US Patent & Trademark Office
Patent Public Search | Text View

United States Patent Application Publication	20250255384
Kind Code	A1
Publication Date	August 14, 2025
Inventor(s)	Koga; Yuji et al.

Button Product Manufacturing Device, Button Product Manufacturing Method, and Non-Transitory Computer Readable Storage Medium

Abstract

A button product manufacturing device for manufacturing a button product by connecting a front member and a back member. The button product manufacturing device includes a printer configured to perform printing on a printed medium, a die set including a lower die configured to support the front member, and an upper die configured to separate the front member from the lower die, and a conveyor configured to convey the printed medium above the front member, in a conveying direction from the printer toward the die set.

Inventors: **Koga; Yuji (Nagoya, JP), Takeuchi; Kenji (Nagoya, JP), Tsujishita; Yoji (Ichinomiya-shi, JP)**

Applicant: **Brother Kogyo Kabushiki Kaisha** (Nagoya, JP)

Family ID: **90930317**

Appl. No.: **19/197382**

Filed: **May 02, 2025**

Foreign Application Priority Data

JP	2022-177203	Nov. 04, 2022

Related U.S. Application Data

parent WO continuation PCT/JP2023/038284 20231024 PENDING child US 19197382

Publication Classification

Int. Cl.: **A44B1/06** (20060101); **B29D19/04** (20060101)

U.S. Cl.:

CPC **A44B1/06** (20130101); **B29D19/04** (20130101);

Background/Summary

REFERENCE TO RELATED APPLICATIONS [0001] This is a continuation application of International Application No. PCT/JP2023/038284 filed on Oct. 24, 2023, which claims priority from Japanese Patent Application No. 2022-177203 filed on Nov. 4, 2022. The entire contents of the aforementioned applications are incorporated herein by reference.

BACKGROUND ART
[0002] In the related art, a device for manufacturing a button product such as a button badge to which a predetermined image is applied is known, and Patent Literature 1 discloses a button product manufacturing device that manufactures a button badge by caulking a front lid to a back lid.
[0003] However, in the related art described above, a user himself or herself places a transparent film on a film placement surface of a lower die, the transparent film being used for caulking a front lid together with a back lid supported by a lower die. Therefore, the user himself or herself can enjoy the manufacturing of the button badge by participating in the manufacturing of the button badge, but the positioning accuracy of the transparent film may decrease. As a result, there is a problem that it is difficult to manufacture a button product with high accuracy.
[0004] Therefore, an object of the present invention is to provide a button product manufacturing device, a button product manufacturing method, and a button product manufacturing program capable of manufacturing a button product with high accuracy.
SUMMARY
[0005] A button product manufacturing device for manufacturing a button product by connecting a front member and a back member. The button product manufacturing device includes a printer configured to perform printing on a printed medium. A die set includes a lower die configured to support the front member, and an upper die configured to separate the front member from the lower die. A conveyor configured to convey the printed medium above the front member, in a conveying direction from the printer toward the die set.

Description

BRIEF DESCRIPTION OF DRAWINGS
[0006] FIG. **1** is a perspective view illustrating a button product manufacturing device according to an embodiment.
[0007] FIG. **2** is a plan view illustrating the button product manufacturing device in FIG. **1**.
[0008] FIG. **3** is a block diagram illustrating a configuration of a control system of the button product manufacturing device in FIG. **1**.
[0009] FIG. **4** is a perspective view illustrating a configuration of a front member feed unit.
[0010] FIG. **5** is a perspective view illustrating a configuration of a back member feed unit.
[0011] FIG. **6**A is a plan view illustrating a print medium.
[0012] FIG. **6**B is a plan view illustrating a white film.
[0013] FIG. **7** is a perspective view illustrating a configuration of a conveying unit.
[0014] FIG. **8** is a side view illustrating the conveying unit in FIG. **7**.
[0015] FIG. **9** is a plan view illustrating a lower plate and an upper plate that are provided on a lower die.

[0016] FIG. **10**A is a perspective view illustrating a pressing unit.
[0017] FIG. **10**B is a perspective view of the pressing unit viewed from a direction different from that of FIG. **10**A.
[0018] FIG. **11** is a diagram illustrating a standby position of a pressing head of the pressing unit.
[0019] FIG. **12** is a diagram illustrating a pressing position of the pressing head of the pressing unit.
[0020] FIG. **13**A is a perspective view of a die set.
[0021] FIG. **13**B is a perspective view of the die set viewed from a direction different from that of FIG. **13**A.
[0022] FIG. **14**A is a perspective view illustrating a front member and a back member.
[0023] FIG. **14**B is a cross-sectional view of a button product manufactured by connecting the front member and the back member in FIG. **14**A.
[0024] FIG. **15**A is a cross-sectional view of an upper die and two lower dies for illustrating a caulking process of the front member and the back member.
[0025] FIG. **15**B is a cross-sectional view of the upper die and the two lower dies for illustrating the caulking process of the front member and the back member.
[0026] FIG. **16**A is a cross-sectional view of the upper die and the two lower dies for illustrating the caulking process of the front member and the back member.
[0027] FIG. **16**B is a cross-sectional view of the upper die and the two lower dies for illustrating the caulking process of the front member and the back member.
[0028] FIG. **17** is a perspective view of a take-out unit.
[0029] FIG. **18** is a diagram illustrating the taking-out of the button product by the take-out unit in FIG. **17**.
[0030] FIG. **19** is a flowchart illustrating a flow of a process by the button product manufacturing device.
[0031] FIG. **20**A is a diagram illustrating a first modification of a cutting configuration of a coupling portion of a printed medium.
[0032] FIG. **20**B is a diagram illustrating a second modification of the cutting configuration of the coupling portion of the printed medium.
[0033] FIG. **21**A is a diagram illustrating a third modification of the cutting configuration of the coupling portion of the printed medium.
[0034] FIG. **21**B is a diagram illustrating a fourth modification of the cutting configuration of the coupling portion of the printed medium.
[0035] FIG. **22** is a diagram illustrating a fifth modification of the cutting configuration of the coupling portion of the printed medium.
[0036] FIG. **23** is a diagram illustrating a modification of a shape of a connected portion of the printed medium.
[0037] FIG. **24** is a diagram illustrating a first modification of a relation between a conveying direction of the printed medium and movement directions of the two lower dies.
[0038] FIG. **25** is a diagram illustrating a second modification of the relation between the conveying direction of the printed medium and the movement directions of the two lower dies.
[0039] FIG. **26** is a diagram illustrating a relation between the conveying direction of the printed medium and movement directions of the front member and the back member.

DESCRIPTION

[0040] Hereinafter, a button product manufacturing device according to an embodiment of the present invention will be described with reference to the drawings. The button product manufacturing device to be described below is merely an embodiment of the present invention. Accordingly, the present invention is not limited to the following embodiment, and can be added, deleted, or modified without departing from the scope of the present invention.

Overall Configuration

[0041] FIG. **1** is a perspective view illustrating a button product manufacturing device **100** according to an embodiment of the present invention. FIG. **2** is a plan view illustrating the button product manufacturing device **100** in FIG. **1**. FIG. **3** is a block diagram illustrating a configuration of a control system of the button product manufacturing device **100** in FIG. **1**. The button product manufacturing device **100** is a device that manufactures a button product by connecting a front member and a back member, for example, by caulking the front member and the back member. The button product manufacturing device **100** includes a printing unit **1**, a conveying unit **2**, a die set **3**, a front member feed unit **4**, a back member feed unit **5**, a pressing unit **6**, a take-out unit **7**, a collection box **8**, and a button product container **9**, as illustrated in FIGS. **1** and **2**. In FIGS. **1** and **2**, directions orthogonal to one another are referred to as a first direction Dx, a second direction Dy, and a third direction Dz. In the present embodiment, for example, the first direction Dx is a front-rear direction of the button product manufacturing device **100**, the second direction Dy is a left-right direction of the button product manufacturing device **100**, and the third direction Dz is an up-down direction. In this case, a front surface side of the printing unit **1** is referred to as a front side, a back surface side is referred to as a rear side, and left and right sides when viewed from a front surface are referred to as a left side and a right side. In the following description, Dx is referred to as the front-rear direction, Dy is referred to as the left-right direction, and Dz is referred to as the up-down direction.

[0042] The printing unit **1** is disposed below the die set **3**, the front member feed unit **4**, the back member feed unit **5**, the pressing unit **6**, and the take-out unit **7**. The printing unit **1** is an inkjet printer configured to print an image on a printed medium W (FIG. **6**A to be described later) such as a transparent film. The printing unit **1** is configured to perform printing on the printed medium W. Specifically, the printing unit **1** includes an ejection head **10**, and printing is performed by ejecting ink droplets onto the printed medium W by the ejection head **10**. The printing unit **1** includes a conveying motor **11** configured to drive a conveying roller. The ejection head **10** may be a serial head type or a line head type.

[0043] The printing unit **1** includes a sheet holder (not illustrated) configured to hold a plurality of sheets of printed media W and a plurality of sheets of white films F (FIG. **6**B to be described later). The printed media W and the white films F are held in the sheet holder as a bundle in which the printed media W and the white films F are alternately stacked. The white film F is supplied to the conveying unit **2** without being printed by the printing unit **1**, and the printed medium W is supplied to the conveying unit **2** after a predetermined image is formed by the ejection head **10** of the printing unit **1**. The predetermined image is an inverted image that becomes a normal image when a user views the image from a surface opposite to a surface on which the image is printed among the surfaces of the printed medium W. In the present embodiment, an example in which the printing unit **1** is an inkjet printer has been described, but the printing unit **1** is not limited thereto, and may be another printer such as a laser printer or a thermal printer.

[0044] The button product manufacturing device **100** further includes a control device **110**, a first drive circuit **115**, a second drive circuit **116**, a third drive circuit **117**, a fourth drive circuit **118**, a fifth drive circuit **119**, a sixth drive circuit **120**, and a seventh drive circuit **150**, as illustrated in FIG. **3**. The control device **100** includes an interface **111**, a calculation unit **112**, and a storage unit **113**. The interface **111** is configured to receive various data such as image data from an external device **114** such as a computer, a camera, a communication network, a recording medium, a display, and a printer. The control device **110** may be implemented by a single device, or may have a configuration in which a plurality of devices are arranged in a distributed manner and cooperate with each other to perform the operation of the button product manufacturing device **100**. The control device **110** is an example of a controller.

[0045] The storage unit **113** is a memory accessible from the calculation unit **112**, and includes a RAM and a ROM. The RAM temporarily stores various data including data received from the external device **114** such as image data, data converted by the calculation unit **112**, and the like.

The ROM stores a button product manufacturing program for performing various processes, predetermined data, and the like. The button product manufacturing program may be stored in an external storage medium different from the storage unit **113** and accessible from the calculation unit **112**, such as a CD-ROM.

[0046] The calculation unit **112** includes at least one circuit, for example, a processor such as a CPU, and an integrated circuit such as an ASIC. The calculation unit **112** is configured to control each unit by executing the button product manufacturing program. In the present embodiment, the calculation unit **112** corresponds to a computer, a feed control unit, a print controller, a conveying controller, an upper die controller, and a connection controller.

[0047] The control device **110** is configured to output a control signal to the first drive circuit **115**. The first drive circuit **115** is configured to generate a drive signal based on the control signal and to output the drive signal to the ejection head **10** of the printing unit **1**. The ejection head **10** is driven in response to the drive signal, which causes ink droplets to be ejected from nozzles. In detail, the first drive circuit **115** is configured to cause the ejection head **10** to eject ink droplets onto the printed medium W while moving the ejection head **10** in a predetermined movement direction based on the image data acquired from the external device **114**. The first drive circuit **115** drives the conveying motor **11** to convey the printed medium W in a predetermined conveying direction. In this way, the first drive circuit **115** alternately repeats the printing pass and the conveying operation, so that an image based on the image data is printed on the printed medium W.

[0048] The control device **110** is configured to output a control signal to the second drive circuit **116**. The second drive circuit **116** is configured to generate a drive signal based on the control signal and to control the operation of the conveying motor **23** provided in the conveying unit **2**. In this case, the second drive circuit **116** is configured to control the operation of the conveying motor **23**, based on detection results of a first conveying sensor S**1**, a second conveying sensor S**2**, and a third conveying sensor S**3** provided in the conveying unit **2**.

[0049] The control device **110** is configured to output a control signal to the third drive circuit **117**. The third drive circuit **117** is configured to generate a drive signal based on the control signal and to control each operation of an upper die lifting motor **34** and a lower die moving motor **140** included in the die set **3**. The control device **110** is configured to output a control signal to the fourth drive circuit **118**. The fourth drive circuit **118** is configured to generate a drive signal based on the control signal and to control an operation of a pusher motor **46** provided in the front member feed unit **4**. Further, the control device **110** is configured to output a control signal to the fifth drive circuit **119**. The fifth drive circuit **119** is configured to generate a drive signal based on the control signal and to control an operation of a pusher motor **56** provided in the back member feed unit **5**. The control device **110** is configured to output a control signal to the sixth drive circuit **120**. The sixth drive circuit **120** is configured to generate a drive signal based on the control signal and to control an operation of a pressing motor **60** provided in the pressing unit **6**. The control device **110** is configured to output a control signal to the seventh drive circuit **150**. The seventh drive circuit **150** is configured to generate a drive signal based on the control signal and to control an operation of a take-out motor **70** provided in the take-out unit **7**.

[0050] The control device **110** is configured to perform a process of causing an upper die **33** to separate a front member SE and a connected portion Wb of the printed medium W from a lower die **30**, and a process of connecting, to a back member BE, the front member SE and the connected portion Wb of the printed medium W that are separated by the upper die **33**.

Front Member Feed Unit

[0051] Hereinafter, configurations and functions of the conveying unit **2**, the die set **3**, the front member feed unit **4**, the back member feed unit **5**, the pressing unit **6**, and the take-out unit **7** will be described in detail.

[0052] First, the front member feed unit **4** and the back member feed unit **5** will be described. FIG. **4** is a perspective view illustrating a configuration of the front member feed unit **4**. The front

member feed unit **4** is configured to feed the front members SE to the lower die **30** provided in the die set **3**. Each of the front members SE is formed of a magnetic material such as a tin-plated steel plate. The front member feed unit **4** is an example of a front member feeder.

[0053] The front member feed unit **4** is disposed above the printing unit **1** and to the right of the die set **3**. The front member feed unit **4** includes a front member stocker **40**, a front member slope **43**, a pusher **45**, and the pusher motor **46**, as illustrated in FIG. **4**. The front member stocker **40** is configured to accommodate a plurality of front members SE each having, for example, a circular shape in plan view while the front members SE are stacked in the up-down direction Dz. The front member stocker **40** is formed in a cylindrical shape. The front member stocker **40** is erected such that an axial center thereof is oriented in the up-down direction. A slit **40***a* extending in the up-down direction is formed in the front member stocker **40** at a portion close to the lower die **30**. The slit **40***a* has a width dimension smaller than a diameter dimension of the front member SE. The slit **40***a* is formed in a portion from an upper end to a lower end of the front member stocker **40**. The user can visually recognize the front members SE accommodated in the front member stocker **40** through the slit **40***a* of the front member stocker **40**. That is, the user can grasp the remaining number of the front members SE. When the remaining number is small, the user can newly replenish the front member SE from the upper end of the front member stocker **40**. When a straight line orthogonal to a conveying direction Dc**1** in FIG. **2** is defined as a first straight line L**1** and a straight line connecting a center C**1** of the lower die **30** and a center C**2** of the front member stocker **40** in plan view is defined as a second straight line L**2**, an acute angle α formed by the first straight line L**1** and the second straight line L**2** is, for example, more than 0 degrees and 30 degrees or less.

[0054] A space having a dimension equal to or slightly larger than a thickness dimension of one front member SE is provided between the lower end of the front member stocker **40** and an upper surface of the front member slope **43**. The pusher **45** is configured to push out the front members SE on the front member slope **43** toward the lower die **30**. The pusher **45** is disposed on a side opposite to the lower die **30** with respect to the front member stocker **40**. That is, the front member stocker **40** is disposed between the lower die **30** and the pusher **45**. The pusher **45** includes, for example, a plate-shaped pusher main body **45***a* and a rack gear **45***b* connected to the pusher main body **45***a* and extending in a predetermined feed direction D**1**. The rack gear **45***b* meshes with a pinion gear **47** connected to a rotary shaft of the pusher motor **46**. The pusher motor **46** is rotationally driven, so that the rack gear **45***b* moves in the feed direction D**1** and an opposite direction thereof, and the pusher main body **45***a* moves on the front member slope **43** in the feed direction D**1** and the opposite direction along with the movement. In this case, when the pusher main body **45***a* moves in the feed direction D**1**, a leading end of the pusher main body **45***a* passes below the front member stocker **40** and reaches the vicinity of the lower die **30**. Accordingly, one front member SE supplied from the front member stocker **40** onto the front member slope **43** is pushed out by the pusher main body **45***a* and sent out in the feed direction D**1** toward the lower die **30**. Accordingly, the lower die **30** supports the front members SE. In this case, when the pusher main body **45***a* moves in an opposite direction to the feed direction D**1** and retracts, the leading end of the pusher main body **45***a* retreats from below the front member stocker **40** to the outside. Accordingly, one front member SE is supplied from the front member stocker **40** onto the front member slope **43**.

[0055] The front member slope **43** is configured to guide the front member SE pushed out by the pusher **45** toward the lower die **30** in the feed direction D**1**. The front member slope **43** is disposed below the front member stocker **40**, and extends below the front member stocker **40** from a predetermined position adjacent to the lower die **3**. The front member slope **43** includes a pair of support portions **42** and a slope main body **41** whose cross section is formed in, for example, a concave shape. The pair of support portions **42** are provided on both ends of a bottom portion of the slope main body **41** in a direction (that is, a width direction) orthogonal to the feed direction D**1**. Accordingly, an escape groove **44** that is a portion lower than a height of the support portion **42**

is formed on an inner bottom surface of the slope main body **41**. When the front member SE is supplied from the front member stocker **40** toward the front member slope **43**, the front member SE is supported by the pair of support portions **42** of the front member slope **43**.

[0056] The front member slope **43** has a notch **43***a* at a downstream end of the front member SE in the feed direction D**1**. The notch **43***a* has an arc shape cut out in a convex shape in the opposite direction to the feed direction D**1**.

[0057] By providing the notch **43***a* in the front member slope **43**, an upstream end of the front member SE (that is, an end on a side opposite to a side where the lower die **30** is present) is less likely to be caught by the front member slope **43** when the front member SE is supplied from a downstream end of the front member slope **43** to the lower die **30**. Therefore, the front member SE can be supplied to the lower die **30** with high accuracy.

Back Member Feed Unit

[0058] Next, the back member feed unit **5** will be described. FIG. **5** is a perspective view illustrating a configuration of the back member feed unit **5**. The back member feed unit **5** supplies the back member BE to a lower die **31** different from the lower die **30**. The back member BE is formed of a magnetic material such as a tin-plated steel plate. A method of feeding the back member BE by the back member feed unit **5** is basically the same as a method of feeding the front member SE by the front member feed unit **4**.

[0059] The back member feed unit **5** is disposed above the printing unit **1** and to the left of the die set **3**. The back member feed unit **5** includes a back member stocker **50**, a back member slope **53**, a pusher **55**, and the pusher motor **56**, as illustrated in FIG. **5**. The back member stocker **50** accommodates a plurality of back members BE each having, for example, a circular shape in plan view while the back members BE are stacked in the up-down direction Dz. The back member stocker **50** is formed in a cylindrical shape. The back member stocker **50** is erected such that an axial center thereof is oriented in the up-down direction. A slit **50***a* extending in the up-down direction is formed in the back member stocker **50** at a portion close to the lower die **31**. The slit **50***a* has a width dimension smaller than a diameter dimension of the back member BE, and is formed at a portion from an upper end to a lower end of the back member stocker **50**. The user can visually recognize the back members BE accommodated in the back member stocker **50** through the slit **50***a* of the back member stocker **50**. That is, the user can grasp the remaining number of back members BE. When the remaining number is small, the user can newly replenish the back member BE from the upper end of the back member stocker **50**.

[0060] A space having a dimension equal to or slightly larger than a thickness dimension of one back member BE is provided between the lower end of the back member stocker **50** and an upper surface of the back member slope **53**. The pusher **55** is configured to push out the back members BE on the back member slope **53** toward the lower die **31**. The pusher **55** is disposed on a side opposite to the lower die **31** with respect to the back member stocker **50**. That is, the back member stocker **50** is disposed between the lower die **31** and the pusher **55**. The pusher motor **56** is rotationally driven, so that the pusher **55** moves on the back member slope **53** in a predetermined feed direction D**2** and an opposite direction thereof via a rack gear and a pinion gear (not illustrated) similar to those of the front member feed unit **4**. In this case, in a case where the pusher **55** moves in the feed direction D**2**, a leading end of the pusher **55** passes below the back member stocker **50** and reaches the vicinity of the lower die **31**. Accordingly, one back member BE supplied from the back member stocker **50** onto the back member slope **53** is pushed out by the pusher **55** and sent out in the feed direction D**2** toward the lower die **31**. On the other hand, in a case where the pusher **55** moves in an opposite direction to the feed direction D**2** and retracts, the leading end of the pusher **55** retracts from below the back member stocker **50** to the outside. Accordingly, one back member BE is supplied from the back member stocker **50** onto the back member slope **53**.

[0061] The back member slope **53** is configured to guide, toward the lower die **31** in the feed direction D**2**, the back member BE pushed out by the pusher **55**. The back member slope **53** is

disposed below the back member stocker **50**, and extends below the back member stocker **50** from a predetermined position adjacent to the lower die **3**. The back member slope **53** includes a pair of slope main bodies **51** and a pair of guide walls **52** on a downstream side in the feed direction D**2**. The slope main bodies **51** are disposed apart from each other in a direction, which is the width direction, orthogonal to the feed direction D**2**. Accordingly, a space is provided between one slope main body **51** and the other slope main body **51**. Further, one guide wall **52** is erected at an outer end of one slope main body **51**, which is an outer end in a direction orthogonal to the feed direction D**2**, and the other guide wall **52** is erected at an outer end of the other slope main body **51**. Both ends of the back member BE, supplied from the back member stocker **50**, in the direction orthogonal to the feed direction D**2** are supported from below by the pair of slope main bodies **51**. Accordingly, when, for example, a pin or the like is provided in the back member BE, it is possible to avoid interference of the pin or the like with the slope main bodies **51**. Although the space is provided between the one slope main body **51** and the other slope main body **51** as described above, the configuration of the back member slope **53** is not limited thereto. In the back member slope **53**, as illustrated in FIG. **4**, an escape groove formed by the slope main body and A pair of support portions may also be provided.

Printed Medium and White Film

[0062] Next, the printed medium W and the white film F conveyed from the printing unit **1** by the conveying unit **2** will be described. FIG. **6**A is a plan view illustrating the printed medium W, and FIG. **6**B is a plan view illustrating the white film F.

[0063] The printed medium W is, for example, a transparent sheet. As illustrated in FIG. **6**A, the printed medium W has a rectangular shape. The printed medium W includes an edge portion We**1** on a downstream side in the conveying direction Dc**1**, and an edge portion We**2** on an upstream side in the conveying direction Dc**1** when being conveyed toward the die set **3** by the conveying unit **2**. The printed medium W includes a sheet-shaped connected portion Wb connected to the front member SE and the back member BE by the die set **3**, a sheet-shaped remaining portion Wa different from the connected portion Wb, and a plurality of coupling portions Wc coupling the connected portion Wb and the remaining portion Wa. The connected portion Wb has, for example, a circular shape in plan view, and is unevenly distributed toward the edge portion We**1** in the printed medium W. The printed medium W after a second cutting process to be described later, that is, the connected portion Wb has the same size as the connected portion Fb of the white film F or is larger than the connected portion Fb of the white film. The remaining portion Wa is disposed to surround the connected portion Wb. The printed medium W further includes a linear weak portion Wd extending from the edge portion We**1** to the connected portion Wb. In a case where the remaining portion Wa of the printed medium W is separated from the connected portion Wb, the remaining portion Wa is conveyed by the conveying unit **2** in a conveying direction Dc**2** that is an opposite direction to the conveying direction Dc**1**. In this case, in the conveying direction Dc**2**, the edge portion We**2** corresponds to an edge portion on the downstream side, and the edge portion We**1** corresponds to an edge portion on the upstream side. Details thereof will be described later.

[0064] The coupling portion Wc and the linear weak portion Wd form a weak portion having lower strength than the connected portion Wb and the remaining portion Wa. Specifically, there has been illustrated that the coupling portion Wc and the linear weak portion Wd may be recesses or the like having a thickness smaller than those of the connected portion Wb and the remaining portion Wa. As another example, there has been illustrated that the coupling portion Wc and the linear weak portion Wd have the same thickness as the connected portion Wb and the remaining portion Wa, but the coupling portion Wc and the linear weak portion Wd are partially cut to form perforations.

[0065] The printed medium W includes the plurality of coupling portions Wc and a cutting portion Wf between adjacent coupling portions Wc, at a boundary between the connected portion Wb and the remaining portion Wa. Accordingly, the connected portion Wb and the remaining portion Wa are cut and not coupled between the adjacent coupling portions Wc. Here, the connected portion

Wb includes a first position Pw**1** where the connected portion Wb is pressed toward the lower die **30** by a first pressing portion **66***e* (to be described later) provided in the pressing unit **6**, and a second position Pw**2** where the connected portion Wb is pressed toward the lower die **30** by a second pressing portion **66***f* (to be described later). The coupling portion Wc includes a first coupling portion Wc**1**, a second coupling portion Wc**2**, and a third coupling portion Wc**3**. The first coupling portion Wc**1** couples the first position Pw**1** and the remaining portion Wa. The second coupling portion Wc**2** couples the second position Pw**2** and the remaining portion Wa. The third coupling portion Wc**3** couples the remaining portion Wa with the third position Pw**3** of the connected portion Wb excluding the first position Pw**1** and the second position Pw**2**.

[0066] The total number of the first coupling portions Wc**1** and the second coupling portions Wc**2** is smaller than the number of the third coupling portions Wc**3**. In this case, the two coupling portions Wc present on a straight line orthogonal to the conveying direction Dc**1** and passing through a center Cw of the connected portion Wb may be included in the first coupling portion Wc**1** and the second coupling portion Wc**2**, or may be included in the third coupling portion Wc**3**.

[0067] A configuration of the white film F is basically the same as a configuration of the printed medium W. As illustrated in FIG. **6**B, the white film F has the same size as the printed medium W and has a rectangular shape. The white film F includes an edge portion Fe**1** on the downstream side in the conveying direction Dc**1** and an edge portion Fe**2** on the upstream side in the conveying direction Dc**1** when being conveyed toward the die set **3** by the conveying unit **2**. The white film F includes a sheet-shaped connected portion Fb connected to the front member SE and the back member BE by the die set **3**, a sheet-shaped remaining portion Fa different from the connected portion Fb, and a plurality of coupling portions Fc coupling the connected portion Fb and the remaining portion Fa. The connected portion Fb has, for example, a circular shape in plan view, and is unevenly distributed toward the edge portion Fe**1** in the printed medium W. The remaining portion Fa is disposed to surround the connected portion Fb. The printed medium W further includes a linear weak portion Fd extending from the edge portion Fe**1** to the connected portion Fb. In a case where the remaining portion Fa of the printed medium W is separated from the connected portion Fb, the remaining portion Fa is conveyed by the conveying unit **2** in the conveying direction Dc**2** that is an opposite direction to the conveying direction Dc**1**. In this case, in the conveying direction Dc**2**, the edge portion Fe**2** corresponds to an edge portion on the downstream side, and the edge portion Fe**1** corresponds to an edge portion on the upstream side.

[0068] The coupling portion Fc and the linear weak portion Fd form a weak portion having lower strength than the connected portion Fb and the remaining portion Fa. Specifically, there has been illustrated that the coupling portion Fc and the linear weak portion Fd may be recesses or the like having a thickness smaller than those of the connected portion Fb and the remaining portion Fa. Further, as another example, there has been illustrated that the coupling portion Fc and the linear weak portion Fd have the same thickness as the connected portion Fb and the remaining portion Fa, but the coupling portion Fc and the linear weak portion Fd are partially cut to form perforations.

[0069] The printed medium W includes the plurality of coupling portions Fc and a cutting portion Ff between adjacent coupling portions Fc, at a boundary between the connected portion Fb and the remaining portion Fa. Accordingly, the connected portion Fb and the remaining portion Fa are cut and not coupled between the adjacent coupling portions Fc. Here, the connected portion Fb includes a first position Pf**1** where the connected portion Fb is pressed toward the lower die **30** by the first pressing portion **66***e* of the pressing unit **6**, and a second position Pf**2** where the connected portion Fb is pressed toward the lower die **30** by the second pressing portion **66***f* (to be described later). The coupling portion Fc includes a first coupling portion Fc**1**, a second coupling portion Fc**2**, and a third coupling portion Fc**3**. The first coupling portion Fc**1** couples the first position Pf**1** and the remaining portion Fa. The second coupling portion Fc**2** couples the second position Pf**2** and the remaining portion Fa. The third coupling portion Fc**3** couples the remaining portion Fa with the third position Pf**3** of the connected portion Fb excluding the first position Pf**1** and the second

position Pf**2**.
[0070] The total number of the first coupling portions Fc**1** and the second coupling portions Fc**2** is smaller than the number of the third coupling portions Fc**3**. In this case, the two coupling portions Fc present on the straight line orthogonal to the conveying direction Dc**1** and passing through the center Cf of the connected portion Fb may be included in the first coupling portion Fc**1** and the second coupling portion Fc**2**, or may be included in the third coupling portion Fc**3**.

Conveying Unit

[0071] Next, the conveying unit **2** will be described. FIG. **7** is a perspective view illustrating a configuration of the conveying unit **2**. FIG. **8** is a side view of the conveying unit **2** in FIG. **7**.
[0072] Regarding the conveying unit **2**, a part of the conveying unit **2** is disposed in front of the printing unit **1**, and the entire conveying unit **2** is disposed in front of the die set **3**. The conveying unit **2** is configured to convey the printed medium W and the white film F conveyed from the printing unit **1** onto the front member SE, which is supplied prior to the lower die **30**, along the conveying direction Dc**1** toward the die set **3**. Further, the conveying unit **2** is configured to convey, to the collection box **8** along the conveying direction Dc**2**, the remaining portion Wa of the printed medium W and the remaining portion Fa of the white film F. Accordingly, the remaining portion Wa of the printed medium W and the remaining portion Fa of the white film F are collected in the collection box **8** as discarded portions. The collection box **8** corresponds to a collection container. In the present embodiment, a film conveying process is performed in which the white film F is conveyed by the conveying unit **2** so as to be placed on the front member SE held by the lower die **30** prior to the printed medium W. Since a conveying method of the printed medium W by the conveying unit **2** is the same as a conveying method of the white film F, the conveying of the printed medium W will be representatively described below.
[0073] As illustrated in FIGS. **7** and **8**, the conveying unit **2** includes support plates **20** and **22**, a pair of conveying guides **21**, a conveying motor **23**, drive rollers Rk**1** to Rk**6**, and endless drive belts Be**1** to Be**6**.
[0074] The support plates **20** and **22** extend in the up-down direction Dz and are spaced apart from each other in the left-right direction Dy. The support plate **20** and the support plate **22** are coupled by a plurality of plate coupling shafts **24** extending in the left-right direction Dy. The support plate **20** is provided with the conveying guide **21** that curves forward from a lower end rear portion of the support plate **20** and extends upward. The conveying guide **21** is also provided on the support plate **22**. The conveying guide **21** includes a first guide body portion **21***a* and a second guide body portion **21***b*. A groove-shaped space is provided between the first guide body portion **21***a* and the second guide body portion **21***b*, and ends of the printed medium W in the left-right direction Dy are inserted into the space during conveying. The first guide body portion **21***a* is bent or curved forward from the lower end rear portion of the support plate **20**, extends upward, and is bent or curved rearward. The second guide body portion **21***b* is bent or curved forward from the lower end rear portion of the support plate **20** and extends upward. The first guide body portion **21***a* as a whole is disposed behind the second guide body portion **21***b*.
[0075] The conveying motor **23** is provided in the support plate **22**. A drive gear Ga**1** is connected to a rotary shaft of the conveying motor **23**. The drive rollers Rk**1** to Rk**6** are provided on the support plate **22**. A drive gear Gb**1** is connected to a rotary shaft of the drive roller Rk**1**. A drive gear Gb**2** is connected to a rotary shaft of the drive roller Rk**2**. A drive gear Gb**3** is connected to a rotary shaft of the drive roller Rk**3**. A drive gear Gb**4** is connected to a rotary shaft of the drive roller Rk**4**. A drive gear Gb**5** is connected to a rotary shaft of the drive roller Rk**5**. A drive gear Gb**6** is connected to a rotary shaft of the drive roller Rk**6**. The drive rollers Rk**1** to Rk**6** are located to the left of the support plate **22**. The drive roller Rk**1** is disposed behind and below the drive gear Ga**1**. The drive roller Rk**2** is disposed in front of the drive roller Rk**1** and behind the drive gear Ga**1** and is disposed above the drive roller Rk**1**. The drive roller Rk**3** is disposed above the drive roller Rk**2**. The drive roller Rk**4** is disposed above the drive roller Rk**3**. The drive roller Rk**5** is disposed behind

and below the drive roller Rk**4**. The drive roller Rk**6** is disposed in front of the drive roller Rk**5**. The drive belt Be**1** is stretched around the drive gear Ga**1** and the drive gear Gb**1**. The drive belt Be**2** is stretched around the drive gear Gb**1** and the drive gear Gb**2**. The drive belt Be**3** is stretched around the drive gear Gb**2** and the drive gear Gb**3**. The drive belt Be**4** is stretched around the drive gear Gb**3** and the drive gear Gb**4**. The drive belt Be**5** is stretched around the drive gear Gb**4** and the drive gear Gb**5**. The drive belt Be**6** is stretched around the drive gear Gb**5** and the drive gear Gb**6**. With such a configuration, the drive force by the conveying motor **23** is transmitted to the drive roller Rk**1**, the drive roller Rk**2**, the drive roller Rk**3**, the drive roller Rk**4**, the drive roller Rk**5**, and the drive roller Rk**6** via the drive belts Be**1** to Be**6**.

[0076] The first guide body portion **21***a* and the second guide body portion **21***b* are provided with notches Ng corresponding to the respective drive rollers Rk**2** to Rk**4**. The drive roller Rk**1** includes a drive shaft Sa**1** extending in the left-right direction Dy and a pair of drive-side rollers Ro**1**. A pair of driven-side rollers Ro**2** are provided to face the pair of drive-side rollers Ro**1**, respectively. Each of the pair of driven-side rollers Ro**2** is coupled to a driven shaft Sa**2**. The drive roller Rk**2** includes a drive shaft Sa**3** extending in the left-right direction Dy and a pair of drive-side rollers Ro**3**. A pair of driven-side rollers Ro**4** are provided to face the pair of drive-side rollers Ro**3**, respectively. Each of the pair of driven-side rollers Ro**4** is coupled to a driven shaft Sa**4**. The pair of drive-side rollers Ro**3** are disposed in the notches Ng of the first guide body portion **21***a*, and the pair of driven-side rollers Ro**4** are disposed in the notches Ng of the second guide body portion **21***b*. Ends of the printed medium W in the left-right direction Dy are clamped by the drive-side rollers Ro**3** and the driven-side rollers Ro**4**. A configuration corresponding to the drive rollers Rk**5** or Rk**6** (that is, a pair of drive-side rollers, a pair of driven-side rollers, a drive shaft, and a driven shaft) is the same as a configuration corresponding to the drive roller Rk**1**, and thus the description thereof will be omitted. A configuration corresponding to the drive rollers Rk**3** or Rk**4** (that is, a pair of drive-side rollers, a pair of driven-side rollers, a drive shaft, and a driven shaft) is the same as a configuration corresponding to the drive roller Rk**2**, and thus the description thereof will be omitted.

[0077] In a case where the conveying motor **23** is driven, the drive force by the conveying motor **23** is transmitted to the drive rollers Rk**1** to Rk**6**. Accordingly, the printed medium W is conveyed to the lower die **30** by the rotation of the drive-side rollers Ro**1** and the driven-side rollers Ro**2**, the rotation of the drive-side rollers Ro**3** and the driven-side rollers Ro**4**, the rotation of drive-side rollers Ro**5** and driven-side rollers Ro**6**, the rotation of drive-side rollers Ro**7** and driven-side rollers Ro**8**, and the rotation of drive-side rollers Ro**9** and driven-side rollers Ro**10**.

[0078] As illustrated in FIG. **8**, a conveying guide piece **25** is disposed, between the support plate **20** and the support plate **22**, above the second guide body portion **21***b* and in front of the first guide body portion **21***a* as a whole. The conveying guide piece **25** has flexibility and is made of, for example, resin. A base end of the conveying guide piece **25** is fixed to the support plates **20** and **22**, and a front end of the conveying guide piece **25** is a free end. The front end of the conveying guide piece **25** faces the first guide body portion **21***a*. A distance between the conveying guide piece **25** and the first guide body portion **21***a* decreases toward the rear, that is, toward the lower die **30**. The printed medium W is guided toward the drive-side rollers Ro**9** and the driven-side rollers Ro**10** by the first guide body portion **21***a* and the conveying guide piece **25**. Thereafter, the printed medium W is conveyed to the lower die **30** along the conveying direction Dc**1** by the drive-side rollers Ro**9** and the driven-side rollers Ro**10**. As described above, the first guide body portion **21***a*, the second guide body portion **21***b*, and the conveying guide piece **25** constitute a first conveying path Cp**1** of the printed medium W toward the lower die **30** of the die set **3**.

[0079] The first conveying sensor S**1**, which is, for example, a contact sensor, is provided behind the drive-side roller Ro**1** and the driven-side roller Ro**2**. The second conveying sensor S**2**, which is, for example, a contact sensor, is provided between the first guide body portion **21***a* and the conveying guide piece **25**. The second drive circuit **116** drives the conveying motor **23** in a case where the printed medium W supplied from the printing unit **1** is detected by the first conveying

sensor S**1**. In a case where a downstream end of the printed medium W is detected by the second conveying sensor S**2**, the second drive circuit **116** controls driving of the conveying motor **23** based on a rotation amount of the conveying motor **23** detected by an encoder (not illustrated) immediately after the detection. Accordingly, the printed medium W is conveyed to a predetermined position of the die set **3** with high accuracy.

[0080] A conveying guide **26** and a conveying guide piece **27** are provided between the drive-side roller Ro**9** and the driven-side roller Ro**11** and between a drive-side roller Ro**10** and a driven-side roller Ro**12**. The conveying guide **26** is located above the conveying guide piece **27**. The conveying guide **26** extends in the front-rear direction Dx. A trailing end **26***a*, which is an end on a lower die **30** side, of the conveying guide **26** is bent upward. Meanwhile, the conveying guide piece **27** has flexibility and is made of, for example, resin. The conveying guide piece **27** extends in the front-rear direction Dx. A trailing end **27***a* of the conveying guide piece **27** is located in front of a trailing end **26***a* of the conveying guide **26**. The trailing end **27***a* of the conveying guide piece **27** is bent downward. The conveying guide piece **27** intersects the first conveying path Cp**1** in a side view illustrated in FIG. **8**. In such a configuration, the conveying guide **26** and the conveying guide piece **27** constitute a second conveying path Cp**2** of the remaining portions Wa and Fa from the lower die **30** of the die set **3** toward the collection box **8**.

[0081] In a case where the printed medium W is conveyed along the first conveying path Cp**1**, a lower surface of the conveying guide piece **27** is pressed by a downstream end of the printed medium W and is bent upward. Accordingly, the conveying guide piece **27** allows conveyance of the printed medium W from the drive-side rollers Ro**7** and the driven-side rollers Ro**8** to the drive-side rollers Ro**9** and the driven-side rollers Ro**10**. In a case where the printed medium W is conveyed in the conveying direction Dc**1** and reaches a predetermined position of the lower die **30**, an upstream end of the printed medium W is in a state of being gripped by the drive-side roller Ro**9** and the driven-side roller Ro**10** and is in a state of being located on a downstream side with respect to the conveying guide piece **27** in the first conveying path Cp**1**. At this time, the conveying guide piece **27** returns to the state of intersecting the first conveying path Cp**1** again due to its flexibility.

[0082] As described above, a cutting process of causing the pressing unit **6** (to be described later) to cut the connected portion Wb and the remaining portion Wa of the printed medium W, which is conveyed to the predetermined position of the lower die **30**, is performed. Thereafter, a separation process is performed in which the remaining portion Wa is separated from the connected portion Wb and only the remaining portion Wa is discarded. In the separation process, the second drive circuit **116** reversely rotates the conveying motor **23** in a state where the connected portion Wb is pressed against the front member SE disposed on the lower die **30** by the pressing unit **6**. In this case, the drive force by the conveying motor **23**, which is the drive force by the reverse rotation, is transmitted to the drive roller Rk**5** and the drive roller Rk**6** via the drive rollers Rk**1** to Rk**4**. Accordingly, the remaining portion Wa is separated from the connected portion Wb. The remaining portion Wa is conveyed in the conveying direction Dc**2** after separation, is guided to the second conveying path Cp**2** by coming into contact with an outer surface of the conveying guide piece **27**, and is conveyed toward the drive-side roller Ro**11** and the driven-side roller Ro**12**. In this case, since the trailing end **27***a* of the conveying guide piece **27** is bent downward, the remaining portion Wa is easily guided to the second conveying path Cp**2**. Thereafter, the remaining portion Wa is conveyed while the edge portion We**2** of the remaining portion Wa is sandwiched between the drive-side roller Ro**11** and the driven-side roller Ro**12**, and is collected in the collection box **8**.

[0083] The third conveying sensor S**3**, which is, for example, a contact sensor, is provided in front of the drive-side roller Ro**9** and the driven-side roller Ro**10** and behind the drive-side roller Ro**11** and the driven-side roller Ro**12**. It is possible to determine whether the remaining portion Wa is conveyed to the collection box **8** based on a detection result obtained by the third conveying sensor S**3**. In a case where the remaining portion Wa cannot be detected by the third conveying sensor S**3** within a predetermined time after the second drive circuit **116** starts to reversely rotate the

conveying motor **23**, the control device **110** determines that a jam of the remaining portion Wa occurs. When the remaining portion Wa is still detected after a predetermined time after the remaining portion Wa is detected by the third conveying sensor S**3**, the control device **110** may determine that a jam of the remaining portion Wa occurs. When it is determined that a jam of the remaining portion Wa occurs, the control device **110** causes the second drive circuit **116** to stop the rotation of the conveying motor **23**.

Pressing Unit

[0084] Next, the pressing unit **6** will be described. FIG. **9** is a plan view illustrating a lower plate Mp**1** and an upper plate Mp**2** that are provided on the lower die **30**. FIG. **10**A is a perspective view of the pressing unit **6**, and FIG. **10**B is a perspective view of the pressing unit **6** viewed from a direction different from that of FIG. **10**A. FIG. **11** is a diagram illustrating a standby position Psa of a pressing head **66** of the pressing unit **6**, and FIG. **12** is a diagram illustrating a pressing position Psb of the pressing head **66** of the pressing unit **6**. FIG. **12** illustrates a state before the separation process of separating the remaining portion Wa from the connected portion Wb is performed. The pressing unit **6** is an example of a forming press.

[0085] The pressing unit **6** is configured to press the printed medium W and the white film F against the lower die **30**. Specifically, the pressing unit **6** is configured to perform a cutting process (a first cutting process) of cutting at least a part of the plurality of coupling portions Fc in the white film F disposed on the front member SE held by the lower die **30**. Similarly, the pressing unit **6** is configured to perform a cutting process (the second cutting process) of cutting at least a part of the plurality of coupling portions Wc in the printed medium W disposed on the connected portion Fb disposed on the front member SE (that is, the connected portion Fb after the first cutting process). By the first cutting process and the second cutting process, the connected portion Fb and the connected portion Wb are overlapped on the front member SE held by the lower die **30**. Since the first cutting process is basically the same as the second cutting process, the second cutting process performed by the pressing unit **6** will be described below as a representative example.

[0086] As illustrated in FIG. **9**, the pressing unit **6** includes the lower plate Mp**1** disposed on the lower die **30** and the upper plate Mp**2** disposed on the lower plate Mp**1**. The lower plate Mp**1** includes a lower plate body **121** having a substantially rectangular plate shape, and guide side walls **122** erected from left and right side edge portions of the lower plate body **121**. A distance between a trailing end of the left guide side wall **122** and a trailing end of the right guide side wall **122** is smaller than a distance between a front end of the left guide side wall **122** and a front end of the right guide side wall **122**. The distance between the trailing end of the left guide side wall **122** and the trailing end of the right guide side wall **122** is equal to or slightly larger than a dimension of the printed medium W in the left-right direction (that is, a width dimension) and a dimension of the white film F in the left-right direction. Such guide side walls **122** facilitate positioning of the printed medium W and the white film F conveyed from the conveying unit **2** with respect to the front member SE held by the lower die **30**.

[0087] The lower plate body **121** is provided with a rectangular notch **123** that opens at a front portion of the lower plate body **121**, and a notch **124** that opens adjacent to a trailing end of the notch **123** and protrudes rearward and has a semicircular shape. A diameter of the notch **124** is substantially the same as a diameter of a recess of the lower die **30** (that is, a holding portion of the front member SE). Bearing walls **125** are erected on left and right side edge portions of the front portion of the lower plate body **121**. A bearing hole is formed in each bearing wall **125**, and a plate support shaft **126** extending in the left-right direction is inserted into each bearing hole. Accordingly, the lower plate Mp**1** is swingable up and down with the bearing wall **125** as a base point via the plate support shaft **126**. A guide portion Bt**1** (FIG. **8**) bent downward is provided at a front end of the lower plate body **121**. Further, guide pieces **127** extending rearward and having trailing ends curved upward are provided at left and right portions of a trailing end of the lower plate body **121**. Since the lower plate Mp**1** smoothly rides on upper surfaces of the lower dies **30**

and **31** when the lower dies **30** and **31** rotate as to be described later by the guide pieces **127**, positioning of the lower plate Mp**1** with respect to the lower dies **30** and **31** is easily determined.
[0088] The upper plate Mp**2** is provided with a rectangular notch **128** that opens at the trailing end of the upper plate Mp**2**, and a semicircular notch **129** that opens adjacent to a front end of the notch **128**. A diameter of the notch **128** is substantially the same as the diameter of the recess of the lower die **30** (that is, the holding portion of the front member SE). Since a rear portion of the upper plate Mp**2** is cut out as described above, the rear portion of the lower plate body **121** is exposed at the rear portion.
[0089] Bearing walls **130** are erected on left and right side edge portions of a front portion of the upper plate Mp**2**. Each bearing wall **130** is disposed further inward than the corresponding bearing wall **125**. A bearing hole is formed in each bearing wall **130**, and the plate support shaft **126** is inserted into each bearing hole. Accordingly, the upper plate Mp**2** is swingable up and down with the bearing wall **130** as a base point via the plate support shaft **126**. A guide portion Bt**2** bent upward is provided at a front end of the upper plate Mp**2**. The guide portion Bt**2**, together with the guide portion Bt**1**, smoothly introduces the printed medium W and the white film F conveyed from the conveying unit **2** between the lower plate Mp**1** and the upper plate Mp**2**.
[0090] The upper plate Mp**2** and the lower plate Mp**1** are disposed to overlap each other in the up-down direction. In a state where the upper plate Mp**2** and the lower plate Mp**1** are disposed to overlap each other, the semicircular notch **124** of the lower plate Mp**1** and the semicircular notch **129** of the upper plate Mp**2** are combined with each other to form a circular opening for exposing the recess of the lower dies **30** and **31**.
[0091] The pressing unit **6** further includes the following components. As illustrated in FIGS. **10**A and **10**B, the pressing unit **6** includes the pressing motor **60**, a pair of support plates **61**, a coupling shaft **62**, a swing arm **63**, a support block **64**, a remaining portion pressing head **65**, and the pressing head **66** that presses the printed medium W.
[0092] The pressing motor **60** is fixed to one support plate **61**. A rotary shaft of the pressing motor **60** is rotatably inserted into one support plate **61**. A plurality of drive gears Ga**2**, Ga**31**, Ga**32**, Ga**41**, Ga**42**, and Ga**5** are provided between the one support plate **61** and the other support plate **61**. The drive gear Ga**2** is connected to a rotary shaft of the pressing motor **60**. The drive gear Ga**2** meshes with the drive gear Ga**31**. The drive gear Ga**32** is provided coaxially with the drive gear Ga**31**. The drive gear Ga**32** meshes with the drive gear Ga**41**. The drive gear Ga**42** is provided coaxially with the drive gear Ga**41**. The drive gear Ga**42** meshes with the drive gear Ga**5**. The drive gear Ga**5** is provided with the coupling shaft **62** coaxially with the drive gear Ga**5** and penetrating the drive gear Ga**5**. A base end of the swing arm **63** is coupled to the drive gear Ga**5** by the coupling shaft **62**. For example, a boss is provided on the drive gear Ga**5** and is fitted into a recess at the base end of the swing arm **63**. In such a configuration, when the pressing motor **60** is rotationally driven, a drive force thereof is transmitted to the drive gears Ga**2**, Ga**31**, Ga**32**, Ga**41**, Ga**42**, and Ga**5**.
[0093] The support block **64** is connected to a leading end of the swing arm **63**. The support block **64** supports the pressing head **66**. In a case where the pressing motor **60** is rotationally driven to rotate the drive gear Ga**5**, the swing arm **63** rotates in a rotation direction Dr**1** illustrated in FIG. **11**. In detail, for example, when the drive gear Ga**5** rotates forward, the swing arm **63** rotates from the standby position Psa (FIG. **11**) which is a position where the pressing head **66** stands by to the pressing position Psb (FIG. **12**) which is a position where the connected portion Wb is pressed by the pressing head **66**. Meanwhile, for example, in a case where the drive gear Ga**5** reversely rotates, the swing arm **63** rotates from the pressing position Psb to the standby position Psa.
[0094] The remaining portion pressing head **65** includes a support shaft **65***a*, a head body portion **65***b*, and a spring **65***c*. A base end of the support shaft **65***a* is connected to the spring **65***c*. As illustrated in FIG. **12**, the support shaft **65***a* extends along the conveying direction Dc**2** in a case where the pressing head **66** is at the pressing position Psb. The head body portion **65***b* is connected

to a leading end of the support shaft **65***a*. The head body portion **65***b* is located on the downstream side of the pressing head **66** in the conveying direction Dc**2** in a case where the pressing head **66** is at the pressing position Psb. In a case where the head body portion **65***b* of the pressing head **66** is at the pressing position Psb, the spring **65***c* biases the head body portion **65***b* in a direction of pressing the remaining portion Wa of the printed medium W sandwiched between the lower plate Mp**1** and the upper plate Mp**2**. Accordingly, the head body portion **65***b* is configured to press the remaining portion Wa toward a trailing end central portion **121***a* of the lower plate body **121**.

[0095] In the second cutting process, the pressing head **66** of the pressing unit **6** is configured to press the pressing head **66** to a lower position closer to an inner bottom surface **30***a***2** than a placement surface **30***b***5** (to be described later) of the lower die **30**. The pressing head **66** includes pressing ends **66***a*, **66***b*, **66***c*, and **66***d*, the first pressing portion **66***e*, and the second pressing portion **66***f* that press the connected portion Wb of the printed medium W against the lower die **30**. The pressing ends **66***a*, **66***b*, **66***c*, and **66***d*, the first pressing portion **66***e*, and the second pressing portion **66***f* face the connected portion Wb of the printed medium W in a case where the pressing head **66** is at the pressing position Psb. The pressing end **66***a* and the pressing end **66***b* are located to the left and right in the left-right direction Dy in a case where the pressing head **66** is at the pressing position Psb. The pressing end **66***c* and the pressing end **66***d* are located forward and rearward in the front-rear direction Dx in a case where the pressing head **66** is at the pressing position Psb. The first pressing portion **66***e* is located between the pressing end **66***a* and the pressing end **66***c*. The first pressing portion **66***e* presses the first position Pw**1** of the connected portion Wb in a case where the pressing head **66** is at the pressing position Psb. The second pressing portion **66***f* is located between the pressing end **66***b* and the pressing end **66***c*. The second pressing portion **66***f* presses the second position Pw**2** of the connected portion Wb in a case where the pressing head **66** is at the pressing position Psb. Of the portions of the pressing head **66** facing the connected portion Wb in a case where the pressing head **66** is at the pressing position Psb, a portion excluding the pressing ends **66***a*, **66***b*, **66***c*, and **66***d*, the first pressing portion **66***e*, and the second pressing portion **66***f* form a spherical shape recessed upward. Accordingly, the portion can have a shape along a surface shape of the front member SE.

[0096] The first pressing portion **66***e* is formed to be located further downward than the second pressing portion **66***f* in a case where the pressing head **66** is at the pressing position Psb. Accordingly, when the swing arm **63** rotates and the pressing head **66** is disposed at the pressing position Psb in the second cutting process, the control device **110** causes the first pressing portion **66***e* to press the first position Pw**1** of the connected portion Wb prior to the second pressing portion **66***f*. That is, in the second cutting process, the control device **110** causes the first pressing portion **66***e* to press the first position Pw**1** of the connected portion Wb, causes the first pressing portion **66***e* to press the first position Pw**1** of the connected portion Wb, and then causes the second pressing portion **66***f* to press the second position Pw**2** of the connected portion Wb. By such second cutting process, at least the coupling portion Wc**1** and the coupling portion Wc**2** among the coupling portion Wc**1**, the coupling portion Wc**2**, and the coupling portion Wc**3** of the printed medium W are cut. Therefore, the coupling portion Wc of the printed medium W has a first portion (that is, the first coupling portion Wc**1** and the second coupling portion Wc**2**) that is cut by the second cutting process, and a second portion (that is, the third coupling portion Wc**3**) that is not completely cut by at least the second cutting process. Therefore, after the second cutting process, the control device **110** performs the following second separation process of cutting the entire third coupling portion Wc**3** of the coupling portion Wc to separate the remaining portion Wa from the connected portion Wb. After the first cutting process, the first separation process of cutting the entire third coupling portion Fc**3** of the coupling portion Fc to separate the remaining portion Fa from the connected portion Fb is basically the same as the second separation process. Therefore, the second separation process will be described below as a representative example.

[0097] The pressing unit **6** further includes a cutting unit **67**. The cutting unit **67** is provided at the

pressing end **66***d*. The cutting unit **67** has a triangular shape. In a case where the first pressing portion **66***e* is pressed against the first position Pw**1** and the second pressing portion **66***f* is pressed against the second position Pw**2**, the cutting unit **67** is located on a downstream side in the conveying direction Dc**2** with respect to a downstream end in the conveying direction Dc**2** of the linear weak portion Wd of the printed medium W. In a case where the first pressing portion **66***e* is pressed against the first position Pw**1** and the second pressing portion **66***f* is pressed against the second position Pw**2**, the cutting unit **67** is positioned such that a vertex of a triangular shape is located on an upstream side in the conveying direction Dc**2**.

[0098] In the second separation process, the control device **110** causes the conveying unit **2** to convey the printed medium W in the conveying direction Dc**2** which is an opposite direction to the conveying direction Dc**1** in a state where the connected portion Wb is pressed by the first pressing portion **66***e* and the second pressing portion **66***f* as described above. Accordingly, by cutting the entire third coupling portion Wc**3**, the remaining portion Wa is separated from the connected portion Wb. At this time, in a state where the remaining portion Wa is pressed against the lower plate body **121** by the head body portion **65***b*, the linear weak portion Wd is cut by the cutting unit **67** with a downstream end of the linear weak portion Wd in the conveying direction Dc**2** as a starting point. Thereafter, the remaining portion Wa of the printed medium W is conveyed to the collection box **8** by the conveying unit **2**. That is, the remaining portion Wa of the printed medium W is in a state of surrounding the pressing head **66** only by being separated from the connected portion Wb, and is caught by the pressing head **66** when being conveyed in the conveying direction Dc**2** as it is. However, since the remaining portion Wa of the printed medium W has the linear weak portion Wd and the linear weak portion Wd is cut, the remaining portion Wa is divided into a right end and a left end with the linear weak portion Wd as a boundary. The remaining portion Wa of the printed medium W passes through the pressing head **66** while being divided into the right end and the left end with the linear weak portion Wd as a boundary. Therefore, the remaining portion Wa of the printed medium W is conveyed to the collection box **8** without being caught by the pressing head **66**.

Die Set

[0099] Next, the die set **3** will be described. FIG. **13**A is a perspective view of the die set **3**, and FIG. **13**B is a perspective view of the die set **3** viewed from a direction different from that in FIG. **13**A.

[0100] The die set **3** is configured to connect the front member SE and the back member BE, and, for example, perform caulking of the front member SE and the back member BE. The die set **3** includes the lower die **30**, the lower die **31**, the lower die moving motor **140**, a rotation support table **32**, the upper die **33**, the upper die lifting motor **34**, a first gear **35**, a second gear **36**, a pair of rotary cams **37**, and a support plate **38**, as illustrated in FIGS. **13**A and **13**B.

[0101] The lower die **30** and the lower die **31** are formed in a circular shape in plan view. The lower die **30** and the lower die **31** are disposed to face each other with reference to a center of the rotation support table **32**, and are supported by the rotation support table **32** via a spring **30***s* and a spring **31***s* (FIGS. **16**A and **16**B), respectively. In an initial stage, the lower die **30** is disposed in front of the lower die **31**. The rotation support table **32** has a substantially circular shape in plan view. A gear **32***a* is provided on a side peripheral surface of the rotation support table **32** parallel to an axial direction. The lower die moving motor **140** is provided on a lateral side of the rotation support table **32**. A gear **131** is connected to a rotary shaft of the lower die moving motor **140**. The gear **131** meshes with the gear **32***a* of the rotation support table **32**. Accordingly, in a case where the lower die moving motor **140** is rotationally driven, a drive force thereof is transmitted to the rotation support table **32** via the gears **131** and **32***a*. Accordingly, the rotation support table **32** rotates around the up-down direction Dz. By rotating the rotation support table **32**, either the lower die **30** or the lower die **31** can be positioned at a position (hereinafter, referred to as a second die position) facing the upper die **33** in the up-down direction Dz. A position facing the second die

position in the front-rear direction Dx is referred to as a first die position. The first die position is a position sandwiched between the front member slope **43** of the front member feed unit **4** and the back member slope **53** of the back member feed unit **5**. In a case where the lower die **30** is at the first die position, the lower die **30** receives the front member SE from the front member feed unit **4**. On the other hand, in a case where the lower die **31** is at the first die position, the lower die **31** receives the back member BE from the back member feed unit **5**.

[0102] The support plate **38** is erected on the lateral side of the rotation support table **32**. The upper die lifting motor **34** is disposed on the support plate **38**. A third gear (not illustrated) is connected to a rotary shaft of the upper die lifting motor **34**. The third gear meshes with the first gear **35**. The first gear **35** is provided with a fourth gear (not illustrated) coaxially with the first gear **35**. The fourth gear meshes with the second gear **36**. A pair of rotary cams **37** are connected to the second gear **36**.

[0103] The support plate **38** is provided with a plate member **38***a* extending in the front-rear direction Dx toward above the lower die **31**. The upper die **33** is located below the plate member **38***a*. The upper die **33** includes an inner die **33***a* and an annular outer die **33***b* provided below the inner die **33***a* coaxially with the inner die **33***a* and having an inner diameter larger than an outer diameter of the inner die **33***a*. The inner die **33***a* is provided with a pair of pressed members **33***c* provided below the plate member **38***a* and extending in the left-right direction Dy. One rotary cam **37***a* of the pair of rotary cams **37** presses one of the pressed members **33***c* downward, and the other rotary cam **37***b* of the pair of rotary cams **37** presses the other pressed member **33***c* downward. In such a configuration, in a case where the upper die lifting motor **34** is rotationally driven, a drive force thereof is transmitted to the second gear **36** via the third gear, the first gear **35**, and the fourth gear. Accordingly, the second gear **36** rotates in a rotation direction Dr**2**, and the pair of rotary cams **37** also rotate in the rotation direction Dr**2** accordingly. At this time, the rotary cam **37***a* pushes down one of the pressed members **33***c*, and the rotary cam **37***b* pushes down the other pressed member **33***c*, so that the inner die **33***a* can be slid with respect to the outer die **33***b* and lowered to the lower die **30** or the lower die **31**. The upper die **33** can be raised above the lower dies **30** and **31** by reversely rotating the upper die lifting motor **34**.

[0104] FIG. **14**A illustrates perspective views of the front member SE and the back member BE, and FIG. **14**B is a cross-sectional view of the button product **200** manufactured by connecting the front member SE and the back member BE illustrated in FIG. **14**A.

[0105] The front member SE and the back member BE each have a circular shape in plan view. As illustrated in FIGS. **14**A and **14**B, the front member SE is a member in which a peripheral edge portion SEa protrudes downward, and the back member BE is a member in which a peripheral edge portion BEa protrudes upward. The button product **200** is formed by connecting, specifically caulking, to the back member BE, the front member SE and the connected portion Wb of the printed medium W that are separated and held by the upper die **33**. The button product **200** is, for example, a button badge. In a state where a peripheral edge portion Fg of the connected portion Fb and a peripheral edge portion Wg of the connected portion Wb that are disposed on the front member SE are bent and sandwiched between the peripheral edge portion SEa and the peripheral edge portion BEa, the peripheral edge portion SEa and the peripheral edge portion BEa are caulked. Hereinafter, a method of manufacturing the button product **200** using the upper die **33** and the lower dies **30**,**31** will be described.

[0106] FIG. **15**A, FIG. **15**B, FIG. **16**A, and FIG. **16**B are sectional views of the upper die **33** and the lower die **30**, **31** for illustrating a caulking process of the front member SE and the back member BE. In FIGS. **15**A, **15**B, **16**A, and **16**B, the connected portion Fb is not illustrated. As illustrated in FIG. **15**A, the lower die **30** includes, for example, a columnar pedestal **30***a*, a cylindrical slide die **30***b* that slides up and down along an outer peripheral surface of the pedestal **30***a*, and the above-described spring **30***s* that biases the slide die **30***b* upward. The pedestal **30***a* includes an upper end outer peripheral surface **30***a***1** and the inner bottom surface **30***a***2**. The slide

die **30***b* includes an upper end inner peripheral surface **30***b***1**, a guide wall **30***b***2**, and the placement surface **30***b***5**.

[0107] In a case where the lower die **30** is at the first die position, the front member SE is disposed on the inner bottom surface **30***a***2** which is an upper surface of the pedestal **30***a* of the lower die **30**. The inner bottom surface **30***a***2** of the pedestal **30***a* is formed in a circular shape slightly smaller than an inner diameter of the front member SE. The annular guide wall **30***b***2** is provided at an upper end edge portion of the slide die **30***b*. The guide wall **30***b***2** has an upper end surface **30***b***3**. The connected portion Wb is placed on the placement surface **30***b***5**, which is an inner surface of the guide wall **30***b***2**, of an upper surface of the slide die **30***b*. Further, a diameter of the upper end inner peripheral surface **30***b***1** of the slide die **30***b* is larger than a diameter of the upper end outer peripheral surface **30***a***1** of the pedestal **30***a*. Accordingly, a gap **30***b***4** is formed between the upper end inner peripheral surface **30***b***1** and the upper end outer peripheral surface **30***a***1**. The gap **30***b***4** also includes, as a part of the gap **30***b***4**, a space between the upper end outer peripheral surface **30***a***1** of the pedestal **30***a* and an inner peripheral surface **33***b***2** of the outer die **33***b* to be described later. The placement surface **30***b***5** surrounds the inner bottom surface **30***a***2** and is located above the inner bottom surface **30***a***2**.

[0108] The upper die **33** includes the inner die **33***a* and the outer die **33***b* that holds the inner die **33***a*. The inner die **33***a* is held so as to be slide downward in the outer die **33***b*. A pressing surface **33***a***1** of the inner die **33***a* has a diameter equal to or slightly larger than a diameter of the inner bottom surface **30***a***2** of the pedestal **30***a*.

[0109] The outer die **33***b* has an annular end surface **33***b***1** as a lower surface of the outer die **33***b*. After the lower die **30** is moved to the second die position by the rotation of the rotation support table **32**, in a case where the outer die **33***b* is lowered, the end surface **33***b***1** comes into contact with the upper end surface **30***b***3** of the guide wall **30***b***2** of the slide die **30***b*, and pushes down the slide die **30***b* to a predetermined position against a biasing force of the spring **30***s* as illustrated in FIG. **15**B. Thereafter, the upper die **33** is raised to separate the front member SE from the lower die **30**. A diameter of the inner peripheral surface **33***b***2** of a lower end of the outer die **33***b* is slightly larger than the diameter of the inner bottom surface **30***a***2** of the pedestal **30***a* and the diameter of the upper end outer peripheral surface **30***a***1** of the pedestal **30***a*. Accordingly, when the upper die **33** is crimped to the lower die **30**, a peripheral edge portion of the front member SE, a peripheral edge portion of the connected portion Fb, and a peripheral edge portion of the connected portion Wb are folded downward between the upper end outer peripheral surface **30***a***1** of the pedestal **30***a* and the inner peripheral surface **33***b***2** of the outer die **33***b*, and are disposed in the gap **30***b***4**.

[0110] In a case where the lower die **30** is moved to the second die position, the lower die **31** is moved to the first die position accordingly. In a case where the lower die **31** is at the first die position, the back member BE is disposed on an upper surface of the pedestal **31***a* of the lower die **31**. As illustrated in FIG. **16**A, the lower die **31** includes, for example, a columnar pedestal **31***a*, a cylindrical slide die **31***b* that slides up and down along an outer peripheral surface of the pedestal **31***a*, and the above-described spring **31***s* that biases the slide die **31***b* upward.

[0111] The pedestal **31***a* has an annular upper end portion **31***a***1**. An outer diameter of the upper end portion **31***a***1** is substantially the same as a diameter of the pressing surface **33***a***1** of the inner die **33***a* of the upper die **33**. The outer diameter of the upper end portion **31***a***1** is slightly larger than a diameter of the back member BE. The back member BE is disposed on the upper end portion **31***a***1** of the pedestal **31***a*. In a state where the back member BE is disposed on the upper end portion **31***a***1**, a space **31***a***3** is formed between the back member BE and a groove portion **31***a***2** provided in the pedestal **31***a*. For example, when a pin or the like is provided in the back member BE, the pin or the like can be disposed in the space **31***a***3**, and thus interference of the pin or the like with the pedestal **31***a* can be avoided.

[0112] The slide die **31***b* has an annular end surface **31***b***1** as an upper surface of the slide die **31***b* and an inner peripheral surface **31***b***3** of the slide die **31***b*. A tapered surface **31***b***2** inclined

downward toward an upper end of the inner peripheral surface **31***b***3** of the slide die **31***b* is formed inside the end surface **31***b***1**. The tapered surface **31***b***2** functions as a guide surface in which the peripheral edge portion of the front member SE and the peripheral edge portion of the connected portion Wb extending outward from the peripheral edge portion are rolled up inside the slide die **31***b* when the front member SE and the back member BE are caulked.

[0113] An upper edge of the inner peripheral surface **31***b***3** of the slide die **31***b* is positioned at a position higher than an upper surface of an upper end portion **31***a***1** of the pedestal **31***a*. Accordingly, the inner peripheral surface **31***b***3** functions as a guide surface when the back member BE is located on the upper end portion **31***a***1** of the pedestal **31***a*.

[0114] After the lower die **31** is moved to the second die position by the rotation of the rotation support table **32** in a state where the back member BE is disposed on the pedestal **31***a* of the lower die **31**, in a case where the outer die **33***b* of the upper die **33** is lowered, the end surface **33***b***1** comes into contact with the end surface **31***b***1** of the slide die **31***b*, and pushes down the slide die **31***b* to a predetermined position against the biasing force of the spring **31***s*. In a case where the outer die **33***b* of the upper die **33** pushes down the slide die **31***b* to a predetermined position against the biasing force of the spring **31***s*, the peripheral edge portion Wg of the connected portion Wb comes into contact with the peripheral edge portion BEa of the back member BE and is folded between the peripheral edge portion SEa of the front member SE and the peripheral edge portion BEa of the back member BE. After the peripheral portion of the connected portion Wb is folded, the peripheral edge portion of the connected portion Wb that covers the peripheral edge portion SEa of the front member SE comes into contact with the tapered surface **31***b***2** and is guided by the tapered surface **31***b***2**. As the peripheral edge portion of the connected portion Wb is guided, the peripheral edge portion SEa of the front member SE is pressed and deformed by the tapered surface **31***b***2**, and the connected portion Wb is crimped together with the back member BE on the pedestal **31***a*. As a result, as illustrated in FIG. **16**B, the front member SE and the back member BE are caulked so that the peripheral edge portion of the connected portion Wb extending outward from the peripheral edge portion of the front member SE is sandwiched between the front member SE and the back member BE, whereby the button product **200** is manufactured.

Take-Out Unit

[0115] Next, the take-out unit **7** will be described. FIG. **17** is a perspective view of the take-out unit **7**, and FIG. **18** is a diagram illustrating the taking-out of the button product **200** by the take-out unit **7** in FIG. **17**.

[0116] The take-out unit **7** has a function of, after the lower die **31** holding the button product **200** moves from the second die position to the first die position by the rotation of the rotation support table **32**, removing the button product **200** from the lower die **31** and guiding the button product **200** to the button product container **9** disposed in front of the take-out unit **7**. The take-out unit **7** is disposed in front of the front member feed unit **4**. As illustrated in FIG. **17**, the take-out unit **7** includes the take-out motor **70**, a swing arm **71**, a magnet member **72**, a seat portion **73**, and drive gears Ga**6** and Ga**7**.

[0117] A rotary shaft of the take-out motor **70** is connected to the drive gear Ga**6**. The drive gear Ga**6** meshes with the drive gear Ga**7**. The swing arm **71** is connected to the drive gear Ga**7**. In a case where the take-out motor **70** is rotationally driven to rotate the drive gear Ga**6**, a drive force thereof is transmitted to the swing arm **71** via the drive gear Ga**7**. Accordingly, the swing arm **71** rotates in a rotation direction Dr**3** in FIG. **17**. Specifically, for example, in a case where the drive gear Ga**7** rotates forward, the swing arm **71** rotates from a collection position Psc in FIG. **17** to a taking-out position Psd (FIG. **18**) which is a position where the button product **200** held by the lower die **31** is taken out. On the other hand, for example, when the drive gear Ga**7** reversely rotates, the swing arm **71** rotates from the taking-out position Psd to the collection position Psc. When the swing arm **71** takes out the button product **200** at the taking-out position Psd, the button product **200** adheres to a magnet member **72** made of, for example, a permanent magnet provided

at a leading end of the swing arm **71**. With the button product **200** adhering to the magnet member **72**, the swing arm **71** rotates from the taking-out position Psd to the collection position Psc.

[0118] The seat portion **73** extends toward the button product container **9**. The seat portion **73** includes a seat surface **73***a* and a guide portion **73***b*. The seat surface **73***a* is an inclined surface that is lowered toward the guide portion **73**. The seat surface **73***a* is provided with a groove portion **73***c* in a direction in which the swing arm **71** extends. The collection position Psc is a position where the swing arm **71** enters and fits into the groove portion **73***c*. An upper surface of the magnet member **72** of the swing arm **71** positioned at the collection position Psc is located at a position lower than an upper end of the groove portion **73***c*. Immediately before the swing arm **71** rotates from the taking-out position Psd toward the collection position Psc and fits into the groove portion **73***c*, the button product **200** comes into contact with the seat surface **73**. Accordingly, the button product **200** adhering to the magnet member **72** is detached from the magnet member **72**. Thereafter, the button product **200** is guided to the guide portion **73** along the inclination of the seat surface **73**. The button product **200** is guided by the guide portion **73***b* and then stored in the button product container **9**.

Flow of Overall Processing

[0119] FIG. **19** is a flowchart illustrating a flow of a process by the button product manufacturing device **100**. As illustrated in FIG. **19**, first, the control device **110** determines whether there is an instruction to manufacture a button product from the user (step S**1**). When there is no instruction to manufacture a button product (No in step S**1**), the control device **110** waits as it is.

[0120] When there is an instruction to manufacture a button product (Yes in step S**1**), the control device **110** causes the front member feed unit **4** to feed the front member SE to the lower die **30** (step S**2**). Next, the control device **110** causes the conveying unit **2** to convey the white film F onto the front member SE (step S**3**).

[0121] Next, the control device **110** causes the pressing unit **6** to cut the coupling portion Fc of the white film F (step S**4**). Then, the control device **110** causes the conveying unit **2** to separate the remaining portion Fa of the white film F from the connected portion Fb and to convey the separated remaining portion Fa to the collection box **8** (step S**5**).

[0122] Subsequently, the control device **110** causes the conveying unit **2** to convey the printed medium W printed by the printing unit **1** onto the connected portion Fc of the white film F (step S**6**). Next, the control device **110** causes the pressing unit **6** to cut the coupling portion Wc of the printed medium W (step S**7**). Then, the control device **110** causes the conveying unit **2** to separate the remaining portion Wa of the printed medium W from the connected portion Wb and to convey the separated remaining portion Wa to the collection box **8** (step S**8**).

[0123] Next, the control device **110** causes the rotation support table **32** to move the lower die **30** from the first die position to the second die position such that the lower die **30** is located below the upper die **33** in the die set **3**, and then causes the upper die **33** to hold the front member SE and the connected portions Wb and Fb that are held by the lower die **30** (step S**9**). The control device **110** causes the back member feed unit **5** to feed the back member BE to the lower die **31** that is moved to the first die position along with the movement of the lower die **30** (step S**10**).

[0124] Subsequently, the control device **110** causes the rotation support table **32** to move the lower die **31** from the first die position to the second die position such that the lower die **31** holding the front member SE and the connected portions Wb and Fb is located below the upper die **33**, and then causes the upper die **33** to be lowered and performs a caulking process (step S**11**). Accordingly, the button product **200** is manufactured. Thereafter, the control device **110** causes the rotation support table **32** to move the lower die **31** from the second die position to the first die position such that the lower die **31** holding the button product **200** is located at the first die position, and then causes the take-out unit **7** to take out the button product **200** (step S**12**). Accordingly, the button product **200** is placed into the button product container **9**. After the taking-out of the button product **200** by the take-out unit **7** is finished, the control device **110** causes the

rotation support table **32** to move the lower die **30** at the second die position to the first die position.

[0125] Thereafter, the control device **110** determines whether a predetermined number of button products **200** is manufactured (step S**13**). When the predetermined number of button products **200** is not manufactured (No in step S**13**), the control device **110** returns to the process of step S**2** and repeats the subsequent process. On the other hand, when the predetermined number of button products **200** is manufactured (Yes in step S**13**), the control device **110** ends the button product manufacturing process.

[0126] As described above, according to the button product manufacturing device **100** in the present embodiment, the printed medium W is conveyed by the conveying unit **2** above the front member SE supported by the lower die **30**. Accordingly, the conveying accuracy of the printed medium W with respect to the front member SE is improved. Therefore, the button product **200** can be manufactured with high accuracy. In addition, a labor of the user is not required for manufacturing the button product **200**.

[0127] In the present embodiment, the control device **110** performs a process of causing the conveying unit **2** to convey the printed medium W onto the front member SE supported by the lower die **30**. Accordingly, the conveying of the printed medium W with respect to the front member SE is appropriately controlled.

[0128] In the present embodiment, after the conveying process of the printed medium W with respect to the front member SE, at least the first coupling portion Wc**1** and the second coupling portion Wc**2** of the coupling portion Wc are cut by pressing at least the connected portion Wb of the printed medium W against the lower die **30** by the pressing unit **6**. In a state where the connected portion Wb is pressed by the first pressing portion **66***e* and the second pressing portion **66***f*, the printed medium W is conveyed by the conveying unit **2** in the conveying direction Dc**2** which is an opposite direction to the conveying direction Dc**1**, so that the remaining portion Wa is separated from the connected portion Wb. As described above, the two-stage processes of the cutting process and the separation process makes it easier to separate the remaining portion Wa from the connected portion Wb than in a case where only the separation process is performed.

[0129] Further, in the present embodiment, since the coupling portion Wc forms a weak portion having a smaller strength than the connected portion Wb and the remaining portion Wa, the coupling portion Wc is easily cut in the cutting process.

[0130] In the present embodiment, after the separation process, the conveying unit **2** conveys the remaining portion Wa of the printed medium W in the conveying direction Dc**2**, so that the remaining portion Wa is conveyed to the collection box **8**. Accordingly, the remaining portion Wa can be easily discarded to the collection box **8** only by the conveyance by the conveying unit **2**.

[0131] In the present embodiment, the total number of the first coupling portions Wc**1** and the second coupling portions Wc**2** is smaller than the number of the third coupling portions Wc**3**. Accordingly, in the cutting process, only the first coupling portion Wc**1** and the second coupling portion Wc**2** are easily cut without cutting the third coupling portion Wc**3** of the coupling portion Wc as much as possible.

[0132] In the present embodiment, the strength of the linear weak portion Wd of the printed medium W is smaller than that of the connected portion Wb and the remaining portion Wa. Accordingly, when the remaining portion Wa is conveyed in the conveying direction Dc**2** by the conveying unit **2**, the linear weak portion Wd is easily cut by the cutting unit **67**.

[0133] Further, in the present embodiment, one front member SE supplied from the front member stocker **40** onto the front member slope **43** is pushed out by the pusher main body **45***a* and sent out in the feed direction D**1** toward the lower die **30**. Accordingly, the front member SE can be supplied to the lower die **30** with high accuracy.

[0134] Further, in the present embodiment, since the acute angle formed by the first straight line L**1** and the second straight line L**2** is larger than 0 degrees and equal to or smaller than 30 degrees, a

dimension of the button product manufacturing device **100** in the left-right direction Dy can be made relatively small, and thus the button product manufacturing device **100** can be made compact.
[0135] In the present embodiment, the front member slope **43** has a notch **43***a* at a downstream end of the front member SE in the feed direction D**1**. Accordingly, when the front member SE is supplied to the lower die **30** from the downstream end of the front member slope **43**, it is possible to limit or prevent the upstream end of the front member SE (that is, an end on a side opposite to a side where lower die **30** is present) from being caught by the front member slope **43**.
[0136] Further, in the present embodiment, the white film F is conveyed onto the front member SE by the conveying unit **2** prior to the printed medium W. The front member SE and the back member BE in which the connected portion Wb of the printed medium W is crimped onto the connected portion Fb of the white film F are crimped. Accordingly, in the button product **200**, the background of an image or the like printed on the connected portion Wb can be made white, thereby improving the appearance of the image.

Modifications

[0137] The present invention is not limited to the above-described embodiment, and modifications can be adopted without departing from the gist of the present invention. For example, the present invention is modified as follows.
[0138] FIG. **20**A is a diagram illustrating a first modification of a cutting configuration of the coupling portion Wc of the printed medium W, and FIG. **20**B is a diagram illustrating a second modification of the cutting configuration of the coupling portion Wc of the printed medium W. As illustrated in FIG. **20**A, the button product manufacturing device **100** may include a pressed portion **201** against which the printed medium W is pressed, and a lower die moving portion **202** that moves the lower die **30** holding the printed medium W in a direction approaching and a direction separating from the pressed portion **201**. After the conveying process of the printed medium W to the lower die **30**, the control device **110** causes the lower die moving portion **202** to move the lower die **30** to approach the pressed portion **201**. Accordingly, a pressing process of cutting the coupling portion Wc by pressing the connected portion Wb of the printed medium W against the pressed portion **201** may be performed. The lower die moving portion **202***a* is an example of a lower die transport.
[0139] As illustrated in FIG. **20**B, the button product manufacturing device **100** may include a suction device **203** disposed at a position different from a position of the lower die **30**. The suction device **203** has a plurality of suction holes **204** on a side facing the lower die **30**. After the conveying process of the printed medium W to the lower die **30**, the control device **110** may perform a cutting process of causing the suction device **203** to suck the connected portion Wb of the printed medium W to cut the coupling portion Wc.
[0140] FIG. **21**A is a diagram illustrating a third modification of the cutting configuration of the coupling portion Wc of the printed medium W, and FIG. **21**B is a diagram illustrating a fourth modification of the cutting configuration of the coupling portion Wc of the printed medium W. As illustrated in FIG. **21**A, the button product manufacturing device **100** may include a cutter device **205** movable in parallel to the printed medium W. The cutter device **205** includes a cutter **206** on a side facing the lower die **30**. After the conveying process of the printed medium W to the lower die **30**, the control device **110** may perform a cutting process of causing the cutter **206** of the cutter device **205** to cut the coupling portion Wc. The cutter **206** is movable back and forth in the up-down direction from a main body of the cutter device **205**, and moves back and forth so as to come into contact with the printed medium W when cutting the coupling portion Wc, and not to come into contact with the printed medium W when not cutting the coupling portion Wc. The cutter device is an example of a cutter transport.
[0141] Further, in the button product manufacturing device **100**, as illustrated in FIG. **21**B, the lower die **30** may include a cutter **207** on a surface facing the printed medium W. After the conveying process of the printed medium W to the lower die **30**, the control device **110** may

perform a cutting process of moving the upper die **33** to approach the lower die **30** and pressing the upper die **33** against the printed medium W to cause the upper die **33** and the cutter **207** to cut the coupling portion Wc.

[0142] FIG. **22** is a diagram illustrating a fifth modification of the cutting configuration of the coupling portion Wc of the printed medium W. As illustrated in FIG. **22**, a conveying unit **208** having a first conveying path **209** along which the printed medium W is conveyed toward the lower die **30** and a second conveying path **210** that is a conveying path different from the first conveying path **209** and in an opposite direction to the first conveying path **209** and along which the printed medium W is conveyed in a direction away from the lower die **30** may be adopted. The conveying unit **208** includes a conveying roller, and further includes a driven roller **211** constituting the first conveying path **209** and a driven roller **212** constituting the second conveying path **210**. The first conveying path **210** has a U shape. Specifically, the second conveying path **210** extends along a direction folded back in an opposite direction to the first conveying path **209** with the downstream end of the first conveying path **209** as a base point. The control device **110** causes the conveying unit **208** to convey the connected portion Wb of the printed medium W and the remaining portion Wa along the first conveying path **209**. In this case, when the printed medium W is folded back from the first conveying path **209** to the second conveying path **210**, the connected portion Wb of the printed medium W is separated from the remaining portion Wa and falls toward the lower die **30** along the direction D**40**. Accordingly, the connected portion Wb is supplied to the lower die **30**. On the other hand, the remaining portion Wa after the connected portion Wb is separated is conveyed along the second conveying path **210**. Accordingly, only the remaining portion Wa of the printed medium W is cut and conveyed along the second conveying path **210**.

[0143] FIG. **23** is a diagram illustrating a modification of a shape of the connected portion Wb of the printed medium W. As illustrated in FIG. **23**, the printed medium W**1** may include, for example, a connected portion Wb**1** having an elliptical shape in plan view, a remaining portion Wa**1** different from the connected portion Wb**1**, a plurality of coupling portions Wc**10** coupling the connected portion Wb**1** and the remaining portion Wa**1**, and a linear weak portion Wd**1**. Alternatively, the printed medium W may be formed in a circular shape in plan view. In this case, the cutting process by the pressing unit **6** and the separation process by the conveying unit **2** are not required, which is simple. The shape of the connected portion Wb is not limited to the above-described shape, and various shapes can be adopted.

[0144] FIG. **24** is a diagram illustrating a first modification of a relation between the conveying direction of the printed medium W and movement directions of the two lower dies **221**, **222**. FIG. **25** is a diagram illustrating a second modification of a relation between the conveying direction of the printed medium W and the movement directions of the two lower dies **221**, **222**.

[0145] The conveying direction of the printed medium W and the movement directions of the two lower dies **221**, **222** may be the same. In this case, as an example, as illustrated in FIG. **24**, the printed medium W is conveyed along a conveying direction D**20**. The two lower dies **221**, **222** are supported by a slide portion **220**. The lower die **222** is disposed on a downstream side of the lower die **221** in the conveying direction D**20**. The slide portion **220** is slidable in a movement direction D**21** which is the same direction as the conveying direction D**20** and a movement direction D**22** which is an opposite direction to the movement direction D**21** while holding the lower dies **221**, **222**. When the slide portion **220** is at an initial position (that is, a position before moving in the movement direction D**21**), the upper die **223** is positioned above the lower die **222**. For example, when the slide portion **220** is at the initial position, the front member SE is conveyed to the lower die **221** by a feed unit (not illustrated). Thereafter, the printed medium W is conveyed in the conveying direction D**20** by a conveying unit (not illustrated) onto the front member SE held by the lower die **221**. When the lower die **222** is positioned at a predetermined position to which the slide portion **220** has moved along the movement direction D**21**, the back member BE is supplied to the lower die **222** by the feed unit (not illustrated), and at this time, the front member SE held by the

lower die **221** moved below the upper die **223** is held by the upper die **223** by lowering the upper die **223**. Thereafter, when the slide portion **220** moves in the movement direction D**22** and returns to the initial position, the caulking process may be performed by lowering the upper die **223** holding the front member SE with respect to the lower die **222** holding the back member BE.

[0146] As another example, as illustrated in FIG. **25**, the printed medium W is conveyed along a conveying direction D**23** which is a direction perpendicular to the movement directions D**21** and D**22** of the slide portion **220**. The lower die **222** is disposed on the downstream side of the lower die **221** in the movement direction D**21**. When the slide portion **220** is at the above-described initial position, the front member SE is conveyed to the lower die **221** by the feed unit (not illustrated). When the lower die **222** is positioned at the predetermined position to which the slide portion **220** has moved along the movement direction D**21**, the back member BE is supplied to the lower die **222** by the feed unit (not illustrated). At this time, the printed medium W is conveyed in the conveying direction D**20** by the conveying unit (not illustrated) onto the front member SE held by the lower die **221** moved below the upper die **223**, and then the front member SE held by the lower die **221** is held by the upper die **223** by lowering the upper die **223**. Thereafter, when the slide portion **220** moves in the movement direction D**22** and returns to the initial position, the caulking process may be performed by lowering the upper die **223** holding the front member SE with respect to the lower die **222** holding the back member BE.

[0147] Alternatively, a configuration based on the following production line may be adopted. FIG. **26** is a diagram illustrating a relation between the conveying direction of the printed medium W and movement directions of the front member SE and the back member BE. As illustrated in FIG. **26**, the front member SE and the back member BE may be conveyed along, for example, an annular conveying path **237**. The conveying path **237** rotates in a rotation direction Dr**4** in a state where the front member SE and the back member BE are alternately disposed. Around the conveying path **237**, a back member feed unit **230**, a front member feed unit **231**, a printing unit **232**, a peeling unit **233**, a caulking unit **234**, and a take-out unit **235** are provided in this order along the rotation direction Dr**4**. The back member BE is supplied to the conveying path **237** by the back member feed unit **230**. The front member SE is supplied to the conveying path **237** by the front member feed unit **231**. When the front member SE is conveyed to a predetermined peeling position by the peeling unit **233** in the conveying path **237**, the printed medium W on which printing is performed by the printing unit **232** is conveyed along the conveying direction D**30** and is disposed on the front member SE. In this state, the remaining portion Wa of the printed medium W is peeled off by the peeling unit **233**, whereby the remaining portion Wa is separated from the connected portion Wb. In the caulking unit **234**, after the front member SE on which the connected portion Wb is disposed is temporarily held by the upper die, the back member BE on an upstream side in the rotation direction Dr**4** is conveyed to a predetermined caulking position in the conveying path **237**, and the caulking process of the back member BE and the front member SE is performed to manufacture the button product **200**. The manufactured button product **200** is conveyed to a predetermined taking-out position by the take-out unit **235** along the conveying path **237**, and then is taken out by the take-out unit **235** and accumulated in an accumulation unit **236**.

[0148] In the above embodiment, the lower plate body **121** is provided with the rectangular notch **123** that opens at the front portion of the lower plate body **121**, and the notch **124** that opens adjacent to the trailing end of the notch **123** and protrudes rearward and has a semicircular shape. However, the present invention is not limited thereto. The lower plate body **121** may be provided with a through hole. Since the notch **123** opens at the front portion of the lower plate body **121**, the material cost can be reduced. When the lower plate body **121** is desired to have strength, it is preferable to provide a through hole.

[0149] In the above embodiment, the notch **124** has a convex and semicircular shape. However, the present invention is not limited thereto. The notch **124** may have a rectangular shape. The notch **124** may have three or more corners.

[0150] Further, in the above embodiment, the bearing wall **125** is erected on the lower plate body **121**. The lower plate body **121** and the bearing wall **125** may be integrally formed of the same material. Further, the lower plate body **121** and the bearing wall **125** may be separate members, and the lower plate body **121** and the bearing wall **125** may be connected to each other. When the lower plate body **121** and the bearing wall **125** are separate members, the lower plate body **121** and the bearing wall **125** may be made of the same material or different materials.
[0151] Further, in the above embodiment, the bearing wall **130** is erected on the upper plate Mp**2**, and the upper plate Mp**2** and the bearing wall **130** may be integrally formed of the same material. The upper plate Mp**2** and the bearing wall **130** may be separate members, and the upper plate Mp**2** and the bearing wall **130** may be connected to each other. When the upper plate Mp**2** and the bearing wall **130** are separate members, the upper plate Mp**2** and the bearing wall **130** may be made of the same material or different materials.
[0152] In the above-described embodiment, the second drive circuit **116** drives the conveying motor **23** when the printed medium W supplied from the printing unit **1** is detected by the first conveying sensor S**1**. The control device **110** performs a process of causing the upper die **33** to separate the front member SE and the connected portion Wb of the printed medium W from the lower die **30**, and a process of connecting, to the back member BE, the front member SE and the connected portion Wb of the printed medium W that are separated by the upper die **33**. However, the control device **110** may additionally perform a process of causing the conveying unit **2** to convey the printed medium W onto the front member SE supported by the lower die **30**. That is, the control device **110** performs a process of causing the conveying unit **2** to convey the printed medium W onto the front member SE supported by the lower die **30**, a process of causing the upper die **33** to separate the front member SE and the connected portion Wb of the printed medium W from the lower die **30**, and a process of connecting, to the back member BE, the front member SE and the connected portion Wb of the printed medium W that are separated by the upper die **33**.
[0153] The control device **110** may cause the second drive circuit **116** to drive the conveying unit **2** after an image is printed on the printed medium W by the printing unit **1**, instead of causing the second drive circuit **116** to drive the conveying motor **23** when the printed medium W is detected by the first conveying sensor S**1**. The control device **110** may cause the second drive circuit **116** to drive the conveying unit **2** before an image is printed on the printed medium W by the printing unit **1**, instead of causing the second drive circuit **116** to drive the conveying motor **23** when the printed medium W is detected by the first conveying sensor S**1**. The control device **110** may cause the second drive circuit **116** to drive the conveying unit **2** when an image is printed on the printed medium W by the printing unit **1**, instead of causing the second drive circuit **116** to drive the conveying motor **23** when the printed medium W is detected by the first conveying sensor S**1**.

Claims

1. A button product manufacturing device for manufacturing a button product by connecting a front member and a back member, the button product manufacturing device comprising: a printer configured to perform printing on a printed medium; a die set including: a lower die configured to support the front member; and an upper die configured to separate the front member from the lower die; and a conveyor configured to convey the printed medium above the front member, in a conveying direction from the printer toward the die set.
2. The button product manufacturing device according to claim 1, further comprising: a controller, wherein the controller is configured to perform: a conveying process of causing the conveyor to convey the printed medium onto the front member supported by the lower die; a process of causing the upper die to separate the front member and the printed medium from the lower die; and a process of connecting, to the back member, the front member and the printed medium that are separated by the upper die.

3. The button product manufacturing device according to claim 2, further comprising: a forming press configured to press the printed medium against the lower die, wherein the printed medium includes: a sheet-shaped connected portion connected to the front member and the back member; a sheet-shaped remaining portion different from the connected portion; and a coupling portion coupling the connected portion and the remaining portion, and after the conveying process, the controller is configured to perform a cutting process of causing the forming press to press at least the connected portion of the printed medium against the lower die to cut at least a part of the coupling portion.

4. The button product manufacturing device according to claim 2, further comprising: a pressed portion against which the printed medium is pressed; and a lower die transport configured to move the lower die in a direction approaching the pressed portion and in a direction separating from the pressed portion, wherein the printed medium includes: a sheet-shaped connected portion connected to the front member and the back member; a sheet-shaped remaining portion different from the connected portion; and a coupling portion coupling the connected portion and the remaining portion, and after the conveying process, the controller is configured to perform a pressing causing the lower die transport to move the lower die toward the pressed portion to cut the coupling portion by pressing the connected portion of the printed medium against the pressed portion.

5. The button product manufacturing device according to claim 2, further comprising: a suction device disposed at a position different from a position of the lower die, wherein the printed medium includes: a sheet-shaped connected portion connected to the front member and the back member; a sheet-shaped remaining portion different from the connected portion; and a coupling portion coupling the connected portion and the remaining portion, and after the conveying process, the controller performs a cutting process of causing the suction device to suck the connected portion of the printed medium to cut the coupling portion.

6. The button product manufacturing device according to claim 2, further comprising: a cutter transport configured to be moved in parallel to the printed medium placed on the front member, wherein the printed medium includes: a sheet-shaped connected portion connected to the front member and the back member; a sheet-shaped remaining portion different from the connected portion; and a coupling portion coupling the connected portion and the remaining portion, and after the conveying process, the controller is configured to perform a cutting process of causing the cutter transport to cut the coupling portion.

7. The button product manufacturing device according to claim 2, wherein the printed medium includes: a sheet-shaped connected portion connected to the front member and the back member; a sheet-shaped remaining portion different from the connected portion; and a coupling portion coupling the connected portion and the remaining portion, the lower die includes a cutter on a surface facing the printed medium, and after the conveying process, the controller performs a cutting process of moving the upper die to approach the lower die and pressing the upper die against the printed medium to cause the upper die and the cutter to cut the coupling portion.

8. The button product manufacturing device according to claim 2, wherein the printed medium includes: a sheet-shaped connected portion connected to the front member and the back member; a sheet-shaped remaining portion different from the connected portion; and a coupling portion coupling the connected portion and the remaining portion, the conveyor is formed with: a first conveying path via which the printed medium is conveyed toward the lower die; and a second conveying path different from the first conveying path and via which the printed medium is conveyed in a direction away from the lower die, and the controller is configured to cause the conveyor to convey the printed medium such that the connected portion and the remaining portion of the printed medium are conveyed via the first conveying path, and the remaining portion of the printed medium is conveyed via the second conveying path.

9. The button product manufacturing device according to claim 1, wherein the front member has a circular shape in plan view, and the printed medium is formed in a circular shape in plan view.

10. The button product manufacturing device according to claim 3, wherein the coupling portion forms a weak portion having lower strength than the connected portion and the remaining portion.
11. The button product manufacturing device according to claim 3, wherein the coupling portion includes: a first portion to be cut by the cutting process; and a second portion not to be cut by the cutting process, and after the cutting process, the controller performs a separation process of cutting the second portion of the coupling portion to separate the remaining portion from the connected portion.
12. The button product manufacturing device according to claim 11, wherein the forming press includes a first pressing portion and a second pressing portion that are at least two pressing portions configured to press the connected portion of the printed medium against the lower die, the controller is configured to: in the cutting process, cause the first pressing portion to press a first position of the connected portion, and then causes the second pressing portion to press a second position of the connected portion; and in the separation process, cause the conveyor to convey the printed medium in an opposite direction to the conveying direction in a state where the connected portion is pressed by the first pressing portion and the second pressing portion.
13. The button product manufacturing device according to claim 3, wherein the forming press includes a pressing head configured to be pressed against the printed medium, the lower die includes: an inner bottom surface configured to support the front member; and a placement surface on which the printed medium is placed, the placement surface surrounding the periphery of the inner bottom surface and being located above the inner bottom surface, and in the cutting process, the controller is configured to press the pressing head to a lower position closer to the inner bottom surface than to the placement surface.
14. The button product manufacturing device according to claim 12, further comprising: a collection container configured to collect the remaining portion, wherein after the separation process, the controller is configured to cause the conveyor to convey the printed medium in the opposite direction to convey the remaining portion to the collection container.
15. The button product manufacturing device according to claim 12, wherein the printed medium includes, at a boundary between the connected portion and the remaining portion, a plurality of the coupling portions and a cutting portion between the coupling portions adjacent to each other, the coupling portions include: first coupling portions coupling the first position and the remaining portion; second coupling portions coupling the second position and the remaining portion; and third coupling portions coupling the remaining portion and a third position in the connected portion excluding the first position and the second position, and a total number of the first coupling portions and the second coupling portions is smaller than the number of the third coupling portions.
16. The button product manufacturing device according to claim 12, wherein the printed medium has a rectangular shape, the remaining portion is disposed to surround the connected portion, and the printed medium includes: a downstream side edge portion located in a downstream side of the printed medium in the conveying direction, and a linear weak portion extending from the downstream side edge portion to the connected portion and having lower strength than the connected portion and the remaining portion.
17. The button product manufacturing device according to claim 16, wherein the forming press includes a cutting unit located on a downstream side in an opposite direction to the conveying direction with respect to a downstream end of the linear weak portion in the opposite direction to the conveying direction in a case where the first pressing portion is pressed against the first position of the printed medium and the second pressing portion is pressed against the second position of the printed medium.
18. The button product manufacturing device according to claim 1, further comprising: a front member feeder configured to feed the front member to the lower die.
19. The button product manufacturing device according to claim 18, wherein the front member feeder includes: a front member stocker configured to accommodate the front member; a pusher

configured to push out the front member toward the lower die; and a front member slope configured to guide the front member pushed out by the pusher toward the lower die.

20. The button product manufacturing device according to claim 19, wherein the lower die has a circular shape in plan view, the front member stocker has a cylindrical shape, and when a straight line intersecting the conveying direction is defined as a first straight line and a straight line connecting a center of the lower die and a center of the front member stocker in plan view is defined as a second straight line, an acute angle formed by the first straight line and the second straight line is more than 0 degrees and 30 degrees or less.

21. The button product manufacturing device according to claim 19, wherein the front member slope has a notch at a downstream end of the front member in a push-out direction.

22. The button product manufacturing device according to claim 21, wherein the notch has an arc shape.

23. The button product manufacturing device according to claim 2, wherein the controller is configured to perform a film conveying process of causing the conveyor to convey a white film such that the white film is placed on the front member prior to the printed medium.

24. The button product manufacturing device according to claim 23, wherein after the cutting process, the printed medium has the same size as the white film or is larger than the white film.

25. A button product manufacturing method for manufacturing a button product by connecting a front member and a back member, the button product manufacturing method comprising: supporting the front member by a lower die; performing printing on a printed medium by a printer; conveying, by a conveyor, the printed medium in a conveying direction above the front member supported by the lower die; separating the front member and the printed medium from the lower die by an upper die; and connecting, to the back member, the front member and the printed medium that are separated by the upper die.

26. A non-transitory computer readable storage medium storing a button product manufacturing program executed by a computer in a button product manufacturing device configured to manufacture a button product by connecting a front member and a back member, the button product manufacturing program being configured to cause the computer to function as: a feed controller configured to feed the front member and cause a lower die to support the front member; a print controller configured to cause a printer to perform printing on a printed medium; a conveying controller configured to cause a conveyor to convey the printed medium in a conveying direction above the front member supported by the lower die; an upper die controller configured to cause an upper die to separate the front member and the printed medium from the lower die; and a connection controller configured to connect, to the back member, the front member and the printed medium that are separated by the upper die.