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(54) **HIGH-FREQUENCY VIBRATING TRANSVERSE DRUM CUTTER HEAD, AND DRUM CUTTER MACHINE AND TUNNEL BORING MACHINE THEREWITH**

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See application file for complete search history.

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(57) **ABSTRACT**

A high-frequency vibrating transverse drum cutter head, and a drum cutter machine and a tunnel boring machine with such drum cutter head are disclosed. The transverse drum cutter wheel of the high-frequency vibrating transverse drum cutter head is driven by the cutting motor to rotate, the transverse drum cutter wheel is provided with cutting teeth, the transverse drum cutter wheel is mounted on one end of the drum cutter head base, the other end of the drum cutter head base is connected to a U-shaped drum cutter mechanism body, a connecting base is mounted on the U-shaped drum cutter mechanism body and used for mounting the
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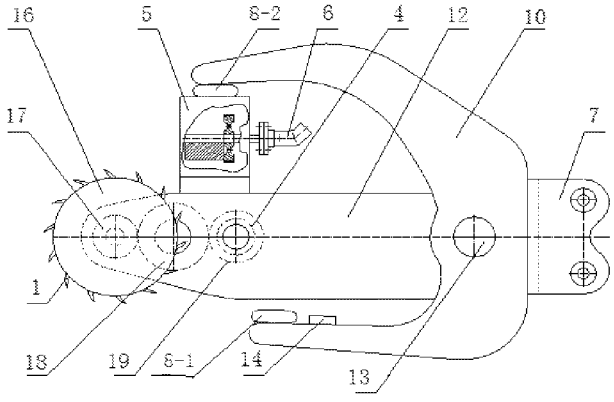

high-frequency vibrating transverse drum cutter head on a drum cutter machine or a tunnel boring machine, a vibration box is mounted on the drum cutter head base, and the vibration box is adapted to output high-frequency vibration force to the transverse drum cutter wheel through the drum cutter head base, so that the transverse drum cutter wheel **16** is able to perform high-speed repetitive vibrating movement while achieving its own rotation. Both rotation motion and high frequency repetitive vibration can be implemented at the same time by the present invention, through the combination of the transverse drum cutter wheel and the vibration box, making the cutting teeth on the drum cutter wheel apply combined action of impacting and cutting on the contacted materials.

6 Claims, 2 Drawing Sheets

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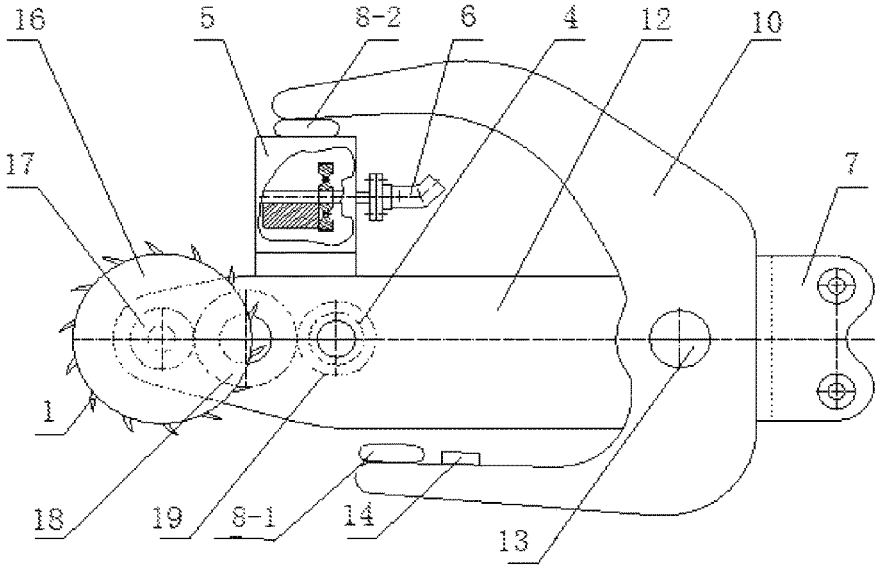

FIG. 1

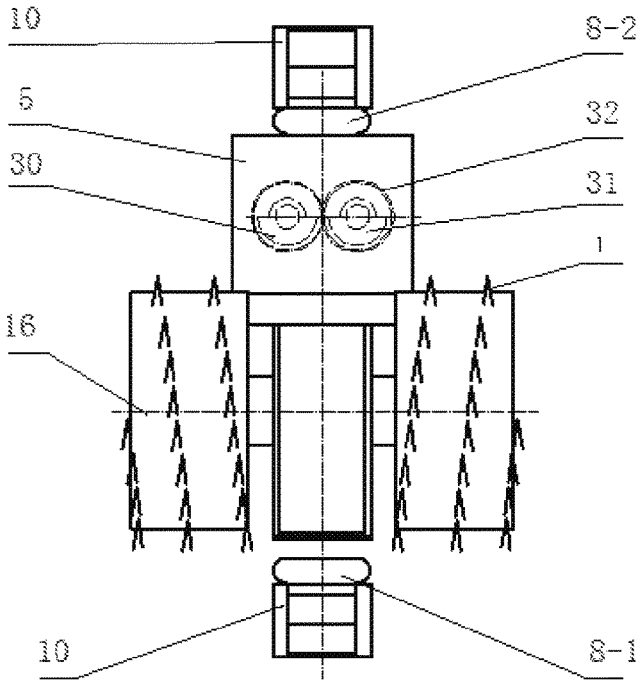

FIG. 2

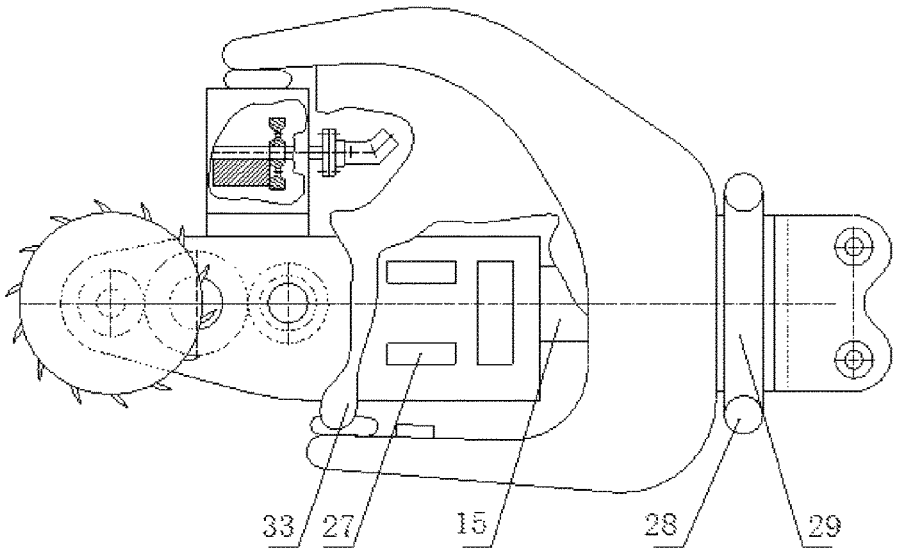

FIG. 3

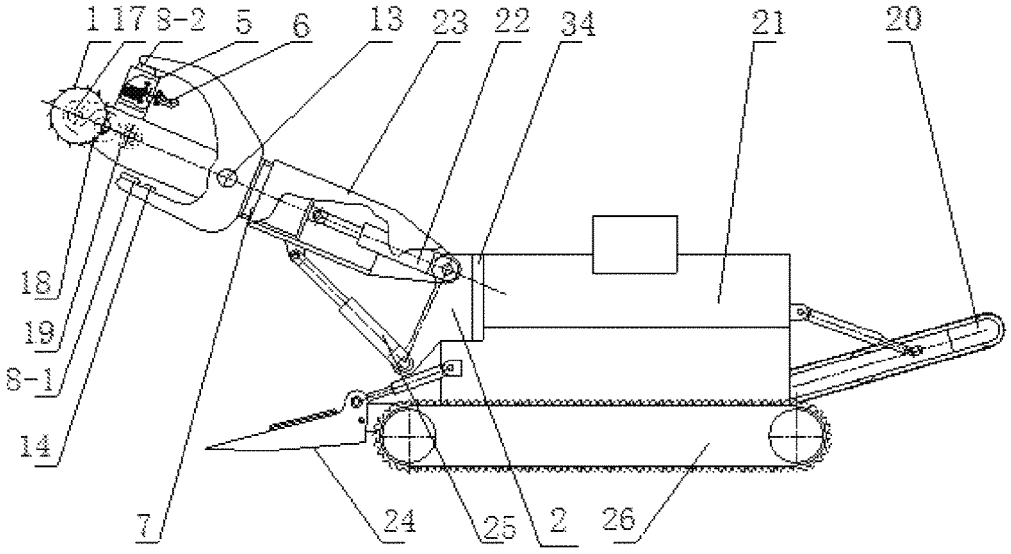

FIG. 4

HIGH-FREQUENCY VIBRATING TRANSVERSE DRUM CUTTER HEAD, AND DRUM CUTTER MACHINE AND TUNNEL BORING MACHINE THEREWITH

CROSS-REFERENCE TO RELATED APPLICATION

This patent application is a 35 USC § 371 U.S. national stage of International Application No. PCT/CN2015/000535 filed on Aug. 3, 2015, which claims priority under the Paris Convention to the Chinese Patent Application No. CN 201510337224.6 filed on Jun. 17, 2015.

FIELD OF THE DISCLOSURE

The present disclosure relates generally to the technical field of construction machinery, and specifically to a high-frequency vibrating transverse drum cutter head, and a drum cutter machine and a tunnel boring machine with such drum cutter head.

BACKGROUND OF THE DISCLOSURE

The drum cutter machine is a hydraulic appurtenance supporting the use of an excavator, which can be widely used for construction, such as tunnel, channel, engineering construction, and rock excavation, with advantages of high efficiency, accuracy and low cost. According to different arrangements of the drum cutter head, the drum cutter machine can be divided into two basic categories: transverse drum cutter machine and longitudinal drum cutter machine. Drum cutter machines of various sizes have been used in many countries in the prior art. The tunnel boring machine is a kind of construction equipment similarly to a drum cutter machine mounted on a special chassis, which combines functions of cutting, loading, travelling and operation, and is mainly used to cut down-hole rock, coal-rock drift or mixed coal-rock drift, each with cross-sections of arbitrary shapes. Both of the drum cutter machine and the tunnel boring machine may work like this: the drum cutter head may be driven by a hydraulic motor through a transmission mechanism to rotate, so that cutting teeth mounting on the drum cutter head can cut the contacted materials and thus strip away the materials, to achieve the purpose of drilling and digging. An electric motor may be further used to drive the drum cutter head in the tunnel boring machine. Both of the drum cutter machine and the tunnel boring machine in the prior art may be generally suitable for rock formations or minerals with relatively low hardness, and they may be not able to work or in low efficiency when encountering rock formations with relatively high hardness, with great spoilage of cutting teeth, so their application sites receive restriction.

SUMMARY OF THE DISCLOSURE

A technical problem to be solved by the present disclosure is to provide a high-frequency vibrating transverse drum cutter head, and a drum cutter machine and a tunnel boring machine with such drum cutter head, a drum cutter wheel of which can perform high frequency repetitive vibration while doing rotation movement, making the cutting teeth on the drum cutter wheel apply combined action of impacting and cutting on the contacted materials, so as to break hard rock easily.

The above technical problem can be solved by the following technical solutions.

A high-frequency vibrating transverse drum cutter head is provided, including a transverse drum cutter wheel **16**, a drum cutter head base **12**, and a cutting motor **4**, wherein the transverse drum cutter wheel **16** is driven by the cutting motor **4** to rotate, the transverse drum cutter wheel **16** is provided with cutting teeth **1**, the transverse drum cutter wheel **16** is mounted on one end of the drum cutter head base **12**, the other end of the drum cutter head base **12** is connected to a U-shaped drum cutter mechanism body **10**, a connecting base **7** is mounted on the U-shaped drum cutter mechanism body **10** and used for mounting the high-frequency vibrating transverse drum cutter head on a drum cutter machine or a tunnel boring machine, a vibration box **5** is mounted on the drum cutter head base **12**, and the vibration box **5** is adapted to output high-frequency vibration force to the transverse drum cutter wheel **16** through the drum cutter head base **12**, so that the transverse drum cutter wheel **16** is able to perform high-speed repetitive vibrating movement while achieving its own rotation.

An upper air spring **8-2** which is compressible by the U-shaped drum cutter mechanism body **10** is arranged at the top of the vibration box **5**, and a lower air spring **8-1** which is compressible by the drum cutter head base **12**, and a first vibration reduction rubber **14** are arranged on the lower part of the U-shaped drum cutter mechanism body **10**.

The middle part of the U-shaped drum cutter mechanism body **10** is connected to the drum cutter head base **12** through a connection bearing **13**, or alternatively, a lateral side of the U-shaped drum cutter mechanism body **10** is provided with a strengthening rib **33**, the drum cutter head base **12** is connected to the strengthening rib **33** through a lateral vibration reduction rubber **27** to achieve sliding displacement, and a second vibration reduction rubber **15** is arranged between the drum cutter head base **12** and the U-shaped drum cutter mechanism body **10**.

The cutting motor **4** is mounted on the drum cutter head base **12**, a driving gear **19** is mounted on an output end of the cutting motor **4**, the driving gear **19** is engaged with a transmission gear **18** mounted on the drum cutter head base **12**, and the transmission gear **18** is engaged with a driven gear **17** mounted on the axle of the transverse drum cutter wheel **16**.

A pivoting support **29** is mounted between the U-shaped drum cutter mechanism body **10** and the connecting base **7**, so that the high-frequency vibrating transverse drum cutter head is pivotable about the connecting base **7** for a certain angle.

A drum cutter machine with the high-frequency vibrating transverse drum cutter head according to the present disclosure has the following structure: the high-frequency vibrating transverse drum cutter head is connected to one end of a telescopic driving arm **23** through the connecting base **7**, the other end of the driving arm **23** is hinged to a mounting base **2** of an excavator or tunnel boring machine, a telescopic cylinder **22** and a lifting cylinder **25** are mounted on a lateral side and a lower side of the driving arm **3** respectively, one end of each of the telescopic cylinder **22** and the lifting cylinder **25** is hinged to the mounting base **2**, and the other end of each of the telescopic cylinder **22** and the lifting cylinder **25** is hinged to the driving arm **23**.

A tunnel boring machine with the high-frequency vibrating transverse drum cutter head according to the present disclosure has the following structure: the high-frequency vibrating transverse drum cutter head is connected to one end of a telescopic driving arm **23** through the connecting base **7**, the other end of the driving arm **23** is hinged to a mounting base **2** of an excavator or tunnel boring machine,

a telescopic cylinder **22** and a lifting cylinder **25** are mounted on a lateral side and a lower side of the driving arm **23** respectively, one end of each of the telescopic cylinder **22** and the lifting cylinder **25** is hinged to the mounting base **2**, and the other end of each of the telescopic cylinder **22** and the lifting cylinder **25** is hinged to the driving arm **23**; and the mounting base **2** is mounted on one end of a tunnel boring machine chassis **21**, a side-shifting mechanism **34** is provided to control the mounting base **2** to swing from side to side, the other end of the tunnel boring machine chassis **21** is provided with a conveying device **20**, a collecting device **24** is arranged below the driving arm **23**, mounted on the tunnel boring machine chassis **21**, and connected to the conveying device **20**, and a travelling mechanism **26** is mounted at the bottom of the tunnel boring machine chassis **21**.

The high-frequency vibrating transverse drum cutter head according to the present disclosure can perform both rotation motion and high frequency repetitive vibration at the same time, through the combination of the transverse drum cutter wheel and the vibration box, making the cutting teeth on the drum cutter wheel apply combined action of impacting and cutting on the contacted materials, so as to break hard rock easily.

The drum cutter machine or tunnel boring machine fitted with the high-frequency vibrating transverse drum cutter head according to the present disclosure can not only cut the materials with the cutting teeth, but also apply great impact force to break the rock instantaneously. Compared with the prior art, the drum cutter machine or tunnel boring machine according to the present disclosure can excavate various rocks and materials with high hardness, and significantly improve the operating efficiency of rocks and materials with low hardness. Since the rock bodies are broken into pieces mainly by the impact force, the abrasion of the cutting teeth is significantly reduced, with obvious advantages. In addition, such drum cutter machine or tunnel boring machine is suitable for various rocks with medium or high hardness, to improve operating efficiency and reduce the abrasion of the cutting teeth.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a structural schematic diagram illuminating a high-frequency vibrating transverse drum cutter head according to a first embodiment of the present disclosure, in which the drum cutter head base **12** is connected to the drum cutter mechanism body **10** through a connection bearing **13**.

FIG. **2** is a left view of FIG. **1**.

FIG. **3** is a structural schematic diagram illuminating a high-frequency vibrating transverse drum cutter head according to a second embodiment of the present disclosure, in which the drum cutter head base **12** is connected to the drum cutter mechanism body **10** through a lateral vibration reduction rubber **27**.

FIG. **4** is a schematic diagram illuminating a drum cutter machine with the high-frequency vibrating transverse drum cutter head of FIG. **1** and a tunnel boring machine therewith.

DESCRIPTION OF REFERENCE SIGNS

1 cutting tooth, **2** mounting base, **4** cutting motor, **5** vibration box, **6** vibration motor, **7** connecting base, **8-1** upper air spring, **8-2** lower air spring, **10** drum cutter mechanism body, **12** drum cutter head base, **13** connection bearing, **14** first vibration reduction rubber, **15** second vibration reduction rubber, **16** transverse drum cutter wheel, **17** driven gear, **18** transmission gear, **19** driving gear, **20** conveying device, **21** tunnel boring machine chassis, **22** telescopic cylinder, **23** driving arm, **24** collecting device, **25** lifting cylinder, **26** travelling mechanism, **27** lateral vibration reduction rubber, **28** pivoting support motor, **29** pivoting support, **30** left eccentric wheel, **31** right eccentric wheel, **32** meshing gear, **33** strengthening rib and **34** side-shifting mechanism.

DETAILED DESCRIPTION OF THE DISCLOSURE

In the following description of embodiments, reference is made to the accompanying drawings which form a part hereof, and in which it is shown by way of illustration specific embodiments of the disclosure that can be practiced.

First Embodiment

As shown in FIGS. **1** and **2**, a high-frequency vibrating transverse drum cutter head is provided, including a transverse drum cutter wheel **16**, a drum cutter head base **12**, a cutting motor **4**, a vibration box **5** and a U-shaped drum cutter mechanism body **10**. The transverse drum cutter wheel **16** is arranged transversely with respect to the U-shaped drum cutter mechanism body **10**, adapted to transversely cut the object to be milled and excavated. The transverse drum cutter wheel **16** is driven by the cutting motor **4** to rotate. The cutting motor **4** is mounted on the drum cutter head base **12**. A driving gear **19** is mounted on the output end of the cutting motor **4**. The driving gear **19** is engaged with a transmission gear **18** mounted on the drum cutter head base **12**. The transmission gear **18** is engaged with a driven gear **17** mounted on the axle of the transverse drum cutter wheel **16**. The driving gear **19**, transmission gear **18** and the driven gear **17** are arranged side by side. The transverse drum cutter wheel **16** is provided with cutting teeth **1**. The transverse drum cutter wheel **16** is mounted on one end of the drum cutter head base **12**, and the other end of the drum cutter head base **12** is connected to the middle part of the U-shaped drum cutter mechanism body **10** through a connection bearing **13**, so that the drum cutter head base **12** may pivot about the connection bearing **13** for a certain angle. A connecting base **7** is mounted on the U-shaped drum cutter mechanism body **10** and used for mounting the high-frequency vibrating transverse drum cutter head on a drum cutter machine or a tunnel boring machine. The connecting base **7** may be connected to a bucket pin of an excavator. The vibration box **5** is mounted on the drum cutter head base **12**. An upper air spring **8-2** which is compressible by the U-shaped drum cutter mechanism body **10** is arranged at the top of the vibration box **5**, and a lower air spring **8-1** which is compressible by the drum cutter head base **12**, and a first vibration reduction rubber **14** are arranged on the lower part of the U-shaped drum cutter mechanism body **10**. Any appropriate vibration box in the prior art may be used as the vibration box **5**.

In this embodiment, the vibration box **5** has a left eccentric wheel **30** and a right eccentric wheel **31** arranged in pair. Meshing gears **32** mounted on rotation shafts of the left eccentric wheel **30** and the right eccentric wheel **31** respectively are exactly the same. The rotation shaft of one eccentric wheel is driven by the vibration motor **6** to rotate, making the eccentric wheel in pair move relative to one another through the meshing gears **32**, so that the vibration box **5** output high frequency vibration force on the drum cutter head base **12**. In this way, the transverse drum cutter

wheel **16** is able to perform high-speed repetitive vibrating movement while achieving its own rotation.

When working, the cutting motor **4** may be activated to drive the driving gear **19** to rotate, and the transmission gear **18** engaged with the driving gear **19**, and the driven gear **17** engaged with the transmission gear **18** are further driven to rotate, so the transverse drum cutter wheel **16** coaxial with the driven gear may be driven to rotate. Then the vibration motor **6** may be activated to drive the rotation shafts of the eccentric wheels to rotate. The two rotation shafts make in-phase rotations with respect to each other through exactly same meshing gears, so as to bring the left eccentric wheel **30** and the right eccentric wheel **31** which are exactly the same into in-phase rotation movements. In this way, the eccentric three of the vibration box in the horizontal direction may be offset, while the eccentric force of the vibration box in the vertical direction may be superposed, so the vibration box may output repetitive vibration force in the vertical direction on the drum cutter head base **12**, to drive the transverse drum cutter wheel **16** to make repetitive vibration movement. Since the other end of the drum cutter head base **12** is connected to the U-shaped drum cutter mechanism body **10** through the connection bearing **13**, the repetitive movement of the transverse drum cutter wheel **16** may make a circle with the center of the connection bearing **13**, with a vibration frequency depending on the rotation speed of the vibration motor **6**.

When the drum cutter head base **12** is driven by the vibration box **5** to make high speed repetitive movement, the position of the top of the vibration box **5** moving upwards may be restrained by the upper air spring **8-2**, and meanwhile, the upper air spring **8** may store the upward vibration force and the counter force of the material to be cut applying on the transverse drum cutter wheel **16**, and these forces may be released during the downward movement, so the cutting teeth may have greater impact force on the material. A lower air spring **8-1** and a first vibration reduction rubber **14** are arranged between the drum cutter head base **12** and the U-shaped drum cutter mechanism body **10**.

Second Embodiment

As shown in FIG. **3**, the configuration of the high-frequency vibrating transverse drum cutter head in this embodiment is almost the same as that in the first embodiment, except that the U-shaped drum cutter mechanism body **10** is not connected to the drum cutter head base **12** through the bearing, but a lateral vibration reduction rubber **27**. The drum cutter head base **12** may be connected to the mechanism body **10** through a plurality of lateral vibration reduction rubbers, with a certain range of motion. As shown in FIG. **3**, a lateral side of the U-shaped drum cutter mechanism body **10** is provided with a strengthening rib **33**, the drum cutter head base **12** is connected to the strengthening rib **33** through a lateral vibration reduction rubber **27**, and a second vibration reduction rubber **15** is arranged between the drum cutter head base **12** and the U-shaped drum cutter mechanism body **10**. The second vibration reduction rubber **15** may have a function of vibration reduction for the U-shaped drum cutter mechanism body **10**, while restricting the displacement of the drum cutter head base **12** to the right.

In order to facilitate the operations of the high-frequency vibrating transverse drum cutter head according to the present disclosure for objects with different angles, a pivoting support **29** may be arranged between the U-shaped drum cutter mechanism body **10** and the connecting base **7**. The base of the pivoting support **29** is fixedly connected to the connecting base **7**, and the rotation part is fixedly connected to the U-shaped drum cutter mechanism body **10**, so that the high-frequency vibrating transverse drum cutter head may pivot about the connecting base **7** for a certain angle.

As shown in FIG. **4**, the high-frequency vibrating transverse drum cutter head according to the present disclosure may be used in a drum cutter machine or tunnel boring machine. The drum cutter machine according to the present disclosure is an appurtenance supporting the use of the excavator, which has the following structure: the high-frequency vibrating transverse drum cutter head of the first embodiment is connected to one end of a telescopic driving arm **23** through the connecting base **7**, the other end of the driving arm **23** is hinged to a mounting base **2** of an excavator or tunnel boring machine, a telescopic cylinder **22** and a lifting cylinder **25** are mounted on a lateral side and a lower side of the driving arm **3** respectively, one end of each of the telescopic cylinder **22** and the lifting cylinder **25** is hinged to the mounting base **2**, and the other end of each of the telescopic cylinder **22** and the lifting cylinder **25** is hinged to the driving arm **23**.

The high-frequency vibrating transverse drum cutter head according to the present disclosure should be connected to the driving arm **23** and then connected to the excavator for working. The location of the bucket may be replaced with the connecting base **7**. A hydraulic pipe may be connected to a pipe of the driving device of the present invention. Upon connecting, the U-shaped drum cutter mechanism body **10** may be positioned to a position that needs to be milled and excavated, through the operation of the arms of the excavator.

After the rotation speed and the vibration frequency of the transverse drum cutter wheel **16** are adjusted to appropriate values, the transverse drum cutter wheel **16** may contact the object to be milled and excavated, through controlling the driving arm **23**. The cutting teeth **1** may not only cut the object, but also apply vibration impact force on the object, to break the rock instantaneously. The broken materials may be drained out to move out of place through the rotation movement of the drum cutter head **2**, to avoid secondary abrasion of the cutting teeth **1**.

The transverse drum cutter wheel **16** may be further driven to contact the object to be milled and excavated sequentially through operating the arms of the excavator, to form a sequential construction operation.

The tunnel boring machine according to the present disclosure is shown in FIG. **4**, which incorporates a travelling mechanism **26**, a tunnel boring machine chassis **21**, a collecting device **24** and a conveying device **20**, based on the above high-frequency vibrating drum cutter machine. The high-frequency vibrating transverse drum cutter head of the first embodiment is connected to one end of a driving arm **23** through the connecting base **7**, the driving arm **23** is in a telescopic structure, the other end of the driving arm **23** is hinged to a mounting base **2**, the mounting base **2** is fixed on the excavator, a telescopic cylinder **22** and a lifting cylinder **25** are mounted on a lateral side and a lower side of the driving arm **3** respectively, one end of each of the telescopic cylinder **22** and the lifting cylinder **25** is hinged to the mounting base **2**, and the other end of each of the telescopic cylinder **22** and the lifting cylinder **25** is hinged to the driving arm **23**; and the mounting base **2** is mounted on one end of the tunnel boring machine chassis **21**, a side-shifting mechanism **34** is mounted between the mounting base **2** and the tunnel boring machine chassis **21**, and the mounting base **2** is controllable to swing from side to side by the side-

shifting mechanism **34**, so that the driving arm **23** can perform lateral motion for a certain angle. The other end of the tunnel boring machine chassis **21** is provided with the conveying device **20**, a collecting device **24** is arranged below the driving arm **23**, mounted on the tunnel boring machine chassis **21**, and connected to the conveying device **20**, and a travelling mechanism **26** is mounted at the bottom of the tunnel boring machine chassis **21**. The high-frequency vibrating transverse drum cutter head of the second embodiment is used as the high-frequency vibrating transverse drum cutter head of this embodiment.

The tunnel boring machine chassis **21** used herein is the same as that in the prior art. The hydraulic pump may be driven by an engine or electric motor in the chassis to provide the power source. The driving arm **23** may move up and down through the lifting cylinder **25**. The U-shaped drum cutter mechanism body **10** is mounted on the front end of the driving arm **23**. The driving arm **23** is provided with the telescopic cylinder **22** which makes the U-shaped drum cutter mechanism body **10** take a certain telescopic motion.

During working, the tunnel boring machine chassis **21** may drive the travelling mechanism to a working position. The driving arm **23** may be lifted to a required position by the telescopic cylinder **22**. Then the cutting motor **4** may be activated, and drive the transverse drum cutter wheel **16** to rotate.

The vibration motor **6** may be activated to make the vibration box **5** vibrate in high-frequency. The vibration box **5** may drive the drum cutter head base **12** to make high-speed repetitive movement.

After the rotation speed and the vibration frequency of the transverse drum cutter wheel **16** are adjusted to appropriate values, the transverse drum cutter wheel **16** may contact the object to be milled and excavated, through the operation of the telescopic cylinder **22**. The cutting teeth **1** may not only cut the object, but also apply vibration impact force on the object, to break the rock instantaneously. The broken materials may be drained out to fall down to the ground through the rotation movement of the drum cutter head **2**.

The collecting device **24** may collect the falling materials continuously, and transmit them to the lower part of the tunnel boring machine chassis **21** until the conveying device **20** at the back. The materials may be conveyed to a transport cart by the conveying device **20**. In this way, a sequential boring operation may be formed.

The cutting motor **4** in the tunnel boring machine according to the present disclosure may be replaced with an electric motor. The drum cutter head may be driven by the electric motor through a gearbox.

According to the requirements of working conditions, the vibration box in the present invention is not limited to the above structure of eccentric vibration box, but can use a 6-eccentric wheel, 8-eccentric wheel, eccentric block or other vibration boxes of various configurations.

Preferably, a vibration box with a continuously adjustment mechanism having a eccentric moment may be used, so that the vibration box may output vibration force only when the vibration frequency of the vibration box reach a preset value, to avoid the damage of the machine caused by the machine operating within its resonance frequency range.

What is claimed is:

1. A vibrating transverse drum cutter head, comprising a transverse drum cutter wheel, a drum cutter head base, and a cutting motor, wherein the transverse drum cutter wheel is driven by the cutting motor to rotate, the transverse drum cutter wheel is provided with cutting teeth, the transverse drum cutter wheel is mounted on one end of the drum cutter head base, the other end of the drum cutter head base is connected to a U-shaped drum cutter mechanism body, a connecting base is mounted on the U-shaped drum cutter mechanism body and used for mounting the vibrating transverse drum cutter head on a drum cutter machine or a tunnel boring machine, a vibration box is mounted on the drum cutter head base, and the vibration box is adapted to output vibration force to the transverse drum cutter wheel through the drum cutter head base, so that the transverse drum cutter wheel is able to perform repetitive vibrating movement while achieving its own rotation, wherein an upper air spring which is compressible by the U-shaped drum cutter mechanism body is arranged at a top of the vibration box, and a lower air spring which is compressible by the drum cutter head base, and a first vibration reduction rubber are arranged on a lower part of the U-shaped drum cutter mechanism body.

2. The vibrating transverse drum cutter head of claim **1**, wherein a middle part of the U-shaped drum cutter mechanism body is connected to the drum cutter head base through a connection bearing, or alternatively, a lateral side of the U-shaped drum cutter mechanism body is provided with a strengthening rib, the drum cutter head base is connected to the strengthening rib through a vibration reduction rubber to achieve sliding displacement, and a second vibration reduction rubber is arranged between the drum cutter head base and the U-shaped drum cutter mechanism body.

3. The vibrating transverse drum cutter head of claim **1**, wherein the cutting motor is mounted on the drum cutter head base, a driving gear is mounted on an output end of the cutting motor, the driving gear is engaged with a transmission gear mounted on the drum cutter head base, and the transmission gear is engaged with a driven gear mounted on an axle of the transverse drum cutter wheel.

4. The vibrating transverse drum cutter head of claim **1**, wherein a pivoting support is mounted between the U-shaped drum cutter mechanism body and the connecting base, so that the high-frequency vibrating transverse drum cutter head is pivotable about the connecting base for a certain angle.

5. A drum cutter machine with the vibrating transverse drum cutter head of claim **1**, wherein the vibrating transverse drum cutter head is connected to one end of a telescopic driving arm through the connecting base, the other end of the driving arm is hinged to a mounting base of the drum cutter machine, a telescopic cylinder and a lifting cylinder are mounted on a lateral side and a lower side of the driving arm respectively, one end of each of the telescopic cylinder and the lifting cylinder is hinged to the mounting base, and the other end of each of the telescopic cylinder and the lifting cylinder is hinged to the driving arm.

6. A tunnel boring machine with the vibrating transverse drum cutter head of claim **1**, wherein the vibrating transverse drum cutter head is connected to one end of a telescopic driving arm through the connecting base, the other end of the driving arm is hinged to a mounting base of the tunnel boring machine, a telescopic cylinder and a lifting cylinder are mounted on a lateral side and a lower side of the driving arm respectively, one end of each of the telescopic cylinder and the lifting cylinder is hinged to the mounting base, and the other end of each of the telescopic cylinder and the lifting cylinder is hinged to the driving arm; and the mounting base is mounted on one end of a tunnel boring machine chassis, a side-shifting mechanism is provided to control the mounting base to swing from side to side, the other end of the tunnel boring machine chassis is provided with a conveying device, a collecting device is arranged below the

driving arm, mounted on the tunnel boring machine chassis, and connected to the conveying device, and a travelling mechanism is mounted at the bottom of the tunnel boring machine chassis.

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