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Working machine

Abstract

A working machine includes: an operator's seat; and at least one pedal to be operated by being stepped on with a foot, or with feet. The at least one pedal is disposed ahead of the operator's seat. The at least one pedal includes a pedal body extending in a predetermined direction, a pedal shaft having an axis intersecting the predetermined direction and supporting the pedal body in such a way as to allow pivotal motion of the pedal body around the axis, and a tread surface provided on an upper surface of the pedal body and being a surface on which an operator places the foot. The tread surface is sloped such that a height from the pedal body decreases gradually from a portion closer to a big toe of the foot of the operator placed thereon toward a portion closer to a little toe.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation application of International Application No. PCT/JP2021/047012, filed on Dec. 20, 2021, which claims the benefit of priority to Japanese Patent Application No. 2021-011441, filed on Jan. 27, 2021. The entire contents of this application are hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION
1. Field of the Invention
(1) The present invention relates to a working machine such as a backhoe.
2. Description of the Related Art
(2) A working machine disclosed in Japanese Unexamined Patent Application Publication No. 2019-019572 is known in the art.
(3) The working machine disclosed in Japanese Unexamined Patent Application Publication No. 2019-019572 includes left and right traveling pedals making up a pair and operable for manipulating a traveling device by being stepped on with operator's feet.
SUMMARY OF THE INVENTION
(4) A tread surface that is an upper surface of a traveling pedal in the art is a flat surface formed in parallel with an axis of a pedal shaft. Therefore, when the operator places the sole of the foot on the tread surface, foot motion is not smooth, and the operator tends to get tired.
(5) In light of the above problem, the present invention aims to provide a working machine that makes it possible to perform smooth pedal operation.
(6) A working machine according to an aspect of the present invention includes: an operator's seat; and at least one pedal to be operated by being stepped on with a foot, or with feet, the at least one pedal being disposed ahead of the operator's seat. The at least one pedal includes a pedal body extending in a predetermined direction, a pedal shaft having an axis intersecting the predetermined direction and supporting the pedal body in such a way as to allow pivotal motion of the pedal body around the axis, and a tread surface provided on an upper surface of the pedal body and being a surface on which an operator places the foot. The tread surface is sloped such that a height from the pedal body decreases gradually from a portion closer to a big toe of the foot of the operator placed thereon toward a portion closer to a little toe.
(7) The pedal shaft may extend in a machine-body width direction. The pedal shaft may be disposed at an intermediate position in the direction in which the pedal body extends. The pedal shaft may support the pedal body in such a way as to allow the pivotal motion of the pedal body.
(8) The at least one pedal may include a tread member provided closer to toes of the foot of the operator placed thereon than the pedal shaft on the upper surface of the pedal body. The tread surface may be formed as an upper surface of the tread member.
(9) The working machine may include, as the at least one pedal, a pair of pedals arranged at a distance from each other.
(10) The distance between the pair of pedals may become greater gradually toward the toes of the feet of the operator placed thereon.
(11) Going from the portion closer to the big toe of the foot of the operator placed thereon toward

the portion closer to the little toe, the tread member may be skewed in an orientation of coming closer to the pedal shaft in a plan view.
(12) The working machine may further include: a traveling device. The at least one pedal may be at least one traveling pedal for manipulating the traveling device.
(13) The upper surface of the pedal body may be a planar surface that is in parallel with the direction in which the pedal body extends. The tread surface may be sloped such that the height from the upper surface of the pedal body decreases gradually from the portion closer to the big toe of the foot of the operator placed thereon toward the portion closer to the little toe.
(14) The working machine may further include: a manipulator base disposed in front of the operator's seat; a manipulation member to be gripped and operated, the manipulation member being provided on the manipulator base; and an armrest extending rearward from the manipulator base. The at least one pedal may be disposed at a position where the at least one pedal is operable by the operator in a posture of leaning an upper part of a body forward and gripping the manipulation member, with an elbow rested on the armrest.
(15) The above and other elements, features, steps, characteristics and advantages of the present invention will become more apparent from the following detailed description of the preferred embodiments with reference to the attached drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) A more complete appreciation of preferred embodiments of the present invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings described below.
(2) FIG. **1** is a plan view of a working machine.
(3) FIG. **2** is a side view of a working machine.
(4) FIG. **3** is a side view of a cabin.
(5) FIG. **4** is a perspective view of an operator's station.
(6) FIG. **5** is a front view of the operator's station.
(7) FIG. **6** is a side view of a traveling pedal and a support structure assembly.
(8) FIG. **7** is a front view of the traveling pedal and the support structure assembly.
(9) FIG. **8** is a plan view of the traveling pedal.
(10) FIG. **9** is a cross-sectional view taken along the line J**1**-J**1** of FIG. **8**.
(11) FIG. **10** is a view taken along the line J**2**-J**2** of FIG. **8**.
DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS
(12) The preferred embodiments will now be described with reference to the accompanying drawings, wherein like reference numerals designate corresponding or identical elements throughout the various drawings. The drawings are to be viewed in an orientation in which the reference numerals are viewed correctly.
(13) A certain embodiment of the present invention will now be described while referring to the drawings, where necessary.
(14) FIG. **1** is a schematic plan view illustrating the overall structure of a working machine **1** according to the present embodiment. FIG. **2** is a schematic side view of the working machine **1**. In the present embodiment, a backhoe, which is a swiveling working machine, will be taken as an example of the working machine **1**.
(15) As illustrated in FIGS. **1** and **2**, the working machine **1** includes a machine body (swivel base) **2**, a traveling device **3**, and a working device **4**. A cabin **5** is mounted on the machine body **2**. An operator's seat **6**, on which an operator sits, is provided inside the cabin **5**. In other words, the

operator's seat **6** is mounted on the machine body **2**, and the cabin **5** encloses the operator's seat **6**. The operator's seat **6** includes a seat portion **6**A, which is a portion where the operator sits, and a backrest portion **6**B, which is a portion for supporting the back of the operator.

(16) In the present embodiment, the term “forward”, etc. will be used for referring to a direction going forward with respect to the operator sitting on the operator's seat **6** of the working machine **1** (direction indicated by an arrow A**1** in FIGS. **1** and **2**), the term “rearward”, etc. will be used for referring to a direction going rearward with respect to the operator (direction indicated by an arrow A**2** in FIGS. **1** and **2**), the term “leftward”, etc. will be used for referring to a direction going leftward with respect to the operator (direction indicated by an arrow B**1** in FIG. **1**), the term “rightward”, etc. will be used for referring to a direction going rightward with respect to the operator (direction indicated by an arrow B**2** in FIG. **1**), and the direction indicated by an arrow K**1** in FIGS. **1** and **2** will be referred to as “front-rear direction”.

(17) As illustrated in FIG. **1**, a horizontal direction orthogonal to the front-rear direction K**1** will be referred to as “machine-body width direction” K**2** (width direction of the machine body **2**).

(18) As illustrated in FIGS. **1** and **2**, the traveling device **3** is a crawler-type device that supports the machine body **2** in such a way as to make it travelable. The traveling device **3** includes a traveling frame **3**A, a first traveling device **3**L provided on the left side of the traveling frame **3**A and a second traveling device **3**R provided on the right side of the traveling frame **3**A. The first traveling device **3**L is driven by a first traveling motor M**1**. The second traveling device **3**R is driven by a second traveling motor M**2**. A dozer device **7** is mounted on the front portion of the traveling device **3**. The traveling device **3** is not limited to a crawler-type traveling device. For example, the traveling device **3** may be a wheeled-type traveling device.

(19) As illustrated in FIG. **2**, the machine body **2** is supported via a swivel bearing **8** on the traveling frame **3**A such that the machine body **2** can swivel around a swivel axis X**1**. The machine body **2** is driven to swivel by a swiveling motor M**3**. A fuel tank T**1**, a hydraulic fluid tank T**2**, and a weight **10** are mounted on the rear portion of the machine body **2**.

(20) As illustrated in FIG. **1**, the cabin **5** is mounted at one side (left side) on the machine body **2** in the machine-body width direction K**2**. A prime mover E is mounted at the other side (right side) on the machine body **2** in the machine-body width direction K**2**. The prime mover E**1** is a diesel engine. The prime mover E**1** may be a gasoline engine. Alternatively, the prime mover E**1** may be a hybrid-type device that includes an engine and an electric motor. A hydraulic pump P**1** is attached to the rear portion of the prime mover E**1**.

(21) As illustrated in FIGS. **1** and **2**, a swing bracket **21** is mounted via a swing shaft **26** on the front portion of a support bracket **20** in such a way as to be able to perform pivotal motion around a vertical axis. The working device **4** is attached to the swing bracket **21**.

(22) As illustrated in FIG. **2**, the working device **4** includes a boom **22**, an arm **23**, and a bucket (working tool) **24**. A proximal portion **22**A of the boom **22** is pivotally attached to the top of the swing bracket **21** by a boom pivot **27** in such a way as to be able to rotate freely around a horizontal axis (an axis extending in the machine-body width direction K**2**).

(23) The arm **23** is pivotally attached to a distal end of the boom **22** in such a way as to be able to rotate freely around a horizontal axis. The bucket **24** is provided on a distal end of the arm **23** in such a way as to be able to perform shoveling operation and dumping operation. The shoveling operation is operation of moving the bucket **24** closer to the boom **22** pivotally. For example, the shoveling operation is performed when scooping earth and sand or the like. The dumping operation is operation of moving the bucket **24** away from the boom **22** pivotally. For example, the dumping operation is performed when letting the scooped earth and sand or the like fall (when discharging it from the bucket).

(24) In addition to or in place of the bucket **24**, other kind of working tool (hydraulic attachment) that can be driven by a hydraulic actuator can be attached to the working machine **1**. Some examples of such other kind of working tool are: a hydraulic breaker, a hydraulic crusher, an angle

broom, an earth auger, a pallet fork, a sweeper, a mower, and a snow blower.
(25) The swing bracket **21** is capable of moving pivotally by extending-and-retracting motion of a swing cylinder C**2** provided on the machine body **2**. The boom **22** is capable of moving pivotally by extending-and-retracting motion of a boom cylinder C**3**. The arm **23** is capable of moving pivotally by extending-and-retracting motion of an arm cylinder C**4**. The bucket **24** is capable of performing shoveling operation and dumping operation by extending-and-retracting motion of a bucket cylinder (working tool cylinder) C**5**. The swing cylinder C**2**, the boom cylinder C**3**, the arm cylinder C**4**, and the bucket cylinder C**5** are hydraulic cylinders.
(26) As illustrated in FIGS. **1** and **3**, a manipulator **41** is provided inside the cabin **5**. The manipulator **41** is provided in front of the operator's seat **6**. The operator's seat **6** and the manipulator **41** constitute an operator's station **42** for operating the working machine **1** (for manipulating the machine body **2**, the traveling device **3**, the working device **4**, the swing bracket **21**, and the like).
(27) As illustrated in FIGS. **3** and **4**, the operator's seat **6** is supported by means of a seat pedestal **76** and the like over a floor **5**B, which is the bottom portion of the cabin **5**. A suspension device **77** is provided on the seat pedestal **76**. The operator's seat **6** is provided on the suspension device **77** in such a manner that its position can be adjusted forward and rearward along slide rails **78**.
(28) As illustrated in FIGS. **3** and **4**, the manipulator **41** includes a manipulator base **81**, a manipulation member **82**, a monitor **84**, a dozer lever **80**, and left and right traveling pedals (pedals) **85** making up a pair.
(29) The manipulator base **81** is provided on the machine body **2** in front of the operator's seat **6**. The manipulator base **81** includes a base column **86**, which is provided in such a way as to rise from the floor **5**B (the machine body **2**), and a manipulator base body **87**, which is disposed on the top of the base column **86**. The manipulation member **82** is a member configured to be gripped and operated by the operator. The manipulation member **82** is mounted on the manipulator base body **87** (the manipulator base **81**). The manipulation member **82** includes a first manipulation handle **82**L and a second manipulation handle **82**R, which are provided side by side in the machine-body width direction K**2**. The operator is able to perform manipulation for, for example, swiveling motion of the machine body **2**, pivotal motion of the boom **22**, pivotal motion of the arm **23**, and pivotal motion of the bucket **24** by operating the first manipulation handle **82**L and the second manipulation handle **82**R.
(30) As illustrated in FIG. **4**, the manipulator base body **87** includes an attachment portion **92**, which is a center portion in the machine-body width direction K**2**, and armrests **93**, which are provided to the left and right of the attachment portion **92**. The attachment portion **92** is detachably attached to the base column **86**. The armrest **93** located to the left of the attachment portion **92** will be referred to as a first armrest **93**L. The armrest **93** located to the right of the attachment portion **92** will be referred to as a second armrest **93**R.
(31) The first armrest **93**L includes an armrest base portion **93**L**1**, which is provided on the left side of the attachment portion **92**, and an armrest body **93**L**2**, which is pivotally supported behind the armrest base portion **93**L**1**. The second armrest **93**R includes an armrest base portion **93**R**1**, which is provided on the right side of the attachment portion **92**, and an armrest body **93**R**2**, which is formed integrally with the armrest base portion **93**R**1**.
(32) The armrest body **93**L**2** extends rearward (toward the operator's seat **6**) from the armrest base portion **93**L**1**. Similarly, the armrest body **93**R**2** extends rearward (toward the operator's seat **6**) from the armrest base portion **93**R**1**. That is, the armrests **93** are provided on the manipulator base **81** and extend toward the operator's seat **6** from the manipulator base **81**.
(33) As illustrated in FIG. **3**, the lower surface of the armrests **93** (the first armrest **93**L and the second armrest **93**R) is sloped up rearward. This structure makes the space under the armrests **93** wider toward the operator's seat **6**. The operator's station **42** according to the present embodiment is designed such that the left thigh of the operator will be positioned under the first armrest **93**L and

the right thigh of the operator will be positioned under the second armrest **93**R. Sloping up the lower surface of the armrests **93** rearward makes the leg space of the operator wider.

(34) As illustrated in FIG. **4**, each of the armrest body **93**L**2** and the armrest body **93**R**2** has, at its rear portion, an elbow support portion **93**A where the operator can rest the elbow. The elbow support portion **93**A is made of a material having cushioning property. The manipulation member **82** is operated by the operator in a posture of leaning the upper part of the body forward and gripping the manipulation member **82**, with the elbows rested on the armrests **93**. More specifically, the operator rests the left elbow on the elbow support portion **93**A of the first armrest **93**L and grips the first manipulation handle **82**L with the left hand and rests the right elbow on the elbow support portion **93**A of the second armrest **93**R and grips the second manipulation handle **82**R with the right hand. Therefore, the operator sitting on the operator's seat **6** operates the manipulation member **82** in a posture of leaning the upper part of the body forward.

(35) The dozer lever **80** is a lever for manipulating the dozer device **7**.

(36) As illustrated in FIGS. **3** and **4**, the pair of traveling pedals **85** are members that are operable for manipulating the traveling device **3** by being stepped on with the operator's feet, and are installed on the floor **5**B. One of the pair of traveling pedals **85**, denoted as **85**L (the left one), is the pedal for manipulating the first traveling device **3**L. The other traveling pedal **85**R (the right one) is the pedal for manipulating the second traveling device **3**R.

(37) As illustrated in FIG. **5**, the traveling pedals **85** making up the pair are arranged ahead of the operator's seat **6** side by side with a distance therebetween in the machine-body width direction K**2**. More specifically, the one traveling pedal **85**L is disposed ahead of the operator's seat **6** at one side (the left side) in the machine-body width direction K**2**, and the other traveling pedal **85**R is disposed ahead of the operator's seat **6** at the other side (the right side) in the machine-body width direction K**2**. In other words, the one traveling pedal **85**L is disposed to the left of the base column **86**, and the other traveling pedal **85**R is disposed to the right of the base column **86**. In addition, the one traveling pedal **85**L is disposed under the first armrest **93**L in such a way as to overlap therewith in a plan view, and the other traveling pedal **85**R is disposed under the second armrest **93**R in such a way as to overlap therewith in a plan view. Therefore, when the traveling pedals **85** are operated, the left leg is present between the first armrest **93**L and the one traveling pedal **85**L, and the right leg is present between the second armrest **93**R and the other traveling pedal **85**R. Furthermore, the pair of traveling pedals **85** are disposed at positions where they are operable by the operator in a posture of leaning the upper part of the body forward and gripping the manipulation member **82**, with the elbows rested on the armrests **93**.

(38) As illustrated in FIG. **5**, the distance between the one traveling pedal **85**L and the other traveling pedal **85**R in the machine-body width direction K**2** becomes greater forward gradually. That is, the distance between the pair of traveling pedals **85** becomes greater gradually toward the toes of the feet of the operator placed thereon. More specifically, the traveling pedals **85** are disposed obliquely such that, as it goes forward, the one traveling pedal **85**L and the other traveling pedal **85**R become more distant in a distancing direction D**1**, which is a direction of going away in the machine-body width direction K**2**, from the center CL therebetween in the machine-body width direction K**2** (the center between the pedals).

(39) The traveling pedals **85** are pedals for performing manipulation for forward traveling and rearward traveling of the working machine **1** and for steering thereof. Specifically, the working machine **1** (the machine body **2**) travels forward when the operator steps on the traveling pedal **85** to press its front portion down. The working machine **1** (the machine body **2**) travels rearward when the operator steps on the traveling pedal **85** to press its rear portion down. The working machine **1** (the machine body **2**) travels straight when the left and right traveling pedals **85** are stepped on in the same stepping-on direction with an equal stepping-on amount. The working machine **1** (the machine body **2**) makes a turn when the stepping-on amount of the one traveling pedal **85**L is different from the stepping-on amount of the other traveling pedal **85**R. That is, it is

possible to change the number of revolutions of the first traveling motor M**1** based on the stepping-on amount of the one traveling pedal **85**L, and it is possible to change the number of revolutions of the second traveling motor M**2** based on the stepping-on amount of the other traveling pedal **85**R. The working machine **1** according to the present embodiment is designed such that, in order to ensure straightness, the operator steps on the traveling pedals **85** up to the maximum position (press the pedals all the way down) when causing it to travel straight. The operator is able to change the traveling speed by operating a shift-up/down switch provided on the manipulation member **82**.

(40) FIG. **6** is a right side view of the other (right) traveling pedal **85**R. FIG. **7** is a front view of the other traveling pedal **85**R.

(41) As illustrated in FIGS. **6** and **7**, each of the traveling pedals **85** is supported over the floor **5**B by a support structure assembly **43**. The structure of the support structure assembly **43** supporting the one traveling pedal **85**L is the same as the structure of the support structure assembly **43** supporting the other traveling pedal **85**R. Therefore, the support structure assembly **43** supporting the other traveling pedal **85**R will be described as a representative example, and an explanation of the support structure assembly **43** supporting the one traveling pedal **85**L will be omitted.

(42) The support structure assembly **43** includes a pedal shaft **44** supporting the traveling pedal **85**. The traveling pedal **85** is supported by the pedal shaft **44** pivotally for front and rear seesaw motion. The pedal shaft **44** is disposed on the upper surface of the traveling pedal **85**. The pedal shaft **44** is disposed at an intermediate position of the traveling pedal **85** in the front-rear direction. More specifically, the pedal shaft **44** is disposed behind the center of the traveling pedal **85** in the front-rear direction. In addition, the pedal shaft **44** is disposed in such a way as to extend in the machine-body width direction K**2**.

(43) The pedal shaft **44** includes a rotary shaft **45**, which has a cylindrical sleeve shape and is fixed to the traveling pedal **85**, and a support spindle **46**, which is inserted through the rotary shaft **45**. The rotary shaft **45** and the support spindle **46** have an axis (rotational axial center) X**2**, which extends in the machine-body width direction K**2**. The rotary shaft **45** is supported in such a way as to be able to rotate around the axis with respect to the support spindle **46**. That is, the traveling pedal **85** is configured to pivot on the rotational axial center X**2** extending in the machine-body width direction K**2** for front and rear seesaw motion.

(44) The support spindle **46** is fixed between left and right pedal brackets **47** making up a pair. The left and right pedal brackets **47** are provided in such a way as to rise from a base plate **48** mounted on the floor **5**B. One of the pedal brackets **47** is disposed to the left of the pedal shaft **44** and the traveling pedal **85**. The other pedal bracket **47** is disposed to the right of the pedal shaft **44** and the traveling pedal **85**. Therefore, the traveling pedal **85** is supported by the pedal shaft **44** and the pair of pedal brackets **47** over the floor **5**B (the base plate **48**) in such a way as to be able to pivot for front and rear seesaw motion.

(45) The support structure assembly **43** includes a return-to-neutral mechanism **49** configured to return the traveling pedal **85** to its neutral position from its stepped-on position, which is a front-pressed-down or rear-pressed-down position with respect to the neutral position. The return-to-neutral mechanism **49** includes a rotary cylinder **50**, a rotary shaft **51**, an arm member **52**, an interlocking shaft **53**, a returning spring device **54**, and a transmission link **55**. The rotary cylinder **50** is fitted on the outer surface of the rotary shaft **51** in such a way as to be able to rotate together therewith around a horizontal axis extending in the machine-body width direction K**2**. The rotary shaft **51** is supported between left and right bracket members **56** making up a pair and provided on the lower surface of the base plate **48** with a distance therebetween in the machine-body width direction K**2** in such a way as to be able to rotate around the horizontal axis extending in the machine-body width direction K**2**. The arm member **52** is fixed to the rotary cylinder **50** in such a way as to project upward. One end of the interlocking shaft **53** is pivotally coupled to the top portion of the arm member **52**. The other end of the interlocking shaft **53** is housed in a housing **54**A of the returning spring device **54** in such a way as to make it movable in the front-rear

direction (in such a way as to enable it to advance and retract). The returning spring device **54** includes a returning spring (not illustrated) configured to return the interlocking shaft **53** to its default position corresponding to the neutral position of the traveling pedal **85**. The returning spring is housed in the housing **54**A. The housing **54**A is disposed over the base plate **48** and is pivotally supported by a bracket member **57**. The bracket member **57** is mounted on a fixing plate **58** fixed between the pair of pedal brackets **47**. The transmission link **55** includes a first link **55**A, one end of which is fixed to the rotary cylinder **50**, a second link **55**B, one end of which is pivotally coupled to the other end of the first link **55**A, and a third link **55**C, one end of which is pivotally coupled to the other end of the second link **55**B and the other end of which is fixed to the lower surface of the traveling pedal **85**.

(46) In the return-to-neutral mechanism **49** having the structure described above, when the operator steps on the traveling pedal **85** to press its front portion down from the neutral position, the second link **55**B is pulled upward, and the first link **55**A, the rotary cylinder **50**, and the arm member **52** rotate together to push the interlocking shaft **53** forward into the housing **54**A. As a result, the returning spring inside the housing **54**A gets compressed. When the operator releases the foot pressure applied to the traveling pedal **85**, the traveling pedal **85** returns to its neutral position due to the resilience of the returning spring. When the operator steps on the traveling pedal **85** to press its rear portion down from the neutral position, the second link **55**B is pushed downward, and the first link **55**A, the rotary cylinder **50**, and the arm member **52** rotate together to pull the interlocking shaft **53** rearward out of the housing **54**A. As a result, the returning spring inside the housing **54**A gets compressed. When the operator releases the foot pressure applied to the traveling pedal **85**, the traveling pedal **85** returns to its neutral position due to the resilience of the returning spring.

(47) The stepping-on amount and stepping-on direction of the traveling pedal **85** is detected by an angular sensor **59**. The angular sensor **59** is, for example, a potentiometer. The angular sensor **59** detects the stepping-on amount and stepping-on direction of the traveling pedal **85** by detecting the rotation angle and rotation direction of the rotary shaft **51**. A detection signal outputted from the angular sensor **59** is sent to a controller. Based on detection signals outputted from the angular sensors **59**, the controller controls control valves for controlling the first traveling motor M**1** and the second traveling motor M**2**.

(48) The rear portion of the traveling pedal **85** is supported by a damper **60** so as to give a natural pedal operation feeling to the operator.

(49) FIG. **8** is a plan view of the other traveling pedal **85**R. FIG. **9** is a cross-sectional view taken along the line J**1**-J**1** of FIG. **8**. FIG. **10** is a view taken along the line J**2**-J**2** of FIG. **8**.

(50) As illustrated in FIGS. **6** and **8**, the traveling pedal **85** includes a pedal body **61** and a tread member **62**, which is fixed to the upper surface of the pedal body **61**. The pedal body **61** is made of a flat plate material. As illustrated in FIG. **6**, the pedal body **61** extends in a predetermined direction K**3**, and the pedal shaft **44** supports the pedal body **61** in such a way as to allow its pivotal motion in the predetermined direction K**3**. In the present embodiment, the pedal body **61** extends in the front-rear direction K**1**. The upper surface of the pedal body **61** is a planar surface that is substantially in parallel with a plane going through the pedal shaft **44** and being in parallel with the direction in which the pedal body **61** extends (the predetermined direction K**3**). The rotary shaft **45** of the pedal shaft **44** is fixed to the upper surface of the pedal body **61**.

(51) The tread member **62** is a member on which the operator places the foot. That is, the tread member **62** is a member to be stepped on by the operator. In the present embodiment, the tread member **62** includes a first tread member **62**A, which is provided in front of the pedal shaft **44** on the upper surface of the pedal body **61**, and a second tread member **62**B, which is provided behind the pedal shaft **44** on the upper surface of the pedal body **61**. The tread member **62** (the first tread member **62**A, the second tread member **62**B) is made of a block member that has a rectangular shape in a plan view. The first tread member **62**A is provided throughout a front region in the width

direction (the machine-body width direction K**2**) on the upper surface of the pedal body **61**.
(52) The upper surface of the first tread member **62**A is a tread surface **63** to be stepped on by the operator. In other words, the traveling pedal **85** includes the first tread member **62**A (the tread member **62**) provided closer to the toes of the operator's foot placed thereon than the pedal shaft **44** on the upper surface of the pedal body **61**, and the tread surface **63** is formed as the upper surface of the tread member **62**.
(53) As illustrated in FIGS. **9** and **10**, the tread surface **63** is sloped such that a height H**1** from the upper surface of the pedal body **61** decreases gradually as it goes in the distancing direction D**1**. Specifically, the tread surface **63** of the first tread member **62**A of the other traveling pedal **85**R has a greater height at its left side (the side closer to the center CL between the pedals) and has a less height at its right side. The tread surface **63** of the first tread member **62**A of the one traveling pedal **85**L has a greater height at its right side (the side closer to the center CL between the pedals) and has a less height at its left side. Therefore, the portion having a greater height (the greater-height portion) **63***a* of the tread surface **63** of the first tread member **62**A is the portion closer to the big toe of the foot placed on the tread surface **63**, and the portion having a less height (the less-height portion) **63***b* of the tread surface **63** of the first tread member **62**A is the portion closer to the little toe of the foot placed on the tread surface **63** (see FIG. **5**).
(54) Therefore, as illustrated in FIGS. **6** and **9**, the tread surface **63** is sloped such that the height H**1** from the upper surface of the pedal body **61** (reference plane) decreases gradually from the portion **63***a* closer to the big toe of the operator's foot placed thereon toward the portion **63***b* closer to the little toe.
(55) As illustrated in FIG. **9**, the tread surface **63** is inclined with respect to the axis (rotational axial center) X**2** of the pedal shaft **44**. The greater-height portion **63***a* of the first tread member **62**A is located above the rotational axial center X**2**. The less-height portion **63***b* of the first tread member **62**A is located below the rotational axial center X**2**.
(56) As illustrated in FIG. **8**, the first tread member **62**A is skewed in an oblique orientation (oblique direction) D**2** such that it goes rearward as it goes in the distancing direction D**1** in a plan view. In other words, going from the portion closer to the big toe of the operator's foot placed thereon toward the portion closer to the little toe, the tread member **62** is skewed in an orientation of coming closer to the pedal shaft **44** in a plan view. More specifically, the front surface **62***a* of the first tread member **62**A extends obliquely in the direction D**2** to go rearward as it goes in the distancing direction D**1**, and the rear surface **62***b* of the first tread member **62**A also extends obliquely in the direction D**2** to go rearward as it goes in the distancing direction D**1**. Therefore, the first tread member **62**A is skewed with respect to the machine-body width direction K**2** and is skewed with respect to the axis X**2** of the pedal shaft **44**. In the present embodiment, the tread surface **63** (the first tread member **62**A) is sloped such that the height H**1** decreases gradually as it goes in the oblique direction D**2**.
(57) A lateral surface **62***c* of the first tread member **62**A, which is the surface closer to the center CL between the pedals, is inclined with respect to a lateral edge **61***a* of the pedal body **61**, which is the edge closer to the center CL between the pedals. The opposite lateral surface **62***d* of the first tread member **62**A, which is the opposite of the lateral surface **62***c*, is in line with the opposite lateral edge **61***b* of the pedal body **61**, which is the opposite of the lateral edge **61***a*.
(58) As illustrated in FIGS. **6** and **8**, the second tread member **62**B has a rectangular shape in a plan view and is disposed such that its front surface **62***a* and rear surface **62***b* are parallel to the axis of the pedal shaft **44**. A tread surface (another tread surface) **64**, which is the upper surface of the second tread member **62**B, is a flat surface that is parallel to the rotational axial center X**2**. The tread surface **64** of the second tread member **62**B corresponds to the heel of the operator's foot placed on the traveling pedal **85**. That is, the second tread member **62**B is stepped on by the operator with the heel.
(59) In the present embodiment, the entire region of the tread surface **63** formed on the first tread

member **62**A is sloped; however, the scope of the disclosure is not limited thereto. For example, the slope may be formed at the front portion only of the tread surface **63**. The first tread member **62**A and the second tread member **62**B may be formed integrally. The second tread member **62**B may also have a sloped structure such that the height H**1** from the pedal body **61** decreases gradually as it goes in the distancing direction D**1**, as is the case with the first tread member **62**A. In the illustrated example, the traveling pedal **85** is horizontal at its neutral position; however, the scope of the disclosure is not limited thereto. For example, the traveling pedal **85** may be inclined forward or inclined rearward at its neutral position.

(60) The traveling pedal **85** having the structure described above enables the operator to perform pedal operation by stepping on (pressing down) its tread surface with the big toe of the foot, with the knees together, at the time of forward traveling, that is, when applying foot pressure to the traveling pedal **85** to press its front portion down. Moreover, the operator is able to perform pedal operation by stepping on (pressing down) the tread surface with the heel, with the knees apart, at the time of rearward traveling, that is, when applying foot pressure to the traveling pedal **85** to press its rear portion down.

(61) In the present embodiment, it has been described that the upper surface of the pedal body **61** is a planar surface that is in parallel with a plane going through the pedal shaft **44** and being in parallel with the direction in which the pedal body **61** extends (the predetermined direction K**3**); however, the scope of the disclosure is not limited thereto. For example, the upper surface of the pedal body **61** may have irregularities and/or a sloped shape. In such a case, the following structure suffices: a plane going through the portion, of the pedal body **61**, supported by the pedal shaft **44** and being in parallel with the direction in which the pedal shaft **44** extends and the direction in which the pedal body **61** extends (the predetermined direction K**3**) is taken as the reference plane of the pedal body **61**, and the tread surface **63** is sloped such that the height from the pedal body **61** (the reference plane of the pedal body **61**) decreases gradually from the portion **63***a* closer to the big toe of the operator's foot placed thereon toward the portion **63***b* closer to the little toe.

(62) In the present embodiment, it has been described that the pedal shaft **44** is fixed to the upper surface of the pedal body **61**; however, the scope of the disclosure is not limited thereto. For example, the pedal shaft **44** may be fixed to the lower surface of the pedal body **61**.

(63) In the present embodiment, an example of a case where the present invention is applied to each of the pair of traveling pedals **85** has been described; however, the scope of the disclosure is not limited thereto. The present invention may be applied to either one only of the pedal provided for the left foot and the pedal provided for the right foot. The target of application is not limited to the traveling pedal(s) **85** for manipulating the traveling device **3**. For example, the present invention may be applied to a pedal for manipulating equipment other than the traveling device **3** such as the swing cylinder C**2**, the boom cylinder C**3**, the arm cylinder C**4**, the bucket cylinder C**5**, a dozer cylinder, or various kinds of equipment attached to the working machine **1**.

(64) In the present embodiment, an example of a case where the present invention is applied to a backhoe whose pedal operation is performed by the operator in a posture of leaning the upper part of the body forward and gripping the manipulation member **82**, with the elbows rested on the armrests **93**, has been described; however, the scope of the disclosure is not limited thereto. For example, it may be configured such that the operator performs pedal operation in a posture of leaning on the backrest portion **6**B of the operator's seat **6**. The present invention may be applied also to various working machines other than a backhoe.

(65) The above structure makes it possible to perform smooth pedal operation. Moreover, it is possible to perform fine operation easier.

(66) The working machine **1** described above includes: the operator's seat **6**; and the at least one pedal **85** to be operated by being stepped on with a foot, the at least one pedal **85** being disposed ahead of the operator's seat **6**; wherein the at least one pedal **85** includes the pedal body **61** extending in the predetermined direction K**3**, the pedal shaft **44** supporting the pedal body **61** in

such a way as to allow pivotal motion thereof in the predetermined direction K**3**, and the tread surface **63** provided on an upper surface of the pedal body **61** and being a surface on which an operator places the foot, and the tread surface **63** is sloped such that the height H**1** from the pedal body **61** decreases gradually from a portion closer to a big toe of the foot of the operator placed thereon (the greater-height portion **63***a*) toward a portion closer to a little toe (the less-height portion **63***b*).

(67) This structure enables the operator to operate the pedal by stepping thereon with the ball of the big toe of the foot, with the knees together, resulting in smooth pedal operation.

(68) The pedal shaft **44** is disposed at an intermediate position of the at least one pedal **85** in the front-rear direction K**1**, supports the pedal body **61** in such a way as to allow front and rear seesaw motion thereof, and extends in the machine-body width direction K**2**.

(69) This structure also makes it possible to operate the traveling pedal **85** smoothly.

(70) The at least one pedal **85** includes the tread member **62** provided closer to toes of the foot of the operator placed thereon than the pedal shaft **44** on the upper surface of the pedal body **61**, and the tread surface **63** is formed as an upper surface of the tread member **62**.

(71) This structure makes it possible to form the sloped tread surface **63** easily.

(72) The working machine **1** includes, as the at least one pedal **85**, a pair of pedals **85** arranged at a distance from each other.

(73) This structure makes it possible to perform pedal operation of the working machine **1** equipped with the pair of pedals smoothly.

(74) The distance between the pair of pedals **85** becomes greater gradually toward the toes of the feet of the operator placed thereon.

(75) This structure enables the operator to place the feet on the pair of pedals **85** comfortably.

(76) Going from the portion closer to the big toe of the foot of the operator placed thereon (the greater-height portion **63***a*) toward the portion closer to the little toe (the less-height portion **63***b*), the tread member **62** may be skewed in the orientation D**2** of coming closer to the pedal shaft **44** in a plan view.

(77) The working machine **1** further includes the traveling device **3**, wherein the at least one pedal **85** is at least one traveling pedal for manipulating the traveling device **3**.

(78) This structure makes it possible to operate the at least one traveling pedal smoothly.

(79) The upper surface of the pedal body **61** is a planar surface that is in parallel with the direction K**3** in which the pedal body **61** extends, and the tread surface **63** is sloped such that the height from the upper surface of the pedal body **61** decreases gradually from the portion closer to the big toe of the foot of the operator placed thereon (the greater-height portion **63***a*) toward the portion closer to the little toe (the less-height portion **63***b*).

(80) This structure also makes it possible to perform smooth pedal operation.

(81) The working machine **1** further includes: the manipulator base **81** disposed in front of the operator's seat **6**; the manipulation member **82** to be gripped and operated, the manipulation member **82** being provided on the manipulator base **81**; and the armrest **93** extending rearward from the manipulator base **81**, wherein the at least one pedal **85** is disposed at a position where the at least one pedal **85** is operable by the operator in a posture of leaning an upper part of a body forward and gripping the manipulation member **82**, with an elbow rested on the armrest **93**.

(82) The present embodiment makes it possible to enhance the operability of the at least one pedal **85** operated in a posture of leaning the upper part of the body forward and gripping the manipulation member **82**, with the elbow rested on the armrest **93**.

(83) While preferred embodiments of the present invention have been described above, it shall be construed that the embodiments disclosed herein are just illustrative in every aspect and not restrictive, and it is to be understood that variations and modifications will be apparent to those skilled in the art without departing from the scope and spirit of the present invention. All modifications made within the scope of the claims and its equivalents are intended to be

encompassed herein. The scope of the present invention, therefore, is to be determined solely by the following claims.

Claims

1. A working machine, comprising: an operator's seat; and at least one pedal to be operated by being stepped on with a foot, or with feet, the at least one pedal being disposed ahead of the operator's seat, wherein the at least one pedal includes a pedal body extending in a predetermined direction, a pedal shaft having an axis intersecting the predetermined direction and supporting the pedal body in such a way as to allow pivotal motion of the pedal body around the axis, and a tread surface provided on an upper surface of the pedal body and being a surface on which an operator places the foot, and the tread surface is sloped such that a height from the pedal body decreases gradually from a portion closer to a big toe of the foot of the operator placed thereon toward a portion closer to a little toe.
2. The working machine according to claim 1, wherein the pedal shaft extends in a machine-body width direction, is disposed at an intermediate position in the direction in which the pedal body extends, and supports the pedal body in such a way as to allow the pivotal motion of the pedal body.
3. The working machine according to claim 2, wherein the at least one pedal includes a tread member provided closer to toes of the foot of the operator placed thereon than the pedal shaft on the upper surface of the pedal body, and the tread surface is formed as an upper surface of the tread member.
4. The working machine according to claim 1, comprising: as the at least one pedal, a pair of pedals arranged at a distance from each other.
5. The working machine according to claim 4, wherein the distance between the pair of pedals becomes greater gradually toward the toes of the feet of the operator placed thereon.
6. The working machine according to claim 3, wherein going from the portion closer to the big toe of the foot of the operator placed thereon toward the portion closer to the little toe, the tread member is skewed in an orientation of coming closer to the pedal shaft in a plan view.
7. The working machine according to claim 1, further comprising: a traveling device, wherein the at least one pedal is at least one traveling pedal for manipulating the traveling device.
8. The working machine according to claim 1, wherein the upper surface of the pedal body is a planar surface that is in parallel with the direction in which the pedal body extends, and the tread surface is sloped such that the height from the upper surface of the pedal body decreases gradually from the portion closer to the big toe of the foot of the operator placed thereon toward the portion closer to the little toe.
9. The working machine according to claim 1, further comprising: a manipulator base disposed in front of the operator's seat; a manipulation member to be gripped and operated, the manipulation member being provided on the manipulator base; and an armrest extending rearward from the manipulator base, wherein the at least one pedal is disposed at a position where the at least one pedal is operable by the operator in a posture of leaning an upper part of a body forward and gripping the manipulation member, with an elbow rested on the armrest.