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(54) **ELECTRIC RIVET NUT GUN**

(57) An electric rivet nut gun includes a cover, a trigger, a circuit board, a power motor assembly, a pull-riveting system, a leadscrew drive system, a clutch control system, and a planetary gear deceleration system. The cover is provided with the circuit boards, the trigger, the stroke mounting plate, and the stroke adjusting plate. The circuit board is connected to the motor and stroke control plate by control lines. Both ends of the stroke control plate are provided with inductors. The stroke mounting plate and the stroke adjusting plate are controlled by stroke adjusting nut assembly. The roller positioning block is provided with magnet, and the inductors are located under the magnet. The center lines of the power motor assembly, the planetary gear deceleration system, the leadscrew drive system, and the pull-riveting system are on the same axis as the direction of riveting. The electric gun fully uses the space of tool and can pull rivet nuts with different sizes, and has a good adaptability.

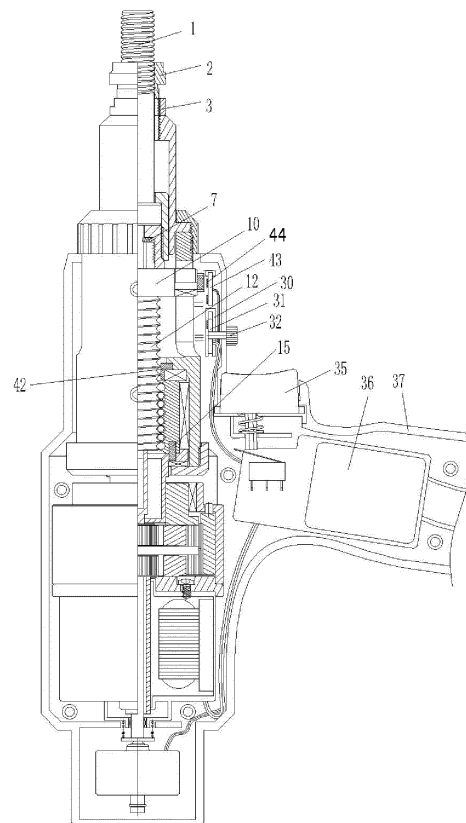


Fig. 1

## Description

### Technical Field

**[0001]** The present invention belongs to the field of mechanical technology, in particular, to an electric rivet nut gun.

### Background

**[0002]** The rivet nut tool is specially offered as the installation tool for riveting nuts, which includes pneumatic rivet nut gun and electric rivet nut gun. The pneumatic rivet nut tool has the advantages of speed and large tension. However, there is a big motor crash risk where the rotating blades of pneumatic motor for screwing in and out the rivet nuts are suddenly stuck and out of work when the rotating blades are frequently used or work in the environment with even slight dust. Moreover, the limitation of the volume of pneumatic motor leads to a small torsion. Although the riveting tension can be large, there is a drawback that the volume is also increased. Furthermore, the pneumatic motor cannot be used outdoor without pneumatic source. At present, there are two riveting methods for the electric rivet nut gun. One method completely relies on the rotary riveting, which can damage the rivet nuts easily. The other one is the method conventionally used by vertically pull-riveting after the rivet nut is screwed to the designated position. The electric mechanism does not crash when the rivet nuts are screwed in or out, such that the method is widely used. However, since the electric rivet nut gun has the following restriction, great inconvenience is caused to the operator, i.e. the electric rivet nut gun uses pure mechanical device to control the clutch with limitations, and the reliability of riveting is guaranteed by adjusting multiple components with thread-structure at same time without a reference for the measurement of adjusting.

**[0003]** As the rivet nut tools are more and more widely used, in order to improve the efficiency and quality of riveting nuts, a United States patent which has the publication/issuance No. US056050704 is retrieved. Though the rivet nut tool is improved, some drawbacks are still there. The main drawbacks are illustrated in detail as below.

1. Since the clutch stroke of machine is uncontrollable, the requirement of clutch can be achieved only when a certain location is reached. The idle stroke is long. The time and power are wasted, and the productivity is low.

2. The rotational force is ensured by the torsion of mechanical torsion spring, thus the rotationally tightening force for screwing in and out the rivet nut is small. When there is an abnormal situation, in which the rivet nut is hard to screw out, and when the torsion spring is frequently used, due to the repeated friction

and collision with other associated mechanism, the torsion spring gets heated easily, which leads to unstable torsion of torsion spring that changes with the temperature. Thus, there is a drawback that the rivet nut will be damaged or cannot be screwed to the designated position during the installation process.

3. The normal operation is extremely complicated, multiple threaded parts need to be adjusted at same time to ensure the screwing length and riveting length. These threaded parts need to satisfy both the stroke adjustment requirement and the pull-riveting strength requirement. Due to the reliability requirement of riveting, the thread needs to be tightened. If the thread is not well tightened, the rivet would get loose easily, such that the stroke would be changed, even worse, the thread would be broken. Usually, the well-adjusted stroke is changed again after the thread is well tightened, which makes it hard for non-professionals and unskilled people to operate smoothly. When rivet nuts are used in a small quantity, the adjusting time is even longer than the using time.

4. The structure is complex with too many parts. Most parts are damageable, hard to be replaced, prone to break down, and with a short service life.

5. Since the axis of the leadscrew nut assembly and the screwing nut, the axis of gear, and central axis of motor are parallel to each other, not all the parameters can be independently designed according to the demands for each system. Details are as below.

- (1) The motor meshing teeth that engage with the motor pinion gear cannot be too large, i.e. cannot go beyond the axis of the leadscrew nut assembly and the screwing nut. Otherwise, the interference would be generated. Thus, the modulus and the teeth number of the gear are greatly limited within an extremely small range.
- (2) The motor engages with the motor meshing teeth without interference and space waste as much as possible. Thus, the size of the motor is limited. The rotational speed and power of the motor have a lot to do with the size. If the motor is too small, the torsion and power of the motor would be small too. If the motor is large, as the power is increased, the motor shaft is also enlarged, and the motor pinion gear should also be large. Otherwise, the engaging cannot be carried out. However, when the motor pinion gear is enlarged, the reduction ratio would be affected. Therefore, it is hard to freely select a properly matched motor in the design.
- (3) The leadscrew nut component is obtained from processing the gear on the outside of nut, which requires extremely complicated process

with high requirement. The main defect is that if the gear of the leadscrew nut is designed to be large, the space will be wasted. If the gear is designed to be small, the engagement conditions would not be satisfied. In conclusion, during the design of said rivet nut tool, the rotational speed of motor, the reduction ratio of deceleration gear, the size of leadscrew cannot be reasonably designed according to the demands, which usually leads to the situation of "unreasonable power matching" with slow speed or bad pulling. The present electric rivet nut tool cannot break the large-size rivet nut having strong riveting strength.

(4) There is a high matching requirement for the motor assembly, the gear, and the leadscrew assembly. Not only these three parts should be ensured to be parallel to each other, but also three axis lines should be ensured in the same plane. A slight deviation of the parallelism and planeness would affect the engagement requirement and lead to high noise in operating the tool.

6. For the appearance design, all the parts are limited to parallel arrangement (e.g. the motor must be arranged in the direction parallel to that of the leadscrew), such that the use of space is greatly limited. The space is greatly wasted. The tool looks huge. The center of gravity on the handheld tool is not ergonomically designed since force must be applied to the tool using the soft tissue of the hand between the thumb and index finger, quickly fatiguing the user. Such mechanical arrangement which is not ergonomic is hard to be modified under the existing conditions.

### Technical Problems

[0004] To solve the above technical problems, the present invention aims to provide an excellent electric rivet nut gun which is designed with a hollow through hole in the sun gear of the motor shaft and planetary gear deceleration system. Moreover, the power motor assembly, the planetary gear deceleration system, the leadscrew drive system, and the pull-riveting system are on the same axis. When the tool is held by hands, the design is ergonomic, and has simple and reliable connections between each part. For different rivet nuts, just a simple adjustment can produce several types of tools. Specifically, when the rivet nut of small tension is pulled, the design can be adjusted to have a higher speed. When the rivet with high broken limit is pulled, the design can be adjusted to have a large tension and a low speed. However, such designs can be reached by simply changing the motor, the planetary gear deceleration system, or the ball screw (i.e. the speed can be changed by changing the screw pitch of the ball screw). Several kinds of

tools with different parameters can be derived from one structure. The user can select a proper kind of tool according to their demands.

## Solutions for the Problems

### Technical Solution

[0005] An electric rivet nut gun includes a cover, a trigger, a circuit board, a power motor assembly, a pull-riveting system, a leadscrew drive system, a clutch control system, and a planetary gear deceleration system.

[0006] The power motor assembly includes a motor and a motor shaft. The motor shaft is arranged with a hollow structure and the front end of the motor shaft is provided with a motor pinion gear.

[0007] The leadscrew drive system includes a roller positioning block, a ball screw, a leadscrew nut, a front bearing pedestal, a rear bearing pedestal, and a connecting shaft. The front end of the ball screw having a hollow structure is fixed by the roller positioning block, and the rear end of the ball screw is connected to the leadscrew nut. The leadscrew nut is arranged inside the front bearing pedestal. The front bearing pedestal is connected to the rear bearing pedestal, and the connecting shaft passing through the rear bearing pedestal is fixed to the leadscrew nut. The roller positioning block is arranged on the front bearing pedestal.

[0008] The planetary gear deceleration system includes a rear planetary gear pedestal, a front planetary gear pedestal, a sun gear I, a sun gear II, a plurality of planetary gears and an internal gear. The sun gear I and the sun gear II are arranged with a hollow structure. The sun gear II is provided with three planetary gears II and a pinion. The three planetary gears II engage with the motor pinion gear and internal gear at the same time. The internal gear is arranged inside the front planetary gear pedestal in a position-limited manner. The sun gear I is provided with three planetary gears I. The three planetary gears I engage with the pinion. The rear planetary gear pedestal is connected to the front planetary gear pedestal.

[0009] The pull-riveting system includes a pull rod, a gun head, an adjusting nut, an outer sleeve, a pull-rod nut, a leadscrew locknut, a hexagon connecting rod, a connecting rod fixing circlip and an outer sleeve nut. The outer sleeve is connected and locked to the front bearing pedestal by the outer sleeve nut. The pull-rod nut is arranged inside the rear end of outer sleeve. The leadscrew locknut is arranged inside the pull-rod nut. The pull-rod and the gun head are arranged on the front end of outer sleeve. The rear end of the gun head is provided with thread by processing. The adjusting nut is connected to the threaded part on the rear end of the gun head. The pull-rod is connected to the hexagon connecting rod. The connecting rod fixing circlip is sleeved on the hexagon connecting rod, and located between the front end of ball screw and leadscrew locknut.

**[0010]** The clutch control system includes an electro-magnet, a thrust terminal, a reset spring, and a clutch connecting shaft. The hexagon hole on one end of the clutch connecting shaft is connected to the hexagon of the hexagon connecting rod. The middle portion of clutch connecting shaft has a hexagon shape which engages with the hexagon hole of hollow sun gear II. The middle portion of the clutch connecting shaft is near the front end of the hexagon connecting rod and is always connected to the hexagon connecting rod. The thrust terminal is arranged on the rear end of the clutch connecting shaft. One end of the reset spring is arranged on the rear end of motor, the other end of the reset spring is arranged on the end face of thrust terminal. The electromagnet controls the clutch connecting shaft to move back and forth by the program in the circuit board, so as to control the clutch connecting shaft to separate and engage with the sun gear II. When the hexagon inner hole of the sun gear II engages with the middle hexagon part of clutch connecting shaft, the hexagon connecting rod and pull-rod are driven to rotate, and the electromagnet pushes the clutch connecting shaft to separate the hexagon inner hole of the sun gear II and the hexagon part of clutch connecting shaft, such that the pull-rod stops rotating.

**[0011]** The cover is provided with a circuit board, a trigger, a stroke mounting plate, and a stroke adjusting plate. The circuit boards are connected to the stroke control plate and the motor respectively by control lines. Both ends of stroke control plate are provided with inductors. The stroke mounting plate and stroke adjusting plate control the adjustment of pull-riveting stroke by the stroke adjusting nut assembly. The roller positioning block is provided with electromagnet, and the inductors are located below the electromagnet.

**[0012]** The center line of the power motor assembly, the planetary gear deceleration system, the leadscrew drive system, the pull-riveting system and the direction of riveting are on the same axis.

**[0013]** The cover is provided with a transparent window which is located on the outer side of the stroke adjusting plate, and the transparent window is provided with a ruler for stroke adjustment.

**[0014]** The front end of leadscrew nut is provided with the scraper seal which is fixed inside the front bearing pedestal.

## Beneficial Effects of the Invention

### Beneficial Effects

**[0015]** The electric rivet nut tool of the present invention has the following advantages and beneficial effects.

(1) A new technology of the motor with hollow motor shaft is used in the present invention. Such motor would not be limited by the size and rotational speed. The size of motor could be changed and adjusted according to the requirement, such that the matching

and function of the motor and clutch connecting shaft are better.

(2) The planetary gear deceleration system is used because the planetary gear deceleration system has the advantages of small volume, light weight, high bearing capacity, long service life, stable operation, low noise, large output torque, high transmission efficiency (since the meshing area is large, the torque is large, and the transmission efficiency is high), good safety performance, etc. Above all, the whole space is fully and reasonably used by the match between the hollow structure of sun gear and the clutch connecting shaft. The design of the reduction ratio for planetary gear deceleration system is completely released, so the reduction ratio can be designed according to the demands.

(3) The structure of leadscrew nut is simple. The nut is not restricted to be combined with the gears, and thereby the process is simplified. By designing the leadscrew nut according to the tension, the diameter and length of the leadscrew nut can be changed according to the changing of rivet strength. When the riveting strength is high, a leadscrew nut with large diameter, relatively short pitch, and long screwing length is used, such that the electric gun has a large size and a low pull-riveting speed. When the riveting strength is low, a leadscrew nut with small diameter, relatively long pitch, and short screwing length is used, such that the electric gun has a small size and a high riveting speed. In conclusion, the tool system has a reasonable division of work. For instance, with regard to the aluminum rivet nut with low riveting strength, a fast motor with low power, a planetary gear deceleration system with low reduction ratio, and a leadscrew drive system with a slightly long pitch and a small size can be selected to make a fast rivet nut tool with small tension. Vice versa, an electric rivet nut gun with large tension also can be made. Since the power motor assembly, the planetary gear deceleration system, the leadscrew drive system, and the direction of riveting are arranged in a straight line, this structure is not restricted too much in adjusting. These three parts can be replaced to meet the demands, such that the motor, the planetary gear deceleration system, and the leadscrew drive system are in a reasonable balance, and a reasonable power matching can be achieved. When the load is low, the system is fast. When the load is high, the system is powerful and can rivet large-sized nut.

(4) Another benefit of the above structure is that the power motor assembly, the planetary gear deceleration system, the leadscrew drive system, and the direction of pull-riveting are arranged in a straight line, such that the tool is compact and aesthetic. Also, space is fully used, and the handheld gravity center of is ergonomic. Moreover, the cooperation between the power motor assembly, the clutch connecting shaft, the planetary gear deceleration system, and

the leadscrew drive system is simple. Even if a small coaxial deviation occurs, the noise will not be loud. Furthermore, the cooperation between the four parts is simple. The clutch control is simple and reliable, and the noise is far lower than the meshing noise of the gears of conventional tools.

(5) The mature two-speed transmission planetary gear deceleration system can be used in the present invention to satisfy the transmission demands during use.

**[0016]** The present invention is convenient to carry. The present invention not only has the rapidness and powerfulness of pneumatic tool, but also can be conveniently operated in the field. Desired parameters can be achieved according to requirements, such that the parameter of the electric rivet nut tool can be designed to be the most reasonable and humanized, and thereby the labor force is greatly liberated, and the work efficiency is improved.

### Brief Description of the Drawings

#### Description of the Drawings

**[0017]**

Figure 1 is a schematic diagram of the structure of the electric rivet nut gun of the present invention.

Figure 2 is a schematic diagram of the local structure of the electric rivet nut gun of the present invention.

Figure 3 is a schematic diagram of the structure of the power motor assembly of the present invention.

Figure 4 is an exploded view drawing of the planetary gear deceleration system of the present invention.

Figure 5 is an assembly diagram of the planetary gear deceleration system of the present invention.

Figure 6 is a local decomposition diagram of the planetary gear deceleration system of the present invention.

Figure 7 is a schematic diagram of the structure of the clutch connecting shaft of the present invention.

Figure 8 is a schematic diagram of the indicating part of the stroke control system of the present invention.

Figure 9 is a schematic diagram of transmission and shifting of the present invention.

**[0018]** 1. Pull-rod; 2. Gun head; 3. Adjusting nut; 4. Outer sleeve; 5. Pull-rod nut; 6. Leadscrew locknut; 7. Connecting rod fixing circlip; 8. Hexagon connecting rod; 9. Outer sleeve nut; 10. Roller positioning block; 11. Magnet; 12. Ball screw; 13. Front bearing pedestal; 14. Leadscrew nut; 15. Steady pin; 16. Connecting shaft; 17. Rear bearing pedestal; 18. Sun gear I; 19. Front planetary gear pedestal; 20. Internal gear; 21. Sun gear II; 22. Planetary gear; 23. Rear planetary gear pedestal; 24. Motor; 25. Motor shaft; 26. Clutch connecting shaft; 27. Reset spring; 28. Thrust terminal; 29. Electromagnet; 30. Stroke

mounting plate; 31. Stroke adjusting plate; 32. Stroke adjusting nut assembly; 33. Ruler; 34. Transparent window; 35. Trigger; 36. Circuit board; 37. Cover; 38. Gear shift fork; 39. gear shifting switch; 40. Motor pinion gear; 41. Pinion; 42. Scraper seal; 43. Stroke control plate; 44. Inductor; 221. Planetary gear I; 222. Planetary gear II.

### Embodiments

#### 10 Embodiments of the Present Invention

**[0019]** Hereinafter, the present invention is described with reference to the drawings.

**[0020]** As shown in Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, and Figure 8, the electric rivet nut gun includes cover 37, trigger 35, circuit board 36, the power motor assembly, the pull-riveting system, the leadscrew drive system, the clutch control system, and the planetary gear deceleration system.

**[0021]** The power motor assembly includes motor 24 and motor shaft 25. Motor shaft 25 is arranged with a hollow structure. The front end of motor shaft 25 is provided with motor pinion gear 40. Power motor assembly can carry out positive and negative rotation to mount or

dismount the rivet nut and pull-rivet the nut.

**[0022]** The leadscrew drive system includes roller positioning block 10, ball screw 12, leadscrew nut 14, front bearing pedestal 13, rear bearing pedestal 17, and connecting shaft 16. Said ball screw 12 has a hollow structure. The front end of ball screw is fixed by roller positioning block 10, while the rear end of ball screw is connected to leadscrew nut 14 which is the normal leadscrew. Compared with the leadscrew which is combined with an added gear, leadscrew nut 14 of the present invention has a simple process. In addition, the diameter and length of the leadscrew nut can be designed according to the tension. Leadscrew nut 14 is arranged inside front bearing pedestal 13. Rear bearing pedestal 17 is connected to front bearing pedestal 13. Connecting shaft 16 passes through rear bearing pedestal 17 and is fixed to leadscrew nut 14 by steady pin 15. Roller positioning block 10 is arranged on front bearing pedestal 13.

**[0023]** As shown in Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, and Figure 9, the planetary gear deceleration system includes rear planetary gear pedestal 23, front planetary gear pedestal 19, sun gear I 18, sun gear II 21, planetary gear 22, and internal gear 20. Sun gear I 18 and sun gear II 21 are arranged with hollow structures. Sun gear II 21 is provided with three planetary gears II 222 and a pinion 41. Three planetary gears II 222 engage with motor pinion gear 40 and internal gear 20 at the same time. Internal gear 20 is arranged inside front planetary gear pedestal 19 in a position-limited manner. Sun gear I 18 is provided with three planetary gears I 221 which engage with pinion 41. Rear planetary gear pedestal 23 is connected to front planetary gear pedestal 19. Cover 37 can be provided with gear shift fork 38 which is connected to internal gear 20 pro-

vided with a groove. Gear shift fork 38 is controlled by gear shifting switch 39 to shift the internal gear. The present invention is designed according to the demand and has a good adaptability, and a robust applicability. The hollow structure of sun gear II 21 is a structure with an abnormal hexagon hole which engages with clutch connecting shaft 26 to mount and dismount the rivet nut.

**[0024]** The pull-riveting system includes pull-rod 1, gun head 2, adjusting nut 3, outer sleeve 4, pull-rod nut 5, leadscrew locknut 6, hexagon connecting rod 8, connecting rod fixing circlip 7 and outer sleeve nut 9. Outer sleeve 4 is connected and locked to front bearing pedestal 13 by outer sleeve nut 9. The rear end of outer sleeve 4 is provided with pull-rod nut 5. Leadscrew locknut 6 is provided inside pull-rod nut 5. The front end of outer sleeve 4 is provided with pull-rod 1 and gun head 2. The rear end of gun head 2 is provided with thread by processing, which is connected to adjusting nut 3. Pull-rod 1 is connected to hexagon connecting rod 8. Connecting rod fixing circlip 7 is sleeved on hexagon connecting rod 8 and is located between the front end of ball screw 12 and leadscrew locknut 6. After gun head 2 is properly adjusted, adjusting nut 3 is screwed and locked on the end face of outer sleeve 4 and performs the function of fixing gun head 2 and protecting the thread. Because under the situation of being unlocked, the gap of screwing would cause deviation and damage of the thread.

**[0025]** The clutch control system includes electromagnet 29, thrust terminal 28, reset spring 27, and clutch connecting shaft 26. The hexagon of hexagon hole on one end of clutch connecting shaft 26 is connected to hexagon connecting rod 8. The middle portion of clutch connecting shaft 26 has a hexagon shape, which engages with the hexagon hole of hollow sun gear II 21. Thrust terminal 28 which is connected to another end of clutch connecting shaft 26 is pushed and pulled by the driving of electromagnet 29 to separate from and engage with the hexagon hole of hollow sun gear II 21. The middle portion of clutch connecting shaft 26 is always connected to hexagon connecting rod 8 near the front end of hexagon connecting rod 8. Thrust terminal 28 is arranged on the rear end of clutch connecting shaft 26. One end of reset spring 27 is arranged on the rear end of motor 24, another end of reset spring 27 is arranged on the end face of thrust terminal 28. Electromagnet 29 controls clutch connecting shaft 26 to move back and forth by the program in the circuit board, so as to control the separation and meshing with the sun gear II 21. When the hexagon inner hole of sun gear II 21 engages with the hexagon part of clutch connecting shaft 26, the hexagon connecting rod 8 and pull-rod are driven to rotate. Electromagnet 29 drives clutch connecting shaft 26 to separate the hexagon inner hole of sun gear II 21 from the hexagon part of clutch connecting shaft 26 so as to stop the rotation of pull-rod 1. The clutch control system has fewer components, which avoids the instability of single mechanical clutch, and has a better stability and reliability.

**[0026]** Cover 37 is provided with circuit board 36, trig-

ger 35, stroke mounting plate 30, and stroke adjusting plate 31. Circuit board 36 is connected to motor 24 and stroke control plate 43 respectively by control lines. Circuit board 36 is provided with a current overload protection device. Both ends of stroke control plate 43 are provided with inductors 44. Stroke mounting plate 30 and stroke adjusting plate 31 are controlled and adjusted by stroke adjusting nut assembly 32. Roller positioning block 10 is provided with magnet 11. Inductor 44 is located under magnet 11.

**[0027]** The center lines of the power motor assembly, the planetary gear deceleration system, the leadscrew drive system, and the pull-riveting system are on the same axis as the direction of riveting. The whole design plus clutch connecting shaft 26 make the electric gun more convenient to operate with much low noise, and the space of the electric gun is saved effectively.

**[0028]** As shown in Figure 8, cover 37 is provided with transparent window 34 which is located on the outer side of stroke adjusting plate 31. Transparent window 34 is provided with ruler 33 for stroke adjustment, through which the details of stroke adjustment can be seen clearly, such that the stroke is controlled more accurately.

**[0029]** As shown in Figure 1, the front end of leadscrew locknut 6 is provided with scraper seal 42 which is fixed inside front bearing pedestal 13, such that the stoppage caused by sweeps and dust during nut riveting can be effectively avoided, and the service life of the electric gun is improved.

**[0030]** In the above overall structure design, the arrangement of all components is reasonable. The design of the same axis avoids the restriction and waste of space use. The space of the electric gun is fully used. With the adjusting nut, the adjustment of screwing stroke of nut becomes straightforward and simple. The design of clutch connecting shaft makes the clutch control of the power motor assembly, the planetary gear deceleration system, and the leadscrew drive system easy and reliable. The appearance of the tool is simple and fully ergonomic in handheld use. The use is simple and labor-saving. The tool is easy to operate. Connections between each part are simple and reliable. In addition, the electric gun is strong in power and can work indoor and outdoor, and can pull rivets with different sizes. The clutch control system is more reliable, the pull-riveting system is more stable, and has better applicability.

**[0031]** While the above embodiments of the present invention are described and illustrated in detail, it should be noted that various equivalent changes and modifications of above embodiments made according to concept of the present invention should be within the protection scope of the present invention, under the condition that the function does not exceed the spirit of the specification.

## Claims

1. An electric rivet nut gun comprising a cover, a trigger,

a circuit board, a power motor assembly, a pull-riveting system, a leadscrew drive system, a clutch control system, and a planetary gear deceleration system;

Wherein the power motor assembly further comprises a motor and a motor shaft, the motor shaft is arranged with a hollow structure and a front end of the motor shaft is provided with a motor pinion gear; the leadscrew drive system further comprises a roller positioning block, a ball screw, a leadscrew nut, a front bearing pedestal, a rear bearing pedestal, and a connecting shaft; a front end of the ball screw having the hollow structure is fixed by the roller positioning block, and a rear end of the ball screw is connected to the leadscrew nut, the leadscrew nut is arranged inside the front bearing pedestal, the front bearing pedestal is connected to the rear bearing pedestal, the connecting shaft passing through the rear bearing pedestal is fixed to the leadscrew nut, the roller positioning block is arranged on the front bearing pedestal;

the planetary gear deceleration system further comprises a rear planetary gear pedestal, a front planetary gear pedestal, a sun gear I, a sun gear II, a plurality of planetary gears and an internal gear; the sun gear I and the sun gear II are arranged with the hollow structure, the sun gear II is provided with three planetary gears II and a pinion, the three planetary gears II engages with the motor pinion gear and the internal gear at the same time,

the internal gear is arranged inside the front planetary gear pedestal in a position-limited manner, the sun gear I is provided with three planetary gears I, the three planetary gears I engages with the pinion, the rear planetary gear pedestal is connected to the front planetary gear pedestal;

#### **characterized in that**

the pull-pull-riveting system comprises a pull rod, a gun head, an adjusting nut, an outer sleeve, a pull-rod nut, a leadscrew locknut, a hexagon connecting rod, a connecting rod fixing circlip and an outer sleeve nut; the outer sleeve is connected and locked to the front bearing pedestal by the outer sleeve nut, the pull-rod nut is arranged inside a rear end of the outer sleeve, the leadscrew locknut is arranged inside the pull-rod nut, the pull-rod and the gun head are arranged on a front end of the outer sleeve, a rear end of the gun head is provided with thread by processing, the adjusting nut is connected to a threaded part on the rear end of the gun head, the pull-rod is connected to the hexagon connecting rod, the connecting rod fixing circlip is sleeved on the hexagon connecting rod, and the connecting rod fixing circlip is located between a front end of ball screw and the leadscrew locknut;

the clutch control system comprises an electromagnet, a thrust terminal, a reset spring, and a clutch connecting shaft; a hexagon hole on an end of the

clutch connecting shaft is connected to a hexagon of the hexagon connecting rod, the middle portion of the clutch connecting shaft has a hexagon shape, the middle portion of the clutch connecting shaft engages with the hexagon hole of the hollow sun gear II 21, the middle portion of the clutch connecting shaft is near the front end of the hexagon connecting rod and is always connected to the hexagon connecting rod, the thrust terminal is arranged on a rear end of the clutch connecting shaft, an end of the reset spring is arranged on a rear end of motor, an other end of the reset spring is arranged on an end face of the thrust terminal, the electromagnet controls the clutch connecting shaft to move back and forth by a program on a circuit board, so as to control the clutch connecting shaft to separate and engage with the sun gear II, when a hexagon inner hole of the sun gear II engages with a middle hexagon part of the clutch connecting shaft, the hexagon connecting rod and the pull-rod are driven to rotate, and the electromagnet pushes the clutch connecting shaft to separate the hexagon inner hole of the sun gear II and the hexagon part of the clutch connecting shaft, such that the pull-rod stops rotating;

the cover is provided with a circuit board, a trigger, a stroke mounting plate, and a stroke adjusting plate; the circuit board is connected to a stroke control plate and the motor respectively by control lines, both ends of the stroke control plate are provided with inductors, the stroke mounting plate and the stroke adjusting plate control an adjustment of a pull-riveting stroke by the stroke adjusting nut assembly, the roller positioning block is provided with the electromagnet, and the inductors are located below the electromagnet;

center lines of the power motor assembly, the planetary gear deceleration system, the leadscrew drive system, the pull-riveting system and a direction of riveting are on the same axis;

2. The electric rivet nut gun of claim 1, **characterized in that** the cover is provided with a transparent window which is located on an outer side of the stroke adjusting plate, and the transparent window is provided with a ruler for stroke adjustment.
3. The electric rivet nut gun of claim 1, **characterized in that** a front end of the leadscrew nut is provided with a scraper seal which is fixed inside the front bearing pedestal.

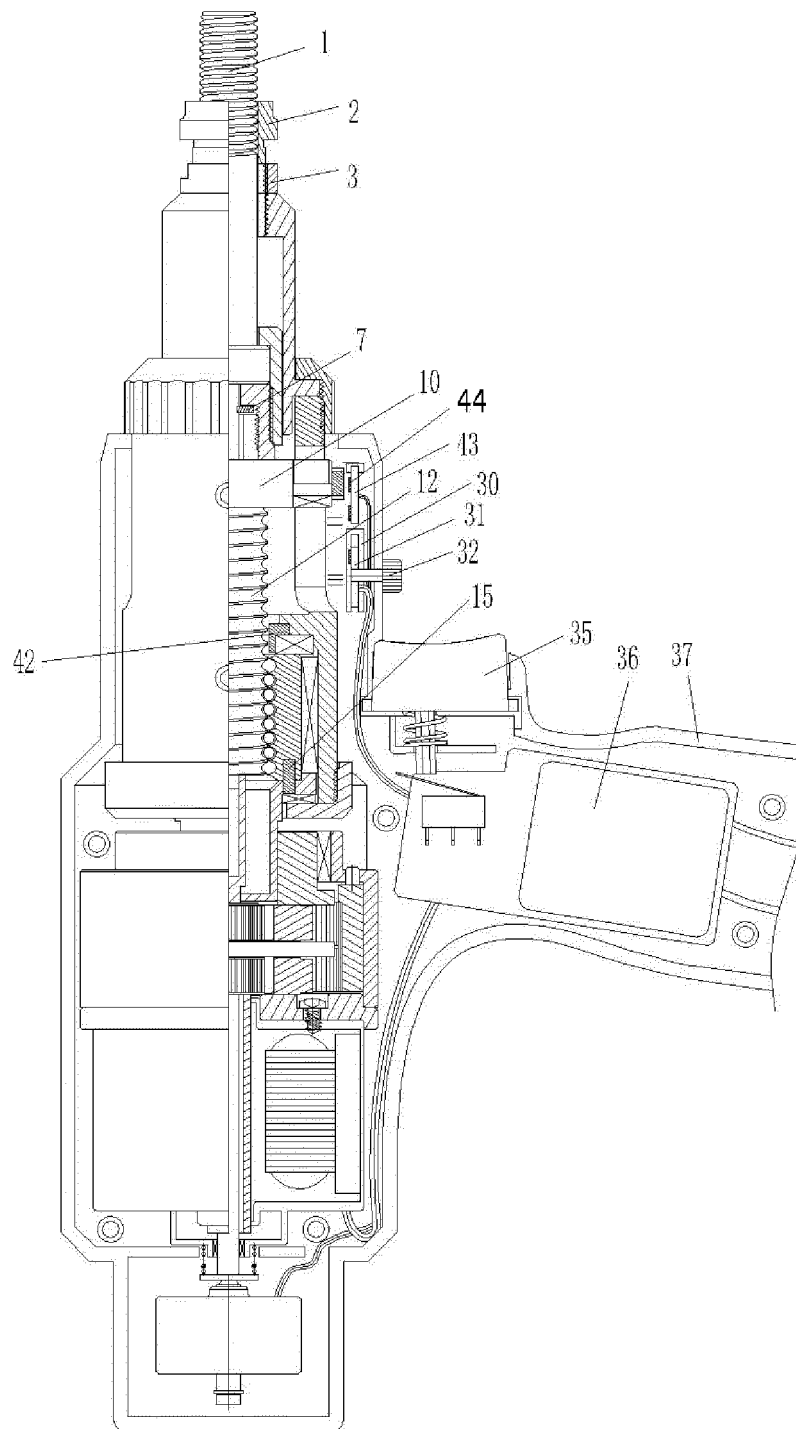


Fig. 1

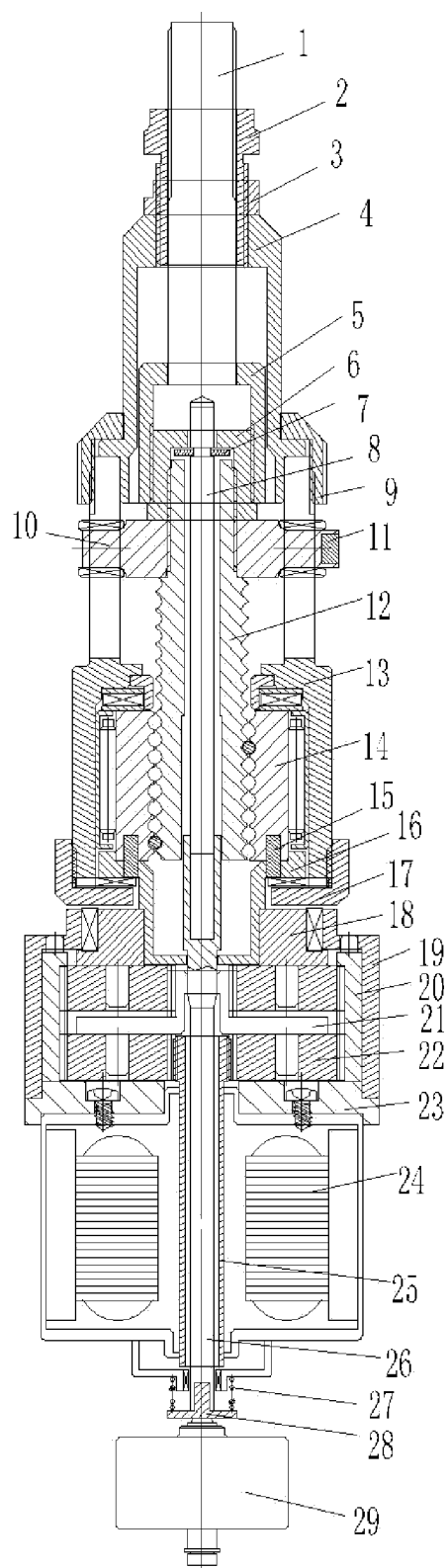


Fig. 2

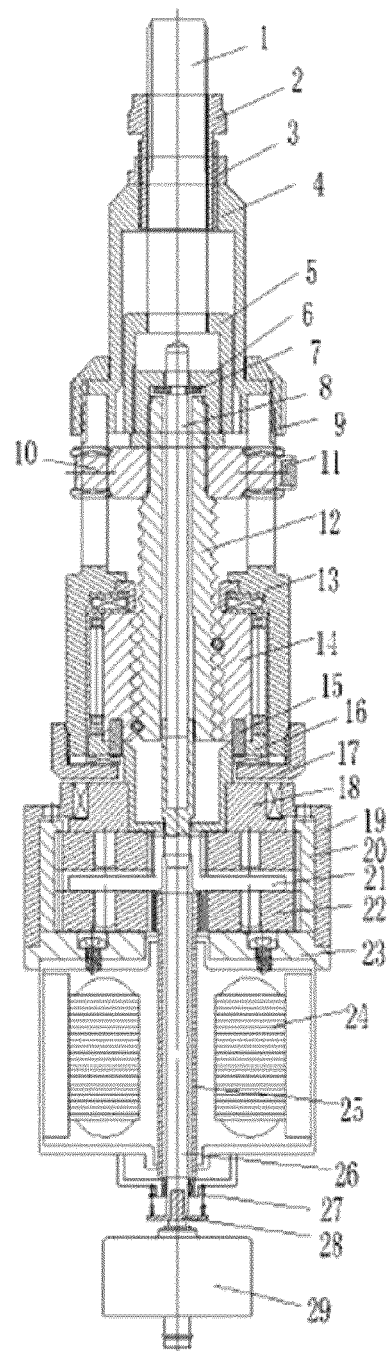


Figure 3

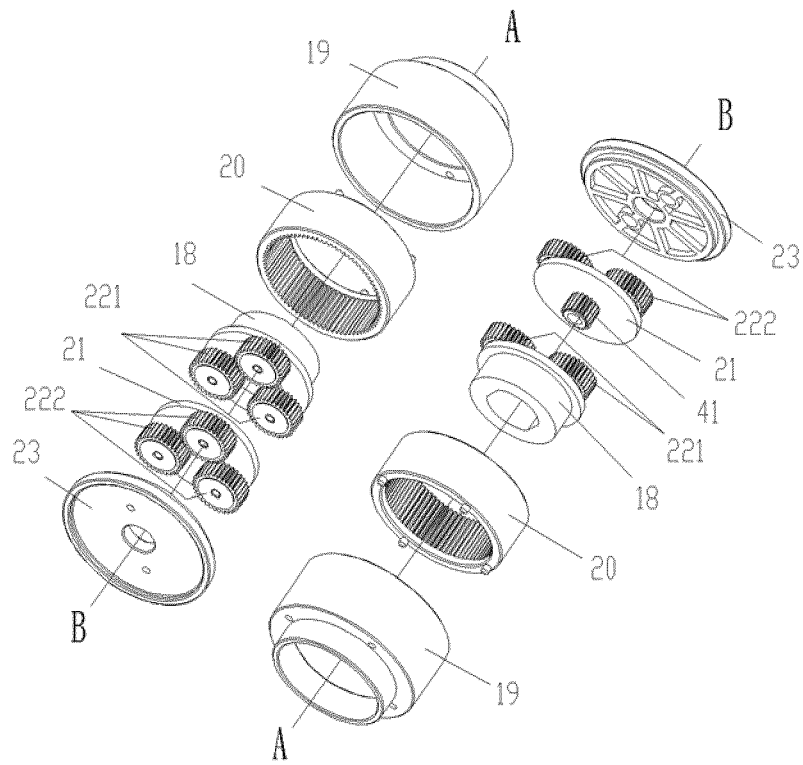


Fig. 4

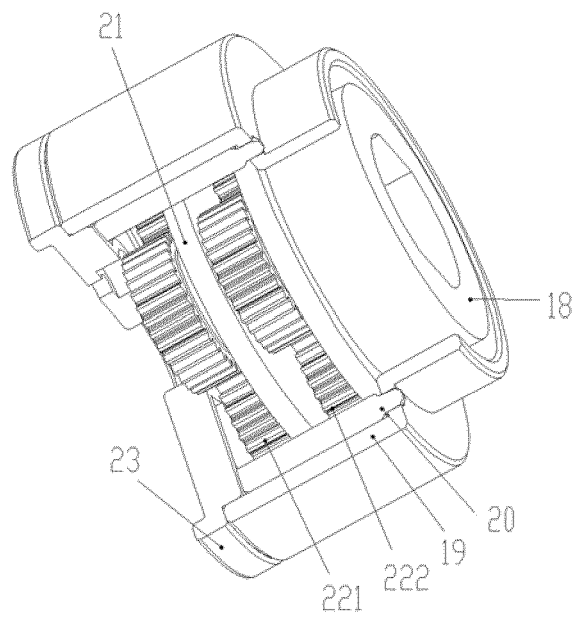


Fig. 5

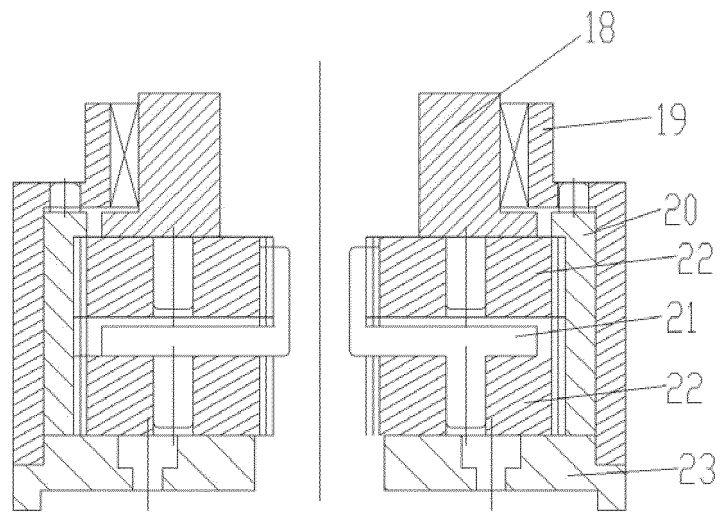


Fig. 6

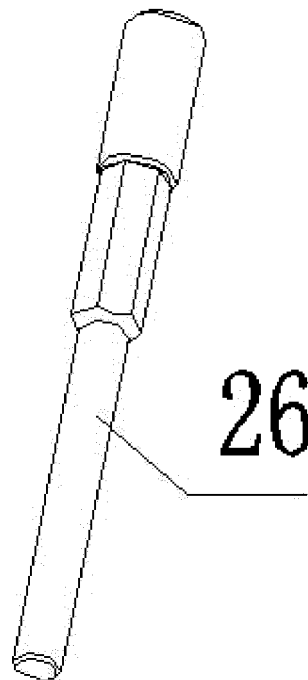
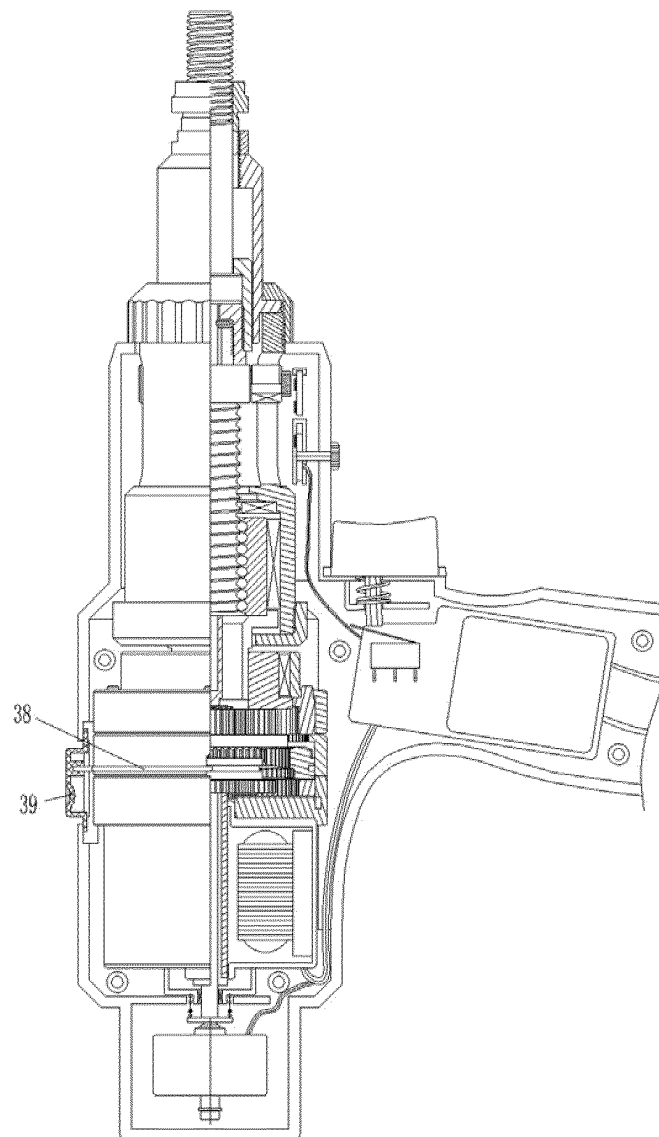
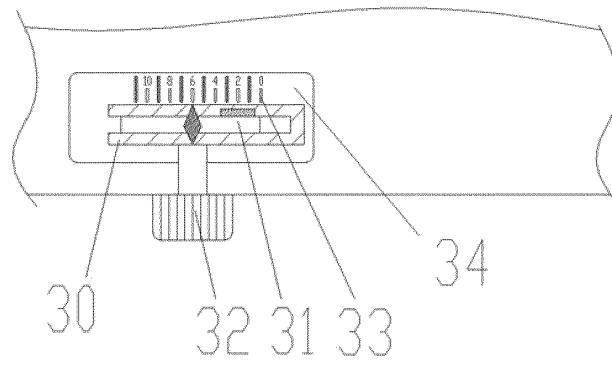


Fig. 7



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2015/096136

## A. CLASSIFICATION OF SUBJECT MATTER

B25B 21/00 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B25B, B21J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, CNPAT: insert nut, wall; nut, rivet, insert, gun

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                | Relevant to claim No. |
|-----------|---------------------------------------------------------------------------------------------------|-----------------------|
| A         | CN 201871671 U (YANGZHOU SHUANGYING TOOL FACTORY), 22 June 2011 (22.06.2011), the whole document  | 1-3                   |
| A         | CN 2822887 Y (WANG, Ronglin), 04 October 2006 (04.10.2006), the whole document                    | 1-3                   |
| A         | CN 201295891 Y (LI, Renchao), 26 August 2009 (26.08.2009), the whole document                     | 1-3                   |
| A         | DE 3219716 A1 (HONSEL NIETEN & METALLWARENFAB), 01 December 1983 (01.12.1983), the whole document | 1-3                   |
| A         | EP 0496499 A1 (EMHART INC.), 29 July 1992 (29.07.1992), the whole document                        | 1-3                   |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

|                                                                                                                                                                         |                                                                                                                                                                                                                                                  |
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|                                                                                                                                                                                                                    |                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Date of the actual completion of the international search<br>05 February 2016 (05.02.2016)                                                                                                                         | Date of mailing of the international search report<br><b>04 March 2016 (04.03.2016)</b> |
| Name and mailing address of the ISA/CN:<br>State Intellectual Property Office of the P. R. China<br>No. 6, Xitucheng Road, Jimenqiao<br>Haidian District, Beijing 100088, China<br>Facsimile No.: (86-10) 62019451 | Authorized officer<br><b>WANG, Rui</b><br>Telephone No.: (86-10) <b>62085447</b>        |

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| Patent Documents referred in the Report | Publication Date | Patent Family  | Publication Date |
|-----------------------------------------|------------------|----------------|------------------|
| CN 201871671 U                          | 22 June 2011     | None           |                  |
| CN 2822887 Y                            | 04 October 2006  | None           |                  |
| CN 201295891 Y                          | 26 August 2009   | None           |                  |
| DE 3219716 A1                           | 01 December 1983 | DE 3219716 C2  | 21 July 1988     |
| EP 0496499 A1                           | 29 July 1992     | JP H04304974 A | 28 October 1992  |

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- US 056050704 B [0003]