

APPARATUS FOR CUTTING MASKING TAPE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an apparatus for cutting a masking tape, which is used for an apparatus for applying cut masking tapes on a metal strip to protect portions of the strip other than portions to be plated.

Description of Related Art

Stripe plated strips are used for materials of various terminals of connectors and IC lead frames.

Stripe plated strip is a strip base which is manufactured by plating an elongated metal strip of copper alloy, stainless steel or nickel and the like in a longitudinal direction in such a manner that plated portion and unplated portion are continuously formed in the form of stripe.

The stripe plated strip may be made by two steps including a taping step for applying cut masking tapes on a metal strip to form unplated portions and a step for plating the metal strip with gold, silver or solder. The process may further include a preliminary step for plating a copper or nickel undercoat prior to the taping step.

With the increase in the degree of integration from ICs into LSIs, accuracy in plating width and spacing therebetween of the

stripe plated strips used as lead frame material becomes more severe. The required accuracy of plating position is currently ± 0.05 mm or less.

The accuracy of plating position and width is directly determined by the accuracy of application of the masking tape.

At conventional step for applying masking tapes, a cutting apparatus which is capable of cutting a masking tape into a given width at a high accuracy has been required to enhance the accuracy of application of the masking tape.

An example of conventional masking tape cutting apparatus is disclosed in Japanese Unexamined Patent Publication No. Hei 3-178796 (refer to Fig. 4). A masking tape MT is longitudinally cut into a number of elongated tapes having various widths while it is on a receiving roll 104. Cutting is conducted by a cutting blade 105.

The cutting blade 105 is supported by a support mechanism comprising an X-axis stage 112 which is provided in parallel with the blade face of the cutting blade 105, a Y-axis stage 111 which is provided at normal angles with respect to the X-axis stage 112 and a Z-axis stage 110 which is provided at normal angles with respect to the X and Y-axis stages 112 and 111.

At a cutting station, the masking tape MT is on a receiving roll 104 while it is tensioned. Unless the cutting blade 105 will be forced into the masking tape MT under this condition, the tape would not be easily cut. Accordingly, the cutting resistance imposed upon the cutting blade 105 increases, so that the adhesive of the masking tape MT is liable to adhere to the cutting blade 105. Thus, the X-axis stage 112 is provided to

sequentially move the cutting blade 105 to avoid reduction in cutting ability due to adhesion of the adhesive of the masking tape MT upon the cutting blade 105.

If the biasing force of the cutting blade 105 to cut the masking tape MT on the receiving roll 104 is excessively strong, the cutting blade would interfere with the receiving roll 104. Conversely if the biasing force of the cutting blade 105 is weak, the cutting blade 105 could not cut the masking tape MT. The Y-axis stage 111 is provided for preventing interference between the receiving roll 104 and the cutting blade 105 and for finely adjusting the biasing force upon the masking tape MT.

The cutting blades 105 having the same number as that of the cuts provided and spaced at the same spaces corresponding to the widths of cut tapes. The Z-axis stage 110 is provided to move an assembly of the cutting blades 105 in a width direction of the masking tape MT in alignment with the position of the metal strip J.

When the blade face having a blade face length of 1 cm is moved in a direction of an arrow W by 1 mm every 10 m passing of the metal strip J, the maximum length of the metal strip which can be cut by such cutting blade is 100 m. In this manner, since the length of the blade face of the cutting blade is finite, the proportion of the movement of the X-axis stage 112 is made less than a preset value if the entire length of the metal strip is longer than the maximum length of the metal strip. Accordingly, the longer the metal strip becomes, the smaller the movement ratio of the X-axis stage 112 becomes, resulting in that the blade becomes dull. In some case, the movement

margin may disappear prior to completion of taping due to wrong proportion of movement, so that taping should be continued by using the dull cutting blade 105.

The adjustment of the biasing force of the Y-axis stage 111 is so critical that well-experience is required to conduct such difficult operation. Excessively strong biasing force will cause the cutting blade 105 to interfere with the receiving roll 104 so that the cutting blade 105 may be damaged. Conversely, excessively weak biasing force will cause the cutting blade 105 not to cut off the masking tape MT.

It is an object of the present invention to provide an apparatus for cutting a masking tape which overcomes the above-mentioned problem of the prior art and has a less cutting resistance and is capable of easily adjusting the position of the cutter.

SUMMARY OF THE INVENTION

In order to accomplish the above mentioned object, the present invention provides an apparatus for cutting a masking tape into a plurality of tapes having predetermined widths, which is used for an apparatus for applying on an elongated metal strip said cut tapes continuously in a longitudinal direction and discontinuously in a width direction, comprising a pair of spaced rolls for holding the masking tape while it is tensioned at a given tension; guiding means for guiding said elongated metal strip to a given position; and cutting means between said rolls, including a blade portion having a plurality

of blades disposed in positions corresponding to cutting positions of said masking tape in the width direction, a holding portion for holding said blade portion, a slide portion for slidably supporting said support portion in the width direction of said masking tape, a measuring portion for moving said blade portion to a preset position relative to the position where said elongated metal strip is supplied by measuring and finely adjusting the position of said slide portion and securing portion for securing said slide portion relative to said elongated metal strip..

Said guide means preferably has a pair of rolls between which said elongated metal strip is sandwiched vertically or laterally.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described in detail by way of a preferred embodiment of a masking tape cutting apparatus with reference to drawings.

Fig. 1 is a schematic front view showing an embodiment of a masking tape cutting apparatus of the present invention;

Fig. 2 is a view of the masking tape cutting apparatus of Fig. 1 as viewed in a direction of an arrow A;

Fig. 3 is a perspective view showing a guide unit for a metal strip;

Fig. 4 is a schematic front view showing the conventional masking tape cutting apparatus.

Now, the structure of the masking tape cutting apparatus of

the present invention will be described in detail.

The masking tape cutting apparatus of the present invention mainly comprises guide rolls 62 for guiding masking tapes MT, pressure adhering rolls 61 for biasing the masking tapes MT upon a metal strip J, cutting apparatuses 10 between the basing rolls 61 and the guide rolls 62 and a guide device 20 for guiding the metal strip J to a given position on a pressure adhering apparatus 60.

The cutting apparatus 10 mainly comprises a cutter 11, a holding mechanism for holding the cutter 11, a slide mechanism for sliding the holding mechanism in a width direction of the metal strip J, a measuring mechanism for precisely measuring the position of the cutter 11 in the width direction for its fine adjustment, and a securing mechanism for securing the cutter 11 to a given position along of its sliding length.

The cutter 11 comprises a shank 11e having a longer and shorter shafts which are disposed on either side of a shoulder 11f and having a threaded portion on respective tips of the shafts; a plurality of cutter blades 11a through which the longer shaft of the shank 11e extends and which are supported thereon; a plurality of spacers 11b between the cutter blades 11a, through which the shank 11e extends and which are supported thereon; a nut 11c which is screwed on the tip portion of the longer shaft of the shank 11e for integrally securing the cutter blades 11a and spacers 11b; and a washer 11d for preventing the nut 11c from loosening.

The width dimensions of the spacers 11b are adjusted so that spaces between the tips of cutter blades 11a in an

assembled condition of the cutter 11 correspond to the dimensions of widths of cut masking tapes MT.

The holding mechanism comprises a cutter holder 13 having a holder 13b which projects from a holder main body at its upper and left portions as viewed in Fig. 2 and a mounting hole 13a at the front end of the holder 13b, extending in the width direction of the metal strip J. The cutter 11 is mounted on the cutter holder 13 by inserting the shorter shaft portion into the mounting hole 13a of the cutter holder 13 and presetting the angle of the cutter 11 with respect to the metal strip J and then fastening the fastening nut 18 so that a washer 18a is disposed between the nut 18 and the holder 13b.

The slide mechanism comprises a platen 19 which are secured to the main body of the masking tape applying apparatus, and a stage 12 having a linear guide mechanism on the platen 19, which is slidable in the width direction of the metal strip J. The cutter holder 13 is mounted on the stage 12.

The measuring mechanism comprises a micrometer mounting bracket 17 mounted on the lower side of the platen 19 as shown in Fig. 2 and a micrometer 16 secured to the micrometer mounting bracket 17.

The securing mechanism comprises a pair of bases 15b which are disposed on the platen 19 on the opposite side of the micrometer 16 and each having a threaded hole extending in a slide direction of the stage 12, biasing bolts 15, each threaded into the threaded hole of the base 15b and locking nuts 15a for securing the biasing bolt 15 to a given position.

After the plunger 16a is moved to a given position by

rotating the micrometer knob 16b of the micrometer 16, the stage 12 is secured by fastening the biasing bolts 15 and the biasing bolts 15 are locked by the locking nuts 15a. The cutter 11 is thus fixed.

Each of the cutting apparatuses 10 is adapted to cut the masking tape MT while the tape MT is tensioned between the guide roller 62 and the pressure adhering roll 61 at a given tension. The resistance against a cutting force becomes less since the cut masking tapes MT escape in a left and right directions by a length as half as the thickness of the cutter blade 11a immediately after cutting. Accordingly, a risk of adhesion of the adhesive of the masking tape MT on the cutter blade 11a is reduced. Since the resistance against cutting is less, no vibration of the cutter 11 occurs. The cutting accuracy depends upon the accuracy of tips of assembled cutter blades.

The cutter holder 13 may be secured to the stage 12 by means of butterfly bolts 14. The cutter 11 can be easily and safely removed from and mounted on the stage 12 while it is mounted on the cutter holder 13.

The guide unit 20 comprises a pair of rolls 21 between which the metal strip J is disposed in the width direction; a slide roll holder 22 having its vertical shaft on which one of the rolls 21 is rotatably journaled, said holder 22 being slidable in the width direction of the metal strip J, a stationary roll holder 23 having its vertical shaft on which another roll 21 is rotatably journaled, said holder 23 being fixed, a slide base 24 having a linear guide mechanism enabling the slide roll holder 22 to slide in the width direction of the metal strip J, a mount for mounting

the stationary roller holder 23 and a plurality of mounting holes 29 for securing the slide base 24 to the main body of the masking tape applying apparatus; and a knob 28 to cause the linear guide mechanism of the slide base 24 to slide.

Alternatively, the rolls 21 may be vertically disposed.

The rolls 21 may be preferably provided on the outer periphery thereof with grooves 21a to which the opposite edges of the metal strip J are fitted. Fitting of opposite edges of the metal strip J into the groove 21a enables the metal strip J to be stably guided.

The guide unit 20 is capable of guiding various metal strips having different widths by sliding the slide roll holder 22 by rotating the knob 28.

The knob 28 may be preferably provided with graduate representative of knob rotation angle or the slide length corresponding to knob angular movement. Alternatively, measuring instrument may be provided which is capable of directly measuring the slide length of the slide roll holder 22.

The graduate of the micrometer knob 28 may be calibrated in such a manner that the home position of the slide mechanism of the cutting apparatus 10 is determined with reference to the roll 21 which is journaled on the stationary roll holder 23 of the guide device 20. An operator can adjust the position of the cutter 11 by easily determining the position of the metal strip J based upon the graduate on the micrometer knob 28.

The masking tape cutting apparatus of the present invention cuts a masking tape while it is tensioned at a given tension between a guide roll and a pressure adhering roll.

Accordingly, the cutting resistance of the masking tape is less. Thus, adhesion of the adhesive of the masking tape to the cutter blades is reduced.

Since the cutting resistance is less, no vibration of the cutter occurs. Thus, the accuracy of the cutting dimension depends upon the accuracy of the blade tips of the assembled cutter blades. Therefore, only adjustment of the masking tape in a width direction is required to accomplish the adjustment of the cutter position.

Adjustment of cutter position can be easily accomplished by only provision of a guide device for metal strip.

What is claimed is:

1. An apparatus for cutting a masking tape into a plurality of tapes having predetermined widths, which is used for an apparatus for applying on an elongated metal strip said cut tapes continuously in a longitudinal direction and discontinuously in a width direction, comprising

a pair of spaced rolls for holding the masking tape while it is tensioned at a given tension;

guiding means for guiding said elongated metal strip to a given position; and

cutting means between said rolls, including a blade portion having a plurality of blades disposed in positions corresponding to cutting positions of said masking tape in the width direction, a holding portion for holding said blade portion, a slide portion for slidably supporting said support portion in the width direction of said masking tape, a measuring portion for moving said blade portion to a preset position relative to the position where said elongated metal strip is supplied by measuring and finely adjusting the position of said slide portion and securing portion for securing said slide portion relative to said elongated metal strip.

2. An apparatus for cutting a masking tape as defined in Claim 1 in which said guide means has a pair of rolls between which said elongated metal strip is sandwiched vertically or laterally.

