CLAIMS

[Claim 1]

A resin molding apparatus, in which a work is resin-molded by closing an upper mold and a lower mold having a cavity and filling the cavity with a resin, the resin molding apparatus being characterized in,

that the lower mold comprises: a lower mold cavity piece for configuring a bottom of the cavity; a lower mold clamper for configuring sides of the cavity; a film loader capable of holding and conveying a film on which the resin has been loaded; and a sucking section for sucking the film, which is disposed so as to cover an end face of the lower mold cavity piece and an end face of the lower mold clamper,

that the lower mold cavity piece is capable of moving relative to the lower mold clamper,

that the film loader disposes the film on the lower mold, in which the end face of the lower mold cavity piece is held level with the end face of the lower mold clamper, so that the resin is located above the lower mold cavity piece, and

that the sucking section sucks and holds the film so as to conform to an inner face of the cavity and supplies the resin to the cavity.

[Claim 2]

The resin molding apparatus according to claim 1,

wherein the film loader has a hand section including: a holding face for holding the film; a recessed part being formed in the holding face so as to act as a clearance of the resin loaded on the film; and an air path being communicated to a part of the holding face, which is located around the recessed part, so as to suck the film.

[Claim 3]

The resin molding apparatus according to claim 2,

wherein the loader has a rolled shutter section for opening and closing the holding face, the film is held and conveyed by the shutter section in a state where the shutter section is closed, and the film is disposed onto the lower mold in a state where the shutter section is opened.

[Claim 4]

The resin molding apparatus according to any one of claims 1-3,

wherein the loader has a heating section and a cooling section.

[Claim 5]

The resin molding apparatus according to claim 1,

wherein an upper part of the lower mold cavity piece is separable,

an upper part of the lower mold clamper are separable,

the upper part of the lower mold cavity piece and the upper part of the lower mold clamper are connected by a connecting member, and

the loader conveys the film, which covers the end face of the upper part of the lower mold cavity piece and the upper end face of the upper part of the lower mold clamper in a state where the end face of the upper part of the lower mold cavity piece and the upper end face of the upper part of the lower mold clamper are level with each other.

[Claim 6]

The resin molding apparatus according to claim 1,

further comprising a ring-shaped upper plate and a ring-shaped lower plate,

wherein the lower plate has a step-shaped part, which is formed in

an outer edge part, recessed from an upper plate-side face and extended in a circumferential direction,

a film plate section is constituted by the upper plate and the lower plate, the film is pinched between the plates, the step-shaped part of the lower plate is fitted to an inner part of the upper plate, and

the lower mold clamper has a step-shaped part, which is formed in an outer edge part, recessed from the end face and extended in a circumferential direction, the film plate section is fitted by fitting the step-shaped part of the lower mold clamper to an inner part of the lower plate.

[Claim 7]

The resin molding apparatus according to claim 1,

wherein an upper part of the lower mold cavity piece is separable, and

the upper part of the lower mold cavity piece is floating-supported so as to make the end face of the upper part of the lower mold cavity piece level with the end face of the lower mold clamper while opening the molds.

[Claim 8]

The resin molding apparatus according to any one of claims 1-7,

wherein the lower mold clamper has a plurality of pins, which are floating-supported and capable of projecting from the end face of the lower mold clamper, and

the plurality of pins are projected from the end face of the lower mold clamper so as to support the work and retracted in the lower mold clamper while clamping the work.

[Claim 9]

A resin molding apparatus, in which a work is resin-molded by closing a first mold and a second mold having a cavity and filling the cavity with a resin, the resin molding apparatus being characterized in,

that the second mold comprises: a cavity piece for configuring a bottom of the cavity; a clamper for configuring sides of the cavity; a movable section for moving the cavity piece relative to the clamper; a sucking section for sucking a film, which is disposed so as to cover the end face of the cavity piece and the end face of the clamper, and

that a film loader conveys the film in a flat state and disposes the film on the end face of the cavity piece and the end face of the clamper, in the flat state, with maintaining the end face of the cavity piece level with the end face of the clamper.

[Claim 10]

A resin molding method being performed in a resin molding apparatus, in which a work is resin-molded by closing an upper mold and a lower mold having a cavity and filling the cavity with a resin, the resin molding method being characterized in,

that the lower mold comprises: a lower mold cavity piece for configuring a bottom of the cavity; a lower mold clamper for configuring sides of the cavity; a film loader capable of holding and conveying a film on which the resin has been loaded; and a sucking section for sucking the film, which is disposed so as to cover an end face of the lower mold cavity piece and an end face of the lower mold clamper, and

that the resin molding method comprises:

(a) a step of disposing the film, by the film loader, to the lower mold, in which the end face of the lower mold cavity piece and the end face of the lower mold clamper are held level with each other, so as to

dispose the resin above the lower mold cavity piece; and

(b) a step of relatively moving the lower mold cavity piece with respect to the lower mold clamper, with sucking the film by the sucking section, so as to form the cavity, thereby the film is sucked and held with conforming to an inner face of the cavity and the resin is supplied to the cavity in a state where the resin is loaded on the film

[Claim 11]

A resin molding apparatus comprising a clamping mechanism for opening and closing molds, the resin molding apparatus being characterized in,

that the clamping mechanism comprises:

a movable platen for supporting at least one mold of a mold set;

a fixed platen for supporting the other mold thereof;

a first open/close mechanism cooperating with the movable platen and closing the mold set, with the fixed platen, until reaching a first clamping force;

a second open/close mechanism cooperating with the movable platen, closing the mold set until reaching a second clamping force greater than the first clamping force and maintaining a final resin pressure; and

a control section for controlling open-close actions of the first open/close mechanism and the second open/close mechanism, and

that the control section synchronously actuates the first open/close mechanism and the second open/close mechanism when starting the mold-closing action, the control section controls clamping the work supplied to the mold by: clamping the work with the first clamping force applied by the first open/close mechanism via the movable platen;

making the second open/close mechanism take over a pressurizing state of the first open/close mechanism; and clamping the work with the second clamping force, which is greater than the first clamping force and applied by the second open/close mechanism via the movable platen.

[Claim 12]

The resin molding apparatus according to claim 11,

wherein a plurality of the first open/close mechanisms are disposed, along an outer periphery of the movable platen, at regular intervals, and the second open/close mechanism is disposed in a center part of the movable platen.

[Claim 13]

A resin molding apparatus comprising: a fixed platen supporting one of molds of a mold set; a movable platen capable of moving upward and downward, the movable platen supporting the other mold of the mold set; and a clamping mechanism for opening and closing the mold set, the resin molding apparatus being characterized in,

that the clamping mechanism comprises:

a toggle link mechanism being linked with the center of the movable platen; and

at least three ball screw mechanisms being disposed, along the outer periphery of the movable platen, at regular intervals, the ball screw mechanisms being connected to the movable platen at the disposed positions.

[Claim 14]

A resin molding method being performed in a resin molding apparatus, comprising: a movable platen for supporting one of molds of

a mold set; a fixed platen for supporting the other mold thereof; and a clamping mechanism for opening and closing the molds for resin-molding, the resin molding method comprising:

a step of supplying a work and a resin to the opened mold set;

a step of synchronously actuating a first open/close mechanism and a second open/close mechanism, which are cooperated with the movable platen, and closing the mold set, by the first open/close mechanism, until the work is clamped with a first clamping force;

a step of making the second open/close mechanism take over the pressurizing state of the first open/close mechanism, and moving the movable platen until the mold set is clamped with a second clamping force greater than the first clamping force; and

a step of thermally curing the resin with maintaining a final resin pressure generated by clamping the mold set with the second clamping force.

Amended Claims

[Received by International Bureau on August 27th 2014 (27.08.2014)]

[Claim 1] (Amended)

A resin molding apparatus, in which a work is resin-molded by closing an upper mold and a lower mold having a cavity and filling the cavity with a resin, the resin molding apparatus being characterized in,

that the lower mold comprises: a lower mold cavity piece for configuring a bottom of the cavity; a lower mold clamper for configuring sides of the cavity; and a sucking section for sucking the film, which is disposed so as to cover an end face of the lower mold cavity piece and an end face of the lower mold clamper, and

that a loader has a first member and a second member, and the loader is capable of conveying the film, on which the resin is loaded, in a state where the film is pinched and stretched by the first member and the second member.

[Claim 2] (Amended)

The resin molding apparatus according to claim 1,

wherein the first member is a ring-shaped upper plate,

the second member is a ring-shaped lower plate,

the lower plate has a step-shaped part, which is formed in an outer edge part, recessed from an upper plate side face and extended in a circumferential direction,

a film plate section is constituted by the upper plate and the lower plate, the film is pinched between the plates, the step-shaped part of the lower plate is fitted to an inner part of the upper plate, and

the lower mold clamper has a step-shaped part, which is formed in an outer edge part, recessed from the end face and extended in a

circumferential direction, the film plate section is fitted by fitting the step-shaped part of the lower mold clamper in an inner part of the lower plate.

[Claim 3] (Amended)

The resin molding apparatus according to claim 1 or 2,

wherein the lower mold clamper has a plurality of pins, which are floating-supported and capable of projecting from the end face of the lower mold clamper, and

the plurality of pins are projected from the end face of the lower mold clamper so as to support the work and retracted in the lower mold clamper while clamping the work.

[Claim 4] (Amended)

The resin molding apparatus according to any one of claims 1-3,

wherein the loader has a rolled shutter section for opening and closing the holding face, the film is held and conveyed by the shutter section in a state where the shutter section is closed, and the film is disposed onto the lower mold in a state where the shutter section is opened.

[Claim 5] (Amended)

The resin molding apparatus according to any one of claims 1-4,

wherein the loader has a heating section and a cooling section.

[Claim 6] (Amended)

A resin molding method being performed in a resin molding apparatus, in which a work is resin-molded by closing an upper mold and a lower mold having a cavity and filling the cavity with a resin, the resin

molding method being characterized in,

that the lower mold comprises: a lower mold cavity piece for configuring a bottom of the cavity; a lower mold clamper for configuring sides of the cavity; and a sucking section for sucking the film, which is disposed so as to cover the end faces of the lower mold cavity piece and the end face of the lower mold clamper, and

that the resin molding method comprises:

(a) a step of holding the film, by a loader having a first member and a second member, in a state where the film is pinched and stretched by the first member and the second member;

(b) a step of moving the lower mold cavity piece relative to the lower mold clamper, by downwardly pressing the lower mold clamper by the loader, until the end face of the lower mold cavity piece is held level with the end face of the lower mold clamper, so as to dispose the resin, which is loaded on the film, above the lower mold cavity piece; and

(c) a step of relatively moving the lower mold cavity piece with respect to the lower mold clamper, with sucking the film by the sucking section, so as to form the cavity, thereby the film is sucked and held with conforming to an inner face of the cavity and the resin is supplied to the cavity as it is.

[Claim 7] (Amended)

A resin molding apparatus comprising a clamping mechanism for opening and closing molds, the resin molding apparatus being characterized in,

that the clamping mechanism comprises:

a movable platen for supporting at least one mold of a mold set;

a fixed platen for supporting the other mold thereof;

a first open/close mechanism cooperating with the movable platen and closing the mold set, with the fixed platen, until reaching a first clamping force;

a second open/close mechanism cooperating with the movable platen, closing the mold set until reaching a second clamping force greater than the first clamping force and maintaining a final resin pressure; and

a control section for controlling open-close actions of the first open/close mechanism and the second open/close mechanism, and

that the control section synchronously actuates the first open/close mechanism and the second open/close mechanism when starting the mold-closing action, the control section controls clamping the work supplied to the mold set by: clamping the work with the first clamping force applied by the first open/close mechanism via the movable platen; making the second open/close mechanism take over a pressurizing state of the first open/close mechanism; and clamping the work with the second clamping force, which is greater than the first clamping force and applied by the second open/close mechanism via the movable platen.

[Claim 8] (Amended)

The resin molding apparatus according to claim 7, wherein a plurality of the first open/close mechanisms are disposed, along an outer periphery of the movable platen, at regular intervals, and the second open/close mechanism is disposed in a center part of the movable platen.

[Claim 9] (Amended)

A resin molding apparatus comprising: a fixed platen supporting one of molds of a mold set; a movable platen capable of moving upward and downward, the movable platen supporting the other mold of the

mold set; and a clamping mechanism for opening and closing the mold set, the resin molding apparatus being characterized in,

that the clamping mechanism comprises:

a toggle link mechanism being linked with the center of the movable platen; and

at least three ball screw mechanisms being disposed, along the outer periphery of the movable platen, at regular intervals, the ball screw mechanisms being connected to the movable platen at the disposed positions.

[Claim 10] (Amended)

A resin molding method being performed in a resin molding apparatus, comprising: a movable platen for supporting one of molds of a mold set; a fixed platen for supporting the other mold thereof; and a clamping mechanism for opening and closing the molds for resin-molding, the resin molding method comprising:

a step of supplying a work and a resin to the opened mold set;

a step of synchronously actuating a first open/close mechanism and a second open/close mechanism, which are cooperated with the movable platen, and closing the mold set, by the first open/close mechanism, until the work is clamped with a first clamping force;

a step of making the second open/close mechanism take over the pressurizing state of the first open/close mechanism, and moving the movable platen until the mold set is clamped with a second clamping force greater than the first clamping force; and

a step of thermally curing the resin, with maintaining a final resin pressure generated by clamping the mold set with the second clamping force.

[Claim 11] (Deleted)

[Claim 12] (Deleted)

[Claim 13] (Deleted)

[Claim 14] (Deleted)

Explanation under Article 19(1) of PCT

The applicant amends claims 1-10 and deletes claims 11-14.

The amended claim 1 is based on the original claim 1 and the descriptions of the paragraphs [0123] to [0137] of the specification (especially, the paragraphs [0123] and [0124]).

The amended claim 2 is based on the original claim 6.

The amended claim 3 is based on the original claim 8.

The amended claim 4 is based on the original claim 3.

The amended claim 5 is based on the original claim 4.

The amended claim 6 is based on the original claim 10 and the descriptions of the paragraphs [0123] to [0137] of the specification.

The amended claim 7 is based on the original claim 11.

The amended claim 8 is based on the original claim 12.

The amended claim 9 is based on the original claim 13.

The amended claim 10 is based on the original claim 14.

CLAIMS

[Claim 1]

A resin molding apparatus, in which a work is resin-molded by closing an upper mold and a lower mold having a cavity and filling the cavity with a resin, the resin molding apparatus being characterized in,

that the lower mold comprises: a lower mold cavity piece for configuring a bottom of the cavity; a lower mold clamper for configuring sides of the cavity; and a sucking section for sucking the film, which is disposed so as to cover an end face of the lower mold cavity piece and an end face of the lower mold clamper,

that a loader has a first member and a second member, and the loader is capable of conveying the film, on which the resin is loaded, in a state where the film is pinched and stretched by the first member and the second member, and

that the loader has a rolled shutter section capable of opening and closing, the film is held and conveyed by the shutter section in a state where the shutter section is closed, and the film is disposed onto the lower mold in a state where the shutter section is opened.

[Claim 2]

The resin molding apparatus according to claim 1,

wherein the first member is a ring-shaped upper plate,

the second member is a ring-shaped lower plate,

the lower plate has a step-shaped part, which is formed in an outer edge part, recessed from an upper plate side face and extended in a circumferential direction,

a film plate section is constituted by the upper plate and the lower plate, the film is pinched between the plates, the step-shaped part of the lower plate is fitted to an inner part of the upper plate,

and

the lower mold clamper has a step-shaped part, which is formed in an outer edge part, recessed from the end face and extended in a circumferential direction, the film plate section is fitted by fitting the step-shaped part of the lower mold clamper in an inner part of the lower plate.

[Claim 3]

The resin molding apparatus according to claim 1 or 2,

wherein the lower mold clamper has a plurality of pins, which are floating-supported and capable of projecting from the end face of the lower mold clamper, and

the plurality of pins are projected from the end face of the lower mold clamper so as to support the work and retracted in the lower mold clamper while clamping the work.

[Claim 4]

The resin molding apparatus according to any one of claims 1-3,

wherein the loader has a heating section and a cooling section.

[Claim 5]

A resin molding method being performed in a resin molding apparatus, in which a work is resin-molded by closing an upper mold and a lower mold having a cavity and filling the cavity with a resin, the resin molding method being characterized in,

that the lower mold comprises: a lower mold cavity piece for configuring a bottom of the cavity; a lower mold clamper for configuring sides of the cavity; and a sucking section for sucking the film, which is disposed so as to cover the end faces of the lower mold cavity piece and the end face of the lower mold clamper, and

that the resin molding method comprises:

(a) a step of holding the film, by a loader having a first member, a second member and a rolled shutter section capable of opening and closing, in a state where the film is pinched and stretched by the first member and the second member, and holding and conveying the film by the shutter section in a state where the shutter section is closed;

(b) a step of moving the lower mold cavity piece relative to the lower mold clamper, by downwardly pressing the lower mold clamper by the loader, until the end face of the lower mold cavity piece is held level with the end face of the lower mold clamper, so as to dispose the resin, which is loaded on the film, above the lower mold cavity piece, and disposing the film onto the lower mold in a state where the shutter section is opened; and

(c) a step of relatively moving the lower mold cavity piece with respect to the lower mold clamper, with sucking the film by the sucking section, so as to form the cavity, thereby the film is sucked and held with conforming to an inner face of the cavity and the resin is supplied to the cavity as it is.