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Hung

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(54) **TORSION-DETECTING PNEUMATIC IMPACT TOOL**

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B25B 23/145	(2006.01)
B25F 5/02	(2006.01)

(52) **U.S. Cl.**

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(58) **Field of Classification Search**

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USPC ... 173/2, 176, 183, 93, 93.5, 93.6, 181, 217; 318/432, 434, 811; 310/47, 50, 239, 244; 73/862.21, 862.23, 862.31, 862.35

See application file for complete search history.

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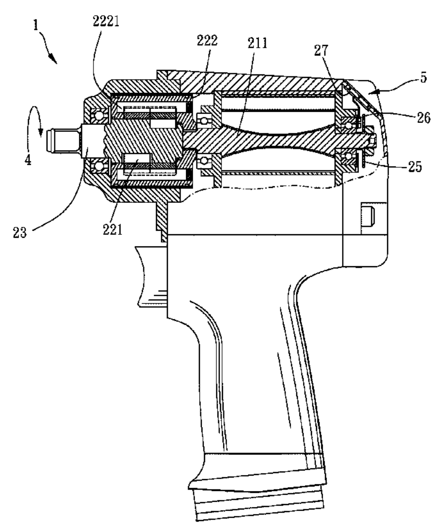
(57) **ABSTRACT**

A torsion-detecting pneumatic impact tool is provided. A hammering set having at least one hammering block and a rotating portion which is connected with each hammering block. A transmission shaft penetrates through each the hammering block. A torsion detecting unit includes a marking piece which has a plurality of blocks, at least two sensors which detect the marking piece and an processing unit which is electrically connected with each the sensor. The hammering set, the marking piece, and the rotating assembly rotating synchronously. When each the hammering block swing strikes the transmission shaft in a direction, the hammering set and the marking piece rotate reversely slightly because of the counterforce of swing strike. When the marking piece rotates reversely, the processing unit receives a signal of a degree of rotation of the blocks detected by the at least two sensors and computes a torsion value.

10 Claims, 4 Drawing Sheets



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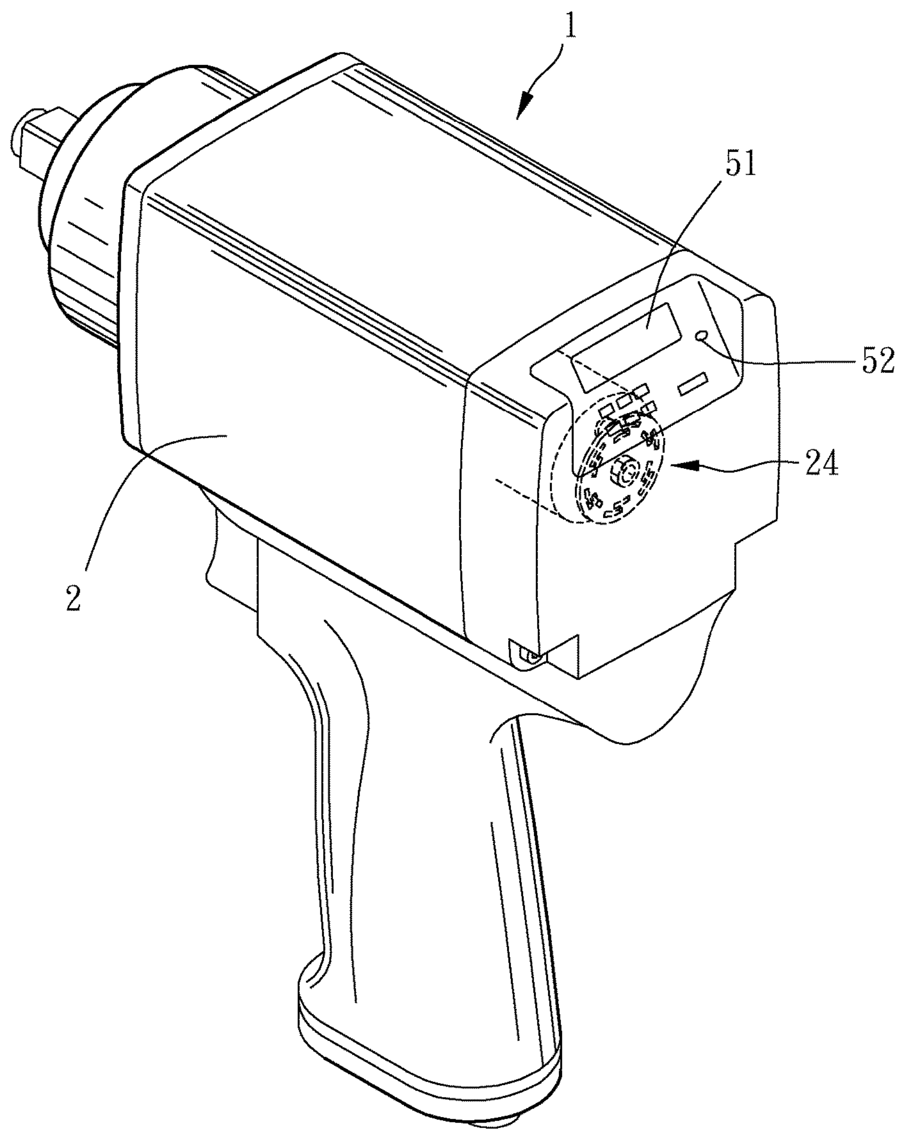

FIG. 1

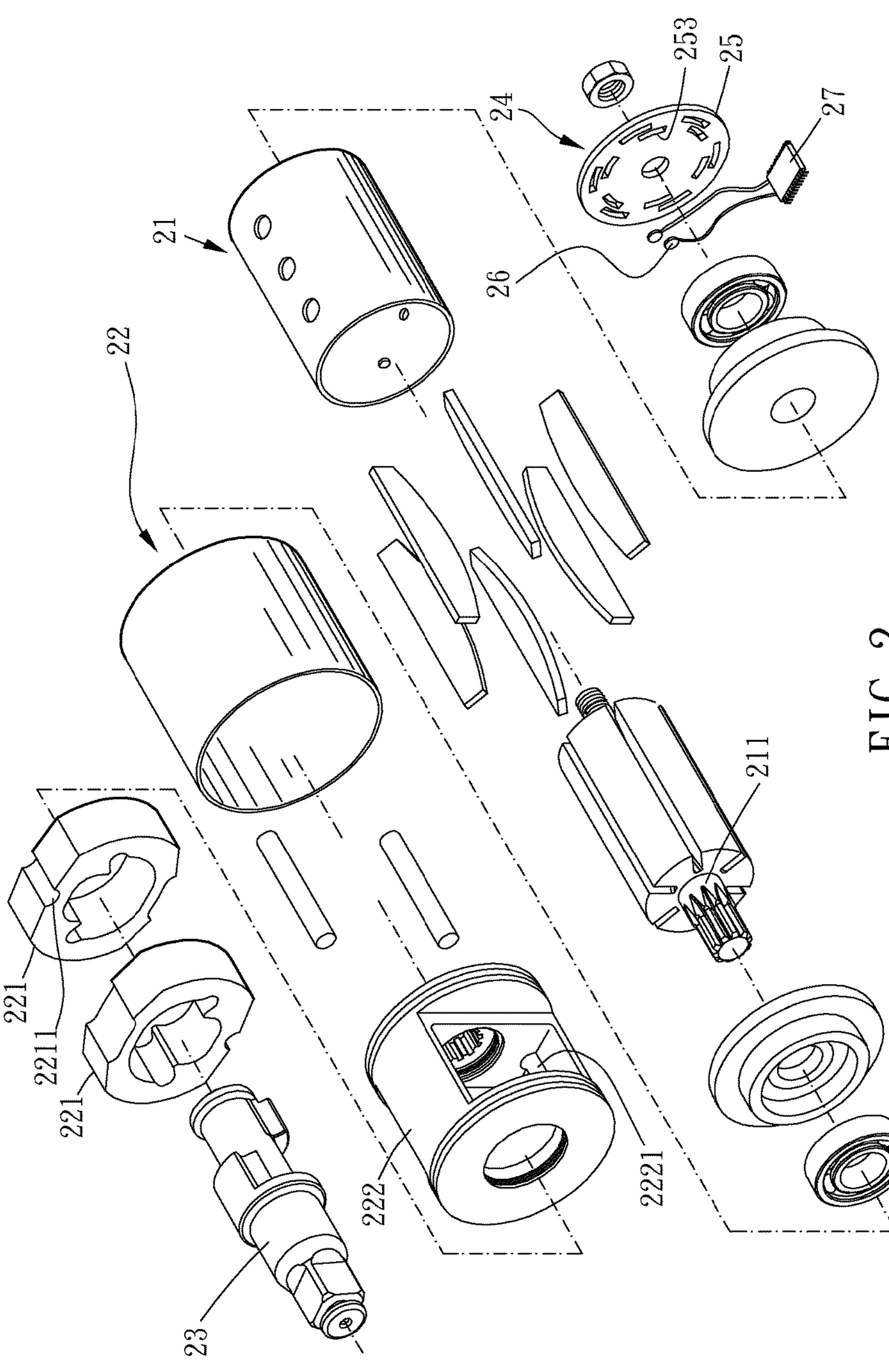

FIG. 2

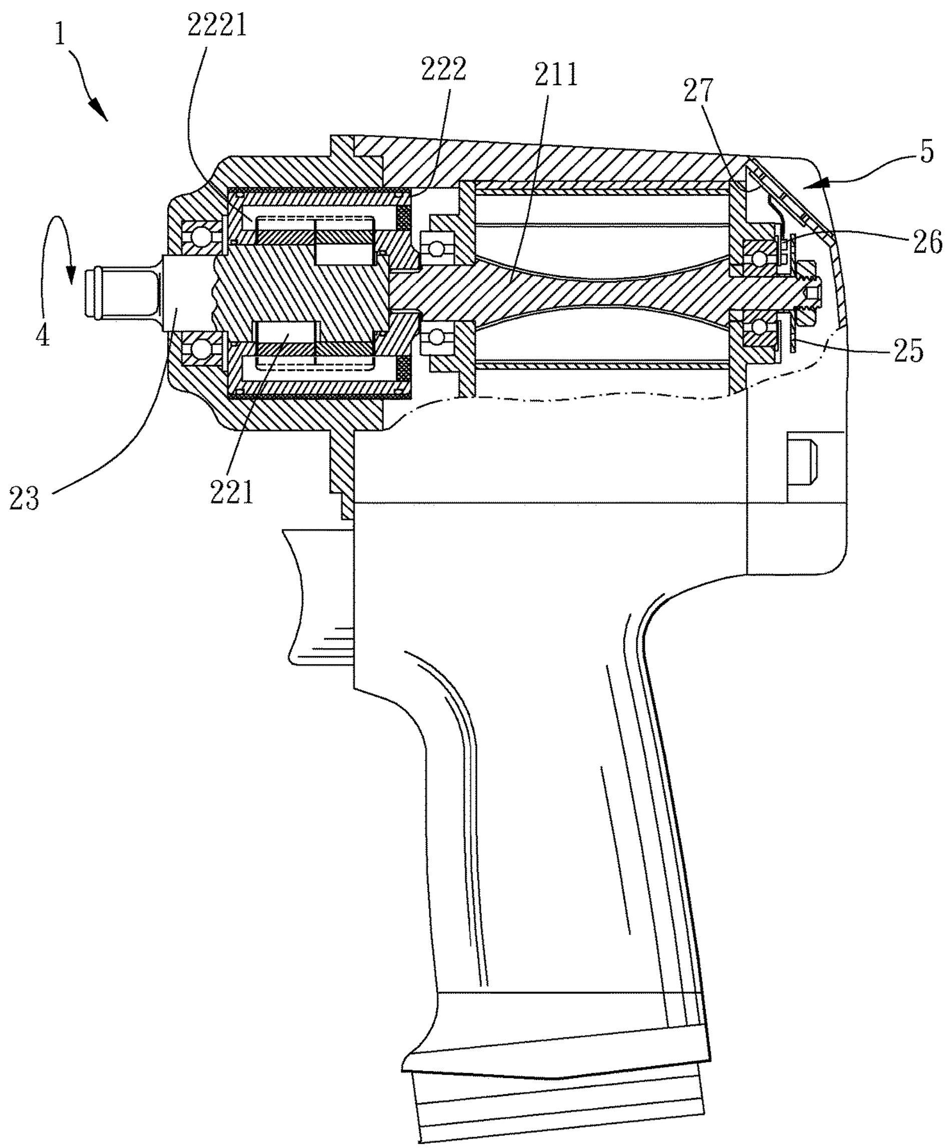

FIG. 3

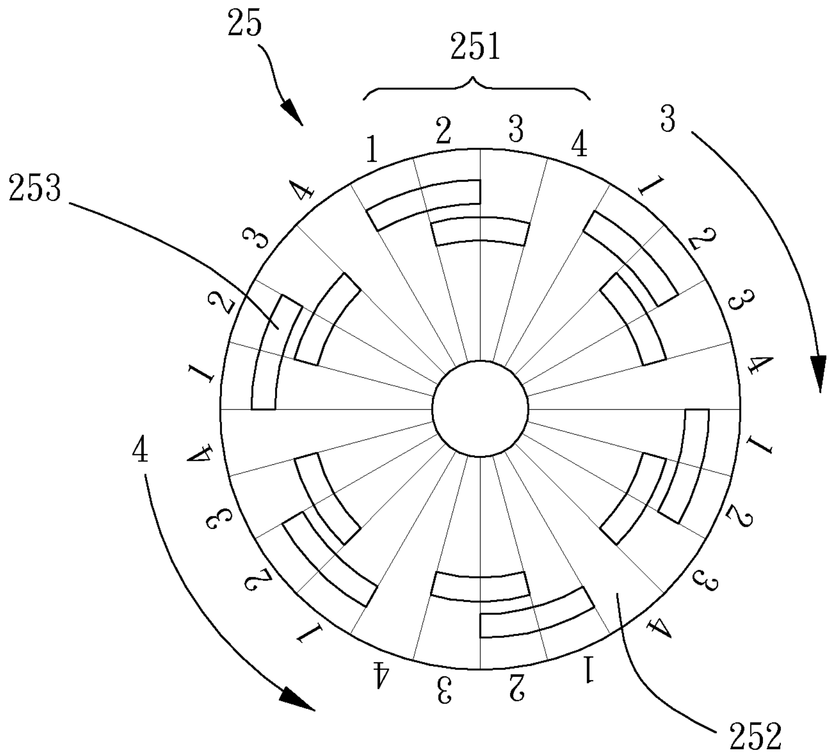

FIG. 4

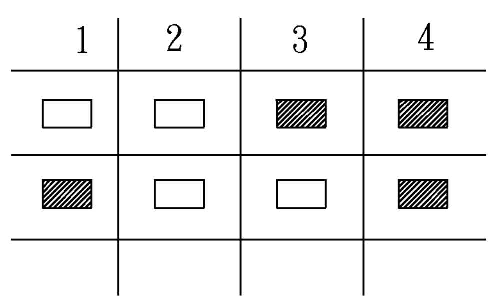

FIG. 4A

TORSION-DETECTING PNEUMATIC IMPACT TOOL

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a pneumatic impact tool, and more particularly to a torsion-detecting pneumatic impact tool.

Description of the Prior Art

Usually, a pneumatic impact tool drives a transmission shaft to rotate and provide greater torsion through a hammering block of a hammering assembly swing striking intermittently. When the pneumatic impact tool is designed, the application perspectives are taken into consideration to determine the greatest rotation speed and the greatest torsion value and to protect a user's safety. However, regarding the pneumatic impact tool of the prior art, the user only knows the greatest value of the pneumatic impact tool, for example, the greatest torsion value is 610 Nm, instead of the information in actual practice, for example, normal rotation, reverse rotation or the torsion value. The user uses the pneumatic impact tool according to his/her experiences, and an inexperienced user is uncertain about the more appropriate output power (torsion); therefore, members of the pneumatic impact tool are easily damaged, and what is worse is that the user may get hurt.

The present invention has arisen to mitigate and/or obviate the afore-described disadvantages.

SUMMARY OF THE INVENTION

The major object of the present invention is to provide an torsion-detecting pneumatic impact tool, which detects a torsion value when a pneumatic impact tool is operated, to let a user know a more appropriate torsion value for a driven object when s/he operates the pneumatic impact tool so as to prevent the driven object from overload. The present invention not only provides preferable use efficiency but also protects the security of the driven object and the user.

To achieve the above and other objects, a torsion-detecting pneumatic impact tool of the present invention is provided, including a main body, a transmission shaft and a torsion detecting unit. A rotating assembly and a hammering set are disposed in the main body. The hammering set has at least one hammering block and a rotating portion which is connected with each hammering block, and each hammering block, the rotating portion and the rotating assembly rotate synchronously. The transmission shaft penetrates through each hammering block and is actuated intermittently by the hammering block's swing strike. The torsion detecting unit has a marking piece which is formed with a plurality of blocks, at least two sensors which detect the marking piece and an processing unit which is electrically connected with each sensor, and the marking piece and the rotating assembly rotate synchronously. Wherein, when each hammering block swing strikes the transmission shaft in a direction, each hammering block, the rotating portion and the marking piece rotate reversely slightly because of a counterforce of swing strike. The processing unit receives a signal of a degree of rotation of the blocks detected by the at least two sensors and computes a torsion value.

The present invention will become more obvious from the following description when taken in connection with the

accompanying drawings, which show, for purpose of illustrations only, the preferred embodiment(s) in accordance with the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a preferred embodiment of the present invention;

FIG. **2** is a breakdown drawing of the preferred embodiment of the present invention;

FIG. **3** is a side cross-sectional view of the preferred embodiment of the present invention;

FIG. **4** is a drawing illustrating encoding principle according to the preferred embodiment of the present invention; and

FIG. **4**A is a drawing showing encoded codes in correspondence with FIG. **4**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will be clearer from the following description when viewed together with the accompanying drawings, which show, for purpose of illustrations only, the preferred embodiment in accordance with the present invention.

Please refer to FIG. **1** to FIG. **4** for a preferred embodiment of the present invention. A torsion-detecting pneumatic impact tool **1** includes a main body **2**, a transmission shaft **23** and a torsion detecting unit **24**.

A rotating assembly **21** and a hammering set **22** are disposed in the main body **2**. The hammering set **22** has at least one hammering block **221** and a rotating portion **222** which is connected with each hammering block **221**, and each hammering block **221**, the rotating portion **222** and the rotating assembly **21** rotate synchronously. The transmission shaft **23** penetrates through each hammering block **221** and is actuated intermittently by swing strike of the hammering block **221**. The torsion detecting unit **24** has a marking piece **25** which is formed with a plurality of blocks **252**, at least two sensors **26** which detect the marking piece **25** and an processing unit **27** which is electrically connected with each sensor **26**, and the marking piece **25** and the rotating assembly **21** rotate synchronously. Wherein, when each hammering block **221** swing strikes the transmission shaft **23** in a direction, each hammering block **221**, the rotating portion **222** and the marking piece **25** rotate reversely slightly because of a counterforce of swing strike, when the marking piece **25** rotates reversely, the processing unit **27** receives a signal of a degree of rotation of the blocks **252** detected by the at least two sensors **26** and computes a torsion value.

Specifically, a plurality of encode groups **251** are annularly formed on the marking piece **25** and repeatedly arranged along the marking piece **25**, and each encode group **251** has a part of the blocks **252** which are encoded in a first direction **3**. In other words, characteristics of the blocks **252** are correspondingly encoded, along the first direction **3** in sequence, into codes to build a code table. When the marking piece **25** rotates in a second direction **4**, the processing unit **27** determines whether the second direction **4** and the first direction **3** are the same or not according to the coding sequence the processing unit **27** receives. In this embodiment, each sensor **26** is a light sensor, and the marking piece **25** is a grating plate; that is, the marking piece **25** is formed with a plurality of through holes **253**, and the through holes **253** partially overlap radially to define the blocks **252** so as to be detected by the sensor **26**.

More specifically, please refer to FIG. **4** and FIG. **4**A for this embodiment. Six said through holes **253** are arranged along a phantom inner circle and six said through holes **253** are arranged along a phantom outer circle on the marking piece **25**, respectively. Taking one said encode group as an example, when the block **252** has only one said through hole **253** arranged along the phantom outer circle, the block **252** is encoded as code **1**; when the block **252** has two said through holes **253** arranged along the phantom inner and outer circles respectively, the block **252** is encoded as code **2**; when the block **252** has only one said through hole **253** arranged along the phantom inner circle, the block **252** is encoded as code **3**; and when the block **252** has none of the through holes, the block **252** is encoded as code **4**. When the first direction **3** is clockwise, the encode group **251** is arranged in sequence (1→2→3→4); therefore, when the processing unit **27** receives the coding sequence (4→3→2→1), the second direction **4** of the marking piece **25** rotating can be known to be counter-clockwise. The at least two sensors **26** are, preferably, disposed on the same radial extension line respectively to detect the changes of the blocks **252** synchronously. Aside from determining rotation direction, the time of the processing unit **27** receiving coding changes can be used to measure a rotation speed of the rotating assembly **21**.

In this embodiment, the marking piece **25** has six said encode groups **251**, and each block **252** represents a 15-degree angle respectively. When the hammering block **221**, the rotating portion **222** and the marking piece **25** rotate clockwise and rotate reversely slightly because of the counterforce of swing strike, the coding sequence which the processing unit **27** receives changes. For example, originally, the clockwise-encoding sequence without strike which is 1→2→3→4 changes into a sequence 1→2→2→3→4. That is, the hammering block **221** swingingly strikes the transmission shaft **23** in a position corresponding to the block **252** encoded as code **3**, to make the marking piece **25** rotate reversely (counter-clockwise) to correspond to the block **252** encoded as code **2**; thereby, the processing unit **27** can compute the actual torsion value, accordingly. In addition, different amounts of torsion produce different extents of counterforce; therefore, the marking piece **25** rotates reversely in different angles, and the greater the torsion is, the more blocks **252** the marking piece **25** crosses when the marking piece **25** rotates reversely. Furthermore, it is to be noted that when the marking piece **25** has more said encode groups **251**, the angle which each block **252** represents is smaller. In other words, if the marking piece **25** is divided into more regions, the processing unit **27** can compute the torsion value more accurately.

In addition, the rotating portion **222** is preferably formed with at least one first pivot portion **2221**. Each hammering block **221** has at least one second pivot portion **2211** which is pivoted to one said first pivot portion **2221**, and each hammering block **221** swings about each first pivot portion **2221** which severs as a center axis. In this embodiment, the rotating portion **222** is formed with two the first pivot portions **2221**, the rotating assembly **21** has a main axis **211**, the main axis **211** drives the rotating portion **222** and the marking piece **25** synchronously, and the main axis **211**, the rotating portion **222** and the marking piece **25** are coaxially disposed. Preferably, the main body **2** is further formed with an operating region **5** which is electrically connected with the processing unit, and the operation region **5** has a display region **51** which shows the torsion value computed by the arithmetic operating unit. More preferably, the operation region **5** is further formed with an alarm device **52** (for example, an LED light, but not limited thereto) which is electrically connected with the processing unit, and the processing unit is provided for setting a preset torsion value; therefore, when the torsion value computed by the processing unit is greater than or equal to the preset torsion value, the alarm device **52** is actuated. Thereby, a driven object can be prevented from damage effectively.

Given the above, the torsion-detecting pneumatic impact tool can provide different information when the pneumatic impact tool is operated in actual practice, for example, the rotation direction, rotation speed and torsion value.

In addition, with the display region in the operating region, a user can know the torsion value timely and clearly. When different driven objects are driven, a more appropriate driving power (torsion) can be set and work with the alarm device to warm the user so as to prevent the driven object from being damaged and protect the user's safety.

While we have shown and described various embodiments in accordance with the present invention, it should be clear to those skilled in the art that further embodiments may be made without departing from the scope of the present invention.

What is claimed is:

1. A torsion-detecting pneumatic impact tool, including:

a main body, a rotating assembly and a hammering set disposed inside the main body, the hammering set having at least one hammering block and a rotating portion which is connected with each hammering block, each hammering block, the rotating portion and the rotating assembly rotating synchronously;

a transmission shaft, penetrating through each hammering block, the transmission shaft actuated intermittently by the hammering block's swing strike;

a torsion detecting unit, including a marking piece which has a plurality of blocks, at least two sensors which detect the marking piece and a processing unit which is electrically connected with each sensor, the marking piece and the rotating assembly rotating synchronously;

wherein, when each hammering block swing strikes the transmission shaft in a direction, each hammering block, the rotating portion and the marking piece slightly rotate reversely because of a counterforce of swing strike, wherein when the marking piece rotates reversely, the processing unit receives a signal of a degree of rotation of the blocks detected by the at least two sensors and computes a torsion value.

2. The torsion-detecting pneumatic impact tool of claim **1**, wherein the rotating assembly has a main axis, and the main axis drives the rotating portion and the marking piece synchronously.

3. The torsion-detecting pneumatic impact tool of claim **2**, wherein the main axis, the rotating portion and the marking piece are coaxially disposed.

4. The torsion-detecting pneumatic impact tool of claim **1**, wherein the at least two sensors are arranged on the same radial extension line respectively relative to the marking piece.

5. The torsion-detecting pneumatic impact tool of claim **1**, wherein a plurality of encode groups are annularly formed on the marking piece and repeatedly arranged along the marking piece, each encode group has a part of the blocks which are encoded in a first direction, wherein, when the marking piece rotates in a second direction, the processing unit determines whether the second direction and the first direction are the same or not according to the coding sequence the processing unit receives.

6. The torsion-detecting pneumatic impact tool of claim **1**, wherein each sensor is a light sensor, and the marking piece is a grating plate.

7. The torsion-detecting pneumatic impact tool of claim **6**, wherein the marking piece is formed with a plurality of through holes which partially overlap radially to define the blocks.

8. The torsion-detecting pneumatic impact tool of claim **1**, wherein the main body further has an operation region which is electrically connected with the processing unit, and the operation region is formed with a display region.

9. The torsion-detecting pneumatic impact tool of claim **8**, wherein the operation region is further formed with an alarm device which is electrically connected with the processing unit, the processing unit is provided for setting a preset torsion value, and when a torsion value computed by the processing unit is greater than or equal to the preset torsion value, the alarm device is driven.

10. The torsion-detecting pneumatic impact tool of claim **1**, wherein the rotating portion has at least one first pivot portion, each hammering block has at least one second pivot portion which is pivoted to one said first pivot portion, and each hammering block swings about each first pivot portion which severs as a center axis.

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