

TAPE UNIT AND TAPE AFFIXING MACHINE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a tape unit and a tape affixing machine.

Description of the Related Art

Processing of semiconductor wafers involves using a tape affixing machine for affixing a tape such as a protective tape for use in a grinding step or a tape for use in a dicing step to a semiconductor wafer (see, for example, JP 2009-206161A). Usually, tapes to be applied to semiconductor wafers are stored in dedicated storage bags that bear tape information. For affixing a tape to a semiconductor wafer, the operator takes the tape out of its dedicated storage bag and sets the tape on a tape affixing machine.

If the type of a tape to be affixed to a semiconductor wafer is misidentified, then the semiconductor wafer with the tape applied thereto is likely to become defective when it is processed. To avoid confusion between different tape types, it is customary to mark storage bags dedicated to tapes for semiconductor wafers with tape information in order for the operator to

be able to confirm the types of tapes. The operator can decide whether or not a tape to be set on a tape affixing machine is correct by visually confirming the tape information on its storage bag.

SUMMARY OF THE INVENTION

However, once the operator has removed the tape from the dedicated storage bag that bears the tape information, the operator may not be able to confirm the tape information or may set a wrong tape on the tape affixing machine.

It is therefore an object of the present invention to provide a tape unit and a tape affixing machine that prevent a tape from being misidentified when set on the tape affixing machine.

In accordance with an aspect of the present invention, there is provided a tape unit including a core and a tape wound on the core, in which the core includes an information recording medium for recording tape information therein.

With the above arrangement, since the tape unit itself includes the information recording medium for recording tape information therein, the tape unit contributes to preventing the tape to be set on the tape

affixing machine from being misidentified.

The information recording medium may include a one-dimensional code, a two-dimensional code or an radio frequency (RF) tag of an radio frequency identifier (RFID) from which information can be read and into which information can be written by way of wireless communication.

With the above arrangement, the tape information can easily be assigned to the tape.

In accordance with another aspect of the present invention, there is provided a tape affixing machine for affixing, to a wafer, a tape of a tape unit including a core and a tape wound on the core, the core including an information recording medium for recording tape information therein, including a holder for holding the tape unit, a sticking member for sticking the tape delivered from the holder to the wafer, a reader for reading the information recording medium, and a controller. The controller includes a tape registering section for registering a plurality of pieces of tape information, a tape selecting section, and a tape determining section. The tape selecting section records therein tape information selected by the operator from the tape information registered in the tape registering

section. The tape determining section determines whether or not the tape information recorded in the tape selecting section and the tape information read by the reader agree with each other.

With the above arrangement, the tape affixing machine is able to prevent the tape to be set on thereon from being misidentified.

In the tape affixing machine, the tape information may include at least a type and an expiry date of the tape. The tape determining section may determine whether or not the type included in the tape information recorded in the tape selecting section and the type included in the tape information read by the reader agree with each other. If the types do not agree with each other, the tape determining section may indicate that a tape misidentification has occurred. If the types agree with each other, the tape determining section may compare the current time and the expiry date included in the tape information read by the reader with each other. If the expiry date has expired, the tape determining section may indicate that the expiry date has expired.

With the above arrangement, the tape affixing machine is also able to prevent the tape to be set on thereon from being misidentified.

The above and other objects, features and advantages of the present invention and the manner of realizing them will become more apparent, and the invention itself will best be understood from a study of the following description and appended claims with reference to the attached drawings showing a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view illustrating the appearance of a wafer according to an embodiment of the present invention;

FIG. 2 is a perspective view illustrating by way of example a tape unit according to the embodiment;

FIG. 3 is a perspective view illustrating an example in which a protective tape is affixed to the wafer according to the embodiment;

FIG. 4 is a perspective view illustrating by way of example the structure of a frame unit according to the embodiment;

FIG. 5 is a perspective view illustrating the appearance of a tape affixing machine according to the embodiment;

FIG. 6 is a side elevational view, partly in cross

section, of the tape affixing machine according to the embodiment;

FIG. 7 is a side elevational view, partly in cross section, of the tape affixing machine according to the embodiment;

FIG. 8 is a view illustrating a general scheme for a processing arrangement according to the embodiment;

FIG. 9 is a flowchart of a processing sequence according to the embodiment;

FIG. 10 is a perspective view illustrating by way of example a tape unit according to a modification of the embodiment;

FIG. 11 is a perspective view illustrating by way of example a tape unit according to another modification of the embodiment; and

FIG. 12 is a side elevational view, partly in cross section, of a tape affixing machine according to a modification of the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will hereinafter be described in detail below with reference to the drawings. The present invention is not limited to the details of the embodiment described below.

The components described below cover those which could easily be anticipated by those skilled in the art and those which are essentially identical thereto. Furthermore, the arrangements described below can be used in appropriate combinations. Various omissions, replacements, or changes of the arrangements may be made without departing from the scope of the present invention.

Moreover, in the case where a plurality of components having essentially identical functions and configurations do not need to be particularly distinguished from each other in the embodiment, those components may be denoted by identical reference signs in their description. Some of such identical reference signs may be suffixed with different numerals, characters, or the like for distinguishing themselves from each other.

In the description that follows, an orthogonal XYZ coordinate system will be established, and the positional relationship between components will be explained in relation to the orthogonal XYZ coordinate system. It is assumed in the description and drawings that a direction in a horizontal plane is referred to as an X-axis direction, a direction perpendicular to the X-axis direction in the horizontal plane is referred to as a Y-axis direction, and a direction perpendicular to the X-

axis direction and the Y-axis direction in the horizontal plane is referred to as a Z-axis direction. An XY plane that includes the X-axis direction and the Y-axis direction lies parallel to the horizontal plane. The Z-axis direction perpendicular to the XY plane represents a vertical direction.

[Structures of wafer and tape]

A wafer and a tape unit that are to be handled by a tape affixing machine according to the embodiment will first be described below. FIG. 1 is a perspective view illustrating the appearance of a wafer according to the present embodiment. FIG. 2 is a perspective view illustrating by way of example a tape unit according to the present embodiment. FIG. 3 is a perspective view illustrating an example in which a protective tape is affixed to the wafer according to the present embodiment. FIG. 4 is a perspective view illustrating by way of example the structure of a frame unit according to the present embodiment.

A wafer 11 illustrated in FIG. 1 is a semiconductor wafer or an optical device wafer including a substrate made of silicon, sapphire, gallium arsenide, or the like, and is of a circular structural object. The wafer 11 has a face side 11-3 including a plurality of devices 11-2

such as integrated circuits (ICs), large scale integration (LSI) circuits, or the like formed in respective areas that are demarcated by a plurality of crossing streets 11-1. The wafer 11 also has a notch 11-4 defined in an outer circumferential edge thereof for indicating a crystal orientation. The wafer 11 may alternatively have an orientation flat on its circumferential edge for indicating a crystal orientation.

A tape unit 4 illustrated in FIG. 2 includes a core 41 and a tape 420 wound on the core 41. The core 41 is of a tubular shape that is hollow inside and is made of plastics, for example. The core 41 includes an information recording medium 201 for recording tape information. The information recording medium 201 is implemented as an RF tag of an RFID (hereinafter referred to as an "RFID tag") from which information can be read and into which information can be written by way of wireless communication. The tape information that can be recorded in the information recording medium 201 may represent the name of the type of the tape 420, the lot number of the tape 420, and the expiry date of the tape 420. The tape 420 may be in the form of a protective tape 421 (see FIG. 3) for protecting the face side 11-3 of the wafer 11, a dicing tape 422 (see FIG. 4) of a frame unit

11-F to be described later, or the like. In FIG. 2, the information recording medium 201 is illustrated as being disposed on an outer curved surface of the core 41 and elongate longitudinally along the core 41. However, the present invention is not limited to the information recording medium 201 illustrated in FIG. 2.

As illustrated in FIG. 3, the protective tape 421 is affixed to the face side 11-3 of the wafer 11, for example, in a predetermined tape affixing step that is carried out by a tape affixing machine 1 (see FIG. 5). If the protective tape 421 is a protective tape for a back grinding (BG) process, then the protective tape 421 protects face side 11-3 of the wafer 11 when a reverse side 11-5 of the wafer 11 is ground.

In the tape affixing step that is carried out by the tape affixing machine 1, the frame unit 11-F illustrated in FIG. 4 is produced. The frame unit 11-F includes the wafer 11, an annular frame 29, and the dicing tape 422.

The annular frame 29 is of a ring shape with an opening defined inside. The dicing tape 422 has an outer circumferential portion stuck to the annular frame 29 and a central portion stuck to the reverse side 11-5 of the wafer 11 that is opposite the face side 11-3 thereof. The

dicing tape 422 includes a base layer made of a synthetic resin and a glue layer disposed on the base layer and stuck to the reverse side 11-5 of the wafer 11. The base layer is made of a synthetic resin such as polyolefin (PO), polyvinyl chloride (PVC), or the like. The dicing tape 422 may alternatively include only a base layer made of a synthetic resin, and may be stuck to the wafer 11 by way of thermocompression bonding.

As the central portion of the dicing tape 422 is stuck to the reverse side 11-5 of the wafer 11, the wafer 11 is placed in the opening of the annular frame 29. In other words, the wafer 11 and the annular frame 29 are integrally combined with each other by the dicing tape 422. The wafer 11 and the annular frame 29 that are integrally combined with each other by the dicing tape 422 form a frame unit 11-F. The frame unit 11-F firmly holds the wafer 11 at the time the wafer 11 is divided into individual device chips including the respective devices 11-2 in a cutting step.

[Structure of tape affixing machine]

A tape fixing machine according to the present embodiment will be described below. FIG. 5 is a perspective view illustrating the appearance of a tape affixing machine according to the present embodiment.

FIGS. 6 and 7 are side elevational views, partly in cross section, of the tape affixing machine according to the present embodiment.

The tape affixing machine, denoted by 1 in FIGS. 5 through 7, includes a pay-out roll 6, i.e., an example of a holder, having a mount shaft 5 on which the tape unit 4 is mounted in a roll form and a take-up roll 16 having a take-up shaft 18 for winding up the tape 420 that has been used in a roll form.

The tape 420 as it is delivered from the pay-out roll 6 travels around a fixed roller 8, a sticking roller 10, and between peeling rollers 12 and 14, and then is wound up on the take-up shaft 18.

The tape affixing machine 1 includes a holding table 22. The holding table 22 has a frame placing region 24 for placing the annular frame 29 fixedly thereon and a wafer placing region 26 for placing the wafer 11 fixedly thereon. The holding table 22 is positioned selectively in a working area 28 and an affixing area 30 by moving in directions perpendicular to the direction along which the tape 420 is delivered from the pay-out roll 6 to the take-up roll 16, i.e., directions parallel to the X-axis direction. The working area 28 is an area where the wafer 11 and the annular frame 29 are placed by the operator.

The affixing area 30 is an area where the wafer 11 and the annular frame 29 are placed when the tape 420 is affixed thereto.

The tape affixing machine 1 includes a cutter assembly 20. The cutter assembly 20 has a mount base 32 and a swing arm 34 as illustrated in FIGS. 6 and 7. The mount base 32 is movable in vertical directions, i.e., in directions parallel to the Z-axis direction, by an actuating means, not illustrated. The swing arm 34, which is swingably mounted on the mount base 32 by a swing shaft 36, is swingable about the swing shaft 36 with respect to the mount base 32 by an actuating means, not illustrated.

The swing arm 34 has a tape cutter 38. The tape cutter 38 is attached so as to be positionally adjustable in horizontal directions, i.e., directions parallel to the X-axis direction.

The tape affixing machine 1 includes a touch panel 33 (see FIG. 5). The touch panel 33 accepts entries input from the operator for operating the tape affixing machine 1. The touch panel 33 can display various pieces of information in a tape affixing step carried out by the tape affixing machine 1. The touch panel 33 may be a touch screen display including a display unit.

The tape affixing machine 1 includes a reader 90 illustrated in FIG. 5. The reader 90 reads the tape information recorded in the information recording medium 201 from the information recording medium 201 on the core 41 of the tape unit 4. Processing details of the tape affixing machine 1 based on the tape information read by the reader 90 will be described later.

The control unit 100, i.e., an example of a controller, includes an arithmetic processing unit such as a central processing unit (CPU), a memory unit such as a read only memory (ROM) or a random access memory (RAM), and an input/output interface unit. The control unit 100 thus configured is in the form of a computer for executing computer programs for controlling the components, referred to above, of the tape affixing machine 1 in order to carry out the tape affixing step to be described below.

[Operation of tape affixing machine]

Tape affixing operation of the tape affixing machine 1 according to the present embodiment will now be described in detail below with reference to FIGS. 5 through 7. Specifically, the tape affixing step for forming the frame unit 11-F illustrated in FIG. 4 will be described by way of example below. First, the operator

positions and places the wafer 11 and the annular frame 29 respectively in the wafer placing region 26 and the frame placing region 24 of the holding table 22 that is positioned in the working area 28.

Then, when the operator presses a button 22A on the holding table 22, the tape affixing machine 1 holds the wafer 11 and the annular frame 29 under suction on the holding table 22, and then moves the holding table 22 in the direction indicated by the arrow 5S in FIG. 5 until the holding table 22 is positioned in the affixing area 30.

Thereafter, the tape affixing machine 1 moves the sticking roller 10, i.e., an example of a sticking member, in the directions indicated by the arrow 6S in FIG. 6 to stick the tape 420 to the wafer 11 and the annular frame 29 that are positioned in the affixing area 30, as indicated by the dotted line in FIG. 6. The wafer 11 and the annular frame 29 are now integrally combined together by the tape 420. The sticking roller 10 is rotatable about its own central axis that extends perpendicularly to the direction along which the tape 420 is delivered, i.e., the direction perpendicular to the Y-axis direction.

Then, as illustrated in FIG. 7, the tape affixing machine 1 lowers the cutter assembly 20 from an upper

standby position to bring the tape cutter 38 into contact with an upper surface of the annular frame 29 with the tape 420 interposed therebetween.

The tape affixing machine 1 turns the swing arm 34 through 360°, i.e., a 360 degree, about the swing shaft 36 to cause the tape cutter 38 to cut the tape 420 into a circular shape, thereby producing a frame unit 11-F in which the wafer 11 and the annular frame 29 are integrally combined with each other by the tape 420. Having thus cut the tape 420, the tape affixing machine 1 retracts the cutter assembly 20 back to its upper standby position.

Then, the tape affixing machine 1 moves the peeling rollers 12 and 14 reciprocally in the directions indicated by the arrow 6S in FIG. 6, peeling off the tape 420 cut by the tape cutter 38 from the annular frame 29. At the same time, the tape affixing machine 1 winds up the used portion of the tape 420 on the take-up roll 16 and pulls out an unused portion of the tape 420 from the pay-out roll 6 to the affixing area 30.

Thereafter, the tape affixing machine 1 moves the frame unit 11-F fixedly held on the holding table 22 from the affixing area 30 to the working area 28, whereupon the tape affixing step comes to an end. The operator

picks up the frame unit 11-F that has moved to the working area 28 from the holding table 22, and stores the frame unit 11-F that has been picked up into a wafer cassette, not illustrated, which is then delivered to a next processing step such as a cutting step or a grinding step.

Usually, the tape 420, i.e., the protective tape 421 or the dicing tape 422, for use on wafers 11 is stored in a dedicated storage bag bearing tape information. When the operator is to use the tape 420, the operator takes the tape 420 out of the dedicated storage bag and sets the tape 420 on the tape affixing machine 1. Once the operator has removed the tape 420 out of the dedicated storage bag, however, if the operator is unable to confirm the tape information because the storage bag is missing or the operator cannot identify the storage bag from which the tape 420 has been taken out, then the operator may possibly set a wrong tape on the tape affixing machine 1. According to the present embodiment, the tape affixing machine 1 is configured to prevent the operator from misidentifying the tape 420 to be set on the tape affixing machine 1, as described below.

[General scheme for processing arrangement]

FIG. 8 is a view illustrating a general scheme for

a processing arrangement according to the embodiment. As illustrated in FIG. 8, the tape unit 4 to be set on the tape affixing machine 1 includes the information recording medium 201 recording the tape information that represents the name of the type of the tape 420, the lot number of the tape 420, and the expiry date of the tape 420. In the case where the information recording medium 201 is implemented as an RFID tag, the tape unit 4 bears the tape information in advance according to a method (1) or a method (2) as follows.

(1) The manufacturer of the tape 420 ships the tape unit 4 including the RFID tag that has recorded the tape information in advance.

(2) The operator who uses the tape 420 puts an RFID tag on the core 41, then prepares an apparatus capable of writing information in the RFID tag, i.e., an RFID writer, reads the tape information printed as a two-dimensional code or a bar code, i.e., a one-dimensional code, on the tape storage bag, and writes the read tape information into the RFID tag on the core 41 using the RFID writer.

Alternatively, as illustrated in FIGS. 5 and 8, the reader 90 of the tape affixing machine 1 reads the tape information recorded in the information recording medium 201 from the information recording medium 201 on the core

41 of the tape unit 4 set on the mount shaft 5 of the pay-out roll 6. For example, in the case where the information recording medium 201 that records the tape information therein is implemented as an RFID tag, the reader 90 may be implemented as an RFID reader. The reader 90 is mounted on the tape affixing machine 1 at a position capable of reading the tape information recorded in the RFID tag. The reader 90 then sends the read tape information to the control unit 100.

As illustrated in FIG. 8, the control unit 100 includes a tape registering section 110, a tape selecting section 120, and a tape determining section 130. The sections of the control unit 100 realize or carry out various processing functions and operations of the tape affixing machine 1 according to the present embodiment. The sections of the control unit 100 are realized by functions provided by programs stored in the memory unit, for example. Specifically, the sections of the control unit 100 are realized when the arithmetic processing unit executes the programs stored in the memory unit using the RAM or the like as a working area. The functional configuration of the control unit 100 is not limited to the scheme illustrated in FIG. 8, but may be of other schemes insofar as various processing details of the tape

affixing machine 1 can be performed as described below.

The tape registering section 110 is able to register therein a plurality of pieces of tape information entered by the operator through the touch panel 33.

The tape selecting section 120 records therein tape information selected by the operator from the tape information registered in the tape registering section 110. Specifically, the tape selecting section 120 displays a list of the pieces of tape information registered in the tape registering section 110 on the touch panel 33 in response to an operation entered by the operator. Then, the tape selecting section 120 records those pieces of tape information which are selected by the operator from the list of the pieces of tape information displayed on the touch panel 33.

The tape determining section 130 determines whether or not the tape information recorded in the tape selecting section 120 and the tape information read by the reader 90 agree with each other. In this manner, the tape determining section 130 determines whether or not the tape information registered in advance by the operator as representing a tape to be actually used in the tape affixing step and the tape information

representing the tape unit 4 set on the tape affixing machine 1 agree with each other. If the tape types included in the compared tape information agree with each other, then the tape determining section 130 decides that the tape types of the compared tape information agree with each other. If the tape types of the compared tape information agree with each other, then the tape determining section 130 may further determine whether or not the expiry date included in the tape information has expired. Specifically, the tape determining section 130 is configured to function as a clocking section for recording the current time and an expiry time monitoring section. Then, the tape determining section 130 compares the current time with the expiry date included in the tape information read by the reader 90. In the case where the current time, i.e., present date and time, has exceeded the expiry date, the tape determining section 130 issues an error signal. The control unit 100 can send a notice to the operator based on the error signal.

The tape determining section 130 can provide the operator with a notice depending on the determined result. For example, if the tape determining section 130 decides that the tape types of the compared tape information do not agree with each other, then the tape determining

section 130 displays a notice, i.e., a tape error, indicating that a tape misidentification has occurred on the touch panel 33 for the operator to recognize. In addition, if the tape determining section 130 decides that the current time has exceeded the expiry date, then the tape determining section 130 may display a notice, i.e., a tape error, indicating that the expiry date of the tape has been exceeded on the touch panel 33 for the operator to recognize. In the case where the tape types of the compared tape information agree with each other, the tape determining section 130 may also display a notice indicating that the correct tape has been set on the tape affixing machine 1 on the touch panel 33.

The control unit 100 may upload the tape information of the tape unit 4 set on the tape affixing machine 1 via a communication network 2 to a management apparatus 3. The operator who uses the management apparatus 3 can perform unified management of an inventory of tapes or the like on the basis of the tape information uploaded from the tape affixing machine 1.

The management apparatus 3 may manage tape information. The tape registering section 110 may register tape information acquired from the management apparatus 3 via the communication network 2.

[Processing sequence]

FIG. 9 is a flowchart of a processing sequence according to the embodiment. The processing sequence is carried out by the sections of the control unit 100, for example.

The reader 90 reads the tape information recorded in the information recording medium 201 from the information recording medium 201 on the core 41 of the tape unit 4 set on the mount shaft 5 of the pay-out roll 6 (step S101).

The tape selecting section 120 records those pieces of tape information which are selected by the operator from the list of the pieces of tape information displayed on the touch panel 33 (step S102).

The tape determining section 130 determines whether or not the tape type included in the tape information read in step S101 and the tape type included in the tape information recorded in step S102 agree with each other (S103).

If the tape determining section 130 decides that the tape types do not agree with each other (step S103: No), then the tape determining section 130 displays a tape error indicating that a tape misidentification has occurred on the touch panel 33 (step S104), after which

the processing sequence illustrated in FIG. 9 is ended.

On the other hand, if the tape determining section 130 decides that the tape types agree with each other (step S103: Yes), then the tape determining section 130 determines whether or not the expiry date of the tape has expired (step S105). Specifically, the tape determining section 130 compares the current time with the expiry date included in the tape information read in step S101 to determine whether or not the current time has exceeded the expiry date of the tape. If the tape determining section 130 decides that the expiry date of the tape has expired (step S105: Yes), then control goes to step S104, displaying a tape error indicating that the expiry date has expired on the touch panel 33. On the other hand, if the tape determining section 130 decides that the expiry date of the tape has not expired (step S105: No), then the processing sequence illustrated in FIG. 9 is ended. At this time, the tape determining section 130 may display that the correct tape has been set on the tape affixing machine 1 on the touch panel 33, for example.

As described above, the tape unit (4) according to the present embodiment includes the core (41) and the tape (420) wound on the core (41), the core (41) including the information recording medium (201) for

recording tape information therein. Since the tape unit itself records the tape information therein, even if the operator is unable to confirm the tape information borne on the storage bag of the tape, the tape unit contributes to preventing the tape to be set on the tape affixing machine from being misidentified.

Furthermore, since the information recording medium (201) combined with the tape according to the present embodiment is an RFID tag from which information can be read and into which information can be written by way of wireless communication, tape information can easily be assigned to the tape.

Moreover, the tape affixing machine 1 according to the present embodiment includes the holder, i.e., the pay-out roll 6 or the like, the sticking member, i.e., the sticking roller 10 or the like, the reader (90), and the controller, i.e., the control unit 100 or the like. The holder holds a tape. The sticking member sticks a tape delivered from the holder to the wafer (11). The reader reads the information recording medium (201). The controller includes the tape registering section (110) capable of registering a plurality of pieces of tape information, the tape selecting section (120), and the tape determining section (130). The tape selecting

section records therein tape information selected by the operator from the tape information recorded in the tape registering section. The tape determining section determines whether or not the tape information recorded in the tape selecting section and the tape information read by the reader agree with each other. The tape affixing machine 1 thus configured is able to prevent the tape to be set on the tape affixing machine from being misidentified.

[Modifications]

(1) Information recording medium

FIGS. 10 and 11 illustrate in perspective tape units according to modifications of the embodiment. In the above embodiment, an RFID tag is mounted on the core 41 of the tape unit 4 as the information recording medium 201 that records tape information therein. However, the present invention is not limited to the above embodiment.

As illustrated in FIG. 10, a two-dimensional code may be applied to the core 41 of the tape unit 4 as an information recording medium 202 that records tape information therein. Alternatively, as illustrated in FIG. 11, a bar code, i.e., a one-dimensional code, may be applied to the core 41 of the tape unit 4 as an information recording medium 203 that records tape

information therein. The bar code applied to the tape unit 4 may be produced by the operator on the basis of the bar code printed on the storage bag of the tape unit 4, or the tape manufacturer may ship the tape unit 4 with the bar code applied to the core 41.

As illustrated in FIGS. 10 and 11, the information recording medium 202, i.e., the two-dimensional code, or the information recording medium 203, i.e., the bar code, is applied to a surface of the core 41 that lies parallel to a YZ plane on the end of the core 41 of the tape unit 4.

In the case where the two-dimensional code illustrated in FIG. 10 or the bar code illustrated in FIG. 11 is used as the information recording medium that records tape information therein, the reader 90 is implemented as an image capturing apparatus capable of capturing an image of the tape information recorded in the two-dimensional code or the bar code. The reader 90 is mounted on the tape affixing machine 1 at a position capable of capturing an image of the information recording medium 202, i.e., the two-dimensional code, or the information recording medium 203, i.e., the bar code.

(2) Tape affixing machine

The tape affixing machine 1 according to the above

embodiment may be replaced with a tape affixing machine 1X (see FIG. 12) that is capable of affixing a tape including peel-off paper. FIG. 12 is a side elevational view, partly in cross section, of a tape affixing machine according to a modification of the embodiment. The tape affixing machine, denoted by 1X in FIG. 12, according to the modification is different from the tape affixing machine 1 in that it incorporates a mechanism for separating peel-off paper from a tape 420X. In the case where a plurality of components of the tape affixing machine 1X that have essentially identical functions and configurations to those of the tape affixing machine 1 according to the above embodiment do not need to be distinguished therefrom, those components may be denoted by identical reference signs to those of the tape affixing machine 1 in their description. However, those components of the tape affixing machine 1X that have essentially identical functions and configurations to those of the tape affixing machine 1 according to the above embodiment may be denoted by different reference signs for illustrative purposes in their description.

When the tape 420X that is delivered from the pay-out roll 6 travels around fixed rollers 44 and 46, a peel-off sheet 50 of paper is peeled off from the tape

420X. The tape affixing machine 1X includes a peel-off paper take-up roll 52 that winds up the peel-off sheet 50 of paper as it travels around a fixed roller 48.

The tape 420X from which the peel-off sheet 50 of paper has been peeled off past the fixed roller 46 travels around fixed rollers 54 and 56, around a sticking roller 58, between tape-peeling movable rollers 60 and 62, and around a fixed roller 64, and is then wound on the take-up roll 16.

In the tape affixing machine 1X, the sticking roller 58 and the tape-peeling movable rollers 60 and 62 are disposed on the same side of the holding table 22. The sticking roller 58 and the tape-peeling movable rollers 60 and 62 operate in a manner different from the tape affixing machine 1 according to the above embodiment.

Specifically, the tape affixing machine 1X moves the sticking roller 58 toward the side where the fixed rollers 54 and 56 are disposed in a direction perpendicular to the X-axis direction, thereby pressing and sticking the tape 420X to the wafer 11 and the annular frame 29.

Then, with the sticking roller 58 waiting in the vicinity of the fixed rollers 54 and 56, the tape affixing machine 1X lowers the cutter assembly 20 from

the upper standby position to bring the tape cutter 38 into contact with an upper surface of the annular frame 29 with the tape 420X interposed therebetween.

Then, the tape affixing machine 1X turns the swing arm 34 through 360°, i.e., a 360 degree, about the swing shaft 36 to cause the tape cutter 38 to cut the tape 420X into a circular shape. After having cut the tape 420X, the tape affixing machine 1X retracts the cutter assembly 20 back to its upper standby position.

Thereafter, the tape affixing machine 1X moves the tape-peeling movable rollers 60 and 62 toward the side where the fixed rollers 54 and 56 are disposed in a direction perpendicular to the X-axis direction, thereby peeling off the used portion of the tape 420X from the annular frame 29.

Then, the tape affixing machine 1X moves the sticking roller 58 and the tape-peeling movable rollers 60 and 62 simultaneously back to their original positions, winds up the used portion of the tape 420X on the take-up roll 16, and pulls out an unused portion of the tape 420X from the pay-out roll 6 to the affixing area 30. The tape affixing machine 1X subsequently operates in the similar manner as the tape affixing machine 1 according to the above embodiment.

The tape affixing machine 1X is also able to prevent the tape to be set on the tape affixing machine 1X from being misidentified, as with the tape affixing machine 1. Specifically, the tape unit 4 to be set on the tape affixing machine 1X incorporates the information recording medium 201, 202, or 203, and the tape affixing machine 1X includes the reader 90 and the sections of the control unit 100. The tape unit 4 and the tape affixing machine 1X thus configured prevent the operator from misidentifying the tape 420X to be set on the tape affixing machine 1X.

(3) Others

The control unit 100 may include an individual information processing apparatus physically independent of the tape affixing machine 1 according to the embodiment. The information processing apparatus acquires tape information by way of data communication with the control unit 100 of the tape affixing machine 1, determines whether or not the tape types of compared tape information agree with each other, and sends the determined result to the control unit 100. On the basis of the determined result regarding the tape information from the information processing apparatus, the control unit 100 displays information on the touch panel 33 to

indicate the information regarding the tape to the operator.

The components of the tape affixing machine 1 according to the above embodiment are functional and conceptual in nature, and may not necessarily be physically configured as illustrated. In other words, the sections of the control unit 100 of the tape affixing machine 1 may not be specifically dispersed or integrated as illustrated, but may be functionally or physically dispersed or integrated wholly or partly in any desired units depending on various loads on the control unit 100 and the way in which the control unit 100 is used. For example, the tape registering section 110 and the tape selecting section 120 may be implemented as functionally or physically integrated in the control unit 100.

The present invention is not limited to the details of the above described preferred embodiment. The scope of the invention is defined by the appended claims and all changes and modifications as fall within the equivalence of the scope of the claims are therefore to be embraced by the invention.

WHAT IS CLAIMED IS:

1. A tape unit comprising:
a core; and
a tape wound on the core,
wherein the core includes an information recording medium for recording tape information therein.

2. The tape unit according to claim 1, wherein the information recording medium includes a one-dimensional code, a two-dimensional code or a radio frequency tag of a radio frequency identifier from which information is read and into which information is written by way of wireless communication.

3. A tape affixing machine for affixing, to a wafer, a tape of a tape unit including a core and a tape wound on the core, the core including an information recording medium for recording tape information therein, comprising:

a holder for holding the tape unit;
a sticking member for sticking the tape delivered from the holder to the wafer;
a reader for reading the information recording medium; and
a controller,
wherein the controller includes

a tape registering section for registering a plurality of pieces of tape information therein,

a tape selecting section for recording therein tape information selected by an operator from the tape information registered in the tape registering section, and

a tape determining section for determining whether or not the tape information recorded in the tape selecting section and tape information read by the reader agree with each other.

4. The tape affixing machine according to claim 3,

wherein the tape information includes at least a type and an expiry date of the tape,

the tape determining section determines whether or not the type included in the tape information recorded in the tape selecting section and the type included in the tape information read by the reader agree with each other,

if the types do not agree with each other, the tape determining section indicates that a tape misidentification has occurred,

if the types agree with each other, the tape determining section compares current time and the expiry date included in the tape information read by the reader

with each other, and

if the expiry date has expired, the tape determining section indicates that the expiry date has expired.

5. The tape affixing machine according to claim 3, wherein the information recording medium includes a one-dimensional code, a two-dimensional code or a radio frequency tag of a radio frequency identifier from which information is read and into which information is written by way of wireless communication.

6. The tape affixing machine according to claim 4, wherein the information recording medium includes a one-dimensional code, a two-dimensional code or a radio frequency tag of a radio frequency identifier from which information is read and into which information is written by way of wireless communication.