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(54) **POWERED SHINGLE REMOVER**

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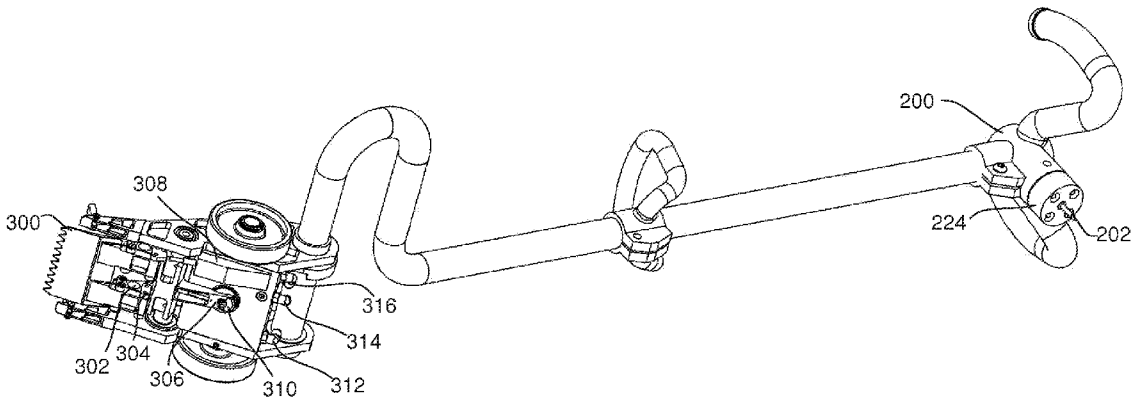
(57) **ABSTRACT**

A device used to remove surface covering materials such as shingles. The device is comprised of an end handle having a plurality of switches and an anchoring mechanism, a handle shaft with a straight and curved portion, a secondary handle, and a base assembly. The anchoring mechanism can be used to secure the device to its work surface. The base assembly provides the mechanisms to automate the removal of shingles or other surface covering materials fastened using fasteners such as nails. The base assembly includes a blade assembly, a rotary support, a lever, a piston assembly, and a switch valve. The switch valve controls the routing of the fluid supply connected to the device. The device is powered by a supply of air or other fluid from a source such as a compressor.



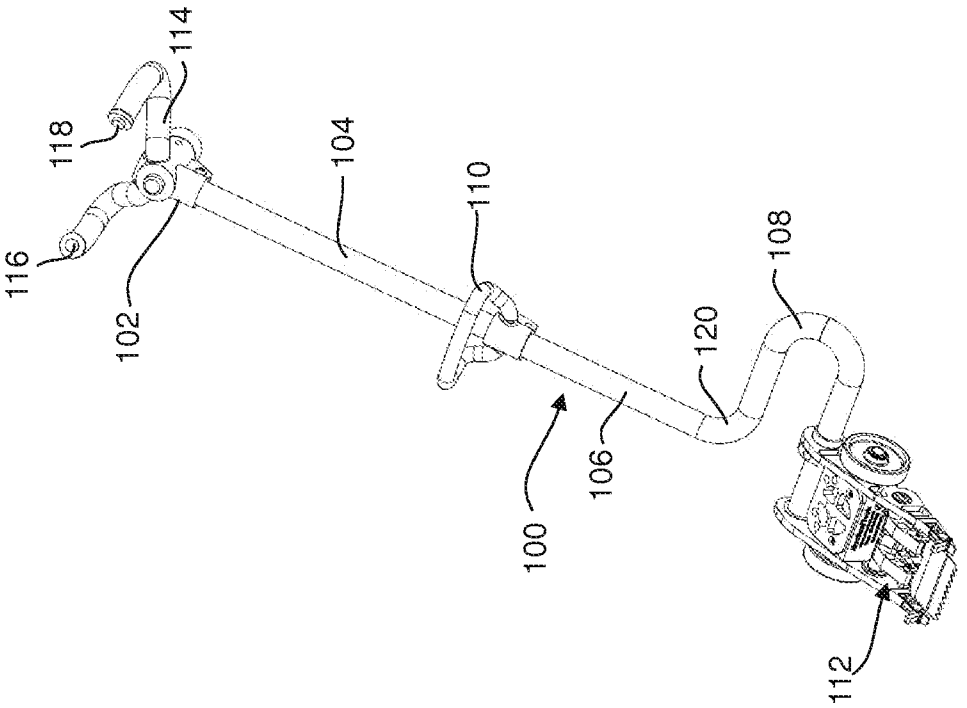


FIG. 1

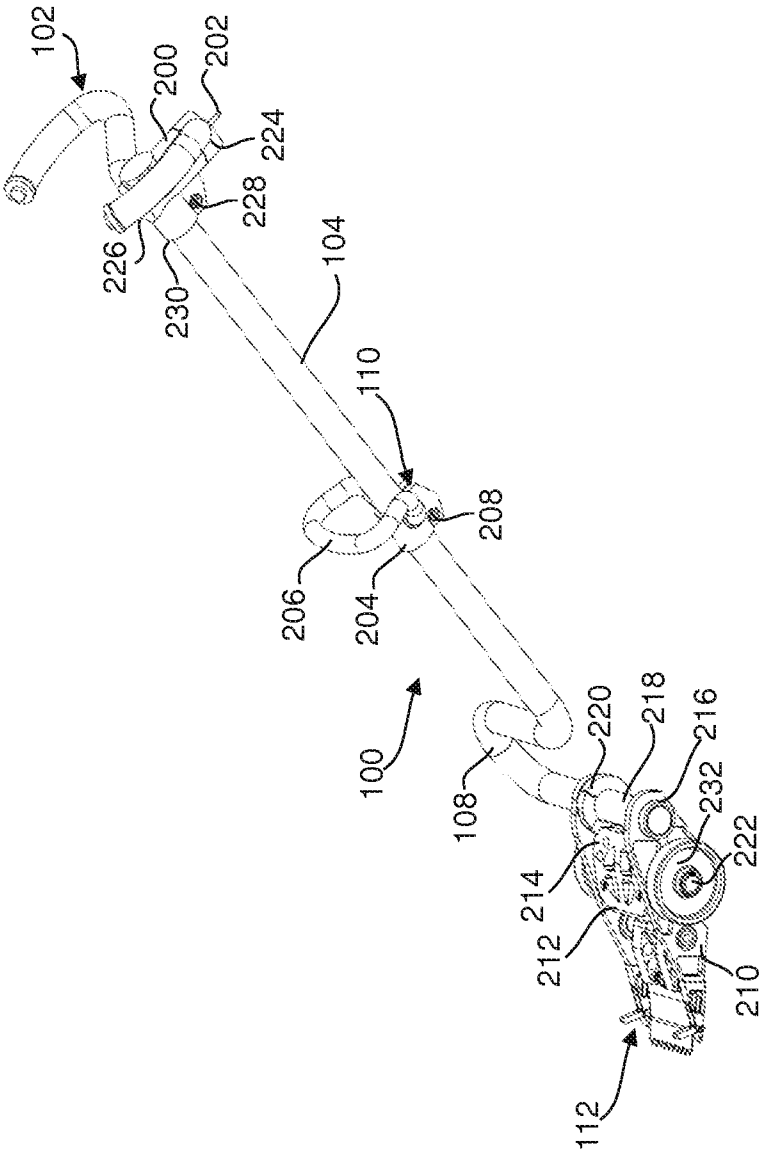

102
200
202
224
228
226
230
104
110
208
206
204
100
108
220
218
216
232
222
214
212
210
112

FIG. 2

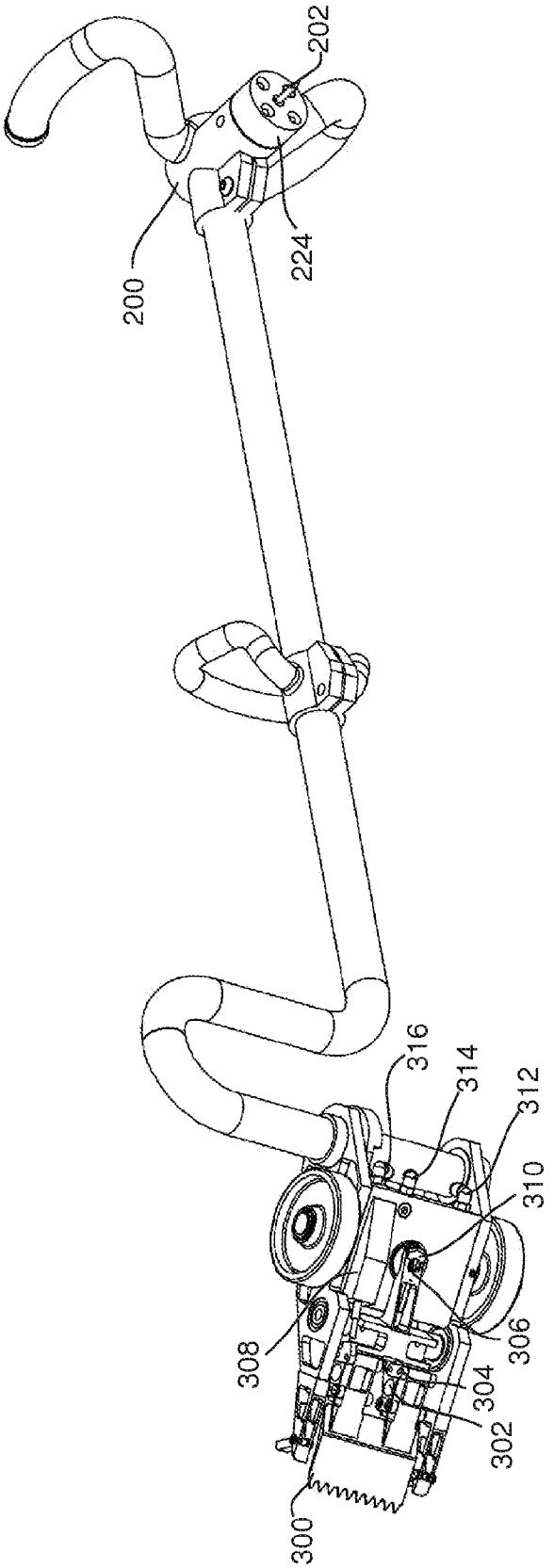


FIG. 3

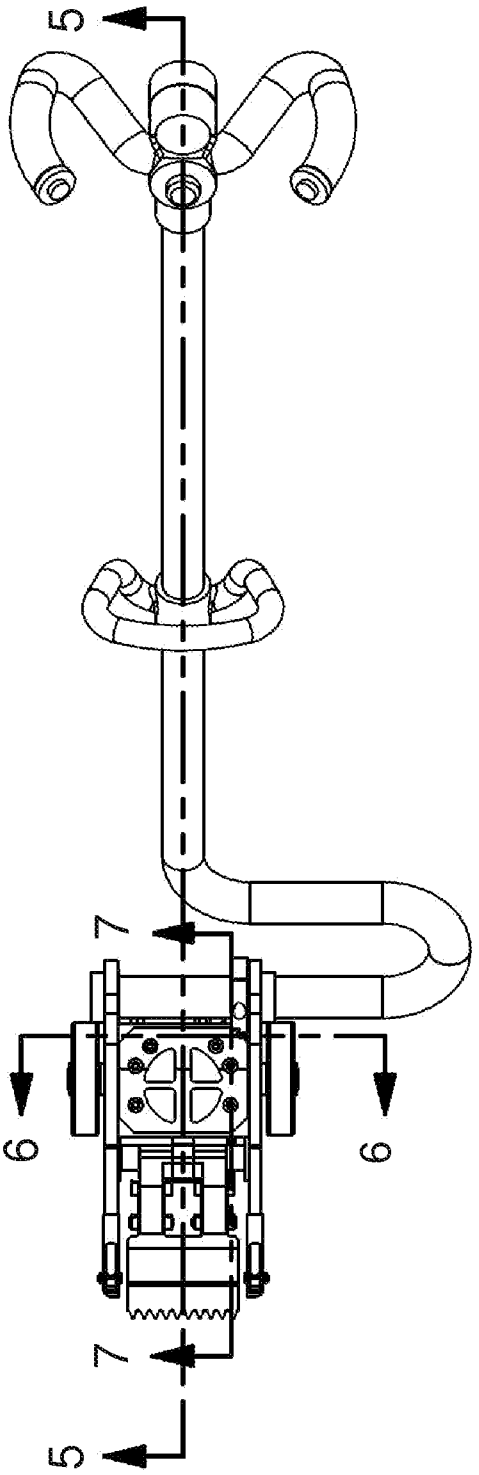


FIG. 4

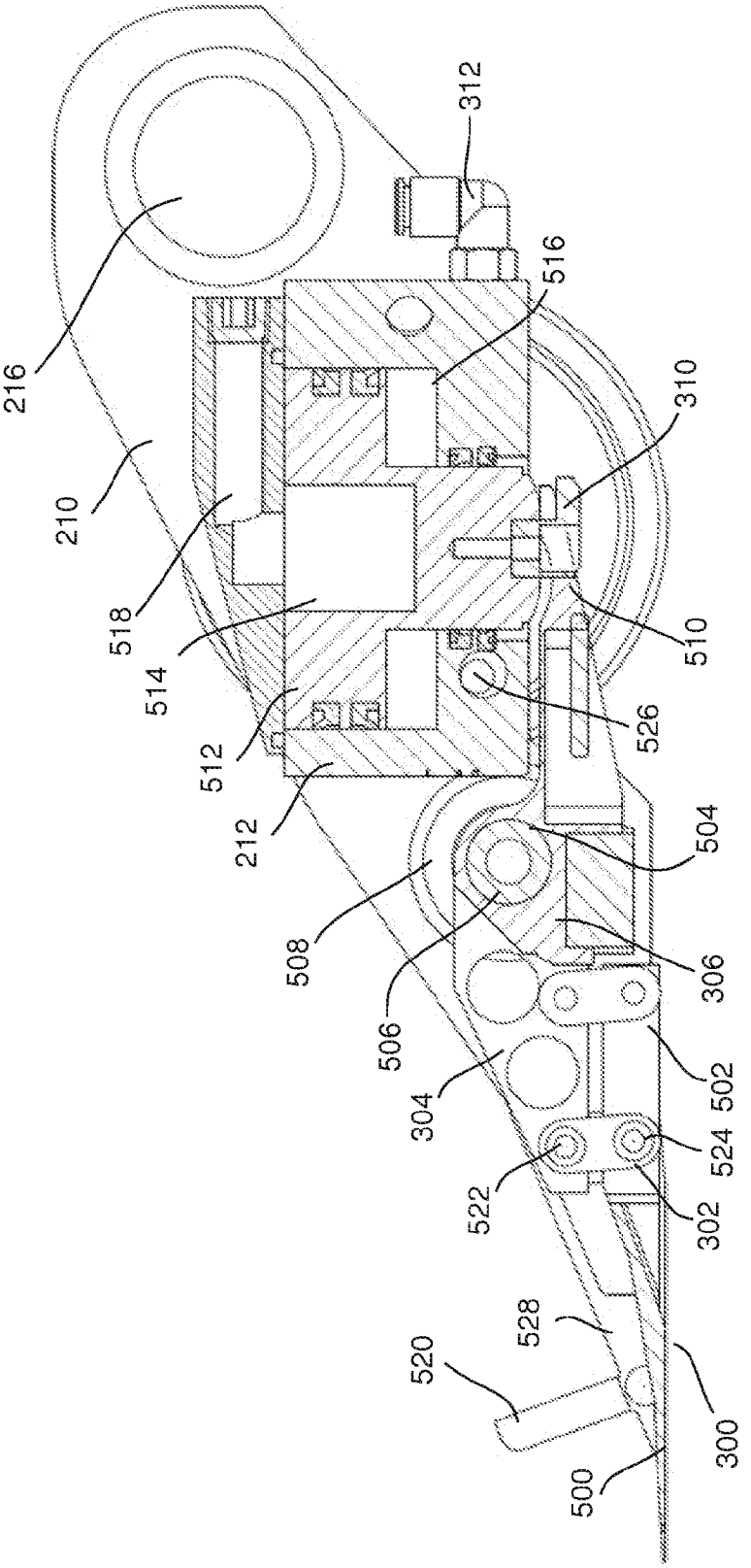

312
516
216
310
210
518
514
510
526
512
212
504
508
306
506
502
304
524
522
302
528
520
300
500

FIG. 5

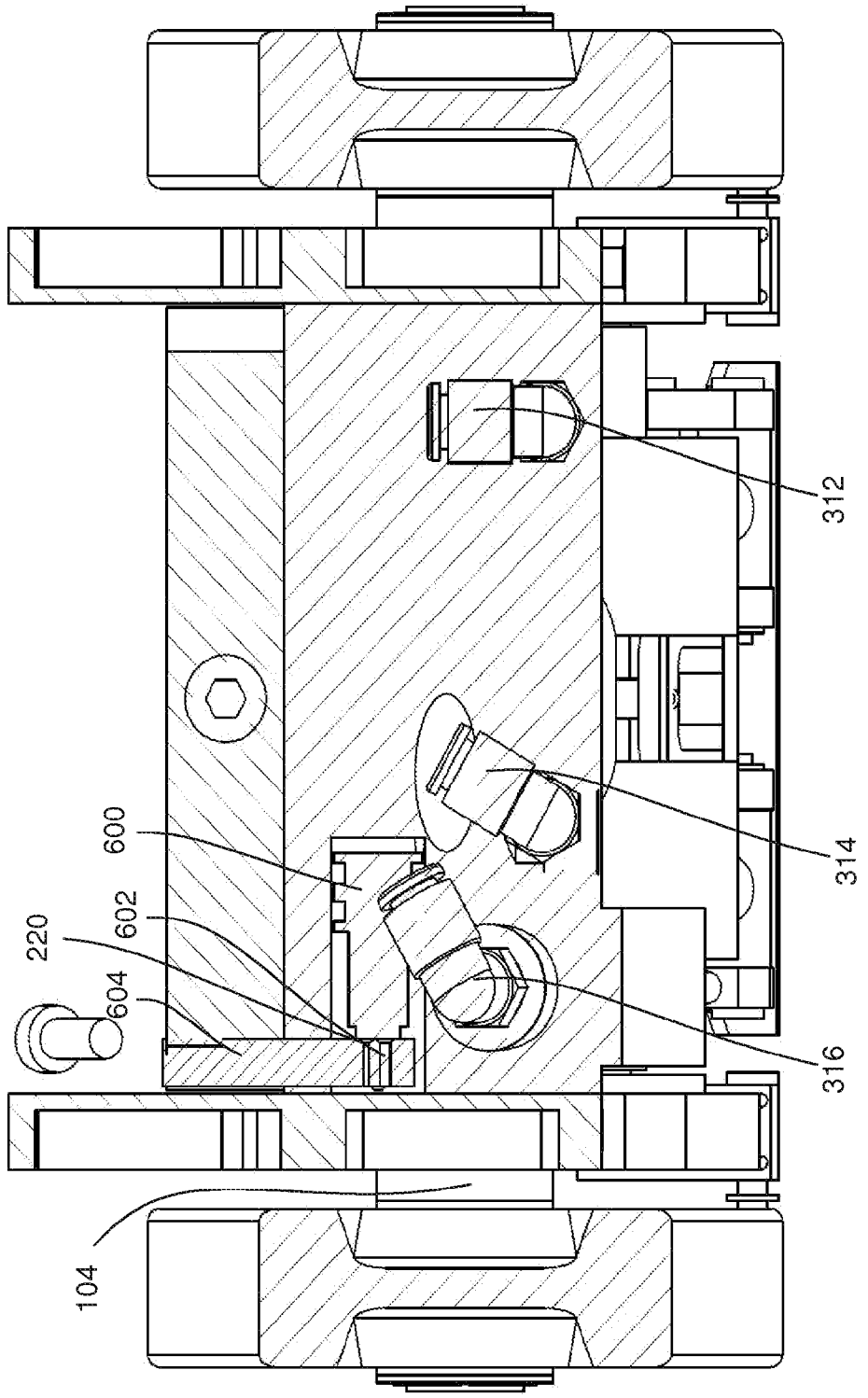


FIG. 6

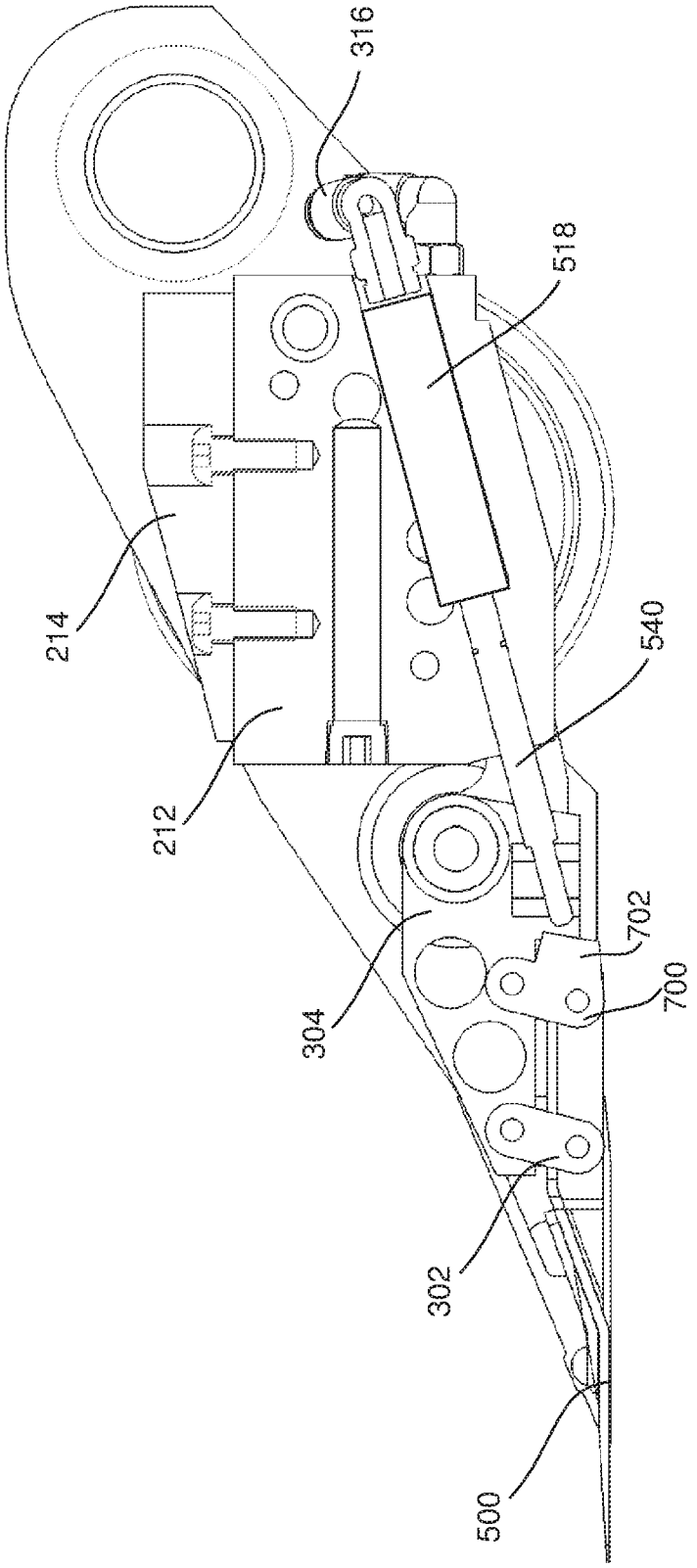


FIG. 7A

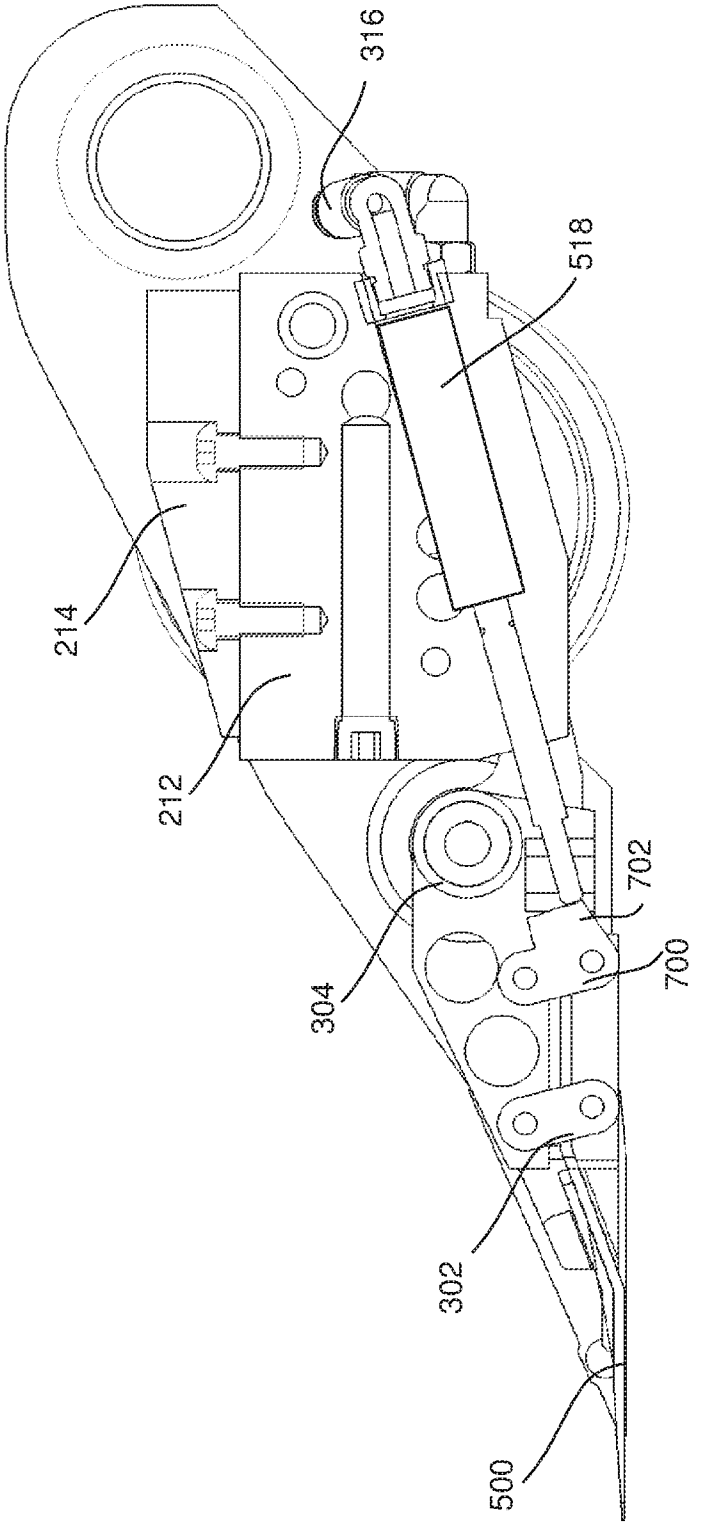


FIG. 7B

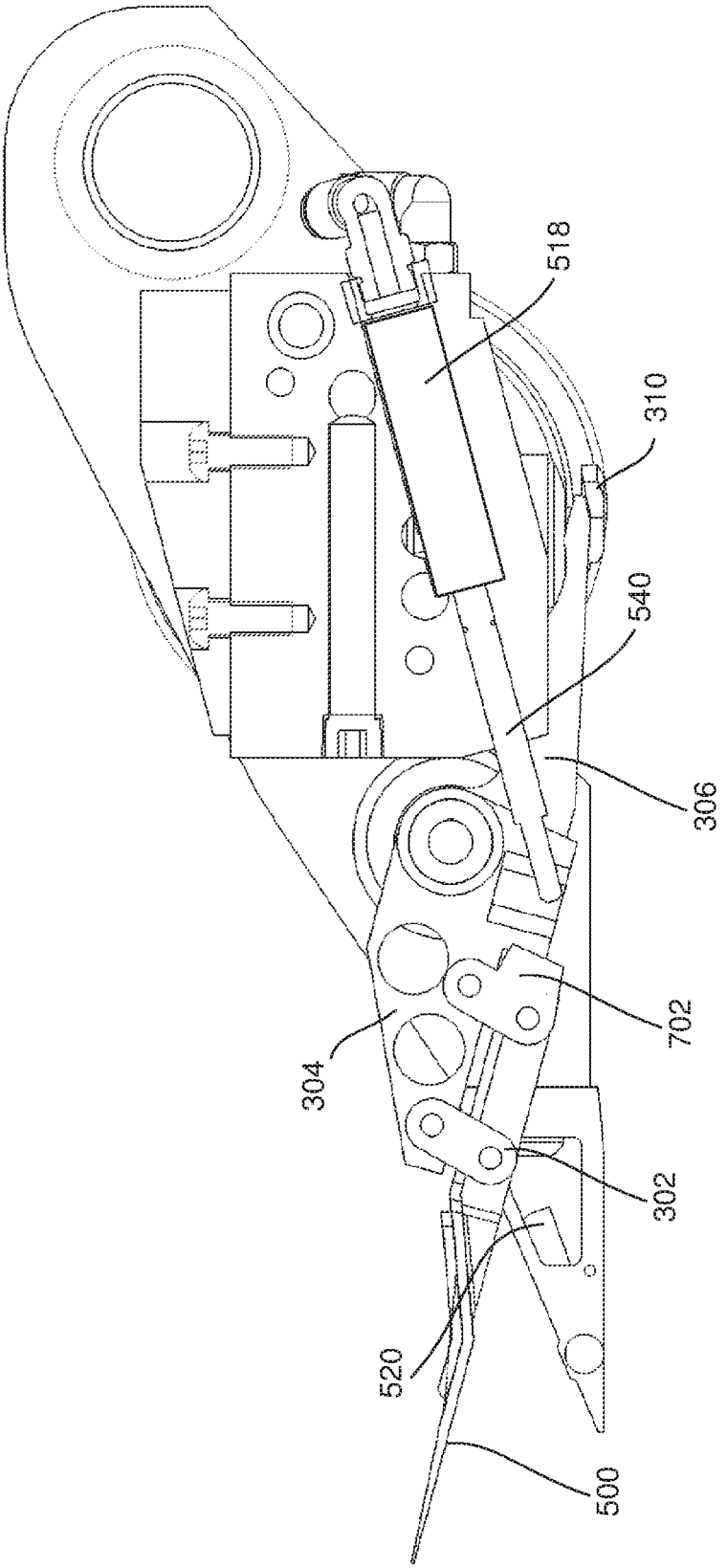


FIG. 7C

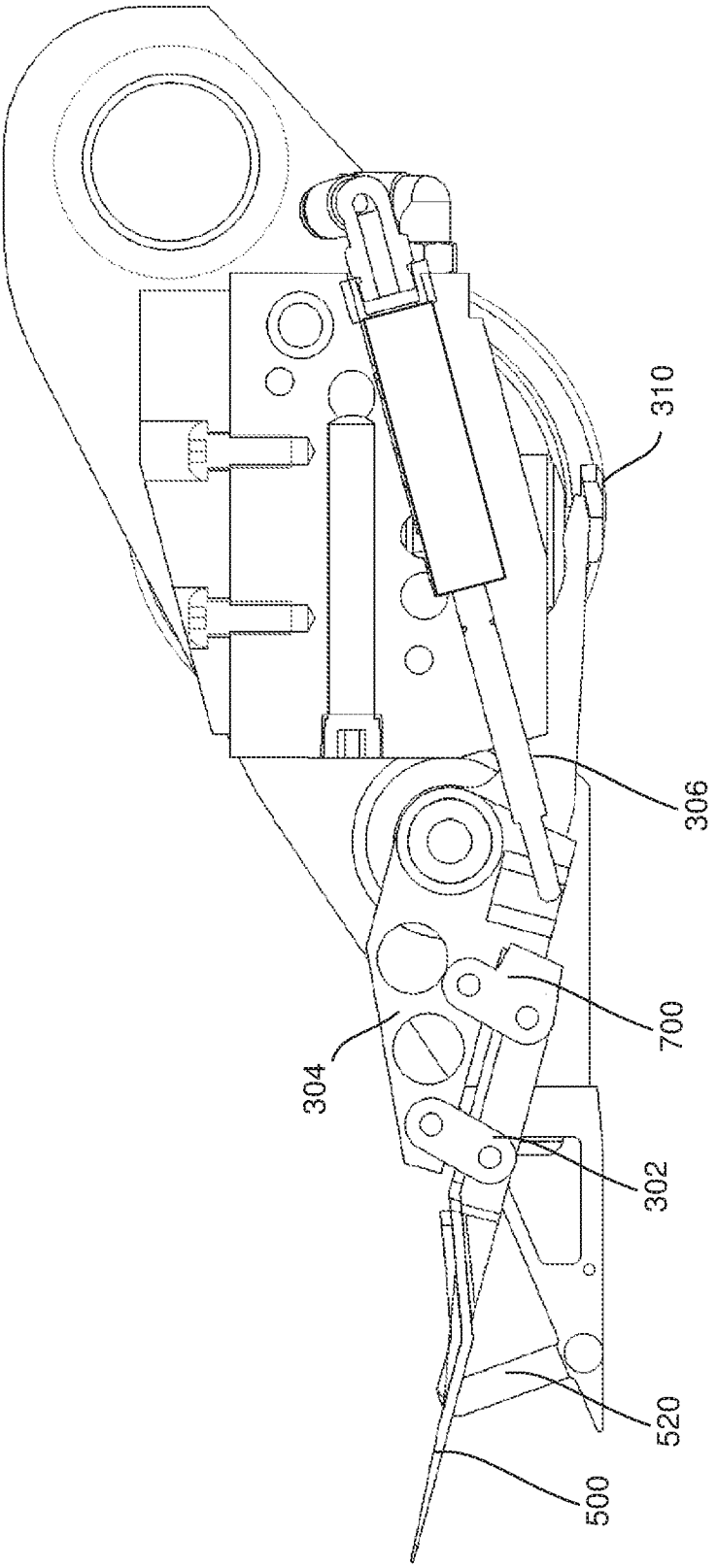


FIG. 7D

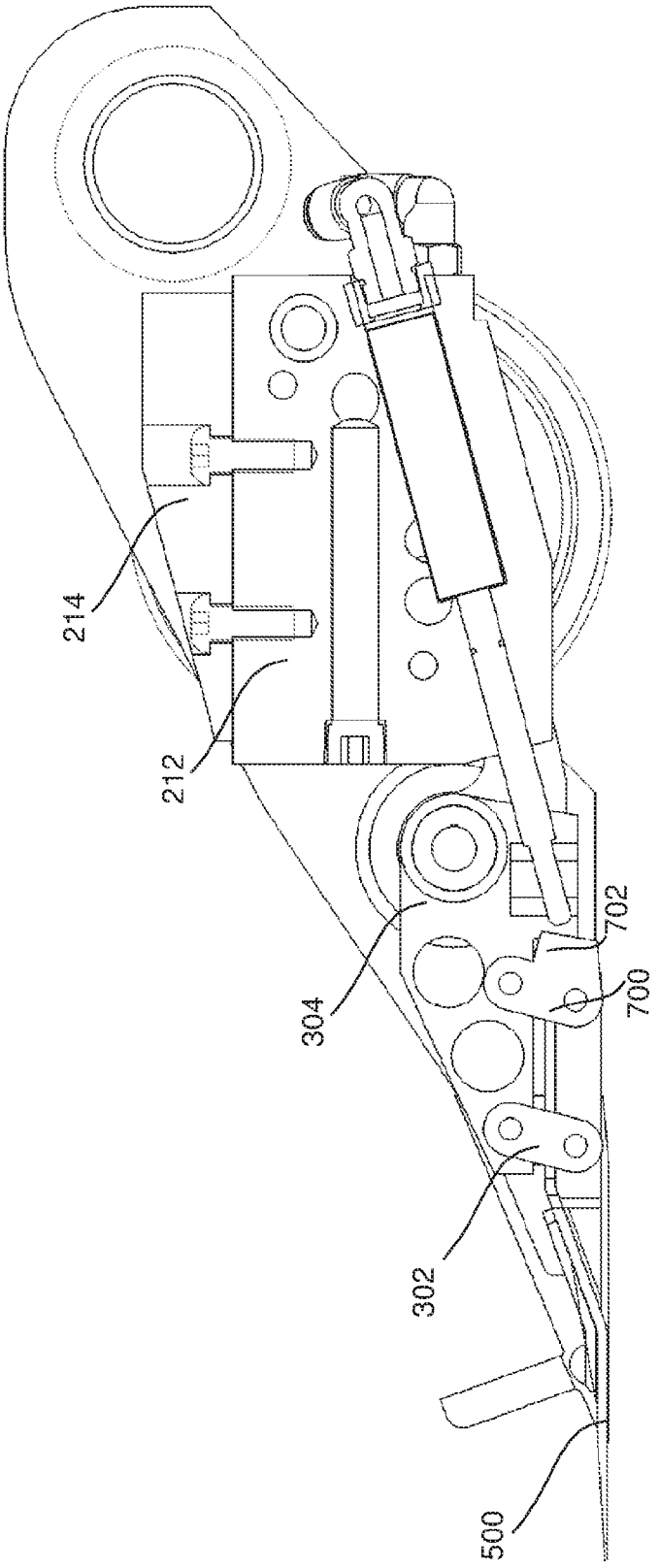


FIG. 7E

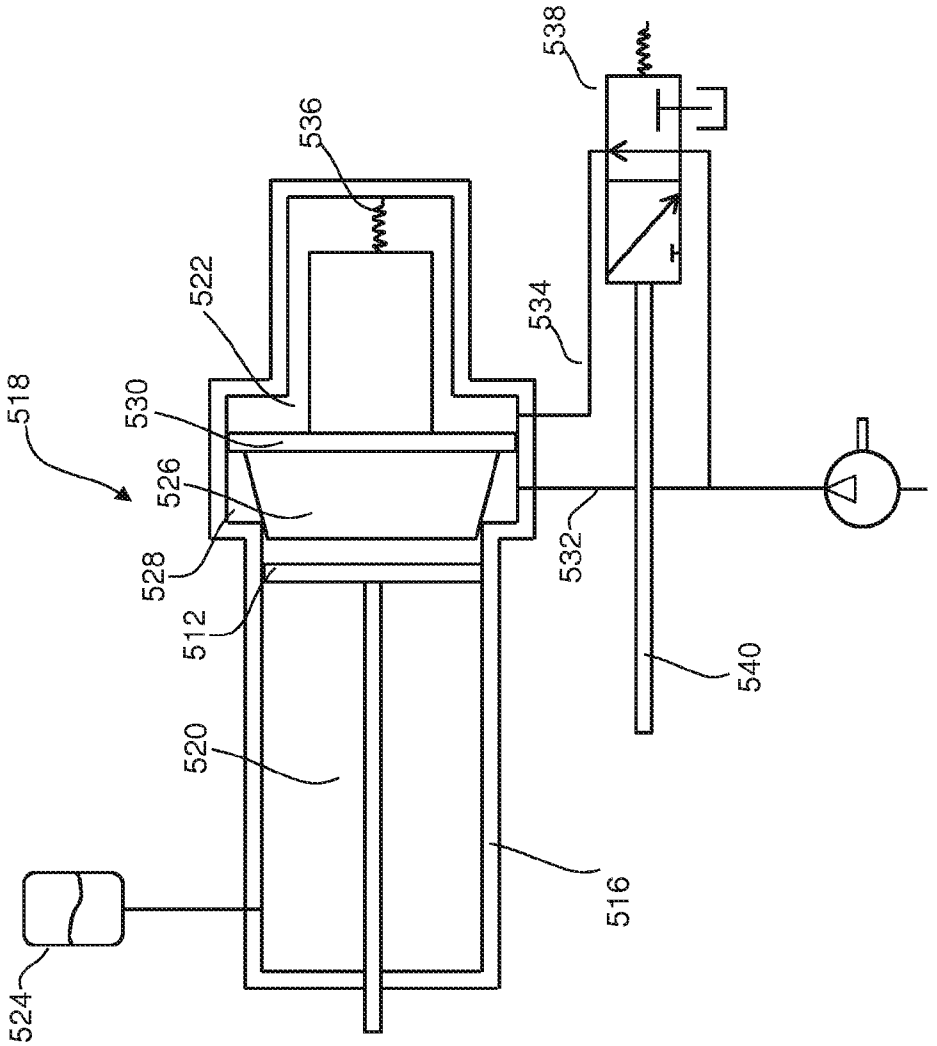


FIG. 8

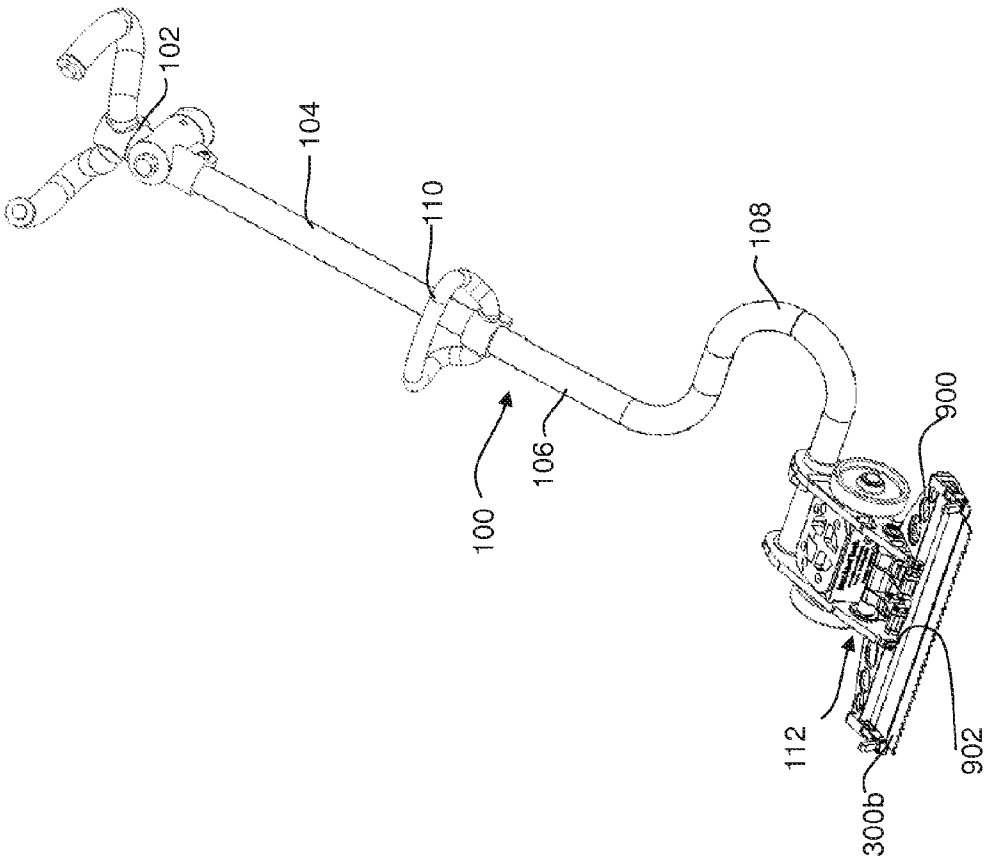


FIG. 9

POWERED SHINGLE REMOVER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application No. 62/079,904 filed on Nov. 14, 2014, entitled "Powered Shingle Remover" and the entire contents of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a tool for use in removing surface covering materials, such as roof shingles.

DESCRIPTION OF THE PRIOR ART

[0003] Outdoor surfaces are exposed to weather conditions that vary around different times of the year. In many instances, these surfaces need to be covered to provide protection against the environment.

[0004] One outdoor surface in particular need of protection is a roof. Roofs are used to protect the interior of a house and other structures from the external environment, and are subject to severe weather conditions. A roof typically has an external water repellent surface covering made from a material that provides a reasonable service life at a reasonable cost. One such covering in widespread use is a bitumen based shingle that can be applied to the roof structure in a simple and efficient manner.

[0005] Shingles are formed from strips of material that are arranged in rows across a roof. The shingles are secured by nails to the underlying structure and subsequent rows are arranged to overlap the nails of the previous, lower, row. Shingles can be made from materials such as wood, plastic, composites, metal, fiber reinforced cement, or other materials with the required surface protecting qualities.

[0006] However, these surface coverings have a limited lifespan, depending on the material used, and need to be replaced on a regular basis. This requires the shingle and the nail to be removed so a new layer of shingles may be secured to a clean, flat surface.

[0007] Traditionally, shovels and forks have been used to remove a shingle by inserting a blade or tine beneath the lower edge of the shingle. The shingle may then be levered vertically away from the substrate to which it is secured to release the shingle. The leverage from the shovel or fork also ideally extracts the nails securing the shingles on the surface and thereby leaves the surface ready for the new shingle.

[0008] However, such methods are cumbersome and require a great deal of energy to be expended. Moreover, the shingle itself may tear around the nail, particularly when the shingle has deteriorated with age, leaving the nail in the substrate. Further work is then needed to remove the remaining nails and debris.

[0009] In order to reduce the manual labour involved, a number of powered shingle removal tools have been developed. Exemplary patents include U.S. Pat. No. 4,691,439, which a shovel-like device with a blade having slots to engage the body of a nail. The apparatus uses a piston to provide the motive force for removing the shingles. However, the device requires manual operation by inserting the blade into engagement with the nails and pivoting to remove the shingles. As the device needs to be carried at all times and requires a large amount of force to remove the nails it can be understood that it still requires significant manual labour to remove the shingles.

[0010] U.S. Pat. No. 4,663,995 shows a device for removing material, especially roofing material. It consists of a baseplate assembly connected to a shaft member with a guide handle attached. The baseplate includes a blade with teeth capable of being lifted and a piston drive to lift the blade. Actuation of the blade is performed manually after the blade has been positioned.

[0011] U.S. Pat. No. 6,467,377, and U.S. Pat. No. 6,128,979 similarly show manually operated shingle removal mechanisms using a reciprocating baseplate driven via a piston drive.

[0012] U.S. Pat. No. 5,988,021, U.S. Pat. No. 8,056,444, U.S. Pat. No. 5,863,100, U.S. Pat. No. 7,401,861 U.S. Pat. No. 4,858,503, and application US 2012/0096990 similarly show piston powered shingle removers with a reciprocating blade to remove the shingles and with roller assembly to facilitate movement over the roof. However all of these systems require manual actuation of the shingle removal system. The user must move to one portion of the roof sliding under the shingles, then actuate the removal mechanism, remove the shingles, and then carry on to the next portion of the roof.

[0013] U.S. Pat. No. 7,992,467 shows a shingle removal apparatus with a handle, stripper member, and a drive assembly with a lost motion mechanism. The stripper member moves reciprocally up and down using a crank arm connected to a powered drive assembly. However, in this device the crank mechanism is continuously engaged, thereby consuming significant compressed air, which is used as the source of energy.

[0014] U.S. Pat. No. 7,520,197 shows a roofing material removal device. The device can be pneumatically powered and automatically triggered. The automatic trigger is activated by the user pushing the device forward causing a drive member to push back and come into contact with a plunger. Once activated, a rigid member on the same drive receives an impact from an activated piston. Once the piston impacts this member it pushes forward, and a pulley assembly causes the front blade to lift on a lever raising the roofing material. The mechanism for lifting the blade is very complex and because of the orientation of the blade and drive mechanism for the blade, creates recoil when in use. Not only is this tiring, but the recoil poses a potential safety hazard when used on a roof.

[0015] It is therefore an object of the present invention to provide a shingle removing device that obviates or mitigates the above disadvantages.

SUMMARY OF THE INVENTION

[0016] Accordingly, the present invention provides a device for the removal of surface covering materials. The device includes a head having a blade for insertion between the covering material and a substrate. The head is supported for movement across the substrate and the blade is moveable away from the substrate to lift the covering material from the substrate. The blade is moved by an actuator acting in a direction generally normal to the substrate. Operation of the actuator is controlled by a sensor moving with the blade between the covering and substrate and responsive to the force opposing such movement to actuate the actuator.

[0017] Preferably, the sensor is carried by the blade and projects in advance of the head to determine the opposition to continued movement of the blade.

[0018] As a further preference, the sensor is moveable relative to the blade and relative movement between the blade and sensor causes said actuator to lift said blade away from said substrate.

[0019] In a preferred embodiment, the head is supported on wheels and a handle assembly extends from the head to permit manipulation of the head on the substrate.

[0020] Preferably, the blade is pivotably mounted on the head and the actuator cause pivotal movement of the blade relative to the head.

[0021] By positioning the actuator to act in a direction generally normal to the substrate, the forces applied to the covering are reacted by the substrate and do not require the lifting forces to be reacted the operator. The sensor is not subjected to the lifting forces, thereby allowing the sensor to react to the resistance to continued motion and providing a lifting force only when required.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Embodiments of the invention will now be described by way of example only with reference to the accompanying drawings in which

[0023] FIG. **1** is a perspective view of a shingle removal device;

[0024] FIG. **2** is a side perspective view of the device of FIG. **1**;

[0025] FIG. **3** is a bottom perspective view of the device of FIG. **1**;

[0026] FIG. **4** is a top view of the device of FIG. **1**;

[0027] FIG. **5** is a cross sectional view of the device on the line **5-5** of FIG. **4**;

[0028] FIG. **6** is a cross sectional view of the device on the line **6-6** of FIG. **4**;

[0029] FIG. **7**A is a cross sectional view of the device on the line **7-7** of FIG. **4**, showing alternative configurations of a sensor and valve utilised in the control of the shingle removing device;

[0030] FIG. **7**B is a further cross sectional view of the device on the line **7-7** of FIG. **4**, showing alternative configurations of a sensor and valve utilised in the control of the shingle removing device;

[0031] FIG. **7**C is a further cross sectional view of the device on the line **7-7** of FIG. **4**, showing alternative configurations of a sensor and valve utilised in the control of the shingle removing device;

[0032] FIG. **7**D is a further cross sectional view of the device on the line **7-7** of FIG. **4**, showing alternative configurations of a sensor and valve utilised in the control of the shingle removing device;

[0033] FIG. **7**E is a further cross sectional view of the device on the line **7-7** of FIG. **4**, showing alternative configurations of a sensor and valve utilised in the control of the shingle removing device;

[0034] FIG. **8** is a schematic representation of the pneumatic control system used in the device of FIG. **1**; AND

[0035] FIG. **9** is a view similar to FIG. **1** of an alternative embodiment of a shingle removal device.

[0036] The features of the invention will become more apparent in the following detailed description in which reference is made to the appended drawings

DETAILED DESCRIPTION OF THE INVENTION

[0037] Referring initially to FIGS. **1** and **2**, an exemplary embodiment of a device for removing a surface covering material from a substrate is shown. The device is referred to as a powered shingle remover **100**. The remover **100** comprises a handle assembly **102** connected to a housing referred to as operating head **112**. The handle assembly **102** includes an elongate shaft **104** with a linear, straight, section **106** terminating in a curved section **108**. The linear section **106** of the shaft transitions into the curved section **108** through a plurality of elbows **120** to define a generally "C" shape lying in a transverse plane. Situated on the linear straight section **106** is a stabilising handle **110**, whose position may be adjusted along the linear section **106** to suit the operator using the remover **100**.

[0038] The handle assembly **102** terminates in a yoke **114** for primary control by the operator. A plurality of switches are located on the yoke **114** for access by the operator including a switch **116** for manual override to allow manual operation of the device **100**, and a latch **118** which controls a handle lock mechanism **220** to adjust the angle between the handle assembly **102** and the operating head **112**.

[0039] The handle assembly **102** also includes an anchoring mechanism **200** which has an anchoring nail **202** slideable within a boss **224**. The nail has an exposed nail head **226** and is naturally biased to have its nail head **226** project from the housing **224** by a spring.

[0040] Referring to FIG. **2**, the stabiliser handle **110** is situated on the straight portion **106** of the handle shaft **104** and includes a main body **204** which fits over the handle shaft **104** and is secured using a clamping screw **208**. The main body **204** is attached to a "D" shaped grip **206**, which projects generally orthogonal to the axis of the shaft **104**.

[0041] The head **112** includes a pair of side plates **210** spaced apart laterally to define each respective side face of the head **112**. A central body **212** is positioned between the side plates **210** and covered by a top plate **214**.

[0042] As seen more clearly in FIGS. **2** and **5**, each of the side plates **210** has an aperture **216** near its respective top apex with the centres of the apertures **216** aligned on a transverse axis. The apertures **216** are dimensioned to receive a terminal portion **218** of the curved portion **108** of the shaft **104** and allow for the handle assembly **102** to rotate relative to the head **112**. The handle assembly **102** may be locked relative to the head **112** using a handle lock mechanism **220**, as seen more fully in FIG. **6**. A notched plate **604** is carried by the terminal portion of the curved portion **108** adjacent to one of the side plates **210** and a spring loaded piston **600** biased to engage one of the notches. The piston **600** may be moved by air pressure to release the piston from the notch and allow relative movement of the handle and head.

[0043] The head **112** is supported by a pair of wheels **232**, each of which is connected to a respective one of the side plates **210**. The wheels **232** are rotatably supported on an axles **222** secured to the side plates **210**, to facilitate movement of the head **112**. The side plates **210** project forwardly from the axles **222** and carry spring loaded lift fingers **520** at their forward end that assist in lifting shingles as the head is pushed beneath the shingles. The fingers **520** are located within the side plate **210** and biased to be in the upright position via a spring. Each side plate **210** also has a guide strip **528** at the front of the side plates **210** to act as wear strips for a blade assembly **300**.

[0044] As shown in FIGS. **3** and **5**, the head **112** includes a blade assembly **300** which is rotatably mounted to the side plates **210** by a shaft **501** supported at opposite ends on bearings **508**. The blade assembly **300** has a trunnion **306** which has a pair of forwardly projecting fingers **304**. Each of the fingers **304** supports a blade **500** on parallel links **302** that allow relative fore and aft movement between the fingers **304** and blade **500** but transmit lifting forces from the trunnion **306** to the blade **500**. The links **302** have pins **522**, **524** at opposite ends to permit limited pivotal movement of the links **302**. The blade **500** extends between the side plates **210** and the forward edge of the blade **500** has a series of notches or teeth. The blade **500** is biased to a forward position relative to the trunnion by torsion springs (not shown) acting on the links **502** to provide a resistance to rearward movement.

[0045] The trunnion **306** also has a centrally located rearwardly projecting tail **510** that engages an end of a piston rod **310**. The piston rod **310** is connected to a piston **512** (FIG. **5**) which is slidable in a cylinder **516** formed in the central body **212** and sealed by a top plate **214**. The piston **512** and cylinder **516** are components of a reciprocating pneumatic motor, indicated generally at **518**, the details of which are shown schematically in FIG. **8**.

[0046] The pneumatic motor **518** operates on similar principles to those of a pneumatic nailer used to drive nails in to a substrate at high velocity. The piston **512** subdivides the cylinder **516** in to a pair of chambers **520**, **522**. An accumulator **524** is connected to the closed chamber **520** to store air expelled from the chamber **520** during movement of the piston **512**. Air flow to the chamber **522** is controlled by a pressure balanced check valve **526** having a valve member **530** that is slidable in an extension **528** of the cylinder **516**. Air pressure from a source, typically a compressor, is fed to both sides of the valve member **530** through conduits **532**, **534**. A spring **536** biases the valve member **530** in to a closed position in which flow to the chamber **522** is prohibited.

[0047] A two position control valve **538** regulates flow through the conduit **534** and is biased to a first position in which flow from the source to the valve member is permitted. The control valve **538** is moveable to a second position against the bias so that air in the conduit **534** is vented to atmosphere. Movement of the valve from the first to the second position is controlled by rod **540** that projects toward the blade **500**.

[0048] The rod **540** is aligned laterally with a rearward one of the links **302** which has a boss **702** facing the rod **540**.

[0049] In operation, the configuration of the remover is first adjusted to suit the particular operator. Referring to FIGS. **1**, **2**, and **6** when the angle between the handle shaft **104** and base assembly **112** is desired to be adjusted, the brake switch **118** can be activated. Activation of the switch causes deactivation of the air supplied to the piston **600** from the lock fitting **314**. This disengages the lock **602** from a hole on the disc **604**. This disengagement allows the terminal portion **218** of the handle shaft **104** to rotate. When the desired angle between the handle shaft **104** and base assembly **112** is reached, the brake switch **118** can be released. Releasing the switch **118** reactivates the air supplied to the piston **600** and causes engagement between the lock **602** and the desired hole on the disc **604**.

[0050] The shingle remover **100** is then positioned on the roof so the blade **500** can pass beneath one of the shingles. The second handle **110** can be gripped at the gripper **206** and easily lifted. The second handle **110** allows for a means to lift the device **100** from closer to its centre of mass making it easier to transport. The location of the second handle **110** on the straight section **106** of the handle shaft **104** can be adjusted by loosening the fastener **208** using a suitable tool. When the fastener **208** is loosened it allows for the main body **204** to slide on the straight section **106** of the handle shaft **104**. When the main body **206** is at the desired location the faster **208** can again be fastened, fastening the main body **204** at the desired location on the straight portion **106** of the handle shaft **104**.

[0051] With the remover positioned on the roof and connected to a supply of compressed air, the operator manoeuvres the remover **100** by rolling it along the roof on the wheels **232**. The blade **500** is introduced between the substrate and the shingle and pushed forwardly to lift the shingle from the roof. The upper edge of side plates **210** and the fingers **520** lift the shingle to allow the body to be advanced.

[0052] Initially the remover is conditioned as shown in FIGS. **5** and **7***a* with the blade **500** biased forwardly and the piston **512** fully retracted in the cylinder **516**. In this position, the control valve **538** is in its first position so that air is supplied to opposite sides of valve member **530**. The bias of the spring **536** maintains the valve member **536** in a seated position and prevents air from entering the chamber **522**. As the device is pushed forward, the blade **500** is subjected to increased resistance, typically by engagement with a nail, and is forced rearwardly relative to the sideplates **210** against the bias of the spring. The links **302** permit the rearward movement and bring the boss **702** into engagement with the rod **540** and displace the rod, as seen in FIG. **7***b*. The rod **540** acts as a sensor to detect the rearward movement of the blade **500** and operates on the control valve **538** to move it to the second position and vent one side of the valve member **536** to atmosphere. The valve member **536** is unbalanced as air pressure acts on one side only and is moved off its seat to supply pressure to the chamber **522** to act on the piston **512**. Air in the chamber **520** is expelled in to the accumulator **524** to allow movement of the piston **512** in the cylinder **516**.

[0053] The piston **512** moves downwardly in the cylinder **516** and acts on the tail **510** of the trunnion to cause it to rotate on the shaft **501**. As the trunnion rotates, it lifts the blade **500** through the links **302** and lifts the nail from the substrate as seen in FIG. **7***c*. The vertical forces are of course taken by the wheels **232** acting on the substrate. The elongate side plates **210** stabilise the head **112** as the lifting force is applied to enhance the lifting forces applied.

[0054] It will be noted that the boss **702** is moved away from the rod **540** as the blade is lifted, allowing the control valve **538** to return to its initial first position. The vent line is closed and the pressure on the valve member **536** balanced so that the valve member is again seated. Air stored in the accumulator **524** returns the piston **512** to its retracted position and allows the trunnion to return. The load is removed from the blade **500** in part through the operation of the fingers **520**, which hold the removed shingle away from the substrate. With the load taken on the fingers **520**, the nail is held above the substrate and the blade can move forward under the bias of the springs, as seen in FIG. **7***d*. Once the blade is returned the device enters the configuration shown in FIG. **7***e*, it can again be advanced to remove additional nails and strip the shingles from the roof.

[0055] As seen in FIGS. **1**, **2**, and **3**, the curved portion of the handle allows for no obstruction for the shingles as they move atop the base assembly **112**. Due to the handle shaft **104**

being attached from the side, the shingles can slide above the base assembly **112** and land behind it, leaving the shingles behind as the device **100** continues operating on its set path. This in turn allows for a more systematic method for future cleaning and collection of the shingles.

[0056] If the operator wishes to manually operate and cause the lifting of the blade mechanism, the manual override switch **116** can be used. When the manual override switch **116** is activated it acts on the rod **540** to move the control valve **538** to the second position and cause the piston **512** to move down vertically and perform the shingle removal operation previously described.

[0057] Referring to FIGS. **2** and **3**, when it is desired to secure the device **100** on a surface such as a roof, the anchoring mechanism **200** on the end handle assembly **102** can be utilized. First, the angle between the handle shaft **104** and the base assembly **112** can be adjusted such that the anchoring nail **202** is perpendicular or nearly perpendicular to the surface. The user then strikes the nail head **226** with a tool such as a hammer, causing the anchoring nail **202** to slide within the housing **224** and be driven into the surface. The anchoring nail **202** can then pulled upon using a tool such as hammer to disengage from the surface. When secured on the surface the anchoring nail **202** inhibits any movement of the device **100**. This is particularly advantageous when the device **100** is being used on a sloped surface, such as a roof.

[0058] It can be appreciated that though the specification provided details the use of the device **100** to remove shingles on roofs, it can be utilized on any other surface to remove a surface covering material, such as floor tiles, in the same method of a powered material remover.

[0059] The head **112** can be configured to carry different widths of blade **500** as shown in FIG. **9**. As can be seen in FIG. **9**, the blade **500** is wider than the spacing between the side plates **210**. Outriggers **900** and supported on the side plates **210** and support the lateral ends of the blade **500**. Fingers **520** are located on the outriggers **900** and have a bar **902** extending between them to provide support across the width of the blade for the removed shingle.

1. A device for the removal of surface covering material from a substrate, the device comprising:

a. a housing supported for movement across the substrate;

b. a blade attached to the housing, the blade insertable between the covering material and the substrate;

c. a sensor responsive to a force opposing movement of the blade between the surface covering material and the substrate;

d. an actuator coupled to the blade to move the blade away from the substrate to lift the covering material from the substrate; and

said actuator being controlled by said sensor upon attainment of a predetermined force opposing the movement of the blade.

2. The device of claim **1** wherein upon attainment of the predetermined force the sensor triggers the actuator to move the blade through the extent of its travel to an end position wherein the blade is remote from the substrate and subsequently returns the blade to an initial position wherein the blade is positioned proximal to the substrate.

3. The device of claim **1** wherein the blade is movable relative to the head.

4. The device of claim **3** wherein the sensor detects the movement of the blade relative to the head.

5. The device of claim **4** wherein the blade is pivotally attached to the housing.

6. The device of claim **5** wherein the actuator causes pivotal movement of the blade relative to the housing.

7. The device of claim **6** wherein the blade engages the sensor as the blade moves relative to the head.

8. The device of claim **7** wherein pivoting of the blade releases the sensor to return to a position sensing no force opposing movement of the blade.

9. The device of claim **8** wherein the actuator housed in the housing and is pneumatically powered.

10. The device of claim **8** wherein the housing comprises at least one finger situated proximal to the blade, and each of the at least one finger is biased to project generally perpendicular to the housing to support the surface covering material.

11. The device of claim **10** wherein the device further comprises an actuating switch coupled to the actuator to manually actuate the actuator.

12. The device of claim **11** wherein the housing is supported on wheels and a handle is attached to the housing to permit manipulation of the housing on the substrate.

13. The device of claim **12** wherein the handle includes a curved section curved in the transverse plane and proximal to the housing, and a straight section distal to the housing.

14. The device of claim **13** wherein the curved section is shaped to permit passage of the surface covering material through the curved section.

15. The device of claim **14** wherein the housing includes a pivot assembly to pivotally attach the handle to the housing.

16. The device of claim **15** wherein the pivot assembly includes a lock assembly, the lock assembly operable between a locked position, in which relative movement between the housing and handle is inhibited, and a released position in which relative movement between the housing and the handle is permitted.

17. The device of claim **16** wherein a release switch is coupled to the lock assembly to operate the lock assembly between said locked and released positions.

18. The device of claim **17** wherein the device further comprises at least one anchor assembly mounted on the handle, the anchor assembly including a fastener operable to secure the device on the substrate.

19. The device of claim **18** wherein a stabilising handle is situated on the straight section of the handle, the stabilising handle projecting generally perpendicular to the handle and away from the substrate, the stabilising handle being adjustable in its position along the handle.

20. The device of claim **19** wherein the release switch, the actuating switch and the anchor assembly are integrated into a yoke attached to the handle at an end opposite to the housing.

21. A device for the removal of surface covering material from a substrate, the device comprising:

a. a housing supported for movement across the substrate;

b. a blade attached to the housing, the blade insertable between the covering material and the substrate;

c. at least one finger situated on the housing proximal to the blade, each of the at least one finger biased to extend generally perpendicular to the housing to support the surface covering material; and

d. a handle pivotally connected to the housing at the end opposite to the blade.

22. The device of claim **21** wherein the housing is supported on wheels and attached to a handle having a curved

section curved in the transverse plane and proximal to the housing, and a straight section distal to the housing, the curve section shaped to permit passage of the surface removing material through the handle.

23. A device for the removal of surface covering material from a substrate, the device comprising:

a. a housing supported for movement across the substrate;

b. a blade attached to the housing, the blade insertable between the covering material and the substrate;

c. an actuator coupled to the blade to move the blade away from the substrate to lift the covering material from the substrate;

d. a handle pivotally connected to the housing by a pivot assembly at one end to permit pivotal movement of the handle relative to the blade; and

e. at least one anchor assembly mounted on the handle, the anchor assembly including a fastener operable to secure the device on the substrate.

24. The device of claim **23** wherein a sensor a sensor responsive to a force opposing movement of the blade between the surface covering material and the substrate, and the sensor actuates the actuator in response to the force.

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