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(54)

METHOD FOR ECOLOGICAL RESTORATION OF MINE VEGETATIOIN WITH SIMULATE LOAM

(57) The application relates to the field of soil protection, and in particular, to a method for ecological restoration of mine vegetation with simulate loam, including following steps: Step 1: fixing a hanging net on a mine surface; Step 2: spray seeding a first layer of simulate loam on the mine surface; Step 3: spray seeding a second layer of simulate loam on a surface of the first layer of simulate loam; Step 4: proportioning the plant seeds with a proportioning equipment, sowing shrubs on a surface of the second layer of simulate loam; sowing arbors at intervals on the surface of the second layer of simulate loam. The proportioning equipment includes a soaking barrel and a stirring barrel, a side wall of the soaking barrel is configured with a discharge hole, a conveying pipe is arranged between the soaking barrel and the stirring barrel; an adjustment assembly is provided on an outer wall of the soaking barrel, and an opening and closing assembly is provided on the outer wall of the soaking barrel; a stirring assembly is arranged in the stirring barrel, and a lifting assembly is arranged on an outer wall of the stirring barrel. A better growth environment for plants can be provided, thereby improving the survival rate and diversity of plants.

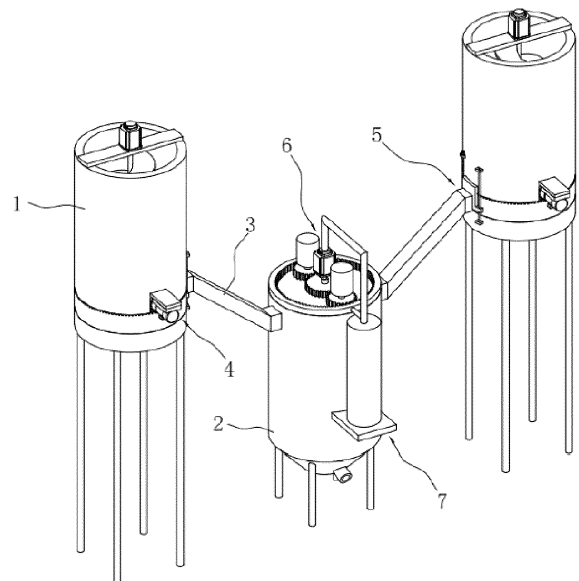


FIG. 1

Description

Technical field

[0001] The application relates to the field of soil protection, and in particular, to a method for ecological restorage of mine vegetation with simulate loam.

State of the art

[0002] With the rapid development of mineral mining technology, more and more abandoned mines are left behind after the completion of mineral mining.

[0003] After mining, the bedrock is exposed, especially in the case of high and steep slopes, rocky gravel slope surfaces would be formed after long-term weathering, by which it is difficult for soil conservation and which cannot provide good site conditions for plant growth, resulting in low survival rate of seedlings. A single herb community are prone to form after treatment, and it is impossible to restore the vegetation diversity of the mountain. In the case of the single herb community, the infection rate of pests and diseases will increase, which results in the increased management and maintenance cost.

Summary

[0004] In order to provide a better growth environment for plants and improve the survival rate and plant diversity, a method for ecological restorage of mine vegetation with simulate loam is provided, including the following steps:

- Step 1: fixing a hanging net on a mine surface;
- Step 2: spray seeding a first layer of simulate loam on the mine surface;
- Step 3: spray seeding a second layer of simulate loam on a surface of the first layer of simulate loam;
- Step 4: sowing shrubs on a surface of the second layer of simulate loam; sowing arbors at intervals on the surface of the second layer of simulate loam.

[0005] According to the above approach, the adhesion ability of the simulate loam on the slope surface of mine is improved with the hanging net, so as to reduce the loss of the simulate loam, so that it is easier for plant seeds to survive on the mine surface, thereby improving the survival rate of plants. Two layers of simulate loam are used to simulate the soil layer of normal land, to improve the survival rate of plants after planting in the simulate loam. During growing of the shrubs, the root systems of the shrubs anchor the simulate loam to the mine surface, which improves the adhesive force of the simulate loam on the slope surface and facilitates the growth of other plants on the slope surface. Arbors grow slowly, is deeply rooted, and can survive the winter. After the shrubs wither in winter, the arbors replace the shrubs to anchor the simulate loam, thereby further improving the fixation ef-

fect on the simulate loam and soil, so as to improve the survival rate of the shrubs after winter, and in turn improve the survival rate of all plants and increase plant diversity.

[0006] In a specific implementation, in the Step 4, before sowing shrubs and arbors, soaking plant seeds with a proportioning equipment.

[0007] According to the above approach, with the help of soaking, the pests and diseases of seeds can be reduced, the survival rate of plants after the plant seeds are planted can be improved, and the germination efficiency of seeds can be improved.

[0008] In a specific implementation, the proportioning equipment includes a soaking barrel and a stirring barrel, a side wall of the soaking barrel is configured with a discharge hole, a conveying pipe is arranged between the soaking barrel and the stirring barrel, and the conveying pipe is configured to connect the discharge hole and the stirring barrel;

an adjustment assembly for controlling a discharge area of the discharge hole is provided on an outer wall of the soaking barrel, and an opening and closing assembly is provided on the outer wall of the soaking barrel;

a stirring assembly is arranged in the stirring barrel, and a lifting assembly for raising and lowering the stirring assembly is arranged on an outer wall of the stirring barrel.

[0009] According to the above approach, after the completion of soaking of the plant seeds in the soaking barrel, the plant seeds are automatically transported to the stirring barrel through the adjustment assembly and automatically proportioned. The proportioned plant seeds are stirred in the stirring barrel and mixed evenly for easy sowing.

[0010] In a specific implementation, the adjustment assembly includes an adjustment ring and a transmission wheel, the outer wall of the soaking barrel is configured with a chute, the adjustment ring is arranged in the chute, the adjustment ring is configured with a throughhole, the throughhole is in communication with the discharge hole, the transmission wheel is coupled with the adjustment ring to take the adjustment ring to slide in the chute, and the outer wall the soaking barrel is provided with a first driving motor for driving the transmission wheel to rotate.

[0011] According to the above approach, the first driving motor drives the transmission wheel to rotate, and in turn drives the adjustment ring to slide in the chute, to adjust the communication area of the throughhole and the discharge hole, and control the discharge speed of the plant seeds.

[0012] In a specific implementation, a pressure regulating cavity is defined in the soaking barrel, an installation cavity in communication with the pressure regulating cavity is defined in the soaking barrel, a first piston block is arranged in the pressure regulating cavity, and a second piston block is arranged in the installation cavity;

a bottom surface of the adjustment ring is configured with locking teeth, an aperture is defined in an inner wall of the chute facing the locking teeth, a slider is arranged in the aperture, and limiting teeth are configured on a side of the slider facing the locking teeth, the limiting teeth are configured to be engagable with the locking teeth, one end of the slider away from the limiting teeth is coupled with the second piston block;

a groove in communication with the pressure regulating cavity is defined in the outer wall of the soaking barrel, a driven block is arranged in the groove, the driven block is coupled with the first piston block, and the driven block is coupled with the opening and closing assembly.

[0013] According to the above approach, the opening and closing assembly is opened and closed, such that the driven block slides in the groove, thereby controlling the engagement or disengagement of the limiting teeth and the locking teeth. After the limiting teeth are engaged with the locking teeth, the adjustment ring can be prevented from sliding in the chute, thereby improving the stability of the adjustment ring after positioning.

[0014] In a specific implementation, the opening and closing assembly includes a lifting plate, a guide rod and a lifting screw rod, the guide rod is arranged on the outer wall of the soaking barrel, the lifting screw rod is arranged on the outer wall of the soaking barrel and is parallel to the guide rod, a first end of the lifting plate is screwed to the lifting screw rod, and a second end of the lifting plate is penetrated by the guide rod, a second driving motor for driving the lifting screw rod to rotate is arranged on the outer wall of the soaking barrel.

[0015] According to the above approach, the second driving motor is started, to drive the lifting screw rod to rotate, thereby driving the lifting plate to rise and sink, so as to automatically control the opening and closing of the discharge hole.

[0016] In a specific implementation, a bottom of the soaking barrel is configured with a discharge outlet, a filter is arranged in the discharge outlet, a sealing plate is arranged in the discharge outlet, one end of the sealing plate is articulated with an inner wall of the soaking barrel, an air cylinder is arranged at the bottom of the soaking barrel, and a piston rod of the air cylinder is articulated with the sealing plate;

a top surface of the soaking barrel is provided with a fixing plate, a bottom of the fixing plate is configured with a connecting rod, the connecting rod is provided with a stirring blade, a third driving motor for driving the connecting rod to rotate is arranged on the fixing plate, and an inner wall of the soaking barrel is provided with a guide ring.

[0017] According to the above approach, the third driving motor is started, to drive the connecting rod to rotate, thereby driving the stirring blade to stir the seeds in the soaking barrel, and lifting the plant seeds upward, so that

the plant seeds that have not been successfully soaked float on the water surface. After the plant seeds sink, the plant seeds with pests and diseases will accumulate at the top. The survival rate of plant seeds at the bottom and in the middle are improved.

[0018] In a specific implementation, the stirring assembly includes a stirring rod and a stirring paddle, the stirring paddle is arranged on a side wall of the stirring rod, a fourth driving motor for driving the stirring rod to rotate is arranged at a top of the stirring rod, and the fourth driving motor is coupled with the lifting assembly.

[0019] According to the above approach, the fourth driving motor is started, to drive the stirring rod and the stirring paddle to stir the plant seeds, so as to evenly mix different types of plant seeds, so that after the plant seeds are sown, the plants diversity in an area is improved.

[0020] In a specific implementation, the stirring rod is provided with a driving wheel, the stirring rod is provided with a supporting plate, a plurality of driven rods are arranged in the stirring barrel, a side wall of each of the plurality of driven rods is provided with a plurality of stirring plates, each of the plurality of driven rods is provided with a driven wheel, the driven wheel is configured to be coupled with the driving wheel, a transmission ring is arranged at a top of the stirring barrel, the driven wheel is coupled with the transmission ring in a transmission way;

[0021] a communicating cavity is defined in each of the plurality of driven rods, a relief cavity in communication with the communicating cavity is defined in each of the plurality of stirring plates, a side wall of each of the plurality of stirring plates is configured with a plurality of liquid outlets in communication with the relief cavity, and a feeding barrel in communication with the communicating cavity is arranged at a top of each of the plurality of driven rods.

[0022] According to the above implementation, the driven rod rotates on its axis while rotating around the stirring rod, to drive the stirring plate to stir the plant seeds more sufficiently, so that the plant seeds are mixed more evenly, and the mixing efficiency of the plant seeds is improved. The nutrient solution is introduced into the communicating cavity and transported to the plant seeds in the stirring barrel through the relief cavity. During the continuous stirring, the nutrient solution can be evenly attached to the surface of the plant seeds, so that the survival rate of the plant seeds is further improved.

[0023] In a specific implementation, the lifting assembly includes a lifting oil cylinder and a connecting arm, the connecting arm is arranged on a piston rod of the lifting oil cylinder, and the connecting arm is coupled with the stirring assembly.

[0024] According to the above approach, the piston rod of the lifting oil cylinder extends and retracts, to drive the connecting arm to rise and sink, and thus drive the stirring assembly to rise and sink, which facilitates the removal of the stirring assembly from the stirring barrel and the maintenance of the stirring assembly.

[0025] In summary, at least one of the following ben-

eficial technical effects is realized:

1. The actual soil layer is simulated with simulate loam, and the adhesive force of the simulate loam on the mine surface is improved with hanging nets. Through the better fertility of the simulate loam, the survival rate of plant seeds in the simulate loam is improved. Shrubs and arbors anchor the simulate loam on the mine surface, so as to reduce the loss of the simulate loam, thicken the soil layer, thereby improving the survival rate of plants on the mine surface, and increasing the plant diversity.
2. The proportioning equipment is provided to soak and automatically proportion plant seeds. The seeds that are automatically proportioned are stirred, so that a variety of plant seeds have been evenly mixed when sowing, and the plant diversity in an area after the plants are grown is improved.

Description of drawings

[0026]

- Fig. 1 is an overall structure diagram of the embodiment according to the present application.
- Fig. 2 is a schematic view showing the structure of the opening and closing assembly.
- Fig. 3 is a sectional view showing the internal structure of the soaking barrel.
- Fig. 4 is a sectional view showing the structure inside the inner wall of the soaking barrel.
- Fig. 5 is a schematic view showing the structure of the lifting assembly.
- Fig. 6 is a schematic view showing the structure of the stirring assembly.

[0027] Reference signs list: 1. soaking barrel; 2. stirring barrel; 3. conveying pipe; 4. adjustment assembly; 41. adjustment ring; 42. transmission wheel; 43. first driving motor; 44. locking teeth; 5. opening and closing assembly; 51. lifting plate; 52. guide rod; 53. lifting screw rod; 54. second driving motor; 6. stirring assembly; 61. stirring rod; 62. stirring paddle; 63. fourth driving motor; 7. lifting assembly; 71. lifting oil cylinder; 72. connecting arm; 8. discharge hole; 9. throughhole; 10. chute; 11. fixing plate; 12. connecting rod; 13. stirring blade; 14. third driving motor; 15. guide ring; 16. filter; 17. sealing plate; 18. air cylinder; 19. driving wheel; 20. driven wheel; 21. driven rod; 22. stirring plate; 23. transmission ring; 24. supporting plate; 25. communicating cavity; 26. relief cavity; 27. liquid outlet; 28. feeding barrel; 29. pressure regulating cavity; 30. installation cavity; 31. first piston block; 32. second piston block; 33. limiting teeth; 34. driven block; 35. transmission rod; 36. groove; 37. slider; 38. aperture.

Detailed embodiments

[0028] The application will be described in further detail below with reference to accompanying drawings 1-6.

[0029] A method for ecological restorage of mine vegetation with simulate loam includes the following steps:

Step 1: fixing a hanging net on a mine surface, to facilitate the improvement of the adhesive force of the simulate loam on the mine surface when the spray seeding technology is subsequently adopted to spray seed simulate loam on the mine surface, so that the simulate loam is less likely to be lost under the erosion by rainfall after spray seeding.

Step 2: spray seeding a first layer of simulate loam on the mine surface to form a basic layer of simulate loam substrate for simulating a leaching horizon. Further, the simulate loam is adopted, so as to store more nutrients and to improve the survival rate of plants after planting.

Step 3: spray seeding a second layer of simulate loam on a surface of the first layer of simulate loam, to form a surface layer of simulate loam substrate for simulating a humus horizon or a weathered layer, such that dust, leaves and the like can be prevented from flying away with the wind and can be retained on the second layer of simulate loam when the wind blows with dust, leaves and the like, so as to increase the thickness of the soil layer and improve the soil fertility, so that plants can get more nutrients after sowing, which accelerates the growth of plants and further improves the survival rate of plants.

Step 4: before sowing, proportioning and soaking the plant seeds according to the results of field investigation. The soaking can improve the germination efficiency of plant seeds and accelerate the growth of plants. Further, soaking can reduce diseases and insect pests in the plant seeds and improve the survival rate of plants.

[0030] After the completion of the soaking, sowing seeds on the second layer of simulate loam. In the case that shrubs are planted on the second layer of simulate loam, the shrubs grow faster and take root faster, such that the surface soil layer can be quickly anchored and fixed, which reduces soil erosion and improves the survival rate of other plants. In the case that arbors are planted on the second layer of simulate loam, there should be gaps between adjacent arbors when planting arbors, which is convenient for arbors to take root and reduce the competition for nutrients between arbors. The arbors are deeply rooted, which can better anchor and fix the soil layer, so as to further reduce soil and water erosion, and improve the survival rate of plants.

[0031] The growth speed of arbors is different from that of shrubs. Shrubs grow faster, but they are easy to die in winter. The dead shrubs form food for the slow-growing arbors, so that the arbors can get sufficient nutrients

when growing up, which accelerates the growth efficiency of the arbors and improves the survival rate of arbors. After the arbors grow up, the soil layer is fixed by the arbors, and nutrients are not easily lost. Shrubs can easily sprout and grow in spring. A new cycle is started.

[0032] Referring to Fig. 1 and Fig. 2, the embodiment of the present application further discloses a proportioning equipment. The proportioning equipment includes a plurality of soaking barrels 1 and a stirring barrel 2. The side wall of each soaking barrel 1 is penetrated by a discharge hole 8. The discharge hole 8 is defined at the bottom of the soaking barrel 1. There is a conveying pipe 3 between each soaking barrel 1 and the mixing barrel 2. The first end of the conveying pipe 3 is fixed on the outer wall of the soaking barrel 1 and is in communication with the discharge hole 8. The second end of the conveying pipe is in communication with the stirring barrel 2. After the plant seeds are soaked in the soaking barrel 1, they are transported to the stirring barrel 2 through the conveying pipe 3. The plant seeds conveyed from different soaking barrels 1 are stirred and mixed in the stirring barrel 2 to facilitate sowing.

[0033] Referring to Fig. 2 and Fig. 3, an adjustment assembly 4 is provided on the outer wall of the soaking barrel 1. The adjustment assembly 4 includes an adjustment ring 41 and a transmission wheel 42. The outer wall of the soaking barrel 1 is configured with an annular chute 10. The adjustment ring 41 is arranged in the chute 10. The adjustment ring 41 is penetrated by a throughhole 9. The top surface of the adjustment ring 41 is integrally formed with transmission teeth. The transmission wheel 42 is arranged in the chute 10. The transmission wheel 42 is a gear. The transmission wheel 42 is meshed with the transmission teeth. A first driving motor 43 is fixed on the outer wall of the soaking barrel 1, the output shaft of the first driving motor 43 is coaxially and fixedly connected to the transmission wheel 42. The first driving motor 43 drives the transmission wheel 42 to rotate, which in turn drives the adjustment ring 41 to rotate. During the rotation of the adjustment ring 41, the throughhole 9 and the discharge hole 8 are gradually communicated. By controlling the communication area between the throughhole 9 and the discharge hole 8, the discharge speed of seeds in the soaking barrel 1 is controlled. By controlling the discharge speed of seeds in different soaking barrels 1, the proportioning of plant seeds is facilitated.

[0034] Referring to Fig. 2 and Fig. 3, the outer wall of the soaking barrel 1 is provided with an opening and closing assembly 5. The opening and closing assembly 5 is arranged in the conveying pipe 3. The opening and closing assembly 5 includes a lifting plate 51, a guide rod 52 and a lifting screw rod 53. The guide rod 52 is vertically fixed on the outer wall of the soaking barrel 1. The lifting screw rod 53 is vertically fixed on the outer wall of the soaking barrel 1. The first end of the lifting plate 51 is screwed to the lifting screw rod 53. The second end of the lifting plate is penetrated by a socket for the guide rod 52. A second driving motor 54 is fixed on the outer

wall of the soaking barrel 1. The output shaft of the second driving motor 54 is coaxially and fixedly connected to the lifting screw rod 53. The second driving motor 54 drives the lifting screw rod 53 to rotate and in turn drives the lifting plate 51 to lift. During the gradual communication between the adjustment ring 41 and the discharge hole 8, the initial conveying speed of the seeds in a plurality of soaking barrels 1 is the same. When the conveying speed of the seeds in the soaking barrels 1 no longer changes, the conveying speed of the seeds in the plurality of soaking barrels 1 are no longer the same, which leads to errors in the proportion of the plant seeds at the beginning. After the lifting plate 51 is attached to the outer wall of the adjustment ring 41 and the adjustment ring 41 is adjusted, the lifting plate 51 rises, to connect the throughhole 9 with the conveying pipe 3, so that the initial conveying speeds of the plant seeds are different from each other, thereby improving the accuracy of proportion of plant seeds.

[0035] Referring to Fig. 2 and Fig. 4, a pressure regulating cavity 29 is configured in the soaking barrel 1. An installation cavity 30 in communication with the pressure regulating cavity 29 is configured in the soaking barrel 1. A first piston block 31 is arranged in the pressure regulating cavity 29. A second piston block 32 is arranged in the installation cavity 30. The side wall of the first piston block 31 is integrally formed with a driven block 34. The outer wall of the soaking barrel 1 is configured with a groove 36 in communication with the pressure regulating cavity 29. The driven block 34 is arranged in the groove 36 and protrudes from the groove 36. A transmission rod 35 is fixed on the bottom surface of the lifting plate 51. The bottom end of the transmission rod 35 is fixedly connected to the driven block 34. When the lifting plate 51 rises or sinks, it can drive the driven block 34 to rise or sink, thereby driving the first piston block 31 to slide in the pressure regulating cavity 29. When the first piston block 31 rises in the pressure regulating cavity 29, the air pressure in the pressure regulating cavity 29 increases, so that the air in the pressure regulating cavity 29 flows toward two installation cavities 30, therefore, the air pressure in the installation cavities 30 increases, so that the second piston block 32 slides upward. On the contrary, when the lifting plate 51 sinks, the pressure in the pressure regulating cavity 29 decreases, so that the second piston block 32 is driven to slide downward.

[0036] Referring to Fig. 2 and Fig. 4, the bottom surface of the adjustment ring 41 is provided with locking teeth 44. The inner wall of the chute 10 facing the locking teeth 44 is configured with an aperture 38. A slider 37 is arranged in the aperture 38. One end of slider 37 away from the adjustment ring 41 is fixedly connected to the second piston block 32. Limiting teeth 33 are integrally formed on the side of the slider 37 facing the adjustment ring 41. When the slider 37 is driven to rise by the second piston block 32, the limiting teeth 33 can be meshed with the locking teeth 44, thereby preventing the adjustment ring 41 from rotating and improving the stability of the

adjustment ring 41 in the chute 10.

[0037] Referring to Fig. 2 and Fig. 4, when the discharge area of the discharge hole 8 is adjusted by the adjustment ring 41, the lifting plate 51 closes the discharge hole 8 at this time, in particular, the first piston block 31 is located at the bottom of the pressure regulating cavity 29, and the slider 37 is accommodated in the aperture 38. When the lifting plate 51 rises to open the discharge hole 8, the first piston block 31 rises with the lifting plate 51, so that the limiting teeth 33 on the slider 37 are gradually meshed with the locking teeth 44 on the adjustment ring 41, so as to prevent the adjustment ring 41 from rotating under the pressure of the plant seeds, thereby improving the stability of the adjustment ring 41. Referring to Fig. 2 and Fig. 3, the bottom of the soaking barrel 1 is configured with a discharge outlet. A filter 16 is fixed on the inner wall of the discharge outlet. A sealing plate 17 is articulated with the inner wall of the discharge outlet. The sealing plate 17 is arranged below the filter 16. An air cylinder 18 is articulated with the inner wall of the discharge outlet. The piston rod of the gas cylinder 18 is articulated with the end of the sealing plate 17 away from the hinge point where it is articulated with the soaking barrel 1. In the normal state, the piston rod of the air cylinder 18 extends, and the sealing plate 17 closes the discharge outlet, such that the seeds can be soaked in the soaking barrel 1. After the completion of the soaking, the piston rod of the air cylinder 18 is retracted, so that the liquid for soaking is discharged from the discharge outlet, and the filter 16 blocks the plant seeds in the soaking barrel 1.

[0038] Referring to Fig. 2 and Fig. 3, one end of the filter 16 close to the discharge hole 8 inclines downward, so that the plant seeds on the filter 16 tend to roll toward the discharge hole 8, which facilitates the transportation of the plant seeds in the soaking barrel 1 to the conveying pipe 3.

[0039] Referring to Fig. 2 and Fig. 3, a fixing plate 11 is fixed on the top surface of the soaking barrel 1. A third driving motor 14 is fixed on the fixing plate 11. The output shaft of the third driving motor 14 extends toward the soaking barrel 1. A connecting rod 12 is provided at the bottom of the fixing plate 11. The connecting rod 12 is coaxially fixed on the output shaft of the third driving motor 14. A stirring blade 13 extending spirally along the length direction of the connecting rod 12 is provided on the side wall of the connecting rod 12. A guide ring 15 is fixed on the inner wall of the soaking barrel 1. The inner diameter of the guide ring 15 gradually decreases in the vertical downward direction.

[0040] Referring to Fig. 2 and Fig. 3, after the completion of the soaking, the third driving motor 14 is started, to drive the connecting rod 12 and the stirring blade 13 to rotate, which facilitates lifting the plant seeds upward, so that the plant seeds surge in the soaking barrel 1. Plant seeds are floating around due to the water flow. Under the guidance of the guide ring 15, the plant seeds float toward the connecting rod 12 and the stirring blade

13, which facilitates the reciprocating stirring of the plant seeds. There is a significant difference in density between intact seeds and seeds with pests and diseases after soaking, in particular, the density of the intact seed is greater, while the density of the seed with pests and diseases is smaller. By stirring the seeds up and down, a large number of seeds with pests and diseases are accumulated at the top, such that the survival rate of plant seeds at the bottom and in the middle is improved, while plant seeds at the top can be selected as needed.

[0041] Referring to Fig. 5 and Fig. 6, a stirring assembly 6 is arranged in the stirring barrel 2, and a lifting assembly 7 is provided on the outer wall of the stirring barrel 2. The lifting assembly 7 is coupled with the stirring assembly 6, to bring the stirring assembly 6 into the stirring barrel 2 to stir the plant seeds, and to take the stirring assembly 6 from the stirring barrel 2 after the stirring of the plant seeds is completed.

[0042] Referring to Fig. 5 and Fig. 6, the lifting assembly 7 includes a lifting oil cylinder 71 and a connecting arm 72. The lifting oil cylinder 71 is fixed on the outer wall of the stirring barrel 2. The connecting arm 72 is fixed on the piston rod of the lifting oil cylinder 71. The stirring assembly 6 is arranged at the bottom of the connecting arm 72. The piston rod of the lifting oil cylinder 71 extends and retracts to drive the connecting arm 72 to rise and fall, and thus to drive the stirring assembly 6 to rise and fall.

[0043] Referring to Fig. 5 and Fig. 6, the stirring assembly 6 includes a stirring rod 61 and a stirring paddle 62. The stirring rod 61 is arranged at the bottom of the connecting arm 72. The stirring paddle 62 is fixed on the side wall of the stirring rod 61. A fourth driving motor 63 is fixed on the connecting arm 72. The output shaft of the fourth driving motor 63 is coaxially and fixedly connected to the stirring rod 61. The fourth driving motor 63 drives the stirring rod 61 to rotate, which in turn drives the stirring paddle 62 to stir the plant seeds in the stirring barrel 2 to fully mix different types of plant seeds.

[0044] Referring to Fig. 5 and Fig. 6, a supporting plate 24 is fixed on the stirring rod 61. A plurality of driven rods 21 are arranged in the stirring barrel 2. A driven wheel 20 is coaxially fixed on the driven rod 21. The driven wheel 20 is arranged on the supporting plate 24. A driving wheel 19 is coaxially fixed on the stirring rod 61. Both the driving wheel 19 and the driven wheel 20 are gears. The driving wheel 19 and the driven wheel 20 are meshed with each other. A transmission ring 23 is fixed on the piston rod of the lifting oil cylinder 71. The transmission ring 23 is a ring gear, and the transmission ring 23 is meshed with the driven wheel 20. A plurality of stirring plates 22 are fixed on the side wall of the driven rod 21. When the stirring rod 61 rotates, the driven rod 21 is driven by the driving wheel 19 and the driven wheel 20 to revolve around the stirring rod 61 while rotating on its axis at the same time, to more fully stir the plant seeds in the stirring barrel 2.

[0045] Referring to Fig. 5 and Fig. 6, a communicating

cavity 25 is defined in the driven rod 21. A relief cavity 26 in communication with the communicating cavity 25 is defined in the stirring plate 22. The side wall of the stirring plate 22 is configured with a plurality of liquid outlets 27 in communication with the relief cavity 26. A feeding barrel 28 in communication with the communicating cavity 25 is arranged at the top of the driven rod 21. The nutrient solution is accommodated in the feeding barrel 28. While the stirring plate 22 mixes the plant seeds, the nutrient solution is coated on the surface of the plant seeds to facilitate the growth of the plant seeds.

[0046] The implementation principle of the embodiment of the present application is: different plant seeds are placed in different soaking barrels 1 for soaking. After the plant seeds have been soaked, the third driving motor 14 is started to stir the plant seeds. After the plant seeds have been stirred and sink, the piston rod of the air cylinder 18 retracts, and the liquid in the soaking barrel 1 is discharged. The first driving motor 43 is started to rotate the adjustment ring 41, so as to adjust the communication area between the throughhole 9 and the discharge hole 8. The second driving motor 54 is started to lift the lifting plate 51 and to drive the first piston block 31 to rise, so that the limiting teeth 33 are meshed with the locking teeth 44, to transport the plant seeds into the stirring barrel 2. The fourth driving motor 63 is started to drive the stirring plate 22 and the stirring paddle 62 to stir the plant seeds.

[0047] All of the above are preferred embodiments of the present application, and are not intended to limit the protection scope of the application. Therefore, all equivalent modification made according to the structure, shape and principle of the application should be covered by the protection scope of the application.

Claims

1. A method for ecological restorage of mine vegetation with simulate loam, **characterized in that** the method comprises following steps:

Step 1: fixing a hanging net on a mine surface;
 Step 2: spray seeding a first layer of simulate loam on the mine surface;
 Step 3: spray seeding a second layer of simulate loam on a surface of the first layer of simulate loam;
 Step 4: sowing shrubs on a surface of the second layer of simulate loam; sowing arbors at intervals on the surface of the second layer of simulate loam.

2. The method for ecological restorage of mine vegetation with simulate loam according to claim 1, **characterized in that** in the Step 4, before sowing shrubs and arbors, soaking plant seeds with a proportioning equipment.

3. The method for ecological restorage of mine vegetation with simulate loam according to claim 2, **characterized in that** the proportioning equipment comprises a soaking barrel (1) and a stirring barrel (2), a side wall of the soaking barrel (1) is configured with a discharge hole (8), a conveying pipe (3) is arranged between the soaking barrel (1) and the stirring barrel (2), and the conveying pipe (3) is configured to connect the discharge hole (8) and the stirring barrel (2);

an adjustment assembly (4) for controlling a discharge area of the discharge hole (8) is provided on an outer wall of the soaking barrel (1), and an opening and closing assembly (5) is provided on the outer wall of the soaking barrel (1); a stirring assembly (6) is arranged in the stirring barrel (2), and a lifting assembly (7) for raising and lowering the stirring assembly (6) is arranged on an outer wall of the stirring barrel (2).

4. The method for ecological restorage of mine vegetation with simulate loam according to claim 3, **characterized in that** the adjustment assembly (4) comprises an adjustment ring (41) and a transmission wheel (42), the outer wall of the soaking barrel (1) is configured with a chute (10), the adjustment ring (41) is arranged in the chute (10), the adjustment ring (41) is configured with a throughhole (9), the throughhole (9) is in communication with the discharge hole (8), the transmission wheel (42) is coupled with the adjustment ring (41) to take the adjustment ring (41) to slide in the chute (10), and the outer wall the soaking barrel (1) is provided with a first driving motor (43) for driving the transmission wheel (42) to rotate.

5. The method for ecological restorage of mine vegetation with simulate loam according to claim 4, **characterized in that** a pressure regulating cavity (29) is configured in the soaking barrel (1), an installation cavity (30) in communication with the pressure regulating cavity (29) is configured in the soaking barrel (1), a first piston block (31) is arranged in the pressure regulating cavity (29), and a second piston block (32) is arranged in the installation cavity (30);

a bottom surface of the adjustment ring (41) is configured with locking teeth (44), an aperture (38) is defined in an inner wall of the chute (10) facing the locking teeth (44), a slider (37) is arranged in the aperture (38), and limiting teeth (33) are configured on a side of the slider (37) facing the locking teeth (44), the limiting teeth are configured to be engagable with the locking teeth (44), one end of the slider (37) away from the limiting teeth (33) is coupled with the second piston block (32); a groove (36) in communication with the pressure regulating cavity (29) is defined in the outer

- wall of the soaking barrel (1), a driven block (34) is arranged in the groove (36), the driven block (34) is coupled with the first piston block (31), and the driven block (34) is coupled with the opening and closing assembly (5). 5
6. The method for ecological restorage of mine vegetation with simulate loam according to claim 3, **characterized in that** the opening and closing assembly (5) comprises a lifting plate (51), a guide rod (52) and a lifting screw rod (53), the guide rod (52) is arranged on the outer wall of the soaking barrel (1), the lifting screw rod (53) is arranged on the outer wall of the soaking barrel (1) and is parallel to the guide rod (52), a first end of the lifting plate (51) is screwed to the lifting screw rod (53), and a second end of the lifting plate is penetrated by the guide rod (52), a second driving motor (54) for driving the lifting screw rod (53) to rotate is arranged on the outer wall of the soaking barrel (1). 10
7. The method for ecological restorage of mine vegetation with simulate loam according to claim 3, **characterized in that** a bottom of the soaking barrel (1) is configured with a discharge outlet, a filter (16) is arranged in the discharge outlet, a sealing plate (17) is arranged in the discharge outlet, one end of the sealing plate (17) is articulated with an inner wall of the soaking barrel (1), an air cylinder (18) is arranged at the bottom of the soaking barrel (1), and a piston rod of the gas cylinder (18) is articulated with the sealing plate (17); 15
- a top surface of the soaking barrel (1) is provided with a fixing plate (11), a bottom of the fixing plate (11) is configured with a connecting rod (12), the connecting rod (12) is provided with a stirring blade (13), a third driving motor (14) for driving the connecting rod (12) to rotate is arranged on the fixing plate (11), and the inner wall of the soaking barrel (1) is provided with a guide ring (15). 20
8. The method for ecological restorage of mine vegetation with simulate loam according to claim 3, **characterized in that** the stirring assembly (6) comprises a stirring rod (61) and a stirring paddle (62), the stirring paddle (62) is arranged on a side wall of the stirring rod (61), a fourth driving motor (63) for driving the stirring rod (61) to rotate is arranged at a top of the stirring rod (61), and the fourth driving motor (63) is coupled with the lifting assembly (7). 25
9. The method for ecological restorage of mine vegetation with simulate loam according to claim 8, **characterized in that** the stirring rod (61) is provided with a driving wheel (19), the stirring rod (61) is provided with a supporting plate (24), a plurality of driven rods (21) are arranged in the stirring barrel (2), a side wall of each of the plurality of driven rods (21) is provided 30
- with a plurality of stirring plates (22), each of the plurality of driven rods (21) is provided with a driven wheel (20), the driven wheel is configured to be coupled with the driving wheel (19), a transmission ring (23) is arranged at a top of the stirring barrel (2), the driven wheel (20) is coupled with the transmission ring (23) in a transmission way; 35
- a communicating cavity (25) is defined in each of the plurality of driven rods (21), a relief cavity (26) in communication with the communicating cavity (25) is defined in each of the plurality of stirring plates (22), a side wall of each of the plurality of stirring plates (22) is configured with a plurality of liquid outlets (27) in communication with the relief cavity (26), and a feeding barrel (28) in communication with the communicating cavity (25) is arranged at a top of each of the plurality of driven rods (21). 40
10. The method for ecological restorage of mine vegetation with simulate loam according to claim 3, **characterized in that** the lifting assembly (7) comprises a lifting oil cylinder (71) and a connecting arm (72), the connecting arm (72) is arranged on a piston rod of the lifting oil cylinder (71), and the connecting arm (72) is coupled with the stirring assembly (6). 45
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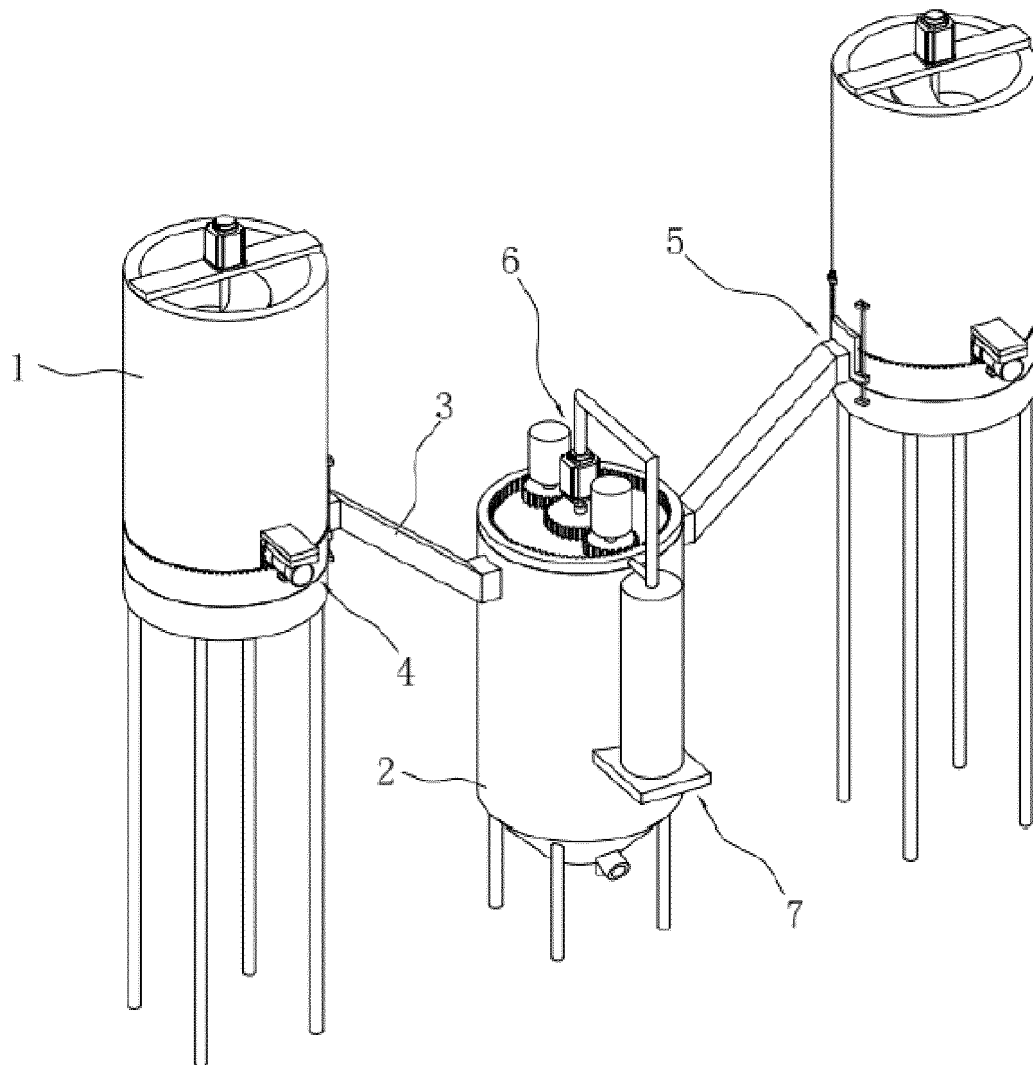


FIG. 1

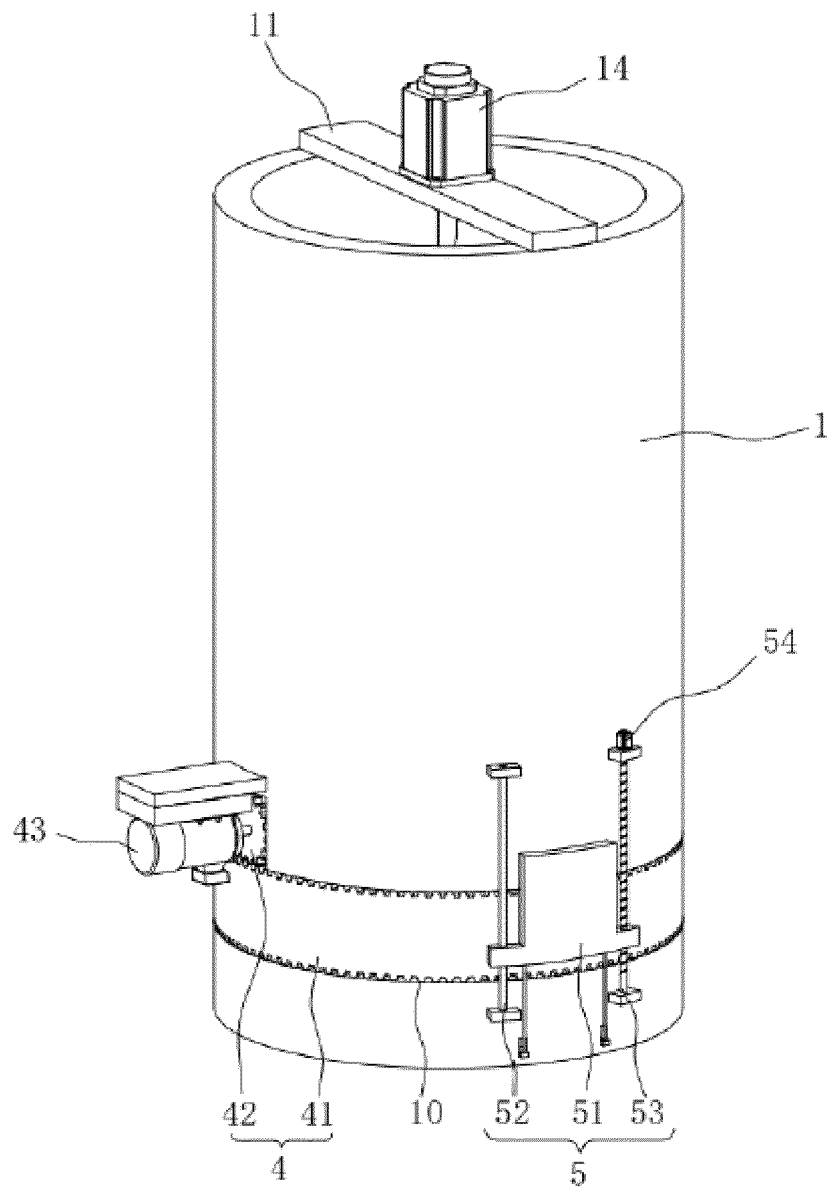


FIG. 2

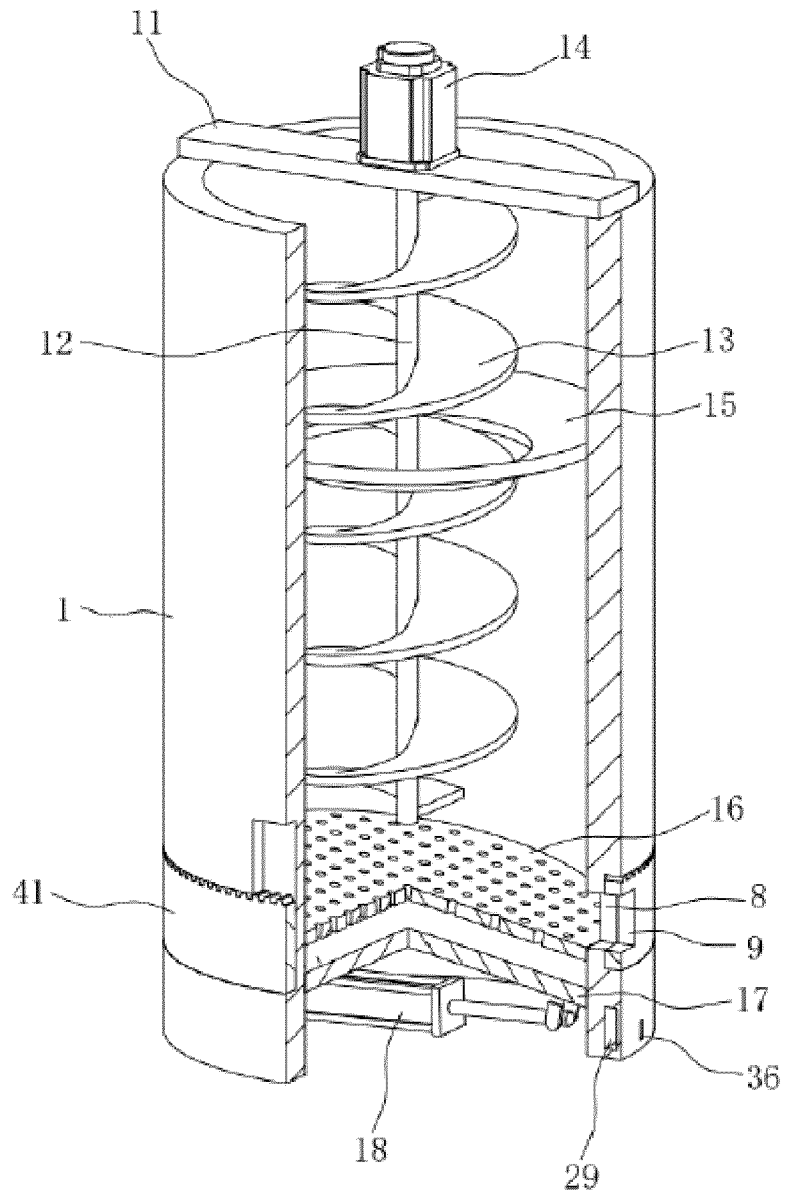


FIG. 3

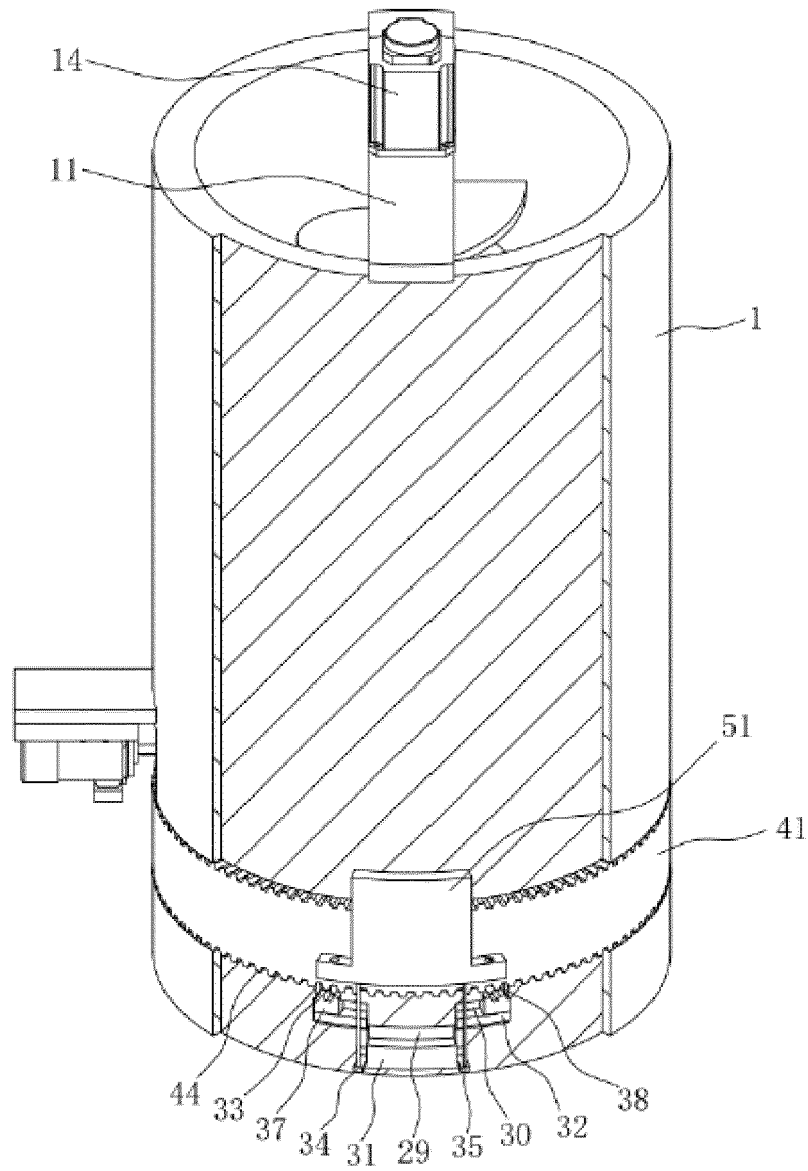


FIG. 4

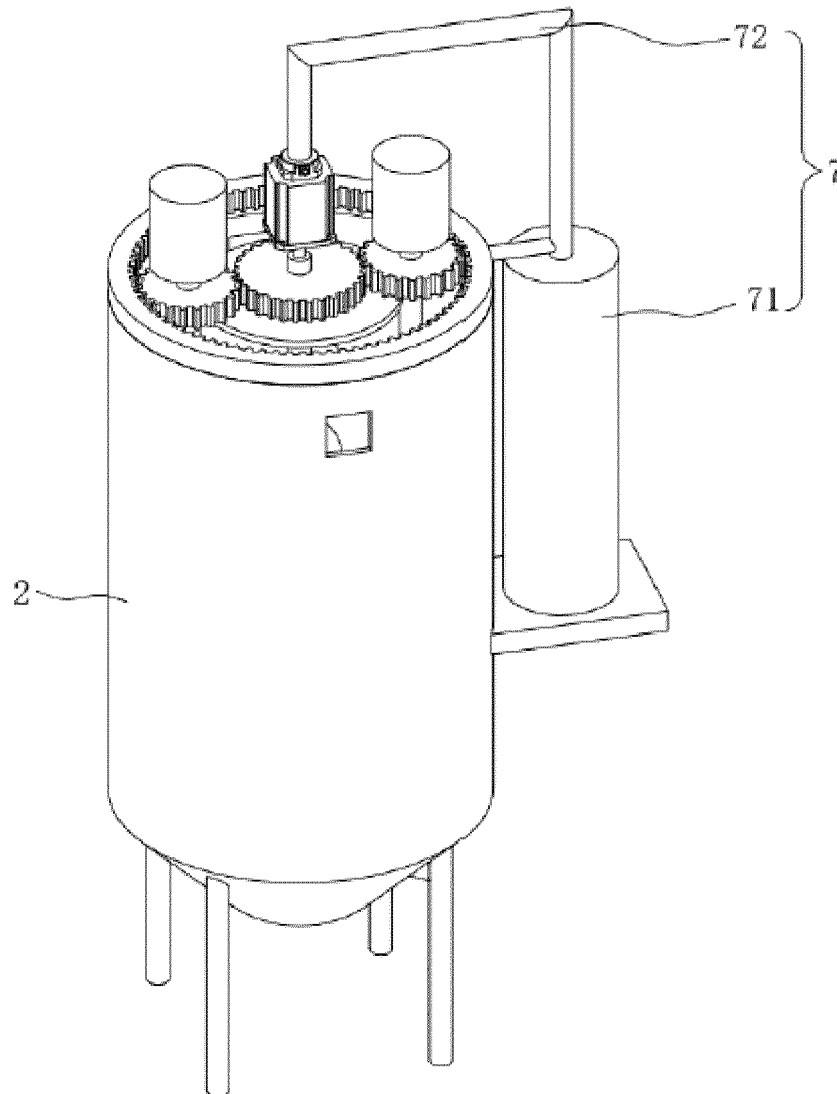


FIG. 5

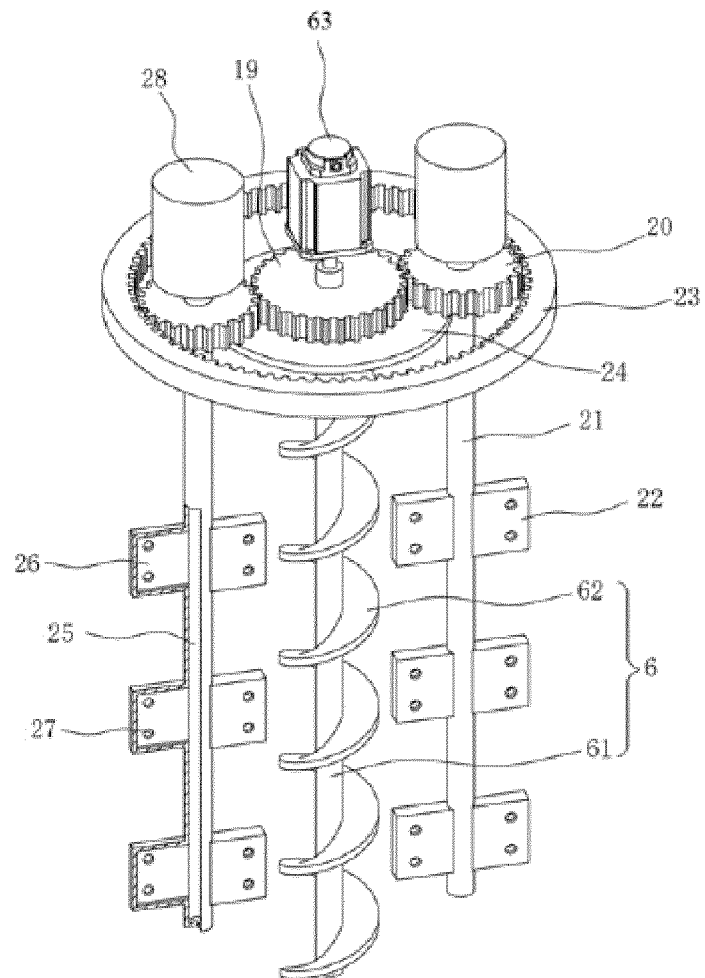


FIG. 6



EUROPEAN SEARCH REPORT

Application Number

EP 24 15 0517

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			E21C E02D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 May 2024	Examiner Morrish, Susan
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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The members are as contained in the European Patent Office EDP file on
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17-05-2024

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