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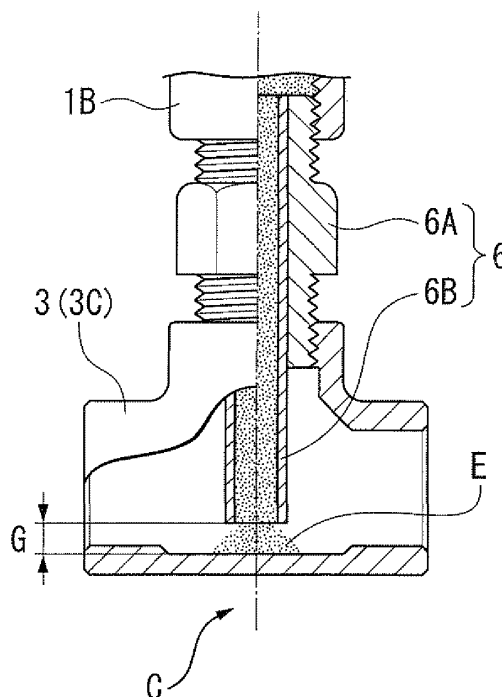
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(54) **DRESSER FEEDING DEVICE**

(57) A dresser supply device of a grinding tool which supplies powdery dresser to a grinding tool having an abrasive grain layer on cutting blade tips, the dresser supply device comprising: an air supply source which supplies air; a dresser supply air pipe including a base end which is connected to the air supply source; a dresser tank which holds the dresser; a dresser supply pipe which connects the dresser tank and the dresser supply air pipe to each other, is smaller in diameter than the dresser supply air pipe at a connecting portion with the dresser supply air pipe, has a first tip inserted and projecting into the dresser supply air pipe, and is located at a space from an inner peripheral surface of the dresser supply air pipe; and an opening-and-closing valve which is provided in the dresser supply air pipe between the connecting portion and the air supply source side.

FIG. 3



Description

TECHNICAL FIELD

[0001] The present invention relates to a dresser supply device which supplies dresser to a grinding tool such as a core drill which has an abrasive grain layer as a cutting blade tips.

BACKGROUND ART

[0002] A grinding tool, such as a core drill which has an abrasive grain layer as a cutting blade tips on the tip of a cylindrical drill body is used for drilling a wall or the like of an existing concrete structure. The abrasive grain layer is constructed of combined diamond abrasive grains by a binder. In the drilling by this core drill, the drill body is advanced while being rotated around its cylindrical central axis and is made to cut into a concrete structure. Thereby, a rebar or the like in the structure is cut while digging up the concrete by the grinding action by the abrasive grains of the cutting blade tips. After that, the hole is opened to concrete or the like.

[0003] In the drilling by such a core drill, conventionally, drilling is performed while cooling water is supplied to the cutting blade tips for the purpose of removing chips generated by grinding or cooling the cutting blade tips. However, the supplied cooling water is discharged as muddy water including the chips. Consequently, there is a possibility of polluting the surrounding environments. For this reason, in recent years, the drilling by a dry construction method, which supplies compressed air to perform chip removal and cooling, and collects dust of the discharged chips by a dust collector instead of a wet construction method using such cooling water is being performed. On the other hand, however, in such a dry construction method, the abrasive grain layer which constitutes the cutting blade tips causes clogging immediately due to the dust of the chips, thereby impairing the grinding action. Thus, a problem occurs that efficient drilling becomes impossible.

[0004] Thus, a drilling apparatus and a dresser supply device are suggested in, for example, Patent Documents 1 to 3. In Patent Documents 1 to 3, the drilling apparatus and the dresser supply device with improved drilling efficiency are disclosed.

Namely, a proper quantity of dresser (grinding material) along with compressed air is intermittently supplied to the cutting blade tips of a core drill, thereby the self growing action of abrasive grains which become the cutting blades is promoted while the grain layer is dressed even during the drilling. Consequently, the sharpness of the cutting tips is maintained. Moreover, the inventors of the present invention have also suggested a drilling apparatus equipped with such a dresser supply device, and using ultrafine anhydrous silica with a particle size of 5 to 50 nm which has a silanol group as the dresser, in Patent Document 4.

[0005] Meanwhile, in the dresser supply devices described in Patent Documents 2 to 4, a tank holding the dresser is only connected to a supply pipe which supplies compressed air toward a core drill via a valve. For this reason, the valve should be frequently opened and closed in intermittently supplying the dresser. The dresser to be supplied is a hard dresser having the same property as the abrasive grains. Thus, there is a possibility in that the valve body which engulfs the dresser cannot be reliably opened and closed. Moreover, there is a possibility in that the dresser cannot be supplied early due to severe damage of the valve.

[0006] On the other hand, a supply device in which the tank of the dresser is connected to the compressed air supply pipe via the valve as described above is described in Patent Document 1. In addition, the supply pipe is branched by a solenoid valve of a three-way valve type into an air supply line which goes to core drill side from this valve, and a dresser supply line arranged between the air supply line and the valve, a dresser tank is connected to the dresser supply line via a T-shaped discharge nozzle, and a branch pipe branches from between a discharge nozzle of the dresser supply line and the valve is connected to an upper end of the dresser tank is also described in Patent Document 1. In this dresser supply device, when compressed air passes through the air supply line, the dresser is not supplied, and when compressed air flows into the dresser supply line by the switching of the solenoid valve, a portion of the dresser flows into the dresser tank from the branch pipe, and thus the pressure within the tank becomes equal to the pressure of the discharge nozzle. Thereby, the dresser is discharged to a main pipe of the dresser supply line and is supplied to the core drill side by the remaining compressed air that flows through the main pipe.

[0007] However, in this dresser supply device, the connection between the dresser tank and the main pipe of the dresser supply line is made by a mere T-shaped discharge nozzle. Therefore, it is difficult to exactly control the discharge amount of the dresser to be discharged from the dresser tank to the main pipe of the dresser supply line, i.e., the supply amount per once of the dresser to be intermittently supplied to the core drill at every switching of the solenoid valve so as to always become a certain quantity. For this reason, if the amount of supply of the dresser is little, the abrasive grain layer is not sufficiently dressed, and the sharpness of the cutting blade tips cannot be maintained. On the contrary, if the supply amount is excessive, the abrasive grain layer may be dressed more than needed. Thus, there is a possibility of significantly shortening the product life of the core drill.

[0008] Further, in this dresser supply device, the control of the discharge amount of the dresser is difficult. Thus, there is also a possibility of discharging a larger amount of dresser at a time from the dresser tank. The dresser discharged in large quantity in this way may form a bridge to block the main pipe. Accordingly, in this case, the subsequent dresser supply becomes impossible.

Therefore, once drilling operation is interrupted, the dresser with which a bridge is formed has to be removed. As a result, operating efficiency may be lowered significantly.

[Patent Document 1] Japanese Unexamined Patent Application Publication, First Publication No. H08-18326

[Patent Document 2] Japanese Unexamined Patent Application Publication, First Publication No. H08-18327

[Patent Document 3] Japanese Patent Publication No. 2549787

[Patent Document 4] Japanese Unexamined Patent Application Publication, First Publication No. 2002-370167

DISCLOSURE OF THE INVENTION

[Problems to be Solved by the Invention]

[0009] The present invention is achieved in view of the above circumstances, and has an object of providing a dresser supply device which can more accurately and more reliably supply a specific amount of dresser in intermittently supplying the dresser to an abrasive grain layer during grinding by a grinding tool, such as the drilling by the aforementioned core drill.

Means for Solving the Problems

[0010] In order to solve the above problems to achieve such an object, the present invention provides a dresser supply device of a grinding tool which supplies powdery dresser to a grinding tool having an abrasive grain layer on cutting blade tips. The dresser supply device includes: an air supply source which supplies air; a dresser supply air pipe including a base end which is connected to the air supply source; a dresser tank which holds the dresser; a dresser supply pipe which connects the dresser tank and the dresser supply air pipe to each other, is smaller in diameter than the dresser supply air pipe at a connecting portion with the dresser supply air pipe, has a first tip inserted and projecting into the dresser supply air pipe, and is located at a space from an inner peripheral surface of the dresser supply air pipe; and an opening-and-closing valve which is provided in the dresser supply air pipe between the connecting portion and the air supply source side.

[0011] The supply device of the invention may further include a control unit which allows the opening-and-closing valve to be opened and closed intermittently. When the opening-and-closing valve is opened, the air from the air supply source is introduced into the dresser supply air pipe, and the dresser supplied into the dresser supply air pipe via the dresser supply pipe from the dresser tank is supplied to the grinding tool side along with air. At this time, since the opening-and-closing valve is disposed

closer to the air supply source, i.e., the more upstream side than the connecting portion with the dresser supply pipe to which the dresser is supplied in the dresser supply air pipe, the dresser does not pass the opening-and-closing valve, and the opening-and-closing valve is not damaged by engulfing, etc. of the dresser.

[0012] Next, when the opening-and-closing valve is closed, powdery dresser is supplied via the dresser supply pipe from the dresser tank and is held within the dresser supply air pipe at the connecting portion with the dresser supply pipe. At this time, in the present invention, the dresser supply pipe is smaller in diameter than the dresser supply air and has a first tip protruding and inserted into the dresser supply air pipe at a space from the inner peripheral surface of the dresser supply air pipe, the dresser forms a cone at a tapered angle according to an angle of repose between the first tip of the dresser supply pipe and the inner peripheral surface of the dresser supply air pipe.

[0013] Since the cone formed in this way is stabilized so as to form a bridge between the first tip of the dresser supply pipe and the inner peripheral surface of the dresser supply air pipe, a lot of dresser exceeding the volume of the cone is not supplied at a stretch. Accordingly, the gap between the first tip of the dresser supply pipe and the inner peripheral surface of the dresser supply air pipe is set such that the amount of dresser of a cone to be formed between them becomes an amount according to the supply amount per once of the dresser to be supplied to the grinding tool side, so that a specific amount of dresser can always be exactly supplied to the inside of the dresser supply air pipe.

[0014] On the other hand, the dresser supply pipe of a small diameter projects and is inserted into the dresser supply air pipe. As a result, at the connecting portion between the dresser supply pipe and the dresser supply air pipe, dresser is supplied into the dresser supply air pipe and even though the cone is formed, a gap portion is formed between the inner peripheral surface of the dresser supply air pipe and the outer peripheral surface of the dresser supply pipe. Moreover, the area of the gap portion is smaller than the cross-sectional area in the dresser supply air pipe. For this reason, the air introduced into the dresser supply air pipe when the opening-and-closing valve is opened next pushes and collapses the dresser formed in a conical shape when passing through the connecting portion, or increases in flow rate so as to engulf the dresser when passing through the gap portion with small area and is thereby supplied to the grinding tool side along with the dresser.

[0015] As such, according to the dresser supply device of the invention, it is possible to exactly supply a specific amount of dresser to the dresser supply air pipe by intermittent opening-and-closing of the opening-and-closing valve, and it is possible to reliably supply the dresser to the grinding tool side by air. Accordingly, it is possible to reliably dress the abrasive grain layer which forms the cutting blade tips of the grinding tool, such as a core drill

without causing excessive wear, thereby performing grinding while the sharpness thereof is maintained. Thereby, a grinding operation, such as stable and efficient drilling, can be performed while the extension of tool life is achieved.

[0016] Here, the gap between the first tip of the dresser supply pipe and the inner peripheral surface of the dresser supply air pipe may be adjustable. In this case, even if changes occur in various conditions during the grinding operation, such as drilling by a core drill, according to the changes, by the gap is adjusted it is possible to intermittently supply dresser in a supply amount per once which is always optimal.

[0017] Further, the dresser supply device may include an air supply pipe provided with a pressure control valve which connects the region of the dresser supply air pipe between the opening-and-closing valve and the air supply source; and the region of the dresser supply air pipe between the connecting portion and a second tip on the side of the grinding tool. By reducing the pressure of the air which flows through the inside of the air supply pipe by the pressure control valve, the air introduced into the dresser supply air pipe has a higher pressure than the air supply pipe when the opening-and-closing valve is opened. Accordingly, it is possible to reliably supply the dresser supplied to the connecting portion to the grinding tool via the air supply pipe from the connecting portion between the dresser supply air pipe and the air supply pipe on the grinding tool side.

[0018] Moreover, when the air supply pipe is connected in this way, a dresser tank connecting tube is communicated with: a portion between the connecting portion of the dresser supply air pipe and the second tip of the dresser supply air pipe; and a inside of the dresser tank. When the is closed, the pressure of the air which flows through the inside of an air supply pipe serves as high voltage rather than a dresser supply air pipe instantaneously, and this high-pressure air flows into a dresser supply air pipe from the connecting portion of the grinding tool side of both pipes. However, when the dresser tank connecting tube is connected, the air which has flowed into the dresser supply air pipe from the air supply pipe is introduced into the dresser tank from the dresser tank connecting tube, and the impact of an air hammer acts on the dresser held within the dresser tank. Accordingly, the dresser supply pipe has a small diameter as described above. Therefore, even if dresser forms a bridge within the dresser supply pipe, this bridge is collapsed by the impact of the air hammer action, and the dresser is extruded by the pressure by the air introduced into the dresser tank, so that every proper amount of dresser can be reliably supplied to the dresser supply air pipe. Advantages of the Invention

[0019] As described above, according to present the invention, every specific amount of dresser can be reliably and exactly supplied to the grinding tool side intermittently. Accordingly, it is possible to perform grinding, such as drilling, while the abrasive grain layer which

forms the cutting blade tips of the grinding tool, such as a core drill, is dressed without causing excessive wear. For this reason, since grinding can be performed while the sharpness of the cutting blade tips is maintained, stable and efficient grinding can be performed while the extension of tool life is achieved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a view showing the schematic configuration of one embodiment of the present invention.

FIG. 2 is a view showing a dresser supply air pipe and an air supply pipe of the embodiment shown in FIG. 1.

FIG. 3 is a partial fragmentary view showing a connecting portion of the embodiment shown in FIG. 1.

FIG. 4 is a view in which the connecting portion of the embodiment shown in FIG. 1 is seen from an extension direction of the dresser supply air pipe.

[Reference Numerals]

[0021]

1:	dresser tank
2:	air compressor (air supply source)
3:	dresser supply air pipe
3A to 3D:	pipe joint
4:	air supply pipe
4A:	ball valve (pressure control valve)
6:	dresser supply pipe
6A	coupling member
6B:	pipe body
7:	solenoid valve (opening-and-closing valve)
8:	control unit
9:	dresser tank connecting tube
10:	drilling tool (grinding tool)
A to C:	connecting portion
E:	dresser
S:	dresser supply device

BEST MODE FOR CARRYING OUT THE INVENTION

[0022]

FIGS. 1 to 4 show one embodiment of the invention. As shown in FIG. 1, a dresser supply device S of this embodiment includes a dresser tank 1 holding powdery dresser E, an air compressor 2 as an air supply source, a dresser supply air pipe 3 connected to the grinding tool side from the air compressor 2, and an air supply pipe 4 both ends of which are respectively connected to the portions of the dresser supply air pipe 3 on the air compressor 2 side and the grinding tool side (second tip side of the dresser supply air pipe 3) at connecting portions A and B, respectively, and which extend in parallel with the dresser supply air pipe 3, which are mounted on and integrated with a portable frame 5. Also, the dresser

supply air pipe 3 is connected with the dresser tank 1 via a dresser supply pipe 6 at a connecting portion C between the connecting portions A and B.

[0023] As shown in FIG. 2, straight pipes and couplings composed of steel pipes, etc. is connected with T-shaped pipe joints 3A through 3D. As a result, the dresser supply air pipe 3 extends in a horizontal straight extension direction as a whole, and is disposed laterally. At the connecting portions A and C, extending straight pipe portions of the pipe joints 3A and 3C runs along the extension direction. At the connecting portion B, a branch portion which extends vertically from the straight pipe portion of the pipe joint 3B runs along the extension direction. Particularly the branch portion of the pipe joint 3C at the connecting portion C is directed vertically upward. The T-shaped joint 3D is also interposed between the connecting portions B and C to constitute a connecting portion D. The pipe joint 3D at the connecting portion D is also connected such that its straight pipe portion runs along the extension direction and its branch portion is directed vertically upward.

[0024] A solenoid valve 7 serving as an opening-and-closing valve in this embodiment is interposed between the connecting portions A and C of the dresser supply air pipe 3, that is, at a portion closer to the grinding tool side than the connecting portion A with the air supply pipe 4. The solenoid valve 7 is intermittently and instantaneously opened and closed at preset time intervals and is controlled to repeat the operation of introducing a portion of the air supplied from the air compressor 2 from the connecting portion A into the dresser supply air pipe 3 and the operation of inhibiting this introduction, by a control unit 8 shown in the FIG. 1 provided with a timer, etc.

[0025] The air supply pipe 4 extends so as to be connected to the straight pipe portion of the pipe joint 3B at the connecting portion B from a branch portion of the pipe joint 3A at the connecting portion A, and is adapted to always supply the air supplied from the air compressor 2 to the grinding tool side. It is noted herein that a ball valve 4A serving as a pressure control valve in this embodiment is interposed between the connecting portions A and B in the air supply pipe 4. The pressure of the air to be supplied to the grinding tool side through the air supply pipe 4 can be reduced by the ball valve 4A.

[0026] At the connecting portion A between the air supply pipe 4 and the dresser supply air pipe 3 on the side of the air compressor 2, the branch portion of the pipe joint 3A may not be directed upward. Even at the connecting portion B between the air supply pipe 4 and the dresser supply air pipe 3 on the side of the grinding tool side, the straight pipe portion of the pipe joint 3B to which the air supply pipe 4 is connected does not need to be directed in the vertical direction. In this embodiment, the pipe joints 3A and 3B are directed in the horizontal direction orthogonal to the extension direction of the dresser supply air pipe 3. A portion of the air supply pipe 4 may be a flexible pipe, such as a nylon pressure-proof tube

4B shown in FIG. 2 as long as the pipe can sufficiently bear the pressure of the air to be supplied.

[0027] The dresser tank 1 has a conical funnel-shaped lower portion and has a cylindrical upper portion. An upper end of the dresser tank 1 is provided with a slot of the dresser E, and this slot can be airtightly sealed by a lid 1A. As the dresser E which is loaded from this slot and held in the dresser tank 1, it is desirable to use, for example, a dresser containing at its surface ultrafine anhydrous silica powder with a particle size of 5 to 50 nm which has a silanol group as described in Patent Document 4.

[0028] One end of a dresser tank connecting tube 9 which is made of a material having flexibility and resistance to pressure, such as the nylon pressure-proof tube, is connected to the upper end of the dresser tank 1, in a position above the dresser held within the dresser tank 1. The dresser tank connecting tube 9 has the other end connected with the branch portion of the pipe joint 3D at the connecting portion D, and is connected to the dresser supply air pipe 3 closer to the grinding tool side than the connecting portion C between a dresser supply pipe 6 which extends from the dresser tank 1 and the dresser supply air pipe 3.

[0029] A dresser tank supply pipe 1B extends vertically downward from a lower end of the conical funnel-shaped lower portion of the dresser tank 1, and the lower end thereof is arranged so as to coaxially face the upper end of the vertically upwardly directed branch portion of the T-shaped pipe joint 3C at the connecting portion C at a space therefrom. The dresser supply pipe 6 is interposed between the dresser tank supply pipe 1B and the pipe joint 3C at the connecting portion C. Consequently, the dresser tank 1 is connected with the dresser supply air pipe 3 by the dresser supply pipe 6.

[0030] As shown in FIG. 3, the dresser supply pipe 6 has male thread portions formed at outer peripheries of its axial opposite ends and has a nut formed at an outer periphery of a middle portion between the male thread portions. Moreover, the dresser supply pipe 6 is composed of a coupling member 6A in which a through hole having a circular section is formed along the axis, and a pipe body 6B which is fitted into and attached to the through hole of the coupling member 6A and which is made up of, for example, a cylindrical straight pipe, such as a steel pipe. Not only the internal diameter of the pipe body 6B but the external diameter thereof is made smaller than the dresser supply air pipe 3, and more spherically made smaller than the internal diameter of the pipe joint 3C at the connecting portion C. The male thread portions of the opposite ends of the coupling member 6A are mutually twisted in the same direction at equal pitches.

[0031] Such a dresser supply pipe 6 is interposed between the dresser tank supply pipe 1B and the pipe joint 3C by screwing the male thread portions of the opposite end of the coupling member 6A into a female thread portion which is formed at an inner periphery of a lower end of the dresser tank supply pipe 1B and an female thread

portion formed at an inner periphery of the branch portion of the pipe joint 3C of the connecting portion C, respectively. Accordingly, the inside of the dresser supply pipe 6 and the inside of the dresser tank 1 are made to airtightly communicate with the inside of the pipe joint 3C of the connecting portion C, i.e., the inside of the dresser supply air pipe 3 via an inner peripheral portion of the pipe body 6B of the dresser supply pipe 6.

[0032] At the upper end of the dresser supply pipe 6 connected to the dresser tank supply pipe 1B, upper end surfaces of the coupling member 6A and the pipe body 6B are made flush to each other. On the other hand, at the lower end of the dresser supply pipe connected to the pipe joint 3C of the connecting portion C, the pipe body 6B protrudes farther than the lower end surface of the coupling member 6A so as to be inserted into the pipe joint 3C, and is disposed such that its tip (lower end, first tip) may be located with a slight gap G from an inner peripheral surface (inner bottom surface) of the pipe joint 3C. The gap G can be adjusted by adjusting the screwing positions between the male thread portions of the opposite ends of the coupling member 6A and the female thread portions of the dresser tank supply pipe 1B and pipe joint 3C to make the dresser supply pipe 6 advance and retreat vertically.

[0033] In this embodiment, a grinding tool in which the dresser E is to be supplied by the supply device configured in this way is a drilling tool 10, such as a core drill which drills, for example, a wall W or the like, in a concrete structure as shown in FIG. 1. The drilling tool 10 is adapted such that a plurality of cutting blade tips 12 made up of an abrasive grain layer in which hard abrasive grains, such as diamond abrasive grains, are combined together by a proper binder are attached to a tip edge of a cylindrical tool body 11 at intervals in a peripheral direction. A rear end of the tool body 11 of such a drilling tool 10 is attached to a rotary shaft of a drilling apparatus 13. As the drilling apparatus 13 is advanced and the cutting blade tips 12 cut in the wall W in the axial direction while being rotated around the axis. The hole is drilled on the wall W by the grinding action by the abrasive grain layer, leaving a cylindrical core at an inner periphery of the tool body 11.

[0034] An attaching portion to the tool body 11 of the drilling apparatus 13 is equipped with a swivel 13A. The swivel 13A is connected to the end of the air supply pipe 4 of the dresser supply device S provided closer to the grinding tool side than the connecting portion B via an air hose 14. On the other hand, a cover 15 is provided in a drilled portion of the wall W so as to cover the outer periphery of the tool body 11 of the drilling tool 10 from which the cutting blade tips 12 are cut in.

The cover 15 is connected to a suction unit 18 via a dust collector 17, such as a cyclone, by a dust hose 16.

[0035] The air supplied from the dresser supply device S and the dresser E accompanied by the air are introduced into an inner peripheral portion of the tool body 11 via the swivel 13 and are supplied to a grinding portion

ground by the cutting blade tips 12 from a gap between the tool body 11 and the core. The grinding portion is cooled by air, and the abrasive grain layer of the cutting blade tips 12 is dressed by the dresser E. In this way, the dresser E which has dressed the abrasive grain layer or dressing waste, fallen abrasive grains, and chips generated by the grinding of the cutting blade tips 12 follow the air sucked by the suction unit 18, and are discharged into the cover 15. Moreover, while the air is sucked through the air hose 14, such chips are caught by the dust collector 17.

[0036] In the supply device of the dresser E of the above configuration, the solenoid valve 7 is opened and closed intermittently and instantaneously, while the air compressor 2 is driven to always supply air to the air supply pipe 4 as indicated by a broken line in FIG. 2. Thereby, when the solenoid valve 7 is opened, as indicated by a chain line in FIG. 2, a portion of the air is introduced into the dresser supply air pipe 3, and the dresser E supplied to the connecting portion C of the dresser supply air pipe 3 is sent toward the drilling tool (grinding tool) 10 along with the air. Since the solenoid valve 7 is disposed closer to the air compressor 2 as an air supply source than the connecting portion C, the dresser E is not caught by the solenoid valve 7, but prevents damage of the solenoid valve 7, so that the opening-and-closing operation can be stably performed over a prolonged period of time.

[0037] When the solenoid valve 7 is closed, the dresser E is supplied to the connecting portion C of the dresser supply air pipe 3 via the dresser supply pipe 6 from the dresser tank 1. At this time, in the supply device, the pipe body 6B of the dresser supply pipe 6 inserted through the dresser supply air pipe 3 at the connecting portion C has a smaller diameter than the dresser supply air pipe 3, and its tip is located at the slight gap G from the inner peripheral surface of the dresser supply air pipe 3. Thus, the supplied powdery dresser E forms a bridge between the pipe body 6B and the inner peripheral surface of the dresser supply air pipe 3, thereby stably forming a cone having an apex at its tip at a tapered angle according to an angle of repose and made up of a certain volume, i.e., a specific amount of dresser E whenever being supplied to the dresser supply air pipe 3 as shown in FIG. 3.

[0038] The small-diameter pipe body 6B of the dresser supply pipe 6 protrudes and is inserted into the dresser supply air pipe 3. Accordingly, even if the dresser E is supplied, a gap portion F is always formed at an outer periphery of the pipe body 6B which has protruded into the dresser supply air pipe 3 between this outer periphery and the inner peripheral surface of the dresser supply air pipe 3 as shown in FIG. 4 as seen from the extension direction of the dresser supply air pipe 3. For this reason, the dresser supply air pipe 3 is not blocked by the dresser E. Moreover, since the area of the gap portion F becomes smaller than the cross-sectional area of the dresser supply air pipe 3, when the air introduced into the dresser supply air pipe 3 as the solenoid valve 7 is opened passes

through this connecting portion C, its flow velocity is increased. Accordingly, the cone of the dresser E supplied can be pushed and collapsed to engulf the dresser E and can be reliably supplied to the grinding tool side along with air.

[0039] According to such a supply device of the dresser E, a specific amount of dresser E can be exactly and reliably supplied to a grinding tool, such as a core drill, intermittently. Thereby, the grinding operation, such as drilling, can be performed while the abrasive grain layer which forms the cutting blade tips is dressed without excess or deficiency. Accordingly, the operation can be performed while the sharpness of the cutting blade tips is always kept high. Also, while the cutting blade tips or a grinding portion is cooled by the air which is always supplied, and chips, etc. are discharged, the grinding by a dry construction method having little possibility that the surrounding environment is polluted can be stably and efficiently executed while achieving the extension of tool life.

[0040] In the supply device of the above embodiment, the pipe body 6B of the dresser supply pipe 6 is attached to the coupling member 6A screwed into the dresser tank supply pipe 1B and the pipe joint 3C at the connecting portion C of the dresser supply air pipe 3. By adjusting the amount of screwing of the coupling member 6A to make the coupling member advance and retreat, it is possible to adjust the gap G.

Therefore, even if grinding conditions, such as the type of the dresser E and the external diameter or rotational speed of the core drill change, the dresser E can be intermittently supplied to the grinding tool side by a proper amount of supply according to the conditions, and an efficient grinding operation can be efficiently performed irrespective of the grinding conditions, etc.

[0041] For example, when the internal diameter of the dresser supply air pipe 3 is set to 11 mm, the external diameter and internal diameter of the pipe body 6B of the dresser supply pipe 6 are set to 6 mm and 4 mm, respectively, and ultrafine anhydrous silica having a grain size of about # 60 is used as the dresser E, the gap G is adjusted to 3.5 mm, and the dresser E of about 2g is intermittently discharged between the tip of the pipe body 6B and the inner peripheral surface of the dresser supply air pipe 3 (pipe joint 3C) as the amount of supply per once supply from the dresser supply pipe 6, thereby forming the cone.

[0042] In this embodiment, the air supply pipe 4 is connected between the connecting portions A and B of the dresser supply air pipe 3 on the side of the air compressor 2 and the grinding tool, and air is always supplied to the grinding tool side. Thus, even when the solenoid valve 7 is closed, cooling of the cutting blade tips 12, discharge of chips, etc. can be performed reliably. The air supply pipe 4 is equipped with the ball valve 4A as a pressure control valve. When the solenoid valve 7 is opened by reducing the pressure of the air which flows through the air supply pipe by the ball valve 4A, the pressure of the

air which is introduced into the dresser supply air pipe 3, and has reached the connecting portion B of the air supply pipe 4 on the grinding tool side along with the dresser E becomes higher than the pressure of the air which has flowed through the air supply pipe 4. Accordingly, it is possible to reliably supply the dresser E supplied to the connecting portion C to the grinding tool via the air supply pipe 4 and the air hose 14 from the connecting portion B on the grinding tool side.

[0043] On the other hand, when the solenoid valve 7 is closed, the pressure of the air which flows through the inside of the air supply pipe 4 as the supply of air to the dresser supply air pipe 3 is shut off becomes a high pressure instantaneously, and this high-pressure air flows into the dresser supply air pipe 3 from the connecting portion B on the grinding tool side. Meanwhile, in this embodiment, the dresser tank connecting tube 9 communicating with the inside of the dresser tank 1 is connected to the dresser supply air pipe 3 at the connecting portion D between the connecting portion B, and the connecting portion C with the dresser supply pipe 6. Accordingly, the high-pressure air which has flowed into the dresser supply air pipe 3 is introduced into the dresser tank 1 from the dresser tank connecting tube 9 as indicated by a broken line in FIG. 2, thereby giving the impact of an air hammer action to the dresser E held within the dresser tank 1.

[0044] For this reason, for example, even if the pipe body 6B of the dresser supply pipe 6 is made to have a small diameter as described above, and the dresser E forms a bridge inside the pipe body, and is easy to cause clogging. According to this embodiment, when the solenoid valve 7 is closed, the bridge within the pipe body 6B is collapsed by the impact, and the dresser E is extruded by the pressure of the air introduced into the dresser tank 1. As a result, it is possible to more reliably supply a proper quantity of dresser E to the dresser supply air pipe 3 and to supply the dresser to the grinding tool side intermittently.

[0045] Although the preferable embodiment of the invention has been described hitherto, the invention is not limited to the embodiment. Additions, omissions, substitutions, and other alternations can be changed without departing from the scope of the invention. The invention is not limited by the aforementioned description, and is limited only by the scope of the appended claims.

[Industrial Applicability]

[0046] According to the invention, it is possible to reliably and exactly supply certain amount of dresser to the grinding tool side intermittently, and it is possible to perform grinding while the abrasive grain layer which forms the cutting blade tips of the grinding tool is dressed without causing excessive wear. Accordingly, stable and efficient grinding can be performed while the extension of tool life is achieved and the sharpness of the cutting blade tips is maintained. Further, in addition to the drilling tool

10, such as a core drill which performs drilling while forming a core as described above, the invention can also be applied to, for example, cases where other types of grinding tools which have an abrasive grain layer as the cutting blade tips, such as a drilling tool which performs drilling without forming such a core, and a blade or a wire saw which cut a concrete structure, etc., are used in the dry construction method as the grinding tool.

Claims

1. A dresser supply device of a grinding tool which supplies powdery dresser to a grinding tool having an abrasive grain layer on cutting blade tips, the dresser supply device comprising:
 - an air supply source which supplies air;
 - a dresser supply air pipe including a base end which is connected to the air supply source;
 - a dresser tank which holds the dresser;
 - a dresser supply pipe which connects the dresser tank and the dresser supply air pipe to each other, is smaller in diameter than the dresser supply air pipe at a connecting portion with the dresser supply air pipe, has a first tip inserted and projecting into the dresser supply air pipe, and is located at a space from an inner peripheral surface of the dresser supply air pipe; and
 - an opening-and-closing valve which is provided in the dresser supply air pipe between the connecting portion and the air supply source side.
2. The dresser supply device according to Claim 1, further comprising a control unit which allows the opening-and-closing valve to be opened and closed intermittently.
3. The dresser supply device according to Claim 1, wherein the gap between the first tip of the dresser supply pipe and the inner peripheral surface of the dresser supply air pipe is adjustable.
4. The dresser supply device according to Claim 1, further comprising an air supply pipe provided with a pressure control valve which connects:
 - the region of the dresser supply air pipe between the opening-and-closing valve and the air supply source; and
 - the region of the dresser supply air pipe between the connecting portion and a second tip on the side of the grinding tool.
5. The dresser supply device according to Claim 4, wherein a dresser tank connecting tube is communicated with:

a portion between the connecting portion of the dresser supply air pipe and the second tip of the dresser supply air pipe; and the inside of the dresser tank.

6. The dresser supply device according to Claim 5, wherein a downstream connecting portion of the dresser supply air pipe and the air supply pipe downstream is located on the downstream side of a connecting portion between the dresser tank connecting tube and the dresser supply air pipe.

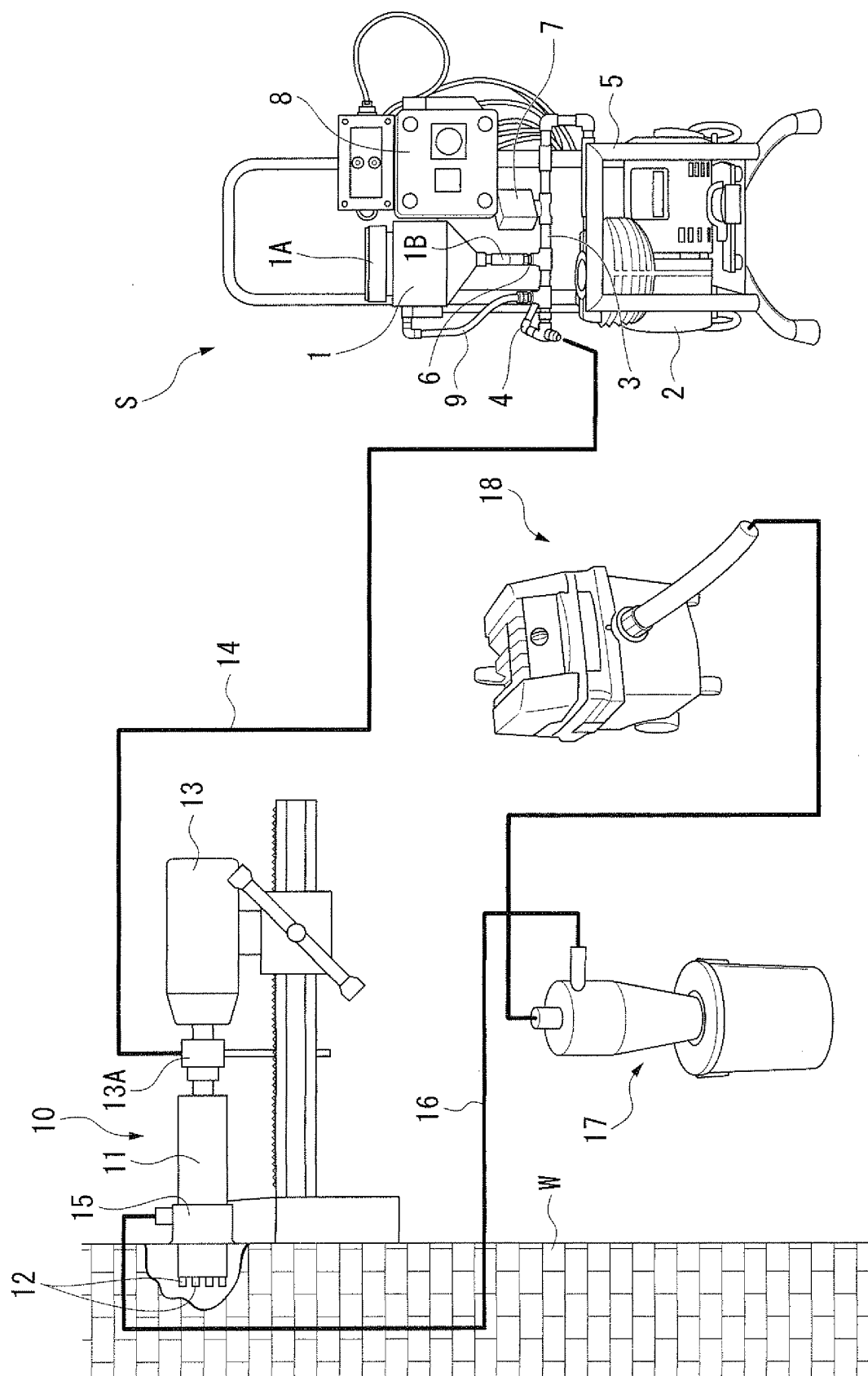


FIG. 1

FIG. 2

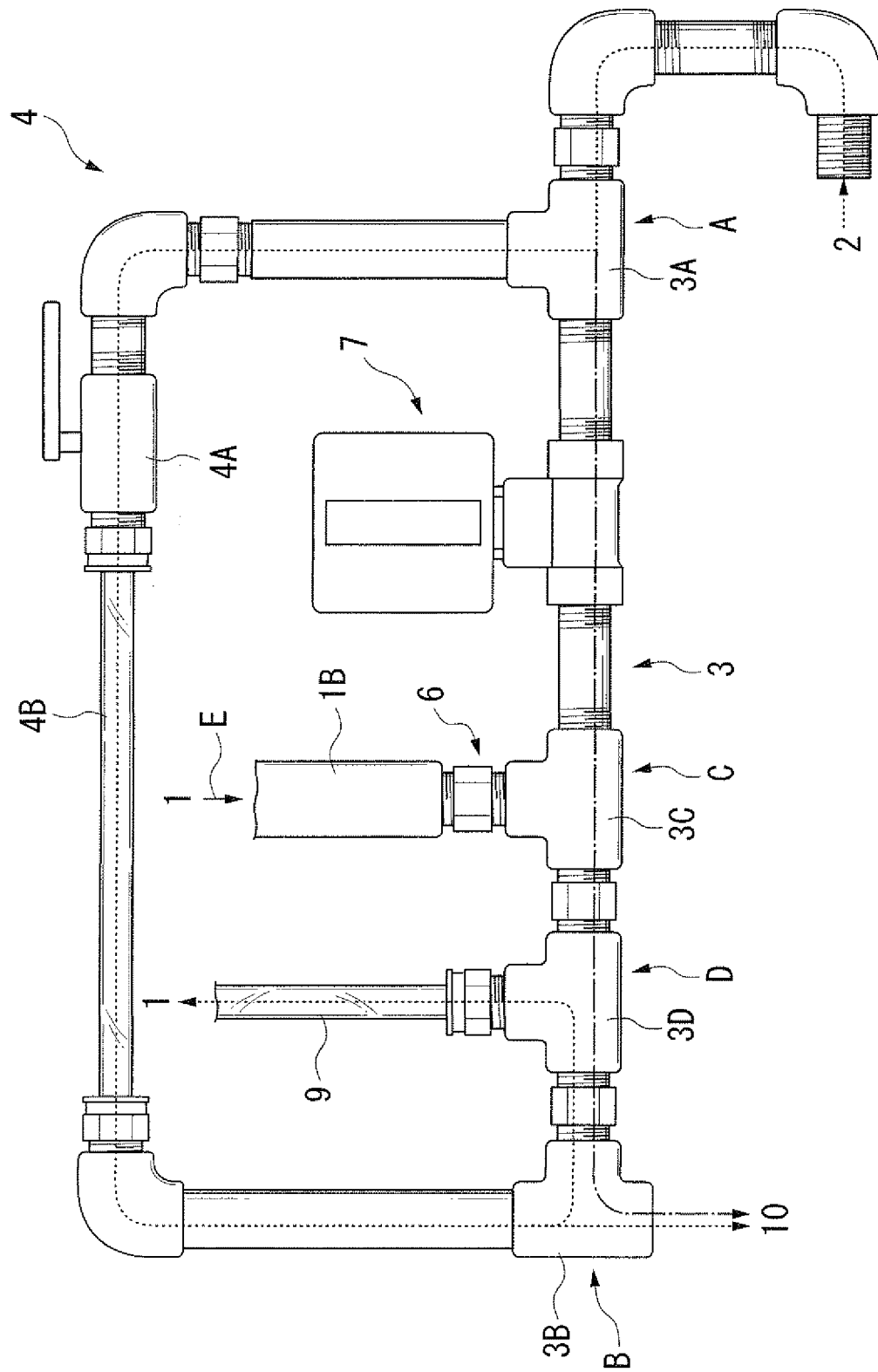


FIG. 3

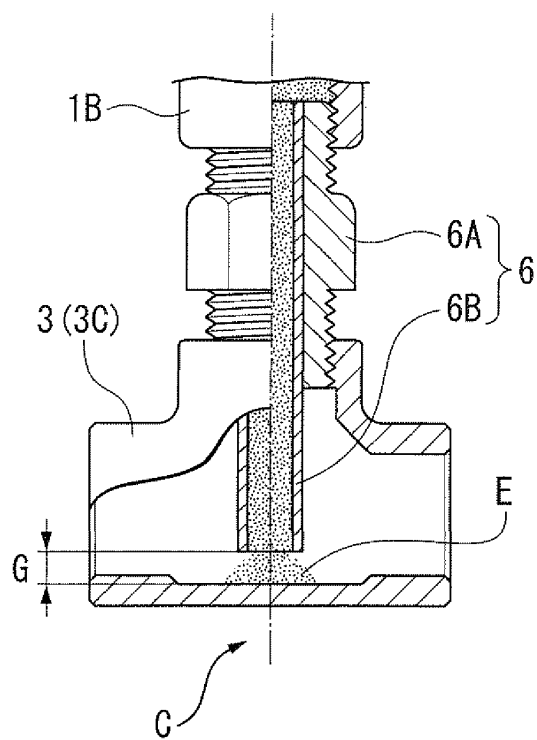
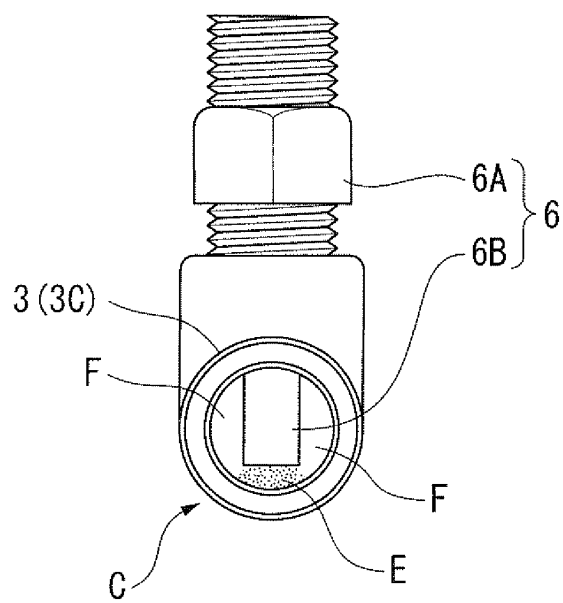


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/303309

A. CLASSIFICATION OF SUBJECT MATTER B24B53/013 (2006.01)		
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) B24B53/013, B65G53/66, B65G53/06, B24C7/00, B28D1/14		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006 Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 5-104522 A (Rasa Industries, Ltd.), 27 April, 1993 (27.04.93), (Family: none)	1-6
A	JP 5-86467 U (Sinto Kogyo Ltd.), 22 November, 1993 (22.11.93), (Family: none)	1-6
A	JP 53-131295 U (Atsuji Tekko Kabushiki Kaisha), 18 October, 1978 (18.10.78), (Family: none)	1-6
A	JP 59-74822 A (Sumitomo Metal Industries, Ltd.), 27 April, 1984 (27.04.84), (Family: none)	1-6
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 14 April, 2006 (14.04.06)		Date of mailing of the international search report 25 April, 2006 (25.04.06)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/303309

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 49-68487 A (Sanko Air Plant, Ltd.), 03 July, 1974 (03.07.74), (Family: none)	1-6

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

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