (when viewed in the direction of tractor motion when in operation) is in a furrow next to previously processed earth. In this case the plough is placed in it's left working position. When the said cylinder 17 with the said hook 4 is placed in the far right position, the soil-working machine is also in it's far left position, while the right wheel of the tractor T (when viewed in the direction of tractor motion when in operation) is in a furrow next to previously processed earth. In this case the plough is placed in it's right working position.

Industrial applicability

The applicability of the present invention is clear and obvious from the previous description. That is, to succesfully apply the present invention in the practice there is no need to possess some special knowledges, directions of implementation or experiences. The knowledge that an averagely skilled person in the art possesses is both necessary and sufficient to successfully apply present invention based on the given description. All

constructional characteristics of the present invention the Applicant has successfully tested on the built prototype.

Also, any constructional improvements or modifications which would remain within the scope of the described assembly of the combined soil-working machine and which would be in the purpose of it's functional improvement are considered as being included in this Application.

Applicant:



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CLAIMS

1. Combined soil-working machine for tilling by means of a rotary plough, fertilizing, soil preparing, stabilizing and sowing of crops, ***characterized in that***, it consists of a rotary plough (1) attached to the tractor (T) via a three-point linkage, a frame (5) with the frame (9) attached to the sleeves of the rear wheels semi-axes of the tractor (T), and tools assembly (40), and that the assembly (40) which is placed mainly within the frame (9) consists of big hollow roller (8) with sickle-like teeth (22) for rough grinding of soil, an artificial fertilizer reservoir (21) placed above and somewhat in front of the said roller (8), an array of mutually parallel stripe cleaners (10) placed inbetween said sickle-like teeth (22), a rectangular, planar and slightly back-stooped soil leveler (26) placed right behind the row of said cleaners (10), vibrational plates (11) for soil stabilization placed behind the said leveler (26), a reservoir (16) of the planter placed above and behind the said vibrational plants (11) and the actuation assembly (35; 29, 30, 33) for driving the said artificial fertilizer reservoir (21) and the eccentric shaft (18).
2. Combined soil-working machine according to the Claim 1, ***characterized in that***, the grated frame (5) is at it's front end attached by two horizontally oriented inclined levers (5.1, 5.2) to the moveable tow-ball (3) placed on a tow hitch (4), that said tow hitch (4) with said tow-ball (3) is placed on a horizontally oriented hydraulic cylinder (17), that said hydraulic cylinder (17) with said tow hitch (4) is placed on a horizontal carrier (2), that said carrier (2) is at it's ends attached to the upper parts of the vertical carrier (2a) placed on the outside of the tractor (T), where the carriers (2a) are at it's bottom ends attached to the sleeves of the rear wheels semi-axes of the tractor (T) and by means of two support holders (2b) placed on the inner sides of the wheels of the tractor (T) connected to the tractor's (T) differential, that in the rear end of the frame (5), behind the plough (1), are attached vertical carriers (5.3) whose bottom ends are fixed to the front end of the horizontal frame (9) for carrying of the

assembly (40), that on the said carriers (5.3) there are placed hydraulic cylinders (19) for raising and lowering of said assembly (40), while at the bottom end (7) of the carrier (5.3) transportational wheels (6) are placed and that the rear end of the horizontal frame (9) is centrally connected to the frame (5) by means of the vertically placed lever (14) with the nut (15) for adjusting the machine's placement and the depth of soil processing.

3. Combined soil-working machine according to the Claim 1, ***characterized in that***, the assembly (40), which is placed mainly within the frame (9), consists of a large hollow roller (8) with sickle-like teeth (22), where said teeth (22) are dimensionally larger and are placed on said roller (8) wider apart.
4. Combined soil-working machine according to the Claim 3, ***characterized in that***, the sickle-like teeth (22) are of triangular cross section with the blade (22a) pointing in the direction of the tractor (T) movement and that behind the roller (8) and partly in between it's sickle-like teeth (22) there exists an array of mutually parallel stripe cleaners (10) which are steeped front and downwards.
5. Combined soil-working machine according to the Claim 1, ***characterized in that***, the stripe cleaners (10) are arranged out of the vertically placed wider part (10a) and the thinner part (10b) while the said part (10b) is horizontally placed and fixed to the bottom of the said part (10a).
6. Combined soil-working machine according to the Claim 1, ***characterized in that***, behind the soil leveler (26) there are placed a vibrational plates (11) for soil stabilization which, on their bottom sides, have a shield (20) made out of stainless steel attached in order to reduce wear and tear of the said plates (11) during usage and are of rectangular shape with the front end (front in respect of the direction of tractor motion) slightly upward inclined, and that each vibrational plate (11) is at it's upper side connected to a cylindrical spring (28), which are at their upper ends connected to their respective housings of ball bearings of the eccentric shaft (18)

while the cams of the said eccentric shaft (18) are adjusted in such a way to achieve alternated „thumping“ of said plates (11) on the ground.

7. Combined soil-working machine according to the Claim 1, ***characterized in that***, the assembly (35) consists out of a chain and sprocket wheel to actuate the artificial fertilizer reservoir (21) and that the actuation assembly (29, 30, 33) for driving the eccentric shaft (18) and for driving the vibrational plates (11) consists out of a junction box (33) within which the chains (29) and sprockets (30) are housed.
8. Combined soil-working machine according to the Claim 1, ***characterized in that***, above and somewhat behind of the vibration plates (11) there is a reservoir (16) of the planter under which the sliding seed depositor (12) is arranged, and that on top of said depositor (12) there is fixed a shutter (34) in form of a steel leaf for closing the furrow and covering the seed with earth, that the said seed depositor (12) is attached to the frame (9) by means of the joint hinge (12a) and adjustable spring (12c) loaded bolt (12b), and that the reservoir (16) is connected to the actuation wheel (13) of the planter by means of the chain (32) and sprocket (31).
9. Combined soil-working machine for tilling by means of a rotary plough, soil preparing and stabilizing according to Claims 2 to 9 and a variant embodiment, ***characterized in that***, within frame (9) there is a tools assembly (41) attached, that within said tools assembly (41) at the end there is arranged a small roller (23) for fine soil graining and preparing, that said roller (23) is attached to the outside of the frame (9) by means of the carrier (25), that on said roller (23) there is arranged a number of longitudinally placed and equally spaced apart sickle-like teeth (24) and that behind said roller (23) placed on a special carrier there is arranged an array of cleaners (27) of the small roller (23) which enter the space between said sickle-like teeth (24) cleaning it.

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FIG. 1.

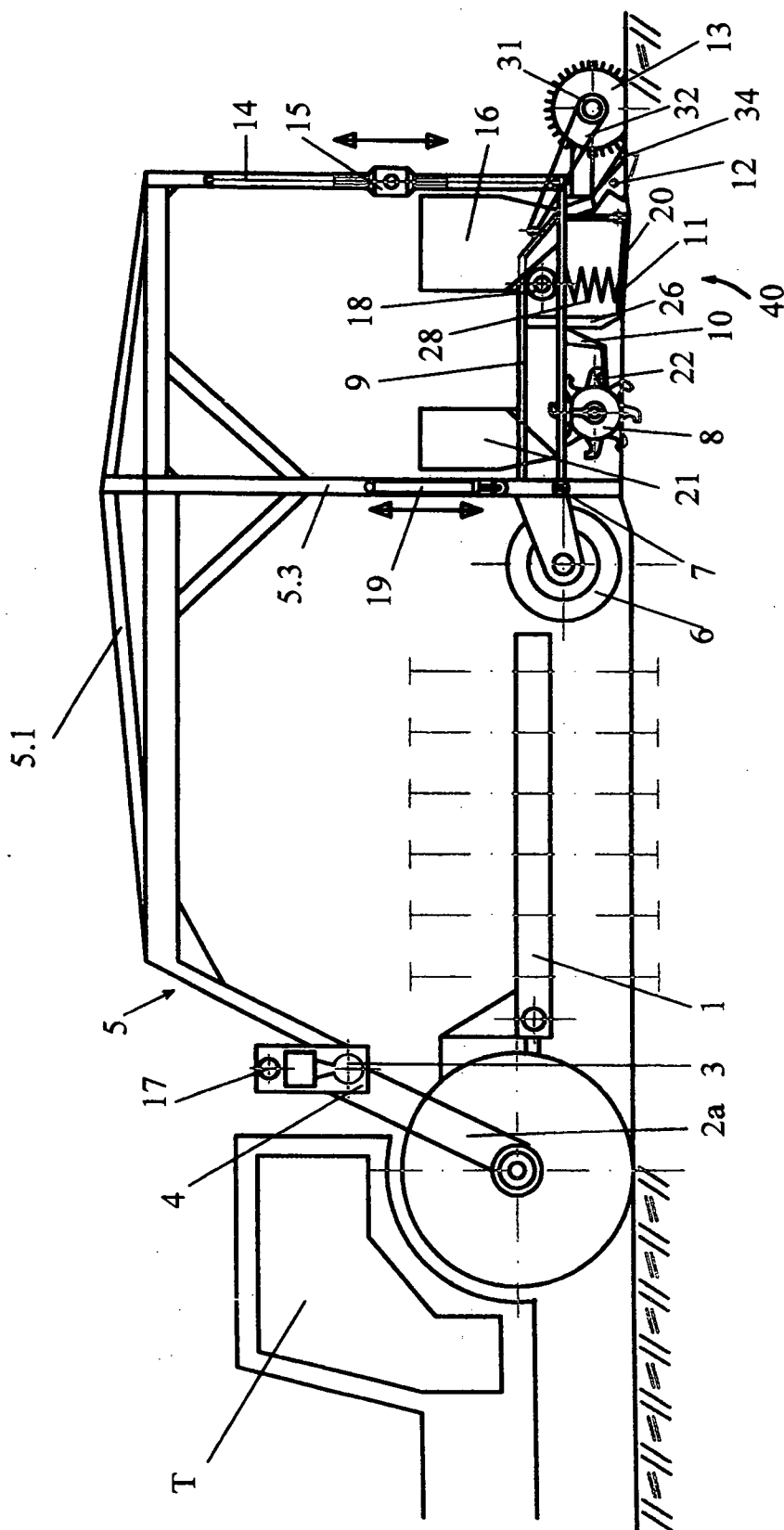


FIG. 2.

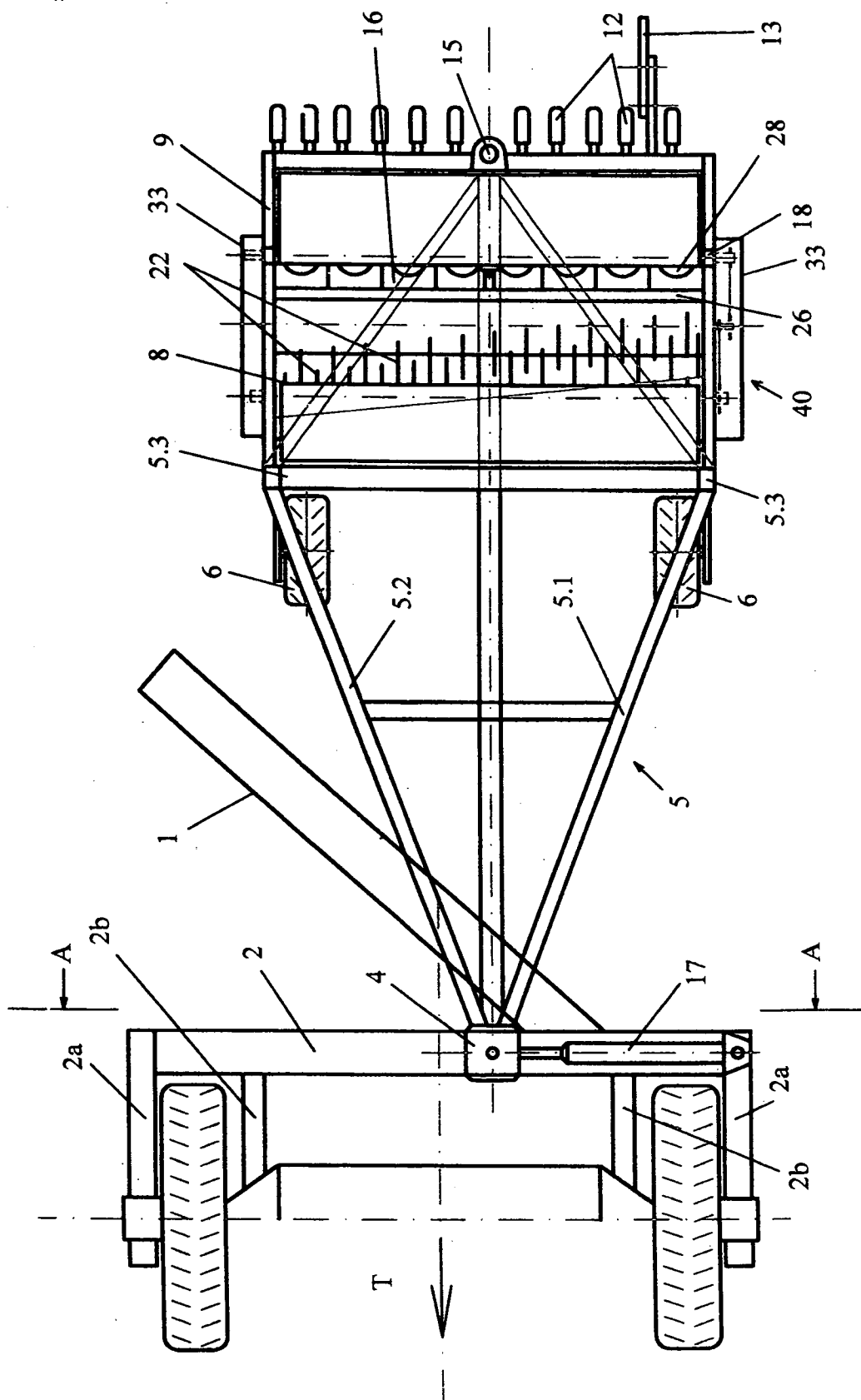


FIG. 3.

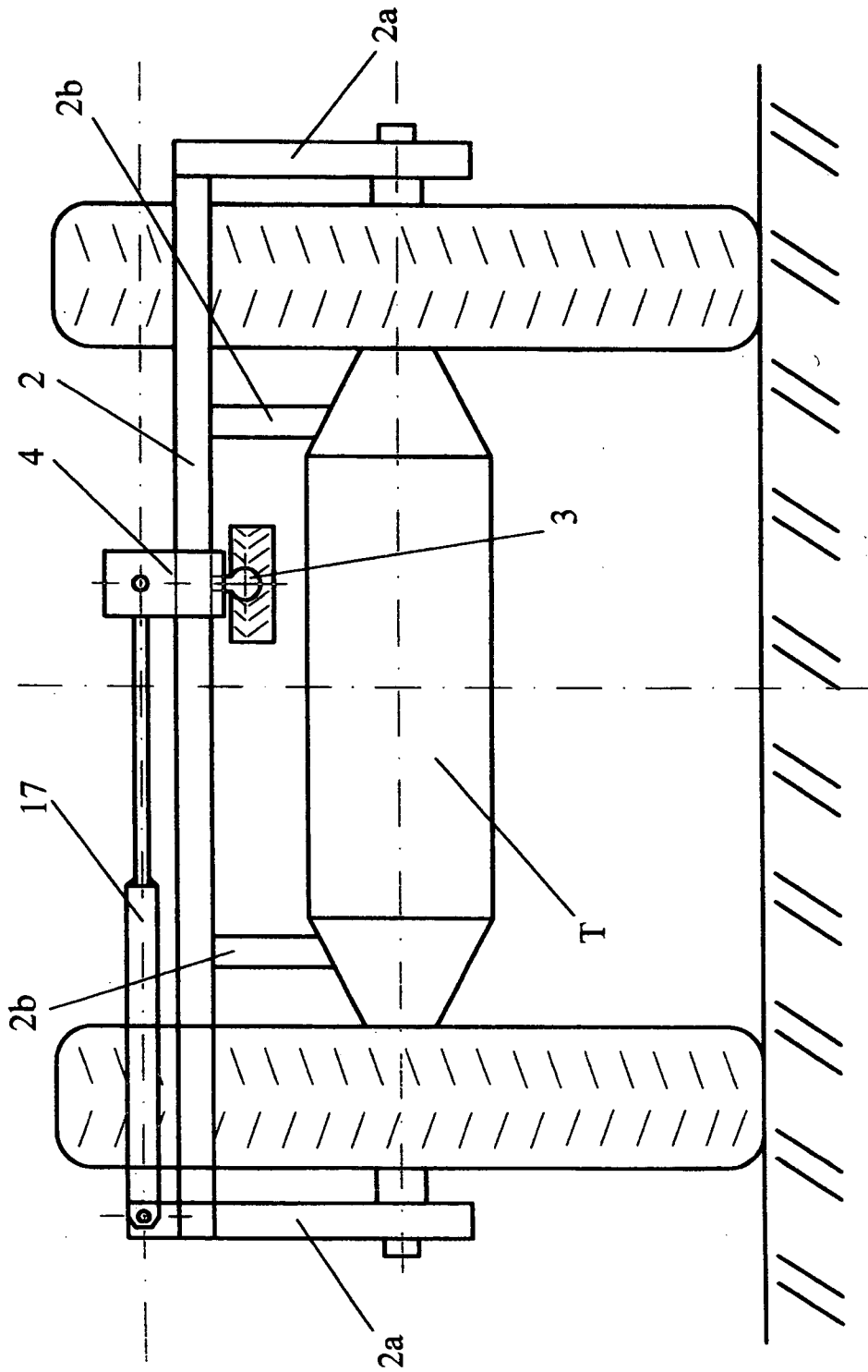


FIG. 4.

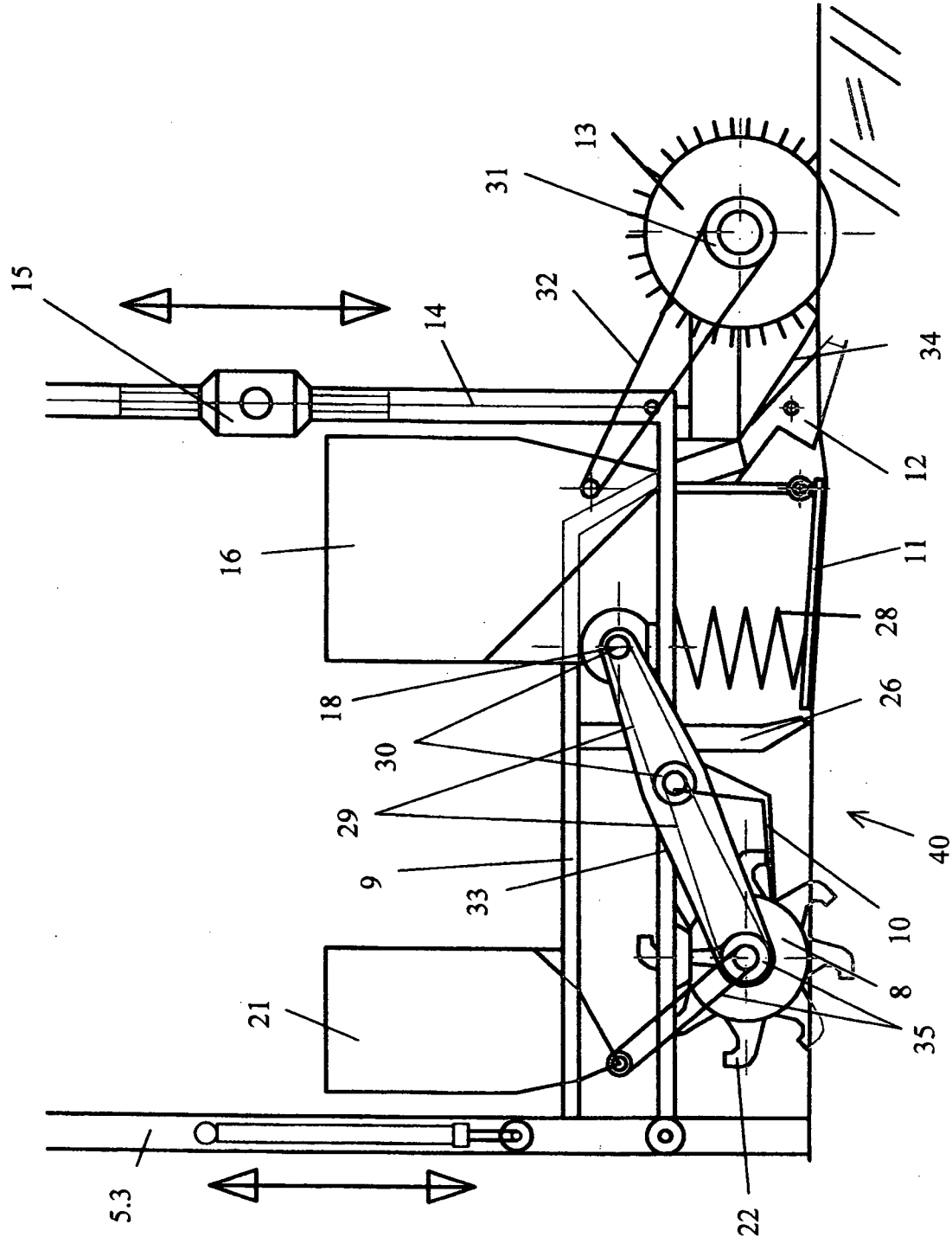


FIG. 5.

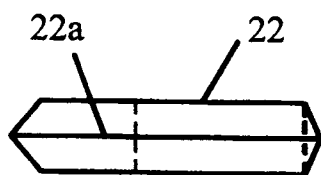
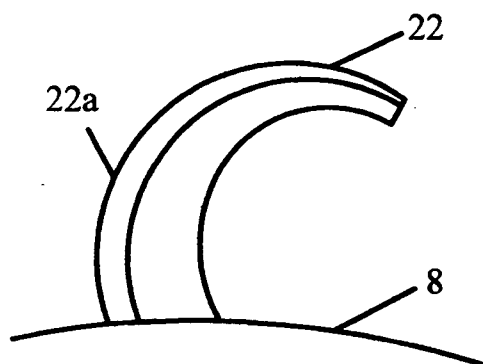


FIG. 5A.

FIG. 6.

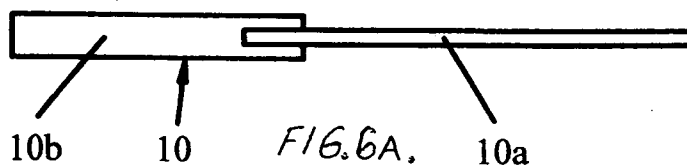
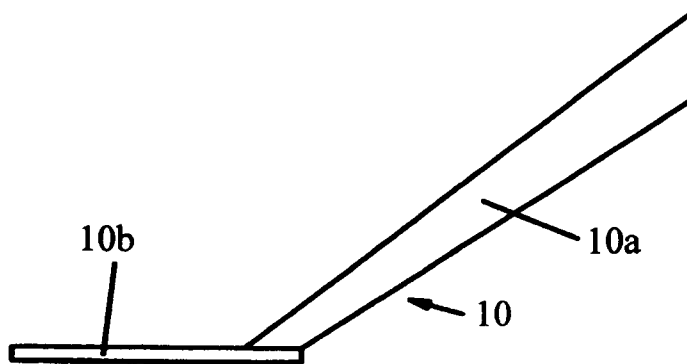


FIG. 6A.

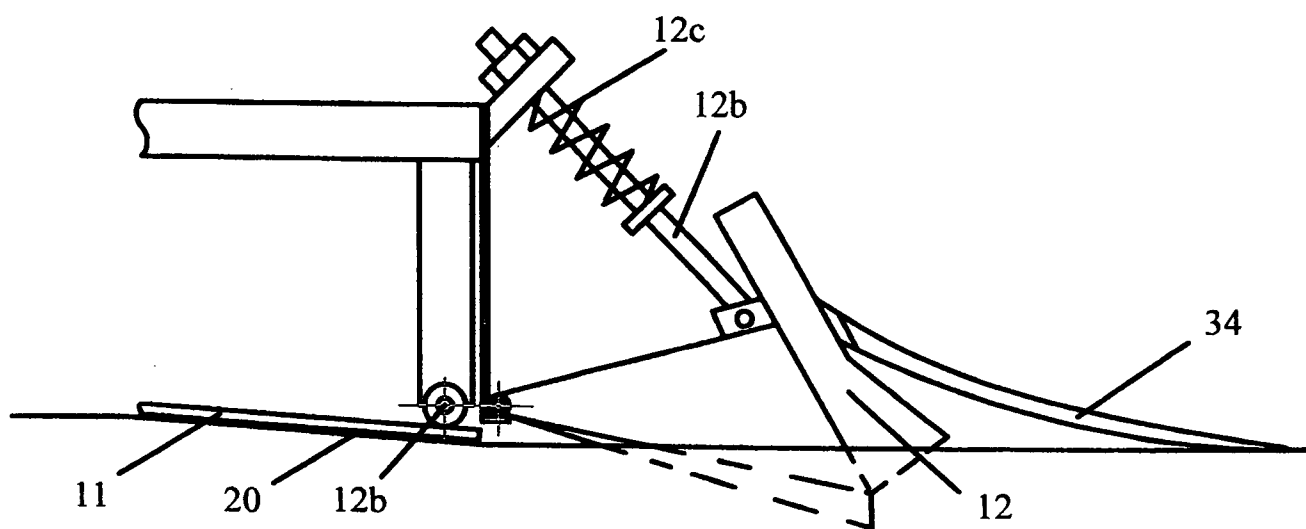


FIG. 7.

FIG. 8.

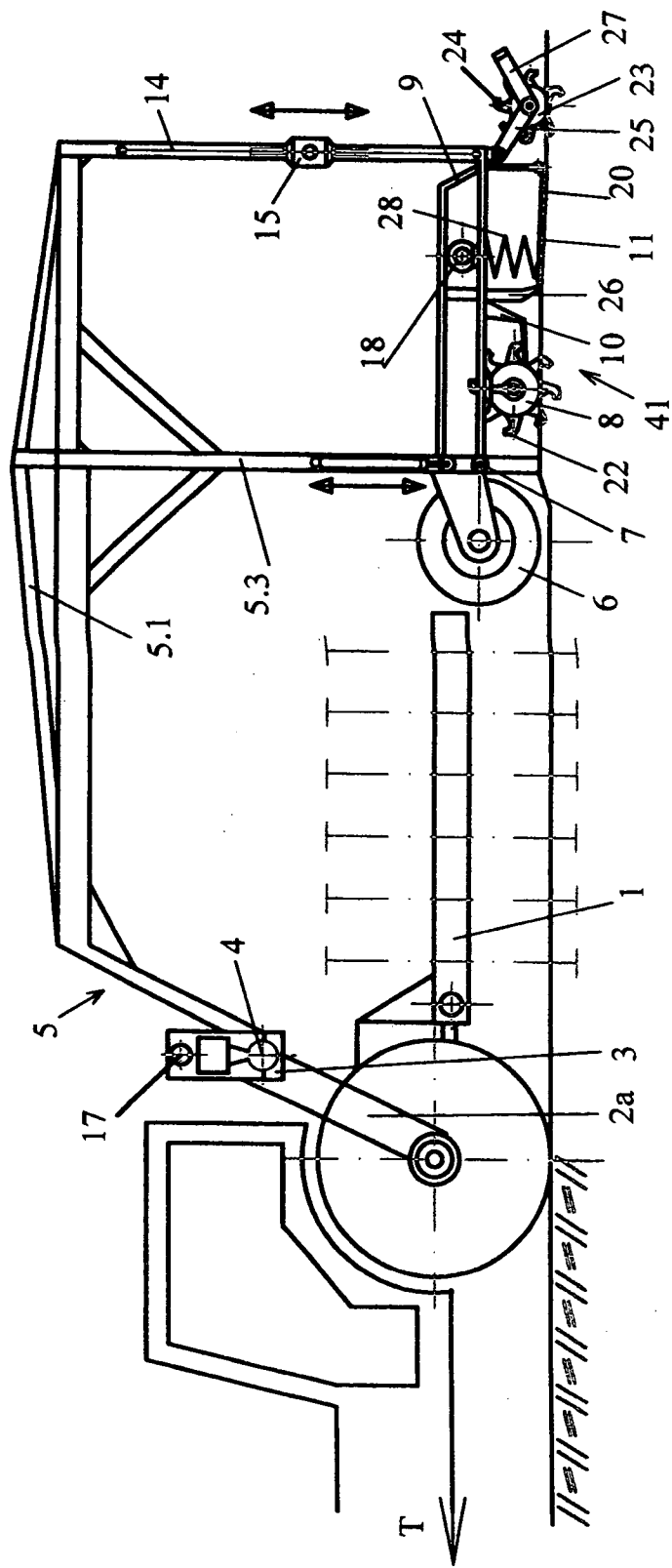


FIG. 9.

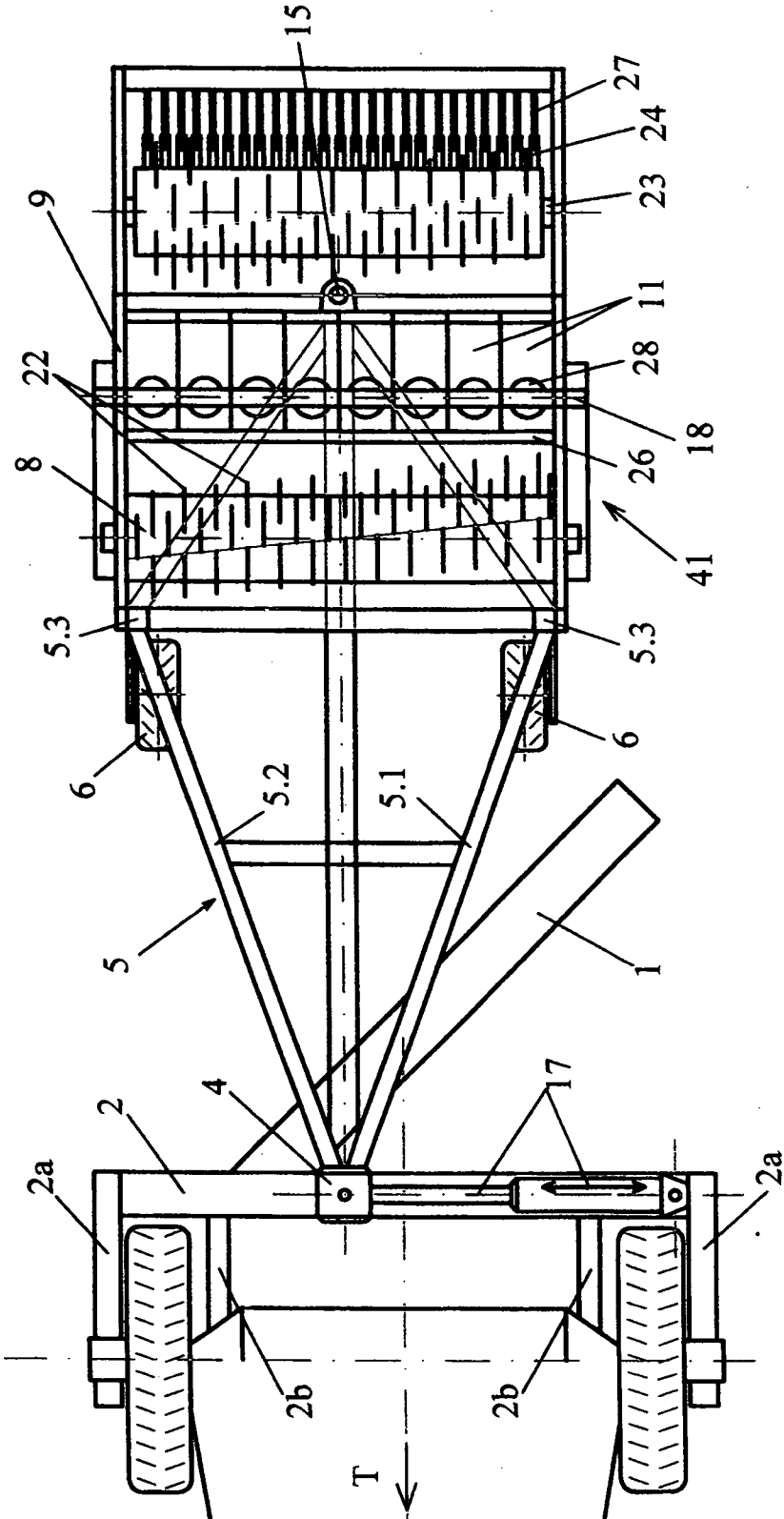


FIG. 10.

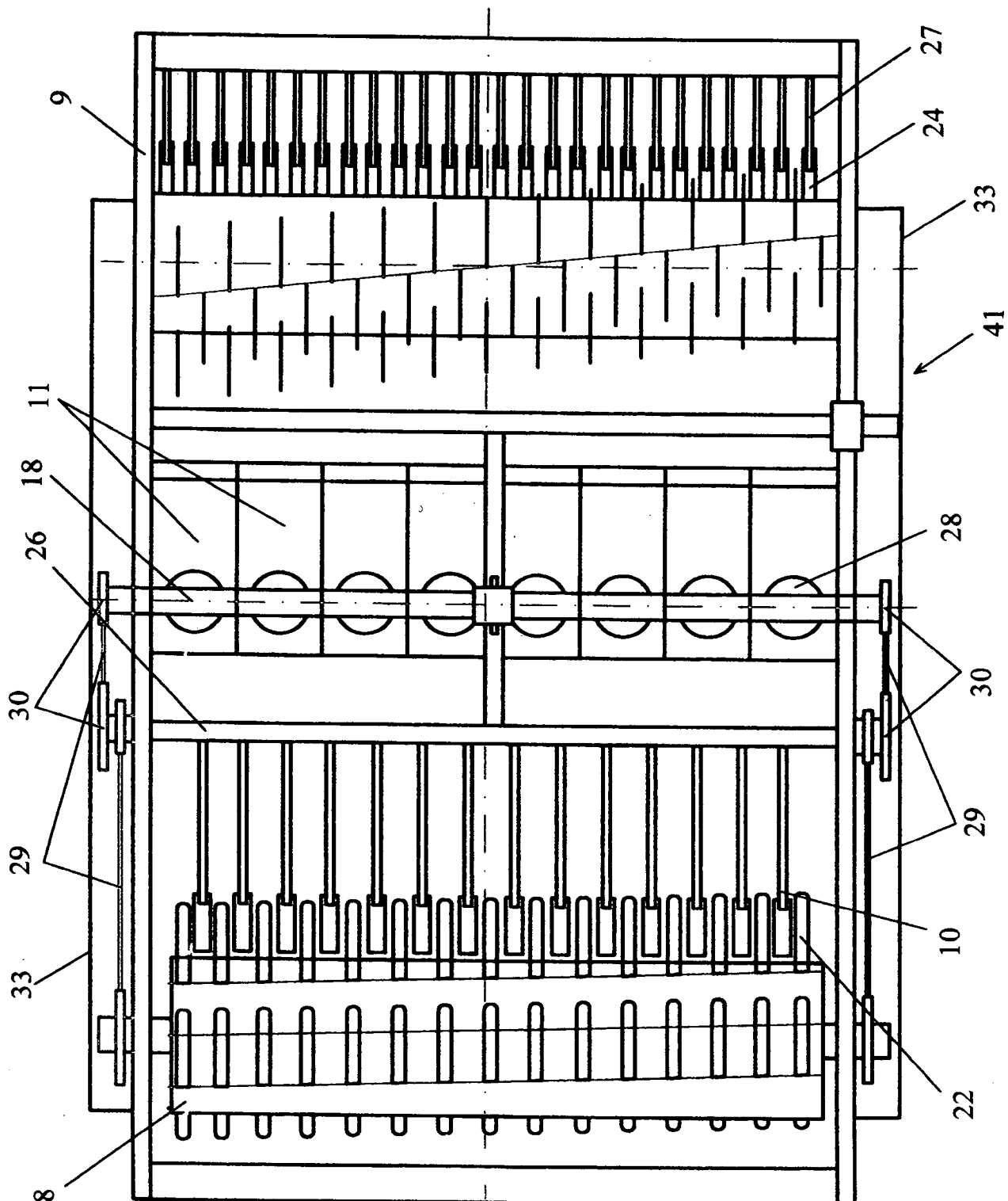


FIG. 11.

