[Name of Document] Description
[Title of Invention] CUTTING SYSTEM AND CUTTING DEVICE
[TECHNICAL FIELD]
[0001]

The present invention relates to a cutting system and a cutting device.

[BACKGROUND ART]
[0002]

Conventionally, a cutting device that cuts an object such as a film made of a resin attached to a workpiece such as a substrate is known.

As such a cutting device, for example, a device that cuts a laminate film into a length that suits a length of a substrate when the laminate film is attached to the substrate is known.

Note that a technique concerning a cutting device is, for example, described in Patent Literature 1.

[Citation List]
[Patent Literature]
[0003]
[PTL 1]: Japanese Unexamined Patent Application Publication No. 2010-208311
[Summary of Invention]
[Technical Problem]
[0004]

However, in recent years, substrates and the like that have complicated shapes such as a curved surface shape are used. In a case where a film attached to such a substrate is cut, it is difficult to cut the film properly according to a conventional method such as a method of successively cutting a film by a cutter roller or a method of cutting a film by linearly moving a cutter.

Furthermore, in a case where one end of a film attached to a substrate having a complicated shape is a free end when a portion of the film that sticks out from an end edge of the substrate is to be cut, a method that requires cutting a film while giving tension cannot be used.

That is, according to conventional methods for cutting a sheet-shaped member such as a film, it is sometimes impossible to properly cut the sheet-shaped member.

[0005]

An object of the present invention is to realize a technique of more properly cutting a sheet-shaped member.

[SOLUTION TO PROBLEM]
[0006]

In order to achieve the object described above, a cutting system according to an aspect of the present invention comprising:

a cutting device including

a body that has a vibrator that applies ultrasonic vibration to a cutting blade, and

a guide unit that includes a guiding unit and a linking unit, the guiding unit accommodating a tip of the cutting blade, the tip

protruding from the body, the linking unit linking the guiding unit to the body, a part of the guiding unit having a cutting space into which an object to be cut is introduced, a part of the cutting blade being exposed in the cutting space; and

a transport unit that moves the cutting device and the object to be cut relative to each other.

[Advantageous Effects of Invention]

[0007]

According to the present invention, it is possible to provide a technique of more properly cutting a sheet-shaped member.

[BRIEF DESCRIPTION OF DRAWINGS]

[0008]

[Fig. 1] Fig. 1 is a schematic view illustrating an overall configuration of a cutting system 1 according to the present invention.

[Fig. 2] Fig. 2 is a schematic view (side view) illustrating an example of a specific configuration of the cutting device 20.

[Fig. 3] Fig. 3 is a schematic view (perspective view) illustrating an example of a structure of the guide unit 20B.

[Fig. 4] Fig. 4 is a schematic view illustrating an example of a linkage angle of the guide unit 20B with respect to the body 20A (standard posture).

[Fig. 5] Fig. 5 is a schematic view illustrating an example of a linkage angle of the guide unit 20B with respect to the body 20A (withdrawal posture).

[Fig. 6] Fig. 6 is a schematic view illustrating an example of a linkage angle of the guide unit 20B with respect to the body 20A (acute-angle cutting posture).

[Fig. 7] Fig. 7 is a schematic view illustrating an example of an object to be cut.

[Fig. 8] Fig. 8 is a schematic view illustrating an operation when an object to be cut is cut by using the guide unit 20B that is set in the standard posture (before the film 110 is guided).

[Fig. 9] Fig. 9 is a schematic view illustrating an operation when an object to be cut is cut by using the guide unit 20B that is set in the standard posture (when cutting film 110).

[Fig. 10] Fig. 10 is a schematic view (side view) illustrating an operation when an object to be cut is cut by using the guide unit 20B that is set in the withdrawal posture.

[Fig. 11] Fig. 11 is a schematic view (rear view) illustrating an operation when an object to be cut is cut by using the guide unit 20B that is set in the withdrawal posture.

[Fig. 12] Fig. 12 is a schematic view illustrating an example of a configuration of the cutting device 20 where the cutting space S is formed only on an upstream side of the cutting blade 21.

[Fig. 13] Fig. 13 is a schematic view illustrating an example of a configuration in which the guide unit 20B is brought into the withdrawal posture by moving the guiding unit 22 in parallel.

[DESCRIPTION OF EMBODIMENTS]

[0009]

An embodiment of the present invention is described below with reference to the drawings.

[First Embodiment]

[Configuration]

Fig. 1 is a schematic view illustrating an overall configuration of a cutting system 1 according to the present invention.

The cutting system 1 is a device that cuts a film 110. In particular, the cutting system 1 can easily cut the film 110 attached to a workpiece 100 having a three-dimensional shape (e.g., a curved surface shape) at any posture along the workpiece 100.

In the following description, examples of a member called the film 110 include various members attached to the workpiece 100 and, for example, include attached objects called a film, a seal, a sheet, and a web.

[0010]

As illustrated in Fig. 1, the cutting system 1 includes an articulated robot 10 and a cutting device 20.

The articulated robot 10 (transport device) is, for example, a six-axis vertical articulated robot. The articulated robot 10 is equipped with the cutting device 20, and the articulated robot 10 cuts the film 110 attached to the workpiece 100 by controlling the cutting device 20 to desired position and posture.

The cutting device 20 has a cutting blade 21 to which ultrasonic vibration is applied by an ultrasonic vibrator, and cuts the film 110 while guiding the film 110 to the cutting blade 21.

[0011]

In the cutting device 20, the cutting blade 21 is brought into a state in which the cutting blade 21 is covered by a guide unit 20B (described below), and a part of the guide unit 20B is open; and, from the open portion, a part of the cutting blade 21 covered by the guide unit 20B is exposed. When the film 110 is to be cut, the articulated robot 10 equipped with the cutting device 20 moves the cutting device 20 while changing the posture of the cutting device 20. This makes it possible to cut the film 110 by the cutting blade 21 while guiding the film 110 to the open portion of the guide unit 20B.

[0012]

Fig. 2 is a schematic view (side view) illustrating an example of a specific configuration of the cutting device 20.

As illustrated in Fig. 2, in the cutting system 1, the cutting device 20 includes a body 20A and the guide unit 20B, and the guide unit 20B is rotatably linked to the body 20A.

The body 20A has built therein an ultrasonic vibrator 30 that applies ultrasonic vibration to the cutting blade 21, and the cutting blade 21 is installed on an end of the ultrasonic vibrator 30.

By applying ultrasonic vibration to the cutting blade 21 by using the ultrasonic vibrator 30, the cutting blade 21 reciprocates in a direction of protrusion from the body 20A and cuts an object

to be cut (here, the film 110).

[0013]

Fig. 3 is a schematic view (perspective view) illustrating an example of a structure of the guide unit 20B.

As illustrated in Figs. 2 and 3, the guide unit 20B includes a guiding unit 22 and a linking unit 23.

The guiding unit 22 includes a grooved portion 221 that accommodates a tip of the cutting blade 21 protruding from the body 20A, and the grooved portion 221 has a shape that does not cause the guiding unit 22 to interfere with the reciprocation movement of the cutting blade 21 resulting from the ultrasonic vibration.

The guiding unit 22 has a cutting space S into which an object to be cut is introduced, and a part of the cutting blade 21 is exposed in the cutting space S.

[0014]

In side view, the guiding unit 22 has a bifurcated structure in which one of end portions (a right end portion in Figs. 2 and 3) includes an upper branch B1 and a lower branch B2. A space between the upper branch B1 and the lower branch B2 constitutes the cutting space S into which an object to be cut is introduced, and a space between a tip of the upper branch B1 and a tip of the lower branch B2 constitutes an opening E that receives the object to be cut. In the guiding unit 22, the tip of the upper branch B1 and the tip of the lower branch B2 each has a taper, and the opening E of the cutting space S has a shape whose opening width increases with decreasing distance to the tip of the upper branch B1 and the tip of the lower branch B2. Therefore, it is possible to realize a structure that allows the object to be cut to be easily introduced into the cutting space S. Note that, with regard to the shape of the opening E, in order to prevent the body of a worker from coming into contact with the cutting blade 21, it is desirable that the opening width of the opening E be a value that does not cause, for example, a finger of a person to come into contact with the cutting blade 21.

A part of the cutting blade 21 accommodated in the grooved portion 221 is exposed in the cutting space S. Therefore, when an object to be cut is introduced into the cutting space S from the opening E, while the object to be cut is being guided to the upper branch B1 and the lower branch B2, the object to be cut comes into contact with the cutting blade 21 and is cut by the cutting blade 21 to which ultrasonic vibration has been applied.

[0015]

The linking unit 23 links the guiding unit 22 and the body 20A, and is rotatably installed on the body 20A through a rotary unit 231. That is, the guide unit 20B, by rotating around a rotary shaft of the rotary unit 231, can change its linkage posture with respect to the body 20A to difference linking angles.

[0016]

Figs. 4 to 6 are each a schematic view illustrating an example of a linkage angle of the guide unit 20B with respect to

the body 20A. Fig. 4 illustrates a posture in which the guiding unit 22 faces the body and accommodates the tip of the cutting blade 21 in the grooved portion 221 (hereunder referred to as "standard posture"), Fig. 5 illustrates a posture in which the guiding unit 22 withdraws from a position where it accommodates the tip of the cutting blade 21 and in which the guiding unit 22 does not interfere with an object to be cut that is cut by the cutting blade 21 (hereunder referred to as "withdrawal posture"), and Fig. 6 illustrates a posture in which the guiding unit 22 rotates to an opposite side (a side where the object to be cut is introduced) opposite to the position of the withdrawal posture of the guiding unit 22 and in which the cutting blade 21 cuts into the object to be cut at an acute angle (hereunder referred to as "acute-angle cutting posture").

[0017]

As illustrated in Figs. 4 to 6, as a result of the linking unit 23 rotating around the rotary shaft of the rotary unit 231, it is possible to maintain the posture of the guide unit 20B at any posture while the posture changes from the acute-angle cutting posture, in which the guiding unit 22 rotates toward an opposite side (a side where the object to be cut is introduced) opposite to the position of the withdrawal posture of the guiding unit 22 and in which the cutting blade 21 cuts into the object to be cut; to the standard posture, in which the guiding unit 22 accommodates the tip of the cutting blade 21 in the grooved portion 221; and then to the withdrawal posture, in which the guiding unit 22 withdraws from the position where it accommodates the tip of the cutting blade 21 and in which the guiding unit 22 does not interfere with the object to be cut that is cut by the cutting blade 21.

[0018]

By maintaining the guide unit 20B at various angles with respect to the body 20A, it is possible to, in the cutting space S, change an angle of intersection of the cutting blade 21 with respect to the guiding unit 22 (specifically, the upper branch B1 and the lower branch B2).

For example, in the standard posture illustrated in Fig. 4, in the cutting space S, the angle of intersection of the cutting blade 21 with respect to the lower branch B2 of the guiding unit 22 is 80 degrees, and, in the acute-angle cutting posture illustrated in Fig. 6, the angle of intersection of the cutting blade 21 with respect to the lower branch B2 of the guiding unit 22 is 60 degrees.

Therefore, in accordance with the properties of the object to be cut, it is possible to change the angle at which the cutting blade 21 cuts into the object to be cut.

[0019]

[Operation]

Next, an operation when an object to be cut is cut by the cutting system 1 according to the present embodiment is described.

Fig. 7 is a schematic view illustrating an example of an

object to be cut.

In the example illustrated in Fig. 7, the film 110, which is made of a resin, is attached to the workpiece 100, which is a glass substrate, and a peripheral edge of the workpiece 100 has a bent portion having a convex shape and a concave shape.

In Fig. 7, a region A1 is a region where the film 110 protrudes from the workpiece 100 and whose one end is a free end; a region A2 is a region where the film 110 is supported by the workpiece 100 at a portion thereof near the peripheral edge of the workpiece 100; and a region A3 is a region where the peripheral edge of the workpiece 100 is bent in a concave shape and where the cutting device 20 and the workpiece 100 easily interfere with each other when the film 110 is to be cut.

[0020]

Figs. 8 and 9 are each a schematic view illustrating an operation when an object to be cut is cut by using the guide unit 20B that is set in the standard posture; Fig. 8 illustrates a state before the film 110 (object to be cut) is guided to the cutting space S of the guiding unit 22; and Fig. 9 illustrates a state in which the film 110 is guided into the cutting space S of the guiding unit 22 and is cut by the cutting blade 21.

The cutting system 1 is equipped with the cutting device 20 as a tool of the articulated robot 10, and, while the articulated robot 10 optionally controls the position and the posture of the cutting device 20, an object to be cut (film 110) can be cut.

[0021]

In a case where the cutting system 1 cuts the film 110, the workpiece 100 is held in a space within an operation range of the articulated robot 10, for example, by sucking the workpiece 100 to which the film 110 has been attached.

In this state, one end of a peripheral part of the film 110 that sticks out from the workpiece 100 is a free end to which no tension is being given.

In this way, as illustrated in Fig. 8, with the guide unit 20B being set in the standard posture, with respect to the peripheral part, which is the free end, of the film 110, the cutting device 20 is moved and the film 110 is guided to the cutting space S from the opening E.

[0022]

Here, since the opening width of the opening E is increased with decreasing distance to an end portion, it is possible to easily introduce the film 110.

Then, as illustrated in Fig. 9, with the film 110 being supported by the upper branch B1 and the lower branch B2 of the guiding unit 22, the film 110 comes into contact with the cutting blade 21.

Therefore, it is possible to properly cut the film 110 having the free end, like the region A1.

[0023]

Figs. 10 and 11 are each a schematic view illustrating an

operation when an object to be cut is cut by using the guide unit 20B that is set in the withdrawal posture; Fig. 10 is a side view of a state in which the film 110 is being cut at a portion thereof near the peripheral edge of the workpiece 100; and Fig. 11 is a rear view of a state in which the film 110 is being cut at a portion thereof near the peripheral edge of the workpiece 100.

As illustrated in Figs. 10 and 11, since, near the peripheral edge of the workpiece 100, the film 110 is attached to the workpiece 100, a certain supporting force acts upon the film 110.

Therefore, it is possible to cut the film 110 without using a supporting force provided by the guide unit 20B.

[0024]

Here, since the guide unit 20B is in its withdrawal posture, the guide unit 20B that is not used can be prevented from interfering with the workpiece 100 or the film 110 that is to be cut, and the film 110 can be properly cut.

That is, it is possible to properly cut the film 110 at a portion thereof near the peripheral edge, like the region A2, of the workpiece 100.

When the guide unit 20B is in the withdrawal posture, as with the region A3, even at a portion where the peripheral edge of the workpiece 100 is bent in a concave shape and where the cutting device 20 and the workpiece 100 more easily interfere with each other, it is possible to prevent the guide unit 20B from interfering with the workpiece 100 and to properly cut the film 110. It is also possible to easily change a direction of movement of the cutting blade 21 and to cut the film 110 along the peripheral edge of the workpiece 100.

That is, it is possible to properly cut the film 110 at a portion, like the region A3, where the cutting device 20 and the workpiece 100 easily interfere with each other.

[0025]

When the guide unit 20B is in the withdrawal posture, since the tip of the cutting blade 21 is in an exposed state, it is possible to, without cutting into the film 110 from its peripheral edge, start cutting the film 110 by running the tip of the cutting blade 21 into a cutting position of the film 110 (for example, a position near the peripheral edge of the workpiece 100).

Therefore, it is possible to flexibly select the cutting method when the film 110 is to be cut.

[0026]

Note that it is possible to cut the film 110 with the guide unit 20B being set in the acute-angle cutting posture instead of in the standard posture.

When the guide unit 20B is in the acute-angle cutting posture, since the action of interposing the film 110 between the cutting blade 21 and the lower branch B2 of the guiding unit 22 is enhanced, it is possible to cut a cutting portion of the film 110 while applying a high tension to the cutting portion of the film 110.

[0027]

As described above, in the cutting system 1 according to the present embodiment, the articulated robot 10 is equipped with the cutting device 20, and, while the articulated robot 10 controls the cutting device 20 to a desired position and posture, the cutting blade 21, a part of which is exposed in the cutting space S of the guide unit 20B, cuts an undesired portion of an object to be cut (film 110) attached to the workpiece 100.

Since the opening width of the opening E of the cutting space S is increased, it is possible to easily introduce the object to be cut into the cutting space S.

Then, the object to be cut that has come into contact with the cutting blade 21 to which ultrasonic vibration has been applied is cut while being supported by the upper branch B1 and the lower branch B2 of the guiding unit 22.

Therefore, according to the cutting system 1, it is possible to more properly cut a sheet-shaped member.

[0028]

By bringing the guide unit 20B into, for example, the standard posture, since the tip of the cutting blade 21 is accommodated in the guiding unit 22 and only a part of the cutting blade 21 is exposed in the cutting space S, it is possible to suppress the body (for example, a finger) of a worker and the cutting blade 21 from coming into contact with each other.

[0029]

The cutting system 1 has a structure that does not easily allow the cutting device 20 and the workpiece 100 to interfere with each other. That is, in the standard posture and in the acute-angle cutting posture, the body 20A of the cutting device 20 is offset to an opposite side (for example, the upper side in Fig. 2) with respect to the position of the cutting space S with the rotary unit 231 being interposed therebetween. Therefore, according to the cutting system 1, in the standard posture and in the acute-angle cutting posture, it is possible to cut the film 110 at a position thereof near an end edge of the workpiece 100.

[0030]

Furthermore, according to the cutting system 1, in a case where the film 110 is attached to both surfaces of the workpiece 100 such as a substrate and an end part of the film 110 attached to one surface of the workpiece 100 is to be cut, only the film 110 to be cut of the films 110 attached to surfaces (a front surface and a rear surface) that are close to each other can be guided from the opening E of the space for cutting S into the space for cutting S with certainty. As a result, the film 110 can be cut properly.

[0031]

[Modification 1]

Although, in the embodiment above, an example of a configuration (see Fig. 2) in which, in the standard posture, the cutting space S of the guiding unit 22 extends toward a side of the cutting blade 21 opposite to the opening E to also form a space on

a downstream side where an object to be cut (film 110) moves relative to the cutting blade 21 has been described, the present invention is not limited thereto.

Fig. 12 is a schematic view illustrating an example of a configuration of the cutting device 20 where the cutting space S is formed only on an upstream side of the cutting blade 21.

In the example of the configuration illustrated in Fig. 12, in the standard posture, the cutting space S of the guiding unit 22 is formed up to the position of the cutting blade 21 from the opening E without extending to the downstream side where an object to be cut (film 110) moves relative to the cutting blade 21.

Therefore, it is possible to prevent, for example, entry of the cut object in a space situated on the downstream side of the cutting blade 21.

[0032]

[Modification 2]

Although, in the embodiment above, an example of a configuration in which, in order to bring the guide unit 20B into the withdrawal posture, the rotary unit 231 is rotated to move the guiding unit 22 toward the position of a rear surface of the body 20A has been described, the present invention is not limited thereto.

It is possible to use, for example, a configuration in which the guide unit 20B is brought into the withdrawal posture by moving the guiding unit 22 in parallel.

Fig. 13 is a schematic view illustrating an example of a configuration in which the guide unit 20B is brought into the withdrawal posture by moving the guiding unit 22 in parallel.

As illustrated in Fig. 13, a cutting device 20 of the present modification includes a horizontal-movement actuator M1 (for example, an air cylinder or an electric motor) that is installed on a body-20A side and that moves the guiding unit 22 in a horizontal direction (direction along a direction of movement relative to an object to be cut), and a vertical-movement actuator M2 (for example, an air cylinder or an electric motor) that is installed on a guiding-unit-22 side and that moves the guiding unit 22 in a vertical direction (direction vertical to the direction of movement relative to an object to be cut).

Specifically, a supporting member H where the vertical-movement actuator M2 is installed is installed on a movable part of the horizontal-movement actuator M1, and the guiding unit 22 is installed on a movable part of the vertical-movement actuator M2.

Even such a configuration makes it possible to bring the guide unit 20B into the withdrawal posture.

[0033]

Note that the present invention can be, for example, modified and improved as appropriate as long as the effects of the present invention are produced, and is not limited to the above embodiment.

For example, a transport device such as the articulated robot 10 can not only cut an object to be cut (e.g., the film 110) by

moving the cutting device 20, but also can cut the object to be cut by moving the object to be cut and the cutting device 20 relative to each other in various manners such as moving the object to be cut relative to the cutting device 20 or moving both of the object to be cut and the cutting device 20.

[0034]

In the embodiment above, an actuator for changing an angle (for example, the standard posture, the withdrawal posture, and the acute-angle cutting posture) of the guide unit 20B with respect to the body 20A may be provided. It is possible to realize, for example, a configuration in which an actuator that rotates the rotary unit 231 is installed at the cutting device 20 and the angle of the guide unit 20B with respect to the body 20A is changed by driving the actuator. This makes it possible to cut an object to be cut while properly adjusting the angle of the guide unit 20B with respect to the body 20A (that is, an angle of intersection of the cutting blade 21 with respect to the lower branch B2 of the guiding unit 22) in accordance with, for example, the properties of the object to be cut.

In addition to providing the actuator that rotates the rotary unit 231, it is possible to operate, for example, the articulated robot 10 or a separately provided robot arm to rotate the guide unit 20B around the rotary unit 231 and to thus change the angle of the guide unit 20B with respect to the body 20A. It is possible to, for example, while operating the articulated robot 10 and pushing the guide unit 20B against, for example, a predetermined fixed member, change the angle of the guide unit 20B with respect to the body 20A. Alternatively, it is possible to, by using a mechanism such as a robot arm separately provided with respect to the cutting device 20 held by the articulated robot 10, rotate the guide unit 20B and change the angle of the guide unit 20B with respect to the body 20A.

[0035]

Although, in the embodiment above, an example of a configuration (see, for example, Fig. 2) in which, when the guide unit 20B is brought into the standard posture or the acute-angle cutting posture, a part of the cutting blade 21 is exposed in a space between the body 20A and the guiding unit 22 has been described, the present invention is not limited thereto. That is, it is possible to realize a configuration in which a member such as the linking unit 23 covers the cutting blade 21 provided between the body 20A and the guiding unit 22.

It is also possible to realize a configuration in which the configurations of, for example, the embodiment and the modifications above are combined as appropriate.

[0036]

As described above, the cutting system 1 of the present embodiment includes an articulated robot 10 and a cutting device 20; and the cutting device 20 includes a body 20A and a guide unit 20B.

The body 20A has an ultrasonic vibrator 30 that applies ultrasonic vibration to the cutting blade 21.

The guide unit 20B includes a guiding unit 22 and a linking unit 23, the guiding unit 22 accommodating a tip of the cutting blade 21, the tip protruding from the body 20A, the linking unit 23 linking the guiding unit 22 to the body 20A, a part of the guiding unit 22 having a cutting space S into which an object to be cut is introduced, a part of the cutting blade 21 being exposed in the cutting space S.

The articulated robot 10 moves the cutting device 20 and the object to be cut relative to each other.

Therefore, since it is possible to, by introducing the film 110 into the cutting space S, support the film 110 by using the guiding unit 22, even if a tension is not applied to the film 110, it is possible to properly cut the film 110.

Therefore, according to the cutting system 1, it is possible to more properly cut a sheet-shaped member.

[0037]

The opening E of the cutting space S of the guide unit 20B has an opening width that increases with decreasing distance to an opening end.

Therefore, it is possible to easily introduce the object to be cut into the cutting space S.

[0038]

The guide unit 20B is switchable between a posture in which the guide unit 20B accommodates the tip, which protrudes from the body 20A, of the cutting blade 21 and a posture in which the guide unit 20B allows the tip, which protrudes from the body 20A, of the cutting blade 21 to be exposed and withdraws to a position where the guide unit 20B does not interfere with the object to be cut that is cut.

Therefore, even at a portion where the cutting device 20 and the workpiece 100 easily interfere with each other, it is possible to prevent the guide unit 20B from interfering with the workpiece 100 and to properly cut the film 110.

[0039]

In a posture in which the guide unit 20B accommodates the tip, which protrudes from the body 20A, of the cutting blade 21, the guide unit 20B is such that an angle of intersection of the guiding unit 22 and the cutting blade 21 exposed in the cutting space S is adjustable.

Therefore, it is possible to, in accordance with the properties of the object to be cut, change the angle at which the cutting blade 21 cuts into the object to be cut.

[0040]

In the posture in which the guide unit 20B accommodates the tip, which protrudes from the body 20A, of the cutting blade 21, the cutting blade 21 that is exposed in the cutting space S intersects the guiding unit 22 at an acute angle on a side where the object to be cut is introduced.

Therefore, since an action of interposing the film 110 between the cutting blade 21 and the lower branch B2 of the guiding unit 22 is enhanced, it is possible to cut a cutting portion of the film 110 while applying a high tension to the cutting portion of the film 110.

[0041]

Although the embodiment of the present invention has been described above, the present invention is not limited to the above embodiment. The effects described in the present embodiment are most suitable effects produced by the present invention, and the effects of the present invention are not limited to the ones described in the present embodiment.

[Reference Signs List]

[0042]

1 cutting system, 10 articulated robot (transport device), 20 cutting device, 20A body, 20B guide unit, 21 cutting blade, 22 guiding unit, 221 grooved portion, 23 linking unit, 231 rotary unit, 30 ultrasonic vibrator, 100 workpiece, 110 film, S cutting space, B1 upper branch, B2 lower branch, E opening, M1 horizontal-movement actuator, M2 vertical-movement actuator, H supporting member

[Name of Document] CLAIMS

[Claim 1]

A cutting system comprising:

a cutting device including

a body that has a vibrator that applies ultrasonic vibration to a cutting blade, and

a guide unit that includes a guiding unit and a linking unit, the guiding unit accommodating a tip of the cutting blade, the tip protruding from the body, the linking unit linking the guiding unit to the body, a part of the guiding unit having a cutting space into which an object to be cut is introduced, a part of the cutting blade being exposed in the cutting space; and

a transport unit that moves the cutting device and the object to be cut relative to each other.

[Claim 2]

The cutting system according to claim 1, wherein an opening of the cutting space of the guide unit has an opening width that increases with decreasing distance to an opening end.

[Claim 3]

The cutting system according to claim 1 or claim 2, wherein the guide unit is switchable between a posture in which the guide unit accommodates the tip, which protrudes from the body, of the cutting blade and a posture in which the guide unit allows the tip, which protrudes from the body, of the cutting blade to be exposed and withdraws to a position where the guide unit does not interfere with the object to be cut that is cut.

[Claim 4]

The cutting system according to any one of claims 1 to 3, wherein, in a posture in which the guide unit accommodates the tip, which protrudes from the body, of the cutting blade, the guide unit is such that an angle of intersection of the guiding unit and the cutting blade exposed in the cutting space is adjustable.

[Claim 5]

The cutting system according to any one of claims 1 to 4, wherein, in a posture in which the guide unit accommodates the tip, which protrudes from the body, of the cutting blade, the cutting blade that is exposed in the cutting space intersects the guiding unit at an acute angle on a side where the object to be cut is introduced.

[Claim 6]

A cutting device comprising:

a body that has a vibrator that applies ultrasonic vibration to a cutting blade; and

a guide unit that includes a guiding unit and a linking unit, the guiding unit accommodating a tip of the cutting blade, the tip protruding from the body, the linking unit linking the guiding unit to the body, a part of the guiding unit having a cutting space into which an object to be cut is introduced, a part of the cutting blade being exposed in the cutting space.